BANGLADESH DELTA PLAN 2100

Baseline Studies : Volume 6

Governance and Institutional Development

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Dr. Jaap de Heer
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Government of the People's Republic of Bangladesh

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Baseline Studies on Governance and Institutional Development

Volume 6

Baseline Study 22: Institutional Framework and Arrangements

Baseline Study 23 : Information and Knowledge Management

Baseline Study 24 : Regional Cooperation

Baseline Study 25 : Finance Mechanisms & Arrangements in the Water Sector

Baseline Study 26 : Private Sector Engagement in Deltas

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Disclaimer

Baseline studies were conducted to review past performances to generate information and knowledge, identify caveats and draw policy lessons and observe inter-sectoral impacts relating to water resources, land and agricultural practices and analyse climate change impacts. All these have been done to formulate delta action plan based on strategies developed through research by eminent scientists and professionals. Data, information and statements provided in the studies entirely belong to the authors, as such, GED bears no responsibility of inaccuracy, if any of data or statement.

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A H M Mustafa Kamal, FCA, MP
Minister
Ministry of Planning
Government of the People's Republic of Bangladesh

Message

I am happy to know that the General Economics Division (GED) of Bangladesh Planning Commission is publishing the Baseline Studies in six (6) volumes which were prepared for formulation of the Bangladesh Delta Plan (BDP) 2100.

Over the past 47 years since independence Bangladesh has secured tremendous gains in development. Bangladesh has achieved food self-sufficiency and the economy is gradually transforming from an agrarian base towards a modern manufacturing and services economy. Making this growth sustainable is even more challenging in the face of extreme adverse climate variability, with frequent storm and tidal surges, flooding, and droughts. I am confident that the BDP 2100 will amply guide us in realizing the vision that is aspired in the plan of being a prosperous country beyond 2041 and also contribute directly in making the growth sustainable by ensuring long term water and food security, economic growth and environmental sustainability while effectively reducing vulnerability to natural disasters and building resilience to climate change and other delta challenges. I hope BDP 2100 will also contribute to the making of 5 year plans as well as contribute to achieving SDG's and other national policy goals.

The Baseline Studies generated both quantitative and qualitative benchmark information for relevant subject areas of the plan and identified critical areas for future intervention. It also forms the basis for determining strategies and measures that have been suggested in BDP2100 for different climatic Hotspots.

I am particularly pleased to note that BDP 2100 being a techno-economic plan, is the first attempt in our national planning history to formulate a real long term plan prepared by GED. The publication of the Baseline Studies in book form which served as basis for the preparation of the BDP 2100 has immense importance to keep the institutional memory preserved. These will be useful references to the policymakers, development partners, academics, researchers, students and professionals alike to further research endeavor and knowledge sharing.

In this instance, I would congratulate relevant officials of GED of Bangladesh Planning Commission for their hard work in compiling the Baseline Studies in book form. My sincere appreciation goes to the experts in their respective fields for completing the Background Studies for formulation of the BDP 2100.

(A H M Mustafa Kamal, FCA, MP)

M. A. Mannan, MP
State Minister
Ministry of Finance and Ministry of Planning
Government of the People's Republic of Bangladesh

Message

It gives me immense pleasure to learn that the General Economics Division (GED) of Bangladesh Planning Commission is going to publish 26 Baseline Studies in six (6) volumes which have been used as the inputs for preparing the country's first long term Plan i.e. Bangladesh Delta Plan (BDP) 2100. The Baseline Studies of BDP 2100 are the culmination of both quantitative and qualitative benchmark information for relevant subject areas of the plan and identified critical areas for future intervention. I believe, GED of Bangladesh Planning Commission has pursued with various eminent professionals, scientists, researchers, academia etc. at national and international levels for conducting these Baseline studies.

I know that BDP 2100 is the long term plan for the country to realize sustainable and a commonly agreed upon strategy with specific short, medium and long term interventions involving all relevant stakeholders for an optimum level of water safety and food security as well as sustained economic growth of Bangladesh and a framework for its implementation.

I congratulate the GED for taking up this bold initiative. I would like to thank the authors and also the reviewers who have contributed to prepare these Baseline Studies. Documented Baseline Studies will also be helpful for policy planners, development practitioners, researchers, academicians, professionals and even students as well. I also expect that the Baseline Studies will be useful for the officials of GED to prepare necessary policy briefs and write-ups they often prepare. I believe that not only GED but also other relevant officials will be immensely benefited with these Baseline Studies for upgrading and updating their knowledge and professional competences. Finally, I thank GED leadership for undertaking this endeavor for publishing Baseline Studies of the BDP 2100 for much wider use.

I wish all the best and all out success.

M. A. Mannan, MP

Shamsul Alam
Ph.D. (Newcastle), M.A. Econs. (Thammasat)
M.Sc. Ag. Econ. (BAU)
Member (Senior Secretary)
General Economics Division
Bangladesh Planning Commission

Prefatory Comments

Bangladesh is one of the largest delta's of the world and its rivers and floodplains support life, livelihood and economy. The country is defined by the delta, with almost a third of the country lying less than 5 (five) metres above sea level, on the contrary however, coastal zone, the low-lying area, is highly vulnerable, especially to cyclones and storm surges. In addition, salt-water intrusion, floods, sea level rise intensify the vulnerability of the community of the areas. These problems are likely to become even worse due to climate change adverse impact.

Many more challenges lie ahead for Bangladesh, the most important being pressure on land use, environmental protection, governance, globalization and macro-economic development. Given the ambition to be a developed country by 2041, addressing the expected impacts of climate change, there is a need for an integrated approach to future land and water management in relation to water safety, agricultural growth and food security. The recent and future anthropogenic changes in the hydrological cycle due to e.g. climate change, construction of dams and barrages in the upstream countries in combination with increasing water demand are expected to make future water governance and management even more challenging.

With a view to meeting the above challenges, the Government of Bangladesh (GoB) requested the Government of the Netherlands (GoN) to assist for formulation of adaptive, multi-sectoral, comprehensive and holistic Delta Plan taking lessons from Dutch experiences. The GoN agreed to provide the necessary support through its Embassy in Dhaka. In accordance with the decision of the Government, the General Economics Division (GED) of the Planning Commission, Ministry of Planning was assigned to lead the formulation of Bangladesh Delta Plan 2100, as the GED is mandated for medium and long term planning at the national level.

Bangladesh Delta Plan 2100 has been conceived as a techno-economic, long-term, holistic, water centric, strategic plan. As such, formulation of strategies in the short (budgeting), medium and long term is the most significant part in the planning process. The long term strategies will help to fulfil the Delta Vision, whereas the short and medium term strategies will help achieve benefits within the country's 5 year planning horizon as well as contribute to achieving SDG's and other national policy goals. An interactive planning process has been followed comprising three major steps: i) Conducting Baseline Studies; ii) Formulation of Adaptive strategies; and iii) Development of the Delta Management Framework. These steps were supported by country wide consultation processes which eventually led to the outcome of an Investment and Implementation Plan.

The project has prepared 26 Baseline Studies on known delta problems, reviewing existing policies and governance challenges in the sector of water resources, land, environment, disaster, agriculture, fisheries, livestock, transportation, finance, governance, knowledge generation etc. The studies followed the basic steps of reviewing the current policy situation, assessing the status of individual sectors, identification of drivers or pressures, conducting integrated analysis

for the right interpretation of problems, challenges and knowledge gaps. For starting an integrated analysis with stakeholders it was essential to create an overview of already established and agreed-upon policies as well as to rank priorities for further investigation, research and discussion. The key elements in the approach were (a) knowing the present state, problems, impacts, challenges and current responses or interventions; (b) consideration of uncertainties of social and natural systems and knowledge gaps; (c) the evaluation of drivers, trends or events in the interaction between the delta and society.

These Baseline Reports have been clustered into Six Volumes on the basis of thematic issues and topics.

Volume 1: Water Resources Management consists of seven Baseline Reports: 1. Sixty Years of Water Resources Development in Bangladesh: Lessons Learnt; 2. River System Management; 3. Water Resources; 4. Groundwater; 5. Coast and Polder Issues; 6. Water Supply and Sanitation; 7. Part A- Sediment Management and Part B- Meghna Estuary Study;

Volume 2: Disaster and Environmental Management consists of four Baseline Reports: 8. Climate Change; 9. Disaster Management; 10. Environmental Pollution; 11. Ecological Setting;

Volume 3: Land Use and Infrastructure Development consist of three Baseline Reports: 12. Land Resources Management; 13. Urbanization and Settlement; 14. Sustainable Transportation and Infrastructure;

Volume 4: Agriculture, Food Security and Nutrition consists of four Baseline Reports: 15. Agriculture and Food Security; 16. Fisheries; 17. Livestock; 18. Forests and Biodiversity;

Volume 5: Socio-Economic Aspects of the Bangladesh Delta consist of three Baseline Reports: 19. Population Growth and Management; 20. Socio-Economic and Demographic Condition; 21. Socio-Economic Characteristics of Chittagong Hill Tracts;

Volume 6: Governance and Institutional Development consists of five Baseline Reports: 22. Institutional Framework and Arrangements; 23. Information and Knowledge Management; 24. Regional Cooperation; 25. Financial Mechanisms & Arrangements in the Water Sector in Bangladesh; and 26. Private Sector Engagement in Deltas.

Volume 6: Governance and Institutional Development

Institutional Framework and Arrangements: Sound implementation of public policies and programs depends upon the prevailing governance environment and underlying institutional arrangements. These requirements gain added significance when policies and programs are cross-sectoral in nature and involve multiple line agencies. Bangladesh Delta Plan 2100 deals essentially with cross-sectoral issues and multi-stake holder contributions and interests. The Delta Plan implementation arrangements will involve multiple line ministries, local government institutions, communities and private sector parties. The existing culture is that the line ministries and most of the other stakeholders primarily act in their own domains. BDP 2100 in its holistic approach , collaborative planning and implementation process based on Adaptive Delta Management principles, seeks to increase the capacity to collaborate, by connecting the relevant sectors, national and sub-national levels, different types of relevant organisations and actors. As such, increase of the connective capacity in cross-sectoral and multi-level aspects is needed. This requires cultural change which can be stimulated and supported by awareness raising and training, building trust between stakeholders, boundary spanning actions. For all these, institutional arrangements would shape essential possibilities for Delta governance.

The BDP 2100 formulation process and its implementation need to be embedded within an adequate governance structure, and integrated budget allocation mechanism as well as an effective and efficient sectoral institutional setting. It is the purpose of the proposed Delta Framework to address the governance challenges and improve the governance structure and mechanisms in order to bring the institutional framework and government agencies in a position to play an active and required role in the BDP 2100 process and its implementation. This integration will promote sustainable economic development in Bangladesh and will enhance the institutional capacity of the government and its agencies.

The BDP 2100 formulation process concerns the achievement of stated goals in line with the policy framework in the country and in connection to that, a strategic planning, decision making and funding process. Arrangements of goal

setting and realization and the related processes are elements of the core governance of Bangladesh. The whole policy making and implementation process takes place within conditions of transparency and accountability with respect to the responsible administrators. In both the private and the public sector, there is a trend towards ever increasing demand for accountability and transparency as well as an ever increasing awareness of the necessity for having checks and balances. Governance and associated subjects have become, both explicitly and implicitly, important issues for business, government, politics, and last but not least for the general public. That is why governance plays a significant role in both the private sector as well as the public sector.

Information and Knowledge Management: During the formulation of the BDP 2100, a lot of information and scientific data have been gathered and produced, starting with the Baseline Studies. Information is needed for the description of the present status in the Delta, for development of the Climate Atlas, and for the formulation of the Delta Vision, scenarios, strategies and measures as well as the Delta framework and implementation plan. The information streams that have been produced during the project will be stored in a knowledge repository, with all the relevant reports, documents, presentations and minutes of meetings. A Baseline Study on information and knowledge management needed to be prepared for the development and implementation of this knowledge portal. It describes the information and knowledge management practices of different government organizations and other stakeholders. A number of organizations such as BWDB, WARPO, BBS, BHWDB, BMD, DLRS, SoB, and LGED are currently using state of the art technology to efficiently manage information. Existing situation of databases, data management and Information Portals of different organizations such as National Water Resources Database (NWRD), Integrated Coastal Resources Database (ICRD), Integrated Haors & Wetlands Resources Database (IHWRD) and other databases are described briefly. These information and knowledge management systems help to organize and store information and assist in national level as well as local level planning and decision making. Latest hardware, software and other ICT facilities that are being used by different government and private organizations for knowledge management, exchange and sharing are mentioned in the Baseline Report. Activities required for the development of the portal, information and data processing, features and functionalities of the knowledge portal, accessibility of data by wide range of users are also mentioned. The portal is designed and developed using the standard four-tier architecture of software development.

The main challenges to the development of an information and knowledge management system for BDP 2100 are: unavailability of required information or availability of information from source organizations in unusable format, reluctance of sharing of data with others, periodic update and sustainability of the developed system. The probable solution of sustainability is to seek assistance for system maintenance from any partner organizations of the BDP 2100 project having required facilities readily available. Every year GED can allocate GoB for periodic updating of the portal.

One of the aims of the BDP 2100 project is to make information on vulnerabilities and climate change risks accessible for further planning and implementation purposes. One of the key challenges is to give easy access to available maps and spatial information in such a way that it can be used by planners and decision makers in problem analysis, strategy-making and monitoring steps. Delta Plan Tools were developed for this purpose. The Delta Plan Tools are developed to access and to interact with the data in the information portal.

The 'meta-modelling pilot project' is a pilot activity of BDP 2100. The main purpose of the pilot is to demonstrate the potential of meta-modelling to support decision making process on Delta planning in Bangladesh. Decision-making for the Delta Plan includes all key socio-economic sectors. Integrated impact analysis is therefore the key. The pilot project is also aimed at supporting decision-making under conditions of uncertainty and developing an *adaptive plan*. For this purpose, a model is required that can deal with simulations in a limited time as multiple combinations and sequences of actions under multiple futures; such model is known as the meta model.

Regional Cooperation: Bangladesh is developing rapidly and experiences huge economic growth. A major uncertainty for Bangladesh's development is the amount of water available to Bangladesh in the coming decades. Bangladesh is downstream of the mighty rivers Ganges, Brahmaputra and Meghna, and almost entirely covered by these river basins. The three river basins flow through India and then to Bangladesh into the Bay of Bengal. When combined, these rivers

constitute the worlds' second largest riverine drainage basins: the Ganges-Brahmaputra-Meghna basins. The entire basins are flood prone and vulnerable to flood consequences. The frequency and intensity of floods is expected to increase due to climate change.

Because Bangladesh is a downstream country, delta governance and water resources management is complex and very much dependent on upstream developments. Upstream infrastructural developments are expected to have a notable impact on the dry season flow. Changes in flows and sedimentation rates resulting from the development of the Farakka barrage may be illustrative of the type of impacts which may be expected, should further upstream infrastructural development take place. For the last decades, India has constructed barrages and dams on tributaries of the Ganges and Brahmaputra rivers, while also diverting water from these rivers for irrigation purposes. The country is likely to follow this pattern as irrigation plays an increasing role in India's economic growth and sufficient food for its rapidly expanding and urbanising population. Of particular interest for Bangladesh are the Indian proposals to construct 16 barrages on the Ganges River and the country's plans to divert water from the Ganges and the Brahmaputra rivers towards the South of India. In addition, India is planning to construct the Tipaimukh dam in the north-eastern part of the country. All three projects will impact the water availability in Bangladesh as well as the ecological condition of the rivers.

Upstream of the Brahmaputra River, China is constructing hydropower dams in order to make use of the river's potential hydropower capacity. At the moment relatively smaller dams are being constructed in order to create the right conditions for the construction of the large Great Bend hydropower dam. According to the Chinese Government all these projects would have no significant impact on the river discharge downstream as no water is extracted. However, there might be ecological consequences that are yet unknown. Moreover, concerns remain in India and Bangladesh over water diversion from the upper part of the Brahmaputra to the North of China. India and China state very clearly that the countries will only negotiate bilaterally with other riparian countries within the Ganges-Brahmaputra-Meghna basins. However, even though this approach has been prevalent for decades, a shift can be noticed in India's attitude towards a more multilateral approach with regard to the country's trans-boundary rivers.

In order to limit the negative impacts of these developments, Bangladesh can focus on the establishment of close cooperation with upstream riparian countries; India, Nepal, Bhutan and China. These countries' actions will highly impact the water quantity as well as the water quality of the rivers entering Bangladesh. Implementing the water diplomacy approaches can be a promising step in order to strengthen the position of Bangladesh in the Ganges-Brahmaputra-Meghna basins. Bangladesh needs to convince upstream countries of the extra benefits to be gained while focusing on the basins as a whole rather than to be restricted by the current political boundaries. By searching for mutual gains and by inviting different stakeholders to the negotiation table, the negotiations and outcome will become more flexible and accordingly it will be more likely the parties reach a mutually beneficial agreement or even establish joint management of the river basins.

Finance mechanisms & arrangements in the water sector in Bangladesh: Bangladesh's economy has grown rapidly over the last decade, at average around 6% annually. If this rate of growth is sustained, Bangladesh will be transformed in the next 5 to 10 years into the first stages of an upper middle income country. Due to the changing status of the country Development Partners might shift away resources to other countries. For this reason, it is important that Bangladesh prepares itself to develop more independent national funding sources in order to finance the large future needs in the water sector (and for climate adaptation).

Financing mechanisms aim to attract more private finance for Delta governance and water resources management through innovative financing mechanisms aiming at reducing risks or losses, decrease transaction costs and diversification of risks. Mechanisms include viability gap funding, match funding, revolving funds, blending instruments and pooled funds. The main actors in these arrangements are aid and development banks, private banks, governments, and (local) NGOs. The NGOs, take the role to connect the funds to local actors. These often use micro-credit like mechanisms to ensure sustainable development projects. Reoccurring lessons learned from international practices related to institutional arrangements include:

- A sufficient level of private sector and financing expertise is required to develop and sustain blending and pooling mechanisms;
- Government or donor grants or guarantee mechanisms are often important in order to attract private finance.

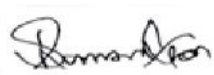
Internationally, there are many cases involving private actors and private capital in water service delivery. The fact that Public-Private Partnerships (PPP) take up a large share of the cases indicates that PPP is widely recognised as a promising contracting or funding arrangement in the Delta Plan related sectors, both in developed and developing countries. Scope extension projects are innovative arrangements which extend the provision of water services by including revenues from non-water services such as land development, land reclamation, transport, urban development, and energy production.

Securing the involvement of private capital is the main recurring theme throughout the lessons learned of the institutional arrangements. Cooperation with private partners can lead to significant (public) cost reductions and efficient management. However, the downside of cooperation with private actors is that private actors do exactly what they are paid for, but no more than that. Lessons learned therefore additionally include:

- Strong monitoring mechanisms, sound performance indicators of quality specifications, and decent contracts;
- Active multi-stakeholder engagement and capable and solid governance and governments;
- Sufficient demand for the project's additional revenue sources (land demand, toll road traffic, urban development, tourism).

There are various ways to fund investments for the short, medium and long term identified in the Bangladesh Delta Plan 2100. The most suitable way of funding however, depends on the type of services that will be provided. This is because each service has different funding and financing potential and modalities. To elaborate on the potential future financing arrangements the current situation of the core water services in Bangladesh has been analysed.

Private sector engagement in Deltas: Effective engagement of the private sector will generate sizable resources to finance the Delta Plan. The Delta Plan projects that on average Bangladesh should (in the medium and long term) be able to mobilize at least 0.5% GDP per year for private financing of water and related infrastructure. Good practice international experience shows that the prospects for attracting private investments including through public-private-partnerships (PPP) in water treatment, water supply and sewage treatment are excellent. Another prospective area is irrigation. A third area is dredging. There is strong private sector interest in undertaking dredging contracts. The cost of dredging may be significantly offset by the sale proceeds from sand, making dredging costs quite low. Bangladesh can learn from good practice international experience in developing the proper contracting arrangements for dredging. A fourth area for a PPP role concerns land reclamation. Combining land reclamation with dredging of rivers in a PPP concession framework would make very good sense. Finally, a PPP initiative is also possible in establishing river port infrastructure for inland water transport (IWT). However, as mentioned before this level of 0.5% from the private sector requires considerable improvement of institutional and financial capacity and trust and might only be reached after 10 to 15 years from now, due to its slow development over time.



(Shamsul Alam)

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We acknowledge the guidance and timely direction provided by the National Steering Committee (NSC) headed by Mr. Md Abul Kalam Azad, Principal Secretary of the Hon'ble Prime Minister and Dr. Kamal Abdul Naser Chowdhury, Principal Secretary of the Hon'ble Prime Minister and Mr. Md. Nojibur Rahman, Principal Secretary of the Hon'ble Prime Minister in consecutive terms for their contributions to successful completion of the Plan.

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We from GED gratefully acknowledge the efforts by all concerned.

June 2018

BDP 2100 Baseline Study

Volume 6

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Abbreviations

ADB	Asian Development Bank
ADP	Annual Development Programme
AUS AID	Australian Government Overseas Aid Program
ARIS	Agricultural Resources Information System
ADM	Administration and Institutions
ADB	Asian Development Bank
ADP	Annual Development Programme
AFD	Agence Française de Développement
AIIB	Asian Infrastructure Investment Bank
APR	Annual Principle Repayment
AusAID	Australian Agency for International Development
BADC	Bangladesh Agricultural Development Council
BARC	Bangladesh Agricultural Research Council
BBS	Bangladesh Bureau of Statistics
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BCCRF	Bangladesh Climate Change Resilience Fund
BCCT	Bangladesh Climate Change Trust
BCCTF	Bangladesh Climate Change Trust Fund
BDP2100	Bangladesh Delta Plan 2100
BEPZA	Bangladesh Export Processing Zones Authority
BIWTA	Bangladesh Inland Water Transport Authority
BMDA	Barind Multi-purpose Development Authority
BOT	Build Operate Transfer
BWDB	Bangladesh Water Development Board
BBS	Bangladesh Bureau of Statistics
BCC	Bangladesh Computer Council
BNM	Bangladesh National Museum
BDP 2100	Bangladesh Delta Plan 2100
BMD	Bangladesh Meteorological Department
BUET	Bangladesh University of Engineering and Technology
BWDB	Bangladesh Water Development Board
BHWDB	Bangladesh Haor & Wetlands Development Board

BARC	Bangladesh Agriculture Research Council
BADC	Bangladesh Agriculture Development Corporation
BCCSAP	Bangladesh Climate Change Strategy & Action plan
BD	Bangladesh
BDP 2100	Bangladesh Delta Plan 2100
BIWTA	Bangladesh Inland Water Transport Authority
BMDF	Bangladesh Municipal Development Fund
BWDB	Bangladesh Water Development Board
CAG	Comptroller and Auditor General
CC	City Corporation
CCSAP	Climate Change Strategy and Action Plan
CCTA	Climate Change Trust Act
CDMP	Comprehensive Disaster Management Programme
CEGIS	Center for Environmental and Geographic Information Services (CEGIS)
CETP	Central Effluent Treatment Plant
CFAB	Climate Forecast Applications in Bangladesh
CHT	Chittagong Hill Tracks
CIF	Climate Investment Funds
COP	Conference of Parties
CPPCR	Committee for the Protection and Promotion of Children's Rights
CTF	Clean Technology Fund
CC	Citizen's Charter
CIP	Country Investment Program
CSR	Corporate social responsibility
CEGIS	Center for Environmental and Geographic Information Services
CCD	Climate Change Database
DANIDA	Danish International Development Agency
DBFM	Design Build Finance Operate and Maintain
DBO	Design Build Operate
DC	Development Cooperation
DCLG	Department for Communities and Local Government
DDM	Department of Disaster Management
Defra	Department for Environment Food & Rural Affairs
DFID	Department for International Development

DoAE	Department of Agriculture Extension
DoE	Department of Environment
DoF	Department of Forestry
DoS	Department of Shipping
DP	Development Partner
DPHE	Department of Public Health Engineering
DPP	Development Project Proforma
DWASA	Dhaka Water Supply & Sewerage Authority
DWI	Drinking Water Inspectorate
DLRS	Directorate of Land Record and Survey
DSS	Decision Support System
DRAS	Drought Assessment Framework
DoE	Department of Environment
DAC	Development Assistance Committee
Danida	Danish International Development Agency
DFID	Department for International Development
DoE	Department of Environment
DOF	Department of Fisheries
DPHE	Department of Public Health Engineering
DWASA	Dhaka Water Supply and Sewerage Authority
ECNEC	Executive Committee of the National Economic Council
EIA	Environmental Impact Assessment
EKN	The Embassy of the Kingdom of the Netherlands
EU	European Union
ECO	Economics and Finance
EA	Environmental Agency
EC	European Commission
ECNEC	Executive Committee of National Economic Council
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EIP	Early Implementation Projects
EKN	The Kingdom of the Netherlands
EPZ	Export Processing Zone

ERD	Economic Relations Division
ETPs	Effluent treatment plants
FCD	Flood Control and Drainage
FCDI	Flood Control, Drainage and Irrigation projects
FCR	Full Cost Recovery
FCERM	Flood and Coastal Erosion Risk Management
FD	Forest Department
FFCW	Flood Forecasting Warning Centre
FIP	Forest Investment Programme
FY	Fiscal Year
FYP	Five Year Plan
FUN	Funds and Interventions
FAO	Food and Agricultural Organization
GED	General Economics Division (Planning Commission)
GOB	Government of Bangladesh
GED	General Economic Division
GCP	Ground Control Points
GAFS	Global Agriculture & Food Security
GCF	Green Climate Fund
GDP	Gross domestic product
GED	General Economic Division
GIS	Geographic information system
GIZ	Gesellschaft für Internationale Zusammenarbeit
GNI	Gross National Income
GoB	Government of Bangladesh
GoN	Government of the Netherlands
HTML	Hypertext Markup Language
HUM	Human Beings and Social Conditions
ISP	Internet Service Provider
ICT	Information and Communication Technology
INF	Assets, Infrastructure and Services
ICRD	Integrated Coastal Resources Database
ICZMP	Integrated Coastal Zone Management Plan
IHWRD	Integrated Haors & Wetlands Resources Database

IBRD	International Bank for Reconstruction and Development
ICT	Information and Communication Technology
IDB	Islamic Development Bank
IDCOL	Infrastructure Development Company Limited
IEE	Initial Environmental Examination
IFAD	International Fund for Agriculture Development
IFC	International Finance Cooperation
IFI	International Financing Institute
IIED	International Institute for Environment and Development
IMED	Implementation, Monitoring and Evaluation Division
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPSWAM	Integrated Planning for Sustainable Water Management
IUCN	International Union for Conservation of Nature
IWM	IWM
IWRM	Integrated Water Resources Management
IWT	Inland Water Transport
IWW	Inland Water Ways
ICZM	Integrated Coastal Zone Management
IDA	International Development Association
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
IWM	Institute of Water Modelling
JICA	Japan International Cooperation Agency
JRC	Joint Rivers Commission
IWMI	International Water Management Institute
JICA	Japanese International Cooperation Agency
JRC	Joint Rivers Commission
KfW	Kreditanstalt für Wiederaufbau
LCCRD	Low Carbon Climate Resilient Development
LDC	Least developed country
LDCF	Least Development Countries Fund
LGD	Local Government Division
LGED	Local Government Engineering Department

LAN	Local Area Network
LGED	Local Government Engineering Department
LCG	Local Consultative Group (of development partners)
LGD	Local Government Division
LGED	Local Government Engineering Department
LGRDC	Ministry of Local Government, Rural Development & Cooperatives
MIS	Management Information System
MSL	Mean Sea Level
MDA	Ministries, Divisions, Agencies
MDGs	Millennium Development Goals
M&E	Monitoring & Evaluation
MIE	Multinational Implementing Agencies
MoA	Ministry of Agriculture
MoDMR	Ministry of Disaster Management and Relief
MoEF	Ministry of Environment and Forests
MoLGRD&C	Ministry of Local Government, Rural Development and Cooperatives
MoU	Memorandum of Understanding
MOM	Management, Operation, Maintenance
MP	Master Plan
MPs	Honourable Members of Parliament
MPA	Mongla Port Authority
MTBF	Medium-Term Budgetary Framework
MoA	Ministry of Agriculture
MTBF	Medium-Term Budgetary Framework
NEC	National Economic Council
NGO	Non-governmental Organization
NWMP	National Water Management Plan
NWRC	National Water Resources Council
NWRD	National Water Resources Database
NBR	National Board of Revenue
NDA	National Designated Authority
NDB	Non-Development Budget
NGOs	Non-governmental organization
NIE	National Implementing Agencies

NPV	Net Present Value
NRW	Non Revenue Water
NWMP	National Water Management Plan
NWPo	National Water Policy
NWRC	National Water Resources Council
NWRD	National Water Resources Database
NWMP	National Water Management Plan
NRE	Natural Resources and Environment
OTA	Operational Acceptance Testing
OIS	Object Identification System
OAIS	Open Archival Information System
OFID	OPEC Fund for International Development
OFWAT	Water Services Regulation Authority
OPEC	Organisation of the Petroleum Export Countries
PC	Planning Commission
OECD	Organization for Economic Cooperation and Development
PEC	Project Evaluation Committee
PIM	Public Investment Management
PKSF	Palli Karma-Sahayak Foundation
PMU	Project Management Unit
PP	Project Proposal
PPCR	Pilot Programme for Climate Resilience
PPP	Public Private Partnership
PPP	Public Private Participation
PSP	Private Sector Participation
PSU	Policy Support Unit
PRI	Policy Research Institute
PSC	Project Service Cell
RADP	Revised Annual Development Programme
RHD	Roads and Highways Department
R&D	Research and development
R&M	Roads and Highways Department
RRI	River Research Institute
RAJUK	Rajdhani Unnayan Kartripakkha (Capital Development Authority)

SCF	Strategic Climate Fund
SDGS	Sustainable Development Goals (SDGs)
SDR	Special Drawing Rights
SIDS	Small Island Developing States
SPEMP	Strengthening Public Expenditure Management Programme
SREP	Scaling up Renewable Energy Programme
SSP	Sector Strategy Paper
SSWRDSP	Small Scale Water Resources Development Sector Programme
SWF	Sovereign Wealth Fund
SQL	Structured Query Language
SRDI	Soil Resource Development Institute
SoB	Survey of Bangladesh
SOA	Service Oriented Architecture
SDC	Swiss Agency for Development and Cooperation
SDP	Sector Development Plan
SIP	Sector investment Plan
SIDA	Swedish International Development Cooperation Agency
TA	Technical Assistance
TIB	Transparency International Bangladesh
TPP	Technical Assistance Project Proforma/Proposal
ToR	Terms of Reference
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Emergency Fund
USAID	United States Agency for International Development
UNICEF	United Nations Children's Fund
US$	United States Dollar
US AID	United State Agency for International Development
VAT	Value Added Tax
VGF	Viability Gap Funding
WARPO	Water Resources Planning Organization

WASA	Water Supply & Sewerage Authority
WATSAN	WATER and SANITATION
WB	World Bank
WMO	World Meteorological Organization
WSP	Water Sanitation Programme
WSPF	Water and Sanitation Pooled Fund
WB	World Bank
WARPO	Water Resources Planning Organization
WASA	Water Supply and Sewerage Authority
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WMA	Water Management Associations
WMG	Water Management Groups
WSS	Water Supply and Sanitation
WTO	World Trade Organization
WARPO	Water Resources Planning Organization
WMIP	Water Management Improvement Project

BASELINE STUDY: 22

Institutional Framework and Arrangements

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Executive Summary : Study 22

The implementation of public policies and programmes depends upon the prevailing governance environment and underlying institutional arrangements. These requirements gain added significance when policies and programmes are cross-sectoral in nature and involve multiple line agencies. The Delta Plan agenda is essentially cross-sectoral and implementation arrangements involve multiple line ministries, local government institutions, communities and private sector. Clarity of role, interdependence of actions and a coordinated approach are essential requirements of the institutional set up for Delta Plan implementation. The stakes are large and so are the resource requirements. Yet, resources are limited and there are competing demands. How resources are allocated among competing demands, how trade-offs are made and how effectively programmes are implemented to get the best results from limited resources are major political economy issues that depend critically upon the prevailing governance environment.

Globally there are many other delta experiences and Bangladesh can learn from these experiences with a view to avoiding their mistakes and adapting the positive experiences to the Bangladesh situation. Importantly, Bangladesh itself has a long experience in dealing with the Bangladesh delta issues and challenges. A solid review of these experiences, identifying areas of success and areas where there are major gaps can provide useful lessons for building the institutional arrangements for the implementation of the Delta Plan.

Institutions are dynamic in the sense that they evolve over time. Starting with a thoughtful design that involves pragmatic solutions based on the present socio-political realities of Bangladesh and working within the umbrella of the overall capacity constraints in public administration, institutional changes can further evolve as implementation progress is made. The immediate challenge is to develop a basic minimum core arrangements now without which the implementation of the Delta strategy will falter. In order to develop and delta governance, the following issues and challenges are of crucial importance: i) *Fragmentation of tasks and agencies:* Institutions responsible for water management in Bangladesh are fragmented and characterized by multiple inefficiencies and capacity constraints; ii) *Administrative and technical capabilities of water related institutions are seriously constrained:* For example, the BWDB continues to follow a response-based approach rather than seeking a long-term, sustainable solution to floods and erosion; iii) *Missing separation of implementation from regulation and (compliance) monitoring:* A general principle that has become a global norm in water and sanitation is the separation of implementation from regulation and (compliance) monitoring, at least in so far as the functions are performed in the same geographical area. This consideration is missing in Bangladesh; iv) *Capacity constraints in water agencies, similar constraints in other Delta agencies:* In addition to the capacity constraints in water agencies, capacities are similarly constrained in other Delta agencies (e.g. Ministries of Agriculture, Environment and Forests, Shipping, Land and Fisheries and Livestock); v) *Community participation in water management:* This is a major problem area for Bangladesh. Historically, Bangladesh has pursued a top down engineering approach to water management. Large water schemes such as polders and river embankments have been installed in many parts of the country with little or no community involvement; vi) *Research and Knowledge Agenda:* Research and knowledge agenda that are critical input for adaptive delta management is not well organized in Bangladesh; vii) *Gap in monitoring and evaluation (M&E) of water and other delta issues:* Another major gap is monitoring and evaluation (M&E) of water and other delta programs; viii) *Coordinated approach to adaptive planning of delta issues related investments:* Another area of concern is coordinated approach to planning delta issues related investments, setting investment priorities and arranging financing; ix) *Public-Private Partnership:* A final area of concern is the under-developed public-private partnership in delta investments. The government has a long-standing interest in developing private participation in water management.

Delta Governance Strategy & Conditions for Institutional Framework: Given the issues and challenges, the development culture regarding delta governance could be transformed more profoundly from short term and sector wise to a medium - long term, multi-sector and multi-level approach with a consistent programming, funding and implementation process and with strong emphasis on coordination of planning and resource allocation as well as on adequate collaborative implementation. In this respect, the BDP2100 governance approach addresses the five

mentioned basic elements of the governance cycle: i) Steering and Administering BDP2100 at national level: increasing the connectedness and adaptive policy making, coordination and funding and spending capacity; ii) Preparation and coordinating of (investment) planning, programming and implementation: increasing the planning and implementation quality and coordination and connective capacity; iii) Implementing the measures and interventions on national and sub-national level: increasing readiness and implementation capacity; iv) Monitoring and evaluation providing feedback on progress and on a possible need to adapt towards implementing agencies and policy makers: increasing insight in drivers and indicators and of the adaptive capacity; v) Accountability and transparency approach: increasing public trust and ownership capacity.

The Delta Plan Institutional Framework encompasses necessary and agreed reforms of the current institutional framework and the governmental organizations involved. These organizations need to be involved in such a way as to be prepared to participate in the BDP2100 formulation; they also need to adopt and execute the implementation program in an integrated, targeted, inclusive, broadly supported and transparent way. To enable and facilitate increase of the five above mentioned capacities, especially with respect to coordination and connective capacity, a central national body with adequate position and mandate, legal basis and fund is proposed to coordinate, facilitate and monitor the sectoral and decentral implementing agencies which need to be significantly strengthened in many aspects. A Delta Commission, Fund and Act are therefore proposed.

Key elements of the governance and institutional reforms under the Bangladesh Delta Plan: Drawing from the above noted replicable lessons of the Dutch Delta management, past Bangladesh experience, and the socio-economic-political realities of Bangladesh, the proposed approach to delta governance and institutions are as follows:

(i) The legal institutional framework for delta management: A new *Delta Act* should be enacted to provide a sound legal coverage for the long-term nature of BDP 2100 including establishment of the Delta Fund, establishment of the Delta Commission and the Plan itself. Climate Change Trust Act 2010, Disaster Management Act 2012, National River Conservation Commission Act 2013 are examples of similar Acts in Bangladesh. This Delta Act is in no way, content wise and purpose wise, conflicting with the National Water Act 2013. The Bangladesh Delta Act will simply provide legal coverage to the establishment of the Delta Commission and Delta Fund. The three main areas it will need to address are: (a) establishing a Bangladesh Delta Commission; (b) establishment arrangements to local water bodies to develop for a future role in local water management and beneficiaries pay principle and (c) establishing a Bangladesh Delta Fund.

a) Bangladesh Delta Commission: The Bangladesh Delta Commission would be an independent entity of Government of Bangladesh (GoB) which would be linked, for administrative purposes, with the Ministry of Planning. A small higher level forum, the 'Delta Governance Council (DGC)' is proposed, which would be chaired by the Prime Minister. The DGC would function as a formal linkage for achieving political commitments regarding BDP 2100, provide directions and makes decisions. It would provide strategic advice and policy guidelines. The Delta Commission would steer continuous planning and coordinate and facilitate the implementation of the Bangladesh Delta Plan 2100 (BDP2100) by related ministries and implementing agencies, including its investment plan, to ensure that Bangladesh is able to pursue climate-resilient sustainable development. Key functions of the Delta Commission would be national level coordination, planning, programming, resource mobilization, facilitating program and project preparation and facilitating implementation, monitoring and evaluation, conducting research and innovation studies, preparing policy and guidelines, knowledge management and coordination etc. Involved Ministries and Agencies shall implement the programs and projects included in the Delta Program (BDP2100 investment plan) and in subsequent updates.

- The Delta Commission would be headed by the Delta Commissioner appointed by the President for minimum of a three to five-year term with the status of the State Minister;
- The Delta Commissioner would be assisted by two part-time specialist 'Advisors' as and when necessary from a broad range of disciplines;
- A Delta Secretariat would provide secretariat and functional support to the Delta Commission;

- The Delta Secretariat may be structured following the structure of a Division of the Planning Commission headed by a "Member" equivalent to the Senior Secretary/Secretary to the Government. The division may have several wings: (i) Programming and Planning; (ii) Study, Research & Knowledge Management; (iii) Monitoring & Evaluation and (iv) Administration, Financing & Coordination.
- The Delta Division would have multi-sectoral staffing, with at least half of them on deputation from different agencies/ministries at the desk level and the other half would be appointed from planning and development related officials of GoB;
- Delta Commission may have small regional office in each Regional Water Institutions/Bodies proposed in the Institutional report headed by a Deputy Chief/Director.
- BIDS, WARPO, BARC, JRC, CEGIS and IWM and others have been identified as key knowledge support organizations.
- Until the establishment of the Delta Commission, as an interim arrangement, a Delta Program Wing could be established in GED.

b) Local water bodies: In Bangladesh both the Local Government Institutions (LGIs) and Water Management Organisations (WMO) are institutionally weak though LGIs have a century old tradition of having a democratic governance. WMOs are still seen as temporary set ups and linked to donor-assisted projects in BWDB or in LGED. Furthermore, many other agencies like DAE, DPHE also establish their own user groups. For example, Tube well user groups are established (DPHE) to operate and maintain communal water supply, markets and other community facilities. Farmers forum is established (DAE) as focal point for the agricultural development activities of DAE. More over Social Forestry Groups have also been formed (FD) to carry out tree plantation, look after the planted trees and also to safeguard the infrastructure and climate as well.

There is an on-going discussion on stronger linkages between Union Parishads and WMOs. This is yet to happen and can provide reasons for WMOs or other delta related organizations, WASAs, to succeed as stronger organization. It is possible that over time, this linkage can emerge as 'decentral local water bodies'.

c) Bangladesh Delta Fund: Bangladesh presently spends about 0.8% of GDP for water resources, mostly for new investments. This is very inadequate compared to the needs of the Delta Plan. There is a minimum financing need of about 2.5% of GDP, of which 2.0% would be new investments and 0.5% of GDP as annual O&M. This proposed amount of annual Delta investments would amount to a third of the total ADP. Given competing needs, this jump from 0.8% of GDP to 2.5% of GDP can only be gradual. Importantly, this will also require alternative sources of financing. Given limited resources and the need for a coordinated and integrated approach to delta spending, it would seem appropriate to establish a Delta Fund in the following way: 1) The Bangladesh Delta Fund would be an earmarked fund for financing the implementation of the Bangladesh Delta Plan 2100. Sources of this fund may be GOB, DPs, Environment and Climate Change related funds, PPP, etc.; 2) The Government has a plan to allocate about 2% of GDP annually to the Delta Fund gradually – as indicated in the 7th Five-Year Plan. At present, this amounts to around US$ 4.0 billion annually (10-12% of the Annual Budget and about 30% of ADP); however, in 2030 (depending on which scenario is taken out of the six presented in chapter 6) this amount varies between US$ 7.4 billion and 12.1 billion (still in 2015 prices) In the long run this amount might increase significantly with a factor of 1.5 to 4); 3) The Delta Fund would consist of capital expenditure for investment projects and recurrent budget funds for operation & maintenance to ensure sustainability of delta-related projects; 4) O&M budget for related infrastructure could be part of this Delta Fund; 5) Operational and administrative cost for the Delta Commission would be met from the GOB's annual budget.

d) Developing the Delta Act: Both the Bangladesh Delta Commission and the Bangladesh Delta Fund would be legally established and mandated through enactment of the 'Bangladesh Delta Act. Preparing the Delta Act and the associated institutions: the Delta Commission; and the Delta Fund can start immediately. The best way of going about this is, as an interim arrangement, a Delta Plan Wing in the form of a wing could be established in GED. This Wing will undertake all necessary preparatory activities and stake-holder consultations and should submit its report to existing National

Steering Committee (NSC). Formal review by NSC and final approval by exiting National Advisory Committee (NAC) and cabinet should facilitate a submission of the Delta Act to the Parliament.

(ii) Strengthening core delta institutions: Success of any institutional arrangement depends critically upon the quality of these institutions. These in turn depend upon clarity of rules of engagements, clearly identified functions, measurable outputs and deliverables, clear accountability rules, quality of staffing and adequacy of budgetary resources. Bangladesh has considerable capacity constraints in its public administration. For the Delta Plan to succeed and to effectively implement the Delta Act, it is imperative to strengthen the core delta institutions. This is a tough challenge and involves long term effort. Yet some core institutions require immediate attention. These include: BWDB, WARPO, DoE, the Local Government including municipalities (WASAs, City Corporations), Water Management Organizations and their foreseen and expected development and all specialized institutions within different non-water delta line ministries (specialized institutions working on delta-related issues in the ministries of agriculture, disaster management, shipping and inland water, local government, environment and forestry and fishing).

As noted previously, the Ministry of Water Resources is the primary water management institution in the country. Its work is supported by a number of specialized agencies including the two core institutions: BWDB and the WARPO. They urgently need considerable strengthening in new technology, innovation, integrated planning, research, economic management and consultative processes. These institutions will help out with the establishment of the local water bodies and learn to work with them collegially as complementary bodies rather than as competing institutions. The BWDB has a long and respected history of involvement with water planning and implementation. BWDB has excellent water engineers, but is weak in areas of economic analysis, financing, holistic approach and institution building. These gaps will have to be addressed with proper staffing of experts and necessary tools and provisions in the missing areas. Additionally, BWDB must be encouraged to find innovative engineering solutions to water management problems. Attention should be given to adaptive delta management pathways and possible tipping points, designing and adopting "no regrets" engineering solutions to flood and irrigation management projects. Further strengthening of the BWDB and WARPO is elaborated.

(iii) Strengthening cross-boundary dialogue and related institutions: As a lower riparian, Bangladesh faces some real risks from adverse developments upstream. The main upper riparian is India. While there have been some successes, there are many issues and outstanding challenges. Many of the past dialogue failures are explained by adverse political relations. More recently, a major positive development that holds considerable promise of better cross-boundary water outcomes is the sharply improved political relations of Bangladesh with India.

Lessons of international experience suggest that a river basin approach has the best prospects of success. A further consideration would be to think of river agreements in terms of providing multi-purpose benefits. When water sharing is viewed as a zero sum game where more for one riparian means less for other, disputes become dominant and negotiations tend to fail. When water sharing involves multiple benefits (flood control, water storage, irrigation and hydro-power), the zero-sum game feature is converted to a win-win situation for both parties and the dialogue takes the shape of negotiating the best deal in terms of sharing of costs and benefits.

The ability to think innovatively requires both diplomacy and technical skills. The later are required to come up with well-thought multi-purpose river basin projects. Accordingly, the capacity of the Joint Rivers Commission (JRC) will have to be considerably strengthened. Partnership and coordination of JRC with BWDB and Delta Secretariat will need to be strengthened. Possible multi-purpose technical options and cost-benefit analysis of these options will need to be developed as background research to dialogue with India. Routine dialogue involving exchange of pleasantries and general purpose concerns/complaints and information sharing must give way to strategic dialogue aimed at problem solving and finding solutions. Satisfactory progress with cross-boundary water management is a sine-qua-non for successful implementation of the Delta Plan. Positive results on this count will have far-reaching positive consequences including lower-cost water solutions for Bangladesh. The priority assigned to this task should be as high as priority given to large water infrastructure projects.

(iv) Creating a delta information and knowledge Portal and maintenance: As exemplified by the Dutch experience, creation of a delta knowledge bank is an essential pre-requisite for undertaking adaptive delta management. With the establishment of the Delta Commission and the Delta Secretariat, this responsibility will be assigned to the Delta Secretariat, who will create a knowledge unit with three main responsibilities: a) Collate all relevant delta related knowledge globally and nationally into a digitized knowledge library; b) Establish a delta data bank; c) Develop and implement a comprehensive delta knowledge and data updating effort. As a first step, the Delta Secretariat should undertake a quick stock taking of existing knowledge over a 6 months period. A summary of the knowledge bank stock should be shared with other delta-related public and private policy and research institutions to develop a knowledge and data upgrading agenda. The Delta Secretariat should review this agenda to check for consistency and relevance with the needs of the delta management, especially in the context of doing a sound monitoring and evaluation of the Delta Plan, and develop a 3-5 year data and research work program with annual targets. Resource requirements should be determined. Following approval by the Delta Commission of the knowledge work programme and budget, implementation may proceed. Data work can be implemented in conjunction with the Bangladesh Bureau of Statistics and other delta ministries. Research can be out-sourced to universities and local research institutions. The Delta Secretariat should be responsible for coordination and oversight.

(v) Establishment of Issue Based Coordination Mechanism and Problem Solving: Delta issues show in many cases challenges or problems which require dedicated involvement and real input and commitment of the stakeholders. In some issues, like waterlogging in South-West Bangladesh or drainage congestion in South-Central area, none of the stakeholders can solve the problem individually nor has the exclusive mandate to decision making. In these cases, an Issue Based Coordination and Problem Solving approach offers effective possibilities to address the long lasting issue, identify an agreed problem definition and agree on relevant organizations to play a role. A lead government organization needs to be identified which could form a Council or Task Force as temporary joint institutional setup at field level consisting of relevant government agencies including district administrations but also other LGIs, NGOs, civil society. The issue should be addressed in a comprehensive manner and strategies and measures will be developed phase wise as per community feedback. Where needed, Delta Commission could facilitate this issue based coordination and problem solving approach and could support the proposed Council or Task Force to mainstream the agreed measures at national level.

(vi) Developing a sound monitoring and evaluation (M&E) system: The practice of conducting M&E of government policies and programs is a weak link in Bangladesh policy planning. Water related M&E is no exception. A solid M&E effort is essential for sound implementation of the delta plan in the context of adaptive delta management. The M&E issues are discussed in detail in Chapter 13. The main point of note is the assignment of institutional responsibility for M&E. So far as investment projects are concerned, the M&E is the responsibility of the implementing agencies. Similarly, M&E of sectoral policies and programs should rest with the concerned sectoral ministry and IMED. Regarding M&E of the entire Delta Plan, this will be a key responsibility of the Delta Commission. As in the case of implementation of the knowledge agenda, the Delta Commission can draw on the technical capabilities of its knowledge partners to help with the Delta Plan level M&E. Needless to say, the M&E for the Delta Plan will need to be done consultatively, drawing on the analysis of the M&E at the project and sectoral levels and involving all inter-ministerial agencies dealing with delta issues and the IMED.

(vii) Information and Knowledge Management and Approach: The comprehensive knowledge domains of delta issues as well as the adaptive nature of delta management emphasize the importance of knowledge management and the requirement of an approach. Five elements of the Approach are described below: (i) *Knowledge Needs & Agenda* have been formulated. The Knowledge Agenda identified nine key subjects as burning issues with their top-3 most important research questions. (ii) *Knowledge accumulation* has been made with the conduct of the 19 Baseline Studies. These Baseline Studies are a rich source of knowledge accumulation. Further knowledge was gathered in the field through a series of Delta Ateliers. (iii) *Knowledge availability* is ensured through a web-based information portal, gathering

geographical data layers, studies, policy documents, meeting reports. (iv) Value *realization* can be done from delta knowledge once it is put to use in practice. This is done, for example, in actual planning, such as the input to the 7th Five Year Plan, preparation of the Climate Atlas, the Bangladesh Delta Plan 2100 and Investment Plan, or when related policies are informed by available knowledge and scientific findings. (v) *Delta Knowledge Community*, comprises of academics, policy makers, international donors, NGOs and field workers in a community of participants. This Delta Knowledge Community will be able to engage in continuously make knowledge available to its stakeholders, enabling them to engage in adaptive delta management. Further, tools were developed to give easy access to available maps and spatial information. These were *delta atlas*, *touch table*, *knowledge portal* and *Meta model*.

(viii) Reviewing and Updating of BDP2100: As the BDP is an adaptive and long-term plan, it needs to be integrated with the planning process of the country. It should be periodically and regularly reviewed and incorporated in future Five Year Plans routinely. Moreover, integration with new knowledge and technologies is necessary to enhance the present status of the plan. Its implementation also requires continuous monitoring and evaluation in the future.

1. Background, Scope, Objective, Approach and Methodology

1.1. Introduction

Bangladesh is the largest deltaic flood plain in the world, about 80 percent of which is featured with rivers and their flood plains. These rivers and floodplains support life, livelihoods and economy of the whole Bangladesh delta and as such proper development and management of water resources is the key of the future development of Bangladesh. Due to its geographical location, the country is vulnerable to natural disasters like floods, cyclones, droughts, river erosion, etc. Vulnerability is also posed by adverse socio-economic developmental activities and climate change and variability. These are considered as the major challenges in the way to maintaining the status of a middle - high income country. To reduce vulnerabilities of natural and manmade disasters as well as proper management of water, land and other natural resources an integrated and holistic approach of long term planning (50-100 years) for sustainable development is the urgent need of the country. Keeping this in mind, General Economics Division (GED) of Bangladesh Planning Commission in cooperation with the Government of the Kingdom of the Netherlands has undertaken the task of formulating an integrated, comprehensive and long term plan for Bangladesh Delta to be known as "Bangladesh Delta Plan (BDP) 2100".

For formulation of BDP 2100, background studies are being carried out in a number of thematic areas, which are defined as baseline studies. These Baseline Studies would work as approach paper. In total 19 thematic baseline studies are being prepared in eight clusters (**Table 1.1**). The study 'Institutional Framework and Arrangements' is one of the three studies under the Governance Cluster. The other two are – 'Regional Cooperation' and 'Information and Knowledge Management.

Table 1.1: Cluster and Study Themes of 19 Baseline Studies

No.	Cluster	Study theme
1	**Water resources**	1. Water resources
		2.River systems management including morphological dynamics of Bangladesh Delta and Trans-boundary cooperation
		3.Coast and polder issues
2	**Water supply and sanitation**	4.Public health, water supply and sanitation
3	**Disaster risk reduction**	5.Disaster management
		6.Climate change
4	**Spatial planning and land use**	7.Land resource management
		8.Urbanization and settlement
5	**Food security**	9.Agriculture and food security
		10.Fisheries and livestock
6	**Environmental management**	11.Ecological settings
		12.Forest and biodiversity
		13.Environmental pollution
7	**Economics and finance**	14.Growth of Population and management
		15.Socio-economic and demographic condition
		16.Sustainable transportation and infrastructure
8	**Governance**	17.Institutional framework/arrangements
		18.Regional cooperation
		19.Information and knowledge management

This study report has linkages to the themes of other studies (in using the same data, same focus areas and others). These linkages are shown in **Table 1.2**.

Table 1.2: Linkages of other Baseline Studies with this Baseline Study

Thematic Baseline Studies	Linkage Canvas 'Institutional Framework/ Arrangement'							
	S o	S e	E c	E n	G e	H o	P o	I n
1. Water Resources	x	x		x	x	x	x	x
2.River Systems Management		x	x	x		x		x
3.Coast and Polder Issues	x			x		x	x	
4.Public Health, Water Supply and Sanitation	x	x		x	x		x	x
5.Disaster Management	x	x	x	x	x		x	x
6.Climate Change	x		x		x		x	x
7.Land Resource Management	x		x	x	x		x	x
8.Urbanization and Settlement	x		x	x	x	x	x	x
9.Agriculture and Food Security	x		x		x		x	x
10.Fisheries and Livestock			x		x		x	x
11.Ecological Settings	x	x		x				
12.Forest and Biodiversity	x	x	x		x		x	x
13.Environmental Pollution	x	x		x	x		x	x
14.Growth of Population and Management	x		x		x		x	x
15.Socio-Economic and Demographic Condition	x	x	x	x	x		x	x
16.Sustainable Transportation and Infrastructure		x	x				x	x
18.Regional Cooperation	x		x	x				x
19.Information and Knowledge Management	x	x	x	x	x	x	x	x

1.2. Scope of the Study

This study has been undertaken to explore and analyse the governance and institutional arrangements regarding formulation, approval and implementation of BDP 2100 and its legacy through review and analysis of the existing policies, plans, programs and institutional situation. So, the very purpose of this study is to assess the adequacy or inadequacy of the existing decision making process, planning system and implementation arrangements, where there is a need for integration in planning, programming and implementation with efficiency in resource utilization and affectivity in generating results. The BDP 2100 formulation process and its implementation need to be embedded within an adequate governance structure and integrated budget allocation mechanism as well as an effective and

efficient sectoral institutional setting. It is the purpose of the proposed Delta Framework to address the governance challenges and improve the governance structure and mechanisms in order to bring the institutional framework and government agencies in a position to play an active and required role in the BDP 2100 process and its implementation. This integration will promote sustainable economic development in Bangladesh and will enhance the institutional capacity of the government and its agencies.

An Investment Plan will be prepared to assist the decision makers in program planning. This Investment Plan together with the Delta Framework, Delta funding and financing mechanisms will be included in the Delta Plan. In this study, the capacities of four vital elements of governance, as shown below, have been analysed.

- planning institutions,
- actors in plan formulation and implementation
- instruments (policies, strategies, acts, etc.) and
- The process through which the existing plan is being formulated.

Important activities in the stage 'Preparing the Ground' belong to the study of the current situation, the baseline conditions. This is a very important part of the process because it provides the necessary insights, information and data on the baseline conditions and trends. It prepares also the ground to undertake an integrated analysis and scenario building with main stakeholders. The Baseline Studies should lead to a common and inclusive knowledge base on water, land and related natural resources and spatial planning in the Bangladesh delta.

1.3. Objectives

The objectives of the Study are:

- to evaluate existing problems, developments and government / private plans in view of the long term (socio-economic and climate) challenges;
- to describe and assess the existing planning institutions, actors and instruments on to what extent these are capable to formulate and implement a holistic long term delta plan;
- to describe and assess the existing planning, legal and decision making process on how they are capable in coordination, formulation and implementation of a long term plan;
- to depict possible measures on how to overcome the existing weakness in terms of institutional, actors, legal, instruments and planning process with view to capacity development and resource mobilization;
- to propose to the Government of Bangladesh on institutional, actors and instrument restructuring for developing a capable planning system, in particular, the Delta Framework i.e. Delta Fund, Delta Decisions, Delta Commission, and Delta Act within a broad spectrum of BDP2100 implementation;
- To explore relevant governance and institutional mechanisms in relation with the implementation trajectory.

1.4. Approach and Methods

The approach for the Baseline Studies should ensure that the above mentioned objectives are met. The studies should be such that a maximum of existing knowledge and information is being used. The challenge is to make use of the existing studies, reports and literature in a way that it contributes to the development of a Delta Vision and Strategy, as well as creates alliance and sustains commitment with stakeholders in existing/ongoing programs. This requires a critical analysis of the current issues and plans in view of long term sustainability, taking into account the main drivers of change (such as demographic developments, economic development and climate change). Another aspect to analyse is the relations with other themes, in order to obtain an integrated vision. For the analysis and evaluation of existing plans it is useful to apply a number of criteria to be developed in an early stage of the Baseline Study.

The Study will:

- review the present state of development planning together with the implementation process
- assess current governance and institutional situation (present status) and identify the areas where improvement is needed;
- describe identified development trends/ forecasts;
- focus on problems / challenges (long term);
- give rough indication of tipping points (future problems)/ extend of the problem;
- establish essential links to other problem fields / thematic (on both impact and causal relations);
- review and evaluate existing acts, rules, plans;
- identify opportunities and formulate goals / vision;
- conceptualize needed plans / formulate measures and strategies (incl. no regret);
- Describe knowledge gaps / assumptions / data reliability.

The following approach on governance and institutional development will be elaborated:

- Development of socio-political support to the BDP 2100 planning process and its meaning: from GoB officials, focal points, Local Consultative Group (LCG) of development partners, sector wide approach of International Financial Institutions (IFIs), NGOs and the private sector. Capacity building will play an important role;
- embedding Delta Plan 2100 and a Delta framework within the governance context and model as well as institutional setting (5 D's) of Bangladesh;
- initiating and guiding strengthening and change e.g. formation of the Program Service Cell, a Guideline for implementation, policy coordination and program management;
- Developing a frame of reference for review or assessment and decision making on prioritization of measures and investments in relation to existing policies and plans.

Methods of study followed are data collection; desk study; review of acts, rules, policy, plans, strategy, etc.; interviews and meetings with key stakeholders and resource persons; workshops or focal group meetings to discuss governance issues, findings, analysis and/or to conceptualize solutions. Relevant documents those were reviewed included the followings:

- The Constitution of Bangladesh;
- The Rules of Business and the Allocation of Business;
- Perspective Plan of Bangladesh, 2010-2021;
- 6th Five Year Plan , 7th Five Year Plan, National Sustainable Development Strategy (NSDS);
- National Budget Document and future desired growth target of the Finance Division;
- Vision and Mission document, Strategies and Rolling Plans of the relevant ministries and divisions;
- Governance structure and Local Government Institutes(LGIs);
- Water related Acts and Rules (e.g. Bangladesh Water Act 2013, Water Resources Planning Act 1992);
- Related Sectoral Plans, Strategies and Policies
- Other Plans like NWMP, ICZM, BCCSAP, Dredging Plan, Hoar Master Plan, Southern Delta Master Plan and their governance structure.

Two vital methods with respect to the development of the BDP 2100 governance structure are 1) interaction with opinion leaders, national experts, policy-planners and implementing authorities and 2) involvement of stakeholders and key informants from the general people.

2. Existing Development Planning & Decision-Making Framework

2.1. Government Structure

The structure of the Government of Bangladesh is determined and its business is conducted according to the rules prescribed in the Rules of Business (Rules) made by the President under Article 55(6) of the Constitution of the People's Republic of Bangladesh. The President of the Republic is the head of the State while the Prime Minister is the head of the government. All executive powers of the Republic are vested in the Prime Minister who also heads the Council of Ministers. Bangladesh is predominantly an administered polity. There is hardly any sphere of public life beyond the purview of direct contact with the government and its functionaries. The entire governmental system is divided into three sub-systems *i.e.* the executive, legislative and judiciary - with distinctive duties and responsibilities, roles and functions, all of which are governed by established laws, rules and regulations. Among these three sub-systems the executive branch has the direct responsibilities for bringing about socio-economic change and development in the country through implementation of public policies and programs. Government business is conducted through a number of Ministries, Divisions, its Attached Departments, Agencies, Autonomous Bodies and Local Government Institutions (LGIs).

Government policies taken at the level of the Ministry is normally executed by the Attached Departments and Agencies. Attached Departments are generally responsible for providing executive direction in the implementation of policies laid down by the Ministry to which they are attached. They also serve as the repository of technical information as well as render advice to their respective Ministries on technical aspects of business transacted by the latter. Minister is the head of the Ministry. The agency offices generally function as field establishments responsible for the actual execution of government policies. Most of them function under the direction of the attached Departments but a few of them may be linked directly under the Ministries. There are also autonomous, semi-autonomous and public corporations established by dint of the President's order, ordinance and act to perform certain specialized functions or to provide public services. They have much greater freedom vis-a-vis the attached Departments in terms of personnel management and financial administration. All the activities of the government- general administration, public service delivery and development project implementation - at national and local levels - Ministry/Division, attached department/agency, corporation, division, district, upazila - are carried out by civil services.

Figure 2.1 shows the structure of the government at different layers.

The politico-administrative culture of Bangladesh reflects the existing socio-political culture. Quality of governance is being considered as the principal prerequisite for solving many problems and for the socio-economic development in developing countries. The economic growth and social welfare beings are taking place in Bangladesh slowly compared to the need to confront problems of poverty, civil strife, community development and above all the provision of basic services essential for the people of the state. Despite remarkable progress in some areas, there is still a long way to go before the desired momentum in economic growth, poverty reduction, and improvement in quality of life and overall social development is created to realize national aspirations and global commitment like Sustainable Development Goals (SDGs). Bangladesh has the basic infrastructure for good governance, but they are not well utilized and organized.

Administrative culture in Bangladesh portrays concentration of power at the top of the hierarchy and delay in giving decisions on important matters (Khan 2013). This adversely affects development and maintenance of healthy working relation between officials at different levels in the hierarchy and encourages and perpetuates authoritarian tendencies within public sector. In most cases Bangladesh Civil Service finds itself in a position where the important aspects of recruitment, promotion, transfer and training are dealt on the basis of political motive.

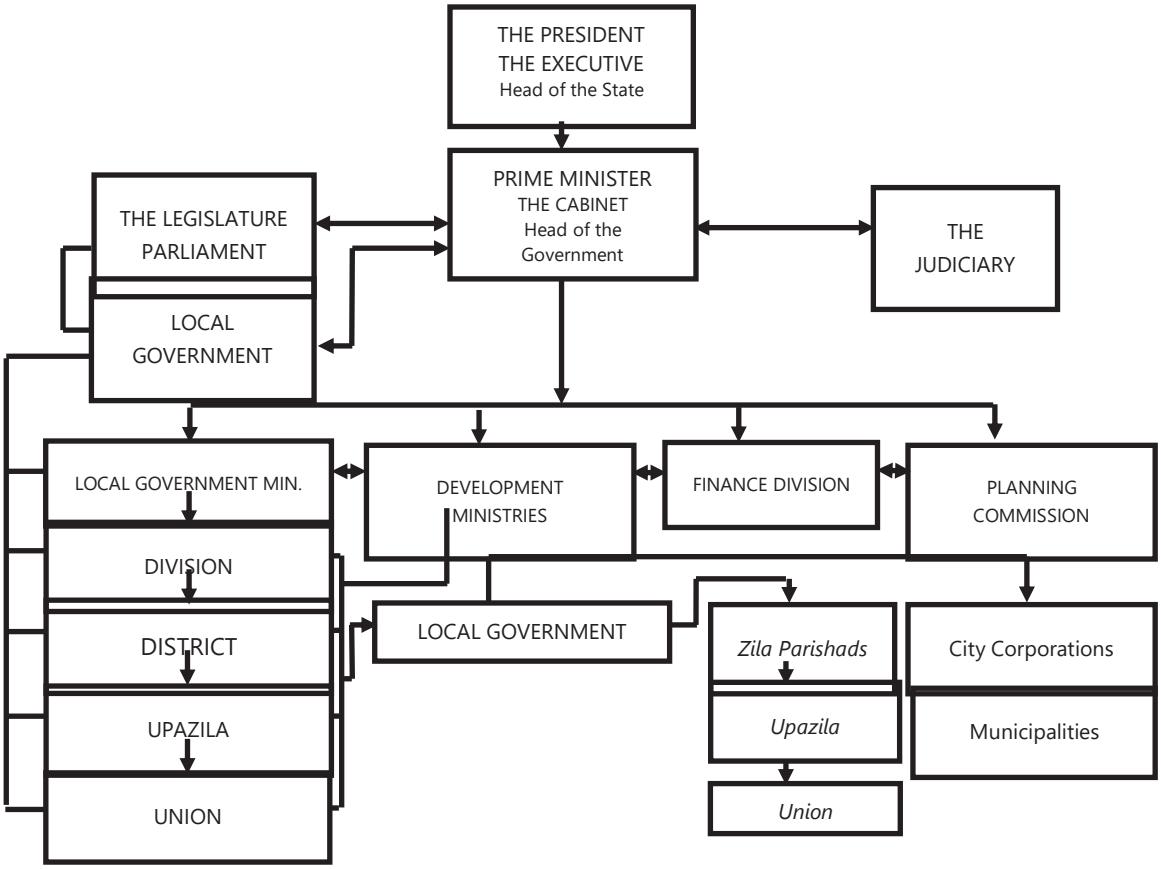


Figure 2.1: Government Structure of Bangladesh

2.2. Socio-political culture and politico-administrative culture

2.2.1. Politicization of Bureaucracy

Bangladesh bureaucracy has witnessed massive politicization but it was not to gain efficiency and increase effectiveness. Rather, the primary emphasis was placed on recruiting "party men bureaucrats" irrespective of their qualifications. Politicization appeared in various forms including the placement of party loyalists in important civil service positions.

When Bangladesh decided to embrace a democratic system in 1991, the bureaucracy found its autonomy challenged. It appeared that political patronage and favouritism threatened to erode the cohesiveness and unity of the civil service. Eventually, the bureaucracy found out a new strategy to overcome this "problem". It was done in two ways. First, after retirement, senior bureaucrats began "infiltrating the ranks of politicians". Second, the bureaucracy allowed itself to be politicized. The political parties did not prevent this, as the bureaucracy's support was necessary to run and manage the country. This gave rise to massive politicization and to an erosion of the traditional values of public service neutrality held by the bureaucracy. (Haque and Rahman, 2003: 404).

The politicization of bureaucracy is not unique to Bangladesh. For example, a debate about the politicization of bureaucracy emerged in the UK during the time of Margaret Thatcher when Sir John Hoskins stated that moderate politicization at the higher level of the bureaucracy would help the government to implement its policy more effectively (Ali, 2004:15-16). In one way or another, politicization is present in the administration of almost every developed country. It exists to allow the political leadership—those who are elected and the advisors they hire or appoint directly—to coordinate with the administrative leadership, senior career civil servants. Reorganizing ministries and transferring selected senior civil servants are political actions, but they can be justified or rationalized as enhancing efficiency and can be considered positive or allowable politicization. In this discussion we focus on the negative aspect of politicization.

It exists when personnel management decisions like transfer, promotion, and contractual recruitment depend not on quality and efficiency but on the person's loyalty to a certain political party: the subversion of merit and seniority standards damages the civil service as an institution.

This politicization has an adverse effect on the overall performance of the civil service. Since the return to democratic rule, the bureaucracy has redefined its role to defend its autonomy and character. An alliance has been created in which the bureaucrats let themselves be politicized. The problem of negative politicization has become very common over the years in Bangladesh.

2.2.2. Progress in Improving Governance

Public administration in Bangladesh is slowly adapting to changes in the social, economic, and political environment of the country. Government of Bangladesh has pursued Millennium Development Goals (MDGs), formulated Vision 2021, Perspective Plan and adopted other policies and plans including e. governance, e-commerce, Citizen Charter, National Social Security Services (NSSS) for ensuring customer- friendly public service delivery and sustained economic growth of the country.

A wide range of efforts have been experimented with to reform the civil service so that the public administration can be more accountable, efficient and transparent. Bangladesh public administration has coped reasonably well with the emergence of alternative service delivery providing organizations such as Non-Governmental Organizations (NGOs) and Community Voluntary Organizations (CVOs). Human resource training and development have been institutionalized. The administrative reform initiatives, though had limited success left some imprints. For example, with the re-introduction of upazila system of administration (local government decentralization) signs are already visible that local government bureaucracy is working with elected functionary. It has changed the politico-administrative relationship at the local level.

In recognition of the importance of good governance and institutions, the country has been relentlessly striving for achieving good governance since its independence in 1971 for the long-term development of Bangladesh. The government has undergone through a number of reforms in strengthening of judiciary, law enforcing agencies, democratic institutions, economic policy making institutions, and public administration. The notable achievements made in this respect are described below:

Progress with Policies

A number of important steps have been taken place in recent years to improve governance in the following areas:

- The Government has already formulated a National Integrity Strategy (NIS) in 2012 which identifies the contexts and challenges faced by different state and non-state institutions and it sets goals for a large array of institutions to ensure integrity in their respective operations.
- Separation of judiciary from executive has been made effective from 2007. Right to Information Act (RTI) has been enacted in 2012 to ensure transparency and accountability.
- Measures have been taken to link the Medium-Term Budgetary Framework (MTBF) with the development plans.
- The Government has decided to formulate 'Sector Strategy Papers (SSP)'/Sectoral Plan for each of the major sector within its scope.
- The Government Servants Act 2015 was approved on 7 June, 2015 by the Cabinet in principles. The principle objective is to create an effective public sector that is capable of meeting the development challenges of the country.
- The revision of the conduct rules is under progress. The aim of the initiative is to formalize behavioural norms that are pertinent for the creation of a modern bureaucracy. At present, the Ministry of Public Administration is overlooking the entire process and the draft will be ultimately placed to the Secretary's Committee on Administrative Development for final approval.

- The Ministry of Public Administration (MoPA) has developed a Performance Based Evaluation System (PBES) under which an Annual Performance Report (APR) format has been finalized. The PBES will be implemented in MoPA among its official on a pilot basis.
- The Citizen's Charter (CC) initiative has been taken by the Government of Bangladesh in 2007. The Cabinet division has instructed the Government organizations to formulate the CC in 2007. Following that, the Ministry of Public Administration has focused on the CC issue through the Civil Service Change Management programme. The CC has already been piloted in 56 public service providers under 13 ministries across 16 districts.
- To improve the service delivery process further and strengthen the Grievances Redress System (GRS) as an effective instrument, a separate branch has been introduced recently in the Cabinet Division. Each ministry has a focal point officer to deal with the public grievances.
- Measures have been taken to increase the transparency and accountability of local Governments. For instance, union digital centres have improved transparency at the local level and few investigations into corruption have occurred. Some efforts to improve planning and budgeting capacity at the local level have been initiated. The Access to Information (A2I) initiative has brought progress in the state of e-governance at the local level through the implementation of a well-designed program of ICT, hardware and software, technical assistance and training programs.
- The Government has also taken a number of initiatives to implement the Digital Bangladesh vision. In particular, a set of wide-ranging initiatives to greatly expand the use of ICT to improve efficiency and effectiveness is taken notably through Policy Intervention, National Portal Framework (NPF), District e-Service Centres (DeSCs), ICT in Education, Union Digital Centre (UDC), Jatiyo e-Tathyakosh, e-Purjee
- The Government has also facilitated improvements in the 'planning and budgeting framework' and adopting a better 'results based monitoring and evaluation framework'.
- Commendable progress has been made in the area of introducing results-based M&E at the macroeconomic level. The First Implementation Review of the Sixth Plan was done in July 2012 using a quantitative results framework. The mid-term review has also been done. Efforts are also underway to institutionalize arrangements at GED to undertake periodic results based M&E exercise at the macroeconomic and sectoral levels. The area where progress has been lagging concerning results-based monitoring at the project-specific level. IMED continues to focus on physical and financial aspects of project implementation. A results-based approach to project level M&E remains to be adopted.
- Measures have been taken to bring improvement in project quality through more realistic project design, better assessment of implementation capacity and management and more realistic costing, enhancing the financial authority of Project Director for accelerating the ADP implementation, ensuring quality procurement of goods and services, strengthening the capacity of Government officials regarding project implementation through proper assignment of staff, through better training, and through better accountability and introducing results-based monitoring of public funds.

Progress with Institutions

Civil Service reforms: Progress is ongoing in reforming civil service in a number of areas. Besides processing of enactment of Government Servant Act, in order to motivate civil servants a public administration award policy has been formulated and brought under implementation. Competitive recruitment process is helping attract better quality talents in the civil service. On-the-job and specialized training is helping improve performance. Special focus is now on developing capacities of the civil officers through strengthening of the public administration training centres. To improve service delivery E-filing has been introduced. It has already been piloted in the career planning wing of the Ministry of Public Administration. Incentives have also been improved by increasing the retirement age of civil servants by two years. These are all steps in the right direction but further steps are needed to institute performance-based promotion and to provide to upgrade skills through more systematic and periodic training. Special efforts are needed to attract and retain

civil servants in a number of specialized areas such as economic management, tax planning, financial management, project management and results-based monitoring and evaluation.

Local Government Institutions (LGIs): Good progress has been made in instituting elected local Governments. Efforts are also underway to institute district level budgets and to assign greater responsibility to LGIs for delivery of basic services such as health and education. Training manuals for LGI staff have been developed and some training is underway. Nevertheless, the major gap is in the area of financial accountability. Capacity of local governments to raise resources is severely handicapped by the absence of sound fiscal decentralization. Local Governments are heavily dependent upon transfers from the Government for even financing its staff and performing routine functions. All development projects depend upon Government grants. Overall, local Governments face a severe budget constraint. Additionally, capacity of LGIs is heavily constrained by lack of quality staff. This high-priority institutional agenda requires substantial attention from the highest levels of Government.

Partnership with NGOs: Bangladesh is justly proud of its long tradition of partnership with NGOs and takes pride in nurturing world-class NGOs. The outreach of NGOs in the delivery of large range of services including education, health, training, women's empowerment, micro-credits, climate change and social protection has continued to blossom. The Government has also established good partnership with a number of private research institutions to strengthen macroeconomic management and policy making. This has provided a stronger basis for strategy and policy formulation in a number of areas including banking, tax policy, planning, trade policy, poverty analysis, social protection and regional cooperation.

Annual Performance Agreement (APA): With a view to ensure a systematic review of all Ministries/Divisions in order to generate more accountability and effectiveness within public organizations, the Govt. has already instituted a framework of performance management called Annual Performance Agreement (APA).

2.2.3. Contemporary Challenges in Macro Governance

A detailed examination of the Mid-Term Review of Sixth Five Plan (6th FYP) and other recent events has convinced policymakers that four areas have shown noticeable weaknesses that demands urgent attention in future. The choice of these areas as 'key challenges' is primarily determined by their importance for the overall economy and the weaknesses they have exhibited over the recent years. These areas are:

Judicial Effectiveness: Access to judiciary is critical for administering the rule of law and protecting the rights of citizens which could be supported by the fact that in 2010, total back log of cases in both upper and lower judiciary was approximately 1.8 million which has now increased to more than 3 million. This is a serious concern and it has severely affected the speed with which both civil and criminal litigations are managed.

Public Administration Capacity: Strengthening capacity of public administration capacity is a prerequisite for ensuring the delivery of adequate public services. In the absence of comprehensive mechanisms to ensure meritocratic recruitment, postings and promotions in the civil service, Bangladesh has shown some weaknesses in this area. The present situation demands that the Government facilitate substantial improvements in public administration capacity – without which vision for becoming middle income country would unlikely to be realized.

Economic Governance: Effective economic governance is concerned with providing an optimal level of physical infrastructure and organizational strength, so that private economic agents do not suffer from the under provision of public goods or lack of regulatory oversight. Therefore, improving economic governance through articulating specific interventions in the financial market has emerged as a priority area for creating enabling environment of doing business and to attract private investment.

Improving Local Government Performance: An effective local Government is essential for addressing the heterogeneous socio-economic needs and concerns of diverse localities within a democratic space. In fact, a devolved and effective local Government system is decisive for conceptualizing a pro-poor development agenda, widening participation in

decision making and ensuring that resources are targeted to constituents where they are most needed. This, of course, results in increased allocative efficiency within the economic domain. Nonetheless, the performance of LGIs within Bangladesh has been somewhat disappointing. LGIs are constrained with capacity, budget support, and authority to deliver the expected services and governance. Particularly new capacity development challenges have emerged as essential issues within the discourse on local Government. Therefore, a focused approach in this regard is likely to facilitate addressing governance deficits to ensure better service delivery at the local level.

2.3. Development Planning and Budgeting in Bangladesh

According to the commitment made in the constitution of the country, Bangladesh has been following a path of planned economy since independence. Till date a number of plan documents have been prepared to guide the development of the country. The country adopted its First Five Year Plan in 1973. Between the time-span of 1973 and 2015, Bangladesh has implemented six successive five-year plans: 1973-1978, 1980-1985, 1985-1990, 1990-1995, 1997-2002 and 2011-2015. The 7th Five Year Plan has recently been approved by the Government. An interim plan was implemented to fill in the gap between the First and Second Five Year Plans and the break between the Fourth and Fifth Five Year Plan (1999-1997) remained a plan holiday year. In 2003, the country deviated from its regular course of medium-term five-year planning and shifted to a process of shorter-term Poverty Reduction Strategy Paper (PRSP). The PRSP regime continued up to 2010. During this period, the First Interim PRSP, the First PRSP (Unlocking the Potential) and the Second PRSP (Moving Ahead) were prepared and implemented (2003-2010). Obviously, the PRSPs were not full-blown development plans as in these strategy papers (not plans) even no GDP (gross domestic product) growth rate had been targeted to attain during the implementation period. So, as a result, the growth performances achieved during the PRSP periods cannot be evaluated. The performance by target achievements of different plans in Bangladesh is presented in **Table 2.1**.

Table 2.1: Growth performance in the Five Year Plans along with Interim Plans. Source: GED, 2015

Plan Period (FY)	Plans	Av. Growth Target	Actual Growth	Percent Target
1973-78	First Five Year Plan	5.5	4.0	72.73
1978-80	Two Year Plan	5.6	3.5	62.50
1980-85	Second Five Year Plan	5.4	3.8	70.37
1985-90	Third Five Year Plan	5.4	3.8	70.37
1990-95	Fourth Five Year Plan	5.0	4.2	84.00
1997-02	Fifth Five Year Plan	7.0	5.1	72.86
2003-05	Interim Poverty Reduction Strategy Paper (IPRSP)	-	6.21	-
2005-08	Unlocking the Potential: National Strategy for Accelerated Poverty Reduction (NSAPR-II)	-	6.41	-
2009-11	Steps Towards Change: National Strategy for Accelerated Poverty Reduction (NSAPR-1)	-	6.33	-
2011-15	Sixth Five Year Plan	7.3	6.31	86.44
2016-2020	Seventh Five Year Plan	7.44	-	-

The country took a paradigmatic shift in its planning process in 2010 and formulated two important and highly contextual plans with a long term vision. These are Perspective Plan and NSDS; core elements of those are described below:

Perspective Plan

To make the Vision 2021 a reality, the Perspective Plan of Bangladesh for 2010-2021 was adopted. The overarching vision of the first Perspective Plan is to accelerate national development process. The fundamental objective of the Plan

is to eradicate poverty through attainment of higher growth rates and to achieve the middle-income country status in real terms by 2021, the Golden Jubilee Year of national independence. It envisions equitable and inclusive growth process, where poverty would be at its lowest and regional development would be balanced. The Perspective Plan was formulated in consultation with people from different walks of life including farmers, labourers, ethnic people and other marginalised and disadvantaged sections of the population, civil society members, administrators, professionals and policy makers, public and private enterprises, NGOs, and other interest groups, thereby making the document a participatory one. The consultations took place at the national, divisional and district levels. The perspective plan has been able to attract serious political attention and support which has also helped to achieve the target by bringing the development agenda in the political manifesto.

National Sustainable Development Strategy (NSDS) of Bangladesh

National Sustainable Development Strategy has been published by GED with approval from the government at the end of 2013. The NSDS has addressed mainstreaming sustainable development challenges and integrate economic, social and environmental objectives across sectors. It also includes mechanism for monitoring implementation progress and institutional mechanism for people's participation.

The framework for the NSDS is presented in **Figure 2.2** which indicates that the goal of the strategy is to ensure sustainable development. To fulfil the vision of sustainable development the following five strategic priority areas are identified: *Sustained Economic Growth, Development of Priority Sectors, Urban Development, Social Security and Protection, Environment, Natural Resource and Disaster Management*. The NSDS has also identified three cross-cutting issues which are important for implementation of all five strategic priority areas. These cross-cutting areas are: *Disaster Risk Reduction and Climate Change, Good Governance and Gender*.

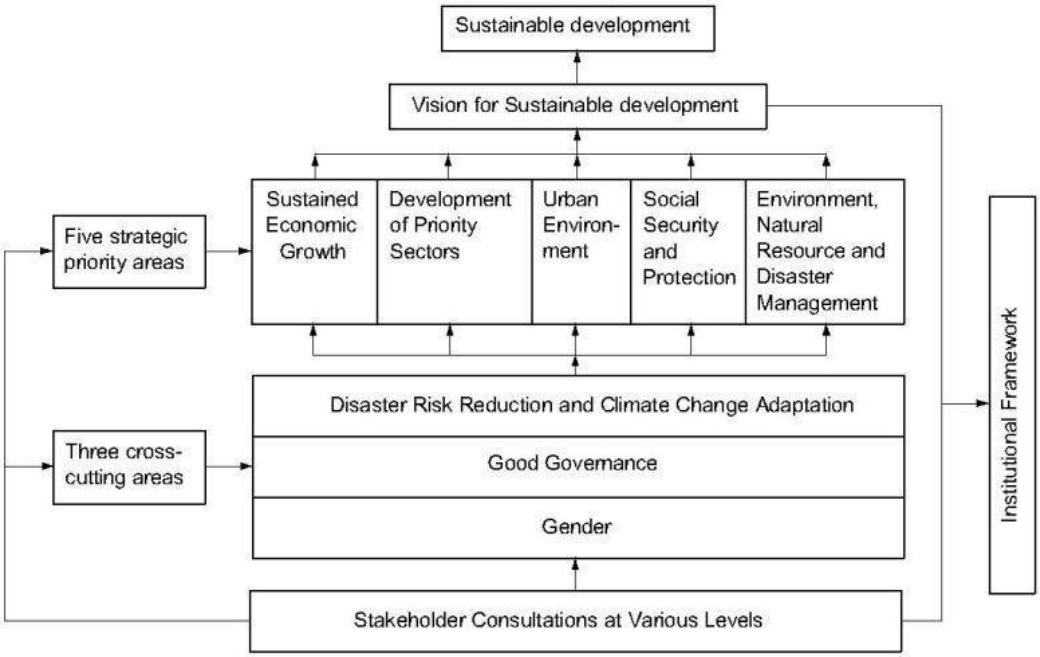


Figure 2.2: Flow Chart of National Sustainable Development Strategy Framework

Medium term Plan: Seventh Five Year Plan (FY 2016-2020)

The 7th FYP articulates new strategies, institutions and policies, while strengthening existing ones, to complete the remaining agenda of achieving the social and economic outcomes of the Vision 2021 and the Perspective Plan. The 7th FYP begins with the country having entered the ranks of lower middle income countries. The first year of the 7th Plan also coincides with the launch of the UN's Sustainable Development Goals (SDGs). In the backdrop of these factors, the 7th Plan focuses on the following themes:

High Growth and inclusiveness: The 7th FYP seeks to raise the GDP growth rate progressively from 6.5 percent in FY2015 to 8.0 percent by FY2020. The average growth rate is projected at 7.4 percent over the Seventh Plan period. Manufacturing sector growth will be pivotal whose contribution grow to 21 percent of GDP by FY2020. Inclusiveness is emphasized in the 7th FYP that entails equal opportunities for all to benefit from higher growth, creation of productive employment, and improved access to services for the marginalized and physically challenged people. Reduction of the current income inequality of 0.45 will be pursued while spending on social protection as a share of GDP will be increased to 2.3 percent of GDP by FY2020.

Growth and poverty reduction: The 7th FYP seeks to reduce poverty rate to 18.6percent and extreme poverty to around 8.9 percent by FY2020. Along with growth, the 7th Plan emphasizes human development, social protection and social inclusion as essential elements of a comprehensive poverty reduction strategy.

Growth and employment: It is estimated that some 12.9 million additional jobs will be available during the tenure of the 7th FYP, including some 2.0 million jobs abroad for migrant workers, as compared with the 9.9 million labours that is expected to join the workforce during the same period. Thus job creation, both domestic and foreign, will exceed the additional labour force that will be looking for work so that the backlog of under-employment will also be reduced significantly.

Despite a number of notable achievements, governance remains a key issue. Consequently, it will address with determination in the 7th FYP, focusing on three key areas: (i) Justice and Rule of Law, (ii) Public Sector Capacity in terms of Administration and Financial Management, and (iii) Economic Governance.

To strengthen the Public Investment Management, the Government during the 7FYP, will introduce a multi-year Public Investment Programme (PIP) to ensure a close match between approved projects and the availability of financial resources. It will also scale up project design, appraisal and approval system to increase the quality of the investment portfolio. The Financial Management activities that will take place include introducing a modern Integrated Financial Management Information System (IFMIS) capable of producing timely, comprehensive and reliable financial statements. Also, a new Budget and Accounting Classification System (BACS) will be adopted and audit system will be strengthened. The 7th Plan will continue the 6th Plan's emphasis on prudent macroeconomic management. Government spending will be increased to 21.1percent of GDP in the same period.

The 7th FYP (2016-20) is the first development instrument and flagship document for Bangladesh to address the global Sustainable Development Goals (SDGs) approved by the United Nations. While formulating the plan document, the proposed goals were taken into consideration so that the goals of the SDGs can be illustrated in the national plan and budgetary allocations. The 7th FYP has been formulated through extensive horizontal and vertical consultations among the stakeholders. The formulation process is described at the later section of the report.

Investment Plan: Annual Development Programs (ADP)

The medium-term development plan is implemented through Annual Development Programs (ADPs). A Five Year Plan is implemented by five budgets comprising ADPs (Annual Development Programmes). Budgets are prepared within the budgetary allocations and growth targets set in a Plan. Development expenditures are reflected in the ADPs. ADP implementation over the years is shown in **Table 2.2**, covering the period FY2006 to FY2015. The ADP is the tool of the government through which resources are allocated to different development projects/programmes under different

ministries/divisions with a view to achieving the national goals specified in the Five Year Plan and the perspective plan. Process of the Annual Development Programme is generally undertaken at the Programming division of Planning Commission. For the last few years, there has been a huge leap in development expenditure under ADP to achieve the goals of the 6th FYP.

Table 2.2: Implementation of ADP

Fiscal Year	ADP Allocation	RADP Allocation	RADP Expenditure	
	(Billion BDT)	(Billion BDT)	(Billion BDT)	(Percent)
Average [FY2002 to FY 2006]	**210.0**	**188.2**	**169.2**	**90.0**
FY2006	**245.0**	**215.0**	**194.7**	**90.6**
FY2011	385.0	358.8	330.1	92.0
FY2012	460.0	410.8	380.2	92.6
FY 2013	550.0	523.7	500.4	96.0
FY 2014	658.7	600.0	567.5	95.0
FY 2015	803.2	750.0	685.3	91.0
Average [FY 2011 to FY2015]	**571.4**	**534.3**	**492.8**	**93.3**

Source: IMED, Ministry of Planning

Bangladesh as a country is adept at formulating good plans and documents. The problem is in implementation characterised by lack of proper monitoring and evaluation. Previous plan documents suggested some measures to address this. First Implementation Review of the Sixth Five Year Plan has suggested some measures to improve and quicken implementation of the development projects. Some measures can be implemented in quick time which can bring positive result in the short run.

2.4. Elements of core Development Administration: Planning Commission and its Core Elements

The Bangladesh Planning Commission (PC) is the central planning entity of the Government. It performs mainly three types of functions: advisory, executive and coordinating. As part of advisory function, PC has the responsibility of advising the government in matters of development goals, priorities, strategies and policy measures. More precisely, it is responsible for translating the ideas, aspirations and political agenda of the government into macro and micro economic policies and sets them in long, medium and short-term plans. As part of its executive function, the Planning Commission is responsible for preparing, processing and approving development plans, programmes as well as projects. The coordination function of PC encompasses the whole range of planning activities in order to ensure consistency of investments with overall and sectoral objectives of plans of the relevant ministries and divisions (**Figure 2.3**).

Planning Commission determines objectives, goals and strategies of medium and short-term plans within the framework of long-term perspective plans and formulates policy measures for the achievement of planned goals and targets. Its activities include the following elements of development planning:

- Policy Planning: determination of goals, objectives, priorities, strategies and policy measures for development plans;
- Sectoral Planning: identification of the role that the various sectors of the economy are required to play in the context of the Plan objectives and goals;
- Programme Planning: formulation of detailed resource allocation to realize the Plan objectives and goals;

- Project Planning: appraisal of projects embodying investment decisions for the implementation of the sectoral plans; and
- Evaluation: impact analysis of projects, programs and plans on the people's living standard.

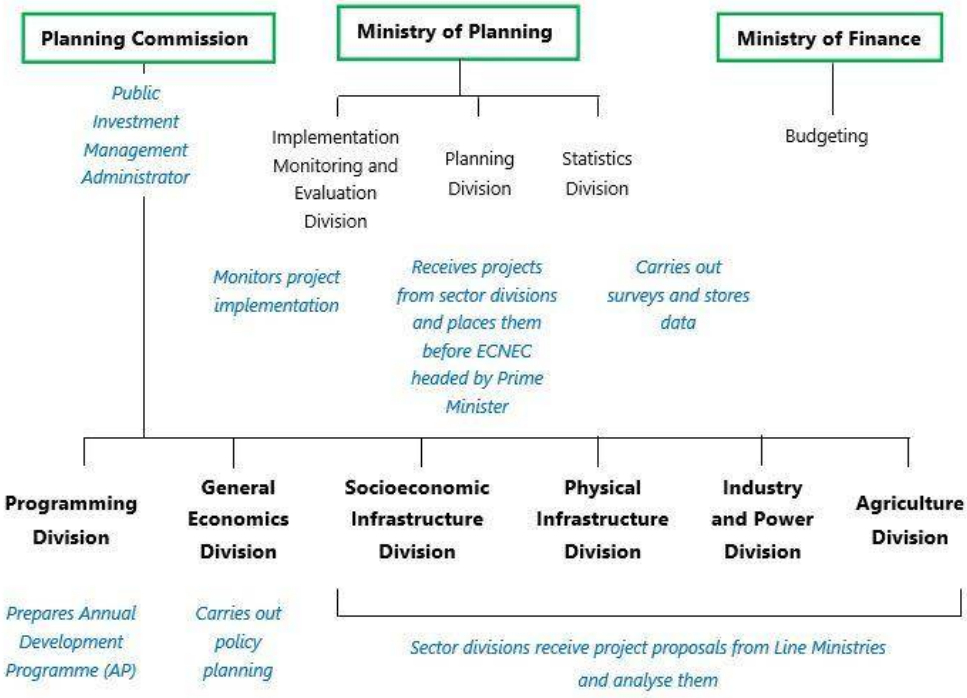


Figure 2.3: Institutions for Development Planning in Bangladesh

This instiutional mix for development planning has been elaborated in later section of this report.

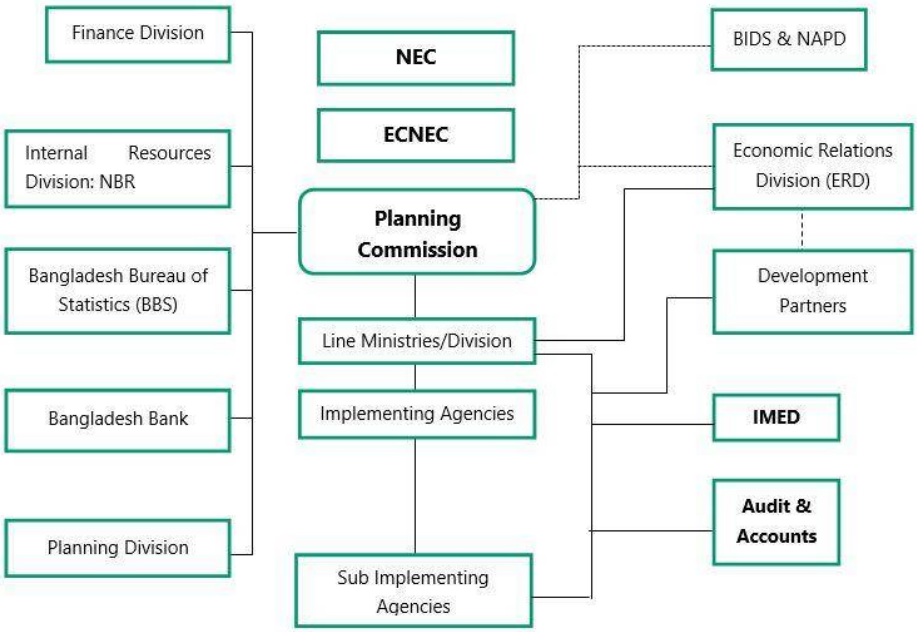


Figure 2.4: Development Administration in Bangladesh

The Commission is required to maintain close liaison with all ministries/divisions and agencies of the government. The sector divisions of the planning commission initiate project approval processing only after it receives the same from the respective ministries/divisions. In addition to these, the Commission has to depend for planning inputs on some specialized agencies of the government. With reliance on external aid for implementation of plans, programmes and projects, the task of negotiation and lining up of foreign aid has been assigned to Economic Relations Division. Finance Division and the Internal Resource Division are responsible for internal resource mobilization. The allocation of funds to individual projects in the ADP is done by the Programming division of the Planning Commission being guided by the progress reports on projects prepared by Implementing, Monitoring and Evaluating Division (IMED). The data requirement of the Commission is met by the Bangladesh Bureau of Statistics (BBS) is shown in **Figure 2.4**.

2.5. Institutional Linkages of the Planning Commission

In preparing Five Year Plan, the ADP and in carrying out the process of project appraisal and approval, the Planning Commission interacts with different Ministries/Divisions/Agencies of the Government shown in the **Figure 2.5**.

Sectoral planning is done by the sector ministries, who formulate policy and policy guidelines, strategies and/or master plans. Sector ministries also prepares plan and formulate development projects normally translating development goals prescribed in the long term plans (perspective plan and 5-Year plans) of the Planning Commission and also sectoral policy and policy guidelines, strategies and/or master plans.

The sector ministries formulate policy guidelines to achieve the development goals through development projects. The Departments and other line agencies of the Ministries are the main executing bodies for implementation of the projects. While sectoral policies are usually approved at the cabinet of Ministers headed by the Prime Minister, sectoral strategies/master plans are approved by the Minister concerned. Planning Commission does not take active role in the formulation and in the approval mechanism of sectoral strategies/ master plans.

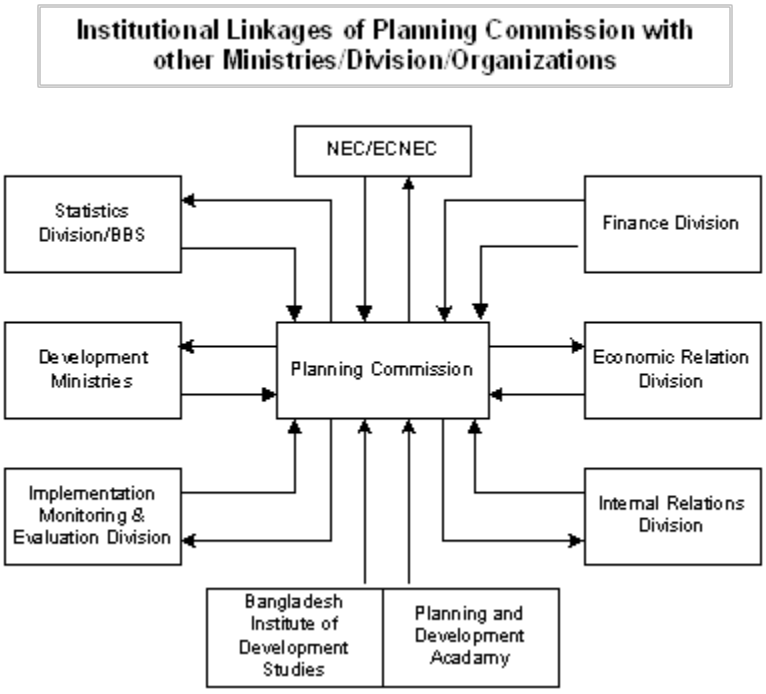


Figure 2.5: Institutional linkage of Planning Commission with Ministries, Divisions and Agencies

Implementation Monitoring and Evaluation Division (IMED) is responsible for implementation, monitoring and evaluation of the national program and projects. ADP implementation under the Five Year Plan framework is monitored by the IMED and the Planning Commission takes corrective steps accordingly. The Statistical Division meets comprehensive data requirements of the Planning Commission. Finance Division (FD) and Internal Resource Division (IRD) advise the Planning Commission on matters of resource availability and formulation of fiscal and monetary policy. Given the country's dependence on official development assistance (ODA) from the international community for development planning, the role of Economic Relations Division (ERD) is also very important. ERD mobilizes ODA to meet saving-investment gap in the development planning. At the micro level, ERD lines up project aids for implementation of ADP. Bangladesh Institute of Development Studies (BIDS) gives backup research support to the Planning Commission whenever necessary. National Academy for Planning and Development (NAPD) supports the Commission by providing training inputs for its officials. Finally the Commission submits plans, programmes and projects to the National Economic Council (NEC)/Executive Committee of the NEC (ECNEC) for formal approval. The National Economic Council (NEC) is the highest economic policy-making and decision-making body of the nation, and is headed by the Prime Minister.

2.6. Structures, Procedures and Practices of Development Planning and Decision Making

Bangladesh Planning Commission is the central planning organization of the country. After independence in 1971, when the nation crafted its first-ever Constitution, the government arrived at a consensus that the country will follow the path of a planned economy for realizing its development objectives. Article 15 of the Constitution says, "It shall be a fundamental responsibility of the State to attain, through planned economic growth, a constant increase of productive forces and a steady improvement in the material and cultural standard of living of the people…" Thus, the Constitution enshrined the development philosophy that seeks economic growth with equity and social justice. Accordingly, the country in the early years of independence pursued an equitable growth strategy aiming, especially, to reduce poverty and income inequality by ensuring access of the poor to economic resources, reducing regional imbalance in development and raising economic participation of women and youths as well as the disadvantaged.

The Prime Minister is the Chairman of the Planning Commission. The Minister for Planning is the Vice-Chairman of the Commission. At the policy level, the Commission consists of one Chairman and one Vice Chairman and six Members. Secretary Planning Division acts as the Member Secretary of the Commission. The Planning Division provides the administrative and secretarial support to the Planning Commission. The Planning Commission is composed of six divisions. The divisions and their functions are presented in **Figure 2.6.**

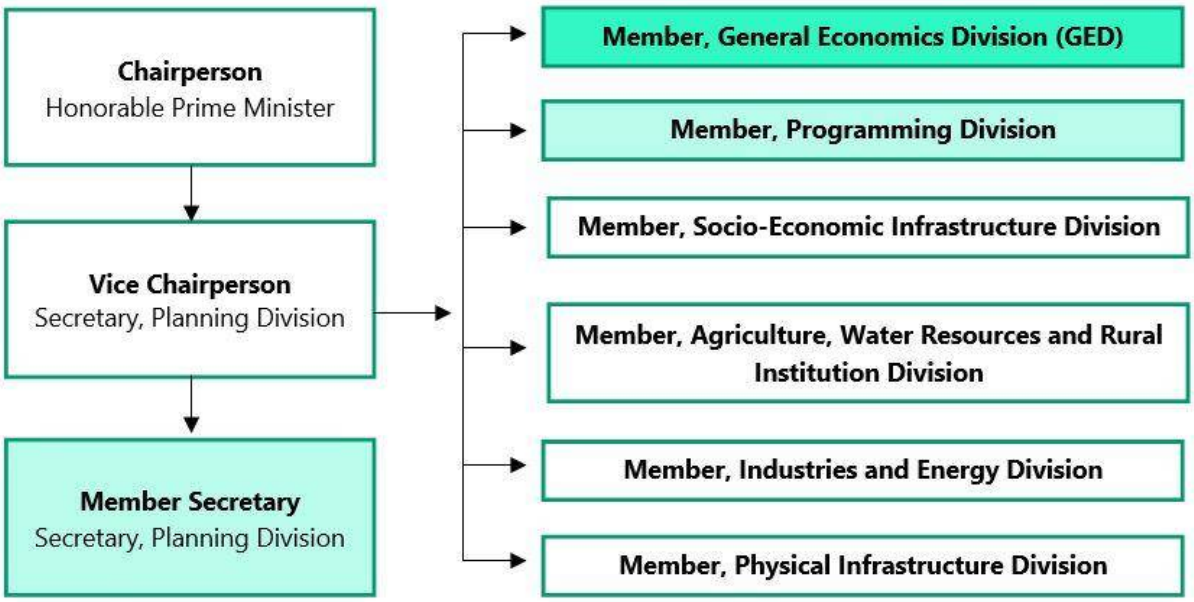


Figure 2.6: Divisions of Planning Commission with functions

GED is responsible for preapring the mid and long term plans, M&E of plans, determination of macroeconomic scenario in the context of development plan, publishing MDGs progress report, formulating results framework including SDGs and regular monitoring based on those etc. Programming Division is responsible for preparing ADP, act on resource allocation for sectors, process release of fund for revised unapproved projects etc. Other 4 Sectoral divisions are in charge of formulation of sectoral plans, processing of development projects for approval including appraisal, providing secretarial services to the PEC; Preparation of sectoral ADP in consultation with line ministries etc.

The standard operating process for development planning and approval/management of the development programmes/projects is well adopted in public administrations. *Development* is probably, the most widely used term in today's resource management with universal appeal. Attaining development, therefore, has become a prime objective for all ministries, divisions, departments and agencies, who keep the public administration in Bangladesh under the spot light. The provision for ensuring professional services in development management is well demonstrated in the creation of a separate cadre (Economic Cadre) for this sector. The creation of Planning Wing/Branch in most of the Ministries/Divisions and staffing it by professionals from Planning Commission (Economic Cadre) reaffirms the government's willingness to strengthen development administration. The decision also demonstrates the government's commitment in accelerating the process of change to promote the quality of human life involving major changes in social structure, popular attitudes and national institutions as well as enhancement of economic growth, reducing inequality and eradication of absolute poverty.

However, in planning and formulating development projects of sector ministries, the planning commission has a direct role. Each ministry/division has a Planning Wing/Branch, staffed by professionals from Planning Commission (Economic Cadre).

The Planning Commission is essentially a body of professionals and sector specialists engaged in the formulation of macro as well as micro economic policies of the government under the guidance of the Planning minister. But ultimate decision-making rests with the head of the government i.e., the Prime Minister who is the chairperson of the National Economic Council (NEC). The PC works in close collaboration with different line ministries/divisions/functional departments and maintains close liaison with development partners through ERD.

Planning instruments that have been used so far and their inter-linkages are shown in **Figure 2.7**. Till now the Perspective Plan is the principle guiding and vision document to steer the development efforts of the country. The perspective plan has been planned to be implemented through two consecutive Five Year Plans (6th and 7th) from FY 2010 to 2020. Besides these, MDG targets were also used to measure the progress of achieving the development milestones. Five year plans are translated into ADP which are basically listing of interventions for a particular financial year to be implemented and funded. Annual budget thus consists of revenue budget and this ADP budget and get approval from parliament each year. Mid-term budgetary framework also estimates financing requirements for the next three years which are followed during ADP formulation. Bangladesh Delta Plan 2100 will be a longer term development plan for the country with an in-built investment portfolio to achieve its targets. This BDP 2100 will also be implemented through five year plans and ADPs. Investment portfolio that will be identified in the BDP 2100 and to be updated continuously and fine-tuned with possible feasibility studies will be also included in the ADP.

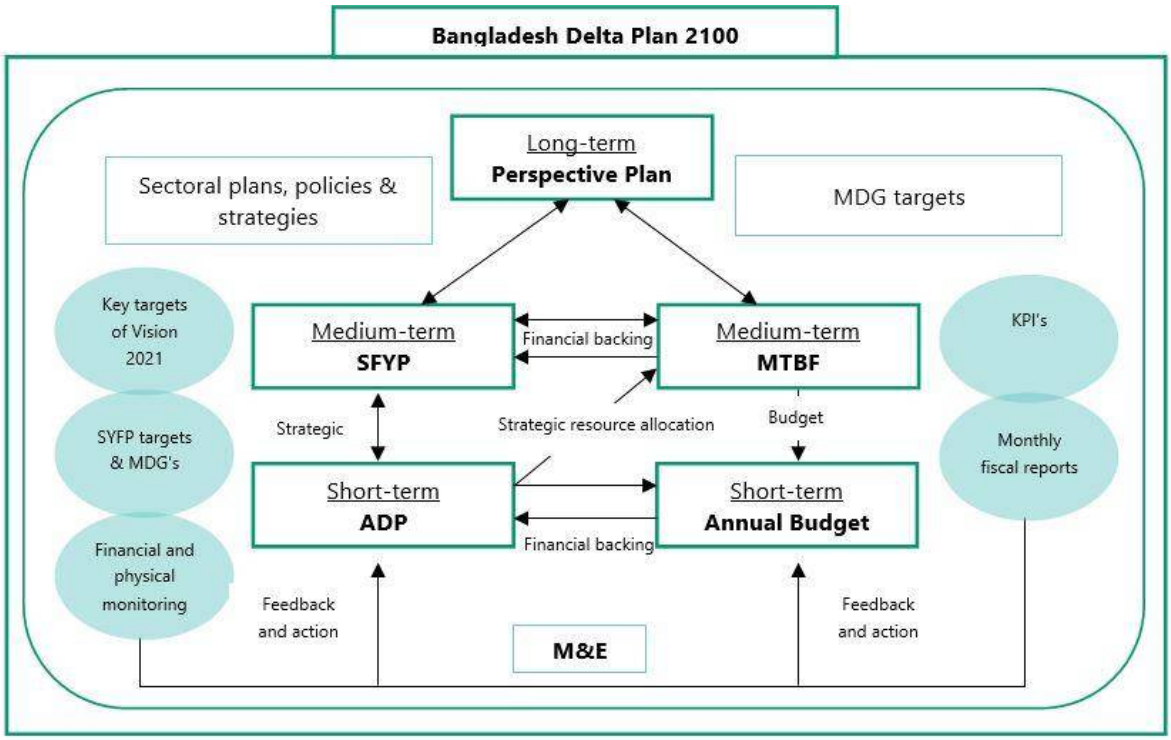


Figure 2.7: Planning Instruments

2.7. Development Planning Process and Institutions (e.g. FYP Process)

The formal rules for the business of the government require inter-ministerial consultation where the subject of the case concerns more than one Ministry/Division. Similarly, preparation of development plan follows the path of intensive consultation with the stakeholders. Coordination among the various ministries / Divisions and other stakeholder remains is a challenge for timely and effectively formulation of the development plan. The stages followed in preparation of 5 Year Plan are shown in **Figure 2.8**.

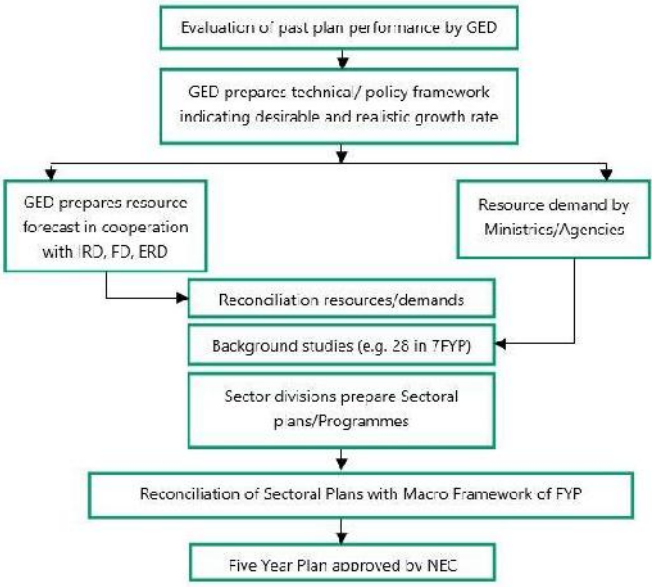


Figure 2.8: Stages followed in preparation of the 5 Year Plan

The processes followed in preparation of Seventh 5Year Plan of Bangladesh,which is approved recently, are pointed out in **Figure 2.9**:

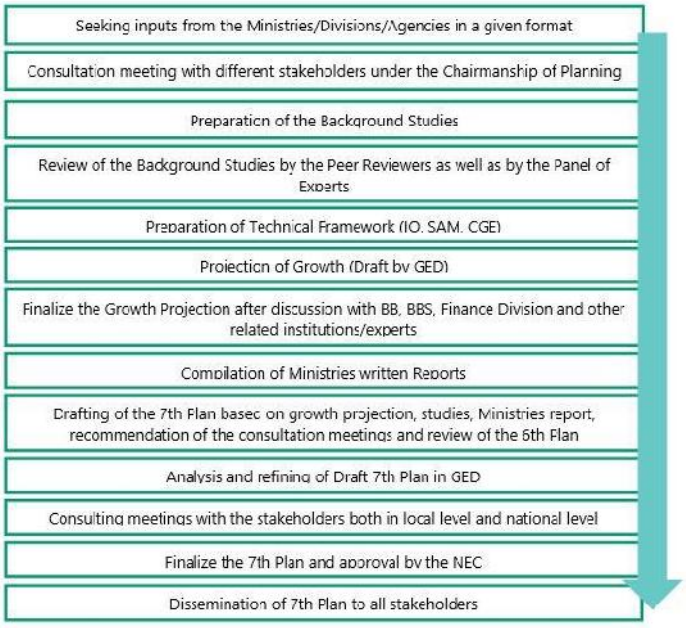


Figure 2.9: Processes of 5 Year Plan preparation

2.8. Development Plan Implementation Monitoring and Evaluation processes

While the Implementation Monitoring and Evaluation Division (IMED) plays a useful function in tracking financial and physical implementation of projects, there is a major gap in terms of results-based M&E. In the backdrop of national and international stakeholders seeking increased accountability, transparency and most importantly results from governments and organization, globally the emphasis is shifting more towards results-based M&E system. This demand is also growing in Bangladesh. Accordingly, the 7th FYP takes specific steps to move towards a results-based M&E and

strengthen the process initiated during 6th FYP. This system is likely to bring about major political and cultural changes in the way governments and organizations operate- leading to improved performance, increased accountability and transparency, learning and knowledge. In the specific context of 'Vision 2021' and the Seventh Plan, a results-based M&E is recognized as critical to helping the Government track and monitor progress with implementation of the respective targets and take corrective actions when major gaps or divergences emerge.

Furthermore, in the democratic government system and the establishment of a range of Parliamentary Committees, the need for results-based M&E is even more pronounced. The political commitment and the ownership of the government is a major step forward. Several other actions have also been taken to help move towards a results-based M&E system. These include the institution of the MTBF, the initiation of the Digital Bangladesh, and the strengthening of the Bangladesh Bureau of Statistics (BBS).

However, the lack of capacity and broad-based awareness of the importance of a results-based M&E is a major challenge. Data generation for the set of indicators and their useful analysis remains a formidable task. Most importantly, there is a clear lack of institutions and institutional coordination in terms of who will manage the overall M&E process which involves: (i) ensuring that the necessary data is generated in a timely and reliable fashion; (ii) the data is examined adequately to shed insights on the progress; (iii) the findings are disseminated to all relevant state and non-state actors so that better public policies are formulated and implemented to support the progress. Thus, to mitigate such institutional, structural and policy deficits, which undermines the overall state of result-based M&E system within the public sector, the principle strategy of the GOB will be to undertake major institutional reforms and implement a comprehensive set of activities that will create a conducive environment for an effective M&E culture.

As part of a nation-wide M&E framework, GED bears the responsibility for the macro-level M&E related to the implementation of national plans and major policies. It is now necessary to strengthen its capacity. The effort again will be long-term, but it is possible to start in a phased manner. GED has already developed some capacity in the context of designing a Development Results Framework (DRF) for the Seventh Five Year Plan. As a result, this will be used as a starting point to scale up the effort. As a first step, GED will be assigned responsibility for doing 1st annual implementation review of the Seventh Plan in 2016. A dedicated Results-Based Monitoring and Evaluation (RBM) Unit needs to be institutionalized within GED to carry out these responsibilities. It is important to mention that RBM Unit will be the most crucial institution in operationalizing the entire macro-level results-based M&E system and a large range of activities need to be undertaken within the Seventh Plan time interval to achieve this outcome.

In this context, strengthening GED's capacity to undertake the aforementioned responsibilities and specific institutional rearrangements will be needed. First, the culture of frequent turnover of staff will be minimized for the officials of GED. Second, the work program of the current Poverty Analysis and Monitoring Wing of GED will be redefined to make Seventh Plan related M&Es as a key part of its accountability. To deliver this accountability, GED will require technical assistance that could be funded through donor support. On the whole, over the Seventh Plan time interval, the capacity of GED has to be built up with range of activities aimed at improving staffing, skills and technology.

2.9. Results Framework for Monitoring 7th Five Year Plan

Setting measurable goals, targets, outputs, and outcomes require properly designed monitoring framework. These will differ by the type of plans, policies, programs and projects. But without quantitative indicators of performance and latest baseline against which performance indicators and targets will be monitored, a useful results-based M&E is not possible. A monitoring framework is useful to monitor performance but this need to be beefed up with results framework to assess the performance. The process of linking results chain from inputs to outputs and outcomes is as important as the related quantitative indicators.

The results framework of the Sixth Plan was the first attempt to establish a set of quantitative goals, targets and performance indicators for macro-level M&E. This was an important step forward. However, the first and mid-term

implementation review of SFYP reviewed the results framework (RF) and recommended to refine some of the goals, targets and indicators, particularly those that are long-term in nature and involve institutional changes for ensuring good governance.

The GED has taken a lead to design a Results Framework for the 7th FYP in collaboration with BBS, IMED and line ministries. In this connection, a two-day long consultation workshop took place in Dhaka during 7-8 March 2015 to design a Results Framework in line with 7th FYP in an interactive and participatory manner especially through engagement of government ministries/institutions. The workshop created opportunity for thematic discussion on selected sectoral areas for the 7th FYP to identify sectoral outcomes and its measurable performance indicators. Initially a total of 86 outcome level indicators were identified for the monitoring of the Plan in consultation with relevant government ministries/institutions. Subsequently, the draft Results Framework with identified indicators were disseminated to all relevant (32) ministries for reviewing their respective parts and set up baseline and targets. A national level consultation workshop was also organized by the GED on the draft Results Framework involving all stakeholders including GO, NGOs, CSO, research institutions, academics, and development partners in order to finalize the framework. Ultimately, under the Seventh Plan's results framework – a total of 90 indicators were chosen to implement the results-based M&E system. The choice of these indicators is shaped by the intensive consultations with relevant government ministries, departments, agencies as well as national and international development partners in Bangladesh.

2.10. Development Budgeting Process (i.e. Annual Development Program)

The constitution of the People's Republic of Bangladesh 1972 provides the basic legal framework for the Governmental Budget process. Articles 81 to 92 outline the requirements of budgetary procedures. The budget preparation for the next year usually commences soon after the start of the current financial year. The preparation culminates in their presentation to the Parliament and their approval in the Appropriation Act. Therefore, there are two targets in the budget preparation process:

a) Completion of the process in time for the proposals to be incorporated in the budget speech by the Minister of Finance; and
b) Presentation of the budget to Parliament sufficiently prior to the financial year end to allow time for final printing and distribution of the budget prior to the commencement of the New Year.

The Finance Division of the Ministry of Finance has overall responsibility for the orchestration of the Revenue and Development Budget preparation process. The Planning Commission is responsible for preparation of the Annual Development Programme (ADP) which after preparation is converted into the Development Budget by the Development Wing of the Ministry of Finance. Following approval by Parliament and promulgation of the legislation, the spending ministries are notified of their allocations by the Finance Division in a circular accompanied by the approved sections of the budget books appropriate to them. This constitutes the formal approval for sanctioning to issue sanction orders authorizing the incurring expenditure.

Development planning is considered to be the most important aspect of the Government's Fiscal Policy. Planning for a fiscal year begins with formulation of the Annual Development Programme (ADP). Approved projects are shown with funding arrangements in the ADP. Unapproved projects are also shown in the ADP in a separate section of ADP generally listed without the funding arrangement. ADP is the tools of the government through which resources are allocated to different Development Projects/Programme under different ministries/divisions with a view to achieve the National Goals specified in the short, medium and long term planning documents of the Country (FYP, Perspective Plan etc.). A simplified series of steps in the formulation process of Annual Development Programme is shown in **Figure 2.10**

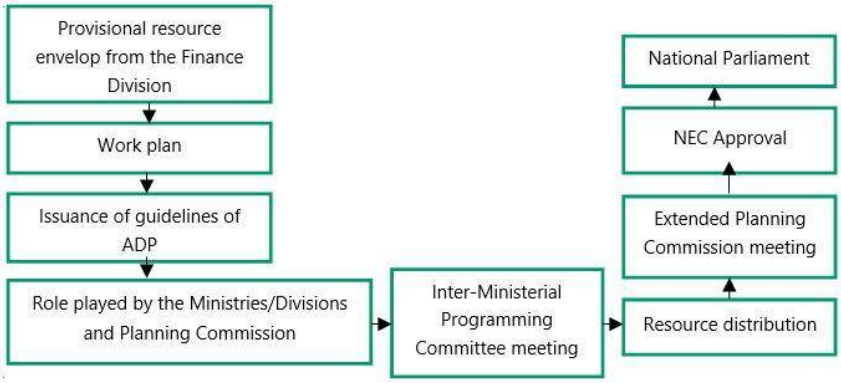


Figure 2.10: ADP formulation Process

National Programming and Financing cycle

National programming and financing cycle usually goes hand in hand. Programming or planning systems are usually centred on the preparation and implementation of the 5-Year Plan. The 5-Year Plan contains statements of Government objectives and policies, strategies for achieving objectives, a resource framework for the plan period (projections of revenues and expenditures) and a programme of sectoral development to be implemented during the period. The programme of projects is based on the projected resource availability, while taking into account of the recurrent requirements for the period. Plan preparation and formulation as for BDP 2100, with its specific institutional and financial Delta Framework, is likely to take place within the framework of the country programming cycle (**Figure 2.11**).

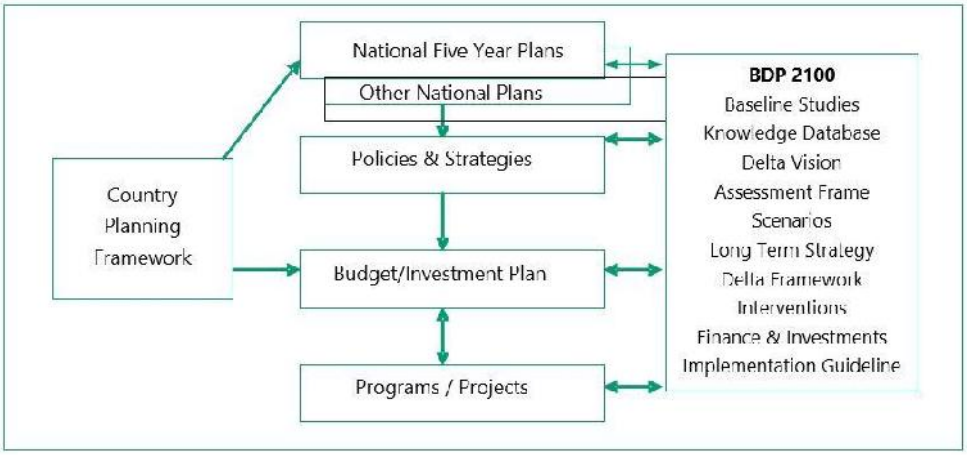


Figure 2.11: Country Planning Framework for BDP 2100

Following the Country Planning Framework, the planning cycle is closely integrated with the process of budgeting and accounting (**Figure 2.12**). In fact, some of the stages in the planning cycle are synonymous with budgeting and accounting. Securing and allocating resources (stage 3) is the process of budgeting and monitoring of the activity (stage 5) involves accounting for expenditure. The overall budget is the annual operationalization of the plans contained in the 5-Year Plan, translating resource projections into annual revenue estimates and expenditure plans into the annual revenue and development budgets. The Resource Framework, contained in the 5-Year Plan covers all financial resources available to the government, including domestic funds and external aid, and which are used to finance the budget proposals contained in the two areas, revenue and development, of the overall budget. The revenue budget is

predominately funded from local resources whilst the development budget is funded from a combination of local and foreign resources.

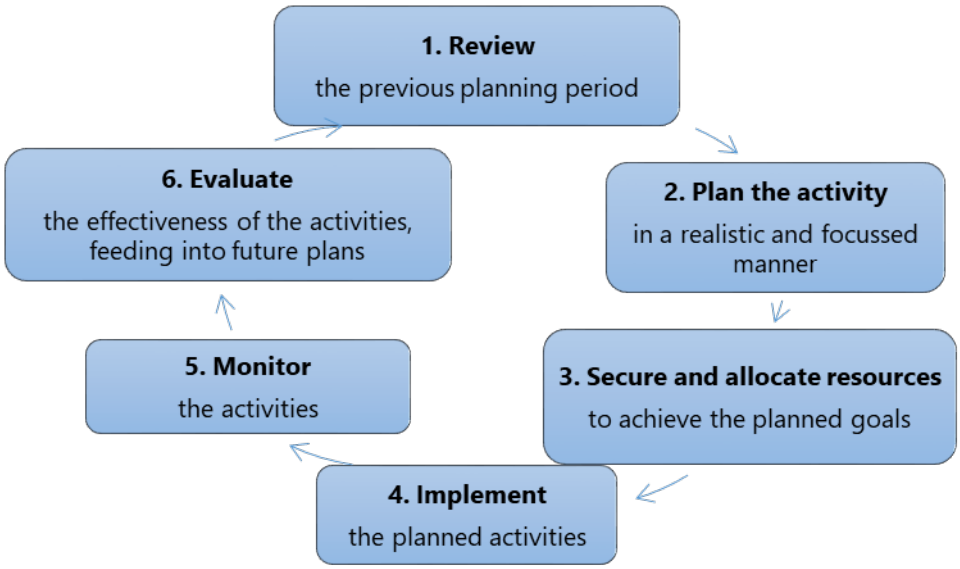


Figure 2.12: Stages of a Planning Cycle

2.11. Programme/Project Planning Process and Institutional Linkages

One of the important tasks of the Planning Commission is to approve the development projects (both investment and TA projects). The concerned sectors Division of the Commission for the purpose appraise and process the approval of the projects. As mentioned before, 4 (four) Sector Divisions of the Commission - (1) Agriculture, Water Resources and Rural Institution, (2) Physical Infrastructure, (3) Socio-economic Infrastructure and (4) Industries and Energy Division are responsible for appraising and processing approval of the projects of their concerned sector. Planning Commission has its own format for presentation of project proposal: Development Project Proposal (DPP) for Investment project and Technical Assistance Project Proposal (TPP) for TA project. Planning Commission does not carry out the responsibly of project processing in isolation; rather it shares the exercises with line Ministry/Division and engages itself into rigorous consultation with them.

The project approval process has been simplified and rationalized over the years. The project proposal prepared by the implementing agency is scrutinized and evaluated by Departmental Project Evaluation Committee (DPEC) for investment project and by Special Departmental Project Evaluation Committee (DSPEC) for TA projects in the line Ministry /Division. Representatives of the concerned Ministries/ Divisions/Organizations and the Planning Commission are included in the DPEC and SPEC. Finance Division is given the responsibility of rationalizing the project personnel to be recruited under the project with government's own resources. It exercises this power through an inter-ministerial committee. Sector Divisions of the Planning Commission appraise of their respective projects and process the approval process through Project Evaluation Committee (PEC) in case of investment projects and while for TA projects through Special Project Evaluation Committee (SPEC). Various committees: DPEC, PEC, DSPEC and SPEC recommend approval of the project to the respective authority. Provision of different committees in the Ministries/ Division and Planning Commission is shown in **Figure 2.13**.

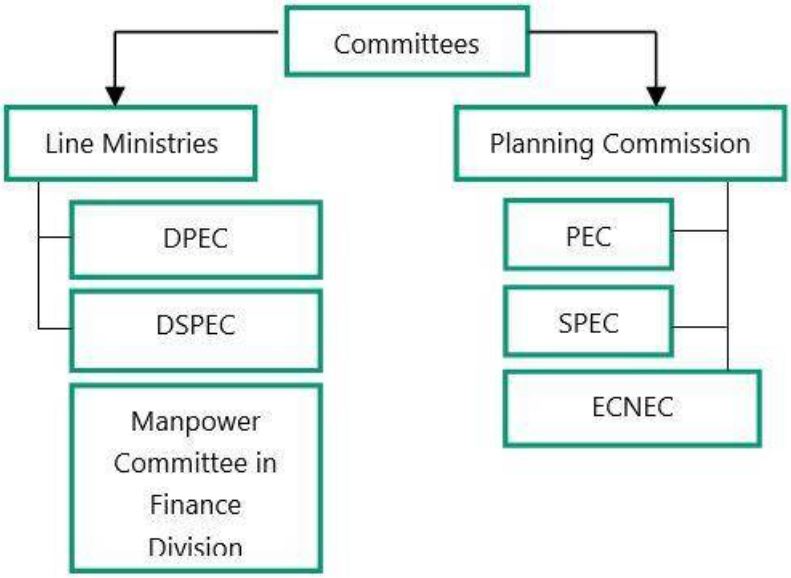


Figure 2.13: Project Committee in Ministries/Divisions & Planning Commission

Project approval authority varies and depends on the total cost of the project. For Investment project, approval authority remains with the Planning Commission. Approval authority of investment project having cost up to Tk. 250.00 million lies with the Minister in charge of the Ministry of Planning, while ECNEC approves the investment projects whose cost exceeds the threshold of Tk. 250 million. Minister of the Sponsoring Ministry approves the TA project costing up to Tk.70.00 million while the TA projects with cost above Tk. 70 million are approved by the Minister, Ministry of Planning. The Minister of the Sponsoring Ministry reserves the sole authority of approving self -financed projects irrespective of their cost. **Figure 2.14** shows the different authorities and their limits of project approval in the public sector.

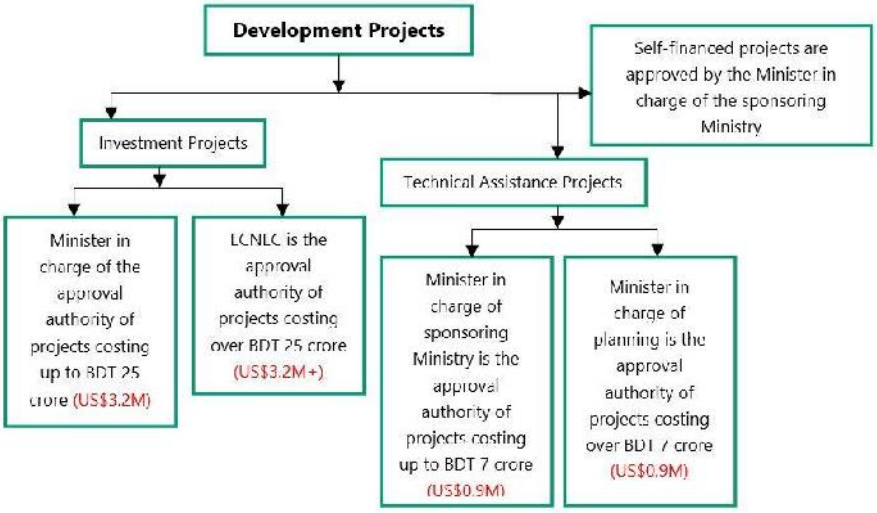


Figure 2.14: Project Approval Authorities

Logically, submitting a project proposal for approval is the first stage of contact between the sponsoring Ministry/Division and Planning Commission. The submission puts in motion a number of processes for review and approval. **Figure 2.15** shows the various stages of processing and approval of investment projects.

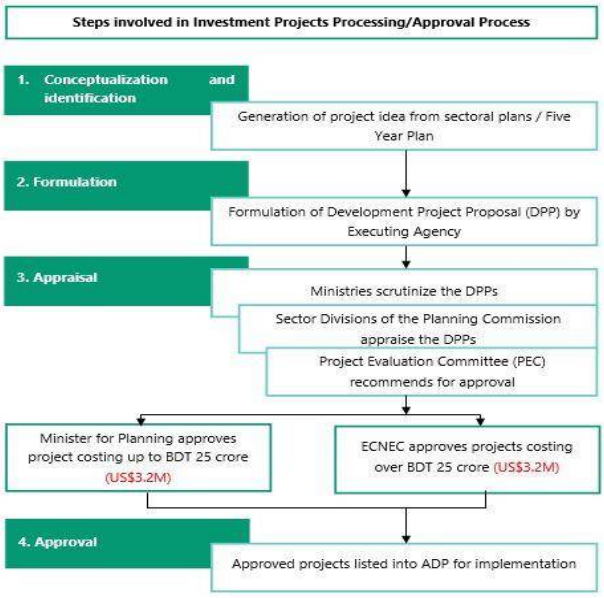


Figure 2.15: Steps of Investment Project processing for approval

A summary of the project approval process has been shown in the **Figure 2.16**

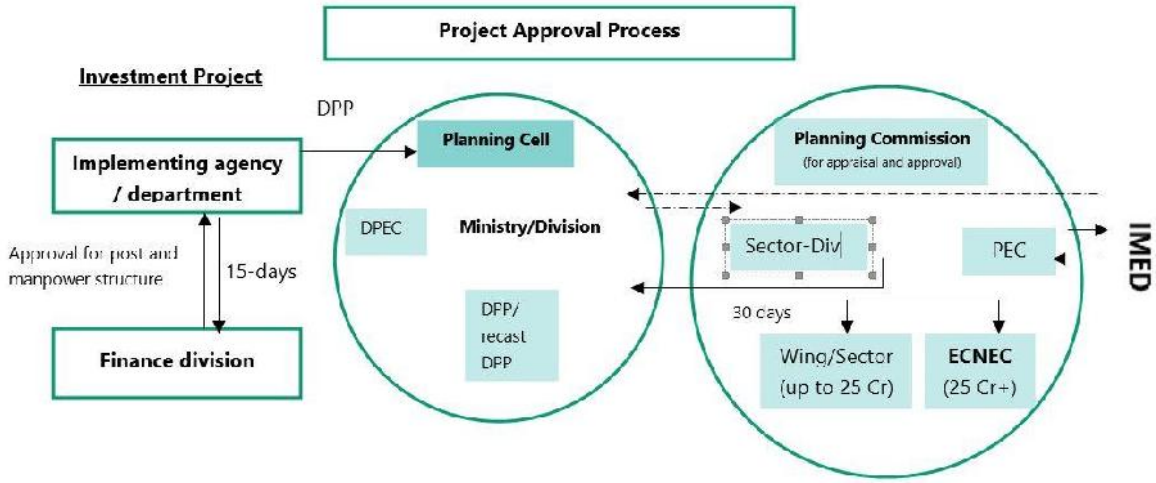


Figure 2.16: Project Approval Process

Notes

PEC: Project Evaluation Committee (Planning Commission)

DPP: Development Project Proforma/Proposal

DPEC: Departmental Project Evaluation Committee (Ministry/Division)

TPP: Technical Assistance Project Proforma/Proposal

SPEC: Special Project Evaluation Committee for TPP (Planning Commission

DSPEC: Departmental Special Project Evaluation Committee for TPP (Ministry/Division)

2.12. Weaknesses in planning process: Public Investment management

The key issues of Public Investment Management (PIM) identified under the current analysis are grouped into five broad categories:

1. The Annual Development Programme (ADP) process;
2. Strategic linkages between the Five Year Plan (FYP)[i] and the ADP;
3. M&E of development plans and projects; (4) strategic resource allocation; and (5) cross-cutting issues.
   Figure 2.7 indicates the groups (1)–(4) of key issues in the context of development planning, budgeting and PIM systems in Bangladesh.

2.12.1. The ADP process

The Annual Development Programme (ADP) plays a big role in PIM in Bangladesh. The Planning Commission (PC) is responsible for overall management of the ADP process. The Finance Division sets annual budget ceilings on the ADP based on the Medium Term Budget Framework (MTBF), whereas line ministries, divisions and their implementing agencies are responsible for the preparation of the Development Project Proposal and Technical Assistance Project Proposal (DPP/TPP), and the implementation of approved projects. The following key issues must be addressed to improve the ADP process:

1. *Guidelines are not followed*. Every year the Programming Division issues a guideline in the light of the existing policies/strategies of Five Year Plan for inclusion of new projects. But this guideline is not properly followed for the selection of priority projects. As a result huge numbers of relatively less important or unimportant projects are being included in ADP. Projects of similar nature for different areas are too many – which can be brought under one umbrella project for rationalising costs and avoiding duplications.
2. *Mismatch between MTBF and demand of the ministries.* Every year Finance Division determines the ceiling for each Ministry/Division under MTBF. But often it does not commensurate with the demand of the Ministry/Division. As the demand is much higher than the ceiling stipulated in MTBF it becomes almost impossible to allocate adequate fund for all on-going projects and new projects. As a result duration and cost of the projects increase. With long implementation period projects become sick and even unworthy.
3. *Insufficient capacity of PC to manage the increasing number and budget amount of projects in ADP.* The number of staff members of the PC has not changed since the 1990s, but the number and budget amount of projects to be reviewed have been soaring rapidly. The PC is already overwhelmed by the increasing number and budget amount of projects in the ADP. This clearly points to the need to strengthen the capacity of the PC to meet the increasing importance and expectations of public investment. Reducing number of small projects may help in this regard.
4. *Over programming.* An increasing number of projects are inserted every year in the ADP without adequate assessment of resource availability and economic feasibility study due to various reasons including persuasion of elected representatives. Due to inadequate allocation, time over run is inevitable which ultimately leads to cost over run for the projects. Table 2.3 shows the inadequacy of fund allocation of projects calculated for Bangladesh Water Development Board as an example. The table above shows that yearly allocation can be made only up to around 10% of the total estimated cost. As a result, time overrun is inevitable which will also cause huge cost overrun.

Table 2.3: Cost, allocation, expenditure and estimated completion year of BWDB projects. (Amount in crore Taka)

RADP/ADP	No of Projects	No. of New Projects (Green page)	Total Project cost (GoB)	Cumulative expenditure	Required total allocation (Col 4- 5)	GoB Allocation this year	Ratio of Allocation	Estimated completion year
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
RADP 2010-11	53	16	9249	1136	8113	784	8%	12
RADP 2011-12	49	21	10548	1491	9057	1000	9%	11
RADP 2012-13	47	13	11157	2139	9018	1277	11%	9
ADP 2013-14	43	17	10678	1946	8732	1244	12%	9

Source: ADP and RADPii, 2010-13, Planning Commission

5. *Poor quality of DPP/TPP***.** Generally DPPs/TPPs are prepared at the agency level mostly by non-professional persons. In the Ministry/Division these documents are examined in the Planning Wing. In some cases Planning Wing has to forward these documents to the Planning Commission without proper screening due to the urgency of the agency or Ministry. Very often Planning Commission also has to complete the approval process within a very short time period due to external pressure resulting poorly formulated DPP/TPP being approved which caused serious bottleneck in implementation. Revision becomes inevitable in such case which causes both time and cost overrun. The quality of DPP/TPP is compromised because of the following factors: (i) insufficient capacity of implementing agencies to prepare quality DPP/TPP; (ii) insufficient capacity/motivation of planning wings of line ministries and divisions to appraise DPP/TPP; (iii) insufficient capacity of the PC to prioritize and select DPP/TPP; and (iv) lack of an established process to train officials who prepare and appraise DPP/TPP. These factors cause delays in approving DPP/TPP, and result in time and cost overruns for implementation of projects. Divisions in the Planning Commission should be headed by long experienced professionals as they can be less malleable to undue pressures to get a project approved. In this regard, their status may also be restored as enjoyed in early years of Planning Commission, as also prevailed in Indian Planning Commission. For this, selection/recruitment policies may also be developed.

2.12.2. Strategic linkages between FYP and ADP

The projects in the ADP are expected to serve as the main tool to implement strategies and achieve targets of the Perspective Plan and the FYP. However, many of the ongoing projects in the ADP have no clear linkages with the FYP. Any new projects in the ADP should have clear strategic linkages with the FYP.

Weak linkages between ADP and FYP. Few projects in the ADP have clear indications as to which strategies in the FYP they are aligned with, what objectives the projects aim to achieve, and how the objectives contribute to the achievement of FYP set targets. All new projects prepared and appraised in the period of the FYP should be prioritized and selected, based on the extent to which they contribute to implementing the strategies and achieving the targets of the FYP. This would require framing DPP/TPP and the ADP and for this concerned officials should be quite conversant with the national medium term and long term plan documents. Many of the officials, who are involved in project preparation, do not know exactly what are there in the FYP. So they do not look for the objectives/targets of the FYPs, rather they prepare the project documents first without prioritizing and only then try to match with any of the objectives/targets of Five Year Plan (FYP). As a result, most often the link between the project and FYP is superficial.

2.12.3. M&E of development plans and projects

A fair number of indicators for M&E of development plans and projects are already in place: (i) the Perspective Plan sets the targets by FY2021; (ii) the SFYP and MDGs set the targets by FY2015; (iii) MTBF includes Key Performance Indicators (KPIs) over FY2011–FY2015; (iv) financial and physical monitoring of projects in ADP; and (v) monthly fiscal reports of the Annual Budget. The SFYP also includes results based indicators for M&E at the sector/macro level.

Transition toward result-based M&E. Bangladesh started moving toward a result-based M&E system with the SFYP. Currently, the M&E focuses primarily on financial inputs. The SFYP sets up a Results Framework for the first time in Bangladesh's history of five-year plans, and will conduct periodic monitoring of SFYP implementation. The Key Performance Indicators (KPIs) in the MTBF have not been regularly monitored. Indicators listed in the SFYP needs to be revised and the effort is on. First Implementation Review of the SFYP on result-based indicators has already been published by the GED with two years implementation experience of SFYP.

Limited capacity of M&E: In the M&E of the FYP, it is imperative to strengthen the General Economics Division (GED) through training staff, setting up a data compilation system, and establishing sound coordination mechanisms to collect information from ministries, divisions, and implementing agencies. In the M&E of the ADP, it is clearly necessary to strengthen the monitoring of outputs and outcomes to make a transition toward result-based M&E at the project level by the IMED.

Limited authority of IME: IMED does not have any direct legal instrument to enforce its observations as the outcome of its monitoring and evaluation activities. In most of the cases sponsoring ministries and their implementing agencies do not give sufficient attention to the observations of IMED which makes the monitoring functions ineffective. Moreover, limited logistic support and manpower shortage are the impediments in monitoring increased number of projects in the ADP.

2.12.4. Strategic resource allocation

The Perspective Plan and the FYP are expected to guide the decision making on resource allocations among the sectors in the MTBF and the Annual Budget. The allocation of resources (funds) among projects and programs within the ADP should be also guided by the FYP. This would improve allocative efficiency of public expenditures towards achieving Vision 2021.

Differences of sector classification between ADP and MTBF/Annual Budget: In the ADP, a traditional sector classification (17 sectors) continues to be used since the start of the ADP in the 1970s. By contrast, the MTBF and the Annual Budget use 13 sectors. The difference in sector classification causes ambiguity and confusion among concerned institutions in negotiating and making decisions on resource allocation among sectors.

Weak strategic linkages between FYP and MTBF: The FYP (Five Year Plan) and the MTBF are formulated by the Planning Commission and the Finance Division (FD), respectively. Coordination between them has not been satisfactory in the processes to prepare the FYP and the MTBF, and that there is scope for strengthening the linkages between the FYP (GED) and the MTBF (FD). Both these Divisions should work jointly in development of the Macroeconomic Framework to be used in preparing medium term plan and corresponding budgets.

2.12.5. Cross-cutting issues

The following key issues cut across, and therefore influence, all aspects of PIM.

Frequent revision of the projects: As the DPP/TPPs are not prepared with due diligence and sometimes prepared hastily, revision becomes inevitable very soon. Programs/projects are included in the ADP without proper cost rationalization leading subsequently to time and cost over-run. Many agencies try to include new projects in the ADP with intentionally low estimated cost at the beginning to get into the project appraisal process. They also seek very less amount as the first year allocation so that approving authority does not feel burdened with the demand. However, from following year,

those projects become burdens and even require quick revision due to change in construction rate schedule and price escalation. Delay in procurement is another critical issue in project implementation. Land acquisition is another complex issue which creates serious backlog in completing project activities. Project management staffs including project directors are mostly not trained well and frequent transfers of project officials also hamper the implementation.

Coordination between the ADP process and PPP initiatives: A new policy and procedures on PPP were formulated only recently, and a newly created PPP Office under the Prime Minister's Office started its operation. The PPP Unit under the Finance Division was also set up and is now operational. It is premature to make any assessment on PPP initiatives, but some key issues related to the ADP were identified:

(i) capacity building on management of PPP projects;

(ii) wide dissemination on PPP among the private sector;

(iii) further clarification of relationships between the ADP and PPP; and

(iv) Review the existing legal framework to facilitate PPP and establishing linkages between PPP/ADP/FYP.

Donor harmonization and implementation rules: Among donor agencies, differences in the implementation rules cause occasional delays in donor-supported projects. This is particularly the case in the procurement rules of donor agencies that are generally stricter than the rules of the Government, and there are some variations among donor agencies. As the first step, harmonization of procurement rules among donor agencies would help speed up the implementation and disbursement of donor-funded projects. Development partners often procrastinate on different pleas to get started the TA projects (e.g. in election years they tend to wait until the election is held).

Frequent personnel rotation across ministries and divisions: The current civil service system in Bangladesh requires frequent personnel rotation across ministries and divisions, which is every 3 years on average for an officer. This makes it difficult for officials to accumulate knowledge and experience in specific sectors and perform their assigned tasks efficiently. The limited knowledge and experience in certain sectors among officials at least partly explains the delays in the ADP process.

Weak financial management and accountability: There are serious deficiencies in financial data and budget reporting of projects. Accounting and auditing systems are antiquated and less effective to ensure accountability of project managers. Compliance with internationally accepted accounting practices is not established. To improve economic governance and attract FDIs, introduction of international standard of accounting and transparency is a must.

Lack of institutionalization of planning discipline: Macroeconomic planning process couldn't be rooted into a solid discipline although *Bangladesh Planning Commission* received highest attention since birth of the nation. Many different forms of planning have been experimented during the last 37 years. Perspective plan, five-year plan, two-year plan, rolling plan (three-year), PRS, etc. all have been tried. The economy couldn't yet consolidate the lessons learned from all these experiments. It is still in the process of looking for the best options waiting in the unknown horizon.

Lack of E-processing of DPP/TPP: Taking advantage of E-processing has yet to be visualized in the entire programme/project assessment, evaluation and approval process.

Inconsistency in policy support and personal interest: Too much diversity in government and donor procedures/implementation policies negatively impact the staff capacity at different levels. Frequent changes in policy/priority with changes in political government also affect the system. All of these slow down the process. Moreover, personal interest behind the DPP/TPP processing sometimes seriously matters in the system. The use of varied planning models at different time created scope for influence in the system to serve many different types of personal interests.

2.13. Way forward

A standard operating process for development planning and financing is in place in Bangladesh. The process is inhibited by different types of inadequacy and gap. This process can be transformed into result oriented one should these inadequacies and gap can be effectively remedied. It is crucial to address the issues mentioned in the previous section to streamline the planning process and to make it more effective. Apart from those few suggestions are being forwarded for consideration below:

1. *Drastic change in the mind-set.* It is widely believed that a drastic change is needed in the mind-set with regard to institutional roles to deliver "*public good*" in the context of the present government's commitment for a *changed tomorrow*. Being in the role of deliverer of service, the line ministries need to assume more dynamic responsibility in planning, approval and implementation of projects rather than forwarding recommendations to the Planning Commission. The Planning Commission, on the other hand, has to assume more of the advisory, coordination and oversight functions by pulling line ministries into the executive functions of project approval, renewal and extension. A new relationship dynamics has to evolve in the planning process thereby promoting a outcome-output based planning institution.
2. *Institution of planning discipline.* The time is now ripe for the nation to hold on to a consolidated planning system rather than experimentation. Many different types have already been tried during the last three and half decades. It is essential to institutionalise a firm planning model for the economy that is capable of consolidating the development results in continuity.
3. *Improvement in the level of staff skill involved in planning process.* The importance of expertise and skill in planning cannot be denied in any model. The skill level of the staff involved in planning at all levels needs to be revamped in order to undertake challenges for meeting year 2021 milestones of poverty reduction and reaching at a level of middle-income country group. Capacity development of the planning wing/branch at the ministry and planning unit at the implementing agency/department needs to be prioritized. Continuity in effective utilization of staff skill needs to be ensured.
4. Appropriate staffing of planning unit of the implementing department, wing/branch/ in the ministry and wing/sector-division of planning commission. An effective staff set-up in each level of planning process has to be put in place and made functional. The Planning unit in the agency/department has to have qualified staff with adequate knowledge of project formulation, project documentation and monitoring and implementation. An earlier decision of having a Planning Wing in the ministry with a set-up of 16 staff under the leadership of a Joint Chief needs to be effectively implemented henceforth. The staff strength of the different Wings/Sectors-Divisions in the Planning Commission and IMED has to be increased.
5. *Institutional and individual incentive.* It is expected that institutions and individuals see the potentials of improvement in every change that might stand as observable incentives.

3. Concepts of Governance and Institutions

3.1. Introduction

The BDP 2100 formulation process concerns the achievement of stated goals in line with the policy framework in the country and in connection to that, a strategic planning, decision making and funding process. Arrangements of goal setting and realization and the related processes are elements of the core governance of Bangladesh. Besides, implementation has to be carried out by many government agencies under ministerial responsibility and probably also in collaboration with private sector parties, which requires activities to prepare, support, and execute implementation. This whole policy making and implementation process takes place within conditions of transparency and accountability with respect to the responsible administrators. In both the private and the public sector, there is a trend towards ever increasing demand for accountability and transparency as well as an ever increasing awareness of the necessity for

having checks and balances. Governance and associated subjects have become, both explicitly and implicitly, important issues for business, government, politics, and last but not least for the general public. That is why governance plays a significant role in both the private sector as well as the public sector.

Given the positioning of BDP 2100 within the GED of the Planning Commission belonging to the Ministry of Planning, and the role in the National Planning process of Bangladesh, a closer look to concepts and practice of governance and institutional aspects is required

3.2. Government Governance

Traditionally the concept 'governance' connotes three basic elements (i) authority to direct, (ii) rule or procedure, and (iii) control. Currently, the connotation of the concept is much wider. For practice of the concept in the public domain, a few definitions are stated here:

'Governance is the sum total of the institutions and processes by which society orders and conducts its collective or common affairs' (BIGD)

'Governance is epitomized by predictable, open, and enlightened policymaking (that is, transparent processes); a bureaucracy imbued with a professional ethos, an executive arm of government accountable for its actions; and a strong civil society participating in public affairs; and all behaving under the rule of law'.

'Governance is a complex system of interactions among structures, traditions, functions (responsibilities), and processes (practices) characterized by three key values of accountability, transparency and participation (USAID, 2002).

'A public organisation's basis for existence is to achieve certain objectives on behalf of its political and societal stakeholders. The goal of governance is to create safeguards enabling these public objectives to be achieved, in view of management's responsibility in this respect. For this purpose, the organisation should be managed and controlled, and should be accountable for its activities to its stakeholders, in many cases, through a supervisor appointed on behalf of the stakeholders. Consequently, governance, and therefore government governance, in actual fact comprises management – control – supervision – accountability'. (Government Governance, Corporate governance in the public sector, why and how? Ministry of Finance, The Netherlands, 2000).

The objective of government governance is to provide policy directions and to create safeguards for achieving policy objectives. The design and operation of governance is important at various levels, from government minister to implementing organisations. Central government is concerned with policy objectives set by parliament. The minister is responsible and also accountable for achieving these objectives. The essence of sound governance, from the perspective of the ministerial responsibility, is that there are enough safeguards enabling the minister to bear ministerial responsibility. These safeguards should exist within a policy area, which may extend over an entire policy chain, through a well-designed cycle of the management, control, supervision and accountability processes. Hence, government governance is defined as safeguarding the interrelationship between management, control and supervision by government organisations and by organisations set up by government authorities, aimed at realising policy objectives efficiently and effectively, as well as communicating openly thereon and providing an account thereof for the benefit of the stakeholders.

The definition shows that government governance consists of elements, illustrated in **Figure 3.1**. Each of the relationships indicated is this figure offer possibilities or the necessity for improvements or change.

Figure 3.1: Core aspects of Governance

Ministerial responsibility concerns both the nature of the relationship with the participants in a particular policy area and achieving policy objectives. At the macro level, these are the policy objectives set by parliament. The minister is expected to have a vision on the policy areas he may be held accountable for and to clearly define policy objectives (i.e. effectiveness), and clearly defined preconditions (i.e. quality, efficiency, compliance with relevant laws and regulations, financial control). This whole package forms the starting point for the further structuring of governance.

The first element in the government governance cycle is steering and strategy making, i.e. directing the realization of an organization's goals through, among other things, structuring the organization and developing processes. At the macro level, i.e. the Cabinet, steering and strategizing involves the process of a minister working towards the realization of policy objectives set by parliament through, among other things, arranging mandates, resources and responsibilities, organization structure with tasks and procedures regarding policy implementation processes. Once an organization has been formed, a system of measures and procedures has to be implemented and maintained, providing assurance to the administrators that the implementing organization will remain on the right course, i.e. on course for achieving the adopted policy objectives. This is the second element which is called 'management and control'. 'Supervision' is the third element because it is required that the realization of the objectives can be ascertained for the benefit of all stakeholders. 'Accountability' is the fourth element. The implementing organization has to provide information on all tasks assigned and powers delegated to it, to which the right of discharge is attached. At the macro level, this means that the minister is accountable to parliament for steering and strategy making, for management and control as well as for supervision regarding the results of the policy implementation.

A next essential governance aspect is the inter-relationship between steering and strategy making, management and control, supervision and accountability, aimed at realizing policy objectives, and the required transparency. When the various elements are not fully linked, there are weak or exposed areas. It is important that administrators recognise any exposed areas in their governance. This means that they are aware of any risks and know in which areas measures are necessary and/or appropriate. A governance scan supports the administrator in obtaining assurance as to whether there is sound governance, or assists in bringing to light any governance deficiencies or inefficiencies (i.e. overkill), and thus enhances the bearing of political responsibility.

This stated governance concept can be translated in the national planning system of Bangladesh. Steering and Strategy making in the form of planning authority is practiced in Bangladesh into three hierarchical levels, these are:

1. highest level decision bodies, planning directions and guidelines, for example the NEC
2. second level, plan formulating authorities, for example, the Planning Commission, WARPO, local government institutions etc.
3. Third level, plan implementation authority, for example, the Ministries, Departments, local government institutions etc.

Under the governance concept the next important elements are 'rule and legislation', which signify how the strategies or plans will be formulated; a 'procedure', a 'task' (or functional responsibility) for planning. The planning task has two vital dimensions, in which the first comes as 'governance for plan formulation' and second 'governance for plan implementation'. Both dimensions are important in the planning context of Bangladesh. The planning role and responsibilities will be effective by the national planning institutions if the above goals are implemented in each steps of planning process.

The Goals of Governance in the Bangladeshi context of planning are:

- Legitimate, effective, responsive planning institutions and policies
- Understandable processes and outcomes:
  - with visible results in citizens' lives;
  - with clear standards of success or failure
  - With clear lines of responsibility and accountability.
- Transparency
  - openness from above;
  - participation and scrutiny from below;
  - Integrity and honesty from all.
  - Follow up monitoring and evaluation
- Incentives to sustain good governance
  - For the country-to achieve targeted goals;
  - for leaders- the opportunity to take credit;
  - for citizens- a credible chance for justice and a better life;
  - for neighbouring societies- sharing insights, experiences, expertise, values.
- Vertical accountability
  - government that response and answer to citizens;
  - Citizens, who accept, participate and abide by laws and policies.
- Horizontal accountability and leaders, and among segments of government
  - access to information
  - the right to be consulted
  - Power to check excesses and abuses.

Considering the above concept, the governance for planning can be viewed as of crucial importance to achieve planned economic growth that clearly direct towards the vision of the nation i.e. becoming middle income country by 2021 of Bangladesh. The governance of planning may be defined as administering the national planning processes and managing a skilled and expert group of national planners working in the national planning institutions, responsible for producing the national plans necessary for different scales and levels (local plans, regional and national plans) for optimization, efficiency and effective uses of resources.

The planning outcomes have to be effectively capable to provide and direct the executing authorities on policies and strategies, and effective and efficient implementation process. It also includes the direction on monitoring and result based evaluation system in which citizen's charter, rule of law, shared decisions, transparency, accountability, participation, responsibility, responsiveness need to be optimally practiced.

3.3. Institutions and Institutional Strengthening

3.3.1. Institution is more than organization

Institutional strengthening is about increasing the capacity or ability of institutions to perform their functions in cooperation with their stakeholders. There is mostly a particular focus on improving (good) governance. This regards meaningful and goal oriented steering, effective organizing and managing the relevant processes, transparent accountability and overseeing or controlling the outcomes. One of the important steps towards achieving the BDP 2100 goals is to strengthen the capacity of involved national and sub-national governments, non-governmental organizations and local communities to promote institutional and human capacity development.

Conceptually speaking an institution refers to the complex interplay of norms and behaviours that have become established and continued to be applied and adhered to over time. Institutions are stable patterns of behaviour that are recognized by society. Institutional strengthening or development is the initiation of change in these patterns in society which mostly go beyond the boundaries of a single organization. This means that abstract concepts such as "the law", "policymaking", "organization" and "cultural norms and behaviour", "mind-set" all fall within the parameters of institution. A good and common definition of 'institution' is in this respect: 'complexes of norms, behaviours and mind-sets that persist over time by serving collectively valued purposes'.

Using this definition, a distinction can be made between concrete and abstract institutions. Concrete institutions are organizations that have acquired a certain degree of value and stability, so that they may be called durable. They include e.g. government agencies, NGO's, cooperatives. These are entities that are commonly valued and have durability. So concrete institutions are the actors involved in a certain (development) setting. Analysis of their position and (potential) role is of great importance in the design of development interventions.

Abstract institutions are durable and commonly accepted arrangements like laws, budget system, the market system, unwritten social rules, mind-set and organization culture. The acceptance may be based on historical backgrounds, an agreement, common understanding in society, a contract, or even force. The abstract institutions are the factors influencing the setting. They set the boundaries for development activities. In designing interventions they are to be seriously taken into account as their effect on development activities can be of great importance.

3.3.2. Institutional Strengthening

A working definition of Institutional Strengthening (IS) is the following: 'The creation or reinforcement of a network of organizations and optimization of the relevant factors which are required or supportive to attain specific objectives on a sustainable basis. '

So institutional Strengthening is all about the creation or reinforcement of an active and supportive network of organizations with their factors as laws, policies, mandates and tasks, behaviour, mind-set as well as resources. This regards the institutional environment (network of actors and factors) in which the development intervention takes place. Sustainability of development activities depends to a large extent of the quality of embedding in and making use of the potentialities of such an institutional environment while inertia and obstacles need to be addressed.

3.3.3. Institutional Context of BDP 2100

Institutional strengthening within the scope of BDP 2100 relates to the formulation process carried out by the BDP 2100 project with its strategies and actions in relation to the actors and factors in or connected with the Delta Plan. The BDP 2100 formulation process, with its participants, plans, tools and activities needs to be embedded in a strong supportive, productive and critical setting. In the BDP 2100 approach, governance and institutional strengthening form a cross cutting issue and forms a parallel process. Institutional strengthening is to be approached as multi-level government challenge in which the following levels play different roles: National level – Ministries, implementing agencies; Division level; District level; Local level – Upazilas, Unions, local communities. Next to that roles will be played by development

partners and financial institutions, NGO's, knowledge institutions private sector organizations. Many things can be shared and compared with or learned from other relevant projects.

Acts, laws, rules, regulations and guidelines as well as policies and plans form important factors of the institutional framework in the Blue Gold context. A topical but tentative overview is presented below.

3.4. Elaboration of components of the Institutional Framework

3.4.1. Purpose of Institutional framework

The purpose of an Institutional Framework, for BDP 2100 called 'Delta Framework') is to address the governance challenges and improve the governance structure in order to bring the institutional framework and government agencies in a position to play an active and required role in the BDP2100 process and its implementation. The Delta Framework (including a draft Delta Act) encompasses necessary and agreed reforms of the current institutional framework and the governmental organizations involved. These organizations need to be involved in such a way as to be prepared to participate in the BDP2100 formulation; they also need to adopt and execute the implementation program in an integrated, targeted, inclusive, broadly supported and transparent way.

The Delta Framework will be placed in the Bangladeshi governance context as related to the institutional analysis and modified in interaction with the relevant 'policy arena' and government officials if the basic principles of government require this. The Bangladesh national planning and programming framework is relevant here. BDP2100 and the program for short term implementation have to be incorporated and legally and institutionally embedded in this framework, while at the same time stating requirements for the short term and long term programming and funding as indicated in the Dutch Delta Framework.

The above mentioned elements belong to the core governance of the Government of Bangladesh and require careful analysis and consideration also with respect to implementation and by that societal and economic impact.

3.4.2. Governance characteristics and requirements

The national vision, as e.g. indicated in the Perspective Plan 2021, of Bangladesh will be achieved through setting perspectives and goals in national Five Year Plans. The GED is as per mandate responsible for formulating, administering and coordinating the national Five Year Plans. Overall guidance at the stage of the formulation of Five Year Plans is provided by the National Economic Council (NEC), the highest economic policy-making body of the nation.

A sectoral coordination committee is responsible for coordination matters in relation to the formulation of the National Five Year Plans. The sector ministries formulate policy guidelines to achieve the development goals through development projects. The Departments and other line agencies of the Ministries are the main executing bodies for implementation of the projects. Implementation Monitoring and Evaluation Division (IMED) is responsible for implementation, monitoring and evaluation of the national program and projects. This governance structure shows strong sectoral approaches to policy issues and implementation.

The governance model of BDP 2100 includes Ministries, Departments and Agencies from central to local level along with their roles and responsibilities in managing and achieving a delta vision and a long term holistic delta plan effectively and efficiently. The required governance structure needs to incorporate major institutional components with their governance roles and tools as given below:

- NEC/ECNEC and a National Level Steering Committee (holistic vision, long term strategy and investment arrangements BDP 2100);
- GED (coordination, fund allocation and implementation of holistic vision and medium term strategy via Five Year Plans);

- Ministries, Departments and line agencies (mission, vision, strategy, short term plan coordination and cooperation on integrated approach, actions, indicators and rules);
- Private sector institutions and development partners (collaboration and investment);
- Implementation, Monitoring and Evaluation Division (Delta project implementation and evaluation).

From the BDP 2100 point of view, required governance deviates from the present governance structure, leading to important challenges.

Based on experiences and first analysis, the following challenges are considered as most vital for the governance of BDP 2100.

- Reducing fragmentation and balancing the predominantly sectoral approach of planning and implementation with a long term holistic governance approach including the concepts belonging to that (e.g. delta vision, scenarios, policy pathways, delta framework)
- Long term strategic planning includes projections and a long term vision which need to be back casted into medium and short term vision, strategy and planning
- Existing weak governance practices need to be strengthened to deal with a longer-term holistic planning and implementation effectively. Transparency and integrity require attention
- Development of existing institutional abilities and capacities to deal with BDP 2100 in effective coordination of decision making regarding measures, investments and budget allocation in an integrated manner
- Localization with decentralized resource allocation i.e. from Central Budgeting System including ADP allocation to the district level budget allocation
- Incorporation of many development partners and IFIs in the BDP 2100 process, planning and investment program
- Involving private sectors in approaches of water issues, with attention for improving resource capacity and skills
- Increasing regional cooperation e.g. with attention for strengthening water diplomacy
- Effective and efficient implementation, setting priorities, managing for results.

3.4.3. Basic elements of Governance and Institutional Framework

Governance as is interpreted here as 'the Act of Governing', is a reciprocal concept, referring to the government and the governed. The 'Act of Governing' can't simply be applied to the State only, its national, regional and local institutions, because this would imply that governance equates government. The 'Act of Governance' relates to the relationships, interactions and actions between the state and civil society. This means that government and its modes of value articulation, policy development, planning and operations should be related to stakeholders as civic society, private sector, social movements and citizens in general. This interpretation of governance has been labelled as collaborative governance, co-governance or multi-level governance. Recently, concepts as 'deliberate governance' or 'patch work governance' are also utilized to express the insight that governance in a democratic state should not be considered as state-centred or top down hierarchical governance.

Collaborative governance is a process and a form of governance in which participants (parties, agencies, stakeholders) representing different views and interests are collectively involved and empowered to contribute to a policy development or planning process and to make recommendations to a policy and decision-maker who will not substantially change consensus recommendations from the group.

Governance focuses on the public organization's stakeholders, the associated objectives, and the responsibility of the public organization's management to achieve these objectives. The goal of governance is to create safeguards enabling these objectives to be achieved, in view of management's responsibility in this respect. For this purpose, the public organization should be managed and controlled, and should be accountable for its activities to its stakeholders, in many cases, through a supervisor appointed on behalf of the stakeholders. Consequently, governance, and therefore government governance, comprises management – control – supervision – accountability. **Figure 3.2** shows the basic elements of the Institutional Framework to BDP 2100 based on this concept of collaborative governance.

The objective of government governance is to create safeguards for achieving policy objectives. The design and operation of governance is important at various levels, from government minister to implementing organizations. Central government is concerned with policy objectives set by parliament. The minister is responsible and also accountable for achieving these objectives. The essence of sound governance, from the perspective of the ministerial responsibility, is that there are enough safeguards enabling the minister to bear ministerial responsibility. These safeguards should exist within a policy area, which may extend over an entire policy chain, through a well-designed cycle of the management, control, supervision and accountability processes. Hence, government governance is defined as (**Figure 3.3**)

'safeguarding the interrelationship between management, control and supervision by government organizations and by organizations set up by government authorities, aimed at realizing policy objectives efficiently and effectively, as well as communicating and interacting openly thereon and providing an account thereof for the benefit of the stakeholders.'

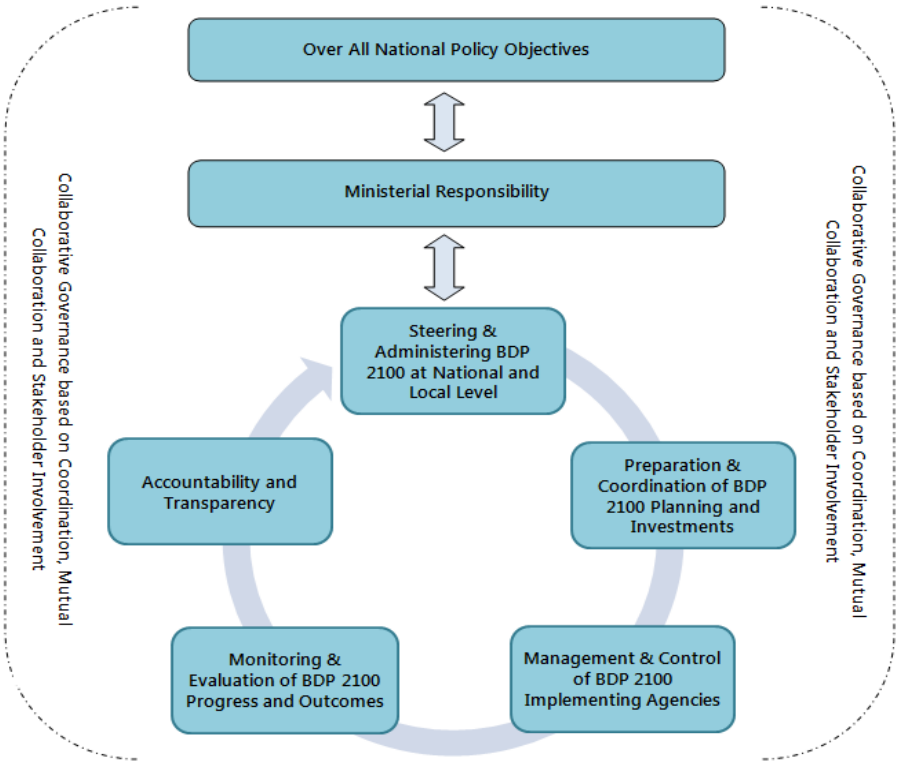


Figure 3.2: Basic elements of the BDP 2100 Institutional Framework

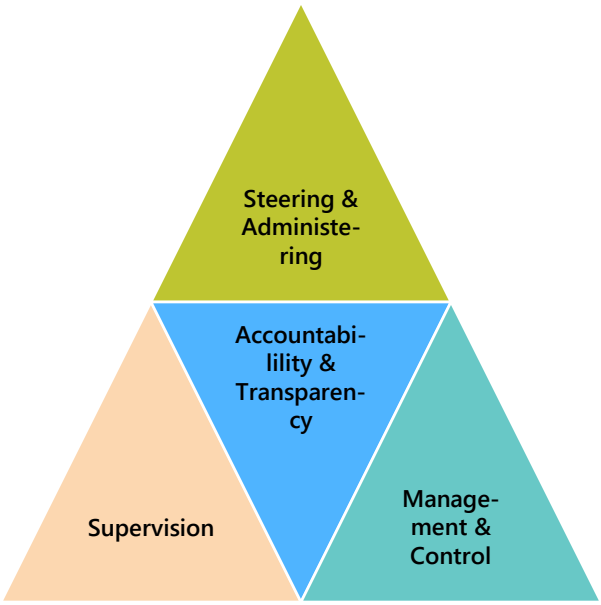


Figure 3.3: Four important elements of governance

4. Water Governance

4.1. Historical overview of Water Governance in Bangladesh

History of water resources management in this subcontinent including present Bangladesh dates back to the ancient period (up to 1100 A.D.) Digging of ponds for drinking water, canals for irrigation and navigation, building of embankment for flood protection, excavating big tanks for storing water during wet season and supplying irrigation during dry season, building flood free home states (human settlements) on the raised high banks of the excavated tanks – were usually practiced by the "Sultan" and "Mughal" regimes and continued till the beginning of colonial period (1757 A.D.). During the British colonial period the water management was concentrated on agriculture and navigation. Levies were collected from the riverine crafts plying over the watercourse and revenues were collected from the farmers. The purpose of traditional water resource management was earning revenue not providing services to the people.

At the end of colonial rule, government intervention in water governance in the then East Pakistan (Presently Bangladesh) was first traced back to 1959 through creation of East Pakistan Water and Power Development Board Authority (EPWAPDA). The sole responsibility for water management was given to then EPWAPDA. In 1964, the EPWAPDA prepared a 20-year Water Master Plan, which was the beginning of water-sector planning in East Pakistan (now Bangladesh). The Master Plan suggested implementation of 58 large flood controls, drainage and irrigation (FCDI) projects which were gradually executed during 1955 to 1980. These projects were successful in agricultural crop production and rural employment generation but overlooked fisheries and navigation. The Master Plan also emphasized on the need to construct embankments and polders. Within the period of 1973-80, small irrigation and FCD /FCDI projects were implemented by both public and private initiatives.

After Bangladesh became independent in 1971, responsibility for planning and management of water resources was handed over to the newly created Bangladesh Water Development Board (BWDB). In early 1980, focus was shifted from mono-sector (agriculture) to multi-sector approach and under the backdrop, Master Plan Organization (MPO) was created to undertake national plan. MPO prepared the National Water Plan-1 in 1981. The organization also prepared the second National Water Plan (NWP-2) in 1986. These two national plans assembled substantial information and used

wide range of planning models and analytical tools for public sectors strategies and programs. Both the plans were criticized as not being comprehensive. After the severe floods of 1987 and 1988 in Bangladesh, a comprehensive study was conducted on water sector. The study is widely known as Flood Action Plan (FAP) and the period extended from 1989 to 1995 - some even extended up to 2000 (FAP-21/22)

Currently, National Water Resources Council (NWRC) is the highest body for policy decision and guidance in the water resource sector. Other major institutions involved in water resource planning, management and program implementation are Ministry of Water Resources (MOWR), Water Resource Planning Organization (WARPO), the Bangladesh Water Development Board (BWDB), the Local Government Engineering Department (LGED) and the Bangladesh Agricultural Development Corporation (BADC). The NWRC, consisting of 47 members under the leadership of the Prime Minister, is the apex national body relating to water management, which facilitates the coordination of water-related policies. The WARPO supports the activities of the Executive Committee of the NWRC (ECNWRC) and is responsible for developing national water policies. The MOWR is the executive agency responsible for implementation of government policies, plans and programme in the water sector. The BWDB is responsible for large-scale (greater than 1,000 ha) water projects, for example inland and coastal flood control, land reclamation and development works (e.g. irrigation), and rainwater harvesting. The LGED is responsible for the development and management of small-scale (1,000 ha and less) projects. The Bangladesh Agricultural Development Corporation (BADC) is responsible for farming, and is therefore involved in irrigation works.

4.2. Existing Legal Framework

Institutions are guided by, among others, policy and regulatory instruments. Policy instruments refer to the policies and plans adopted at national or sectoral level while regulatory instruments are a set of acts, laws, regulations, and guidelines that are enacted and promulgated time to time to control and regulate country's governance mechanism. Water sector institutional arrangements includes all policies, acts, rules, laws and organizations that shape governance structure and process for water resources management (Mokhtar et al 2010). In other words, it is the water institution responsible for water management in the country (Saleth and Dinar 2004; Hossain 2010). Here all the formal laws, policies and administrative rules governing water resources management brought under consideration for documentation of water institutional change in Bangladesh (Livingston 2005). In Bangladesh there are distinct national water policy and a number of rules on water resource management that have shaped the legal framework for operating, administering and enforcing institutional rules and organizational plans having mandate for improved water resources management in Bangladesh.

4.2.1. Plan and Policy

The policy process is a process of balancing different solutions that address the different aspects of a cluster of problems. Every policy has three key elements: a problem definition, goals to be achieved, and the policy instruments to address the problem and achieve the goals. Bangladesh has a rich list of policy documents. A policy often comes in the form of general statements about priorities. Generally speaking public policy is what the government chooses to do, or not to do. It is a decision made by government to either act, or not to act in order to resolve a problem. Public policy is a course of action that guides a range of related actions in a given field. They rarely tackle one problem, but rather deal with clusters of entangled and long-term problems. Public policy provides guidance to governments and accountability links to citizens.

Government of Bangladesh formulated a number of policy documents for managing water resources of the country. They are: the National Water Policy (NWPo), the National Water Management Plan (NWMP), and the National Water Act. The NWPO was published in 1999 by taking into account the contemporary common global concerns for prudent use and efficient management of water resources in the country (MoWR 1999; WARPO 2001). The publication of this policy is only the beginning of a long-process of water resources management in the country. It is followed to develop plans in three phases: short term firm plan (2000-2005); medium term indicative plan (2006-2010) and the long term

perspective plan (2011-2025) (MoWR 2001). The National Water Act 2013 aims to better integrate the management, development, utilisation, and protection of water resources.

This policy has followed same trend of a temporal process and is built on historical evidences but influenced by legacy of the past and uncertainty of the future (Kay 2006). Similarly this policy may be considered as an exhaustive outcome of a series of decisions on what constitutes water problems, possible solutions, and how to implement the preferred solutions (Adger et al. 2002). While this policy document is exhaustive in nature for water resources management in Bangladesh, there are some other sectoral policies which should also be brought into account for successful IWRM in Bangladesh. Islam & Koudstaal (2003) have reviewed following sectoral policies which are considered relevant to the coastal zone management and are also associated with the water resources management in Bangladesh.

- Environment Policy & Implementation Plan (MoEF 1992);
- Livestock Development Policy (MoFL 1992);
- National Tourism Policy (MoCA&T 1992);
- National Forestry Policy (MoEF 1994);
- National Energy Policy (MoEP&MR 1996);
- National Fish Policy (MoFL 1998);
- National Policy for Safe Water Supply and Sanitation (MoLGRD&C 1998);
- National Agricultural Policy (MoA 1999);
- Industrial Policy (MoI 1999);
- National Water Policy (MoWR 1999a);
- National Shipping Policy (MoS 2000);
- National Rural Development Policy (MoLGRD&C 2001); and
- National Land Use Policy (MoL 2001).

GOB has also prepared a number of management plans and guidelines which also contribute to the implementation of policy directives. These management documents are national water plan-I (1986), Flood Action Plans, Bangladesh Water and Flood Management Strategy (1995), Guidelines for Environmental Impact Assessment (2001). When policy is developed, its implementation becomes necessary for which policy analysis is foreseeable. Improvement of policy making processes and its performance depends on the institutional arrangements and linkages of the policy makers, members of the executive, legislative and judicial bodies, and individual stakeholders with this new knowledge (Dunn 1994). Most of the recent policy documents of Bangladesh have recognized the importance of local level participation in planning and implementation. A number of Ministries have already involved local institutions in their sector programme. The real challenge is to integrate activities of different organizations in a coordinated manner and creating platform for stakeholder participation right from local level.

4.2.2. Laws and Acts

Laws, acts and rules are the tools for policy implementation, which determine the enduring regularities of human actions in certain situation and thus form different institutions. A good number of existing acts and laws have direct or indirect consequence on water resources management in Bangladesh. Water resource laws and acts related to water resources management in Bangladesh are shown in **Table** 4.1.

Table 4.1: List of Laws and Acts related to Water Resources Management in Bangladesh

Year	Name of the Law	Year	Name of the Law
1860	Societies Registration	1985	Groundwater Management Ordinance
1864	The Canals Act	1990	Land Management Manual
1868	The Bengal (Alluvial) Act	1992	Water Resources planning Act
1876	The Immigration Act	1994	The companies Act
1889	The private Fisheries Act	1995	Environmental Conservation Act
1908	Registration Act	1996	Water Supply and Sewerage Authority Act
1920	The Alluvial Land Act	1997	Environmental Conservation Rules
1939	The Tanks Improvement Act	1999	Environmental Court Act
1950	The Protection and Conservation of Fish Act	2000	Bangladesh Water Development Board Act
1950	The State Acquisition and Tenancy Act	2000	Guidelines for Participatory Water Management
1952	The Embankment and Drainage Act	2001	The Corporate Society Act
1972	Bangladesh Inland Transport Authority Act	2003	The Imposition, Collection and Use of Service Charge Regulation
1973	The Bangladesh Fisheries Development Corporation Act	2004	The Cooperative Societies Rules
1982	The Acquisition and Requisition of Immovable property Act	2009	Sewerages Rule
1983	The Marine Fisheries Ordinance	2009	Water Rule
1983	Local Government (Union Parishads) Ordinance	2013	The Water Act
1983	Immigration Water Rate Ordinance	2013	Bangladesh Water Development Board Act
1984	The Trust Act	2014	Bangladesh Haor & Water Bodies Development Board Act
		2014	Participatory Water Management Rules

4.3. Existing Institutional Arrangements

4.3.1. Key Actors, Stakeholders and Institutions

Often the term institution and organization are interchangeably used. But in policy science there is conceptual differences between institutions and organizations (Bandaragoda 2000; Svendsen et al. 2005). Institutions are established by rules to contribute to the formation of organization and finally rules, organizations and their associated policies form the institutional arrangements. Organizations can be thought of as group of individuals bound by some common purposes to achieve objectives (North 1990). In many fields of policy studies, organizations consistently play role as actors in action arena (Ostrom 1986). Economists, Sociologist and Politicians have begun to connect institutional arguments to the structure and behaviour of organization from the beginning of early 1950s (Scott 1995). In game theory institutions are the rules of the game and organizations are the players in that game. According to the stated definition and theory it can be viewed that there are a number of organizations and agencies those are responsible for water resources management in Bangladesh. There is a number of a rule or laws that have formed these organizations and their institutions for water resources management in Bangladesh. Key stakeholders can be grouped into three categories: 1) Planning & Policy, 2) Implementation and Management, and 3) Knowledge & Research, that all have both Public and Private Sector stakeholders.

A total of 35 agencies and authorities affiliated with 13 different Ministries of the GoB are found to perform functions relevant to water resources management in Bangladesh (MoWR 2001). A brief list of main organizations and their corresponding roles on water resources management in Bangladesh is given in **Table** 4.2.

Table 4.2: Main organizations and their corresponding roles on water resources management

Name of Organization	Corresponding Organizational Role
ECNWRC: Executive Committee of National Water Resources Council	Policy support to the Government & platform for inter-ministerial coordination platform.
National Economic Council (NEC)	Policy decisions and approval of development projects
Ministry of Water Resources (MoWR)	Represents Government decisions and control other organizations
Joint Rivers Commission	Liaison and collaboration for trans-national water Issues.
Bangladesh Water Development Board (BWDB)	Irrigation and drainage for agriculture, and flood control
Water Resources Planning Organization (WARPO)	Planning support to policy making
Department of Haor & Wetland Development	Water management for agriculture in haor areas
Center for Environmental and Geographic Information Services (CEGIS)	Technological support on geographic information system, data support and collaboration
Integrated Coastal Zone Management (ICZM)	Integrated management of water resources in the coast
Institute of Water Modelling (IWM)	Surface water modelling and river training
Institute of Water and Flood Management (IWFM)	Pursue research and capacity development in water and flood management
Bangladesh Center for Advance Studies (BCAS)	Technical support to the development projects in water sector
Bangladesh Institute for Development Studies (BIDS)	Assessment, technical support to the development organization.
Dhaka Water Supply and Sewerage Authority (DWASA)	Water supply and sewerage services in the city corporation of Dhaka and Narayanganj
Bangladesh University of Engineering and Technology (BUET)	Higher level academic courses and training on flood management.
UNESCO, IUCN, UNDP, FAO, World Bank and Asian Development Bank	International development partners for the improvement of water resources in Bangladesh

4.3.2. Key Ministries and Agencies

In addition to the above listed organizations, a number of Ministries and agencies have important stakes on water resources management in Bangladesh. They are : Ministry of Agriculture, Ministry of Environment and Forest, Ministry of Land, Ministry of Food, Ministry of Disaster Management and Relief, Ministry of Shipping, Local Government Division, Planning Commission, Bangladesh Agriculture Development Corporation, Soil Resources Development Institute, Port Authority, Bangladesh Inland Water Transport Authority, Department of Disaster Management (DDM), Chittagong WASA, Department of Agriculture Extension, Department of Public Health Engineering, Bangladesh Bureau of Statistics. A common platform for integration and collaboration is now required for successful integrated water resource management implementation in Bangladesh. In Annex 1. The key ministries and agencies are indicated.

4.3.3. Local Government Institutions

Paragraph 59 and 60 the Bangladesh constitution has an outline of a local government system with elected representatives facilitating effective participation the people for each unit of administration. In compliance with the Constitutional requirement and to institutionalise the democratic aspirations in all walks of life, it is obligatory to ensure the operation of effective local government organizations.

From a long-term perspective, local government in Bangladesh has been more an area of policy experimentation than one of stable institutional development. The Bengal Local Government Act of 1885 provided the first framework with provisions for local governments at three levels: union, thana (upazila) and district. Policy discourse over the next hundred and odd years have essentially oscillated within this framework (Rahman & Ahmed 2014). There are also newer realities that demand to be factored into the local government discussion. Bangladesh is witnessing a process of rapid urbanization that is transforming the erstwhile rural-urban divide into a rural-urban continuum. It is under this reality and future further urbanization, BDP 2100 sees role of LGIs as central to local economy development (LED) and good governance.

The history of local government in Bangladesh shows that local bodies have been established at different levels in different periods Laws /Ordinances have been made to form local bodies at village, Union, Upazila, Zila (District) and Divisional level from time to time. The present structure of local government in Bangladesh had its origin in British colonial period. The first attempt at establishing local government institution was made during the latter part of the nineteenth century. The structure, functions and financial management of local government institutions have undergone many changes from the British colonial period to the present day.

At present, there are two distinct kinds of local government institutions in Bangladesh: one for rural areas and the other one for urban areas. The local government in rural areas represents a hierarchical system consisting of three tiers: Union Parishads (4542), Upazila Parishads (487), and Zila Parishads (64), while the urban local government consists of Pourashavas (324) and city corporations (11). Chittagong Hill Tracts has a special setup (**Figure 4.1**).

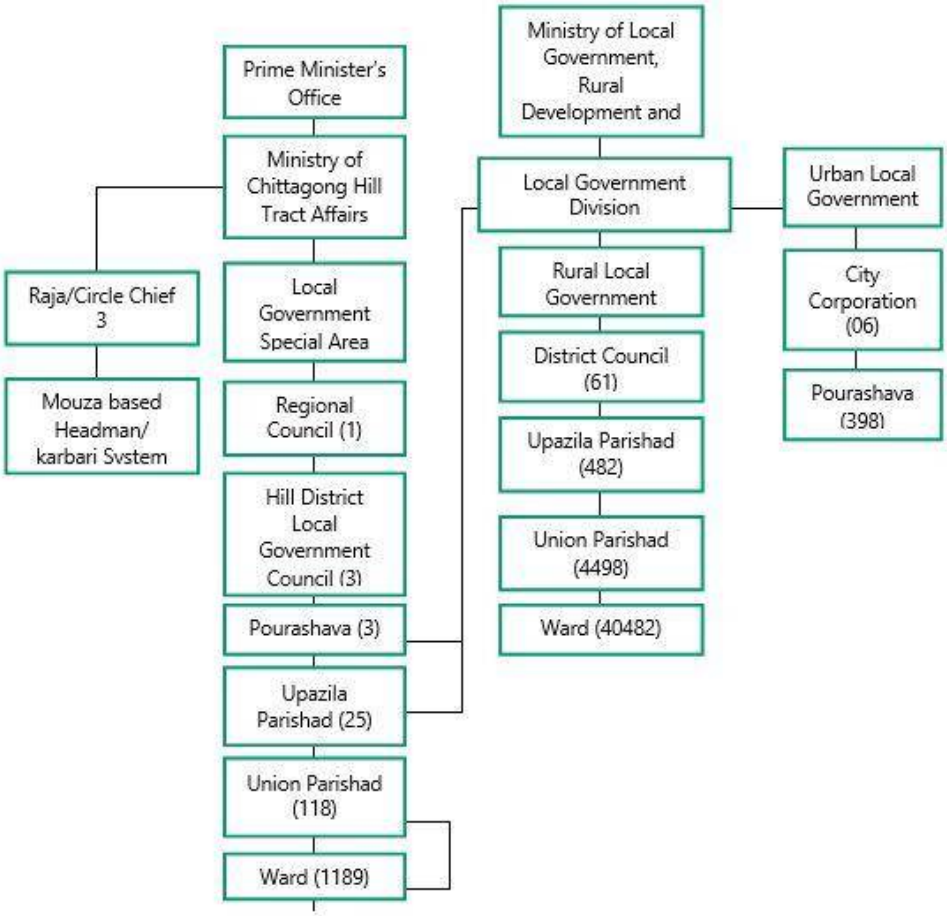


Figure 4.1: Existing structure of Local Government of Bangladesh (source: Kumer 2011*)

*Numbers in brackets have changed since

After Bangladesh became independent decision was taken to strengthen local government institutions at three levels and to make provision for women members. In 1982 Upazila Parishad was established as an elected local government body at Upazila level. Earlier efforts at forming Gram Sarkar and Palli Parishad at village level did not succeed. The Upazila system introduced in 1982 was abolished in 1991. Since inception the local government institutions were given the responsibilities for maintenance of law and order infrastructures development and their maintenance, health, education etc. within their area. Though they had sources of own, revenue income foremost of their activities they mainly relied on various grants from the government (**Figure 4.2**).

Union Parishad, LGI tier at Union level, is the only continuously elected institution since Bangladesh was created. Elections at the second tier Upazila (sub district) were held in late 2009. The Zila Parishad (District Council) has not revived in its democratic form since liberation.

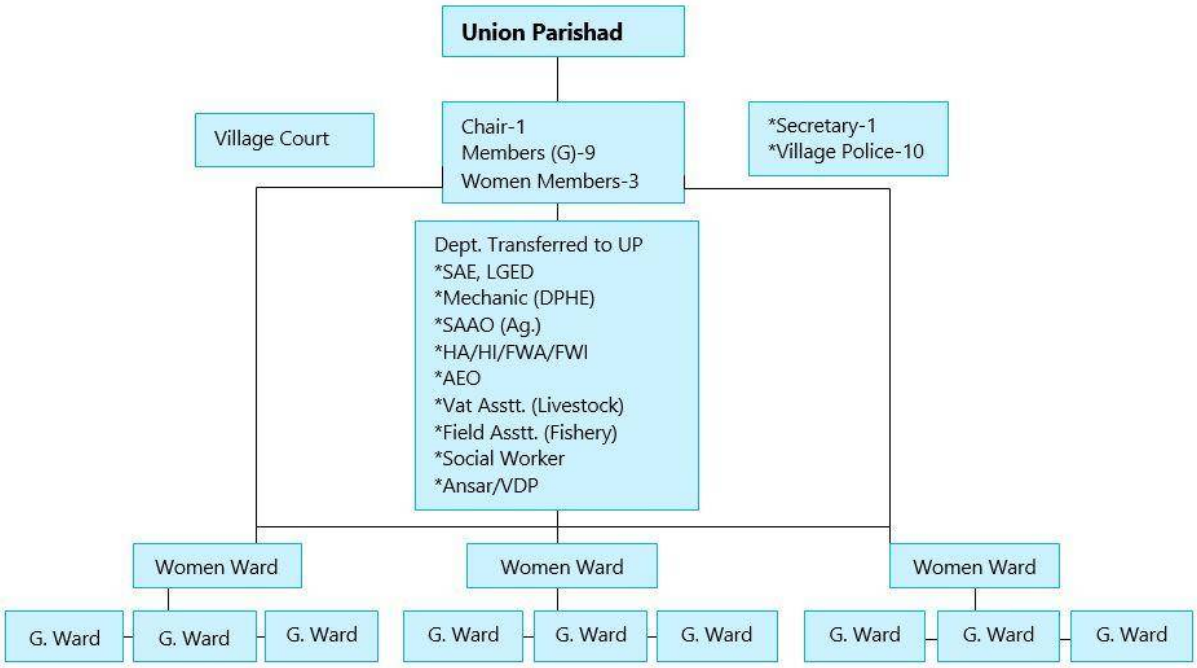


Figure 4.2: Structure of the Union Parishad (Source Rahman & Ahmed 2014)

Union Parishads have been the focal point in the local government system except for a period in the 1980s when the upazila became the focal point. Four important policy changes in the preceding decades have put the spotlight further on this body (Rahman & Ahmed 2014), namely

i) a streamlining of the representational base of the Parishad by demarcating a union into nine wards (electoral units) instead of the previous three and having a member from each ward; this provision first suggested in 1993 became operational through the union election of 1997;

ii) ii) a strengthening of female representation within the Parishads by the 1997 provision for election to three reserved female seats, and

iii) iii) financial strengthening through the provision of direct fund transfer – 'block grants' – introduced in early 2000s and

iv) iv) creation of an upgraded physical 'home' for the UP in the form of the Union Parishad Complexes that have been constructed in phases for all UPs starting from late 1990s.

The Upazilas are the second lowest tier of LGIs in Bangladesh. Each Upazila Parishad (or council) has a chairman, a vice chairman and a woman vice chairman. All three are elected through direct popular election. Union Parishad chairmen within the Upazila are considered as the members of the Parishad. The post of a woman vice chairman was created to ensure at least one-third woman representation in the all elected posts of the local government. Current organogram of UZP is described in **Figure 4.3**.

There are seven separate laws and a few hundred 'rules' that decide the destiny of LGIs (Sharique 2007).

BDP 2100, on a longer term, plans to support GoB's reform initiatives for decentralization and good governance.

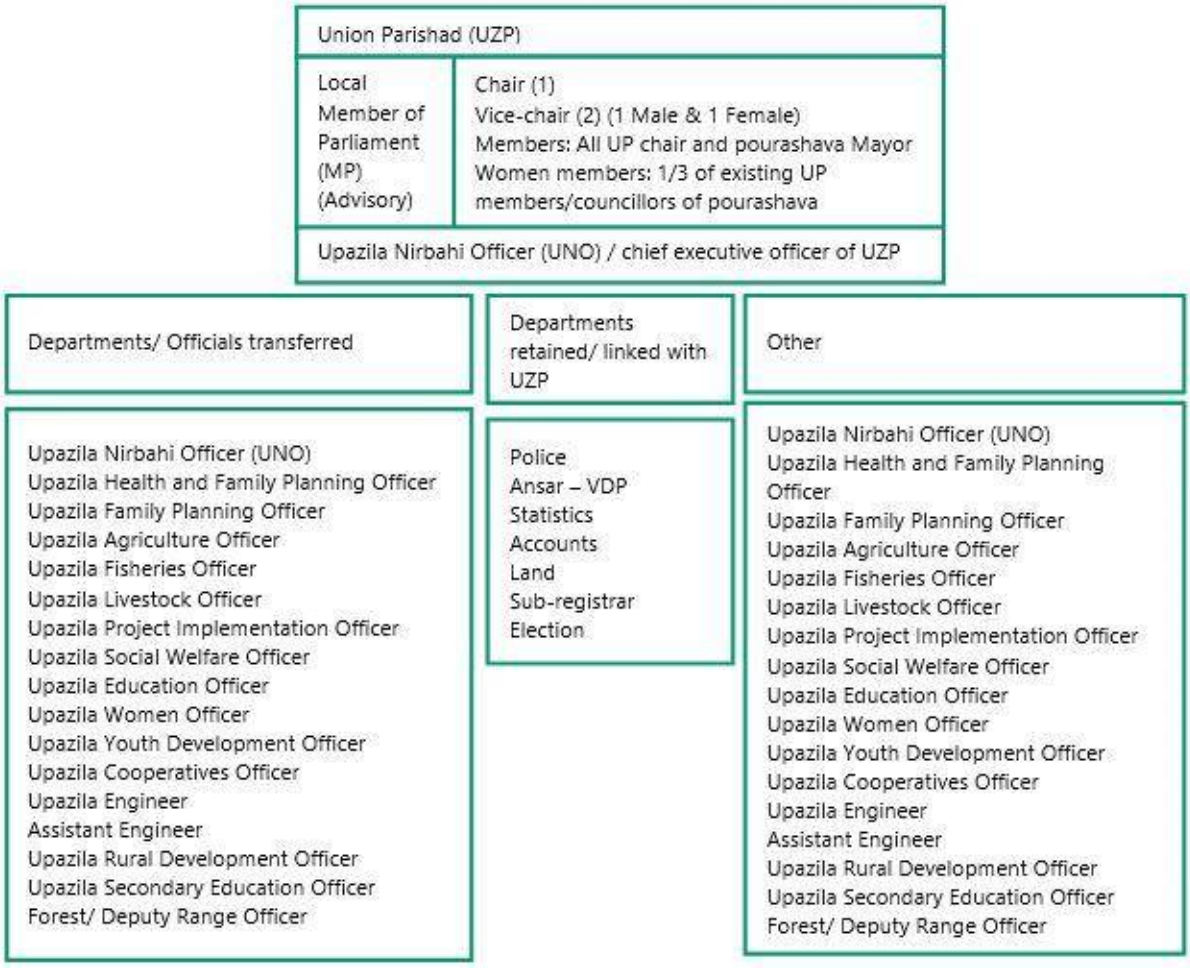


Figure 4.3: Structure of the Upazila Parishad (Source: Rahman & Ahmed 2014)

4.3.4. Water Management Organizations

The institutional framework in which the local stakeholders will participate for water management are known as Water Management Organization (WMO) comprising Water Management Group (WMG), Water Management Association (WMA) and Water Management Federation (WMF) formed on the basis of size and complexity of the project/sub-project/scheme (MoWR, 2001). The WMOs are responsible for planning, implementing, operating and maintaining local water resources schemes in a sustainable way and depending on the type of the project/sub-project/scheme, they will contribute towards the investment and operation & maintenance cost of the project/sub-project/scheme as determined by the government or decided by them acting in their own interest.

Types & Levels of WMOs

For each project/sub-project/scheme, there is at least one level of WMO which is decided by the stakeholders on the basis of their preference and in consideration of the size and complexity of the project/sub-project/scheme. The types of WMO (**Figure 4.4**) which may be formed in respect of different sizes of project/sub-project/scheme are indicated below (MoWR 2000):

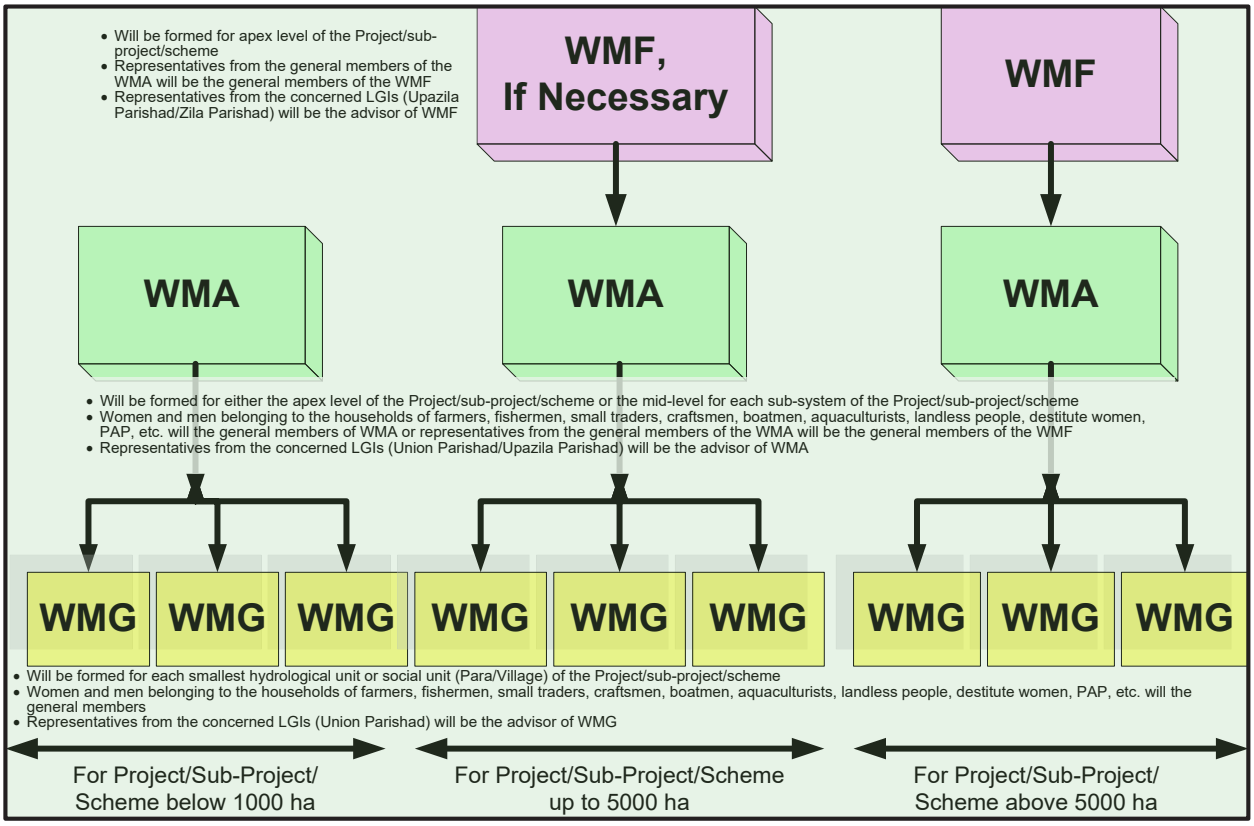


Figure 4.4: Organogram of Water Management Organization

For Project/Sub-Project/Scheme Up to 1000 Ha

In such project/sub-project/scheme, there may be one or two WMOs as indicated below:

- WMG at the lowest level for each smallest hydrological unit or social unit (Para/Village)
- WMA at the apex level of the project/sub-project/scheme.

For Project/Sub-Project/Scheme Up to 5000 Ha

In such project/sub-project/scheme, there may be one or two WMOs as indicated below:

- WMG at the lowest level for each smallest hydrological unit or social unit (Para/Village)
- WMA either at the mid-level for each sub-system of the project/sub-project/scheme or at the apex level for the project/sub-project/scheme.
- If necessary, WMF at the apex level of the project/sub-project/scheme in case WMA is formed at the mid-level for each sub-system.

For Project/Sub-Project/Scheme above 5000 Ha

In such project/sub-project/scheme, there may be one or two WMOs as indicated below:

- WMG at the lowest level for each smallest hydrological unit or social unit (Para/Village)
- WMA at the mid-level for each sub-system of the project/sub-project/scheme
- WMF at the apex level of the project/sub-project/scheme.

Agencies responsible for water management

Bangladesh Water Development Board (BWDB) of the Ministry of Water Resources and Local Government Engineering Department (LGED) of the Ministry of Local Government, Rural Development & Cooperatives are agencies managing water resources in Bangladesh.

Water sector projects have been categorized based on its size, such as,

- small-scale projects < 1000ha;
- medium-scale projects 1000-5000ha; and
- Large-scale projects> 5000 ha (GPWM 2000).

Initially water sector development schemes were implemented in Bangladesh through Bangladesh Water Development Board (BWDB). It was suggested in the National Water Policy that 'the management of public water schemes, barring municipal schemes, with command area up to 5000 ha will be gradually made over to local and community organisations and their O&M will be financed through local resources' (NWPo, 1999).

Other implementing agencies for management of water resources are Bangladesh Agricultural Development Corporation (BADC), Barind Multipurpose Development Authority (BMDA) and the Department of Fisheries

Policy Environment

The Bangladesh Water and Flood Management Strategy recommended people's participation as mandatory from the inception phase, and environmental impact assessment (EIA) as an integral part of planning. These guidelines went through a screening and testing phase which led to the Ministry of Water Resources issuing the Guidelines for People's Participation (GPP) for all water development projects in 1994. Since this time, to varying degrees, the guidelines have been applied in the management of water sector projects implemented by the BWDB. The Local Government Engineering Department (LGED) also prepared a number of reports as: Guidelines and Manual for Operation and Maintenance of Small-Scale Water Resources Schemes (1984), Guidelines for Operation and Maintenance of Small-Scale Flood Control and Drainage Schemes (1986), and Guidelines for Participatory Process of Small-Scale Water Resources Development (1999). A number of projects including Systems Rehabilitation Project (SRP) and the Compartmentalization Pilot Project (CPP) also developed GPPs. As a result, different agencies developed slightly different sets of procedures to ensure stakeholder participation. In 1999, a revised guidelines Institutionalizing Local Participation: Proposal for Guidelines for Participatory Water Management were issued, which has particularly addressed the rights, duties and responsibilities of all those involved in the processes of water development and system management rather than only the procedures to involve people in the processes. In the admittance of too many guidelines and as a consequence upon the declaration of the National Water Policy in 1999, an Inter-Agency Taskforce Committee reviewed all the approaches in this consideration and prepared the current Guidelines for Participatory Water Management (MoWR 2000) in the sector. The current guidelines have tried to avoid conflicts, removed duplications, accommodated flexibility, integrity and complementarities of participatory water management in the country.

Some key and relevant policy and guideline documents are described further.

National Water Policy 1999

The governance and management of the national water resources require a great deal of coordination of existing institutions and in some cases reform and creation of new community based institutions. Properly functioning institutions are essential for effective implementation and administration of the country's water and related environmental resource management policies and directives.

Stakeholder involvement should be an integral part of water resources management, at all stages of the project cycle. Towards that objective there should be a complete reorientation of the institutions for increasing the role of

stakeholders and the civil society in decision making and implementation of water projects. Similarly, Government must lead the effort to ensure greater participation of women in this endeavour.

In order to ensure that all stakeholders actively and fruitfully participate in water resources management decision making at all stages, it is the policy of the Government that:

a. The "Guidelines for People's Participation (GPP) in Water Development Projects" be adhered to as part of project planning by all institutions and agencies involved in public sector management of water resources.

b. Guidelines for formation of water user groups (WUG) and similar community organisations will be formulated.

None of these policy directives, unfortunately, have been mentioned in the Bangladesh Water Act 2013.

Bangladesh Water Development Board Act 2000

Under this Act, functions of the Bangladesh Water Board will be:

12. 1 (f) Establishment of water user's association and other water users/stakeholders' organizations, their training and participation, in project planning, implementation, operation and maintenance and cost recovery for long-term sustainability of benefits to the beneficiaries of completed projects.
12. 2. The Board shall perform the functions mentioned under sub-section (1) by fulfilling the following conditions:
(d) Outlining the institutional mechanism in project documents for securing people's participation in project areas during identification, preparation, implementation, and operation and maintenance in the light of Government guidelines on the subject.
The Board of Directors (BWDB Parishad) shall be composed of, among others, two representatives of beneficiary organizations in Board's executed project: to be nominated by the Government;

Regarding implementation and management of future projects:

1) As per provisions of the National Water Policy and within the framework of sub regional and local water management plans, the Board shall only implement projects having a command area of more than 1000 hectares.
2) Local Authority shall be entitled to execute FCDI projects having command of less than 1000 hectares if these are compatible with the sub-regional and local water management plans
3) Management of projects with a command of less than 5000 hectares shall vest with beneficiary organizations, by whatever name it may be called, formed for this purpose following government guidelines.
4) Management of projects with a command of more than 5000 hectares shall vest in Joint Management Committees (JWC) comprising beneficiary organizations formed for this purpose following government guidelines, the Board and other water-related agencies of the Government; provided the Government may contract out management of a project to a private agency working in the area if it deems necessary.

Regarding Transfer of the Ownership and Management of Existing Projects:

1) The Board shall transfer ownership of FCD and FCDI projects up to 1000 hectares to local authority. Only those projects that are being run by the beneficiary organizations shall be transferred first.
2) The Board may transfer the ownership of any of its existing projects, or a part there of, to another public agency or local authority in view of the expediency of other developmental works or for purposes of maintenance under such terms and conditions as may be determined by the Government.
3) The Board shall gradually transfer the management of all existing water projects with a command area of more than 10,000 hectares but less than 5,000 hectares to beneficiary organizations in a manner determined by the, Government. The management of projects with a command of more than 5000 hectares shall vest in a Joint Management Committee.

Guidelines of Participatory Water Management (MoWR 2000)

Guideline of Participatory Water Management (2000) is the first initiative for formalization the Water Management Organization (WMO) under the authority of Ministry of Water Resources (MoWR). GPWM provides a wide range of stakeholders including local stakeholders (comprising farmers, fishermen, small traders, craftsmen, boatmen, aqua culturist, landless people, destitute women, PAPs), others Public Sector Agencies, LGIs, NGOs, Civil Society, etc. It also guides to process of participation in different phases of project formulation, structure, functions and responsibilities of WMO, capacity building methodology, etc. It is a well-defined document which resolves the conflicting ideas coming from different agencies.

Participatory Water Management Rules, 2014

Participatory Water Management Rules, 2014, under the Bangladesh Water Development Act 2000, is applicable only in the context of projects of Water Development Board,. PWMR, 2014 gives direction for maintaining Participatory Water Management in the following sectors, as: (i) Participatory Water Management definition and process; (ii) Definition of stakeholder, beneficiaries and PAPs, (iii) Legal authority of WMO, (iv) Structure, function and responsibilities of different level of organogram of WMO, (v) Membership process and Registration process and (vi) Financial Control and Auditing process. However, there is no indication of ICT management and participation process in PWMA, 2014. Moreover, this act is highly applied in organizational perspective.

Need for Harmonisation and Sustainability

The Bangladesh Water and Flood Management Strategy recommended people's participation as mandatory from the inception phase, and environmental impact assessment (EIA) as an integral part of planning. These guidelines went through a screening and testing phase which led to the Ministry of Water Resources issuing the Guidelines for People's Participation (GPP) for all water development projects in 1994. Since this time, to varying degrees, the guidelines have been applied in the management of water sector projects implemented by the BWDB. The Local Government Engineering Department (LGED) also prepared a number of reports as: Guidelines and Manual for Operation and Maintenance of Small-Scale Water Resources Schemes (1984), Guidelines for Operation and Maintenance of Small-Scale Flood Control and Drainage Schemes (1986), and Guidelines for Participatory Process of Small-Scale Water Resources Development (1999). A number of projects including Systems Rehabilitation Project (SRP) and the Compartmentalization Pilot Project (CPP) also developed GPPs. As a result, different agencies developed slightly different sets of procedures to ensure stakeholder participation. In 1999, a revised guidelines Institutionalizing Local Participation: Proposal for Guidelines for Participatory Water Management were issued, which has particularly addressed the rights, duties and responsibilities of all those involved in the processes of water development and system management rather than only the procedures to involve people in the processes. In the admittance of too many guidelines and as a consequence upon the declaration of the National Water Policy in 1999, an Inter-Agency Taskforce Committee reviewed all the approaches in this consideration and prepared the Guidelines for Participatory Water Management (MoWR 2000) in the sector. The current guidelines have tried to avoid conflicts, removed duplications, accommodated flexibility, integrity and complementarities of participatory water management in the country. These guidelines are being used in both BWDB and LGED led projects,

This changed from guidelines stage to more legal when the Bangladesh Water Development Board Act 2000 was promulgated indicating roles and responsibilities of the WMOs. This is further elaborated in the Participatory Water Management Rules (2014). Unfortunately, these rules apply only to BWDB led projects. Convergence that was created through the Guidelines for Participatory Water Management (MoWR 2000) was lost with WMOs created under the BWDB has legal binding to follow the Participatory Water Management Rules (MoWR 2014).

WMOs usually obtain legal status by registering under one of four laws: the Societies Registration Act 1860; the Trust Act 1984; the Companies Act 1994 and the Cooperative Societies Act, 2001. After examining various options, LGED opted to get the its WMOs registered under the Cooperative Societies Act, 2001. Under the Participatory Water

Management Rules 2014 created under the Bangladesh Water Development Board Act 2000, registration of all WMOs formed the BWDB will have to be registered in the following manner:

- The registration of the Group (WMG) will be done by the Deputy Chief Extension Officer of the Department of Water Management of the concerned project area, who will be the registering officer in case of WMG.
- Registration of the Association (WMA) will be done by the concerned Chief Extension Officer, who will be the registering officer in case of Association (WMA).
- Registration of the Federation (WMF) will be done by the Chief Water Management of the Board (BWDB), who will be the registering officer in case of the Federation (WMF).

There is need for harmonisation among WMOs created under different agencies.

Furthermore, many other agencies like DAE, DPHE also establish their own user groups. For example, **Tube well user groups** are established (DPHE) to operate and maintain communal water supply, markets and other community facilities. PNGOs established groups which are receiving micro-credit and other services from PNGOs. **Farmers forum** is established (DAE) as focal point for the agricultural development activities of DAE. More over **Social Forestry Groups** have also been formed (FD) to carry out tree plantation, look after the planted trees and also to safeguard the infrastructure and climate as well.

In order to create the employment opportunities for the poor people in char areas where employment opportunities are very limited, CDSP has regularly involved the **Labour Contracting Societies (LCS)** in the process of development activities. CDSP made the provision to involve LCS mainly in earth works under LGED as well as single pit latrine construction and installation under DPHE. WMGs are also involved in maintenance works as re-excavation of khals and re-sectioning of embankments under BWDB

This also calls for further harmonisation.

Sustainability of WMOs were evaluated in the Small-Scale Water Resources Development Sector Project. The review (ADB 2003) is of the opinion that even after the first seven years of the Project, even the most successful sub-projects and WMCAs will require additional support to help them to further develop into the required responsible and resourceful organizations in charge of sustainable operations and management of the small-scale water management schemes. The areas requiring support were (i) management and administration of co-operatives; (ii) technical assistance for identification and implementation of the water-related infrastructure; (iii) assistance related to identification and implementation of community development activities, and (iv) management and administration of the associated micro-credit facility, and interagency co-operation.

An ADB review (ADB 2007) believed that the WMCAs are generally sustainable, taking into consideration the WMCAs' survival for the past 5 years.

4.3.5. Institutional changes

Changes in water institutions are always desirable and necessary under changing economic, physical and political circumstances (Livingston 2005). Water sector interventions of the Government focused mainly on flood protection, irrigation for agriculture, hydro-electric power generation, fish culture and water supply in the urban centers. These functions have caused formation of a good number of sectoral agencies. Economic needs and national prosperity were the two key elements for influencing the formation of such traditional institutions. Major institutional reforms were noticed with the adoption of a comprehensive national water policy in 1999 (MoWR 1999). Since then this policy document has played role to influence remarkable changes in water institutions of Bangladesh. International commitment and motivation have influenced the GoB to bring into account all the contemporary common global issues and concerns for wise use and efficient management of water resources in Bangladesh. This policy advocate's access to water by everyone, including the poor and the underprivileged; taking into account the particular needs of women and children; and bringing forth institutional changes to decentralize the management of water resources and enhance

women's role in water management. While policy statements are imposed by nature and enriched by taking insights from contemporary knowledge of water management, implementation strategy is not contextualized for adoption right from local level. Adoption of this national water policy has given the momentum in the institutional changes for water resources management in Bangladesh not only to address prevailing issues managed under traditional sectoral approaches but also to cover all the four Dublin principles leading to IWRM implementation in the country. The guidelines for participatory water management (2000), national water management plan (2001) and the gender equity strategy and gender and development action plan were developed under the auspices of this policy. Over time, new institutions have been established such as Water Users Groups (WUGs) and Water Management Cooperative Associations (WMCA). BWDB and LGED are now working consistently with the policy objectives which are largely advocating women empowerments, gender equity and local level participation in decision making, water allocation and pricing, water quality standards and water rights etc. But all these changes are seemed to be imposing in nature. A number of new issues are also found in the water resources management of Bangladesh mainly because of evolving water conditions. For example, disaster management came into an existence through a process of significant institutional changes in Bangladesh. Earlier it was simply a relief program of the Government and now turned into a Disaster Management Bureau (DMB) in 1993 to address hazard identification and mitigation, community preparedness and integrated response effort under holistic approach. Government of Bangladesh has also established Climate Change Trust Fund which enables new interventions for changing context of water resources management in the country. Institutional Change for Water Resources Management in Bangladesh over time can be seen from **Table 4.3**.

Table 4.3: Institutional Change observed in Water Resource Management in Bangladesh

Decadal Temporal Seale	**Issue Based Institutional Changes**
Before 1971 (Before Independence)	-Society registration - Canal management - Irrigation - Private fisheries - Tank management - Protection and conservation of fish - Land occupancy - Lease and occupancy of land - Embankment and drainage
1971-1980	- Inland transportation - Fisheries development
1981-1990	- Acquisition and requisition of 'Immovable Property' - Marine fisheries - Local government - Irrigation water rate - Ground water management - Land management
1991-2000	- Water resource planning - Companies act - Environmental conservations (Act) - Water supply and sewerage - Water and flood management strategy - Environmental conservation in details (rules) - Bangladesh Water Development Board - Disaster Management Bureau (DMB)

Decadal Temporal Seale	Issue Based Institutional Changes
	- Involvement of Local Government Institutions
2001-2015	- Participatory water management - water rules to cover water supply services - Climate Change Trust Fund - Flood forecast and warning centre - The Water Act - Bangladesh Water Development Board Act - Participatory Water Management Rules under BWDB Act

It is evident from the above discussion that the year of 1999 was the turning point for water institutional changes in Bangladesh. Institutional changes are articulated both a micro level and at macro level. Earlier main institutional changes were issue based, sectoral and very much occasional. Management practices were traditional but it has been turned into a participatory and integrated management system by following a very comprehensive national water policy. Almost all the contemporary issues of water resources management brought into account of policy statements but strategy on how to implement are not defined right up to lowest appropriate level. Several local institutions are created through project intervention but unable to function without project. When policy statements become comprehensive in nature, implementation strategy remained as an imposed mechanism. For successful IWRM such institutional arrangement is not desirable. Different sectoral government agencies were developed from time to time to address specific issues of water resources management. Now IWRM is considered to be the durable water solution. Potential and need for future water institutional changes in Bangladesh is also articulated by using the framework proposed by Livingston (2005).

Water resources management in Bangladesh has been fragmented across several organizations and departments such as Bangladesh Agriculture Development Corporation, Department of Agriculture Extension, Department of Environment, Bangladesh Water Development Board, Local Government and Engineering Department, Department of Fisheries. There have been some efforts at securing integration. There is no consensus on how IWRM should be defined in Bangladesh. Rather it is variously defined by sectoral policy documents. For example IWRM interpretation by LGED is quite different from IWRM interpretation by BWDB. Many other agencies are yet to define IWRM implementation strategy. The National Water Policy (NWPo) of Bangladesh has endorsed IWRM as the major strategy to attaining national goals of economic development, poverty alleviation, food security and protection of the natural environment and thus to attain sustainable development in the country (Local Government Engineering Department 2006). Achievement of these national goals underpins main philosophy of IWRM implementation as explained by GWP (Savenije & van der Zaag 2008). While IWRM implementation demands for stakeholder participation and collaborative governance, necessary institutional change become compulsion especially to minimize uncertainty and complexity in the management of social-ecological systems (Pahl-Wostl 2007; Steyaert & Jiggins 2007; Tippett et al. 2005). But prevailing institutional arrangements are inadequate to respond to the need of IWRM implementation for desired outcome. Therefore, findings of the study suggest that further institutional changes are required to enable IWRM implementation as durable solution for better success.

4.3.6. Alignment with the Local Government Institutions

The Bangladesh Constitution has provided an outline of a local government system with elected representatives facilitating effective participation of the people for each unit of administration. In compliance with the Constitutional requirement and to institutionalise the democratic aspirations in all walks of life, it is obligatory to ensure the establishment and operation of effective local government organizations. The history of local government in Bangladesh shows that local bodies have been established at different levels in different periods following the state policy of the ruling government. Related acts /ordinances have been made to form local bodies at village, Union, Upazila, Zila (District) and Divisional level from time to time. The present structure of local government in Bangladesh had its origin in British colonial period. The first attempt at establishing local government institution was made during the latter part of the nineteenth century. The structure, functions and financial management of local government institutions have undergone many changes from the British colonial period to the present day.

After Bangladesh became independent decision was taken to strengthen Local Government Institutions at three levels and to make provision for women members. In 1982 Upazila Parishad was established as an elected local government body at Upazila level. Earlier efforts at forming Gram Sarkar and Palli Parishad at village level did not succeed. The Upazila system introduced in 1982 was abolished in 1991. Since inception the local government institutions were given the responsibilities for maintenance of law and order, infrastructures development and their maintenance, health, education etc. within their area. Though they had sources of own revenue income foremost of their activities they mainly relied on various grants from the government.

Union Parishad, LGI tier at Union level, is the only continuously elected institution since Bangladesh was created. Elections at the second tier Upazila (sub-district) were not regular. The Zila Parishad (District Council) has not revived in its democratic form since liberation.

At present, there are two distinct kinds of local government institutions in Bangladesh: one for rural areas and the other one for urban areas. The local government in rural areas represents a hierarchical system consisting of three tiers: Union Parishads, Upazila Parishads, and Zila Parishads, while the urban local government consists of Pourashavas and city corporations. All most all the institutions of local government are directly or indirectly involved in water resource planning and management. Among them LGED and DPHE are active in rural Bangladesh while city corporations and municipalities are active in urban water resource management and planning.

According to the Guidelines for Participatory Water Management (2000), the Local Government Institutions (LGIs) will provide supporting, facilitating and coordinating assistance to the concerned WMOs at the local level. LGIs will provide such assistance through their representation as advisors to the concerned WMO and also through their respective Standing Committees. The purpose will be to ensure sustainable management of local water resources in line with the overall development of their areas and inhabitants.

Under the Participatory Water Management Rules (2014), representation of the Local Government is suggested through members of Union Parishad in case of WMG, Union Parishad Chairmen in case of WMA, and Upazila Chairmen in case of WMF, will be included as Advisors. It means that if a WMG, WMA or WMF area covers more than one Ward, one Union or one Upazila respectively, concerned Members and Chairman of Union Parishad or Chairman of Upazila Parishad will be included in the concerned WMG, WMA or WMF, as the case may be, as Advisor

It has to be explored if these alignments are in practice. Eventually, it has to be explored how to strengthen the alignment with the LGI further to enhance sustainability.

4.3.7. Private Sector Institutions & Non-Governmental Organisations

Government has adopted a pro-market stance in pursuit of its short and long-term development objectives. The private sector is recognized as the primary engine of growth, owning and operating production systems, and accounting for most of the investment in the economy. The state will play the facilitating role in building infrastructure, regulating markets, and creating an enabling environment for business and investment. Private businesses and corporations are now investing in Corporate Social Responsibility (CSR) activities which will have to be given proper tax treatment over time (Perspective Plan 2010-2021).

The private sector is closely involved in all aspects of water resources development and management by consulting, contracting, supplying equipment and training the agencies. Private sector activities have expanded significantly over the last 20 years and they are particularly active in minor irrigation, rural water supply and sanitation. But there is a lack of coordination between the public, private sector and NGOs. The World Bank, the Asian Development Bank and many of the bilateral development partners, notably the Dutch, Danish, Japanese, British and Canadian have been active for many years in financing water development projects with technical assistance and capacity building. UNDP and other United Nations Agencies especially UNICEF, are active in support of water sector programmes and rural development. Proper monitoring is quite inadequate in case of donor funding projects. Academia is also active in the water management. But due to lack of funding and technology, advance research activities such as in rainwater harvesting, conjunctive use of rain-water, ground water and surface water etc. are quite inadequate.

Local and International NGOs are providing goods and services normally associated with the public and private sectors. The NGOs are playing significant role in environment and water management planning. Regional, national and international NGOs have been involved in the water sector, both as partner as well as critic of FCD developments. NGOs have made a substantial contribution to the improved living standards in the country by assisting the rural population to cope with the disasters caused by the floods and cyclones. NGOs have been successful in mobilizing people by forming groups, village centres or village organizations. Such groups are formed by marginal and poor male and female members and using micro credit a large number of group members have improved their livelihood and invested in small businesses, livestock and agricultural activities. In emergency cases these local groups are known to mobilize resources for repairs and maintenance. In a number of projects, NGOs have been involved in FCD development as well, specifically in community mobilization and participatory planning.

4.4. Property Right Regime and Collective Choice Arrangement

Property right regime determines rights and restrictions over property and collective choice arrangement enables its enforcement and thus ensures governance institutions for desired outcomes. According to Bromley (1991), property rights regimes are the arrangements generally established to control the use of resources, which comprise of property rights, the entitlements defining owners' and non-owners' rights and duties in the use of the resource, and property rules, the rules under which those rights and duties are exercised. In absence of clear understanding of property rights, transaction cost will increase and market failure results (Musole 2009). Here property right regime and collective choice arrangement for water resource management in Bangladesh are discussed to articulate the pressure for, and obstacle to the institutional changes in the country. Property rights regime, in narrow sense, determines complete and exclusive control over resources such as water. It refers to ownership rights of resources as defined in formal laws and also refers to overlapping bundles of rights which are expressed in customary laws and local practices of water resources management. Vermillion (2004) has documented an account of important property rights for water users as given below:

- the rights to use, both on individual farms and for the irrigation system as a whole, a certain amount or share of water of an acceptable quantity;
- the right to cultivate land and choose what crop to plant, with collective protection against conversion of irrigated land to other uses;

- the right to use, repair, and improve irrigation infrastructure;
- the right to determine what irrigation services will be provided and by whom;
- the right to adopt rules, irrigation service plans, and budgets;
- the right to establish, collect, and use an irrigation services fee (without having to transmit the funds to the government);
- the right to assign penalties, settle disputes, and obtain legal support;
- the right to give consent to or refuse external assistance;
- the right to maintain representation in a higher-level public council as the river basin or district level.

Property rights serve as a guiding incentive to achieve a greater internalization of externalities for resources management (Demsetz 1967). Property rights will be effective when there is institution for monitoring and enforcement of these rights and restrictions. There are multiple sources of property rights including international treaties and laws, state law, religious law and practices, customary laws, project law, programme regulations, and organizational laws (Meinzen-Dick et al 2004). All these sources of property rights create overlapping pressure on the institutional changes for better water resources management in the country. Property rights may also provide policy tools for strengthening collective action. Property rights affect incentives that individual face and thus create pressure for and overcome obstacles to institutional changes. For example, present national water policy directives have created incentives for water agencies to consider stakeholder participation in water management. Thus government agencies (LGED) has implemented project to form water users groups (WUGs) and water management cooperative associations (WMCA) in the country. Formation of such local institution overcomes different obstacles to implement small and medium scale water projects in Bangladesh. Irrigation system has been decentralized and collective choice arrangement has been mobilized in the country. Participation of resource appropriators in collective choice arrangement can devise a good set of rules given that resource boundary is defined and good fitting rules exist (Ostrom 1990). Hence institutional change is required to enable participation of resource appropriators in collective choice arrangement. Here resource appropriators are considered water users in the country. Water and land resources are two keystone resources to form different resource systems within a river basin. Property rights to these two keystone resources are interrelated and property rights to land are accompanied by presumptive rights to its surface and ground water (Swallow et al 2004). Such an arrangement of water rights creates incentives for individuals for over drafting water without considering its efficient use.

On the other hand secured property rights to water can influence incentives to invest in its improved management. Property right to water need not be exclusive to be secured; it can be held in common when collective choice arrangement become necessary for better access to and allocation for water uses. Effective integrated water resource management depends on desired institutional change and thus is believed to bring economic growth, alleviate poverty and environmental sustainability in the country. Property right regime and collective choice arrangement have links to poverty reduction by affecting livelihood and empowerment of poor people through providing definite access to resources, allowing participation in monitoring and enforcement, making voices and improving bargaining position in collective decisions, ensuring tenure security, and capacity for taking future into account. When future is brought into account for resource management, it becomes environmentally sustainable in the long run. Similarly, tenure security creates incentives for investment for more productive activities and is used as collateral for credits. Thus it contributes to poverty alleviation and economic growth in the country. A number of institutions have been developed in Bangladesh over the last two decades for poverty reduction and livelihood support to local poor. Water resources management is also addressing these issues and hence created pressure for institutional changes especially for its wise, prudent and sustainable management. Decentralization becomes visible in the present programme of the Government. For example, co-management of fisheries and wetlands, co-management in the forestry sector are said to be successful. While transfer of responsibility for resources management has been emphasized transferring corresponding rights remained unresolved. Hence devolution of resources management demands for further institutional changes. Social and political capacity to respond to this devolution mechanism is still creating obstacle to the institutional changes for desired water resources management in Bangladesh.

4.5. Hot Spots & Institutional Arrangements

4.5.1. Features

Hotspots are prototypical areas where similar characteristics and problems converge (such as flood vulnerabilities, climate change impacts water shortages, siltation constraints, etc.). Hotspots can vary in scale between local (e.g. a city) and regional (e.g. a coastal area). These areas can be considered as exemplary for initial years of delta planning and detailed integrated analysis and planning exercises will be applied to these specific areas or locations. The Hotspots are summarised below along with their respective institutions (**Figure 4.5**):

- Mighty rivers: addressing the issues of river training, water retention, inland land reclamation, with effective monsoon run off and morphological management;
- Coastal areas: develop concept of climate resilient coastal defence (growing with the sea level), salinity and sediment management, appraisal of the sustainability concept of coastal polders (ensure seasonal sedimentation, increase drainage capacity to solve the water logging problem) and sustainable fresh water supply and agriculture and fisheries sectors;
- Urban areas (Dhaka and other major cities): assessment of sustainable water supply options, sustainable groundwater management, addressing domestic and industrial pollution control, re-address resilient storm water drainage and flood control concepts, and – cross-cutting – prepare prototypical institutional structures and cost recovery principles that will allow effective management and feasible implementation/operation;
- Haor-areas: several areas involve typical conditions, requiring special solutions in terms of water resources and flood control, economy, agriculture and infrastructure;
- Drought prone areas in the North-West, Barind areas;
- Chittagong Hill Tracts

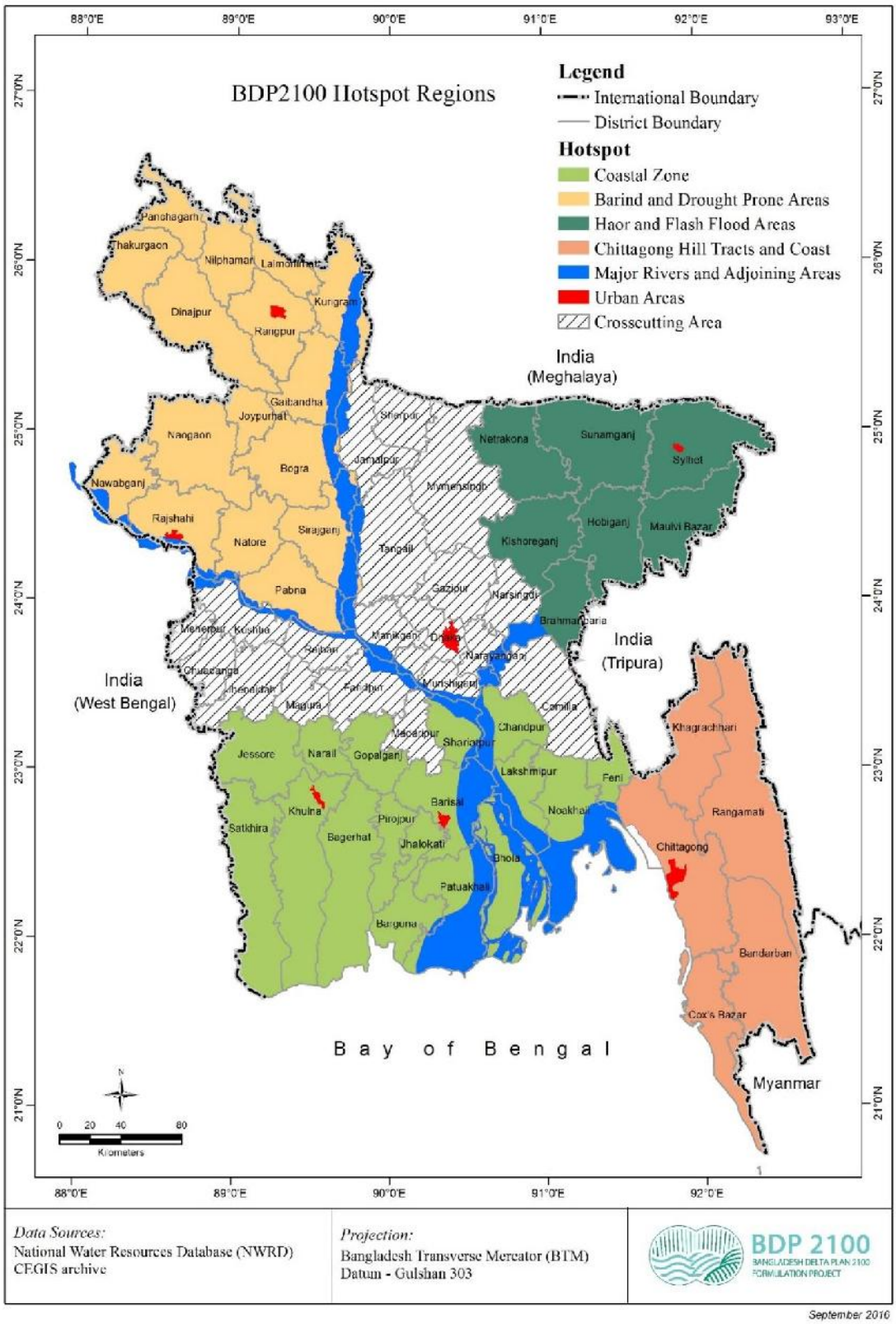


Figure 4.5: Hotspots of the Bangladesh Delta Plan

4.5.2. Institutional Arrangements

Institutional arrangements in all hotspot areas are covered under the prevalent national legal, administrative and the local government systems of Bangladesh. However, for development of some areas, government has instituted special setup which is described below:

Barind Areas of the North-west

The Barind area of relatively high and dry land between the two mighty rivers, the Jamuna and the Padma, is spread over the districts of greater Rajshahi, Bogra, Rangpur and Dinajpur. In 1985 Government of Bangladesh decided to implement a project named Barind Integrated Area Development Project (BIADP) by BADC for agricultural development of the area. A special authority called the Barind Multipurpose Development Authority (BMDA) was constituted by the Ministry of Agriculture.

Haor Areas

For integrated development of haor areas, Government established the Haor Development Board in February 1977 and abolished it in September 1982. The present Bangladesh Haor and Wetland Development Board was created under the Ministry of Water Resources in September 2000, which was again reformed as Department of Haor and Wetland Development in 2015 with the following **f**unctions:

- coordinate the integrated development of the haors and wetlands of Bangladesh among the ministries, agencies and local government bodies and for this purpose, prepare a Master Plan for integrated development of haors and wetlands;
- formulate projects related to the development of haors and wetlands and implement projects through local government bodies and other agencies;
- examine and co-ordinate different projects to be implemented by different ministries and agencies and provide proper advice to the implementing agencies; and

The Department of Haor and Wetland Development has, for the development of haor areas, prepared 'Master Plan of Haor Area 2012'.

River Areas

There are at least 12 different authorities in the Government that deals with different aspects of water and river managements. In the wake of river grabbing and pollution, the Government has established the River Protection Commission under the National River Protection Commission Act, 2013. The Commission will advise the government and coordinate the activities of ministries involved in the management of water and river. The Commission is composed of a Chairman and four members, including hydrologist, environmental expert and lawyer. One of the members should be a woman. The Commission will be reconstituted after every three years and it will submit the annual report to the President by March 31 every year.

Chittagong Hill Tracts (CHT)

The institutional set-up of the Chittagong Hill Tracts (CHT) is quite different and more complex than that in the other parts of Bangladesh. There is a traditional system of tribal administration (Kingships of Chakma, Bomang and Maung). Following the CHT Peace Accord 1997, another parallel system for administration and development, that is, the Chittagong Hill Tracts Regional Council (CHTRC) and three Hill District Councils (HDC), were established. A separate ministry, the Ministry of CHT Affairs, was also established. The CHTRC and HDCs work under this Ministry. Following the establishment of the HDCs, 18 government departments and agencies were deputed under the HDCs as transferred subjects.

The Chittagong Hill Tracts Regional Council formally started it functions since 27 May 1999 as per Chittagong Hill Tracts Regional Council Act 1998. Functions of the Chittagong Hill Tracts Regional Council are given below:

1. Overall supervision and coordination of all development activities under the Hill District Councils and all other matters entrusted to them:
2. Supervision and coordination of the local councils including municipalities;
3. Overall supervision and coordination of the Chittagong Hill Tracts Development Board set up under the Chittagong Hill Tracts Development Board Ordinance, 1976;
4. Supervision and coordination of the general administration of the hill districts, law and order and development;
5. Supervision and coordination of tribal traditions, practices etc. and social justice;
6. Issuing licenses for setting up heavy industries in hill districts in keeping with the National Industrial Policy.
7. To conduct disaster management and relief work and co-coordinating of NGO activities.

4.6. Plans/ Programs of national scale significance related to water

4.6.1. Plans

Bangladesh has wide experience in development planning and have already had formulated and implemented a number of short, medium and long-term development plans. The plans those have linkage and significance with water resource management in Bangladesh are listed in **Table 4.4**

Table 4.4: Water related Plans

Title of the Plan	Prepared by	Period
National Plans		
The Perspective Plan of Bangladesh	GED, Planning Commission	2010-2021
National Sustainable Development Strategy	GED, Planning Commission	2010-2021
1st Five-Year Plans 2nd Five-Year Plans 3rd Five-Year Plans 4th Five-Year Plans 5th Five-Year Plans 6th Five-Year Plans 7th Five-Year Plans	GED, Planning Commission	 FY2011 – FY 2015 FY2016 – FY 2020
Sectoral Plans		
National Water Management Plan	2004	2001-2025
Bangladesh Climate Change Strategy and Action Plan	2009	10 years
The Master Plan for Haor Areas		From 2010Upto 2032
National Plan for Disaster Management	2010	2010-2015
Sector Development Plan for Water Supply & Sanitation Sector in Bangladesh	2011	2011-2025

The time frame of the above stated plans varies ranging from 5 to 25 year. Bangladesh has for the first time initiated formulation of a long term 50-100 years plan like BDP 2100. This time frame of BDP-2100 is necessary to address the issue of climate change, which is almost in consistent with the other delta plans of the world. Strategy of BDP 2100 would be based different scenarios to be developed upto year 2100. The challenge lies in integrated long term strategies as well as efficient coordination and effective implementation of the needed interventions in a well-coordinated and quicker way. Needed to that is a holistic plan with a long term time frame that is commonly supported by key

stakeholders. Such an integrated and coordinated planning approach, including facilities for better spatial planning and disaster management is desirable for managing the natural resources and to fulfill the demands of sectors such as agriculture, fishery, forestry, livestock, industry, water supply and sanitation, environment, navigation etc.

4.6.2. Stakeholder's Participation in Strategy/Plan Formulation

Stakeholder involvement is an important and widely accepted principle in formulation of any national or sectoral strategy or plan. Stakeholder's participation needs to be ensured from the beginning of plan formulation through consultation, dialogue, meeting, seminar/workshop and exchange of views in any form. Degree and level of such consultations vary and is subjected to the relevance of the plan. The process of public consultations practiced during the formulation of NEMAP (sectoral plan), and 7th Five Year Plan are described below:

Formulation process of the National Environment Management Action Plan (NEMAP)

The broad-based consultation system rendered wider scopes for the organizations, agencies and people to offer their views about the plan. NEMAP was developed by the GoB with the assistance of the UNDP under a project. A National NEMAP Committee consisting members from the government, development partner, civil society and media oversaw the consultative phases. Stakeholder's opinion, expert and professionals' views, policy makers' support, were mobilized through consultation meeting, workshops media campaign and questionnaire survey. A total of 23 workshops at grassroots level were organized to obtain the public opinion from every corner of the country. Participation from every segment of the society including women was ensured in these workshops. Under the consultation process 6 regional workshops were organized at Khulna, Sylhet, Comilla, Chittagong, Bogra and Mymensingh in which the elected local govt. functionaries and govt. officials participated. A workshop was arranged at the national level participated by the policy and decision makers. The draft of NEMAP has thus been developed through a series of consultation. The draft was again shared with the stakeholders, professionals, experts, civil society organizations, policy makers and their views, suggestions and comments were duly incorporated in the final draft. Thus Ministry of Environment and Forest (MOE&F) approved the final NEMAP in 1995.

4.7. Financing

A number of Ministries like Ministry of Water Resources (MOWR), Ministry of Agriculture (MOA), Ministry of Local Government, Rural Development and Cooperatives (MOLGRD&C), Ministry of Shipping are involved in implementation of water projects programme and projects. These projects and programme are financed either from GOB's own resources or a combination of domestic (GOB) and external (development partner) resources. Private sector's participation in the water sector programme/projects is not significant. However, private investment could play an important role in related services like irrigation, on-firm water management, river transport and agricultural production. Much of the water sector infrastructure building incur huge cost and, as such, finance for the water sector project programme still remains as big challenge. The current pattern of spending on water resources shows that its budget is channelized through above 4 ministries. Their share in total spending on water resources activities are as follows: MOWR- 22percent, MOLGRD&C- 64percent, Ministry of Shipping- 6percent and MOA-8percent. **Table 4.5** provides picture of agency-wise spending on water resources in 2014-15, which is about 1.0 percent of the GDP and 6.0 percent of the national budget of the respective year.

Table 4.5: Total Budget Spending on Water Resources. Source: Ministry of Finance

	FY2015		FY2016
BDT in Millions	**Budget**	**Revised**	**Budget**
Ministry of Water Resources	29298	38860	40546
Secretariat	130	1027	1078
International Organizations	1	1	1
Bangladesh Water Development Board	28888	37587	39236
Department of Haor and Wetland Development	19	12	12
Joint River Commission	66	65	64
WARPO	110	80	65
River Research Institute	84	89	90
Local Government Division	92570	103456	117083
Rural Development Establishment	136	130	139
Local Government Engineering Department	67051	80656	84685
Dhaka WASA	15910	14490	22222
Chittagong WASA	7690	6494	8830
Rajshahi WASA	220	245	274
Narayanganj City Corporation	220	245	274
Dhaka South City Corporation	600	300	370
Dhaka North City Corporation	742	896	289
Ministry of Agriculture	12401	13377	13827
Department of Agricultural Extension	5032	4934	5886
Bangladesh Agricultural Development Corporation	7368	8443	7941
Ministry of Shipping	7040	6412	9866
Bangladesh Inland Water Transport Corporation (BIWTC)	850	828	1167
National River Conservation Commission	24	22	26
Bangladesh Inland Water Transport Authority	6166	5561	8672
Total	141308	162104	181321
As percent of total budget	5.6	6.8	6.1
As percent of GDP	0.9	1.1	1.1

4.8. Issues, Challenges and Measures

The water resource sector in Bangladesh is characterized by the presence of a number of Ministries, Divisions and agencies representing multiple institutional efficiency at various degrees. Previously, the BWDB possessed the virtual monopoly of decision making in water sector; then the National Water Policy defines the mandates of a number of organizations. WARPO for macro-level planning, CEGIS, IWM and RRI for research and studies, LGED for implementation of small scale irrigation schemes and BWDB is expected to achieve specialization in river management, the implementation and management of larger irrigation project. Coordination and cooperation among these institutions are lacking resulting implementation of overlapped, fragmented and less integrated efforts and programs whereas

there is a crucial need for Bangladesh Delta to implement a holistic, comprehensive and integrated programme for sustainable water resource development and their utilization.

The National Water Policy of 1999 sought to streamline water management responsibilities by institutions. But the NWP is not fully implemented. For example, BWDB continues to follow a response based approach rather than seeking a long-term sustainable solution to floods and erosion. The effectiveness has been limited by poor designs, insufficient maintenance, failure due to river erosion and limited long term planning. Current management practices are also inflexible in dealing with the dynamic nature of the river system and adapting to climate change. This has increased the vulnerability to flood disasters and undermined opportunities to safeguard economic development. Currently there is no organization with given responsibility of ground water management, and such expertise as exists is thinly scattered between DPHE, BWDB and BADC. Some form of abstraction licensing is required, at least in water stressed areas. Currently there is no agency ideally suited in terms of skills, conflicts with existing functions and geographical spread to undertake the administration of licensing.

4.9. Potential and need for institutional change

By following twelve country examples of concepts, Livingston (2005) has presented a conceptual framework to help understand the potential and need for institutional change in a country. This framework is applied here in Bangladesh. Institutional changes are evaluated both at micro and meso level. At micro level, fundamental forces that generate pressure on institutional changes are evaluated and at meso level, structure and sequencing of actual change in institution are evaluated. At micro level, institutional concepts like interest group politics (Olson 1971), equilibrium and evolutionary change status, efficiency, equity and social welfare are taken into account for evaluation of potential institutional changes in Bangladesh. Interest group politics resulted into institutional changes for irrigation systems in Bangladesh. Among different interest groups, development partners are dominant to bring institutional changes in Bangladesh. Present water institution clearly outlined the rights of farmers and indigenous people to ensure equity within water institutions. Social welfare especially the poverty alleviation through water resources management and recommendation for privatization of water services are important elements that created needs for institutional change in Bangladesh.

At meso level water law, water policy, and water administrations are found to be nested and hierarchical and considerable changes are observed since the adoption of a comprehensive national water policy in 1999. To implement this national water policy, national water management plan was prepared in 2001 and it has defined rules related to appropriation, provision, monitoring and enforcement at least at programme appraisal level. It outlined institutional changes by taking into account contemporary water issues of Bangladesh. Among different stages of changes, changes in the perceptions of needed institutional changes, political articulation of needed changes and to some extent some steps are also undertaken to make water institution operational in Bangladesh. The role of subjective and objective elements to enrich perception of needed institutional change is also observed in Bangladesh. Over drafting of ground water in the urban centers, arsenic contamination, industrial pollution, climatic variability, disasters like flood, draught, tidal surge, and outbreak of water borne diseases are main objective elements of physical environment. Requirement of technology for efficient use of water in agriculture and industry is also another elements faced by water management institutions in Bangladesh. Changes in values and ideologies of individuals, especially the professionals, government officials, academicians and experts, took place due to increasing concern for environmentalism. Industrial pollution control, water pricing for improved supply and sewerage services, arsenic contamination in the ground water, increasing demand for irrigation, increasing demand for fish protean has tremendously influenced the water institutional changes. Similarly past institutional experiences of flood, disasters, outbreak of diseases, drought in Barind Tract have influenced the needed institutional change as outlined in the national policy and in the water resources management plan of Bangladesh. Path dependency is also observed in the formation of management plan and policy adoption by the government. There is no doubt that the political transaction cost and economic transaction cost have been reduced within water sector by sharing information and data transfer by using internet, computer database and networking.

While communication, networking, exchange of information and collaboration support are observed among agencies, similar institutional arrangement need to be ensured among individual stakeholders.

4.10. Potential and relevant institutions for BDP 2100

Formulation & implementation of a national plan like BDP 2100 certainly have large and varied actors to contribute to. First of all, all or any of Bangladeshi citizens are stakeholder in the BDP 2100 formulation and implementation. While there shall be opportunities for everyone's participation, yet it is recognised that it is impossible to reach all actors and stakeholders. An effort has been made to prepare a preliminary list in collaboration with the GED following Stakeholder Mapping Method (Inception Report BDP 2100, 2014). An indication of important stakeholder groups is as follows.

4.10.1. Policy & Planning

- Representatives of major political parties.
- Relevant Ministries:
    - Ministry of Agriculture
    - Ministry of Road Transport and Bridges
    - Ministry of Disaster Management and Relief
    - Ministry of Environment and Forest
    - Ministry of Fisheries and Livestock
    - Ministry of Food
    - Ministry of Foreign Affairs (Maritime Affairs Unit)
    - Ministry of Health and Family Welfare
    - Ministry of Housing and Public works
    - Ministry of Industries
    - Ministry of Land
    - Ministry of Local Government, Rural Development and Co-operatives
    - Ministry of Planning
    - Ministry of Power, Energy and Mineral Resources
    - Ministry of Science and Information & Communication Technology
    - Ministry of Water Resources
    - Ministry of Women and Children Affairs Bangladesh.
- International Financing Institutes & Development partners
    - World Bank Group
    - Asian Development Bank
    - Australian Aid
    - Embassy of the Kingdom of the Netherlands
    - Danish International Development Agency
    - Department for International Development, UK
    - Japan International Cooperation Agency
    - USAID
- UN organisations and development agencies
    - Food and Agricultural Organisation of the UN
    - International Fund for Agricultural Development
    - United Nations Development Fund

Professional and civil society bodies like Bangladesh Institute of Planners (BIP), Bangladesh Environmental Lawyers Association (BELA), Institute of Engineers, Institute of Architects, Water Aid, and Bangladesh Paribesh Andolon etc. bodies.

4.10.2. Management & Implementation

- Government organisations under different ministries
    - Water Resources Planning Organization
    - Department of Agricultural Extension
    - Department of Environment
    - Department of Public Health Engineering
    - Department of Disaster Management
    - Department of Fisheries
    - Department of Haor and Wetlands Development
    - Bangladesh Inland Water Transport Authority
    - Bangladesh Agricultural Development Corporation
    - Bangladesh Water Development Board
    - Local Government Engineering Department
    - Roads and Highways Department
    - Soil Resources Development Institute
- Government departments based at Division, District, Upazila level, Union Parishad levels. Local governmental institutions
- Other regional and local parties of importance, like for example fishery, water management or industrial associations at District level.
- Private sector representatives
    - The Federation of Bangladesh Chambers of Commerce & Industry
    - Foreign Investors Chamber of Commerce & Industry
    - Bangladesh Enterprise Institute
    - Women Entrepreneurs Association of Bangladesh (WEAB)
    - Small and Medium enterprises (SME) organizations
- Private sector parties and SMEs that like to invest in Bangladesh; for example, dredging companies and developers of small-scale water management solutions.

4.10.3. Knowledge & Research

- Government organisations under different ministries like BBS, BIDS, RRI, BARC etc.
- Universities/Knowledge institutes,
    - Bangladesh University of Engineering and Technology
    - Bangladesh Institute of Planners (BIP)
    - Bangladesh Institute of Development Studies
    - Center for Environmental and Geographic Information Services
    - Bangladesh Centre for Advanced Studies
    - Institute of Water Modelling
- NGOs, for both knowledge brokering, like International Union for Conservation of Nature (IUCN), and mobilizing (local) people's opinions, like Bangladesh Rural Advancement Committee (BRAC).
- International universities, knowledge institutes and NGOs who like to support Bangladesh in development initiatives with knowledge and experiences, like the partners of the Delta Alliance and CARE International.

4.10.4. Key Institutions (Ministries & Agencies)

The governance model of BDP 2100 includes Ministries, Departments and Agencies from national to local level along with their roles and responsibilities in managing and achieving a delta vision and a long term holistic delta plan effectively and efficiently.

Holistic delta planning as well as implementation brings together multiple agencies and groups to work in concert to achieve the set of jointly defined objectives belonging to the delta vision. Making these joint arrangements function effectively depends upon multi-actor linkages, coordination and action (Inception Report BDP 2014). These actors/organizations need to be involved in such a way as to be prepared to participate in the BDP2100 formulation. They also need to adopt and execute the implementation program in an integrated, targeted, inclusive, broadly supported and transparent way.

The following Ministries and their respective agencies are involved in steering the formulation of Delta Plan. These are as follows (**Table 4.6**):

Table 4.6: Ministries and their respective agencies involved in steering the formulation of BDP 2100

Ministries	**Agencies**
Ministry of Planning	-
Ministry of Water Resources	Water Resources Planning Organisation Bangladesh Water Development Board Department of Haor & Wetland Development
Ministry of Agriculture	Department of Agricultural Extension
Ministry of Local Government	Local Government Engineering Department Public Health Engineering Department
Ministry of Land	Department of Land Records & Surveys
Ministry of Environment & Forest	Department of Environment Forest Department
Ministry of Disaster Management & Relief	Department of Disaster Management
Ministry of Fisheries & Livestock	Department of Fisheries
Ministry of Finance	-
Ministry of Shipping	Bangladesh Inland Water Transport Authority

5. Bangladesh Delta Plan 2100: Governance and Institutional Framework Plan

5.1. Introduction

Deltas are amongst the best places to live and work though they face typical challenges. Due to rapid economic growth, especially in emerging economies, deltas typically wrestle with sustainable use of natural resources, control of environment pollution and complex planning issues. Due to geographical location, people's lives and economic assets in Deltas are under continuous threat of flooding due to cyclones, heavy rain or peak discharges in rivers. Siltation of river water in estuaries makes the river water less usable for irrigation. The fertile, but soft soils, being deposited by rivers, often have a limited bearing capacity and are vulnerable for settlement, subsidence and erosion processes. In addition, because of its low elevation, deltas are extremely vulnerable to climate change impacts of sea level rise and changes in river discharge. Because river basins typically cross borders, there is a high dependency on adequate trans-boundary agreements on water use and pollution. Bangladesh is the largest delta in the world, formed by the confluence of the Ganges, the Brahmaputra and the Meghna rivers. Compared to other deltas in the world, the challenges here are critical and excessive in nature.

Bangladesh is a rapidly developing economy, having achieved an average annual growth of nearly 6.0 percent over the last decade. The country is on its way to fulfilling its ambition of becoming a middle-income country. Due to its high population density, there is already high pressure on the available resources in this delta. Proper land and water management lies central to the country's development concern. Projects or interventions taken and priority investments

made in this field should fit within a long term vision and strategy with phased out short to medium-term implementation and investment plans. Short-term interventions taken without grounding in a long-term vision will make sub-optimal use of financial resources at best; at worst, they can have negative (lock-in) consequences for future decisions on water safety, spatial planning and the environment. This indicates that there is a need for a holistic approach to future land and water management in relation to water safety, food security and socio-economic development of the country.

The related governance and institutional framework should focus on addressing Bangladesh's future challenges following an adaptive delta management approach. It needs to be institutionally equipped and strengthened with respect to long term holistic strategy formulation, investment planning and funding, for steering coordinated action in implementation and for monitoring and evaluation of progress. To optimize and coordinate short-term sectoral interventions, secure the funding for upcoming projects and to prepare for future adaptation, it is necessary to develop a long term holistic BDP 2100 based on sound analysis, a 'delta vision' and relevant scenarios as well as strategies for realization of the vision including interventions and priority investments.

Effective preparation, funding, decision making and implementation of the Delta Plan can be ensured only through creating an enabling environment of good governance with adequate institutions and legal framework. To achieve this, a set of institutional arrangements (like a draft Delta Act, Delta Fund, Project Service Cell, Guidelines etc.) needs to be prepared and a road map for institutional development and capacity building will be chalked out. The Delta Framework (including a draft Delta Act) encompasses necessary and agreed reforms of the current institutional framework and the governmental organizations involved. These organizations need to be engaged to participate in the BDP2100 formulation process; they also will adopt and execute the implementation program in an integrated, targeted, inclusive and transparent way.

The Baseline Study is meant to explore and analyse the governance and institutional development situation regarding formulation, approval and long term holistic implementation of BDP 2100 and its legacy. The purpose of this baseline assessment is whether the existing planning system requires modification with respect to the formulation and approval of a long term holistic delta plan and its implementation process, which are highly integrated, require coordinated action, large investments as well as efficient use of resources use and effective execution for generating expected results.

Therefore, the BDP 2100 formulation and approval process and its implementation need to be embedded within an adequate governance structure and provided with integrated budget allocation mechanism as well as an effective and efficient sectoral institutional setting. It is the purpose of the proposed Delta Framework to address the governance challenges and improve the governance structure and mechanisms in order to bring the institutional framework and government agencies in a position to play an active and required role in the BDP 2100 process and its implementation. This integration will promote sustainable economic development in Bangladesh and will enhance the institutional capacity of the government and its agencies.

5.2. Conceptualization of BDP 2100

Bangladesh is located in the downstream of the largest delta in the world, lying at the confluence of three of the worlds' major rivers the Ganges, the Brahmaputra and the Meghna. Over the centuries, the natural delta has become highly modified, interfering with the natural water dynamics, and thus exacting several comprehensive resource oriented development plans and strategies by the Government of Bangladesh. In the past, Bangladesh has undertaken many sectoral plans and policy documents emphasizing on some of the contemporary issues and challenges, such as floods, droughts, salinity, disasters, storm surge, climate change, sea level rise, trans-boundary water issues etc. However, the temporal extent of such plans is confined within short to medium term (10 to 20 years), limiting the prospects to properly address long term effects of climate change or other uncertainties (population, land use changes etc.).

In this backdrop, Government of Bangladesh has initiated the formulation of Bangladesh Delta Plan 2100. It is an adaptive, holistic and long term strategic plan to steer the country's sustainable development pursuit to the next century. The objective is to build a safe, resilient and prosperous Bangladesh Delta by developing a robust water system.

Bangladesh Delta is the lifeline of the people and the drivers of most of the socio-economic development of the country. Considering this reality, Bangladesh Delta Plan 2100 articulates a long term (50 -100 years) integrated and holistic plan to improve water safety and availability of water, livelihood conditions and sound economic development in the Bangladesh delta, while taking climate change into account. Bangladesh Delta Plan will use scientific procedure and method and generate the facts on a long term which can be used by the national policy-planners and decision makers for taking appropriate actions and decision in formulation of national policy planning. Thus, Bangladesh delta plan would be one of the reference planning instruments that would establish the linkages with the national Perspective Plan (2010-2021), National Sustainable Development Strategy (NSDS), medium term national five year plan and its sectoral plans. Therefore, delta plan creates great opportunity of integrating 'policy' and 'science' establishing a fact findings process for a longer period (50-100 years) which is eventually a challenging task. At this point, the major benefit of this plan would be achieving planned and sustainable economic growth to become the middle income country in the short run and developed country in the long run. GOB has assigned the General Economics Division (GED) of the Planning Commission to take the lead of formulating BDP 2100.

According to the Inception Report, Delta Plan adopted the following concepts:

- a holistic, adaptive long term (50-100 years) plan to achieve sustainable development in Bangladesh;
- adequate governance, institutional arrangements and supportive policies for adaptive delta management, including dealing with climate change, further uncertainties and risk situation to protect the country from natural hazards (i.e. flood, drought, salinity, flash flood etc.) with 'no regret' measures;
- a means of dealing with transboundary issues and strengthening international cooperation with neighbouring countries as well as investment opportunities with the development partners;

Considering the adopted concept, it is revealed that the 'goal' of the Delta Plan, which is the essence of any plan and needs solution through a set of actions, is very long time horizon. Planners as human beings need intellectual capability to understand the reality of the long term future. Therefore, Delta Plan brings the new concepts in national planning and can be considered as paradigm shift in the national planning system of Bangladesh.

5.3. Importance of BDP 2100 in the national planning process

Delta Plan will play pivotal role in the existing planning system of Bangladesh. All development activities in Bangladesh are backed by the national plans as ADPs, National Five Year Plans, Strategic Plans / Master Plans, Vision 2021 – Perspective Plan etc. The consequences of rapid changes of society, technology, climatic parameters require understanding of the reality of an unknown future. The time horizon of this future is defined as 50-100 years, which requires a new theory of planning. BDP 2100 is based on the long term development vision of the Government and is as such related with the Sixth (FY2011-FY2015), and Seventh Five Year Plan (FY2016-FY2020), the Perspective Plan of Bangladesh 2010-2021 and other existing sectoral plans, policies and strategies of the Government. The relevant strategies recommended in these documents will be compiled and briefly assessed. The objective is to recommend strategies which contribute to disaster risk reduction, climate change resilience and adaptation, water safety, food security, environment safety and economic development of the country. Plan preparation and formulation as for BDP 2100, with its specific institutional and financial Delta Framework, are therefore, taking place within the framework of the national programming cycle.

5.4. Delta Issues and Challenges

The baseline studies carried in 19 thematic areas of the Delta Plan have underscored a number of pivotal issues and challenges of the delta. The geographic location, as a lower riparian and flat terrain of Bangladesh, is a major concern for resources management. Around 20percent of the country is inundated under average flooding situations and, in extreme events, the area inundated could be as high as 60percent. In the haor and wetland regions, flash floods are more common, which bring in huge damage to agricultural crops and effects the water-fed occupations of the country (irrigation, fishing etc.), hence shaping our socio-economic condition. The major rivers are highly dynamic and erosion prone. Every year, around 50~60 thousand river erosion victims migrate towards the cities, adjoin villages and chars and adapt to an altered way of living. Siltation is another prominent issue as major tributaries and channels have been de-linked from their sources leading to reduced conveyance and consequently creating drainage congestion issues.

Climate variability and the uncertainties in predicting long- term climate change impacts is a prominent problem for the Bangladesh delta. The salinity frontier of the country is moving upstream and at present, around 40percent area of coastal region is susceptible to dry season saltwater intrusion. Physical and chemical pollution to both the surface and groundwater sources is a major problem, which hampers the domestic use of water. In the urban areas, lowering of groundwater table due to large water abstraction is a prominent concern which impacts the long term water security and leads to soil subsidence. Furthermore, the existing wetlands and surface water sources are often subjected to large-scale and wholesale encroachments due to rapid anthropogenic expansion.

Like many deltas of the world, the Bangladesh Delta is not without challenges, many of which are closely related to its intense pressure on the scarce land and water resources. Building a climate resilient society is perhaps the biggest challenge of the country. Maintaining the coastal polders and sustaining food security is a major challenge in the coastal areas. Bangladesh needs to strengthen its capacity for long term climate forecasting and scenario development, and hence implement flexible strategies for ensuring sustainable development. Management of saltwater intrusion, flood risk mitigation, climate proofing infrastructure, dry season flow augmentation, river erosion protection and river navigability restoration, removal of drainage congestion and water logging, restoring surface and groundwater quality in the sensitive hotspots are some of the salient challenges of Bangladesh.

The urban areas need integrated water treatment and efficient water supply facilities. Spatial planning implications for sources allocation and equitable utilization of resources are another endeavour for water sector development. The implementation of the Integrated Water Resources Management (IWRM) concept in the development projects is a major challenge. Resolving social conflicts and disputes regarding community level water management and use is of high significance in the rural areas.

5.5. Delta Hotspots

The Delta Plan identified following six (6) Hotspot areas which are 'problems and issues' oriented with similar development potential:

Hotspot 1: Coastal Zone -in its natural state, is often subject to inundation by high tides, salinity intrusion, cyclonic storms and associated tidal surges; the area experiences domestic water shortage and sanitation problems;

Hotspot 2: Drought Prone Areas -the area experiences frequent droughts and water scarcity, which immensely hamper dry season irrigation initiatives and domestic water use;

Hotspot 3: Major Rivers and Adjoining Areas -an extensive web of rivers, numbering around 405 rivers and their tributaries, act as a major domain to shape up the country's abundant natural resources. Along with these major rivers and their adjoining areas i.e., the distributaries and char lands are included in this hotspot;

Hotspot 4: Haor and Wetlands -This region dries up in the dry season except for some beels and low pockets, and remains completely inundated during the monsoon. This haor region experiences flash floods and shortage of water also for domestic purposes during the pre-monsoon, floods during the monsoon and drainage congestion during pre- and post-monsoon;

Hotspot 5: Urban Areas -The urban areas frequently experience floods, drainage congestion, water logging, water shortage, dropping of groundwater levels, environmental degradation as well as high incidences of water, air, soil, noise and thermal pollution;

Hotspot 6: Chittagong Hill Tracts -the region experiences cyclonic rainfall, flash flood and landslides during the monsoon and water shortage during the dry season, both for domestic and agriculture purposes.

Besides the identified hotspot areas, the Delta Plan focuses on governance and institutional issues and challenges, related to the national planning process, legal and other institutional arrangements, and performance of implementing agencies and capacity building as well as funding and financial mechanisms.

5.6. Delta Vision

The Vision 2021 of Bangladesh calls for the social and economic environment to be transformed from a low income economy to the first stages of a middle-income nation by the year 2021, Bangladesh is aiming to consolidate its growth to become a developed country by 2041. In order to achieve the national vision and given the socio-economic diversification of Bangladesh and the expected impacts of climate change, an integrated, comprehensive and long term delta vision has been formulated as:

"Ensure long term water and food security, economic growth and environmental sustainability while effectively coping with natural disasters, climate change and other delta issues through robust, adaptive and integrated strategies, and equitable water governance."

The Delta Vision builds on key strategic documents such as Vision 2021, Perspective Plan 2011-2021, National Sustainable Development Strategy and National Social Security Strategy (NSSS) and many other strategic and sectoral plans. This is being developed while Vision 2041 is still being formulated. Within the framework of the national vision, the Delta Vision is essential by indicating opportunities and choices to make regarding its human, land and water resources.

5.7. Delta Goals

Water is central to sustain life and livelihood of the people of Bangladesh. Therefore, to support the sustainable development of the water resources as outlined in the Delta Vision, and to tackle the key issues outlined before, the Delta Plan aims to achieve *six core goals* within the timeframe of the Plan. The goals have been identified based on three distinctive areas namely, water security, food security and economic development. This will be realized, only if an adequate funding and efficient governance in place are ensured throughout the planned period. In each Five Year Plan, there should be a block provision for the implementation of BDP programs. Such block provision will ensure that the BDP programs are given priority beyond the sectoral allocation.

Goal 1: Ensure safety from floods and climate change related disasters

The first goal focuses on managing the risks of floods in the wet season and other climate change related disasters in the Delta including the coastal regions at a well-defined and acceptable level. This level is set to facilitate i) a safe living environment for all, in urban and rural environments; ii) reliable water system conditions for long term economic development; and iii) the performance of key societal and economic functions. The risks of floods and climate change induced disasters are managed according to knowledge base and spatially differentiated safety levels and include the combined approach of climate proofing, early warning and prediction, prevention, evacuation and disaster relief. The goal considers ensuring safety of lives and livelihood against flood, flash flood, drought, salinity intrusion, river bank erosion, cyclones, storm surge etc. through introducing improved adaptation and mitigation options.

Goal 2: Enhance water security and efficiency of water usages

This goal relates to water resources management especially during the dry season as well as water shortage during dry spells. Maintaining a balance between the economic developments, expanding population and the need to secure water for multifaceted uses is the core of the second goal of the Delta plan. The goal aims to ensure reliable and adequate provision of freshwater to support equitable and sustainable economic development, environmental sustainability and

livelihood security. This includes: i) sufficient and timely provision of safe surface and groundwater for drinking, agriculture, fisheries, environment, navigation, industry etc.; and ii) controlling pollution, ensuring water quality and providing sanitation at acceptable levels in relation to defined standards as well as environmental, health, agricultural and industrial needs.

Goal 3: Ensure sustainable and integrated river systems and estuaries management

This goal considers sustainable management of river systems and estuaries, considered as one of the cornerstones of the Bangladesh Delta. The river systems of the country offer key development ingredients for the economy, society and the environment. Sustainable river and estuaries management as a whole, contributes to i) long term solutions for navigation; ii) sufficient sediment supply to floodplains; iii) land reclamation in support of community development and economic growth; and iv) an inter-connected major and minor river system for environmental and economic development. This goal seeks to foster sustainable river system management by coping with its morphological dynamics and results in cost-effective, environment friendly and socially viable options for reclamation and developments of lands.

Goal 4: Conserve and preserve wetlands and ecosystems and promote their wise use

The goal realizes the term 'conservation' as a more generic target to achieve to safeguard and maintain the wetlands, whereas 'preservation' as a more converging approach, to protect some sensitive ecosystem areas. Some of the components to be safeguarded under the goal are mangrove forest, water and riverine ecosystem, coastal greenbelt, seasonal and perennial wetlands, tidal freshwater frontier etc. Conservation and preservation of wetlands is also emphasized by the Government of Bangladesh, in its recent national level policy documents.

Goal 5: Develop effective institutions and equitable governance for in-country and trans-boundary water resources management

The goal aims to improve the existing water governance for tackling both the endo- and exogenous challenges of water resources management. At the same time, the community level functioning of local institutions would also be rejuvenated. Key elements include: i) ensuring adequate financing for investment, operation and maintenance; ii) capacity building and institutional strengthening; iii) stakeholder and private sector participation at all levels; iv) minimizing the gaps between planning and implementation; v) supporting integrated water resource management at regional and local levels, taking into account the interests of all prominent water users; vi) Knowledge development for integrated decision-making though modelling, data and information sharing and management; and vii) Trans-boundary water negotiation.

Goal 6: Achieve optimal and integrated use of land and water resources

The primary quest of the goal is to ensure efficient integration and proper interaction between land and water use aspects. The goal would mainstream the inter-connected resources functions (drainage, navigation etc.) as well. The key topics covered by the goal are land use, water use, multi-modal transportation infrastructures, navigation network, port connectivity and utilities etc. Establishment of connectivity of water courses, and inducing integration between different modes of resources interactions are highly encouraged under this goal.

5.8. Delta Scenarios and Strategies

BDP 2100 scenarios consist of storylines describing different future developments of major uncertain drivers. The scenarios focus on water related impacts as a result of large changes and developments with regards to the socio-economic and natural system. The formulation of the Bangladesh Delta Plan requires the development of a number of vision oriented strategies. Typically, strategies can consist of no-regret interventions and investments, which can be taken on the short term and perform well in every scenario, and measures or interventions which should be deployed if a certain scenario develops.

In order to achieve the formulated goals under different scenarios, strategies need to have flexibility in their measures and needed actions. Keeping the delta vision in consideration and reviewing the delta goals and targets for the first phase (up to 2021), a set of suitable strategies has been established for each hotspot. The concept of Tipping Points (TP) is of much significance in strategy formulation under the Bangladesh Delta Plan. TPs indicate the threshold of a certain strategy, where alteration of strategies or measures would be required. At such a point in time a modified strategy would be needed to meet the identified goals and targets of the Delta Vision.

In order to translate the formulated strategies into investment and implementation level, a comprehensive project portfolio is necessary. The process has to be carried out by investigating foreseeable benefits of each development initiative. The implementation plan will be supported by different national and regional delta ateliers (consultation workshops, seminars etc.).

5.9. Link of BDP 2100 with National development Plans and Water related Plans

BDP 2100, being a holistic and comprehensive plan, has linkages with existing short and medium term plans as well as country's commitment at international forums, as shown in Figure 2.7.

A good number of ministries/divisions of GOB have relevance with vision, mission and objectives of BDP 2100. **Table 5.1** shows the linkages of these ministries/divisions with vision, mission and objectives of BDP 2100.

Table 5.1: Linkages of Ministries/Division to Delta Vision, Mission and Objectives

Institutions	**Delta Vision**	**Overall Objectives**	**Specific Goals**					
			1	**2**	**3**	**4**	**5**	**6**
Ministries								
Ministry of Planning/Planning Commission	•	•	•		•	•	•	•
Ministry of Water Resources	•	•	•	•	•	•		•
Ministry of Environment & Forests	•	•	•	•	•	•		
Ministry of Fisheries & Livestock	•	•	•	•	•	•	•	•
Ministry of Agriculture	•	•	•	•	•	•	•	•
Ministry of Land	•	•	•		•	•	•	•
Ministry of Energy & Mineral Resources	•	•	•				•	
Ministry of Women & Children Affairs	•	•	•				•	
Ministry of Disaster Management & Relief	•	•	•	•	•	•		•
Ministry of Industries	•	•	•	•			•	
Ministry of Shipping	•	•	•			•	•	•
Ministry of LGRD & Co- operatives	•	•	•	•	•	•		•

6. Delta Planning & Implementation Framework in the Netherlands and Elsewhere

6.1. Delta Plans in the Netherlands and Elsewhere

Delta plans have been or are being prepared and implemented for many small and large deltas of the world. Brief descriptions of five of these deltas are presented here:

Dutch Delta Plans 1953, 2008, 2012

The Dutch developed their first Delta Plan after the 1953 flood disaster in the south western Rhine-Meuse-Scheldt delta of the Netherlands. The Dutch Delta plan was firmly responsive to a wide range of concrete measures for coastal protection, water availability and water quality in view of the future economic development of the country and have provisions for 'no regret measure'. When it became clear that climate change is forcing itself upon the Netherlands: a reality that cannot be ignored in light of the country's vulnerability to flooding, the Dutch Government appointed a 'new' Delta Committee with the mandate to formulate a vision on the long-term protection of the Dutch delta. The Dutch Delta Plan 2008 was thus developed. Consequently, the Delta Plan 2012 is a national program in which the central government, provincial and municipal governments and water boards work together, also involving social organizations, knowledge institutes and the business community. The objective is to protect the Netherlands against flooding and to secure a sufficient supply of freshwater for generations ahead. The Delta Plan 2012 is supported by 5Ds: Delta Act, Delta Fund, Delta Decision, Delta Program and Delta Commissioner. Delta Program works aims for achieving a safe and attractive Netherlands, now and tomorrow, where flood risk management and freshwater supplies are organized effectively. That is a key condition for the Netherlands' continued existence and a strong economy.

Mekong Delta Plan, Vietnam 1993, 2013

The Dutch have assisted Vietnam in making the Mekong Delta Master Plan in 1993, which has been a successful instrument in a period of economic progress in the Mekong Delta. In contrast, the Mekong Delta Plan 2013 is a strategic advice concerning the integrated long-term development of the Mekong Delta. The promise for the Mekong Delta Plan is to contribute to realizing and maintaining a prosperous delta, both economically and socially, in which its population can thrive in a vigorous and dynamic economy that is founded on sustainable use of its natural resources, and well adapted to changes in water resources and climate. It spells out what uncertainties and challenges confront the delta from now to 2050, and from 2050 towards 2100, and presents a clear long-term vision towards agro-business Industrialization as a promising future strategy. Taking into account the existing government policies and the institutional framework, it is recognized that the orientation for the agricultural sector in the delta needs to shift from a focus on production towards a focus on added value by improving the product-value chain, involving public-private partnerships and introducing market-based mechanisms. The Mekong Delta Plan includes 'no-regret' and priority measures, as well as measures that can be deferred towards the longer-term that Vietnam could adopt to ensure a safe, prosperous and both economically and environmentally sustainable and climate proof future for the delta region.

- The Niger Delta Action Plan 2004, 2012

The Niger Delta is one of the world's 10 most important wetland and coastal marine ecosystems with a population of 31 million. The quality of the environment is important to the population, not just in terms of health and amenity but also because a high proportion of the population have livelihoods which are dependent upon the environment – principally through agriculture and fisheries. The intensive exploitation of oil and gas in the Niger Delta has degraded the environment. The Delta is now classified as a highly polluted environment (caused by canalization, oil spills, gas leaks, gas flares, and subsidence). The Federal Government of Nigeria (FGN) has taken significant steps to resolve the drivers of conflict and violence in the Niger Delta region. It opened dialogue with leaders of key militant factions and ethnic groups. FGN established the Ministry of Niger Delta Affairs (MNDA) in September 2008 to support its stabilization

and peace building strategy. The MNDA's role is to formulate, coordinate and execute the Federal Government's development initiatives and programs in the region.

The Niger Delta Action Plan is based on the vision, principles and guidelines outlined in the proposed Niger Delta Collaborative Development Framework. The process to formulate the Collaborative Development Framework, and subsequently this Action Plan, took account of a range of policy documents as follows:

- The Niger Delta Master Plan (2004), which sets out a broad range of extensive development needs of the Niger Delta, albeit with a somewhat limited strategy for implementation.
- The Niger Delta Technical Committee Report (November 2008), which made a series of recommendations to address both the security and development needs of the Niger Delta, again without detailed implementation arrangements and follow-up.
- Nigeria Vision 20:2020 (2010), representing a comprehensive, national, long-term planning perspective.
- Transformation Agenda 2011-15, providing a medium-term policy and strategic framework providing impetus for the FGN's programs of action.
- The proposed Niger Delta Collaborative Development Framework – A Conceptual Working Paper (May 2010), which outlined the strategic objectives and intent of the MNDA for development in the Niger Delta.

The Action Plan for the Niger Delta can be implemented within the short (one year), medium (two to three years) and longer term (five years and beyond). The Action Plan comprises of a new Multi-Donor Trust Fund, which will make high impact catalytic investments within this framework, focusing particularly on market development approaches. The Results Framework describes indicative investment allocations of $10 billion, with the MDTF seeking to raise an additional $200 million to finance its first tranche of investments.

The Okavango River Delta Management Plan (ODMP), Botswana 2008

The ODMP is a ground breaking effort on the part of the Government of Botswana to integrate government planning for all the natural resources of the Okavango Delta region. Three countries share the Okavango River Basin. It begins in the highlands of Angola, and flows 1,200 km downstream through the narrow Caprivi Strip of Namibia and empties in Botswana where it forms an alluvial fan known as the Okavango Delta. The Okavango Delta forms the core of one of the largest declared Ramsar sites or Wetlands of International Importance (the Okavango Delta Ramsar Site has an area of about 55,324 km2). Botswana has a strong interest in protecting the socio-economic status of the Delta's communities and the economy of Botswana at large. To this effect the Government of Botswana developed the Okavango Delta Management Plan (ODMP). Across the sectors, the ODMP strives for sustainable use of the Okavango Delta's natural resources in the context of the guiding principles of Botswana's National Vision 2016.The ODMP was used as a basis for the preparation of the Botswana National Action Plan within the auspices of the Permanent Okavango River Basin Water Commission (OKACOM). Furthermore, the ODMP will be enhanced by other initiatives such as the Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA).

The Delta (Sacramento-San Joaquin River, California) Plan 2013

The Sacramento-San Joaquin River Delta is the grand confluence of California's waters, the place where the state's largest rivers merge in a web of channels—and in a maze of controversy. Since the middle 1980s, California has been looking for ways to secure the natural and human values of the Delta while maintaining its place in the state's water plumbing. These efforts have generally started in hope and ended in impasse. In 2009 the Legislature made its latest, most determined bid to find solutions, passing the Delta Reform Act and associated bills. First and foremost, it declared that State policy toward the Delta must henceforth serve two "coequal goals": Providing a more reliable water supply for California, and Protecting, restoring, and enhancing the Delta ecosystem.

In 2009, seeking an end to decades of conflict over water, the Legislature established the Delta Stewardship Council with a mandate to resolve long-standing issues. The Delta Plan contains 87 provisions, some broad and some narrowly technical, some novel, some are common. The Plan is to be revised every 5 years, or sooner as circumstances change.

6.2. Institutional framework

Institutional frameworks of all the described delta plans are presented in **Table 6.1**.

Table 6.1: Institutional Framework in Different Deltas

Deltas	Act	Plan	Institution	Fund	Program
Dutch	X	X	X	X	X
Mekong (Vietnam)		X	X		X
Niger Delta		X	X	X	X
Okavango River (Botswana)		X	X		X
California (USA)	X	X	X		

This shows the institutional framework of the Dutch delta is not a unique framework but similar frameworks exist in other delta plans of the world. Bangladesh Delta Plan requires proposing similar framework of act, plan, fund, institution and program.

6.2.1. Dutch Delta Framework (5 Ds)

The Dutch Delta Framework is based on five pillars: Delta Act, Delta Fund, Delta Decisions, Delta Program and Delta Commissioner which are simply called the 5 Ds.

- Delta Act: constitutes the statutory basis for a Delta Plan and Program;
- Delta Fund: to finance the future delta interventions and investments;
- Delta Decisions: approval and endorsement of proposed delta vision, strategy and investments;
- Delta Program: sets out approach and decision making (prepared by the Delta Commissioner);
- Delta Commissioner: the government commissioner (or committee) for the Delta Program.

The Delta Act 2012 on Flood Safety and Freshwater Supply provides a sound legal basis for new long-term flood safety policy. The act stipulates that a Delta Programme must be drawn up annually and presented to the parliament every year, together with the budget of the ministry responsible. The Delta Programme comprises plans and provisions to guarantee flood safety and a sufficient supply of freshwater, including the relevant planning and a (rough) cost estimate. In addition, the Delta Act also provides for a Delta Fund and the role of the Delta Commissioner.

The Delta Fund is a separate fund for financing the Delta Programme. In this fund, money is set aside for the government investments required to implement measures such as the construction, improvement, management or maintenance of dikes or sand deposits along the coast, and also to conduct research. Up until 2020, all the money earmarked for water safety and freshwater supply is transferred to the Delta Fund. The additional policy agreement laid down by the previous Cabinet stipulates that with effect from 2020, the Delta Fund will be fed with a minimum of €1.0 billion a year in order to ensure momentum in the implementation of the Delta Programme. The Minister of Infrastructure and the Environment bears final responsibility for the expenditures under this fund.

Delta Decisions are the major choices for tackling issues involving water safety and the freshwater supply in the Netherlands. The Delta Decisions provide guidelines for the measures the Netherlands will take in this regard, in both the short and long term. At the heart of the delta decisions is a new approach to indicate how to build in a water-robust way to prevent new problems arising regarding water safety and the freshwater supply; guidance for the concrete approach in the Rhine-Meuse delta and the Ijsselmeer region and a Sand Adaptation Agenda. Examples of Delta Decisions are:

- *Delta Decision on Water Safety* focusing on new water-safety standards.
- Delta Decision on Freshwater Strategy proposes that supply levels be set.
- *Delta Decision on Spatial Adaptation* includes an assessment framework to properly assess the consequences spatial development investments entail in terms of flood risk.
- *Delta Decision on the IJsselmeer Region* involves three strategic choices: discharge into the Wadden Sea, the water levels of the IJsselmeer, Markermeer and the Randmeren (border lakes in the Veluwe region), and the freshwater supply. According to the draft decision, the IJsselmeer can remain at its current winter level up until 2050.
- *Delta Decision on the Rhine-Meuse Delta* involves four elements: the application of new flood defences, the distribution of the discharge from the Rhine across the branches of the Rhine (the Waal, Lower Rhine and IJssel), water storage in the Grevelingen, and the freshwater supply.

The Delta Programme is a programme in which the Dutch government, provinces, municipalities and water authorities work together in collaboration with civil society organisations, the business community and knowledge institutions under the direction of the Delta Commissioner. Every year the Delta Programme for the year ahead is presented to the House of Representatives. Delta decisions lie at the heart of the Delta Programme. The Delta Programme concerns the present and the future. It consists on the one hand of programmes that are already being implemented to raise the standard of safety to the appropriate level. On the other hand, the Delta Programme consists of nine sub-programmes that are aimed at safety and the supply of freshwater in the longer term (until 2100).

A Delta Commissioner is a government appointed position for the Delta Programme and was first appointed in 2010. He steers the Delta Programme in terms of cohesion (integration) and progress. He aims to create and maintain a support base for the measures and the Programme that benefits the delta as a whole among all the administrative tiers involved. His focus is not just on the government but on all the parties involved including civil society. The Delta Commissioner monitors progress and implementation of the Delta Programme and advises Government in view of the state budget. A Delta Commissioner may advise ministers and, if need be, urge them to intervene. The Delta Commissioner is positioned in the administrative field and falls under the political responsibility of the coordinating minister, the Minister of Infrastructure and the Environment. The Commissioner has an office with 14 staff.

6.2.2. Principles Related to the Adaptive Delta Management

Adaptive management can be defined as a structured, iterative process of robust decision making in the face of uncertainty, with an aim to reduce uncertainty over time via system monitoring. Applying adaptive management to deltas is relatively new. One of the first explicit uses of it is by the Dutch Delta (Marchand & Fulco 2014). The Dutch Delta Program formulates ADM as a phased type of decision-making that explicitly and in a transparent manner takes uncertain long-term developments into account. Adaptive delta management encourages an integrated and flexible

approach to increase resilience, reduce vulnerability and limit the risk of over- or underinvestment. One can thus formulate adaptive delta management as a form of uncertainty management. The Dutch Delta Program identified four key points of adaptive delta management:

- linking short-term decisions with long-term challenges around flood risk management and fresh water availability;
- incorporating flexibility in possible solution strategies (where effective);
- working with multiple strategies that can be applied alternatively depending on the developments (i.e. adaptation paths);
- Linking investment agendas from different policy fields.

Thus, implementing BDP 2100 would require establishing such institutional framework which would be capable of handling Adaptive Delta Management strategies and techniques in sound and scientific manner.

6.3. Relevance and Possibilities in Bangladesh Delta Governance and Institutional Setting: Delta Framework

The purpose of a Delta Framework is to address the governance challenges and improve the governance structure in order to bring the institutional framework and government agencies in a position to play an active and required role in the BDP2100 process and its implementation. The Delta Framework (including a draft Delta Act) encompasses necessary and agreed reforms of the current institutional framework and the governmental organizations involved. These organizations need to be involved in such a way as to be prepared to participate in the BDP2100 formulation; they also need to adopt and execute the implementation program in an integrated, targeted, inclusive, broadly supported and transparent way.

The Delta Framework will be placed in the Bangladesh governance context as related to the institutional analysis and modified in interaction with the relevant 'policy arena' and government officials if the basic principles of government demand this. The Bangladesh country programming framework is relevant here, as indicated in Chapter 2. BDP 2100 and the program for short term implementation have to be incorporated in this programming framework.

Holistic delta planning as well as implementation brings together multiple agencies and groups to work in concert to achieve the set of jointly defined objectives belonging to the delta vision. Making these joint arrangements function effectively depends upon multi-actor linkages, coordination, collaboration, cooperation (3Cs) and action. Against the background of the earlier mentioned 5 D's as five pillars, the Delta Framework has the following characteristics in relation with policy development and coordinated action. It is the central mechanism for multi-level governance and coordination (regional as well as local) and cooperation between government agencies. It guarantees, in principle, that the achievement of goals and the realization of measures are orchestrated from a central point of view and that mandates, decision making and allocation of funds are aligned with that. Another characteristic is that the delta decision making on policy measures and investments takes place on the basis of Societal Cost-Benefit Analysis which indicates the impacts and efficiency of investments in a coherent manner. This approach gives insights into the pros and cons of measures and investments. These principles are to be adapted to the Bangladeshi situation and proposals for institutional development.

The Delta Framework will furthermore be related to the approach of Adaptive Delta Management as a way to deal with new circumstances or uncertainties about future developments in the decision making process. The Dutch Delta Program focuses on 2050 with a vision or perspective for 2100. The approach combines strategies with flexibility (making use of initial interventions, 'tipping points' and 'adaptation path ways') in measures to be implemented. The shared values to this are: solidarity, flexibility and sustainability, which form the behavioural basis for all actors involved to manage the required cooperation, choices and realization.

7. Road Map for BDP 2100 Governance, Institutional Development and Change

7.1. Expected Governance Challenges

Due to its nationwide nature, the institutional developments and changes as to be addressed by the BDP 2100 are of significant importance. Therefore, broad acceptance and support for BDP 2100 are needed including strong political commitment at national level and an active involvement of national and local stakeholders. It also demands from individual organizations, institutions, networks and broader social systems to improve their capabilities to carry out the necessary tasks, to manage the institutional development process over time. Historically, plan development in Bangladesh follows top-down and sector oriented approach. However, a number of plans have been formulated using participatory bottom-up approach and multi-sectoral consultations. The linkage of strategic planning with the budgeting and resource allocation system is not strong enough here. Furthermore, the monitoring, evaluation, learning processes e.g. managing for results, enhancing effectiveness and efficiency need improvement.

Based on experiences and first analysis, the following challenges, in addition to challenges described in chapter 3 are considered as vital for the governance of BDP 2100.

- Balancing the predominantly sectoral approach with a long term holistic governance approach of planning and implementation (e.g. delta vision, scenarios, policy pathways, delta framework);
- Transforming highly centralized top down approach into targeted spatial/regional approach with decentralized institutional framework integrated with the centre.
- Long term strategic planning includes projections and a long term vision which need to be back casted into medium and short term vision, strategy and planning; Bangladesh has never produced or formulated a plan with more than 10 years' time frame;
- Existing governance practices need to be strengthened to deal with a longer-term holistic planning and implementation effectively;
- Development of existing institutional abilities and capacities to deal with BDP 2100 in an effective coordination of decision making in relation to investments and budget allocation in an integrated manner;
- Localization with decentralized resource allocation including ADP allocation to the district level budget allocation;
- Incorporation of many development partners and International Financing Institutes (IFIs) in the BDP 2100 process, planning and investment program;
- Involving private sectors in approaches of water issues, with attention for improving resource capacity and skills;
- Increasing regional cooperation e.g. with attention for strengthening water diplomacy;
- Effective and efficient implementation, setting priorities, managing for results; and
- Biggest challenge will be adopting science based policy making in this regard.

7.2. Outline of Bangladesh Delta Framework

The Bangladesh Delta Framework will be based on a number of core elements, which are described below. This framework is needed to be finalized after extensive consultations at various national, sub-national and local levels.

a) Delta Act: constitutes the statutory basis for a Delta Plan, fund, institution and Program;
b) Delta Fund: to finance the future delta interventions and investments;
c) Delta Plan: approval and endorsement of proposed delta vision, strategy, institutional framework, and investments;
d) Delta Program: sets out annual and 5-year investment proposal linking with the national 5-Year Plans & annual budgets (ADP);
e) Delta Institution/Secretariat: the Delta Commissioner along with a secretariat for the Delta Program.

This framework is more or less adopted in delta plans of different countries including the Netherlands, USA.

Bangladesh Delta Act will provide a sound legal basis for a very long term BDP 2100 including establishment of the Delta Fund, establishment of delta institutions/secretariat, the Plan itself and indicative investment priorities and approaches through identified hot spots & priority sectors. *Climate Change Trust Act 2010 and Disaster Management Act 2012* are examples of similar Acts in Bangladesh. The Planning Commission /Ministry of Planning, as the lead Ministry developing the BDP 2100, require initiating drafting of the Act.

Bangladesh Delta Fund will be a separate dedicated fund for the finances involved in implementing the Delta Programme. Both GoB and development partners can commit and allocate annual block funding and they have done so previously. The GoB has established the Climate Change Trust Fund from its own resources. BCCTF is a block budgetary allocation in the form of an endowment by the Government. In addition, Development partners and the World Bank, in coordination with the Government has established the Bangladesh Climate Change Resilience Fund (BCCRF) to channel in over US$188.00 million grant funds to millions of Bangladeshis to build their resilience to the effects of climate change. The HYSAWA Fund is designed as a multi-donor funding mechanism for large-scale delivery of sanitation and water supply facilities with known technological options. The Fund was established in 2007 and have until now been supported by Bangladesh, Australia and Denmark.

Bangladesh Delta Plan 2100 will be a holistic and integrated plan for the development of deltaic Bangladesh. There is already a high pressure on the available land and water resources in the delta. These problems are likely to become worse due to urbanization and population growth, environmental degradation, sea level rise, land subsidence and more frequent drought and floods due to climate change. Programs or interventions taken and priority investments made should fit within a long term Vision and Strategy with short as well as medium and long term investment plans. The Delta Plan will secure approval and endorsement of proposed delta vision, strategy, institutional framework and investments.

The Delta Programme will be a list of concrete programs/projects identified as 5-year and annual investment program. This will be linked to the national 5-Year Plans and annual budget. These identified programs/projects will align with the long term Delta Vision and will contribute to address long term issues like the climate change. These projects/programs will have linkages to the Delta plan 2100 and to be supported through normal national budget and/or through the Delta Fund.

Delta Institute/ Secretariat will be *a* government set up specifically for the Bangladesh Delta Plan. This could be an independent office, attached to the Planning Commission, Ministry of Planning, if approved by the Government. This set up could be named as the 'Delta Commission/Authority'. This office will steer the Delta Programme in terms of cohesion (integration) and progress. The office will aim to create and maintain a support base for the measures and the Programme that benefits the delta as a whole among all the administrative tiers involved. The focus will not be just on the government but on all the parties involved including civil society. The office will monitor progress and implementation of the Delta Programme and advise Government in all matters related to the Delta development. This office will also serve as the secretariat to the inter-ministerial committees. The office will have a small staff set up.

7.3. Strategy for realization of Delta Framework and Institutional Arrangements

7.3.1. Strategic Approach

In any plan formulation in Bangladesh, the normal (business as usual) approach is followed which has two or more steps: Step 1) plan formulation & finalization, Step 2) establishing institutions & instruments and step 3) fund allocation/mobilization and implementation (**Figure 7.1**).In many cases, efforts ended up after step 1. Many comprehensive plans, for example, Flood Action Plan, National Water Management Plan and Integrated Coastal Zone Management Plan, have not been implemented, as such.

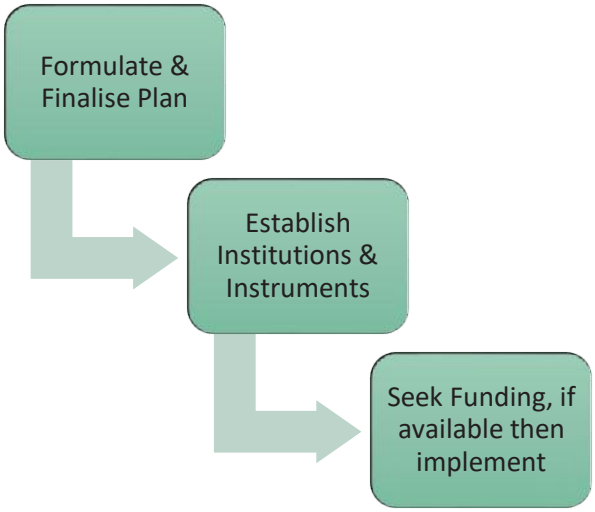


Figure 7.1: Steps of Plan Implementation under Business as Usual Approach

As already mentioned in the Inception Report, a 'Business As Usual' approach is not an option for BDP 2100 formulation. A more challenging, modern and 'Business Not So Usual' approach is being followed in developing and implementing the BDP 2100. Following the 'Business Not So Usual' approach, while the formulation of the Delta Plan 2100 is still on-going, efforts are also on-going to establish the required institutional arrangements for implementation (Delta Commission/Authority) and to establish the Delta Fund, possibly under the legal cover such as the Delta Act (**Figure 7.2**).

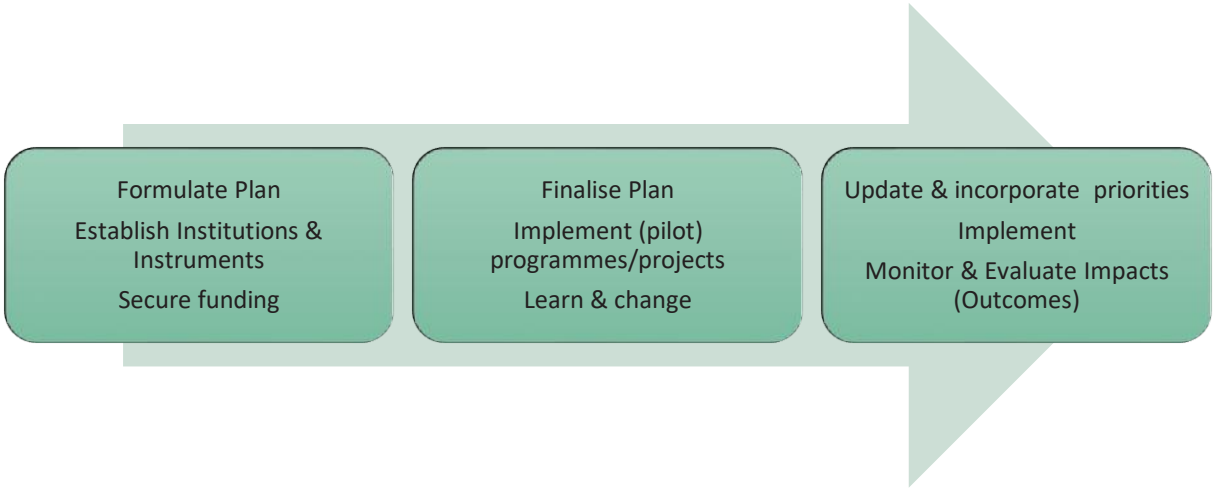


Figure 7.2: Steps of Plan Implementation under Business Not so Usual Approach

This approach is not usual but not new in Bangladesh. This approach has been followed in addressing disaster management and also climate change. This 'Business Not Usual' approach has already helped to master support from development partners. A MoU (Memorandum of Understanding) has been signed on 16 June 2015 among the Governments of Bangladesh and Netherlands, the International Development Agency (IDA) and the International Finance Corporation (IFC) regarding joint cooperation and collaboration for formulation and implementation of the Bangladesh Delta Plan 2100.

7.4. Examples of Institutional Arrangements

Based on the criteria above and to help to conceptualize, existing institutional set up of delta programs in a number of countries were reviewed and found these entities are in the form of either a Ministry, or a Commission or a Council which is presented below (**Table 7.1**):

Table 7.1: Set up of delta programs in a number of countries

Delta Program	Established Institutional set up
Dutch Delta Plan	Delta Commission
The Niger Delta Action Plan	The Ministry of Niger Delta Affairs
The Okavango River Delta Management Plan, Botswana	Okavango River Basin Water Commission
The Delta (Sacramento-San Joaquin River California) Plan	Delta Stewardship Council

Of these, the Dutch Delta Commission is worth for further investigation as an example.

A Delta Commissioner is a government appointed position for the Delta Programme and was first appointed in 2010. He steers the Delta Programme in terms of cohesion (integration) and progress. He aims to create and maintain a support base for the measures and the Programme that benefits the delta as a whole among all the administrative tiers involved. His focus is not just on the government but on all the parties involved including civil society. The Delta Commissioner monitors progress and implementation of the Delta Programme and advises Government in view of the state budget. A Delta Commissioner may advise ministers and, if need be, urge them to intervene. The Delta Commissioner is positioned in the administrative field and falls under the political responsibility of the co-coordinating minister, the Minister of Infrastructure and the Environment. The Commissioner has an office with 14 staff. Institutional set ups of some the relevant institutions in Bangladesh at national level established under legal coverage have been reviewed; key features of them are noted below:

a) Bangladesh River Protection Commission

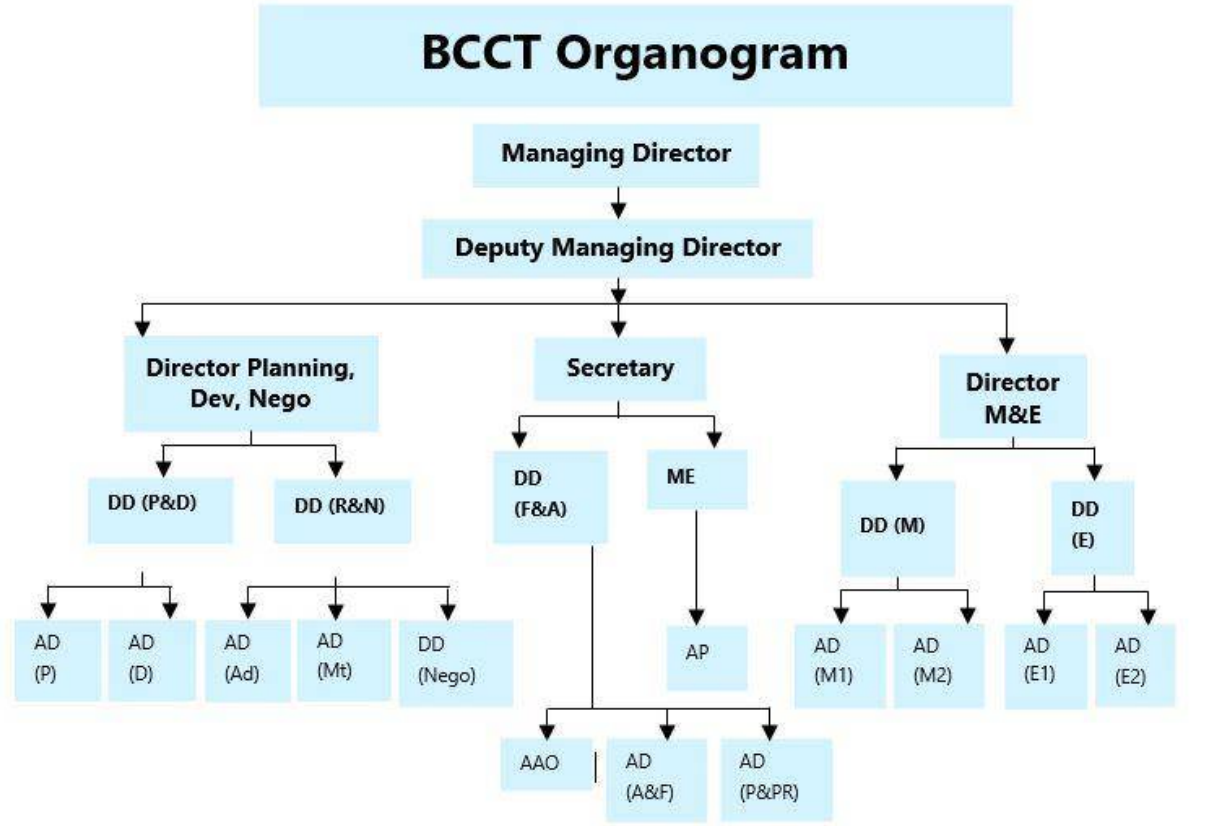
Bangladesh River Protection Commission, being established under National River Protection Commission Act 2013, started its operation in September 2014.It has two full time members -- the Chairman and a permanent member and three part-time honorary members, a hydrologist, an environmental expert and a lawyer. The Commission submits its annual report to the President every year. The Commission is a recommending body and lacks the power to implement any of its decision.

b) Bangladesh Climate Change Trust (BCCT)

Government of Bangladesh has set up the Bangladesh Climate Change Trust (BCCT) under the *Climate Change Trust Act 2010* to manage the Climate Change Trust Fund. Among others, BCCT provides administrative and organisational support to the Trustee Board and the Technical Committee formed under Climate Change Trust Act, 2010. It receives and scrutinizes project proposals submitted by different ministries/divisions of the government, and places them to the Technical Committee for screening. The Technical Committee verifies the viability of the projects and recommends to the Trustee Board for its approval/disapproval or any revision, if required. BCCT implements the decisions of the Trustee Board. It is entrusted with the overall management of Climate Change Trust Fund (CCTF) including the release of funds for the projects approved by the Trustee Board. It coordinates with the Climate Change Focal Points of different ministries/divisions, communicates with concerned stakeholders including civil society, NGO, private sector and international agencies. It also monitors and evaluates the projects approved under CCTF.

BCCT is headed by a Managing Director holding the rank of Additional Secretary to the Government of Bangladesh who acts as Chief Executive Officer of BCCT. Among other posts, one Deputy Managing Director holding the rank of

Joint Secretary to the Government is followed by one Secretary and two Directors. There are 82 sanctioned posts in the BCCT, organogram of which is presented below (**Figure 7.3**).



AAO= Audit & Accounts Officer, Ad= Adaptation, AD= Assistant Director, AP= Assistant Programmer, DD= Deputy Director, Dev= Development, E= Evaluation, F&A= Finance & Admin, M= Monitoring, M&E= Monitoring & Evaluation, ME= Maintenance Engineer, Mt= Mitigation, Nego= Negotiation, P= Protocol, P&D= Planning & Development, PR= Public Relation, R&N= Research & Negotiation

Figure 7.3: Organogram of BCCT

There are elements in all these exemplary organisations that can be incorporated in the Delta Commission structure. Experiences from the institutional arrangements during formulation stage are also considered.

7.5. Political Context

The Government of Bangladesh, with its own resources and assistance from the development partners, is committed to implement the Bangladesh Delta Plan 2100, which is evident from the following facts:

The Prime Minister is keen in implementation of the BDP 2100. She has visited the Netherlands to gain insight of the Dutch Delta Program. After visiting the Netherlands in November 2015, the Prime Minister declared that 'her government is considering forming of a Delta Commission as well as a Delta Fund to implement the Bangladesh Delta Plan 2100.

The 7th Five-year Plan (GoB 2015) states "Annually around 2 percent of GDP (US$ 4.0 billion) will be allocated to the investment programmes which will be related to Bangladesh Delta Plan 2100."

A MoU (Memorandum of Understanding) has been signed on 16 June 2015 among the Governments of Bangladesh and Netherlands, the International Development Association (IDA) and the International Finance Corporation (IFC) concerning collaboration on formulation and implementation of the Bangladesh Delta Plan 2100. Moreover, a few other development partners have indicated their interest in implementing the BDP 2100

The setting up of a Delta Commission (DC), to facilitate implementation via Fast Track procedures, is now seen as of immediate priority.

7.6. Indicative Features of the Institutional Arrangement for BDP 2100

There is no model institutional arrangement fitting all situations. However, attempts have been made to have a logical and pragmatic institutional setting. Though the landscape of the Delta Plan 2100 is the whole of Bangladesh, it does not replace all or any of the existing institutional set ups. Coordination is one of the main roles of the proposed Delta Commission. However, for this, the Delta Commission should not be a newly created 'super agency' or a 'super Ministry'. Line ministries/agencies will implement the BDP 2100 projects/ programs. It is foreseen that implementation of the BDP 2100 will be a multi-dimensional process because of the holistic approach of a complex delta and the long term planning horizon. For these, the proposed institutional arrangements should be a permanent set up, part of/ attached to a government institution under a legal coverage.

Dutch Delta Commission

- Position (Delta Commissioner)
  - Independent
  - Leads small office
- Functions
  - Keep the Delta Plan on the political agenda
  - Streamline / coordinate
  - Preparation and updating of Delta Plan

Considering the coordinated and collaborative nature of task the proposed institutional set up should be a part of the Planning Commission with strong linkage with GED. The Delta Commission should be a multi-disciplinary, forward looking (knowledge based) organization having authority to process fast-track implementation and its monitoring and evaluation. The institution is required to be highly pro-active enough to deal and interact with all relevant agencies & Ministries.

7.7. Indicative roles of the Delta Commission

- Coordinates and facilitates implementation of the Bangladesh Delta Plan 2100
- update BDP 2100 in every 10 years but earlier update could take place if it is so required
- Prepare and update Delta programme within the Delta Fund envelope
- Scrutinise projects to be financed out of Delta Fund and recommend for fast track processing in the Planning Commission for approval
- Facilitate resource mobilization for the Delta Fund (external & internal including PPP)
- Actively promotes bilateral, regional and basin wise cooperation for sustainable delta management
- Seeks guidance from as well as contributes to national aspirations and perspective plans
- Conduct pre-feasibility, feasibility and other related studies (through outsourcing) to make projects ready for implementation
- Establish links to Five-Year Plans and Annual Budget (ADP)
- Creates platforms for debates on critical issues for adaptive delta management
- Creates links with knowledge institutes for knowledge generation & management and makes funding provisions for these activities

- Maintains pro-active interactions with implementing agencies, development partners, private sector, knowledge institutes and NGOs
- Establish a Monitor & Evaluation System and accountability mechanisms
- Reports annually to the Prime Minister through Planning Minister

Reviewing different institutional arrangements in overseas and Bangladesh, it is proposed that the Bangladesh Delta Commission consists of an 'office of the Delta Commissioner' supported by a Secretariat (**Figure 7.4**).

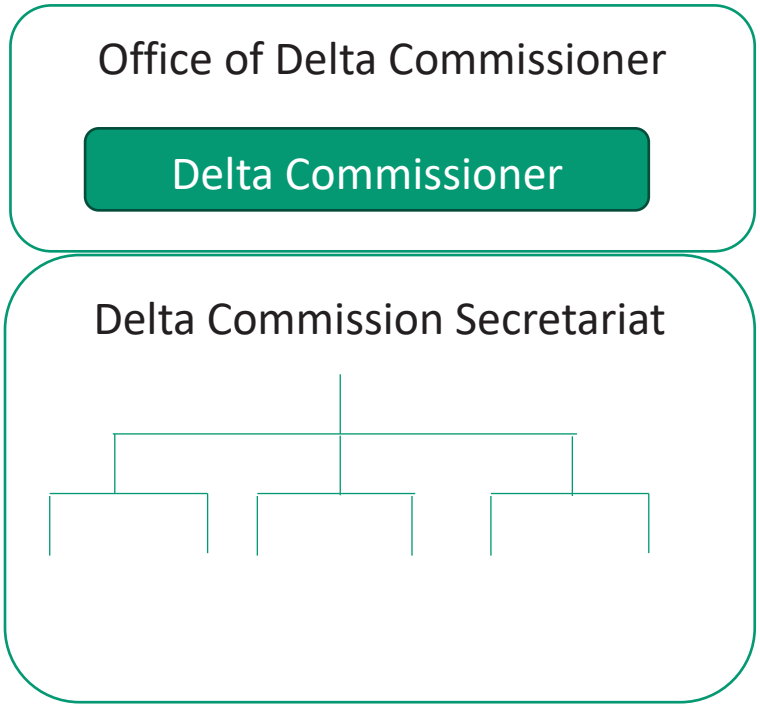


Figure 7.4: Proposed Structure of Delta

7.8. Delta Stewardship Council (DSC)

BDP 2100 implementation needs to be guided by a high level "Delta Stewardship Council". The DSC might be chaired by the Minister, Ministry of Planning. Several other relevant ministers and secretaries like Agriculture, Water Resources, Environment and Forests, Food, Disaster Management etc. would be ex-officio member of the DSC. It would function as a formal linkage for achieving political commitments regarding BDP 2100, provide directions, guidance and makes appropriate decisions. Delta secretariat will provide secretarial support to this council.

The setting of the Delta Commission within the relevant stakeholders as well as its linkage with the stakeholders is presented in the figure below (**Figure 7.5**).

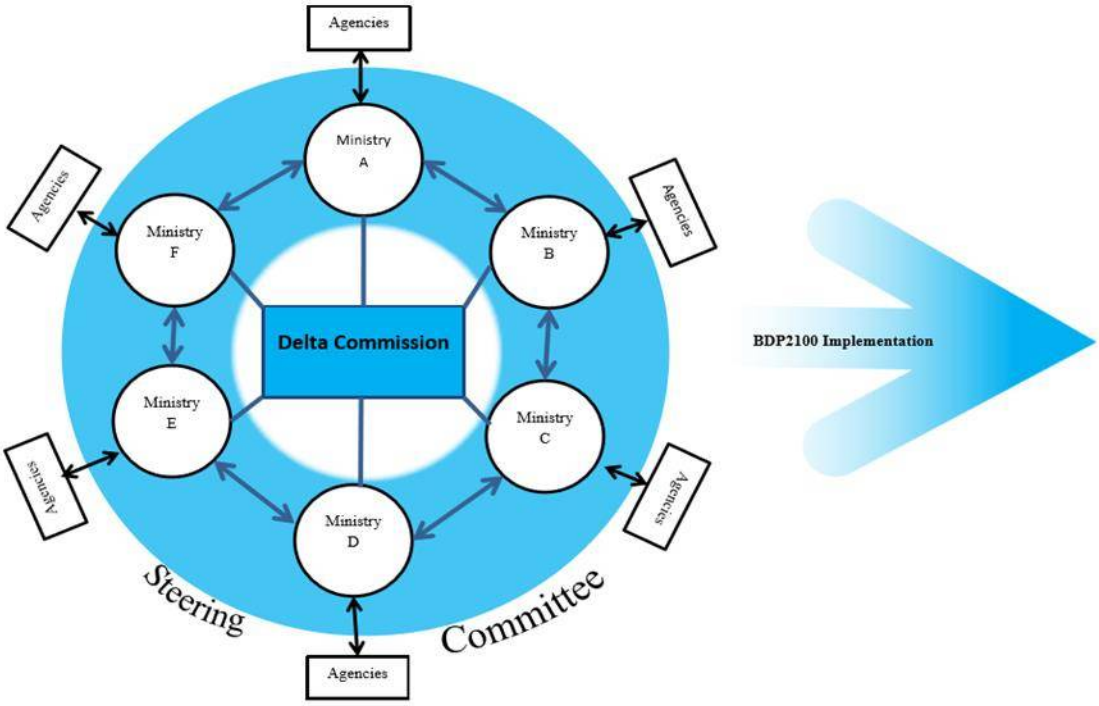


Figure 7.5: Setting and Linkages of Delta Commissioner with relevant Stakeholders

The above proposed institutional arrangement though indicative but it would provide inputs and thoughts for preparing a self-contained proposal for BDP 2100 Institutional Framework. The institutional arrangement framework could further be elaborated and framed up in the "Delta Commission' document.

7.9. Way Forward: Interim Arrangements

As per schedule of work preparation of the BDP 2100 would be completed in September 2015, which is also the terminal date of BDP 2100 Formulation project. So, there might have some arrangement for taking over and processing approval of the project output like Delta act, Delta fund, institutional framework- the Delta Commission, etc. The Project Service Cell, as indicated in the project document, for the interim period, can function as the office of the Delta Commission. The PSC may be composed of 4-5 officials and would be later on transferred to the Delta Commission office, once it is established. The purpose of establishing PSC is to make a head start to establish the Delta Commission on time. Its specific activities may include:

- to prepare 'Bangladesh Delta Act 2016', peer review and initiate formalities for its approval at the Cabinet and adoption at the Parliament
- to support project implementation early under 7th FYP: facilitate inclusion of identified delta related projects in the Annual Budget 2016-17
- to initiate and follow through necessary preparatory formalities to establish the Delta Commission and operationalize the Delta Fund
- to process appointment of the Delta Commissioner
- to locate the office, procure logistics

7.10. Preparing a roadmap for the set-up of, assessing and designing the Delta Framework

A roadmap to bring about necessary reform within the scope of the BDP2100-related domain will be formed on the basis of a 'gap-analysis'. The present situation as presented in earlier Chapters has been compared with the requirements of the design of a Delta Framework for the short, medium and long term. This comparisons have shown a number of gaps and challenges which will have to be bridged by initiatives in the institutional and governance field e.g. capacity development on essential aspects of BDP2100 in a culture of holistic planning, cooperation, integrity, transparency and coordination. Attention needs to be paid to the right mandates and involvement of local government levels. The formulation of BDP 2100 is in this regard a learning and change process, in which capacity building and institutional strengthening play a crucial role. The development of the 7th Five Year Plan, in which outcomes of BDP 2100 will be incorporated, forms an important starting point for change.

The Delta Framework will incorporate institutional and legal arrangements for effective implementation of BDP 2100. Procedures based on experiences from other delta frameworks aimed at transparency and integrity will be included in the Bangladesh Delta Framework. Lessons learned from the delta planning in the Netherlands will be taken into consideration for the design of the Delta Framework. A platform for sharing experiences will be created to involve civil servants from Bangladesh and the Netherlands.

A draft Delta Act for establishment of the Delta Framework including a possible Delta Commission will be prepared, covering the above mentioned aspects and providing an appropriate and transparent institutional set-up for development. The process of developing this Delta Act in relation with other relevant legislation needs to start early in the BDP2100 process and will be linked with the development of socio-political support. The Delta Framework forms the institutional mechanism for legal arrangements regarding long term holistic planning and smooth short term implementation. It structures and aligns the mandates and responsibilities, the policy coordination and decision making procedures and budget allocation, related with the Delta vision, the long term strategy, measures and investments.

7.11. Developing an Implementation Guideline

In order to create and operationalize the implementation strategy of BDP 2100, a guideline will have to be prepared. The implementation guideline will provide a basis for implementation opportunities while BDP 2100 is still being formulated and the implementation strategy is developed. The approach and related methods in this respect will follow following steps:

1. Exploring existing implementation rules and practices. For this, the present situation - the efficiency and effectiveness of projects or interventions would be analysed, leading to problem identification. Next, the implementation practices and procedures are needed to be examined to set up a TPP or DPP, based on the accepted general rules and regulations. There are two options:
2. Use a number of cases to be studied like the NWMP (an agricultural case and a water management case) to identify hick-ups in the procedures themselves and in the way they are applied;
3. Identify existing studies that were aimed at an evaluation of implementation practices and procedures.
4. Diagnose the procedures as well as their application: identify lessons learned, best practices and fail factors. Organizing a Delta Atelier or common workshop to reach commonly agreed conclusions on implementation practices, and to define elements for a new guideline.
5. Given the baseline conditions and lessons learned on implementation practices, a new draft guideline for implementation would be developed.
6. Apply the draft guidelines to new exemplary projects, and explore existing plans on promising exemplary projects.
7. Based on lessons learned, share and discuss the draft guidelines with the relevant stakeholders and apply this guideline on the projects.

Capacity building will be needed for using the guideline in implementation of the BDP 2100 implementation program and related projects.

7.12. Implementation Strategy

The purpose of the 'Implementation Strategy' is to develop a strategy for quick and smooth implementation, a 'Fast Track of implementation', of the BDP 2100 outcomes. The development of this 'Fast Track' is a parallel and closely related process, next to strategic planning process. The implementation of the outcomes of BDP 2100, including the establishment of a Delta Framework and of the exemplary projects, will be a complex process incorporating sectoral and geographical plans, and large numbers of implementing agencies and organizations.

This implementation needs to take place in harmony with the Five-Year planning process and other important sectoral or geographical plans of Bangladesh. This should be performed in close consultation with GoB officials. It will also include promoting regional and sectoral developments on the short term for future governance of water, land and related resources and spatial planning in the Bangladesh delta in line with BDP 2100.

7.13. Results Based Monitoring & Evaluation and Indicators of Impact Evaluation

Results-based monitoring and evaluation (M&E) is a powerful public management tool that can be used to help policy makers and decision makers tracking progress and demonstrate the impact of a given project, program, or policy. Results based M&E differs from traditional implementation-focused M&E in that it moves beyond an emphasis on inputs and outputs to a greater focus on outcomes and impacts (Kusek & Rist 2004).

A results-based monitoring is an essential element of any development plan. This is particularly important for a long-term development plan like the BDP2100. Regular monitoring and updating of BDP2100 on the basis of a quantitative framework will ensure that it is a living document. The RBM&E for BDP2100 will evolve from the goals and targets of the Delta Plan. These goals will need to be developed into quantitative targets along with baseline values to measure progress. The targets will be related to a timeline and will be updated as progress is made. The database for developing an adequate RBM&E may not immediately exist. The RBM&E will therefore likely evolve over time as experience is gained and new information is available.

Delta Vision and associated goals would be the basis for the initial RBM&E. Some of the indicators will be outcomes, some will be outputs, while some will be inputs and process related. An indicative RBM&E is illustrated in **Table 7.2**. Using this as a starting point, further investigation will be conducted to explore regarding the framework that can be strengthened based on available information. The RBM&E for BDP2100 will need to be regularly updated as experience is gained and new information is available. The development of a proper database for BDP2100 and its regular updating is an essential part of the Delta Plan formulation. To be useful, the RBM&E will need to be institutionalized. Regular monitoring and evaluation will only be possible with updated database. It is needed to explore possible institutional arrangements for housing the RBM&E, a system for collecting the data on a regular cycle and proper M&E reports highlighting progress, gaps and challenges. The M&E report will need to be properly disseminated and used as a basis for updating the BDP2100.

Implementation Monitoring and Evaluation Division (IMED) is the central and apex organization of the Government for monitoring and evaluation of the public sector development Projects included in the Annual Development Program (ADP).The IMED Strategic Plan examines the link between financial allocations and equitable economic growth by defining and verifying the relationships between expenditure and eventual development results. While moving IMED strategically forward, the plan is grounded in its current functions as expressed in the Rules of Business. Short-term goals focus on building internal capacity to define project outcomes and impacts, to collect and verify information efficiently and, most importantly, to use this information as the basis of analysis. By this stage IMED should have established enough credibility to coordinate the creation of a national set of performance indicators. This agreed set of national indicators represents the fundamental step towards results based monitoring and management.

BDP2100 will propose and establish results based monitoring and evaluation system with measurable and verifiable indicators against achievable goals. These goals will complement and contribute to national goals as it marches to the year 2100. A list of indicators with targets has been included in the 7th Five Year Plan (**Table 7.2**) for the BDP 2100 which is a good example for developing a results framework.

Table 7.2: Indicative Results Based Monitoring and Evaluation Framework

No.	Indicators	Sub-Indicators	Quantity	Parameters	
				Present	2020
(Goal 1: Ensure safety against water and climate change related disasters)					
1A	Risk zone susceptible to natural hazards	Average flood extent	percent of total area of Bangladesh	30	25
		Extreme flood extent	"	50	35
		Cyclone damage extent	"	10	-
		Average drought extent	"	9	9
		Extreme Drought Extent	"	47	25
		Dry season saltwater intrusion	percent of total coastal area	40	35
		Water logging extent	"	2.5	0.5
		Length of bankline erosion	percent of total river length	15	11
1B	Population vulnerable to natural disasters	Flood vulnerable people	Nos. in million	88	60
		Cyclone vulnerable people	"	8	7
		Erosion vulnerable people	"	1	0.7
		Water logging vulnerable people	"	0.9	0.2
(Goal 2: Ensure water security and efficiency of water usages)					
2A	Dry season flow availability	-	percent of total flow	15	25
2B	Dry season irrigation coverage	-	million ha	6	6.2
2C	Irrigation water efficiency	-	percent of supplied water	30	35
2D	Urban domestic water efficiency	-	percent of supplied water	67	70
2E	Internal Renewable Water Resources	-	cumec/ person	714	1,000
2F	Rural population with safe drinking water access	-	percent of rural population	84	85
2G	Rural population with safe sanitation	-	percent of rural population	58	not covered*

No.	Indicators	Sub-Indicators	Quantity	Parameters	
				Present	2020
2H	Surface water polluted by industrial wastes	-	percent of total river areas	11	9
2I	Surface water sources polluted by other wastes	-	percent of total river areas	10	7
(Goal 3: Ensure integrated river systems and estuaries management)					
3A	Erosion along major rivers	Area eroded along Jamuna	ha/ year	1,750	**1,250**
		Area eroded along Ganges	"	1,100	not covered*
		Area eroded along Padma	"	2,200	not covered*
		Area eroded along Lower Meghna	"	2,900	not covered*
3B	Area of reclaimed lands	-	ha	N/A	31,500
3C	Developed areas from reclaimed areas	-	percent of reclaimed areas	N/A	10,000
(Goal 4: Conserve and preserve wetlands and ecosystems and promote their wise use)					
4A	Identified wetlands	-	percent of total nos. of wetlands	15	not covered*
4B	Water related ecosystem sustainability	-	qualitative judgment	Poor	not covered*
4C	Habitat protection	Area of perennial aquatic habitat	ha	13,200	13,200
		Area of seasonal aquatic habitat	"	30,880	30,880
		Area of marine habitat	"	32,300	32,300
4D	Ecosystem services and goods harnessing	-	qualitative judgment	Poor	not covered*
(Goal 5: Develop effective institutions and equitable governance for intra and trans-boundary water resources management)					
5A	Rural people with adequate capacity for WRM	-	percent of rural population	20	35
5C	Equitable share of water among users	-	qualitative judgment	Poor	Moderate
5D	Adequate monitoring mechanism	-	qualitative judgment	Poor	not covered*
5E	O&M budgeting	-	percent of development budget	13.5	not covered*
(Goal 6: Achieve optimal use of land and water)					

No.	Indicators	Sub-Indicators	Quantity	Parameters	
				Present	2020
6A	Spatial zoning of integrated land and water uses	-	qualitative judgment	None	not covered*
6B	Spatial standardization of drainage density	-	qualitative judgment	None	not covered*
6C	Flood control, drainage and irrigation capacity	Area under irrigation schemes	ha	672	800
		Area under drainage schemes	"	878	not covered*
		Area under drainage and irrigation schemes	"	434	not covered*
		Area under FCD schemes	"	1,863	1,863
		Area under FCDI schemes	"	2,209	2,209
		Area under coastal FCD schemes	"	1,000	1,000
		Area under coastal FCDI schemes	"	28	28
6D	Sectoral use of water	Surface water used for irrigation	km3	6.62	11
		Groundwater used for irrigation	"	24.88	24
		Domestic water use	"	3.6	not covered*
		Industrial water use	"	0.8	not covered*
6E	Connectivity of rivers and khals	-	Qualitative judgment (percent)	20	40
6F	Navigation capacity	wet season navigation course	km	5,968	5,968
		dry season navigation course	"	3,865	5,000

8. Capacity Development for Long-Term Holistic Planning/Implementation

8.1. Introduction

Capacity building offers important approaches as it aims at learning and strengthening of the organizations and networks within which actors operate and interact. It also applies to the situation in the BDP 2100 setting where capacity development is needed at all levels in order to achieve the required commitment, ownership and ability in formulating as well as implementing it. Capacity building relates to many aspects of the BDP 2100 process, not only to deliver quality outputs during the project, but also to help the actors and relevant organizations to improve their knowledge and skills for achieving results and goals and to update and plan for the future. Since BDP 2100 would be a long-term, integrated and holistic plan, the importance of capacity building of its actors is paramount. This needs to be ensured by making use of 'champions', the 'forerunners' from various departments and institutions, who can act as trainers as well, following the 'Train the Trainer (3Ts)' principle through TOT.

Capacity building will be a combination of top-down and bottom-up learning alliances and the principle of "learning by doing" as the two core principles. At the national level and as far as possible at the local level, acquired capacity will be transferred to a broader stakeholder network through active coaching during continuous workshops, meetings and other views exchange sessions etc. Collaboration, Coordination and Cooperation (3Cs) among all the capacity building programs active in Bangladesh are badly needed for bringing efficiency and effectiveness. These programs and possibilities for joint capacity building initiatives will be explored. Need based training programs are to be developed for the relevant stakeholders. The knowledge institutes and expertise centres that are equipped to provide tailor-made courses and trainings are to be selected for training.

8.2. Capacity Building Framework

8.2.1. Concept and Reality

The two terms, namely, "capacity building" and "capacity development" are often used interchangeably. According to JICA (2003) the term "building" connotes "creating something that does not exist". The word "development" stresses on endogenous development process. Many of the BDP 2100 actors are in existence for quite long time and they do have some capacity. But this capacity is not rated compatible with development needs of the country. There are serious gaps in the available capacity and the required capacity. This capacity gaps are more or less equally existent in planning, decision making, implementation and monitoring process of development activities in Bangladesh stretching from individual to institution. Capacity lacking is due to a number of factors: less staffs than required, logistics and equipment constraints, lack of commitment, ownership and training, improper posting, transfer and promotion policy, lack of incentives, etc.

Capacity development would be crucial for a few actors to be created afterwards for BDP 2100. The role of the capacity development service providers is not so much in terms of knowledge transfer or resource transfer, but to facilitate change processes as a change agent that develop capacity of newly created BDP 2100 institutions for achieving development goals. The experiences of local capacity development suggests that capacity development is endogenous, emergent and organic in any particular 'human system' (individual, organization and institutional) – but can be also nurtured, planned and pro-actively supported from outside (UNDP, 2009). Therefore, the role of capacity development service providers is critical.

UNDP defines capacity as: "the ability of individuals, institutions and societies to perform functions, solve problems, and set and achieve objectives in a sustainable manner". Capacity development is thereby the "process through which these abilities are obtained, strengthened, adapted and maintained over time".

Since 2010, the OECD has provided evidence on the main governance gaps hindering water policy design and implementation, and suggested a set of policy responses and good practices for overcoming them. The "OECD Multi-level Governance Framework: Mind the Gaps, Bridge the Gaps" was developed as an analytical framework and tool for policymakers to identify and bridge governance challenges that affect, to a greater or lesser extent, all countries, regardless of their institutional setting, water availability or degree of decentralization (**Figure 8.1**).

Figure 8.1: Multi-level Gaps and Bridges in Delta Governance

8.2.2. Capacity Factors

The 4 (four) capacity factors that affect the achievement of development goals include competency of individuals; effectiveness of organizational arrangements; efficiency of policy instruments; and conduciveness of socio-political environment. These factors are interdependent and complementary to each other. The change that occurs in an individual as a result of improvement in knowledge or skills can be sustained only when s/he could use that knowledge or skill in the organization. The change in organizational environment could be sustained only when a 'critical mass' is achieved. It is important to understand the logical relationship among capacity factors and also between them and development goals during preparation of the capacity development plan. However, these relationships may not be linear and straight forward. The most fundamental problem encountered in assessing impact of the capacity development plan relates to causality and attribution. It becomes even more pronounced when organisational and environmental capacities or changes are objectively measured. **Table 8.1** illustrates the features of these capacity factors.

Table 8.1: Capacity Factors and its Elements. Adapted from Otoo, S. et al., 2009, JICA, 2004 and Lusthaus et al., 1995

Capacity Factors	Definition	Elements on which the capacity is based
Competency of Individual	The will and ability to set objectives and achieve them using one's own competence	Knowledge, skills, attitude, self-rated power, etc.
Effectiveness of Organizational arrangements	Factors that influence an organization's performance	Human resources (adequacy of competent individuals in organizations)
		Physical resources (facilities, equipment, materials, etc.) and budget
		Intellectual resources (organizational vision, strategy, planning, performance management, business know-how & technology, inter-institutional linkage, etc.)
		Organizational structure and systems that enables efficient utilization of resources to realize development goals
		Leadership of the change agents
Efficiency of policy instruments	The formal mechanisms to be used to guide stakeholder actions toward achievement of the development goal.	Policy instruments include policies, laws, regulations, administrative rules, standards, etc. Enforcement of policy instruments
Conduciveness of socio-political environment	The political and social forces that determine the priority given to the development goal by the government, the private sector, and civil society	Compatibility of social norms & beliefs with development goals, awareness of rights, power to voice concerns and hold local government accountable by the stakeholders

Capacity building needs to be properly reflected in the governance cycle of an institution for bringing efficiency and effectiveness. **Figure 8.2** depicts the water governance cycle showing scope of injecting capacity building framework in it.

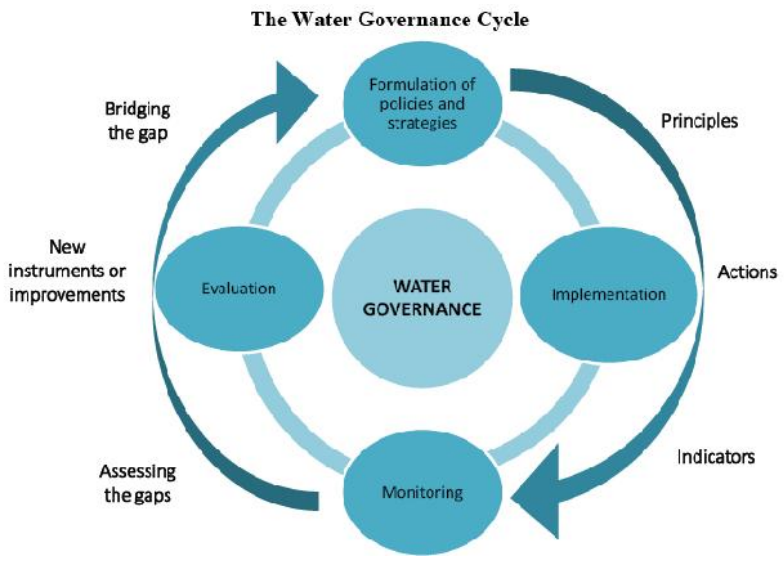


Figure 8.2: Water Governance Cycle and Scope of Capacity Building Framework

(Source: Forthcoming, OECD Working Paper, 2015, Water Governance Indicators)

Important aspect of this capacity building framework is the development of targeted capacity building strategies (**Figure 8.3**), which involves a determination of the categories in which the identified needs fall—what are the organization's needs for additional information or skills? What formal processes and systems should be adjusted or established that will allow the skills and/or information to be applied? Will the culture of the organization sustain the changes necessary for the organization to arrive at its desired destination?

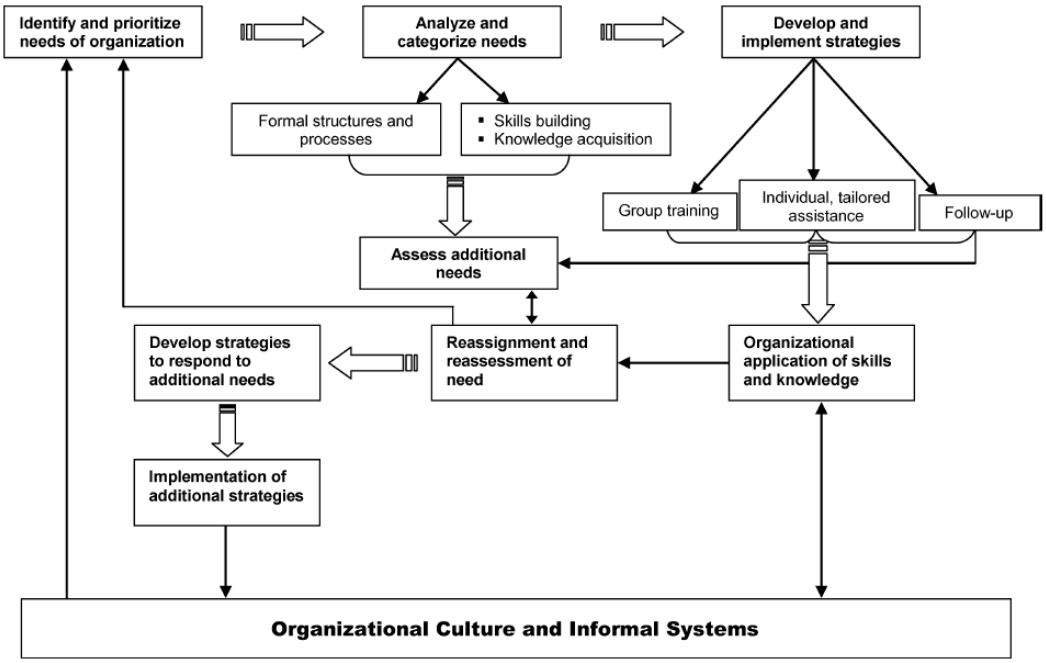


Figure 8.3: Capacity Building Framework for BDP 2100

Many of the above mentioned capacity building needs especially for organizations are needed to be taken up under BDP 2100.

8.3. Outline of Capacity Building Program for BDP 2100

The capacity building program of BDP 2100 will be based on the water governance cycle contextualized with the development planning and project approval process as shown in **Figure 8.2**.

Arrow signs in the above figure indicate capacity needs to streamline project planning and monitoring needs for the BDP 2100 implementation. Among many, a few forms of capacity building for BDP 2100 are mentioned below:

8.3.1. Creating ownership and support

Training of the key stakeholders and champions, creating ownership, enhancing capabilities to cooperate, embedding plan in relevant institutions are the key for effective and smooth implementation of BDP 2100. Ownership of the plan is an essential element which can also be built up through training. Training can identify and empower potential champions who will play a vital role in planning, updating, implementing of BDP 2100 as well as its monitoring. They can play vital role in putting necessary efforts and bringing reforms in the institutional arrangement, if needed in the way to implementation of the BDP 2100. This activity is essential in the early adoption of the BDP 2100 by the different ministries, divisions and agencies of the GoB. Common training, as well as confronting the participants with implemented examples of integrated water management creates awareness and urgency for cross-departmental collaboration and ultimately the holistic approach which lays at the foundation of the plan. Preparation of relevant course material including online resources is necessary.

8.3.2. On-the job training

Actions will be needed to enhance the capacity of the relevant staff members on-the-job, by state-of-the-art knowledge transfer. The training approach is based upon the 'train-the-trainers' principle, in which a core team of champions and a network of champions will be developed.

8.3.3. Knowledge Portal

It refers to develop an internet-based knowledge repository with the relevant reports, documents, presentations etc. in the course of the program. This repository must contain relevant studies, articles and other background material used during the analysis and formulation of BDP 2100. This portal will be accessible to those involved in the process and can be consulted by third parties for study purposes. Training will be needed to effectively use and maintain the possibilities

8.3.4. Delta Atlas & Touch Tables

A 'Delta Atlas' is a set of policy relevant maps that summarizes the results of the baseline studies in an appealing way. Preparatory workshops will be needed to establish joint support for the maps. The Delta Atlas will be accessible through the Touch Table, facilitating the interactive use of spatially referenced information from the baseline studies during the Ateliers. The Touch Table enables to disclose and confront large (spatial) datasets in the form of visualized maps on a big touch screen. In real time, scales can be altered and multiple layers of information can be visually confronted with one another. The climate and land use scenarios will be selected in the Baseline studies. Atlases at Hotspot level will summarize integrate and visualize the Baseline studies at regional level. The Touch Table makes all information accessible and usable.

8.3.5. Multi-lateral learning alliances

Multi-lateral learning tools such as seminars, conferences, workshops, study tours and experiential visits on deltaic strategy planning, integrated water resource management, adaptive delta management and other related subjects of BDP 2100.

8.3.6. National level capacity building and advocacy activities

National level capacity building and advocacy activities targeting planning, finance and other key development issues need to be undertaken to disseminate and facilitate the use of key findings and knowledge on mainstreaming BDP 2100 into development planning and budgeting processes; Officials from the public and private sector will be provided with the necessary skills and knowledge to make use of the various tools and techniques, such baseline studies, scenario and vision development, adaptive pathways, use of Delta Ateliers and Touch Table.

8.3.7. Mainstreaming Adaptive Delta Management approach

One of the main purposes of the training would be mainstreaming ADM approach in strategy making and investment planning of relevant sectoral agencies/ divisions.

8.3.8. Creating a legacy – establish a training hub

The establishment of a central training hub is essential for creating long term ownership, ensuring consistency as well as guarding the holistic approach by creating a multi-disciplinary training facility focusing on fields ranging from governance to hydraulics. By coaching a large number of experts in delivering the training programs, training can be provided in the form of 'packages', tailored to the needs of groups of participants, departments or institutions. Obviously, the hub should be embedded in an existing educational facility that already has a proven track record (including participation in large water related international projects). While claiming substantial resources, the hub might prove to be an essential instrument for future implementation and provide an effective interface between Delta Plan and future 5-year development plans. The exact requirements and operational aspects need to be further developed; an initial inventory phase is therefore required. The hub can form the institution where officials can be certified, follow a master program or an academic curriculum. Training hub will be adequately furnished with required hardware and software including state of the art office equipment.

9. References

Amarsinghe, U.A. and B.R. Sharma 2014. Distress and Promise: GBM riparian states of India. In Situation Analysis on Water, Food Security, Poverty, Ecosystems for Life: A Bangladesh-India Initiative, IUCN, International Union for Conservation of Nature.

Bangladesh Delta Plan 2100, 2014b. Inception Report. June 2014

GoB 2015. Seventh Five Year Plan FY2016-FY2020. General Economic Division, Planning Commission, October 2015.

GoB 2013. National Sustainable Development Strategy 2010-2021. General Economic Division, Planning Commission, May 2013.

GoB 2012. Perspective Plan of Bangladesh 2010-2021 – Making Vision 2021 a reality. General Economic Division, Planning Commission, April 2012.

GoB 2010. Sixth Five Year Plan FY2011-FY2015. General Economic Division, Planning Commission, 2010.

Kumer, P. P. 2011. Local Government System in Bangladesh: How far is it decentralized? Lexlocal-Journal of Local Self-Government. 9(3):205-230.

MoWR, 2000. Guidelines for Participatory Water Management. Ministry of Water Resources, Dhaka, Bangladesh

Quassem, M. A. 2001. Experience with operation of participatory water management: Country Paper Bangladesh.,

Rahman, H.Z. and T. Ahmed, 2014. Strategy on Local Government Strengthening. Background paper for 7th Five Year Plan. Prepared for the GED, Planning Commission, Go Bangladesh.

Sharique. 2007. Compendium of LG Laws (UP), Sharique – A SDC supported project, Dhaka.

UN 2015. Sustainable Development Goals: Transforming Our world – the 2030 Agenda for Sustainable Development. https://sustainabledevelopment.un.org.

Annex I Structure, Mandates & Functions of selected key Ministries & Agencies

The design of a Bangladesh Delta Framework clearly envisages the active participation by a large number of Agencies and their administrative Ministries. The selected Ministries are those particularly involved in steering the formulation of Delta Plan. These are:

Ministries	**Agencies**
Ministry of Planning	-
Ministry of Water Resources	Water Resources Planning Organisation Bangladesh Water Development Board Haor & Wetland Development Board
Ministry of Agriculture	Department of Agricultural Extension
Ministry of Local Government	Local Government Engineering Department Public Health Engineering Department
Ministry of Land	Department of Land Records & Surveys
Ministry of Environment & Forest	Department of Environment Forest Department
Ministry of Disaster Management & Relief	Department of Disaster Management
Ministry of Fisheries & Livestock	Department of Fisheries
Ministry of Finance	-
Ministry of Shipping	Bangladesh Inland Water Transport Authority

The Ministries can be classified into three broad categories, namely, service, line and service-cum-line Ministries. Service Ministries are those Ministries that do not pursue any activities in the field but allocate the resources under their command to the line Ministries for achievement of their goals. Line Ministries are actually engaged in the regulation, conservation, exploitation and development of resources falling within their allocated jurisdiction. Service-cum-line Ministries combine both the functions. The Ministry of Planning and Finance are considered as service Ministry, the Ministry of Land a service-cum-line Ministry and the other six Ministries as line Ministries.

We will now examine selected Ministries and agencies about their structure, mandates and functions individually in order to get an overall view about their organization.

The Ministry of Planning

The Ministry of Planning (MOP) is a service Ministry and possesses unique characteristics. The Ministry consists of three Divisions, namely, Planning Division, Statistics Division and Implementation, Monitoring and Evaluation Division (IMED). The Planning Commission (PC) which is attached to the Ministry of Planning (MOP) as a technical body. Among themselves, these Divisions and the Commission perform the following functions:

- Policy Planning: determination of goals, objectives, priorities, strategies and policy measures for development plans
- Sectoral Planning: identification of the role that the various sectors of the economy are required to play in the context of the Plan objectives and goals

- Program Planning: formulation of detailed resource allocation to realize the Plan objectives and goals
- Project Planning: appraisal of projects embodying investment decisions for the implementation of the sectoral plans
- Evaluation: impact analysis of projects, programs and Plans on the people's living standard.

The (MOP) is headed by a Minister: however, the Chairperson of the Planning Commission is the Prime Minister, the Minister for Finance and the Minister for Planning are the Vice- Chairpersons and the Secretary, Planning who is also a Member, Planning Commission is the Member-Secretary.

Institutional linkages of the Planning Commission

In preparing Five Year Plan, The Annual Development Programme and in carrying out the process of project appraisal and approval, The Planning Commission interacts with different Ministries/Divisions/Agencies of the Government.

Data is the pre-requisite of development planning. The Bangladesh Bureau of Statistics (BBS) meets comprehensive data requirements of the Planning Commission. Finance Division (FD) and Internal Resource Division (IRD) advise the Planning Commission on matters of resource availability and formulation of fiscal and monetary policy. The role of the Implementation Monitoring and Evaluation Division (IMED) in the work of the Planning Commission is very important. ADP implementation under the Five Year Plan framework is monitored by the IMED and the Planning Commission takes corrective steps accordingly. Given the country's dependence on official development assistance (ODA) from the international community for development planning, the role of Economic Relations Division (ERD) is also very important. ERD mobilizes ODA to meet saving-investment gap in the development planning. At the micro level, ERD lines up project aids for implementation of ADP. Bangladesh Institute of Development Studies (BIDS) gives backup research support to the Planning Commission whenever necessary. Planning and Development Academy supports the Commission by providing training inputs for its officials. Finally the Commission submits plans, programmes and projects to the National Economic Council (NEC) / Executive Committee of the National Economic Council (ECNEC) [described in Annex I] for formal approval.

The Planning Commission provides technical support to the Ministry through six Divisions (not self-contained units) each working under a Member. These Divisions are Programing; General Economics; Socio-economic; Physical Infrastructure; Industry and Energy and Agriculture, Water Resources and Rural Institutions.

The General Economics Division (GED), like other Technical Divisions, provides secretariat assistance to the Planning Commission and to the Executive Committee of the National Economic Council and the National Economic Council in all matters relating to plan preparation and formulation of economic policies. The major functions of this Division are as follows:

i. Preparation of national, medium and long term guidelines and plans in accordance with social, economic and political objectives as laid down by the Government;
ii. Preparation of technical frameworks for medium term plans (Five Year Plan);
iii. Formulation of alternative strategies, and policies for mobilization of domestic resources and for achievement of plan objectives;
iv. Undertake research studies on economic issues in the; fiscal and monetary fields, International economics, savings and Investment, employment and income distribution;
v. Undertake macro and sectoral evaluation of. Five year Plan;
vi. Estimation of national income, consumption, savings and investment, domestic resources; external trade and balance of payments;
vii. Preparation of Annual Plan (Annual Economic Review);
viii. Preparation of Memorandum; for Bangladesh aid group meetings;
ix. Preparation of briefs for meetings and negotiations with multilateral organizations like World Bank, IMF ADB, ESCAP, EEC, ECDC, South Asian Forum as 'well as bilateral donors;

x. Provide staff support to the Planning Commission for Council Committee on Exports, Resource Committee, Inter-ministerial Committee on ADP, Foreign Exchange Allocation Committee etc.;

xi. Initiate and organize seminars and professional discussions on issues relevant to economic planning and development.

The preparation of the Bangladesh Delta Plan 2100 is being pursued under the leadership of the General Economic Division of the Planning Commission.

The Ministry of Water Resources

The Ministry of Water Resources is the apex body for development and management of the whole water resources of the country. It formulates policies, plans, strategies, guidelines, instructions and acts, rules, regulations, etc. relating to the development and management of water resources, and regulation and control of the institutions reporting to it. It prepares and implements development projects relating to flood control and drainage (FCD); flood control, drainage and irrigation (FCDI); riverbank erosion control; delta development and land reclamation; etc. and provides irrigation, drainage, flood protection, bank erosion protection, land reclamation facilities by constructing barrages, regulators, sluices, canals, cross-dams, embankments and sea-dykes along the banks of the rivers and the coast, etc. Key mandates of the MoWR are:

- Regulation and development of rivers and river valleys.
- General policy and technical assistance in the field of irrigation, flood control, anti-water-logging, drainage and anti-erosions.
- All matters relating to irrigation, flood forecasting and warring, flood control, flood control works, causes off floods and damage caused by floods to irrigation projects, embankments, etc.
- Basic, fundamental and applied research on river valley projects and flood control works.
- International cooperation in the field of flood control and development of water resources.
- International commissions and conferences relating to irrigation, flood control and water resource management.
- Construction and maintenance of canals under W. D. B. Project; construction and maintenance of water control structures for the canals executed under the Canal Digging programme.
- Soil conservation drainage and water-logging.
- Storage of water and construction of reservoirs, embankment and barrages.
- Land reclamation, estuary control.
- Anti-salinity measures and anti-desertification.
- Hydrological survey and data collection.
- Matters relating to Joint Rivers Commission; Joint Committee, Standing Committee, etc and Common Border Rivers.

Relevant Acts, Policies & Treaties

Acts

- Bangladesh Haor & Water Bodies Development Board Act 2014
- Bangladesh Water Act 2013
- Bangladesh Water Development Board Act 2013
- Water Resources Planning Organisation Act 1992

Policy

- Food for Works Policy 2008
- Coastal Zone Policy 2005
- National Water Policy 1999

Treaty

- Ganges Water Sharing Treaty 1996

The Ministry of Water Resources is a development ministry. The Ministry has 4 wings namely Development Wing responsible for preparation, implementation and monitoring of the aided projects; Planning Wing responsible for processing of all projects for approval by the Planning Commission and preparation, implementation and monitoring of projects solely funded by GoB, and release of all funds of the development projects under ADP; Administrative Wing responsible for the administration of the Ministry and the organizations reporting to it; and Budget & Audit wing. The MOWR is assisted in its tasks by the following Agencies under its administrative control:

- Water Resources Planning Organization
- Bangladesh Water Development Board
- River Research Institute
- Joint Rivers Commission

Following the National Water Act 2013, National Water Resources Council (NWRC) has been reconstituted as per circular dated 19 February 2014. The Council is headed by the Prime Minister.

Following the *Bangladesh Haor & Water Bodies Development Board Act 2014,* Bangladesh Haor Development Board has been provided the status of a Directorate attached to the Ministry of Water Resources.

Ministry of Agriculture

The Ministry of Agriculture (MOA) is one of the largest Ministries of the Government of Bangladesh. The MOA seeks to achieve its objectives by directly supporting extension, agricultural research and supply of agricultural inputs and arranging other support services needed for agriculture.

Allocation of Business

- Develop agricultural policies, plans, regulations, acts, etc. for sustainable agricultural development and for food sufficiency;
- Provide support in developing new agricultural technologies to boost up agricultural production and coordinate with local and international trade agencies for marketing;
- Monitor implementation of agricultural policies, plans, projects, programmes and regulations;
- Monitor distribution of agricultural inputs and subsidies and marketing of the agricultural products in local and international markets;
- Develop capacity of the professionals and other team players with the recent development in the agricultural sector in the world;
- Provide administrative and policy support to MOA agencies for planning and implementation of the development programmes/projects and coordinate with donors and development partners for funding and technical assistance;

The Ministry of Agriculture (MOA) comprises seven wings with responsibilities of policy formulation, planning, monitoring and administration.

Relevant Acts & Policies

Acts/Rules/Ordinances

- Plant Quarantine Act 2011
- Amendment to the Pesticide Rules 1985, 2010
- Fertilizer (Management) Rules 2006
- Fertilizer (Control) Ordinance 1999

Policy

- National Agricultural Policy 2013
- Draft National Agricultural Extension Policy 2012
- National Integrated Pest Management Policy 2002
- The National Seed Policy
- New National Agricultural Extension Policy 1996

The Ministry has 16 Agencies under its control, the highest ever under one Ministry. These Agencies may be listed in the following manner according to the nature of their principal activities:

Research

- Bangladesh Agricultural Research Council,
- Bangladesh Agricultural Research Institute,
- Bangladesh Rice Research Institute
- Bangladesh Institute of Nuclear Agriculture
- Bangladesh Jute Research Institute
- Bangladesh Sugarcane Research Institute
- Cotton Development Board
- Bangladesh Applied Nutrition & HRD Board (BANHRDB)

Extension

- Department of Agricultural Extension
- Agriculture Information Service

Inputs Delivery

- Bangladesh Agricultural Development Corporation
- Seed Certification Agency

Supporting Agencies

- Soil Resources Development Institute
- Department of Agricultural Marketing
- Horticulture Export Development Foundation (Hortex Foundation)

Multipurpose

- Barendra Multipurpose Development Authority

Ministry of Land

Since 1950 Ministry of Land in different names during different regimes is entrusted with the land management of this country. The important aims and objectives of Ministry of Land are management and settlement of the Government owned lands (khas lands), sairat mahals (jalmahal, shirmp mahal etc.), vested properties and abandoned properties. Collection of land development tax is another important task of this ministry as well as land survey and record keeping and updating. Acquisition and requisition of land are also important responsibilities of this ministry.

The Ministry of Land (MOL) has been classified as a service-cum-line Ministry. It is the custodian of all government land and their management. Any agency requiring any land for execution of its project must obtain it through the MOL. In that sense, it is indeed a service Ministry. The Ministry has also the responsibility to manage land owned by the government by sale or lease or through distribution among the landless under special programs. It also collects revenue from eligible landowners and takes necessary steps for collection of arrears of land revenue under the Public Demand

Recovery Act. However, its activities in the matter of bringing newly accreted land in the revenue records and finalizing the individual record of rights expose it to the social milieu of land management. Maintenance of land records, survey for the purpose of revenue and record-of-rights and survey and settlement have emerged to be the most important functions of the MOL (Huda 2000). The MOL discharges its responsibilities through five different agencies:

- Department of Land Record and Surveys
- Land Appeals Board
- Land Reforms Board
- Land Administration Training Centre
- Office of Controller of Accounts (Revenue)

Management of land and ancillary matters are conducted through the local administration. The Additional Commissioners in charge of Revenue in the administrative Divisions, the Additional Deputy Commissioners in charge of Revenue in the administrative Districts and the Assistant Commissioners of Land in the Upazilas are exclusively deployed to perform functions relating to management of land. The Commissioners and the Deputy Commissioners are also revenue officers and if they can find the time, they can also deal with revenue matters. In addition to many functions of administrative nature, they also exercise judicial powers under different Acts. Appeals against the decisions of the Commissioners are heard in the Land Appeals Board.

Relevant Acts & Policies

Acts/Rules/Ordinances

- Vested Properties Release Act, 2012
- The State Acquisition & Tenancy Act 1950
- Survey Act 1875
- Tenancy Rules 1955
- Land Reform Ordinance

Policies

- Jalmohal Management Policy 2009, amendment 2012
- National Land Use Policy 2001
- Chingri Mohal Management Policy 1998
- Salt Mohal Management Policy 1998

Ministry of Environment and Forest

The Ministry of Environment & Forest (MoEF) is the nodal agency for the planning, promotion, co-ordination and overseeing the implementation of environmental and forestry programmes. MoEF oversees all environmental matters in the country.

The Ministry of Environment and Forests (MoEF) was formed in 1989. The MOEF had begun its sojourn as Forest Division after being segregated from the Ministry of Agriculture and Forest in 1987. In July 1989 the Forest Division was raised to the status of a Ministry. In August of the same year, the Ministry of Forest was re-designated as the Ministry of Environment and Forest whereupon the Directorate of Pollution Control under the Local Government Division was transferred to the MOEF after being named as the Department of Environment.

The Ministry also plays a pivotal role as a participant of United Nations Environment Programme (UNEP). The principal activities undertaken by Ministry of Environment & Forests consist of conservation & survey of flora, fauna, forests and wildlife, prevention & control of pollution, forestation & regeneration of degraded areas and protection of environment, in the framework of legislations. In short, Ministry of Environment & Forest (MoEF) has the following major functions:

- Management of environment and ecology.
- Matters relating to environment pollution control.
- Conservation of forests and development of forest resources (government and private), forest inventory, grading and quality control of forest products.
- Forestation and regeneration of forest extraction of forest produce.
- Plantation of exotic cinchona and rubber.
- Botanical gardens and botanical surveys.
- Tree plantation.
- Planning cell is responsible for preparation of schemes and coordination in respect of forest.
- Research and training in forestry.
- Mechanized forestry operations.
- Protection of wild birds and animals and establishment of sanctuaries.
- Matters relating to marketing of forest produce.
- Liaison with international organizations and matters relating to treaties and agreements with other countries and world bodies relating to subjects allotted to this Ministry.

Apart from two major departments, i.e., Department of Environment and Forest Department, working under this ministry, there are four others: Bangladesh Forest Industries Development Corporation (BFIDC), Bangladesh Forest Research Institute (BFRI), Bangladesh National Herbarium (BNH) and Bangladesh Climate Change Trust (BCCT).

Bangladesh Climate Change Trust (BCCT) is a statutory body formed under Climate Change Trust Act, 2010 to administer Climate Change Trust Fund (CCTF).

Relevant Acts & Policies

Acts/Rules/Ordinances

- Bangladesh Biodiversity Act 2012
- Climate Change Trust Act 2010
- Environment Court Act 2010
- Bangladesh Environment Protection (Amendment) Act 2010
- Balumohal lease & related Act 2010
- Bangladesh Environment Protection Act 1995
- The Bangladesh Water Pollution Control Ordinance, 1970
- The Environment Pollution Control Ordinance, 1977
- Environment Protection Rules 1997, Amendement Rules 2002
- Dangerous Waste & Ship Breaking Waste Management Rules 2011
- Bangladesh Biosafety Rules 2012
- Noise Pollution (Control) Rules 2006
- The Ship Breaking and Recycling Rules 2011

Policy

- National Environment Policy 1992

Ministry of Disaster Management and Relief

The Ministry of Food & Disaster Management was separated and the Ministry of Disaster Management and Relief (MDMR) was created on 13 September 2012. The Ministry has been given the mandate to drive national risk reduction reform programs. Its mission relative to this agenda is 'to achieve a paradigm shift in disaster management from conventional responses and relief to a more comprehensive risk reduction culture, and to promote food security as an important factor in ensuring the resilience of communities to hazards'.

The disaster management vision of the Government is to reduce the risk of people, especially the poor and the disadvantaged, from the effects of natural, environment and human-induced hazards to a manageable and acceptable humanitarian levels and to have in place an efficient emergency response management system.

The MODR discharges its responsibilities through:

- Department of Disaster Management
- Department of Relief and Rehabilitation

Relevant Acts & Policies

Acts/Rules/Ordinances

- Disaster Management Act, 2012
- Standing Orders on Disaster 2010

Policy

- Disaster Management Policy, 2012 (draft)
- Cyclone Shelter Construction, Maintenance & Management Policy 2011

Ministry of Fisheries and Livestock

The main functions of the Ministry of Fisheries and Livestock are to preserve fisheries resources, fulfil the requirement of animal protein through proper management and planned development, increase socio-economic conditions of fishermen, create employment opportunities for rural unemployed and landless people, expand foreign exchange earnings by exporting fish, livestock and poultry products and to innovate new technologies through research for fisheries development and preservation. Business allocated to this Ministry, among others, are:

1. Preparation of schemes and coordination of national policy in respect of fisheries.
2. Prevention and control of fish diseases.
3. Utilization of fish and fish wastes and development of fisheries resources and fishing.
4. Control, management and development of Government Fisheries which are under the development scheme of this Ministry and such other fisheries which will be included in future in the development scheme of the Ministry.
5. Fish farms- Management and conservation of fish and other population of aquatic organisms of economic importance.
6. Refrigeration and cold storage facilities for fish.
7. Improvement and augmentation of aquaculture and cultivation of pink pearls.
8. All matters relating of Marine Fisheries including permission for acquisition, licensing and monitoring of operation of fishing vessels including Factory Ship.
9. Fishing and fisheries beyond territorial waters (including deep-sea fishing), fish harbour, fish quality-testing, laboratories and other ancillary organisations.
10. Zoological research, zoological gardens and zoological surveys.
11. Veterinary education (other than Agricultural University) and development of Animal Resources.

12. Improvement of cattle wealth.
13. Coordination and determination of standards in institutions of higher veterinary education (other than Agriculture University).
14. Prevention and control of animal and poultry diseases.
15. Poultry- Management of poultry farm, grading and quality control.
16. Dairies- Management of cattle farm.
17. Animal nutrition.
18. Duckery-Management of Duckery Farm, grading and quality control.
19. Artificial insemination.
20. Professions: Veterinary practice.
21. Prevention of cruelty to animals.
22. Livestock census and cattle insurance.
23. Planning Cell- preparation of schemes and coordination in respect of fisheries and livestock.
24. Research and training in fishery and livestock.
25. Mechanised fishery and livestock operations.
26. Feasibility study on establishment of Fisheries and livestock Farms before allocation of khas lands by Ministry of Land.
27. Utilisation of coastal land for Brackish water shrimp culture.

The MOFL is assisted in its task by the following Agencies under its administrative control:

- Department of Fisheries
- Bangladesh Fisheries Development Corporation
- Bangladesh Fisheries Research Institute
- Department of Livestock Services
- Bangladesh Livestock Research Institute

Relevant Acts & Policies

Acts/Rules/Ordinances

- Fish Hatchery Act 2010
- Bangladesh Animal & Animal Product Quarantine Act, 2005
- Reservoir Protection Act 2000
- Territorial Waters and Maritime Zones Act, 1974
- Protection and Conservation of Fish Act, 1950
- Protection and Conservation of Fish Rules, 1985, Amendments 2011 and 2014
- Fish Hatchery Rules 2011
- Territorial Waters and Maritime Zones Act, 1974 and Maritime boundary (2012)
- The Marine Fisheries Ordinance (1983)
- The Marine Fisheries Rules, 1983

Policy

- National Shrimp Policy, 2014
- Wetland & Water bodies Management Policies 2014
- Government Jalmohol Management Policy 2009
- National Poultry Development Policy, 2008
- National Livestock Development Policy, 2007
- National Fisheries Policy 1998

Ministry of Local Government, Rural Development & Cooperatives

The Ministry of Local Government, Rural Development & Cooperatives has two self-contained Divisions: Local Government, Rural Development & Cooperatives.

Local Government Division (LGD) aims to improve the standard of living of the people by strengthening local government systems and institutions and implement activities for social, economic and infrastructure development. Major Functions include:

a) Manage all matters relating to local government and local government institutions
b) Finance, control and inspect local government institutions established for the running of local government and local administration
c) Manage all matters relating to drinking water
d) Develop water supply, sanitation and sewerage facilities in rural and urban areas
e) Construct, maintain and manage Upazila, union and village roads including the roads of towns and municipal areas and bridges/ culverts
f) Manage matters relating to village police
g) Develop, maintain and manage growth centres and hats-bazaars connected via Upazila, union and village roads
h) Develop, maintain and manage small scale water resource infrastructures within the limit determined by the government

The LGD seeks to achieve its objectives through the following Agencies under its control:

- Local Government Engineering Department
- Department of Public Health Engineering
- Dhaka Water and Sewerage Authority
- Chittagong Water and Sewerage Authority
- Khulna Water and Sewerage Authority
- Rajshahi Water and Sewerage Authority
- National Institute of Local Government

The LGD is politically very sensitive to the extent that major institutional changes have in the recent past been made in the sphere of local governance and the political mobilization at that level will have significant bearing in national politics. It is also very important from the point of view of good governance in as much as it facilitates the process of decentralization, people's participation, empowerment, better utilization of resources and many other attributes identified with good governance (Huda 222). Without a viable local government, programs for poverty alleviation and economic development will not be sustainable in the long run.

Rural Development and Cooperatives Division (RDCD) aims at to reduce poverty and improve socio-economic conditions of the rural poor people through rural development, cooperative based activities, development of cooperative based marketing system and continuous research on rural development. Major functions include:

a) Formulate rural development policy, co-operative laws, rules and policies;
b) Formulate and implement programmes and projects to alleviate rural poverty;
c) Assist entrepreneurs through micro-credit, agricultural credit, cooperative based small and cottage industries, cooperative banking, cooperative insurance, cooperative based farming and marketing, milk and other cooperative enterprises;
d) Initiate human resource development programmes for members of the cooperatives, provide education, training and conduct research programmes on rural development and cooperatives;

e) Innovate new models/strategies on rural development through action research;
f) Assist in the socio-economic development and empowerment of rural women through formation of formal and informal groups under cooperative programmes.

The RDCD seeks to achieve its objectives through the following Department/Agencies:

- Bangladesh Rural Development Board (BRDB)
- Department of Cooperatives
- Palli Daridra Bimochon Foundation (PDBF)
- Small Farmers Development Foundation
- Bangladesh Samabaya Bank
- Bangladesh Milk Producers' Cooperative Union Ltd. (Milk Vita)

Relevant Acts & Policies

Policy

- National Policy for Arsenic Mitigation 2004
- National Policy for Safe Water Supply and Sanitation 1998

Ministry of Finance

The Ministry of Finance consists of four divisions - 1. Finance Division (FD); 2. Economic Relations Division (ERD); 3. Bank and Financial Institutions Division and 4. Internal Resources Division (IRD).

Finance Division (FD)

Economic Relations Division (ERD) ERD is one of the important Divisions of the Government of Bangladesh which mobilizes external resources for socio-economic development of the country. ERD leads as the focal point of the Government for interfacing with the development partners as well as for co-ordination of all external assistance inflows into the country. It assesses the needs of external assistance, devises strategy for negotiations and mobilizing foreign assistance, formalize and enables aid mobilization through signing of loans and grant agreements, determines and executes external economic policy.

The interesting feature of the aid regime is that over the years, the character of the resource flow into the country has dramatically changed. The mode of foreign assistance has shifted its focus from food/commodity aid to project assistance. Foreign assistance today is basically intended for investment, which is very crucial for attaining economic development/growth and successful implementation of the MDG's. However, due to increase in demand for resources and changed outlook of the development partners, the share of grant has substantially decreased. Foreign aid has contributed immensely in the development of the socio economic sectors like education, health, agriculture, power and energy, infrastructure etc.

Bank and Financial Institutions Division (BFID)

The Bank and Financial Institutions Division (BFID) contributes to develop financial sector for economic growth of the country through formulating appropriate policy and regulatory framework. As per Allocation of Business, key functions of the BFID are as follows-

1. Administration and interpretation of the Bangladesh Bank Order, 1972 (P.O. No. 127 1972) and orders relating to the specialized banks and other matters relating to state owned banks, Insurance and financial institutions.

2. Insurance and law of Insurance.

3. Banking including Co-operative Banking.

4. Regulation of share market and future markets.

5. Co-ordination matters relating to

(a) Capital issue;
(b) Credit rate policy;
(c) Interest rate policy.

6. Review of investment policies and programs.

Internal Resources Division (IRD)

Water Resources Planning Organization (WARPO)

The Water Resources Planning Organization (WARPO) is an apex organization under the Ministry of Water Resources, dealing with nationwide water resources planning. In 1983 Government created Master Plan Organization (MPO) with a mandate to prepare National Water Plans. MPO became WARPO under Act no. xii of 1992. Flood Plan Coordination Organization (FPCO) was created in 1989 to coordinate Flood Action Plan (FAP) activities and has been merged with WARPO in January 1996

Mandates of WARPO

Mandates of WARPO are derived from the following Acts/Policy and others:

Bangladesh Water Act (2013)

As soon as possible, after the commencement of this Act, the Water Resources Planning Organisation shall, through the Executive Committee, place for approval before the Council a draft of the National Water Resources Plan prepared in accordance with the *Water Resources Planning Act (1992)*

Water Resources Planning Act (1992)

i. To formulate water resources master plans in an environmentally sustainable manner and to develop national water resources;

ii. To draw up national work plans and policy relating to scientific utilization and conservation of water resources;

iii. To advise other concerned organizations regarding the development, utilization and conservation of water resources;

iv. To co-operate with any institution in conducting surveys involved in the development of water resources, utilization and conservation and if necessary, conduct special surveys regarding any such matter;

v. To evaluate and analyse matters which develop due to the undertaking of measures by any institution involved in development, utilization and conservation of water resources and to advise on such matters;

vi. To develop standards of education, training and professionalism relating to the utilization of water resources;

vii. To collect and analyse information regarding the utilization of water resources and to disseminate the same;

viii. To organize and conduct national seminars, and having obtained the prior approval of the Government, international seminars, conferences and workshops regarding water resources;

ix. To perform such other functions as may be conferred by the Government regarding water resources.

National Water Policy (1999)

National Water Policy (1999) declared WARPO as the Secretariat to Executive Committee to National Water Resources Council (ECNWRC); the policy gave clear mandate on the following:

i. To provide administrative, technical, and legal support to the ECNWRC.
ii. To advise the ECNWRC on policy, planning, and regulatory matters of water resources and related land and environmental management.
iii. To prepare and periodically update the National Water Management Plan.
iv. To setup and update the National Water Resources Database (NWRD) and Information Management System.
v. To act as a "clearing house" for all water sector projects identified by different agencies and reporting to the ECNWRC on their conformity to the NWMP.
vi. To undertake any special study, as may be required by the ECNWRC, for fulfilling the objectives and programmes envisaged in the National Water Policy and the Bangladesh Water and Flood Management Strategy.

Coastal Zone Policy (2005)

i. To co-ordinate the development initiatives taken by different agencies in the coastal zone;

- Other mandates as conceived/emerged from NWMP, NWRC and others

i. To establish a Program Co-ordination Unit (PCU).
ii. To centrally coordinate and monitor the implementation of the "National Water Management Plan";
iii. To prepare and update National Water Law revising and consolidating the laws governing ownership, development, appropriation, utilization, conservation, and protection of water resources."
iv. To resolve interagency conflicts related to water development and management and report to ECNWRC;
v. Upkeep water resources assessment, delineate sub-regions and zones and assist relevant agencies in establishing water stress areas, flood vulnerable areas, zones for brackish aquaculture for planning of new projects and regulations for location of new industries on the basis of water availability and effluent discharge possibilities etc;

Structure WARPO was consciously designed to be a highly professional but a very lean multi-disciplinary organization. WARPO is now a multi-disciplinary organization with a team of 44 professionals from a wide range of disciplines. It is headed by a Director General who, in turn, is assisted by two Directors. At the real working level are the Chief Scientific Officers who are in charge of the technical sections overseeing the work of other professionals.

WARPO is guided by a 10-member (Board of Directors) 'Porichalona Parishad', headed by the Minister, Ministry of Water Resources and a 5-member 'Technical Committee headed by the Member, Agriculture, Water Resources and Rural Institution Division of Planning Commission. Director General, WARPO is member-Secretary to both of these setups.

Relevant Strategy, Guidelines & Plans

Strategy

- Coastal Development Strategy 2005
- NWMP Development Strategy 2001

Guidelines

- Guidelines for Environmental Assessment of Water Management (Flood Control, Drainage and Irrigation) Projects 2005
- Guidelines for Participatory Water Management 2000

Masterplans

- National Water Management Plan 2004

Bangladesh Water Development Board (BWDB)

The Bangladesh Water Development Board (BWDB) came into being in 1959 as the Water Wing of the erstwhile East Pakistan Water and Power Development Authority. After the independence of Bangladesh, the Authority was restructured in 1972 to create two separate organizations dealing with water and power separately. The BWDB was created under the Bangladesh Water and Power Development Boards Order, 1972 (P.O No 59 of 1972) as a fully autonomous organization. The BWDB, at present, identifies itself with the following visions:

1. Develop and manage water resources projects;
2. Management and mitigation of river bank erosion;
3. Stakeholders participation in project planning, design and implementation;
4. Environment friendly development;
5. Promoting food production by surface water irrigation.

The operations of the BWDB are divided into five broad areas managed by wings. These are administration, finance, O&M, planning and implementation. The Director General (DG) is the chief executive of the organization and is assisted by five Additional Director Generals (ADG) looking after the five wings. The DG's office and the five wings form the core of the headquarters of the BWDB. At this stage, it is worthwhile to look at functions of the two relevant wings: Planning & Operation & Maintenance.

PLANNING WING:

a) Providing inputs and technical reviews for the preparation of National Level Perspective and the Five Year Development Plans.

b) Micro planning for water resources development consistent with the National Water Policy and within context of the National Water Management Plan (NWMP).

c) Hydrological studies, data collection, management and research.

d) Undertaking activities for formulation and preparation of planning documentation for BWDB projects.

e) Maintaining updated management information related to planning of water sector development.

f) Supporting WARPO and other water sector agencies in the development of efficient water resources management and utilisation of plans and updating various Guidelines on water management.

O&M WING:

a) Preparing and updating of inventory of completed projects containing all basic project information.
b) Operation and maintenance of completed projects over 5000ha as outlined in the NWPO.
c) Providing management guidelines and necessary assistance to local and community organizations and the local governments for O&M of schemes with command area below 5000 h.
d) Rehabilitation of projects under GOB funding and as directed by the Board from time to time.
e) Transfer of rehabilitated/operating projects of 1000ha or below to the local governments.
f) Water management activities as indicated in the NWPO.
g) All activities under the Food for Works (FFW) programme.
h) Cost recovery, command area development and matters related to participatory water management.
i) Preventive work to forestall damage to water infrastructures due to natural disasters, damage assessment and emergency repairs following natural disasters.

BWDB is basically a field-oriented organization to the extent that all its activities lay outside the Dhaka city. Except for the administration wing, all other wings have their field outfits extending deep inside the rural areas. The basic work of

the organization is carried out by the O&M wing which manages the largest number of professionals in the field. Implementation wing carries out large civil engineering works and on completion, hands them over to the O&M wing. Implementation units in the field are, therefore, temporary whereas O&M set up are permanent. The field outfits of Planning and Finance wings provide necessary support to the O&M and Implementation wings in carrying out their work smoothly.

Department of Haor and Wetland Development

For integrated development of haor areas, Government of Bangladesh formed Haor Development Board by an ordinance on 22nd February of 1977. Later on it was abolished on 21st September 1982 by the then government. The present "Bangladesh Haor and Wetland Development Board (BHWDB)" was created under Ministry of Water Resources by a Presidential order on 11th September 2000 but under the *Bangladesh Haor & Water Bodies Development Board Act 2014,* Bangladesh Haor Development Board has been provided the status of a Directorate attached to the Ministry of Water Resources.

The BHWDB is governed by a Board consisting of 13 members headed by the Prime Minister. It is the highest authority for approval of policy directives for the BHWDB. There is a 10-member Executive Committee chaired by the Minister, Ministry of Water Resources. This Executive Committee provides assistance to the Board.

For operational purpose, the BHWDB is headed by the Director General. The DG is supported by two Directors: Director (Finance & Admin) and Director (Wetlands) who in turn assisted by three Deputy Directors: Deputy Director (Engineering), Deputy Director (Agriculture & Fisheries) and Deputy Director (Land & Environment) and two Deputy Directors located at regional offices at Kishoreganj and Sunamganj.

Functions

- Coordinate the integrated development of the haors and wetlands of Bangladesh among the ministries, agencies and local government bodies. For this purpose, prepare a Master Plan for integrated development of haors and wetlands;
- Formulate projects related to the development of haors and wetlands and implement projects through local government bodies and other agencies;
- Examine and co-ordinate different projects to be implemented by different ministries and agencies and provide proper advice to the implementing agencies; and
- Take necessary steps to perform the activities of the Board.

Relevant Strategy, Guidelines & Plans

- Master Plan of Haor Area 2012

Local Government Engineering Department (LGED)

Local Government Engineering Department (LGED) is one of the largest public sector organizations in Bangladesh entrusted for planning and implementation of local level rural urban and small scale water resources infrastructure development programs. The broad objectives of LGED's development activities are to improve the socio-economic condition of the country through supply of infrastructures at local level and capacity building of the stakeholders. LGED promotes labour-based technology to create employment opportunity at local level and uses local materials in construction and maintenance to optimize the project implementation cost with preserving the desired quality. LGED works in a wide range of diversified programs like construction of roads, bridges/ culverts and markets to social mobilization, empowerment and environmental protection.

The organizational background of LGED can be traced back to early sixties when implementation of works program (WP) comprising Rural Works Program (RWP), Thana Irrigation program (TIP) and Thana Technical Development

Committee (TTDC) was started. A ''Cell'' was established in the Local Government Division (LGD) under the Ministry of Local Government, Rural Development and Cooperative (MLGRD&C) in 1970s. To administer WP nationwide, the Works Program Wing (WPW) was created in 1982 under the Development Budget. It was reformed into the Local Government Engineering Bureau (LGEB) under Revenue Budget of the Government in October, 1984. LGEB was upgraded as the Local Government Engineering Department (LGED) in August, 1992.

The major functions of LGED can be broadly categorized as follows:

- Rural infrastructure development
- Urban infrastructure development
- Small scale water resources development

Other than those above, LGED is extensively involved with *rural infrastructure maintenance program* throughout the country.

Rural infrastructure development program:

The main intervention for rural infrastructure development programs is to develop rural road transport network to improve accessibility to Growth Centers (GC), important social & administrative points and also development of GCs to expand marketing facilities of farm and non-farm products of the rural areas. There are 2100 GCs and 18000 small markets across the country. The rural infrastructure development activities that LGED implement are listed below.

- Construction of Upazila and Union roads and bridge/culverts on those roads.
- Development of Growth Centers (GC)
- Construction of Union Parishad (Council) Complexes and Primary Schools.
- Construction of Jetty and boat landing.
- Constructions of cyclone shelters and Killas (Elevated earthen place for the shelter of livestocks during flood)
- Development of technical specifications and manuals for construction of rural infrastructures.
- Development and updating of rural road master plan, infrastructure database and digital maps.
- Development of Upazila and Union plan book to facilitate local level planning and participation
- Provide technical support to Zila and Upazila Parishads
- Tree plantation on the slope of roads and embankments.

Urban infrastructure development program:

- LGED provides technical and management support to Urban Local Government Institutions (City Corporations, City Councils) to implement urban infrastructure development programs. The overall activities are as follows: Planning and implementation of integrated town centre (bus terminals, markets etc.)
- Planning and implementation of municipal roads, bridge/culverts, drainage, water supply and sanitation projects.
- Planning and implementation of solid waste management projects
- Planning and implementation of slum upgrading projects
- Development of Land use plan, survey & digital mapping.
- Development of database and software for the use of municipalities to improve planning & management capacity and resources mobilization & management.
- Institutional development of municipalities through training and computerizations.
- Preparation of district and upazila town master plan.
- Development of technical specifications and manuals for construction of urban infrastructures.

Small scale water resources development program:

The intervention of LGED for small scale water resources development program is limited up to the command area 1000 hectares. LGED implements the program involving the stakeholders during preparation and implementation stages and the operation & maintenance (O&M) of the project is taken-up by stakeholders through WMCA (Water Management Cooperative Association- which is an elected committee by the stakeholders). The overall activities are as follows:

- Construction of flood protection embankment
- Conservation of water for irrigation and improvement irrigation systems
- Construction of water control structures and Rubber Dams.
- Excavation and re-excavation of Canals.
- Training to stakeholders and WMCA members.

Rural infrastructure maintenance program:

There are total 0.265 million kilometres of roads and 1.2 million meters length of bridge/ culverts under jurisdiction of LGED and LGIs. Once a road is developed or bridge/culverts are constructed, it becomes a public asset. So maintenance of these assets is very vital without which transport systems turn less effective that implicates road safety, vehicle operating cost and many other things. There are three types of maintenance: routine maintenance, periodic maintenance and emergency maintenance for special circumstances like disaster or other natural calamities. The maintenance functions of 'RIMMU – Rural Infrastructure Maintenance Management Unit' are as follows:

- Update and maintain roads and structure database.
- Prepare annual maintenance plan and budget.
- Develop maintenance guidelines and manuals.
- Conduct traffic and road condition survey

LGED is headed by a Chief Engineer and is assisted by five Additional Chief Engineers at the HQ and two Additional Chief Engineers at Dhaka & Rajshahi Divisions. The Department is basically a field-oriented organization and its presence is visible even in the villages. Besides the HQ staff, there is permanent standard set- up for each of the 64 districts and 463 thanas. The cost of this permanent establishment is borne by the GOB through its revenue budget.

Functioning of LGED activities are geared through 16 units: Administration, Planning, Monitoring & Evaluation, Training, Design, GIS, MIS, Maintenance, Procurement, Urban Management, IWRM, Road Safety, Quality Control, Library, Technical Support and Gender & Development Forum.

In order to carry out its mandate for rural infrastructure development, LGED has been trying to develop the necessary planning tools. GIS unit of the LGED has completed digitization of Upazila base map at 1: 50,000 scale for the whole country. The Upazila base map data have been integrated to produce the district base maps. LGED has also prepared the union plan book for selection of priority infrastructure development schemes.

Department of Public Health Engineering (DPHE)

The Department of Public Health Engineering is the national lead agency for provision of drinking water supply and waste management in the country excepting cities where WASAs operate.

The Department of Public Health Engineering (DPHE) is one of the oldest Departments inherited from the British colonial period. Originally created in 1936 as a government entity for the whole of undivided Bengal, it had started functioning as a Directorate of the erstwhile Government of East Pakistan right from 1947. With the creation of the Dhaka and Chittagong Water and Sewerage Authorities in 1963, the functions of the Department in those two cities were transferred to the new entities. Similarly, its water pollution function was transferred to the Environment Control Board created in 1977. That Board has later become the Department of Environment.

With the challenges generated by the discovery of arsenic in incremental areas since its first detection in 1993, DPHE with its development partners is trying to ameliorate the sufferings caused by the lack of safe water. Alternative options for safe water supply are being catered in worse affected areas. Similarly for excreta and other waste management DPHE is implementing different projects to achieve an improved environment. Local governments, urban and rural, are involved in the delivery of WSS services.

Functions

1. Except Dhaka, Chittagong, Khulna and Rajshahi city areas and Narayanganj town, DPHE is responsible for the Water Supply and Sanitation (Human excreta & sullage disposal, drainage and solid waste management) of the whole country, both in rural and urban (City Corporation, Pourashava, Upazila HQs and growth centres) areas.
2. In Urban areas the DPHE solely or jointly with the pourashava be responsible for Water Supply & Sanitation services. Also DPHE is responsible for assisting the Pourashavas and City Corporations through infrastructure development and technical assistance.
3. Assist Local Government Institutions (City Corporations, Pourashavas, Union Parishads etc) in the Operation & Maintenance of the Water Supply & Sanitation infrastructure & services including technical assistance.
4. Ensure supply of adequate number of trained & skilled manpower in the Water Supply & Sanitation sector through HRD of the sector personnel & institutions for proper and sustainable management of infrastructure and services.
5. Strengthen water testing facilities through establishment of laboratories at different levels in order to institutionalize Water Quality Monitoring and Surveillance program throughout the country both in rural and urban areas to ensure safe water for the people.
6. Carryout Hydro-geological investigations in search of safe source (both surface & ground) of water supply.
7. Social Mobilization for Awareness raising towards proper management of water supply & sanitation infrastructure and promotion of personal hygiene practices.
8. Develop safe water supply technologies in the Arsenic affected and other hydro-geologically difficult areas (Saline belt, stone problem areas, hilly regions and areas likely to be affected by other micro-pollutants).
9. Research and Development activities in search of appropriate and affordable options including the indigenous ones of water supply and sanitation in the country.
10. Ensure water supply and sanitation services/ facilities during and after the natural disasters/ calamities.
11. Establish National Water Supply & Sanitation Information Center as a centre of excellence for sectoral information management.
12. Capacity building of the community, LGIs, private entrepreneurs and NGOs with technical know-how, information, training etc. in terms of water supply and sanitation.
13. Monitoring and coordination of activities of the stakeholders including NGOs & private operators working in the Water Supply and Sanitation sector.
14. Overall management of the Water Supply & Sanitation Sector Development Programme.

Relevant Strategy, Guidelines & Plans

Strategy

- National Sanitation Strategy 2005
- Pro Poor Strategy for Water and Sanitation Sector in Bangladesh 2005

DPHE is headed by a Chief Engineer and is assisted by three Additional Chief Engineers, Planning, Water Resources & Works. Additional Chief Engineer (Planning) works through three Circles – Planning, Store and Feasibility Study & Design. Additional Chief Engineer (Water Resources) works through two Circles – Ground Water and Water Quality Monitoring & Surveillance. Additional Chief Engineer (Works) works through field based nine Circles – Chittagong,

Dhaka, Khulna, Rajshahi, Chittagong Hill Tracts, Sylhet, Faridpur, Barisal and Rangpur. It is through these field Circles that the vast network of the DPHE extends upto the village level. The field establishment has a standard staffing pattern for all the districts and the Upazilas in the country.

Department of Agricultural Extension (DAE)

Agricultural extension is a century-old practice. After the independence of Bangladesh, Government took initiatives to strengthen agriculture extension program and established Cotton Development Board, Tobacco Development Board, Horticulture Board. In 1975 agriculture directorate (Extension and Management) and Jute directorate were established. In 1982 six agencies responsible for technology transfer were merged to form the present Department of Agricultural Extension (DAE).

From 1977 to 1990 the DAE conducted the agriculture extension activities under the concept of Training & Visit (T&V) approach. But since 1990 the agriculture extension programs have been going on successfully under the concept of group approach. In 1996 government adopted the New Agriculture Extension Policy (NAEP) to conduct a well-planned Agriculture Extension Service in Bangladesh.

The Department of Agricultural Extension's mission is to provide efficient and effective needs based extension services to all categories of farmer, to enable them to optimize their use of resources, in order to promote sustainable agricultural and socio-economic development. Functions of the DAE, in general, are:

- To provide farmers with the latest results of research and scientific farm-techniques for their socio-economic betterment.
- To motivate and help farmers adopt improved production practice which would increase their farm production and thereby meet national consumption requirements, maximize exports and minimize import.
- To assist farmers to arrive at the most promising course of action for maximizing production and income keeping in view their own needs, resources and abilities.
- To help develop self-reliance and co-operation by training local leadership for organized group action
- To provide channels for service and information from the MOA and its different departments to the farm people and in turn relay the problems and the needs of the farmers that require national level intervention
- To provide an efficient linkage between the various research institutions and the farmers so that along with the flow of technology to the farmers, the farm level problems are also brought to the relevant research institutes for investigation and solution
- To provide educational opportunities in agriculture, especially for front line extension workers, and all rural masses, adults and youth
- To serve as liaison between farmers and other organizations, both public and private concerned with over-all socio-economic development of the rural people, including the credit-giving and input-supply agencies.

Relevant Strategy, Guidelines & Plans

- The Master Plan for Agricultural Development in the Southern Region of Bangladesh 2012-2021, 2013
- Strategic Plan 2002-2006, 2002

The Department is headed by a Director General who is assisted by Directors and Additional Directors. The functions of the DAE have been divided into eight broad areas and are allocated to the eight Wings, as they are called, in the

following manner:

- Administration and Personnel Wing
- Food Crops Wing
- Training Wing
- Planning and Evaluation Wing
- Field Services Wing
- Plant Protection Wing
- Cash Crops Wing
- Project Implementation Wing

Four of these Wings are responsible for the provision of technical support to extension staff in issues related to Food Crops, Cash Crops and Plant Protection, Project Implementation. Field Services Wing is responsible for providing extension services to farmers throughout the country. Training Wing is responsible for providing training services which equip extension staff with the skills necessary to provide high quality services. Planning and Evaluation Wing is responsible for project preparation and on-going monitoring of projects, the Management Information System (MIS), and the evaluation of extension programmes.

The organizational set up of the DAE, except for the Division, follows the administrative jurisdictions of the country and has offices at corresponding levels of the Divisions, Districts and Upazilas. Beyond this, the organizational reach of the DAE goes down to the village level. It is one of the few organizations that are represented at that level. DAE's frontline staff is the Block Supervisors (BS) who deal directly with the farmers. One or more village constitutes a block level. Each block comprises of about 1000 farm families depending on cropping intensity and geographical location. Each block is manned by a Block Supervisor who is responsible for all extension activities in the block.

The BSs are supported by up to five agriculture specialists at the Upazilas. Each Upazila is manned by three agricultural graduates—one of them is in charge of the Upazila Agriculture Office (UAO) while the other two provide him with technical support.

In the field establishment, the district plays the most crucial role. Upazilas falling within the jurisdiction of a district are coordinated by the Deputy Director of Agriculture (DDA). The DDAs are supported by between two to three subject-matter specialists and a District Training Officer. There are 10 regional offices, as against six administrative divisions, to oversee and coordinate the activities of the DDAs.

The Training Wing has the responsibility to draw the Training Master Plan and execute it through 11 Agricultural Training Institutes (ATI) located at different parts of the country as well as through the Central Extension Resources Development Institute (CERDI).

A National Agriculture Committee exists with the Minister for Agriculture as the chairperson to coordinate and monitor agricultural development programs of government organizations, private institutions and the NGOs. This Committee also provides guidance to the field level committees at the district, Upazila and union level for overall development of the agriculture sector.

Department of Fisheries (DoF)

The Department of Fisheries (DOF) is the principal institution for the management and development of fish resources of Bangladesh. Its activities are supported by four other sister organizations, namely, the Bangladesh Fisheries Development Corporation (BFDC) and the Bangladesh Fisheries Research Institute (BFRI), Fisheries & Livestock Information Department and Marine Fisheries Academy.

Mandate of the Department of Fisheries

- To disseminate improved aquaculture technologies through training and demonstration and to extend extension advisory services to the focal stakeholders.
- To enhance fisheries resources through enacting conservation and management measures.
- To assist the administrative ministry to formulate policies, acts etc.
- To enforce quality control measures and issuance of health certificates for exportable fish and fish products.
- To conduct fisheries resources survey and assessment of stock to develop fisheries database for proper planning.
- To facilitate arrangement for institutional credit for fish and shrimp farmers, fishers and fish traders and entrepreneurs.
- To facilitate alternative income generating activities for rural poor and unemployed people towards poverty alleviation.
- To formulate and implement development projects /programs towards sustainable utilization of fisheries resources to ensure food security.
- To disseminate improved aquaculture technologies through e-Extension service

Relevant Strategy, Guidelines & Plans

Strategy/ Plans/ Guidelines/Codes

- National Fisheries Strategy & Sub-Strategies 2006
- Action Plan for the Implementation of the National Fisheries Strategy (Draft) 2006
- Code of Conduct for Selected segments of the Aquaculture Industry in Bangladesh 2011

The DoF is headed by the Director General, who is assisted by four Directors (one reserve) and 2 Principal Scientific Officer (equivalent to Director). There are 1553 technical officers of different stairs and supporting staffs in the DoF. They render their services to achieve the mission and vision of then DoF. There are administrative set-ups at division, district and Upazila (sub-district) levels headed by Deputy Director, District Fisheries Officer and Senior/Upazila Fisheries Officer respectively. Besides these, there are three fish inspection and quality control stations. Furthermore DoF also comprises of Marine Fisheries Station, Fisheries Training Academy, Fisheries Training and Extension Centers, and Fish Hatcheries.

Forest Department (FD)

Forest Department (FD) was established in 1862 as a government service. The role of the FD was formalized by enacting the Forest Act of 1878. The Act generally aimed at regulating and improving the administration of different types of forests.

The administrative head of Forest Department is the Chief Conservator of Forest (CCF). The Forest Department is divided into four wings considering magnitude of the works and line of jurisdiction. Each wing is administered by a Deputy Chief Conservator of Forest (DCCF). The Wings are: Forest Management Wing, Social Forestry Wing, Planning Wing and Education and Training Wing.

Relevant Strategy, Guidelines & Plans

Plans/Master Plans

- Bangladesh Tiger Action Plan 2009-2017
- Forestry Sector Master Plan, 1993-2012

There are nine Circles in the Forest Department, each circle is headed by a Conservator of Forest (CF). These are five Forest Management Circles, three Social Forest Circles and one Wildlife and Nature Conservation Circle.

Similarly there are 44 Forest Divisions, each division is headed by a Divisional Forest officer (DFO) / (DCF). These are 24 Forest Management Divisions, 13 Social Forest Divisions, four Wildlife Management and Nature Conservation Divisions and three Management Plan Divisions.

Land Record and Surveys Department (LRSD)

"Land Record Department" was established as an independent department in 1888. In 1975 it was turned into a department and office was renamed as "Department of Land Records and Surveys". Responsibilities of the Land Record and Survey Department are:

- Within a certain time frame or any district or districts in the entire country, and consists of a portion of the rights to be ready to map / correction.
- Each of the phases in the whole country maujarah
- Each groundwater - and village land record survey map sheets prepared / fixed.
- Every Land Owner Records of Right (ROR) or the rights / rights formulated and print.
- Each Upazila, district and prepare a map of the entire country, and purnamudrana print.
- Via surveys to determine the control points of the map consists trabharsa prastute theodolite-knowing.
- Identifying the international borders of the country, bordering stripa prepare and print the map.
- In determining the boundaries of inter- district and inter- district administrator who provide technical support to police.
- District / Thana purnagathana technical and geographical demands regarding the credibility of the official performing the audit.
- International and inter-district maps, Cadastral surveys and provide advice to government land reform program.
- To organise training on land survey & settlements for BC S. (administration, police) and other cadres and judicial officers.

The LRSD is headed by a Director General who is assisted by three Directors at the Headquarters level. There are three broad areas of responsibility at the HQ, namely, administration, land records and survey. Each of these areas is looked after by a Director. The main field establishment is attached to the Director (Land Records) who is basically responsible for all settlement operations. Director (Survey) is connected with demarcation of international, inter-divisional and inter-district boundaries.

A total of 20 Zonal Settlement Offices for zonal settlement operations are located at the greater district areas of Dinajpur, Rangpur, Borga, Mymensingh, Jamalpur, Tangail, Sylhet, Dhaka, Pabna, Rajshahi, Faridpur, Kushtia, Comilla, Noakhali, Jessore, Khulna, Barisal, Patuakhali, Chittagong and Hill Zones.

Diara Settlement Office is located in Dhaka and two Diara Regional Settlement Offices are located in Chittagong & Barisal.

Department of Disaster Management (DDM)

Department of Disaster Management (DDM) was set up in November 2012 following enactment of the *Disaster Management Act* 2012. The Department has the mandate to implement the objectives of Disaster Management Act by reducing the overall vulnerability from different impacts of disaster by undertaking risk reduction activities; conducting humanitarian assistance programs efficiently to enhance the capacity of poor and disadvantaged as well as strengthening and coordinating programmes undertaken by various government and non-government organizations related to disaster risk reduction and emergency response. DDM is responsible to execute the directions,

recommendations by the Government in connection with disaster management as well as the national disaster management principles and planning

DDM has the vision to be recognized as a vibrant Centre of Excellence for knowledge, research and capacity building on disaster management for the Disaster Management professionals across level. DDM conducts research, organizes workshops and training programmes, publishes its reports and documents and provide various policy advisory services to the concerned Ministry of the Government of Bangladesh.

Relevant Strategy, Guidelines & Plans

- Flood Response Preparedness Plan 2014
- Emergency Preparedness Plan for Cyclones 2014
- National Plan for Disaster Management 2010-2015, 2010

DDM headed by the Director General focuses on networking and collaborating with the various Ministries, Departments and Scientific, Technical, Research, Academic institutions, Development Partners, UN Agencies and non-government Organizations within and outside the Government working on various aspects of disaster risk reduction and response management. DDM achieves its objectives through the cooperation of a multiplicity of organizations, both public and private.

The Standing Order on Disaster outlines arrangements and are carried into action through a number of committees from the national level to the village level. These Councils/Committees operate at two levels—the higher level Committees deal mostly with policy and overall coordination and the lower level Committees dealing mostly with implementation. Councils/Committees are:

- National Disaster Management Council (NDMC)
- Inter-Ministerial Disaster Management Coordination Committee (IMDMCC)
- National Disaster Management Advisory Committee(NDMAC)
- Earthquake Preparedness and Awareness Committee (EPAC)
- National Platform for Disaster Risk Reduction (NPDRR)
- National Disaster Response Coordination Group (NDRCG)
- City Corporation Disaster Management Committee (CCDMC)
- Cyclone Preparedness Programme Implementation Board (CPPIB)
- Committee for Speedy Dissemination and Determination of Strategy of Special Weather Bulletin
- Committee for Focal Points Operational Co-ordination Group (FPOCG)
- Co-ordination Committee of NGOs relating to Disaster Management (NGO Coordination)
- District Disaster Management Committee (DDMC)
- Upazila Disaster Management Committee (UzMC)
- Union Disaster Management Committee (udmc)

National Disaster Management Council (NDMC) is the highest-level policy formulation and coordination body for disaster management chaired by the Prime Minister. It is mandated to meet normally once a year and are concerned with these two set of activities: establishing policies and providing overall directions for all aspects of disaster management and defining priorities and criteria for the allocation of resources.

Department of Environment (DoE)

The first environmental activities in Bangladesh were taken soon after the Stockholm Conference on Human Environment in 1972. As a follow up action to the Stockholm Conference, the Government of Bangladesh funded, under the aegis of the Department of Public Health Engineering and with a staff level of 27 and after promulgating the Water Pollution Control Ordinance in 1973, a project primarily aimed at water pollution control.

In 1977, Environment Pollution Control Board with 16 members headed by a Member of the Planning Commission and Environment Pollution Control Cell headed by a Director with staff complement of 26 was established. This was followed in 1977 by the establishment of the Environment Pollution Control Project, in 1985 by the establishment of the Department Pollution Control and finally, in 1989 by the restructured and renamed the Department of Environment.

Regular Activities of the DoE

- Survey of industrial pollution; identification of polluting industrial units; encourage/compel polluting industrial units to take measures for pollution control and if necessary, under the Environment Protection Act, take actions through mobile Environment Court against polluting industry/individual by initiating court cases.
- Obtain compensation from environmental polluters
- Based on application from new or existing industrial units/projects, conduct necessary inspection and examination before providing environmental clearance certificates;
- Review and approval of the Environmental Impact Assessment (EIA) report received from the Government, non-governmental organisations or individuals, and to provide advice on the EIA to be completed ;
- Receiving complaints regarding environmental pollution and settle through proper investigations; conduct mobile courts against indiscriminate hill cutting, vehicle fitness and polluting vehicles;
- Air and water quality monitoring, air, water and liquid waste sample analysis in laboratories;
- Regular collection of samples from ponds, tube well or other drinking water sources from different areas of the country for diagnosis, analysis, creating data base and report preparation;
- To take necessary local level measures under environment related regional and international conventions, agreements and protocols to comply with the obligations;
- Undertake and implement actions at national and international levels to counter the effects of climate change;
- Undertake programs in the field of biosecurity and biodiversity conservation of the country;
- Undertake controlled import of toxic and hazardous chemicals, transport and use;
- Control of ozone layer depleting substances;
- Undertake effective biodiversity conservation programs through people's participation in Ecologically Critical Areas (ECAs);
- Undertake campaign to create public awareness on environmental issues and easy access to environmental information, observe environmentally important international days;
- Prepare and distribute 'State of the Environment' Report at regular intervals
- Undertake participatory programs with social/cultural/ professional groups to encourage peoples' participation in environment conservation and management;
- Undertake and implement projects and research on important environmental issues;
- Take legal actions against production and marketing companies of banned polythene bags;
- Review and evaluate different projects/initiatives at governmental & non-governmental levels to provide comments/suggestions on environmental issues;
- Undertake training, workshops, consultation meetings at both governmental & non-governmental levels for capacity building regarding environment protection and management
- Actively participate in different committees constituted at all relevant ministries and their Zila and Upazila level offices.

Relevant Strategy, Guidelines & Plans

- National 3R Strategy for Waste Management 2010
- National Action Program for Combating Desertification in Bangladesh 2005
- Bangladesh: National Programme of Action for Protection of the Coastal & Marine Environment from Land-Based Activities
- National Adaptation Programme of Action (NAPA) 2005

- Sustainable Environment Management Plan (SEMP) 1999
- National Environment Management Action Plan (NEMAP)1995

Activities of the DoE are overseen by the Director General. The Department discharges its responsibilities through a head office and six Divisional offices located in Dhaka, Chittagong, Khulna, Bogra, Barisal and Sylhet. The Government has set up 21 new offices at district level with the creation of 468 new positions. As a result, the DOE staff has been increased to 735.

Bangladesh Inland Water Transport Authority (BIWTA)

To set up Authority for development, maintenance and control of inland water transport and of certain inland navigable waterways the then East Pakistan Government on 31st October 1958 promulgated an ordinance called the East Pakistan Inland water Transport Authority Ordinance 1958 (E.P. Ordinance, NO LXXV of 1958). On November 4, 1958 the Government by an order constituted a three member Authority of East Pakistan Inland Water Transport Authority (EPIWTA). The BIWTA came in to existence on promulgation of the above ordinance 1958 as the successor of the former EPIWTA. An advisory committee have subsequently been constituted to advise the authority in respect of all matters related to development, maintenance and operation of inland water transport and of inland waterways in Bangladesh.

The activities / functions

As per Section 15 of the Ordinance E. P. Ordinance No. LXXV of 1958; amendment Ordinance No. LV of 1977, the Authority performs statutory functions of development, maintenance and regulatory nature.

Development and Maintenance functions

- Carry out river conservancy works including river training works for navigational purposes and for provision of aids to navigation including marks, buoys, lights and semaphore signals.
- Disseminate navigational and meteorological information including publication of river charts;
- Provided pilotage and hydrographic survey services.
- Draw up programmers of dredging requirements and priorities for efficient maintenance of existing navigable waterways and for resuscitation of dead or dying rivers, channels, or canals, including development of new channels and canals for navigation.
- Develop, maintain and operate inland river ports, landing/ferry ghats and terminal facilities in such ports or ghats.
- Carry out removal of wrecks and obstruction in inland navigable waterways.
- Conduct traffic surveys to establish passenger and cargo requirements on the main rivers, feeders and creek routes.
- Develop rural water transport by progressing of schemes for modernising and mechanizing country craft.
- Ensure co-ordination of Inland Water Transport with other forms of transport, with major sea ports, and with trade and agricultural interests for the optimum utilisation of the available transport capacity.
- Conduct research in matters relating to Inland Water Transport including development of
- Craft design
- Technique of towage
- Landing and terminal facilities
- Port installations
- Arrange programmes of technical training for Inland Water Transport personnel.
- Maintain liaison with the shipyard and ship repair industry to meet the requirements of the Inland Water Transport fleet repairs and new constructions.
- Maintain liaison with the Government and facilitate import of repair materials for the Inland Water Transport Industry.

- Prepare plans or schemes for carrying out any of the above mentioned functions.

Regulatory functions

a) Fixation of maximum and minimum fares and freight rates for Inland Water Transport on behalf of the Govt.;
b) Approve time tables for passenger launch services.
c) Inspection ships, cargo and inland vessel to ensure compliance with the provision of ISO -1976
d) Act as the Competent Authority of Bangladesh for the protocol on Inland Water Transit and Trade, looking after the use of waterways of Bangladesh on behalf of the Govt. of Bangladesh for the purpose of trade and transit between Bangladesh and India as provided in the Protocol.

The Authority is composed of a Chairman and three other members, Member Engineering, Member Planning & Operations and Member Finance. The Chairman is the chief executive officer of the Authority and is accountable to the MOS for his actions and performance. There are 17 different departments.

BASELINE STUDY: 23

Information and Knowledge Management

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Executive Summary: Study 23

It is expected that during the BDP 2100 project, a lot of information and scientific data will be gathered and produced, starting with the Baseline Studies. Information is needed for the development of the Climate Atlas, and the formulation of the various measures, scenarios, Delta Vision, Delta framework and implementation. The information that (is going to be) /(will be) produced during the project will be stored in a knowledge repository, with all the relevant reports, documents, presentations and minutes of meeting. The baseline study report is being prepared for the development and implementation of this knowledge portal.

This baseline study report describes the Information and Knowledge Management practice of different government organizations and other stakeholders. A number of organizations such as BWDB, WARPO, BBS, BHWDB, BMD, DLRS, SoB, and LGED are currently using state of the art technology to efficiently manage information. Existing situation of databases, data management and Information Portals of different organizations such as National Water Resources Database (NWRD), Integrated Coastal Resources Database (ICRD), Integrated Haors & Wetlands Resources Database (IHWRD) and other databases are described briefly. These information and knowledge management system help to organize and store information and assist in national level as well as local level planning and decision making. Latest hardware, software and other ICT facilities that are being used by different government and private organizations for knowledge management, exchange and sharing are mentioned here.

The report covers the vision, challenges, data validation and the model of the knowledge portal. Activities required for the development of the portal, information and data processing, features and functionalities of the knowledge portal, accessibility of data by wide range of users are also mentioned in the report.

An efficient action plan including needs assessment and design of the initial system architecture of the portal is described in detail. The portal will be designed and developed using the standard four-tier architecture of software development. The main challenges to the development of information and knowledge management system for BDP 2100 are: unavailability of required information or availability of information from source organizations in unusable format, reluctance of sharing of data with others, periodic update and sustainability of the developed system. The probable solution of sustainability is to seek assistance for system maintenance from any partner organizations having required facilities readily available. Every year GED can allocate GoB for periodic updating of the portal. Finally a detailed work plan for implementing the system is presented at the end of the last chapter of the report.

One of the aims of the BDP 2100 project is to make information on vulnerabilities and climate change risks accessible for further planning and implementation purposes. One of the key challenges is to give easy access to available maps and spatial information in such a way that it can be used by planners and decision makers in problem analysis, strategy-making and monitoring steps. Delta Tools were developed for this purpose. The Delta Tools are developed to access and to interact with the data in the information portal.

The 'meta-modelling pilot project' is a pilot activity of BDP 2100. The main purpose of the pilot is to demonstrate the potential of meta-modelling to support decision making process on Delta planning in Bangladesh. Decision-making for the Delta plan includes all key socio-economic sectors. Integrated impact analysis is therefore the key. The pilot project is also aimed at supporting decision-making under conditions of uncertainty and developing an *adaptive plan*. For this purpose a model is required that can deal with simulations in a limited time as multiple combinations and sequences of actions under multiple futures; such model is known as the meta model.

1. Introduction

1.1. Introduction and Scope

During the BDP 2100 project a lot of information and scientific data will be gathered and produced, starting with the Baseline Studies. The information is needed for the development of the Climate Atlas and the formulation of the various measures, scenarios, Delta Vision, Delta framework and implementation. The information produced during the project will be stored in a knowledge repository, with all the relevant reports, documents, presentations and minutes of meeting. It also contains all relevant studies, articles and other background material used during the analysis and formulation of the plan. This knowledge base is accessible to all those involved in the program and can be consulted by third parties for study purposes, via a web-based information portal. The quality of the deliverables that are produced by the project will depend completely on the availability of validated, trustworthy data and information. Therefore the knowledge infrastructure that underlies the collection, storage and dissemination of the data and information is far more than 'just' a database with access via the internet.

It is a vital tool in the process of enriching the collected data facts during the baseline studies, scenario analysis, stakeholder consultations using the touch table, towards information that can be used in the participatory planning phase and the definition of the adaptive delta plan. The data and information in this tool form the base in which the plan will be developed.

In line with the national policy on Right to Information (RTI), this information will be made, transparently and accessibly, available online in a data archiving facility. This imposes requirements on the way the data is stored, maintained and made accessible to the various user groups.

1.2. Objectives

The main objective of the study is to prepare a baseline study report for BDP 2100. The specific objectives are as follows:

1) To evaluate existing systems, principles, problems, developments and (government) plans for Information, data and knowledge management regarding BDP 2100 related aspects;
2) To facilitate the identification of challenges and opportunities for the development of an information portal and database as well as knowledge management for BDP 2100;
3) To inform / get input from the stakeholder analysis carried out in other baseline studies;
4) To prepare and contribute to the creation of a common knowledgebase;
5) To identify knowledge gaps and research needs.

1.3. Deliverables

The deliverables of the study are as follows:

- Open data portal and web-based user interface
- Process design (from data to information to implementation, data digitizing and archiving) with data and information usage policy
- Strategic data conservation plan (data update, maintenance, project legacy)
- Functional and technical design of the database structure
- Draft and Final Baseline Study Report.

1.4. Approach and Methods

In order to prepare an efficient approach and methodology to carry out the activities of the study successfully, a thorough investigation has been done on the ToR. To make the approach and methodology more effective, available

literature and existing system will be reviewed. The requirements will be identified and finalized through discussion with the client. Depending on the requirements, initial architecture of the system will be designed. Based on the initial architecture, the knowledge portal will be developed, tested and installed in the live server.

Data and information on Bangladesh Delta is available in different scales and sectors. The developed knowledge portal will accumulate all the generated knowledge integrating the multi-sectoral issues covering spatial scales and a spatial dimension. Data will be processed to produce information aggregated and summarized according to clusters and themes. Integrated and cross-sectoral analysis of the available data and information will help generating knowledge including new scenarios for future perspective.

2. Describing Existing Situation

2.1. Stakeholders in Information and Knowledge Management

The process of capturing, generating, storing, disseminating and effectively using information and knowledge is called knowledge management. A huge amount of information and knowledge are being continuously generated under different projects and studies undertaken by different government organizations. This knowledgebase information needs to be stored and managed properly to be used in future. A number of organizations such as BWDB, WARPO, BBS, BHWDB, BMD, DLRS, SoB, and LGED are now using state of the art technology to efficiently manage this information.

2.2. Existing situation of databases, data management and Information Portals

2.2.1. Water Resources Planning Organization

National Water Resources Database

National Water Resources Database (NWRD) was established by WARPO with the assistance of EGIS II, predecessor of CEGIS, to provide data and information required for the development of National Water Management Plan (NWMP). It is the largest geo-spatial database in the water sector of the country. It contains more than 500 data layers consisting of spatial, temporal and attributes information. The data available in NWRD have been collected and collated from different data providing agencies. Data are organized in NWRD into several data groups like Base data, Surface water, Groundwater, Soil and Agriculture, Fisheries, Forest, Socio-economic, Meteorological, Documents and Reports, Environment and Images. Each Data Group is sub-categorized into number of Data Types. Each Data Types contains several Data Layers.

A web enabled user-friendly interface has been developed for NWRD to view, query and analysis data from the database. The interface contains five components. *Metadata Viewer* helps to view metadata. *Data Source Viewer* is designed to view spatial, tabular and temporal data. *Time Series Viewer* assists users to view temporal data as a chart or a graph. *Statistical Tool* helps to perform simple statistical analysis such sum, min, max, average, count and standard deviation on temporal data. Analysis can be done on either calendar year or hydrological year. A user-friendly generic *Export Tool* has been developed for easy exporting of data from database. Export Tool allows users to take copies of the data from the database into different format such as excel, access, text etc.

NWRD has been updated and upgraded under Component 3B of Water Management Improvement Project (WMIP). All data layers have been updated using latest information available with the source organizations. Some new data have been incorporated. The database has been upgraded using Oracle 11g and application tools using ASP.Net framework. WARPO has also taken an initiative to host the database in internet to ensure proper utilization of the database by wider range of users, planners and decision makers. It will be available on the internet soon.

Integrated Coastal Resources Database

Integrated Coastal Resources Database (ICRD) has been developed by WARPO as a subset of NWRD during preparation of Integrated Coastal Zone Management Plan (ICZMP). This database contains the information related to coastal region of Bangladesh. More than 600 data layers of different type such as spatial, temporal, tabular, documents are available in ICRD. Data and Information of ICRD has been categorized as Natural Resources and Environment (NRE), Human beings and Social Conditions (HUM), Assets, Infrastructure and Services (INF), Economics and Finance (ECO), Administration and Institutions (ADM) and Funds and Interventions (FUN). Each Category is classified into several Components. Each Component is further classified into different Sub-components. Each Sub-component contains several Data Layers.

ICRD also contains a number of user-friendly application tools to access information. Like NWRD meta database, database and export tool are available in ICRD to view metadata, and data layers (spatial, tabular) and export available data in different format. Information Generator helps to generate information by performing simple analysis such as sum, min, max, average, count and standard deviation on tabular data. Knowledgebase brings together all available knowledge related to coastal area of Bangladesh.

This database has also been upgraded using Oracle 11g and application tools using ASP.Net. ICRD will be available on the internet soon.

2.2.2. Bangladesh Haor and Wetland Development Board

Integrated Haors & Wetlands Resources Database

Bangladesh Haor & Wetlands Development Board (BHWDB) has developed a web-enabled and GIS-based Integrated Haors & Wetlands Resources Database (IHWRD) using the latest tools and techniques under the study 'Preparation of Master Plan and Development of Database for Haors and Wetlands Project' with the assistance of CEGIS. The aim of the development of this comprehensive and integrated database is to assist and guide the planners in the preparation of the Master Plan and coordination of haor management activities by the concerned line agencies. The IHWRD contains 100 data layers of different sectors like Hydrology, Morphology, Water Resource, Climate Change, Agriculture, Fisheries, Ecology, Forestry, Livestock, Health, Education, Industry, Energy, Economy and more. Upazilla as well as haor based information of these layers, covers the entire haor area. A web enabled MIS has been developed to access the database. The MIS contains a number of application tools which are simple to use, help in enhancing the authenticity of the database, and can be used for: Metadata Viewing, Map viewing of spatial data, Tabular and graphical presentation of attribute data, Data exporting and Statistical analysis. Since this geo-spatial database contains latest and authentic information of different sectors, it can be used as base information for evaluation and monitoring the activities of projects taken as part of the implementation of the Master Plan. The database is also made compatible with the National Water Resources Database (NWRD) of WARPO to ensure long term sustainability and wider accessibility to meet the demands for strategic planning, designing, monitoring, and management.

2.2.3. Bangladesh Water Development Board (BWDB)

BWDB is the primary source of hydro-meteorological data. BWDB Hydrology Division collects, stores and disseminates water level, discharge, groundwater, sediment, rainfall and evaporation data. River cross section data are also collected by the division. They store all of these data in digital format into a relational database system. A desktop based tool is used to perform quality check of these data. These data can also be disseminated / exported in different format.

2.2.4. Bangladesh Meteorological Department (BMD)

BMD collects 3 hourly data of all meteorological parameters such as rainfall, sunshine, temperature, wind speed, humidity, evaporation, cloud and radiation for surface and upper air throughout the country. Collected data is entered

into a digital format for further checking and processing. Quality checked data are then stored into a database system. BMD disseminates data in text, access or excel format.

2.2.5. Bangladesh Bureau of Statistics (BBS)

The major responsibility of Census Wing of BBS is to conduct three decennial censuses: the Population and Housing Census, the Agriculture Census, and the Economic Census. All these census data are stored in an Oracle database. BBS also maintain the unique Geo-coding system for different administrative unit such as division, district, upazila and union.

Recently BBS has developed a web-based GIS Application using the complete service oriented architecture (SOA) including ASP.Net (C#), CSS, JavaScript, and Microsoft Silverlight as front-end and Oracle Enterprise Geo-database as back-end. Microsoft Dot Net Framework v4.0 has been used as the base platform in the core development. For publishing GIS documents in the web, ArcGIS Server has been used. ArcGIS API for Silverlight has been used to view and render maps in the web.

The Web based application contains a number of modules, such as Data Explorer, Map Explorer, Export Tool, Reporting Tool and Metadata Viewer. Map Explorer has been developed for generating maps dynamically and view or extract census and survey data as required. Data Explorer has been developed to generate table, map and chart from census and survey data as required. The export tool provides the facility to export data as table/chart/map. The reporting tool helps to view reports including the table, chart and map in one document. A metadata viewer has been incorporated with this application to describe the background information of data.

2.2.6. Directorate of Land Record and Survey (DLRS)

Directorate of Land Record and Survey (DLRS) is responsible for preparing and updating different administrative boundaries such as division, district, upazila, union and mauza. These spatial data are available in digital format.

2.2.7. Survey of Bangladesh (SOB)

SoB is the national survey and mapping organization of Bangladesh. It has established a well-equipped digital mapping center. It has setup up a tidal station at Rangadia, Chittagong to determine Mean Sea Level (MSL) for the country. It has also established national datum yard (vertical and horizontal) at Gulshan, Dhaka and a well-defined databank of Ground Control Points (GCP) for the whole country. It has transformed all its mapping processes into digital system.

2.2.8. Local Government Engineering Department (LGED)

LGED maintains and updates a web based road database which consists of Upazila Road, Union Road, Village Road A and Village Road B. This database can be accessed from their website. Information of different roads can be extracted for a particular Upazila and can be printed. Digital map of the road can also be downloaded as jpg or pdf.

2.2.9. Roads and Highways Department (RHD)

RHD also maintains and updates spatial database which consists of National Highway, Regional Highway, Zilla Road, Bridges and Culverts. RHD has developed web based Road Maintenance Management System. This system can be accessed from their website. It allows users to search for roads and view general information on the roads. Information on roads is generally collected once a year.

2.2.10. Department of Environment (DoE)

Climate Change Cell (CCC) of Department of Environment (DoE) has developed a web-enabled Climate Change Database (CCD) to provide the stakeholders with latest and updated data and information related to climate change, its impacts, adaptation and risk management in Bangladesh that is expected to have a positive influence in global response to climate change. The database becomes a part of the climate change web portal which can be made accessible through internet. Climate Change Database (CCD) has three core components: Database, Knowledgebase

and Metadata. Database has been used for storing, managing and viewing different type of data (Tabular/Time Series, Shape and Image). Knowledgebase is used to view different type of knowledgebase (Policy, Reports, Research Paper and Workshop/Seminars) information. Metadata provides the description about different data layers. The address of CCD is http://180.211.164.220/ccdb.

2.2.11. Soil Resource Development Institute (SRDI)

The objectives of the Soil Resource Development Institute (SRDI) are to make an inventory of soil and land resources and to investigate soil-related problems for agricultural research and development. The functions of SRDI include reconnaissance soil survey of the whole country on the basis of aerial photo interpretation and field and laboratory investigation of soils; detailed and semi-detailed soil surveys of development project areas and research firms for various beneficiary agencies; soil surveys for locating areas of problem soils; soil moisture characterization of the soil tracts of the country; and preparation of various maps and reports based on the surveys.

SRDI maintains Land and Soil Resource Users' Guide (Upazila Nirdeshika) consists of information on soil, land type, land suitability, land classification, cropping pattern and other agricultural and chemical properties of soils for each soil map unit. Most of the Upazila Nirdeshikas have been published and updated on a decadal basis. Upazila Nirdeshikas help agriculture extension officers, planners and users at field level in managing and utilizing available resources. SRDI has developed a GIS based application named Soil and Land Resource Information System (SOLARIS) incorporating base information from the Upazila Nirdeshika and to manage the existing geo-spatial database developed by SRDI. SOLARIS can perform advanced spatial analysis on existing Upazila Nirdeshika data available in the Arc/ Shape file format. The tool has following spatial functionalities:

- Classified Analysis: Soil Texture, Landform, Drainage, Land type, Slope, Surface Water recession.
- Conditional Analysis: Crop Suitability, Land Zoning, Nutrient Status (N, P, K, Zn, S, Bo, pH), Environmental Hazards (Flood, Flash flood, Draught and Salinity) and Fertilizer Recommendations for major crops (T. aman, Boro, T. aus, Wheat, Potato, Mustard, Sugarcane).

2.2.12. Bangladesh Agricultural Research Council's (BARC)

BARC successfully developed Agro-Ecological Zone (AEZ) database in the period 1980-1987. This database contains information on land resources, including physiography, soils, climate, hydrology, cropping systems and crop suitability. It has been used to generate readily accessible information on the physical land resources of the country for use by researchers, extension workers and decision makers in land and agricultural resources management as well as agricultural development planning. Based on AEZ database, a GIS-based Land Resources Information System (LRIS) has been developed in 1996. The LRIS includes additional information, in particular data on socio-economic and demographic factors influencing agricultural production.

2.3. Existing approach on Knowledge Management supported by ICT

ICT plays a very crucial role in knowledge management. It helps to manage and organize knowledge by providing faster and more convenient way for acquiring, storing, sharing, disseminating and reusing of knowledge. Nowadays ICT is considered as an indispensable element for knowledge management because it enables organizations to extract and make proper use of knowledge from collected, collated and generated data and information during carrying out different projects, research and studies.

According to National ICT Policy of Bangladesh, knowledge generated by different studies, research, projects etc. undertaken by different industries, organizations, universities and institutions should be shared with others. The best way to share the knowledge is to develop a knowledge portal and allow students, researchers, planners, decision makers and other users to access the portal.

In, Bangladesh, different government and private organizations are now equipped with latest hardware, software and other ICT facilities. They are using Knowledge Portals, Management Information System (MIS), Decision Support system (DSS), and Database Management System for knowledge management, exchange and sharing. Internet facilities are also expanding rapidly. It is making significant impact on knowledge exchanges, sharing and collaboration among various parts of an organization or distinct organizations throughout the country. Some government organization like

BWDB, WARPO and educational institutes like BUET, BRAC University, East West University are using on-line library management system to efficiently manage as well as share valuable books, journals, reports and other documents available with them to a wide range of users.

Bangladesh Computer Council (BCC) is a legal body under the Ministry of Posts, Telecommunications and Information Technology, Government of Bangladesh (GOB). BCC provides supports to ICT related activities to different government organizations. It has established National Data Center for hosting all the government websites, knowledge portals, e-mail services and web applications. It is the only Tier 3 certified Government Data Center in Bangladesh. BCC is continuing ICT infrastructure development for the government through several development projects/programs to facilitate access to government services from the root level.

2.4. Current Information and Knowledge Management related to Planning issues

All five year plans of GoB emphasized on knowledge sharing, strengthening of ICT infrastructure and bringing different government organizations under internet facilities. As per 7th Five Year Plan, Bangladesh Government has taken initiatives to share available knowledge among different communities. In line with this initiative, the National Institute for Local Government (NILG), under the Local Government Division (LGD), and the Access to Information (a2i) has taken a different program in the rural areas to make public and private information available to the marginalized communities. In order to share and exchange information, the National Portal comprises 25,000 web sites. The ICT infrastructure is also being strengthened at the upazilla and union levels. Government is also promoting the development of different sectors through ICT.

A number of information and knowledge management systems have been developed to assist national as well as local level planning. National Water Resources Database (NWRD) had been developed by WARPO to help in the preparation of National Water Management Plan (NWMP). All national level information required for water resources planning are available in this database. Recently, WARPO has updated the database with current information under component 3B of WMIP project.

WARPO had also developed Integrated Coastal Resources Database (ICRD) to provide information required for Integrated Coastal Zone Management Plan (ICZMP). This database contains all local level information related to coastal area. It is also updated by WARPO under WMIP project.

Bangladesh Haor & Wetlands Development Board (BHWDB) has developed Integrated Haors & Wetlands Resources Database (IHWRD) during the preparation of Haor Master Plan. This database is enriched with the information of different sectors required to help and guide the planners in the development of Master Plan and harmonization of haor management activities by the different line agencies.

CEGIS had developed a computer based Drought Assessment framework (DRAS) with active cooperation of Bangladesh Agriculture Research Council (BARC), which was linked with GIS and other analytical tools. DRAS would be an effective tool for on-farm water management. Drought classification would reflect reduction in crop yields due to water stress. Information on irrigation water needed to minimize the harmful effect of drought is essential to farmers. In the event of inadequate rainfall, it is important for farmers to obtain information on critical periods so that they can ensure timely water supply for the crops. DRAS can provide useful information on the timing of sowing and transplantation. Besides, information provided by DRAS can be useful in formulating a disaster plan in the context of drought management since the model can assess losses in crop production in a particular year over average year production. The knowledge gained though the study can be transferred to the farmer level with the help of DAE, BRRI, BARI and BARC.

3. BDP 2100 Information and Knowledge Management Focus

3.1. Principal Developments and Challenges

The main challenges in the development of information and knowledge management system for BDP 2100 are the unavailability of required information or availability of information from source organizations in unusable format. Reluctance of sharing data with others is also a big challenge to update information. Again, a few organizations maintain relational database system to manage their data and information. Other organizations store their data in excel, access, text, dbf and other digital or in hard copy format. So, it will be a time consuming task to convert these data into a relational database format. Moreover, in case of spatial data, different organizations use different projection system such as LCC, UTM, BTM, or BUTM. During transformation of the projection system, shifting occurs in spatial data and it loses positional accuracy. Another significant issue is the sustainability of the developed system. Due to lack of required IT professional as well as IT infrastructure, it would be very difficult for General Economic Division (GED) to maintain the portal after the end of the project. Regular updating of data is also a big challenge.

3.2. Vision on BDP 2100 related Information and Knowledge Management

The vision for BDP 2100 related information and knowledge management is that the portal will be a knowledge hub which will contain all authentic data and information collected and generated under the project. It will be easily accessible through internet and will have a very user-friendly interface. It will provide support to the planners for participatory and interactive planning process for ensuring adaptive management of Bangladesh Delta. The information of the portal will be periodically updated so that the planners can use most recent information in their decision making process.

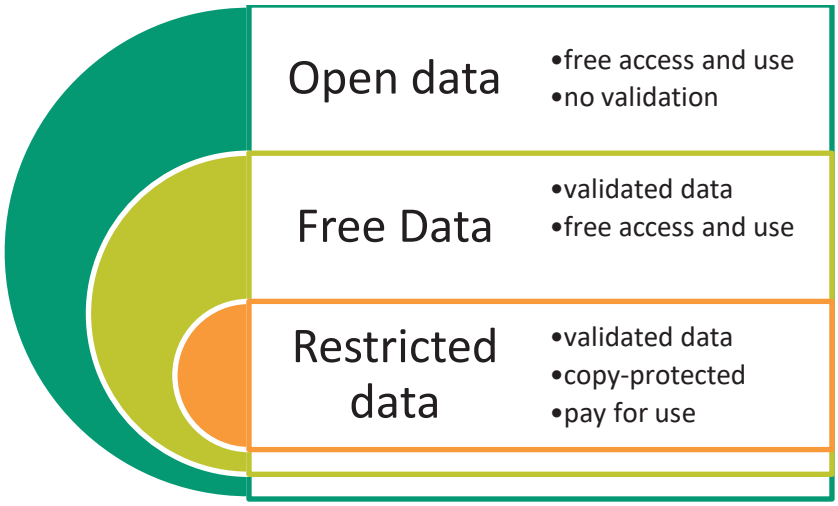
3.3. Principles of validity, trustworthy data and information

Different types of data such as spatial, temporal, tabular as well as reports, and documents will be collected and generated under BDP 2100 project. Quality of spatial data will be checked by using high resolution satellite image and following the spatial quality guideline developed under NWRD. Field visit will be undertaken, if necessary, for ground truthing. A time series data quality guideline and a quality control tool have been developed under NWRD project. This guideline and the tool would be used for validating temporal data. Tabular data will be checked for punching errors. The two guidelines mentioned above, have been reviewed by relevant experts from different organizations and universities and finalized, incorporating their comments and suggestions. These guidelines are very helpful for performing quality checking of temporal and attribute data.

3.4. International ISO Standard, OAIS-model with layered structure

For the structured development of the baseline data layer and to safeguard the quality of the system, an ISO-standard could be used: the OAIS-model (Open Archival Information System). This model describes the way information is preserved and made available to designated user groups. The model takes the maintenance of the information into account, including the impacts of changing technologies, support for new media and data formats and a changing user community. The model sets the standard for the activities that are involved in preserving a digital archive and its development towards a trustworthy repository that can be used as a base for policy formulation.

The functionalities of the model not only cover the delivery of the data and information (terms of delivery, metadata structure, standard layout for spatial data (maps, drawings), selection and value assessment of delivered data), but also the access and dissemination of the data, hereby using a layered structure:



This structure encompasses several principles:

- No data will be stored without basic metadata description;
- The quality, integrity and validity of the data is safeguarded;
- It enables an access policy to ensure correct (re)use of the data; and
- It makes possible to address different levels of data users.

4. BDP 2100 Related Information and Knowledge Management Needs

Under BDP 2100 project, a number of baseline studies on different sectors such as River Systems Management, Water Resources, Regional Cooperation, Land Resources Management, Urbanization and Settlement, Environmental Pollution, Ecological Settings, Forest and Biodiversity, and Fisheries will be conducted by relevant experts. Available knowledge as well as knowledge gap in different sectors will be identified by the respective experts. Based on this knowledge gap analysis, data and information required to develop Delta Plan will be collected and generated under the project. All these information will be incorporated in the knowledge portal.

4.1. Information and Knowledge Management tasks and activities

A number of tasks will be required to carry out for the development of knowledge portal. These are as follows:

(a) Carrying out a system requirements analysis;
(b) Design of knowledge portal;
(c) Design of database;
(d) Development of the knowledge portal;
(e) Development of database;
(f) Processing of collected and generated data and converting into database format;
(g) Uploading data into the database;
(h) Installation and configuration of knowledge portal at server;
(i) Software Testing; and
(j) Users training and capacity building.

4.2. Information and data development areas, applications and streams

For the development of BDP 2100, data and information from 8 sectors such as water resources and morphology, water supply and sanitation, hazards and disaster risk reduction, spatial planning and land use, food security, environmental

management, economics and finance, governance and institutional development will be collected. Water resources management includes droughts and floods, surface and groundwater, water quality and environment and the balancing of the sectoral demands with supply. Morphology includes river system, erosion accretion, coastal area, trans-boundary river. Water supply and sanitation covers groundwater level, groundwater supply, surface water level, discharge, sediment, salinity etc. Disaster management and climate change related information will be collected under hazards and disaster risk reduction. The land use or land coverage include forest, herb/shrubs, fallow/agricultural land, river and water bodies, settlements, hill shades etc. Agriculture, fisheries, livestock and poultry will be considered to ensure food security. Information related to forestry and bio-diversity, environmental pollution and degradation will be required for environmental management. Economics and finance includes demography, literacy rate, migration, economic growth, poverty alleviation, power and energy, inland navigation facilities, railways, and road network. National Water Policy, National Water Management Plan, National Water Act will be required for governance and institutional development. All these information will be either collected or generated under BDP 2100. The available information will be processed and incorporated into a relational database system. A web enabled knowledge portal will be developed to view this information.

4.3. Conditions and Functionalities for data storage in knowledge repository

Analyzed data or information that are not sensitive or restricted will be incorporated into the database. No sensitive data will be made available in the knowledge repository. The quality of the data will be ensured before uploading. A relational database MySQL will be used to develop the physical database. To avoid data redundancy and inconsistency, the database will be normalized and a number of tables will be used to store information. Parent-child relationship will be implemented between tables to maintain data relationships and the referential integrity will be implemented for maintaining the data integrity. The referential integrity will ensure that, no data could be entered in the child tables without entering corresponding data in the parent table. Each table will maintain a primary key, which will uniquely identify each record in the table to reduce the chances of data duplication. Spatial data that already have been generated are stored in geo-server for using in touch table application. These data will be directly used from the geo-server. If any technical problem arises, then spatial data will be stored into a hard disk in hierarchical fashion of file/folder system. The location of these data layer will be kept into the database.

In order to sort and query data easily and efficiently, all data will be categorized into different data groups. Each data group will be further classified into different data type. Each data type will contain several data layers.

4.4. Conditions and Functionality for data accessibility, sharing and exchange

Knowledge Portal developed for BDP 2100 will be web based and will be accessed by a wide range of planners, decision makers and other experts. It will allow users to access all the generated and collected information from a single place through web. This portal will have two components: Data Explorer and Metadata Viewer.

4.4.1. Data Explorer

It will help to display spatial, temporal and attribute data. Zoom in, zoom out, pan, super imposed and other standard facilities of spatial data viewer will be incorporated into the portal. Temporal and attribute data can be viewed as table or chart. The interface of the portal will be very user-friendly and interactive, so that planners, decision makers, researchers, scientists, teachers, students and other users can visualize information easily and efficiently. An intelligent search engine will be incorporated into this tool to assist users to find a knowledge document.

4.4.2. Metadata Viewer

This tool will be developed to display Metadata for each data layer. Metadata is the information about data that enables intelligent and efficient access, and management of data. It is the background information, which describes the content, quality, condition, and other appropriate characteristics of data. Web based customized metadata viewer will be developed on the basis of ISO standard, and the model developed for NWRD. **Table 4.1** shows the set of elements chosen for metadata model. The strategy was to conform to ISO Level 1 extended with some Level 2 elements.

Table 4.1: Metadata Components

Sl No	Name	Definition
1	Title	Name by which the dataset is known
2	Abstract	Brief narrative summary of the data set
3	Purpose	Summary of the intention with which the dataset was developed
4	Use constraints	Constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on using the dataset.
5	Lineage statement	Additional lineage information
6	Qualitative narrative report	Descriptive quality information for the qualitative report type
7	Metadata date	Date that the metadata were created or last updated
8	Responsible party individual name	Person having primary responsibility for the intellectual content of the data
9	Responsible party organization name	Name of the organization associated with the dataset
10	Postal address	Address line for the address
11	City	City of the address
12	Postal code	Postal code of the address
13	Country	Country of the address
14	Electronic mail	Address of the electronic mailbox of the organization or the individual
15	Dataset extent coordinate	Geographic area domain of the dataset
16	Geographic extent name	Commonly used or well-known name of a place, area or region which describes a spatial domain of the dataset
17	Temporal extent date/time	Date and time of the content of the dataset
18	Category	Words or phrases summarizing a subject of the dataset
19	Keywords	Common used word(s) or phrases used to describe the subject of the dataset
20	Map projection	Name of the map projection
21	Feature type	Class of real world phenomena with common properties

5. Roadmap for Development of Information and Data Portal

5.1. Elaboration of Action Plan to create Information and Data Portal

An efficient action plan will be prepared to carry out the activities for creating Knowledge Portal successfully. A description of the different steps of the Action Plan is given in the subsequent sections.

5.1.1. Requirement Analysis/Needs Assessment

An initial discussion meeting will be organized with relevant officials of BDP 2100 to understand the details of requirements of the project, such as design diagram of knowledge portal, data and information need, expected outputs/outcomes of the project, features and functionalities of the knowledge portal, platform and running environment of the proposed system. The requirement assessment task will be accomplished by performing the following sub-activities.

Literature Review

Extensive literature review will be made at this stage to accumulate the necessary information to finalize the action plan and also for a clearer understanding. Existing reports, documents, publications and other literatures related to BDP 2100 will be reviewed to understand project's objectives, activities and implementation mechanism.

Review of Existing System

Existing information and database systems, such as spatial database in geo-server, and/or phoenix (touch table) application .will be examined. User manuals and technical document of these systems will be reviewed. All collected and generated data and information will also be analyzed.

In addition to the above mentioned reviews, different national and regional level web based database and MIS will also be reviewed for betterment and efficient implementation of the portal with state of art technologies. Such database are: Web based GIS Application for Bangladesh Bureau Statistics, Agricultural Resources Information System (ARIS) of Planning Commission, National Water Resources Database (NWRD) & Integrated Coastal Resources Database (ICRD) under WARPO, Integrated Haor and Wetland Resources Database (IHWRD) of Bangladesh Haors and Wetlands Development Board, Climate Change Database (CCD) of Department of Environment, Object Identification System (OIS) of Bangladesh National Museum

Identification of Requirements

A number of meetings will be arranged with project management and other project stakeholders to determine the detailed user needs for the business requirements of knowledge portal. Series of meetings with the officials of BDP 2100 will be arranged to determine the requirements / expectations from the knowledge portal. These meetings will also identify the design and development platform of the database and framework of knowledge portal.

5.1.2. Design and Development of Initial System Architecture

Depending on the requirements as identified in the requirements / needs analysis, a logical model or framework (**Figure 5.1**) of the knowledge portal will be developed. The system will be designed and developed using the standard four-tier architecture of software development. It will consist of the following layers:

- Presentation (user-interface)
- Web server
- Application server
- Data server

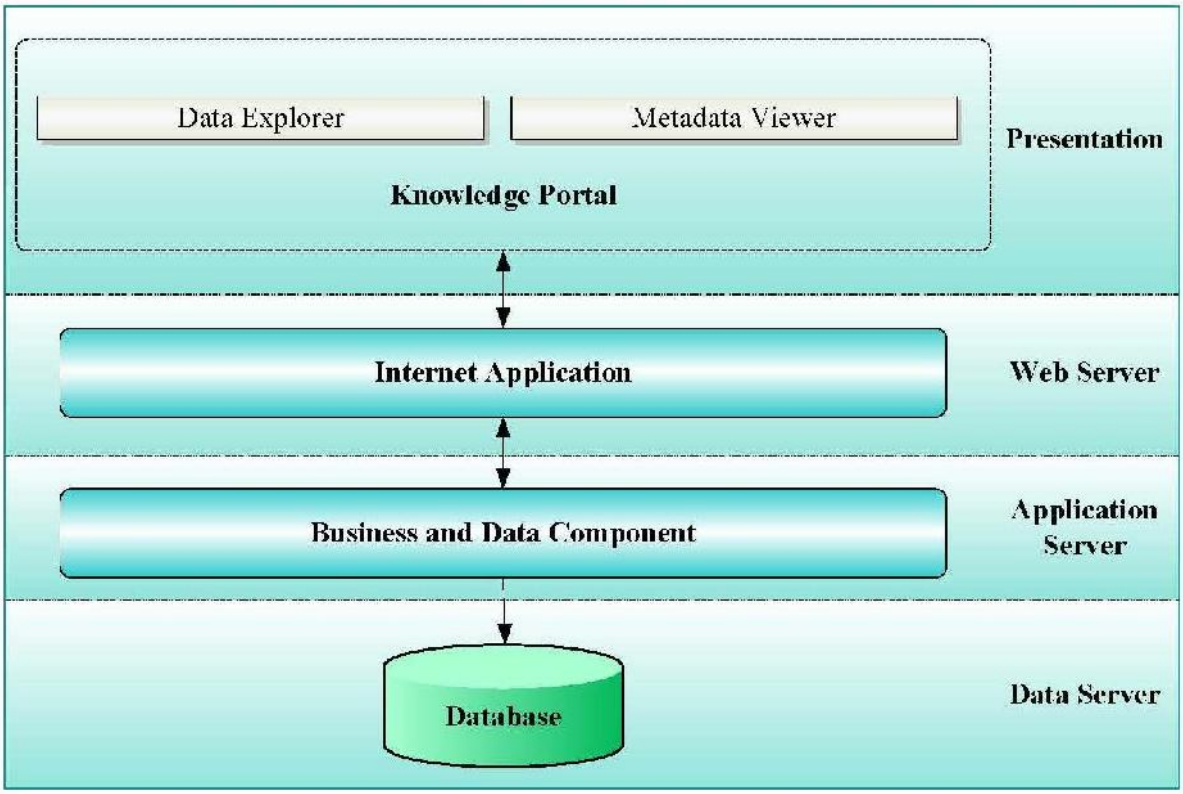


Figure 5.1: System architecture of Knowledge Portal

Presentation Layer

The presentation layer represents user-interfaces that a user uses to interact with the application. This layer will be developed using ASP .Net. HTML5 and CSS3 with jQuery will also be used to develop the user interface. The design and look of interfaces will be made simple and user-friendly in consultation with official of BDP 2100 Project.

Web server

The main service component for a web-based application is the web server. It is a program that manages and delivers web pages and allows users to communicate with the server for data service through the Internet or the intranet. The web server will be configured using Internet Information Services.

Application Server

The application layer is the main development area which will consist of business and data components. The business component is used to impose different business rules and logics. The data component is responsible for retrieving data from the server. The application layer will be developed using Asp .Net.

Data Server

The data server will contain data, views, triggers and stored-procedure. It will execute SQL statements, views, triggers and stored-procedure for data manipulation and presentation. A relational database MySQL will be used to store and organize data.

5.1.3. Design and Development of Database

All collected and generated data will be categorized into different major groups for better management. Each group will be further classified into number of data types. Each data type will contain several data layers.

The database will be normalized and it will contain a number of tables. These tables will be of three types: Data Definition, Metadata and Tabular Data.

Data Definition

The Data Definition contains hierarchical information (Data Group, Data Type and Data Layer) of different data layers and serves as the application-oriented link among data layers. Data Definition tables used in the system are described below

Table Name: Data Group

Description: This table will describe the major category (Data Group) of data.

Group ID	Description
1	River Systems Management
2	Water Resources
3	Regional Cooperation
4	Land Resources Management
5	Urbanization and Settlement
6	Environmental pollution
7	Ecological Settings
8	Forest and Biodiversity
9	Fisheries

Structure: This table will contain two fields. Details of these fields are as follows:

Attribute	Data Type	Length	PK / FK	Ref. Table	Ref. Field	Validation	Comments
DataGroupID	NUMBER	16	PK				
Description	VARCHAR2	50					

Table Name: Data Type

Description: It will describe the sub category (Data Type) of data.

Structure: This table will contain three fields. Details of these fields are as follows:

Attribute	Data Type	Length	PK/FK	Ref. Table	Ref. Field	Validation	Comments
DataTypeID	NUMBER	16	PK				
Description	VARCHAR2	60					
DataGroupID	NUMBER	16	FK	DataGroup	DataGroupID		

Table Name: Data Source

Description: This table describes title, location and file name of each data layer.

Structure: This table will contain four fields. Details of these fields are as follows:

Attribute	Data Type	Length	PK /FK	Ref. Table	Ref. Field	Validation	Comments
DataSourceID	NUMBER	16	PK				
SourceName	VARCHAR2	255					
Description	VARCHAR2	255					
DataSrcName	VARCHAR2	255					

Table Name: Data Source Category

Description: It will link each data layer with corresponding Data Group and Data Type.

Structure: This table will contain four fields. Details of these fields are as follows:

Attribute	Data Type	Len	PK /FK	Ref. Table	Ref. Field	Validation	Comments
DataSourceCategoryID	NUMBER	16	PK				
DataSourceID	NUMBER	16	FK	DataSource	DataSourceID		
DataTypeID	NUMBER	16	FK	DataType	DataTypeID		

Table Name: Bundle Info

Description: This will contain detailed description (field name, display name and unit) of each field of the table of each data layer.

Structure: This table will contain seven fields. Details of these fields are as follows:

Attribute	Data Type	Length	PK /FK	Ref. Table	Ref. Field	Validation	Comments
DataSourceID	NUMBER	16	PK				
FieldID	NUMBER	16	PK				
FieldName	VARCHAR2	32					
FieldDesc	VARCHAR2	500					
DisplayName	VARCHAR2	100					
Unit	VARCHAR2	100					
FieldPos	NUMBER	16					

Relationship: The relationship of data definition tables is shown in **Figure 5.2**.

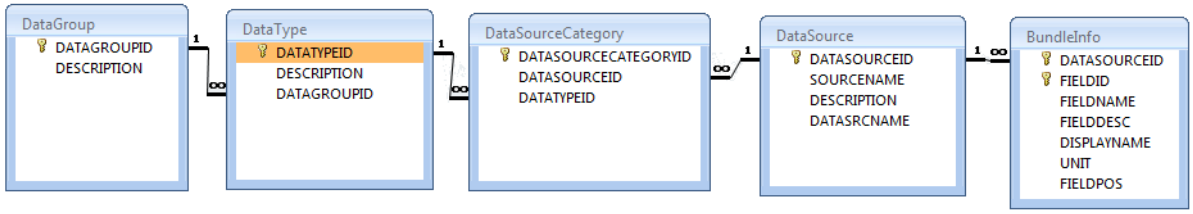


Figure 5.2: Relationship of Data Definition Tables

Metadata

Three tables will be used to describe the Metadata of the data layers. They are MetaHead, MetaFieldName and MetaDataSet.

Table Name: MeataHead

Description: Metadata elements will be categorized into five major groups: Overview, General, Access, Contents, Specific and Item. MetaHead table contains these group names.

Structure: This table will contain two fields. Details of these fields are as follows:

Attribute	Data Type	Len	PK / FK	Ref. Table	Ref. Field	Validation	Comments
HeadID	NUMBER	16	PK				
HeadName	VARCHAR2	50					

Table Name: Meta Field Name

Description: This table will define the Metadata elements for each group.

Structure: This table will contain five fields. Details of these fields are as follows:

Attribute	Data Type	Len	PK / FK	Ref. Table	Ref. Field	Validation	Comments
TableName	VARCHAR2	25	PK				
FieldName	VARCHAR2	50	PK				
LabelText	VARCHAR2	50					
HeadID	NUMBER	16	FK	MetaHead	HeadID		
FieldOrder	NUMBER	16					

Table Name: Meta Data Set

Description: This table will contain the metadata information for each data layer.

Structure: This table will contain 36 fields. Details of these fields are as follows:

Attribute	Data Type	Len	PK / FK	Ref. Table	Ref. Field	Validation
DataCode	NUMBER	16	PK			
DataSet_Language	VARCHAR2	50				
Title	VARCHAR2	100				
Abstract	VARCHAR2	2000				
Purpose	VARCHAR2	2000				
Progress_Code	NUMBER	16				
Access_Constraints	VARCHAR2	2000				
Use_Constraints	VARCHAR2	2000				
Lineage_Statement	VARCHAR2	2000				
Process_Description	VARCHAR2	2000				
Qualitative_Report	VARCHAR2	2000				
Completeness	VARCHAR2	2000				
Distribution_Identifier	VARCHAR2	200				
Distribution_Format	VARCHAR2	100				

Attribute	Data Type	Len	PK / FK	Ref. Table	Ref. Field	Validation
Distribution_Media	VARCHAR2	100				
Size_of_Dataset	VARCHAR2	100				
Level_of_Conformance	VARCHAR2	2000				
MetaData_Language	VARCHAR2	80				
MetaData_Date	DATE					
Initiative_Identification	VARCHAR2	100				
Initiative_Name	VARCHAR2	100				
Reference_Date	DATE					
Responsible_Party_Info	VARCHAR2	100				
Responsible_Party_Name	VARCHAR2	200				
Postal_Address	VARCHAR2	2000				
City	VARCHAR2	100				
Country	VARCHAR2	100				
Electronic_Mail	VARCHAR2	100				
DataSrc_Name	VARCHAR2	100				
DataSrc_Location	VARCHAR2	160				
Browse_Graphic_FileName	VARCHAR2	28				
Type	VARCHAR2	80				
Responsible_Party_Org	VARCHAR2	255				
NWRD_Category	VARCHAR2	50				
MetaData_Supplemental_Info	VARCHAR2	2000				
OtherTable	VARCHAR2	30				

Relationship: The relationship of Metadata tables is shown in **Figure 5.3**.

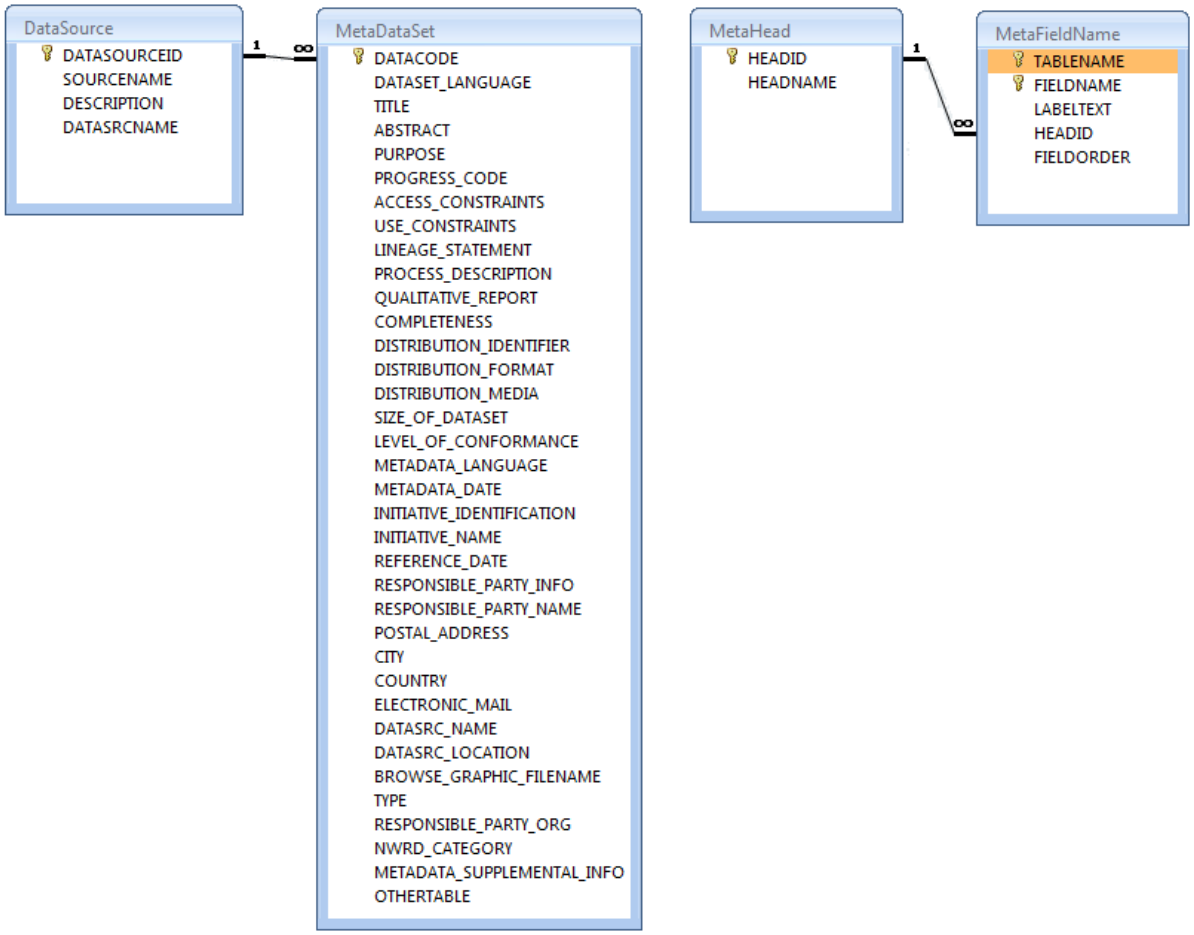


Figure 5.3: Relationship of Metadata Tables

Tabular Data

Tables other than Data Definition and Metadata tables are called Tabular Data. These tables will contain temporal or simple tabular information. One table will be used for a particular data layer. Each table will have a primary key. Structure of these tables will depend on the available information.

Spatial Data

Spatial data will be stored into a hard disk in hierarchical fashion of file/folder system. For example, shapefile of Division boundary will be saved in D:\DeltaData\ Fisheries \FishCatch\Shape\ folder. The location of each spatial data layer will be kept into the tabular database.

5.2. Conditions and Constraints - existing and expected in future

The knowledge portal needs to be installed in a live server. This server should be fully secured. Hardware Firewall, Router, IP Filtering, IP Anti-Spoofing, Anti-Virus protection, online UPS backup, generator supports, periodical backup and other security measures should be taken to place the web server in a secured network topology. High speed (minimum 4 Mbps) dedicated bandwidth will be required for better performance. The database should be backed up regularly. Performance of the system should be monitored time to time.

Most of the government organizations in Bangladesh do not have high speed internet facilities. As the knowledge portal will contain a significant amount of spatial data, its performance may be degraded in some case.

BDP 2100 project office as well as GED does not have the required IT setup to host the portal. Again, GED does not have sufficient IT professionals. So, it will be very difficult for GED to maintain the knowledge portal and keep it operational after completion of the project period. Regular updating of knowledge portal will also be a major concern.

5.3. Possible solutions and actions short and medium term

During the project period, the portal can be hosted at any partner organization of the project like CEGIS or IWM having the required facilities readily available. CEGIS has the required IT infrastructure and IT experts to provide this type of service. So, the knowledge portal could be installed and configured at CEGIS' server. After the project period, CEGIS could continue to maintain the portal on behalf of GED provided that they will have an agreement with GED.

Periodic updating of the knowledge portal is very essential to enrich it with recent data and information. Every year GED can allocate a GoB fund to carry out this task. Knowledge portal can also be hosted at BCC; in that case technical support required for updating the portal would be ensured by GED.

5.4. Preparing Information and Data Portal

The Knowledge Portal and database will be designed and developed as per the initial system architecture and requirement identified in the needs assessment. All collected as well as generated data will be processed and quality checked. Spatial data will be prepared for different sectors. Based on the initial system architecture, the physical database will be developed. After processing and performing quality check, data and information will be uploaded into the database. During and after developing process of the software, different levels of testing need to be performed to ensure software quality. Standard software testing methods such as unit testing, integrated testing, system testing and user acceptance testing will be performed in sequence. After that, the database will be installed and configured in the server. All checked and tested information of the database will be transferred from the test database to the production (central) database. Finally, the application of Knowledge Portal will be installed and configured into the central web server.

5.5. Realization of the Information and Data Portal

After completion of the development, GED could take initiative to create public awareness about this knowledge portal through knowledge and information medium like leaflet, brochure or/and arranging national level workshop. Leaflet and brochure will contain brief description of the information available in the portal. In the workshop, details about the portal can be presented to the invited audience such as planners, researchers, scientists, government officials and other stakeholders. Comments and suggestions of the audience on the knowledge portal will be sought for future development.

5.6. Work plan

A well-prepared implementation plan is required to complete the activities for the development of Knowledge Portal timely and efficiently. A tentative work schedule has been prepared based on the workload, technical considerations and availability of resources and is shown in **Figure 5.4**.

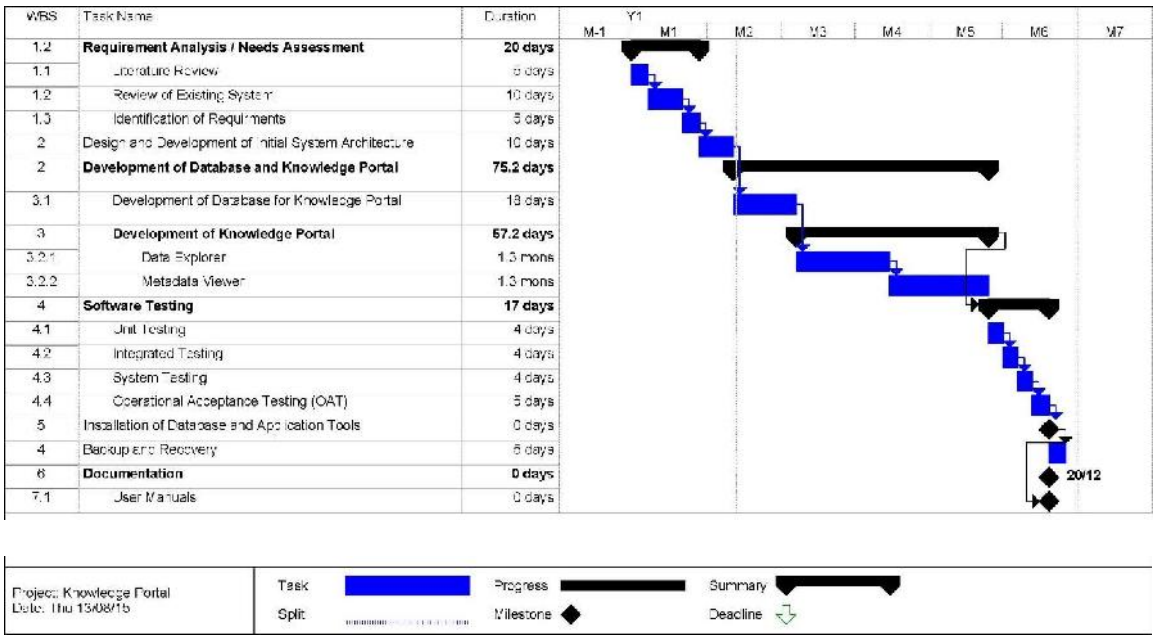


Figure 5.4: Tentative Work Schedule for Development of Knowledge Portal

6. Delta Tools to support the strategy development process of BDP 2100

6.1. Introduction

Many studies on the issues in Bangladesh have been undertaken, leading to an impressive collection of baseline reports, scientific articles and accompanying databases. One of the aims of the BDP 2100 project is to make information on vulnerabilities and climate change risks accessible for further planning and implementation purposes. One of the key challenges is to give easy access to available maps and spatial information in such a way that it can be used by planners and decision makers in problem analysis, strategy-making and monitoring steps. Delta Tools were developed for this purpose.

The Delta Tools are developed to access and to interact with the data in the information portal. This chapter describes the Delta Tools, what they are, how they can be used and how they will be will remain available in support of the implementation of the BDP2100.

6.2. The Delta Tools

Various delta tools have been developed. Each tool has a specific target group and use. The Phoenix software is used on touch tables. The purpose of this tool is to use the data in interactive planning and design sessions. More advanced users may wish to use the data on the information portal for more technical analytical purposes. The Meta Model will be developed and a GIS desktop application (e.g. ArcGIS) can be used to perform spatial analysis and calculations. The Data Viewer makes all information publicly available, and the Delta Atlas summarizes all layers in an interactive pdf. This gives users the opportunity to develop a map they like by combining different map layers, for instance to be used in reports or PowerPoint presentations.

In this way, the Delta Tools are separate modules that can be used independently of each other, for a variety of uses. But all the delta tools are connected to one central Information Portal. **Figure 6.1** presents the information structure.

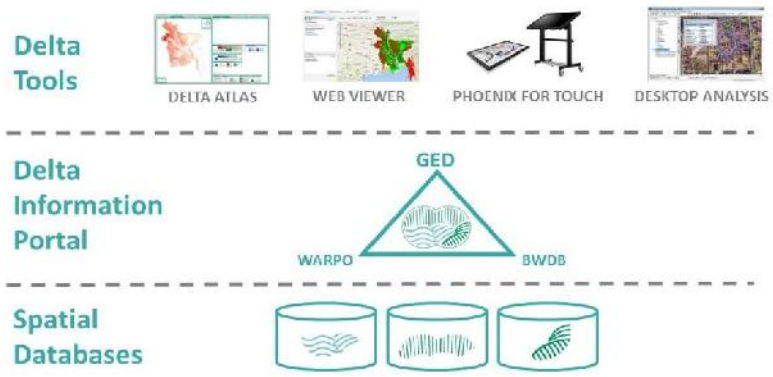


Figure 6.1: Information structure

During the BDP2100 formulation project, we developed the tools in support of the strategy development process. The BDP process started with baseline study/hotspot identification phase, then focus was on development of strategies per hotspot followed by assessment of strategies. Each step has been supported by tools. To identify hotspots and to summarize the spatial data from the baselines, we developed a DELTA ATLAS. All data was harmonized and stored on a central server. The server data can be viewed on any computer using the INFORMATION PORTAL (built by CEGIS). With the PHOENIX touch table application all data can be viewed and users can draw onto the maps and drawings can be stored as GIS shapefiles. This supports interactive design and planning workshops. Desktop GIS and the Meta Model can be used to perform calculations from your desktop. Strategies can be evaluated and assessed (in qualitative way) using the Assessment Framework Rapid Assessment tool.

All spatial information that was gathered has been stored on a local server. The data can be accessed through the information portal but also through the Touch Table. The Touch Table interface (**Figure 6.2**), enables all parties involved to continue with this approach also after finalization of the BDP2100 formulation project is finished in 2016.

The touchtable interface allows users to interactively work with the spatial data. All maps are available and tools such as drawing mode, zooming, measuring distances and diameters and adding measures to the map are available. The main purpose is to support interactive planning and design processes.

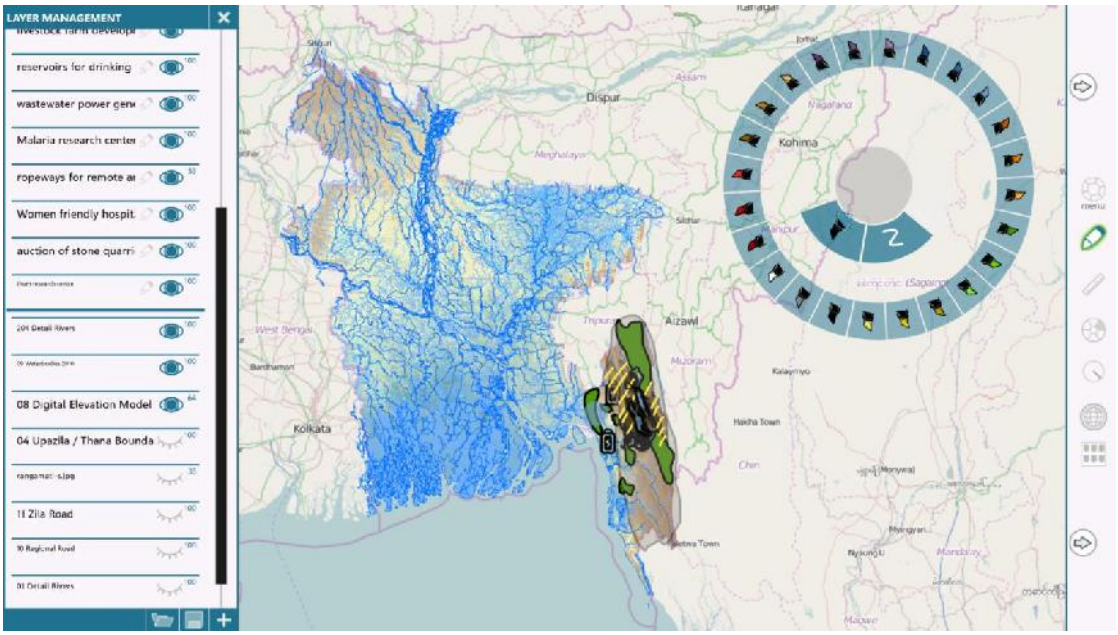


Figure 6.2: The Touchtable Interface

Two touch tables have been prepared for use. The software package Phoenix has been installed, and they have been connected to the data portal. A large sized table is available at the Bandudeltas office. This table is suitable for working in larger groups (up till 10 people), or more when beamed. Also three smaller mobile tablets are available. These are suitable for smaller groups of max 4-5 people. One tablet has been delivered to the GED office, another one has been transferred to IWM office. Another tablet has been delivered to the Dutch Embassy. From a previous project, one large touchtable is available at CEGIS office. Staff of CEGIS and IWM have been trained to operate the touchtable.

The spatial dataset with all data layers are available through the following visualization tools:

1) The touch table platform
2) The interactive delta atlas tool
3) The Information portal

Through data acquisition the Atelier/touch table team has collected data from various sources together with the expert team (data from the baseline studies). All data layers were collected and harmonized, to make it ready for storage in the Geoportal. This resulted in a large collection of data of variable quality, extent, spatial resolution, geo-referencing systems, and so on. Through GIS processing, harmonizing legends, map projections, adding Meta information and adding codes for web mapping services, all data was harmonized and made available. CEGIS and IWM staff were trained in data management and working with the touch table. IWM was offered a tablet size touch table, and IWM can now also work with the touch table interface.

The Delta Geoportal requires a reliable internet connection for the workshops. CEGIS was asked to set up a server with sufficient speed to deal with this. This server is now in place and functions well. Data was collected, maps were prepared, categorized and visualized. From December 2015 a central server was installed in Dhaka from which all spatial data was hosted. Since February the geoportal is running containing all the available geodata layers. Bangladeshi experts were trained to set up this portal and to host data services. Maps are published as WMS-services they can be used by any GIS system. All maps are now publicly available to be used on the touch table platform.

6.3. The touch table platform

With the touch table platform, the power of spatial information is used for better decision-making as it provides an environment for interactive collaboration. The application combines the ease of working on paper with the flexibility provided by a digital work environment and the capabilities of geo-information. During the Delta Ateliers the use of the touch table platform has led to more involvement of stakeholders.

The touch table interface allows users to interactively work with the Delta Atlas (**Figure 6.3**). All maps are available and tools such as drawing mode, zooming, measuring distances and diameters and adding measures to the map are available. The main purpose is to support interactive planning and design processes.

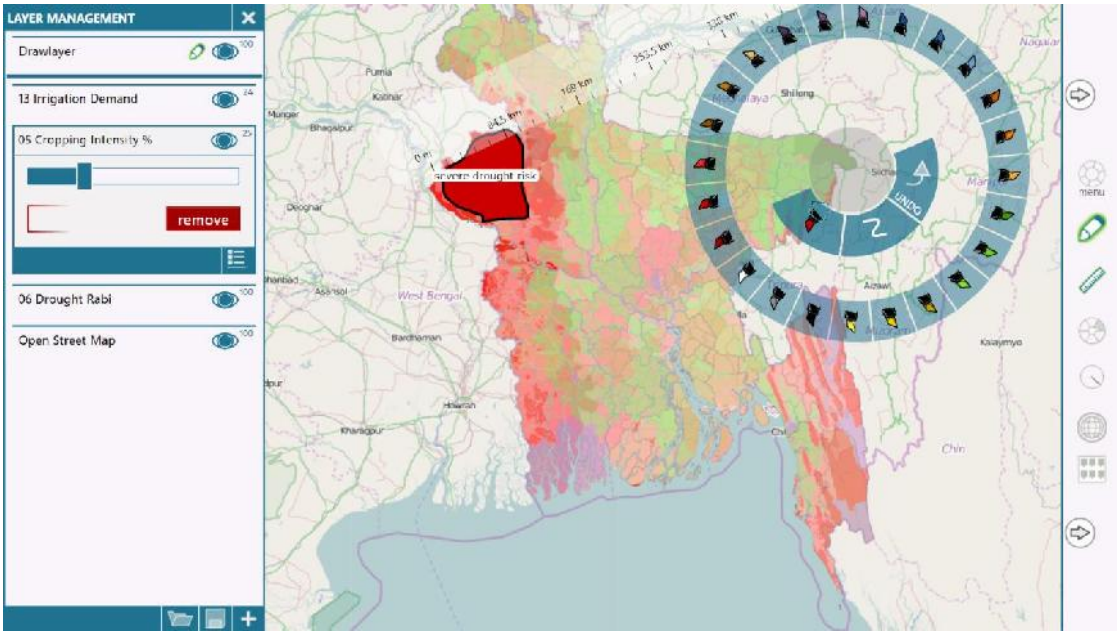


Figure 6.3: The Touchtable: Delta Atlas

Five touch tables have been prepared for use. The software package Phoenix has been installed, and they have been connected to the data portal. A large sized table is available at the BanDudeltAS office. This table is suitable for working in larger groups (up to 10 people), or more when beamed. Also four smaller mobile tablets are available. These are suitable for smaller groups of max 4-5 people. One tablet has been delivered to the GED office, one has been transferred to IWM office, and another tablet has been delivered to the Dutch Embassy and one is available at the BanDudeltAS office. From a previous project, one large touch table is available at CEGIS office.

Staff of GED, WARPO, BWDB, CEGIS and IWM have been trained to operate the touch table. The touch table can be used to support interactive design processes, and will become increasingly valuable as strategies will have to be implemented and incorporated at the local level.

6.4. The interactive delta atlas

The interactive delta atlas visualizes the most relevant maps. The atlas has the advantage of being available off-line (it is an interactive pdf). This means the atlas can be sent out to a wider audience, for instance as an annex to the BDP2100.

The atlas has an interactive legend. Users can view various maps by change the background layers, select maps, and scroll through the legend. The purpose is to study the Bangladesh delta, to analyze and view the various aspects that are relevant for long term delta planning. Zooming and drawing is however not possible in this tool. The touch table application gives users the possibility to draw, overlay and zoom. Also the webviewer will allow users to browse and zoom through layers.

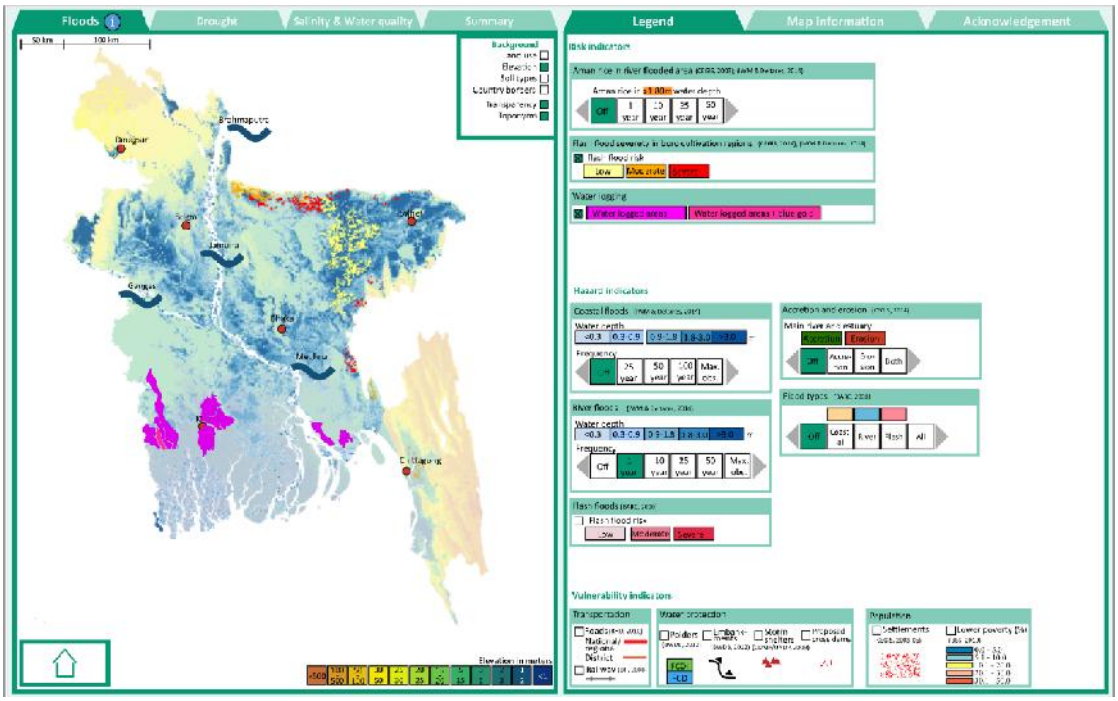


Figure 6.4: The interactive delta atlas tool

6.5. The Knowledge Portal

The Knowledge Portal has been developed on knowledgebase information collected and generated under the study "BDP 2100" by different partners, scientists and specialists working under the project. The aim of this development is to provide support to the planners and decision makers for participatory and interactive planning and decision making process to ensure adaptive management of Bangladesh Delta.

The system architecture of the portal and various servers have been mentioned in chapter 5.

6.5.1. Component of Knowledge Portal

Knowledge Portal has been installed and configured in a scured server at CEGIS. The web address of the portal is *http://202.53.173.179/delta/*. The home page of the portal is shown in **Figure 6.5**.

The Portal has a very user-friendly and interactive interface. It allows users to access all generated and collected information from a single place through web. This portal has three components: Data Explorer, Metadata Viewer and Export Tool.

Data Explorer:

It helps to display spatial, temporal and attribute data. In order to sort and query data easily, all data available in the portal are categorized into different data groups based on thematic area of the project. Each data group has been further classified into different data type. Each data type contains several data layers.

Zoom in, zoom out, pan, super imposed and other standard facilities of spatial data viewer have been incorporated into the portal. Legend and label of the map can be shown. Google map can be viewed as background. Temporal and attribute data can be viewed as table or chart. Documents are viewed in pdf format. The interface of the portal is very user-friendly and interactive, so that planners, decision makers, researchers, scientists, teachers, students and other users can visualize information easily and efficiently. An intelligent search engine has been incorporated into this tool to assist users to find a knowledge document.

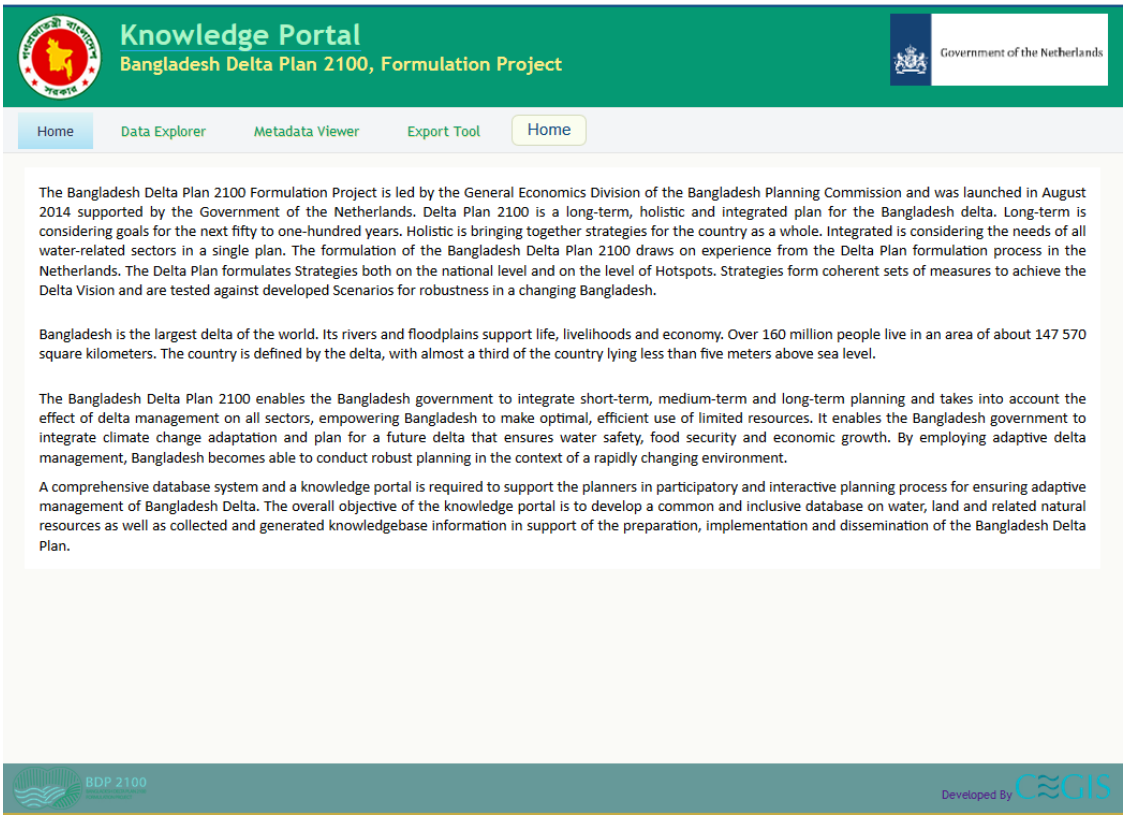


Figure 6.5: Home Page of Knowledge Portal

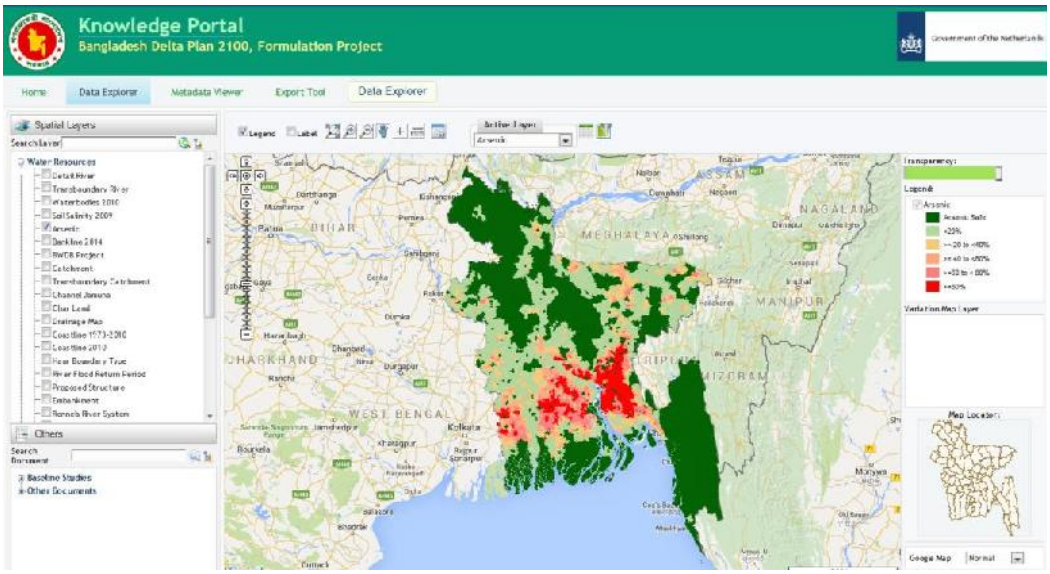


Figure 6.6: Data Explorer of Knowledge Portal

Metadata Viewer:

This tool has been developed to display Metadata for each data layer. Metadata is the information about data that enables intelligent and efficient access and management of data. It is the background information, which describes the content, quality, condition, and other appropriate characteristics of data. Web based customized metadata viewer has been developed on the basis of ISO standard and model developed for NWRD.

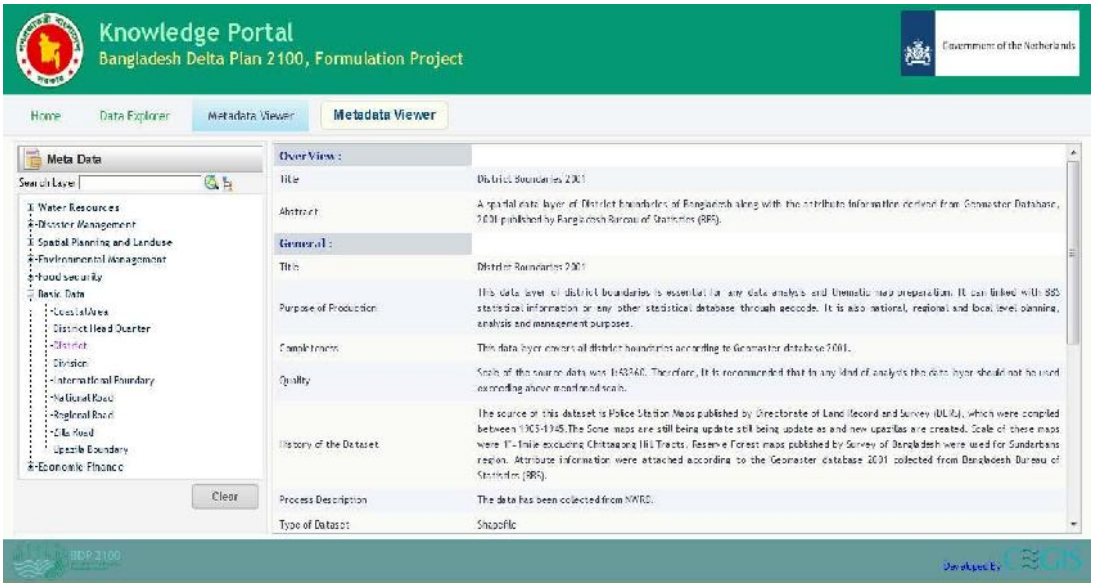


Figure 6.7: Metadata Viewer of Knowledge Portal

Export Tool

This tool allows authorized users to download information from the portal. Spatial data, and attribute information can be downloaded for further analysis.

6.6. Applications of the tools

The tools (Geoportal atlas, touch table and information portal) have different uses and purposes. The table below presents the main target groups and potential uses.

Tool	Target group	Functionality	Potential use
Information por	Professional stakeholders GIS expertise)	Access to the BDP Geoportal data visualized in a web viewer Input touch table, Delta Atlas and web vie	Access to the spatial BDP knowledge base, and availability BDP (legacy)
Touch table	Stakeholders involved i BDP2100 planning and process	Zoom, draw, placing measures, maps	Interactive workshops, planning design support
Interactive delta	All interested people in th all stakeholders involved BDP project	Available off-line, annex to the BD can be sent as a PDF	Getting insight in the main summary maps of the hotspo issues. Overview of the BDP knowledge base

A first round of ateliers was organized in November 2014. An inventory of available maps was performed per baseline and the key issues were prioritized by the expert team. During the first round of workshops the baseline studies were not finished yet. Therefore an additional intermediate round of workshops took place in February. In March a round of ateliers focused on integrating the baseline themes for the hotspots. Hotspots were selected and delineated.

In a series of local Delta Ateliers, the BDP2100 team visited the various hotspot regions of Barind, Coast, Haor, Chittagong Hilltracts, Cox's Bazar coast, the Main Rivers and Urban areas of Dhaka, Chittagong and Sylhet. The small touch tables were brought to the sessions and workshop participants had access to all GIS data layers. Various ideas were designed in the touch table. Some examples are given in figure below.

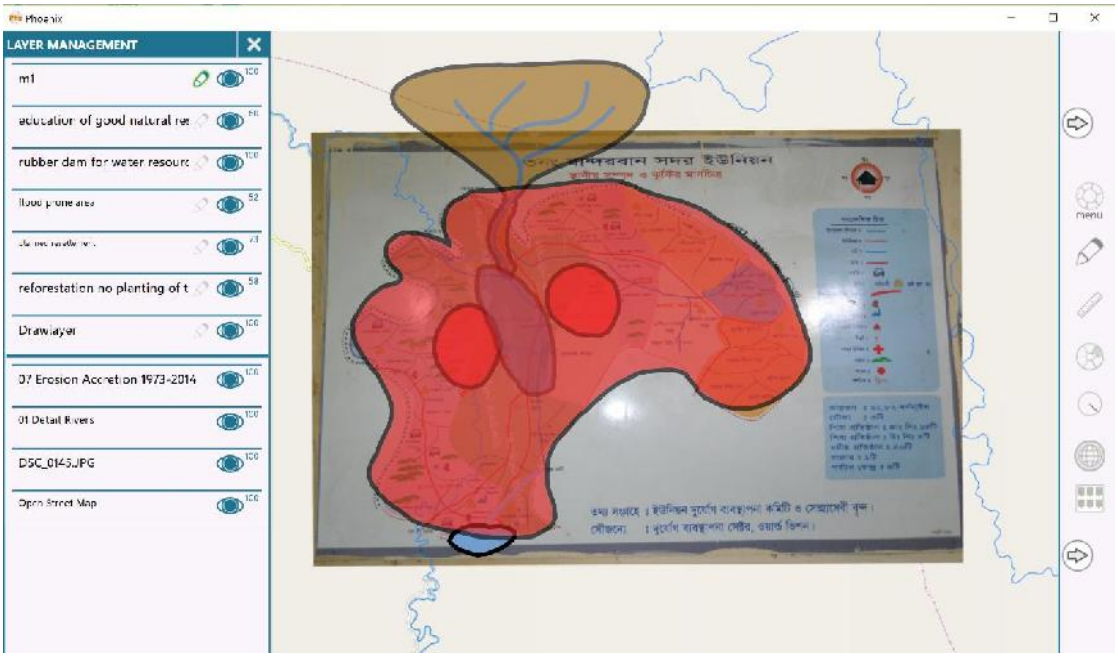


Figure 6.8: Local idea to restore natural forest areas in Bandarban Sadar Upazila

In the above figure (**Figure 6.8**) the local village representatives presented ideas to restore natural forest areas and to prevent or remove unplanned settlements to prevent erosion of river banks and landslides. Good education for sustainable forest management was promoted. We used a local map so that villagers could better identify the locations.

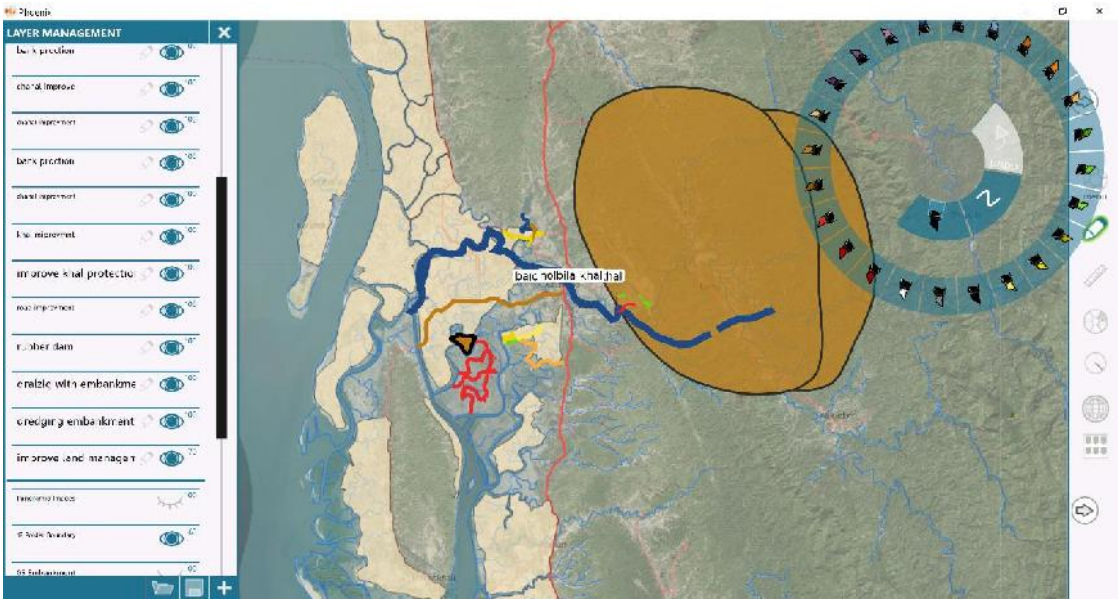


Figure 6.9: Local ideas to promote improved land management in the upstream areas to prevent erosion and sedimentation in the Chakoria area.

In Chakoria the local representatives promoted improved land management in the upstream areas to prevent erosion and sedimentation in the Chakoria area. Also many riverbank and khal improvement projects were identified. Rubber dams were proposed to protect the area against tidal surges. Furthermore, many dredging and water management improvement projects were proposed

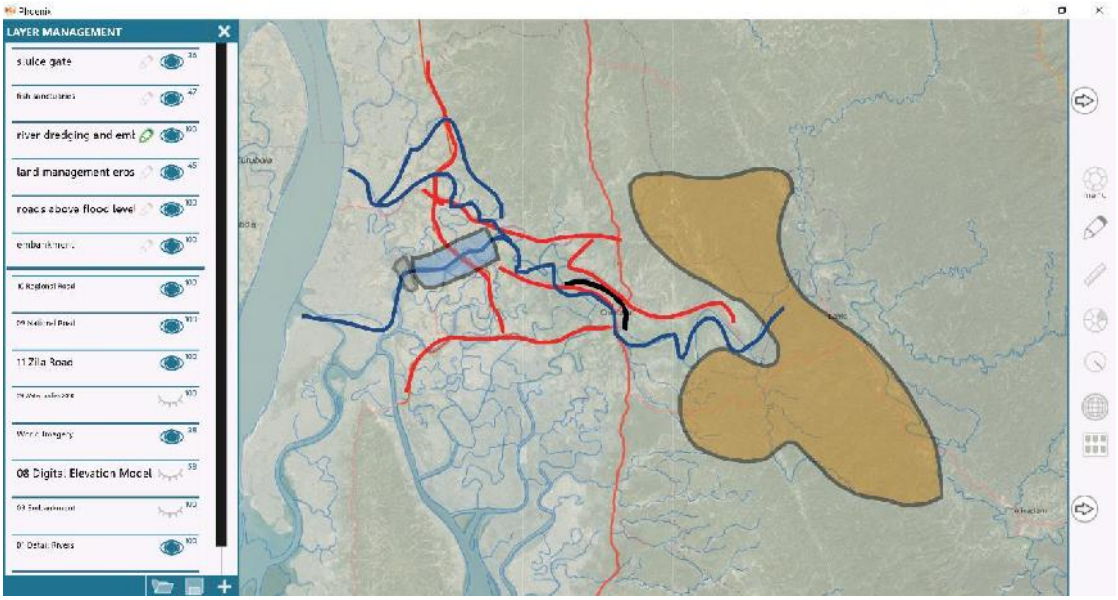


Figure 6.10: Proposed local ideas for Matamuhuri River to improve river dredging in combination with upstream land management improvement

For the Matamuhuri River ideas were proposed to improve river dredging in combination with upstream land management improvement. Roads should be brought above flood level. Also fish sanctuaries were proposed.

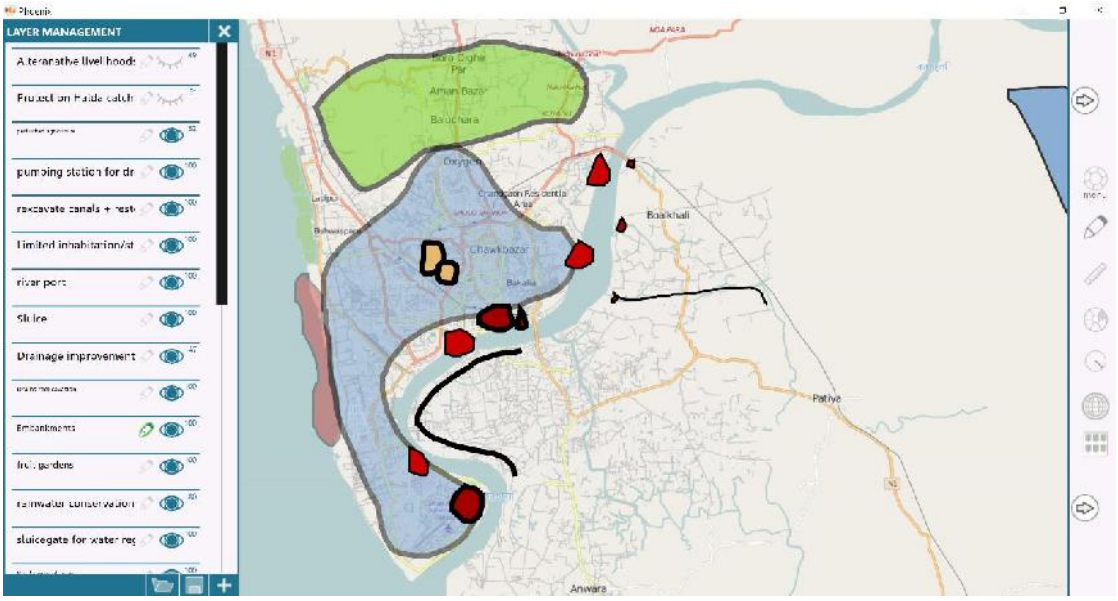


Figure 6.11: Proposed improved drainage for the whole city

For Chittagong improved drainage was proposed for the whole of the city. Locations for sluices were identified and it was proposed to create an embankment to protect the city. Embankments of the Khals need to be reinforced. Also a pumping station is needed for drainage water. Peri-urban agriculture was proposed in the North of the city. Environmental protection is important along the coastal strip. A waste management program is proposed to prevent clogging of drainage canals

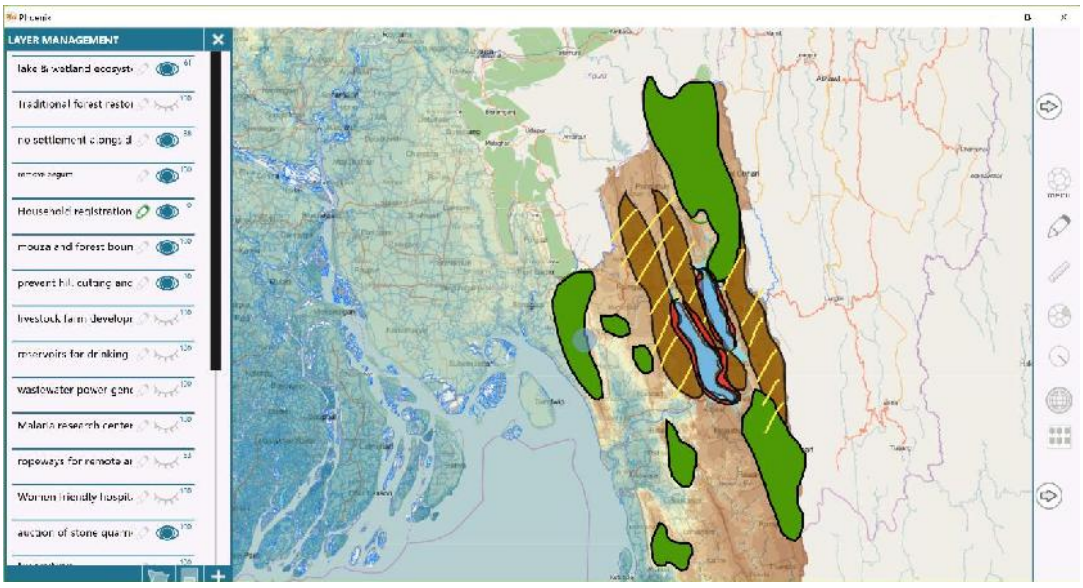


Figure 6.12: Proposed in Rangamati atelier to improve sustainable land management to prevent erosion and landslides

In the Rangamati atelier it was again stressed that it is important to improve sustainable land management to prevent erosion and landslides. Lake and wetland ecosystems need to be restored. Teak plantations should be removed and

indigenous knowledge of traditional Jhum culture should be used and improved. Some more ideas were the creation of reservoirs for drinking water were suggested and women friendly hospitals.

For more examples of the atelier outcome, we refer to the chapters on the atelier results.

6.7. Maintenance and updating the Delta Tools: the legacy

The Delta Information Portal is the central depository for all geospatial data used and generated in BDP2100. It's long term maintenance and regular updating is of crucial importance. Besides GIS data it also hosts the baseline studies and other relevant project material. CEGIS has developed the information portal. The GoB institutes (in particular GED, WARPO and BWDB) will bring this information portal under their responsibility. GED, WARPO and BWDB want to make the data base open access so that all relevant parties involved in the implementation of the BDP2100 can make use of the wealth of information generated.

GED will work towards setting up a support team that is capable of the operations and maintenance of this information structure. This means operating and updating the information portal, but also making the connections between the portal and the delta tools. For example, if a new data layer is added to the portal this layer has to be added to the Phoenix touch table application.

This requires continuous effort and the role of the support team is to operate as a knowledge broker. New research results need to be integrated in the information portal. Innovations in the tools need to be implemented where user needs and requirements are put up front. This requires a close link with the actors involved in the planning and implementation of the BDP2100 strategies. The team needs to ensure that the information portal remains up to date, contains news, for instance by highlighting showcases, successes in the implementation. The information portal and the delta tools connected to it should become a dynamic up to date system that also highlights the progress and successes achieved. It should become a basis for a lively community of practice, sharing scientific information, practical experiences and lessons learnt.

7. Meta-model in the planning context of BDP 2100

7.1. Introduction

The 'meta-modelling pilot project' is a pilot activity of the Bangladesh Delta Plan 2100 project (BDP2100).The main purpose of the pilot is to demonstrate the potential of meta-modelling to support decision making process on Delta planning in Bangladesh. Decision-making for the Delta plan includes all key socio-economic sectors. Integrated impact analysis is therefore key. The pilot project is also aimed at supporting decision-making under conditions of uncertainty and developing an *adaptive plan*. For this purpose a model is required that can deal with simulations in a limited time as multiple combinations and sequences of actions under multiple futures. This model is the meta model. When fully developed, the BDP2100 meta model will:

- enhance integration of physical and socio-economic sub-systems in a modelling framework to support evaluation and development of sustainable strategies;
- make it possible to consider quantitatively many alternatives for multiple futures under long time series, required for robust and adaptive decision making;
- provide the information needed for Investment Planning and the development of Bankable projects; and
- support decision makers and planners in Bangladesh with a powerful tool to develop and evaluate future investment decisions and plans, also after BDP2100.

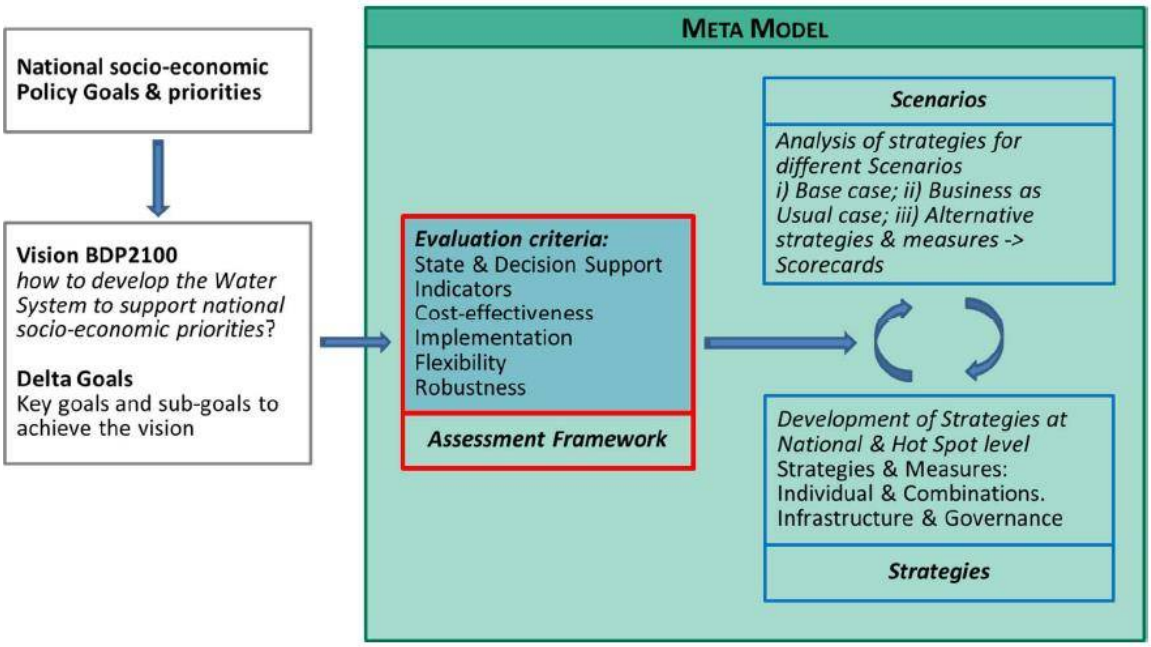


Figure 7.1: Meta model in the BDP2100 planning context

The measures included in the BDP2100 are a mix of detailed feasibility studies, concept notes and programmes. A number of these measures have been assessed by using (detailed) models. Typically, the studies, notes and programmes are difficult to compare for a number of reasons: different consultants, and tools, different data and assumptions or different evaluation criteria. Moreover, most proposals are generally focussed on one particular project and do not take into account the interactions with other measures and projects. The meta model supports the: i) assessment of impacts of combinations of measures on a consistent set of policy indicators; ii) assessment of the synergy, competition or overlaps across measures; and iii) prioritization of measures from a list of multiple possible measures. The BDP2100 project did not include the development of a full-fledged meta-model due to time and budget constraints.

The aim of the meta-model pilot project is therefore to *show the added value of meta-modelling* in Delta planning in Bangladesh by: i) developing a first version of the meta-model by translating the general concepts in actual models; ii) applying these models and addressing the key issues to two pilot regions (Barind and Coast); and iii) developing a work plan for follow-up activities, for the development of the meta-model for Bangladesh.

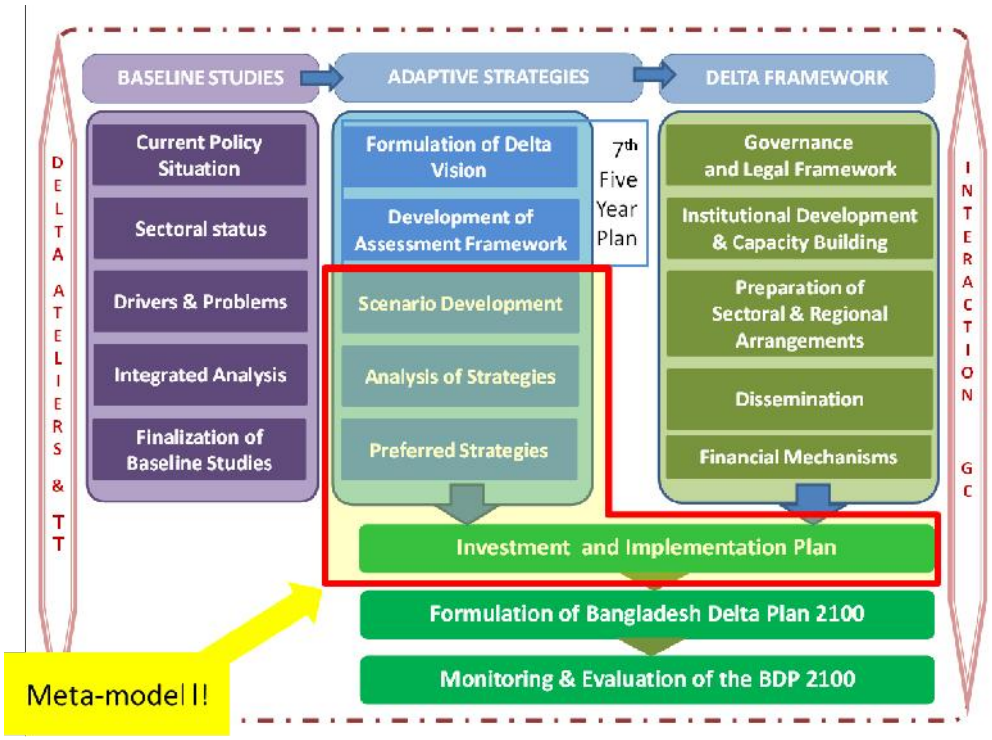


Figure 7.2: Use of the meta model in the BDP planning process

7.2. Set-up of the meta-model

The meta-model is based on the 'Blue Accounting Framework' developed for WARPO to support integrated analysis and decision-making for the National Water Management Plan (NWMP, 2004)[5] The Framework consists of: i) a *conceptual framework* which describes the steps that should be followed in a planning analysis; and ii) a *computational framework*, a set of models and databases and the procedure for their operation and interaction. The meta model is structured to evaluate the impact of projects, strategies and investments on both State and Decision Support Indicators.

- ***State Indicators*** (SIs) illustrate the state of the Water System according to its main Water System Functions. These include indicators such as Flood Extent, Groundwater Levels or the Salinity Level in regional rivers.
- ***Decision Support Indicators*** (DSIs): illustrate how well the Water System and Investments in the Water System contributes to reaching the Delta Goals. These include indicators such as Food Security or Agricultural Productivity. The meta modelling framework enables the evaluation of measures under multiple scenarios and selection of those measures which perform best.

The relation between BDP Strategies & Scenarios (jointly defined as Inputs), State Indicators, Decision Support Indicators and Evaluation-Decision-Making adopted for the preparation of the BDP2100 is visualised in **Figure 7.3.**

[5] The development of the Blue Accounting (Analytical) Framework was supported by WARPO, CEGIS, IWM, IWFM-BUET and Deltares

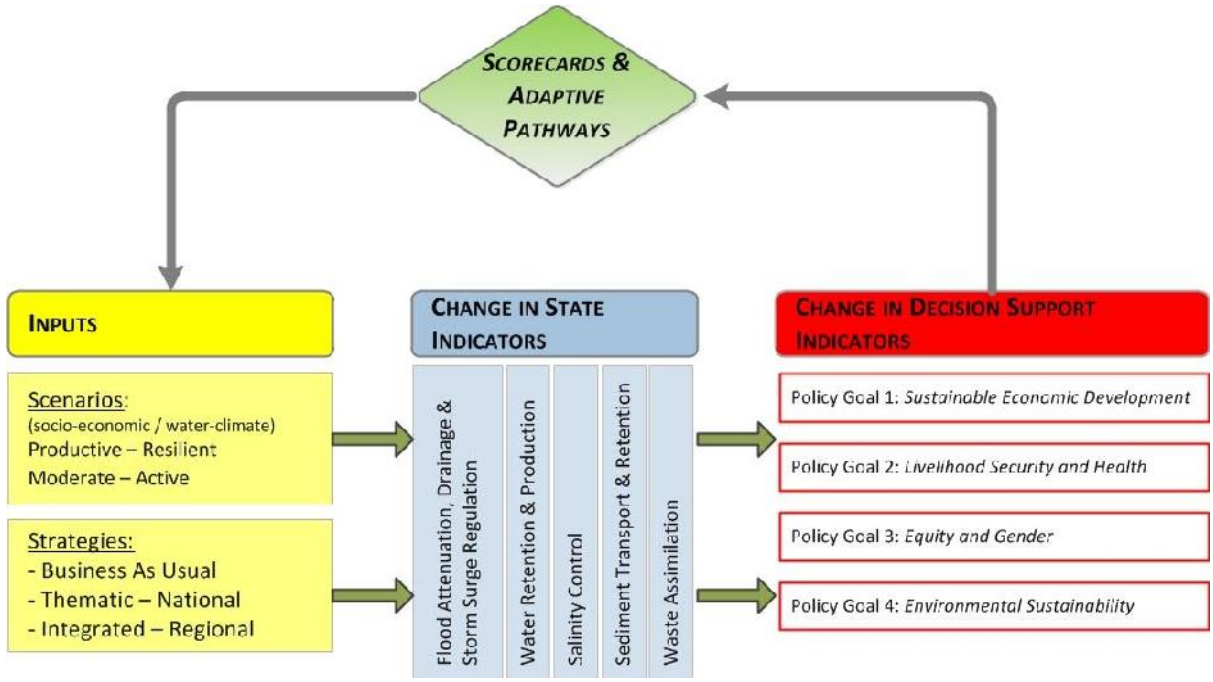


Figure 7.3: Relation between strategies, scenarios, DSIs, SIs and evaluation and decision making

7.3. Main features of the meta-model

The meta model is a fast and integrated model, intended to mimic the behaviour of complex models. This means that results of proposed strategies and investments are visualised in a dashboard in (less than) minutes rather than hours and can be related back to the information source and assumptions if needed in a discussion or analysis. The complex and detailed models are used to develop and validate the results of the meta model, as information to build cause effect relations, and to produce results for building statistical relations. The meta model does not replace the complex and detailed models. After screening and ranking of the actions, strategies and pathways, the detailed models can be used for a more in depth analysis. The computational set-up of the meta model follows the structure as described in the Blue Accounting Framework. The technical infrastructure of the meta model consists of two main components: i) graphical user interface, called *dashboard*, for the user to explore model results; and, ii) related network of *modules* that calculate water system state (SIs) and DSIs, including the *database*. The sector modules describe the performance of the various sectors (agriculture, fisheries, navigation, and industries) and impact modules for demand and socio-economic impacts, as well as issue-specific process modules for the generation of SIs and Input Variables. Whereas the dashboard is designed specifically for use by policy analysts and planners, the model engine and database are more the domain of the modellers, as visualised in **Figure 7.4**.

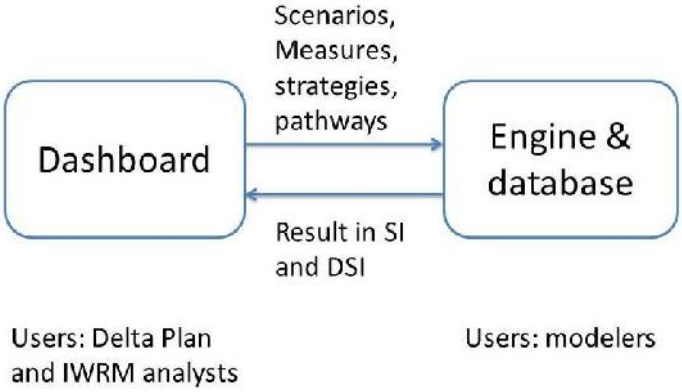


Figure 7.4: Model components and users

The *dashboard* of the pilot version of the meta-model is developed in Microsoft Excel 2010 with Visual Basic for Applications (VBA) as scripting programming language to enable more intuitive interactivity with the dashboard (**Figure 7.5**). The dashboard is built up to be easy-to-use for novice as well as advanced users. The dashboard includes one main overview screen to explore the spatial-temporal impacts (location) of scenarios and strategies on the different SIs and DSIs. Part of the screen is provided to develop new strategies based on a set of measure types. A pathway panel keeps track of the intended time order of the selected strategy and a central scorecard provides summary indicator statistics. Strategies for the specific pilot areas and the impacts on indicators for different areas are provided within one dashboard.

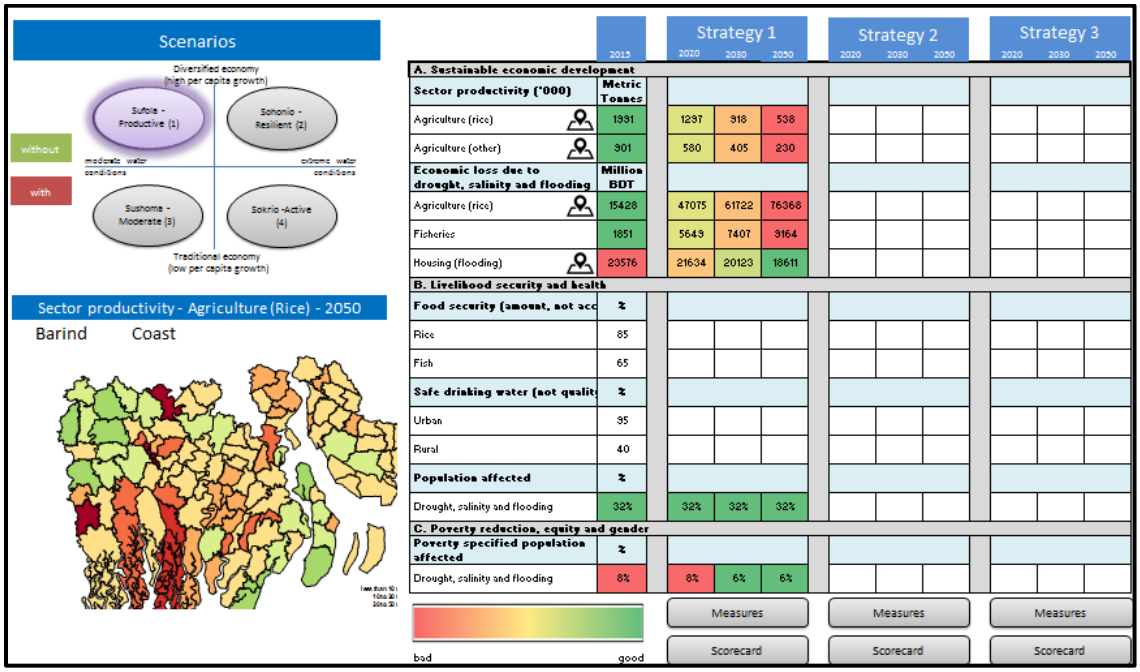


Figure 7.5: Screenshot of the meta model dashboard

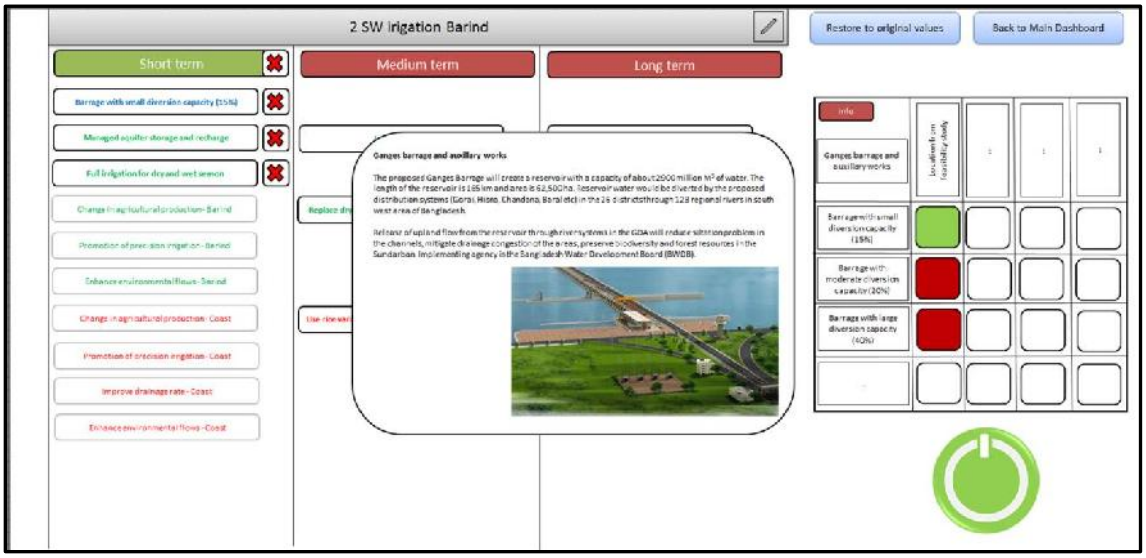


Figure 7.6: Screenshot of the measures input screen of the dashboard

The calculation modules range from simple Microsoft Excel Worksheets, PCRaster9 grid commands, to more advanced processing using the Python programming language. The number of dependent software libraries are kept as low as possible, to keep the meta-model easily transportable to any kind of desktop/laptop computer in Bangladesh. This pilot version only needs Microsoft Excel software as a requirement to be installed. The main spatial calculation unit in the first prototype version are upazilas, as input data does not allow to differentiate within an upazila, yet. Moreover, this is a relevant level for decision support indicators presentation for many policy makers. The meta-model can be easily extended with new modules (system state or decision support) after the pilot version. An overview of included modules in the pilot meta model version is presented in **Figure 7.7**. A detailed description of the Agriculture and Buildings (part of the Assets module) Modules is provided in Annex 3. More details on the Water System Modules are provided in Annex 4.

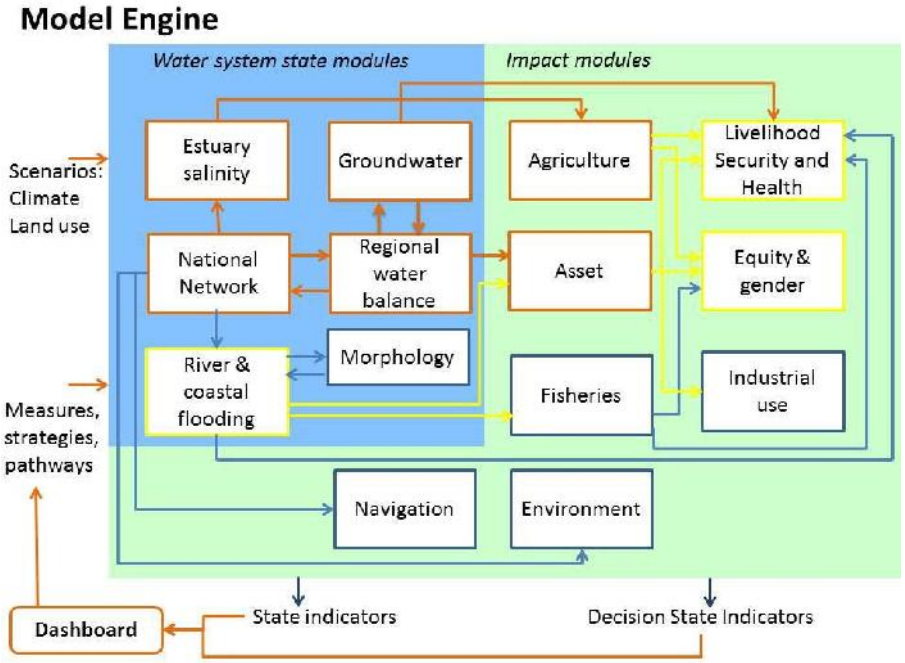


Figure 7.7: Modelling components meta model BDP2100

7.4. Collaborative prototyping: understand the system, evaluate and gradually increase complexity

Following the decision tree of Kelly et al. (2013) the BDP2100 meta model is classified as a knowledge-based motivated model[6] as it can support decision making under uncertainty and the system processes are quite well understood. The meta model for BDP2100 contains simplified versions of existing models.

The key question in each development phase is whether the meta model is accurate enough. Is it fit for the purpose? As mentioned before, the purpose of the model is to support policy makers and stakeholders with the impact assessment of their decisions. The model is meant to facilitate scanning of a large number of potential decisions, and

[6] According to Davis and Bigelow (2003), motivated meta-models are simple, low-resolution models that are needed for high-level reasoning and communication, decision support, exploratory analysis, and rapidly adaptive calculations

help in selecting the right policy options. The question of the quality of the meta-model can thus be reformulated as: *does the meta-model lead policy makers to the same decisions as would be made if using the complex models*? The target to be reached is thus a set of decisions, which corresponds to the decisions made on basis of the complex models.

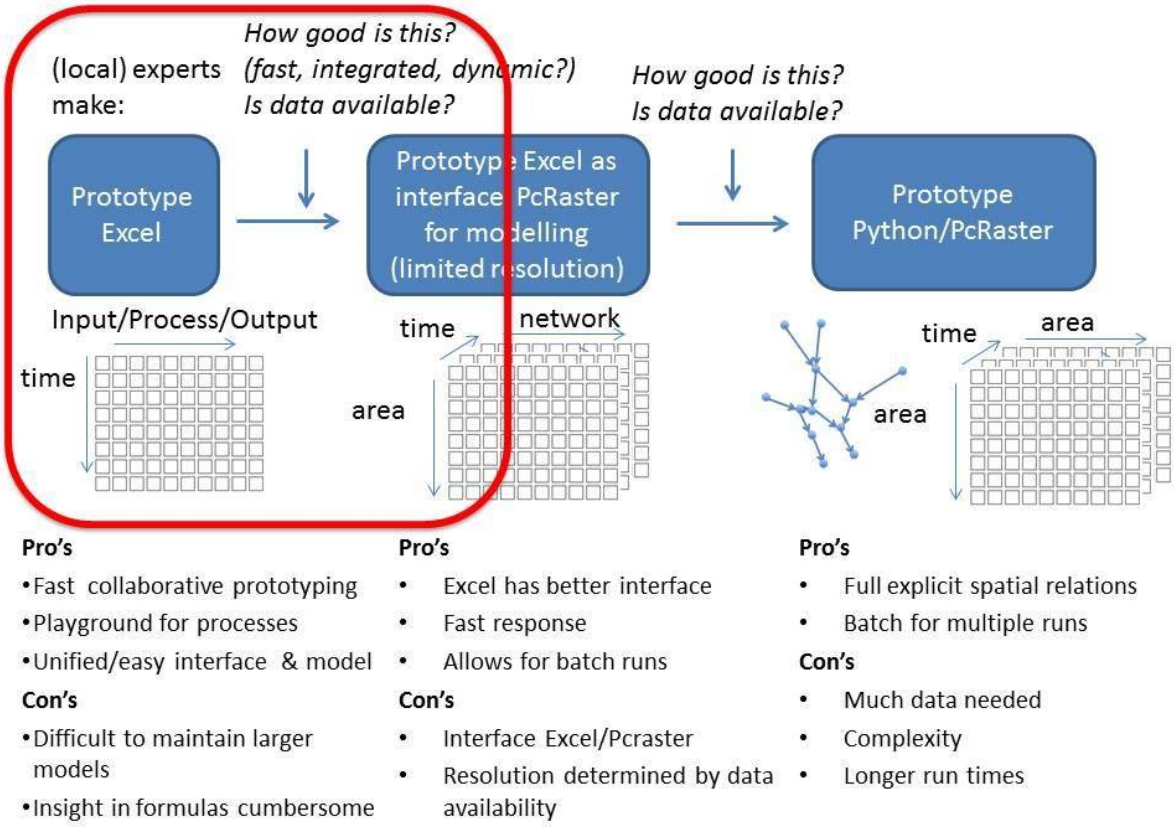


Figure 7.8: Collaborative prototyping: from statistical meta-models to motivated meta-models (red box: pilot meta model)

The performance of the meta-model is assessed in two ways. First, the output of the different model components will be compared to the results of the complex models, and observations for pre-specified periods of interests within between a certain time-period. This includes the comparison of model behaviour with the complex models and historical data in the sense that e.g. dry and wet periods should be reproduced at least with correct relative magnitude and duration.

7.5. Collaborative development and use of the Meta-model

For the development of the meta-model a collaborative modelling approach is followed. This means that decision makers and stakeholders are involved in the meta model development process and use. The collaborative modelling process follows the modelling structure: definition of DSI and SI based on national development goals, as well as co-design of the meta-model dashboard including the selection of scenarios and interventions.

Figure 7.9: Stakeholder workshops August 2016: dashboard, SIs and DSIs

Stakeholder engagement comprised several meetings and technical modelling sessions with the technical advisors for the definition of the computational framework including DSIs (see Annex 1), SIs (see Annex 2), as well as the calculation modules of the *meta model engine*. In these sessions, the list of DSIs and SIs was finalised, the engine was tested and the user-interface (dashboard) was further refined. In addition, the type of interventions or measures were defined that will be included in the meta-model in this pilot phase.

Figure 7.10: Prototype presentation (GED) and engine testing (WARPO, IWM, IWFM, CEGIS and Deltares)

7.6. The pilot regions and measures

The meta model has been developed for two pilot regions (Hot Spots) in the first prototype stage: a) Barind – with drought, groundwater decline and drainage congestion as key water management issues; and b) Coast – with salinity intrusion and ecological degradation as main issues. The meta model is equipped to deal with a selection of the measures included in the BDP2100 Hot Spot Strategies for the Barind and Coast. As per the work plan, 2 measures have been selected from each strategy and tested. These are indicated below in bold and included in the case analysis in the sections hereafter.

The measures selected for the Barind pilot region include:

1. Revitalization of regional rivers trough river management and FCD improvement/wetland restoration (Chalan Beel);
2. *Increased surface water irrigation, through supplementary and full irrigation;*
3. *Replace of boro rice with wheat in the cropping pattern;*

4. Promotion of precision irrigation (increase irrigation efficiency);
5. Promote Managed Aquifer Storage and Recharge (MASR).

The measures selected for the Coast pilot region include:

1. Agriculture intensification through: i) more salt tolerant varieties (up to 3 ppt); ii) improved drainage; Improved irrigation; iv) improved irrigation & drainage;
2. Improved drainage through: i) installing pumping capacity; ii) dredging and excavation; iii) tidal river management; and iv) enhanced O&M;
3. Development of the Ganges barrage to enhance freshwater flows to the South Central river system to reduce salinity intrusion in support of agriculture and environmental objectives;
4. Promoting Managed Aquifer Storage and Recharge (MASR), at private and community level;
5. Improving the durability of rural housing by conversion from 'katcha to pucca'.

Pilot meta model – case analysis

As was discussed above, the pilot meta model supports decision-making and strategy building for Adaptive Delta Management (ADM) and Integrated Analysis or Integrated Water Resource Management (IWRM). It supports adaptive planning by allowing for comparative analysis using multiple scenarios (climate change, socio-economic development). It supports integrated analysis by considering both bio-physical (floods, droughts, water quality) and socio-economic aspects (income, poverty, food availability).

The explanation and case analysis form below guide case analysis using the meta model. Case analysis entails comparing the impact of 1 or more measures, with 1 or more scenario conditions on selected Decision-Making Criteria. Case analysis directly supports decision-making by providing decision-makers with an overview of quantified indicators. The relation between scenarios, strategies & measures and indicators was already illustrated in **Figure 7.3**, above.

A step-by-step explanation to carrying out case analysis is presented below and applied for four different measures in the two Hot Spots thereafter.

Steps	Notes
	The Pilot meta model now covers 2 regions: i) the *Barind*, or more precisely Rajshahi Division including the Barind Tract; and ii) the *Coast*, or more precisely Khulna and Barisal Divisions, covering the South-West and South-Central Hydrological Regions. The regions are described in the Baseline Studies, Delta Atelier Reports and Regional Strategy documents
	Measure(s) or Action(s) are individual interventions or projects, which may be infrastructure but also institutional, legal, economic, knowledge & capacity development. A measure can be oriented at specific spatial, sector- or national-general level. Measures can be part of one strategy but can also fit in multiple strategies. A complete list of measures is included in the Delta Plan Strategies (Barind, Coast, Freshwater, Flood Risk Management)
	A strategy is a coherent combination of measures based on alternative guiding principles or cornerstones, and derived from the Vision that contributes to reaching (policy) goals. The outcome of each strategy is recorded in a summary scorecard reflecting the state and decision support indicators. A strategy can consist of a number of sub-strategies. The (sub-)strategies are described in the Delta Plan Strategy documents

Steps	Notes
	State Indicators (SIs) illustrate the state of the Delta/Water System according to its main Water System Functions. These include indicators such as Flood Extent, Groundwater Levels or the Salinity Level in regional rivers. A description of all the State Indicators can be found in the Delta Plan Assessment Framework document
	Decision Support Indicators (DSIs): illustrate how well the Investments in the Water System contribute to reaching the Policy Goals of the Government of Bangladesh, such as for instance the 6 Delta Goals, the National Sustainable Development Strategy and the 7th Five Year Plan
	Expert judgment is used in parallel to meta model outcomes to compare and increase understanding of model results. The consulted experts are members of the meta modelling team, including IWM, IWFM, CEGIS, ECORYS and Deltares
	The Meta Model supports adaptive planning by allowing for comparative analysis using multiple scenarios (climate change, socio-economic development). At this stage of model development, scenarios are included as static possible future conditions. In a future version, transient scenarios will be developed and included in the model. For comparison purposes, the Productive and Active scenarios are proposed
	The meta model is a pilot project under the BDP2100. Detailed validation and calibration as well as expansion to the National level, including the Urban, Major Rivers, Haor and South-Eastern Regions, are needed to produce sufficiently reliable results. Under observations, any notable deviations from expert judgement and possible causes are included

7.7. Case Analysis 1 Barind

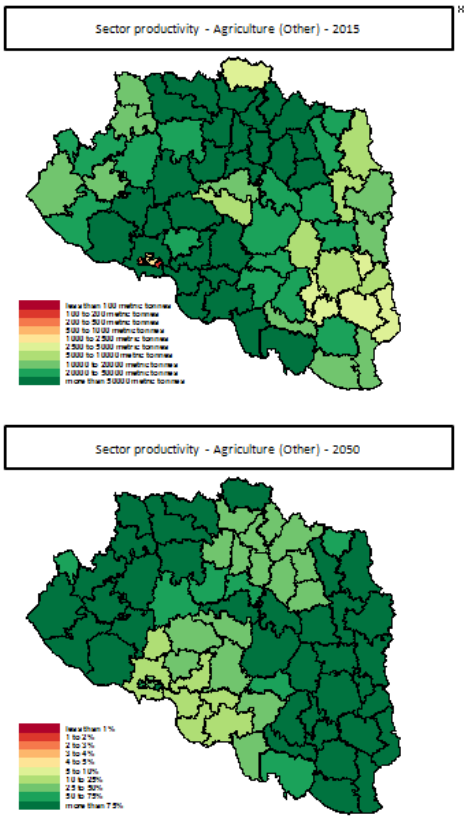
7.7.1. Barind Case (1)

Region	
Barind	
Measure(s)	
Replace Boro by wheat (Barind tract) 50%	
Strategy(ies)	**Sub-strategy(ies)**
Water availability	Demand management and efficient water use
Scorecard DSIs	**Map(s)/Graph(s)**

Total | Barind | Coast

		Business as			measure		
	2015	2020	2030	2050	2020	2030	2050
A. Sustainable economic development							
Sector production	**Million Tonnes**						
Agriculture (rice)	43.30	0.0%	0.0%	0.0%	-14.9%	-22.4%	-29.8%
Culture Fisheries (shrimp)	0.060	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Economic loss due to drought, salinity and flooding	**Million BDT**						
Agriculture (rice)	3218967	0.0%	0.0%	0.1%	-20.9%	-31.3%	-41.7%
Culture Fisheries (shrimp)	0	0%	0%	0%	0%	0%	0%
Housing (flooding)	0	15%	22%	30%	15%	22%	30%
B. Livelihood security and health							
Food security (production vs intake	**%**						
Rice		2.4%	3.6%	4.8%	-1.0%	-1.6%	-2.1%
Fish	0%	0%	0%	0%	0%	0%	0%
Safe drinking water (not quality)	**%**						
Urban	0%	0%	0%	0%	0%	0%	0%
Rural	1%	0%	0%	0%	2%	4%	5%
Population affected	**#**						
Drought, salinity and flooding		-3.4%	-5.1%	-6.8%	-7.3%	-11.0%	-14.6%
C. Poverty reduction, equity and gender							
Affected household budget by income group.	**ratio**						
Drought, salinity and flooding		29.3%	43.9%	58.6%	29.3%	43.9%	58.6%
		Measures			Measures		
		Scorecard			Scorecard		

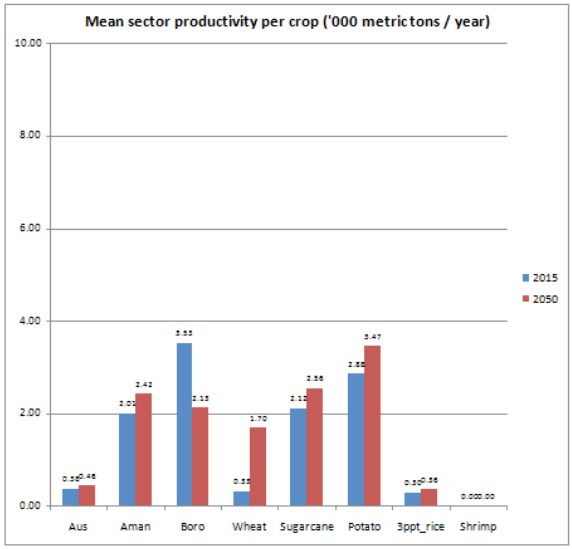
bad good



The graph and table below (model outputs) shows that although 50% of the area of Boro is converted to Wheat, sector productivity of Boro is reduced by 40%. Autonomous production increase of Boro helps to explain this. Wheat productivity increases with more than 200%, because a considerable amount of area is being made available for wheat.

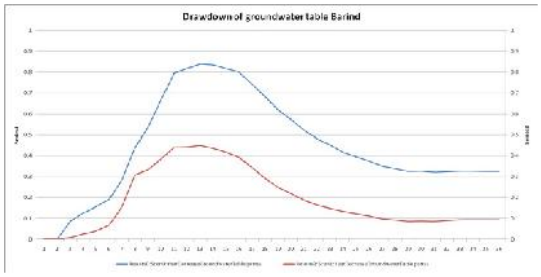
DSI - Scorecard	Unit	Current 2015	Strategy 2021	2030	2050
Sustainable economic development					
Sector productivity					
Agriculture	Metric tons / yr	11.54			13.10
Aus	Metric tons / yr	0.38			0.46
Aman	Metric tons / yr	2.01			2.42
Boro	Metric tons / yr	3.53			2.13
Rice	Metric tons / yr	5.92			5.01
Wheat	Metric tons / yr	0.33			1.70
Sugarcane	Metric tons / yr	2.12			2.56
Potato	Metric tons / yr	2.88			3.47
3ppt_rice	Metric tons / yr	0.30			0.36
Shrimp	Metric tons / yr	0.00			0.00
Other	Metric tons / yr	5.62			8.09
Economic loss due to floods		23.21			16.31
Agriculture	BDT billion / yr	0.00			0.00
Housing	BDT billion / yr	43.30			85.58

The less severe drawdown of the groundwater table results in a higher DSI score for access to safe drinking water.

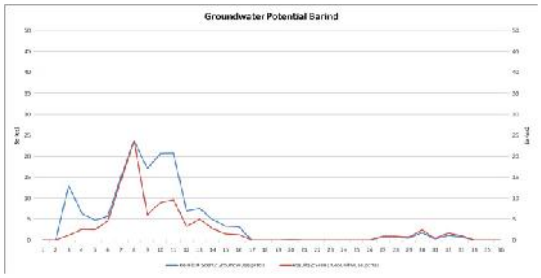


State Indicators Results

The larger recharge of groundwater (due to higher precipitation in the scenarios) combined with the decreased use of groundwater results in a decreased yearly drawdown of the groundwater table. Drawdown of course shows a seasonal effect, but the overall result is a significantly reduced drawdown after changing the cropping pattern, as illustrated in the graph below.



The change in Groundwater Demand or Potential (the potential amount of irrigation demand extracted from groundwater sources) is illustrated in the graph below. This is logical, By replacing Boro with Wheat, significantly less groundwater is used.



Comparison with Expert Judgement

Expert judgment scoring table:

Food availability (volume/caloric needs population)			
	Rice	%	--
	Wheat	%	++
	Fish	%	+
Sufficient drinking water (water availability/needs per capita)			
	Urban	%	0
	Rural	%	+
Unsafe drinking water (water quality)			
	Urban - salinity	%	0
	Urban - arsenic	%	0
	Rural - salinity	%	0
	Rural - arsenic		++
Population affected by floods			
	People affected	#	0
	Population share	%	0
Population affected by droughts			
	People affected	#	0
	Population share	%	0
Population affected by waterlogging			
	People affected	#	+
	Population share	%	+

Because less (Boro) rice is being produced, the economic losses due to drought for rice also decrease.

Due to the replacement of Boro by Wheat the food security for Rice decreases. This is only partly compensated by the increased production of Wheat.

The expected improvement of the drinking water situation for rural people is simulated well by the meta model.

Scenario Comparison

Productive	***Active***
Climate change (increased precipitation) results in a higher recharge rate of the groundwater table, and so the more	Climate change (increased precipitation) results in a higher recharge rate of the groundwater table, and so

extreme climate results in a slightly smaller drawdown of the groundwater.	the more extreme climate results in a slightly smaller drawdown of the groundwater. This effect is reduced by the higher ET0 for the higher temperatures. The active scenario has a larger population, so in principle this would put more people at risk for not having access to safe drinking water. The results obtained with the measure counterbalance this result.
Observations	
The meta model shows results in line (with its direction) with the expert opinions.	

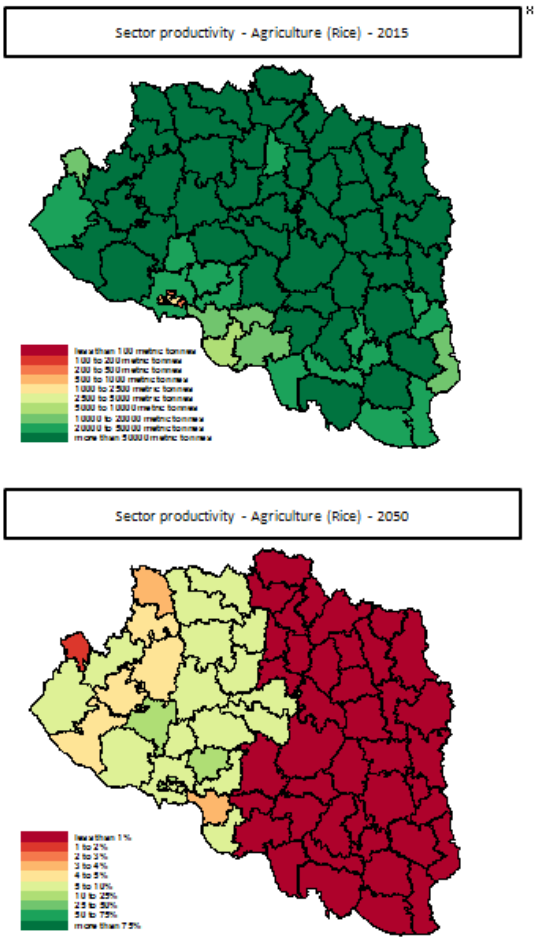
7.7.2. Barind Case (2)

Region	
Barind	
Measure(s)	
Rajshahi irrigation, full (dry season) with Ganges	
Strategy(ies)	**Sub-strategy(ies)**
Water availability	Supply Management and additional irrigation
Scorecard DSIs	**Map(s)/Graph(s)**

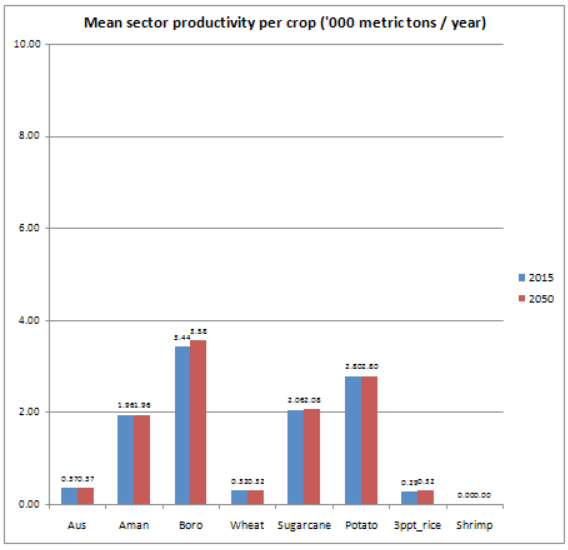
Total | Barind | Coast

		Business as			measure		
	2015	2020	2030	2050	2020	2030	2050
A. Sustainable economic development							
Sector production	**Million Tonnes**						
Agriculture (rice)	43.30	0.0%	0.0%	0.0%	1.3%	1.9%	2.6%
Culture Fisheries (shrimp)	0.060	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Economic loss due to drought, salinity and flooding	**Million BDT**						
Agriculture (rice)	3218967	0.0%	0.0%	0.0%	-16.3%	-24.5%	-32.7%
Culture Fisheries (shrimp)	0	0%	0%	0%	0%	0%	0%
Housing (flooding)	0	13%	20%	27%	13%	20%	27%
B. Livelihood security and health							
Food security (production vs intake	**%**						
Rice		1.6%	2.4%	3.2%	-0.9%	-1.3%	-1.8%
Fish	0%	0%	0%	0%	0%	0%	0%
Safe drinking water (not quality)	**%**						
Urban	0%	0%	0%	0%	0%	0%	0%
Rural	1%	0%	0%	0%	4%	5%	7%
Population affected	**#**						
Drought, salinity and flooding		-5.4%	-8.2%	-10.9%	-6.8%	-10.2%	-13.6%
C. Poverty reduction, equity and gender							
Affected household budget by income group.	**ratio**						
Drought, salinity and flooding		28.4%	42.6%	56.8%	30.7%	46.1%	61.4%
		Measures			Measures		
		Scorecard			Scorecard		

bad — good



DSI - Scorecard	Unit	Current 2015	Strategy 2021	Strategy 2030	Strategy 2050
Sustainable economic development					
Sector productivity					
Agriculture	Metric tons / yr	11.24			11.43
Aus	Metric tons / yr	0.37			0.37
Aman	Metric tons / yr	1.96			1.96
Boro	Metric tons / yr	3.44			3.58
Pics	Metric tons / yr	5.76			5.91
Wheat	Metric tons / yr	0.32			0.32
Sugarcane	Metric tons / yr	2.06			2.08
Potato	Metric tons / yr	2.80			2.80
3ppt_rice	Metric tons / yr	0.23			0.32
Shrimp	Metric tons / yr	0.00			0.00
Other	Metric tons / yr	5.47			5.52
Economic loss due to floods		22.60			15.21
Agriculture	BDT billion / yr	0.00			0.00
Housing	BDT billion / yr	43.30			54.78
Economic loss due to droughts and salinity					
Agriculture	BDT billion / yr	22.60			15.21
Livelihood security and health					
Food security (focus only on amount, not access)					
Rice	%	0.06			0.04
Safe drinking water (not considering water quality)					
Rural	%	0.45			0.52
Population affected by floods		3.71			3.20
People affected	#	3218367			2815633
Population	%	0.43			0.43
Population affected by droughts					
People affected	#	487966			387636
Population	%	0.10			0.07
Poverty reduction, equity and gender					
Flood damage to household income					
Population	%	0.08			0.10
Crop damage due to droughts to household income					
Population	%	0.06			0.03
Aggregated damage to household income		0.14			0.13

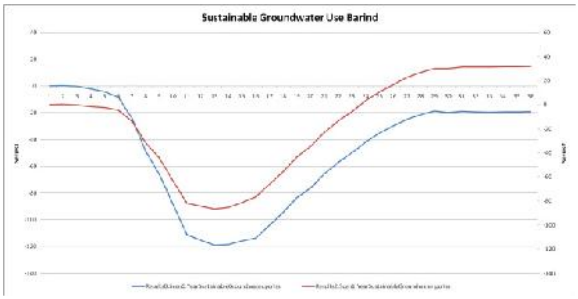


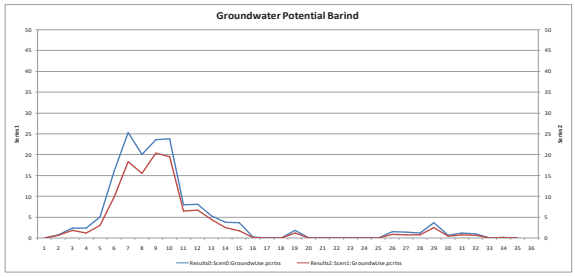
State Indicator results

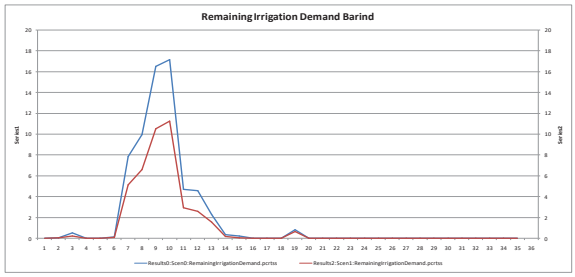
Drought damage for Boro in the current situation seems to be underestimated by the meta model, so the benefits of extra irrigation water on production remain relatively small.

The extra surface irrigation is mainly used to replace groundwater as a source of irrigation water. This makes the situation with groundwater extraction and groundwater depletion better. The over-extraction of groundwater is decreased and that improves the situation of people having access to safe drinking water.

The graph on Sustainable Groundwater Use shows the temporal yearly pattern of cumulative groundwater recharge and groundwater depletion. The line for the current situation clearly shows an overexploitation of the groundwater (blue line: negative value after the year finishes) while the situation with extra surface water for irrigation (red line) shows a positive value at the end of the year. This indicates a non-sustainable current situation versus a sustainable future situation.



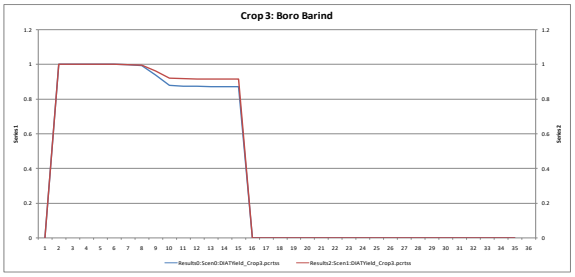




Comparison with Expert Judgement

Sustainable economic development		
Sector productivity		
Agriculture		
Aus	Metric tons / yr	0
Aman	Metric tons / yr	0
Boro	Metric tons / yr	++
Boro 3ppt_rice	Metric tons / yr	0
Rice TOTAL	Metric tons / yr	++
Wheat	Metric tons / yr	+
Sugarcane	Metric tons / yr	
Potato	Metric tons / yr	
Fruits	Metric tons / yr	
Vegetables	Metric tons / yr	
Fisheries		
Shrimp	Metric tons / yr	0
Culture - other	Metric tons / yr	0
Capture	Metric tons / yr	+
Energy	MW	
Industry	BDT	
Transport	BDT/Volume	
Economic loss due to floods		
Agriculture	BDT billion / yr	0
Fisheries	BDT billion / yr	0
Livestock	BDT billion / yr	0
Energy	MW	
Industry	BDT billion / yr	
Transport	BDT billion / yr	
Housing	BDT billion / yr	
Economic loss due to droughts and salinity		
Agriculture	BDT billion / yr	.+
Fisheries	BDT billion / yr	0
Livestock		0
Energy		
Industry	MW	

The additional irrigation introduced by the measured results in reduced drought reduction for rice, and an increased yield of Rice, as was also expected by the experts



Scenario Comparison

Productive	***Active***
Climate change (increased precipitation) results in a higher recharge rate of the groundwater table, and so the more extreme climate is resulting in a slightly smaller drawdown of the groundwater.	Climate change (increased precipitation) results in a higher recharge rate of the groundwater table, and so the more extreme climate is resulting in a slightly smaller drawdown of the groundwater. This effect is reduced by the higher ET0 for the higher temperatures. The active scenario with a slightly larger population, so in principle this would put more people at risk for not having access to safe drinking water. The results obtained with the measure partly counterbalance this anticipated outcome.

Observations

The meta model shows results mainly in line (with its direction) with the expert opinions. Special attention should be focussed on the current situation and the water stress in the current situation. As water stress seems to be relatively low, the effect of these measures on productivity is relatively low. This needs to be confirmed with local experts.

7.8. Case Analysis Coast

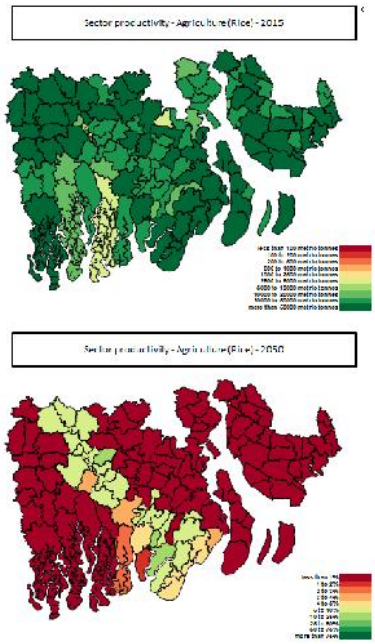
7.8.1. Coast Case (1)

Region	
Coast	
Measure(s)	
Ganges barrage with full flow over Gorai river system. The example run here does not include socio-economic change, only climate change +20% precipitation in wet season, -10% precipitation in dry season	
Strategy(ies)	**Sub-strategy(ies)**
Water availability	Supply management and additional irrigation
Scorecard DSIs	**Map(s)/Graph(s)**

Total | Barind | Coast

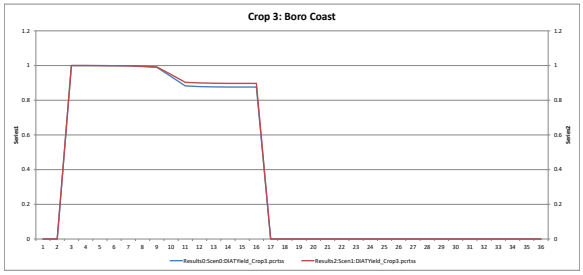
		2015	Business as usual 2020	2030	2050	measure 2020	2030	2050
A. Sustainable economic development								
Sector production	**Million Tonnes**							
Agriculture (rice)	7.31		0.0%	0.0%	0.0%	0.8%	1.2%	1.6%
Culture Fisheries (shrimp)	0.017		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Economic loss due to drought, salinity and flooding	**Million BDT**							
Agriculture (rice)	30		0.1%	0.1%	0.1%	-8.5%	-12.7%	-16.9%
Culture Fisheries (shrimp)	0		0%	0%	0%	0%	0%	0%
Housing (flooding)	9		29%	44%	58%	99%	149%	198%
B. Livelihood security and health								
Food shortage (production vs intake)	**%**							
Rice	9%		0.0%	0.0%	0.0%	-1.0%	-1.4%	-1.9%
Fish	0%		0%	0%	0%	0%	0%	0%
Safe drinking water (not quality)	**%**							
Urban	0%		0%	0%	0%	0%	0%	0%
Rural	80%		0%	0%	0%	4%	5%	7%
Population affected	**#**							
Drought, salinity and flooding	2.7		3.6%	5.4%	7.2%	0.4%	0.6%	0.9%
C. Poverty reduction, equity and gender								
Inequality of damage (>1 disproportionate to poor)	**ratio**							
Drought, salinity and flooding	3.13		29.3%	43.9%	58.6%	29.4%	44.1%	58.9%
			Measures			Measures		
			Scorecard			Scorecard		

bad — good



Scorecard SIs	**Map(s)/Graph(s)**

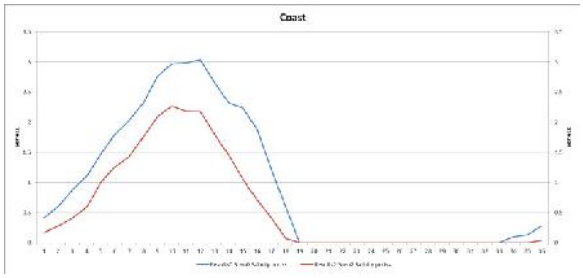
Indicator	2015	BAU	STRAT1
Riverine flooding			
Mean max. extent (ha)	1.2 mil	1.3 mill	1.4 mil
Median min. depth (m)	0.34	0.43	0.51
Flooding duration (dec)	5.3	6.3	7.6
Meteorological drought			



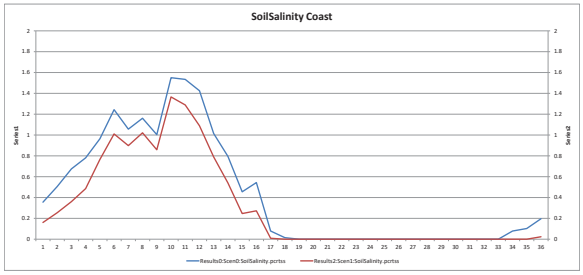
Dry season precipitation (mm)	286	282	282
Precipitation deficit (mm)	75	75	61
Hydrological drought			
Groundwater fluctuation (m)	10.9	10.7	9.5
Depletion rate (m/year)	x	x	x
Groundwater recharge rate (mm/year)	145	162	162
Actual evapotranspiration / potential evapotranspiration	0.94	0.94	0.95
Water demand (mm)	1430	1419	1417
Surface water supply	x	x	x
Groundwater supply	x	x	x
Salinity intrusion			
Max. soil salinity level (ppt)	1.55	1.55	1.37
Mean SW salinity (ppt)	3.20	3.20	2.40

The numbers in the SI scorecard confirms the hypothesis of extended flooding (in extent, depth and duration) due to climate change (BAU vs. 2015) and the Ganges barrage (STRAT1 to BAU). Hydrological drought indicators show that the groundwater fluctuation decreases, due to increase SW flow through the Gorai. The soil and surface salinity levels give expected values.

The graph above shows the potential remaining yield of Boro rice through the year, influenced by water shortage in its growing season. The red line shows the situation with climate change and with Ganges barrage. The blue line is current situation without Ganges barrage. In the new situation, boro crops on their current location will on average provide more yield.



The graph above shows the mean (for the whole river) maximum water salinity in the Gorai through the year. The new situation (large climate change and Ganges barrage in red) shows a large decrease of the SW salinity level as expected.



The graph above shows the average soil salinity in the coastal region throughout the year. It indicates a substantial decrease in soil salinity, due to the effects of the Ganges barrage (red line). The blue line shows, like in the other graphs, the current situation without climate change and barrage.

Comparison with Expert Judgement

Experts indicate that with a Ganges barrage:

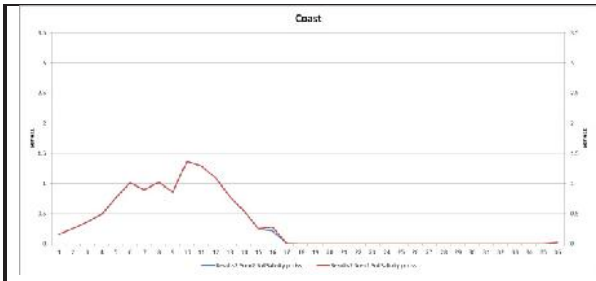
1. Except for shrimp production, agricultural and fisheries production will increase due to increased freshwater flow available for irrigation;

2. Economic losses to agriculture due to floods and droughts will decrease.

3. Food availability of rice will increase.

1. The meta model shows a slight increase of rice production, mainly from an increase in Aus and Boro yield. The meta model shows no indication of decreasing shrimp production. This is because, land use changes (from shrimp to rice e.g.) are not incorporated in the model. The current settings of the model on shrimp sensitivity shows that there is no minimum in salt level there (only a maximum).

4. No impact on the availability of drinking water is expected. 5. Population affected by floods and droughts will decrease. 6. On poverty reduction, no expert opinion could be given.	2. Economic losses to agriculture are indicated to be lower after the measure (-16.9%), as the rice production is more secured through surface water supply. 3. Food shortage for rice shows a slight decrease in the scorecard. This indicates that with the measure the food security is higher; the indicator shows the loss-theoretical production ratio of rice: the higher the loss, the higher the percentage. 4. The meta model indicates a 7% increase in safe rural drinking water supply, because given that increased surface water flow in Gorai can be used for irrigation, unsustainable yields are prevented, more GW is available for drinking water supply. The current average safe drinking water supply in rural areas for the coast is estimated to be 80%. 5. Population affected from drought, salinity and flooding decrease with almost 1%. People additionally affected from flooding are compensated for people less affected from droughts. 6. The measure will have a profound impact on the inequality of damage due to climate change (> 50%) and its resulting flooding and more droughts. The measure will only increase this effect. 7. Flood extent increases as a result of the measure which is contrary to expert judgement. This may well be caused by the fact that morphological changes have not (yet) been incorporated into the pilot meta model, meaning that enhanced drainage capacity due to increased flows are not visible.
Scenario Comparison	
Productive	***Active***
Climate change is only affecting the wet season precipitation here, leading mainly to more flooding, and some small positive effects on the dry season water balance, end of the season. In the graph below the difference is shown in mean max soil salinity throughout the coastal zone throughout the year for both climate change scenarios. This difference is negligible.	A larger climate change has a considerable negative effect on the different indicators. Flooding will be more severe, water deficits and salinity are more profound, certainly when looking at local upazilas and for different years. All graphs above are shown for this worst climate scenario.

	
Observations	
The meta model shows results mainly in line (with its direction) with expert opinion except for flood extent. The latter increases due to increased flows year round. As morphological changes cannot yet be simulated, any increased drainage due to larger flows and resultant morphological changes are not yet simulated.	

7.8.2. Case Coast (2)

Region	
Coast	
Measure(s)	
River management; excavation and smart dredging. Example run with moderate socio-economic change and high climate change (precipitation)	
Strategy(ies)	**Sub-strategy(ies)**
Flood risk management	FCD Rationalization
Scorecard DSIs	**Map(s)/Graph(s)**

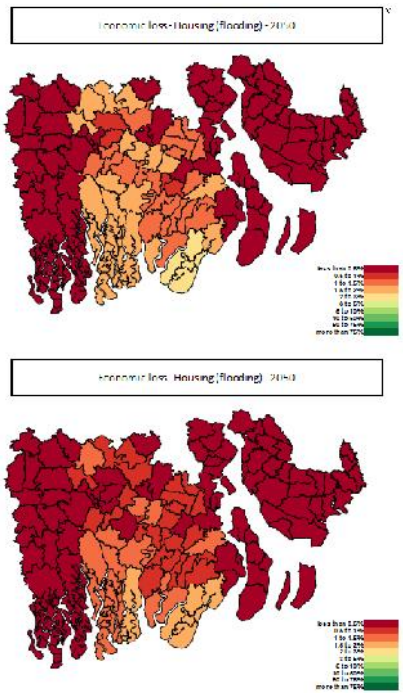
Total | Barind | Coast

		2015	Business as usual 2020	2030	2050	measure 2020	2030	2050
A. Sustainable economic development								
Sector production	**Million Tonnes**							
Agriculture (rice)	7.51		10.3%	15.5%	20.6%	10.3%	15.5%	20.6%
Culture Fisheries (shrimp)	0.017		10.3%	15.5%	20.6%	10.3%	15.5%	20.6%
Economic loss due to drought, salinity and flooding	**Million BDT**							
Agriculture (rice)	31		10.4%	15.6%	20.8%	10.4%	15.6%	20.8%
Culture Fisheries (shrimp)	0		0%	0%	0%	0%	0%	0%
Housing (flooding)	9		72%	108%	144%	51%	77%	103%
B. Livelihood security and health								
Food shortage (production vs intake)	**%**							
Rice	9%		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Fish	0%		0%	0%	0%	0%	0%	0%
Safe drinking water (not quality)	**%**							
Urban	0%		0%	0%	0%	0%	0%	0%
Rural	80%		0%	0%	0%	0%	0%	0%
Population affected	**#**							
Drought, salinity and flooding	2.7		14.8%	22.3%	29.7%	12.4%	18.6%	24.8%
C. Poverty reduction, equity and gender								
Inequality of damage (>1 disproportionate to poor)	**ratio**							
Drought, salinity and flooding	3.11		36.4%	54.6%	72.8%	35.4%	53.0%	70.7%

bad — good

Measures | Scorecard | Measures | Scorecard

The main impact from dredging is shown for the indicator flooding losses to housing (from 144% to 103%). Derivatives like population affected and damage inequality are also positively influenced. This is a run with climate change and socio-economic change

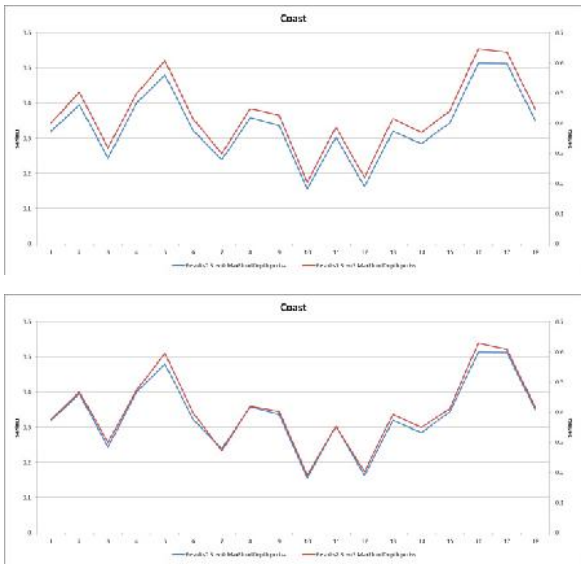


Here, we compare both future situations with relative losses to 2015 (with a counterintuitive legend). The above one shows the additional losses due to high climate and moderate socio-economic change to housing flooding. The lower one shows the situation with high climate and moderate socio-economic change and smart dredging. The lighter the colours the more economic additional loss.

In this specific case, it is clearly shown that only the Gorai diversion has been implemented in the schematization, leading to unreliable economic loss estimates in the area not connected to the Gorai (actually, the model now shows permanent waterlogging here). To improve this, we need to calibrate the 'Maxdrainage' parameter in the model for these upazilas not connected to the Gorai basin.

Scorecard SIs			
Indicator	2015	BAU	STRAT1
Riverine flooding			
Mean max. extent (ha)	1.2 mil	1.32 mill	1.27 mil
Median min. depth (m)	0.34	0.43	0.40
Flooding duration (dec)	5.3	6.3	6.0
Meteorological drought			
Dry season precipitation (mm)	286	282	282
Precipitation deficit (mm)	75	75	75
Hydrological drought			
Groundwater fluctuation (m)	x	x	x
Depletion rate (m/year)	x	x	x
Groundwater recharge rate (mm/year)	145	162	162
Actual evapotranspiration / potential evapotranspiration	0.94	0.94	0.94
Water demand (mm)	1430	1419	1419
Surface water supply	x	x	x
Groundwater supply	x	x	x
Salinity intrusion			

Map(s)/Graph(s)



Both graphs above show differences in yearly (over 18 years) average flood depth in the coastal zone for a) BAU, high climate change and b) smart dredging, high climate change. Red line is future situation, blue the current situation. Climate change impact on average max. flood depth is almost halved by smart dredging.

Max. soil salinity level (ppt)	1.55	1.55	1.55	
Mean SW salinity (ppt)	3.20	3.20	3.20	

Comparison with Expert Judgement	
Experts indicate that dredging of the peripheral rivers may have overall positive impacts on agricultural productivity and fisheries, decrease economic losses for agriculture and housing, improve food availability and rural drinking water supply, and have positive impacts on population affected.	The meta model shows comparable productivity and economic damage to agriculture, in comparison with business as usual, less economic damage to housing, and positive relative results on population affected and the inequality of damage. This means that damage to the homes of the poor due to flooding decrease with this measure.
Scenario Comparison	
Productive	***Active***
Moderate climate change has a small negative impact on many of the indicators. The socio-economic change, also included in the business as usual calculations, has a larger impact. It is assumed that current stoning trends and population growth continues and is built at current plinth level. Therefore mainly more economic damage.	Sector productivity and economic losses will increase mainly due to economic change (higher population or higher productivity) despite diminishing agricultural area. The population affected and inequality index are positively impacted in a better socio-economic scenario. Results indicate that higher climate change contribute for 25-30% of the additional losses to flooding of houses in the meta model (additional economic losses in productive without socio-economic change and moderate climate change is around -13 to +5%, while in with high climate change this is +30 to +58%). With moderate socio-economic change (see figures above) this increase to +144 and 103%, respectively.
Observations	
The meta model shows results mainly in line (with its direction) with expert opinion.	

7.9. Conclusions and the way forward

The pilot application has shown that an integrated and fast meta-model for the water resources system of Bangladesh can indeed be build. The short running time of the model (less than 1 minute) makes the meta-model applicable in decision making processes with stakeholders while the accuracy of the results are well within the ranges needed for decision making. What is needed now is to upscale the model for the whole of Bangladesh and to include all physical and socio-economic processes that determine the performance of the Delta and water resources system.

The first step for developing a full scale meta-model for Bangladesh is to structure the involvement and responsibilities of all stakeholders. This include the 'owners' (GED) and ultimate users of the model (such as WARPO, regional agencies, the BWDB and other planning and implementation agencies), the developers of the software (such as IWM, CEGIS and

BUET, also responsible for the maintenance) and the organizations that will provide the data. Once this organizational structure is clear a start can be made with full-fledged development. This includes enhancing the design of the IT-platform for the model, taking into account accessibility and robustness of the software. The next step is to develop the modules of the meta-model that are not included yet. Important physical models to be added are water quality and morphology. The socio-economic modules that should be added include navigation, ecosystem services and the impacts on households (health, income, employment). Experiences gained from the ESPA-Deltas model can and should be incorporated.

To ensure the sustainability of the ultimate model it will be needed to continue to follow a collaborative modeling approach, involving both the owner/clients of the model as well as the local model developers. A main part of the development should be done by Bangladesh institutes such as IWM and CEGIS while BUET-IWFM should supervise and contribute as well. To ensure the quality of the socio-economic components cooperation will be sought with a local socio-economic research institute.

The development of the full model will take about 2 years. A very first estimate of the budget needed for the development of such full model is 2 MEuro. The development can be done in phases.

Annex 1: Decision Support Indicators - Pilot Phase

Decision Support Indicators		
A	**Sustainable economic development**	
A.1	Sector productivity	
A.1.1	Agriculture (rice, wheat, sesame, oil seeds, potato and sun flowers)	Million tons; tons/ha
A.1.2	Fisheries (aquaculture and capture)	Million tons; tons/ha
A.1.3	Energy	MW
A.2	Economic loss due to floods, droughts, water logging and salinity	
A.2.1	Agriculture	Tk
A.2.2	Fisheries	Tk
A.2.3	Energy	Tk
A.2.4	Housing	Tk
A.2.5	Critical infrastructure	Tk
B	**Livelihood security and health**	
B.1	Food security (focus only on amount, not access)	
B.1.1	Rice	%
B.1.2	Wheat	%
B.1.3	Fish	%
B.2	Safe drinking water	
B.2.1	Urban	%
B.2.2	Rural	%
B.3	Population affected by floods, droughts and salinity	# affected; % population
C	**Poverty reduction, equity and gender**	
C.1	Income distribution	
C.1.1	Gini coefficient	-
C.1.2	Employment rate: Rural (agriculture and fisheries) – Urban (industries)	%
C.1.3	Gender: Male - Female	
C.2	Poverty specified population affected by floods	# affected; % population

Annex 2: State Indicators - Pilot Phase

State indicators		
A	**Flood attenuation and storm surge regulation**	
A.1	Peak main river discharge and water level	m^3/s and m
A.2	Riverine flood extent, duration and depth	ha, days and m
A.3	Extreme cyclone flood extent	ha
A.4	Flash flood extent	ha
B	**Waterlogging and drainage congestion**	
B.1	Drainage and flood recession rate	days and m
C	**Water retention and production**	
C.1	Dry season river flow and no-flow duration	m^3/s and days
C.2	Floodplain water storage	m^3
C.3	Groundwater fluctuation and depletion rate	m and m/year
C.4	Annual groundwater recharge rate	m^3/ha
C.5	Meteorological drought	days
C.6	Agricultural drought – extent, duration and intensity	days, mm
C.7	Hydrological drought	days
C.8	Area under irrigation coverage: ground/ surface water	ha (ground/surface water)
C.9	Irrigation wells falling dry in dry season and shallow depth	days and area
C.10	Drinking water wells falling dry in dry season	days (decade)
D	**Salinity control**	
D.1	Max. inland intrusions length and area affected (surface water)	km and km^2
D.2	Maximum salinity level in groundwater and soil salinity coverage and level	dS/m
D.3	Surface water salinity concentration and spatial variation	dS/m
D	**Environmental sustainability**	
D.1	Ecosystem sustainability	
D.1.1	Environmental flows (Sundarbans, rivers) below threshold	Days
D.1.2	Min flow for connectivity floodplain/beel to main river (Barind: Atrai)	Min flow for connectivity - Ha as function of water flow

Annex 3: Agriculture and Building Modules

Agriculture Impacts Module

Baseline crop production

The baseline crop productivity and agricultural land use were quantified using the BBS District Statistics 2011 (2013). These statistics show the acreage and land use for a wide range of crop types.

The figure below summarises the steps taken to determine baseline crop production. In short, the approach starts with defining the acreages of land per crop type in the regions. These are then amended with the land use trends and changes in order to get to figures for the years 2015 and 2050. The crop survival is subsequently applied to the production of crops per m^2 between 2015 and 2050. Survival (less than 100%) depends on the amount of impact of events (drought, floods, salinity) etc.

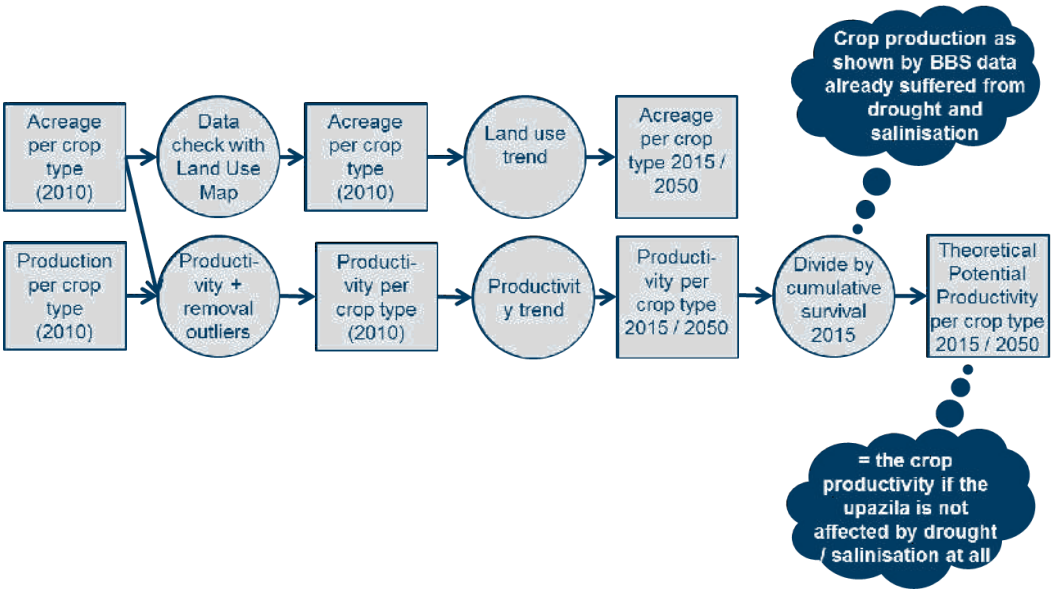


Figure A- 1: Schematic overview of steps taken to determine baseline crop production

Data Validation

We identified internal inconsistencies and strong outliers in the data. Therefore, we performed a data quality validation to ensure any unrealistic data points were identified and correct to fit a valid range. The data validation included the area (acres) and productivity (metric ton) for the seven selected crops across all 190 Upazila.

Agricultural crop area

Having extracted the agricultural statistics on the crop area of all 190 Upazilas, some inconsistencies were found between the sum of the crops and the Upazila's gross area. Moreover, analysing the crop area distribution some areas were found to be remarkably large. Therefore, we conducted a data validation comparing the:

Sum of the gross area of the seven selected crops[7] - District *statistics*

Net agricultural cropped area – *GIS Land-use data*

Net fallow land area - *GIS Land-use data*

In this analysis the second source was considered as most valid, for which any upper outliers which was found in the first was validated and corrected against the second.

The following steps were performed to identify any errors:

Matching the agricultural crop area GIS land-use data with the (seven) selected crop area data for the 190 Upazila.

Harmonizing the variables measurement unit: The sum of gross area of the selected area was converted to a net area via the following steps:

a. STEP 1: calculating the average net/gross area ratio per district on the basis of the *district statistics;*
b. STEP 2: Multiplying sum of gross area of the selected crops in each Upazila with the ratio of the respective district calculated in step 1.

[7] Aus, Aman, Boro, Wheat, Sugarcane, Potato (all), Mango

Checking the absolute and relative difference between the two net are of sum selected crops with the net area in an Upazila (agricultural cropped + fallow).

Highlighting any cases in which the area of the selected crops is physically larger than the GIS mapped area. These Upazilas are highlighted as the selected area cannot be higher than the physical availability of land for agriculture.

Correcting to the seven crops for all highlighted Upazila

Applying a percentage correction to the seven crops for all highlighted Upazila: In case the sum of the net area of the seven selected statistics was found higher than the net agricultural cropped area, the following correction was applied: *each crop area is multiplied by the percentage difference between the net agricultural cropped area and the sum of the net area of the seven selected crops.* Hence: $Correct\ crop\ area_j = crop\ area_j * \left(1 - \frac{(net\ area_i - net\ area\ sum\ of\ 7\ selected\ crops_i)}{net\ area\ sum\ of\ 7\ selected\ crops_i}\right)$ with j= 1 -7 crops and i= 1-190 Upazila. In cases the difference between the net area and the sum of selected crops was larger than one, the formula was corrected to

$$Correct\ crop\ area_j = crop\ area_j * \left(\frac{1}{\frac{(net\ area_i - net\ area\ sum\ of\ 7\ selected\ crops_i)}{net\ area\ sum\ of\ 7\ selected\ crops_i}}\right)$$

The sum of the gross area is, therefore, capped at the net total area (agricultural cropped and fallow) times the districts average annual frequency one acre is used (gross/ net area ratio.

Data Validation Agricultural crop productivity

Having extracted the agricultural statistics on the crop productivity of all 190 Upazilas, outliers inconsistencies were found. These outliers were identified and corrected according the following steps:

Step 1: Analysing the distribution of the productivity statistics per crop and Upazila by identifying the 1st, 2nd, and 3rd quartile and the average and the median.

Step 2: Highlight all data points which are:
- Larger than the third quartile plus three times the difference between the third and the first quartile.
- Smaller than the first quartile minus three times the difference between the third and the first quartile.

Step 3: Denoting all data points which are missing with: "no data".

Step 4: For all crops correcting all highlighted data points (step 2) with the median of the distribution of the respective crop.

Step 5: For all crops correcting data points with "no data" with the district's average productivity for the respective crop.

Outliers of the crop productivity are therefore corrected by the median of the respective crops. Any cases of missing data points are corrected by the district's average productivity for that crop.

Theoretical potential productivity

The crop statistics represent the production under existing climatic conditions. This implies that any damage due to drought, salinity and flooding has already occurred. We therefore correct the observed production values to theoretical potential production. The rationale is we assess what the production would be, had there not been any drought, salinization or flood. We divide the productivity values by the 'cumulative survival fraction' estimated by the model. These cumulative survival fractions are between 0 and 1, 1 implying no damage.

Productivity and land use trends

To assess future baseline crop yields, we apply long term trends on crop productivity (0.9% growth of crop production per year)[8] and land use (0.8% reduction of land use for agricultural crops per year)[9]. Land use of agriculture declined in the past due to the population growth and urbanisation. The future growth rates in the model are based upon historic productivity and agricultural land decline rates in Bangladesh. Moreover, the future rates in the Meta Model are based on historic GDP and population growth, compared to the growth rates of GDP and population in the socio-economic scenarios. In principle we assume a constant linear relation between GDP growth and agricultural productivity growth and population growth and land use decline.

Estimation of crop damage ratios

The figure below schematically shows how crop damages due to drought and salinization have been determined. For a more detailed description of the methodology, we refer to the Drought and Salinity Impact Modules.

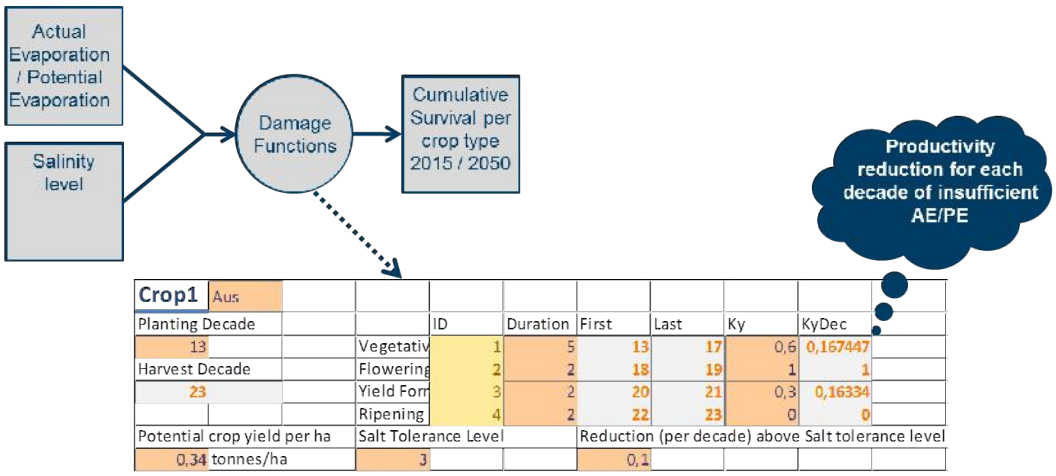


Figure A- 2: Schematic overview of steps taken to drought and salinity crop damage

The effects of water logging on Aman rice have been determined using a flood duration damage function (see the figure below). Water logging on other crop types have not been taken into account.

[8] Kumar et al, 2008, Agricultural Growth Accounting and Total Factor Productivity in South Asia: A Review and Policy Implications

[9] Expert judgment project team

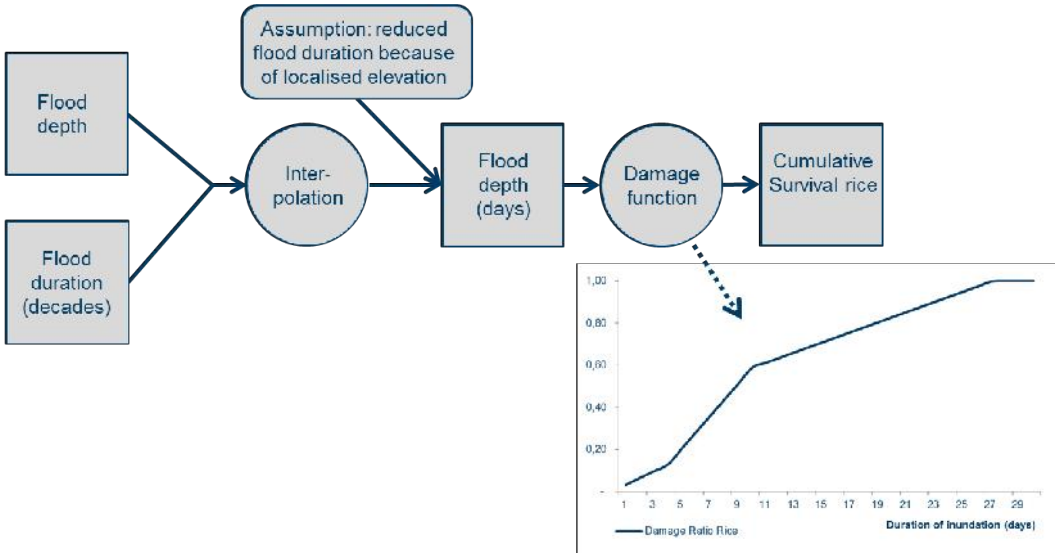


Figure A- 3: Schematic overview of steps taken to determine waterlogging crop damage

The final yield and yield reduction are quantified by confronting the baseline theoretical potential production with the cumulative survival ratios[10] which come out of the Drought and Salinity Impact Module. The values are monetised based on BBS crop value statistics[11], which are kept constant by region and in time. These steps are also visualised schematically below.

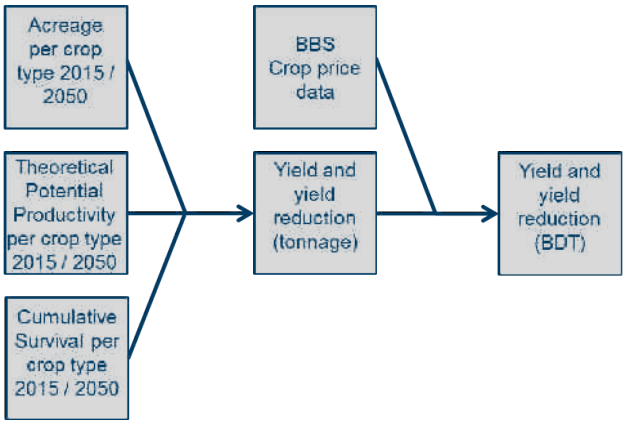


Figure A- 4: Schematic overview of steps taken to assess yield and yield reduction

[10] Cumulative Survival ratio = 1 – damage ratio

[11] Yearbook of Agricultural Statistics-2013 (BBS, 2014)

Agriculture impacts relative to income

The impacts of climate change are recognised to have a disproportionate impact on the poor. This is especially relevant for agriculture, as the main economic sector on which the poor rely, either directly or indirectly (as labour income and as food provision).

The meta model assesses crop damages due to flooding, drought and salinization. This chapter discusses the mechanisms which determine the distribution of these impacts across different income groups. We will specifically discuss dominant agricultural crops (rice, wheat, potatoes) and Coastal Barind's aquaculture (shrimp).

The figure below schematically shows the steps taken by the model.

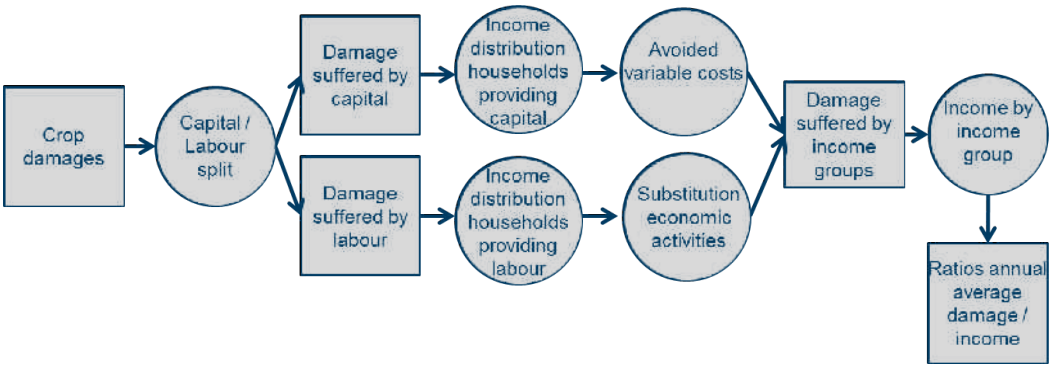


Figure A- 5: Schematic overview of steps taken to assess absolute crop damage compared to income

Mechanisms affecting the income distribution of crop damages

The exposure to damages to agricultural crops of different income groups depends on a variety of factors. This chapter will provide an brief overview of these factors.

Income exposure

Generally, low- income households are found to be more involved in primary production than

higher income groups, i.e. agriculture and fishery[12]. Moreover, low-income households tend to be settled on locations with higher exposure (see the text box below). Damages to the primary production sector could therefore have a disproportionate effect on lower income households.

Geographic exposure: biases in assets at risk due to geographic concentration of poor

Low-income households tend to settle on locations with high hazard risks, especially in the case of informal settlements. Brouwer et al. (2007) find that income is positively correlated with the distance form river banks/ flood plains, hence poor people tend to live closer to flood prone areas. This can be explained by several factors such as land-prices, geographical conditions of the cultivated agricultural and historical land claims. This implies that the model outputs will tend to underestimate the direct exposure of assets of poorer households.

[12] Brouwer et al. (2007)

In our attempt to quantify these relations, we have determined indicative production functions of specific crops. The purpose is to assess the breakdown of the involvement of different income groups by quantifying the cost of provision of inputs in the production process.

We have broken down production costs of main crop types into labour, land and three types of capital costs. Unfortunately, no data on shrimp were available.

Table A 1: Breakdown of production costs per crop type (in tk)

Cost Component	Aman rice	Boro Rice	Aus Rice	Wheat	Potato
Fertilizer cost	6566	7816	3338	7008	25143
Irrigation cost[13]	818	21483	1040	1782	4347
Labour Cost	21229	18949	17864	6360	14683
Machine+ Animal	5053	4700	5041	5612	7181
Biocide Cost	1048	1483	806	255	7065
Seed cost	1455	1023	949	4754	33463
Total production Cost	48134	66358	37706	34723	92717
Gross Return	62446	81352	55139	46869	151120

Source: Ecorys, based on BBS 2008-09

On the basis of the production cost per item (see table), we calculated the income per production component- capital, labour, and land. The latter was calculated by the difference in total production cost and the gross return. This is based on the assumption of perfect competition, in which the return on land equals this difference. Capital is further split into fixed, partly fixed, and variable costs. The semi-fixed capital cost refer to costs which are fixed per harvest (seeds and fertilizer) and the variable cost to cost components which can be cancelled at any time (biocides, irrigation water and fuel). This distinction is relevant, because the farmer has the option to avoid incurring of variable costs and day-labourer costs in the event of a severe hazard.

Table A 2: Distribution of required production factors per crop type

Production factor	Aman rice	Boro Rice	Aus Rice	Wheat	Potato
Labour	34%	23%	32%	14%	10%
Capital (fixed)	8%	12%	10%	13%	5%
Capital (semi-fixed)	13%	11%	8%	25%	39%
Capital (variable)	3%	22%	3%	3%	7%
Land	42%	32%	47%	45%	39%

Source: Ecorys, based upon BBS 2008-09

The figures show illustrate that the labour share is higher for rice than for wheat and potato. This implies that damage to rice crops will for a larger share be borne by providers of labour, compared to wheat and potato. On the other hand, potato and wheat production are more capital intensive, for which the capital owner runs a risks for especially the (partly) fixed components. Similarly, land-owners of wheat and potato are relatively more at risk than for rice.

[13] Irrigation cost are 25% allocated to fixed capital and 75% to continuously variable capital based on the percentage of the depreciation cost vs. the cost of oil, wages, repairs and water (Fujita & Hossain, 1995)

Based on data from the Bangladesh Bureau of Statistics[14], one can indicatively assess the income distribution of providers of the production factors. For the production factor labour, we used the data on the weekly income of agricultural day-labourers. For the production factor land, we used the data on the ownership of land per household. For the production factor capital, have not been able to find reliable statistics, and therefore assume an income distribution identical to the one for land.

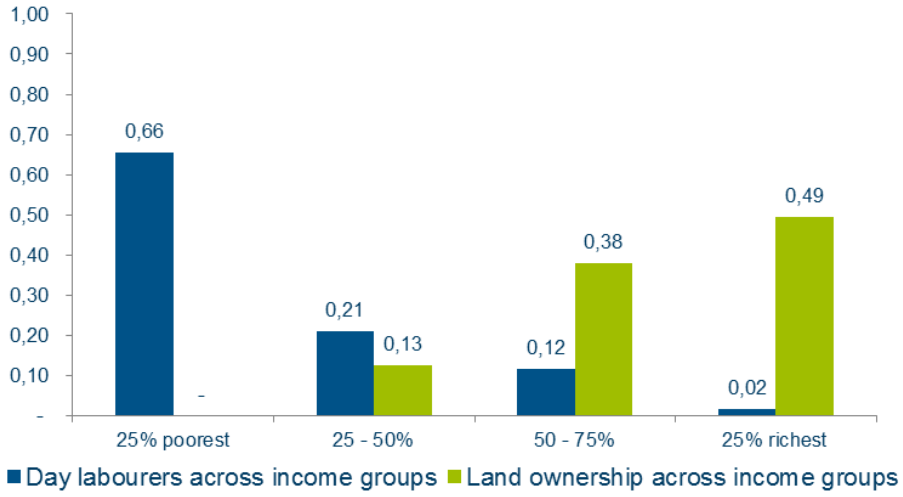


Figure A- 6: Day Labourers and Land Ownership across income groups

The figures show that the production factors land and capital generally belong to higher income groups. When comparing crops, this suggests that the damage distribution among income groups should be skewed to the right for potato and wheat and skewed to the left for rice.

Distribution and transfer of risk

As a nuance to the figures presented above, the provision of inputs in the production process alone provides an incomplete picture. It is important to incorporate distribution of risks across income groups. And because of differences in bargaining power between the actors who provide the inputs, it may well be that this factor is skewed. Especially rural agricultural day-labourers have poor bargaining power, because of limited alternative employment opportunities. This implies that higher-income groups may be able to transfer a disproportionate amount of the risk of crop damages to lower-income groups.

A factor which influences the possibility to transfer risk is the tenure arrangement. This determines which actor holds the initial risk of variations in yield. The table below gives an indication of the tenure structure of different farm size groups, which shows sharecropping is an (the most) important form of land tenure across all farm sizes. Secondly, the table shows the majority marginal farms have own land only. Cash leasing is less prominent and forms of combined cash leases and sharecropping occurs the least.

[14] BBS (2010), Report on Labour Force Survey, and BBS (2010), Household Income and Expenditure Survey

Table A 3: Land tenure arrangements by farm size groups

Tenurial arrangement	Farm size groups (operated land)									
	Feed the Future zone (percent of farmers)					Rural Bangladesh (percent of farmers)				
	Marginal	Small	Medium	Large	All	Marginal (<0.5)	Small (0.5 – 1.49)	Medium (1.5-2.49)	Large (2.5)	All
Pure tenant	35.4	29.2	13.7	16.8	28.1	41.0	33.5	18.4	17.4	33.5
1.Sharecropping	73.4	58.4	53.8	38.1	63.9	74.7	62.2	46.0	56.3	67.0
2. Cash lease	23.6	25.0	39.1	33.3	25.8	21.6	16.7	18.2	7.5	18.8
3. Both	3.0	16.7	7.1	28.6	10.3	3.7	21.1	35.8	36.2	14.1
Own land only	51.9	29.9	28.0	25.5	37.2	48.8	30.2	25.4	31.9	37.1
Mixed tenant (own land + land taken in)	12.7	40.9	58.3	57.7	34.7	10.2	36.3	56.3	50.8	29.4
1.Sharecropping	63.7	65.8	60.2	53.9	62.5	68.3	66.0	58.5	47.9	62.3
2. Cash lease	31.1	18.9	22.6	25.7	22.4	23.7	18.3	25.8	23.8	21.4
3. Both	5.2	15.3	17.3	20.4	15.2	8.0	15.7	15.7	28.2	16.3

Source: HIES (2010)

In cases of own-land only, marginal and small farm are expected to be predominantly owned and cultivated by lower income groups. These groups are, therefore, most at risk to climate inflicted damages. For larger size farm land is expected to be owned by higher income groups and cultivated by wage labourers, which are mostly landless day workers (lowest income quartile- see below)[15]. Any damages are thus shared among the income groups as revenue losses are incurred by the land-owner, while wage-income losses mostly affect lower income groups.

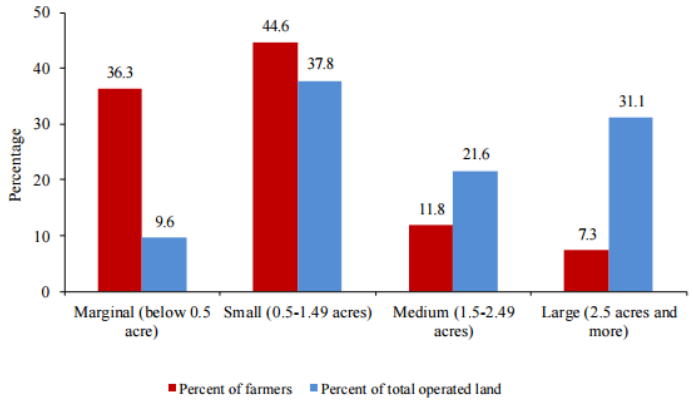


Figure A- 7: Distribution of operated land by farm size groups, rural Bangladesh

Source: Bangladesh Integrated Household Survey 2010-11

[15] https://excludedvoices.wordpress.com/category/agriculture-laborers-of-bangladesh/

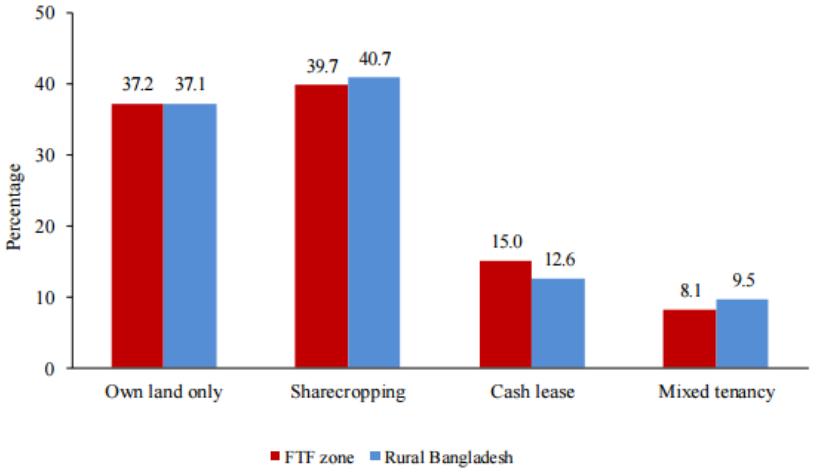


Figure A- 8: Forms of tenancy in the FTF zone and rural Bangladesh

Source: Bangladesh Integrated Household Survey 2010-11

The distribution of damage costs among income groups in share-cropping forms of tenancy is expected to highly differ among the different forms of the tenancy structure. The literature generally defines sharecropping as the "*contract where the landlord supplies the land, the tenant supplies the labour and non-labour inputs and they share the outputs*" (Ahmed, 2012, p.34). An example of these different forms is provided in the figure below. This figure illustrates the tenant bares most of the risk in any case of crop damages as in most forms and most frequently the land owner does not pay the (upfront) costs and receives half the output. In all forms except vii. the landowner also bares risks as it receives a share of produce as compensation for the land it provides.

i.	Land owner does not share any input cost and receives half of the output (main product)
ii.	Land owner shares only fertilizer and irrigation costs and receives half of the output (main product)
iii.	Land owner shares half of the input costs (fertilizer and irrigation costs) and receives half of the produce (main product and by-product)
iv.	Land owner shares half of the input costs (seed, fertilizer and irrigation costs) and receives half of the produce (main product and by-product)
v.	Land owner shares only irrigation costs (security charges) and receives half of the output (main product) with no sharing of by-product
vi.	Land owner shares only seed costs and receives half of the output (main product) with no sharing of by-product
vii.	Land owner shares no input cost and receives a fixed amount of output per unit area of land, i.e., 1 maund/kantha for paddy and half of the paddy straw
viii.	Land owner shares no input cost and receives one third of the produce (main product and by-product)

Figure A- 9: Type of sharing cropping agreements in Bangladesh (in order of occurrence frequency)

Source: Nasrin and Uddin, 2011

As most farmers have marginal size farms, the lowest income group is expected to be most at risk to climate events in relative terms. In summary, the distribution of crop damages among income groups differs among tenure structures. The table below provide a summary per income group and land tenure forms of what type of losses are expected.

Table A 4: Expected risk per income group

Tenure	Low-income group	Middle income group	High income group
Own land	Loss of total produce and investments	Loss of total produce and investments	Loss of total produce and investments
Day labour	Loss of wage income	Loss of wage income	*Likely n/a*
Sharecropping	Loss of X% of the produce (and share of investments)	Loss of x% of the produce (and share of investments	Loss of x% of the produce (and share of investments)

In absolute terms small and large farmers might be expected to incur most of the damage as they own the majority of the land. In relative terms, however, the majority of the farmers are marginal and small farms, in which the lowest income groups are predominately involved, for which the climate inflicted damages are expected to be most significant. Moreover, these farmers generally have less capacity to adopt any mitigation mechanisms, for which the damages are more severe as well.

Substitution effects

When climate events inflict damage to agricultural production and income, actors usually substitute their production factors (labour, land, and capital) to other productive uses. This is best explained through an example.

Take a farmer whose crops are completely perished by a severe drought during the flowering stage of the growth cycle. Because this event occurs quite early in the entire growth cycle, the farmer can cut his losses and use his inputs for other purposes. Examples are to have labourers conduct maintenance works, keep biocide and fuel unused and rent out cattle and machinery to less ill-fortuned farmers. importantly, he can use his land to start the new cycle of crops earlier and in a more optimal way than he would otherwise have done, thereby increasing production of the subsequent crop cycle.

It is crucial to recognize that the extent to which actors can do this depends on i) whether the production factor is still available; and ii) whether it can be put to good alternative use. Regarding the first, a good example of an unavailable production is capital spent on seed. This is money lost – in case of a climate event during or after seeding- which cannot be recovered. The latter is highly relevant, especially for the rural agricultural day-labourers. When a hazard occurs, a significant part of a region is usually affected, causing excessive supply of a low-schooled workers on the labour market.

We use simplified relations regarding the substitutability of production factors to assess relative crop-by-crop differences in substitution rates. Note that this while this will not result in accurate absolute terms, it will reflect differences of impacts per crop type. For setting these relations, we have applied the following sequence of high to low opportunities for substitution: i) variable capital costs; ii) labour costs; iii) semi-fixed variable costs; iv) land costs; and v) fixed variable costs. Moreover, we assume that higher income actors are better able to substitute, as they are as a general rule more mobile and have higher skills and/ or are higher educated. For this reason we assume higher income groups have more alternatives on the labour market. Based on this, we have applied substitution rates as shown it the table below.

Table A 5: Substitution rates by income group

Quartile	Substitution rate
Q1: 25% poorest	0,20
Q2: 25 – 50% income group	0,25
Q3: 50 – 75% income group	0,30
Q4: 25% richest	0,35

Source: Ecorys, based upon BBS 2008-09

Crop-specific considerations for income distribution of damages

Rice

There are about 13 million farm families growing rice in Bangladesh, producing about 70 percent of human consumption and 70 percent of cultivated crop land. This is reflected in a household expenditure of 18-40 percent on rice, varying across income groups

Table A 6: Distribution of expenditure of major food items by monthly household income groups, 2010

Monthly household income group (in Taka)	% of house hold	Average Total monthly exp. on major food items (in Tk)	Percentage of monthly expenditure on major food items										
				Cereals				Fish					
			Total	Rice & rice flour	Wheat& wheat flour	All others		Total	Fish (Sweet water)	Fish Saline water)	Fish (Dry)	All Others
1	2	3	4	5	6	7	8	9	10	11	12	13
National												
< 1500	2.72	2519.41	100.00	40.79	38.01	1.12	1.66	12.64	9.09	2.27	0.81	0.47
1500 - 1999	2.19	3323.82	100.00	42.73	39.47	1.51	1.75	12.26	9.29	1.98	0.76	0.23
2000 - 2499	3.03	3831.30	100.00	43.22	39.77	1.39	2.06	11.74	9.10	1.64	0.69	0.30
2500 - 2999	3.76	3868.59	100.00	43.92	40.30	1.56	2.05	11.07	8.59	1.53	0.63	0.32
3000 - 3999	9.26	4133.35	100.00	42.95	39.52	1.39	2.04	10.94	8.42	1.45	0.68	0.38
4000 - 4999	9.84	4644.74	100.00	41.40	37.73	1.55	2.13	11.39	8.86	1.53	0.66	0.35
5000 - 5999	8.62	4933.74	100.00	39.63	36.13	1.38	2.12	12.12	8.96	2.19	0.62	0.35
6000 - 6999	7.92	5164.15	100.00	39.14	35.58	1.44	2.13	12.20	9.20	2.09	0.57	0.34
7000 - 7999	6.43	5393.25	100.00	37.71	33.87	1.36	2.48	12.66	9.37	2.35	0.59	0.36
8000 - 8999	5.24	5878.21	100.00	37.61	33.99	1.42	2.19	13.16	9.49	2.74	0.57	0.37
9000 - 9999	4.54	6237.05	100.00	35.65	32.04	1.33	2.27	13.84	9.82	2.92	0.73	0.38
10000 - 12499	9.69	6540.28	100.00	34.78	30.99	1.47	2.32	14.23	10.26	3.09	0.55	0.32
12500 - 14999	6.22	7231.09	100.00	32.13	28.47	1.42	2.24	14.66	10.34	3.44	0.49	0.38
15000 - 17499	4.51	7547.61	100.00	31.17	27.33	1.48	2.36	15.31	10.51	3.99	0.40	0.42
17500 - 19999	3.28	8192.94	100.00	30.34	26.46	1.41	2.46	14.41	10.38	3.32	0.44	0.27
20000 - 24999	4.22	8609.68	100.00	29.62	25.88	1.48	2.26	15.34	10.33	4.16	0.40	0.45
25000 - 29999	2.35	9824.91	100.00	27.21	23.09	1.63	2.49	15.77	10.12	5.01	0.34	0.31
30000 - 34999	1.91	9897.33	100.00	26.36	22.21	1.83	2.32	16.20	10.86	4.69	0.32	0.32
35000+	4.27	12651.21	100.00	22.39	18.10	1.83	2.47	17.00	9.97	6.20	0.40	0.43
All Groups	100.00	6030.79	100.00	34.77	31.03	1.49	2.25	13.72	9.69	3.13	0.54	0.36

Source: HIES, 2010

Rice is the most important food crop in Bangladesh both in terms of production and consumption (IRRI 2005). Rice is produced by about 71 million Bangladeshi's, of which 65 million smallholder farmers (Ganesh Kumar 2012). Similarly as to the wider Asian context, only a few of these farmers cultivate more than two hectares (IRRI 2011). Herewith, rice-based farming systems is the main economic activity for millions of rural poor, many of whom do not own their own land[16]. Considering the average monthly income per household per farm size (see below) and the fact rice is predominately produced by small holders, one would expect the distribution of damages on rice production among income groups would be skewed to the lower income groups.

The figure below present a distribution of the damage inflicted by damage to rice production across the four income quartiles in eastern India. Given the similarities between rice production is South-east Asia, this picture further hints towards the fact damages are predominately incurred by lowest quartile.

[16] http://ricepedia.org/rice-as-a-crop/who-grows-rice

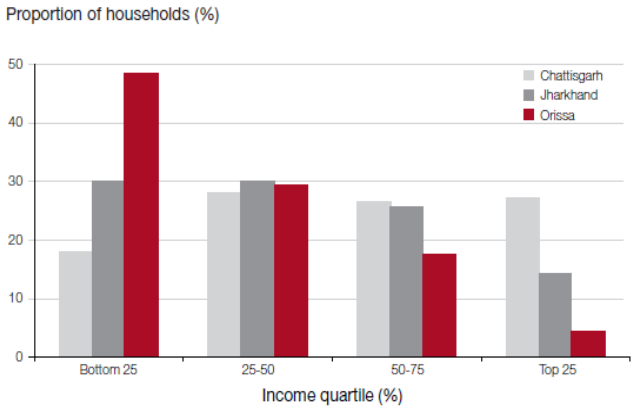


Figure A- 10: Distribution of households incurring over 80% of rice production loss during drought year, by income quartile, eastern India

Source: https://www.ifad.org/documents/10180/a8c7fb9f-f3da-4749-ab06-35ff2fc455c6

Wheat

Wheat is the second most produced crop in Bangladesh, representing about 1,22- 2,1 percent of the household expenditure and about 4 % of the total cropped area (Hossain & da Silva, 2013). The relative household expenditure on wheat varies among income groups but does not have a clear negative or positive trend (HIES, 2010).

Wheat is often cultivated interchangeably with rice. In occurrences of constrained surface water, there may be limitations to cultivate the preferred Rabi-season crops (such as boro rice and vegetables) but sufficient surface water or irrigation capacity to cultivate wheat. The result is a succession of land uses combining wet-season rice cropping with wheat (Kabir and Rawson, 2011).

However, Kabir and Rawson (2011) finds wheat cultivation to be restricted by agricultural knowledge, for which farming experience and educational levels are important determinants of wheat cultivation. Hence, an educated farmer can readily access information on the advantages of wheat and how cropping can be effectively implemented. Therefore, wheat is expected to be of less importance to the lowest income groups, but also not very significant for the highest income group as they prefer cultivate higher value-added crops[17].

This is confirmed by the FAO who finds rice-wheat farming systems to have a moderate to extensive prevalence among the poor in Asia, unlike sole rice cultivation for which the poverty prevalence is extensive[18]. Similarly, wheat consumption in Bangladesh is higher (about twice as much) among people earning between $1-2 a day than $1 dollar a day (FAOSTAT, 2012).

Potato

Potato production ranks third in agricultural production (Mabuz Ahmed et al., 2013) in Bangladesh and representing 1,3 – 2,7 percent of household expenditure (HIES, 2010). Mabuz Ahmed et al. (2013) find the majority of the potato

[17] Note, rice (-wheat) farming system is also prevalent among higher income groups- see rice

[18] http://www.fao.org/docrep/003/y1860e/y1860e07.htm

farmers to be of young age (20-35 years), having medium, illiterate, medium farm size (0.34-1.0 acre), and limited farming experience (1-10 years).

Table A 7: Farm size distribution among potato farmers

Farm size	% potato farmers
Small (0,01-0,33)	26,7
Medium (0,34-1)	43,3
Large (above 7)	30

Source: Mabuz Ahmed et al. (2013)

Table 5 does not provide a direct insight in which income group are mostly affected by any damages to potato production. Nevertheless, comparing the farm size and income distribution (table 4 and 5) hint towards a skewed distribution to the lower-middle quartiles, as the farm size of about 70% of the potato farmers relates to the two lower income quartiles. This is further confirmed by Kabir and Rawson (2011) who note some capacity is needed to be able to cover the (relatively) high costs of potato production and to annually apply one or two irrigations.

Shrimp

Generally shrimp cultivation is predominated by large farmers and land-owners and is a vastly growing and profitable business. Shrimp farming is also often associated with marginalisation of the local coastal population and often comes along with land claim issues (Alauddin & Hamid, 2008; Hussain et al, 2013). The latter points to the issue of land claims by large capital owners and farmers, which stresses the land availability of smallholders (to produce rice for example) . Considering shrimp farming is rather capital intensive, there isn't a large employment potential for lower income groups. Existing employment opportunities are found to be quite limited or sourced from outside the region as specific skill sets are required (Hussain et al, 2013).

The table below provides an indication of the land distribution among different type of shrimp farm owners. This table shows the majority of the operated area (43%) is owned by distant landlords. Furthermore, the large share of Type 3 owners hint towards quite some participation of the middle-income group, who is able to make some capital available but also conduct a large share of the labour. Lower income groups are not expected to be represented in Type 3 owners as they face capital constraints (which is confirmed in Table 7).

Table A 8: Type of shrimp farm owners

Type of owner	Indicative share
1. Single or household operations on their own land using their own / domestic labour.	n/a
2. Single control on owned or rented land using hired labour.	n/a
3. Multiple owners, all or most of whom participate in and control the farming operations.	50%
4. Local people who farm shrimp on land which is partly owned and partly rented.	Small
5. Outsiders who control shrimp farming, using rented land and hired labour.	20% (43% of area)

Source: Ecorys, based up-on Alauddin & Hamid (2008)

Islam (2014) further provides an overview of the stakeholders in the shrimp farm supply chain and specifies to which wealth rank they belong (see below). This table confirms shrimp farmers belong to the wealthiest (rank 4) ad collect the bulk of the income in the supply chain. Lower income group's participation is indeed predominately limited to conducting labour. Calculating the share of the total household income per wealth rank, shows that 83% of the total income is earned by the wealthiest. Again, this confirms the dominance of the higher income groups in shrimp production.

Table A 9: Annual Shrimp Industry Stakeholder Incomes by Income Source Bangladesh, 2003

	Household Income		
	Shrimp-related Activities	Farm and Non-farm Activities	Total Household Income
Stakeholders	*(taka per year)**		
Shrimp farmers	670,180 (78.34)	185,270 (21.66)	855,450 (100)
Land lessors	32,890 (23.82)	105,185 (76.18)	138,075 (100)
Hatchery owners	870,135 (84.96)	153,985 (15.04)	1,024,120 (100)
Depot owners	126,600 (47.42)	140,400 (52.58)	267,000 (100)
Shrimp seed or fry collectors	13,550 (37.85)	22,250 (61.15)	38,800 (100)
Shrimp farm labourers	40,170 (75.00)	13,340 (25.00)	53,510 (100)
Processing plant workers	50,780 (51.33)	48,150 (48.67)	98,930 (100)
Hatchery workers	61,000 (70.67)	25,350 (29.36)	86,350 (100)
Feed mill workers	55,584 (78.41)	15,300 (21.59)	70,884 (100)
Depot workers	19,200 (36.20)	33,840 (63.80)	53,040 (100)
Shrimp traders (*faria*)	48,500 (65.63)	25,400 (34.37)	73,900 (100)

Source: Ecorys, adjusted of Islam (2014)

Distribution of damage across income groups

In the chapters above we have delineated the qualitative and quantitative context on the expected impact of climate inflicted damages to agriculture on different income groups in Bangladesh. This included an outline of the socio-economic context of rice, wheat, potato and shrimp production.

To model the distributions of agricultural crops damages among income groups, a standard approach would be to allocate equal shares to each income group. On the basis of the discussions above, such distribution was found to be inappropriate as 1) different crops have different production functions, for which income- earners are at different risks; 2) income groups not equally affected due to different risk exposure and; 3) different crops have different socio-economic contexts. Therefore, we provide a crop damage distribution among income groups on the basis of the findings delineated above. These distribution are not to be validated in absolute terms, but must be considered in perspective of each other, i.e. the relative differences between the crop damage distributions.

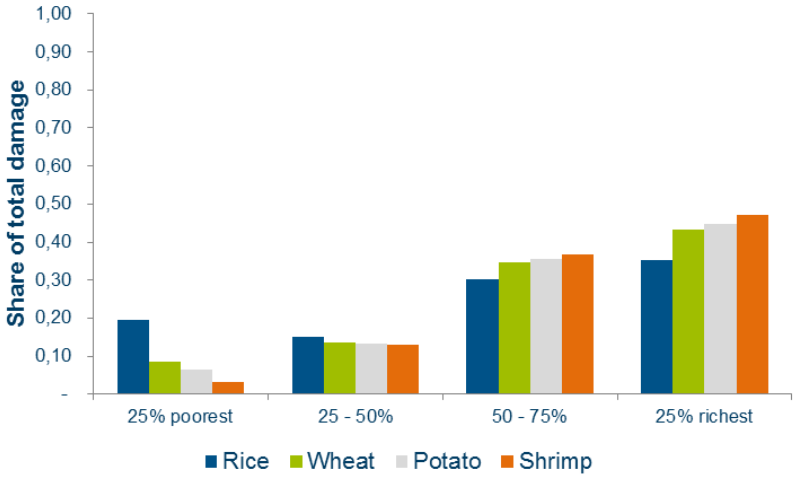


Figure A- 11: The distribution of absolute crop damages across income quartiles in %

Source: Ecorys

The following table shows an example of what the results look like. The figures should be interpreted as the share of income which households need to spend to fully repair all damage caused by drought and salinization.

The 'inequality of damage' indicator shows how much more the poorest 25% households are affected by waterlogging than the richest 25%. It can be interpreted as how much more the poor are affected, when corrected for vulnerability, income differences and value at risk.

Table A 10: Example output of impacts by income groups

Income group	Average annual damage / household income (%)
Quartile 1: poorest 25% households	5.4%
Quartile 2: 25-50%	2.9%
Quartile 3: 50-75%	4.0%
Quartile 4: Richest 25% households	2.0%
Inequality of damage (Poorest 25% / Richest 25%) >1 = disproportionate impact on the poor <1 = disproportionate impact on the rich	Factor 2.6

Buildings Module

The Buildings Module assesses the damage of inundation due to waterlogging on buildings. The module takes the following steps, which are explained in more detail below.

Assessment of baseline value at risk

a. Projection of the building stock, by type and Upazila
b. Assessment of the building stock value at risk

Determining the effect of flooding

Distribution of impact across different income groups

Baseline value at risk

Baseline building stock

The starting point of the analysis is data from the Bangladesh Bureau of Statistics representing the building stock by type and Upazilla in 2011. The figure below schematically shows the elements we included to determine the building stock for 2015 and 2050.

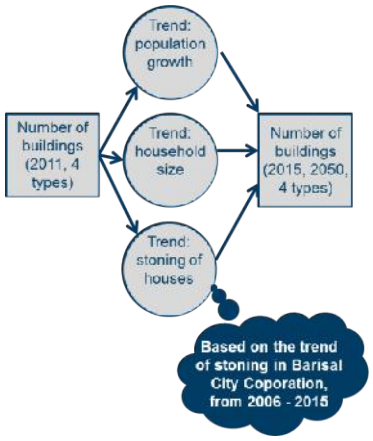


Figure A- 12: Schematic overview of steps to determine the 2015 and 2050 building stock

Source: Ecorys

The building stock is adjusted to 2050 values based on trends in population growth, household size and stoning of houses. The population growth values are based on scenarios form the Bangladesh Delta Plan. For household size trends, we assumed a reduction of household size by 25% by 2050 compared to current values. For stoning of houses, we extrapolated the stoning trends which were derived by Ecorys for the Barisal City Corporation[19], which range from a decrease of 3.3 to 4% for juphri and katcha buildings, and an increase of 8 to 8.6% for semi-pucca and pucca buildings. The actual degree of stoning of houses is set to depend on the socio-economic scenario, where a higher growth of GDP/Capita accelerates the stoning trend.

Value of building stock

The building stock resulting from step 1 is valued using various cost figures and an average depreciation rate. The figure below schematically shows the elements we included to value the building stock for 2015 and 2050.

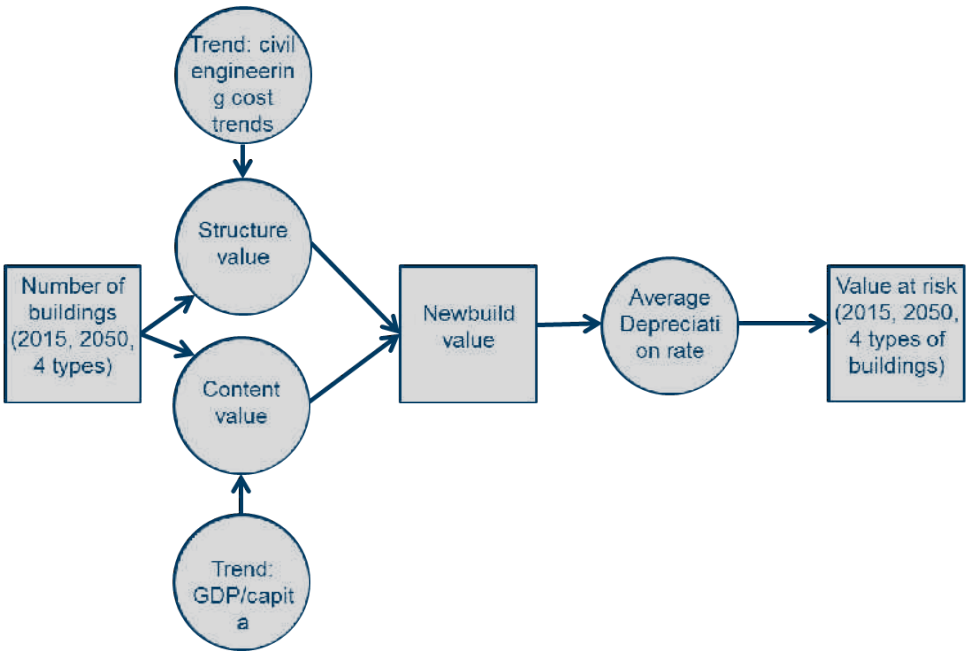


Figure A- 13: Schematic overview of steps for determining the value of the building stock

Source: Ecorys

To assess future building structure and content values, we apply long term trends on civil engineering costs (1% increase per year)[20] for structure values and GDP/Capita for content values. GDP/Capita is a measure for wealth increase and depends on the socio-economic applied. In principle we assume a constant one-on-one linear relation between GDP/Capita growth and the growth rate of buildings content value.

[19] Ecorys (2016), Consulting Services for a Vulnerability Analysis and Feasibility Study for the city of Barisal.

[20] Expert judgment

Effect of waterlogging

The effect of waterlogging on buildings is determined by confronting the inundation depth with a damage function. The inundation depth is an output of the Water System State modules. The figure below shows the damage functions which have been applied.

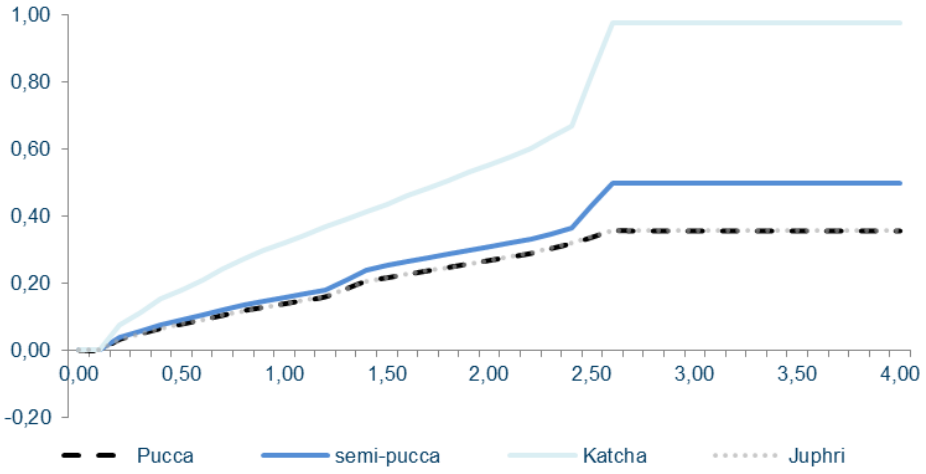


Figure A- 14: Damage functions for the four building types

Source: Ecorys (2016), Consulting Services for a Vulnerability Analysis and Feasibility Study for the city of Barisal

Distribution of impacts by income groups

An assessment of waterlogging damage on buildings based on absolute values alone tends to give an incomplete picture. Policy based on such figures will be biased towards favouring richer households, considering that the main driver for waterlogging risk is the value at risk. This would lead to suboptimal policy, considering that assets of poorer households are generally affected more frequently and severely, while they have a lower income to absorb these shocks (as shown in the figure below).

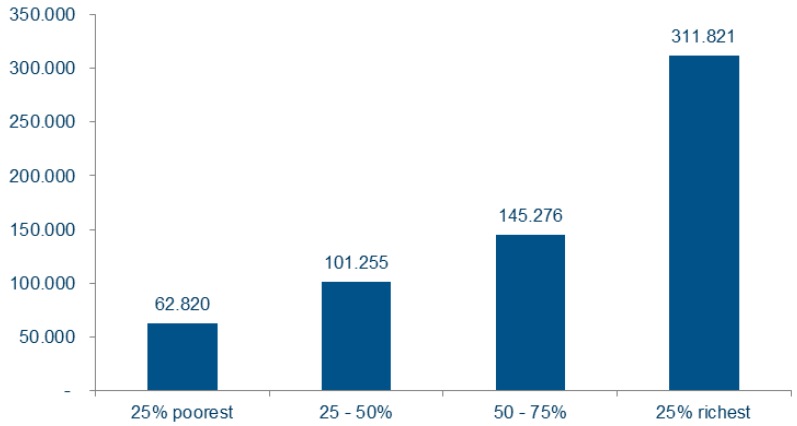


Figure A- 15: Household income across income groups (four quartiles, 2010 tk.)

Source: Ecorys based on the Household Income and Expenditure Survey (2010)

To address these biases, we place the values in perspective by presenting them in relation to the income of households. For this purpose, we link household income to the four house types, based on BBS data[21]. The relevant data is shown in the chart below.

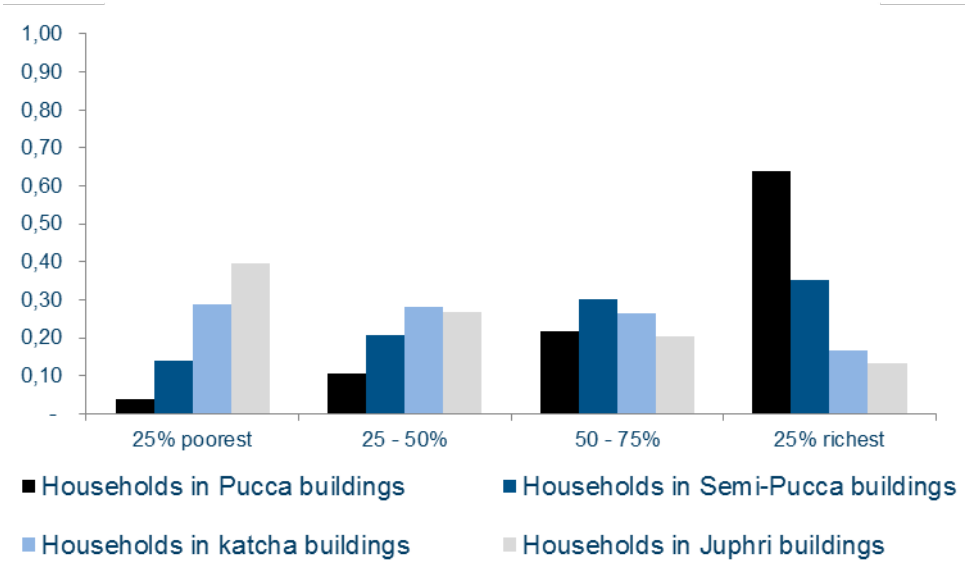


Figure A- 16: Distribution of household income by building type

Source: Ecorys, based on the Household Income and Expenditure Survey (2010)

The following table shows an example of what the results look like. The figures should be interpreted as the share of income which households need to spend to fully repair all damage caused by waterlogging.

The 'inequality of damage' indicator shows how much more the poorest 25% households are affected by waterlogging than the richest 25%. It can be interpreted as how much more the poor are affected, when corrected for vulnerability, income differences and value at risk.

Table A 11: Example output of impacts by income groups

Income group	Average annual damage / household income (%)
Quartile 1: poorest 25% households	4.8%
Quartile 2: 25-50%	3.0%
Quartile 3: 50-75%	2.0%
Quartile 4: Richest 25% households	0.9%
Inequality of damage (Poorest 25% / Richest 25%) >1 = disproportionate impact on the poor <1 = disproportionate impact on the rich	Factor 5.3

[21] Household Expenditure and Income Survey 2010, Table No. 79: Percentage distribution of household according to the type of dwelling unit of the head of household by expenditure, 2010

Annex 4: System State Modules

Overview of the SI modules

To make the spatial calculations, the freely available GIS modelling scripting language PCRaster is chosen as GIS engine. Database and user interface are implemented in Excel, spatial modules to simulate the State Indicators (SI's) are implemented in PCRaster and some of the post-processing algorithms to arrive at the Decision Support Indicators (DSI's) are also implemented in Excel. The main overview of the modules is presented in **Figure A- 17**. In the red rectangle are the currently implemented modules, and the figure also shows the planned extensions. The developed framework allows for adding the additional extensions.

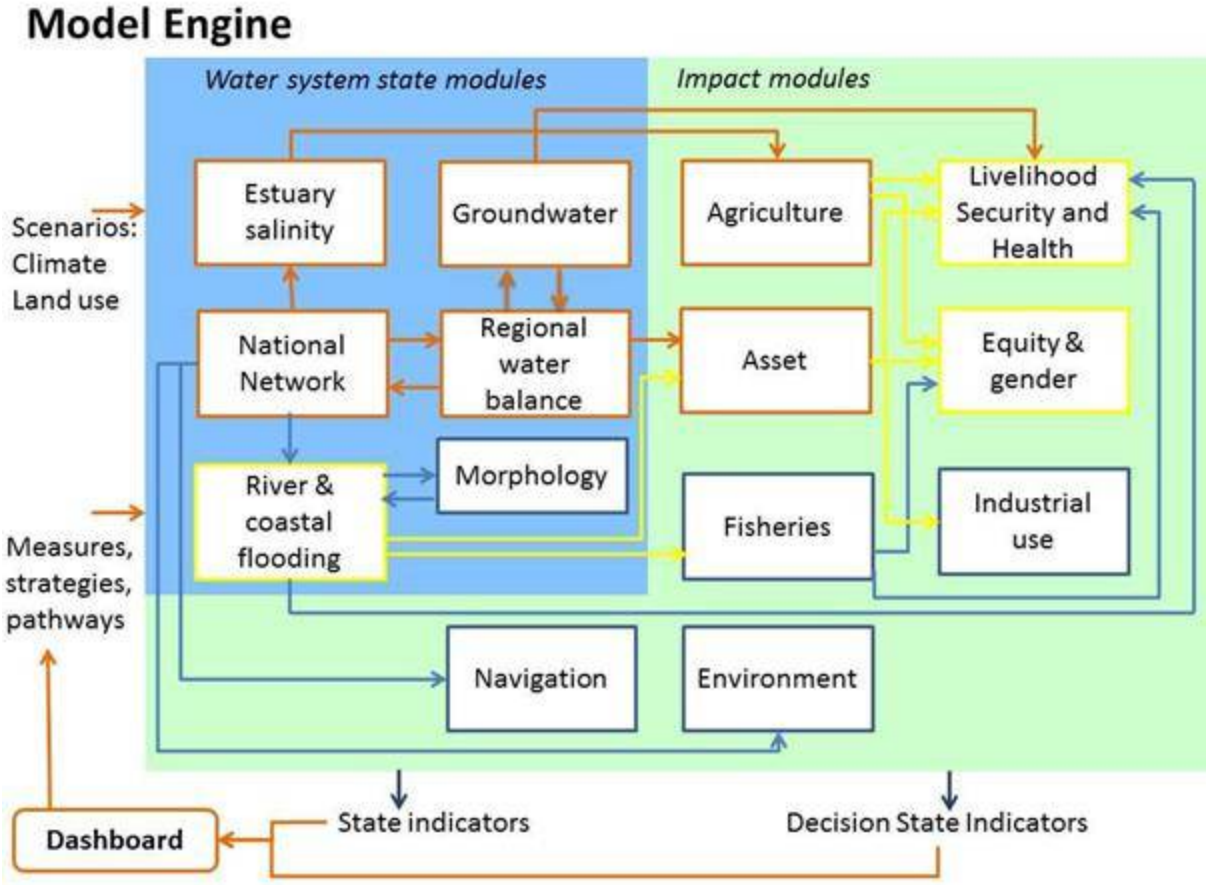


Figure A- 17: Design of the modules. The red rectangle shows the implemented modules while the figure also shows the planned additional modules.

The Main Network module

The main network module simulates water flow through the main rivers in Bangladesh. Input to the module is transboundary flow through the major rivers, and the task of the module is to distribute the water over the different branches. For each of the branches a Q-h relationship is developed. Output of the Main Network Module is decadal discharge through the branches, and decadal water levels in the branches. A diversion control algorithm is used to divert water between Gorai and Ganges, and this control algorithm is used to simulate the impact of the proposed Ganges Barrage (**Figure A- 18**).

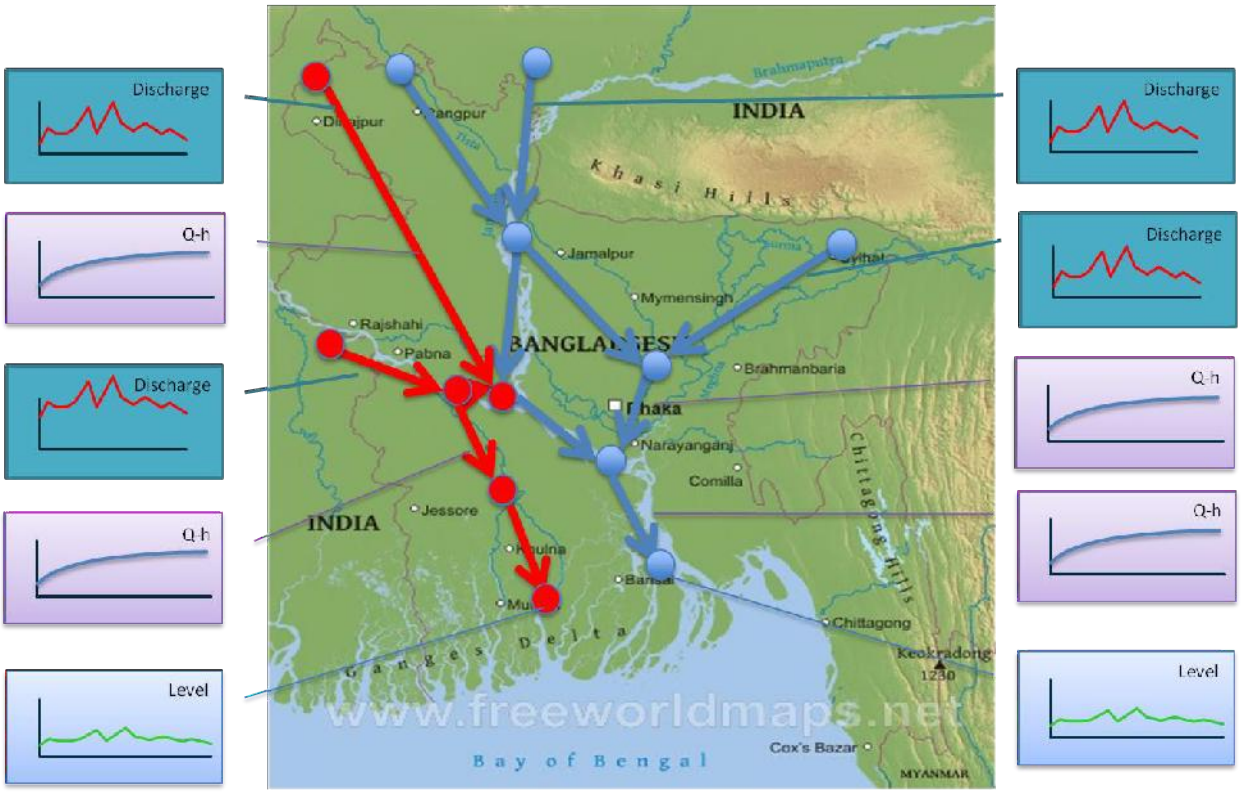


Figure A- 18: Schematization used in the Main Network module. Simulations on each branch results in discharge and water level estimates

The SW Delta and Estuary module

The main task of the SW Delta and Estuary module is to provide simulations of flow through the Gorai river system (Gorai, Nabaganga, Atrai, Pusur river system). For this river system, salinity levels are simulated for various inflow conditions (dependent on the offtake of water for the Gorai, linked to the Main Network module) and seasonal salinity levels in the Bay of Bengal. To arrive at these simulated salinity levels, the complex hydrodynamic WS regional model is used to simulate results for characteristic cases (discharge of 0 m3/sec over the Gorai during the dry season, 50 m3/sec, 100 m3/sec, 150 m3/sec, 200 m3/sec, 250 m3/sec and 300 m3/sec). These complex simulations are used to derive salinity profiles over the Gorai river system, and these salinity profiles are as a database in the Meta model. Now each situation with a simulated flow over the Gorai can be linked to a salinity profile, and for all sections in the Gorai river system, salinity levels cab be assessed (**Figure A- 19**).

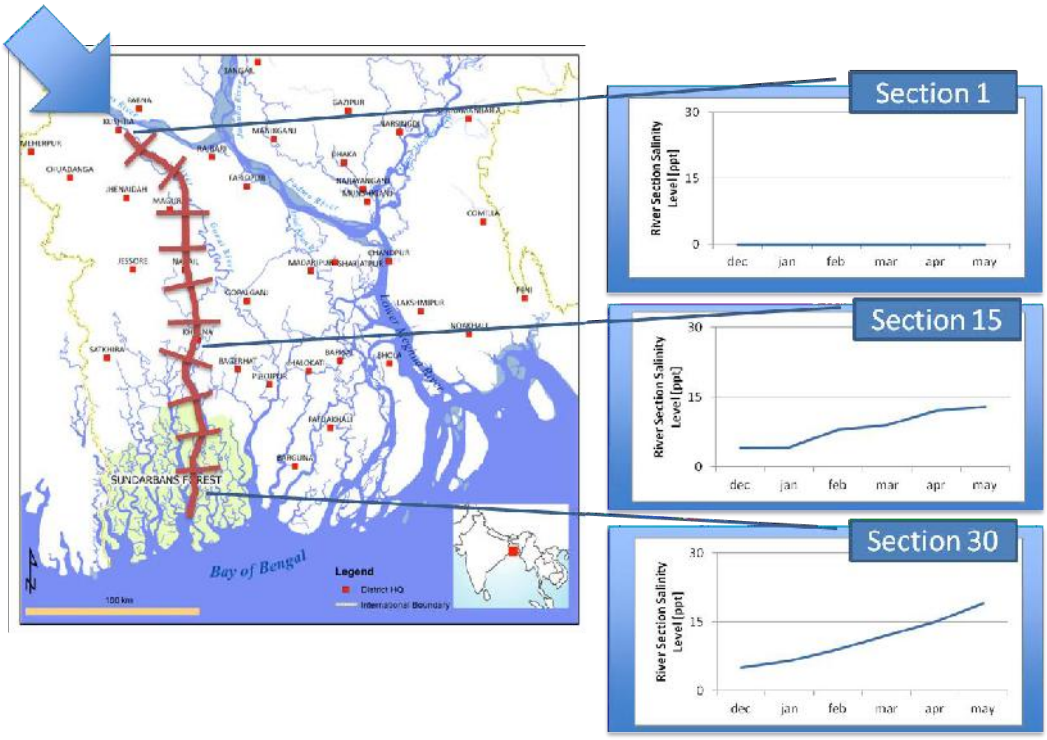


Figure A- 19: Schematization of the Gorai river system and the link the database with salinity levels

The Regional Water Balance module

The Regional Water Balance module is the main module for simulating water available for agriculture. The module schematizes the soil water balance per Upazilla with as major inputs decadal precipitation and evapotranspiration, and during precipitation excess it simulated surface water storage and draining. This surface water is subsequently drained into the Main River network. During periods of high water levels on the main rivers, congested drainage situations occur, and the land is inundated. During periods of precipitation deficit the module determines agricultural water demand and the potential for irrigation through surface water and groundwater (**Figure A- 20**). The regional water balance module is a spatially distributed module, in which Upazilla are linked to branches in the Main River network. Thus water levels on the main river network can control drainage and surface water potential, and salinity levels of water extracted from the Main River Network (**Figure A- 21**).

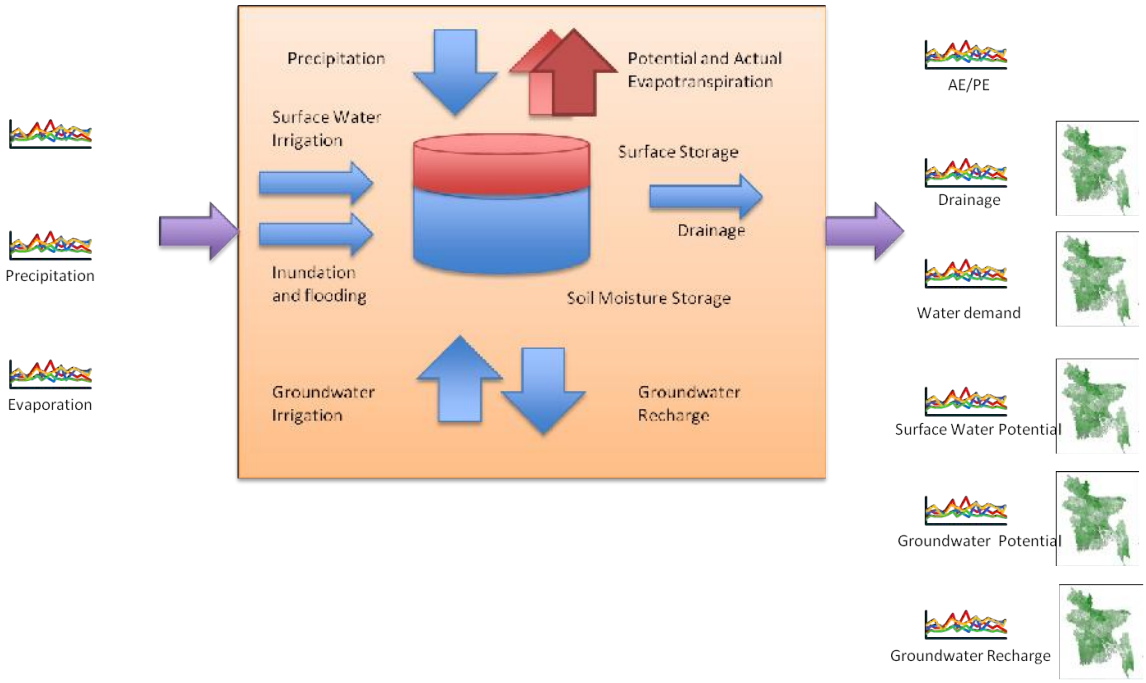


Figure A- 20: Schematic overview of the Regional Water Balance module

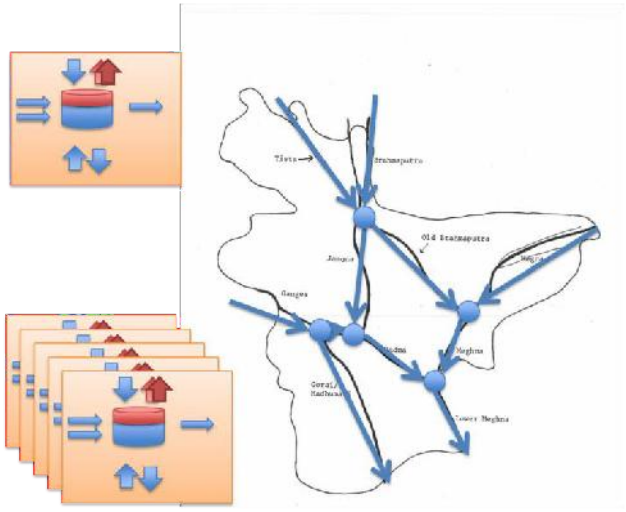


Figure A- 21: Linking the Regional Water Balance module (spatially distributed) to the Main Network

The Drought and Salinity Impact module

The Meta model recognizes 8 different crop types, including the main Bangladesh rice varieties Boro, Aus and Aman. For each of these crops the database contains characteristic information on their response to drought and salinity. For drought we closely follow the approach of the FAO, in which drought response of the crops in the various stages of development is characterized with yield response values (Ky values), which give the relation between water stress and yield loss. For salinity a similar but simpler approach is taken, crop yield are reduced with a certain percentage in situations in which salinity levels are above a crop-specific threshold (**Figure A- 22**).

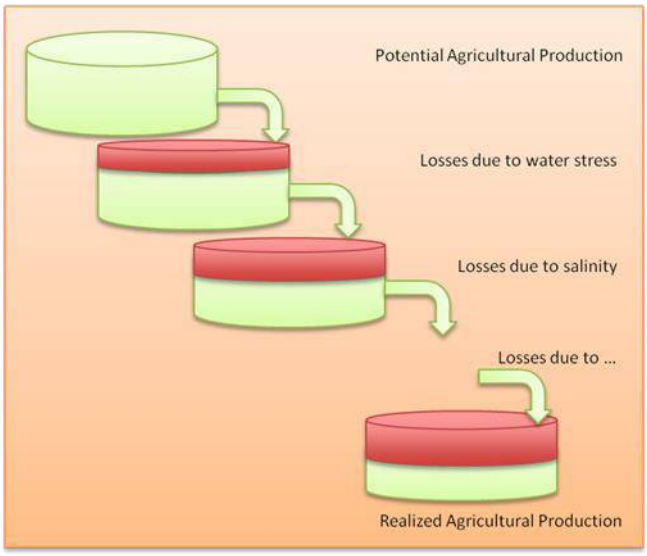


Figure A- 22: Yield reduction due to drought and salinity

Recommendations for improvement

Based on the pilot experience, the following recommendations for improvement have been made, resulting from discussions with model developers and stakeholders.

Regional water balance

The current Upazilla based water balance should be replaced by a simplified version of the WARPO regional water balance. This will ensure a better connection with current Bangladesh practice, and will minimize problems with parameterisation and calibration, as we can use the WARPO regional water balance model as starting point. *Flooding and Morphology* should be included in the main modelling processes.

Time steps

The current 10-day time step of the meta model is too coarse for proper flooding calculations. However, the current version of the WARPO model is also 10 day. A logical sequence of actions is:

1. Develop the 10-day WARPO water balance in the current meta model (separate action, not necessarily part of meta model development)
2. Redesign, recalibrate and implement the 1 day time step in the WARPO water balance model
3. Evaluate the performance of the WARPO 1-day water balance
4. If needed, implement the 1-day water balance in the meta model

Estuary and salinity module

The current approach for salt intrusion is promising. However, in the current version the focus is on the Gorai only, and a next version should include more rivers in the estuary. The current module does not take into account the effects of sea level rise. However, the approach taken for the development of the current approach for the salinity module allows for easy adaption to the inclusion of sea level. For this, runs should be defined based on detailed models. Essentially, runs as for current situation should be made (0, 50, 100, 150, 200, 250, 300 m3/sec inflow in Gorai for 0m SLR (current runs), for 0.5m and 1.0m SLR).

BASELINE STUDY: 24

Regional Cooperation

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Executive Summary : Study 24

The aim of this report is to provide an overview of current regional cooperation activities, as well as to indicate potential directions for further development of regional cooperation. This study examines the problems and challenges related to these areas for the establishment of regional cooperation with regard to trans-boundary rivers. The baseline study focuses particularly on sub-regional cooperation developments and their potential for Bangladesh. In Part II and Part III of this report, opportunities for regional cooperation with Nepal, India, Bhutan, China and Myanmar are explored, analysed and elaborated in possible strategies for improvement.

Part I : Country and Regional Setting

Bangladesh and India share some of the most intricate and complex river systems in the world. The formidable network of waterways includes the three major rivers, the Ganges (or *Padma* in Bangladesh), the Brahmaputra (or *Jamuna* in Bangladesh) and the Meghna (which originates as the *Barak* in India). When combined, these rivers constitute the worlds' second largest riverine drainage basins: the Ganges-Brahmaputra-Meghna basins. The entire basins are flood prone and vulnerable to flood consequences. The frequency and intensity of floods is expected to increase due to climate change. In the case of Bangladesh, total annual water availability including ground water is about 1297 billion m^3 (bcm), of which the three main rivers contribute around 981 bcm. Of the latter amount, some 56 percent is contributed by the Brahmaputra, 30 percent by the Ganges and nearly 14 percent by the tributaries of the Meghna. However, the dry season (January-April) availability is only 88 bcm of which 74 bcm is cross border flows. The contribution of the Ganges in this case is 17 percent, 75 percent is contributed by the Brahmaputra and the Meghna provides only 7 percent[4]. The contribution from other rivers is negligible. It indicates that during the dry season Brahmaputra's contribution is vital for Bangladesh.

Because Bangladesh is located in the low-lying delta of the Ganges-Brahmaputra-Meghna basins, water resources management is complex and very much dependent on upstream developments. Upstream infrastructural developments are expected to have a notable impact on the dry season flow. Changes in flows and sedimentation rates resulting from the development of the Farakka barrage may be illustrative of the type of impacts which may be expected, should further upstream infrastructural development (and especially increased diversion of flows for irrigation consumption) take place.

For the last decades, India has constructed dams and barrages within the Ganges and Brahmaputra basins for mainly power generation and irrigation purposes. The country is likely to follow this pattern as irrigation plays an increasing role in India's economic growth and for growing sufficient food for expanding population. Of particular interest for Bangladesh are the Indian proposals to construct 16 barrages, one in every 100 kilometres of the Ganges under the Ganges Waterway Project and the country's plans to divert water from the Ganges and the Brahmaputra rivers towards the South of India. In addition, India is planning to construct the Tipaimukh dam in the north-eastern part of the country. All these projects will impact the water availability in Bangladesh as well as the ecological condition of the rivers. Fisheries and agriculture activities within Bangladesh are expected to be harmed by these developments.

Upstream of the Brahmaputra River, China is constructing hydropower dams in order to make use of the river's potential hydropower capacity. At the moment relatively smaller dams are being constructed in order to create the right conditions for the construction of the large Great Bend hydropower dam. This dam is estimated to generate 40,000 megawatts of electricity after its completion. According to the Chinese Government all these projects would have no significant impact on the river discharge downstream as no water is extracted. However, there might be ecological

[4]There is no official acceptable figure of water availability in Bangladesh. The data shown here is provided by the Joint River Commission (JRC).

consequences that are yet unknown due to the regime change of the river flows. Moreover, concerns remain in India and Bangladesh over water diversion from the upper part of the Brahmaputra to the North of China.

India and China state very clearly that the countries will only negotiate bilaterally with other riparian countries within the Ganges-Brahmaputra-Meghna basins. However, even though this approach has been prevalent for decades, a shift can be noticed in India's attitude towards a more multilateral approach with regard to the country's trans-boundary rivers. The state visits between India and Bangladesh in 2010, 2011 and 2015 paved the way for the Joint Working Group, an initiative involving Nepal, Bhutan, India and Bangladesh to jointly manage the Ganges and the Brahmaputra rivers. So far, this initiative is in a premature stage but seems as a promising development with regard to water diplomacy practices in the Ganges-Brahmaputra-Meghna basins.

The state visits between India and Bangladesh also resulted in a more friendly relationship between the two countries. This window of opportunity led to several rapprochement attempts in order to improve cooperation on energy, transportation, trade and water. Increased cooperation is in the interest of Bangladesh because the country has only signed one treaty with India (the Ganges Treaty in 1996) while no official agreements have still been made between the countries on all 53 other shared rivers. Recently, more and more flood data is shared by India with Bangladesh. The years after the state visits, the Teesta agreement was being negotiated – although not signed due to cancellation by India – and other treaties for medium trans-boundary rivers are being prepared and will be discussed in due course. The Joint Rivers Commission established in 1972 has played an important role in bringing India and Bangladesh together on shared rivers, especially since signing of the Ganges Waters Treaty of 1996, and the state visits of 2010, 2011 and 2015. The Joint Rivers Commission has set up dialogues between the countries and has been used a platform for treaty discussions, sharing of (flood) data and joint management of water resources at basin level, development of hydro-power jointly etc.

Bangladesh also receives flood related data from China on the Brahmaputra River and from few tributaries of the Ganges from Nepal. In addition the countries hold frequent meetings at the government level to discuss water issues. Bangladesh took up the issue of diversion of water from the Brahmaputra river based on media report through its Embassy in Beijing. Besides, Bangladesh has expressed its concern regarding Dams in China on the Brahmaputra. There is also a diplomatic relation with regard to water cooperation with Nepal, however, limited with Bhutan and almost absent with Myanmar.

Part II : Establishing Regional Cooperation

Based on the current situation, upcoming projects and proposed plans, four scenarios for future forms of regional water cooperation have been developed (figure below). The scenarios indicate to what extent new infrastructural intervention will influence the flow of the rivers and whether competition or cooperation is the more dominant socio-political approach applied by riparian countries during water negotiations. Regardless of the amount of new interventions in the river basins, a cooperative attitude results in many more benefits. By working together, the social, economic and ecological benefits of cooperation will be greater than the sum of the current individual national benefits.

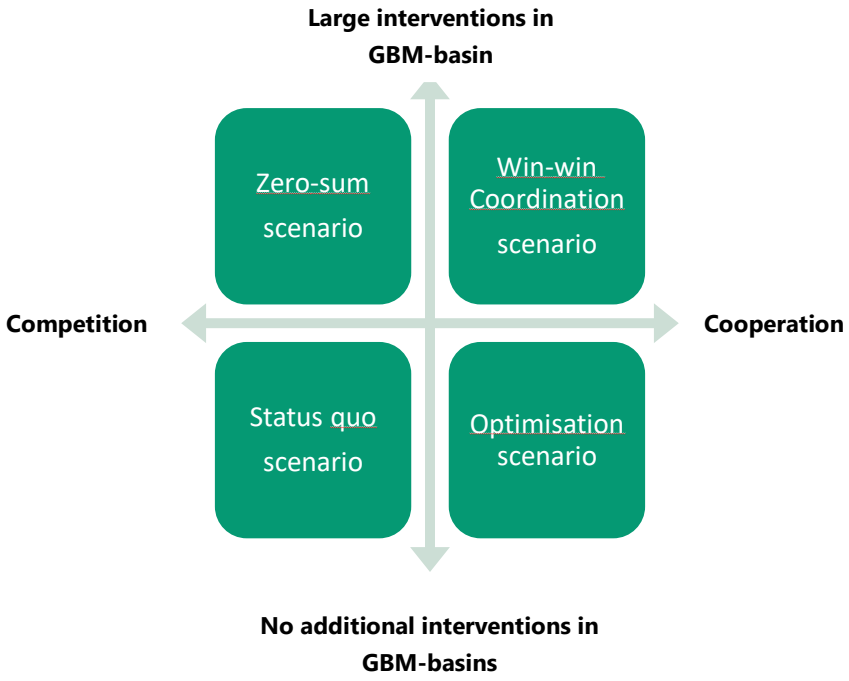

Figure 1: Regional Cooperation Scenarios

Bangladesh is a downstream country and therefore extremely affected by co-riparian actions upstream. Generally speaking, most of the future developments are not in the direct sphere of influence of Bangladesh. Policies of regional key players like India and China will without doubt have huge implications for how Bangladesh's situation will look like in 2100. In order to have control over the rivers' conditions, Bangladesh has to influence Indian, Chinese and other co-riparian water policies and river development plans. Bangladesh has no other option but to engage in negotiations over co-riparian countries and impress upon them that the upstream riparian countries will be severely affected economically and social-politically in case Bangladesh's river-ecology, livelihoods and economy is significantly harmed by upstream interventions resulting to reduced or polluted rivers discharge.

To improve the negotiation position of Bangladesh, a combination of five water diplomacy approaches is advised to apply during negotiations over trans- boundary water with India, Nepal, Bhutan and China. (1) The basin approach is centred on the concept of benefit sharing to make optimal use of the river and its services by constructing infrastructure on the most optimal hydrological and ecological location in the river basin. (2) Negotiating multiple treaties simultaneously is the second approach Bangladesh can implement in order to increase beneficial options during the negotiation process. (3) The mutual gains approach entails the incorporation of non-water issues into the negotiation process in order to augment the basket of benefits to consequently other tradable benefits next to water can be taken into account as well. (4) As part of the Multi-layer water dialogue approach civil society and academics are invited to the negotiation table as well. Multi-layer dialogues enable participating countries to start the negotiations from a new entry point and connect water negotiations with other river interests. (5) The fifth approach involves the active participation of a third party, either an international organisation or a country.

In line with the above water diplomacy approaches, a total of nine non-water issues are identified that could function as leverage during negotiations on shared water bodies, including data and knowledge sharing, climate change, migration, Sundarban Forest, inland navigation and transportation, trade, electricity/ hydropower, port development and tourism.

Part III: Joint River Basin Management

The governments of Bangladesh and India only share on a limited basis their authority with the technical organ of the Joint Rivers Commission (JRC). The organisation is mainly used as institutional structure to address technical issues of common rivers, resolve minor issues and facilitate communication between both countries. On the operational level, the Joint Rivers Commission monitors the Ganges Treaty at the Farakka barrage. While comparing the activities of the Joint Rivers Commission with the different types of cooperation, coordination is the main type of cooperation between India and Bangladesh.

Successful joint river basin management depends on numerous factors, including the presence of treaties and formal agreements, clear responsibilities between all local, national and regional authorities and availability of decision making procedures including the availability of dispute resolution procedures in case disputes cannot be solved. In the case of Bangladesh, the Ganges Treaty is the only treaty signed so far. Furthermore, responsibilities have been shared to some extent with the Joint Rivers Commission, the regional authority, but the national governments are still in control. No specific decision making procedures are published and disputes are directly dealt with by national governments. Thus, room to improve joint river basin management within the Ganges-Brahmaputra-Meghna basins is certainly available. By contrast, all of the eleven barriers for trans-boundary river management recognized by Granit and Claassen (2009) seem to be (to some extent) present in the Ganges-Brahmaputra-Meghna basins. Establishing joint river basin management is therefore not likely to be attained easily, but will require dedication and long-term commitment of all actors involved.

Part I : Country and Regional setting

1. Introduction

1.1. Regional Cooperation, Trans-boundary Issues and Water Diplomacy

Bangladesh is developing rapidly and experiences huge economic growth. Whether there will be sufficient water to sustain this growth is yet uncertain. A major uncertainty for Bangladesh's development is the amount of water available to Bangladesh the coming decades. Bangladesh is downstream of the mighty rivers Ganges, Brahmaputra and Meghna, and almost entirely covered by these river basins. The Ganges-Brahmaputra-Meghna region refers to the three river basins that flow through India and Bangladesh into the Bay of Bengal. There are about 405 rivers in Bangladesh of which 57 are trans-boundary. Of these 57 rivers, 54 are shared with India and 3 with Myanmar. Hence, Bangladesh is incredibly dependent on fresh water provided by the rivers shared with India, China, Nepal, Bhutan and Myanmar. Upstream developments will have a direct impact on Bangladesh. Because of the impact neighbouring countries are likely to have on the development of Bangladesh, it is important to take regional developments and the development of regional cooperation into account.

Over the years, regional cooperation has gained momentum. Bangladesh recognises the potential of joint initiatives for the benefit of the nation. With its central position in the Bay of Bengal, cooperating on water, trade, energy and transport with neighbouring countries India, Nepal, Bhutan, Myanmar and China is essential for the region to foster further development. As stated in the Perspective Plan, it is Bangladesh's ambition to play an active role in establishing cooperation within the region in order to raise the standard of living and reduce poverty. Out of all regional cooperation issues, water is the most difficult area of regional cooperation to settle agreements on. Cooperation in other fields, i.e. fish, food security and transportation, is easier to establish.

1.2. Scope and Deliverables

This baseline study is part of 26 baseline studies conducted in preparation for the Bangladesh Delta Plan 2100. The aim of this report is to provide an overview of current regional cooperation activities, as well as indicate potential directions for further development of regional cooperation. The scope of the Baseline Study for Regional Cooperation is closely related with the BDP 2100 main objectives concerning decrease of flood risk and related increase of food security and economic growth. Therefore, the focus of this baseline study will be on trans-boundary rivers. This study examines the problems and challenges related to these areas for the establishment of regional cooperation. In addition, this baseline study focuses particularly on sub-regional cooperation developments and their potential for Bangladesh. In line with the Perspective Plan of Bangladesh 2010-2021, possibilities for regional cooperation with Nepal, India, Bhutan, China and Myanmar with regard to BDP 2100 related issues will be explored, analysed and elaborated in possible strategies for improvement.

1.3. Approach and Methods

As far as possible the research team attempted to conduct this study with existing knowledge and information. Based on available documentation, information gaps have been identified and a second round of information collection took place in which key experts were asked to indicate relevant documentation and share their insights and observations.

To conduct this study, a combination of various methods has been employed. A desk study and data collection was carried out to review agreements, regulation, plans, reports and academic articles. To check the preliminary findings and further deepen the analysis interviews and meetings with key resource persons were organized. These meetings made it possible to discuss governance issues and conceptualize solutions.

Furthermore, information was gathered in workshops and conferences on trans-boundary water issues.

A couple of adjustments have been made to the initial table of content during the research and writing process. First, in order to make this report as concise and structured as possible, some initial subsections are either now divided or combined in the final version of the report. Second, further research showed the significance and the relevance of all topics indicated beforehand. The importance and relevance is reflected by the small changes in the table of content, for instance while the development of the relationship with India and China is described in more detail, past policies are not analysed as due to recent changes these policies are no longer relevant for regional cooperation up to 2100.

1.4. Structure of the Report

This report focuses on the short and long term. The short term is addressed in Part I, which includes Chapter two on the Existing hydrological setting and water resources issues and Chapter three on Governance and institutional aspects. These chapters focus on the country and regional setting, including the current state of regional cooperation as well as upcoming developments within the Ganges-Brahmaputra-Basins, the institutional framework, the past and current relationship with other sub-regional countries and relevant Indian, Chinese and Bangladeshi policies.

Part II focuses on the long term. In Chapter four a scenario strategy has been applied to give an idea of possible situations in the coming decades. By looking at current trends and possible developments, four different scenarios are selected for Bangladesh's regional cooperation situation and consequent water availability in 2100. In Chapter five an overview is provided of possible areas of cooperation and various approaches that can be used to encourage regional cooperation on particularly water.

The last part, Part III, looks further into joint river basin management. Based on current literature, a brief overview is given on aspects of successful joint water bodies. In the conclusion the importance and relevance of challenges and opportunities for regional water cooperation will be discussed.

2. Existing Hydrological Setting and Water Resources Issues

2.1. Existing and Expected Future Situation of Relevant River / Coast System

Bangladesh and India share some of the most intricate and complex river systems in the world. The Himalayan region is the largest fresh water reservoir in the World. This formidable network of waterways consists of small mountain streams, winding seasonal creeks, traversing canals and magnificent rivers and their tributaries and distributaries. Totalling thousands of kilometres, this network includes the three major rivers the Ganges (or *Padma* in Bangladesh), the Brahmaputra (or *Jamuna* in Bangladesh) and the Meghna (which originates as the *Barak* in India). These rivers constitute the worlds' second largest riverine drainage basins: the Ganges-Brahmaputra-Meghna basins. All three major river systems drain to the Bay of Bengal through Bangladesh. The Ganges-Brahmaputra-Meghna river systems are the third largest freshwater outlet to the world's oceans, being exceeded only by the Amazon and the Congo River systems (Chowdhury and Ward, 2004).

The total catchment area of these three rivers is 1.72 million km^2 of which some 7 percent lies in Bangladesh (Amarsinghe and Sharma, 2010). The location and geography of Bangladesh in the low-lying delta of the Ganges-Brahmaputra-Meghna river systems makes water resources management complex and diverse. In the case of Bangladesh, total annual water availability including ground water is about 1297 km^3, of which the three main rivers contribute around 1133 km^3. Of the latter amount, some 56 percent is contributed by the Brahmaputra, 30 percent by the Ganges and nearly 14 percent by the tributaries of the Meghna. However, the dry season (January-April) availability is only 88 km^3 of which 74 km^3 is cross border flows. The contribution of the Ganges in this case is 17 percent, 75

percent is contributed by the Brahmaputra and the Meghna provides only 7 percent[5]. The contribution from other rivers is negligible. It indicates that during the dry season Brahmaputra's contribution is vital for Bangladesh. Key features of the three rivers are provided in Table 1.

Together the Ganges, Brahmaputra and Meghna basins have an average peak flow of 141,000 m^3/s at its estuary (Amarsinghe and Sharma, 2010). The Ganges-Brahmaputra-Meghna basins cover five countries, including India (64 percent), China (18 percent), Nepal (9 percent), Bangladesh (7 percent) and Bhutan (3 percent).

The water from the Ganges, Brahmaputra and Meghna drains through Bangladesh into the Bay of Bengal (see Figure 2). The entire basins are flood prone and vulnerable for flood consequences. The frequency and insensitivity of floods is expected to increase due to climate change.

Table 1: Key features of the great rivers

River	Ganges	Brahmaputra	Meghna
Length (km)	2,510	2,900	912
Catchment (km^2)	1,087,300	552,000	82,000
Average annual rainfall (mm)	1,200	1,900	4,900
Average annual discharge (m^3/s)	11,000	20,000	4,600
Max. discharge (m^3/s)	78,091 (Sept. 1998)	102,535 (Sept. 1998)	20,000
Sediment transport (million ton/year)	550	590	13

Source: Amarsinghe and Sharma, 2010

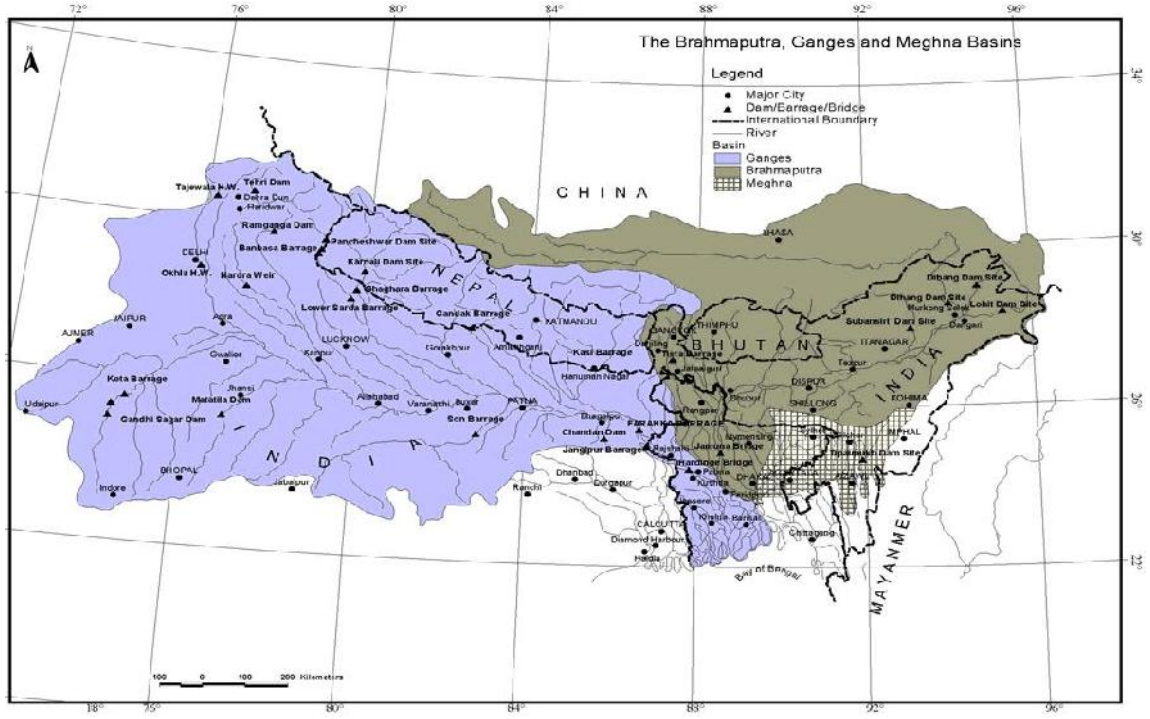

Figure 2: The Ganges, Brahmaputra and Meghna Basins (NWMP, 2001)

[5]There is no official acceptable figure of water availability in Bangladesh. The data shown here is provided by the Joint River Commission (JRC).

2.1.1. Ganges River system

The Bhagirathi, the traditional source of the Ganges rises from the Gangotri glacier in the Himalayas, India at an elevation of 7010 meters. The river flows in a south-south easterly direction through the Indian states of Uttar Pradesh, Bihar and West Bengal before swinging around the Rajmahal hills to enter Bangladesh at the western extremity of Nawabganj district. Three major tributaries of the Ganges – the Karnali, the Gandaki and the Kosi – rise in China, and flow through Nepal to join the Ganges in India. These three left bank tributaries of the Ganges contribute about 71 percent of the natural dry season flow and 41 percent of the total annual flow of the Ganges. The important right bank tributaries of the Ganges are the Ramganga, the Yamuna, the Ton and the Sone. From about 18 km below Farakka (in West Bengal), the Ganges forms the common boundary between Bangladesh and India for about 119 km. About 40 km downstream of Farakka, a distributary of the Ganges takes off as the Bhagirathi-Hoogly and flows southward through West Bengal into the Bay of Bengal.

The Ganges, upon entering Bangladesh, flows east-southeast for about 240 km and joins the Jamuna River (the main flow of the Brahmaputra) at Goalondo. After this confluence, the combined flow is known as the Padma, which continues to flow in a south-easterly direction to join the Meghna River near Chandpur. The length of the Ganges River from its source to its confluence with the Brahmaputra is about 2500 km, of which about 240 km lies in Bangladesh. The Ganges water level starts rising in July and reaches its peak in late August or early September. Along its left bank, the only important tributary of the Ganges within Bangladesh is the Mahananda, while it gives off numerous distributaries and spill channels along its right bank. Of them the most important distributary is the Gorai, whose sustenance is crucial for the life and livelihood and overall environmental health of south-western Bangladesh.

Over the last decades, water use has increased dramatically. In the 1930s the British rulers started using the Ganges water for irrigation purposes and through small interventions the water was diverted to agricultural land. In the 1960s the Indian Government started developing more projects, dams and barrages. As a result the Ganges flow declined during dry season since the 1960s. In 1975 India put the Farakka barrage in use, which resulted in 50 percent flow diversion away from downstream Bangladesh.

2.1.2. Brahmaputra River system

The Brahmaputra rises in the great glacier in the Kailash range of the Himalayas in Tibet (China) at an elevation of 5150 meters. Locally named as Yaluzangbu, it flows eastward – parallel to the Himalayas – for about 1700 km. Along the north-eastern corner of India, it takes a sharp bend toward south and southwest to enter Arunachal Pradesh (India). After joined by two tributaries – the Dibang and the Lohit – the river is known as the Brahmaputra and flows westward. During its course through Arunachal and Assam, the Brahmaputra is joined by several tributaries including the Subansiri, the Dhansiri and the Manas.

The Brahmaputra enters Bangladesh in Kurigram district, and is joined by many tributaries flowing through the northern part of West Bengal (India) and northern Bangladesh – the principal ones among them are the Dudhkumar, the Dharla and the Teesta. After its confluence with the Teesta, a lesser channel branches off as the Old Brahmaputra – flowing in a south easterly direction to join with the Meghna near Bhairab Bazar. (The Old Brahmaputra was the original channel of the Brahmaputra before its shifting in 1780s). The principal channel of the Brahmaputra flows southward and meets the Ganges at Goalundo. About 70 km before joining the Ganges, the Brahmaputra throws off a distributary – the Dhaleswari – from its left bank. The Dhaleswari falls into the Meghna near Munshiganj, while an offshoot from it – the Buriganga – takes off from its left bank and falls back into it (the Dhaleswari), and the capital city of Dhaka is sited along the north bank of the Buriganga. The total length of the Brahmaputra, from its source up to its confluence with the Ganges at Goalundo, is about 2900 km, of which about 260 km lies within Bangladesh. The water level in the Brahmaputra-Jamuna attains its peak in June-July. The Brahmaputra is a large braided and multi-channel river with an average width of over 12 km in the flood season, and is also susceptible to severe bank erosion.

The Brahmaputra is Bangladesh's main river. Keeping a steady dry season flow is essential for the country to have sufficient surface water needed for the estuaries. It is estimated that around 70 percent of the dry season flow is required to protect the estuaries against salinization[6]. If the dry season flow is affected, the southern part of the river estuaries will become more saline and subsequently harm the livelihoods and ecosystem in the coastal area of Bangladesh.

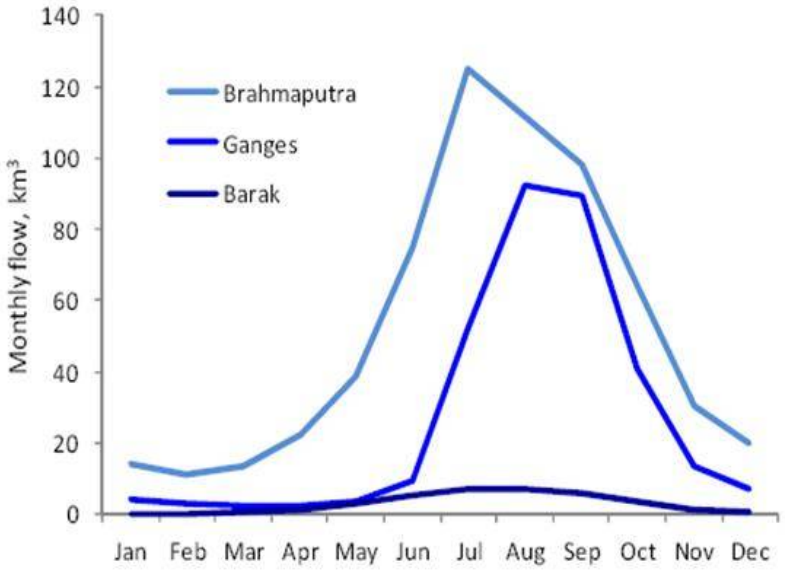

Figure 3: Monthly border inflows of the three main trans-boundary rivers, averaged 1980 - 2009

Source: IWM, 2014

2.1.3. Meghna River system

The headwaters of the Meghna – the Barak – rises in the hill ranges forming the border of Nagaland and Manipur States at an elevation of about 2900 meters. After flowing in a south westerly direction, it takes a sharp turn near Tipaimukh to flow northward. Emerging from the hills, the Barak flows toward the Bangladesh border of Sylhet, where it bifurcates into two channels – the Surma and the Kusiyara – and both of them enter the greater Sylhet district. Within Bangladesh, both rivers receive several tributaries, and they re-join at a point upstream of Bhairab Bazar, and thereafter, the river is named as the Meghna. The river then flows southwest to meet the combined flows of the Ganges-Padma and the Brahmaputra near Chandpur. South of Chandpur, the combined flow of the three river systems is known as the Lower Meghna, and falls into the Bay of Bengal through a wide estuary. The length of the Meghna from its source up to Chandpur is about 912 km, of which around 452 km lies within Bangladesh, while the distance from Chandpur to the Bay is about 130 km. The Meghna is a rain fed river and it normally attains its peak in August-September.

2.1.4. Teesta River system

The Teesta is the fourth major trans-boundary river in Bangladesh. The origin of the Teesta River is located in the north of the Indian State Sikkim. The river originates from the Lake Cho Lhamo at a height of 5.330 metres (Bhushan and Ahmed, 2014). Before the Teesta River enters Bangladesh it flows through Sikkim and for 97 km through the State of West Bengal. In Bangladesh the river merges with the Brahmaputra River. The total length of the river is 366 kilometres and it drains an area of 11,272km^2. Upstream inflow in this river provides key support to agricultural production in the Teesta River floodplain in the northwest region of the country. Bangladesh constructed a barrage on the Teesta River in 1990 to provide irrigation water for crop production in the Teesta Barrage Project area. At an earlier stage, India

[6]Interview with Director WARPO

constructed the Gazaldoba barrage upstream of the Teesta barrage. The Teesta barrage started operation with limited conveyance infrastructure in 1993, with a further expansion in 1998 (completion of Phase 1) (Islam et al., 2003)

Since then, two main dams have been developed in the Indian part of the Teesta; the TeestaV dam, completed in 2007 has been the largest project so far. The Teesta V dam was developed to generate hydroelectric power (510 MW) and assist flood control. The second dam is the Rangit III hydroelectric project, completed in 2000 on the greater Rangit River, a tributary of Teesta River. The other three (much smaller) completed projects are the Lower Lagyap, Upper RongniChhu and MayangChhu projects.

The Teesta River provides irrigation to Cooch Bihar, Jalpaiguri, Darjeeling, Utter and Daksin Dinajpur and Malda in West Bengal and to the north-western region of Bangladesh comprising parts of the districts of Nilphamari, Dinajpur, Rangpur, Gaibandha, Joypurhat and Bogra. Both India and Bangladesh have constructed barrages to divert the water to agricultural land via a canal system. The upstream Indian Gazaldoba barrage controls the amount of water released to the Bangladeshi Dalia/Doani barrage. As a result, the flow of the Teesta River towards Bangladesh is restricted by the amount India releases, if any, after India's own demand for irrigation water has been met. "In the dry season, the exclusive control of the river water at Gazaldoba renders the Dalia Barrage almost useless for diversion of water due to low flows" (Bhushan and Ahmed, 2014).

2.1.5. River system shared with Myanmar

This analysis has not been carried out yet. No major issues are noticed with regard to the shared river system with Myanmar.

2.2. Availability and Demand for Water, Sediment Transport

The deforestation upstream will cause erosion and consequently extra sedimentation downstream which increases the floodplain and raises the chances of river floods. The availability and demand for water is described more in-depth in the Water Resources Baseline Study. With regard to sediment provision and transport of sediment, the Rivers Baseline Study is recommended for more information.

2.3. Analysis of Constraints of Quantity, Quality, and Ecosystem

This section is partially drawn from the Water Resources Baseline Study. Chapter 2 of the Water Resources Baseline Study outlines water quantity and quality constraints in detail.

2.3.1. Water resources issues and constraints in relation to international developments

Being highly dependent upon developments upstream, the diversion, use or storage of flows from the Trans-boundary Rivers is of major importance to Bangladesh. Impacts on dry and monsoon season flows, salinization, siltation of rivers and sediment deposition in the Meghna estuary are the most important factors. These, in turn have a direct impact on the ability of the floodplains to keep up with sea level rise in the Meghna estuary (see Baseline Study on Rivers Systems Management).

Impact on dry season flow

Upstream infrastructural developments (for instance the Indian River-Linking Project (IRLP)") are expected to have a notable impact on the dry season flow. Through the project, water will be transferred and redistributed from the Brahmaputra and the Ganges basins through 30 link canals with the aim to connect the major rivers of these two basins. The Ganges River has been found to be the most negatively impacted river among the major rivers followed by the Brahmaputra and the Meghna Rivers, while the most impacted regional rivers are: the Gorai, Mahananda, Koratoya, Teesta, Dharla, Dudhkumar, Old Brahmaputra, Dhaleswari rivers etc. The six adjacent hydrological regions (North West,

North Central, North East, River and Estuary, South West and South Central) of the country would be impacted at various magnitudes.

Ganges

Changes in flows and sedimentation rates resulting from the development of the Farakka Barrage may be illustrative of the type of impacts which may be expected should further upstream infrastructural development (and especially increased diversion of flows for irrigation consumption) take place. According to M. Monirul Qader Mirza (1997), the diversion of dry season flows from the Ganges as a result of the construction of the Farakka barrage, has caused considerable hydrological changes in the Ganges system in Bangladesh, notably a reduction in dry season flow and an increased siltation of the Gorai River and the entire river systems of the South Western region. The impact on floods was already discussed above. Hoelscher (PRIO, 2013) states that, referring to discharge (BWDB) and precipitation data (BMD) studied over the period from the 1940's to the present for the Ganges river, 'These data appear to indicate that there has been a noticeable shift in dry season river flow volumes that coincided with commencement of operations of the Farakka Barrage. This downward trend appears independent of regular cyclical patterns of river flow, and independent of wet season flows.' According to Hoelscher, besides the effect of a natural cycle in the flow regime, the decline continued since the mid 1970's following the operation of the Farakka barrage in India. Hoelscher suggests that the (cyclical) decline of the dry season flows of the Ganges may have been exacerbated by operation of the Farakka Barrage. Based on the same data analysis, but from different weather and discharge stations, Gain and Giupponi (2014) confirm these conclusions.

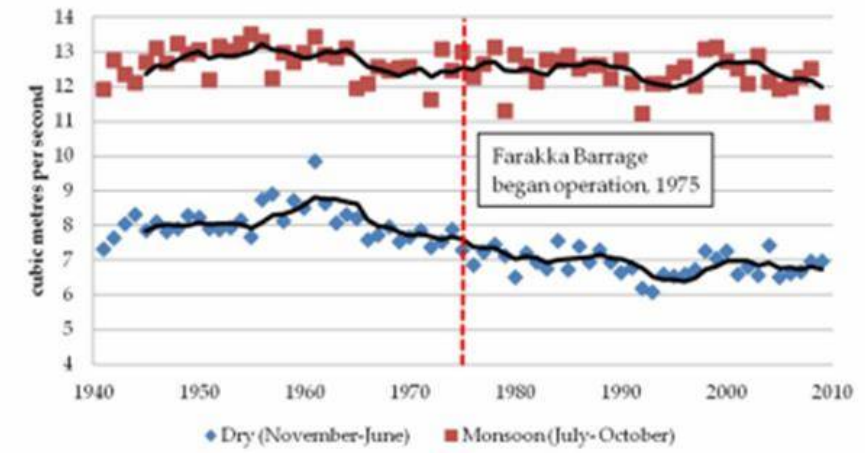

Figure 4: Average annual monsoon and dry season flows in the Ganges river, measured at the Hardinge Bridge station, Kushtia (PRIO, 2013)

It may be expected that further infrastructure development on the Ganges River will exacerbate the impacts outlined above. In addition to a further siltation of the rivers in the Ganges Dependent Area, an increased salinization of the South West Region will likely occur, further to the on-going trends. This will negatively impact the natural values of the Sundarbans reserve, and agriculture and fisheries in the Ganges Dependent Area.

Brahmaputra and other main rivers

If (further) major infrastructure development takes place, it will result in changes in low and high flows and sediment transport through these rivers. Should for instance the low flows for the Brahmaputra be affected in a similar manner as observed above for the Ganges, a comparable impact as for the Ganges Dependent Area may therefore be expected for the coastal zones (i.e. the South Central hydrologic region) dependent on the Brahmaputra (and Meghna), entailing increased salinization and siltation of regional river systems. A different picture would seem to emerge for the Teesta

from the analysis by Hoelscher (2013). According to Reza A. Mullick et al.(2010) "a reduction of the low flow in the Teesta in recent years results an alarming situation to the agriculture as well as to the in-stream users downstream to the barrage in Bangladesh part". .It reveals from the official record that the lean season (January- April) flows at Dalia in Bangladesh has decreased from 198 m3/sec (1973-85; before Indian diversion period) to 85 m3/sec (1998- 2010; after Indian diversion)) while the mean monthly minimum flow in February has fallen from 158 m3/sec to 54 m3/sec corresponding to same periods.

Impact on Floods

The impact of upstream developments on floods would seem to be of a very different order than droughts. The example of the development of the Farraka barrage may serve as example. The Farraka barrage seems to have limited impact on floods. Trends in peak flows are not statistically significant. However, decreased discharges during low flow periods may result in siltation of rivers and hence in higher water levels, even if the discharge is not increasing. Bankfull discharge may occur at lower flows and enhance more frequent flooding. This problem was observed in the Gorai River. Since the construction of the Farraka barrage, less water flows through the Gorai during periods of low flow. The resulting siltation reduced the discharge capacity. Consequently, a larger part of the discharge now flows through the Ganges. The increase in water levels is shown in the stage discharge relationship for the Gorai River. Monirul Qader Mirza (1997) shows that peak discharge in the Ganges has increased, but that no increase in water level was detected. He suggests that the river cross sections may have adjusted to the higher peak flows.

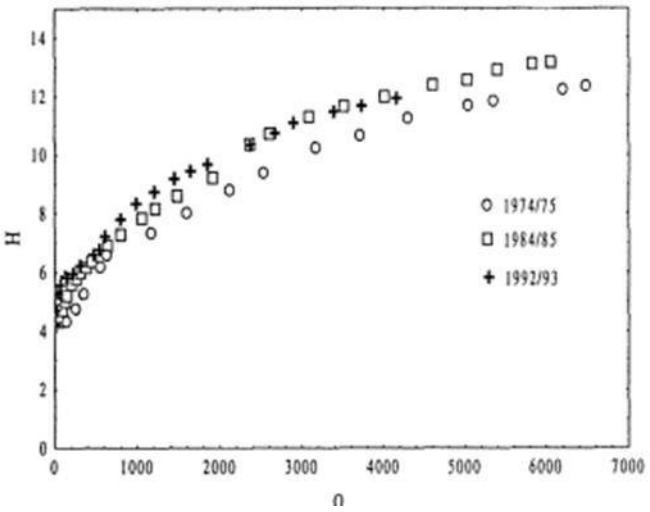

Figure 5: Stage-discharge relationships for the Gorai (Monirul Qader Mirza (1997)

Coastal area

The Indian part of the Sundarbans is in a different condition than the Bangladeshi side. The amount of fresh water that flows towards the Bangladesh part of the Sundarbans depends for large extent on the water flow India directs to Bangladesh. The alarming water logging taking place in the Bangladeshi side of the Sundarbans is not seen at the other side of the border. Due to the Farakka barrage India has access to divert sufficient water to their part of the Sundarbans. In addition, the India Sundarbans have ample deposition of sediments and receive sufficient fresh water to prevent the area of becoming saline.

2.4. Current Technical Problems and Solutions

2.4.1. Knowledge gaps related to water resources and international developments

To adequately assess the potential impacts of trans-boundary development on water resources, further research on Basin Wide Water Resources Assessment is required for Trans-boundary Rivers. The following knowledge gaps have been identified in the Water Resources Baseline Study with relation to trans-boundary rivers:

1. Knowledge gaps on Water Availability and its distribution may be studied:
    - Low and high flows in the Ganges, Brahmaputra, Teesta (and other minor) rivers
    - Sediment availability and river morphology
    - Groundwater recharge from cross-border aquifers and trans-boundary river systems
2. Climate variability and climate change in the whole Basin, affecting e.g. rainfall-runoff patterns – *this should result from the Climate Change Baseline Study;*
3. Socio-economic developments, reflected in changing water requirements, upstream storage and consumption;
4. Quantification of the demand: to determine the impact of periods of water scarcity (low discharge and rainfall) on different sectors, requirements at national level have been assessed (in e.g. the CSIRO study). Given the variation between the hydrological regions and expected impact of external drives, the demand needs to be quantified in detail at the level of each region for each of the key sectors.

2.5. Known Upcoming Plans

2.5.1. Indian upcoming plans

River Inter Linking Project India

Currently around 62 percent of the annual fresh water availability in India is restricted to the river basins in the north of India that comprise only 33 percent of the countries surface (Wirsing, 2012). The Indian River Inter Linking Project will transfer and redistribute water from the Brahmaputra and the Ganges basins through 30 link canals towards the south west of India. The River Inter Linking Project encompasses a possible diversion of 200 to 250 Billion Cubic Meters from the Ganges, Brahmaputra, Teesta & other eastern rivers to the water shortage Indian States of Uttar Pradesh, Madhya Pradesh, Haryana, Maharastra, Rajasthan & Gujrat, Orissa, Andra Pradesh, Karnataka & Tamil Nadu. An estimated amount of 173 billion cubic meters of water is proposed to be transferred to the western and southern regions of India. Water will be diverted from all the major tributaries of the Ganges, as for instance from the rivers Sarda, Kosi, Mechi, Gandaki, Karnali and Ghagra to the central, north and western part of India. Of particular interest for Bangladesh is the Himalayan component of the project. The links with particular effect on Bangladesh are link nr. 1 Brahmaputra – Ganges, link nr. 13 Farakka – Sundarbans and link nr. 14. Brahmaputra – Ganges (see figure 6). The Brahmaputra-Ganges Link has been proposed to augment the flows of the Ganges by diverting water from the Brahmaputra to the Ganges. According to the proposals, the Ganges basin has 'marginal surplus' water availability whereas the Brahmaputra basin has 'surplus' water availability (CEGIS, n.d.). The "Inter Basin Water Transfer" idea was developed in India in the 1950s but it was until 1980 that India proposed a National Water Master Plan in which the Inter Basin Water Transfer was the main measure. From 1982 the National Water Development Agency has carried out surveys and has prepared feasibilities reports on River Link Projects. The aim to develop the Inter Basin Water Transfer was part of several consecutive National Water Policies but no actual implementation of the plans took place after. In 2002, the Indian Supreme Court ordered the Central Government of India to complete the River Linking Project by 2012. To date, India has constructed already 285 dams and 9 barrages in the Ganges basin, as well as 4 dams and 1 barrage in the Brahmaputra basin (CEGIS, n.d.). The National Water Development Agency has already prepared a pre-feasibility report of MSTG Link for transferring the surplus flows of Manas and Sankosh rivers, tributaries of Brahmaputra River and

intermediate rivers up to Teesta into the Ganges River upstream of Farakka. Part of this surplus water is proposed for augmentation of the Ganges River to meet the water requirement for the functioning of Calcutta Port.

As part of the River Inter Linking Project, India also plans to construct water reservoirs in Nepal to store monsoon water and release this water through the canals built (see Figure 7). To date, India has not yet officially consulted Nepal to construct the water reservoirs in Nepal. The cooperation of Nepal is not secured as such. The reservoirs could be a welcome source for economic development for Nepal. On the other hand Nepal could reject the Indian plans as the water reservoirs would harm the rivers' ecology and with increasing population human settlement have to be destroyed.

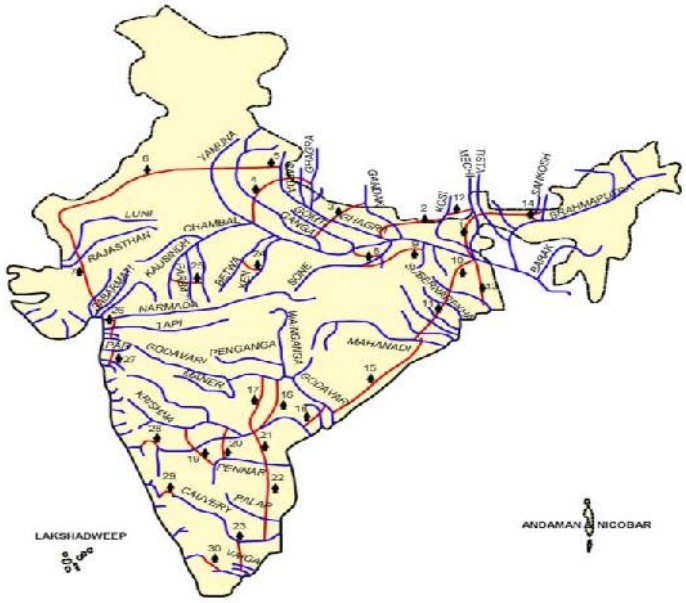

Figure 6: River Inter Linking Project

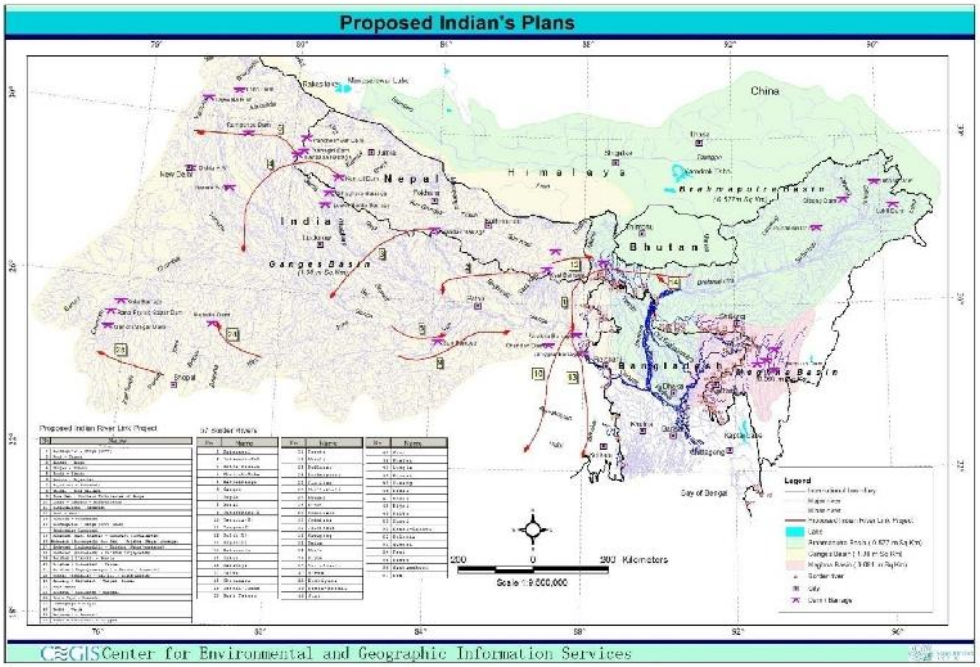

Figure 7: Proposed plans as part of the River Inter Linking Project

Bangladesh has raised its objection to India about the River Inter Linking Project as Bangladesh is concerned over the devastating effect on the rivers ecology and consequent effect on the country's economy. India informed Bangladesh that they will not implement the Indian River Linking Project without consulting Bangladesh first. However, India has meanwhile completed the feasibility studies of 16 link canals and India is therefore continuing without the consent of Bangladesh. A study carried out by WARPO[7] indicates that due to the diversion of water from the Ganges and the Brahmaputra large areas of Bangladesh would be severely affected as agriculture will be impeded by the significant changes in the availability of surface and groundwater. With regard to the impact on ecosystems, water diversion from the Ganges and Brahmaputra will affect both the terrestrial as well as aquatic ecosystems within Bangladesh. The livelihoods of fishermen will be affected as a result.

16 dams project/ Jal Marg Vikas project

The central Indian government has decided to implement the Jal Marg Vikas project as part of the Ganges waterway project. 16 barrages will be built on the Ganges River between Allahabad and Haldia. In practice, a barrage will be constructed on every 100 km. With the construction of the sequential barrages the central Indian government aims to tame the river and ensure three metre navigability to enable river navigation between Haldia and Allahabad. The Jal Marg Vikas project has already been allocated a budget of 4,200 crore rupees by Indian Finance Minister Arun Jaitley (Daily Star, 2014).

Interventions like the Jal Marg Vikas project have also large implications within India because of the cumulative environmental impact that will affect millions of people living near the river (Daily Star, 2014). Sediment will be trapped leading to erosion problems downstream in Bangladesh. The water flow will also be disturbed which affect fisheries and aquatic life of the Ganges. The diversion of fresh water also affects the Indian part of the Sundarbans, leading to huge increase of salinity and eventual destruction of this very valuable ecosystem.

Tipaimukh Dam on Barak River

The Barak River is a trans-boundary river flowing from India to the North East part of Bangladesh where the river splits into the Surma and the Kushiyara River and become part of the Meghna river system. The river system is the second largest drainage system in northeast India (Ranjan Singh, 2009). India is planning to construct the Tipaimukh Dam upstream of the Barak River. The Tipaimukh Dam project envisages construction of a 162.8 meter high rock fill dam across the river Barak near Tipaimukh village on the Manipur-Mizoram border in India. This project will be one of the largest Hydro Electric Project in Eastern India to date and will be located 500 meters downstream of the confluence of the Tuivai and Barak Rivers in the District of Churachanpur in the State of Manipur, near the Manipur - Mizoram border. The dam's direct benefits include hydropower generation installed capacity of 1500 MW and flood protection of an area of 1.50 lakh Ha. in Cachar, Karimganj and Hailakandi district of Assam. India will also indirectly benefit as navigation, pisciculture and recreation possibilities are increased due to the dam's proposed construction[8]. The proposal has not yet been approved by the Environmental Department of the Central Indian government.

The Tipaimukh dam has been discussed several times by the Joint Rivers Commission in the 1970s. After a pause of 25 years, the Tipaimukh dam was discussed again in 2005 as India proposed the dam's construction at the Joint Rivers Commission meeting in Dhaka in 2005. The Government of Bangladesh expressed its concerns regarding the adverse downstream impact of the Tipaimukh dam project (Bisht, 2012). The dam is likely to control the discharge flow and consequently should be able to decrease the occurrence of severe flooding in immediate vicinity. India states that the annual flow downstream in the Barak River will not change as the Tipaimukh dam is constructed for hydropower generation purposes. The daily flow will, however, be largely impacted as the distribution of the river discharge will be

[7] The study is not publicly available

[8] Idem

more gradual instead of peak and low river discharges according to the season. As a result, the dam will impact the ecology of the river. Besides, it may also impact agriculture and fisheries in the region. According to the ISN, the Bangladesh and Indian perceptions on the impact of the Tipaimukh dam do not match:

"The perception prevails in Bangladesh that their larger neighbour is carrying out the project without any consultation with the lower riparian state and that ultimately the proposed dam will have a severe ecological impact that could lead to the desertification of eastern Bangladesh. India argues that since the Tipaimukh dam would be used for hydroelectric power generation and not for irrigation, it would not cause any negative consequences downstream or any ecological harm to Bangladesh" (ISN, 2014).

During the last years, the proposed plans have been discussed at a couple of meetings of the Joint Rivers Commission. Bangladesh and the former Indian Government agreed that a joint study between India and Bangladesh would assess the impact of the Tipaimukh Dam on Bangladesh. A joint committee was established to look after the study and finalize the results. The joint committee was supported by IWM and CEGIS during the research.

2.5.2. Chinese upcoming plans

This section provides an overview of the current Chinese plans for the Brahmaputra River. The origins of the Brahmaputra River are located in Tibet, China where the river flows first from the west to the east. At the Great Bend, the river makes a U-turn before flowing towards the Indian border in the south. As no official documents are made available by the Chinese Government and official statements turned out to be inconsistent, this section is based on secondary data sources and news articles. As such, the sources for this section could not all be verified. Therefore these sources have been analysed with due care.

Hydropower dams

The Great Bend has the biggest hydropower potential of any place in the world. Throughout the bend, the river lowers nearly 2500 meters in altitude (Tibetan Plateau, 2010). At the same time, estimates indicate that the Brahmaputra's hydropower potential has only been tapped for 5 per cent, leaving 95 percent open for development (Wirsing, 2012).

In 2010, 10 dams were completed on the tributaries of the upper Brahmaputra by China, whereas three dam projects were still under construction. An additional 15 dams were either under consideration or already proposed; see Figure8 (Tibetan Plateau, 2010). According to the Chinese Government, all of these rivers have no significant impact on the river's discharge downstream as they are solely designed to generate electricity. An overview of hydropower projects on the Tibetan part of the Brahmaputra (published by Tibetan Plateau) shows the multitude of planned Chinese hydropower projects.

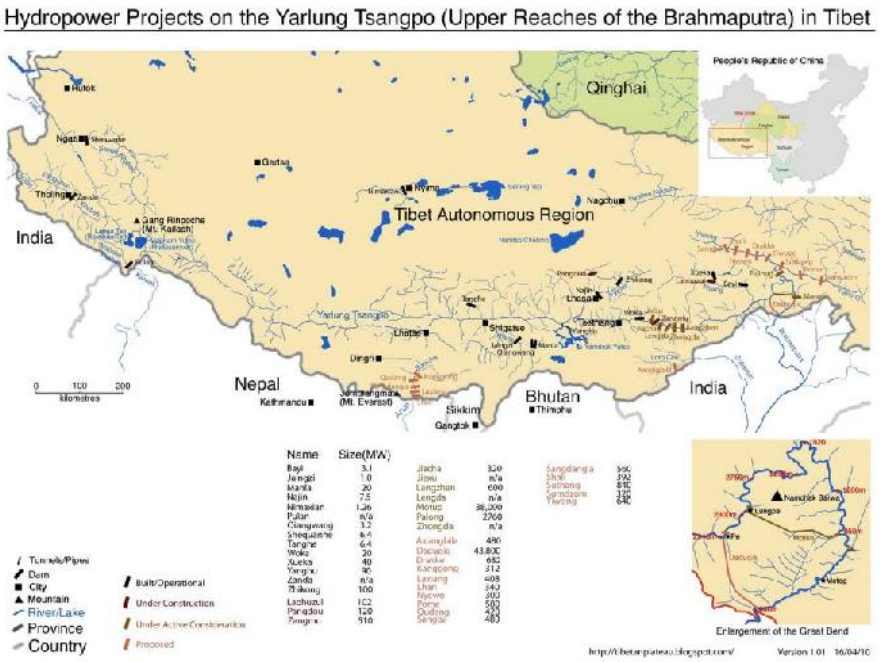

Figure 8: Chinese hydropower projects on the upper part of the Brahmaputra

China is likely to build hydropower plant at the Great Bend, although this has been denied until the writing of this report by the Chinese Government. The plan is to construct nine successive dams in the 400-kilometre long Great Bend of the Brahmaputra. The dams are projected to genereate over 40,000 megawatts to supply electricity the large cities near the Chinese coast. Water is divided from the river for the Great Bend and let through nine consecutive tiers. Over the course of the dams, the water fals over 2,000 meters. At the other side of the Bend and near the village of Motuo, the water is again merged with the main river flow. The dams will be constructed in a tunnel that will be constructed between the towns Lungpe and Motuo near both sides of the Great Bend. The State Grid cooperation of China has already included the proposed Great Bend dam in the Chinese National Gird Plan of 2020 (Tibetan Plateau, 2010). The project is economically and technically feasible, but the constructions will only starts under certain conditions. According to Tibetan Plateau, the hydropower consecutive dams in the Great Bend are "likely to be built after related infrastructure of nearby dams to supply power for its construction and ultra-high voltage power transmission lines are completed". Upstream preparations for the construction of the Great Bend dam are underway to control the water flow above the proposed Great Bend dam. Five dams will be constructed in the mainstream of the upper part of the Brahmaputra (Wirsing, 2012). The Zangmu dam is the first dam to be completed. The scheduled construction time of the Great Bend dam is unknown.

India and Bangladesh have expressed their concerns about Chinese upstream activities. The actual impact is yet uncertain as the impact of the plans has not been scientifically studied. Since China does not disclose information on its dam projects, it is problematic to estimate what impact the river interventions in the upper Brahmaputra will have on the river's flow. China maintains that the dam projects will not lead to remarkable water flow changes downstream as the dams do not divert the water elsewhere. For Bangladesh and India it is important to know whether the Great Bend dam will hamper the dry season flow as in that case both downstream countries would be hugely affected. The Great Bend dam project will, however, cause environmental problems and cause geological risks for downstream areas (Walker, 2011). "The [Great Bend dam] project is at the convergence point of three gigantic mountain ranges and several very big rivers" (Walker, 2011). The seismic activity in the region has already been noticed because a massive flood after the earthquake in Yushu almost caused the collapse of the Thrangu dam. The dams constructed in the upper part of the Chinese Brahmaputra are located in a less geological sensitive area.

South-North Water Diversion Project

China recently completed the eastern route of its South-to-North Water Diversion Project. The central and western routes are still under construction. The western route encompasses a water link between three tributaries of the Yangtze River. The aim of the western route is to provide four billion cubic metres of water to the northern water deficit parts of China by 2050.

Within India and Bangladesh a lot of speculation exists on Chinese plans to link the Brahmaputra with the most western branch of the South North Diversion Project. In that situation, water from the Brahmaputra would no be able to flow towards India as it would be diverted towards the north of China. Until now no steps have been undertaken by the Chinese Government and are not likely to be taken in the near future. The Tibetan Plateau provides a compact rationale on why India and Bangladesh should not be concerned about potential diversion projects because water diversion projects from the Brahmaputra to northern China are – for the moment – unrealistic and not economically interesting:

"Close study of the terrain around the Great Bend area and possible canal routes on Google Earth show that the laws of physics will not allow water diversion from the Great Bend as suggested. For example, a reservoir like Motuo (850 m altitude) which is ideal for taking advantage of the drop in the Great Bend altitude would have lost 2000 meters of height that must be transferred over corrugated mountain ranges—through canals that are hundreds of kilometres long. Some may stubbornly argue that it is possible to divert the water with the combined power supplied by the dams at Motuo and Yiwong- Parlung rivers and with "peaceful nuclear explosions" to bore tunnels in the mountains. Even if these were possible, the immense costs do not make sense given the fact that water can be diverted from other rivers more easily and the key attraction for power generation at the Great Bend is economic development, not pumping water. Another major issue is the climate of the Tibetan Plateau, where it is below freezing point during winters and during early spring when water demand is highest in North China." (Tibetan Plateau, 2010)

In short it is expected that the coming decades Chinese activities on the Brahmaputra will solely concentrate on increasing hydro-power generation capacity.

2.5.3. Plans of Nepal, Bhutan and Myanmar

For the last few years, Nepal is constructing small dams instead of big storage projects. Nepal has come to realize that large infrastructures impact the countries ecosystem and affect livelihoods of the people. In 1989 Bangladesh and Nepal carried out a joint study to develop flood mitigation measures and multipurpose use of water resources. It was estimated at the time that next to the retention of monsoon water for augmentation of the dry season flow, the hydro-power potential of the reservoirs sites could be a total of 36,616 MW (Bangladesh-Nepal Joint Study Team, 1989). No plans of Myanmar which will affect the Ganges-Brahmaputra-Meghna basins are known.

2.6. Trends and Challenges

2.6.1. Proposed upstream projects

Both India and China are developing infrastructural projects on the Ganges and Brahmaputra. Dams and barrages are constructed to control the river and to enable navigation to stimulate internal trade and transportation facilities. Irrigation systems increasingly divert water from the rivers inland to supply agricultural land with sufficient water to sustain the demand for food within upstream riparian countries.

Furthermore, both countries have started with river diversion projects. At this point, the Chinese South-North River Project is not likely to be connected to the Brahmaputra in the near future. The Indian River Inter Linking project is, on the contrary, more of a treat to Bangladesh's water supply because India's plans for diversion of the Brahmaputra river water are serious. However, linking the north east water surplus to the water deficit area in India's western and southern states is not yet realized due to financial and technical constraints.

The consequences of these developments will be largely felt by Bangladesh. The rivers' ecologies will be harmed by the dams and reduced water flow, which in turn will negatively affect terrestrial as well as aquatic ecosystems, agriculture, the livelihoods of fishermen and other (most rural) communities in Bangladesh. This will also adversely impact the terrestrial and aquatic ecosystem.

3. Governance and Institutional Aspects

3.1. Socio-economic Aspects and Demographic Development

3.1.1. Population in the Ganges-Brahmaputra-Meghna basins

It is estimated that at least 630 million people live in the Ganges-Brahmaputra-Meghna basins[9]. Compared to other countries in the Ganges-Brahmaputra-Meghan basins, India – along with China – is by far the largest country in terms of surface, population and economy. Over 75 percent of the population live in India compared to only 20 percent of the population in Bangladesh. In Table 2 the population in the three basins is broken down per country. For a better understanding of the socio-economic aspects and demographic development of the basins, a closer look at especially the Indian socio-economic and demographic developments is provided in this section.

Table 2: Population Ganges-Brahmaputra-Meghna basins

Total population in Ganges-Brahmaputra-Meghna basins	~ 630 million
India	75.8%
Bangladesh	20.3%
Nepal	3.5%
Bhutan	0.2%
China	0.2%

Source: Amarsinghe and Sharma, 2010

3.1.2. Indian demographic developments per states

The Indian states of Bihar, Uttar Pradesh and West Bengal are the most populated Indian states in the Ganges-Brahmaputra-Meghna basins and have experienced enormous population growth over the last decade. All three of them are located in the Ganges basin but only one of these states share a border with Bangladesh. Considering estimates that Indian urban population will increase by 497 million people by the next fifty years, India's water consumption pattern – and consequently its water demand – will change drastically over the next decades. According to the International Water Resource Management Institute, water demand will increase by 32 percent in 2050 (Saran et al., 2014). However, up to 2050 it is expected that the majority of Indians in the Ganges-Brahmaputra-Meghna basins will still be living in rural instead of urban area (Amersinghe and Sharma, 2010).

The area covered by the Brahmaputra basin – the north eastern part of India – is compared to other Indian regions relatively poor and underdeveloped. On average, the per capita income of the north eastern part of India is about 30 percent lower than the Indian national average (Mahanta, 2012). Several explanations exist for the why the Indian parts close to Bangladesh are relatively underdeveloped. One author argues that "due to weak governance and poor institutional mechanisms, the region remains one of the most backward in the country" (Mahanta, 2012). Considering the fact that the population in the region is rapidly increasing while land productivity is declining, the region is relatively more dependent on the natural resources for its survival and poverty is widespread. Therefore the region is very vulnerable for disrupting effects of climate change on agricultural productivity. Furthermore, especially the poorer and more marginalized communities will experience the consequences of climate change.

[9] Water Report 37, 2011. AQUASTAT, FAO: http://www.fao.org/nr/water/aquastat/basins/gbm

3.1.3. Agriculture as main source of income

Compared to Indian states like Punjab and Haryana, eastern Indian states have low food productivity. Increasing land productivity is therefore one of the main priorities within India. Despite the fact that the main source of income is agriculture, agricultural productivity in the Ganges-Brahmaputra-Meghna basins is low due to small and fragmented land, inadequate irrigation infrastructure and resources and regularly occurring natural hazards like floods and droughts (Amersinghe and Sharma, 2010). This is remarkable because the soil of the basins is very fertile due to sediment deposition and the climate enables multiple yields per year. Rice and wheat are the main crops grown in the basins. These crops make up 89 percent of the total food consumption in the region (Amersinghe and Sharma, 2010).

3.1.4. Poverty

The Indian riparian states are amongst the poorest states of India; of which a substantial part of the population is characterized as chronically poor. Thus, the population of the Ganges-Brahmaputra-Meghna basins is poor, vulnerable and food-insecure. Poverty in the region is severe, multi-faceted and still a rural phenomenon.

3.2. Socio-political Aspects and Approaches

In the Ganges-Brahmaputra-Meghna basins, water is very much approached as a zero-sum game by the riparian countries. If Bangladesh gains from an agreement, the dominant view is that other countries will lose as a result. Mutual beneficial situations are not often considered as realistic nor are they pursued during negotiation processes. Establishing river agreements is therefore very complicated. Often the downstream countries get the long end of the stick since they have no viable options to counter the upstream interventions. Another important socio-political characteristic is the secrecy surrounding negotiations. Data is not shared openly as an attempt by states to control the negotiation process. The rest of this section will describe the socio-political approaches relevant for regional cooperation, with particular attention to general aspects and approach with regard to regional water negotiation processes.

3.2.1. Bilateral negotiations

Bringing countries on board of river sharing negotiations is challenging in the Ganges-Brahmaputra-Meghna basins. Especially upper riparian states do not always see the benefit of active involvement in river dialogues. So far, the strategy to invite upper riparian states is therefore not very effective. To date, China avoided active involvement in discussion over shared rivers on the government level. Furthermore, India and China are very explicit in their official documents and statements about their will to exclusively negotiate bilaterally on water issues. Both countries are not openly interested in setting up multilateral agreements, although – see Section 3.2.2 - a more flexible Indian attitude is noticed recently. China and India point at their size and upstream position for their lack of interest to involve actively in water negotiations. An indication of Indian's preference for bilateral diplomacy is article 8 of the Ganges Treaty "The two Governments recognise the need to cooperate with each other in finding a solution to the long-term problem of augmenting the flows of the Ganges during the dry season".

3.2.2. Multilateral negotiations

The year 2010 can be regarded as a tipping point for the relationship between India and Bangladesh. Despite the bilateral focus put forward in the Indian National Water Plan from 1999, a distinct shift in Indian policy is made towards regional cooperation. Until now, this observed change in attitude towards multilateral meetings has been supported by Prime Minister Mr. Narendra Modi. In line with the improving relationship between the two countries, cooperation on water resources management and (hydro-) power is also emerging on a more sub-regional level according to the Bangladesh Ministry of Foreign Affairs. In September 2011, a framework agreement on cooperation for development was signed by the Prime Ministers of Bangladesh and India. This framework agreement can pave the way for inter-alia basin wide management of international rivers, jointly development of hydro power etc.

The Joint Working Group is the most tangible outcome of the successful state visits between India and Bangladesh in 2010, 2011 and 2015, and the resulting framework agreement. The first meeting of the Joint Working Group took place in April 2013, where a sub-regional initiative on water cooperation was launched. The countries Bangladesh, Bhutan and India were present; Nepal could not join due to its domestic political situation. Regional cooperation is initiated for two sectors. Meetings are organized around water resources and hydropower track and a connectivity track. The Joint Working Groups on Sub-regional cooperation are headed by the Ministry of Foreign Affairs and supported by representatives from relevant Ministries and Organizations. The Joint Rivers Commission's Member is one of the members of the Joint Working group on water resources management and (hydro-) power. In addition to Bangladesh, India, Nepal and Bhutan are participating in this initiative. The Joint Working Group is the first sub-regional water initiative India is willing to participate at. The willingness of India to take part in this initiative was the driving force for other countries to also take part in this sub-regional cooperation initiative.

So far three meetings have taken place alternatively in Dhaka and Delhi. The 1st meeting was held on 18 April, 2013 represented by the delegations of Bangladesh, Bhutan and India wherein the Terms of Reference and the responsibilities of the Joint Working Group were discussed. The meeting attached highest importance on the directives of the Prime Ministers of Bangladesh and India for harnessing advantages of sub regional cooperation.

The 2nd meeting of the JWGs on sub-regional cooperation between Bangladesh, Bhutan, India and Nepal (BBIN) on Water Resources Management and Power/Hydropower and on Connectivity and Transit was held in New Delhi on 30-31st January 2015. They reviewed the existing cooperation in these sectors and discussed the scope for power trade and inter-grid connectivity between the four countries as well as potential for closer cooperation in future power projects. They also took stock of existing bilateral arrangements between the four countries on data sharing for flood forecasting and ways of improving the same.

The 3rd meeting of the JWG for sub-regional cooperation between the BBIN was held in Dhaka on 19-20 January 2016. It was agreed to form a Joint Experts Group on sharing best practices of basin wide water resources management during this session. The Group will suggest potential projects and work on the specifics of the identified projects, and also work on power trade and inter-grid connectivity, flood forecasting, and areas of further possible cooperation.

Thus, the sub-regional cooperation on water resources and hydropower is in progress though tangible outcome is yet to be realized. However, as is shown by the current rapprochement of India with regard to regional cooperation, it is already inevitable for India to change its approach towards multilateral dialogues with countries in the South Asian region. By contrast, no multilateral meetings between China, India and Bangladesh have been initiated to date, nor are they likely to be organized soon.

3.2.3. Involvement of stakeholders during negotiations

Sub-regional negotiations on water agreements are exclusively carried out by representatives of national governments. Besides national government representatives, little room is left for other stakeholders to influence the negotiation process. As a consequence, the social, ecological and stakeholder issues are often ignored during negotiation processes. The "actual stakeholders and powerful actors are forced to sit outside formal negotiations" (Khanom, 2014). Their lack of involvement weakens the sustainability and acceptance of an agreement by the general public.

3.2.4. Lack of river dispute resolution mechanism

No official river dispute resolution mechanism is in place to be used by Bangladesh in case conflict emerges over its trans-boundary rivers. In the Ganges Treaty with India – the only water treaty Bangladesh has signed – no provisions are made for "judicial settlement of disputes arising out of the interpretation or implementation of the Treaty" (Subedi, 1999). As a result, disputes over any of the main and tributary rivers are complicated – if not impossible – to solve. Furthermore, none of the other upstream countries in the Himalayan delta have signed the UN Convention of 1997 on the Law of the Non-Navigational Uses of International Watercourses. The principle of the UN Convention is the

equitable and reasonable utilisation of international water courses. The convention only applies to contracting parties and not to all riparian countries of the international watercourse, and therefore no resolution mechanism is prevalent for the Ganges-Brahmaputra-Meghna River basins at time of writing this report.

3.3. Past and Present Patterns of Behaviour regarding Trans-boundary Issues

Since Bangladesh became independent in 1971, several phases of regional water cooperation can be distinguished. Section 3.3.1 provides a description of the Government of Bangladesh's attitude towards trans-boundary water issues over the past decades. In Section 3.3.2 the degree of cooperation between Bangladesh and neighbouring countries is explained in more detail.

3.3.1. Government patterns of behaviour in the past

The relationship between Bangladesh and neighbouring states – particularly its neighbouring state India – started harmoniously after Bangladesh had become independent in 1971. In 1972, India and Bangladesh signed the "Treaty of Friendship and Peace" and were on track to develop strong ties for the 25 year duration of the treaty. However, the relationship between India and Bangladesh did not remain same after the political changeover in 1975; a telling description of the period is that "bilateral relations have been characterized by belligerence and insensitivity on India's part, and oversensitivity and suspicion on the part of Bangladesh (Pant, 2007). [10]

3.3.2. Current government patterns of behaviour

A change in governance culture is observed and a more pragmatic approach is applied on issues with regard to regional cooperation.

"*In the past water agreements have been difficult to come by because of the tendency to think of this resource as a zero-sum game: more for my neighbour means less for me. This need not always is the case. A package deal that looks at hydro-power, irrigation and flood control together based on an equitable sharing of financial costs and benefits will likely show that a cooperative solution is indeed a win-win."(Perspective Plan of Bangladesh 2010-2021, Planning Commission, Govt of Bangladesh)*

3.3.3. South Asian regional cooperation India

India-Bangladesh relationship in the past

Bangladesh has looked predominantly in the direction of India with regard to regional cooperation on water. This can partly be explained by the quantity of water flowing directly from India to Bangladesh. Another major factor is the bilateral preference of India in negotiating water agreements.

Current state of India-Bangladesh relationship

The mind-set of the Government of India is important for the success of negotiations on the shared rivers. Some reluctance was observed in the past Indian government run by the Congress Party, when the sharing of water comes out for discussion. Other Indian parliamentary parties are generally more open to idea of sharing. When the Ganges Treaty was signed, the Awami League government was in power. The current Bangladesh government has developed relatively better relationship with the Indian government. In general, main political parties in Bangladesh, both government and opposition, seem to realize the advantages regional cooperation can bring to Bangladesh. The opposition generally used to be very critical about sharing water with India. Bangladeshi politicians have become aware

[10] For a more detailed description of the relationship between India and Bangladesh over the last four decades, the article 'Conflicts over International Waters' by Rakesh Tiwary from 2006 is recommended.

of possibilities for cooperation not alone with regard to river sharing, but they are also aware of opportunities with regard to the creation of energy links, navigation routs and transportation.

The Indian data on water is not publicly available and the data provided to Bangladesh is therefore limited. The common opinion within India is that the country has been generous about sharing of water during the last decades. Nevertheless, an extensive survey under water sector officials showed that the current relationship between practitioners is not yet on the same level. Water sector officials were asked to rate the current levels of cooperation with neighbouring countries on water issues. 50.7 percent of the Indian officials rated cooperation with Bangladesh negative while a similar large group of 40.3 percent regarded the level of cooperation rather neutral. Consequently, only 9 percent of the participants were positive about the level of cooperation on water issues with Bangladesh (Saran et al., 2014). By contrast, Bangladesh water officials rated the relationship with India for 61 percent either neutral or negative and only six percent of the officials rate the current levels of cooperation with India on water issues as positive (Saran et al., 2014).

State visits 2010, 2011 and 2015

In 2010, 2011 and 2015, three important meetings took place between the Prime Ministers of Bangladesh and India. The state visits contributed to a more friendly relationship between India and Bangladesh. The Prime Ministers of both countries indicated that the recent elections provided a historic opportunity to work towards a better understanding between the nations. During these occasions, agreement was established between both states on a long list of measures and projects. A good indicator of the improved relationship is the fact that in the past few years both countries have been willing to look for possible areas of cooperation. The first statement of the state visit Joint Communiqué 2010 announced the Prime Ministers' desire "to launch a new phase in their [Indian and Bangladesh] bilateral relations". In the joint communiqué the country recognizes the need to look for synergies with Bangladesh as a way for "further deepening of cooperation and widening of the relations into new areas". This statement shows that India is willing to set up cooperation on a multitude of areas that will be beneficial for Bangladesh.

"Both leaders agreed that the recent elections in both countries presented them with a historic opportunity to write a new chapter in their relationship" (Joint communiqué, 2010).

As an illustration of the established good relationship between the two countries, Bangladesh Prime Minister Sheikh Hasina received the Indira Gandhi Prize for Peace, Disarmament and Development for 2009. Afterwards, a joint communiqué was released confirming the "excellent bilateral relations and friendship" that exists between the two countries. Both nations regarded the visits as very important considering the multitude of ministers and senior officials taking part from both countries. All visits were attended by the nations Prime Ministers, Ministers of Foreign Affairs and Ministers of Water Resources. The evident presence of the Water Resource Ministers during both state visits shows the importance of cooperation on water for the nations' relationship.

A milestone agreement named ''Framework Agreement on Cooperation for Development'' was signed by the two Prime Ministers during the visit of the Indian Prime Minister in Bangladesh in September 2011. This historical document encompasses number of areas of mutual interest, the highlights of which are as follows.

- To promote trade investment and economic cooperation
- To enhance cooperation in sharing of waters of common rivers and exploring the possibilities of common basin management of common rivers for mutual benefit.
- To cooperate in flood forecasting and control.
- To cooperate and provide necessary assistance to each other to enhance navigability and accessibility of river routes and ports.
- To develop mechanisms for technical cooperation and exchange of advance information with respect to natural disasters.

- To establish arrangements for cooperation in generation, transmission and distribution of electricity, including electricity from renewable or other sources.
- To promote scientific , educational, cultural and people to people exchanges and cooperation between the two countries, which will be implemented through programmes and joint initiatives in the areas of agriculture, education and culture, health, tourism, sports, science and technology.
- To develop and implement programmes for environmental protection and responding to the challenges of climate change through adaptation.
- To harness the advantage of sub-regional cooperation in the power sector, water resources management, physical connectivity, environment and sustainable development for mutual advantage, including jointly developing and financing projects.
- To cooperate closely on issues relating to their national interests.
- To cooperate on security issues of concern to each other while fully respecting each other's sovereignty

The momentum of cooperation was further strengthened during the visit of the Prime Minister of India, Mr Narendra Modi, in June, 2015. The manifestation of such momentum is visible in the Joint Declaration of the two Prime Ministers named "Nayi Disha" which depicts that Bangladesh and India entered a new phase in bilateral relations with a pragmatic, mature and practical approach based on sovereignty, equality, friendship, trust and understanding for the mutual benefit of their citizens and collective prosperity of the region. The expression and satisfaction of both the Prime Ministers over the resolution of the 1974 Land Boundary Agreement and its 2011 Protocol; and reaffirmation of their commitment to extend all facilities to the residents of the enclaves, and assurance to protect the rights of all citizens will be marked in history in golden letters for the magnanimity of their service to humanity. Reiteration of their commitment to address the issue of water resources management of common rivers including water sharing, in a holistic manner through common basin management and agreement to harness the advantages of sub-regional cooperation in power sector, water resources, trade, transit and connectivity for mutual benefit is also an illustration of joint initiative for economic growth, peace and harmony of the region.

Bangladesh-Bhutan Joint Declaration in December 2014

During the visit of the Prime Minister of Bhutan to Bangladesh in December, 2014, the two Prime Ministers agreed inter-alia to enhance collaboration in Water Resources Management and Power/Hydro-power and Connectivity in the sub-regional context. Both sides also agreed to enhance cooperation in tourism sector, agriculture, education, health and human resources development.

New plans for the Ganges and Brahmaputra

India is rapidly industrialising and looking for ways to secure basic resources, including water, energy and food routes; while also focussing on improving transportation and communication opportunities. With over a billion citizens, India is a key player in Asia and as an upper riparian country of major influence on Bangladesh's development.

The announcement of the decision to build 16 barrages on the Ganges has been made without consultation with Bangladesh. The Joint Rivers Commission was not informed about this particular plan. The plan was never included in the 5 year plan and portrayed with great secrecy at the Indian ministry. The decision making procedure of the 16 barrages on the Ganges show that even though India has made earlier assurances to discuss plans on Himalayan Rivers with Bangladesh, India does not take the impact on Bangladesh into account nor is Bangladesh explicitly consulted beforehand about the Indian plans.

Although the possible further developments on the Ganges River were not explicitly discussed during the 2010 and 2011 meeting, the Prime Ministers of both countries recognized at the time "the sufferings of the people of both sides in the face of scarcity of lean season flows" in the case of the Teesta River. The 16 barrages project would have a much more devastating effect on the lean season flow of the Ganges while affecting a much larger area as well. As a result of

the Farakka barrage construction and consequent lower river flow, salinity has entered 100 km inwards in the southern western region of Bangladesh. The *Jal Marg Vikas* project would have much more devastating effect on the region, including destroying the ecosystem of the Sundarbans (Daily Star, 2014).

There is currently no dispute on the Brahmaputra River between Bangladesh and India, but with further development in the region it is likely that India and Bangladesh will have to negotiate the river flow in the coming future. One of Bangladesh's major concerns is upstream interventions in the Brahmaputra River. India is already planning to generate electricity in the eastern part of the country by making use of the river's run off. The turbines, sometimes with limited storage facilities, will not affect the water flow downstream. More of concern to Bangladesh is India's plan to divert water from the river to other parts of India instead of downstream Bangladesh. Due to elevation issues and lack of technology and funding, the project has not yet started. Bangladesh apprehends the implementation of India's linking project is only a matter of time. In order to make a firm stance during future negotiations on the Brahmaputra River, Bangladesh realizes that it needs to use the water prior to Indian claims. Prior occupation provides a better position during future negotiations. At this point in time, the water is predominantly used to keep the estuaries from turning saline. By taking future negotiations into account, Bangladesh may have to construct the Brahmaputra barrage near Bahadurabad to provide water mainly to its command areas in both sides for agriculture, fisheries, navigation, environment etc. and to rejuvenate the old Brahmaputra.

Central and State governments

India's international politics are important to take into account as these dynamics will determine the way India will develop and therefore how in the middle and longer term Indian policies and activities will impact Bangladesh. Decision making power of Indian governments depends on the subject. Water is to a large extent the responsibility of the states. Except in cases of inter-state water disputes, Indian states are the responsible Indian authority to plan, implement and manage water related projects (Saran et al., 2014). On the state level water policies are designed and implemented. Even though Bangladesh signs treaties on the central level, the implementation will be fully taken up by the Indian states except in the case of centrally controlled projects like the Farakka Barrage on the Ganges River. The Farakka barrage is under the full control of the Central Indian Government. Also, large water infrastructure projects are often initiated by the central Indian Government. Concerns about big dam construction projects are mostly expressed by the State governments in India. Even in more recent cases, lack of state involvement during the decision making procedure created tensions between various layers of Indian government.

As the Indian government is composed of different levels, concerns about big dam construction projects are not restricted to Bangladesh. In West Bengal and Sikkim they have great concerns over big dam constructions. Recently, Sikkim has experienced a number of sudden and devastating glacial lake outburst floods following the decline of glaciers due to climate change. Internal Indian dynamics also affect the timing of when trans-boundary agreements will be signed. So the Indian state politics will continue to limit bargaining space negotiations with foreign countries including Bangladesh. As a result, Bangladesh's hydro-diplomacy activities with India need to have a mixed focus on India's central as well as state governments. *"India's failure to sign the Teesta agreement in 2011 has continued to be a sore point between both countries on other issues, including transit facilities and the sharing of other trans-boundary rivers"* (Khanom, 2014). The Teesta River negotiations are in more detail described in section 3.3.4.

China

Regional Cooperation approach

China is the upper riparian state in the Brahmaputra basin. During neither river treaty negotiations nor river dialogues Chinese officials participate.

"China's dire water circumstances, combined with its impressive economic strength, military power, and uniquely advantageous upper riparian position, give us little reason for optimism when it comes to river sharing agreements with lower riparian countries" (Wirsing, 2012).

In 2011, the deputy-Minister of Water Resources Jiao Yong stated that China had no plans for developing infrastructure on the Brahmaputra. No projects of this sort would be included in the 12thfifth year plan which is in effect till 2015 (Chinese Ministry of Water Resources, 2011). The Minister stated that he hopes to develop the Brahmaputra eventually but that such a project would face too many technical problems, in a difficult environment and with consequences for other countries. Remarkably, however, the construction works of the Zangmu hydropower dam in the main stream of the Brahmaputra River was already being executed.

China – downstream riparian countries

China is planning to construct hydro-power dams in the Brahmaputra basin. These interventions will likely first affect India and then Bangladesh. India's cooperative attitude is probably mainly due to the wish to address wide ranges of common issues from an economic point of view, and maintaining social and political harmony in the sub-regions for its own safety.

Bangladesh and China signed a Memorandum of Understanding on cooperation in the field of water resources. As per provision of the memorandum, Bangladesh receives flood related data from three stations on the Brahmaputra from China since 2006. Bangladesh and China holds regularly meetings at Minister level, Secretary/Vice Minister level and Director-General level to address issues of mutual interest in the field of water resources. The last meetings between the Water Resources Secretary of Bangladesh and Vice Minister of China were held in Dhaka in June, 2014 and Beijing in March, 2015.

Nepal, Bhutan and Myanmar

Bangladesh shares no border with Nepal or Bhutan. Both countries are upstream countries but differ in their approach towards regional water cooperation. Nepal is interested in the creation of joint river basin management. In 1989, Nepal and Bangladesh already discussed the creation of water retention reservoirs for the benefit of both countries (see Section 2.5.3). Nepal did not participate during the first meeting of the Joint Working Group due to internal political dynamics however. Bhutan, on the contrary, is very much committed to the Government of India because the country's hydro-power generation is mainly bought by India.

Cooperation between Bangladesh and Myanmar is absent in practice. This results partly by the weak water connection between both countries because Bangladesh shares only three trans-boundary rivers with Myanmar. Recently Myanmar is opening up and as a result huge economic development is expected. As a result, huge potential for regional cooperation between Bangladesh and Myanmar emerges. Regional cooperation would be beneficial on other issues like hydro-power, shared ecosystems and animals, and power sharing. A more specific opportunity lies in the possibility of power transportation from Myanmar through Bangladesh to India. Bangladesh could gain from this development without any major losses.

3.3.4. Water treaties

In 1996, Bangladesh signed the Ganges Treaty with India. To date this is the only trans-boundary river treaty signed by Bangladesh. No treaties have been signed for the country's other 56 trans-boundary rivers. This section will address in more detail the Ganges Treaty and the proposed but cancelled Teesta River Treaty. In the last section, the local decision making process is described as well as the current status quo of negotiations on the Sundarbans and ground water.

To start, it should be noted that Indian water sector officials see the purpose and added value of water treaties as it is believed that "while the terms of several of India's water treaties with its riparian's were considered outdated, ineffective and in need of review, respondents seemed to rate these treaties in a positive manner indicating that treaties were still

considered a necessary confidence-building measure and a bilateral mechanism of continued relevance in South Asia" (Saran et al., 2014).

Ganges Treaty

The Ganges Treaty addresses the trans-boundary dispute on water sharing, especially during dry season flow. The Ganges Treaty is the only accomplished treaty between Bangladesh and India, 53 more shared rivers have no legal provision. It is important to note that the Ganges Treaty was agreed in a period of time in which the political situation favoured regional cooperation (SFG, 2013). A major contribution of the Ganges Treaty was that it stimulated confidence and trust building between India and Bangladesh.

The Ganges Treaty of 1996 formulates the method by which the Ganges water is shared between India and Bangladesh in the dry season. The treaty regulates the dry season flow from January till May by three different clauses: In case that water availability at Farakka is less than 70,000 cusec (cubic feet per second[11]), the water will be shared equally by India and Bangladesh. If between 70,000 and 75,000 cusec water is available at Farakka, Bangladesh is secured of 35.000 cusec and the rest of the water can be used by India. In the case that over 75.000 cusec water is available at Farakka, India will receive 40.000 cusec and the additional water is directed to Bangladesh. In the event flow at Farakka falls below 50,000 cusec in any 10-day period, the two Governments will enter into immediate consultations to make adjustments on an emergency basis, in accordance with the principles of equity, fair play and no harm to either party.

Not only can the Treaty be considered as a water sharing agreement for the Ganges but also as a framework treaty that can be used for the establishment of other trans-boundary rivers between the two countries. Articles IX of the treaty sets out the principles for equitable sharing water with regard to other common rivers between Bangladesh and India:

> *Article IX*
>
> *Guided by the principles of equity, fairness and no harm to either party, both the Governments agree to conclude water sharing Treaties/Agreements with regard to other common rivers.*

Article IX of the Ganges Treaty is an important step towards the creation of more river treaties between India and Bangladesh. However, despite the intentions expressed in the Ganges treaty, to date no other water treaty has been signed between the two countries. Furthermore, up until the writing of this report no single project has been implemented to take advantage of the Ganges treaty in Bangladesh and for augmentation jointly as enunciated in Article VIII of the Treaty.

One of the main critics on the Ganges Treaty is that it is only addresses the quantity of water shared by India and Bangladesh and neglects the quality of water discharged to Bangladesh. The treaty therefore does not protect the ecological function of the river nor provide arrangements on how polluted water should be handled with between the two countries (Saran et al, 2014). Another often expressed criticism relates to the lack of flood management provisions in the Ganges Treaty. Whereas the treaty provides a protocol for during the dry season, no agreement has been established on actions to be taken to prevent floods.

Critics of the Ganges Treaty also argue that a lot of water infrastructure projects are still carried out in India that limit the water flow downstream. The absence of a guarantee clause is also a point of criticism as it does not limit India from developing water intensive agriculture or construct barrages upstream. Moreover, the agreement has been signed between both national governments. As mentioned in Section 3.3.4, the central Indian government has limited control over States' water projects. The Ganges Treaty does not take state level water projects into account. States are not

[11] 1 cusec = 1.669 m^3/min = 0.02832 m3/s. 70.000 cusec = 1.982 m^3/s.

participating in the treaty and therefore not liable for any controversial water intervention that is not in line with central government agreements.

Teesta River Treaty

The Teesta is the fourth largest trans-boundary river in Bangladesh. The river flows through five northern districts of Bangladesh with an estimated population in 2011 of 9.15 million. About 21 million people in Bangladesh are directly or indirectly affected (Knanom, 2014). The last five years, India and Bangladesh held active negotiations over the equitable share of water from India to Bangladesh at Gazaldoba. The construction of the Gozaldoba Barrage by India upstream of the river affects the water flow to Bangladesh. This barrage has resulted in reduction of dry season water flow. The Teesta negotiations take place at the intersection of rapid population growth, reduced water availability due to climate change and a political tense environment (Knanom, 2014).

The Teesta agreement was supposed to be signed during the visit of Indian Prime Minister Manmohan Singh in September 2011. Two days before his arrival in Dhaka, the Chief Minister of the State of West Bengal announced that she would not join the Prime Minister on his visit. The Chief Minister Mamata Banerjee announced that the ratio of water sharing as included in the Teesta agreement was not in the interests of West Bengal (Bushan and Ahmed, 2014). The Indian Prime Minister has the right according to the Indian constitution to sign bilateral water treaties (SFG, 2013). However, it was decided that the concerns of West Bengal had to be addressed first before to agree on the Teesta River. Probably part of the reason for the Prime Minister to postpone the treaty signing is that both leaders were part of the – at that time – ruling United Progressive Alliance.

Concrete plans to sign the Teesta agreement lead to high expectations. It was expected that due to the agreement, the relationship between India and Bangladesh would improve. Indeed, the Teesta agreement was supposed to function as a model agreement for other trans-boundary rivers. As a result of the cancellation from the Chief Minister of West Bengal, the hope turned rapidly into confusion and despair (Bushan and Ahmed, 2014). The political energy needed to push the agreement forward disappeared as a result. To analyse correlation between availability at Gazaldoba and Dalia both sides exchanged data of the Teesta at Gazaldoba and Dalia for the period 1998-2010.

The failure to sign the Teesta River Agreement does not only harm the direct area of the Teesta basin but affects the relationship between India and Bangladesh on a much larger scale. First of all, the impasse on the Teesta River affects other negotiations on water treaties. Even though treaties on six other trans-boundary rivers namely Manu, Muhuri, Khowai, Gumti, Dharla and Dudhkumarare currently being prepared, no political momentum exists to either negotiate or sign them before the issue of the Teesta River Treaty is being solved.

"India's failure to sign the Teesta agreement in 2011 has continued to be a sore point between both countries on other issues, including transit facilities and the sharing of other trans-boundary rivers" (Khanom, 2014)."

The water dispute on the Teesta River has slowed negotiations on other issues like transit and transportation cooperation. In other words, water resources sharing disputes have large implications for all aspects of the Indian-Bangladesh relationship (Khanom, 2014).

Current water negotiations

This section provides an overview of the current trans-boundary activities that are either in a preliminary phase or only takes place at the local level. Though data and other technical parameters have been exchanged, negotiations on the draft agreements are yet to be started for the six medium trans-boundary rivers between India and Bangladesh: the Monu, Khowai, Muhuri, Gumti, Dharla and Dudhkumar.

Technical Level and Local Level Committees

The Technical Level Committee of the Joint Rivers Commission is headed by the Members of the Commission of both sides (also called Standing Committee). The Technical Level Committee addresses all the trans-boundary river issues and normally resolves most of the problems with the mandate of the Government except very strategic issues like water sharing agreements. In case of water sharing issues the Technical Level Committee works out the technical details and places to the Governments for decision. An example of such Technical Level Committee decision is the 2012 meeting between Indian and Bangladeshi representatives on the Feni River. The Feni River functions as a border region between India and Bangladesh. At the meeting in 2012, the Technical Level Committee worked out the technical details of the intake well for withdrawal of restricted quantity (which was agreed at the Secretary Level meeting in January, 2010) of water by India for drinking water purposes.

Besides, the Joint Rivers Commission has Local Level Committees under it, normally headed by zonal Chief Engineers of Bangladesh Water Development Board and counterpart Chief Engineers of the concern States of the Govt. of India to primarily address issues related to flood control embankment and river bank erosion of Trans-boundary rivers. These committees may also address other small scale level trans-boundary water issues if assigned to them. Representatives of Bangladesh Water Development Board, relevant Departments of State Government of India, local administration and border security forces normally attend the meetings while a representative from the Joint Rivers Commission may attend if necessary. Often, many consecutive meetings are being organized and the points raised are either solely discussed or also solved and implemented. If any issue cannot be resolved by the Local level Committees, it is referred to the Technical Level Committee which monitors the activities of the Local Level Committees.

Sundarbans

Negotiations on the shared ecosystem of the Sundarbans were intensified during the two state visits in 2010 and 2011. During the state visit of the Indian Prime Minister to Bangladesh in 2011, a Memorandum of Understanding on the Sundarbans, Ganges, Brahmaputra and Meghna was signed. This memorandum may in the future lead to increased information exchange and joint projects and joint research. To date, no changes have been noticed as a result of this Memorandum of Understanding. No follow up took place nor have particular policies been introduced with regard to the protection of the Sundarbans.

Groundwater

Groundwater is not officially taken into account during talks between India and Bangladesh, and much is yet unknown about trans-boundary aquifers. The issue of ground water may be discussed while a holistic planning would be undertaken at basin scale under a joint basin management body (like River Basin Organization).The discussion on groundwater may delay the present pace of river sharing negotiation between India and Bangladesh. This will deprive Bangladesh from receiving equitable share of river water. Bangladesh uses surface water mainly for agriculture, fisheries, navigation and in stream flow need in order to sustain the ecology and the environmental system of the country etc. Any decrease in the amount of water flowing down from upstream will have huge negative impact on food production, fisheries, environment and overall economy of the country. Further research is required to predict how reduced water flow affects the ecology of Bangladesh.

3.4. Policies, Strategies and Plans

The South Asian governments have addressed regional cooperation in several of its policies, strategies and plans. In this Section, these documents are analysed in the light of the BDP2100 and is discussed – as far as feasible – to what extent the documents have been implemented. By analysing the policies, strategies and plans a better understanding can be created of the regional governments approach and ambitions with respect to regional cooperation development.

3.4.1. National policies, strategies and plans affecting trans-boundary water bodies

Perspective Plan of Bangladesh 2010-2021

The Perspective Plan proposes several strategies to improve regional cooperation within its sub region. Strategies are not overly ambitious nor do they neglect the active role Bangladesh can play in this case. A good indication of Bangladesh's approach towards regional cooperation is provided by the following statement "Bangladesh intends to play a proactive role in seeking out opportunities for beneficial cooperation in the South Asia Region and beyond". The Government of Bangladesh has listed four general long-term strategies for strengthening regional cooperation in the Perspective Plan:

1. More vigorous efforts in multiple forums to make SAFTA, APTA and BIMSTEC more effective organizations;
2. Forging effective cooperation in trade, cross-border investment and all the other areas of mutually beneficial activities;
3. Initiatives to resolve cross-border issues and undertake joint projects, such as production and distribution of electricity, gas, coal, fertilizer and other products, all on a win-win basis;
4. Participation in the grand Asian Highway and Asian Railway Systems that generate win-win outcomes. This however calls for development common standards through establishment of institutions backed by adequate financing from participating governments.

The section on water resource management in the perspective plan is divided by five paragraphs on the state's main water issues (integrated management, irrigation, scarcity and climate change) and a last paragraph on the long-term water resource management strategies. In this section the Government of Bangladesh recognizes the state's need for cooperative regional water management. It is stated that the Government of Bangladesh will take the initiative to reach agreements on the Teesta River and the other 55 rivers the countries shares with India and Myanmar.

The 13 long-term water resource management strategies dealing with the emerging water problems are almost exclusively targeted on the national or sub-national level. Only one is explicitly mentioning regional cooperation as a long-term strategy for Bangladesh's water problems. This strategy encompasses: *"Resume negotiations with India and other upper riparian states for equitable water sharing arrangements for all trans-boundary rivers, particularly major rivers"*.

Sixth Five Year Plan (2011 – 2015)

The Five Year Plans are one of the most important policy documents of the Government of Bangladesh. For this baseline study the Sixth Five Year Plan is reviewed with a special emphasize of proposed strategies with relation to water and of relevance for the Bangladesh Delta Plan 2100.

One of the key strategies in the Sixth Year Plan is to pursue an environmentally sustainable development process in order to limit the degradation of natural resources and consequent reduction of human livelihoods. "Thus, the focus of the Sixth Plan's environmental management strategy would be the conservation and maintenance of natural resources, reducing air and water pollution, and liberating encroached rivers, water bodies, forest areas and khas land". However, the plan does not mention a specific strategy to deal with the potential international induced environmental challenges and opportunities. The only direct reference to action with international dimension is the statement that the Department of Environment programs is responsible for the implementation of the international conventions and protocols signed by the government. To be more precise, the Sixth Year Plan highlights that the Government of Bangladesh signed the Ramsar Convention on the protection of wetlands already in 1992. The plan accordingly points out that Bangladesh will fulfil the commitment that is required from signatory countries. As the wetlands – and in particular the Sundarbans – are a shared ecosystem with neighbour country India, it is remarkable that using international cooperation as a means to protect wetlands is not mentioned as one of the strategies.

In Section VI, Environmental Sustainability' the plan mentions that core targets include protection of wetlands, green belt protection along the coast, promotion of eco-tourism and development of comprehensive Marine Resources Management Plan. The success of these targets will depend to large extent on the activities and degree of cooperation with neighbouring countries. However, again no reference to any transnational action strategy is provided in this section. Furthermore, the integrative implementation approach proposed in this chapter lists many different stakeholders – ranging from ministries, civil society and business, but does not many stakeholders from outside Bangladesh who will be included in the implementation process. Cooperation with neighbouring countries should not be overlooked as ecosystem borders do not match political borders.

3.4.2. Sectoral policies, strategies and plans affecting trans-boundary water bodies

Bangladesh Water Act 2013

The Bangladesh Water Act has been approved in 2013 and has since been one of the most important national water policies of Bangladesh. The act regulates all aspects of water for Bangladesh. It also provides the legal framework for the National Water Resources Council. As part of the framework and obligations of the council, paragraph 7 'Exchange of international and regional Cooperation' describes the council's role with regard to international activities. The role includes giving "advice to the Government to enter into any memorandum of understanding, agreement, convention, treaty or any other similar instrument with any foreign country, government, or international or regional organization", In addition, in the Bangladesh Water Act it is stated that the Government of Bangladesh can cooperate with any foreign entity with regard to education and training programmes, development of water resources measures, abstraction and distribution of international river water, joint studies, joint measures for prevention of chemical and organic pollution, and the exchange of data in respect of common water resources. According to the Water Act, the Government of Bangladesh should consult the National Water Resources Council before any official action is taken.

Based on paragraph 7 of the Bangladesh Water Act, the National Water Resources Council needs to be taken aboard by the Government of Bangladesh during the negotiation of trans-boundary river treaties or other activities performed together with foreign governments. As a result, the National Water Resources Council can be regarded as an influential institution with regard to regional water cooperation next to the Ministry of Water Resources or the Ministry of Foreign Affairs.

As other Government policies and documents, the international component is addressed separately and not integrated throughout the various paragraphs of the Bangladesh Water Act. With exclusion of paragraph 7, the rest of the Bangladesh Water Act does not refer to any provisions regarding international activities. The Bangladesh Water Act is entirely focused on providing adequate regulation for the use and management of water within the boundaries of the country.

National water policy 1999

The National Water Policy is developed by the Ministry of Water Resources and agreed upon by the Government of Bangladesh in 1999.

Paragraph 4.1 on River Basin Management is the first section of the actual National Water Policy. The section addresses the steps the Government of Bangladesh plans to undertake for fostering international cooperation in water management. A distinction is made between long-term and middle-to short term measures. On the long run, the Government aims to develop basin-wide planning "for development of the resources of the rivers entering its borders". On the short to middle term, the National Water Policy indicates several objectives.

Agreements and cooperation with upstream countries are pursued on the following fields of cooperation:

1. Sharing of water
2. Assessment of international rivers for better understanding of the basins' potential

3. Data exchange
4. Resource planning
5. Management of water resources, both under normal and under conditions to mitigate floods and augment flows of water during the dry season
6. Management of the catchment areas, including the prevention of deforestation and erosion
7. Prevention of chemical and biological pollution
8. Training, education and research with relation to water management

Measures proposed in other paragraphs focus solely on Bangladesh and do not connect the policies to possibilities for regional cooperation. For some policies, as i.e. hydropower development as mentioned in paragraph '4.11 Water for Hydropower and Recreation', developing cooperation with upstream riparian countries would be a logical step.

The National Water Policy is the most detailed official document on international water cooperation. To date, the National Water Policy has been 15 years in place. No significant progress has been made with regard to basin-wide cooperation of international rivers. However, noticeable progress has been made with regard to exchange of flood data and river bank protection works. For the last couple of years, India provides Bangladesh with flood data on the Ganges at 78 km beyond the Farakka Barrage and also transmission of flood data of different rivers on a continuous basis. No agreements have been established on water sharing, resource planning or preventing polluting activities upstream. Initiatives on training, education and research have been developed by NGO's, the World Bank and knowledge institutes and limited from Government initiatives.

National Water Management Plan 2004

The National Water Management Plan was prepared from 1998 to 2001. Due to elections and a new government the National Water Management Plan was eventually approved in 2004. Regional cooperation on water bodies is only sideways addressed in the National Water Management Plan. Three concrete actions are mentioned in the report:

1. Promoting of the dialogue with co-riparian countries
2. Developing long term strategies for the overall river system
3. Gaining knowledge on how Bangladesh can maintain a secure and sufficient supply of fresh water given, with the regional development taken into account.

In the National Water Management Plan, the strategies on regional cooperation are avoided because of the rationale that water availability would not significantly change due to international factors within a time frame of 25 years. At the time of approval, the Ganges treaty had just been signed and no signs of interventions on the Brahmaputra were detected. The internally orientated plan would therefore not require the inclusion of strategies on regional cooperation.

3.4.3. Policies, strategies and plans of neighbouring countries

An analysis of policies, strategies and plans of neighbouring countries will be provided in this Section. The analysis is restricted to only the documents that will affect the water situation of Bangladesh. As a result, particular attention has been paid to Indian policies, strategies and plans. Understanding the policy development within South Asia is of relevance to Bangladesh because it indicated whether synergy possibilities are possible or which developments upstream Bangladesh has to be taken into account while designing new strategies for BDP2100.

Policies and strategies of India

India and Bangladesh differ in the aspects they value and incorporate in water policies and plans. "India's water policy does not draw much focus upon the regional cooperation with other riparian countries" whereas regional cooperation is discussed in the water policy documents of Bangladesh. Other differences include the facts that India looks for non-traditional practices and improving efficiency of water use. Bangladesh, on the other hand, focuses on development for

multi-purpose uses, comprehensive development and management of major rivers, and agreements with co-riparian countries (Khanom, 2014).

National Water Policy

The National Water Policy is adopted by the Central Government of India in 2012. It is an umbrella and leading document for all State Water Policies. The aim of the National Water Policy is to govern public policies on water resources by certain basic principles to foster a common approach "in dealing with planning, development and management of water resources". The National Water Policy stresses the future challenges for India on water. Like Bangladesh, India will face problems with frequent flooding and regularly occurring droughts. Most Indian states have already become water stressed. The core of India's challenge lies in

> *"a growing population and rising needs of a fast developing nation as well as the given indications of the impact of climate change, availability of utilizable water will be under further strain in future with the possibility of deepening water conflicts among different user groups"* (National Water Policy – India, 2012).

Throughout the National Water Policy, frequently emphasize is put on application of scientific knowledge planning and project implementation of river and water planning bodies. Another characteristic of the National Water Policy is the more economic approach to water usage by focusing on water as an economic good.

In the National Water Policy the central government proposes a couple of new initiatives to strengthen its position on water regulation. The National Water Policy proposes to set up a Water Regulatory Authority, a standardized national information system and a national Water Framework Law notwithstanding the fierce resistance of some Indian states. Instead of previous temporarily Water Disputes Tribunals, in the National Water Policy a permanent Water Dispute Tribunal is proposed. Even though the Indian constitution appoints water as a state subject, the Government of India proposes to set up "adequate institutional arrangements at the Center" for the implementation of international agreements.

Articles potentially impacting Bangladesh

The National Water Policy sets out the prioritization of water usages within India in article 3.1. Most priority is given to water for domestic use, after which with decreasing importance water consumption for agriculture, hydro-power, thermal power, navigation and recreation are listed. For Bangladesh, it is interesting to notice that India prioritizes allocation of water to irrigation directly after drinking water needs. Irrigation takes up a large portion of the total water consumption in India and is likely to increasingly do so in the near future. This increased water demand will lead to new river projects to divert water to agricultural land. Consequently, water availability downstream of Indian rivers will continue to decrease.

The National Water Policy does not mention any form of cooperation on river ecology with neighbouring countries. Article 3.3 states that "A portion of river flows should be kept aside to meet ecological needs ensuring that the low and high flow releases are proportional to the natural flow regime, including base flow contribution in the low flow season through regulated ground water use".. However, it seems this article refers to the ecological needs of rivers within India, and not to the ecological needs of the entire river basin. Securing the ecological river flow is, therefore, only a priority for India's upstream part of Trans-boundary Rivers.

According to article 5.2 the "availability of water for utilization needs to be augmented to meet increasing demands of water", enhancing water availability is a priority listed in the National Water Policy in order to counteract the effects of climate change. The National Water Policy urges states to increase water storage capacity, including y means of large reservoirs. Augmentation of water for utilization needs has direct – and often negative – impact on water availability downstream if the augmented water is not shared with downstream countries.

Another interesting article with regard to the water availability in Bangladesh is article 5.5 on inter-basin water transfers. Instead of only focusing on increased production following the construction of these river linking projects, the inter-basin water transfers are framed as essentially to guarantee "basic human need and achieving equity and social justice". This framing indicates the importance of inter-basin projects from the perspective of the Government of India.

Section 9 of the National Water Policy is written on water resource projects' planning and implementation. Even though social and environmental aspects should be considered according to article 9.2, this provision is – as also seen in article 3.3 – limited to Indian borders.

Section 13 of the National Water Policy addresses trans-boundary rivers. The section is short and only lists exchange on hydrological data as field of cooperation between India and neighbouring countries. The brief section on trans-boundary rivers further upholds India's bilateral approach towards water sharing and management of international rivers. In the National Water Policy the importance of "keeping paramount the national interest" is explicitly mentioned.

Indian State Water Policies

This section provides an analysis of State Water Policies of Indian states that share a border with Bangladesh. A distinction can be made in the importance and the impact the several State Water Policies have on Bangladesh. Of all neighbouring Indian states, the water policies of the states West Bengal, Assam and Bihar have the largest impact on Bangladesh's water availability. The states Bihar and West Bengal are located in the Ganges basin, and the State of Assam encompasses the Indian part of the Brahmaputra basin. The other states discussed in this Section share a border with Bangladesh and therefore might affect the small to medium sized shared rivers.

A couple of general aspects can be found in the Indian State Water Policies. One important reason for this is that the State Water Policies are all bound to the National Water Policy. In all State Water Policies, water for human needs is given utmost priority. This provision stems directly from the National Water Policy. Similar to the National Water Policy, in most State Water Policies regional cooperation is only marginally addressed and therefore this analysis does also address how policies and proposed projects mentioned in the policies indirectly affect Bangladesh. The state Sikkim does not address regional cooperation on water at all in its water policy. The State Water Policies focus almost exclusively on internal water issues. Despite the fact that most of the policies include a section on interstate rivers or the interstate sharing of water, Indian States are only willing to share water in cases of excess or within the monsoon season. Water sharing with water deficit states is therefore only acceptable when the own state's water users activities are provided with sufficient amounts of water.

In all Indian states water is regarded as a scarce resource. All Indian states understand how important water resources are for people, nature, agriculture and economic growth. This understanding results in the policies focus on protecting the river's ecosystem. Another common feature of the State Water Policies are the proposals for flood management measures. Especially during the Monsoon season, these upstream areas face problems due to the harmful effects of floods. In that sense, most neighbouring Indian States face similar drought and flood problems as Bangladesh does. A recurring theme in all State Water Policies is the aim to set up multipurpose projects. The State Water Policies state that a project should not have only one function but should combine multiple purposes like irrigation, hydroelectric power generation, drinking water facilities and flood mitigation. Another returning aspect in the Indian water policies is the fact that in most State Water Policies a provision is emphasized on a multi-disciplinary, integrated and holistic approach while planning and implementing projects. Furthermore, in addition to technical aspects of water projects, the projects should take into account how the environment, human lives, public health and the economy are impacted.

In addition to the similar aspects of India's State Water Policies described above, this section will briefly describe the differences and variation in prioritization of the various State Water Policies which will impact the water situation downstream. In other words, only aspects of the State Water Policies are described that will be of relevance for Bangladesh.

Government of Bihar State Water Policy

For this analysis a draft version of the State Water Policy is used that has been proposed by the Public Health Engineering Department (PHED) in 2010. Information on the adoption of this State Water Policy is not provided by the Government of Bihar. The coming decades, Bihar is expected to experience great variations of water availability. In the State Water Policy this projection is highlighted as one of the critical water issues of Bihar State.

The State Water Policy is almost exclusively looking to intra-state issues like water pricing, community empowerment and sanitation. No particular plans are proposed on development of new irrigation or hydro-power projects. As a result, the potential impact of the State Water Policy on Bangladesh are uncertain. The policy does not contain any section on inter-state water sharing, let alone policy on water sharing with Bangladesh.

Government of West Bengal State Water Policy

Bangladesh shares several rivers with West-Bengal. Tributaries to the Brahmaputra and Ganges River flow through West Bengal, and the mangrove forest ecosystem Sundarbans are located both over West Bengal and Bangladesh. The State Water Policy of Bengal positions the state in the basins of the Brahmaputra and Ganges, and therefore acknowledges the influence its policy has on the larger river basin.

Another interesting feature of the West Bengal State Water Policies The protection of the coastline is marked as a matter of national importance and therefore also the responsibility of the Government of India. Following this provision, with regard to cooperation for the protection of the Sundarbans, Bangladesh should not only address the State of West Bengal but also the Central Indian Government.

The State of West Bengal foresees that it will require a larger quantity of water due to industrial development. Article 5.3 states that the non-conventional methods for utilization of water resources should be developed by West Bengal. Inter basin transfers is one of these methods. The Government of West Bengal makes clear in article 5.5 that any diversion from its waters to water deficit areas is not accepted. However, "any inter-basin transfer to this State from any water surplus State during this period" is open for further investigation. Furthermore, with regard to cooperation on water, article 22.1 states the need of the establishment of a water sharing agreement between the basin states within India. The State Water Policies stresses that attention should be paid to "water resources availability and needs within the water basin". From the context of the article, it can be concluded that West Bengal focuses on the river basin within the Indian borders.

Government of Assam State Water Policy (draft)

Two important Bangladeshi rivers flow to the State of Assam: the Brahmaputra and Barak River. The State Water Poilcy of Assam encompasses a specific session on Regional Cooperation. The state acknowledges the interdependencies between Assam and neighbouring countries. Moreover, article 10.1 and 10.2 state:

Article 10.1

"*While formulating major projects of integrated multipurpose water resources development certain general principles of information & data sharing, equity, fairness, no significant harm, optimum utilization, mutual accommodation and political climate for good neighbourliness would be enunciated*"

Article 10.2

"All major integrated multipurpose water resources developments projects would be revisited with water dialogue with neighbours to review options and strategies and build a synergy through regional cooperation specifically in respect of water sharing on scientific basis, flood cushioning in projects for the benefit of neighbours, flood moderation and navigation to regional benefit, addressing issues of negative effects in neighbouring States, evacuation of hydropower, etc. ".

Thus the State of Assam opens the way for fruitful talks on regional water cooperation by explicitly mentioning the principle of "good neighbourliness". However, the State Water Policy is not very precise on whether neighbours include only neighbouring Indian states or also Bangladesh since article 10.3 states very explicitly that water disputes with other countries need to be resolved by the Central Government.

Like most other Indian states, the State of Assam is confronted with devastating floods during the monsoon period. In the State Water Policy Assam State announces a master plan for flood control and management, which likely will impact the river flow downstream. It will be interesting for Bangladesh to monitor whether any infrastructural projects related to this master plan are developed and what the effects of these projects will be on the frequency and quantity of river discharge. Furthermore, the State of Assam encourages the development of "micro-, mini- and small-hydro schemes, up to 20 MW".

Government of Jharkhland State Water Policy

The Jharkhland State is located in the Ganges basin. The Jharkhand State Water Policy is adopted in 2011 by the Government of Jharkhand. The policy is one of the most elaborate Indian water policies with regard to regional cooperation. One of the measures announced as part of a special plan for augmenting drinking water facilities, is the "undertaking of a techno-economic feasibility study of lifting water" from the Ganges River. The Government of Jharkhland reassures that it will take the treaty on the Ganges into consideration. The aim of the lifting projects would be to supply water to existing and proposed dams to meet the drinking water demand outside the monsoon season. In addition, the consecutive article 8.2.3 also announces a measure that will have implications for the water availability in Bangladesh. The article states that "the Government will take initiative for the construction of large reservoirs near thickly populated cities for the supply [of] drinking water.

The State of Jharkhland announces in article 5.0 to "initiate necessary action to protect the interest of the state" with respect to inter-state water sharing. However, no remarks are made on inter-country water sharing. Nevertheless, article 5.0 indicates the protectionist position of the Jharkhland government with regard to other Indian states. The Jharkhland government's attitude on water sharing will most likely be similar or less cooperative. In addition, the Government of Jharkhland states in article 17.6 its positive position on non-conventional water approaches as "intra-state river basin transfer of surplus water from a river basin into deficit basin". In other words, the Government of Jharkhland supports the Indian interlinking project, which will likely comes at the expense of the river flow discharged to Bangladesh.

Government of Sikkim State Water Policy

The Teesta River flows through Sikkim before entering the State of West Bengal and Bangladesh. The State Water Policy of Sikkim was adopted in 2009. During the monsoon period "the entire state is affected by landslides and soil erosions due to excessive precipitation and as a result lot of damages are caused to the lives and properties." At the other hand, outside monsoon time, the state explicitly states it would not share water unless the state's own water demands are met. The State Water Policy of Sikkim has no section included on regional cooperation, even though the state shares its border with Nepal, Bhutan and China upstream and Bangladesh downstream.

As a mountain rich state, Sikkim is planning on developing hydro power plants to generate energy for the state and sell surplus power to additional income. Electricity generation upstream on the river could affect Bangladesh, although in article 11 of the policy is stated that taking "environmental conversation [sic], catchments area treatment and water needs of not only human beings and animals but also of flora and fauna of the downstream of the project site".

Government of Meghalaya State Water Policy

The Meghalaya State Water Policy is only available in a draft version. Any information on further formalization of the document is not available. Two aspects of the draft State Water Policy are particularly relevant for Bangladesh. First, Meghalaya State is planning on making use of the state's potential hydropower capacity. As the state is upstream of

Bangladesh, hydropower development might impact the river flow downstream or the ecological condition of the river. However, one the main principles listed for the development of hydropower is the execution of "rigid environmental and social impact assessments". Secondly, the section on cooperation with Bangladesh is rather vague. Article 3.1.1 Principles mentions an 'interstate and international cooperation principle' as a provision to let downstream water users benefit adequately from the shared water resources. In other words, the Government of Meghalaya is aware of its actions impact downstream. Any form of cooperation on water, however, is marked as a responsibility of the Central Indian Government.

Government of Tripura State Water Policy

No State Water Policy is publicly available. Chance exists that Tripura State has not yet developed a State Water Policy.

Government of Mizoram State Water Policy

No State Water Policy is publicly available. Chance exists that Mizoram State has not yet developed a State Water Policy.

Policies and strategies of China

China has not made its water policies publicly available. As China and Bangladesh are mainly connected through the Brahmaputra River (as contribution of China in the Ganges is not appreciable), it is important to understand which strategies are proposed for the upper part of this river. In Section 2.5.2 the hydropower dam development plans for the Brahmaputra basin are described in more detail.

Policies and strategies of Nepal, Bhutan and Myanmar

As is described in Section 2.5.3, Nepal has the intention to develop water storage reservoirs to capture monsoon rain and release the water in order to generate electricity. The from plan was reflected in Nepal Bangladesh joint study report in 1989. To date, the implementation of the policy has not started though it is believed that the plan is updated and still reflexes the Nepalese ambitions with regard to water storage development.

3.5. Governance and Institutional Aspects

Following the description of the mutual relationships and the strategies of the Bangladesh's neighbouring countries in the previous section, this section of the baseline study focuses on the governance and institutional aspects of regional cooperation. An overview of the important institutions and their responsibilities of both Bangladesh and the other South Asian countries is provided.

3.5.1. National institutions

This section of the baseline study focuses on the governance and institutional aspects of regional cooperation. Therefore, only institutions – and sometimes only their respective department – that are active in the field on regional cooperation are listed below.

National institutions

A few national institutions are involved in regional water cooperation. The main national organization is the Government; the Prime Minister, the Ministry of Foreign Affairs, the Ministry of Water Resources and the Joint Rivers Commission under the ministry of water resources, in particular. The Planning Commission, however, has not appointed any particular division or person to work on regional cooperation or trans-boundary water issues.

Governmental Water organizations

The National Water Policy from 1999 explicates the roles and responsibility of the main governmental water institutions in Bangladesh; respectively the National Water Resources Council, the Executive Committee of the National Water Resources Council and the Water Resource Planning Organization (WARPO).

National Water Resources Council (NWRC)

According to the NWP, the "The National Water Resources Council (NWRC) will coordinate all water resources management activities in the country". NWRC is particularly responsible for:

1. The formulation of water resource management related policies and related issues that require attention;
2. Directing and utilising national water resources;
3. Overseeing the preparation and implementation of the National Water Management Plan;
4. Provide directions in order to develop efficient water resource management institutions
5. Develop policy directives for coordination between water organizations.

Executive Committee of the National Water Resources Council (ECNWRC)

The ECNWRC has the following responsibilities according to the NWP:

1. Providing directives on the planning, management, and coordination of water resources across all sectors, as may be required by the NWRC;
2. Guidance of water management institutions at the national, regional, and local levels in the formulation and implementation of policies and plans for improved water management and investment;
3. Periodically informing and advising of the NWRC on water resource management;
4. Performing any other function required by the NWRC.

The NWRC and the ECNWRC also discussed regional cooperation on transboundary water issues.

Water Resources Planning Organization (WARPO)

WARPO is the exclusive government institution for macro-level water resource planning. In addition, WARPO serves also as the Executive Secretariat of the ECNWRC. Responsibilities assigned by the NWP include:

1. Providing administrative, technical, and legal support to the ECNWRC;
2. Advising the ECNWRC on all aspects related to water resources management;
3. Preparing and updating the National Water Management Plan;
4. Setting up and updating the National Water Resources Database (NWRD) and Information Management System;
5. Assessing water projects on their conformity to the NWMP;
6. Conduct studies required by the ECNWRC;
7. Performing any other function assigned by the Government.

Indian institutions

When water negotiations are conducted, the Ministry of Foreign Affairs is always present jointly with representatives of the Ministry of Water Resources. Officially, the Ministry of Water Resources and the Joint Rivers Commission provide the Ministry of Foreign Affairs with information only in cases where the Ministry of Foreign Affairs request this. In practice, however, the Ministry of Foreign Affairs is the leading ministry with regard to regional cooperation and negotiations with Bangladesh. The Ministry of Foreign Affairs has separate divisions for each of the sub-regional cooperation tracks. The Ministry of Water Resources requires clearance from the Ministry of Foreign Affairs before it contacts Bangladesh.

The Ministry of Water Resources provides the member for the Joint Rivers Commission. This member is the so-called Ganga Commissioner. This ministry is responsible for water management and planning. Under this ministry fall several agencies, including the Central Water Commission, the Central Groundwater Board and the National Water Development Agency. These agencies provide the Ministry of Water Resources with technical support (Saran et al., 2014). The Central Water Commission is in particular responsible for the "initiating, coordinating and furthering in consultation of the State Governments concerned, schemes for control, conservation and utilization of water resources throughout the country, for purpose of Flood Control, Irrigation, Navigation, Drinking Water Supply and Water Power Development. It also undertakes the investigations, construction and execution of any such schemes as required" (CWC; 2014). Water quality is ensured by the Pollution Control Board that is part of the Ministry of Environment and Forests. The Planning Commission is active on both the national as the state level as it is actively involved in water resources development policy formulation at the national level while the commission also allocate financial resources to states for the development of programmes and schemes for water resources management (Eoearth, 2008).

Indian States differ in how they organise their water sector. Some states, like West Bengal, have a Ministry of Water Resources whereas the States of Assam and Meghalaya have not. Local government institutions, such as municipalities and Panchayats (village level public organisations), are responsible for drinking water facilities and drinking water supply. In addition, the influence Indian States have on national water policies differs widely. In case of the Teesta River, the State of Sikkim influences only in the margins whereas West Bengal is a very influential state. West Bengal is the lower riparian state and uses a large portion of the water to sustain irrigated agriculture.

Chinese and Nepalese, Bhutanese and Myanmar institutions

Due to the relative focus of Bangladesh on India with regard to regional water cooperation, Bangladesh has only marginally been in contact with the Ministries of Foreign Affairs and Water Resources Ministries of China, Nepal, Bhutan and Myanmar. Further research is required to understand the internal institutional framework of institutions involved with trans-boundary water bodies in China, Nepal, Bhutan and Myanmar.

3.5.2. Current international institutions and initiatives

Within South Asia, several regional organizations have been established to facilitate cooperation within the region. In this section the multilateral organizations will be described first. Afterwards, the Joint Rivers Commission will be discussed; a bilateral organization between India and Bangladesh since 1972.

General Regional Cooperation organizations

Bangladesh is a member of several South Asian organisations. These multilateral organizations are in general not much focused on water issues. In most organizations listed below, this topic is not officially addressed and probably only informally discussed during the organization's meetings.

SAARC

Water is regarded as a bilateral issue and SAARC is clear in its policy to not address any bilateral issues. In history, national officials have been appointed to a water committee but have never actually met. SAARC does, on the contrary, include water while working on disaster management. Furthermore, even though the Joint Rivers Commission has addressed the importance of discussing joint basin issues during the SAARC meetings, no dialogue has been initiated. Furthermore, at the moment, SAARC is not a very active forum for associated countries. The organization is more or less dormant, as the relationship between India and Pakistan has worsened. For some time, China has been an observatory member. However, China has also been a competing power within the organization which causes some tensions. As a result, other organizations for regional cooperation have become more prevalent, including organisations as BIMSTEC and ASEAN.

Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)

Comparable to SAARC, BIMSTEC also focuses on regional south Asian issues. BIMSTEC focuses on economic cooperation and regional development and no room is provided to address water issues during BIMSTEC meetings.

The South Asia sub regional Economic Cooperation Program (SASEC)

The South Asia Sub regional Economic Cooperation (SASEC) Program brings together Bangladesh, Bhutan, India, the Maldives, Nepal, and Sri Lanka in a project-based partnership with the objective to improve the quality of life for people in these countries. There is tremendous potential for these countries to increase trade among themselves and within South Asia. SASEC seeks to strengthen cross-border connectivity by creating multi-model transport networks that boost intraregional trade, and open up trade opportunities with East and Southeast Asia. It helps to build modern and effective customs administrations that speed up the time and reduce the costs of moving goods and vehicles across borders. SASEC also helps member countries improve energy security by developing infrastructure and promoting intraregional power trade to reduce costs and import dependence. However the Bangladesh SASEC projects relate to transportation and energy and not to water sector issues, there is a potential platform with relation to water resources related issues.

World Bank

The World Bank stimulates regional cooperation between Bangladesh and India, particularly cooperation in the transport sector. Another area of cooperation which is stimulated by the World Bank is the sharing of electricity between India and Bangladesh. Regional Cooperation on water is not specifically stimulated other than a couple of analytical studies on cooperation in the Ganges-Brahmaputra-Meghna basins that have been carried out. In addition, the World Bank has funded two regional cooperation projects: the Abu Dhabi Dialogue and the South Asian Water Initiative.

Abu Dhabi Dialogue

Six Abu Dhabi Dialogue meetings took place between 2006 and 2012. The Abu Dhabi Dialogue was initially initiated by International Institute of Strategic Studies after which representatives subsequently established the Abu Dhabi Dialogue as an informal consultative process (SAWI, 2014). The aim of the Abu Dhabi Dialogue was to open the participating countries for regional cooperation in several fields, with water as one of these fields of cooperation, in order to foster water cooperation dialogues without the pressure of negotiating agreements. The Ganges River, Brahmaputra River, Sundarbans and the Indus River were discussed, three out of four with direct relevance for Bangladesh.

The Abu Dhabi Dialogue has not resulted in tangible projects or joint water bodies. The South Asian Water Initiative was operating on the track 1 and track 2 level. The interesting feature about this dialogue was the fact that government officials are participating while the non-commitment to proposals discussed is requested from participating governments. Countries differ in the representatives they send to participate in the Abu Dhabi Dialogue. The representation of Bangladesh is composed of the Secretary of the Ministry of Water Resources, the member of the Joint Rivers Commission and a representative from the civil society. China sends representatives from the DG level. India, by contrast, was poorly represented as its participating officials were low in rank.

Asian Development Bank

The Asian Development Bank is not involved, nor support programmes related to regional water cooperation. The topic is regarded as too sensitive for the organisation to work on. The ADB, however, is indirectly involved in Regional Cooperation as the Asian Development Bank conducted a sectoral assessment on the hydropower potential of India

Cooperation initiatives by non-riparian countries or official organisations

In addition to official political forums on regional water cooperation, several organisations and non-riparian countries attempt to contribute to the establishment of trans-boundary water cooperation in the Ganges-Brahmaputra-Meghna

basins. This section will list three of the most substantial initiatives, including the South Asia Water Initiative by the World Bank, Development of Track 3 dialogue by Saci Waters and the Ecosystems for life programme of IUCN. The South Asia Water Initiative (SAWI) is "designed to support countries improve and deepen trans-boundary dialog, enhance the basin and water resources knowledge base, strengthen water institutions, and support investments that lead to sustainable, fair and inclusive development" (SAWI, 2014).The SAWI is supported by the World Bank and the Australian, Norwegian and UK governments. IUCN organises the project 'Ecosystems for Life/Water Futures' with the help of the Dutch government. Aim of this project is to bring water professionals from both India and Bangladesh together. Pairs of professionals worked together for 15 days. During the day, the professionals attended lectures and in the evening groups worked together on their own subject. With the consent of India, Nepal and other South Asian organizations have been invited to attend as observer. In addition to IUCN, SaciWATERs is experimenting with track 3 water dialogues. SaciWaters is organizing a dialogue in the Himalayan river delta on multi track diplomacy. The main difference between the IUCN and SaciWATERs approach is that the latter focuses on a more general level, in which Nepal and Bhutan are included as well, and the incorporation of education activities as part of their support programme. Another difference between both organizations is that Bangladesh state is a member of IUCN, and therefore track 3 activities are limited by conditions set by track 1[12].

Joint Rivers Commission

The Joint Rivers Commission was established in 1972 "to address the issues relating to the equitable sharing and management of water of trans-boundary rivers with the co-riparian countries" (Joint Rivers Commission website, 2014).

Organization of the commission

When the Joint Rivers Commission meeting is organized in Bangladesh, the minister of Bangladesh is usually the chair. The same principal applies to meetings organized in India. The Joint Rivers Commission is built up by two pillars; and Indian and Bangladesh side. The joint board does not hold office together but regular contact exists between the several members of the Joint Rivers Commission. The organisation is built up by three different layers. A Joint Rivers Commission meeting includes the ministers, the second level is organized on a secretary level and technical members will meet as part of the third level. The technical member's meeting takes place on a regular basis. The Joint Rivers Commission is part of the Ministry of Water Resources and it takes support from CEGIS, IWM, BUET, IWFM and other departments and experts whenever necessary.

Responsibilities

The Joint Rivers Commission meetings were named in the joint communiqué of the 2010 state visit as one of the institutional mechanisms to promote the bilateral relationship between India and Bangladesh. The Indo-Bangladesh Joint Rivers Commission was established on a permanent basis pursuant to the joint declaration of the Prime Ministers in March 1972, to carry out comprehensive survey of the common river systems and inter-alia to formulate projects in the field of flood control and irrigation projects. The Joint Rivers Commission is also mandated to discuss and arriving at treaties for sharing of waters of common rivers, and to subsequently implement the treaties. Currently, the Joint Rivers Commission is working on different tasks related to common rivers, including monitoring of the Ganges Treaty, sharing arrangement of other common rivers, river bank erosion and flood warning and a joint study on Tipaimukh hydro-electric projects.

[12] Idem

Mandate of the Joint Rivers Commission:

- To maintain liaison between the participating countries in order to ensure the most effective joint efforts in maximising the benefits from common river systems to both the countries,
- To formulate flood control works and recommend implementation of joint projects,
- To formulate detailed proposals on advance flood warnings, flood forecasting and cyclone warnings,
- To study flood control and irrigation projects so that the water resources of the region can be utilized on an equitable basis for the mutual benefit of the peoples of the two countries, and
- To formulate proposals for carrying out co-ordinated research on problem of flood control affecting both the countries.

The Joint Rivers Commission is working on river bank erosion, as approximately 700 km of the border between India and Bangladesh faces problems with river bank erosion. Construction works in the border area take place on mutual understanding and are coordinated by the Joint Rivers Commission. Since 1972, the Joint Rivers Commission receives information from India to warn for river floods. The Flood forecasting information includes substantial data but the data is only from 78 km upstream of the Farakka barrage on the Ganges, up to Guwahati on the Brahmaputra and some stations on other rivers including flashy rivers. Until 2010 Bangladesh did not receive data on a continuous basis the country desired to provide daily forecast during the monsoon season. Between the 15th of May (1stof April in case of flashy rivers) and the 15thof October, data was provide by India as the river flow acquired a certain height; the so-called flood warning stage was being reached. Today, the water level data is provided to Bangladesh by India irrespective of the river conditions. Flood data of the Ganges and the Brahmaputra systems is provided via email while those of flashy rivers through point to point link by wireless.

The Joint Rivers Commission provides technical support to the Government particularly Ministry of Water Resources with regard to the Trans-boundary rivers. In doing so, it conducts necessary technical analyses and prepares strategic position papers for negotiation keeping interest of the Government. To that end, it takes into account the opinion of other experts, departments, reports and opinion of the civil society members as available in the public domain as far as applicable.

Decision making procedure

In case of non-political sensitive issues and initiatives, technical members from both countries participate in the Joint Rivers Commission to access data, write proposals and implement projects. The technical members do not take decisions on highly sensitive issues like water sharing. In general, technical persons investigate the technicalities and initiate cooperation.

The Bangladeshi technical member and Indian counterpart agree first on the agenda. Communication between the counterparts on this level is rather informal. A second step is reaching agreement between the technical members of both countries, which is the most important step. They exchange data, analyse it, meet regularly to discuss the data and eventually come to an understanding. By taking this approach, the Joint Rivers Commission technical members close the margins between both countries interests. By applying this approach, the room for manoeuvre is sharply decreased and the ranges of possible outcome of the negotiations are limited.

All official information exchange between both countries is facilitated by the Joint Rivers Commission. The Joint Rivers Commission does not share much of the information they acquire from their Indian counterparts. Data sharing is often inhibited by a cultural aversion to cooperate and share data unless the top clearly gives instructions to do so. Only in cases were a Bangladeshi organization urgently needs the information the Joint Rivers Commission will disclose it. Organizations require permission from the Ministry of Water Resources first. In other words, there is no free flow of information between Joint Rivers Commission and other organizations.

The State Visits of 2010, 2011 and 2015 have been of utmost importance for re-establishing the position of the Joint Rivers Commission as a powerful motor for bilateral cooperation on shared rivers. Not only did the Prime Ministers of both countries agree on the joint coordination of current and new cooperation initiatives, they also specifically addressed the contributing effect the Joint Rivers Commission has with regard to regional cooperation on water. Both the Indian and Bangladeshi governments are more pragmatic nowadays, which provides opportunities for the Joint Rivers Commission to set up new initiatives and prepare new treaties. As a result, the Joint Rivers Commission has played a role in setting up a couple of dialogues between both countries and has been used a platform for treaty discussions and sharing of (flood) data.. India and Bangladesh for example jointly investigated the Tipaimukh dam. The Joint Rivers Commission coordinated the trip in India of 10 people from various agencies to discuss the development of the Tipaimukh dam. However, even though a dialogue and joint trip was established, a study conducted by CEGIS and IWN on the impacts of the Tipaimukh barrage on fisheries and agriculture were hindered by Indian's lack of willingness to provide data. Instead, the study had to be based on assumptions.

3.6. Trends and Challenges for Regional Cooperation

Chapter 3 has provided an analysis of all policies, relationships and institutions involved with regard to regional water cooperation. Based on this analysis, a couple of challenges and trends can be identified that will determine the possibility for cooperation on rivers and water resources in the short to long term.

3.6.1. Challenges

(Internal) political dynamics

Internal political dynamics might harm regional cooperation processes. Deciding on which parties to incorporate into treaty negotiations is important. As mentioned in this chapter, in India water policies are the responsibility of the state governments. Although the central Indian government will be the main negotiating partner, incorporating the interests of Indian states is essential for unhindered implementation and compliance to the agreement.

Unwillingness to cooperate by upper riparian countries

India and China both took part in the South Asia Water Initiative and the Abu Dhabi Dialogue, no concrete projects or agreements resulted from these initiatives. From the perspective of these upper riparian states, Bangladesh has not much to offer and these states even more to lose. The zero-sum game philosophy is still prevalent.

Large proposed river infrastructures

Both for the Brahmaputra as for the Ganges large river infrastructures are proposed. China is constructing hydro-power dams in the upper part of the Brahmaputra which will likely only affected the ecology of the river to some – yet unknown – extent. India's plans, on the contrary, will have far more impact on the river discharge towards Bangladesh. India's plan to develop 16 barrages in the Ganges will make the river Ganges ecological dead. In combination with the River Inter Linking Project, the barrages will divert Ganges water to the southern water deficit Indian states, leaving less water available for Bangladesh. India's plans also involve the creation of a link between the Brahmaputra and the Ganges to divert water towards the western and southern parts of India. In that way, India will be able to control the two most import river basins of Bangladesh. It is important to note that Bangladesh has not been consulted on the proposed infrastructural projects described in this section. Incorporating Bangladesh's interests in above proposals is therefore complicated.

3.6.2. Trends

Political momentum due to state visits in 2010, 2011 and 2015

The State visits of the Indian and Bangladeshi prime Ministers in 2010, 2011 and 2015 mark a change in the relationship between India and Bangladesh. The visits expressed the political will of both countries to start cooperating on the trans-boundary rivers as well. The state visits provided a window of opportunity for regional cooperation instead of a continuation of the non-decision making situation that has lasted for years – negotiation on the Ganges Treaty took 45 years to culminate. The states visits created the political momentum for finalizing the agreements on the rivers Teesta and Feni. The Ministers of Water Resources were directed to convoke a Joint Rivers Commission meeting at ministerial level to discuss an agreement on the Teesta River. The prime ministers also called upon the Joint Rivers Commission to discuss the cooperation on other shared rivers, specifically the Feni, Manu, Muhuri, Khowai, Gumti, Dharla and Dudhkumar. In addition, at the 2011 state visit the Prime Ministers directed the technical members and other Joint Rivers Commission officials to conclude the negotiations on these shared rivers. In the joint communiqué the nations stated arrangements need to have a fair and equitable basis. At the same time, by openly speaking about the negotiation process on the Mau, Muhuri, Khowai, Gumti, Dharla and Dudhkumar rivers, the Prime Ministers showed the importance of agreements on shared rivers.

Multi-layer dialogues

In the last few years, a couple of multilayer dialogues have been organized by a variety of organisations, including the World Bank, IUCN and SaciWATERs. Setting up dialogues on multiple levels ensures better development of cooperation and engagement on both sides of the negotiation table. Track 2 and track 3 dialogues are not the panacea for all water disputes since several of these illegitimate negotiation efforts have failed before (SaciWATERs, 2014). However, engagement from both sides is key for a sustainable treaty and multitrack dialogues increase the chance of thoughtful cooperation of both India and Bangladesh. In the end, it increases the chance of finding the right mix of people which will persistently work towards signed river treaties. Gaining officials' approval for track 2 and 3 is also an important requirement to apply the multitrack diplomacy strategy in practice. IUCN, The World Bank and SaciWATER invited the Joint Rivers Commission and Planning commission as part of the joint dialogue. Both actors showed their willingness to be part of this new approach.

Multilateral negotiations

Upper riparian countries are increasingly becoming aware of the inevitability of multilateral negotiations. The careful approach towards multilateral negotiations is illustrated by the creation of the Joint Working Group and the willingness of countries to participate during the Abu Dhabi Dialogue. All of these initiatives are either still in a very premature stage or have not yet resulted in tangible outcomes. Nevertheless, the willingness of China and India to participate in any of these initiatives is a step forward for Bangladesh.

Increased data sharing

Generally sharing of dry season information of river discharges and water levels with neighbouring countries is not at desired level, however, the data is shared from time to time as per decision at the appropriate level. On the other hand, India shares actual and forecasted river-level data with Bangladesh inter-alia on four major rivers as per existing arrangement since 1972. Data is transmitted twice a day (morning and evening) during monsoon (May to October) through e-mail on 8 points: Shahibganj, Farakka, Guwahati, Pandu, Goalpara, Dhubri, Domohoni, A.P. Ghat (Shilchar). In Addition data is transmitted through wireless stations (5times a day) on 7 points: Badarpur, Amarpur, Kailaswar, Gojaldoba, Domohoni, Ghughumari, Jaldhaka. (Source: Comments from Ministry of Water Resources, Bangladesh)

River	Point
Ganges	Farakka and 78 km beyond the Farakka barrage at Shahibganj
Brahmaputra	Dhubri, Goalpara, Panduand Guwahati
Teesta	Domohani
Meghna	Silchar

Besides, flood related data is also transmitted from few stations on some other rivers like; Manu, Khowai, Gumti, Dharla, Dudhkumar, etc. Presently, flood data is transmitted on continuous basis to facilitate daily forecast. This has been an improvement compared to earlier periods and increased cooperation might result in more data to be shared by India.

Part II : Establishing Regional Cooperation

4. Rationale for Regional Cooperation

This chapter will provide a basis for new strategies for shared water resources by providing four potential future situations and by describing the factors in which regional cooperation between the riparian countries of the Ganges-Brahmaputra-Meghna basins will flourish.

4.1. Trans-boundary Uncertainties

The world will be changed entirely in 2100. The expected impact of climate change may be overshadowed by river interventions upstream that could obstruct the flow of large quantities of fresh water to reach Bangladesh. With stronger economies and continuation of technical developments, constructing river water diversion projects might become more feasible for India and China. As these countries are upper riparian countries of the most important Bangladeshi rivers, Bangladesh has to prepare itself for significant reduction of fresh water inflow and consequent harmful effects for livelihoods and the country's ecosystem. As the Jal Marg Vikas project and the River Inter Linking Project activities in India show, water availability in Bangladesh is uncertain for the middle and long term. Bangladesh needs a long term perspective and needs to prepare itself for any scenario that could become reality in 80 years' time. For Bangladesh, setting up river cooperation with neighbouring countries is absolutely essential due to the security risks the country faces otherwise.

4.2. Linkage of Regional Cooperation uncertainties with Scenarios and Adaptation Pathways

Based on Part I Country and Regional setting, four scenarios have been developed. The scenarios differ in the extent to whether competition or cooperation is the more dominant socio-political approach used by riparian countries during water negotiations. The scenarios also show a spectrum that shows to what extent new infrastructural intervention will influence the flow of the rivers in the Ganges-Brahmaputra-Meghna basins. Figure 9 shows the four scenarios in relation to one another.

At this point in time, no prediction can be made about which of the scenarios will be the most likely one by 2100. Therefore, for the development of a regional cooperation strategy, Bangladesh should be able to adapt to all four scenarios outlined in this section.

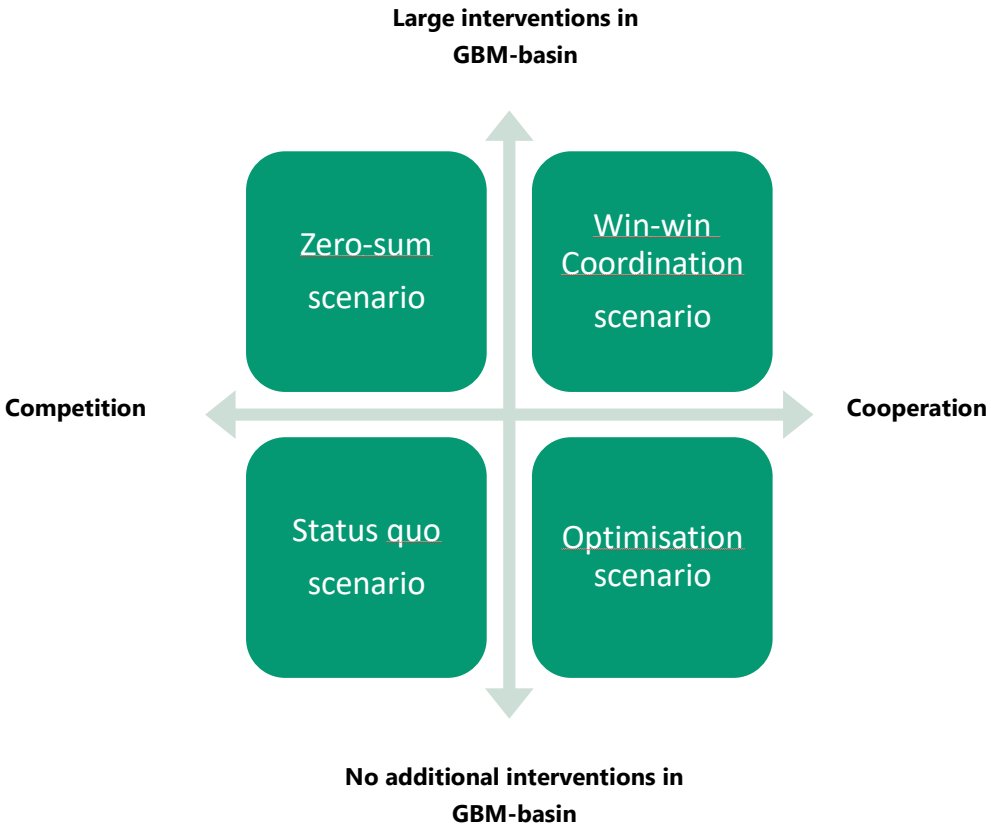

Figure 9: Regional Cooperation scenarios

4.2.1. Scenario 1: Status quo scenario

The status quo scenario describes the situation in which regional cooperation on trans-boundary waters will resemble the current situation to great extent. The relationship with upper riparians is to large extent characterised by a zero-sum mentality instead of a cooperative attitude. Furthermore, Indian and Chinese plans to construct river interventions are not (yet) implemented.

4.2.2. Scenario 2: Zero-sum scenario

The zero-sum scenario applies to a situation in which cooperation on trans-boundary water with co-riparian's has not been further developed while interventions in the course of the river upstream have become reality. In this case, the lack of cooperation hinders Bangladesh in having any influence on the plans and projects in the upper parts of the Ganges, Brahmaputra and Meghna (tributary) rivers. As a result, the interests of Bangladesh are not taken into account and Bangladesh will be severely affected by upstream developments.

4.2.3. Scenario 3: Optimisation scenario

The optimisation scenario depicts the situation in which no additional developments take place in the Ganges-Brahmaputra-Meghna basins. The course of the rivers and their current discharge will stay similar to the current practice. By improving the relationship with upstream riparian's, Bangladesh can attempt to work together to make the best use of the rivers' potential, including shared programmes on capturing monsoon rainwater or joint flood protection measures.

4.2.4. Scenario 4: win-win coordination scenario

In the win-win coordination scenario, riparian countries work together during the development of new river infrastructure. As a result, the countries balance the use of the river and share the river's benefits. By establishing a good relationship with other co-riparian's, Bangladesh is able to influence the plans and projects in the upper parts of the basins. As a result, Bangladesh is able to focus on win-win situations in which Bangladesh also reaps the benefits from these developments that will offset the negative implications of river interventions on the country.

4.3. Possibilities of Water Diplomacy

4.3.1. Water diplomacy definition

Water diplomacy – also called hydro-diplomacy – "tries to harmonise water policies and standards [of co-riparian's] and brings into focus issues at different levels and across sectors, encompassing not only technical but also social and economic implications" (Pangare and Nishat, 2014). Water diplomacy ranges from "conflict prevention, to treaty-making, to ensuring regional integration" (Clingendael Institute, 2011).

4.3.2. Favouring and obstructing factors for successful water diplomacy

This section will give an overview of factors that – in general – influence the success of water diplomacy.

Favouring factors

Bearing in mind that a state's national interest determines its foreign policy, several drivers favour effective water diplomacy attempts. First, establishing a dialogue and good political relation's is important to express interests and understand the position of other states before to start with the negotiation process. It is important that the appropriate stakeholders and network interests are adequately represented during the negotiation process (Fierman, 2013). A driver for successful water diplomacy is the incorporation of civil society organisations during the negotiation process. Secondly, water diplomacy is more successful in cases where stakeholders' interests could be aligned (Clingendael Institute; 2011). A third factor is the occurrence of interdependence linkages between countries (not necessarily related to water). Joint fact-finding is another very important factor for successful water diplomacy. By engaging together during the collection of data and by discussing the uncertainties and disagreements, participating countries acquire a shared understanding of the water body and its complexity (Fierman, 2013). A last driver for successful water diplomacy is the provision of a follow-up plan or strategy to ensure that plans are further worked out and proposed actions are being monitored (Fierman, 2013).

Obstructing factors

On the contrary, water diplomacy can be obstructed by several factors, of which seven significant ones are summed up in this section (Clingendael Institute, 2011).One has to bear in mind that this is not an exhaustive overview.

1. An upstream hegemon without the political will to cooperate;
2. Conflicting perceptions of water entitlements;
3. Rapid demographic or environmental changes in the river or aquifer basin;
4. Large unilateral development projects without consultation;
5. The lack of a treaty between riparian states;
6. The absence of a River Basin Commission; and
7. General hostile political relations

In addition, the authors Susskind and Islam argue that one of the biggest obstacles for concluding a water agreement is uncertainty. Uncertainty is further specified in three different types, including uncertainty of information, uncertainty of action and uncertainty of perception ("people see what they expect to see rather than what is actually there"). All

three forms of uncertainty form an obstacle to successful water diplomacy. However, even though the elimination of these uncertainties will not be possible, joint fact-finding and the establishment of dialogues provide solutions to overcome some aspects of the uncertainties.

4.3.3. Rational for regional water cooperation

The main reason why regional water cooperation is in the interest of Bangladesh and other co-riparian countries is that cooperation will result in many more benefits which together by and large outweighs the costs of adjustments a country has to made as part of regional water cooperation. By working together, the social, economical and ecological benefits of cooperation will be greater than the sum of the current individual state benefits.

Another reason for Bangladesh is that the country is a downstream country and therefore extremely affected by co-riparian actions upstream. Bangladesh has almost no control on the country's water flow as about 87 percent of the country's water flows first through upstream states. In order to have control over the rivers' conditions, Bangladesh has to influence Indian, Chinese and other co-riparian water policies and river development plans.

The rational for upstream countries – on the contrary – is that there is no doubt these states will feel the consequences in case Bangladesh is severely harmed ecologically and economically by the impact of reduced river discharge. Regional water cooperation will contribute to poverty alleviation since water availability is essential for livelihoods and living standards; and therefore to peace and security in the region.

5. Regional Water Cooperation in Practice

Many opportunities exist for cooperation between Bangladesh and co-riparian countries in the Ganges-Brahmaputra-Meghna basins. For the last couple of years, cooperation on trade and finance has been intensified between India and Bangladesh. By contrast, cooperation on water has not shown any noticeable intensification. This chapter provides an overview of the possible areas of cooperation and premises for successful cooperation. In addition, various water diplomacy approaches are described which either individually or combined could entail the future water diplomacy approach of Bangladesh.

5.1. Exploration of Possible Areas of Cooperation and Way Forward

Ideally, trans-boundary water cooperation would encompass cooperation on data, water sharing, dry season flow augmentation, flood prevention, watershed management, river erosion and mitigation, and pollution control and management. In the case of Bangladesh, most of these areas of trans-boundary water cooperation are still underdeveloped and room to improve cooperation still exist. As regional cooperation on water is only one aspect – although very relevant for Bangladesh – of regional cooperation, in this section areas of regional cooperation are discussed that are not particularly water related but have close ties with water and could therefore be relevant during water negotiations.

5.1.1. Data and knowledge sharing

Dissemination of knowledge and data sharing is a potential area for regional cooperation. Knowledge and data sharing is a requirement for successful trans-boundary river cooperation because data are valuable input during water negotiations. Furthermore, considering the fact that Bangladesh and India are frequently confronted with floods and droughts that affect vulnerable communities in the river Ganges-Brahmaputra-Meghna basins, information sharing on for example how best to adapt to climate change should also be in the interest of both countries. Knowledge can be shared on climate change trends, impact assessments and adaptation options for vulnerable communities in the river basins (Mahanta, 2012 via IUCN).In addition to cooperation on river flow data exchange, real-time exchange of the rivers' water quality would be beneficial for Bangladesh. The water quality data can be applied for the maintenance of the river's ecosystem. Bangladesh and its upstream countries can for instance set up joint quality monitor programmes

to share information on pollution flows in order to better protect the river's ecology and consequently the livelihoods of river communities from being harmed. Joint quality monitoring also enables communities to know understand the type of pollution and therefore find the right remedy – if available – against the pollution.

5.1.2. Climate change

Initiating regional cooperation to combat the consequences of climate change could be a smart strategy for Bangladesh because upstream countries – and in particular India – face similar problems caused by climate change. A large portion of the Indian population lives in the Ganges-Brahmaputra-Meghna basins and is therefore expected to face the same environmental changes as Bangladesh (IUCN, 2012). Like Bangladesh, north eastern Indian states are also becoming increasingly more prone to flooding or cases of extreme droughts. Consequently, climate change will also impact the Indian agricultural sector by flood damage, temperature increase, decreased soil moisture, salinity ingress, rainfall variability and intense precipitation as it will in Bangladesh (Shreelakshimi, 2012). The climate change implications on public health will also impact riparian countries to large extent. For instance, climate change will enable the transmission of malaria for a longer period of time in the region (Mahanta, 2012).

Consequently, a collaborative approach to counter the consequences of climate change in the Ganges-Brahmaputra-Meghna basins will not only be in the interest of Bangladesh but will also be beneficial for other countries in the basins. For instance, collaborative research on the specific effects of climate change for the Ganges-Brahmaputra-Meghna basins would result in useful knowledge that could be applied by all countries in the basins. Furthermore, co-riparian's can pool their resources to enhance available information and set up early warning systems. The basins' countries could also join forces in capitalizing water resources during the monsoon period while simultaneously preventing floods from occurring through cooperation on water storage infrastructure.

Another argument for establishing regional cooperation on climate change mitigation measures is that the costs of non-cooperation will simply become too high to not act together:

> *"Climate change raises the stakes of non-cooperation, encouraging nation states not only to capture additional economic benefits, but also to manage better their growing common risks. In trans-boundary river basins, existing risks are likely to be intensified by climate change. Effective cooperation in trans-boundary basin management could become a singularly effective risk management strategy."*

(Grey, Sadoff and Genieve Connors, 2009)

5.1.3. Sundarbans

During the 2011 state visits, bilateral documents on various topics were signed, including the Mutual Understanding on conservation of the Sundarbans. No substantial discussions are taking place on the national level between India and Bangladesh with relation to the protection of the Sundarbans. This is a missed opportunity as the Sundarbans are key for the coastal protection of West Bengal State and Bangladesh. It is in both countries interest to maintain this ecosystem. The main form of cooperation in the region takes place as a result of international agencies activities in the coastal area. Some research projects initiated by the UK and the Netherlands included institutions from both sides; for example, to understand the ecosystem and to learn more on how to keep the Sundarbans survive in a substantial manner.

5.1.4. Inland navigation and transportation

One of the only examples of already established cooperation between India and Bangladesh is the cooperation on inland navigation. Inland water transportation through Bangladesh is an important and efficient way for India to link the millions of people of the eight north-eastern states with the rest of the country. Due to geographical conditions, India's eastern states are only connected by a small land corridor with the rest of India. However, the north-east of India

is also connected via the Brahmaputra and Barak rivers with the Bay of Bengal and consequently with the rest of India. To avoid cumbersome transport routes, India is interested in access to Bangladesh's inland river network.

In 1972, almost right after independence, Bangladesh signed the Protocol on Inland Water Transit and Trade with India. The protocol arranges the free pass between the north-eastern part of India, Bangladesh and the Indian mainland for the transportation of goods from one side of India to another side through Bangladesh's river system. The arrangement is restricted to cargo transport and does not include agreements on passenger transport. This protocol has been renewed every two years. The protocol determines four different transit routes and assigned five ports on for each country for facilitating inter-country trade. As part of the cooperation between India and Bangladesh on inland water transport, India is actually paying Bangladesh to dredge its water ways because these routes are critical for India to connect the east to the west of the country, even though according to the protocol Bangladesh is responsible for developing and maintaining these transport routes (Mishra, 2012). India provides 20 million Bangladeshi Taka to Bangladesh for the maintenance of the transport routes. Article 2.1 of the protocol describes the agreement on the conservation of the water routes as following: "Each country will maintain the river routes falling within its territory in a navigable condition and provide all the essential pilotage and conservancy services".

The inland water transport routes are the only official connections open for Indian transportation. Transportation of goods by train or trucks is still not approved. Therefore, enabling transportation through rail or road through Bangladesh could be a new area of cooperation between India and Bangladesh. Also, cooperation could be further developed on passenger traffic and tourism activities on the trans-boundary rivers of India and Bangladesh. At this point, the protocol between India and Bangladesh on Inland Water Transit and Trade does not include any provision for tourism activities involving passenger traffic (Mishra, 2012).

As the investments from India for the maintenance of several water ways show, inland water transportation through Bangladesh is in the interest of India. Bangladesh could use this interest in including India in a joint study on how climate change and possible upstream infrastructure developments by India impact on trans-boundary inland navigation and consequently how the two countries can mitigate these impacts to allow Indian and Bangladeshi vessels to continue to navigate on Bangladesh rivers. Moreover, the importance of Bangladesh's water ways for India's connectivity could be used as an argument by Bangladesh to urge India to maintain sufficient water levels. In other words, dwindling water levels as a result of water diversion from the Brahmaputra towards the west of India will not only harm Bangladesh but also massively impact India's connectivity between the north-east and the rest of the country.

Intensification of cooperation between India and Bangladesh on the internal water transport can be encouraged by extending the renewal period of the protocol. Initially, the protocol was supposed to be renewed every two years whereas for the last few years the protocol has even been renewed for only one year. Despite the fact that the protocol has been renewed every single time since 1972, private investors will only invest in navigation routes through Bangladesh when they are sure that they can reap the benefits of their investment. Renewing the protocol for less than two years is therefore discouraging for the private sector to investment in inland water transport as the protocol is a critical factor for cooperation between India and Bangladesh.

5.1.5. Trade

In contrast to most other areas of cooperation, cooperation on trade has always existed in the border area between Bangladesh and India. Trade between India and Bangladesh has increased immensely during the last decade. Whereas inter-country cargo trade was 0.1 million tons in the year 2001-2002, less than then a year later inter country trade cargo had increased to 1.28 million tons in 2009-2010 (Hussain, 2012). This trend of cross-boundary trade has continued over the last years and could be used as leverage during water negotiations to secure sufficient river flow for an economic vital Bangladesh that is capable of trading with India and other riparian countries.

Compared to other areas of possible regional cooperation, developing cooperation on trade is relatively more easy compared to the establishment of cooperation on trans-boundary rivers. Trade connections are already established and

could be used by the Governments of Bangladesh and India as a stepping stone to address water needs. As has been indicated in the previous section on 'Inland navigation and transportation', co-riparian's will only be able to further develop economic ties with Bangladesh as long as the country does not face an environmental crisis caused by upstream interventions.

5.1.6. Electricity/hydropower

Compared to the global average, the Ganges basin has relatively low per capita commercial energy consumption (Upadhyay, 2014). However, the economic growth and consequent increase in energy demand puts pressure on countries within the Ganges-Brahmaputra-Meghna basins. Most of these countries have limited energy reserves but need to increase their energy supply to sustain the economic growth. For large extent Bangladesh relies on domestically available natural gas for its energy supply but its gas fields are aging and new alternatives need to be found (Mahajan et al., 2014). India relies – similar to Bangladesh – mainly on energy imports as a result of India's rising energy consumption and dwindling resources (Mahajan et al., 2014). Increasingly Bangladesh is looking for opportunities to cooperate with neighbouring countries on sharing and producing energy. South Asia has a huge potential for establishment of closer (hydro-) power cooperation.

Several noteworthy developments are already taking place with relation to cooperation on power. First, India and Bangladesh are constructing a transmission line of 500MW between Berhampore, India and Bheramara, Bangladesh. Second, India is currently constructing a coal based power plant near the Sundarbans in Khulna. The power plant is a joint venture between Bangladesh and India. With relation to the three main rivers shared between Bangladesh and India, cooperation on hydropower could be a solution for both countries search for additional energy sources. Due to Bangladesh's geographic conditions – the country's flat terrain and population density – hydro power projects cannot be considered as a significant source of potential energy. However, Bangladesh could support hydropower development upstream in India. Especially the nearby north-eastern part of India has substantial hydropower based electricity generation potential (Mahajan et al., 2014). Working together with India on joint hydropower projects could be beneficial for both countries, as for India incorporation of Bangladesh makes it easier to acquire its consent whereas Bangladesh would be able to provide input during the development of a new hydropower generation plant while also acquire part of the power generated by the hydropower plant.

Not only is Bangladesh interested in importing energy from India, but Bangladesh is also interested in making use of the power potential from further upstream countries like Bhutan and Nepal, of which it has been reported that they have a power potential of 20,000MW and 42,000MW respectively (Islam, 2014). India only marginally trades power with Nepal and assists Bhutan with developing its hydropower potential in order to export the generated energy back to India. India and Nepal signed a Power Trade Agreement in 2014 (Upadhyay, 2014). At the moment, despite the country's hydropower potential, Nepal is importing power from India. Hydropower dams in Bhutan are mostly funded by India and consequently Bhutan will only start exporting electricity to Bangladesh when both India and Bhutan experience a surplus of energy supply. Furthermore, if China will construct the Great Bend hydropower dam upstream in the Brahmaputra, the electricity generated could be beneficial for other South Asian countries too. India and Bangladesh would both be interested in using the energy generated by the Great Bend dam if China would be willing to sell the electricity.

5.1.7. Port development

The Port of Chittagong has huge potential for further development, as it could act as a deep-sea port for the entire South Asia region. In order to secure enough resources and funds to expand the harbour, Bangladesh could collaborate with neighbouring countries. Access to the port will be in interest of India to connect its north eastern part with the Bay of Bengal, as well as in the interest of China because the Port of Chittagong could be a good alternative for inland industrial cities Kunming and Chengdu compared to the Chinese deep-sea ports on the east coast of China. With expansion of the Port of Chittagong, cooperation on inland navigation, railway facilities and roads towards the harbour

from India and China becomes a potential field of cooperation as well which could be used as leverage during river negotiations.

5.1.8. Tourism

Room for new cooperation opportunities exist with regard to trans-boundary river tourism. Like Bangladesh, upstream of the Brahmaputra in Sikkim (India), development of tourism, horticulture and floriculture has huge potential (Khanom, 2014). India and Bangladesh can start working together in further developing these opportunities as a new source of income for rural communities in northern Bangladesh and north east India. Bangladesh, India, Nepal and Bhutan may jointly explore tourism at the attractive tourist places.

5.2. Synthesize Analysis to Possible Water Cooperation Approaches

It is important for Bangladesh to render the power asymmetry irrelevant which the country is currently confronted with in the Ganges-Brahmaputra-Meghna basins. This section will provide five approaches which Bangladesh can combine to develop its water diplomacy approach to improve its position towards Indian and Chinese interactions upstream.

5.2.1. The basin approach

The basin approach is centred on the concept of benefit sharing. The idea behind benefit sharing is to make optimal use of the river and its services by constructing infrastructure on the most optimal hydrological and ecological location in the river basin. The electricity or food acquired as a result of this river infrastructure can be shared with other riparian states. The establishment of cooperation between countries to share the river's benefits will only be sustainable as states acquire more benefits than they would do by solely acting unilaterally. "States may cooperate when the net economic and political benefits outweigh the benefits of unilateral action" (Grey, Sadoff and Connors, 2009).Basin cooperation could result in four types of benefits that are explained in Table3:

Even key Indian water stakeholders argue that while India's own water interests need to be secured, basin-level cooperation between riparian countries is essential to meet India's own water needs and to achieve stability in the region (Saran et al., 2014).

Table 3: River sharing benefits

Type of benefit	**Example**
Environmental benefits to the river	Improve water quality, conserved biodiversity
Economic benefits from the river	Increased food and energy production
Reduction of costs because of the river	Reduced geo-political tensions, enhanced flood management and improved navigation
Benefits beyond the river	Catalysing wider cooperation and economic integration

Source: Grey, Sadoff and Genieve Connors, 2009.

However, benefit sharing will not in all cases be an appropriate or possible solution (Aarons, 2014). It is important to note that to up to this moment, sharing of benefits has been discussed in theoretical terms but has never been tested in an actual basin (Jägerkog et al., 2009). Benefit sharing is based on rational considerations while interaction between states are in general not characterised by rational behaviour but more by power play and lack of trust of other riparian countries. Moreover, benefit sharing requires states to give up some sovereignty to receive more in return, which is often not considered politically acceptable. Benefit sharing will only strive in cases where hydro politics is not subordinate to the broader political context (Jägerskog et al., 2009).

5.2.2. Negotiation of multiple treaties approach

As was discussed in Section 3.3.4, the establishment of treaties is still considered necessary by Indian water sector officials to build confidence and trust between countries. Despite other strategies, treaties are a valued bilateral mechanism to settle water disputes.

Instead of attempting to agree on one treaty at a time, negotiation of multiple treaties would be a better approach to gain optimal outcomes for Bangladesh. By negotiating multiple treaties simultaneously, the "pie of options to agree upon is expanded" and benefits given up on one treaty could be used as leverage for another – more significant – treaty. By applying the negotiation of multiple treaties approach, both India and Bangladesh have more options to come to mutually agreeable and beneficial treaties.

5.2.3. Mutual gains approach

The mutual gains approach is a benefit-sharing model that discourages unilateral actions and encourages coordination between riparian countries. The concept behind mutual gains is to incorporate non-water issues into the negotiation process to augments the basket of benefits. Cooperation becomes more likely when actions are taken to broaden the basket of benefits. In other words, involving other areas of cooperation in addition to water cooperation could drive effective cooperation. By taking into account other tradable benefits next to water, water negotiations will be broadened and new beneficial outcomes for both parties are more likely to be created. The mutual gains approach works as a negotiation strategy when for instance a downstream state has leverage on a non-water issue in relation to an upstream state (Clingendael, 2011). In other words, bringing other tradable benefits to the table often results in a better chance of success (Saran et al., 2014). As a result, more opportunities emerge to overcome conflicting interests between states.

Potential areas for cooperation between India and Bangladesh have been indicated during the state visits of 2010, 2011 and 2015. For the implementation of the mutual gains approach, these potential areas of cooperation could be taken as a starting point. The benefit sharing model can be developed for the following sectors: water resources, power, transportation and connectivity, tourism and education. The Prime Ministers of India and Bangladesh already expressed their wish to operationalize these various areas of cooperation as part of the state visits. Involving these other areas of cooperation in addition to water cooperation could drive effective cooperation. There is no doubt that India will feel the consequences if Bangladesh is severely harmed ecologically and economically by the impact of climate change and environmental crisis due to reduced river discharge (Mahmood, 2013).

5.2.4. Multi-layer water dialogue approach

Instead of only focussing on trans-boundary water negotiations on the governmental level, multilayer water dialogues invite other types of institutions to the negotiation table as well, such as civil society and the science community. Multilayer dialogues enable participating countries to start the negotiations from a new entry point and connect water negotiations with other river interests and other regional cooperation issues – linking in with the 'mutual gains approach' discussed in Section 5.2.3. By means of dialogues, countries are brought together in a more informal way while simultaneously demystifying the other negotiating country by exchanging knowledge and opinions (Saran et al., 2014). Multilayer dialogues are characterized by an open environment to enable participants to understand the viewpoints of other parties. Contributors are not hampered by political or other power oriented position. It is a bottom up approach that provides informed and technical opinions (SaciWATERs, 2014). Setting up dialogues on multiple levels ensures better development of cooperation and engagement on both sides of the negotiation table. Furthermore, "[w]hile formal agreements at the official level are absolutely necessary, this approach often disregards that water resources is managed at multiple scales, thus for these agreements to work on the ground and to be acceptable at the national or country level, involvement of water users at different levels including local communities are also essential" (Pangare and Nishat, 2014). Consequently, multilayer dialogues could be promoted by Bangladesh as a new form for trans-boundary river negotiation.

The advantage of incorporating other – non official – stakeholders in river negotiations is that political and sociological issues are also taken into account during treaty negotiations. Another advantage of this approach is that it involves people and institutions that are generally more open to talk about water cooperation and are not hindered by political interests or party affiliation. Organisations composed of water practitioners often attempt to bridge the disagreements on trans-boundary rivers. A survey of the Observer Research Foundation found out that key stakeholders of the water scene in India acknowledge the added value of track II water diplomacy. Dialogues and cross-border cooperation between civil society organizations and academia is seen as one of the most effective ways to establish "a cooperative understanding of each country's water needs that would ultimately filter into policy decisions" (Saran et al., 2014). While legal water-sharing arrangements and treaties are undoubtedly key formal mechanisms, civil society organizations were regarded – by key stakeholders in the Indian water sector – as essential in helping the state better understand its riparian's water needs, which in turn would also filter into policy decisions (Saran et al., 2014). Involving civil society organisations is essential for helping the states better understand the needs of other riparian countries, which will lead to better outcomes of water negotiations.

This approach should be used in combination with other water diplomacy approaches, as it mainly supports other regional cooperation initiatives. Except for the Hilsa fish, no tangible results have been observed though involved stakeholders have been very positive on the established relationships between co-riparian civil society and academic institutions.

Track 3 success story: Hilsha fish

The Hilsa fish is Bangladesh's national fish. In order to protect the Hilsa fish against the influences of over fishing and siltation, The Bangladesh's Ministry of Fisheries developed policies to protect the fish by imposing a ban on fishing. The fish is also an iconic fish for West Bengal. However, India was initially not quitting it's fishing activities. To stimulate the protection of the Hilsa fish, IUCN organised a track 3 dialogue. Journalists from West Bengal were invited and wrote about the dialogue. It is believed that these reports have paved the way for influencing the Government of West Bengal. IUCN kept both Governments informed during this process. In addition, the Government of Bangladesh provided IUCN with valuable information. To date, both countries have a common policy to conserve the Hilsa fish and moreover, the fishing ban time period is simultaneously for both countries.

5.2.5. International involvement approach

This fifth approach involves the active participation of a third party, either an international organisation or a country. "Mediation by a third-party during and after negotiations for formal water agreements is often crucial to reach agreements and to subsequently implement them" (Clingendael Institute, 2011). International involvement can be organised in different ways, either by mediation, fact-finding or by means of conciliation.

In order to ensure the effectiveness and acceptance of international involvement, both Bangladesh and India need to agree first to do so. Not only will it harm the relationship between India if without approval other parties are invited to the negotiations – especially with the dominant focus on bilateral treaties instead of multilateral ones, consent from co-riparian's is also important for the mediator to be considered legitimate by all parties.

5.3. Application and Practicing Principles of Water Diplomacy

As seen in section 3.3.4 under Local Level Decisions, regional cooperation is already taking place at the local level. For smaller trans-boundary rivers, government officials work pragmatically to solve water disputes between India and Bangladesh. On a more macro level, cooperation on many areas is so far lacking or either very much underdeveloped. Cooperation on trans-boundary water bodies as the Ganges, Brahmaputra and the Sundarbans is particularly underdeveloped. Furthermore, none of the identified water diplomacy approaches (section 5.2) has had a significant impact and the basin approach, the international involvement approach and the mutual gains approach are still to be

developed. In other words, even though principles for effective water diplomacy are available as are the conditions to implement them, in practice none of the approaches is actively being applied by Bangladesh nor are the possible areas of regional cooperation applied as leverage to establish cooperation on trans-boundary rivers (see Table4).

Table 4: Future prospect on Basin Wide Flood, Forecasting, Roads and Railways as possible areas of cooperation.

Possible areas of regional cooperation	**Current status of cooperation**
Data and knowledge sharing	Limited and very restricted although progress is observed: India provides Bangladesh with more data to forecast floods
Climate change	No cooperation is being observed
Migration	No cooperation is being observed. Solving the migration issue is in the interest of India
Sundarbans	No official cooperation is being observed, cooperation takes place initiated by third parties
Inland navigation and transportation	Protocol signed by India and Bangladesh and India provide Bangladesh funds to dredge its waterways
Trade	Cooperation is increasing, largely due to private sector investments and activities *[to be further developed]*
Electricity/hydropower	Limited cooperation is being observed and large potential and interests for further development
Harbour development	Chinese and Japanese interest to develop the harbour of Chittagong *[to be further developed]*
Tourism	No cooperation is being observed, potential to India, Nepal and Bhutan with Bangladesh tourism sector

Part III : Joint River Basin Management

6. Mechanisms of Joint River Basin Management

6.1. Types of Regional Water Cooperation

With regard to the intensity of regional cooperation, a continuum exists starting at unilateral action, developing to coordination and consequently to collaboration to eventually joint action as one of the most developed forms of regional cooperation (see Table5 for descriptions). In the first three types of cooperation, authority lies at the national level whereas in case of the fourth type of cooperation – joint action – river authority is shared between countries and a River Basin Organisation.

Table 5: Types of cooperation

Type of cooperation	Description	Example of type of cooperation activities
Unilateral action	Independent, non-transparent national planning and management	Individual studies
Coordination	Sharing information regarding national planning and management	Inter-governmental panels
Collaboration	Adaptation of national plans for mutual benefits	Conventions and treaties
Joint action	Joint planning, management or investment	Comprehensive regional water framework

Source: (Grey, Sadoff and Genieve Connors, 2009; Module III UNITAR, 2014).

This continuum of regional cooperation does not necessarily overlap with institutional arrangements for regional cooperation of shared water resources. In other words, the existence of a River Basin Organisation does not necessarily mean that countries jointly plan, manage and invest in the river basin. In the case of Bangladesh and India, national governments share almost none of their authority with the Joint Rivers Commission.

6.1.1. River Basin Organisations

To further explore the difference between level of cooperation and River Basin Organisations, it is useful to look at the four performance levels of River Basin Organisations distinguished by Dr Mostert (Module III UNITAR, 2014). River Basin Organisations have operational, planning and analytical activities and responsibilities, as well as that these organisations function as institutional structure of all sorts of cooperative activities between riparian countries. With these different levels of performance comes the variability in authority shared with the River Basin Organisation.

As mentioned in the section above, the governments of Bangladesh and India share almost none of their authority with the Joint Rivers Commission. The organisation is mainly used as institutional structure to facilitate communication between both countries. On the operational level, the Joint Rivers Commission monitors the Ganges Treaty at the Farakka barrage. While comparing the activities of the Joint Rivers Commission with the different types of cooperation, coordination is the main type of cooperation between India and Bangladesh.

Table 6: Performance levels River Basin Organisations

Performance levels River Basin Organisations	Joint Rivers Commission
Operational	Monitoring of the Ganges Treaty
Planning	No common projects are initiated
Analytical	Some data is exchanged but not jointly analysed
Institutional structure	Facilitation of communication and negotiation processes

6.2. Barriers for Joint River Basin Management

According to Granit and Claassen (2009), at least eleven barriers for the development of trans-boundary river management exist. In Table 7 the extent to which these barriers apply to the Ganges-Brahmaputra-Meghna basins is being analysed. As can be seen in the Table, all of the eleven barriers for trans-boundary river management development seem to be (for some extent) present in the Ganges-Brahmaputra-Meghna basins. Establishing joint river basin management is therefore not likely to be attained easily but will require a dedication and long term commitment of all actors involved.

Table 7: Barriers for trans-boundary river management development (taken from Granit and Claassen, 2009) and to what extent the Barrier applies to the Ganges-Brahmaputra-Meghna basins

Barrier	Does this barrier apply to the Ganges-Brahmaputra-Meghna basins?
A high level of inequality between riparian states	Yes; GDP differs substantially between the riparian states
A strong geopolitical influence in a basin by certain states	Yes; India and China have a strong geopolitical influence in the basin
A large difference between riparian states legal systems	Yes
Difference in access to investment markets by riparian states	Yes; China has ample funds to finance hydropower dams in the Brahmaputra river
The existence of civil strife in a basin	Yes; local communities in north eastern India and within Tibet are against dam construction to generate hydropower
Different and/or low levels of in-country infrastructure	Yes
The absence of regional cooperative frameworks,	Yes
A basin that is closed i.e. with limited water resources or water quality constraints	Yes
Limited in-country capacity to manage water resources and to effectively participate in regional cooperation	Yes and in particular to Bangladesh as the country has due to geographical regions no possibility to store monsoon water

6.3. Factors for Successful Joint River Basin Management

Successful joint river basin management depends on numerous factors, including the presence of treaties and formal agreements, clear responsibilities between all local, national and regional authorities and availability of decision making procedures including the availability of dispute resolution procedures in case disputes cannot be solved within the joint river basin management framework. This list is nonexclusive but contains four of the most important factors for successful joint river basin management.

6.3.1. Treaties and formal agreements

Based on Vingradov, Wouters and Jones work, the Clingendael Institute argues that a good water agreement contains provisions and articles on:

1. Inclusive membership
2. Geographic and hydrological scope as well as scope of allowed activities in the watercourse
3. Substantive rules to clarify key principles of the treaty
4. Procedural articles, i.e. on data-sharing, prior notification of any water course disturbances and the agreements flexibility in dealing with future challenges.
5. Joint institution
6. Dispute resolution articles
7. Compliance enhancement, i.e. provisions for monitoring, sanctioning and capacity-building

Of the seven good water treaty points indicated above, the Ganges Treaty only matches the criteria on procedural articles – the division of water during the dry season, a joint institution – namely the Joint Rivers Commission, and to some extent on dispute resolution articles. The Ganges Treaty does not include upstream riparian Nepal, also it does not specify allowed activities in the watercourse nor is there a form of compliance enhancement part of the Ganges Treaty.

To date, the Ganges Treaty (Section 3.3.4) is the only signed treaty between India and Bangladesh, whereas India and Nepal signed three agreements on Ganges tributaries, namely the Koshi Agreement (1954), the Gandak Agreement (1959) and the Mahakali Treaty (1996). The Framework Agreement agreed by the Indian and Bangladesh Government provides an opportunity for sub-regional cooperation on water. Article 7 states the following: "To harness the advantages of sub-regional cooperation in the power sector, water resources management, physical connectivity, environment and sustainable development for mutual advantage, including jointly developing and financing projects." Furthermore, the Joint Communiqué released during the state visit of 2011 also mentions in paragraph 58 that "the two sides would harness advantages of regional and sub-regional cooperation in power, water resources, transport and other forms of connectivity, food security, education of both sides to study and formulate […] necessary terms for undertaking joint projects in the field of water resources management and hydro-power".

6.3.2. Clear responsibilities

With regard to clear responsibilities on the regional level, it must be clear what kind of organisational model is being used when states agree to work together. In general, three types of models to organise responsibilities can be distinguished for River Basin Organisations that can be broader applied to all forms of joint river management (Module III UNITAR, 2014):

1. The Hydrological model: the organisational structure of the River Basin Organisation is based on existing hydrological boundaries and the management of the basin is under the responsibility of one authority;
2. The Administrative model: the River Basin Organisation functions as an intermediary while the responsibility for the basin's management is still at the local and national level authorities;
3. The Coordinated model: River Basin Organisations work together with local and national administrative bodies

For successful cooperation, countries need to make a clear decision about which organisational model and associated responsibilities will be used.

6.3.3. Availability of decision making procedures

Countries need to decide whether they or a joint organisation – for instance a River Basin Organisation – will decide by consensus or on the basis of majority rule. Both decision making procedures affect whether negotiations (consensus)

or coalition building (majority rule) will be the prevalent practice. After decisions are made, it is necessary that the countries secure adequate means or institutional facilities to enforce the measure and to assure the rules are not bypassed (Module III UNITAR, 2014). Furthermore, it is important to decide beforehand on what issues a River Basin Organisation is authorized to decide upon. Is the organisation only able to conduct joint studies or can the River Basin Organisation force countries to share more of its river flow with other countries? Are there any limitations to the authority of the organisation at which the national governments take over the decision making process?

6.3.4. Dispute resolution procedures

Part of the decision making procedures, are procedures on dispute resolution. Procedures have to be designed prior to the outbreak of potential disputes to set out the rules in case countries disagree with the River Basin Organisation or with a joint action. Dispute resolution procedures can both address how River Basin Organisations address these disputes as well as at which points disputes are too big to handle and cannot be solved within the framework of a joint River Basin Organisation. In that case, negotiations between countries shall decide upon how the dispute will be handled. Because of the importance of procedural agreement on dispute settlement, it is one of the important provisions recommended for the success of water treaties (see 6.4.1).

6.4. Joint River Management Case Study: Indus River

6.4.1. Situation

Irrigation plays an important role within the mainly agrarian economy of the semi-arid Indus River basin. The limited water resources are vital for the countries' security and development. Since Punjab's independence from Great Britain, the Indus irrigation system is shared by two countries; namely Pakistan and India. As both countries depend on irrigated agriculture, disputes over the allocation of Indus water emerged almost instantly until resolved by the Indus Treaty in 1960 (Alam, 2002). The treaty was signed after years of negotiations between both countries. The treaty was signed after due to a change of regime following a coup d'etat in Pakistan in 1958. The new Pakistani regime accepted the 1954 World Bank plan while India had already agreed to the World Bank proposal.

Under the Indus Treaty the three western rivers are by and large allocated to Pakistan whereas the three eastern rivers can mostly be used to the advantage of India. In addition, restrictions have been imposed on India – as the upper riparian – as to the extent of irrigation development is allowed (Iyer, 1999). With the Indus Treaty being over 50 years in place, the treaty is one of the rare successful trans-boundary river agreements. Furthermore, it is commonly agreed that the Indus Treaty has been working reasonably well despite the often difficult relationship between India and Pakistan (Iyer, 1999).

6.4.2. Challenges

The Indus Treaty has overcome a couple of major challenges, including two wars and the nuclear era (Alam, 2002). Currently, both in India and in Pakistan people argue that the treaty does not share the rivers equally and is not fair to either Pakistan or India – depending on the nationality of the advocates. These voices argue that the Indus Treaty should be renegotiated. Until the writing of this report, however, renegotiation is not a viable political option and therefore not very likely to take place in the near future. India and Pakistan have no guarantee a new treaty will lead to a better agreement while at the same time the countries will face the risk of losing the benefits of the 1960 Indus Treaty.

6.4.3. Comparison with Ganges-Brahmaputra-Meghna river basins

According to Iyer, there are three reasons why the Indus Commission has been working reasonably better than the Indo-Bangladesh Joint Rivers Commission (Iyer, 1999):

1. "The first part is that the Indus Commission came into being under the treaty that settled the water dispute; it merely had to monitor the implementation of the treaty. On the other hand, the JRC had to function in a situation of a bitter unresolved inter-country dispute, and became a part of the negotiation mechanisms".

2. In the case of the Indus Treaty, "there is no continuing process of water-sharing in a given river, requiring operations, measurements, monitoring, etc, as is the case under the Ganga Treaty".
3. "[T]he JRC is concerned with all the rivers common to India and Bangladesh, the Ganga being only one of them and one that is covered by a treaty".

6.4.4. Lessons for Bangladesh

A couple of lessons can be learnt from the joint management of the Indus River. First of all, in order to make a treaty viable it is necessary to simplify the treaty as much as possible and feasible. Secondly, if negotiations are not progressing, a third party can be invited to facilitate or even guide the negotiation process; as was the World Bank's position during the Indus Treaty negotiations. The World Bank played an interesting part during the negotiation process. Not only did the World Bank facilitate negotiations by inviting both parties' delegations to the negotiation table. The World Bank also took a pro-active approach by mediating the negotiation process. A good example is the fact that the World Bank used the input from the Indian and Pakistani delegation to draft a new treaty proposal (the 1954 World Bank plan) to discuss with both parties. By actively interfering, the World Bank guided India and Pakistan during the negotiation process. The World Bank was able to take up this position because India and Pakistan needed the funds from the World Bank to develop the Indus River. By blocking any funds until an agreement was reached, the World Bank created one of the main incentives for India and Pakistan to collaborate.

The third and most important lesson that can be drawn from the Indus Treaty is that cooperation was seen as the best option by India and Pakistan to safeguard their long-term water supply (Alam, 2002). "It would appear that Indo-Pakistan cooperation occurred because water is scarce, vital, expensive, a security issue, demand is outstripping supply and a war would not guarantee future resources – neither water nor international finance – to build the infrastructure needed to use the water" (Alam, 2002).

6.5. Joint River Management Case Study: Mekong River

6.5.1. Situation

Joint management of the Mekong River did not develop overnight but was the result of a long collaborative process of over 50 years. The current Mekong River Commission is the third multilateral institution operating in the lower Mekong River. The countries Cambodia, Laos, Thailand and Vietnam are members of this organisation. After the introduction of the Mekong Committee in 1957 and the Interim Mekong Committee in 1978, the Mekong River Commission was established in 1995 by means of the 'Agreement on the Co-operation for the Sustainable Development of the Mekong River Basin'. This agreement encompasses principles of cooperation and rules for reasonable and equitable use of the basin's water resources. The Secretariat is the technical and planning arm of the commission and is led by the Chief Executive Officer. The establishment of the Mekong River Commission and its 2001 Work Programme signifies a shift in the lower Mekong river basin from a project-oriented focus to an emphasis on better management and preservation of existing resources (Jacobs, 2002).

6.5.2. Challenges

The Mekong River Commission has not been as successful as anticipated and hoped for (Backer, 2007). The Mekong River Commission is a small organisation with limited resources and cooperation initiatives have operated in a context of instability. South East Asia experienced wars and political instability that resulted in membership changes and funding problems. Remarkably, however, according to Jacobs two reasons exist why environmental and social instability resulted in high degree of organizational resilience of the Secretariat and committees (Jacobs, 2002):

1. "The lack of dams across the lower Mekong resulted in some unanticipated benefits, as conflicts that may attend the redistribution of benefits of dam and reservoir operations were avoided"
2. "The relatively good condition of the Mekong River basin ecosystem may also have helped dampen potential conflicts over water and related natural resources"

At the moment of writing, one of the other and increasingly main challenges for the joint management of the Mekong River is the fact that upstream developments – dams in particular – massively impact downstream river flows. China is not officially part of the Mekong River Commission – China holds observer status like Myanmar does – despite the fact that the country is increasingly developing or planning to develop dams in the upper parts of the river. Other challenges are related to the widespread poverty in the river basin as well as the increasing demand of water and environmental resources in the region (Jacobs, 2002).

6.5.3. Comparison with Ganges-Brahmaputra-Meghna river basins

Similar to the Mekong River basin, all of Bangladesh' major rivers flow through multiple countries. With the exclusion of China, however, none of the Mekong countries is significantly bigger or more powerful than any other of the participating countries. Power is more balanced in the Mekong River basin. By contrast (and more similar to the situation of Bangladesh), the member states have different aspirations as for how joint river management should be organised for the Mekong River basin (Backer, 2007). Whether countries are located up or downstream of the river impacts the joint river management ambitions, as is for example the case for downstream country Cambodia:

"[T]he direction of the development of the Mekong River basin is perceived to have a more direct and serious impact on the well-being of the country than what is likely for certain others of the regime members, which might make Cambodia more eager to see a strict regime than other members [of the Mekong River Commission]".

(Backer, 2007).

6.5.4. Lessons for Bangladesh

The establishment of the Mekong River Commission followed out of two developments. First, all riparian countries were willing to cooperate on water issues and, secondly, Cambodia political situation stabilized. In other words, in order to establish joint river management with India – and even China – it is important that all countries are interested in river cooperation as well as that participating countries are not too occupied with internal dynamics in order to be able to focus on collaborative initiatives. Furthermore, it is important to note that despite the establishment of formal cooperation by means of institutions similar to the Mekong River Commission, the success of joint river management is much more dependent on the willingness and aspirations of countries to cooperate in the basin.

7. Conclusion

7.1. Opportunities for Improved Regional Water Cooperation

Located downstream of the mighty Ganges, Brahmaputra and Meghna rivers, Bangladesh is very vulnerable for upstream river interventions. Changes in flows and sedimentation rates resulting from the development of the Farraka barrage may be illustrative of the type of impacts which may be expected should further upstream infrastructural development (and especially increased diversion of flows for irrigation consumption) take place. In addition, the frequency and insensitivity of floods is expected to increase due to climate change

In the coming decades, Bangladesh has to start preparing itself for more and bigger interventions in the upper parts of the rivers by other riparian countries. India and China have both proposed plans for hydro-power development, water diversion or new dam developments. Furthermore, the governments of these countries also allocated funds to realize those projects and some of the projects are even already being implemented. At the moment of writing, no guarantee exists that the Indian and Chinese governments will take the interest of Bangladesh into account. Bangladesh has only signed a treaty with India on the Ganges river. For the country's other 56 trans-boundary rivers, no agreements nor guarantees have been agreed.

In order to limit the negative impacts of these developments, Bangladesh has to focus on the establishment of close cooperation with upstream riparian countries; India, Nepal, Bhutan and China. These countries' actions will highly impact the water quantity as well as the water quality of the rivers entering Bangladesh. Implementing the water diplomacy

approaches described in this report can be a promising step in order to strengthen the position of Bangladesh in the Ganges-Brahmaputra-Meghna basins. Bangladesh needs to convince upstream countries of the extra benefits to be gained while focusing on the basin as a whole rather than to be restricted by the current political boundaries. By searching for mutual gains and by inviting different stakeholders to the negotiation table, the negotiations and outcome will become more flexible and accordingly it will be more likely the parties reach a mutually beneficial agreement or even establish joint management of the river basins.

7.2. Knowledge Gaps and Recommendations for Further Research

This report is an attempt to provide as much information on regional developments and prospects for future cooperation as possible. During the research, a couple of knowledge gaps were discovered that require more in-depth research however. First, some of the Indian State Water Policies seem to be non-existing. The water strategy of these upstream Indian States is therefore unknown for Bangladesh strategy and policy makers. Second, specific plans and projects of Indian States with relation to water, i.e. hydropower and irrigation plans, need to be further researched to examine the exact impact upstream developments will have on Bangladesh. Examples are the impact of the Indian dams on the eastern rivers Teesta, Manu, Khowai, Gumti, Muhuri and many others. Further research could also be conducted in order to understand the institutional and political dynamics within India. The State to State power dynamic has a lot of impact on foreign policy but it requires more research to understand these processes. With regard to China, it is so far unlikely China will connect the Brahmaputra to the western South-to-North Water Diversion Project. Further research needs to be done whether a diversion from the Brahmaputra could in the far future become economically feasible for China. Another knowledge gap is related to other international treaties and agreements that exist for rivers with multiple riparian countries as for example the Indus, the Rhine, the Danube, the Nile, the Mekong and the Zambia. Bangladesh can learn from the successes of some of these treaties.

8. References

Alam, U.Z. (2002) 'Questioning the Water Wars Rationale: A Case Study of the Indus Waters Treaty', The Geopgraphical Journal, vol. 168, no. 4.

Amarsinghe, U. A. and Sharma, B. R. (2014) 'Distress and promise: GBM riparian states of India', in Situation Analysis on Water, Food Security, Poverty, Ecosystems for Life: A Bangladesh-India Initiative, IUCN, International Union for Conservation of Nature.

Backer, E.B. (2007) 'The Mekong River Commission: Does It Work, and How Does the Mekong Basin's Geography Influence Its Effectiveness?',Südostasienaktuell 4/2007.

Bangladesh-Nepal Joint Study Team (1989) 'Report on Flood Mitigation Measures and Multipurpose Use of Water Resources'.

Bhushan, B. and Ahmed, J. (2014) 'An Analytical Review of Media Reports: Context of Trans-boundary Aspects of the Teesta/Tista River, Ecosystems for Life: A Bangladesh-India Initiative', IUCN, International Union for Conservation of Nature.

Bisht, M. (2012) 'Tipaimukh Dam: Some Myths, Some Facts', Institute for Defence Studies and Analyses, April 25 2012.

Bushan, B. and Ahmed, J. (2014) 'An Analytical Review of Media Reports: Context of Trans-boundary aspects of the Teesta River', Ecosystems for Life: A Bangladesh-India Initiative, IUCN, International Union for Conservation of Nature.

CEGIS (n.d.) 'Impact of upstream withdrawal of waters, presentation made by G.A. Choudhury.

Chowdhury, M.R. and Ward, N. (2004) 'Hydro-meteorological variability in the greater Ganges-Brahmaputra-Meghna basins', International Journal of Climatology, 24, 1495-1508.

Clingendael Institute (2011) 'Water Diplomacy: a Niche for the Netherlands?', Netherlands Institute of International Relations 'Clingendael'.

CWC (2014) 'Central Water Commission website', accessed on 17-11-2014.

Daily Star (2014) 'Southwest may turn wasteland, India plans to build 16 more barrages on Ganges', October 21, 2014.

Eoearth (2008) 'Water profile of India'.

Fierman, E. (2013) 'The Practice of Water Diplomacy in a Nutshell', in Islam, S. and Susskind, L.E. (2013) 'Water Diplomacy, a Negotiated Approach to Managing Complex Water Networks', RFF Press: New York.

FAO Land and Water Division (2012) 'Irrigation in Southernand Eastern Asia in figures,

AQUASTAT Survey – 2011', Rome.

Gain, A.K. and Giupponi, C. (2014) 'Impact of the Farakka Dam on Thresholds of the Hydrologic Flow Regime in the Lower Ganges River Basin (Bangladesh)', in Water 2014, 6, 2501-2518 (ISSN 2073-4441).

Government of Assam (2007) 'State Water Policy (Draft)'.

Government of Bangladesh (2010) 'Sixt Five Year Plan 2011-2014'.

Government of Bangladesh, Ministry of Law, Justice and Parliamentary Affairs (2013) 'Bangladesh Water Act', Legislative and Parliamentary Affairs Division.

Government of Bangladesh, Ministry of Water Resources (1999) 'National Water Policy'.

Government of Bangladesh, Planning Commission, General Economics Division (2012), Perspective Plan of Bangladesh 2010-2021.

Governments of Bangladesh and India (1996) 'Treaty between the Government of the People's Republic of Bangladesh and the Government of the Republic of India on Sharing of the Ganga/Ganges Waters at Farakka'.

Government of Bihar, Public Health Engineering Department (2010) 'State Water Policy – Draft 2'.

Government of India, Ministry of Water Resources (2012) 'National Water Policy'.

Government of Jharkhland, Water Resources Department (2011) 'State Water Policy'.

Government of Meghalaya (2013) 'State Water Policy (draft)'.

Government of Sikkim, Irrigation and Flood Control Department (2009)'State Water Policy'.

Government of West Bengal (n.d.) 'State Water Policy'.

Granit, J. and Claassen, M. (2009) 'A Path Towards Realising Tangible Benefits in Trans-boundary River Basins', in Jägerskog, A., Zeitoun, M. (2009) 'Getting Trans-boundary Water Right: Theory and Practice for Effective Cooperation. Report Nr. 25. SIWI, Stockholm.

Grey, Sadoff and Genieve Connors (2009) 'Effective Cooperation on Trans-boundary Waters: A Practical Perspective', in Jägerskog, A., Zeitoun, M. (2009) 'Getting Trans-boundary Water Right: Theory and Practice for Effective Cooperation. Report Nr. 25. SIWI, Stockholm.

Hussain, S.M. (2012) 'Towards a Bangladesh-India initiative', in Mishra, D.K. and Hussain, S.M. (2012) 'Situation Analysis on Inland Navigation, Ecosystems for Life: A Bangladesh-India Initiative, IUCN, International Union for Conservation of Nature.

Iyer, R.R. (1999) 'Conflict-resolution: Three River Treaties', Economic and Political Weekly, vol. 34, no. 24.

International Relations and Security Network (ISN) (2014) 'India, Bangladesh: Dam Diplomacy', ISN, Center for Security Studies (CSS), ETH Zurich, Switzerland.

Islam, M.N. (2014) 'Energy Security in the Ganges, Brahmaputra and the Meghna (GBM) Basins', in IUCN (2014) 'Situation Analysis on Energy Security, Ecosystems for Life: A Bangladesh-India Initiative, IUCN, International Union for Conservation of Nature.

Islam, M.N. et al. (2003) 'Teesta River Water Sharing: a Case Study in Teesta Barrage Project', Integrated Water Resources Management Unit.

Islam, S. and Susskind, L.E. (2013) 'Water Diplomacy, a Negotiated Approach to Managing Complex Water Networks', RFF Press: New York.

IUCN, 2014: "River Atlas: Sketching the Rivers flowing from India to Bangladesh". Attained via http://www.iucne4l.org/tbr-home.php on 20-10-2014.

Jacobs, J.W. (2002) 'The Mekong River Commission: Trans-boundary Water Resources Planning and Regional Security', The Geographical Journal, vol. 168, no. 4.

Jägerskog et al. (2009) 'Addressing Trans-boundary Water Management Challenges: Getting it Right', in Jägerskog, A., Zeitoun, M. (2009) 'Getting Trans-boundary Water Right: Theory and Practice for Effective Cooperation. Report Nr. 25. SIWI, Stockholm.

Joint Rivers Commission (2014), 'Joint Rivers Commission website', accessed on 17-9-2014.

Joint Statement (2011) 'Joint Statement on the occasion of the visit of His Excellency Dr.Manmohan Singh, Prime Minister of India to Bangladesh'.

Joint Communique (2010) 'Joint Communiqué issued on the occasion of the visit to India of Her Excellency Sheikh Hasina, MP, Prime Minister of Bangladesh'.

Kirby, A. et al. (2014) 'Review the Maritime boundary verdict in the Bay of Bengal (India and Myanmar)', review the Maritime boundary verdict in the Bay of Bengal (India and Myanmar).

Knanom, S. (2014) 'Teesta Water Sharing Agreement and Bangladesh-India Relations', Bangladesh Institute of International and Strategic Studies (BIISS), presentation during Teesta Workshop, Monash University, October 16-17 2014, Dhaka.

Mahajan et al. (2014) 'An Exploration of Cooperation Potentials for Energy Security in the GBM Region', in IUCN (2014) 'Situation Analysis on Energy Security, Ecosystems for Life: A Bangladesh-India Initiative, IUCN, International Union for Conservation of Nature.

Mahanta, C. (2012) 'Climate change impacts and north-east India', in IUCN (2012) 'Situation Analysis on Climate Change, Ecosystems for Life: A Bangladesh-India Initiative', IUCN, International Union for Conservation of Nature.

Mahmood, S.A.I. (2013) 'Imact of climate change in Bangladesh: Role of two governments', Journal of Ecology and the Natural Environment, vol 6(3), pp. 119-125.

Mirza, M.M.Q. (1997) 'Hydrological changes in the Ganges system in Bangladesh in the post-Farakka period', Centre for Environmental and Resource Studies (CEARS), University of Waikato, Private Bag 3105, Hamilton, New Zealand, in Hydrological Sciences 42(5) October 1997.

Mishra, D.K. (2012) 'Navigation cross-boundary rivers: an India perspective', in Mishra, D.K. and Hussain, S.M. (2012) 'Situation Analysis on Inland Navigation, Ecosystems for Life: A Bangladesh-India Initiative', IUCN, International Union for Conservation of Nature.

Mullick, R.A. (2010) 'RW02 Flow characteristics and environmental flow requirements for the Teesta River, Bangladesh', Water Engineering and Management, Asian Institute of Technology, Bangkok, Thailand, Proc. of International Conference on Environmental Aspects of Bangladesh (ICEAB10), Japan, Sept. 2010.

Pangare, G. and Nishat, B. (2014) 'Perspectives on Hydro-Diplomacy' in IUCN (2014) 'Hydro-Diplomacy: Sharing Water Across Borders, New Delhi: India: Academic Foundation'.

Pant, H.V. (2007) 'India and Bangladesh: Will the Twain Ever Meet?', Asian Survey, vol 47, no 2, pp. 231-249.

PRIO (Peace Research Institute Oslo) (2013) 'Water Scarcity in Bangladesh, Trans-boundary Rivers, Conflict and Cooperation', PRIO Report 1-2013 (various authors, ISBN 978-82-7288-485-6).

Ranjan Singh, R.K. (2009) 'Communities Say No to India's Tipaimukh High Dam', International Rivers, September 2009 World Rivers Review/4619.

SaciWATERs (2014) 'Trans-national dialogue towards effective Co-basin management of trans-boundary rivers: Learnings from the Brahmaputra River basin', presentation during Teesta Workshop, Monash University, October 16-17 2014, Dhaka.

Saran, S. et al., (2014) 'Attitudes towards Water in India', Observer Research Foundation.

SAWI (2014) 'South Asian Water Initiative website, Abu Dhabi Dialogue: 2006', accessed on 17-11-2014..

Shreelakshimi, K. (2012) 'Impacts in India: key issues', in IUCN (2012) 'Situation Analysis on Climate Change, Ecosystems for Life: A Bangladesh-India Initiative', IUCN, International Union for Conservation of Nature.

Strategic Foresight Group (SFG) (2013) 'Rivers of Peace, Restructuring India Bangladesh Relations', India: Mumbai.

Subedi, S.P. (1999) 'Hydro-Diplomacy in South Asia: The Conclusion of the Mahakali and Ganges River Treaties', The American Journal of International Law, vol. 93, no. 4, pp. 953-96.

Tibetan Plateau (2010) 'Damming Tibet's Yarlung Tsangpo-Brahmaputra and other South Asian rivers', May 24, 2010.

Walker, B. (2011) 'Saving south Asia's water', The Third Pole, 01.11.2011.

WARPO (2004) 'National Water Management Plan'.

Wirsing, R.G. (2012) 'The Brahmaputra: Water hotspot in Himalayan Asia', Global Water Forum, June 2, 2012.

General Assembly of the United Nations (1997) Convention on the Law of the Non-navigational Uses of International Watercourses.

UNITAR (2014) 'Introduction to Water Diplomacy - Module I'.

UNITAR (2014) 'Introduction to Water Diplomacy - Module II'.

UNITAR (2014) 'Introduction to Water Diplomacy - Module III'.

Upadhyay, S.N. (2014) 'Regional Cooperation and Challenges of Water Management in South Asia', GWP Nepal/JVS, presentation.

BASELINE STUDY: 25

Part -I
Finance mechanisms & arrangements in the water sector in Bangladesh

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Executive Summary: Study 25

Bangladesh's economy has grown rapidly over the last decade, at average around 6% annually. If this rate of growth is sustained, Bangladesh will be transformed in the next 5 to 10 years into the first stages of an upper middle income country. Due to the changing status of the country Development Partners might shift away resources to other countries. For this reason, it is important that Bangladesh prepares itself to develop more independent national funding sources in order to finance the large future needs in the water sector (and for climate adaptation).

This report on financing mechanisms addresses the following three main questions:

- What are the current practices of financing water and water related investments and what are the current funding mechanisms of their operations and maintenance (O&M) activities?
- How to arrive at a new financing as well as a more self-sufficient funding arrangements in the medium and long term, making use of a transition period in the next 15 to 25 years.
- Implementation of BDP will require large investments. The GoB decided to allocate about 2% of GDP annually (in 2015 prices USD 4 billion or BDT 320 million) for Delta Plan related projects. From which sources will this 2% GDP allocation be sourced in the short, medium and long term?

Budgeting in Bangladesh is done on an annual basis, though a limited medium-term perspective is provided through the Medium-Term Budgetary Framework (MTBF). The annual budget is comprised of an investment and technical assistance expenditure portfolio, called the Annual Development Programme (ADP), and a recurrent cost budget, called the non-development budget (NDB). Over the last five years the total annual budget has risen between 9% and 24% year-on-year, from 1,321.70 billion BDT in 2010-2011 to 2,505.07 billion BDT in 2014-2015. In terms of the ADP share of total GDP, this means an increase of over 50% (from a share of 3.2% to 5.0%). The majority of the budget goes to the NDB (c. 70%), with the ADP taking up a smaller share (30%). A key issue is that according to a Report from World Bank (World Bank 2015) that due to high capital expenditure growth sourced by loans from Development Partners and national loans interest payments rise and non interest payments decline over the years 2006-2014. This accumulates into a potentially unhealthy mixture.

Below we summarize some important facts:

- Bangladesh has among the lowest revenue collection rates in the world and, whilst significant progress has not yet been witnessed, there is a recognition of the need to improve collection rates (not least in the 7th FYP) and steps are being taken to strengthen the tax collection apparatus;
- Although a persistent gap between GoB revenues and expenditure exists, net foreign financing of the deficit declined significantly from around 4.8% of GDP in the 1990s to less than 2% of GDP in recent years, while net domestic financing increased from 1.6% of GDP in 2000 to 3.3% in FY13;
- Foreign loans and grants still finance 30-40% of the ADP, but a declining tendency in DPs' contributions to the ADP is being observed and is expected to continue as Bangladesh consolidates its status as a middle income country;
- The May 2014 Debt Sustainability Analysis conducted by the IMF and World Bank offered a positive prognosis, concluding that Bangladesh is at low risk of an external or domestic debt crisis;

Nonetheless, despite quite sustainable public debt there are some serious public investment challenges:

- ***Dual budgeting system with a one year focus and insufficient O&M budget***. In general, a single year budgeting system is not conducive to the effective financing of long-term projects and programmes. Most projects in the ADP have a multi-year duration, but resource allocation takes place on a single-year basis. There is a wide consensus that operations and maintenance (O&M) receives insufficient financial support to ensure sustainability of investment projects.

- ***Weak alignment of national/sectoral strategies with actual expenditure.*** There is a weak alignment between individual projects and national development priorities espoused in the 7th FYP. This is caused in large measure by a lack of strategic planning at both sector and Ministry-levels:
- There is an ***overall proliferation of projects in the ADP***, with the result that there is insufficient funding for individual investments. This results from a combination of politicisation of the approvals process and poor administrative practices whereby projects are designed, appraised and ultimately approved regardless of fiscal space. An *overloaded ADP* with resources spread too thinly translate into *time overruns up to 65%-75% and cost overruns up to 40%;*
- ***Project design, appraisal and approval challenges*.** Aside from the overall weak alignment with strategic priorities and unaffordability highlighted above, there are also significant, related weaknesses with the way in which individual projects are designed, appraised and approved. These weaknesses can be ascribed to two main factors – firstly, weak project design, appraisal and approval capacities and procedures; and secondly, heavy politicisation of the entire process;
- Numerous ***project implementation challenges*** are faced stemming in part from the project design and funding weaknesses highlighted above as well as from limited implementation capacity on the part of contractors and shortcomings in the project supervision capacity of MDAs. These challenges manifest themselves in the aforementioned cost and time overruns as well as in projects that simply do not (fully) meet their objectives.
- Current **Monitoring and Evaluation** practices are insufficiently result oriented and do not provide sufficient management information that can be used at either polity or operational levels. The current M&E system is therefore not able to serve as a powerful tool for policy makers to align project outputs and outcomes to national and sectoral strategies.

Current financing mechanisms in the water sector

Flood protection and water availability including navigation

Investment projects dealing with flood control, irrigation, drainage, dredging, river training, etc. are in general funded by the Government of Bangladesh (GoB) as well as DPs, like the World Bank, ADB and JICA. DPs are usually providing concessional loans (soft loans) with a very low interest rate and a long term repayment period (32 to 40 years), with 8 to 10 years grace period. From the GoB side there are hardly any regional and/or local financial contributions in place (for example from local charges and/or local taxation systems, like a water user charge (for extraction) to contribute to the overall project costs).

Key issues are:

- The available budget for existing and new flood protection infrastructure is currently not sufficient (too low) to properly operate and maintain the infrastructural facilities.
- BIWTA, along with other bodies, responsible for development and maintenance of navigability by dredging and river training, is also unable to recover its operational costs (let alone investment costs) from revenues.
- Farmers in Bangladesh do not pay for use of per unit of irrigation water. For irrigation small fees are being paid by farmers, which partly cover the O&M costs of the irrigation system. Investment costs of irrigation systems are financed by the GoB and/or through loans from DPs. Large scale irrigation systems have traditionally been characterised by low cost recovery and the government aims to hand these over to private management through leasing, concession, or management contract under open competitive bidding or jointly managed by the project implementing agency along with local government and community organisation. Since 2000, substantial efforts have been made to improve irrigation MOM through the introduction of participatory irrigation management, which has been generally successful on small and medium-sized schemes in Bangladesh but yielded limited results for large schemes

Drinking water supply and sanitation

- Service levels are very low. In 2013 an ADB report[4] indicated that the operation and maintenance (O&M) of the water supply system is Bangladesh is inadequate, as reflected in high water losses or what is technically termed non-revenue water (NRW). The NRW in Dhaka is estimated about 30%; Chittagong and Khulna are estimated to have similar levels;
- Full cost recovery is not being achieved anywhere. According to a benchmarking study (World Bank 2014, WSP programme report), operational cost recovery was achieved by all groups of utilities (in survey 33 utilities involved). Only operational costs are recovered: on average the rates of operating cost recovery are between 1.20 and 1.40 in the period 2007-2012. No water utility reported investments from its own finances. But, this does not mean that the current expenditure levels are reflecting an adequate service level standard.

In general we can conclude: tariffs are not yet set at full cost recovery levels and funding for investment and maintenance is below the needed levels. This implies a lack of funding/revenues for all expenses. And as a consequence this is resulting in deterioration of the water supply infrastructure and less drinking water availability for the population.

Private sector funding

Currently (2016), private sector engagement and funding in the water sector in Bangladesh is very limited . A number of obstacles are reported by private firms in a survey for BDP2100. These are: late payments by government clients, fragmentation of contracts, selection of contractors based on low costs proposals, bribery and bureaucracy, lack of experience with PPP or concession regulations, etc. (see also Chapter 18 regarding private sector engagement). In order to attract more private sector engagement and especially private sector funding these bottlenecks need to be overcome.

In order to attract more private funding for water services private sector operation and delivery of the services would be needed. Models for private sector service delivery are basically privatization or Public Private Partnership (PPP). Although in 2015 PPP act is implemented and a PPP office is operational no PPP water projects are currently in the PPP project pipeline (projects are mainly in transport and health sectors). Important barriers for private delivery of water services (PPP or privatized) are:

- Lack of revenue potential due to low cost recovery;
- Lack of experience and capacity regarding PPP in public and private sectors;
- Limited dialogue between public and private sector.

In order to overcome these barriers it is recommended that a number of activities will be started to create a PPP enabling environment. Important actions are to pilot with financial performance improvement TA projects in the water supply sector, start-up a PPP vehicle for PPP capacity building, stimulating PPP pilots in the water sector and to create a financial mechanism (viability gap funding and guarantees) for PPPs in Bangladesh.

Development Partners' (DP) funding of core water services

An analysis of the ADP for FY2009/10 up to FY2013/14 on sector and project level revealed that over this 5 year period, the share of total investment portfolio of BDP2100 core sectors[5] in total ADP investment portfolio fluctuated between 10-15%. At the same time, the power and transportation sectors (excluding IWW), which are closely related to BDP2100, took up an increasingly higher share (from 32% in 09/10 to 43% in 13/14) of the ADP total investments portfolio.

[4] Dhaka Environmentally Sustainable Water Supply Project (RRP BAN 42173), September 2013, Sector Assessment WS and other Municipal Infrastructure Services

[5] BDP2100 core sectors are: Water resources, Irrigation, Water supply and sanitation (from WASAs, CCs, DPHE and LGED) and Inland water ways (IWW)

The dynamics of related annual expenditures of BDP2100 core sectors investment projects are captured in the table below. The average of allocated annual investment expenditures of BDP2100 sectors in total ADP expenditures is 13% in this 5 years period (with fluctuations varying between 10 and 16%). The share of total annual BDP2100 relevant investments equated, on average, to 0.6% of GDP, while total ADP annual expenditures as percentage of GDP is 4.7%.

The current involvement of Development Partners (DPs) in funding the BDP2100 core water services is substantial. On average DPs are financing more than 45% of total annual expenditures in this 5 years period (with fluctuations between 39 and 53%). Looking closer, it appears that especially inland water ways, irrigation and (perhaps surprisingly) water resources are mostly funded through GoB resources. Water supply and sanitation (through WASAs, CCs, DPHE and LGED) or briefly called WATSAN are clearly predominantly funded through DP resources

Ways of financing by DPs

Looking at major BDP2100 relevant investments made by development partners in the last 15 years it appears major DPs use mostly concessional loans to provide assistance to water projects (see figure below). Only a few distribute non-concessional finance in Bangladesh, and most also offer other funds such as blend finance (mix concessional and non-concessional loan) and grants. It can be observed that many loan providers are financing projects in core BDP2100 sectors, such as water management and WATSAN.

The portfolio size of these investments is to the tune of 6.5bln USD (in current prices). The GoB has approximately taken up one fifth (19%) of these costs, whereas DPs have financed the majority of the share (81%), where they used mostly concessional loans (74%) and a small share with grants (7%).

The following priorities of development partners can be mentioned:

- Climate change adaptation seems to be a cross cutting topic which is a priority for almost all development partners and NGOs.
- BDP2100 formulation process coincides with the formulation processes of multi annual country strategies by major development partners (ADB, WB, DFID, USAID, among others).
- COP21 in Paris has led to increased climate finance commitments by many of the main development partners of Bangladesh, including World Bank, ADB, JICA, DFID, amongst others.

The most important climate fund relevant for Bangladesh is ***the Green Climate Fund*** (GCF). This fund is hailed as one of the main mechanisms to distribute $100 billion a year of climate finance worldwide by 2020. Currently, GCF has received 10.3bln US$ equivalent in pledges which will serve its 2015-2018 programming period and aims to take funding decisions of $2.5 billion dollars in 2016. Flood protection, water availability and transportation are fully congruent with GCFs climate adaptation and mitigation strategies. But also WATSAN interventions of BDP2100 may be aligned with GCF under its sixth strategic impact ´Food, water security and Health´ where the fund states that it can improve water sanitation and management systems and infrastructure in urban areas. In this way the Fund can seek to improve water management systems and infrastructure (Elements 2016, p.44).

BDP2100 could provide crucial substantiation to projects proposed to the GCF; projects included in the BDP2100 investment plan by default adhere to Adaptive Delta Management principles (relating to specific criteria such as impact potential, sustainable development potential, efficiency and effectiveness and needs of the recipients) and per definition denotes country ownership. If GCF indeed becomes the main mechanism for climate finance this could become an important source for BDP2100 finance.

International practices funding and financing arrangements

More than 40 cases on funding and financing arrangements have been investigated from about 30 countries all over the world (including some cases already in place in Bangladesh). The international practices show a number of examples which might also be relevant for Bangladesh; of which some are mentioned below.

Flood protection and water security

In a number of countries *dedicated funds* have been set up to allocate resources for specific purposes in the climate or water sector. Recently especially in the field of climate change a number of funds have been established earmarking financial resources for specific aims and types of projects. Examples are the Green Climate Fund (GCF – see Chapter 5) or the Sustainable Water Fund or in the Netherlands the *Delta Fund*.

In countries such as UK or Nigeria examples are shown of *Public Private Partnership (PPP) models* for flood protection. Often scope extension - combining water protection with land reclamation or urban development - is used to tap into new revenue streams. This could be most relevant in the medium and long term for coastal zones and urban areas in Bangladesh. In the UK PPP models with availability payments[6] for flood protection infrastructure have been started.

Water availability and river transport

The report mentioned above shows interesting *water pricing systems in irrigation* from Israel, irrigation PPP model from Morocco and a combined system from South Africa. Some of these private irrigation schemes and water pricing models could be relevant for application for new irrigation projects in Bangladesh.

Water supply and sanitation

In this sector a range of market based arrangements has been found which all aim to improve cost recovery:

- Optimal tariff setting (gradual increase scheme tariffs in Senegal, block tariffs in Fiji etc.);
- Smart metering and innovative payment and billing systems (cases from Africa);
- Innovative leak detection in order to reduce non-revenue water (Mozambique);
- Introduction of benefit charging and polluters pay principle (example water extraction in the Baltics);

Apart from market based arrangements a number of institutional developments are interesting:

- Small scale plug and play water purification stations operated by private sector (rural areas or peri-urban areas);
- Community or private operation of small drinking water operations (rural areas Haiti);
- PPP and privatization (Manila Water, Chile, Netherlands PPP Waste Water Treatment).

Finally, a number of innovative financing instruments have been investigated based upon principles of revolving funds, blending grants and/or guarantees with repayable finance and pooling.

Potential pathways for Bangladesh are presented below based upon the lessons from the international practices.

Lessons learned from international practices

Market based instruments

The dominant finance and funding instruments within the international practices of market based mechanisms are based on cost recovery and several forms of benefit charging, all aimed to improve the financial performance of the water services delivery. What is clear is that especially for flood protection projects governments always play an important role, whereas in the other subsectors more mixed arrangements can be seen. Important reoccurring lessons learned from practices regarding market based mechanisms include:

- Willing governance, political commitment and leadership;

[6] An availability payment contract is a contract in which a payment for performance of the concessionaire is agreed irrespective of demand. This is an option in projects that generate no revenues from users or inadequate revenues to cover full cost of construction and ongoing operation.

- Registration systems and water metering are important conditions;
- Sufficient and fair monitoring is in place;
- Proper stakeholder communication and participation; and
- Sufficient and realistic charges and incentives.

Institutional arrangements

Internationally, there are many cases involving private actors and private capital in water service delivery. The fact that Public-Private Partnerships (PPP) take up a large share of the cases indicates that PPP is widely recognised as a promising contracting or funding arrangement in the water sector, both in developed and developing countries. Scope extension projects are innovative arrangements which extent the provision of water services by including revenues from non-water services such as land development, land reclamation, transport, urban development, and energy production.

Securing the involvement of private capital is the main recurring theme throughout the lessons learned of the institutional arrangements. Cooperation with private partners can lead to significant (public) cost reductions and efficient management. However, the downside of cooperation with private actors is that private actors do exactly what they are paid for, but no more than that. Lessons learned therefore additionally include:

- Strong monitoring mechanisms, sound performance indicators of quality specifications, and decent contracts;
- Active multi-stakeholder engagement and capable and solid governance and governments;
- Sufficient demand for the project's additional revenue sources (land demand, toll road traffic, urban development, tourism).

Financing mechanisms

Financing mechanisms aim to attract more private finance in the water sector through innovative financing mechanisms aiming at reducing risks or losses, decrease transaction costs and diversification of risks. Mechanisms include viability gap funding, match funding, revolving funds, blending instruments and pooled funds. The main actors in these arrangements are aid and development banks, private banks, governments, and (local) NGOs. The NGOs, take the role to connect the funds to local actors. These often use micro-credit like mechanisms to ensure sustainable development projects. Reoccurring lessons learned from international practices related to institutional arrangements include:

- A sufficient level of private sector and financing expertise is required to develop and sustain blending and pooling mechanisms.
- Government or donor grants or guarantee mechanisms are often important in order to attract private finance.

Specific lessons from the Netherlands and the UK

In the Netherlands, semi-public drinking water companies and a set of regional water boards operate regional drinking water & sewerage systems and regional water management systems at full cost recovery level based upon a system of water tariffs and levies. The Netherlands tends to ensure strategic, long-term expenditures on flood protection and water supply by the realisation of the Delta programme, the Delta Commissioner and a specific Delta Fund. The Delta Commissioner's task is to promote the development and implementation of the Delta Programme and the financing of future measures is invested in the Delta Fund. The Delta Fund has been established to ensure that in the long-run sufficient funds are available to ensure realization of necessary national measures regarding flood protection and freshwater supplies in the Netherlands. The Delta Fund has its own budget, which is an independent part of the national budget.

In the UK system, the burden of drinking water and sanitation services for the public budget is minimised. Private water utilities and sewage companies are full cost recovery based and can attract capital from private banks or capital markets.

A lesson from the UK is that private operations of water and sewerage can be efficient, but needs a proper regulator. This is a system Bangladesh could aim for in the long run after improving financial performance of water utilities in the next decade(s).

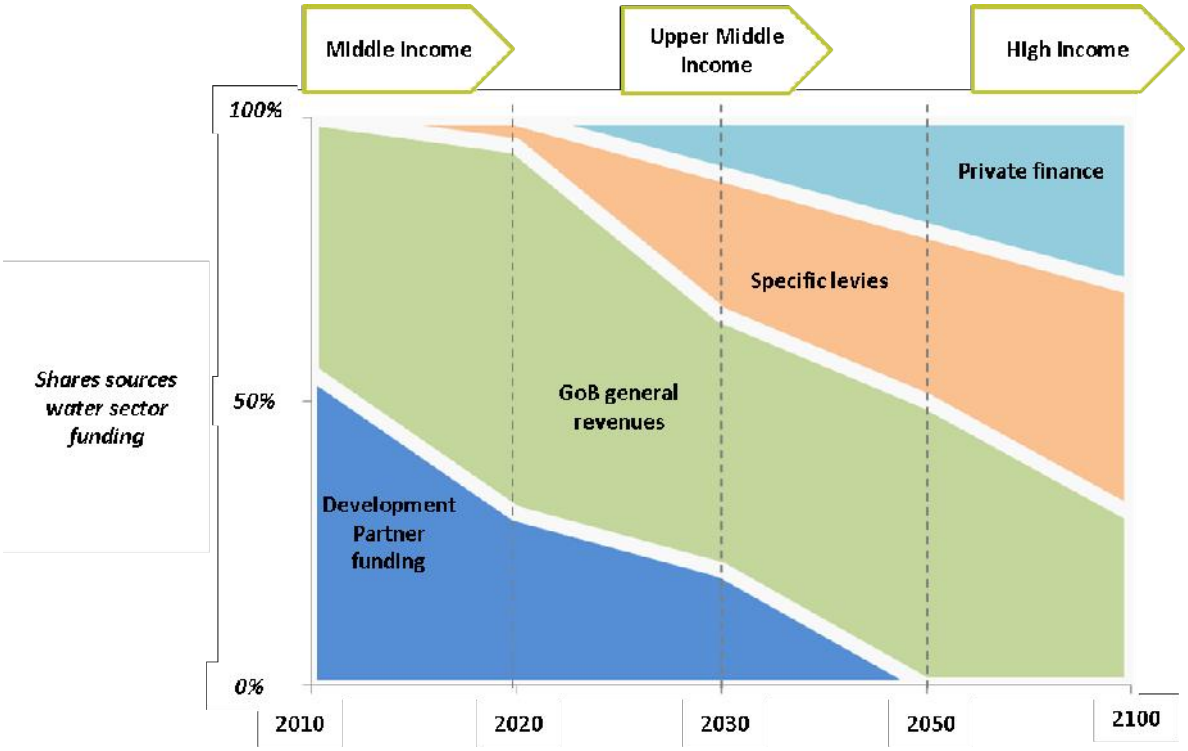
The way forward and short term actions

Aspirations for composition of water sector funding

Aspirations for water sector funding are based on the transformation process from low income country to the first stages of a middle income nation by the year 2021 and consolidation of its growth to become a full-fledged developed country by 2041. It is also based on the on-going process within GoB to a higher self-dependency level as Development Partners will shift their focus to other low(er) income countries as Bangladesh transitions towards a full middle/high income country. Besides, in the first half of the 2020's the Green Climate Fund (GCF) is probably fully operational and Bangladesh would be, with the support of BDP2100, well aligned with GCF's priorities. GCF would therefore potentially provide substantial funding for a significant part of investments in flood risk reduction for many years.

As in many countries in the world, the general tax revenue budget would remain the major contributor in financing flood risk protection measures (in the medium and long term). Specific levies (possibly being differentiated per region) might be introduced slowly after 2030 (when the general tax system is optimized and all people are registered/having own bank accounts, etc.). Private sector involvement in flood risk protection and water availability is likely to be limited in the short term as this requires an advanced level of administration where taxes and levies are collected by the state on a national basis. However, launching big operation and maintenance contracts for a long period (minimum 10 to 15 years) for flood protection works might be attractive and would challenge the private sector to invest in equipment, new technologies, etc.

In the water supply and sanitation (WATSAN) sector specific levies (through a tariff system) already exist today (2015). Although currently (2015) cost recovery levels in this sector are low, as well as their service levels, WATSAN is gradually improving their business.



Aspirations for composition of water sector funding in Bangladesh

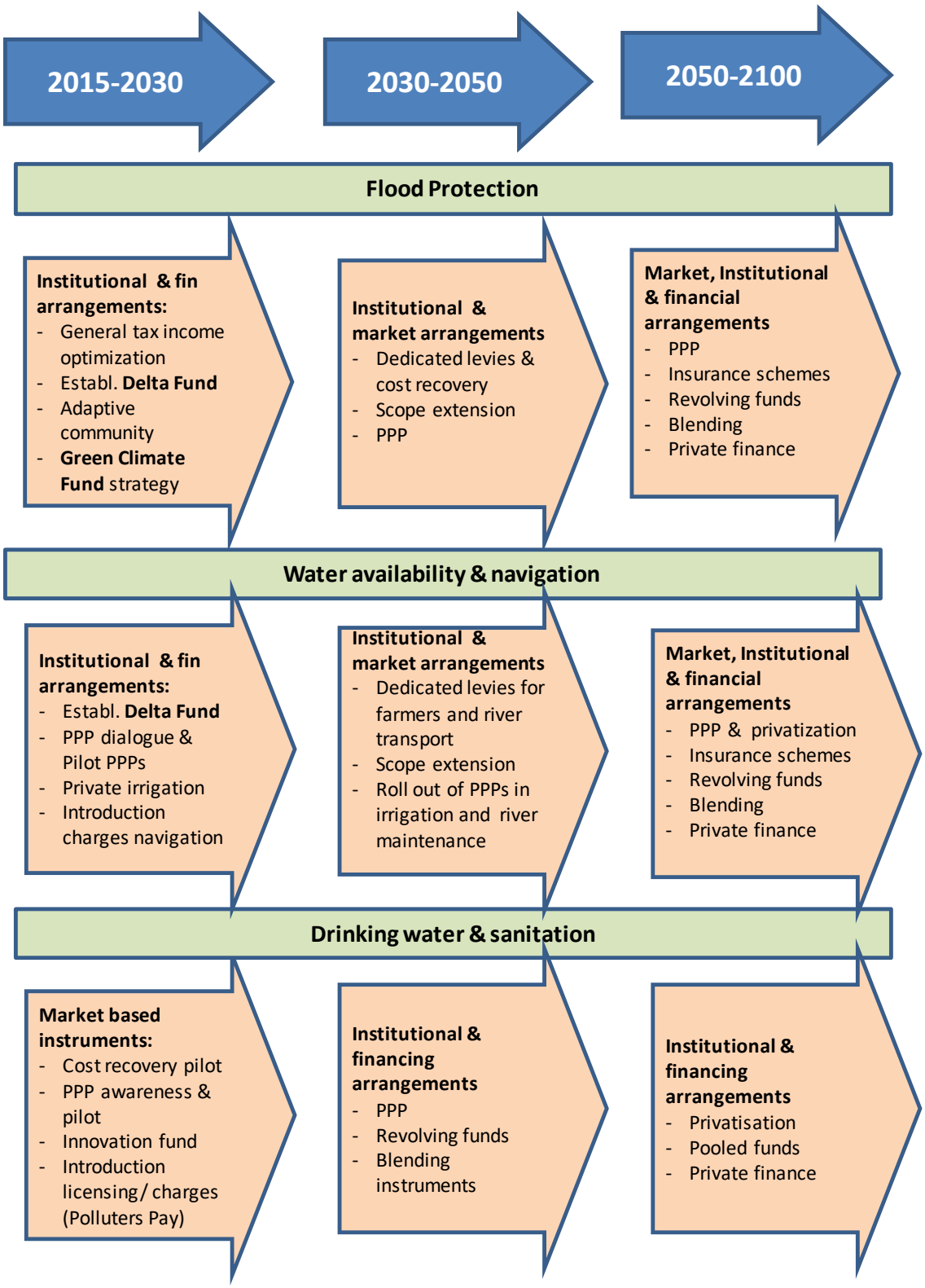
First, big improvements would be realized in the major cities (Dhaka, Chittagong). Both WASAs are gradually operating in a more sustainable way, significantly upgrading their service level (including drinking water quality) and applying more affordable (block) tariffs aimed at full cost recovery in a 10-years period.. Dependency on the GoB's budget for investments in this WATSAN sector will slowly come down as full cost recovery principles would be introduced gradually. In Pourashavas, where huge investments in water supply systems and sanitation would be realised, spread over a period of 15 to 20 years (aimed at fulfilling the SDGs for water and sanitation), full cost recovery targets will take much longer. After 2030, when in a number of cities WATSAN is technically and financially sustainable, the private sector will start to participate leading to a number of PPPs in this sector or even private entities. Such a development would mean that the central government grant funding responsibility might be faded out.

The same process might happen in the irrigation sector, in which large scale irrigation investment projects will implement sustainable operations in the next 10 to 15 years. This would be realised through PPPs and cost recovery principles being applied, based on tariffs to be paid by the farmers. Another example concerns river transportation: river operations and maintenance might be realised by establishing a River Authority, entering into large contracts with private firms through PPP, and introducing a specific levy for dredging activities to be paid by all vessels using the river system.

In order to achieve the envisaged funding structure for the water sector a number of policy directions are necessary. Potential pathways for Bangladesh are presented below based upon the lessons from the international practices.

These policy directions are shown per subsector in the picture below and are summarized as follows:

- For ***water safety*** (flood protection) purposes first of all current practices of general tax collection (systems, experience) etc. need to be improved. In the period 2015-2030 it is advised to establish as soon as possible a dedicated Delta Fund (under the Delta Commission) funded by tax income and Development Partners' contributions as well as making use of financing from the *Green Climate Fund* (GCF). More sophisticated financial instruments for flood protection could be introduced after 2030 (such as viability gap funding, availability payment schemes for flood defence PPPs, match funding and blending grants and loans).
- In the sector ***water availability (including irrigation) and river transport (navigation)*** the introduction of private water pricing schemes for farmers and more tailored "conservancy" charges for vessels could be feasible interventions for the short run (until 2030). In the longer run, PPPs for river operation & maintenance and larger scale irrigation schemes seem more feasible.
- For ***drinking water & sanitation*** the cost recovery of water services needs to be improved in the coming years. A pre-condition for success is a substantial improvement of the service level of these activities. Measures regarding the enabling environment and improving cost recovery are conditional for the start of PPPs and privatization. As a consequence these measures can be stated as "more urgent". Implementation of PPP in the drinking water and sanitation sector is therefore more feasible after 2030 (although a first pilot project might start before 2030).



Directions and potential practices for the future funding and operation of water services in Bangladesh

Short term strategy for budget allocation and sourcing

The aspirations as outlined in the previous sections are translated in this paragraph into proposed budget allocation targets and a sourcing strategy for BDP implementation on the short term (<2030).

Table 2 presents the actual share of investments in Delta Plan related thematic areas as % of GDP and a proposal for the future budget allocation targets. This proposal is in line with the agreed 2% allocation of GDP to BDP2100 interventions/measures as already included in the 7th FYP (2016-2021). It is strongly recommend to continue this ***annual*** budget allocation of 2% of GDP for the next FYPs (8thFYP, 9thFYP, etc.). This annual budget allocation will be used to source the proposed Bangladesh Delta Fund, to be established with the objective to make resources available for investments as well as related O&M costs.

Actual and proposed BDP2100 Investment and O&M budget allocation

Annual budget allocation (as % of GDP)						
		Actual		*Proposed Targets*		
		FY10	**FY15**	**FY20**	**FY25**	**FY30**
A	**Budget allocation investments**	0.60	0.70	1.70	1.60	1.50
B	**Budget allocation O&M**	0.05	0.05	0.30	0.40	0.50
C	**Total annual BDP budget allocation**	0.65	0.75	2.00	2.00	2.00

Source: BDP2100 team

Current water and water related budget allocations are summing up to 0.7% of GDP for investments and to 0.05% for related O&M activities in recent years[7] (resulting in an allocation of 0.75% of GDP in total). Without implementation of BDP2100 this level of investments in water and water related activities will remain the same in the near future. This is also valid for the relatively very low level of related O&M activities in case no additional (policy) actions will be taken to improve the sustainability of the (existing) assets. However, implementation of BDP2100 will require huge investments as well as a substantial increase in O&M activities in the short term (as well as in the medium and long term). As mentioned above for this reason the 2% of GDP will be allocated annually, causing a substantial resource gap of 1.25% of GDP (annually), already from FY2016 onwards.

Budget allocations for BDP2100 investments will increase from 0.7% of GDP to 1.7% of GDP in FY2020 (more than doubling the available budget). Moreover, a substantial increase will be earmarked for operations and maintenance (O&M), increasing from the current level of 0.05% of GDP to 0.30% of GDP in the corresponding FY. As time goes by, more and more investment projects enter the operational stage and thus the related O&M costs will accumulate significantly. Therefore, a growing share of budget allocation for O&M activities is badly needed, every 5 years period at the expense of the investment budget allocation. By FY2030, the allocation towards O&M will increase to 0.50% of GDP while investments will be scaled down in relative terms to 1.5% of GDP. As such, 25% of BDP2100 budget will be earmarked for O&M in FY2030, which is a fourfold increase compared to current levels (6.7% in FY2015). This greatly contributes to the sustainability of BDP2100 and ultimately saves significant sums of money in future as excessive remedial investments are avoided.

The BDP2100 Main Report (volume 3, Chapter 16) will reflect on whether the 2% GDP annual funding level is adequate to finance the present investment planning programme for the short term.

[7] Assumption based on figures presented by PRI

Table 3: BDP2100 sources of finance for the short term (<2030)

Sources of BDP annual budget (allocations as % of GDP)						
		Actual		*Targets*		
		FY10	**FY15**	**FY20**	**FY25**	**FY30**
A	**GoB O&M**	0.05	0.05	0.30	0.40	0.50
B	**GoB investment**	0.30	0.35	0.90	0.70	0.65
C	**DP investment**[8]	0.30	0.35	0.40	0.40	0.25
D	**GCF new investment**	-	-	0.39	0.45	0.50
E	**Private finance**	-	-	0.01	0.05	0.10
F	**Total annual BDP sources**	0.65	0.75	2.00	2.0	2.00

Source: BDP2100 team

When discussing the BDP2100 sources of finance, it has to be stressed here that not only the substantial resource gap of 1.25% of GDP needs to be taken into account, but the current allocation of 0.75% of GDP as well! Main messages are as follows:

- Current allocation of 0,75% of GDP is far below the investment needs and needs to be increased towards 2%
- O&M will increase in importance and public funding for higher O&M needs to be secured
- Private funding can only play a limited role (2-4% share, 0,1% of GDP) until 2030 due to number of obstacles but could grow in after 2030

Short term actions

The following short term policy actions are important to generate additional funding sources for the investments needs in the water sector.

General

- ***To establish a Delta Fund in Bangladesh*** under the Delta Commission based upon the example from the Netherlands. Such a dedicated fund to be tailored to the Bangladeshi situation aims to cover long term investment costs as well as recurrent maintenance costs of flood protection infrastructure and other water management related services.
- The ***current taxation system should be improved*** aiming at higher tax collection and revenues to feed the annual budget of the GoB and implicitly water related services and, in addition dedicated levies for water services should be introduced.
- Create the ***conditions for payments of the public for water services***. Important elements in creating a willingness to pay for water services are quality of water service delivery, transparency regarding the use of payments and accountability. In order to stimulate willingness to pay, it is therefore important to separate financial flows for the water system from the general budget and taxes and create a system of cost recovery levies for drinking water and sewerage and waste water treatment.
- Better ***enforcement of environmental regulations*** in order to set the conditions for water extraction and/or pollution charges and/or licensing systems. By enforcing environmental regulations, the costs (penalties) for

[8] DP investments are a forecasted levels of investment over time and are not proposed targets

polluting companies will increase and incentives for own treatment systems might increase. The introduction of water extraction licenses or caps could also introduce incentives for investments in water use efficiency improvement in companies.

Climate resiliency or water safety

- To create *a* **Delta Secretariat with a Programming Wing as part of the Delta Commission**. The Programming Wing will include a Project Preparation Cell, which will initiate (pre-feasibility studies and detailed concept notes through out-sourcing, initiate land acquisition prior to project implementation.
- To prepare a ***strategy and team in order to gear investment programmes and develop ready projects for the Green Climate Fund*** (GCF). Because the Green Climate Fund is a new source of donor funding, this source should be tapped by GoB and the private sector in Bangladesh in an optimal manner. GCF will often work with national co-finance and private finance elements. Therefore, those climate adaptation programs and projects need to be prepared which suit GCF financing conditions best. Within the Delta Commission programming unit a special cell could be established and trained to advise on project development (at early stages) private revenue generation project finance etc.
- *To* ***develop incentive schemes*** in order to stimulate actors to adapt to climate events such as floods. Blended subsidy-loan schemes for households for resilient housing and land raising could be interesting to explore together with IFC, and multi-lateral and bi-lateral development banks (like ADB, FMO, DEG, etc.) and housing financiers. For agriculture programmes crop change could be piloted in some regions (for example shifting to more water resilient rice variants). In some places or instances, these incentive schemes could be more efficient compared to traditional public funding of large water safety infrastructure.

Water availability (irrigation), river transport and industrial waste water treatment

- Establishment of a ***PPP cell*** *including a pilot PPP project pipeline in the Delta Programming Wing* Dialogue and information sharing between the public and private sector and developing a pilot PPP project pipeline is especially important in the short term for some subsectors where pilot PPPs are most feasible.

Water supply & sanitation

- An important short term action consists of implementing a *pilot project on financial performance improvement of a selected water utility* (e.g. Khulna WASA or Rajshahi WASA) through a range of measures such as smart metering, more optimal tariffs systems: block tariffs and gradually increasing tariffs, introducing modern technologies: prevention of leakages, illegal tapping, Improving payment systems by introducing ICT solutions;
- *Establishment of an* ***innovation fund*** *to stimulate private sector small scale water supply, sanitation and irrigation initiatives*

  Practices from other countries showed a number of upcoming small scale private sector operations water supply systems in towns or rural areas, private irrigation schemes etc. These cases often are not immediately profitable and grants for capacity building and promotion (TA) are often needed. In order to stimulate the introduction or piloting of these practices in Bangladesh an innovation fund could be established to provide viability gap grants for private initiatives.

1 Introduction

1.1 Introduction

1.1.1 Context

In Bangladesh public funds are scarce and allocative efficiency is of considerable importance. In 2009 about 60% of the public investments in Bangladesh were funded through contributions coming from Development Partners (DPs) like multilateral donors (IFIs) and bilateral donors. Bangladesh is still regarded as a lower middle income country and as such strongly benefits from DP support. However, data on water sector funding sources shows that the share coming from DPs decreased to 35% in 2014.

Bangladesh's economy has grown rapidly over the last decade, at a pace of around 6% annually. If this rate of growth is sustained, Bangladesh will be transformed in the next 5 to 10 years into the first stages of an advanced middle income country. However, due to the changing status of the country DPs might shift away resources to other countries. For this reason, it is important that Bangladesh prepares itself to develop more independent national funding sources in order to finance the large future needs in the water sector (and for climate adaptation).

This report addresses the following two main questions:

- What are the current practices of financing water and water related investments and what are the current funding mechanisms of their operations and maintenance (O&M) activities?
- How to arrive at a new financing as well as a more self-sufficient funding arrangement[9] in the medium and long term, making use of a transition period in the next 15 to 25 years, in which Bangladesh is being transformed from a lower middle income country to a full middle income country in 2041[10].

1.1.2 Core water services

The BDP2100 is defined as a water-centric, multi-sectoral, techno-economic long term plan, in which the core sectors are:

- Flood protection: reduction or prevention of the detrimental effects of flood waters;
- Water quantity management: management of water resources in order to prevent drought, water scarcity, flooding through heavy rainfall and salinization, including irrigation as well as navigation;
- Drinking water supply and sanitation:
    - Production and supply of drinking water for households, industry and public services;
    - Wastewater collection and treatment: providing sewage and wastewater treatment services for the above mentioned customers.

These services are in most cases provided by public agencies in Bangladesh to households, firms and public and semi-public institutions.

1.1.3 Financial requirements

Implementation of the BDP2100 will require large investments, and financing for the agreed investment programmes and interventions will need to be secured. In Bangladesh, as indicated above, public funds are scarce and allocative efficiency is of considerable importance. Interventions need to be clearly aligned with and meet the goals of BDP2100

[9] See for a schematic overview of financing and funding arrangements section 1.4.2

[10] The GoB's vision 2021 calls for the social and economic environment to be transformed form a low income country to the first stage of a middle income nation by the year 2021; Bangladesh is aiming to consolidate its growth to become a full-fledged developed country by 2041.

because this will ensure the greatest impact over time. Currently part of the public investments in Bangladesh are funded through contributions coming from Development Partners (DPs). However, as already mentioned, due to the changing status of the country DPs might shift away resources to other countries. Another possibility might be that in this transition period (about 5 to 10 years) DPs shift their focus from water and water related sectors to other sectors like education and public health, and/or will change significantly their terms and conditions for loans (from concessional to non-concessional, with substantial higher interest rates, a significant shorter grace period as well as a shorter duration of the repayment period). And, finally, in the long run after 2050 financing by DPs may (even) come to an end. Therefore, the GoB needs to identify other financing modalities and sources in time to ensure continuous and sustainable implementation of BDP2100.

During the first part of the BDP2100 formulation process, the Delta vision and goals were formulated and included in the 7th FYP, as well as a priority list of "no regret"[11] investment projects suggested to be implemented during this 5 year period (FY2016-2020). Moreover, the GoB decided to include an allocation of 2% of GDP annually as a block provision for BDP2100 activities. In current values (2015) this 2% of GDP is about USD 4 billion or BDT 320 billion annually (in 2015 prices). Whether this 2% of GDP will be allocated on top of the current budget allocation for the ADP (5% of GDP in FY2015), to make room for the expected significant increase in investment needs for BDP2100 activities in the short and medium term or will be allocated just within the existing ADP budgetary allocation, is (still) not clear. This has important implications both from the perspective of financial sources as well as from the perspective of the various (other) sectors involved in ADP having their own investment needs and priorities. Therefore, it is recommended to clarify this important issue as soon as possible.

In this respect the following two additional questions are quite relevant:

- From which sources will this 2% GDP allocation be financed annually, not only in the short term (up to 2030), but also in the medium and long term?, and
- Which vehicle is the most suitable to ensure an integrated and sustainable approach from a financial perspective?

Both questions are also addressed in this report. Potential sources are investigated and policy directions for the short, medium and long term are indicated followed by a number of short term actions. Secondly, building blocks are presented which support the Delta Fund (and Delta Commission) approach, which will be dealt with in a separate BDP2100 report.

1.2 Structure of the report

This report (part 1) has the following structure. Chapter 1 is the introduction chapter which contains the context, definition of core water services of BDP2100 as well as the financial requirements. It also addresses two main questions and two additional questions this report is aimed to answer as much as possible. Chapter 2gives insight into the GoB revenue mobilisation and public expenditure practices, which is crucial to understand as BDP2100 will be implemented using these systems. The chapter also deals with the public investment challenges BDP2100 has to anticipate. In the third chapter an overview is provided of the relevant water services in Bangladesh and the current institutional set-up and funding arrangements. The chapter also pays attention to the current private sector funding in the water sector. The fourth chapter is focused on the involvement of Development Partners in funding core water services. Attention has been paid to the current share of DPs funding in investment projects, DPs focus areas and type of financing as well as their commitments in the period 2000-2015. Moreover, an overview of most important investment projects relevant for BDP2100, already financed by DPs are shown as well as some terms and conditions of the major players. This chapter conclude with DPs priorities (for major players) in the next five years. Chapter 5 gives an overview of climate funds for adaptation measures as the BDP2100 is primarily geared towards climate adaptation initiatives. Attention is paid to the

[11] 'No regret' means that measures will contribute to vision and goals of BDP2100 under each or most scenarios

Bangladesh Climate Change Trust Fund (BCCTF), the Bangladesh Climate Change Resilience Fund (BCCRF), the Pilot Programme for Climate Resilience (PPCR) and the upcoming Green Climate Fund (GCF) which offers significant opportunity for Bangladesh. Chapter 6 provides an overview of directions for future arrangements for the funding of water services in Bangladesh. These directions are sometimes shortly illustrated with examples from practice. This chapter conclude with some lessons learned from some interesting countries all over the world.. A more extensive overview of international practices of funding and financing arrangements is provided in a separate document (Part 2 of this report). The final chapter (seven) is dealing with the way forward and the short term actions. It describes aspirations for composition of water sector funding (including the evolving composition of the proposed Bangladesh Delta Fund). The chapter also contains some policy directions/strategy for the short, medium and long term. Finally, a short term strategy for budget allocation and sourcing has been proposed as well as the short term actions needed. A summary is presented at the beginning of this report.

2 Relevant Practices in the GoB's Revenue Mobilisation and Public Expenditure

2.1 Introduction

It is crucial to understand the GoB revenue mobilisation and public expenditure practices as BDP2100 will be implemented using these systems and also has to anticipate public investment challenges. Therefore, before going into the funding arrangements of the core water services, this section provides a synopsis of the key practices. In addition challenges are identified that typically impede the flow of public investments.

2.2 Government Annual Budget – GoB expenditure on investments and recurrent costs

Budgeting in Bangladesh is done on an annual basis, though a limited medium-term perspective is provided through the Medium-Term Budgetary Framework (MTBF). The annual budget is comprised of an investment and technical assistance expenditure portfolio, called the Annual Development Programme (ADP), and a recurrent cost budget, called the non-development budget (NDB). The NDB allows Ministries, Divisions and Agencies (MDAs) to finance recurrent costs such as salaries, interest, pensions, operations and maintenance.

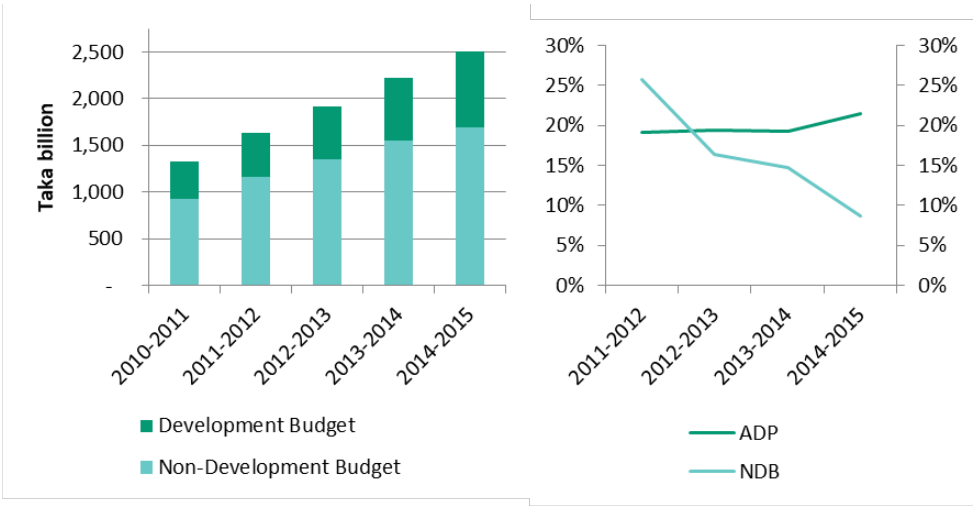


Figure 2.1 Annual budget allocations 2010-2015 and Annual growth rates of ADP and NDB allocations

Source: MoF

Key facts on the annual budget include:

- Over the last five years the total annual budget has risen between 9% and 24% year-on-year, from 1,321.70 billion BDT in 2010-2011 to 2,505.07 billion BDT in 2014-2015. In terms of the ADP share of total GDP, this means an increase of over 50% (from a share of 3.2% to 5.0%);
- The majority of the budget goes to the NDB (c. 70%), with the ADP taking up a smaller share (30%);
- The ADP is growing at a faster rate (19.8% on average between 2010 and 2015) compared to the NDB allocation (16.4% on average between 2010 and 2015).

As shown above, the NDB takes up the major share of the annual budget (around 70%). Around half of the NDB goes to the pay of allowances, interests and grants in aid. Goods and services (including operations and maintenance) are falling even though the ADP budget in energy, power, transport and communications is going up (demonstrating the growing important of user charges as a source of revenue). Importantly, interest payments are increasing rapidly; crowding out other expenditures (see graph below). In fact, over the last decade interest payments have become increasingly dominant in the recurrent budget. While interest payments only accounted for 19% of total recurrent budget in FY11, they amounted to 24% in FY14.

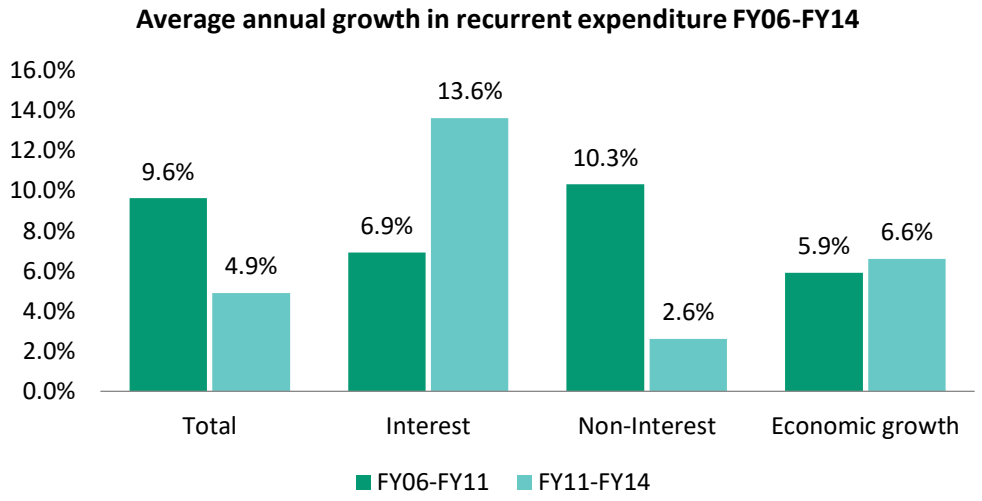


Figure 2.2 Average annual growth in recurrent expenditure FY06-FY14

Source: World Bank 2015

Expenditure on infrastructure is an important example to showcase how the trends of 1. high interest payments; 2. high capital expenditure growth; and 3. slow recurrent expenditure growth interact and accumulate into a potentially unhealthy mixture. Infrastructure capital investments have seen significant increases in the last decade, yet at the same time infrastructure maintenance expenditure has remained broadly the same in real terms (World Bank 2015[12]). This leads to a situation where the GoB capacity to maintain capital investments is being curtailed by default. In section 15.3.2 we will describe more on the implications for the water sector.

2.3 GoB resources and the role of DPs' project aid

Bangladesh has gained a good record of low fiscal deficits and sustainable public debt. Over the past decade, Bangladesh achieved an average fiscal deficit of 3.1 per cent of GDP and, at 3 per cent in FY14, the deficit was well

[12] Public Expenditure Review Update, World Bank 2015

below the South Asia average of 3.7 per cent (World Bank 2015:xv). There is a persistent gap between GoB revenues and expenditure (see below). This is partly natural as GoB receives loans and grants from DPs but at the same time GoB also uses expensive domestic loans and issues expensive saving instruments, both with high interest rates, to finance the deficit. This is why total expenditure will only rise significantly if total domestic revenues are increased (see below).

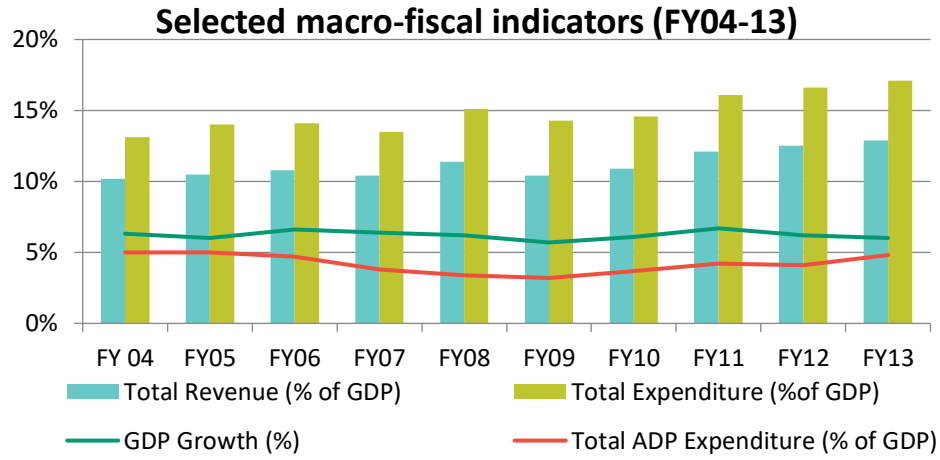


Figure 2.3 Selected macro fiscal indicators

Source: Bangladesh Bank, Bangladesh Bureau of Statistics, IMF and WB staff estimates

Bangladesh has among the lowest revenue collection rates in the world (as a percentage of GDP). As can be seen in the figure below, at just over 10%, it compares poorly with other countries in South Asia (e.g. India and Nepal) which have rates of around 20%. The 7th FYP has set an intermediate target of increasing the revenue collection rate to 16.1% by 2020. However, the GoB's efforts to modernise the tax collection system have still not delivered substantial results. This is shown, in part, by the implementation of the new Value Added Tax (VAT) Law and Supplementary Duty Act 2012 being delayed for another year.

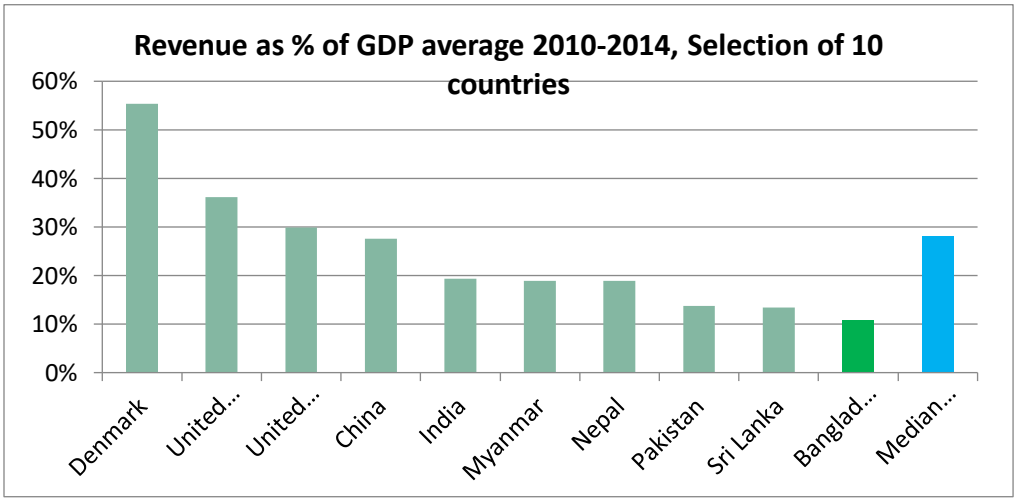


Figure 2.4 Revenue as % of GDP average 2010-2014, Selection of 10 countries

Source: IMF, World Economic Outlook, April 2015

The figure below shows the origin of the funding of the national budget in selected recent years. Most of the resources for the annual budget come from tax revenues levied by the National Board of Revenue (NBR). More specifically, NBR revenues are comprised of Value Added Tax (35-40%) and Income Tax (30-40%).

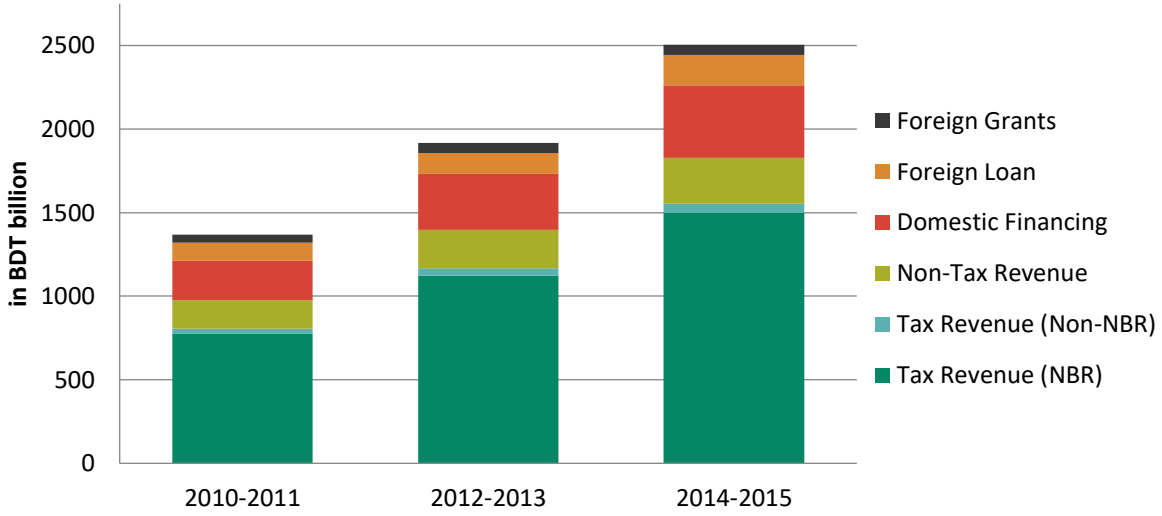


Figure 2.5 Resource origin for total annual budget in selected fiscal years

Source: MoF

Bangladesh has received about USD 55 billion as foreign aid in nominal terms in the last four decades. The role of foreign aid has been declining over the last two decades. Even though (concessional) loans and grants only make up around 10% of total resources needed for the annual budget, these still currently finance 30-40% of the ADP and accounted for an average of 51% over the last decade.[13] ODA as a percentage of GDP has fallen significantly; while foreign aid accounted for about 2.9% of GDP between 1995 and 2004, the last few years have seen lower averages and in 2014 foreign aid only amounted to 1.9% of GDP (Bhattacharya 2015). At present, around 10 per cent of total Project Aid is spent on TA projects, as opposed to investment projects (World Bank 2014).

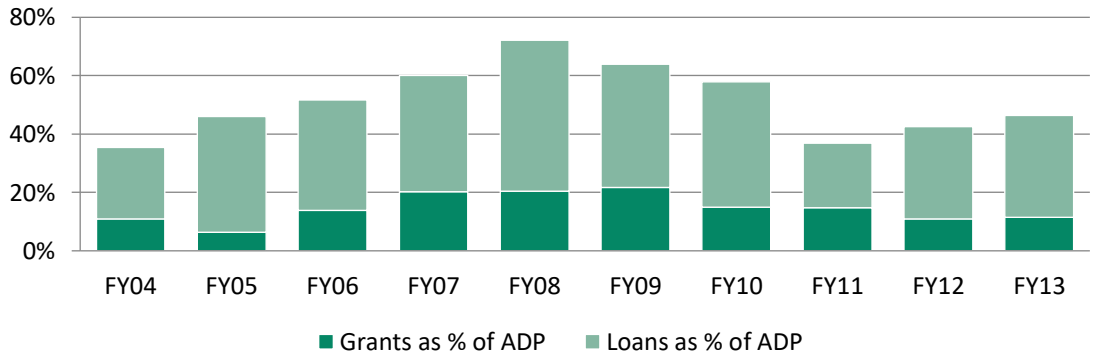


Figure 2.6 Project Aid Disbursements (as % of ADP)

Source: ERD (in World Bank 2014:9)

[13] It was over 70 per cent in FY08, when ADP spending dropped due to political turmoil and at the same time Bangladesh received a large influx of humanitarian and post-disaster assistance following the onslaught of cyclone Sidr in 2007.

In the last decade Bangladesh has experienced strong real economic growth between 5-7% which is one of the contributing factors behind its achievement of reducing its external debt by one percentage point of GDP a year. Public debt reached less than 34% of GDP at the end of FY14 (composed of 12.9% external debt and 21.3% domestic debt). At the same time, net foreign financing of the deficit declined significantly from around 4.8% of GDP in the 1990s to less than 2% of GDP in recent years, while, net domestic financing increased from about 1.6% of GDP in 2000 to 3.3% in FY13. According to the World Bank (2015) this explains the recent rise in in the share of interest in total recurrent expenditure, and the World Bank has suggested looking into cheaper financing options.

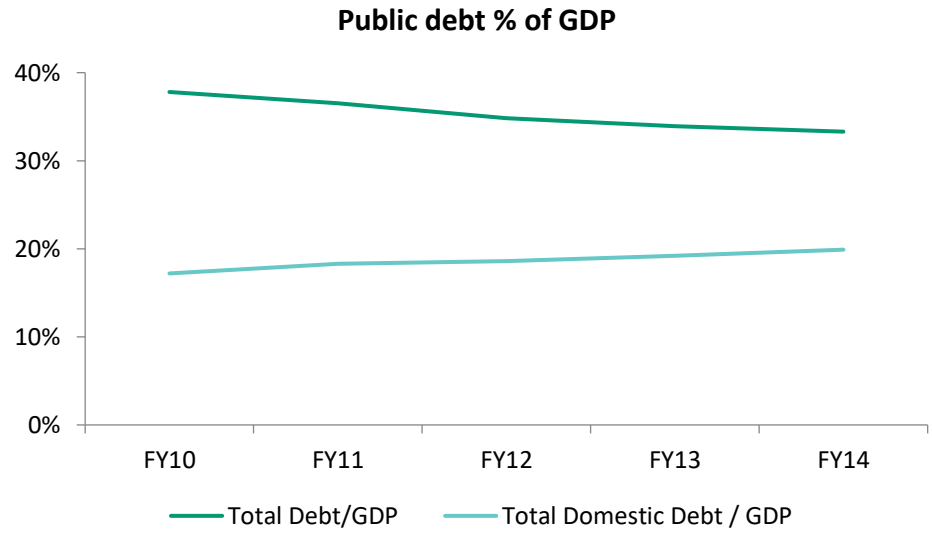


Figure 2.7 Public debt % of GDP

Source: Bangladesh Bank

A recent Debt Sustainability Analysis presented a generally positive picture (IMF and World Bank, May 2014). It concluded that Bangladesh is at low risk of an external or domestic debt crisis. Assumptions include further continuation of the downward trend in public debt as a share of GDP, real economic growth of 6-7 per cent each year for next twenty years, inflation of 4-5 per cent a year, and well-contained fiscal deficits. While these assumptions are fairly optimistic (World Bank 2015) it still shows that Bangladesh is doing a good job in managing its public debt and is building up a strong track record in this respect. However, in its Public Expenditure Review Update, the World Bank (2015:5) urges GoB to remain cautious as much depends on the boosting of tax revenues to finance its ambitious economic growth and poverty reduction programme in the 7th FYP, in combination with the recent trend of using expensive domestic loans / saving certificates to finance the deficit.

2.4 Public investment challenges

The previous paragraphs have established the overall budget flows in terms of their origin and destination. These budget flows typically encounter some common bottlenecks that characterise public investments in Bangladesh and could potentially impede smooth implementation of BDP2100. The main bottlenecks are an annual (as opposed to multi-year) dual budgeting system, weak alignment of national/sectoral strategies with planned and actual expenditure,

a proliferation of projects, weak design, appraisal and approval of individual investment projects owing to excessive politicisation and technical shortcomings as well as poor procurement and project implementation practices[14].

2.4.1 Dual budgeting system with a one year focus and insufficient O&M budget

In general, a single year budgeting system is not conducive to the effective financing of long-term projects and programmes. Most projects in the ADP have a multi-year duration, but resource allocation takes place on a single-year basis. Projects are approved without any recognition of available funding and often do not even receive what they budgeted for in their first year. This undermines efficiency of the appraisal process, as first year funding can be understated, which then contributes to overloading the ADP in subsequent years. (WB 2014:26). This single year perspective contributes to there being no recognition of the forward cost implications of the existing project portfolio when new projects are being approved, which collectively reduces insight into overall fiscal space.

There is a wide consensus that operations and maintenance (O&M) receives insufficient financial support to ensure sustainability of investment projects. Each project document is required to contain a schedule of future recurrent costs for O&M, but this is not necessarily reflected in the revenue budget. The lack of consolidated data on total maintenance funding for individual agencies across both the ADP and NDB, and the absence of data on actual maintenance spending, makes it difficult to assess the adequacy of current funding levels and future affordability. Similarly, analysis of the adequacy of staffing and other operational funding is limited (WB 2014: 28).

2.4.2 Weak alignment of national/sectoral strategies with actual expenditure

There is a weak alignment between individual projects and national development priorities espoused in the 7th FYP. This is caused in large measure by a lack of strategic planning at both sector and Ministry-levels, although parallel ongoing reforms to introduce the Sector Strategy Papers (SSPs) and Medium-Term Strategy and Business Plans (MTSBPs) are seeking to correct these gaps. The effects of this lack of strategic planning are made worse by the large number of MDAs[15] and can lead to cases of different initiatives within the same sector actually contradicting one another.[16]

Both the ADP and the FYP are the responsibility of the Planning Commission. Although allocations should be based on national strategies (as set out in the long-term Perspective Plan 2021, FYP among others) to Ministries and sectors, the reality has been that the allocation ratios of previous years are typically maintained and budgets receive an incremental top-up to reflect the increase of the total budget. Importantly, both ADP/MTBF are effectively geared towards ministries, while FYP is geared towards sectors. All in all, sector allocation procedures are not based on sector funding needs.

Finally, current monitoring and evaluation practices are insufficiently result oriented and do not provide sufficient management information that can be used at either polity or operational levels. The current M&E system is therefore not able to serve as a powerful tool for policy makers to align project outputs and outcomes to national and sectoral strategies.

[14]This sub-section draws heavily on three main sources: (1). diagnostic work undertaken through the World Bank's Public Investment Management (PIM) Project (part of the multi-donor funded and World Bank-administered SPEMP Programme); (2). learning from the follow on Strengthening Public Investment Management System (SPIMS) project funded by JICA; and (3) The World Bank Public Expenditure Review Update 2015.

[15] In total, the public sector is made up of 42 separate ministries, 12 Divisions and 164 Agencies. This results in a complex interplay which requires substantial coordination and cooperation.

[16] An example of this is in the transport sector where one agency tried to improve the navigability of inland waterways while at the same time another agency wanted to improve regional interconnectivity by building bridges. The bridges ended up being constructed too low for river vessels, thereby spoiling plans to ensure improved inland water connectivity.

2.4.3 Project proliferation

There is an overall proliferation of projects in the ADP, with the result that there is insufficient funding for individual investments. This results from a combination of politicisation of the approvals process and poor administrative practices whereby projects are designed, appraised and ultimately approved regardless of fiscal space. One way in which this occurs is through the practice of projects entering the ADP's "Green pages" whereby they are not eligible for funding under the current ADP but are often subsequently approved at a later date for funding under subsequent (R)ADPs.

An overloaded ADP means that individual projects cannot be implemented as planned – resulting in time and cost overruns. In some cases, projects have been in the ADP for many years and only receive a token allocation each year. Project implementation is generally better with DP than regular GoB financed (domestic) projects. In terms of allocation, foreign-funded projects receive significant preference; in the RADP process for example, allocations to foreign projects cannot be redistributed (Haque 2014: 33, 44).

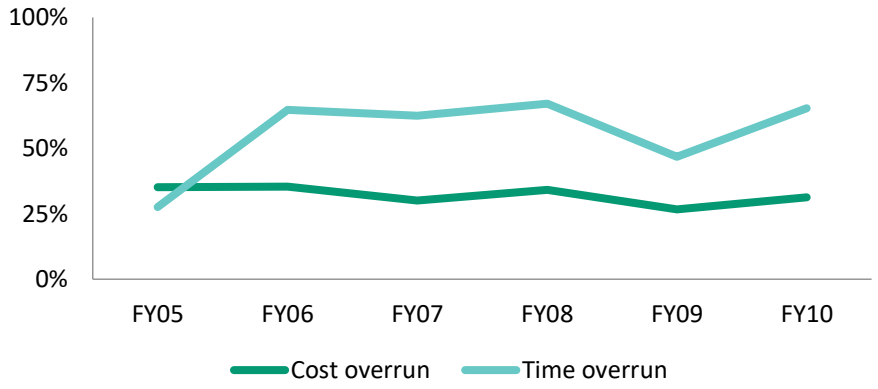


Figure 2.8 Share of Projects Closed with a Cost or Time Overrun

Source: IMED (in World Bank 2014:29)

In the figure below it can be observed that Bangladesh compares rather unfavourably with other developing countries in this respect.

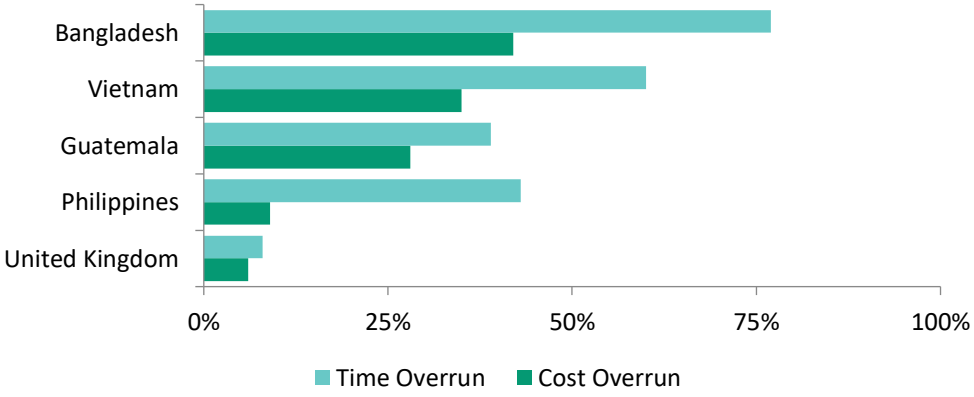


Figure 2.9 A cross country comparison of average time and cost overrun

Source: CoST (2011), IMED data for Bangladesh (in World Bank 2014:29)

In the last decade, the GoB has initiated two 'rationalisation' exercises to cut back the number of non-functional projects. However, the root causes were not addressed (among others: weak project appraisal processes, politicisation of project approval and annual budgeting) and the situation soon returned to one of an overloaded ADP.

2.4.4 Project design, appraisal and approval challenges

Aside from the overall weak alignment with strategic priorities and unaffordability highlighted above, there are also significant, related weaknesses with the way in which individual projects are designed, appraised and approved. These weaknesses can be ascribed to two main factors – firstly, weak project design, appraisal and approval capacities and procedures; and secondly, heavy politicisation of the entire process.

Project design capacities within agencies are often underdeveloped, resulting in a situation whereby projects have major design shortcomings that contribute to implementation challenges (see below). Support is also often required from both their Sponsoring Ministry and/or the Planning Commission to assist with project preparation. This latter issue triggers a scenario where there is an unclear division of responsibilities and possible conflicts of interest with key stakeholders who, whilst being involved in the design of specific projects, are then subsequently involved in their appraisal and approval. For example, the Sponsoring Ministry convenes the Project Scrutinising Committee (PSC) meeting and, once the project proposal has been sent to the Planning Commission, the relevant Sector Division organises the Project Evaluation Committee (PEC).

Project appraisal is also subject to a number of limitations – resulting both from weak capacity to conduct robust appraisal and political interference with the process. This results in a situation where projects can be put forward with negative Net Present Values (NPVs) or where the associated assumptions upon which the Cost-Benefit calculations have been based are completely implausible.

Project approval also faces challenges – both from the heavy politicisation of the process ensuring that certain projects are approved no matter what (including the common practice of projects passing into the ADP proper via the Green Pages) as well as the fact that the sheer number of projects to be approved poses a significant burden on the systems in place. As such, key approval fora such as the aforementioned PSCs and PECs as well as the ultimate approval body for most projects, ECNEC, do not have the time nor resources to properly scrutinise individual projects and approval of projects can take an inordinate amount of time. Aside from the inevitable delays, the result is that the ultimate approval of most projects is pre-ordained – particularly if they have powerful political supporters.

The GoB and DPs often face difficulties with synchronising their project preparation and appraisal processes. Synchronisation can delay projects significantly, and this has sometimes even resulted in projects being cancelled when the internal commitment deadlines of DPs (such as European Commission) have passed. In less severe cases, projects lose time and money as they have to wait for the DPP/TPP to be approved. Feasibility studies are sometimes repeated by GoB even though DP probably has done much deeper feasibility studies, which have already been completed.

2.4.5 Project implementation challenges

Numerous project implementation challenges are faced stemming in part from the project design and funding weaknesses highlighted above as well as from limited implementation capacity on the part of contractors and shortcomings in the project supervision capacity of MDAs. These challenges manifest themselves in the aforementioned cost and time overruns as well as in projects that simply do not (fully) meet their objectives.

Each year, the GoB experiences a huge expenditure spike in the fourth quarter (Q4) of the fiscal year. The highest spike occurs in May-June which coincides with the Monsoon period when BDP2100 interventions will be difficult to implement. This can be attributed to a number of causes amongst which the most notable are[17]:

[17] SPEMP Output 5b 2014

- Q1 is usually used for procurement planning, compressing actual expenditures to Q2-Q4;
- Expenditure is often delayed on purpose as payments to contractors are held back to enforce performance;
- Release of funds by Finance Division takes time; and
- Q4 expenses can only be made upon RADP approval.

In February 2015 the Project Preparatory Fund was announced. It offers potential to reduce project costs and time-overruns by bearing the cost of land acquisition, feasibility studies and environmental impact assessment for large scale development projects. Land acquisition will be completed under the new fund before taking up a project under ADP to reduce complexities in land acquisition that delays project implementation. The fund size or its launch date is yet to be determined.

2.4.6 Project Monitoring and Evaluation

Current **Monitoring and Evaluation** (M&E) practices are insufficiently result oriented and do not provide sufficient management information that can be used at either policy or operational levels. The current M&E system is therefore not able to serve as a powerful tool for policy makers to align project outputs and outcomes to national and sectoral strategies.

2.5 Summary of relevant observations for BDP 2100

The following conclusions are relevant for the implementation of BDP2100 and its financing:

- Bangladesh has among the lowest revenue collection rates in the world and, whilst significant progress has not yet been witnessed, there is a recognition of the need to improve collection rates (not least in the 7th FYP) and steps are being taken to strengthen the tax collection apparatus;
- Foreign loans and grants still finance 30-40% of the ADP, but a declining tendency in DPs' contributions to the ADP is being observed and is expected to continue as Bangladesh consolidates its status as a middle income country;
- Although a persistent gap between GoB revenues and expenditure exists, net foreign financing of the deficit declined significantly from around 4.8% of GDP in the 1990s to less than 2% of GDP in recent years, while net domestic financing increased from 1.6% of GDP in 2000 to 3.3% in FY13;
- The May 2014 Debt Sustainability Analysis conducted by the IMF and World Bank offered a positive prognosis, concluding that Bangladesh is at low risk of an external or domestic debt crisis;
- According to the 7th FYP, the total ADP budget as a proportion of GDP went up by more than 50% over a five year period (from 3.2%) to about 5% of GDP in 2015;
- There are significant weaknesses with project design, appraisal and approval which manifest themselves in downstream problems with project implementation;
- Most projects in the ADP have a multi-year duration, but resource allocation takes place on a single-year basis. Moreover, during the last few years the GoB is facing a significant underspend of the ADP year by year;
- An overloaded ADP with resources spread too thinly translate into time overruns up to 65%-75% and cost overruns up to 40%;
- O&M receives insufficient funding, threatening the overall sustainability of existing and new investments.

3 Core water services in Bangladesh and current funding arrangements

3.1 Introduction

There are various ways to fund investments for the short, medium and long term identified (and to be identified) in the Bangladesh Delta Plan 2100 (BDP2100). The most suitable way of funding however, depends on the type of water services that will be provided. This is because each water service has different funding & financing potential and modalities. To elaborate on the potential future financing arrangements, to be discussed in the next chapter(s), first the current situation of the core water services in Bangladesh needs to be analysed briefly.

In this chapter the core water services will be briefly discussed, starting with the institutions involved and their responsibilities as well as the current way of financing.

3.2 Flood protection and water availability including navigation

3.2.1 Responsible institutions[18]

The Ministry of Water Resources is responsible for most aspects of the water sector, including flood control, irrigation, drainage, water conservation, surface and groundwater use and river management. Under this Ministry the Bangladesh Water Development Board (BWDB) is the key responsible authority: its principal responsibilities (among other tasks) are to build, operate and maintain physical infrastructures such as embankment, bank revetment, dredging and excavation work of river/khal for flood inundation and river bank erosion as well as barrage/pumping plant, irrigation canal and salinity intrusion; and to provide and improve irrigation, drainage and navigation. BWDB is also responsible for flood and drought forecasting, hydrological survey and investigations, research, establishment and training of water user associations and other stakeholder organizations (Ashim Das Gupta et. al., 2005). The Flood Forecasting Warning Centre (FFCW), is a centre under the BWDB responsible for emergency response to flood situations with an objective of minimising loss of life and damage to properties. FFWC aims to achieve this through enhancing the capacity of the community and the government to effectively manage flood-disasters.

BIWTA (along with other bodies) is responsible for development and maintenance of navigability by dredging and river training. Because both BIWTA and BDWB are involved in dredging and river training activities (from different perspectives), good coordination between these agencies is absolutely essential, not only from a technical and institutional point of view but also from a financial point of view.

LGED (under control of LGD) has been responsible for the implementation of the Small Scale Water Resources Development Sector Programme (SSWRDSP), which now in its third phase. Over 500 FCD(I) schemes have been implemented in the Western and Southern part the country. These schemes are, in line with the provisions laid down in the NWPo, below 1000has in size.

Ministry of Agriculture (MoA), through its Department of Agriculture Extension (DoAE), dealing with both extension and to a lesser extent social organisation of farmers and water users. the Bangladesh Agricultural Development Council (BADC) with its particular mission to: 'Provide irrigation facilities to the farmer through minor irrigation activities' and 'Innovation of appropriate technologies for increasing irrigation efficiency' (see: http://www.badc.gov.bd/), the Barind Multipurpose Development Authority (BMDA), with a particular mandate to develop and manage groundwater resources for irrigation in the Barind tract, and the Bangladesh Agricultural Research Council (BARC), responsible for carrying out applied research on i.a. agricultural drought and on-farm water management . BARC also produces crop suitability and zoning maps for all major crops based on agro-edaphic factors, depth of inundation, flood hazards and landform (http://www.barc.gov.bd/).

Regional, national and international NGOs have been involved in (among others) flood control and disasters. NGOs have made a substantial contribution to the improved living standards in the country by assisting the rural population to cope with the disasters caused by the floods and cyclones. In the process of micro credit operation NGOs have organized groups, village centres or village organizations. Such groups are formed by marginal and poor male and female members and using micro credit a large number of group members have improved their livelihood and invested in small businesses, livestock and agricultural activities. In emergency cases these local groups are known to mobilize resources for repairs and maintenance. In a number of projects (SRP, EIP, SSWRSDP, IPSWAM), NGOs have been involved in FCD development as well, specifically in community mobilization and participatory planning[19].

[18] Baseline Study "Water Resources", BDP2100, BanDuDeltAs, 2015
[19] Baseline Study "Water Resources", BDP2100, BanDuDeltAs, 2015.

3.2.2 Current financing mechanisms

In response to a number of disastrous floods in the 1950's, the first master plan for water resource development was initiated in 1964 and envisaged the creation of 58 large flood protection and drainage projects covering some 5.8 million ha of land. The 1972 Land and Water Study, carried out by the World Bank, placed greater emphasis on rapid implementation of smaller schemes in areas with a relatively low flooding depth. Projects such as the Early Implementation Projects (EIP) were formulated and an impressive expansion of protected areas took place. The Bangladesh Water Development Board (BWDB) was formed as a separate entity and this organization came to play a central part in the development of Flood Control and Drainage (FCD) projects. To date, some 752 schemes have been developed.

In 2013[20] a report from the ADB indicated that the BWDB is managing (February 2013) 45 projects involving: a) River training and flood protection along major rivers; b) Other river training works including procurement of dredger and pilot dredging; c) Coastal work including AILA and one cross dam, and d) FDCI work, including drainage, town protection, irrigations projects, embankments at smaller rivers. Of the 45 projects, 6 projects are donor related projects and 39 are funded by the Government of Bangladesh (GoB). Another 9 more government funded projects (at that time) was recently approved and is undergoing the process of implementation. Part of these projects mentioned before are thus directly related to flood protection and the remaining are related to water quantity management activities of BWDB.

In general such investment projects (as mentioned above) are thus funded by the Government of Bangladesh (GoB) as well as the Development Partners (DPs), like the World Bank, ADB and JICA. GoB is funding these projects from the Annual Budget through the Annual Development Plan (ADP). DPs are usually providing concessional loans (soft loans) with a very low interest rate and a long term repayment period (32 to 40 years), with 8 to 10 years grace period.

From the GoB side no regional and/or local financial contributions are in place (for example from local charges and/or local taxation systems, like a water user charge (for extraction) to contribute to the overall project costs). There are some exceptions:

- The water extraction licence fee to water providers, which exists only in the jurisdictions of WASA's[21].
- The conservancy charge to BIWTA: every vessel[22] operating in inland water ways has to pay (a prerequisite to get the annual service certificate from DOS). The conservancy charge depends on the GRT of the vessel concerned. It is meant to cover all services from BIWTA, but the charges are very low and not cost based.)

Therefore, the budget allocated or earmarked for annual operation and maintenance of new infrastructure is in principle included in the annual Revenue Budget allocated to the relevant agency. However, the available budget for existing and new infrastructure is currently not sufficient (too low) to properly operate and maintain the infrastructural facilities[23]. In practice this results in deterioration of the infrastructure and reduction of protection[24].

[20] Irrigation Management Improvement Project (app 5: Financial Management Assessment of BWDB (ADB, 2013)

21 DWASA charges BDT 4.0/m3 to the 2,000 privately registered tube wells in their area. This forms an important part of DWASA's total annual revenues. To compare: DWASA owns another 750 tube wells in the area.

[22] Vessels registered under Inland Shipping Ordinance and Merchant Shipping Ordinance (valid only for Bangladeshi vessels)

[23] BWDB currently also does not insure its asset after the project construction period. Irrigation Management Improvement Project (app 5: Financial Management Assessment of BWDB (ADB, 2013)

[24] Embankment breaching (due to weak points, holes, cuts, breaks etc.) is the main cause of flooding and damage for embanked areas. Also, it is known that no monitor/operator for regulating structures is in place. Moreover, after completion of projects regular repair and maintenance budget is either meagre or even lacking/unavailable (Baseline Study "Disaster Management", BDP2100, BanDuDeltAs, 2015).

A recent Feasibility Study for the River Bank Improvement Programme[25] revealed the following for BWDB:

- Over the last 5 fiscal years (up to FY2013/14) only 17% of the total O&M budget requirement for BWDB was provided (proposed budget was BDT 104,616 million versus allocated budget being BDT 17,477 million);
- O&M budget was almost entirely utilised for periodic maintenance and a negligible portion for emergency maintenance only in the last fiscal year. A budget provision for preventive or routine maintenance does not exist.

BIWTA, along with other bodies, responsible for development and maintenance of navigability by dredging and river training, is also unable to recover its costs from revenues. Of total revenues earned by BITWA 55% on average comes from GoB grants and revenues for conservancy charges.[26] As already indicated both BIWTA and BWDB are involved in dredging and river training activities (from different perspectives). Therefore, good coordination between these agencies is absolutely essential, also from a financial point of view.

Farmers in Bangladesh do not pay for use of per unit of irrigation water (Chowdhury[27] 2012). For irrigation small fees are being paid by farmers, which partly cover the O&M costs of the irrigation system. Investment costs of irrigation systems are financed by the GoB and/or through loans from DPs. Large scale irrigation systems have traditionally been characterised by low cost recovery and the government aims to hand these over to private management through leasing, concession, or management contract under open competitive bidding or jointly managed by the project implementing agency along with local government and community organisation (Water Act 1999). In the Chittagong division the Muhuri Irrigation Project (financed by ADB) is being implemented. This is a project designed to realize the full production potential of large scale irrigation scheme in Bangladesh. It will address the recurrent lack of sustainable management, operation, and maintenance (MOM) and increase water productivity bu transferring MOM schemes to private operators and introducing innovative infrastructure modernization. Since 2000, substantial efforts have been made to improve irrigation MOM through the introduction of participatory irrigation management, which has been generally successful on small and medium-sized schemes in Bangladesh but yielded limited results for large schemes.[28] According to Tved and Jacobsson [29] (2006:207) large scale FCDI projects are generally characterised by delay in completion, cost overrun, poor maintenance, and very low cost recovery.

3.3 Drinking water supply and sanitation

3.3.1 Responsible institutions

The Local Government Division (LGD) of the Ministry of Local Government, Rural Development, and Cooperatives (MoLGRD&C)[30][31]. has overall responsibility for the water and sanitation sector at the national level. The Department of Public Health Engineering (DPHE) and Water Supply and Sewerage Authorities (WASAs) are under the administrative control of the LGD. DPHE is responsible for implementation of the water and sanitation projects in the public sector in both the rural and urban areas outside the areas covered by the WASAs. Moreover, DPHE is responsible for assisting the Pourashavas and City Corporations (except in the WASA areas) through infrastructural development and technical assistance. Besides, both in rural and urban areas, DPHE collaborate with the private sector, NGOs and CBOs.

[25] Feasibility Study "River Bank Improvement Program", Annex B Volume 1, Institutional and Financial Assessment, Joint Venture FICHTNER & NHC in association with Resource Planning & Management Consultants, Aqua Consultant and Associates, IWM and CEGIS, June 2015.

[26] Baseline study "Sustainable Transportation and Infrastructure", BDP2100, BanDuDeltas, 2015.

[27] Chowdhury, N.T. (2012) Irrigation Institutions of Bangladesh: Some Lessons, in: Kumar, M. (2012) Problems, Perspectives and Challenges of Agricultural Water Management , ISBN: 978-953-51-0117-8,

[28] ADB 2014, Report and Recommendation of the President to the Board of Directors – Irrigation Management Improvement Project

[29] Tvedt, T. and Jacobsson, E. (2006) A History of Water: Volume I: Water Control and River Biographies, Tauris & Co. Ltd. New York

[30] Benchmarking to Improve Urban Water Supply Delivery in Bangladesh, WSP program report, World Bank 2014

[31] Baseline Study Public Health, Water Supply and Sanitation, BDP2100, BanDuDeltAs, 2015

In addition to DPHE, the Local Government Engineering Department (LGED), also under the control of LGD, undertake water supply and sanitation related activities in particular in foreign aided projects where it is specifically required as a component of overall infrastructure package. In such project-based cases LGED assists the concerned Pourashavas in the implementation and provide technical assistance.

Finally, Local government institutions (the City Corporations (8) and Pourashavas (311 municipalities)[32]), are legally responsible for water supply and sanitation for the people, including the poor people, within the municipality area, except in Dhaka, Chittagong, Rajshahi, and Khulna. In each of these City Corporations a water supply and sewerage authority (WASA) has been set up. Among these water utilities, only Dhaka WASA also provides sewerage services.

3.3.2 Tariff Setting Mechanism[33]

In accordance with the Pourashava Water Supply By-Law of 1999, the Pourashava (=municipality) is responsible for setting the water tariff rate, and the Pourashava council imposes the rate without requiring prior permission from the Government. This is the reason that the water tariff varies substantially from utility to utility and no fixed rule or regulation is in place to periodically update monthly water tariff rates. The latter is left completely to the utility's discretion. It appeared that some Pourashavas change rates only every three to five-years period and some do not change their rates even over a 10 to 12 years period (leading to a drastic depreciation of water utility revenues by inflation, let alone real costs increases in this sector). In fact, Pourashavas have been operating under these arrangements without a supervision and monitoring mechanism from the central level. The same arrangement exists for the City Corporation and Water Supply and Sewerage Authorities (WASAs)

The same WSP report (2014) revealed the following information on existing tariff rates in different utilities in Bangladesh.

- Water tariffs based on real consumption (per m3) are only existing in Dhaka WASA and Chittagong WASA. For residents the current water tariff is 7.24 BDT/m3 in Dhaka[34] and 6.57 BDT/m3 in Chittagong. In case no water meter is installed at the premises of a customer, the tariff is fixed by the diameter of the pipe connection.
- In other utilities (next to Dhaka WASA and Chittagong WASA 31 utilities participated in the WB survey) most water tariffs are fixed (per connection per month) based on a 12 mm diameter pipe connection for residential purposes. There are a few exceptions in which some utilities do have water meters, but they are few in number. The fixed rates per connection per month vary from 50 BDT (Rangpur City Corporation) and 60 BDT (Barisal City Corporation) to 200 BDT (Chowmuhani & Hajigonj) to even 250 BDT (Chandpur) and 275 BDT (Gopalgonj). However, most utilities charge a fixed rate around 100 to 150 BDT per connection per month.

As remarked earlier, only Dhaka WASA provides sewerage services for households. Dhaka WASA is charging a fixed sewerage fee per month[35]:

- For households with water connection without a sewer connection, but with a sewer line within 100ft of the household, 17.1 BDT;
- For households connected to the sewer system 47.21 BDT.

For industry a number of Export Processing Zones (EPZs) established by the Bangladesh Export Processing Zones Authority (BEPZA) house central effluent treatment plants (CETPs). These CETPs collect and treat effluent from all connected companies within an EPZ. The connection to the CETP is provided by default by BEPZA. This aims to ensure

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32 Baseline Study Public Health, Water Supply and Sanitation, BDP2100, BanDuDeltAs, 2015

33 Benchmarking to Improve Urban Water Supply Delivery in Bangladesh, WSP program report, World Bank 2014

34 A recent study (Consolidation and Analysis of Information on Water Resources Management in Bangladesh, 2030 WRG, 2015) mentioned a comparable (more recent) water tariff for households in Dhaka of 7.33 BDT/m3 for metered connection and 47.21 BDT for non-metered and a water tariff for industrial use which is 24.44 BDT/m3 for metered connection and 52.52 BDT for non-metered.

35 Consolidation and Analysis of Information on Water Resources Management in Bangladesh, 2030 WRG, 2015.

optimum capacity utilisation of the CETPs, as well as environmental protection. Further, the CETP establishment has also been promoted as a business unit within the EPZ, which is expected to make profits on the treatment of ETPs. The tariff the CETP operator charges the industrial units is determined by BEPZA. For example, in Comilla EPZ, the CETP facility is chargeable at Tk. 38.8 per m3 of effluent. In Dhaka EPZ, the CETP has been established on a PPP basis by a Singaporean company, which started operations in 2012.[36]

3.3.3 Cost Recovery Rates

On cost recovery rates, currently limited information is available from utilities serving drinking water to their customers. The WSP program report (2014)[37] revealed the following:

- Cost recovery was achieved by all groups of utilities (in survey 33 utilities involved). Cost recovery rates vary from 1.10 to even 1.90 in 2007 and 6 years later (2012) vary between 1.20 and 1.50. On average the rates are between 1.20 and 1.40 in the period 2007-2012. This implies full cost recovery is not being achieved anywhere;
- However, at the same time no utility reported investments from its own finances.

In this respect the statement from DWASA's is obvious[38]:

> *.....The major concern faced by Dhaka WASA due to low tariffs is that it results in insufficient revenue to cover the costs of supplying water. Full cost recovery is essential for successful management of water supply. The appropriate water tariff is very much required for Dhaka WASA to balance the benefits and costs of water usage, and to ensure sufficient revenue for the long-term financial sustainability of the water supply business. However, low revenues limit the utility's capacity to make a higher contribution to investments..... .*

Many cities rely on grants from the central government to cover investment costs. In case (instead of a grant) a governmental loan is received, repayment of this loan (in practice) is only hardly implemented, because the financial performance of utilities does not allow any repayment. In small urban water supply systems, property taxes are used as cost recovery mechanism for operations. Funding might also be obtained from the Municipal Development Fund and external funding from donors is also common.

Service levels are very low. In 2013 an ADB report[39] indicated that the operation and maintenance (O&M) of the water supply system is Bangladesh is inadequate, as reflected in high water losses or what is technically termed non-revenue water (NRW). The NRW in Dhaka is estimated about 30%; Chittagong and Khulna are estimated to have similar levels. Periodic maintenance of the systems is not done properly, resulting in leakages in pipelines and early deterioration of pipes, wells and machinery. No WASA has uninterrupted water supply: in Dhaka about 22.5 hours per day and in Chittagong and Khulna nearly 12 hours per day. In Rajshahi (set up since 2010) water supply remains irregular and low. It is also reported that Dhaka WASA can recover a small part of the investment costs in addition to full O&M costs, whereas Chittagong and Khulna can hardly recover even the O&M-costs[40].

The National Water Master Plan provides for the gradual increase of tariffs aimed at eventually reaching full cost recovery of service provision in urban areas. Essentially an increasing block tariff structure is used. In rural areas, the tariffs should cover at least all operation and maintenance costs. Since this framework is not yet implemented, municipalities or water utilities have the right to set their own tariffs controlled by the government[41]. In this regard it is

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36 Consolidation and Analysis of Information on Water Resources Management in Bangladesh, 2030 WRG, 2015.
37 Benchmarking to Improve Urban Water Supply Delivery in Bangladesh, WSP program report, World Bank 2014
38 Baseline Study Public Health, Water Supply and Sanitation, BDP2100, BanDuDeltAs, 2015
39 Dhaka Environmentally Sustainable Water Supply Project (RRP BAN 42173), September 2013, Sector Assessment WS and other Municipal Infrastructure Services
40 Government of Bangladesh, Sector Development Plan FY2011-2025: Water Supply and Sanitation Sector, Dhaka
41 https://en.wikipedia.org/wiki/Water_supply_and_sanitation_in_Bangladesh

worthwhile to mention that currently DWASA has the power to increase tariffs up to 5% annually, and by more than 5% with approval from the government. However, since inflation is about 6% or more in the last 5 to 10 years, real tariffs decrease by default. Although DWASA in October 2010 endorsed the proposal to amend Clause 22 (3) of the WASA Act 1996, to increase the threshold of its authority to increase tariffs form the level of 5% to 10% per annum, no changes were approved since then. The establishment of a Regulatory Commission covering the entire WATSAN sector in reviewing and setting the tariffs, might be a welcome solution. However, so far this has not materialised.

In general we can conclude: many tariffs are not yet set at full cost recovery level and funding for investment and maintenance is below the needed levels. This implies a lack of funding/revenues for all expenses. And as a consequence this is resulting in deterioration of the water supply infrastructure and less drinking water availability for the population.

3.4 Private sector funding

Currently (2016), private sector engagement and funding in the water sector in Bangladesh is very limited. Although private firms are active in industrial waste water on some economic zones, household drinking water filtration equipment and dredging contracts, there are no private investments taking place in drinking water supply, flood protection or irrigation. In Bangladesh water infrastructure Public Private Partnership contracts (PPPs) have so far only developed regarding water treatment on economic zones and Muhuri irrigation project. In a recent study for BDP2100 regarding private sector engagement in the water sector firms report a number of barriers for private sector participation. On of these is .a lack of clear policy and investment program by the government on private sector participation. Other obstacles mentioned by forms in the survey are: late payments by government clients, fragmentation of contracts, selection of contractors based on low costs proposals, bribery and bureaucracy, lack of experience with PPP or concession regulations, etc. (see also Chapter 18 regarding private sector engagement). In order to attract more private sector engagement and especially private sector funding these bottlenecks need to be addressed. To enable private funding for water services operation and delivery of the water services definely should be private. Models for private sector service delivery are basically privatization or Public Private Partnership (PPP). Although in 2015 PPP act is implemented and the PPP Office is operational, no PPP water projects are currently in the PPP project pipeline (projects are mainly in transport and health sectors).

International experience in PPP shows that PPPs in the water sector are developing in other countries in the following subsectors:

- Drinking water (often in combination with viability gap funding schemes such as in India);
- Irrigation: schemes where farmers form private collectives or separate firms operate the irrigation system (ie. Morocco and Muhuri project funded by ADB in Bangladesh);
- Land reclamation: flood protection in combination with land and urban development (Manilla Bay Philippines, Atlantik in Nigeria);
- Dredging and inland navigation & shipping: private river or canal authorities (Romania).

These are also subsectors where PPPs and private financing might develop in Bangladesh. However, according to the survey under firms in Bangladesh undertaken there are currently some serious obstacles for private operation and finance of water services. Important barriers for private delivery of water services (PPP or privatized) are[42]:

- Lack of revenue potential due to low cost recovery;
- Lack of experience and capacity regarding PPP in public and private sectors;
- Underdeveloped capital market instruments and banking sector capacities for PPP water investments;
- Limited dialogue between public and private sector.

[42] See Private Sector Engagement in Delta's, BDP2100 Report 2016.

To overcome these barriers it is recommended that a number of activities should be started in the next five years to create a **PPP enabling environment**. The enabling environment needs to assure that policies, regulations, financial instruments, dialogue and knowledge& experience are in place to start a number of PPP pilots in the water sector in the period 2020-2030. Important actions are to pilot with financial performance improvement TA projects in the drinking water & sanitation sector, start-up a PPP vehicle for PPP capacity building & public-private dialogue, and to create a dedicated financial mechanism (viability gap funding and guarantees) for PPPs in Bangladesh.

Castalia and PRI report that private sector finance should play a significant role in financing BDP2100 investments[43]. PRI assumes that starting in 2019 private sector finance should be able to fund 20% of the BDP investments in water services (equal to about 0, 5% of GDP per year). This would amount to almost 1, 3 billion USD yearly in 2020 and 2,4 billion USD annually in 2030 (in constant prices 2015 Business as Usual scenario). For the whole period 2019-2030 this would amount to a total of about 20 billion USD of private sector investments. We regard this as highly ambitious and not very realistic for the period 2015-2030 for several reasons:

- Currently, there are no agreed water PPP projects in the pipeline of the PPP Office and only about 4-5 project concept notes in the BDP investment plan could possibly qualify for some form of PPP. These are related to irrigation (inter alia for example the North Rasjahi project), land reclamation and water supply (ie. Chittagong Hill tracts). As it will take about 4-5 years to prepare PPP BDP projects until contracting phase the amounts assumed by PRI seem highly unrealistic for the period 2019-2030.
- In the survey undertaken by BDP2100 in 2015 private firms in Bangladesh express very low interest in investing or operations in the water sector (see also footnote 24). This is related to the before mentioned obstacles for private sector engagement in Delta Plan sectors.
- A large part of the BDP2100 project pipeline is regarding flood safety, a sector with the lowest PPP potential due to the public good nature of water safety and complexity and time needed for introducing the beneficiary pay principle in the period 2019-2030. There are only few examples in the world where the private sector plays a role in private operations and funding of flood safety investments.
- Sectors with currently potential for revenue generation such as drinking water & sanitation and irrigation show very limited cost recovery levels. In the period 2019-2030 these levels might be improved, but public funding is expected to remain important at least until 2030 for development of PPP projects, because of the affordability and willingness to pay issues (as shown by viability gap funding models also in other countries). Some form of public viability gap funding (or availability payments scheme) will be needed in order to develop PPPs and attract private finance in the water sector in Bangladesh. This implies that 100% private funding of water sector projects in BDP thematic areas is very unlikely fort the period 2019-2030. A recent World Bank report concludes: "More and more countries are adopting a PPP model in which investment is largely funded by public money, with the private operator focusing on improving service and operational efficiency"[44].

This implies that it is more plausible that private financing will slowly develop over time because of the current obstacles, time needed to build up a PPP enabling environment and PPP project pipeline in the water sector. The PRI assumption of private funding of 20% of BDP investments (0, 5% of GDP) seems very ambitious and unrealistic as target for private finance in 2020 and 2030. Piloting with PPPs in about 5 water projects until 2030 with a mixed public and private funding scheme could reach private funding levels total of 150-400 million USD over the period 2020-2030 (excluding ports and hydro energy). This would imply an annual allocation of about 15-40 million USD per year, which is less than 0, 02% of GDP in 2020. In this respect we regard a share of private funding of total BDP investments of around 2-4% (0, 1% of GDP) until 2030 as the maximum more realistic potential for private funding. After 2030 this

[43] See Castalia Strategic Advisers (2016), "Development of an Investment Plan to Support the Bangladesh Delta Plan 2100: Initial Findings Report", May 2016 and PRI (2016) Bangladesh Delta Plan 2100, main Report (Chapter 11).

[44] World Bank (2009), "Public Private Partnerships for Urban Water utilities".

figure might rise due to improvements in the PPP enabling environment and cost recovery, introduction of beneficiary payments principles and the learning curve.

3.5 Conclusion

In this chapter the core water services in BDP2100 have been briefly discussed. Funding of these services requires a specific approach depending on the institutional setting and possibilities for collecting revenues through tariffs, charging specific taxes, receiving grants, etc., etc. The current financing mechanisms do not cover new investments and/or re-investments/renovations and often even do not fully cover the annual operation & maintenance costs, while services levels are also (too) low. On the long term this will have negative consequences for operations of the existing (and future) infrastructure. In other words: the sustainability of the services and related infrastructure will be a major issue. Existing infrastructure will become less functional, services levels to be provided to users diminish further, and moreover, any extension of services to other users will not be possible. This will result in a vicious circle, less services, less revenues, etc.

4 Development assistance in the water sector

4.1 Development Partners' (DP) funding of core water services

To get insight in the involvement of DPs in funding the core water services as defined in BDP2100, an analysis of the ADP for FY2009/10 up to FY2013/14 on sector and project level have been performed. From the ADP the following sectors are taken into account as core water services: Water resources, Irrigation, Water supply and sanitation (from WASAs, CCs, DPHE and LGED) and Inland water ways (IWW). The analysis revealed that over this 5 year period, the share of total investment portfolio of BDP2100 core sectors. in total ADP investment portfolio fluctuated between 10-15%. At the same time, the power and transportation sectors (excluding IWW), which are closely related to BDP2100, took up an increasingly higher share (from 32% in 09/10 to 43% in 13/14) of the ADP total investments portfolio.

The dynamics of related annual expenditures of BDP2100 core sectors investment projects are captured in the table below.

Table 4.1 Annual expenditures of BDP2100 sectors (through ADP) for FY 2009/10 up to FY2013/14

	ADP investment projects Annual expenditures (in Lakh BDT)					average (2009/10-2013/14)
	2009/10	2010/11	2011/12	2012/13	2013/14	
Water Resources	83.627	119.401	134.413	213.832	159.011	
Of which Dev Partners financing	*40.027*	*50.467*	*40.588*	*77.216*	*31.459*	
Irrigation	42.473	69.135	66.198	73.362	63.907	
Of which Dev Partners financing	*8.759*	*12.215*	*17.760*	*20.000*	*17.184*	
water supply and sanitation (WASAs, DPHE)	89.071	175.081	253.064	214.283	210.676	
Of which Dev Partners financing	*37.696*	*97.797*	*180.264*	*121.813*	*122.776*	
inland water ways	19.596	24.935	39.796	40.785	53.204	
Of which Dev Partners financing	*5.497*	*10.986*	*16.448*	*12.760*	*10*	
physical planning (LGED)	69.570	37.440	81.397	94.488	72.092	
Of which Dev Partners financing	*47.154*	*22.045*	*51.397*	*65.114*	*45.522*	
TOTAL BDP2100 sectors (in lakh BDT)	**304.337**	**425.992**	**574.868**	**636.750**	**558.890**	
Of which Dev Partners financing	*139.133*	*193.510*	*306.457*	*296.903*	*216.951*	
Share of Dev Partner in total financing	*45,7%*	*45,4%*	*53,3%*	*46,6%*	*38,8%*	***46,0%***
GDP (in billion of BDT)	6.148	6.943	7.967	9.181	10.380	
ADP figures for BDP sectors as % of GDP	**0,50%**	**0,61%**	**0,72%**	**0,69%**	**0,54%**	**0,61%**
Of which DEV Partners financing as % of GDP	**0,23%**	**0,28%**	**0,38%**	**0,32%**	**0,21%**	**0,28%**
TOTAL annual expenditures ADP (in lakh BDT)	**2.459.117**	**3.104.022**	**3.557.519**	**4.755.456**	**5.783.248**	
Share BDP2100 sectors in total ADP	**12,4%**	**13,7%**	**16,2%**	**13,4%**	**9,7%**	**13,1%**
ADP total expenditures as % of GDP	**4,0%**	**4,5%**	**4,5%**	**5,2%**	**5,6%**	**4,7%**

Source: ADP FY2009/10 – FY2013/14, own calculations BDP2100 team

The average of allocated annual investment expenditures of BDP2100 sectors in total ADP expenditures is 13% in this 5 years period (with fluctuations varying between 10 and 16%). The share of total annual BDP2100 relevant investments equated, on average, to 0.6% of GDP, while total ADP annual expenditures as percentage of GDP is 4.7%.

The current involvement of Development Partners (DPs) in funding the BDP2100 core water services is substantial. On average DPs are financing more than 45% of total annual expenditures in this 5 years period (with fluctuations between 39 and 53%). Looking closer, it appears that especially inland water ways, irrigation and (perhaps surprisingly) water resources are mostly funded through GoB resources. Water supply and sanitation (through WASAs, CCs, DPHE and LGED) or briefly called WATSAN are clearly predominantly funded through DP resources

To get more insight in the involvement of DPs on a project level, the 10 largest BDP2100 relevant investment projects which were on-going in 2015 are listed in the table below. The total project value (in current prices) is about USD 3.3 billion (or BDT 265 billion). The majority of the projects are water supply and sanitation investment projects (6) with a total value (in current prices) of USD 2.2 billion, which is 66% of total project value. Two investment projects are disaster management projects and one is focused on water security.

Table 4.2 Largest BDP2100 relevant investment projects on-going in 2015

	Project name	DPs	Begin	End	Loan (in US$ mln)	Grant (in US$ mln)	GoB (in US$ mln)	Hotspot	Objective
1	Dhaka Environmentally Sustainable Water Supply Project	ADB, AFD, EIB	2013	2019	450	-	225	Urban areas	WATSAN
2	Coastal Embankment Improvement Project	WB, CIF	2013	2020	375	25	-	Coastal Zone	Water Security
3	Multipurpose Disaster Shelter Project	WB	2014	2020	375	-	2	Coastal Zone	Disaster Management
4	Karnaphuli Water Supply project Phase II	JICA	2013	2022	357	-	98	Urban areas	WATSAN
5	Khulna Water Supply Project	ADB, JICA	2011	2017	259	-	105	Urban areas	WATSAN
6	Modern Food Storage Facilities	WB	2014	2020	210	25	5	Cross-Cutting	WATSAN
7	Bangladesh Urban Resilience Project	WB	2015	2020	173	-	9	Urban areas	Disaster Management
8	Chittagong Water Supply Improvement	WB	2010	2018	170	-	17	Urban areas	WATSAN
9	Third Urban Governance and Infrastructure Improvement Project	ADB, OFID	2014	2020	165	-	71	Urban areas	WATSAN
10	City region development project	ADB, KfW	2010	2017	120	30	20	Urban areas	Spatial planning

Source: BDP2100 team research

4.2 Development Partners focus areas and type of financing

A number of Development Partners are actively contributing to development projects in BDP2100 relevant sectors. When analysing the different ways in which DPs provide assistance, it helps to distinguish between DPs providing loans and DPs providing grants. Grants are sometimes strategically coupled to loans and thus enable large scale projects to finance both soft (e.g. knowledge and institutional capacity) and hard (e.g. infrastructure and products) capital investments.

In the tables below an overview is presented of the most pertinent financing sources and their sector project focus (relevant for BDP2100) and the type of financing. While DPs are active in many sectors, only the ones related to BDP2100 are mentioned. For more information is referred to Annex 2.

Major DPs using mostly concessional loans to provide assistance are listed in the table below. Only a few distribute non-concessional finance in Bangladesh, and most also offer other funds such as blend finance (mix concessional and non-concessional loan) and grants. It can be observed that many loan providers are financing projects in core BDP2100 sectors, such as water management and WATSAN.

The following DPs mainly provide loans.

Table 4.3 DPs mainly providing loans with relevant sector/project focus and type of financing

Financing source	BDP2100 relevant sector/project focus	Type of finance
World Bank (WB)	• Disaster management/Climate Change • Water management • Energy supply and distribution • Transportation infrastructure • Water supply and sanitation • Agriculture and natural resources	• Concessional loans • Blend loan • Grants
Asian Development Bank (ADB)	• Disaster management/Climate Change • Water management • Energy supply and distribution • Transportation infrastructure • Water supply and sanitation • Agriculture and natural resources	• Concessional loans • Blend loan • Grants
Japanese International Cooperation Agency (JICA)	• Disaster management/Climate Change • Energy supply and distribution • Transportation infrastructure • Water supply and sanitation • Agriculture and natural resources	• Concessional loans • TA grants • Grants
International Fund for Agriculture Development	• Water management • Agriculture and natural resources	• Concessional loans • Grants
European Investment Bank (EIB)	• Power supply and distribution • Water supply and sanitation • Transportation Infrastructure	• Concessional loans
OPEC Fund for International Development (OFID)	• Transport • Energy • Urban development	• Concessional loans
Islamic Development Bank (IDB)	• Infrastructure	• Concessional loans • Non-Concessional loans • Grants
China	• Infrastructure	• Concessional loans • Grants
India	• Infrastructure	• Concessional loans
Agence Française de Développement (AFD)	• Urban transportation infrastructure • Urban power distribution and water supply	• Concessional loans • Non-concessional loans
International Finance Cooperation (IFC)	• Energy • Agriculture • Water efficiency	• Equity • Non-concessional loans • Grants
Asian Infrastructure Investment Bank (AIIB)	• Infrastructure • Energy • Power distribution	• Non-Concessional loans

Source: BDP2100 team research

From the table below it can be seen that many grant providing DPs offer assistance in BDP2100 relevant sectors.

Table 4.4 DPs providing predominantly grants with relevant sector/project focus.

Financing source	BDP2100 relevant sector/project focus	Type of finance
Department for International Development (DFID)	• Disaster management / Climate Change • Water management and WASH • Food Security	• Grants
Dutch Embassy (EKN)	• Water management and WASH • Food Security	• Grants
UNDP	• Disaster management / Climate Change • Climate Finance Governance	• Grants
USAID	• Agriculture and Food Security • Disaster Management • Renewable Energy • Environment & Global Climate Change	• Grants
European Commission (EC)	• Environment & Disaster Management • Food Security & Nutrition	• Grants
KfW & GIZ	• Climate Adaptation urban areas (incl. WASH) • Energy • Climate Finance Governance	• Grants
DANIDA	• Rural transport infrastructure • Rural water supply and sanitation • Agriculture	• Grants • Occasional concessional loans

Source: BDP2100 team research

4.3 Development Partners commitments (in core water services) in the period 2000-2015

Over the last 15 years development partners have been quite active in large BDP2100 related investment projects[45]. The portfolio size of these investments is to the tune of 6.5bln USD (in current prices). The GoB has approximately taken up one fifth (19%) of these costs, whereas DPs have financed the majority of the share (81%), where they used mostly concessional loans (74%) and a small share with grants (7%). This is depicted in the figure on the right:

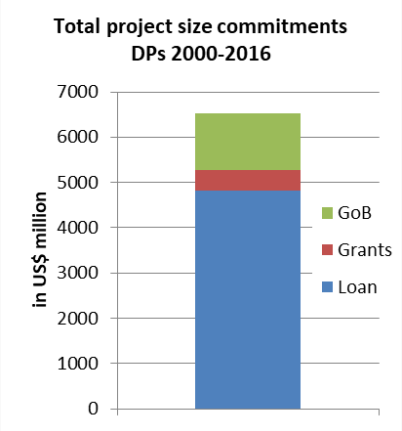

Figure 4.1 Total project size commitments DPs 2000-2016

[45] Technical Assistance projects are not included in this analysis. Commitments were made between 2000-2016 and were on-going or closed in 2016.

These projects are not evenly distributed over BDP2100 hotspots. Chittagong and Coast, Major Rivers and Haor appear to have received smaller BDP2100 related commitments. It is to be noted that no project was found that solely targeted Barind and Drought Prone hotspot issues, but this hotspot was quite often included in Cross-Cutting/National projects and programmes. Urban areas have received the lion share of BDP2100 related project finance, which were often aimed at the largest urban centres (Dhaka and Chittagong) but sometimes also secondary and even tertiary cities. The coastal zone has been a traditional focus area for many DPs so it is rather unsurprising that many BDP2100 related projects were active here between 2000 and 2016.

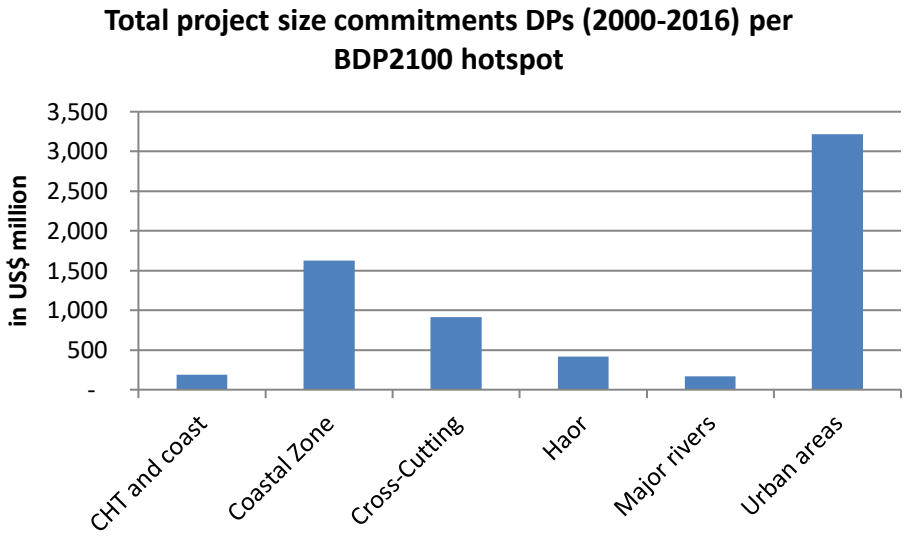

Figure 4.2 Total project size commitments DPs (2000-2016) per BDP2100 hotspot

Four development partners account for the lion share (66% or about 4.3bln US$) of BDP2100 relevant commitments over the last 16 years. When segregating the commitments into flood protection and water availability on side and WATSAN on the other some interesting patterns emerge. World Bank and IFAD have both spent mostly on flood protection and water availability whereas the ADB and JICA have allocated most funds to water supply and sanitation).

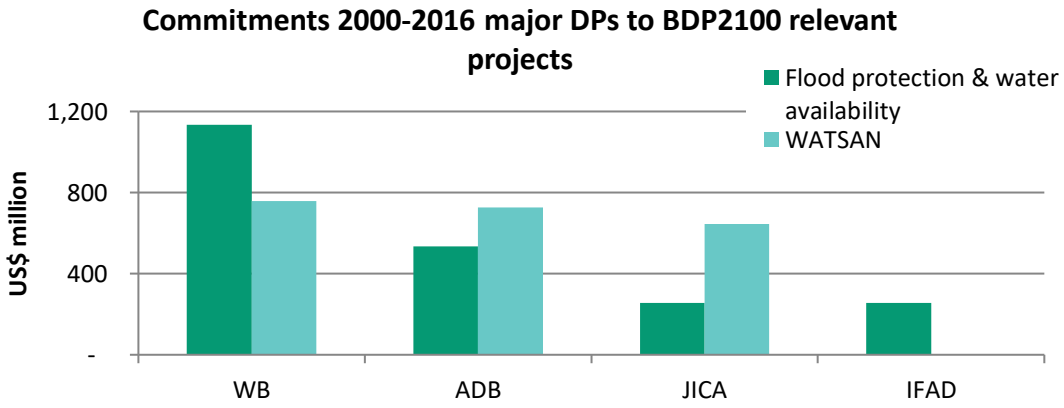

Figure 4.3 Commitments 2000-2016 major DPs to BDP2100 relevant projects

Source: research and own calculations BDP2100 team

4.4 Most important BDP2100 relevant projects

An overview of the most important projects relevant to BDP2100 (but may not be 100% complete due to scope of this study) are presented in the following tables.

In most cases commitments and total project size and duration reflect project design in respective board approval documents and may have changed during project implementation. This overview does not seek a detailed understanding of all projects related to BDP2100, but rather aims to paint an overall picture of BDP2100 relevant investments in the last 15 years and of projects currently on-going. 11 projects were BDP2100 relevant projects were identified which were contracted after 2000 but had finished by 2015. 26 projects were found to be currently on-going and a further 11 future projects are identified, which are in the pipelines of major donors (see tables below).

Table 4.5 Most important BDP2100 relevant flood protection and water availability projects, financed by DPs (2000-2016), in chronological order.

Project name	start	end	DPs	Loan (in $US mln)	Grant (in $US mln)	GoB (in $US mln)	Hotspot
Small Scale Water Resources Development Sector II	2001	2009	ADB, GoN	34	24	20	Cross-Cutting
Sunamganj Community-Based Resource Management Project	2003	2014	IFAD	32	-	4	Haor
Jamuna-Meghna River Erosion Mitigation Project	2003	2009	ADB	42	-	19	Major rivers
Secondary Towns Integrated Flood Protection (Phase 2)	2005	2013	ADB, OFID	95	-	34	Urban areas
Southwest Area Integrated Water Resource Planning and Management	2006	2016	ADB	20	-	13	Coastal Zone
Water Management Improvement Project (WMIP)	2007	2016	WB, GoN	102	20	14	Cross-Cutting
Small Scale Water Resources Development	2007	2014	JICA	45	-	19	Cross-Cutting
Improvement of Storm Water Drainage System in Dhaka City Phase II	2007	2009	JICA	-	7	-	Urban areas
Emergency 2007 Cyclone Recovery and Restoration	2008	2017	WB	109	-	-	Coastal Zone
Emergency Disaster Rehabilitation Project	2008	2011	ADB, JICA, OFID, GoN	200	24	30	Coastal Zone
Participatory Small-scale Water Resources Sector Project	2009	2018	IFAD, ADB	87	-	30	Cross-Cutting
city region development project	2010	2017	ADB, KfW	120	30	20	Urban areas
Char Development Resettlement Project IV	2011	2017	GoN, IFAD	47	21	21	Coastal Zone

Project name	start	end	DPs	Loan (in $US mln)	Grant (in $US mln)	GoB (in $US mln)	Hotspot
Bangladesh Integrated Agricultural Productivity Project	2011	2016	GAFS	-	46	17	Cross-Cutting
Haor Infrastructure and Livelihood Improvement Project	2011	2019	IFAD, Spain	85	16	32	Haor
Bangladesh Integrated Agricultural Productivity Project	2011	2016	GAFS	-	46	17	Cross-Cutting
Coastal Embankment Improvement Project	2013	2020	WB, CIF	375	25	-	Coastal Zone
Coastal Climate Resilient Infrastructure Project	2013	2019	IFAD, ADB, KfW, PPCR	99	20	31	Coastal Zone
Blue Gold	2013	2019	GoN	-	67	11	Coastal Zone
Irrigation Management Improvement Project	2014	2019	ADB	46	-	12	CHT and coast
Multipurpose Disaster Shelter Project	2014	2020	WB	375	-	2	Coastal Zone
Haor Flood Management and Livelihood improvement Project	2014	2022	JICA	144	-	103	Haor
Flood and Riverbank Erosion Risk Management Investment Program - I	2014	2019	ADB	65	15	23	Major rivers
Coastal Towns Environmental Infrastructure Project	2014	2020	ADB, PPCR	82	12	23	Urban areas
Bangladesh Urban Resilience Project	2015	2020	WB	173	-	9	Urban areas

Source: BDP2100 team research

Table 4.6 Most important BDP2100 relevant WATSAN projects, financed by DPs (2000-2016) & chronological.

Project name	start	end	DPs	Loan (in $US mln)	Grant (in $US mln)	GoB (in $US mln)	Hotspot
CHITTAGONG HILL TRACTS RURAL DEVELOPMENT PROJECT	2002	2008	ADB, DANIDA, PKSF	30	19	12	CHT and coast
Urban Public and Environmental Health Sector Development Program	2002	2010	ADB	60	-	-	Urban areas
Bangladesh Water Supply Program Project	2003	2012	WB	40	-	15	Cross-Cutting
Urban Governance and Infrastructure	2003	2009	ADB	60	-	27	Urban areas

Project name	start	end	DPs	Loan (in $US mln)	Grant (in $US mln)	GoB (in $US mln)	Hotspot
Secondary Towns Water Supply and Sanitation Sector Project	2006	2012	ADB, OFID	50	-	21	Urban areas
Karnaphuli Water Supply project Phase I	2006	2010	JICA	105	-	41	Urban areas
Dhaka Water Supply Sector Development Program	2007	2015	ADB	-	-	-	Urban areas
Second Urban Governance and Infrastructure Improvement Project	2008	2015	ADB, GIZ, KFW	87	41	39	Urban areas
Dhaka water supply and sanitation project	2008	2017	WB	149	-	17	Urban areas
Social Investment Program Project II	2010	2016	WB	115	-	20	Coastal Zone
Chittagong Water Supply Improvement	2010	2018	WB	170	-	17	Urban areas
Second Chittagong Hill Tracts Rural Development Project	2011	2018	ADB	55	-	16	CHT and coast
Khulna Water Supply Project	2011	2017	ADB, JICA	259	-	105	Urban areas
BD Rural Water Supply and Sanitation Project	2012	2017	WB	75	-	18	Cross-Cutting
Dhaka Environmentally Sustainable Water Supply Project	2013	2019	ADB, AFD, EIB	450	-	225	Urban areas
Karnaphuli Water Supply project Phase II	2013	2022	JICA	357	-	98	Urban areas
Modern Food Storage Facilities	2014	2020	WB	210	25	5	Cross-Cutting
Third Urban Governance and Infrastructure Improvement Project	2014	2020	ADB, OFID	165	-	71	Urban areas

Source: BDP2100 team research

Table 4.7 Most important BDP relevant flood protection and water availability projects in pipeline of major DPs.

Project name	DPs	start	end	Total project size	Hotspot
Disaster Risk Reduction, Emergency Response and Recovery Project	JICA	n/a	n/a	0	Coastal Zone
Flood and Riverbank Erosion Risk Management Investment Program - Tranche III	ADB	2020	2023	124.8	Major rivers
Flood and Riverbank Erosion Risk Management Investment Program - Tranche II	ADB	2016	2021	145.3	Major rivers

Project name	DPs	start	end	Total project size	Hotspot
River Management Improvement Program - Phase I	WB	2016	n/a	650	Major rivers
Dhaka-Chittagong Multi-Modal Corridor	WB	n/a	n/a	n/a	Major rivers
Ganges–Kobadak irrigation project	ADB	n/a	n/a	n/a	Coastal Zone
Teesta irrigation project	ADB	n/a	n/a	n/a	Barind
Dhaka Water Supply Network Improvement	ADB	n/a	n/a	275	Urban areas
Bangladesh Weather and Climate Services Regional Project	WB	n/a	n/a	127.8	Cross-Cutting
River Management Improvement Program - Phase II	WB	2019	2025	700	Major rivers
River Management Improvement Program - Phase III	WB	2021	2026	300	Major rivers

Source: BDP2100 team research

Table 4.8 Most important BDP relevant WATSAN projects in pipeline of major DPs.

Project name	DPs	start	end	Total project size	Hotspot
Dhaka Water Supply Network Improvement	ADB	n/a	n/a	275	Urban areas

Source: BDP2100 team research

4.5 DPs: major players in the water sector: terms and conditions of loans

At present, Bangladesh can make use of concessional loans of the major four DPs. Their terms differ according to the projects they finance. An energy project for example usually has higher interest rates and a shorter pay-back period than projects aimed at flood protection. JICA has thus far given loans at exceedingly conditional terms, with an interest rate of 0.01% and a 40 year pay-back period, including 10 year grace period. It is expected that in the next 5-10 years all development partners will make their terms and conditions less conditional, which will thus be more expensive and have to be paid back sooner. However, this also means that Bangladesh can increase its loan volume as the IFIs are able to spend more medium/low concessional finance than high concessional finance. A simplified overview of the terms of conditions of the major IFIs active in Bangladesh is presented below.

Table 4.9 Terms and conditions for Bangladesh on loans from ADB, World Bank, IFAD and JICA

		ADB*		WB		IFAD	JICA
	Concessionality: Unit:	**High**	**Medium**	**High**	**Medium**	**High**	**High**
Maturity	Years	32	25	38	25	40	40
Grace period	years	8	5	6	5	10	10
Average Annual Principal Repayment	*% of initial capital per annum*	*4.15*	5.0	*2.63*	*4.00*	*3.33*	*3.33*
Interest	% per annum	1-1.5	2	0	1.25	0	0.01
Service fee	% per annum			0.75	0	0.75	0
Commitment fee	% per annum	0	0	0	0.25	0	0
Total fee	*% per annum*	*1-1.5*	*2*	*0.75*	*1.5*	*0.75*	*0.01*

Source: BDP2100 team research

4.6 Development Partners' priorities

The following priorities of development partners can be mentioned:

- Climate change adaptation seems to be a cross cutting topic which is a priority for almost all development partners and NGOs.
- BDP2100 formulation process coincides with the formulation processes of multi annual country strategies by major development partners (ADB, WB, DFID, USAID, among others).
- COP21 in Paris has led to increased climate finance commitments by many of the main development partners of Bangladesh, including World Bank, ADB, JICA, DFID, amongst others.

Priorities of the major players are:

- MoU between Bangladesh, World Bank and The Netherlands regarding BDP 2100 formulation and implementation; World Bank's contribution to Investment Planning;
- WB country strategy 2016-2020 lists BDP2100 as one of 3 focus areas.
- The ADB's County Operational Business Plan 2016-2018 supports integrated planning process for climate change mitigation & adaptation, governance, integrated water resource management, water supply and sanitation;
- The ADB's strong presence in water sector likely to continue, in line with water operational plan 2011-2020 (region wide) and as indicated by the (proposed) Bangladesh Country Partnership Strategy 2016-2020 which has a focus, amongst others, on climate resilient infrastructure and services;
- JICA appears to have developed recent an interest in climate adaptation projects and may or may not continue in this line.
- IFAD: current portfolio is characterized by projects which demonstrate very high BDP2100 relevancy. This is likely to continue.

5 Climate Adaptation funds for BDP2100

5.1 Introduction

Increasingly, policy makers realize that action needs to be taken now to prevent an excess of climate change taking place as well as to prepare resilience against future climate change influences. Climate finance denotes the flow of finance channelled by a range of actors and institutions towards adaptation and mitigation actions (Buchner, Falconer et al. 2011). It is expected to play a key role in the transition to low carbon climate resilient development (LCCRD). Many Climate Investment Funds (CIFs) are active on a global/international level since this the climate change is taking place

on a planetary scale, requiring a global coordinated approach. As the Bangladesh Delta Plan is primarily geared towards climate adaptation initiatives, this section only considers climate funds for adaptation measures.

Bangladesh is one of the front runners among developing countries (especially amongst Least Developed Countries) in setting up its own climate fund – the Bangladesh Climate Change Trust Fund (BCCTF), fully financed by its own national budget. Secondly, there is a bilateral fund – the Bangladesh Climate Change Resilience Fund (BCCRF), which is managed by the World bank. Bangladesh receives also financing from different climate funds such as the Pilot Programme for Climate Resilience, the Adaptation Fund and from the Least Developed Countries Fund (LDCF). Finally, there is the upcoming Green Climate Fund which offers significant opportunity for Bangladesh. The report does not look at the small (and currently empty) funds like the LDCF and the Adaptation Fund; The LDCF has almost reached its country ceiling in Bangladesh of $30 mln and the Adaptation Fund is available to Bangladesh but has not been utilized thus far.

Table 5.1 Climate funds available for Bangladesh

Financing source	BDP2100 relevant sector/project focus	Type of finance
PPCR	• Climate Adaptation • Water management	• Grants • Concessional loans
LDCF	• Climate Adaptation	• Grants
BCCRF	• Climate Adaptation • Infrastructure	• Grants
BCCTF	• Climate Adaptation • Infrastructure	• Grants
Green Climate Fund (GCF)	• Climate Mitigation and adaptation • Urban Adaptation • Rural Adaptation	• Equity • Non-Concessional loans • Concessional loans • Grants

Source: BDP2100 team research

This section will briefly discuss governance features of the four climate funds, as well their volume size, investment priorities and to what degree their activities are aligned with BDP2100 topics.

5.2 Climate funds available to Bangladesh only: BCCTF and the BCCRF

This paragraph discusses the main features of the two climate adaptation funds that are only available to Bangladesh are currently active. The Bangladesh Climate Change Trust Fund (BCCTF) is fully nationally owned with its funds originating from the national non-development budget in the form of a yearly block allocation. The BCCTF is managed by the Ministry of Environment and Forests (MoEF). The Bangladesh Climate Change Resilient Fund (BCCRF) is a bilateral fund, financed by development partners, and administered by the World Bank in conjunction with MoEF.

Both the BCCTF and BCCRF are designed to implement the Bangladesh Climate Change Strategy and Action Plan. After cyclone SIDR in 2007 caused massive destruction, the "Bangladesh-UK Climate Conference" was held in London to see how the UK government could support Bangladesh in climate change adaption. At the conference Bangladesh launched its BCCSAP, which was revised and finalised in 2009. BCCSAP sets out a 10 year program (2009-2018) targeting the following 6 areas:

- Food Security and Climate Change
- Comprehensive disaster management
- Infrastructure
- Research and Knowledge Management
- Mitigation and low carbon development
- Capacity building

To implement the BCCSAP 2009 schedule, five billion dollars over five years, or on average, one billion dollars a year was estimated to be roughly necessary for the first five years[46] (Clause 57 and 58, BCCSAP 2009). The BCCTF and the BCCRF were envisaged to mobilize and channel a large share of this sum. As can be observed in this section, these two funds have been able to deliver some output but have not been to deliver on their expectations.

5.2.1 BCCTF

To implement 44 programs specified under the 6 thematic areas of BCCSAP 2009, the BCCTF was created in the fiscal year of 2009-10. The Trust Fund was being operated through a project titled "Strengthening Institutional Capacity of Climate Change Unit under the Ministry of Environment and Forests". Subsequently, Climate Change Trust Act (CCTA), 2010 was enacted; and as per direction of CCTA 2010, Bangladesh Climate Change Trust (BCCT) was established 24 January 2013 with effect from 13 October 2010[47]. By funding its own climate fund Bangladesh has gained international recognition for taking climate adaptation measures seriously, even while being a Least Developed Country. On the 27th of September 2015, Bangladesh received the Champions of the Earth award, UNEP's highest award environmental accolade in recognition of Bangladesh's far-reaching initiatives on climate change.

BCCTF governance

BCCT and its functions are governed by a 17-member Trustee Board. The Trustee Board is the highest decision making body for the Trust Fund. It comprises of honourable Minister, MoEF as the chair, and 16 other members including 9 ministers/state ministers. Cabinet Secretary, Governor of Bangladesh Bank, Finance Secretary, Member of Planning Commission and 2 experts appointed by the GoB. The Secretary, MoEF, is its Member Secretary.

To assist the Trustee Board, there is a Technical Committee headed by the Secretary, MoEF. It comprises 13 members including experts/representatives from the Planning Commission, DoE, DoF, CEGIS and social organizations/NGOs working on climate change. [48]

Accountability Mechanism[49]

- Both BCT and individual projects are audited by Comptroller and Auditor General (CAG) of Bangladesh.
- The Trustee Board is also required to submit to the Government an Annual Report on its activities of the previous fiscal year.
- BCCT is answerable to questions raised by Honourable Members of Parliament (MPs) in Jatiya Sangshad. Its activities are also discussed in the meetings of Parliamentary Standing Committee on Ministry of Environment and Forests.
- There are representatives from Civil Society in the Trustee Board and the Technical Committee.

Implementing agencies

In the graph below TIB (2013) has made an inventory of implementation agents involved50. The Ministry of Water Resources is by far the leader in terms of BCCTF projects approved (58 out of 140) and the total grant money allocated ($86 million out of $190 million). MoEF and LGRD are quite far behind but have still received much more than the other implementation agencies.

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[46] Out of the USD 594 million that the developed countries had pledged to Bangladesh until June 2013, the contribution realized for implementation is much less than the required amount (TIB 2013:10). In addition, the BCCTF has

[47] Booklet distributed by BCCTF in 2014.

[48] Booklet distributed by BCCTF in 2014.

[49] BCCTF website

[50] TIB seems to have knowledge of 140 projects when they published their study (October 2013), which is inconsistent with BCCTF which mentions on its website that there are 219 projects led by government agencies.

We can observe a significant correlation between total number of projects and BCCTF grant money allocated per implementation agency, with some fluctuations, indicating that there are limited differences in terms of grant money allocated per project.

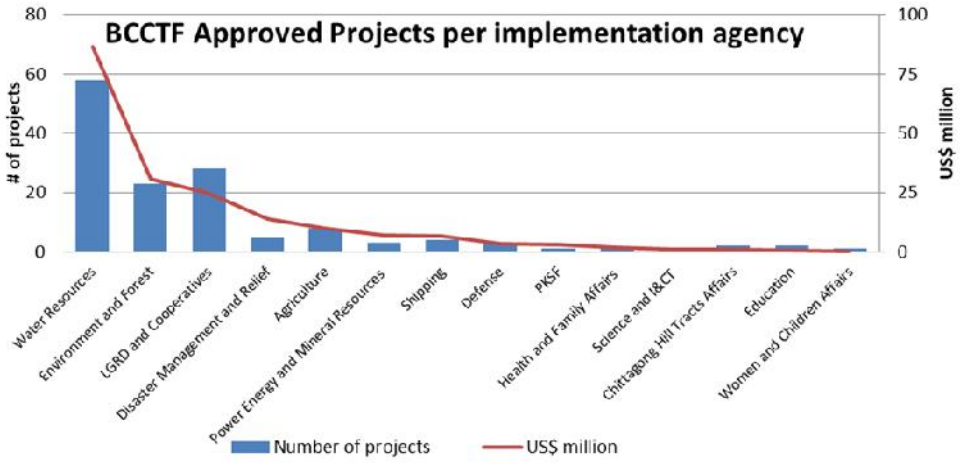


Figure 5.1 BCCTF Approved projects per implementation agency

Source: TIB 2013

In addition, BCCTF finances non-governmental organisations. PKSF manages NGO's finance for the BCCTF. It includes NGO selection, project selection, drafting criteria, distribution of funds, monitoring, and evaluation. 63 NGO were finally selected and projects are currently being implemented. In the report on climate finance governance by Transparency International Bangladesh (TIB), these investments particularly have faced most scrutiny (compared to grants to government agencies) from the global watchdog and most of its wrath and criticism. According to TIB, PKSF has a good background in micro finance, but little, to none in climate finance. More importantly, TIB noticed the opaque decision making process which made it almost impossible to determine why NGOs/projects were selected, how they were managed, what outcomes they would generate and how they would be monitored and evaluated. In addition, granular investigation revealed NGO were difficult to trace – and some even appeared non-existent. Finally TIB found numerous accounts of projects obtained through exercising political influence, and numerous conflicts of interests were recorded (TIB 2011 and TIB 2013). Interviews with the BCCTF management in October 2015 revealed that the fund has stopped working with NGO's and now only works with government implementing agencies.

Volumes and projects

As of July 2014, BCCTF has disbursed $251.5 million against commitment of $350.60 million. The BCCTF only provides grant finance. The BCCTF is receiving funds on a continuous basis from the recurrent (non-development) budget. Up until FY2015-2016, BDT 3,000 crore has gone into the BCCTF in total, see graph below. However, flow of funds has decreased substantially over the years.

As of April 2013, 282 projects have been undertaken with an estimated cost of BDT 1,997.04 crore. Several Ministries, Departments and Agencies of the Government are implementing 219 projects while 63 projects are being implemented by NGOs. Among the Government projects, 31 have been completed. The financial management of NGO projects has been vested to Palli Karma- Sahayak Foundation (PKSF). So far, BDT 25 crore has been allocated to PKSF (BCCTF website

11/5/2015). The average project[51] appears to average BDT 876 lakh, in which the lowest grant is BDT 19 lakh, whereas the largest grant was BDT 2,500 lakh. BCCTF has been governed by an inter-ministerial committee and each year it allocated two-thirds of the amount towards projects submitted by different agencies and ministries, while keeping one-third in a reserve account to be used in case of emergencies.

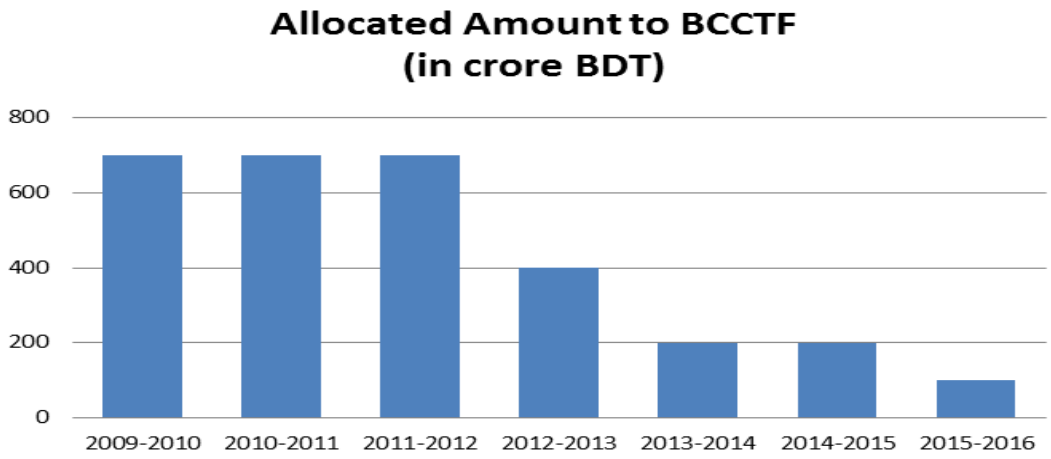


Figure 5.2 Allocated Amount to BDDTF

Implementation criteria

BCCTF has the following implementation criteria:

BCCTF Project Grant Criteria for GoB Executed Components:

- Any proposed project must fall under one of the 44 programs categorized under 6 thematic areas as specified BCCSAP 2009.
- The Project Proposal (PP) must include a specific plan of action aiming to address any of the risks of climate change. It must also mention the expected outcome of the project.
- To avoid duplication with any other projects, a certificate from the head of the proposing ministry or agency has to be attached.
- A project can be implemented by a maximum of three implementing agencies where one agency will take the lead.
- A project under the BCCTF is to be completed usually within 3 years. In special cases, the Trust Board can extend the duration.
- The estimated expenditure of a project should be limited within Tk 25 crore
- Normally, the project is to be implemented by the existing manpower of the implementing agency.
- The recruitment of foreign consultants is not permitted.
- A detailed design of construction work, if any, and estimated cost of the project will have to be submitted separately with the project proposal.

[51] Based on updated project list (as of 17/11/2014) found on BCCTF website. It includes 236 projects with a total grant size of BDT 206,759.85 lakh

- Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) must be submitted with the proposal, where applicable

BCCTF projects

The BCCTF has undertaken 305 projects as of October 2015 (interview BCCTF), which include construction of embankments and river bank protective work, building cyclone resilient houses, excavation /re-excavation of canals, construction of water control infrastructures including regulators/sluice gates, waste management and drainage infrastructure, introduction and dissemination of stress tolerant crop varieties and seeds, afforestation, installation of solar panels and so on. Detailed and structured achievements for the BCCTF are unavailable, but BCCTF lists the following key achievements on its website (October 2015):

- 15.4 km of coastal sea dyke have been constructed.
- 6,760 cyclone resilient houses have been erected.
- 142 km of embankments have been built.
- 122 km of river bank protective work have been completed.
- 535 km of canals have been excavated/re-excavated.
- 44 water control infrastructures including regulators/sluice gates have been constructed.
- 166 km of drainage have been constructed in the urban areas to reduce water logging.
- 740 deep tube wells, 30 pond-sand-filters and 50 water treatment plants have been installed.
- 500 water sources and 550 rain water reservoirs have been established.
- Agro-met stations for early weather forecasting have been set up in 4 upazilas.
- 143.35 million trees have been planted
- 7,800 biogas plants have been installed.
- 528,000 improved cook-stoves have been distributed.
- 12,872 solar home systems have been installed in the remote off-grid areas.
- Introduction of stress tolerant crop varieties have been introduced
- 4,500 metric tons of stress tolerant seeds have been produced and distributed.

IIED has researched BCCTF portfolio in 2014 and found that most resources were spend in infrastructure sector (71%) after mitigation and low carbon development (13 %), while least has been spend on comprehensive disaster management (1%) and capacity development and institutional strengthening (1%).

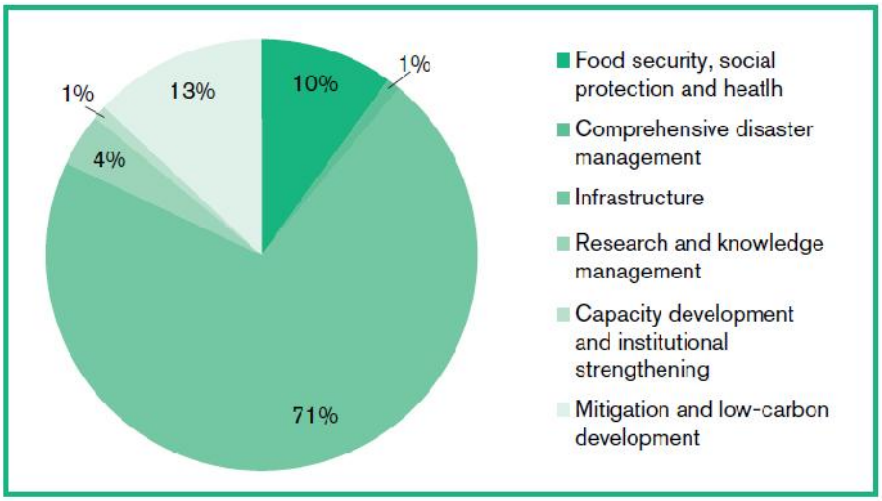


Figure 5.3 BCCTF spending by BSCCAP 2009 theme

Source: IIED2014: p3,[52

5.2.2 BCCRF

The Government and development partners agreed on a fourfold vision statement for BCCRF:

By 2020, the BCCRF will be a government led, owned and managed collaborative, and sustainable climate change financing mechanism, which is transparent and accountable, aimed at developing capacity and resilience of the country to meet the challenges of climate change.

BCCRF aims to support the implementation of the BCCSAP through an institutional framework by:

- Providing a platform for coordination of BCCRF stakeholders and acting as a catalytic agent for wider coordination
- Serving as a climate fund, which also brings innovation, harmonization and added value to the GoB's climate change initiatives
- Serving as a financing mechanism to bring global climate change funding to Bangladesh
- Supporting implementation of prioritized, results-oriented climate change interventions that deliver sustainable outcomes particularly targeting the least resilient.

Once a project is approved (and before funding is disbursed), the Economic Relations Division draws up a grant agreement with the World Bank (the fund's Trustee and interim secretariat until 2017) and the recipient government agency. In this case the implementing government agency is accountable to the Resilience Fund's Governing Council. The remaining 10 per cent of funding has been allocated to non-state actors. This envelope – the Community Climate Change Project- is managed by the Palli Karma Sahayak Foundation. The Foundation is accountable to the Resilience Fund through the World Bank, which is currently in charge of providing managerial and technical assistance to the Fund. (TIB 2013:8)

BCCRF Governance

BCCRF was established in May 2010 with the signing of a Memorandum of Understanding between the Government of Bangladesh, development partners and the World Bank. BCCRF is managed and implemented by GoB while the World Bank (on behalf of development partners) provides backstop technical and fiduciary services until 2017. The World Bank

52 http://pubs.iied.org/17227IIED

was initially open to discussions to possibly provide this service after 2017 but is now no longer interested to continue its involvement. The World Bank charges, in total, 3.4% for overall trust fund and project management.

BCCRF has a three tier governance system: A Governing Council which provides overall strategic direction and guidance to BCCRF and ensures its alignment with the CCSAP. The Management Committee is responsible for the work programme, ensuring that the BCCRF is implemented in line with the agreed implementation manual and consider grant requests submitted by various line ministries and other eligible institutions. The MC is thus responsible for project selection, review, assessment, monitoring and evaluation. Both the Governing Council and the Management Committee are chaired by the Government and includes representatives from line ministries, Development Partners and Civil Society. The third tier of the governance system is the BCCRF secretariat which supports the Governing Council and Management Committee and manages day-to-day operations of BCCRF.

Issues within the BCCRF came to a head in 2014, culminating in the decision by the trustee (World Bank) & the contributing donors that the BCCRF should be closed in an orderly manner by its end disbursement date of June 30, 2017. This meant that no new projects would be initiated. The Fund will spend less than half its budget with a commensurate reduction in results (DFID 2015; monitoring report CC Project).

The original plan of the World Bank supporting the secretariat in 2012: "The World Bank has been providing support to the day-to-day operations of the BCCRF. However, this responsibility is gradually going to transition to a Secretariat that will be established at the Ministry of Environment and Forests. The Bank team will work closely with the Ministry of Environment and Forests to build the capacity of the Secretariat. The Secretariat will be responsible for providing support to the Governing Council and Management Committee, provide advocacy, communication and coordination support to all agencies implementing activities funded by BCCRF".[1]

Implementing agencies

The Line Ministries of the Government of Bangladesh (GoB), Bangladeshi NGOs and Civil Society Organizations could apply to BCCRF for funding. Community-based organizations, research institutions and other civil groups could also submit proposals. 84.6% of the total activities funded by the BCCRF would be implemented by Government institutions, 10% by NGOs and other civil society organizations under the community-based program and 2% by the Bank to provide analytical work and technical assistance under CCSAP's fourth and sixth pillars.

The BCCRF Governing Council designated the Palli Karma-Sahayak Foundation (PKSF) as the responsible agency for this project. US$ 10.4 million will focus on competitive grants to NGOs to implement community-driven adaptation to climate change. The remaining funds will be allocated to monitoring Among the 41 NGOs involved in the CCCP project, fourteen proposals target salinity-prone, eighteen target flood-prone, and nine target drought-prone areas. The World Bank is satisfied with progress made by the project until June 2015. However, prof. dr. Atiq Rahman reports that many NGOs did not have adequate access to BCCTF and BCCRF. [53] Indeed, also the Indigenous Peoples National Coordination Committee[54] reported that indigenous populations were not consulted in projects where they were among the main stakeholders, this was especially the case for BCCTF projects, but also for BCCRF funded projects. <

[53] http://www.thedailystar.net/supplements/24th-anniversary-the-daily-star-part-3/environmental-governance-and-growth-71123

[54] http://iva.aippnet.org/indigenous-peoples-national-preparatory-meeting-for-cop21-and-national-workshop-on-climate-change-and-dialogue-with-the-government-of-bangladesh-held-in-dhaka/

Investment priorities

Any activity that supports one or more pillars of the BCCSAP was eligible for funding by the fund. More specifically, selection criteria included:

- Grant Beneficiaries: Defined target population impacted by climate change
- Grant Executor: Government of Bangladesh line agency
- Grant Amount: Between $15 to 25 Million (indicative)
- Eligible Activities: Identified activities that meet BCCSAP objectives
- Basis of Approval: Approved Project Grant Request and DPP, World Bank Project Appraisal, and signed Grant Agreement between GOB and the World Bank
- Implementation Period: Three years (indicative), with possible one year extension, based on satisfactory performance, and follow-up grants
- Results Monitoring: Baseline, mid-term and final evaluation of outcomes based on agreed results indicators
- Grant Administration: Priority given to proposals that use existing project units of development-type operations to administer the grant

Volumes and projects

Initially DPs had contributed USD 170 million in grant funding. Contributing DPs were United Kingdom (US$95 million), the European Union (US$37 million), Sweden (US$13 million), USAID (US $ 13 million), AusAID (US $ 7 million), Switzerland (US$ 3.4 million) and Denmark (US$1.2 million). However, due to several complications these contributions were not translated into projects. Of the original pipeline of eight major projects, four are underway, with a total value of $81 million. A total of $32m has been disbursed up until June 2015(DFID 2015).

Table 5.2 Projects underway and percentage of disbursement up to June 2015

Project	Budget (USD million)	Disbursed (USD million)	% disbursed
1. Cyclone shelters	25	18.74	75%
2. CCCP	12.5	5.35	43%
3. Afforestation	33.8	7.81	23%
4. Solar Irrigation	10	0.644	6%
TOTALS	**81.30**	**32.54**	**40%**

Source: Annual review DFID Climate Change Programme – June 2015

All projects of BCCRF are adaptation finance except the solar irrigation programme which can be defined as a climate mitigation activity. In two cases BCCRF has utilized a blending mechanism by co-financing along with the World Bank in large projects.

Table 5.3 Six major projects financed by BCCRF grants (as communicated in Dec. 2014 by BCCRF)

Project title	***Short description***	***Finance in mln USD***	***Duration***	***Region***
1. Multipurpose Cyclone Shelter Construction Project	recovery from the damage to livelihoods and infrastructure caused by Cyclone Sidr and to build long-term preparedness through strengthened disaster risk reduction and management	BCCRF 25 KfW 4.86 GFDRR 2.96 *Concessional loan:* WB 324	2008-2017 (original: 2008-2013	Khulna district (Coastal region)
2. Community Climate Change Project	Enhance the capacity of selected communities to increase their resilience to the impacts of climate change	BCCRF 12.5	2012-2016	All Bangladesh
3. Climate Resilient Participatory Afforestation and Reforestation Project	Increase forest cover through community participatory and co-management approaches, in the coastal and hilly areas of Bangladesh to reduce the impact of cyclones and tidal surges.	BCCRF 33.8 GoB 1.2	2013-2016	Coastal
4. Rural Electrification and Renewable Energy Development II	Increase access to clean energy in rural areas through renewable energy and promote more efficient energy consumption.	BCCRF 10 GoB 10 KfW 12.9 USAID 7.6 Local beneficiary 53.4 NGO 90.2 GoB 42.4 *Concessional loan:* WB 155	2013-2018	National

Source: information gathered by authors from different official channels

5.2.3 Conclusion BCCTF and BCCRF

Theoretically BCCTF and BCCRF are fully aligned with BDP2100 as they are geared towards making Bangladesh a climate resistant country and follow the national policies of the Bangladeshi government. However, BCCTF is geared towards small projects whereas the Delta Plan tends to look at larger projects that offer large scale solutions. Perhaps it would still be able to provide grant funding that can offer tactical support to large programs. The BCCRF has stopped developing new projects and will cease operations completely by 2017.

However, some vital lessons and observations can still be made that are relevant for the BDP2100 process.

- The BCCTF has awarded Bangladesh with international recognition on its commitment to fight climate change. However, project selection in practice, and what they have been able to achieve compared to their original objectives is unknown. Indeed according to TIB (2013) BCCTF allocations were accused of bias towards some regions. For example, the most vulnerable regions like Khulna (due to salinity and cyclones), Rangpur and Rajshahi

(drought, flood and river erosion) have been reported not to get much government project under the BCCTF. Also, mid-way 2015 one would expect to see more reports and stories emerging from the fund initiatives. BCCTF has encountered many difficulties, foremost of which serious allegations of corruption and inefficiencies, prompting senior policy makers to radically reduce budgetary commitments to the fund.

- For BCCRF: Clear agreements and coordination between Development Partners themselves and with the Government is crucial for achieving climate objectives.
- The BCCTF and BCCRF have a different fund structure. The BCCTF is an endowment fund whereas the BCCRF is a sink fund. While they could be sustainable, endowment funds require initial capital and are more vulnerable to investment risks. Sink funds are designed to disburse the full principle capital and investment income within a fixed period of time. An endowment fund retains its principle capital throughout the programme, using the investment income to support grants. Although not entirely revenue generating, they receive interest and dividends from investments and capital, making them self-sufficient. While they could be sustainable, endowment funds require initial capital and are more vulnerable to investment risks – as opposed to revolving funds (UNDP 2012). BCCTF and BCCRF fund structures can inform Delta Fund thinking (for example the BCCTF reserved 33% of its funds to receive interest and pay its staff and other costs making self-sufficient and giving the fund a sustainable basis).

BCCTF and BCCRF good practises and lessons learned should be carefully examined and extracted for the implementation of BDP2100.

5.3 Pilot Programme for Climate Resilience

The Pilot Programme for Climate Resilience (PPCR) is a financing instrument within the Strategic Climate Fund (SCF), funded through the World Bank-administered climate investment funds (CIFs). CIFs comprise two multi-donor trust funds – the Clean Technology Fund (CTF) and the SCF – with specific mandates and governance structures. PPCR is one of three targeted programmes, in addition to the Forest Investment Program (FIP) and the Scaling up Renewable Energy Programme (SREP), under the SCF, which were approved in 2009.

The PPCR has already reached its country allocation ceiling for Bangladesh but it was able to mobilise substantial finance from IFIs and DPs. Some projects are now being extended by DPs with additional funds. But the PPCR itself will not be replenished. And such it will not be able to take up any new projects for the BDP2100. In this short chapter the main elements of the PPCR are briefly mentioned.

5.3.1 PPCR objectives

The PPCR was designed to demonstrate ways to integrate climate resilience into core development planning and implementation in participating countries. PPCR is expected to provide lessons that can be taken up by countries and future climate change operations. [55]

The key objectives are to:

(a) Pilot and demonstrate approaches for integration of climate risk and resilience into development policies and planning;

(b) Strengthen capacities at the national level to integrate climate resilience into development planning;

(c) Scale-up and leverage climate-resilient investment, building on other on-going initiatives;

(d) Enable learning-by-doing and the sharing of lessons at the country, regional and global levels.

[55] CEIL 2015 – EoD, p.66

According to Rai et al. (2015) PPCR benefited from strong stakeholder engagement and coalitions: "stakeholders involved in planning the PPCR coalesced into groups that shared a vision towards 'transformational change' and bringing 'development benefits'. These coalitions had the power to direct investment decisions. For example, our discourse analysis in Bangladesh showed that government implementing entities and MDBs shared the narrative that PPCR would bring 'transformation' by investing in capacities for climate resilient infrastructure, and that 'development benefits' would be achieved through economic growth. This coalition steered decisions to invest PPCR finance into large-scale coastal engineering projects."

5.3.2 PPCR volumes in Bangladesh

Current PPCR funding (up to December 2014) is $99.3 million. Original commitment of CPPCR was $110 Million of which US$50.0 million was to be comprised of a grant money and US$60million in concessional Loan. There are a number of 6 projects that are currently being implemented/or have already been implemented by three different MIE's: IFC, IBRD, ADB. What is impressive about the PPRF is that is able to co-finance quite substantial projects, leveraging economies of scale.

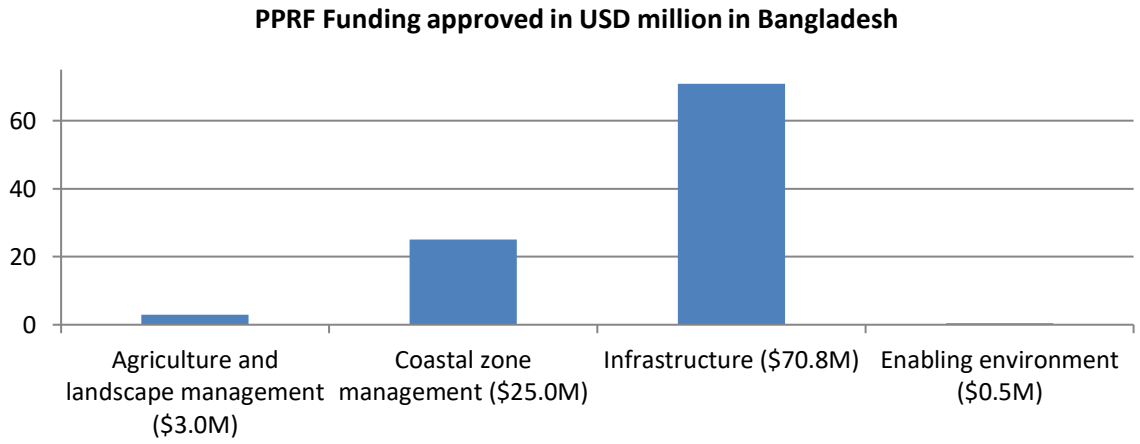


Figure 5.4 PPRF Funding approved in USD million in Bangladesh

Source: Adapted from cif.climateinvestmentfunds.org - Graph includes data updated December 2014

Table 5.4 Pilot Programme for Resilience Fund projects in Bangladesh

Project title	Thematic focus	Sector	MDB	Funding (US$M)	Co-financing (US$M)
Promoting Climate Resilient Agriculture and Food Security	Agriculture and landscape management	Private	IFC	3	0.7
Coastal Embankments Improvement Project	Coastal zone management	Public	IBRD	25	375
Coastal Town Infrastructure Improvement Project	Infrastructure	Public	ADB	40.4	76.7

Coastal Climate Resilient Water Supply, Sanitation, and Infrastructure Improvement[56]	Infrastructure	Public	ADB	30	120
Technical Assistance 1: Climate Change Capacity Building and Knowledge Management	Enabling environment	Public	ADB	0.5	0.1
Technical Assistance 2: Feasibility Study for a Pilot Program of Climate Resilient Housing in the Coastal Region	Infrastructure	Private	IFC	0.4	
Total				**99.3**	**572.5**

Source: Adapted from cif.climateinvestmentfunds.org - Table includes data updated December 2014

5.3.3 PPCR conclusion

The Pilot Programme for Climate Resilience appears to have been successful and development partners would like to send some additional funds to funded projects. The fund itself however has been fully spent and will not be increased. The Green Climate Fund on the other hand is expected to receive significant amounts of climate finance, which will be discussed below.

5.4 Green Climate Fund

The 15th Conference of Parties (COP) meeting in 2009 secured firm funding commitments for climate change adaptation and mitigation in developing countries. Developed countries in that meeting agreed to provide 'new and additional' resources to the tune of $100 billion per annum by 2020 with a balanced allocation between adaptation and mitigation purposes. Consequently, the Green climate Fund (GCF) was established in COP-16 in 2010 under the United Nations Framework Convention on Climate Change (UNFCCC).

The fund is available for member countries coping with and adapting to the effects of climate change. The GCF is different from many other climate funds as it will be scalable and flexible in nature and necessarily meant to maximise the impact of adaptation and mitigation actions in a way that transforms the business-as-usual development (paradigm shift), while generating environmental, social, economic and development benefits in a more inclusive and gender-sensitive way. The GCF means to become the main global fund to catalyse climate change finance at national, regional and international levels, and is already the largest specialised fund in operation.

The fund is set to play a significant role in channelling new concessional finance. It will also have a risk appetite that is consistent with its mandate of promoting a paradigm shift in financing new investments by government, private sector and non-governmental actors in developing countries (GCF Elements 2015).

5.4.1 GCF Governance

The GCF is a legally independent entity with a full-time Secretariat in Songdo, Republic of Korea. The UNFCCC COP formally invited the World Bank to serve as interim trustee for a new GCF. The World Bank has agreed to provide interim trustee services to the GCF (receive financial contributions, hold and invest them, and transfer them upon the instructions of the GCF) until such time as a permanent trustee is selected by the GCF[57]. The WB will provide this service for three years, initially.

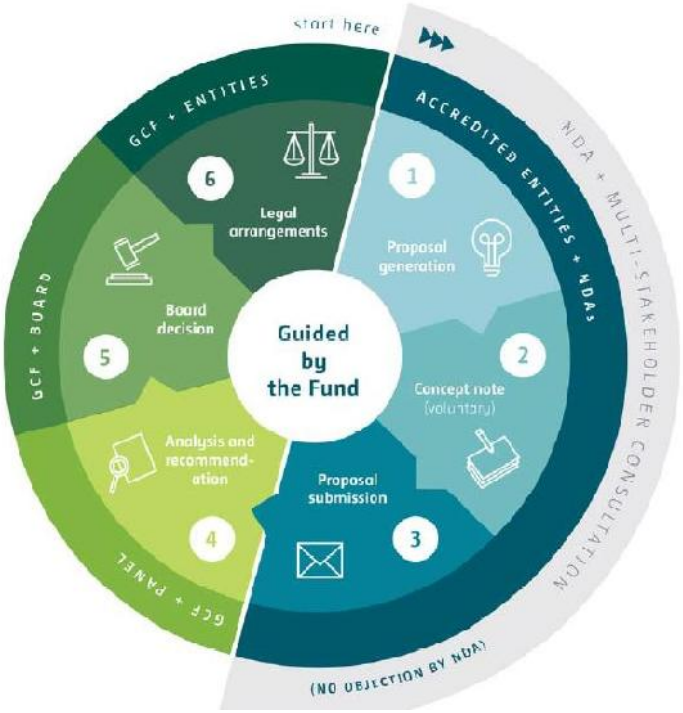
The GCF is governed and supervised by a Board that has full authority for all funding decisions. The GCF Board has 24 members, composed of an equal number of members from developing and developed countries, which is a unique

[56] Component 2- Climate Resilient Infrastructure Improvement in Coastal Zone Project
[57] http://fiftrustee.worldbank.org/index.php?type=fund&ft=gcf

feature among international finance institutions. Each board member has an alternate member who is entitled to participate in the meetings of the Board only through or in the absence of the principal member, without the right to vote, unless they are serving as the member. Bangladesh is alternate member of the GCF Board representing the Least Developed Countries (LDCs).[58]

GCF will pursue a country-driven approach, and promote and strengthen engagement at the country-level. The Fund intends to provide direct accessibility and flexible opportunities to climate vulnerable countries, but the recipient countries have to meet certain requirements to ensure transparency and meet the fiduciary standards set by the Fund's Board. The GCF uses a fit-for-purpose approach by matching the nature, scale and risk of intended activities to the application of the fiduciary standards and environmental and social safeguards.

In order to implement projects, GCF makes use of a National Designated Authorities (NDAs) and National and Multinational Implementing Entities (MIEs and NIEs). Both accredited partners and NDAs can submit funding proposals; NDAs have veto power over investments in their respective territories.



The NDA has 5 key functions:

- Convene national stakeholders
- Nomination letters for direct access
- No-objection letters for projects/ programs
- Approval of readiness support
- Strategic oversight to national priorities

Accredited agencies may carry out a range of functions, including:

- Developing and submitting funding proposals for projects and programs
- Overseeing management and implementation of projects and programs
- Deploying a range of financial instruments within their respective capacities
- Mobilising private sector capital

5.4.1 GCF Implementing Entities in Bangladesh

The GCF has so far accredited 20 implementing entities, some of them are national implementing entities, but most of them are currently multinational implementing entities. In Bangladesh eight of these MIEs have a local office. These are KfW, ADB, World Bank, UNDP, AFD, IUCN, UNEP and WMO.

The government of Bangladesh has designated the External Resources Division (ERD) of the Ministry of Finance as its National Designated Authority (NDA) to deal with the GCF and approve national entities who could apply directly to the GCF for funding. The ERD has already initiated actions to identify national implementing entities that could be approved for submitting funding proposals to GCF. BCCTF had envisioned becoming the NIE for GCF, but a workshop organized by GIZ and the ERD showed that BCCTF was not ready to take on this role. Instead, it appeared that the Infrastructure Development Company LTD (IDCOL) is instead the most promising contender to take up this role (GIZ/ERD 2015). Also, Bangladesh Bank, PKSF and LGED are promising contenders. Insiders believe it will still take some time for NIE's will be accredited.

[58] http://www.dhakatribune.com/environment/2015/may/09/green-climate-fund-reality-or-rhetoric#sthash.HMD36QAN.dpuf

5.4.2 Volumes, allocation and priorities

The total amount pledged to date by developed countries is almost $10.2bn. The GCF reached effectiveness on the 21st of May 2015 when the Government of Japan signed its pledge of USD 1.5 billion equivalent, which brought the fund over the 50% threshold required to start allocating its resources for projects and programmes in developing countries (GCF 2015). The United States of America is the biggest donor and signed USD 3,0 bln, Japan (USD 1.5 bln) and Germany (USD 1.003 bln) are the second and third largest donors, in total there are 43 state governments contributing to the Initial Resource Mobilization.[59] In April 2016 the CGF contains 9.9 billion USD equivalent, or 96% of the total amount announced ($10.3 bln equivalent), see graph:

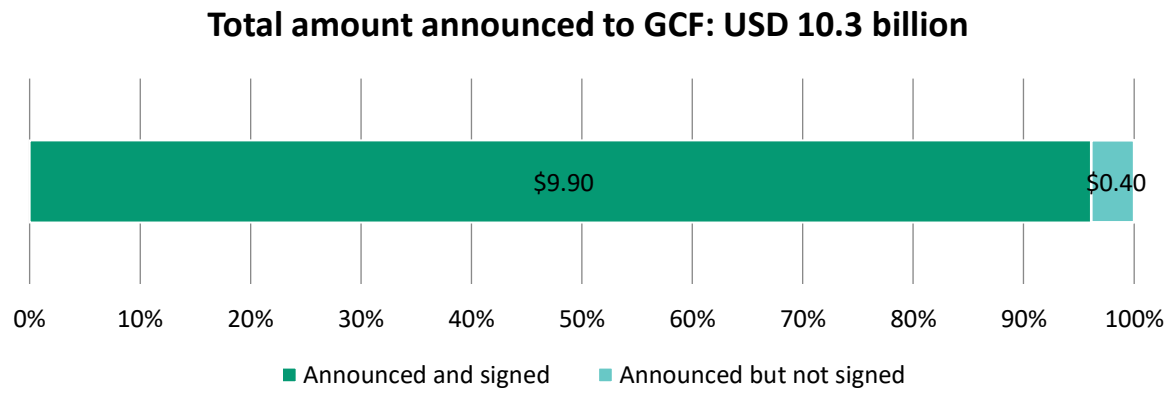


Figure 5.5 Total amount announced to GCF: USD10.3billion

Source: GCF Pledge Tracker (volumes as of April 2016)

Currently, GCF has received 10.3bln US$ equivalent in pledges which will serve its 2015-2018 programming period and aims to take funding decisions of $2.5 bln dollars in 2016. It is important to highlight here how difficult and slow the announced pledges were consolidated into signed pledges. Converting pledges into signed contributions to GCF was far behind schedule for a very long time and indicates the reluctance of rich nations to 'walk the talk' on reducing the impact of climate change outside their own borders.

In its first board meeting of 2016 GCF aimed to take funding decisions worth USD 2.5bln. At the beginning of 2016, GCF had a pipeline of 36 projects (total value of USD 5bln), out of which 22 projects stand at least a fifty-fifty chance of being ready for approval in 2016. These 22 projects amount to USD 1.5 bln of project finance.

The GCF has identified four categories of project sizes that the accredited entity may undertake.

[59] Interestingly, the world's largest economy – China - has made no pledge to the fund yet. Indeed, China's chief climate negotiator Su Wei criticized developed nations for not living up to their 2009 commitment to mobilize $100 billion a year from both public and private sources by 2020 to help poor nations suffering droughts, heat waves, floods and rising seas. Instead of pledging funds, Wei mentioned that China will prioritize climate-related assistance to developing countries through its own development program.

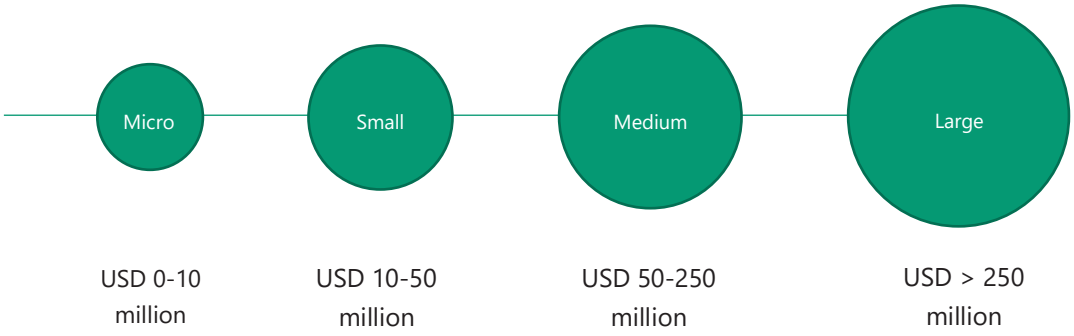


Figure 5.6 GCF project sizes

Source: GCF website

In 2015, the GCF already committed USD 168 million to 8 projects in different countries. Importantly, Bangladesh was also among the 8 countries and received a USD 40 million grant (50% of USD 80 million) for a KfW project called Climate-Resilient Infrastructure Mainstreaming. Here GoB finances USD 25 million (or 31.25%) and KfW provides a USD 15 million grant (18.75%). Bangladesh reaping a major share of the first 8 projects is a positive signal and is aligned with the expectation of many that Bangladesh will be a focus country of GCF.

5.4.3 Financial products; terms and conditions

Accredited entities can undertake mitigation and adaptation initiatives and deploy GCF resources using a variety of financial instruments, including grants, loans with high and low concessionality, guarantees and equity. For grants with repayment contingency, terms will be adapted to the required concessionality of the project or programme. For grants without repayment contingency, no reimbursement is required. However all grants will be subject to an obligation for repayment if the recipient is found to be in material breach of its contractual obligations towards the Fund or involved in a material violation of the Fund's integrity or fiduciary standards, including those on corruption and fraud.

The GCF terms and conditions for loans are outlined in table below. GCF will review all terms and conditions on an annual basis.

Table 5.5 GCF Low and High concessional loans compared to World Bank and JICA loans for Bangladesh

		GCF		WB		JICA
	Concessionality: *Unit:*	High	Low	High (IDA)*	Low (Blend)*	High
Maturity	Years	40	20	38	25	40
Grace period	years	10	5	6	5	10
APR 1	% of initial capital	2[a]	6.7[c]	3.125[d]	3.3[e]	3.33[g]
APR 2	% of initial capital	4[b]	n/a	n/a	6.7[f]	n/a
Average APR	*% of initial capital p. yr*	*2.50*	*5.03*	*2.63*	*4.00*	*3.33*
Interest	%	0	0.75	0	0	0
Interest	% per annum	0	0	0	1.25	0.01
Service fee	% per annum	0.25	0.5	0.75	0	0
Commitment fee	% per annum	≤0.50	≤0.75	0	0.25	0
Total fee	*% per annum*	*0.25 - 0.75*	*0.5 -1.25 + interest*	*0.75*	*1.5*	*0.01*

Source: BDP2100 research

APR= Annual Principal Repayment. a) Yr 11-20, b) Yr 21-40, c) Yr 6-20, Yr 7-38, e) Yr 6-15, f) Yr 16-25, g) Yr 11-40. * IDA and Blend terms are based on Special Drawing Rights (SDR) interest rates. GCF uses major convertible currencies. JICA uses the Japanese Yen.

When comparing loan terms and conditions of the GCF with those offered by World Bank and JICA to Bangladesh, some observations can be made. The conditions of World Bank IDA and Blend loans are broadly similar to those offered by GCF. Adaptation finance tends to be funded with grant money or with highly concessional loans since adaptation projects do not (usually) have a revenue model. It would seem that GCF may have slightly better interest rates than the World Bank in this respect (0.75% per annum versus 0.25%-0.75% per annum). However, when compared to the concessional loans of JICA (0.01% per annum) the GCF is unable to compete.

Reports have been received from MIEs that GCF appears to give some preference to providing concessional loans as opposed to providing grants, also in case of climate adaptation finance. This would put into question the degree of additionality that GCF has over existing climate financing mechanisms. And also appears to contradict the original grounds upon which the GCF was founded, in which developed nations would fund climate mitigation and adaptation initiatives, especially in developing countries, to reduce the impacts of climate change that they had caused. This is also known as the climate justice rationale.

5.4.4 Strategic impacts and investment criteria

The GCF will finance low-emission (mitigation) and climate-resilient (adaptation) projects and programmes developed by the public and private sector to contribute to the sustainable development goals of countries. In doing so, it will aim to equally balance its allocation between adaptation and mitigation over time, and allocate significant resources to the private sector. It will also aim to allocate at least half of its resources for adaptation for countries that are particularly vulnerable to the impacts of climate change. These countries will include Least Developed Countries (LDCs), Small Island Developing States (SIDS) and African States[60].

On the distribution of first tier resources, the Board decided to allocate 20% of GCF's total cumulative commitments through the Private Sector Facility (PSF) for both mitigation and adaptation. GCF seeks to offer added value to recipient countries and remove trade-offs between development and climate action. This is an initial allocation which will be revised and increased, provided the private sectors show a strong result (Box 5.1[61] gives some background information of the importance of private climate finance).

Box 5.1: Private Climate Finance
20% of the total GCF is dedicated to a private sector facility. This could prove a strong impetus for the private sector to become more interested in climate adaptation/mitigation investments. In fact, global climate finance is predominantly originating from private investors according to the Climate Policy Initiative. The private investors – mostly project developers – are however only involved in mitigation projects. Currently, it's the public sector bankrolling climate adaptation investments (see annex for more detailed information). An important caveat here is that methodologies to adequately capture adaptation finance are still being developed, and current statistics understate actual levels of climate adaptation finance.

[60] Previously the board decided this allocation to countries particularly vulnerable to the impacts of climate change, should be 10%. It would appear that this share has already risen to 25% given its latest resource guide published in May 2015 (GCF Elements, 2015).

[61] http://www.worldbank.org/en/news/press-release/2015/07/09/development-banks-common-approach-climate-finance

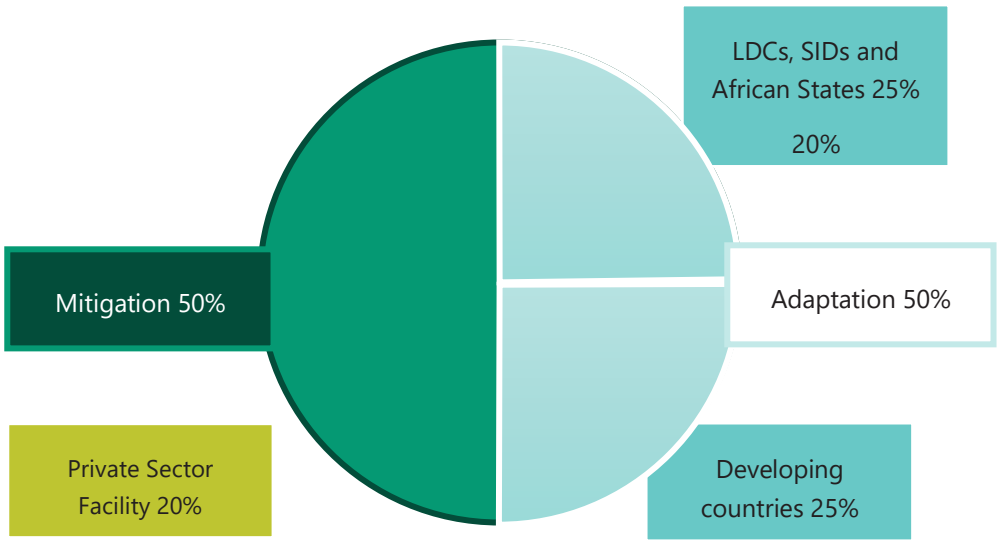


Figure 5.7 First tier resource allocation mechanism GCF

Source: Adapted from GCF Elements (2015)

There are four mitigation and four adaptation strategic impacts to be achieved at the Fund level (see figure below). Importantly, two of these strategic impacts ("Buildings, cities, industries and appliances" and "Health, food and water security") are aimed at both reducing emissions and increasing resilience. In addition to these eight strategic impacts, the GCF also identified opportunities in climate competitive cities, sustainable agriculture and forestry, resilience and energy generation and access. The fund will also actively promote synergies across areas of adaptation and mitigation wherever possible, and promote environmental, social economic and development co-benefits, and take a gender-sensitive approach (GCF Elements 2015).

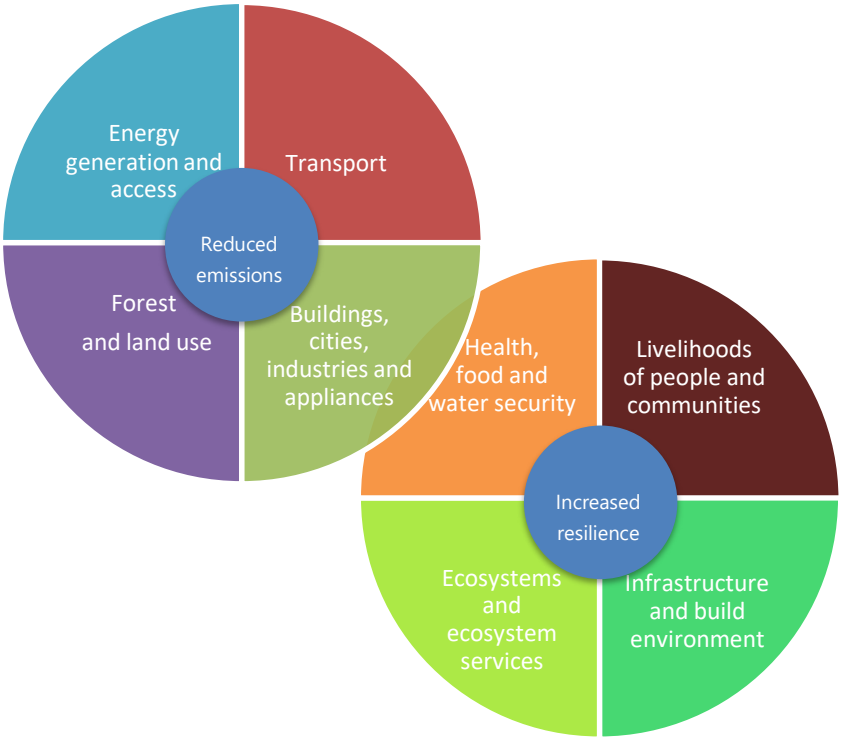


Figure 5.8 Strategic impacts of mitigation and adaptation interventions – second tier allocation mechanism

Source: Adapted from GCF Elements 2015

The Fund will finance projects that contribute towards achieving at least one of the eight strategic impacts of the GCF. Target projects and programs include those that best achieve GCF objectives with minimum concessionality, and that unlock and crowd in private sector investments in low-emission, climate resilient activities (GCF elements 2015).

In Elements 2.0, the fund explains further the holistic nature of the strategic impacts and investment priorities.

Figure 5.9 Investment priorities and strategic impacts of GCF

Source: Elements 2.0 (2016)

The GCF has six investment criteria (IPSCEN), which focus on country ownership and needs of the recipient while at the same time looking at impact, paradigm shift and sustainable development potential. Finally, the degree of economic benefits and financial soundness is also a crucial criterion. Another important indicator is the amount of co-financing and cost-effectiveness, but these do not seem to be valid for adaptation projects and programmes. The six investment criteria are listed below.

1. IMPACT POTENTIAL: Potential of the programme/project to contribute to the Fund's objectives to shift towards low emission and climate-resilient sustainable development.
2. PARADIGM SHIFT POTENTIAL: Degree to which the proposed activity can catalyse impact beyond a one-off project or programme investment. How scalable and replicable is the project? How innovative and transformative is it?
3. SUSTAINABLE DEVELOPMENT POTENTIAL: Wider benefits and priorities. Will the project/programme deliver meaningful environmental, social, and economic co-benefits and have a gender-sensitive development impact?
4. COUNTRY OWNERSHIP: Beneficiary country ownership of and capacity to implement a funded project. How well does the project fit within the beneficiary country's existing policies, climate strategies and institutions?
5. EFFICIENCY AND EFFECTIVENESS: Economic and, if appropriate, financial soundness of the project. For mitigation-specific projects, how cost-effective is it and how much co-financing will it bring? (Minimum concessionality test)
6. NEEDS OF THE RECIPIENT: Vulnerability and financing needs of the beneficiary country. To what extent does the project address vulnerable groups, barriers to financing, and level of exposure to climate risks within the country?

5.4.5 Conclusion: GCF and the Bangladesh Delta Plan 2100

Looking at the eight strategic impact areas and the six investment criteria it becomes obvious that the GCF and BDP2100 are well aligned and are highly compatible. BDP2100 aims and objectives correlate with the five strategic impacts aimed at increasing climate resilience. GCF executive director Héla Cheikhrouhou remarked in her key-note speech at the World Water Week 2015 that water was a cross-cutting issue for the GCF: "For GCF, the significance of water is clear. Sustainable water investment is climate investment. As such, water is one of our key results areas, and the theme of water is embedded across most of the investment areas of the Fund".[62]

5.5 Conclusion Adaptation Funds for BDP2100

Bangladesh enjoys a high profile as a recipient of global climate adaptation finance from different climate funds. There are many climate change funds providing concessional finance, but only the largest and most active are relevant for BDP2100.

- The Bangladesh Climate Change Trust Fund provides financing packages of about $3 mln maximum and is therefore less relevant for BDP2100. However, many lessons can be learned from its operations that are relevant for BDP2100.
- The Bangladesh Climate Change Resilience Fund would have been an interesting potential source of BDP2100 finance; however this fund will close operations in 2017. It is recommended to distil lessons learned from the Trust and Resilient Fund experience and see how this relates to a possible Delta Fund.
- The Pilot Programme for Climate Resilience appears to have been successful and development partners would like to send some additional funds to funded projects. The fund itself however has been fully spent and will not be increased.
- The Adaptation Fund and the Least Developing Countries Fund are both relevant to the BDP2100 but their financial strength is limited.
- The Green Climate Fund is hailed as one of the main mechanisms to distribute $100 bln a year of climate finance worldwide by 2020. Currently, GCF has received 10.3bln US$ equivalent in pledges which will serve its 2015-2018 programming period and aims to take funding decisions of $2.5 bln dollars in 2016.

From this overview it can be concluded that only the Green Climate Fund is able to finance major infrastructure investments required for the BDP2100.

Flood protection, water availability and transportation are fully congruent with GCFs climate adaptation and mitigation strategies. But also WATSAN interventions of BDP2100 may be aligned with GCF under its sixth strategic impact on Food, water security and Health´ where the fund states that it can improve water sanitation and management systems and infrastructure in urban areas. In this way the Fund can seek to improve water management systems and infrastructure (Elements 2016, p.44).

BDP2100 could provide crucial substantiation to projects proposed to the GCF; projects included in the BDP2100 investment plan by default adhere to Adaptive Delta Management principles (relating to specific criteria such as impact potential, sustainable development potential, efficiency and effectiveness and needs of the recipients) and per definition denotes country ownership.

Even without BDP2100, Bangladesh was already among the first 8 countries to receive GCF finance (Bangladesh received the largest grant among them). After all, Bangladesh is one of the most affected countries by climate change and is an active member of the GCF board (on behalf of the LDCs). Additionally, Bangladesh has a long track record of handing climate finance and has shown its commitment to fight climate change by bankrolling its own national climate fund.

[62] http://www.gcfund.org/fileadmin/00_customer/documents/Press/STATEMENT_-_World_Water_Week__2015.8.24_.pdf

Given all these considerations there is ample scope for the GCF to become an important source of funds for the BDP2100. However there are a number of important factors to be taken into account:

- Given the slow process of converting pledged amounts into signed agreements and the limited growth of capital since the funds initiation, it is not clear yet whether GCF will be able to meet its high expectations to channel hundred or even tens of billions of dollars by 2020.
- Some stakeholders in Bangladesh have received discouraging signs that climate adaptation funds will come in the form of (concessional) loans, instead of grants. This is remarkable as the GCF upon principles of climate justice, which should be up held in climate adaptation finance.

6 Directions for future funding arrangements

6.1 Introduction

6.1.1 Context

Each water service has different funding & financing potential and modalities, even where several processes are co-managed by a single institution, such as a river basin authority. The most basic distinction is between water services provided to specific identifiable users, which in most cases can be sold, and other functions without identifiable users. For the latter it is difficult to apply a market price (user charges or tariffs). This latter category includes water resource management and development, creation of strategic infrastructure for storage, flood protection, ecosystem preservation, etc. Many of these functions are public goods or have serious externalities (non market impacts such as saved lives or health benefits, nature preservation etc.). Water services, like drinking water or waste water services can potentially draw on a wider range of funding modalities, from both governments and market sources. Funding options for public goods are more limited. Major projects of water safety infrastructure with long term non market benefits will normally need some form of government involvement and public funding. For this latter category the funding category of (market) pricing mechanisms (such as optimized user charges) are difficult to organize and often alternative institutional set-ups are needed. Here one can think of dedicated (delta) funds, scope extension of flood protection to include other functions (raising non water revenues from land development etc.).

6.1.2 Objective, analytical framework & definitions

To identify *potential additional or new funding sources or mechanisms* relevant for the investment needs related to flood protection and water services in Bangladesh, attention has been paid to i) directions for funding solutions (theoretical framework) as well as to ii) examples from international practices (so called 'cases') based on an extensive investigation through existing literature and web search. The latter covers a wide range of aspects related to funding and financing: new institutional business models or Public Private Partnerships (PPPs), more optimal pricing, billing & payment mechanisms for cost recovery, alternative institutional funding arrangements and (new) financing mechanisms[63]. Below this will be explained in more detail.

In the diagram below the relation between the funding needs for water services, potential funding arrangements and financing mechanisms is illustrated. First, the investment and annual revenue budget needed for operation and maintenance of the relevant water service needs to be specified (I). Based on this budget funding arrangements (II)

[63] The investigation covers both cost recovery (or funding) options to pay for the investments and operation & maintenance costs of water assets and investigates alternative financing mechanisms which can help to secure the most appropriate financing instruments (grants, loans, equity, mezzanine etc.) to finance the investments needed. It should be noted therefore that funding is not the same as financing. Funding arrangements function to find revenue streams (business models or cost recovery models) to recover the investments and operation & maintenance costs of water services assets. Financing mechanisms are more narrowly defined here as the means of financing the net cash-flow in time by combination of financing instruments (loans, equity. mezzanine, subsidies, grants etc.). In this sense the financing mechanisms will follow from the business model or funding structure.

have to be investigated to recover both investment and annual operation& maintenance costs of the relevant water services.

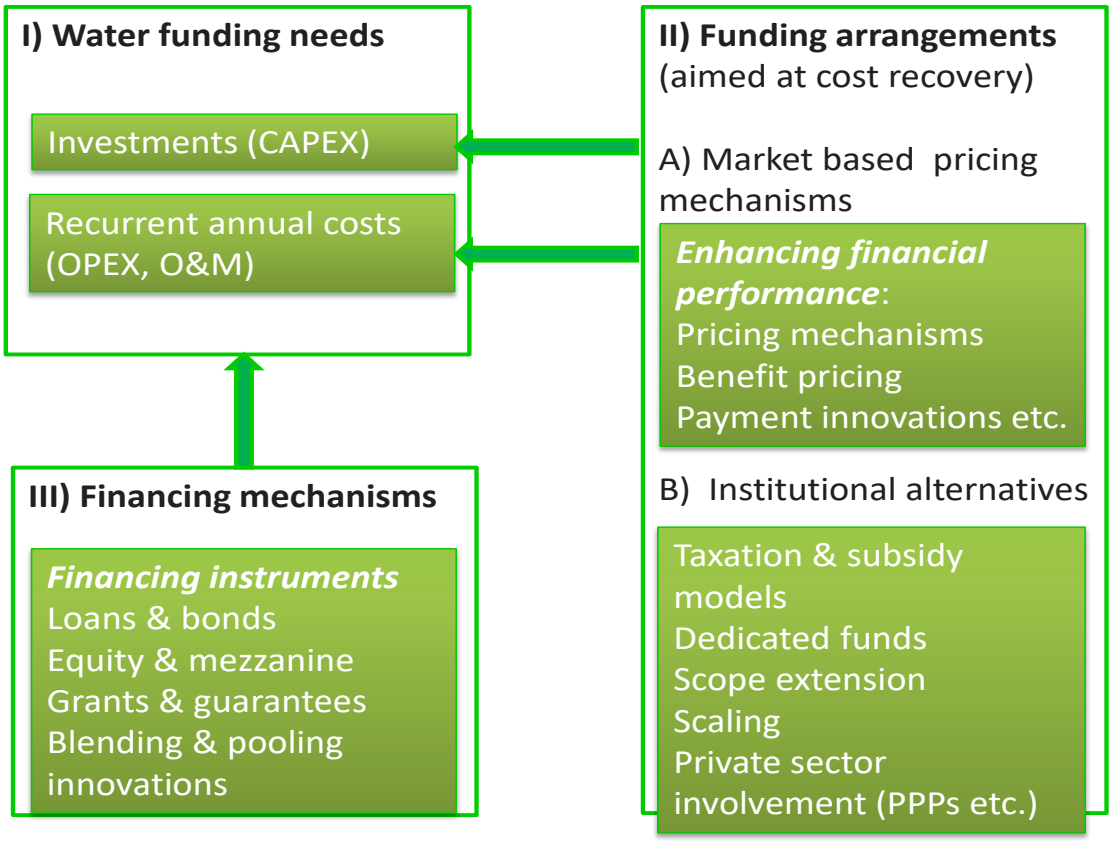


Figure 6.1 Relation between funding needs, funding arrangements and financing mechanisms

The first potential set of funding arrangements (A) consists of pricing mechanisms: optimizing user charges and payments and billing systems in order to recover the costs (as much as possible aimed at full cost recovery). This is often easier for drinking water provision (where clear individual users or consumers can be identified) compared to water resources management (where it can be harder to identify clear individual users or consumers) and where externalities (such as lives saved, health benefits etc.) are more present. Cost optimization can be part of the possible options in the first set.

The next set of potential funding arrangements (B) is in the area of institutional arrangements. Examples can be the setting up of dedicated funds fed by taxes, special levies or reallocation of existing government budgets. Public Private Partnership models or scope extension adding income from other functions (such as land reclamation or urban development) can be part of these options.

After some kind of funding model is chosen, the financing mechanisms (III) consisting of a set of financing instruments (private equity, loans, public grants etc.) will be determined. The mixture or public finance (such as government or donor grants) versus private repayable finance (equity, loans) depends on the funding (cost recovery) pattern and structure. The more private revenues, the higher the possibilities for private finance. Moreover, this financing structure will be different in the development, implementation and operational phases of water services (depending on the risk-return pattern in each phase).

6.2 Categories of potential funding arrangements

Following the diagram presented in the previous section, a more detailed overview and explanation is provided of potential categories of funding arrangements and financing mechanisms for water services. (see table 6.1). These categories are also used as starting point in the investigation into real case studies from international practices (see section 6.6)

Table 6.1 Overview of categories of potential funding and financing arrangements for water services

Funding arrangements: categories	
A Market based mechanisms	***Market based*** cost recovery or adaptation principles through optimal user charges setting, payment and billing systems, losses and cost reductions (financial performance improvement) or small scale adaptive solutions.
More optimal tariff systems or specific taxes	Increasing cost recovery by optimization of tariffs over customer groups and increasing tariffs over time.
Polluter pays principle	Identifying damages and charges for polluters.
Benefit charging (value capturing)	Internalizing non priced benefits into charges to the parties which obtain certain benefits.
Payment and billing innovations	Introducing innovations in order to decrease non accounted for water (Smart metering, IT/ mobile phone payments systems, different schedules etc.).
Cost reductions & efficiency improvements	Cost reductions by scaling up or cost sharing, preventing leakages and/or illegal tapping etc.
Adaptive community approaches or incentive schemes for resiliency	Incentive schemes to stimulate actors to fund resiliency measures to a large extent themselves. Examples of resiliency measures are lifting plots, reinforcing houses etc.
Insurance schemes	Insurance schemes aimed at individual actors to address climate or flood risks.
B Institutional arrangements	Institutional changes which result in additional funding sources from additional revenue streams, taxes or dedicated funds, decreasing risks or attracting private capital.
Taxation models and subsidies	Introducing more general taxes to fund water services.
Dedicated water funds	Setting up a dedicated fund (either fed by new taxes or specific levies etc.). Example: Delta Fund.
Emergency relief funds	Setting up dedicated pooled funds for emergency relief.
Alternative business models	
Scope extension (to non water service provision)	Alternatives business models by including revenues from non water services (such as from land development/ land reclamation, urban development, energy production etc.).
Scaling	Upscaling local models to regional scale or downsizing scale to simple more flexible small scale water purification stations, cheaper to install and maintain.
Public Private Partnership models	Introducing more private participation or PPP contracting modes (some form of private operations or service fee or availability payments based model under a contract with a public entity).

Funding arrangements: categories	
	Often these PPP models enlarge the scope to attract private capital and obtain efficiencies.
Privatization	Selling public utilities to the market: full private ownership and operation.
Community entrepreneurial models	Local entrepreneurs or collectives can operate some water services to obtain more community ownership and sustainability (better maintenance etc.)
Financing mechanisms	
Viability Gap Funding	Grants provided in parts of the investment cost of projects which cannot be recovered from user charges. This scheme is often applied for PPPs where user charges cannot yet be set at commercial full cost recovery levels.
Match funding	Grants of the central grant providing authority needs to be co-financed by grants from a beneficiary or grant applicant. The scheme incentives the beneficiary for commitment and responsibilities for any risks.
Revolving Funds	Revolving funds providing often loans to water related projects at more favourable conditions compared to commercial loans.
Blending & pooling instruments (financial innovations)	Blending: by combining grants or government guarantees with repayable finance more private capital can be mobilized. Pooling: by pooling asset classes & sizes in one fund scale is reached: more risk diversification and reduced transaction costs

Source: BDP2100 team

In the next sections (6.3.up to 6.5) each of the funding and financing possibilities will be elaborated in more detail and possible directions for Bangladesh will be discussed. In section 6.6 some examples will be shown for some more interesting and relevant options for Bangladesh. Finally, in section 6.7 the lessons learned from international practices will be summarized.

6.3 Market based pricing and efficiency mechanisms

There is a clear and pressing need for governments around the world to strengthen the financial dimension of water resources management. An analysis of water governance arrangements in OECD countries flagged lack of finance as a major and recurrent gap in water policies. This gap stems from the following two factors:

1. Users and beneficiaries of water services do not usually pay the *full costs* of the provision of services or may free-ride. In many developing countries only operating costs and sometimes not even the operating and maintenance costs of water services (drinking water, waste water treatment) are recovered by user charges. In Bangladesh according to some reports cost recovery amounts to 10—15% of total value of investments and O&M costs (A report of World Bank 2014 mentions cost coverage of only O&M costs of about 100-140%, but at the same time it is remarked that the service levels are (too) low);
2. Users and beneficiaries of water services are not clearly identified, which makes it difficult to charge them for the services they use. Two financing principles are the cornerstone of environment policy in many countries:
    - The Polluter pays principle: this principle creates conditions to make pollution a costly activity and to either influence behaviour (and reduce pollution) or generate revenues to alleviate pollution;

- The Beneficiary Pays principle: this principle take into account the private benefits attached to a water service and mechanisms are in place to let beneficiaries pay for their benefits.

A requisite for both principles is that polluters and beneficiaries are known and that benefits, attached to water services, are inventoried and valued and mechanisms are set to harness them. See also OECD (2012) and Ecorys (2012). Since both factors contribute significantly to the lack of finance of water services, they will be elaborated in more detail in this section.

6.3.1 The cost recovery principle

Definition of cost-recovery

Water prices must allow for the (adequate) cost recovery of water services. Full costs-recovery includes recovery of all costs associated with the supply of a water service: capital expenditures, operation and maintenance costs, opportunity costs, economic externalities and environmental externalities:

- Capital costs: Capital costs are fixed, *one-time expenses* for instance a drinking water facility or the construction costs of an embankment;
- Operation and maintenance costs (O&M costs): are *ongoing cost* for running a water service. It is a day-to-day expense. O&M costs of for instance a wastewater treatment plant consist of costs related to energy, chemicals and spare parts needed, manpower etc. In short, this is the money the service provider spends in order to provide the services to its customers;
- Opportunity costs or resource costs: This cost addresses the fact that by consuming water, the user is depriving another user of the water. This involves a comparison between the overall benefits of an existing use of water gauged against the economic value of the best current or future alternative use of that water. Hence, resource costs arise as a result of an economically inefficient allocation of water and/or pollution over time between different water users, because some alternative to the actual use generates a greater economic value. For example, the current use of water for purpose A (receiving industrial effluent), may be less economically beneficial that its use for purpose B (water supply), and the resource cost will be a long-term measure of this difference;
- Economic and environmental externalities: The most common externalities are those associated with the impact of an upstream diversion of water or with the release of pollution on downstream users. There are also externalities due to over-extraction from, or contamination of, common pool resources such as lakes and underground water. There may also be production externalities due, for example, to the agricultural production in irrigated areas damaging the markets for upland non-irrigated agriculture, or forcing them to change their inputs. Negative externalities should result in additional costs to users who impose these externalities on others.

The figure below illustrates the different costs elements of water services that have to be taken into account. The share of the different cost elements differs per water service and per situation. The full supply costs could be almost 100 percent of the total costs while in another case the full supply costs are only a small part of the total costs of the water service.

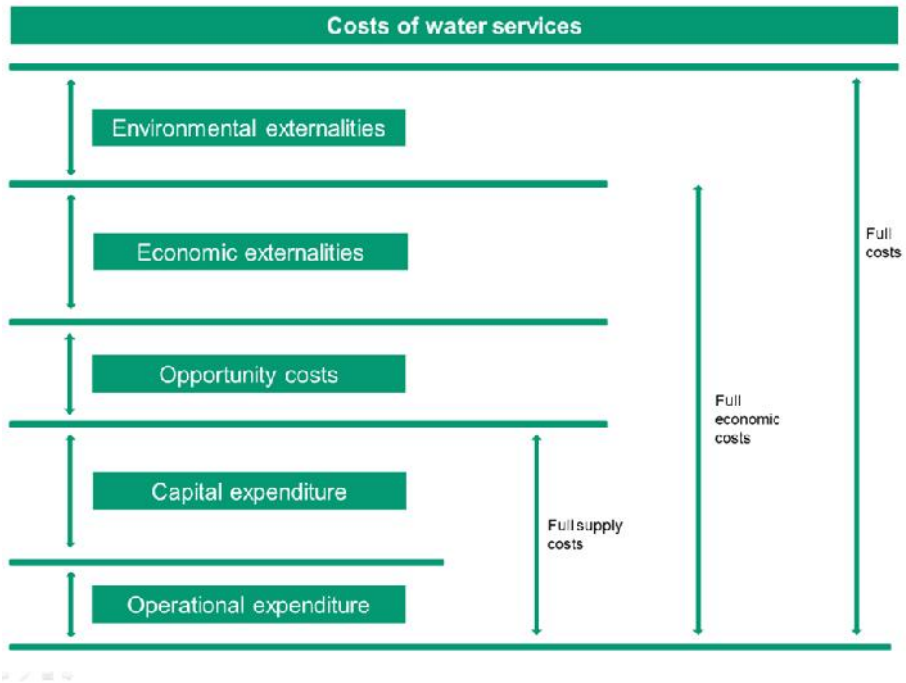


Figure 6.2 Cost of water services

Why should the price of water services seek to incorporate not only their financial cost, but also their resources/opportunity costs and environmental cost? An instinctive feeling is that the price of any product should reflect both the costs of its production and the adverse impacts of the production process upon the environment. Producers should not be allowed to cause environmental damage with impunity and, as a matter of fairness, the cost of that damage should be met by either the producer or the eventual consumer of the product.

Why is cost recovery needed?

Cost recovery needs to be a core element regarding to all water services provided. In both developed and developing countries, there is a large gap between the economic principle of full cost recovery and the on-the-ground-reality of water users paying only a fraction of the costs. Because of poor planning for cost recovery, a lack of government funding and inadequate tariff rates, the ability to recover costs is often limited even for routine operation and maintenance. In many countries, the issues of cost-recovery and sector sustainability were ignored for a long period. As a result, tariffs set were unrealistic and frequently there was insufficient Government subsidy to make up the shortfall in the costs of the service provided. In consequence, the infrastructure has deteriorated and service quality has declined.

Inadequate cost-recovery will also result in an inability to extend for instance water supplies to unserved areas, thus continuing a cycle of inequitable access to water supplies. This not only fails to satisfy the basic human right of all peoples to have access to an adequate water supply (UN, 1977), but will continue to place a continued extra burden on the health care system. It is vital that sufficient resources are raised from existing water supplies not just to ensure their continued functioning, but also to extend services to the urban and rural populations who lack access to an adequate water supply.

Figure 6.3 Consequences of poor cost recovery

Calculating the cost-recovery price

Calculating a price that reflects the true value of water, and thereby contributing to the long-term sustainable management of water resources, is clearly not a simple task. The economic value of a water service consist of the value to the user of the service, the benefits from indirect use, adjustment for societal objectives (e.g. poverty alleviation, employment etc.) and intrinsic value. Funding instruments which should be linked to the users and beneficiaries of a service have to be accumulated in order to cover the full costs of a service.

The share of the different funding instruments in the total value of a service differ per water service and per situation. As indicated in the previous section, flood protection services only benefit direct and indirect beneficiaries, there are no direct users of this service. Therefore the share of tariffs is zero and total costs have to be covered via service charges, specific and general taxes. Drinking water services is an opposite case with tariffs covering a large share of the costs and the share of general taxes is relatively low.

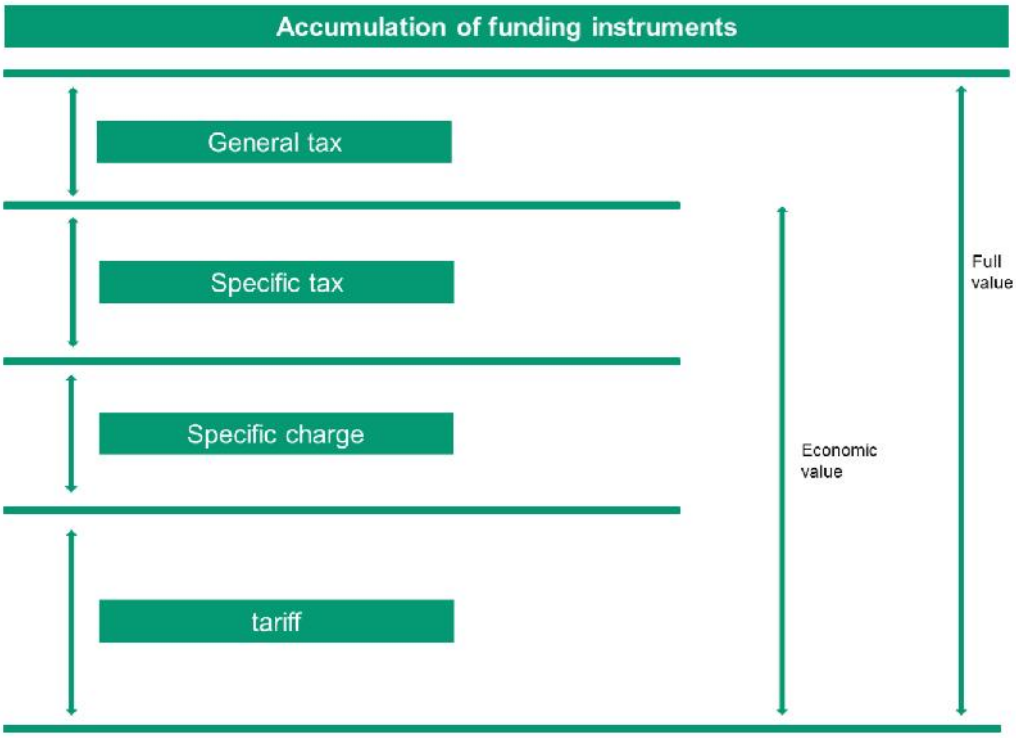


Figure 6.4 Accumulation of funding instruments

General taxes are in many countries used to cover investments and operation of the water safety infrastructure. Given the investment needs for water services in Bangladesh it is important that the Annual Budget of GoB increases in order to allow for funding these needs. Tax base and collection rate improvements could result in higher tax revenues and therefore more government budget available to invest in various sectors including in water infrastructures. However, it is also important to create the conditions for payments of the public for water services. Important elements in creating willingness to pay for water services is quality of water service delivery, transparency regarding the use of payments and accountability. In order to stimulate willingness to pay it is therefore important to state separating the financial flows for the water system from the general budget and taxes and create a system of cost recovery levies for drinking water and sewerage and wastewater treatment.

Metering

In Chapter 3 (section 3.3.2) it was shown that in Bangladesh only in two cities tariffs are applied upon the actual consumption of water. In most places a fee is set per connection (based upon the diameter of the pipe) or property taxes are used for funding operations. Moreover, tariffs are set at very low levels. All in all these conditions negatively affect cost recovery and water use efficiency. The introduction of metering on a much wider scale for water consumption measurement is important as part of a cost recovery strategy.

6.3.2 Tariffs

Tariffs can be applied for most of the water services mentioned with the exception of water services having an explicit good with public character like flood protection (in that case it is very difficult to identify individual direct users). Most common used tariff is the tariff for drinking water, but also tariffs for sewage and wastewater services are rather common. Tariffs are often based on the volume of water, however also some other basis like e.g. the size of the household is possible. Tariffs are a form of a direct user fee.

Suva–Nausori Water Supply and Sewerage Project on Fiji Islands

In this project a new tariff system is proposed. The idea is that cost recovery will be improved through a commercial approach to management, and costs will be reduced through reduction of water loss. The water supply and sewerage agency will recover the cost by a revised tariff. The tariff for fresh water will be set based on metered water consumption. A block tariff structure will be applied for domestic consumers for each 3-month billing cycle. A lifeline block will be applied for the first 50,000 liters consumed, followed by an intermediate block applied for consumption between 50,000 and 100,000 liters, and a high block for consumption exceeding 100,000 liters per billing cycle. A single volumetric tariff will apply to commercial and government consumers.

Cost recovery from beneficiaries will be achieved through the application of a sewerage tariff for those connected to the sewerage system. The tariff will be set based on metered water consumption and applied as a separate line item on customers' water bills.

More detailed information on all cases can be found in Part 2

6.3.3 Specific taxes

In case other stakeholders than direct users and/ or beneficiaries benefit from the services provided, the costs are most likely to be recovered via a system of taxes. If benefits can be earmarked the costs can be recovered (or benefits can be captured) by levying specific taxes like e.g. an environmental tax (when environmental benefits appear) or a health tax (when health benefits appear). If it is not possible to earmark the benefits, a system of general taxes is likely more plausible (see for more general taxation instruments and subsidies under institutional arrangements).

6.3.4 Benefit charges (value capturing)

A service charge can be introduced to recover part of the costs from stakeholders that directly benefit from the introduction of the water service. A benefit charge is an example of how part of the economic value can be recovered to the investor. A benefit charge can be applied upfront (e.g. partnership with private developer in realization of a certain water service; flood defence in combination with land accumulation and tourism resort development) or afterwards (via a benefit billing system). In many instances benefits accrue from more water safety to existing land or building owners. When property taxes are in place automatically parts of these benefits can be captured. However, some economists argue to introduce special property or land tax systems to capture a larger amount of these benefits. The problem is often that is complex to make the legal case for the size of the impacts on land values or property values.

6.3.5 Polluter and beneficiary pays principle

The term 'Polluters' is broadly understood to encompass those actors whose actions give rise to a cost (or social cost or externality) in respect of water services. For example, this would arise where a person's or sector's actions involve the transmission of a contaminant into water that is subsequently used for supply purposes, so that the contaminant needs to be removed before the water is supplied to consumers.

The beneficiary and polluter pay principle

The polluter pay principle is enacted to make the party responsible for producing pollution for the damage done to the natural environment. The beneficiary pay principle is enacted to make the users of or (in)direct beneficiaries from a water service responsible for paying for these services. This principle could be point of departure for mobilisation of funding instruments. In order to get public's support for charges, taxes etc. the link between the actors benefiting from the investments and their contribution to the investments, operation or management should be clear and well communicated.

Baltic countries: Water abstraction charge

In addition to the normal water charge paid by the consumer, a water abstraction charge was introduced in Estonia, Latvia and Lithuania. Estonia has the highest abstraction rates among the three countries. Consumers pay a price ranging from 0.42 euro/m3 for the lowest ground level water abstraction to 0.00016 euro/m3 for abstracting water used for cooling power plants. Some activities are exempted from the abstraction charge. Water used for fishing ponds and energy generation activities are for instance not charged.

Latvia and Lithuania use the same type of water abstraction charge system. Resulting in equal charges in the range between 0.0003 and 0.29 euro/m3. Although the charges are mostly equal, the exemptions differ. Hydroelectric power stations, fish ponds and the reuse of water in industry are free of charge in Latvia. In Lithuania, only the land users that use water on their own land for domestic purposes are exempted water used for fishing ponds and energy generation activities are for instance not charged.

6.3.6 Innovative payment and billing systems

An important way to create more revenues and higher cost recovery is through improving water tariff collection rates. This is often done by introducing more efficient payment and billing systems (for example by using IT or mobile phone technologies), see for example Ecorys (2014).

Mobile payments of water bills in Kenya, Tanzania, Uganda and Zambia

Water utilities are teaming up with network operators and have created mobile paying systems in several towns in Kenya, Zambia, Uganda and Tanzania. Basically invoices are sent to mobile phones and money to pay for the water bill can be transferred by mobile phones. A survey has indicated that most users favor the system because of time savings (not having to travel to banks), cost savings and to a lesser extent to be able to pay on time. Another advantage is that in case billing takes place more frequently (i.e. weekly instead of monthly) people can pay more easily.

6.3.7 Cost reduction or efficiency improvements

Often in drinking water provision a substantial part of water supplied into the system is unaccounted for water. This is the water basically not paid for by consumers, either because consumers do not pay, and/or because illegal tapping takes place and/or because of leakages in the system. There are a number of tools available to reduce unaccounted for water and prevent illegal tapping and leakages.

Financial Improvement FIPAG Mozambique

This project of Vitens Evides International (VEI) in Mozambique aimed at improving financial performance of the large city water asset holder FIPAG. The project was able to increase the billing rate significantly by efforts in monitoring payments and closing off water connections in case of continuous non-payment. Reconnection to the water grid was only possible if all overdue bills were paid. Second, the water loss rate was significantly decreased by focused searches for leakages in grid. These two measures together proved very efficient in reducing costs and improving efficiency. Third and certainly not least important, a scheme was introduced to replace old, often malfunctioning water meters with new meters.

6.3.8 Smart water management

Unctad reported in 2011 that "one of the biggest untapped potentials for smarter water management in all types of enterprises lies in more creative use of information technologies such as meters, sensors, controllers, computers, and mobile phones" (UNCTAD, 2011). These options seem hi-tech, however in view of high use of mobile phones in Bangladesh (80%[64]) there is scope to look at these options. Areas in which ICTs can play an important role in water management are:

- Setting up Early Warning Systems and Metering Water;
- Mapping of Water Resources and Weather Forecasting;
- Asset Management for the Water Distribution Network (ITU, 2010).

6.3.9 Adaptive resiliency measures or incentive schemes

A possible way to avoid large scale public investments in water safety infrastructure is to enable actors in society to adapt themselves better to climate risks such as flood events. Actors can (to a certain extent) take themselves measures to protect their assets (houses, companies etc.) from flood events. This is especially realistic when flood events are not too extreme and the frequency is not too high (and not too low as well). Examples are households taking measures to raise their land with additional sand or to use stronger construction materials for their houses. Incentive schemes could in principle stimulate such adaptive behaviour of actors in society. Economically such a mechanism could be more efficient than protection by public funding of water safety infrastructure, especially when the population is scattered and when events are not too extreme (for example water levels are up to 30 cm above land).

6.3.10 Insurance schemes

Another market based arrangement is setting up insurance schemes for flood events. In countries such as UK, USA and New Zealand such private or public-private type of arrangements have been developed. The advantage of insurance schemes is that some incentive for actors is in place to somehow avoid risks. Because of own contributions in insurance premiums actors can have an incentive to do something regarding flood risk mitigation. However, important issues regarding insurance schemes are about:

- Affordability of insurance premiums for vulnerable groups (especially in developing countries this is an issue);
- Avoiding moral hazard: keeping incentives to avoid risks;
- Existence of an insurance market/ insurance firms and institutional framework.

Flood insurance scheme New Zealand: EQCover

Flood damages to land are currently included as part of the Earthquake Commission coverage (EQCover). This state-guaranteed pooling system was initially provided to enable insurance to be provided primarily for earthquakes, but has since been extended to include damages from other natural events. EQcover comes automatically with conventional fire insurance policies and can therefore be obtained via one's individual insurance company, who passes the fund on the EQC. Other key characteristics of EQCover in relation to flooding are:

- Only flood damages to land are included within the EQC scheme.
- Capped liability based on the average size of property and professional valuation at time of claim.
- Importantly future flood risks caused by land damages to earthquakes are also covered.

EQCover costs 15 cents for every $100 of home or contents fire insurance that a policyholder has. This amount is paid to the policyholder's private insurance company, who passes it on to EQC. The maximum amount paid per year, for one home and its contents, is $180. This would gives cover to a maximum of $100,000 per home and $20,000 for its contents.

More cases of insurance schemes and flood relief funds can be found in Part 2 of this report (separate document).

[64] http://en.cihan.com.tr/en/bangladeshs-mobile-phone-users-reach-126-87-mln-in-june-1844037.htm.

6.4 Institutional arrangements

6.4.1 Tax and subsidy models

In the field of water management (flood protection, drought management, etc.) setting specific user charges or benefit charges is often not feasible. For that reason taxation type of instruments often come into play as a more viable funding option. This implies that some form of taxation to fund for investments and operation and maintenance of assets has to be established. This could be organized at national level or regional or local level, depending on the responsibilities and funding needs. Revenues from taxes are then allocated towards the annual budget needs to invest in and maintain the relevant water assets. This could be as a subsidy either to a special public authority or a department within a government (national, regional or local level). Taxes could have the form of special purpose taxes (water system maintenance levies) or could be combined with other taxes (real estate taxes etc.).

USA: 1% 'extra penny' local sales tax

The City of Tallahassee (the City) and Leon County (the County) manage storm water to reduce flooding and protect drinking water. The relevant authorities developed a Blueprint 2000 and Beyond plan recommending the extension of a 1% sales tax to fund environmental infrastructure and transportation projects. Upon passage of the 1% sales tax, the City of Tallahassee and Leon County created Blueprint 2000, a special purpose intergovernmental agency, to manage and plan the construction of the proposed projects.

6.4.2 Dedicated water funds

In a number of countries dedicated funds have been set up to allocate resources for specific purposes in the climate or water sector. Recently especially in the field of climate change a number of funds have been established earmarking financial resources for specific aims and types of projects. Examples are the Green Climate Fund (GCF) or in the Netherlands the Delta Fund and the Sustainable Water Fund. Often these funds are allocations of government budgets made available for a particular purpose in certain thematic areas (such as climate change, climate adaptation or water etc.). These funds can be totally owned by public institutions (such as the Dutch Delta Fund) or being organized with different partners (such as the Sustainable Water Fund) (OECD/ World Water Council, 2015). These funds can be organized as basically providing grants only or can be organized as a revolving fund based upon some repayable finance (or as a combination). In the Dutch Water Management Case in Part 2 we will elaborate on the structure and setup of the Dutch Delta Fund.

Delta Fund in the Netherlands

The Delta Fund has been established in the Netherlands to ensure that in the long-run sufficient funds are available to ensure realization of necessary measures regarding flood protection and freshwater supplies. The Delta Fund has its own budget which is an independent part of the national budget. Its average annual budget is 1.2 billion euros up to and including 2028. The estimated expenditure of the Delta Fund in 2016 is 1,211 million euro. The Minister of Infrastructure and the Environment manages the fund. The Delta Fund is fed by contributions from the budget of the Ministry of Infrastructure and Environment and other budgets that are part of the national budget. The Water Boards provide an annual contribution to the Delta Fund.

Under financing mechanisms we will describe different fund structures incorporating also more repayable finance and private capital (such as revolving funds and pooled fund instruments).

6.4.3 Alternative business models for water services

We define the business model as the way earnings are generated by either payments of customers for water services or payments for water related services in other sectors. The idea behind most business model innovations is to create

additional revenues (positive cash flows) by creating additional revenue streams either by scope extension to other sectors affected, by creating availability payments from the government and some form of private sector involvement. Another important driver relates to scale: by scaling up the activities economies of scale step in and u**n**it costs can decrease. The main drivers of improving the business case of water related projects basically work at the revenue and cost sides of the business models.

Important drivers aiming at increasing revenues or decreasing costs are mentioned below.

6.4.4 Scope extension: including additional revenues from other non-water functions

New business models in the water sector increasingly include combinations of functions. Recent approaches aim to create new earnings drivers by extending the scope or technological approach for water safety projects. By extending the scope of barrier projects new drivers of revenues are created such as hydropower, land reclamation, toll roads & urban development and functions such as recreation and tourism. Especially in the domain of water safety, flood risk management at coastal zones or river basins and the like we see these new approaches being applied.

A policy framework for water financing needs to look beyond the water sector, and to ensure coherence with non-water sectors. Financing linked to sector policies (e.g. agriculture, energy or climate change) that directly support projects and actions that impact on the water system, makes financing in both sectors more efficient. Because of the cross sectoral nature of water management, its financing will rely on financial sources from both the water sector and other economic sectors (in particular for promoting good practices in these sectors and limit their pressures on aquatic ecosystems). The mechanism and processes developed for ensuring coherence between water and sector policies, and thus financing water resources management, deserves further investigation and analysis (OECD, 2012).

Nigeria: Eko Atlantic

Lagos, in the south-western region of western Nigeria, is a city perpetually on the brink of flooding. Bounded in the South by the Atlantic Ocean, the city is situated on the mainland, home to 70 percent of the city's population with series of islands and a peninsula that holds the remaining 30 percent. Over the past 100 years, the Atlantic shore of Lagos has lost over 2 km in coastline; land that has simply vanished due to coastal erosion. The Eko Atlantic project is committed to bringing it back. The project combines flood protection together with residential, commercial, financial and tourist developments. The revenues from the commercial development (land sales) are used to cross subsidize the flood protection measures within a Development Company concept.

A recent study by Rebel Group concludes that there are business opportunities for land reclamation and that business cases for land winning at a number of coastal areas in Bangladesh can show positive returns[65]. Land reclamation along the large rivers seems less attractive due to the low agricultural land values and problems of erosion. The possibilities for land reclamation depend on being able to making certain reforms at sector level, reach economies of scale for the projects and disclose finance with long tenures. Also important are a long-term cooperation of multiple public stakeholders and the willingness and ability of the private sector to get engaged and taking development risks.

6.4.5 Scaling: upscaling or more flexible small scale solutions

Scaling up can mean that smaller entities are integrated into larger entities *from municipal to region" or it can mean that the demand and supply side are scaled up. Basically these scaling up activities can bring in efficiency gains or savings in unit costs. Moreover, by scaling up private finance becomes easier to obtain (as often private finance is interested in larger transaction deals).

[65] Rebel (2015): Business opportunities for land reclamation in Bangladesh.

Wastewater Union in the pilot region of the Akarçay river basin in Turkey

The cooperation model evaluated in the pilot study is a wastewater union. Several municipalities share one or more Urban Waste Water Treatment Plants (UWWTP) or participate in a regional wastewater treatment organization. The participating municipalities keep their autonomy but make long term agreements on financing, staffing, construction, utilization and maintenance of UWWTPS. The financing of plant operations is handled through an extra fee for drinking water, paid by the consumer. The main benefits are organizational advantages, cost and purchasing reductions.

Scaling down can mean that instead of starting with the implementation of a large water treatment plant and pipeline system for a whole region, smaller water purification stations are installed. Nowadays plug and play drinking water purification stations are produced by small scale producers from a number of countries. Often these technologies are mobile concepts including water treatment technology (membrane or UV) and storage tanks. These small water purification stations are often suitable for villages and small towns and have much lower initial investment cost (no engineering needed), are often more easy to maintain and can start with bottled water (avoiding high costs of piped systems). These facilities can often be privately operated.

Small scale plug and play drinking water stations

Recently small scale drinking water stations have become available on the market. Examples are the purification stations of Dutch Water Partners or the Village Pump. The systems of Dutch Water Partners are being piloted in Ghana with help of the WASH Fund Ghana and US organization Water Health. These systems are basically small purification stations (using some membrane or UV filtering systems) which need a water source at reasonable distance. The systems have compared to traditional engineered central water treatment plants much lower investment and operating and maintenance costs per liter delivered to customers. There are several reasons for these lower costs. Firstly, engineering and construction costs are almost zero or very small. Secondly, these systems can operate with bottled water (without pipeline systems to households). This avoids expensive investment and maintenance costs in the pipeline systems and avoids leakages and illegal tapping. Thirdly, the capacity of these systems can be better matched and phased with actual demand for drinking water avoiding expensive overcapacity in first 10 years. The systems are especially relevant for villages, small towns or for peri-urban areas often in combination with community operation or private entrepreneurs operating the systems.

6.4.6 Public Private Partnership

In the Infrastructure domain Public Private Partnership (PPP) is defined as contracting modes in which the private sector is responsible for operating or financing services which were traditionally delivered by public bodies. Examples of infrastructure PPPs are:

- **Concessions:** A concession gives a concessionaire the long term right to use all utility assets conferred on the concessionaire, including responsibility for operations and some investment. Asset ownership remains with the authority and the authority is typically responsible for replacement of larger assets. Assets revert to the authority at the end of the concession period, including assets purchased by the concessionaire. In a concession the concessionaire typically obtains most of its revenues directly from the consumer and so it has a direct relationship with the consumer. A concession covers an entire infrastructure system (so may include the concessionaire taking over existing assets as well as building and operating new assets). The concessionaire will pay a concession fee to the authority which will usually be ring-fenced and put towards asset replacement and expansion (http://ppp.worldbank.org/public-private-partnership/agreements/concessions-bots-dbos);
- **Build Operate Transfer (BOT)**: BOT is a project in which the concessionaire builds, owns, operates and then transfers the infrastructure to the utility. During the construction and operation's period, the concessionaire owns

the infrastructure. There is less risk for the utility, but at the same time the utility has little influence over the end-result;

- **Design, Build, Operate (DBO)**: The public sector owns and finances the construction of new assets. The private sector designs, builds and operates the assets to meet certain agreed outputs. The documentation for a DBO is typically simpler than a BOT or Concession as there are no financing documents and will typically consist of a turnkey construction contract plus an operating contract, or a section added to the turnkey contract covering operations. The Operator is taking no or minimal financing risk on the capital and will typically be paid a sum for the design-build of the plant, payable in instalments on completion of construction milestones, and then an operating fee for the operating period. The operator is responsible for the design and the construction as well as operations and so if parts need to be replaced during the operations period prior to its assumed life span the operator is likely to be responsible for replacement[66]);
- **Design, Build, Finance, Operate & Maintain (DBFM)**: here the private sector is next to the design, construction, operation and maintenance also responsible for financing the whole project. All over the world this often takes place for large transactions in transport or energy. Syndicates of commercial banks (sometimes together with development banks) and pension funds play a role as financiers in these PPPs.

In the development world PPP is often regarded as any collaboration of public sector with private sector or private sector involvement. This is a much wider concept. In this report we use PPP in the more narrow defined way. PPPs are often considered for infrastructure services provision for several ways:

- *Efficiency gains*: the idea is that private sector can save investment or operating costs compared to public provision;
- *Higher quality*: the idea is that the private sector could provide higher quality services because of better market knowledge or a more professional way of working;
- *Reduction of government expenses* (off government budget or so called off balance financing): the idea is that PPPs can help to finance projects outside the government budget. In the nineties this has also been a motive for governments to stimulate PPPs. However, if PPPs are really more efficient for the government budget depends on a number of factors and is not beforehand a clear cut case.

Manila Water Philippines

Before 1997, the Manila's water supply and distribution were in disarray. Illegal connections ran rampant. Clean and potable water was a privilege that poor families simply did not have, and that others had to acquire at a steep price. In 1995, this situation prompted the Philippine government to enact the National Water Crisis Act, which paved the way for the turnover of the operation of water services from the government-owned Metropolitan Waterworks and Sewerage System (MWSS) to the private sector. Manila Water Company (MWC) took over the East Zone of Metro Manila under a Concession Agreement that granted the company exclusive rights to the use of land and facilities for the production, treatment and distribution of water, as well as the rights to operate the sewerage system. The concession contract was signed for 25 years.

PPPs are most common in transport and water supply, which are areas where cost recovery/ profitability is often better than some other areas. For Bangladesh the direction of development towards PPP contracts will be a process. Currently there are a number of obstacles in Bangladesh which prevent a fast PPP implementation. These obstacles relate to the low cost recovery in the water sector (lack of private revenues), lack of experience with PPP in government and private sector, bureaucracy, lack of transparency and lack of well functioning water sector and PPP or concession regulations. In order to path the way towards PPPs in the water sector first a number of these obstacles need to be tackled in the coming years.

[66] http://ppp.worldbank.org/public-private-partnership/agreements/concessions-bots-dbos

Pevensey Bay PPP availability fee scheme UK

The Pevensey Bay Sea Defence is a flood protection project funded as a Public Private Partnership (PPP). Responsibility for the defences rests with the Executive Agency (EA) a Non-Departmental Public Body of the UK government's Department for Environment, Food and Rural Affairs (Defra). The EA signed a PPP contract with PCDL, which is a special purpose company formed solely for the purpose of performing the Pevensey contract. Following a tendering process, PCDL received an Invitation to Negotiate that ultimately led to a 25 year contract being signed on 1st June 2000, the contract is worth £27.4 million. PCDL actually undertakes none of the work, having subcontracted all obligations to the four shareholders. Each shareholder has a contract with PCDL backed up by a similar direct agreement with the EA, which would allow the EA to continue to maintain the sea defences should PCDL fail to perform. PCDL is required to carry out improvement works to raise the standard of protection and maintain the sea defences for a monthly` availability fee which is based on the condition of the beach. Goal of the PPP is to incentivize innovation and investment.

6.4.7 Privatization

Compared to PPP privatization goes a step further and entails that the private sector also has the unlimited ownership of the assets and therefore more freedom to manage and operate the delivery of water services. For existing assets this implies a sales of the assets to the private sector. The idea behind privatisation is often to generate income (from sales) for the government and that the private sector is more efficient in management and operations compared to the government and or more able to innovate. Full private operations of water assets is only possible in case the business case is commercial viable. This is currently in Bangladesh not the case for almost all water services. Therefore, privatization is a more longer term direction for Bangladesh for the larger drinking water utilities with highest cost recovery and most opportunities to improve financial performance. This implies that at first utilities would have to be selected where cost recovery options are reasonable and where the chances for financial performance improvement are highest.

6.4.8 Community entrepreneurial models

Some new water assets could be operated by local entrepreneurs or collectives. In a number of villages and small towns in for example African and Asian countries examples are taking place where small drinking water and sanitation facilities are operated by local entrepreneurs. Compared to traditional public or NGO funding such a private model can result in stronger community ownership for the asset and generation of long term revenues to recover maintenance. This could avoid sustainability problems for the assets.

6.5 Financing mechanisms

In theory after the funding arrangement (of cost recovery mechanism) is clear there are a number of financial instruments available for financing water service provision. We will introduce some instruments below.

6.5.1 Repayable finance

Public development banks: concessional or specific loans

Large government or multi-donor funded development banks underpin major strategic infrastructure projects in many countries. They typically lend for longer term, and at lower interest rates and other some more favourable conditions compared to commercial banks. Often these institutions support projects of a strategic nature that fail to attract enough finance from private capital markets;

Commercial banks: loans and equity

Commercial loans are only possible in case of a profitable business case at project finance level or if a water utility is credit worthy. In the water sector often the business case is not profitable or political risks (in terms of water tariff influence) are large. Therefore, commercial loans are often not a serious source of finance for the water sector (except for large PPP project finance deals in Western Europe, US, Australia or for credit worthy private water utilities in more developed countries);

Institutional investors: equity or loans

Institutional investors, including pension funds and insurance companies, hold huge amounts of funds and are interested in infrastructure assets with a yield profile matching their liabilities (low risks, reasonable returns). However, their outlets need to have the required balance of risk and reward, which has limited their exposure in the water sector;

Sovereign Wealth Funds (SWFs): grants, loans

SWFs (defined as "a state-controlled entity that invests national wealth for the benefit of future generations) are growing in size and number and diversifying the asset classes for their investment holdings. Infrastructure features increasingly in their plans, but, like other institutional investors, SWFs seek safe and profitable havens for their citizens' money. An important recently established fund relevant for Bangladesh is the *Green Climate Fund*. For this fund currently about 24 donors have pledged about 10 billion dollar for climate change projects in vulnerable countries (50% for climate mitigation and 50% climate adaptation);

International Financing Institutions (IFIs): loans, concessional loans, grants, guarantee mechanisms

IFIs have some share of the water infrastructure finance market especially in the middle and low income countries in which they operate. Important IFIs for Bangladesh are for example World Bank, Asian Development Bank (ADB) and KfW. The IFIs have a crucial role in financing projects, due to the favourable terms of their loans, their ability to deploy a range of products (concessional and non concessional loans) including grants for advice and technical assistance.

The problem with repayable finance such as loans is that often projects in the field of water management (flood protection etc.). do not have enough cash-flow (net revenues) to repay loans. Therefore, in this field often only concessional loans are possible. These loans just spread the budgetary investment need over the years (by repayments) for the government and will not be a permanent solution for Bangladesh as in the end the burden falls back on the government. Moreover, we have seen in the introduction that IFIs will probably shift to lower income countries in the future. For this reason, it is important that apart from optimized funding (cost recovery) new financing instruments are created for water services financing for Bangladesh.

6.5.2 Viability Gap Funding

Viability Gap Funding (VGF) is a grant provided to support infrastructure projects that are economically justified but fall short of financial viability. This means that the total discounted revenues are not sufficient to fully cover the investment and operating & maintenance costs. The lack of financial viability can arise from a period of years to grow in revenues and the inability to increase user charges to full cost recovery (commercial) levels. Through the provision of a catalytic grant assistance in (the not profitable part) of the investment costs, the projects may become bankable. By this mechanism viability gap grants can help to mobilise private investments in water infrastructure with at least a user charge revenue model. This can especially be relevant for Bangladesh as an instrument to introduce pilot PPPs in some areas in the water sector where user charges exist, but are not yet sufficient for full cost recovery. This applies to the drinking water sector in Bangladesh.

Viability Gap Funding in India

Government of India introduced in 2005 a scheme for Viability Gap Funding for a broad category of infrastructure projects that are to be undertaken through Public Private Partnerships. The scheme is administered by the Ministry of Finance with suitable budgetary provisions in the Annual Plans on a year-to- year basis. The scheme is applied to a broad range of infrastructure sectors such as transportation, power, including water supply & sewerage.

6.5.3 Match Funding

Match funding by itself is not a specific instrument, but more a way how grant schemes are often organized. In most of the match funding grant schemes grants do not fund the full cost of a particular project or activity and applicants for grants or other institutions need to cover the remaining part of the budget. The part the grant from the grant scheme authority doesn't cover is the "matched or match funding". It is sometimes also called co-financing, where the match funding will be a percentage or the total project or activity you are applying for the grant for. For example, in EU funds for infrastructures, the beneficiary of the structural funds has to put at least 15% matched funding towards the project and maybe more. The scheme incentives the beneficiary of the grants for commitment and responsibilities for any risks.

6.5.4 Revolving Funds

An alternative method for financing municipal water and sanitation projects is used in a few parts of the world. This alternative method recognizes that a pool of capital can be used repeatedly as a "revolving fund". Basically the model is revolving because of two possible options: either the funds are repayable so they flow back into the fund as repayments plus any returns (such as the interest payments on loans) or there is a co-financing elements in the scheme (which attracts funds from the beneficiaries). The revolving fund may be capitalized by government or may be raised using private capital. The municipality or local water company takes a loan and repays it over time back to the revolving fund and pays some interest costs. There are a number of revolving funds in the world serving the water sector. In the OECD report" Innovative financing mechanisms for the water sector "(2010) a good overview is provided. Examples are US State revolving Funds, the Bond bank financing for water and sanitation in the State of Quintana Roo (Mexico) and the Tamil Nadu Water and Sanitation Pooled Fund (WSPF) in India etc.

The revolving fund model is of interest for several reasons:

1. The revolving fund model is replicable elsewhere. It is not unique to the laws of any one country;
2. The revolving fund model permits governments to better meet their infrastructure needs;
3. The model permits municipalities to access more money than would otherwise be available;
4. It relies on commonly understood financial tools. Each of the individual tools is well known in the capital markets of the world;
5. The revolving fund model can attract private capital;
6. The credit structure permits projects to be financed at lower annual debt service costs;
7. The revolving fund model's credit structure permits longer term borrowing than would normally be available;
8. The model enhances credit ratings and therefore reduces the interest costs for the lenders.

Where private capital is used, it is normally raised in the capital markets, through the sale of bonds or other securities to private investors. For many reasons, private investors find these securities or bonds to be attractive investments. The investors include (local) pension funds, provident funds and insurance companies. These models are in use in India, Mexico, Colombia and US. In the latter all water and sanitation projects are financed with long-term loans and the loan repayment history of US municipalities is good. There have been very few defaults.

The building blocks for the revolving fund model are straightforward. There is wide latitude to create and manage a program consistently within the policies and traditions of each government.

The revolving fund model may come with variations. The basic elements include:

1. Private capital and grants to capitalize the revolving fund model using credit enhancement techniques (grants, pooling and other, see below);
2. A legally dedicated, inviolate fund or account into which the capitalization is placed, which fund is legally isolated from serving any purpose other than that for which it is established;
3. A clear definition of the use of the funds, for example, for drinking water, sanitation, industrial and agricultural and for other wastewater projects.

Zambia: Devolution Trust Fund

The Devolution Trust Fund in Zambia is a Basket Fund and provides loans and grants for drinking water and sanitation for the poor. The fund provides grants and loans based upon a call for proposal towards the 10 commercial water utilities (owned by municipalities). The Fund is operational since 2006.

The Fund provides grants and loans to access to water and sanitation services in low income suburban and urban areas based upon competitive calls for proposals. Proposals are submitted by commercial utilities. Funds are released depending on milestones realized (output based funding). The Fund has two windows; a general fund and a performance enhancement fund. The performance enhancement fund is aiming to improve the commercial viability of utilities and is only available to utilities which have completed successful projects under the general fund.

6.5.5 Blending and pooling instruments: attraction of private capital through financial innovations

Traditionally water supply & sanitation, water safety and security have always been regarded as public goods where the government should play a key role. Therefore, subsidies for capital investments or NGO grants have been dominant for water related projects in many countries. An increasing number of funds and water related projects have been observed where grants are combined with loans (or micro-credits) and equity (so called "blending").

Blending basically includes that concessionary financing (grants, loans with a grant or interest subsidy element) are combined with repayable finance from IFIs or market sources. Blending grant funding with market based funding allows to mitigate some risks for financiers and affordability constraints of the lenders. Most blending cases combine grants or guarantee funds with some kind of credit schemes. Blending serves several aims. First of all private finance is attracted towards the water sector (leverage) by taking out some risks for financiers or (first) losses by using the public funds or guarantees to mitigate these. Secondly, different sets of expertise are mobilized in order to execute and finance the projects.

Blending can take place at two levels: institutional level and project level. At institutional level blending combines the different instruments in one financing institution or funds so that different type of funders do not have to match-up. In this sense it saves transaction costs, important especially for smaller projects. At project level blending is achieved by combing instruments often from several donors and IFIs specifically for the relevant project.

Pooling entails combining different asset classes and sizes into one fund for investors. The advantage of pooling is that risk diversification takes place and that because of combining small transactions into one bigger fund that transaction costs are reduced. An example is a pooled fund to invest in different private drinking water utilities. This idea was first developed as a Water bank (for private water utilities) attracting funds through the bond market in the US and is currently being developed in Kenya. Of course the instrument can only work as a private fund with commercial viable and credit worthy utilities (assets) or commercial viable projects and a deep and well functioning capital market (bond market). However, combined with blending (some form of grant or first loss avoiding or guarantee instrument) this instrument could also in principle work to assist some less commercial viable utilities or projects. For Bangladesh this option seems not very relevant in the short term given the low cost recovery of utilities.

6.6 International practices funding and financing arrangements[67]

6.6.1 Flood protection and water security

In a number of countries *dedicated funds* have been set up to allocate resources for specific purposes in the climate or water sector. Recently especially in the field of climate change a number of funds have been established earmarking financial resources for specific aims and types of projects. Examples are the Green Climate Fund (GCF – see chapter 5) or the Sustainable Water Fund or in the Netherlands the *Delta Fund*.

In countries such as UK or Nigeria examples are shown of *Public Private Partnership (PPP) models* for flood protection. Often scope extension - combining water protection with land reclamation or urban development - is used to tap into new revenue streams. This could be most relevant in the medium and long term for coastal zones and urban areas in Bangladesh. In the UK PPP models with availability payments[68] for flood protection infrastructure have been started.

6.6.2 Water availability and river transport

The report mentioned above shows interesting *water pricing systems in irrigation* from Israel, irrigation PPP model from Morocco and a combined system from South Africa. Some of these private irrigation schemes and water pricing models could be relevant for application for new irrigation projects in Bangladesh.

6.6.3 Water supply and sanitation

In this sector a range of market based arrangements has been found which all aim to improve cost recovery:

- Optimal tariff setting (gradual increase scheme tariffs in Senegal, block tariffs in Fiji etc.);
- Smart metering and innovative payment and billing systems (cases from Africa);
- Innovative leak detection in order to reduce non-revenue water (Mozambique);
- Introduction of benefit charging and polluters pay principle (example water extraction in the Baltics);

Apart from market based arrangements a number of institutional developments are interesting:

- Small scale plug and play water purification stations operated by private sector (rural areas or peri-urban areas);
- Community or private operation of small drinking water operations (rural areas Haiti);
- PPP and privatization (Manila Water, Chile, Netherlands PPP Waste Water Treatment).

Finally, a number of innovative financing instruments have been investigated based upon principles of revolving funds, blending grants and/or guarantees with repayable finance and pooling.

Based on the above a summary table is presented with a selection of international practices.

[67] See, for a comprehensive overview of all cases the BDP2100 report on "Financing and Funding Arrangements in the water sector , part 2: international cases in core water services".

[68] An availability payment contract is a contract in which a payment for performance of the concessionaire is agreed irrespective of demand. This is an option in projects that generate no revenues from users or inadequate revenues to cover full cost of construction and ongoing operation.

Table 6.2 Selection of international practices on Innovative Finance for Water

Water sub-sector & funding category	Practice title	Innovative financial aspects
Flood Protection		
Institutional arrangements	**1% 'extra penny' tax** – USA	To ensure funding for infrastructure and storm water projects, an 1% additional sales tax is imposed.
	Pevensey Bay PPP – UK	The Pevensey Bay Sea Defence is a sea defence project funded as a Public Private Partnership (PPP). . The Agency signed a PPP contract with PCDL a special purpose company.
	Eko Atlantic – Nigeria	The plan in Lagos is to combine flood protection together with residential, commercial, financial and tourist developments. Commercial developments (land sales) can be used to cross subsidise the flood protection measures.
	Delta Fund - Netherlands	A dedicated multi-annual fund for investments and maintenance of flood protection and fresh water supply related to the national Delta Program. The fund is fed from Ministry budget and other resources.
Market based mechanism	**Flood RE –** United Kingdom	Flood Re is an industry owned insurance pool in the UK for flood risks (damage insurance scheme).
Water availability & navigation		
	El Guerdane Irrigation system PPP – Morocco	The El Guerdane PPP irrigation project is about private design, construction and operation of an irrigation infrastructure in an area of 10,000 ha. Farmers co-finance (8% of investments) and pay a single amount to be connected to the irrigation system and additionally a fixed price per cubic metre of water they use.
	Danube Black Sea Canal - Romania	Ships navigating the canal pay a fixed tariff to the ANC, a Romanian national company which operates under the Ministry of Transport and Infrastructure. Tariffs depend on the capacity of the ship and the number of days the canal is used.
Water supply & sanitation		
	Cost recovery water supply - Fiji Islands	Cost recovery will be improved through a commercial approach to management and billing. Costs will be reduced through reduction of water losses (leakages, illegal tapping etc.). The water supply and sewerage agency will recover the cost by an optimized tariff system.
	Viability gap funding of PPP Kolkata Salt Lake Water Supply And Sewerage Network – India	Salt lake water supply is a combined water supply and sewerage project. The project was implemented under a Built-Operate-Transfer (BOT) PPP arrangement with viability funding, provided by the central government's scheme.

Potential pathways for Bangladesh are presented below based upon the lessons from the international practices.

6.7 Lessons learned from international practices

6.7.1 Market based instruments

The dominant finance and funding instruments within the international practices of market based mechanisms are based on cost recovery and several forms of benefit charging, all aimed to improve the financial performance of the water services delivery. What is clear is that especially for flood protection projects governments always play an important role, whereas in the other subsectors more mixed arrangements can be seen. Important reoccurring lessons learned from practices regarding market based mechanisms include:

- Willing governance, political commitment and leadership,
- Registration systems and water metering are important conditions;
- Sufficient and fair monitoring is in place,
- Proper stakeholder communication and participation, and
- Sufficient and realistic charges and incentives.

6.7.2 Institutional arrangements

A large amount of international practices consists of cases involving private actors and private capital in water service delivery. The fact that Public-Private Partnerships (PPP) take up a large share of the cases indicates that PPP is widely recognised as a promising contracting or funding arrangement in the water sector, both in developed as in developing countries. Scope extension projects are innovative arrangements which extent the provision of water services by including revenues from non-water services such as land development, land reclamation, transport, urban development, and energy production.

Consequently, private stakeholders are more and more involved in institutional arrangements that seek additional funding sources and revenue, especially in the scope extension and PPP arrangements. Governments are still involved in these projects, but often take on the role of process facilitator, rather than process driver. Aid organisation and NGOs also engage in scoping by aiming for integral development approaches.

Securing the involvement of private capital is the main recurring theme throughout the lessons learned of the institutional arrangements. Cooperation with private partners can lead to significant (public) cost reductions and efficient management. However, the downside of cooperation with private actors is that private actors do exactly what they are paid for, but no more than that. Lessons learned therefore additionally include:

- Strong monitoring mechanisms, sound performance indicators of quality specifications, and decent contracts;
- Active multi-stakeholder engagement and capable and solid governance and governments;
- Sufficient demand for the project's additional revenue sources (land demand, toll road traffic, urban development, tourism).

6.7.3 Financing mechanisms

Financing mechanisms aim to attract more private finance in the water sector through innovative financing mechanisms aiming at reducing risks or losses, decrease transaction costs and diversification of risks. Mechanisms include viability gap funding, match funding, revolving funds, blending instruments and pooled funds. The main actors in these arrangements are aid and development banks, private banks, governments, and (local) NGOs. The (local) NGOs, take the role to connect the funds to local actors. These often use micro-credit like mechanisms to ensure sustainable development projects. Reoccurring lessons learned from international practices related to institutional arrangements include:

- A sufficient level of private sector and financing expertise is required to develop and sustain blending and pooling mechanisms.
- Government or donor grants or guarantee mechanisms are often important in order to attract private finance.

6.7.4 Specific lessons from the Netherlands and UK

In the Netherlands semi-public drinking water companies and a set of regional water boards operate regional drinking water & sewerage systems and regional water management systems at full cost recovery level based upon a system of water tariffs and levies. The Netherlands tends to ensure strategic, long-term expenditures on flood protection and water supply by the realisation of the Delta programme, the Delta commissioner and a specific Delta Fund. The Delta Commissioner's task is to promote the development and implementation of the Delta Programme and the financing of future measures is invested in the Delta Fund. The Delta Fund has been established to ensure that in the long-run sufficient funds are available to ensure realization of necessary national measures regarding flood protection and freshwater supplies in the Netherlands. The Delta Fund has its own budget which is an independent part of the national budget.

In the UK system the burden of drinking water and sanitation services for the public budget is minimized. Private water utilities and sewage companies are full cost recovery based and can attract capital from private banks or capital markets. A lesson from the UK is that private operations of water and sewerage can be efficient, but needs a proper regulator. This is a system where Bangladesh could aim for in the long run after improving financial performance of water utilities in the next decade(s).

7 The way forward and short term actions

7.1 Envisaged water funding and Delta Fund

Development Partner funding for the water sector is decreasing in Bangladesh from about 60% in 2009 to 35% in 2014. Because of its aspiration to reach advanced middle income status by 2030, Bangladesh has to prepare for even less concessional funding from Development Partners for the water sector in the future (within 5 to 10 years) and aim for more independent national funding mechanisms. International practices show that these new funding sources would need to come from increased domestic income sources, such as optimisation of drinking water tariffs and financial performance of utilities, introduce water pricing for irrigation and special levies for flood protection, charges for river maintenance and finally by attracting more private finance into the water sector.

Cost recovery is still very low across Bangladesh for water supply and sanitation, especially in rural areas. Cost recovery is mainly focused on O&M, but hardly on covering the investments made, hampering to create a financial sustainable operation; this is a hurdle for private sector engagement and PPPs and private finance for large scale water supply operations.

In the previous sections a number of directions have been discussed briefly with practices from other countries which provide potential options for future funding of water services in Bangladesh. *S*ome practices are more relevant for Bangladesh than others and some options might be more feasible in the long run, while others might be more necessary and feasible in the short run. Practices from other countries show possibilities to generate additional funding from PPPs such as scope extension of flood protection projects towards land development and roads or viability gap funding. Practices from comparable countries show that private small scale water supply operations, private irrigation schemes and community flood resiliency could be promising for Bangladesh.

It is essential that Bangladesh will move towards a more mixed set of funding arrangements for the water sector in the future. We envisage that Bangladesh will apply additional funding mechanisms next to funding from general tax

revenues and Development Partner support. Introduction of specific levies and taxes and enabling private finance through a variety of policies would be necessary.

7.1.1 Aspirations for composition of water sector funding

In the picture below this funding path is shown as well as the aspired composition of water sector funding. A rough sketch is presented of an envisaged (short, medium and long term) future for the water sector in Bangladesh. This is based on the realization of GoB's Vision 2021 of Bangladesh calling for the social and economic environment to be transformed from a low income economy to the first stages of a middle-income nation by the year 2021 and consolidation of its growth to become a full-fledged developed country by 2041. In terms of GDP per capita, currently (2015) being about 1,250 USD, this means a substantial increase to about 3,000 USD in the year 2030 and 10,500 USD in the year 2050 (both in 2015 prices).[69]

This outlook is also based on the on-going process within GoB to a higher self-dependency level as Development Partners will shift their focus to other low(er) income countries as Bangladesh transitions towards a full middle/high income economy. On the other hand, in the first half of the 2020's the Green Climate Fund (GCF) is probably fully operational and Bangladesh would be, with the support of BDP2100 well aligned with GCF's priorities. GCF would therefore potentially provide substantial funding for a significant part of investments in flood risk reduction for many years. During the same period, the GoB would, it is hoped, succeed in managing to upgrade taxation system, with a significant expansion in revenue mobilisation, leading to a tax-GDP ratio increase up to 20% or more. Thus, by 2030, under such a scenario, Bangladesh will have caught up with its peers in the region in terms of revenue mobilisation. As a consequence, the GoB's own revenue position would improve tremendously and sufficient resources would be allocated to ministries and agencies for sustainable operations and maintenance of infrastructure in general and BDP2100 related infrastructure and facilities in particular. Moreover, this would lead to a situation where sufficient government budget will become available through the ADP to finance and co-finance the huge investments needed for flood protection, water availability and water quality in the short, medium and long term. The GoB will increase its own contribution from the General Budget gradually over time due to a falling share of DPs funding in total funding in the coming 10 to 15 years and from GCF in the medium term, especially if Bangladesh is able to boost its own revenue mobilisation. This is also needed, because it will take time to prepare an enabling environment and institutional mechanisms for the introduction of specific levies and private finance. In parallel the GoB would change its lending policy due to changing terms and conditions as higher interest rates (shift from concessional to non-concessional and to commercial rates).

As in many countries in the world, the general tax revenue budget would remain the major contributor in financing flood risk protection measures and related operation and maintenance activities to guarantee sustainability of the infrastructure in the medium and long term. Specific levies (possibly being differentiated per region) might be introduced slowly after 2030 (when the general tax system is optimized and all people are registered/having own bank accounts, etc.). Private sector involvement in flood risk protection and water availability is likely to be limited in the short term as this requires an advanced level of administration where taxes and levies are collected by the state on a national basis. However, launching big operation and maintenance contracts for a long period (minimum 10 to 15 years) for flood protection works might be attractive and would challenge the private sector to invest in equipment, new technologies, capacity, etc.

[69] Based on the average of GDP per capita from the productive and resilient scenarios (expressed in 2015 prices).

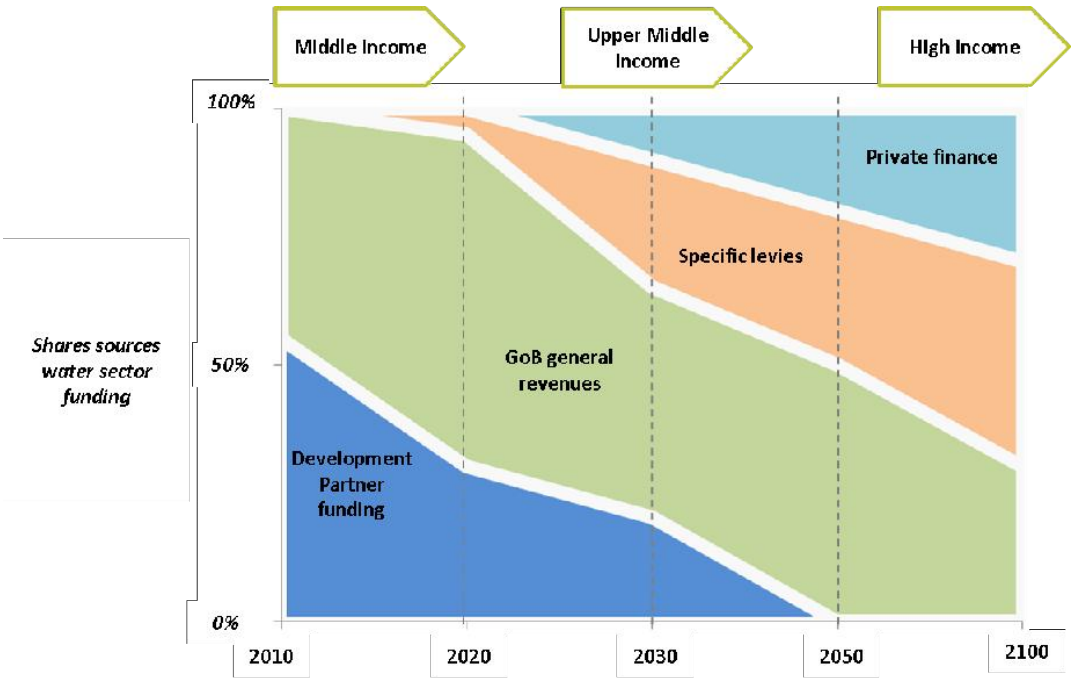


Figure 7.1 Aspirations for composition of water sector funding in Bangladesh, 2010-2100

Source: BDP2100 team

In the water supply and sanitation (WATSAN) sector specific levies (through a tariff system) already exist today (2015). Although currently (2015) cost recovery levels in this sector are low, as well as their service levels, WATSAN is gradually improving their business. First, big improvements would be realized in the major cities (Dhaka, Chittagong). Both WASAs are gradually operating in a more sustainable way, significantly upgrading their service level (including drinking water quality) and applying more affordable (block) tariffs aimed at full cost recovery in a 10-years period. A Regulatory Commission is supposed to be established and tariffs for drinking water and sanitation are regulated. Customers are registered and have their own bank account. In short term this process would also be started in cities where City Corporations are responsible for these services. Dependency on the GoB's budget for investments in this WATSAN sector will slowly come down as full cost recovery principles would be introduced gradually. In Pourashavas, where huge investments in water supply systems and sanitation would be realised, spread over a period of 15 to 20 years (aimed at fulfilling the SDGs for water and sanitation), full cost recovery targets will take much longer. After 2030, when in a number of cities WATSAN is technically and financially sustainable, the private sector will start to participate leading to a number of PPPs in this sector or even private entities. Such a development would mean that the central government grant funding responsibility might be faded out.

The same process might happen in the irrigation sector, in which large scale irrigation investment projects will implement sustainable operations in the next 10 to 15 years. This would be realised through PPPs and cost recovery principles being applied, based on tariffs to be paid by the farmers.

Another example concerns river transportation: river operations and maintenance might be realised by establishing a River Authority, entering into large contracts with private firms through PPP, and introducing a specific levy for dredging activities to be paid by all vessels using the river system.

Summarising, a tendency is observed in which due to a significant improvement in income status in Bangladesh, DP funding (and GCF funding) is expected to slowly fade out in the medium term. At the same time, the GoB's Annual Budget could be increased significantly as % of GDP and would be better targeted, and as a consequence sufficient budgets would be made available for investments in infrastructure as well as for proper operations and maintenance.

Due to higher average incomes, people and businesses would be willing to pay specific levies for specific services for flood protection tailored to the regional situation and charges for river maintenance to sustain the major inland waterways network. Next, participation of the private sector would become stronger through PPPs (in WATSAN operations, through huge maintenance contracts for flood protection, and through river maintenance).

7.1.2 Aspirations of water sector funding and a Bangladesh Delta Fund

The above outlined aspiration developments for water sector funding in Bangladesh can also be viewed from a slightly different perspective, representing the evolving composition of the proposed Bangladesh Delta Fund. An important addition is the distinction between capital and revenue budget allocations, in which the revenue component grows substantially over time. We will show the resource allocation potential in three stages.

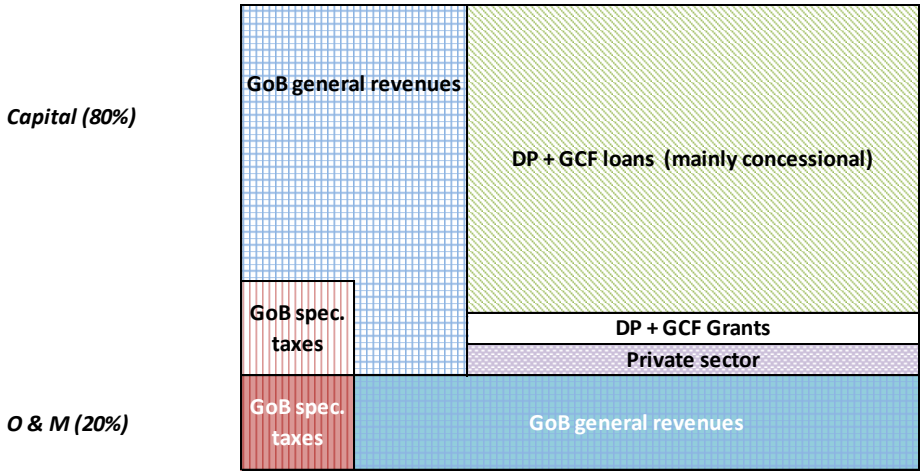


Figure 7.2 Resources allocation potential for water sector funding: Short term 2016-2030

Source: BDP2100 team

In the above diagram we are dealing with an aspired and envisaged development in the short term (2016-2030). A division is made between investments on the one hand and operations and maintenance (O&M) of these investments on the other. Up to 2030, huge investments in BDP2100 core sectors would be foreseen and therefore a large proportion of the total available budget of the Delta Fund would be allocated for these investment needs. Apart from the general budget the majority of these budget needs would come from DPs, although their contribution is likely to decline in the coming decades. However, the upcoming Green Climate Fund (GCF) would fully compensate the gap through loans (mainly concessional) and grants. Involvement of the private sector would be still very low and specific levies hardly exist. The budget allocation needed for sustainable O&M activities would come from the general budget as DPs and GCF are generally not financing these activities. Apart from the general budget, only in the WATSAN sector will revenues be generated (through tariffs) to finance O&M costs of their facilities as well as a part of their capital investments.

In the second picture (period 2030-2050) the envisaged composition will change significantly. First budget needs for investments relative to O&M activities would decline, because ensuring high levels of sustainability of expensive BDP2100 measures is key. DP's contribution for funding investments would be declining further (and if still present mainly at non-concessional terms and conditions).

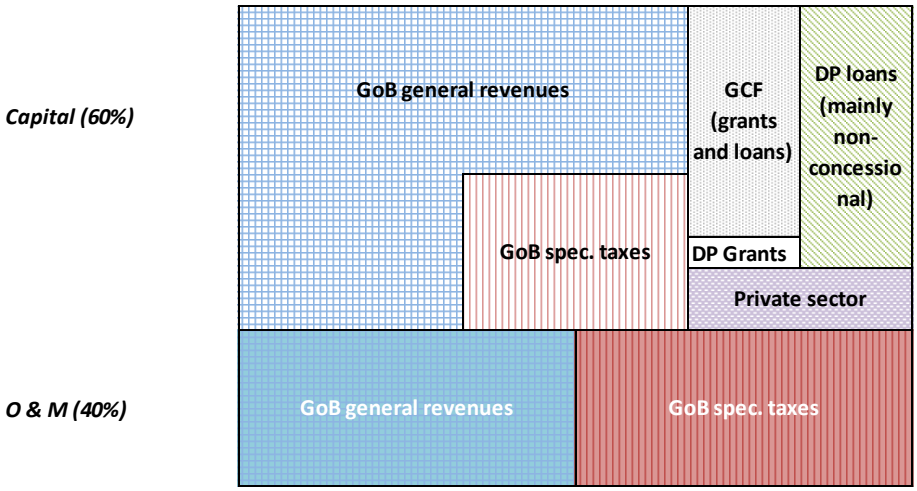


Figure 7.3 Resources allocation potential for water sector funding: Medium term 2030-2050

Source: BDP2100 team

GCF funding would also be declining and the GoB's contribution through general tax revenues as well as specific levies would increase. Private sector funding is expected to increase (through PPPs) based on positive institutional developments and lower risks. etc. O&M activities (for regular annual maintenance as well as major overhauls every 5 year) with a significantly growing share in total budget needs, would remain to be financed by the general budget and for a minor part by specific levies (e.g. through the introduction of a river maintenance charge). The WATSAN sector would have achieved full cost recovery by the end of this period and would be able to finance its capital and revenue expenditures.

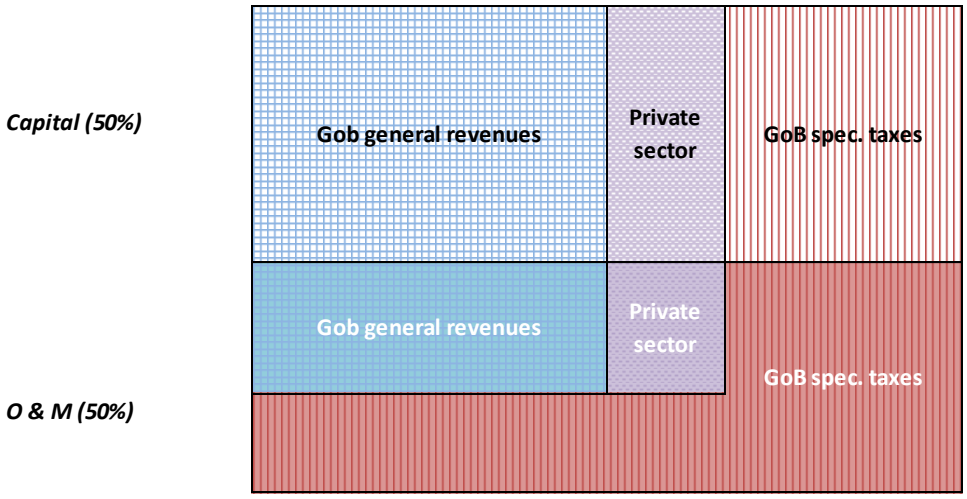


Figure 7.4 Resources allocation potential for water sector funding: Long term 2050-2100

Source: BDP2100 team

The last picture shows an aspired and envisaged long term perspective, covering the period 2050 up to 2100. It, indicates budget needs for investments and O&M activities to be more or less in balance. By this time, most major infrastructural works would be already in place and require high maintenance. General budget as well as specific levies would be in place for both activities. Also the private sector's share in contributing to these activities would be substantial. The WATSAN sector has already achieved full cost recovery in the previous time period, and by the second part of this century the GoB would be able to levy a national water system tax, possibly customised at the local level, for flood

infrastructure. DPs as well as GCF have completely disappeared, as Bangladesh would be a full-fledged middle income country aiming to develop into a high income country in the second half of this century.

7.2 Policy directions / strategy

In order to achieve the envisaged funding structure for the water sector a number of policy directions are necessary.

These policy directions are shown per subsector in the picture below.

For ***water safety*** (flood protection) purposes first of all current practices of general tax collection (systems, experience) etc. need to be improved. In the period 2015-2030 we advise to establish as soon as possible a dedicated Delta Fund (under the Delta Commission) funded by tax income and Development Partners' contributions as well as making use of financing from the *Green Climate Fund* (GCF). In this first period, transparency in the accounting & budget flows for water safety investments needs to be stimulated in order to generate sufficient commitment of all stakeholders before introducing levies or special taxes as new funding source. We regard the introduction of PPP models and insurance schemes for flood protection also as a longer term solution, which needs to be prepared by an enabling environment and market development measures.

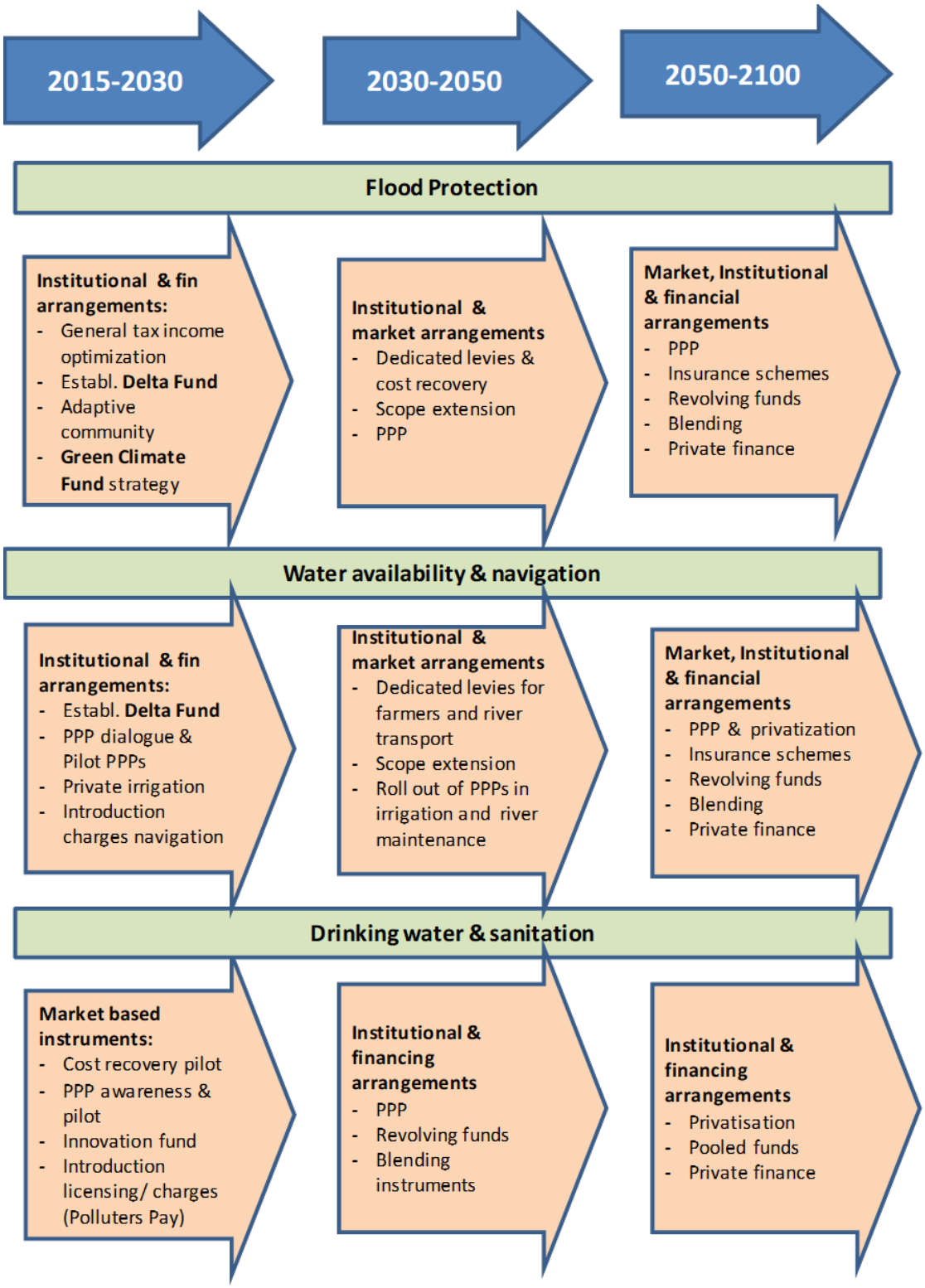


Figure 7.5 Directions and potential practices for the future funding and operation of water services in Bangladesh

Finally, more sophisticated financial instruments for flood protection could be introduced after 2030 (such as viability gap funding, availability payment schemes for flood defence PPPs, match funding and blending grants and loans).

In the sector ***water availability (including irrigation) and river transport (navigation)*** the introduction of private water pricing schemes for farmers and more tailored "conservancy" charges for vessels could be feasible interventions for the short run (until 2030). In the longer run, PPPs for river operation & maintenance and larger scale irrigation schemes seem more feasible. First, the enabling environment (regulations, river basin institutions) for rivers introducing river charges should be prepared. By setting river charges, revenues could be generated for maintenance either to be procured as large traditional maintenance contracts, or as separate PPP river operators.

For ***drinking water & sanitation*** first of all, the cost recovery of water services needs to be improved in the coming years. A pre-condition for success is a substantial improvement of the service level of these activities. The same is true for the enabling environment for private sector engagement and PPP: dialogue and information between public and private sector, mutual trust and capacities need to be developed and PPP regulatory aspects need to be implemented and improved. Therefore, we regard measures regarding the enabling environment and improving cost recovery as conditional for the start of PPPs and privatization and as a consequence these measures can be stated as "more urgent". Implementation of PPP in the drinking water and sanitation sector is therefore more feasible after 2030 (although a first pilot project might start before 2030). The process of improving the financial performance of water service provision is also a pre-condition for development of repayable finance schemes. Financial instruments such as viability gap funding for PPP projects, revolving funds and pooled funds for the water utilities could be introduced after 2030.

7.3 Short term strategy for budget allocation and sourcing

The aspirations as outlined in the previous sections are translated in this paragraph into proposed budget allocation targets and a sourcing strategy for BDP implementation on the short term (<2030).

Table 7.1 presents the actual share of investments in Delta Plan related thematic areas as % of GDP and a proposal for the future budget allocation targets. This proposal is in line with the agreed 2% allocation of GDP to BDP2100 interventions/measures as already included in the 7th FYP (2016-2021). It is strongly recommend to continue this ***annual*** budget allocation of 2% of GDP for the next FYPs (8thFYP, 9thFYP, etc.). This annual budget allocation will be used to source the proposed Bangladesh Delta Fund, to be established with the objective to make resources available for investments as well as related O&M costs.

Table 7.1 Actual and proposed BDP2100 Investment and O&M budget allocation

Annual budget allocation (as % of GDP)					
	Actual		*Proposed Targets*		
	FY10	**FY15**	**FY20**	**FY25**	**FY30**
A **Budget allocation investments**	0.60	0.70	1.70	1.60	1.50
B **Budget allocation O&M**	0.05	0.05	0.30	0.40	0.50
C **Total annual BDP budget allocation**	0.65	0.75	2.00	2.00	2.00

Source: BDP2100 team

Current water and water related budget allocations are summing up to 0.7% of GDP for investments and to 0.05% for related O&M activities in recent years[70] (resulting in an allocation of 0.75% of GDP in total). Without implementation of BDP2100 this level of investments in water and water related activities will remain the same in the near future. This is also valid for the relatively very low level of related O&M activities in case no additional (policy) actions will be taken to improve the sustainability of the (existing) assets. However, implementation of BDP 2100 will require huge investments as well as a substantial increase in O&M activities in the short term (as well as in the medium and long term). As

[70] Assumption based on figures presented by PRI

mentioned above for this reason the 2% of GDP will be allocated annually, causing a substantial resource gap of 1.25% of GDP (annually), already from FY2016 onwards.

Budget allocations for BDP2100 investments will increase from 0.7% of GDP to 1.7% of GDP in FY2020 (more than doubling the available budget). Moreover, a substantial increase will be earmarked for operations and maintenance (O&M), increasing from the current level of 0.05% of GDP to 0.30% of GDP in the corresponding FY. As time goes by, more and more investment projects enter the operational stage and thus the related O&M costs will accumulate significantly. Therefore, a growing share of budget allocation for O&M activities is badly needed, every 5 years period at the expense of the investment budget allocation. By FY2030, the allocation towards O&M will increase to 0.50% of GDP while investments will be scaled down in relative terms to 1.5% of GDP. As such, 25% of BDP2100 budget will be earmarked for O&M in FY2030, which is a fourfold increase compared to current levels (6.7% in FY2015). This greatly contributes to the sustainability of BDP2100 and ultimately saves significant sums of money in future as excessive remedial investments are avoided.

Table 7.2 BDP2100 sources of finance for the short term (<2030)

Sources of BDP annual budget (allocations as % of GDP)						
		Actual		*Targets*		
		FY10	**FY15**	**FY20**	**FY25**	**FY30**
A	**GoB O&M**	0.05	0.05	0.30	0.40	0.50
B	**GoB investment**	0.30	0.35	0.90	0.70	0.65
C	**DP investment**[71]	0.30	0.35	0.40	0.40	0.25
D	**GCF new investment**	-	-	0.39	0.45	0.50
E	**Private finance**	-	-	0.01	0.05	0.10
F	**Total annual BDP sources**	0.65	0.75	2.00	3.0	2.00

Source: BDP2100 team

When discussing the BDP2100 sources of finance, it has to be stressed here that not only the substantial resource gap of 1.25% of GDP needs to be taken into account, but the current allocation of 0.75% of GDP as well! After all, existing allocations are also subject to change in financiers.

O&M is and should be entirely financed by public resources, as DPs are generally not supportive of financing O&M spending through donor funding. However, DPs and GCF will assist in financing investment projects and therefore even though O&M costs increase over time, GoB's share in financing the total BDP2100 budget is projected to be stable around 55-60%.

7.4 Short term actions

We regard the following short term policy actions as important in order to generate additional funding sources for the investments needs in the water sector.

- *To establish a Delta Fund in Bangladesh* under the Delta Commission based upon the example from the Netherlands. Such a dedicated fund to be tailored to the Bangladeshi situation aims to cover long term investment costs as well as recurrent maintenance costs of flood protection infrastructure and other water management related services (and if needed the water supply and sanitation sector too, in any case for the short and/or medium term). The fund could be sourced from national budget lines and DPs contributions

[71] DP investments are a forecasted levels of investment over time and are not proposed targets

(including GCF), as well as from specific charges (to be defined and elaborated upon), but is advised to be at arm's length from day to day politics. Special attention need to be paid on the following:

i. Scrutinise individual projects by applying strict project appraisal and approval procedures through an independent body, thus avoiding political interference;

ii. Prioritize individual projects based on an integrated approach aligning with the BDP2100 goals, taking into account:

- the existing project portfolio and the related current and future financial obligations;
- the remaining annual budget(s) available based on the agreed allocation of funds;
- investment costs as well as related O&M costs;
- the overall capacity of the implementing agency.

iii. Apply a multi-year approach for budgeting, to guarantee sufficient availability of funding sources to implement individual projects properly, and as a result avoiding project delays occurring through lack of resources;

iv. Apply a single budgeting system balancing investments costs as well as its operations and maintenance costs to ensure sustainability of the interventions made;

v. Introduce a strong M&E system to assess the adequacy of current funding levels and future affordability, with a strong focus on projects' BDP2100 goal achievement efficiency and effectiveness;

vi. Apply flexibility in a multi-year budgeting system by allowing moving surpluses/deficits from one fiscal year to the next fiscal year;

vii. In case funding will become available from Development Partners, be secure in aligning the GoB appraisal and approval process of individual projects with the related processes of the Development Partners, avoiding unnecessary delays in project implementation.

- Given the huge investment needs for water services in Bangladesh it is important that the (annual) budget of the GoB increases in order to allow for funding of these needs. The current taxation system should be improved aiming at higher tax collection and revenues to feed the annual budget of the GoB and implicitly water related services and, in addition dedicated levies for water services should be introduced. Tax base and collection rate improvements could result in higher tax revenues and therefore more government budget available to invest in public services (in general) and in water infrastructure (in particular)[72]. Although the first steps in raising tax revenues (income tax as well as VAT) are already planned and announced, they still did not materialise. For raising income tax a substantial extension of the tax net and identifying new tax payers is badly needed. This includes also those who currently are exempted from paying tax; reconsidering conditions and regulations in this respect is strongly recommended. Moreover, tax rates and accompanying taxation blocks should be evaluated on its appropriateness taking into account the high income generating customers, too. Next, some basic requirements like owning an bank account has to be fulfilled and enforced. This is also needed for a smooth operation of the new VAT law, which is currently on hold for another year till summer 2017. Compared to other countries in the world which are in the same stage of development and given the great expectations

[72] In many countries in the world flood risk management/protection measures are financed from the respective national budgets (either completely or to a large extent, supplemented if possible with specific levies). The main reason is that these kinds of investments are public goods, where individual beneficiaries are difficult to identify. These public goods are the full responsibility of the national government (and the audience is its total population).

in boosting economic development in the short and medium term, sufficient room might be available for increasing significantly Bangladeshi total tax revenues.

- Moreover, it is also important to create the conditions for payments of the public for water services. Important elements in creating a willingness to pay for water services are quality of water service delivery, transparency regarding the use of payments and accountability. In order to stimulate willingness to pay, it is therefore important to separate financial flows for the water system from the general budget and taxes and create a system of cost recovery levies for drinking water and sewerage and waste water treatment.
- Better enforcement of environmental regulations in order to set the conditions for water extraction and/or pollution charges and/or licensing systems. By enforcing environmental regulations, the costs (penalties) for polluting companies will increase and incentives for own treatment systems might increase. The introduction of water extraction licenses or caps could also introduce incentives for investments in water use efficiency improvement in companies.
- For the large needs regarding investments **in *climate resiliency or water safety*** infrastructure a number of short term actions are recommended creating new funding arrangements:
    i. To create *a Delta Secretariat with a Programming Wing as part of the Delta Commissi*on in order to identify and explore flood protection, water availability (irrigation) and river transport projects where additional revenues streams could be added from land reclamation and/or urban development, water pricing or river charges for river maintenance. By broadening the scope of projects and introducing charges, new revenue streams could be used for funding. This Programming Wing could also prepare projects for the Green Climate Fund (GCF) and/or PPP authority.
    ii. In addition, the Programming Wing will include a Project Preparation Cell, which will initiate (pre-)feasibility studies and detailed concept notes through out-sourcing, initiate land acquisition prior to project implementation. In later years, programming wing will prepare e-DPPs/e-TPPs based on completed feasibility studies for vetting by the (inter-ministerial) Plan Coordination Committee of the Delta Commission.
    iii. To prepare a strategy and team in order to gear investment programmes and develop ready projects for the *Green Climate Fund* (GCF). Because the Green Climate Fund is a new source of donor funding, this source should be tapped by GoB and the private sector in Bangladesh in an optimal manner. GCF will often work with national co-finance and private finance elements. Therefore, those climate adaptation programs and projects need to be prepared which suit GCF financing conditions best. Within the Delta Commission programming unit a special cell could be established and trained to advise on project development (at early stages) private revenue generation project finance etc.
    iv. *To develop incentive schemes* in order to stimulate actors to adapt to climate events such as floods. Blended subsidy-loan schemes for households for resilient housing and land raising could be interesting to explore together with IFC, and multi-lateral and bi-lateral development banks (like ADB, FMO, DEG, etc.) and housing financiers. For agriculture programmes crop change could be piloted in some regions (for example shifting to more water resilient rice variants). In some places or instances, these incentive schemes could be more efficient compared to traditional public funding of large water safety infrastructure.

Regarding ***water availability (irrigation), river transport and industrial waste water treatment*** the following action could be considered in the short run.

- Establishment of a *PPP cell including a pilot PPP project pipeline in the Delta Programming Wing* Dialogue and information sharing between the public and private sector and developing a pilot PPP project pipeline is

especially important in the short term for some subsectors where pilot PPPs are most feasible. These are in industrial waste water treatment in economic zones and urban areas, land reclamation, irrigation and river transport (and possibly flood protection in combination with land development or roads). The BDP report on private sector engagement (based upon a survey with the private sector) shows that the companies address dialogue, information sharing and capacity building as important needs. Creation of a platform where public and private partners exchange information, share experiences and influence government practices regarding procurement etc. could prepare for roll out of more PPPs after 2030 (also towards other water sectors such as water supply & sanitation). Apart from this data and tool development for feasibility and forecasting studies are essential.

Water supply & sanitation

- An important short term action consists of implementing a *pilot project on financial performance improvement of a selected water utility* (e.g. Khulna WASA or Rajshahi WASA) through a range of measures:
  - Introduction of (smart) metering;
  - Introducing more optimal tariffs systems: block tariffs and gradually increasing tariffs with income increases over time (with first a full cost recovery of operations and maintenance and slowly to be transformed into a full cost recovery of both operations and maintenance as well as investments);
  - Reducing inefficiencies by modern technologies: prevention of leakages, illegal tapping, etc.;
  - Improving payment systems by introducing ICT solutions;

  A pilot large Technical Assistance project (including capacity building) could be started in smaller water utilities.
- *Establishment of an innovation fund to stimulate private sector small scale water supply, sanitation and irrigation initiatives*

  Practices from other countries showed a number of upcoming small scale private sector operations water supply systems in towns or rural areas, private irrigation schemes etc. These cases often are not immediately profitable and grants for capacity building and promotion (TA) are often needed. In order to stimulate the introduction or piloting of these practices in Bangladesh an innovation fund could be established to provide viability gap grants for private initiatives.

8 References

ADB 2014, Report and Recommendation of the President to the Board of Directors – Irrigation Management Improvement Project.

Annual Review DFID Climate Change Programme, June 2015

Baseline Study "Disaster Management", BDP2100, BanDuDeltAs, 2015.

Baseline Study Public Health, Water Supply and Sanitation, BDP2100, BanDuDeltAs, 2015.

Baseline study "Sustainable Transportation and Infrastructure", BDP2100, BanDuDeltas, 2015.

Baseline Study "Water Resources", BDP2100, BanDuDeltAs, 2015.

BDP2100 report on "Financing and Funding Arrangements in the water sector ,part 2: international cases in core water services".

Booklet distributed by BCCTF in 2014.

Castalia Strategic Advisers (2016), "Development of an Investment Plan to Support the Bangladesh Delta Plan 2100: Initial Findings Report", May 2016 and

Challenges of Agricultural Water Management, ISBN: 978-953-51-0117-8.

Chowdhury, N.T. (2012) Irrigation Institutions of Bangladesh: Some Lessons, in: Kumar, M. (2012) Problems, Perspectives and Challenges of Agricultural Water Management, ISBN: 978-953-51-0117-8.

CIEL 2015; TOPIC GUIDE: Guide to National Governance of Climate Finance, Evidence on Demand and Professional Development series.

DFID 2015 Annual Review of CC project.

Dhaka Environmentally Sustainable Water Supply Project (RRP BAN 42173), September 2013, Sector Assessment WS and other Municipal Infrastructure Services.

Ecorys (2012) Quick scan economic instruments integrated water management - Discussion note.

Financial Management Assessment of BWDB, app 5, ADB, 2013.

GCF Pledge Tracker, April 2016

GCF Elements, 2015

GIZ/ERD 2015 Workshop Report NIE Accreditation Process: Getting Bangladesh Ready for the Green Climate Fund Dhaka, 28-29 January, 2015.

Government of Bangladesh, Sector Development Plan FY2011-2025: Water Supply and Sanitation Sector, Dhaka.

IMF: World Economic Outlook, April 2015

Irrigation Management Improvement Project (app 5: Financial Management Assessment of BWDB (ADB, 2013).

ITU (2010) ICT as an Enabler for Smart Water Management. Technology Watch Report. Retrieved via: http://www.itu.int/dms_pub/itu-t/oth/0B/15/T0B1500000D3301PDFE.pdf

Joint Venture FICHTNER & NHC in association with Resource Planning & Management Consultants, Aqua Consultant and Associates, IWM and CEGIS: Feasibility Study "River Bank Improvement Program", Annex B Volume 1, Institutional and Financial Assessment, June 2015.

Neha Rai, Sunil Acharya, Ramesh Bhusal, Raju Chettri, Md Shamshudoha, Misgana Elias Kallore, Nanki Kaur, Sumanta Neupane, Lidya Tesfaye. 2015. Political economy of international climate finance: Navigating decisions in PPCR and SREP. IIED Working Paper. IIED, London.

OECD (2014), Water Governance in the Netherlands Fit for the Future?

OECD (2012) A framework for financing water resources management

OECD (2010): Innovative financing mechanisms for the water sector

OECD & World Water Council (2015) Water: Fit to Finance? Catalysing national growth through investment in water security. Report of the High Level Panel on Financing Infrastructure for a Water-Secure World.

Private Sector Engagement in Delta's, BDP2100 Report 2016.

PRI (2016) Bangladesh DeltaPlan 2100, main Report (Chapter 11).

Public Expenditure Review Update, World Bank 2015.

Rebel (2015): Business opportunities for land reclamation in Bangladesh.

Rijkswaterstaat 2011, Water Management in the Netherlands.

TIB 2013, Climate Finance in Bangladesh: Governance Challenges and Way Out.

TIB 2013; AN ASSESSMENT OF CLIMATE FINANCE GOVERNANCE BANGLADESH.

Tvedt, T. and Jacobsson, E. (2006) A History of Water: Volume I: Water Control and River Biographies, Tauris & Co. Ltd. New York.

Twijnstra Gudde & Tauw (2015): Toekomstbestendige en duurzame financiering van het Nederlandse Waterbeheer

UNDP (2012), Readiness for Climate Finance; A framework for understanding what it means to be ready to use climate finance.

World Bank (2014), Benchmarking to Improve Urban Water Supply Delivery in Bangladesh, WSP program report,

World Bank (2009), "Public Private Partnerships for Urban Water utilities".

World Bank (2014), People's Republic of Bangladesh: A Public Investment Management Review and Reform Roadmap for Bangladesh (part of the multi donor funded and World Bank administered SPEMP programme)

World Bank (2014), People's Republic of Bangladesh: SPEMP. Output 5b (Review of spikes in development expenditure in the fourth quarter)

World Bank (2015), "Public Expenditure Review Update".

2030 WRG, 2015: Consolidation and Analysis of Information on Water Resources Management in Bangladesh

Annex 1: Practices in Integrated Water Management from the Netherlands and the UK

In this chapter some interesting practices are presented from two countries with developed integrated water management systems – the Netherlands and the UK –.

Integrated water management is in our view an approach which promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

Worldwide no perfect examples exist and each country faces challenges in its water management. In this chapter the water management system of two countries is explained. These two countries are chosen because they are good examples of countries with highly developed integrated water management systems.

A1.1 The Netherlands

The Dutch are known for their experiences and expertise within the domain of water management, in the form of hydraulic engineering, flood control, flood protection, foundation technology and infrastructure. Also, water supply, water quality and wastewater treatment are well-established within the Netherlands. Water management is high on the agenda for the Dutch, nonetheless it also is a complicated issue and the challenges for water policy makers are significant.[73]

In this case description, the Dutch water management system, its institutional layering, and the financing mechanism are assessed. Thereafter, the specific water services flood protection, water supply, sanitation and wastewater treatment, and water quantity management are described more thoroughly.

A1.1.1 Institutional layering of water management

Water management in the Netherlands has been traditionally regarded as a responsibility of the public domain and has been highly decentralised from both a territorial and functional perspective. Territorial decentralisation concerns the provinces and municipalities, which have, in principle, a broad responsibility while functional administrative bodies (e.g. regional water authorities) are responsible for one or more specific tasks. [74]

In the figure below an overview is given of all different public institutions that are involved in water management in the Netherlands. The Netherlands has to follow European legislation.

[73] Rijkswaterstaat 2011, Water Management in the Netherlands.
[74] OECD 2014, Water Governance in the Netherlands Fit for the Future?

Figure A1 Institutional layers of water management in the Netherlands

Source: OECD, 2014.

A1.1.2 Water management financing mechanism

The central government, provinces, water boards, and municipalities are investing approximately €8.7 billion annually (Twynstra Gudde, 2015) in the protection of the Netherlands from flooding, waterlogging and drought, the improvement of water quality, the treatment of wastewater, and the infrastructure revolving around water. Water companies are responsible for the supply of water, but these are supported by funds of the central government.

Central government

Twenty-five percent of all costs of water management are funded by the central government (Twynstra Gudde, 2015). These costs are recovered in the form of general taxes (VAT, profit tax) or income taxes that the government charges on its citizens. The remaining costs (circa €6 billion) are being covered by levying local taxes by the water boards, municipalities and, to a lesser extent, the provinces.

Water boards

Although, every water board determines its own values, the water taxes itself (in content) are determined nationally. Mainly, the water taxes can be divided in three types:

1. Water system tax (residents) (waterschapsbelasting):
   This is a fixed amount paid for every household that lives, works and recreates in the area of the water board.

2. Contamination/ pollution tax (households and businesses) (verontreinigingsheffing):
   This is the user tax imposed on those who waste water discharge into drains or rivers. The rates of taxation vary according to water board.
3. Water system tax built, unbuilt and nature (buildings, land or nature):
   These taxes are imposed on the citizens with possession or restricted right to the enjoyment of the property. With these tax revenues the water board pays the maintenance of dikes, embankments and regulate water levels in ditches and channels.

Municipalities

The maintenance and replacement of the sewer is the responsibility of the municipality, for which every business and household is charged with sewer tax. The council determines the amount of sewage charges annually.

Water supply companies

The water supply has a different and unique form of financing, which is based on tariffs per cubic meter instead of taxes. Via central government, as VAT and Tap Tax, additional funding is provided.

A1.1.3 Flood protection

The Dutch water management goes back until the early middle ages when the first dikes were realized in the North of the Netherlands. Nowadays, flood management of the Netherlands belongs to the most advantage systems in the world and major improvements on flood protection have been made.

One of the biggest steps that have been made is the adoption of the Delta Act. The act established the Delta Programme, the Delta Commissioner and the Delta Fund to advance an adaptive governance approach to respond to the country's current and future challenges on water safety and freshwater supply (OECD, 2014). The Delta Commissioner's task is to promote the development and implementation of the Delta Programme. He or she works directly under the Ministry of Infrastructure and the Environment.

The Delta Fund has been established to ensure that in the long-run sufficient funds are available to realize necessary measures regarding flood protection and freshwater supplies in the Netherlands. The Delta Fund has its own budget which is an independent part of the national budget. The Minister of Infrastructure and the Environment manages the fund. The Delta Fund is fed by contributions from the budget of the Ministry of Infrastructure and Environment and other budgets that are part of the national budget. The Water Boards provide an annual contribution to the Delta Fund. Since 2015, expenditures in the areas of water quality, even when these expenditures have no relation to flood protection and freshwater supplies can be accounted for by the Delta Fund.

A1.1.4 Water supply

In 1957 the Water Supply Act came into being. This law ensures the quality of the water and the continuity of supply. Some 99.9 per cent of Dutch households have access to clean, chlorine-free drinking water. Ten water companies in the Netherlands are responsible for the exploration, production, transmission and supply of drinking water under supervision of the authorities via the Water Act.

According to the Drinking Water Act, the charges which water companies use should be cost-effective, transparent, and non-discriminatory. The tariffs exists from a fee charged for having a connection and a rate per cubic meter delivered drinking water. This rate is differentiated by small users (= households), small business and commercial use. In the Netherlands 100% of the costs for drinking water are paid by the tariffs for drinking water. The average tariff is €1,26 per cubic metre. The average amount paid by households for drinking water is € 126 (Vewin, 2012) which is 0,5% of the income of an average Dutch household.

A1.1.5 Sanitation & wastewater treatment

In the course of the nineteenth century for the first time, several larger Dutch cities implemented sewer channels. In villages and smaller towns these weren't even established until the twentieth century. [75] From 1970s onwards, the Dutch began using innovative wastewater treatment techniques. Additionally, the level of re-cycling of industrial wastewater is high, and the water is of sufficient quality for use in the food and beverage industries.[76]

In the Netherlands, sanitation and wastewater treatment services are responsibilities of different authorities. The municipalities are responsible for collecting and discharging wastewater via the sewerage system and the water authorities are responsible for water management in a specific area. Sewerage is often paid for as a fixed price (independent from water consumption). Via the sewage levy 99% of the costs are recovered for municipalities and also the waste water levy has a 100% cost-recovery (Twynstra Gudde, 2015). Households pay for wastewater treatment depending on the size of the household, considering 1 or 3 persons (thus 2- person-households subsidize larger households). Industrial sources that discharge their wastewater over public wastewater treatment plants pay according to the number of population equivalents (based on the BOD and/or COD content[77])[78]. On average households pay annually € 177 for their sewage and € 161 for their wastewater treatment.

A1.1.6 Water quantity management

Large parts of the Netherlands are vulnerable for desiccation, or water shortages. After the Second World War, agricultural production and lot sizes have increased significantly within the Netherlands. The latter resulted in lowering ground water tables with 10 to 40 cm, sometimes even over 1 metre. The most important cause for the fall in water tables is extraction of groundwater for drinking water and industrial process water. In 2009 the act to modernize water boards became effective. One of the aspects of this new act is the water system levy (watersysteemheffing) that integrates the functions water quantity management, weir care and quality management of surface water. Another aspect of the act was the pollution levy. When households are not connected to the sewage this levy has to be paid.

The Dutch Water boards play a key role in environmental management in the Netherlands because they are responsible for managing and maintaining surface water quantity and quality throughout the country.[79] Regional water authorities or the water boards are held accountable for expenditures in the field of water quantity. On average each Dutch household pays annually € 69 for their water quantity management by a water system levy. For the pollution levy a household pays 54 euro per year per unit of pollution (vervuilingseensheid). Together the pollution levy and the water system levy 100% recover the costs of the water boards.

A1.1.7 Conclusion

The Netherlands is as a country highly experienced with water management. The most important conclusions are:

The Dutch invest in water management at various government levels funded by full cost recovery levies

In the Netherlands water is seen as public good. It is a public responsibility to protect the country from floods and to maintain the quality of the water. However, water is also seen as a consumer good that needs to be paid for. That is why central government, as well as water boards, municipalities, and to a lower extent the provinces are investing approximately €6.1 billion annually in water management in the Netherlands. Households and industries fund a large

[75] http://www.riool.info/ontstaan-van-het-riool.
[76] Holland Trade (http://www.hollandtrade.com/sector-information/water/water-technologies/?bstnum=4931).
[77] The biochemical oxygen demand (BOD), i.e. by means of bacteria; The chemical oxygen demand (COD), with the help of a strong oxidiser such as potassium dichromate.
[78] https://courses.edx.org/c4x/DelftX/CTB3365x/asset/Wastewater_Lecture_Note.pdf.
[79] https://www.government.nl/topics/environment/contents/roles-and-responsibilities-of-provincial-government-municipal-governments-and-water-authorities.

part of the investments by dedicated levies. In total households spend less than 5% of their income on water management and drinking water.

The Delta Programme, commissioner and fund ensure a long-term effective flood protection and water supply

The Netherlands tends to ensure strategic, long-term expenditures on flood protection and water supply by the realisation of the Delta programme, the Delta commissioner and a specific Delta Fund. The Delta Commissioner's task is to promote development and implementation of the Delta Programme. The Delta Fund has been established to ensure that in the long-run sufficient funds are available to ensure realization of necessary measures regarding flood protection and freshwater supplies in the Netherlands. The Delta Fund has its own budget which is an independent part of the national budget.

The management of drinking water, sewage and water treatment is full cost recovery

In the Netherlands 100% of the costs for drinking water are covered by tariffs set for drinking water. Moreover, the cost of sewage and wastewater treatment are also fully covered by local pollution levies. This implies that funding is arranged for sustainable operation and maintenance of these services as well as for investments in capacity expansion and/or renewal and rehabilitation.

A2 The United Kingdom

Water management has high priority within the UK. As UK population is growing, the needs of water systems and sewerage networks are changing. Moreover, a large part of its population is at risk of water flooding. In this case description, the UK water management system is assessed.

A2.2.1 Institutional layering of water management & Water management financing mechanism

Before 1973 the water sector of the UK was a fragmented local industry. More than 1000 small local companies existed mostly owned by local governments. Besides, 33 historical privately owned 'water only' companies were present. In 1973 the Water Act was introduced. The Water Act enforced legal consolidation in the UK. Ten, state owned, Regional Water Authorities (regional Water & Sewage companies) came into existence in England and Wales. Besides Regional Water Authorities the 33 historical privately owned companies remained. In 1989 the water sector was privatized. The ten regional companies (earlier mentioned) were transferred to private ownership and individuals started paying for the water service they used. Besides, independent regulators were formed.[80]

The management of water resources in the UK is the responsibility of the Environmental Agency (EA) and Defra (Department for Environment Food & Rural Affairs). The Water Services Regulation Authority (OFWAT) is the economic authority of water and sewerage in England and Wales. OFWAT is responsible for targets, performance standards and regulations.[81] Last, the Drinking Water Inspectorate (DWI) was set up in 1990 to provide independent reassurance that public water supplies in England and Wales are safe and drinking water quality is acceptable to consumers.[82]

A2.2.2 Flood protection

In the UK, (surface) water flood protection and prevention is the responsibility of the government, but is executed by the Environmental Agency (EA). The UK funds its Flood and Coastal Erosion Risk Management (FCERM) mainly via the central government. In 2014, the government raised approximately GBP 795 million for FCERM. Other sources of funding are raised via local authorities, partnership funding, and other incomes.

[80] http://www.jwwa.or.jp/english/kaigai_shiryou/IWA_workshop_7th_2-3.pdf.
[81] http://www.st-andrews.ac.uk/business/ecas/7/papers/ECAS-Cooper-et-al.pdf.
[82] http://www.dwi.gov.uk/about/index.htm.

The funds of the central government are established mainly via the Department for Environment, Food and Rural Affairs (Defra), and for a small part, of GBP 20.7 million via the Department for Communities and Local Government (DCLG). Since EA is the executing body regarding FCERM, Defra provides the majority funds to EA. The EA spends his funding directly on FCERM, but also passes some on to local authorities or internal drainage boards for prevention of surface water flooding.

EA spends most of its funds on improving existing flood defences. FCERM maintenance covers a wide range of activities that includes inspection and maintenance of assets, operation of mechanical and electrical assets, and deployment of temporary flood defences.[83]

A2.2.3 Water supply

The central government has the legal responsibility regarding drinking water. The authorities have to ensure that industry is producing safe, secure and potable water, and carry out the EU law regarding drinking water (the Drinking Water Directive). The authorities have diverted some of their duties to a number of agencies that monitor water companies and drinking water quality.

Defra is the responsible party for legislation and regulations that are enacted upon in order to make sure all drinking water in England is safe, secure, and potable. The Drinking Water Inspectorate (DWI) has the responsibility for keeping water companies and other people that supply drinking water within the legislation.

OFWAT is responsible for making sure that water companies provide the appropriate service at a fair price. OFWAT sets the performance on each activity of the best operating company within an industry as the target for the rest of the companies, and determines its tariffs thereon. Price controls for water and sewage companies are set every five years. It is up to individual operators to outperform these expectations to generate returns for their shareholders. Failure to meet these expectations results in reduced returns (or even losses).[84] OFWAT can also decide to take legal actions on companies who fail to meet the targets.

Households have spent on average approximately GBP 400 per household to water and sewerage companies in the year 2014, which is about 3% of their annual income.[85] Water bills have increased by almost 50% since the privatisation of water services in 1989.[86] In England and Wales there are regional differences in domestic water rates. Domestic water rate depends on the availability of water in a region and size of a region. Water companies calculate the domestic water bills in one of two ways:

- Unmetered: a set amount for domestic water and sewage service is paid, regardless of how much is used. This is based on the rateable value (RV) of your home;
- Metered: domestic water readings are taken from a water meter and households pay for the units of water you use.[87]

A2.2.4 Sanitation & water treatment

The sewage system in the UK was developed in the late 19th century in London. Once this system was completed in London, it was mirrored and reproduced across the UK. Today, 624,200 kilometres of sewers collect over 11 billion litres of wastewater everyday within the UK. About 96% of UK's population is connected to sewers leading to sewage treatment works. The remaining 4% is represented by small communities or individual properties, often in rural areas.

83 http://evidence.environment-agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/fd2678_report.sflb.ashx.
84 http://wedc.lboro.ac.uk/resources/conference/30/Burwell.pdf.
85 http://researchbriefings.files.parliament.uk/documents/SN06596/SN06596.pdf.
86 http://www.uswitch.com/water/price-of-water/.
87 http://www.uswitch.com/water/price-of-water/.

Their systems are mainly privately owned small treatment plants servicing a small number of houses, farms, or individual properties.[88]

The Flood and Water Management Act 2010 incorporates legislation that obliges sewage companies to maintain, improve and replace sewers, to place new sewers and to treat wastewater. The UK authorities have transferred ownership of private sewers from individual households to sewerage companies as of October 2011. The transfer means that sewerage companies are responsible for sewers that are attached to properties instead of owners of these properties. These companies have to work according to standards set by OFWAT. This change also has as a result that planning for the future is easier and more transparent.[89] As a consequence of the shift of ownership, improvements to sewage systems require large amounts of ongoing investments. The five-yearly water company price review done by OFWAT estimates the amounts that are required for the adaptations to sewage systems.

A2.2.5 Water quantity management

Water Resources is the term that the government uses to refer to "the quantity of water available for people and the environment". Abstraction is "the removal of that water, permanently or temporarily, from rivers, lakes, canals, reservoirs or from underground strata". It is being emphasized that abstraction of water must not harm or damage the environment. To prevent this from happening, a licensing system has been introduced, that controls how much, where and when water is abstracted. This system was introduced by the Water Resources Act 1963 and has been refined and changed as a result of the Water Resources Act 1991 and the Water Act 2003.

The Environment Agency is responsible for managing water resources in England. The Environment Agency controls how much water is taken with a permitting system. The funds needed for this duty are raised and distributed mainly via Defra, but for a small part via regional authorities or municipalities.

A2.2.6 Conclusion

The UK water & sewage companies are privatised, full cost recovery and privately funded, but this has had an upward effect on the price of water.

The privatization has resulted in the current state of the water sector of the UK wherein about 96% of the population is connected to sewers leading to sewage treatment works and everybody has access to fresh water. However, since privatisation in 1989 water bills have increased (real-term) with 50% and as a consequence 23% of households in England and Wales spend more than 3% of their income on water and sewerage bills.

The prices of water are regulated and thereby water companies are stimulated to outperform

In the UK the price of water is regulated at central level. OFWAT is responsible for making sure that water companies provide the appropriate service at a fair price. The fair price is determined based on the best operating company within the industry. All other companies are stimulated to reach that target.

Private operation of water and sewerage can be efficient, but needs a proper regulator

In the UK system the burden of drinking water and sanitation services for the public budget is minimized. Private water utilities and sewage companies are full cost recovery and can attract capital from private banks or capital markets. This is a system where Bangladesh could aim for in the long run after improving financial performance of water utilities in the next decade(s).

[88] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69592/pb13811-waste-water-2012.pdf.

[89] https://www.gov.uk/government/publications/2010-to-2015-government-policy-water-and-sewerage-services/2010-to-2015-government-policy-water-and-sewerage-services.

Annex 2: Development Partners in Bangladesh: Focus Areas and Type of Financing

A2.1 Development Partners predominantly providing loans

World Bank

Bangladesh joined the International Development Association (IDA) in 1972, one year after the country's independence. IDA has consistently been the most significant development partner in volume terms, providing more than $18.9 billion in support for policy reforms and investment projects in Bangladesh and accounting for more than one-quarter of all foreign aid to the country during this period. Under the IDA17 cycle, which spans FY2015-2017, Bangladesh is the largest recipient of IDA resources[90], with an indicative total allocation of about SDR 2.8 billion ($3.9 billion equivalent) or 9 percent of all IDA17 resources. The IDA, the World Bank's fund for the poorest countries, currently supports 36 projects in Bangladesh, with a total commitment of over $8.34 billion (end June 2015). FY15-16 will reportedly include new financing commitments of $1.9 billion and disbursements of almost $1 billion. The World Bank is seeing an increased absorption capacity of Bangladesh as its annual disbursements doubled, from an average of $420 million per annum over FY09-12 to an average of $840 million per annum over FY14-15.

When looking at the cumulative lending amounts of the last 5 years, it can be observed that water, sanitation and flood protection received a significant amount of finance of about US$ 1.166 billion or 14.8% of the total USD $7.9bln. Other major focus sectors were health and social services (20.9%), public administration and law (19%) and Education (15.2%).

In its Systematic Country Diagnostic of October 2015 the World Bank identified five key areas where concerted efforts over the next 3-5 years could lead to creation of more and better jobs in Bangladesh. The five areas are inland connectivity and logistics, energy, regional and global integration, urbanisation and delta management. These five transformational priorities are combined with foundational priorities, which are important prerequisites for sustained growth (macroeconomic stability; human development; and institutions and business environment). The Country Partnership Framework (CPF) 2016-2020 prioritizes WB support by combining these two dual objectives and identifying three focus areas.

1. Growth and competiveness
2. Social Inclusion
3. Climate and Environment Management.

Goal 3 explicitly supports BDP2100 by boosting Bangladesh's resilience to climate change and natural disasters, improving the management of water infrastructure and promoting agricultural productivity with climate smart farm practises and technology, diversification and accelerating the move up the value chain.

The WB's transformational priority for adaptive delta management was already given shape in July 2015 when it entered into a three partite strategic partnership agreement between the Government of the Netherlands (GoN) and the Government of Bangladesh Signing of MoU to facilitate the preparation and implementation of BDP2100.

Finally, in light of United Nations Conference of Parties (COP) meeting in Paris, World Bank has committed to increase its climate finance from 21% to 25% of global allocation by 2020 – going from $10.3 bln a year to $16 bln.

[90] IDA funds are provided under highly concessional terms with service charges of 0.75%, a repayment period of 40 years, of which 8 years grace. Bangladesh may face increased service charges on loans following its recent graduation into the lower middle income country (LMIC) status from low-income country (LIC) status. However, in the short term Bangladesh will be able to draw significant amounts of IDA-only / IDA-dominated loans (see terms and conditions chapter below).

Asian Development Bank

The ADB is currently the second largest development partner of Bangladesh, after the World Bank. Between 1973 and 31 December 2014 ADB provided $16.1 billion in loans for 248 projects, $240.6 mln for 409 TA projects. Cumulative disbursement to Bangladesh for lending and grant amounted to $10.7 bn. ADB only finances large projects with its loans, only projects equal or above 50 million USD are eligible for obtaining loans.

The country strategy paper 2011-2015 ADB supports efforts by GoB to achieve more inclusive, resilient, and environmentally sustainable growth. Development efforts to realize this objective include improving: Transport connectivity, labour skills, energy efficiency and access, management of water resources and reducing impact of climate change. In general ADB has become more active in BDP2100 related sectors over the last few decades, and from the table below, it can be observed that in the last decade ADB made highly relevant BDP2100 investments and was able to finance large projects to improve water management, flood protection, among others.

Currently, ADB is crafting its new Country Partnership Strategy which will expire in 2015. In its Country Operations Business Plan for Bangladesh 2016-2018 the ADB already gives some insight into its plans. Responding to the country needs and with ADB's enhanced resource base[91], the 2016–2018 COBP substantially scales up ADB operations from the historical base by programming beyond the indicative assistance level. Bangladesh is a Group B ADB developing member country and currently has access to both the Asian Development Fund (ADF) and ADB's ordinary capital resources (OCR). The indicative resources available during 2016–2018 for sovereign operations amount to $2,778 million. Total amount available for Bangladesh will go up from 1.0 billion USD to 1.5 billion USD. Also the interest rate will increase slightly. This comprises $1,502 million in market-based OCR and $1,276 million in ADF and concessional OCR resources. More specifically, for the sectors Agriculture, Natural Resources and Rural Development [92] ADB has an indicative budget of $779 million for 2016–2018.

Globally, ADB will double its annual climate finance from the current $3 bn to $ 6 bn by 2020. Out of the $6bn, $4bn will be dedicated to mitigation through scaling up support for renewable energy, energy efficiency, sustainable transport and building smart cities while $2bn for adaptation through more resilient infrastructure, climate smart agriculture and better preparation for climate related disasters. ADB's doubling of climate finance's reflects its strategic priorities as well as the increase in ADB's overall financing capacity by up to 50% due to a more efficient use of its balance sheet by combining the equities of its Ordinary Capital Resources and Asian Development Fund in 2017. In addition to scaling up its own climate financing, ADB will continue to explore new and innovative co-financing opportunities with public and private partners. For example, ADB will seek to mobilise concessional financing from the Green Climate Fund

JICA

The Japanese International Cooperation Agency (JICA) is one of the largest development partners of Bangladesh. In the last 40 years JICA has been a steady development partner giving consistent large volumes of cheap, highly conditional, loans with 40 years repayment period, of which 10 years grace and with 0.01% interest rate. Moreover, Japan has often given debt reduction wavers to Bangladesh for outstanding loans.

Traditionally, JICA has focussed its loans towards the power and gas sector. Transportation, Social services and Mining and Manufacturing also received significant amounts of funding.

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[91] ADB will combine its Ordinary Capital Resources (non-concessional) with Asian Development Fund (concessional) – an innovative move which will allow ADB to increase its finance substantially, especially to poor countries, such as Bangladesh, ADB Bangladesh will have more resources at its disposal.

[92] Including rural infrastructure development; river basin and flood management; climate change capacity development; knowledge management; climate-resilient connectivity, and crop insurance and pilot programs

Recently, JICA has significantly scaled up its assistance programme to Bangladesh. A jump to current levels was made in 2011.

IFAD

The International Fund for Agriculture Development provides loans with 40 years payback period, 10 years grace and 0.75% service charge, which are comparable to World Bank's IDA funds. IFAD usually provides a small grant in combination with loan.

Islamic Development Bank

The Islamic Development Bank is quite active in Bangladesh and will step up its presence by setting up a country representative office in September 2015. Bangladesh is one of the largest recipients of IDB funds.

IDB has an active portfolio of 13 on-going projects with total IDB funding of $898.38. These are in the power, education, health, telecommunications, marine fisheries and road communication sectors. As of June 2015 IDB has approved $17.17 bln of which $15.45 bln is trade finance and $1.72bln is project finance. Of the 1.72 bln project finance 10.5% is concessional finance and 89.5% is non-concessional. For concessional loans IDB charges a service fee to cover its administrative costs. It ranges from a minimum of 0.75% (for high poverty content projects) up to a maximum of 2.00% per annum, with a tenure interval of 16 years to 30 and a corresponding grace period of 4 to 10 years. The annual allocation of concessional products (loans and grants) is around $20 million per annum, which is a small share of IDB's total annual commitments to Bangladesh.

Between 1974 and December 2012 the biggest share of operations (funded from Ordinary Capital Resources) has been in energy (36%) with a total amount of $438 million, followed by transportation (20%); industry and mining (13%); education (8%); information and communication (5%); water, sanitation and urban services (4%); health (2%); and finance (1%). With regard to operations by financing mechanism, IDB approved projects mainly under Leasing (42%) and Loan (30%) followed by Istisna'a (23%), Equity (4%) and Line of Financing (1%).

Bangladesh has a long tradition of import financing for oil from the International Islamic Trade Finance Corporation (ITFC) under trade finance mechanism. Trade finance can be seen as a short term 'loan' which has a tenure of 6 to 24 months and an interest rate of around 4%. In June 2015 Finance Minister AMA Munith urged IDB to provide more development funds and reduce loan costs, especially in the light of IDB's planned reorganisation to achieve its Vision 1440H (2030).

In IDB's Country Strategy Partnership Strategy (CSPS) for Bangladesh identified a number of constraints and lessons learned which resemble observations by other DFIs and DPs, including issues of synchronization, insufficient GoB capacity leading to project implementation delays. IDB also states it wishes to enhance collaboration with other MDAs in Bangladesh.

OFID

The OPEC Fund for International Development (OFID) is the development finance institution established by the Member States of OPEC in 1976 as a collective channel of aid to the developing countries. In 2014, Public Sector Lending accounted for 65% of total commitments for the year, with approvals of US$266m (34.4%) for Asia. In December 2015 cumulative activities of OFID in Bangladesh amount to US$ 541.5m, of which transport (32%), energy (32%) and urban development (10%) take up the lion share (74%). In case of BDP2100 relevant projects it distributes soft loans with 1.5% interest rate and 1% service charge. In Bangladesh, OFID often co-finances ADB projects.

China

USD 1,880 million has been disbursed by the Chinese government to Bangladesh since 1976 in terms of loan, interest free debt, grant and technical assistance. There is no strategic plan or any formal document that guides Chinese

assistance to Bangladesh; project are outcome of high level discussion. Also Chinese companies often make unsolicited project proposals that will include a financing package from the Chinese state. In general it can be observed that Chinese companies must be contracted in order to be eligible for Chinese loans.

Currently there are $2-3bln worth of Chinese loans that are ongoing. From different newspaper reports it appears that interest rate is about 2%, with a 5 year grace period and 15 years payback period. Loans also carries 0.%2 commitment fees and 0.2 % management fees. $8-10bln will come from China in the coming 5 years. Projects will be diverse (fertilizer factory, ICT connectivity infrastructure at local levels, Data centres, etc.). In September 2015 Chinese President Xi Jinping said China would cancel debts to the worlds least developed nations, including small islands nations.

In the last few decades already 8 Friendship Bridges have been constructed and 3 new ones will be announced soon. Such projects cost about $20-30 USD each and are financed by grant money from China.

So far, few projects financed by Chinese that would be core BDP2100 projects. There was one embankment project near Chittagong. Quite a few projects might fall in the second or third layer of the BDP, such as energy plants, ports and large infrastructure projects. Recently, there was a Chinese visit to the Ganges Barrage area which indicates that China might consider investing in other large scale BDP2100 projects.

India

Relations with India have improved recently, and this is also reflected in the loan amounts that the Indian government has made available to Bangladesh. In 2012, India provided $1 bln, of which 200 million was allocated to Padma Bridge. In 2016, another package of $2 bln was finalized. This is the largest conditional finance package that the Indian government has ever given in development assistance. While the first package was mostly allocated towards infrastructure projects, the second one also covers other sectors.

EIB

EIB does not have a local office in Bangladesh but still committed quite substantial loans to Bangladesh. So far, this relationship has materialised in three projects namely: (i) 2013: Bangladesh Power Energy Efficiency, EUR 90mln; (ii) 2014: Dhaka Environmentally Sustainable Water Project, EUR 100mln; and (iii) 2015 (under negotiation): Bangladesh Railway Connectivity Investment, Programme, EUR 65mln. These projects are the result of financing requests received from the government authorities (i.e. Ministry of Finance) according to their public investments long-term plans and the corresponding match with specific external financing partners. Many of the said projects presented to EIB are co-financed with other development financing institutions, such as the Asian Development Bank. The EIB does not have a Country Assistance Strategy with Bangladesh. Instead, EIB relies on two main planning strategies in the country to decide on the pertinence of our possible financing; on the one hand, the long-term development plans of the national government (through their long-term public investment plans), and, on the other hand, the country assistance strategy defined by the European Union in Bangladesh. As the "EU Bank" EIB's mandate outside the EU imposes on full alignment with EIB financing activities. Currently the EIB is reluctant to commit more funds as disbursement have been significantly delayed in on-going projects.

AFD

The local office in Dhaka of AFD was re-established in 2012. Since then, annual commitments have been quickly accelerated from EUR 40 mln in 2012, to EUR 47 mln in 2013, to EUR 100 mln in 2014. AFD aims to further increase its yearly commitments. AFD only provides concessional loans in Bangladesh, with interest rates of around 4% with a loan duration of 20 years, including a 7 years grace period. These terms and conditions will become better, and loan volumes will increase further, as Bangladesh becomes more credit worthy, especially after it graduates from LDC status. AFD has contracted 3 investments since its re-establishment; these are all located in Dhaka and are focussed on urban transport, water supply and power distribution. The AFD would like to expand its commitments to other parts of the country.

IFC

IFC in Bangladesh focuses on sustainable private sector development by providing financing and offering advisory support, including facilitating improvements in doing business and promoting competitiveness of small and medium enterprises (SMEs).

One of IFC's flagship projects in Bangladesh is its Water Partnership for Cleaner Textile of $10 mln. This program aims to enhance the long term competitiveness (global license to operate) and environmental sustainability of the textile wet processing sector in Bangladesh by working in partnership with buyers to support factories in specific geographic clusters to reduce their water footprint. The program directly supports factories in setting and achieving cleaner production objectives.

IFC presently has 20 investment clients with a committed portfolio of approximately $800 million (of which financial institutions represent 56 percent, telcoms 30 percent, agribusiness 4 percent, and textiles 3 percent). Until 2013, IFC investments averaged $100 million a year. In 2014, IFC committed $747 million, including mobilization, with a goal of approximately $1 billion a year by 2015.

AIIB

Bangladesh is one of the 57 members of Asian Infrastructure Investment Bank (AIIB), it wentinto operations on the 16th of January 2016 and has authorized capital of US$ 100 billion and subscribed capital of US$ 50 billion. Its headquarters is located in Beijing. In the early years of operations the AIIB will not open country offices in order to retain cost effectiveness. AIIB will invest several sectors including energy, transportation, urban construction and logistics as well as education and healthcare.

AIIB wants to work together with other development partners, including World Bank, Asian Development Bank, JICA, KfW and some of the Chinese development banks, amongst others. According to Jin Liqun, the president-designate of the AIIB, co-financing will become the norm in the future, when all development partners try their best to promote infrastructure investment. The bank will not provide any concessional lending. Maturity period will be up to 30 years and lending charges will be comparable to World Bank's IBRD funds and ADB's OCR funds which carry interest rates of LIBOR plus 1.35% and 4.5% respectively.

In June 2016 Bangladesh was among the first four countries to receive finance from AIIB. The power distribution system project in rural and urban areas amounts to $165 million and has an interest rate of LIBOR plus 1.15 percent and a repayment period of 25 years with five years grace period. At the same time Bangladesh was announced to be selected as an alternative director. As such it appears that Bangladesh features high on AIIB's priority countries list.

A2.2 Development Partners predominantly providing grants

DFID

DFID is largest bilateral donor to Bangladesh with a Total Project Budget for 2015/2016 of £163mln, which accounts for 1.82 % of total DFID budget. DFID Bangladesh only provides grants, no loans. The health sector (22%) receives the greatest allocation as a percentage of DFID country budget, whereas environment sector is the smallest with 6.7%. Disaster management and humanitarian assistance has traditionally been one of DFID's comparative advantages. When including the money the UK channels through multilateral institutions and several funds (including the Pilot Program for Climate Resilience) the total sum of UK development assistance to Bangladesh is about £ 350 mln in 2015/2016.

DFID currently has 33 projects on going and is now in the strategic programming phase determining their 2016-2019 country strategy. In 2016/2017, the current UK investments into the Comprehensive Disaster Management Programme (CDMP) and the Bangladesh Climate Change Resilience Fund (BCCRF) will end. A new programme will effectively do two things:

- firstly, supports a major increase in embedded climate risk and disaster management into other DFID Bangladesh sectoral programmes (eg. urban) and;
- secondly, support the enabling environment for longer term resilience in Bangladesh – institutions and processes, data and information and sectoral priorities.

The new programme will be flexible and adaptive, learning throughout and responding to changing environments (both institutional and on the ground). It will seek to partnership as much as possible with others, to help reduce the fragmentation of engagement on the climate and disaster management agenda. It is likely that DFID will focus on the disaster management and water management aspects of the broad climate change agenda.

EKN

The Embassy of the Kingdom of the Netherlands (EKN) enjoys a transitional relationship with the Government of Bangladesh. The Netherlands helps low- and middle-income countries reduce poverty and boost economic growth. It also helps them to increase their market access and improve their business climate. Netherlands' development cooperation with Bangladesh helps to improve living conditions of the poor,

particularly in three areas: water, sexual and reproductive health and rights and food security. A new priority in the Multi-Annual Strategic Plan (MASP) 2014-2017 are labour conditions in the Ready Made Garments (RMG) sector. MASP 2014-2017 amounts to EUR 170 million, of which the majority of EUR 95.4 (or 56%) is allocated towards the water management, drinking water and sanitation sector. Other major focus areas are food security (EUR 22.5 mln or 13%) and sexual and reproductive health (EUR 20.4 or 12%).

The Netherlands government has always aimed to assist in accelerating the economic growth and sustainable development of Bangladesh through development cooperation with a special focus on the water sector. This collaboration will be continued - linking water management, food production and market access.

USAID

Through the EC-LEDS program, USAID is supporting Bangladesh's commitment to low emissions growth, including through renewable energy development, tree planting and improved forest management, and climate-smart agricultural practices. In 2015 the EC-LEDS programme totals $11.5 mln, which comprises of adaptation ($4 mln), clean energy ($3.5 mln) and sustainable landscapes ($4 mln). CREL and CCE are part of EC-LEDS programme.

KfW & GIZ

Although KfW has an annual commitment in India of about EUR 1 bln, its operations in Bangladesh are quite limited to about EUR 25-30 mln a year. This is only grant financing as KfW does not provide loans to LDCs. Other LDC graduates have seen a rapid increase of KfW commitments and Bangladesh can expect the same when it graduates. KfW closely cooperates with GIZ; together they implement the Bangladesh country strategy of the German Ministry of Development. Germany made a small study of current initiatives into climate adaptation and observed that most interventions are in rural/coastal areas but little in urban centres. KfW focus lies on urban climate resilience and is active in Khulna where it has partnered up with the ADB. It is currently investigating project feasibility in Borishal and Sathkira.

GIZ is very active development partner in Bangladesh and provides support in many different sector. For BDP2100 their assistance on climate finance is of importance (where they provide technical assistance for GoB to manage and attract more climate funds – among which GCF funds) and they have several stand alone mitigation and adaptation projects.

Danida

The Danish Aid agency DANIDA has been in Bangladesh since 1971. Its long experience has allowed Danida to work on the local level. DANIDA has a traditional focus on agriculture but now it also has a focus on climate change resilience and sustainable energy and finally governance. Bangladesh has a yearly budget of about DDK 120 mln, which equals around EUR 15 mln, this amount is fully composed of grant money. The internal planning figure for the country envelope

– managed by the Danish Embassy in Dhaka – for the 2016 – 2021 cycle amounts to DKK 500 million or 67 million euro. This figure is tentative, however, and subject to parliamentary approval. The Dhaka office anticipates Parliament to approve the financial bill in November 2015. "Mixed credits" are also available, but these come from Copenhagen and there is little guidance on this from the Dhaka office. Water treatment plant and international airport are the main loans given to Bangladesh by Denmark.

European Commission

The EC is one of the large development partners in Bangladesh with a total budget of EUR 120 mln for 2015, of which about 85 million went to climate change interventions. Over the next five years (2015-2020) the annual budgets are expected to be 70% higher. Budget allocations are not yet set. The EC aims to align with GoB priorities and with the 7th Five Year Plan in particular.

Dedicated climate finance envelopes might be made available by the European Union; these additional funds can be applied for by Bangladesh. The EC only distributes grant money, no loans. The EC is increasingly interested to upscale in blend finance mechanisms and align with IFI; that way they can make large projects more bankable and also increase their marginal impact per euro.

BASELINE STUDY: 25

Part - II (Case Studies)
Finance mechanisms & arrangements in the water sector in Bangladesh

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1 Introduction

This Report is Part 2 of the Report "Financing mechanisms and arrangements in the water sector". In this Part 2 real case studies of funding and financing arrangements are presented from international practices in the water sector from a range of countries. The case studies provide possible interesting options to adapt to Bangladesh and create new funding and financing potential for the water sector in Bangladesh. Some cases might be more relevant for the context in Bangladesh than others. Some practices might be more suitable for the long run and some more for the short run. The aim of this Part 2 is just to present an overview of the possible examples of funding and financing arrangements available from countries from the world.

In below table the cases are summarized and categorized.

Table 1: Overview of innovative funding & financing cases presented in Part 2

Funding arrangements: categories	**Operationalization**	**Cases**	**Innovative financial aspects**
A Market based mechanisms	***Market based*** cost recovery principles or insurance schemes through optimal user charges setting, payment and billing systems, losses and cost reductions (financial performance improvement)		
More optimal tariff systems or specific taxes	Increasing cost recovery by optimization of tariffs over customer groups and increasing tariffs over time	**Cost recovery water supply -** Fiji Islands	Cost recovery will be improved through a commercial approach to management. Costs will be reduced through reduction of water loss. The water supply and sewerage agency will recover the cost by a revised tariff.
		Three-tired tariff – Israel	Agricultural users pay for water according to an increasing tariff structure based not on the absolute quantity consumed but rather on the percentage of allocation consumed.
		SONEES - Senegal	The financial objectives state that no on-going operating subsidies from the state are allowed, the only support would be in the form of World Bank financing through IDA credit lending window. Water tariffs are increased gradually, adjusted according to progress in reaching financial equilibrium. A "social block" for consumption under 20 cubic meters per sixty days will ensure affordability for low-income households.
		Danube Black Sea Canal - Romania	Ships navigating the canal pay a fixed tariff to the ANC, a Romanian national company which operates under the Ministry of Transport and Infrastructure. Tariffs depend on the capacity of the ship and the number of days the canal is used.
		Irrigation Management Improvement Project - Bangladesh	Project is financed by ADB ($46 mln: 25 payback period, incl. 5 year grace, 2% annual interest rate) GoB ($7.6 mln) and beneficiaries ($4.2 mln through payment of water service charges and

Funding arrangements: categories	Operationalization	Cases	Innovative financial aspects
			$0.17 mln to the development of farm canal systems).
Polluter pays principle	Identifying damages and charges for polluters	**Extraction tariff -** Baltic countries	In addition to the normal water charge paid by the consumer, a water abstraction charge is introduced in Estonia, Latvia and Lithuania to provide incentives on the value of water. The water abstraction charge is based on two factors: I) the source of the water (surface water, groundwater, mineral water) and, II) the region in which water is withdrawn.
		Charges for waste water – Germany	For wastewater treatment, charges are set on a polluter-pays basis and are payable by all property owners and companies connected to the public sewers.
		Water licence and markets in the Murray-Darling basin - Australia	Australian water markets are based on the idea of a 'cap and trade' system.
Insurance schemes	Programmes in which a premium is paid to purchase financial protection against losses from flooding.	**National Flood Insurance Program (NFIP)** – USA	Rates (premium per dollar of coverage) charged for NFIP policies are based on the location of the property, characteristics of the structure, and coverage amounts.
		Earthquake Commission (EQC) – New Zealand	EQC costs 15 cents for every $100 of home or contents fire insurance that a policyholder has. This amount is paid to the policyholder's private insurance company, who passes it on to EQC. The maximum amount paid per year, for one home and its contents, is $180. This would give cover to a maximum of $100,000 per home and $20,000 for its contents.
		Flood RE – United Kingdom	Flood Re is an industry owned insurance pool, the pool itself has two sources of income: individual policies which are passed into it, and an additional levy on the industry.
Payment and billing innovations	Introducing innovations in order to decrease non accounted for water (IT/ mobile phone payments systems, different schedules etc.)	**Mobile payment of Water Bills -** Africa	Basically invoices are sent to mobile phones and money to pay for the water bill can be transferred by mobile phones. A survey has indicated that most users favour the system because of time savings (not having to travel to banks), cost savings and to a lesser extent to be able to pay on time.

Funding arrangements: categories	Operationalization	Cases	Innovative financial aspects
		Low income customer support unit - Bangladesh	The model for providing a legal water connection to low-income communities in Dhaka is based on partnership between slum dwellers and their CBO, and NGOs and DWASA. The CBO functions as a single customer that represents the a group of slum residents with a single bill. This allows slum residents to obtain a piped drinking water connection without the required land title and house registration number.
Cost reductions & efficiency improvements	Cost reductions by scaling up or cost sharing, preventing leakages and/or illegal tapping etc.	**FIPAG water utility financial improvement -** Mozambique	The project in financed by a combination between the Dutch Ministry of Foreign Affairs via the Royal Dutch Embassy in Maputo (63%) and Vitens Evides International (37%). The total contract value is € 7.3 million.
		Water Administration System (WAS) – South Africa	WAS enables to expand irrigated area with the same amount of water, while at the same time reduce the overall cost of operation and management of large-scale public operated surface irrigation schemes
Adaptive community approaches or incentive schemes for resiliency	Incentive schemes to stimulate actors to fund resiliency measures to a large extent themselves. Examples of resiliency measures are lifting plots, reinforcing houses etc.	**Philadelphia storm water bills** - USA	Storm water fee discounts based on reductions in impervious surfaces
		PROOFS - Bangladesh	PROOFS employs a Market Development Approach in acting as facilitator to deliver results by working through and strengthening private sector actors, rather than acting as a direct service provider
Institutional arrangements	Institutional changes which result in additional funding sources from additional revenue streams, taxes or dedicated funds, decreasing risks or attracting private capital		
Taxation models and subsidies	Introducing more general taxes to fund water services	**1% 'extra penny' tax** – USA	To ensure funding for infrastructure and storm water projects, an 1% additional sales tax is imposed.
Dedicated water funds	Setting up a dedicated fund (either fed by new taxes or specific levies etc.). Example: Delta Fund.	**HMGP –** USA	The HMGP programme may provide a state with up to 15 percent of the total disaster grants awarded by FEMA. FEMA can fund up to 75 percent of the eligible costs of each project.
Emergency relief funds	Setting up dedicated pooled funds for emergency relief	**CCRIF** – Caribbean	CCRIF acts as a system by which several countries agree to combine their emergency reserve funds into a common pool.
Alternative business models			
Scope extension (to non water service provision)	Alternatives business models by including revenues from non water services (such as from land	**Eko Atlantic –** Nigeria	The plan is to combine flood protection together with residential, commercial, financial and tourist

Funding arrangements: categories	Operationalization	Cases	Innovative financial aspects
	development/ land reclamation, urban development, energy production etc.).		developments. Commercial developments (land sales) can be used to cross subsidise the flood protection measures.
Scaling	Upscaling local models to regional scale or downsizing scale to simple more flexible small scale water purification stations, cheaper to install and maintain	**Market price waste water -** Turkey	Several municipalities share one or more Urban Waste Water Treatment Plants (UWWTP) or participate in a regional waste water treatment organization. The financing of plant operations is handled through an extra fee for drinking water, paid by the consumer.
		Decentralized sanitation - Philippines	Financial support was provided by the Korean International Cooperation Agency (KOICA) and a small part of the costs was shared with the community.
Public Private Partnership models	Introducing more private participation or PPP contracting modes (some form of private operations or service fee or availability payments based model under a contract with a public entity). Often these PPP models enlarge the scope to attract private capital and obtain efficiencies.	**Pevensey Bay** – UK	The Pevensey Bay Sea Defence is a sea defence project funded as a Public Private Partnership (PPP). Responsibility for the defences rests with the Environmental Agency. The EA signed PPP contract with PCDL, which is a special purpose company.
		Viability gap funding of Kolkata Salt Lake Water Supply And Sewerage Network – India	Salt lake water supply is a combined water supply and sewerage project. The project was implemented under a Built-Operate-Transfer (BOT) PPP arrangement with viability funding, provided by the central government's scheme of Jawaharlal Nehru National Urban Renewal Mission. The concession requires the private developer to operate and manage the water supply and sewerage system for a time period of 30 years.
		Expressway Dike - Philippines	The Expressway Dike is financed as an PPP, where benefits for the private contractor entail real estate development on reclaimed land and the collection of toll on the new high way.
		Manilla water – Philippines	For the Manilla Water PPP construction, MWC invested US$8.2 million, GPOBA provided subsidies for a total amount of US$2.07 million, and the user contributions amounted at US$0.43 million.
		Small towns Private Water Operators – Uganda	The GPOBA offered a $3.2 million investment grant to Uganda's Small Towns project. This grant is used to

Funding arrangements: categories	Operationalization	Cases	Innovative financial aspects
			extend existing, and build new infrastructure under design-build-operate-schemes new infrastructure.
		Harnaschpolder – Netherlands	The Harnaschpolder PPP showed to be 10-15% cheaper than traditional procurement. The consortium expects to return the investments in less than 30 years.
		El Guerdane Irrigation system PPP – Morocco	The El Guerdane PPP irrigation project covers financing, design, construction and management of irrigation infrastructure of an area of 10,000 ha. The financing is provided by the state (48%), the operator (44%) and farmers (8%). Farmers pay a single amount to be connected to the irrigation system and additionally a fixed price per cubic metre of water they use.
		BET Development Zone – China (Build operate transfer scheme)	The relatively high wastewater treatment fee is a notable factor for this PPP. Capital investment is expected to be recouped within 10 years.
Privatization	Selling public utilities to the market: full private ownership and operation.	**EMOS: Metropolitan Sanitation Works Utility** - Chile	The costs of the EMOS water and sanitation works are fully supported by the revenues from user fees.
Community/entrepreneurial models	Local entrepreneurs or collectives can operate some water services to obtain more community ownership and sustainability (better maintenance etc.)	**Semarang polder –** Indonesia	The foremost challenge to successful implementation and management of the polder project is the coordination among the various actors, and the responsibilities that come with the maintenance of the project
		Rural Water and Sanitation project – Haiti	The water and sanitation project is being financed by the World Bank, the Inter-American Development Bank (IDB), the Spanish Fund and other NGOs.
Financing mechanisms			
Revolving Funds	Revolving funds providing often loans to water related projects at more favourable conditions compared to commercial loans	**ITF project –** Uganda	The three MRI partners combined their respective strengths and expertise for the financing of this project, with KfW and its local implementation team in the lead financier role thanks to their long-standing presence in the water sector in Uganda.
		Lending schemes – World	Microloans dedicated to water projects; about 210 loans were provided at interest rates of 24% per year (market rates are about 48% per

Funding arrangements: categories	Operationalization	Cases	Innovative financial aspects
			year). The payback period was 6 – 12 months. The management fee was 2,5% and OIBM required 20% of the loans to be held on its savings account. The repayment rate for the loans was 88%.
		Devolution Trust Fund - Zambia	The Fund provides grants and loans to access to water and sanitation services in low income suburban and urban areas based upon competitive calls for proposals. Funds are released depending on milestones realized (output based funding).
Blending & pooling instruments (financial innovations)	Blending: by combining grants or government guarantees with repayable finance more private capital can be mobilized	**Maji Ni Majsha** - Kenya	This project is facilitating access to finance for community-based water providers by blending output-based subsidies and commercial finance.
	Pooling: by pooling asset classes & sizes in one fund scale is reached: more risk diversification and reduced transaction costs	**Commercial bank loan matching** - Colombia	FINDETER primarily operates as a second-tier development bank, which means its funds are lent to intermediary institutions, which then lend those funds to local borrowers undertaking infrastructure development projects.
		Kenya Innovative Financing Facility for Water (KIFFWA) - Kenya	KIFFWA is a new approach to financing for future water projects, and an alternative for the traditional public private cooperation. In essence, KIFFWA is establishing a water project developer, the Kenya Pooled Water Fund, which ensures project feasibility by bringing together relevant actors and financial partners.
		Guarantee fund - Costa Rica & Kenya	Costa Rica features a national guarantee scheme for small and medium enterprise support of Euro 24 Million.

2 Market based Mechanisms

This chapter focuses on market based cost recovery principles through optimal user charges setting, payment and billing systems, losses and cost reductions. In general all examples aim at financial performance improvement of the water asset holder.

2.1 More Optimal Tariff Systems or Specific Levies

Increasing cost recovery by optimization of tariffs over customer groups and increasing tariffs over time.

Figure 1: Tacirua water project

Source: Tacirua water project, Water Authority Fiji.

Fiji Islands: cost recovery water supply

Introduction

The Fiji Island's principal urban areas suffer from deficiencies in their water supply and sewerage systems, to the extent that their economic and social development is being hindered and their environments are being adversely affected. Water shortages in the Suva–Nausori urban area are having an increasingly harmful effect on the local economy.

The Fiji Island's water supply and sewerage services are suffering from ineffective management, a lack of maintenance, and shortages of funds. Water losses between production and consumption average 55%, and tariff collections average only 60% of billings.

The "Suva–Nausori Water Supply and Sewerage Project" aims to contribute to higher living standards in the Suva–Nausori area, particularly for the urban poor. The objectives of the Project are to:

- Increase the delivery of safe water supply and sewerage services to the Suva–Nausori area through physical and institutional improvements, and
- Enhance the sustainability of water supply and sewerage services throughout the Fiji Islands through appropriate institutional reforms.[4]

Stakeholders involved

- WAF: Water Authority Fiji
- MoIT: Ministry of Infrastructure and Transport
- Fiji National Government

WAF is a commercial statutory authority promulgated under the ambit of the Public Enterprise Act 1996 and manages both water and wastewater services across Fiji in accordance with the functions and powers of the Promulgation reporting to the Ministry of Infrastructure and Transport (MoIT). Since becoming a statutory authority in 2010, WAF has

[4] http://www.adb.org/sites/default/files/project-document/64066/32200-02-fij-rrp.pdf.

been focusing on operational improvements to both the supply of water and wastewater systems. For WAF to be able to improve its financial sustainability and to be more accountable to regulatory bodies, government is tasked with tackling water and sewerage tariff reform, introducing and enforcing liquid waste trade regulations, and reviewing regulations that affect municipal waste water management.

The government of Fiji advances funds from the national budget for WAF as an operational grant for salaries and operational costs and a capital grant for capital expenses. In turn, the government retains all WAF tariff revenues which it shows as national budget income.[5]

The beneficiaries of the project's physical components will be the more than 262, 000 residents of the Suva–Nausori area. Nationally, benefits will accrue from the establishment of an efficient, autonomous water supply and sewerage agency that will provide effective and sustainable services for the future.

Financing mechanism

Cost recovery will be improved through a commercial approach to management, and costs will be reduced through reduction of water losses. The water supply and sewerage agency will recover the cost by a revised tariff.

The tariff for fresh water will be set based on metered water consumption. A block tariff structure will be applied for domestic consumers for each 3-month billing cycle. A lifeline block will be applied for the first 50,000 litres consumed, followed by an intermediate block applied for consumption between 50,000 and 100,000 litters, and a high block for consumption exceeding 100,000 litters per billing cycle. A single volumetric tariff will apply to commercial and government consumers.

Cost recovery from beneficiaries will be achieved through the application of a sewerage tariff for those connected to the sewerage system. The tariff will be set based on metered water consumption and applied as a separate line item on customers' water bills.[6]

The Asian Development Bank (ADB) approved a loan of $47 million from its ordinary capital resources on 8 December 2003 for the project.

What are the main factors of success?

- Public authorities recognised the need to plan carefully for the transition to maintain the high level of accessibility to services in an existing strategic plan;
- There is a difference in tariffs for individuals and government and commercial parties.

Conditions for applying this mechanism

Conditions that are needed for this mechanism to succeed:

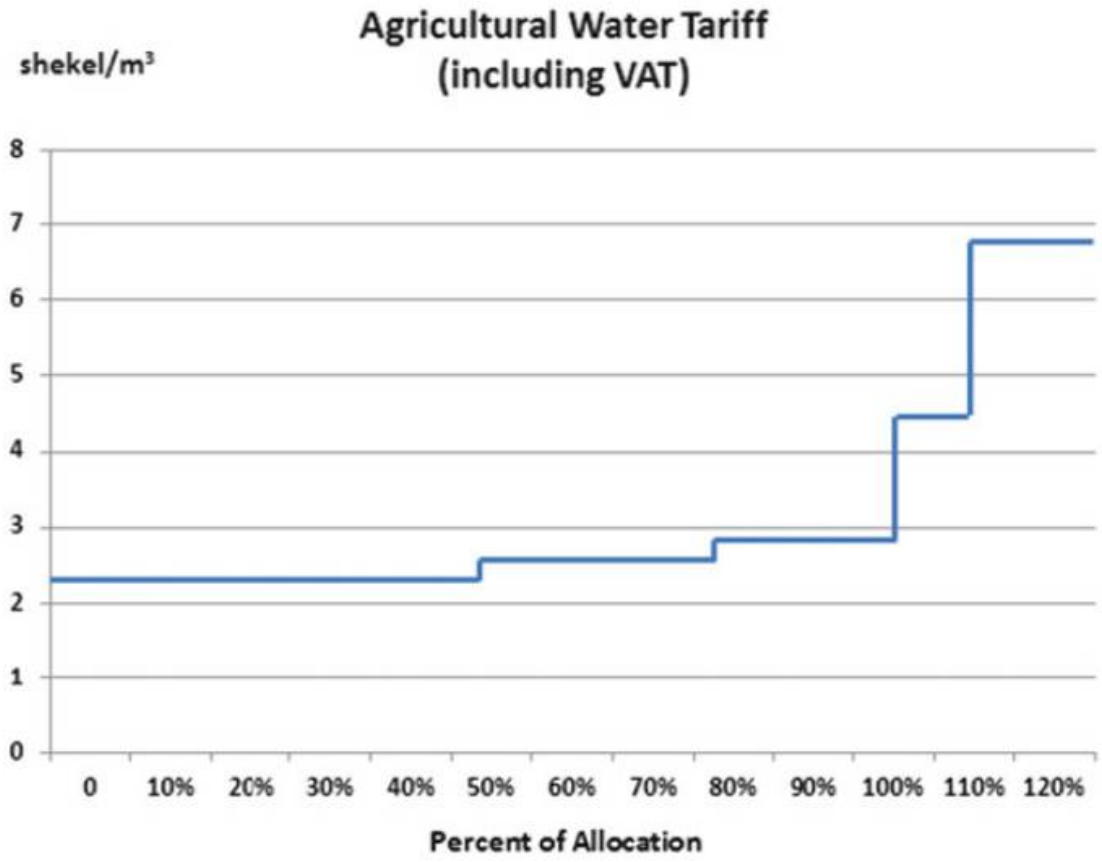
- An engaged donor;
- The project should be identified by the government already as a priority project (otherwise the donor had not been involved);
- The country should be able to pay back the loan.

[5] http://www.gcfund.org/fileadmin/00_customer/documents /MOB201511-11th/04_Add.08__FP008_and_NOL_20151015_fin.pdf.

[6] http://www.adb.org/sites/default/files/project-document/64066/32200-02-fij-rrp.pdf.

Israel: three-tiered tariff

Figure 2: Agricultural water tariff



Source: Becker, N. (2013) Water Policy in Israel. Springer, Dordrecht.

Introduction

Due to increasing water scarcity, Israel has been pushed to innovate its water quantity management system. Since almost all water is publicly owned in the country, these reforms are managed at different governmental levels[7]. Various options have been implemented and/or tried. One example is the 'drought tax' that was initially applied in the summer of 2009 as a surcharge on water prices for consumption in excess of household allocations.[8] This tax, however, was suspended in early 2010 in response to social protest and has not been reintroduced.[9] An other example is that prices of water for domestic use have been increased. This has resulted in significant improvements in the efficiency of irrigated water use and the increased use of alternative sources of water.[10]

7 http://www.oecd.org/israel/Water-Resources-Allocation-Israel.pdf

8 http://www.water.gov.il/Hebrew/ProfessionalInfoAndData/2012/10-Israel-Water-Sector-Economics-Policy-and-Tarrifs.pdf.

9 OECD, 2011b.

10 https://books.google.nl/books?id=CcmXAAAAQBAJ&pg=PA95&lpg=PA95&dq=%22drought+tax%22+israel+40%25&source=bl&ots=rvfaeqnPB3&sig=rBRAOk07PvQybCmcExohUYo0zCU&hl=nl&sa=X&ved=0CGMQ6AEwCWoVChMIv-_opPvkyAIVBpMsCh1wPwVC#v=onepage&q=%22drought%20tax%22%20israel%2040%25&f=false.

A last example of water management innovation in Israel is the three-tired tariff for the agricultural sector. This sector has what economists refer to as derived demand for water – that is, the sector demands water not as a final good as do residential consumers but rather as an input for production. Thus, the agricultural sector can quantify relatively precisely the marginal value of water and adjust demand accordingly. In Israel this sector receives water according to quotas issued by the Water Authority.

Kislev (2001) has shown that many famers are not exploiting all of their quotas, indicating that the marginal price (the third tier) is likely the limiting factor for their consumption (Becker, 2013).

Stakeholders involved

- Water Authority;
- Agricultural sector.

Financing mechanism

Agricultural users pay for water according to an increasing tariff structure based not on the absolute quantity consumed but rather on the percentage of allocation consumed. The first 50% of their quota is supplied at a given price (2.079 shekels as of 2012), which increases for the next 30%, and increases yet again for the final 20%. As such, the pricing structure for agriculture is often presented as a three-tiered tariff. In practice, pricing for this sector is actually five-tiered, as farmers are charged significantly higher if they exceed 100% of their allocation. In addition to the higher tariffs, farmers exceeding their quotas may also see water supply cut and/or risk future reductions in allocations (Becker, 2013).

Water quotas for agriculture and industry are issued to consumers by the Water Authority each year based on a number of factors, including total available resources, historical use, and estimates of the economic productivity of the water. In general, recipients have no rights to trade them. Even if water trade was allowed, it is not clear that given the existing water rights, substantial trade would occur. This is because a willingness to trade water rights could jeopardize future allocations by the Water Authority (Becker, 2013).

What are the main factors of success?

Factors of success are:

- At central level water is managed by water quotas and monitored. When more water is used than possible, the quotas are lowered;
- Water is seen as a service people have to pay for;[11]
- The tariff structure represents both the carrot as the stick: it makes it possible to reward the efficient use of water while it penalises inefficient use.

Conditions for applying this mechanism

Conditions that are needed to apply this mechanism:

- Farmers need to see the value of water and need to be willing to pay for this value.
- There needs to be an institute in place that can set quotas.
- The water use of farmers needs to be monitored.
- The water use and availability of water needs to be monitored at country level in order to make it possible to adjust quotas according to the yearly conditions.

[11] http://www.bloomberg.com/bw/articles/2015-01-08/takadu-helps-israel-be-a-most-efficient-water-manager.

Senegal: SONEES

Figure 3: SONEES

Source: http://www.sones.sn/img/slide/caroussel/sones4.jpg.

Introduction

Water quantity shortages plagued Dakar in the 1990s, at a time when the national water and sewage utility (SONEES) was in shaky financial condition. To make matters worse, investments—critical for renewing distribution networks and for expanding production capacities—were backlogged. Reforming the water sector to improve the competitiveness of the economy was high on the list of priorities for Senegal.[12]

In 1995, the Government of Senegal launched wide-reaching reforms in the urban water sector. The reforms consisted of dissolving the state-run water company Société Nationale d'Exploitation des Eaux du Sénégal (SONEES) and creating a new asset-holding organisation Société Nationale des Eaux du Sénégal (SONES) that owned all fixed assets for the government and would function as an independent sector regulator. SONES was created to be a financially autonomous governmental unit with qualified staff that would be responsible for investments and setting of tariffs. It was also decided that production and distribution of water services would be placed in the hands of an operating company run by a private professional operator which would own at least 51 percent of the water facility, with the other 49 percent owned by a mixture of Senegalese investors, former employees of the original state-run water company (SONEES), and the state.[13]

This public-private partnership has been operating in Dakar since 1996, with Senegalaise des Eaux (SDE), a subsidiary of a major French water company, managing the water system under a 10 year operation and maintenance contract. The terms of the contract allow the government to fine SDE if it fails to achieve the specific performance targets. These targets include an objective later included in the United Nations Millennium Development Goals, which is providing water that meets World Health Organization (WHO) quality standards.

The program has been largely successful in improving the quality and quantity of water delivery in Dakar. Between 1996 and 2003, water production increased by 18% with the addition of 81,000 new household connections and 400 standpipes. An early dispute over the failure of the public sector to make agreed-upon investments, and ambitious initial technical efficiency targets, led to renegotiation of the original terms of the contract with the assistance of a third-party consultant. The successful renegotiation had a significant positive impact on the financial health of SDE and

[12] http://web.worldbank.org/WBSITE/EXTERNAL/EXTABOUTUS/IDA/0,,contentMDK:22229744~menuPK:4754051~pagePK:51236175~piPK:437394~theSitePK:73154,00.html.

[13] http://www.energytoolbox.org/library/incentive-based_operating_contracts/reference+background_documents/Innovative_Contracts_Sound_Relationships_Urban_Water_Sector_Reform_in_Senegal.pdf.

underlined the inherent strength of the reformed institutional structure of the Senegalese water sector. The program is regarded by the World Bank as a model for public-private partnerships in Sub-Saharan Africa.[14]

Stakeholders involved

- International Development Association (IDA), part of the World Bank;
- Société Nationale d'Exploitation des Eaux du Sénégal (SONEES);
- Senegalaise des Eaux (SDE).

Financing mechanism

A major portion of the US$ 300 million invested in the public-private partnership in the Senegalese water sector came from IDA loans to the government. Next to this, the reform was supported by the strategic use of private finance, both from the private operator (who financed some of the investments) and from local private banks that provided a line of credit to assist SONES with its cash flow.

The financial objectives are clearly defined in the contract, stating that there would be no on-going operating subsidies from the state, and the only support would be in the form of World Bank financing through its IDA credit lending window. The contract also stated that water tariffs would be increased gradually, set initially at a constant rate, but adjusted according to progress in reaching financial equilibrium and that a "social block" for consumption under 20 cubic meters per sixty days would be subsidised to ensure affordability for low-income households.

A financial model was created to conduct viability studies and to track the progress of the urban water utility. The model used simulated the flow of funds, including (a) funds generated from operations, (b) investments in fixed assets and working capital, (c) new long-term capital raised through new borrowing and equity capital increases, and (d) debt service.

Using the model, a financial scenario was developed, taking into consideration several factors to predict when the system would attain financial equilibrium. The model predicted that if the World Bank funded investment project went ahead, if network efficiency were improved, and if consumer tariffs were increased at a rate of no more than three percent per year, the project would attain financial equilibrium in 2003. This scenario, including the rate of tariff increases, was accepted by all parties, and became the "base case" upon which the financial projections were prepared. The model also allowed the government to calculate a "ceiling rate" for the price to be offered in a bid by the private operators – a price beyond which private sector management would be uneconomical. This became a crucial method for evaluating the proposals received in the bidding process.

According to the terms of the contract used in Senegal, the private operator does not have any decision-making role in setting tariffs, nor is the fee paid to the contractor based solely on the tariffs to be collected. The operator collects the tariffs, retains a portion of the fee (normally between 50 to 70 percent) and sends the balance (50 to 30 percent) to the government. The government's portion is used to pay for the investment costs of the system.[15]

What are the main factors of success?

The primary factors which contributed to the success of the reform process and the strengthening of the urban water sector can be summarised as follows: the use of a particularly appropriate form of contract; strong political will and good leadership within the government; a well-designed process; and flexibility and innovation when it was needed.

The Senegal water sector reform was also facilitated by the strategic use of private finance, both from the private operator (who financed some investments) and from local private banks who provided a line of credit to assist the state asset-holding company with its cash flow. A major shortcoming of the reform was the failure of the government to

[14] http://www.esc-pau.fr/ppp/documents/featured_projects/senegal.pdf.
[15] http://www.esc-pau.fr/ppp/documents/featured_projects/senegal.pdf

make agreed-upon investments in the network in a timely fashion, but this has now been resolved. The good relationship and effective dispute resolution process meant that the private operator and the state asset-holding company were able to reach agreement on how the operator was reimbursed for lost earnings due to the delay in investments.

The reform has had positive outcomes for the poor, in part due to the nature of the operator's incentives, and in part due to the government policy of subsidising connections in low-income neighbourhoods. However, issues still remain due to tariff inequities and poor targeting of subsidies.[16]

Conditions for applying this mechanism

The main lessons learned in Senegal can be summarised as follows:

- Political commitment and leadership, stakeholder ownership and public sector involvement are crucial to a sustainable reforms process and they must be in place prior to starting the process and maintained during implementation. A climate of trust and cooperation built through capacity building activities and the creation of a collaborative partnership is essential;
- A well thought-out plan, with sector investments that are planned in parallel with reform of the utility, is essential. Investments may be from external support agencies or from some sources of private sector finance, if certain conditions are met;
- The Government must remain committed to sector investments, and implement them in a timely manner, as delays in rehabilitation and extension works will jeopardise improvements in service, which will in turn hamper efforts to restore customer confidence and payment discipline. Government staff must be provided incentives to ensure that investments take place as planned.[17]

Romania: Danube Black Sea Canal

Figure 4: Danube river in blue, canal in red

[16] http://www.energytoolbox.org/library/incentive-based_operating_contracts/reference+background_documents/Innovative_Contracts_Sound_Relationships_Urban_Water_Sector_Reform_in_Senegal.pdf

[17] http://www.esc-pau.fr/ppp/documents/featured_projects/senegal.pdf.

Introduction

The Danube Black Sea canal links the inland port of Cernacoda with the maritime port of Constanta (shown in red). For vessels sailing from the Bosporus, the use of this canal rather than the Sulina canal (in blue) cuts their journey by 397 kilometres. The main advantage of the Danube Black Sea Canal consist of the direct link between the Danube and the port of Constanta, the largest maritime port at the Black Sea and one of the biggest in Europe.[18] Historically, the canal is notorious for the thousands of political prisoners that worked on its excavation during the communist period in Romania. The canal is currently run by the Administration of Navigable Canals, a Romanian national company which operates under the Ministry of Transport and Infrastructure.

Stakeholders involved

- Administration of Navigable Canals (ANC), responsible for maintenance and repair of the canal infrastructure
- Ships navigating the canal

Financing mechanism

Ships navigating the canal pay a fixed tariff, depending on the capacity of the ship and the number of days the canal is used[19]. Additional fees are required for vessels that carry flammable or environmental hazardous cargo. The ANC, a Romanian national company which operates under the Ministry of Transport and Infrastructure, covers close to all yearly costs related to the maintenance and repair of the canal. This income is raised from ship charges (80%), irrigation and water supply (10%), and port activities (10%)[20]. In 2004, nearly 6 million euro revenue is raised through charges on the Danube Black Sea Canal.

What are the main factors of success?

- Yearly operation and maintenance costs are recovered without additional state support.

Conditions for applying this mechanism

- Transit tariffs lower the competitiveness of inland transport in comparison to for instance road and rail transport.

Conditions for river navigation charges in general

- River administrators should choose between full cost recovery or yearly (operation and maintenance) cost recovery. Full cost recovery is unrealistic given the high initial investment costs of canal infrastructure.

Bangladesh: Irrigation Management Improvement Project

Introduction

The project is designed to realize the full production potential of large-scale irrigation and water quantity schemes in Bangladesh. It will address the recurrent lack of sustainable management, operation, and maintenance (MOM) and increase water productivity by transferring MOM schemes to private operators and introducing innovative infrastructure modernization. The project will focus on modernizing the Muhuri Irrigation Project (MIP) in Chittagong division. It will also finance a feasibility study and detailed design for modernizing the Ganges–Kobadak Irrigation Project in Khulna division and the Teesta Irrigation Project in Rangpur division.

[18] Ecorys (2006) Technical assessment for the development of Inland Waterway Transport Romania.
[19] http://www.acn.ro/index.php/en/transit-tariffs-available-from-01-07-2014
[20] Ecorys (2006) Technical assessment for the development of Inland Waterway Transport Romania.

Figure 5: Bangladesh rice fields

BWDB will recruit a private consulting company or consortium through competitive selection and enter into a 5-year management contract agreement. It will be responsible for (i) the delivery of efficient service and revenue collection to recover the cost for MOM, (ii) construction supervision of MIP civil works, (iii) participatory design of level 3 system modernization, and (iv) development of pilot agricultural demonstrations and income generating activities. It is envisaged that after 5 years another company will be recruited through a 15 year lease contract to maintain the MOM levels established during the 5-year first stage. The contract will be awarded through a competitive tender based on (i) a fixed fee for the lease with bidders presenting a financial offer for the water charge, or (ii) a predetermined water charge with bidders presenting a financial offer for the lease. After 15 years, the contract will be retendered.

- Contracting private irrigation management operator under 5-year performance based management contracts – ultimately resulting in O&M cost recovery of 100%.
    - The objective will be to bring the MIP scheme to the profitability and sustainability required to enable recruitment of a long-term (15 years) management phase irrigation operator through a PPP modality.
- Repair 460km of canals, 23km coastal embankments
- Development of about 17,000 ha of a modern and highly efficient piped water distribution system to improve timely water access and reduce water losses;
- provision of prepaid card meters to allow water allocations to be on a volumetric basis and ensure full and transparent payment and accounting;
- full electrification of pumping to reduce operating costs and increase management flexibility; and
- pilot of solar pumping for about 60 ha.

Stakeholders involved

- BWDB;
- ADB;
- Beneficiaries

Financing mechanism

The project is financed by ADB ($46 mln: 25 payback period, incl. 5 year grace, 2% annual interest rate) GoB ($7.6 mln) and beneficiaries ($4.2 mln through payment of water service charges and $0.17 mln to the development of farm canal systems).

What are the main factors of success?

The project has only just started (2015) and although the chances of success are high, the outcome is not yet determined. Crucially, a willingness to pay survey has been performed which was highly positive. Furthermore the

project takes an integrated approach towards improving infrastructure, building institutional capacity (establishing sustainable management of operations and maintenance) and enabling regulatory mechanisms (PPP unit in BWDB).

Conditions for applying this mechanism

In 2012 ADB did a deep analysis of what was needed to modernize large scale irrigation infrastructure in Bangladesh, which among others, helped to formulate a strategy for modernization, starting with Muhiri, Teesta and Ganges–Kobadak irrigation projects. A crucial condition for applying this mechanism is sufficient willingness to pay. A survey has been performed which was highly positive, giving sufficient confidence to commence with the project.

2.2 Polluter Pays Principle

The polluters pay principle is a means to identify and measure environmental damage (caused by pollution) and charges the polluters. It is a means to internalize externalities.

Baltic countries: Water abstraction charge

Figure 6: Baltic countries

Source: google maps.

Introduction

In addition to the normal water charge paid by the consumer, a water abstraction charge is introduced in Estonia, Latvia and Lithuania. The abstraction charge aims to improve water quantity management by providing incentives on the value of water. The water abstraction charge is based on two factors: I) the source of the water (surface water, groundwater, mineral water) and, II) the region in which water is withdrawn.

Stakeholders involved

The abstraction charge levels on water in the Baltic countries are set by different governmental regulations, written by the respective Ministries of Environment. In Estonia, the charge on water was introduced through the Water Law. In Latvia, the charge was introduced through the Law on Natural Resources in 1996. For Lithuania, the principles of a charge on water abstraction are established in the Law on the State Natural Resource Tax. Each country indexes the

charge rates quarterly according to the consumer price index. The revenues from the charge are divided equally between the state (Ministries of Finance) and the respective local municipalities.

Financing mechanism

Estonia has the highest abstraction rates among the three countries. Consumers pay a price ranging from 0.42 euro/m^3 for the lowest ground level water abstraction to 0.00016 euro/m^3 for abstracting water used for cooling power plants. Some activities are exempted from the abstraction charge. Water used for fishing ponds and energy generation activities are for instance not charged.[21]

Latvia and Lithuania use the same type of water abstraction charge system. Resulting in equal charges in the range between 0.0003 and 0.29 euro/m^3. Although the charges are mostly equal, the exemptions differ. Hydroelectric power stations, fish ponds and the reuse of water in industry are free of charge in Latvia. In Lithuania, only the land users that use water on their own land for domestic purposes are exempted.

What are the main factors of success?

This case study shows that there can be many ways of introducing a water abstraction charge and that every country can choose the option that fits their local situation best. In all countries shown in this case, the introduced system provided incentives to divert from undesirable water abstraction. The abstraction charge also allows the countries to get closer to the polluter pays-principle, generating revenues from unsustainable water abstraction and encouraging the efficient use of water. For Lithuania, the abstraction charge generates revenues close to 3 million euro for the Lithuanian budget. Around 90% of this revenue is generated by surface water abstraction for energy production, in particular the cooling of the Ignalina nuclear power station.[22]

Conditions for applying this mechanism

- In the countries (in this case) the water abstraction charge is managed at central level;
- Producers must be willing to pay this abstraction charge;
- A working monitoring and enforcement system should be in place;
- Data must be available of the water used by different water users.

Introduction

Wastewater disposal is a public service duty in Germany. This means that cities and local authorities have responsibility for regulated removal and treatment of waste water, they levy charges and taxes for this and are obliged to maintain their treatment plants and sewerage systems in a condition that will also ensure efficient wastewater management in the future.

[21] ACTeon (2010) Economic Instruments for Mobilizing financial resources for supporting IWRM – Additional information and illustrations for the OECD initiative.

[22] ACTeon, 2009.

Germany: Charges for wastewater

Figure 7: The Bottrop Wastewater Treatment Plant

Source: http://news.wef.org/collaboration-is-the-key-to-innovation/

Based on the 1976 Federal Effluent Charge Law, the charges have been collected by German states (Länder) since 1981. Although collection is left to the states, the charge calculation rules, charge amounts, and damage unit parameters are determined at the federal level. Wastewater disposal of private households is a municipal responsibility. More than 96 per cent of the German population is connected to the public sewage system.

The size of the tax is based on damage units, i.e. quantities and concentrations of pollutants, and the quantity of discharged effluent.[23] The charge is a good example of a policy following the polluter must pay principle.

Stakeholders involved

- Central government;
- German States (Länder);
- Municipalities;
- Inhabitants and companies;
- Water management authorities.

Financing mechanism

For wastewater treatment, charges are set on a polluter-pays basis and are payable by all property owners and companies connected to the public sewers. When calculating the charges, two methods may be used:

- The split-fee scale: a sewage charge, measured in terms of the amount of freshwater consumed, is charged together with a rainwater charge based on the drained area of land;
- The freshwater scale: only drinking water consumption is used for calculation. The cost and collection for the treatment of storm water is included on a pro rata basis.[24]

Utilities also pay a wastewater discharge fee which depends on the degree of pollution of the discharged treated wastewater. The discharge fee is supposed to provide an incentive to treat water beyond what is legally required. It accounts for about 3% of total sanitation costs.[25]

[23] http://www.feem-project.net/epiwater/docs/d32-d6-1/CS14_Germany.pdf.

[24] http://www.ime-medawater-rmsu.org/archive/projects/ZER0-M%20project/reports/01%20water%20in%20each%20country/Water%20costs%20and%20tariffs%20in%20Germany.pdf.

[25] http://www.ime-medawater-rmsu.org/archive/projects/ZER0-M%20project/reports/01%20water%20in%20each%20country/Water%20costs%20and%20tariffs%20in%20Germany.pdf.

Monitoring and enforcement of effluent charges is the responsibility of the water management authorities. Besides the legal requirement of operators of water pollution abatement facilities to monitor themselves (Eigenkontrolle), an activity which can be contracted out to accredited institutions, water management authorities "monitor the self-monitoring"(Kraemer, 1995).

What are the main factors of success?

- The charge is effective in reducing the discharges of pollutants and private emitters into water ways;
- Because of the charge, investments in water treatment plants were possible so that in 2007, 92.6% of effluents in Germany underwent tertiary treatment;
- The charge stimulates industry to innovate production processes so that less wastewater is developed;
- The charge contributed to capacity building in the water management administration.[26]

Conditions for applying this mechanism

- An effective monitoring system is required to monitor the amount of waste water that is produced;
- The charge value has to be chosen with care;
- The income generated from the charge needs to cover the costs made,
- Households need to have the financial capacity to pay the charge;
- The charge (especially for industry) needs to be an incentive to treat waste water to a decent desirable level; and
- Municipalities need to ensure that households are connected to a sewage system.

Australia: Water licences and markets (Murray-Darling Basin)[27]

Figure 8: River in Murray-Darling Basin

Introduction

Global demand for water quantity is increasing due to rapid increases in population and food demand. Meanwhile, supplies of surface water and groundwater are finite, variable, and increasingly at risk from climate change and environmental degradation. Australia successfully introduced a water licencing system in the 1970s to decrease the overexploitation of water resources. Water licences are still issued providing a water allocation, or amount of water that

[26] http://www.feem-project.net/epiwater/docs/d32-d6-1/CS14_Germany.pdf.

[27] http://www.nwc.gov.au/__data/assets/pdf_file/0004/18958/Water-markets-in-Australia-a-short-history.pdf

can be taken each year, expressed as a volume of water. In the years after the introduction of the water licences, this licencing system evolved into a full fledged water market that allowed water trading.

Once it became clear that the water resources in particular catchments were fully allocated, the deficiencies of existing systems of water rights became increasingly exposed. After limits on total use were implemented, the only way existing or new users could gain access to more water to commence or expand their activities was by getting it from someone else who already held a licence. However, because water licences were tied to land, there were no readily available mechanisms to transfer water or licences from one user to another. Those wishing to secure more water were often forced to purchase the land to which a water licence was attached, incurring considerable costs and delays.

The 1980s and 1990s saw the first tentative, but far-reaching, steps towards water trading. However, there were reservations about the treatment of water as an economic good, which led to a very closely controlled and incremental approach to introducing water trading. In many areas 'temporary' seasonal allocation trading was allowed before 'permanent' entitlements could be bought and sold. Trading was also initially confined to geographically defined areas, such as within public irrigation districts. The adoption of nationally agreed water reform packages in 1994 and 2004 facilitated the expansion of water markets across connected valleys and eventually state borders in among others the Murray-Darling Basin. The key elements of the water trading package include:

- Tradable water access entitlements,
- Trading rules have been developed and refined to enable market transactions to better reflect hydrological realities,
- Robust trading platforms have been put in place.[28]

Stakeholders involved

- Australian National Water Commission
- Water brokers
- Water buyers
- Waters sellers

Financing mechanism

When water is plentiful, it can simply be provided to, or taken by, everyone who needs it. However, in many cases, water is limited and its use by one person affects its availability to others. This may result in competition and conflict, and creates the need for a coordinated, equitable and efficient system of allocation. Australian water markets are based on the idea of a 'cap and trade' system in which:

- the cap represents the total pool of the resource available, consistent with sustainable levels of extraction
- individual users are provided with entitlements to a share of the total pool
- entitlement rights and the quantity of water allocated to an entitlement each season (a water allocation) are tradable, so that ownership, control and use can change over time
- the price is determined in the market by the value placed on water by many buyers and sellers.

What are the main success factors?

The main lessons learned from the water markets in Australia are:

- It is feasible to develop working water markets in complex hydrological systems, including across jurisdictional boundaries,

[28] http://www.nwc.gov.au/__data/assets /pdf_file/0004/18958/Water-markets-in-Australia-a-short-history.pdf

- Well-designed water markets can deliver significant benefits in any system where water access is scarce by signalling the value of water dynamically,
- Despite these universal characteristics, water market design needs to be informed by the history and specific characteristics of local water resource management,
- Universal prerequisites for effective water markets include:
    - setting an effective cap on total sustainable extractions (preferably before scarcity becomes acute),
    - establishing entitlements that are clearly specified, monitored and enforced so that users know exactly what they can buy and sell,
    - having a sound regulatory and governance framework within which water trading can take place,
    - implementing fundamental elements of good water management, such as metering and water accounting.
- Measures to address environmental and social outcomes that could be affected by water trading should be carefully considered and targeted to limit interference with the operation of the market. Some interventions, such as restrictions imposed on trade, are costly and have unintended negative consequences.
- Market participants learn quickly and make decisions based on the rules that are in place. Any efforts to stifle market development or impede progress inevitably lead to creativity by market players, which may have unintended consequences for property right holders.

Conditions for applying this mechanism

- Sound metering capabilities to ensure that licence holders receive the water they paid for.
- Allocation of water quantity caps based on scientific extraction limits.
- Regional caps to ensure that water in certain areas is not over-extracted to the benefit of other areas.

2.3 Insurance Mechanisms

Insurance mechanisms aim to provide insurance to property owners for flood or climate events.

USA: National Flood Insurance Program (NFIP)

Figure 9: NFIP logo

Introduction

Property damage from flooding has been an important risk exposure facing property owners in the U.S. The National Flood Insurance Program aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain

management regulations.[29] The NFIP is housed within the Federal Emergency Management Administration (FEMA), which is within the Department of Homeland Security. The program provides coverage for the structure and contents. As of October 2014, there were over 5.29 million NFIP policyholders across the U.S. In the past, the NFIP was criticised for a number of reasons. For example, by creating this scheme, it is seen as an incentive to live in flood-prone areas. In addition, extensive losses as a result of hurricane Katrina revealed that the NFIP was not able to financially sustain itself.[30] Therefore, additional legislation has been enacted to strengthen the program, ensure its fiscal soundness, and inform its mapping and insurance-rate setting. Among others by significantly improving FEMA's borrowing authority to allow for more and higher flood insurance claims.

Stakeholders involved

- Federal Emergency Management Administration (FEMA);
- Individual policyholders.

Financing mechanism

There are two NFIP programs, the Emergency Program and the Regular Program, where the former program is for properties in communities that do not have a flood map that identifies flood hazard areas. The Regular Program is for properties in communities that have a Flood Insurance Rate Map (FIRM) and have met the floodplain management requirements. The coverage available is shown in the figure below. [31]

Amount of Coverage Available through the NFIP

		Emergency Program	Regular Program
Building Coverage			
	Single Family Dwelling	$35,000	$250,000
	2-4 Family Dwelling	$35,000	$500,000
	Other Residential	$100,000	$500,000
	Non- Residential	$100,000	$500,000
Contents Coverage			
	Residential	$10,000	$100,000
	Non-Residential	$100,000	$500,000

Source: Niehaus, G. (2014) Report on Establishing a Residual Market Mechanism for Flood Insurance.

Rates (premium per dollar of coverage) charged for NFIP policies are based on the location of the property, characteristics of the structure (e.g., elevation, the number of stories, whether there is a basement, whether there are other obstructions, whether it is a single family versus multi-family dwelling), and coverage amounts. In addition, rates can vary depending on the year that the dwelling was constructed. The impact of location on rates depends on several factors. Residents of communities in the Emergency Program are eligible for a limited amount of coverage at less than actuarial fair rates (i.e., subsidised rates). Under the Regular Program, areas within a community are designated as either special flood hazard areas, which have relatively high probabilities of experiencing flooding, or non-special flood hazard areas (NSFHA), which have relatively low probabilities of flooding. Within each of these categories, areas are further divided into zones, and rates vary by zone.

What are the main factors of success?

- NFIP provides a service that is not provided by the private market because of the high risks.

[29] FEMA (2015) The National Flood Insurance Program. Retrieved via: https://www.fema.gov/national-flood-insurance-program.
[30] Niehaus, G. (2014) Report on Establishing a Residual Market Mechanism for Flood Insurance. University of South Carolina.
[31] Niehaus, G. (2014) Report on Establishing a Residual Market Mechanism for Flood Insurance. University of South Carolina.

Conditions for applying this mechanism

- Program participation: Homeowners need to recognise that their dwellings are exposed to flood risk, as the NFIP is not mandatory. In the absence of flood insurance, the cost of repairing flood damaged property is usually borne either by the property owner from their own financial resources, or by federal relief payments instead of by flood insurance payments. This situation has resulted in billions of dollars of uninsured losses in the past;
- Adequate flood risk assessment: in case of hurricane Katrina, the flood risk in almost all areas of New Orleans were underestimated. As a result, premiums were too low to the reflect the damage and did not provide incentive to discourage certain flood prone neighbourhoods;
- Adequate pricing of flood risks: the premium needs to reflect the actual flood risk faced by the policyholder. If not, the insurance will not be able to refund the damage caused by actual floods. [32]

New Zealand: Earthquake Commission

Figure 10: Wanganui Floods, June 22 - 2015 (Taranaki and Hokitika regions)

Source: EQC website, 2016)

Introduction

Flood damages to land are currently included as part of the Earthquake Commission coverage (EQCover). This state-guaranteed pooling system was initially provided to enable insurance to be provided primarily for earthquakes, but has since been extended to include damages from other natural perils. EQcover comes automatically with conventional fire insurance policies and can therefore be obtained via one's individual insurance company, who passes the fund on the EQC. Other key characteristics of EQCover in relation to flooding are:[33]

- Only flood damages to land are included within the EQC scheme;
- Capped liability based on the average size of property and professional valuation at time of claim;
- Importantly future flood risks caused by land damages to earthquakes are also covered.

[32] King, O.R. (2011) National Flood Insurance Program: Background, Challenges, and Financial Status. *Congressional Research Service*.

[33] Priest, Sally J. (2014) Review of international flood insurance and recovery mechanisms: Implications for New Zealand and the resilience of older people - research summary.

Stakeholders involved[34]

- Earthquake Commission (EQC);
- New Zealand National Government;
- Policy holders.

Financing mechanism

EQCover costs 15 cents for every $100 of home or contents fire insurance that a policyholder has. This amount is paid to the policyholder's private insurance company, who passes it on to EQC. The maximum amount paid per year, for one home and its contents, is $180. This would gives cover to a maximum of $100,000 per home and $20,000 for its contents. This amount of insurance is available for each event of natural disaster damage. Furthermore, EQCover is government guaranteed. This provides assurance to consumers in case of very large number of claims, for example after a major natural disaster. [35]

What are the main factors of success?

- Government guarantee;
- Containment into existing insurance schemes saves additional paperwork and/or bureaucracy.

Conditions for applying this mechanism

- Widespread and sufficiently working insurance programmes to attach flood risk cover;
- Willingness to pay additional fee to insure against flood risk;
- A government that is able and willing to ensure payments in case of major natural disasters.

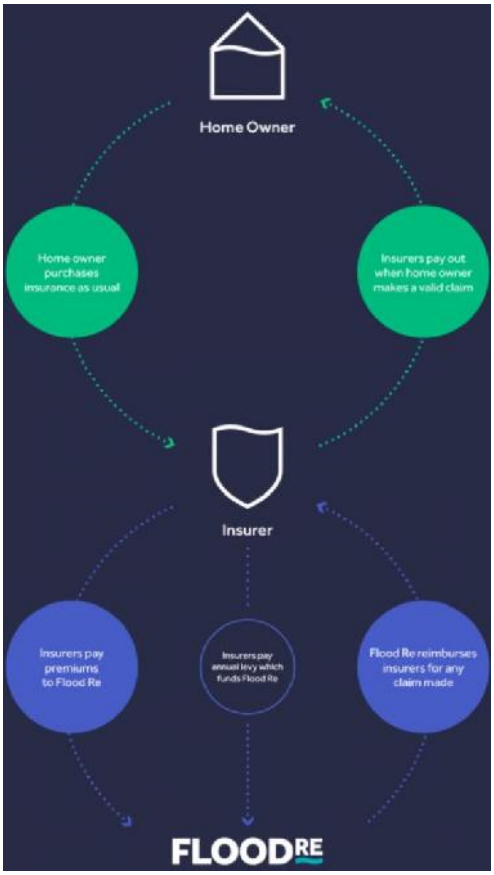
Introduction

The Flood Re scheme is a not-for-profit flood reinsurance fund, owned and managed by the insurance industry, and established to ensure that those domestic properties in the UK at the highest risk of flooding can receive affordable cover for the flood element of their household property insurance. Flood Re is directly accountable directly to Parliament and is funded from a levy on insurance companies. This insurance scheme be launched in April 2016 and will help insurers provide cover for an estimated 350,000 homes.[36] Homes built since 2009 are not covered, the Association of British Insurers (ABI) says this is designed "to avoid incentivising unwise building in flood risk areas".[37]

[34] EQC (2015) EQC Insurance EQCover. Retrieved via: http://www.eqc.govt.nz/what-we-do/eqc-insurance.
[35] EQC (2014) Householders' Guide to EQCover.
[36] Flood Re (2016) Flood Re Explained. Retrieved via: https://www.abi.org.uk/Insurance-and-savings/Topics-and-issues/Flooding/Government-and-insurance-industry-flood-agreement/Flood-Re-explained
[37] http://www.theguardian.com/money/2014/feb/18/flood-re-home-insurance-questions-answered

United Kingdom: Flood Re

Figure 11: Flood Re schematic visualisation



Reinsurance is a way for insurers themselves to insure against large scale losses with other insurers. Insurers sell policies to their customers in the usual way, but then may pass the risk carried by those policies to a reinsurance company, or reinsurance vehicle – like Flood Re – where those risks are pooled into a fund which pays out to the insurer if claims are made. The contractual responsibility for paying out to the customers if a claim is made still rests with the original insurer – but they have their own back up from the reinsurance pool which they can claim against. This helps insurers take on more risk as the consequences of large claims are more widely spread.

Financing mechanism

The insurance industry is paying the £10 million set up costs to get Flood Re up and running. The Flood Re pool itself has two sources of income. The first is the flood element of the policies which are passed into it. The second is an additional levy on the industry, equivalent to the existing cross-subsidy that exists in the market.[38] The premiums charged to insurers will be capped based on Council Tax bands, starting at £210 per policy per annum in Bands A and B (lowest) for a combined policy, rising to £1200 for a Band H home (highest). Customers will continue to buy their home insurance in the normal way. Although Flood Re will not be responsible for setting prices for home insurance, the objective is that, due to its existence, the number of affordable home insurance options available for households at risk of flooding will significantly increase.[39]

[38] https://www.abi.org.uk/Insurance-and-savings/Topics-and-issues/Flooding/Government-and-insurance-industry-flood-agreement/Flood-Re-explained

[39] http://www.ft.com/cms/s/0/83560050-c8f8-11e5-be0b-b7ece4e953a0.html#axzz3z6lvvzGo

Stakeholders involved

- Policyholders/homeowners
- Insurers
- Flood Re

What are the main factors of success?

- Flood Re allows the 350.000 highest risks homes to obtain affordable flood risk insurance. Businesses however, are not included in Flood Re.[40]
- Flood Re is privately funded and does not require public or governmental monetary support.

- A woman cleans the inside window her bar, as the floodwaters rise from the rivers. Photograph: Justin Tallis/AFP/Getty Images.

Conditions for applying this mechanism

- Well functioning insurance system that is able to organises all insurers.

2.4 Payment and Billing Innovations

Introducing innovations in order to decrease non accounted for water (IT/mobile phone payments systems, different schedules etc.).

[40] http://www.theguardian.com/environment/2015/dec/28/latest-flooding-brings-calls-to-extend-flood-re-scheme-to-businesses
Source: http://www.empowermagazine.com/mobile-health-apps-become-first-line-defense-outbreaks/.

Africa: Mobile Payments of Water Bills

Figure 12: Mobile Payments of Water Bills

Introduction

In Africa in 2013 more people are living with a mobile phone connection than with access to drinking water (African continent: 620 million mobile phone subscriptions in 2013). Many water providers have problems with performance and cost recovery. Lack of payments of water bills is a big problem in many countries in Africa. About 500 mln USD per year is not paid. This is why in a number of African countries water providers have started collection of water bills by mobile phone transfers in order to increase water tariff collection (and therefore cost recovery).

Stakeholders involved

Main players are the local water utilities and network operators and banks. Systems function on local scale in Kenya (Nairobi) and Tanzania and national scale in Uganda and Zambia.

Financing mechanism

Water utilities are teaming up with network operators and have created mobile paying systems in several towns in Kenya, Zambia, Uganda and Tanzania. Basically invoices are sent to mobile phones and money to pay for the water bill can be transferred by mobile phones. A survey has indicated that most users favour the system because of time savings (not having to travel to banks), cost savings and to a lesser extent to be able to pay on time. Another advantage is that in case billing takes place more frequently (i.e. weekly instead of monthly) people can pay more easily.

What are the main factors of success?

Trust by the (potential) users in the system is a key success factor. Therefore, users would like to see authorized confirmations when payments are made. Some network operators charged high transaction cost which prevented good penetration. Finally promotion and marketing are very important factors.

Conditions for applying this mechanism

- It must be easier for local people to pay their bills via their telephone compared to the system they use currently;
- Mobile phone penetration must be high;
- Network operators need to charge reasonably high transaction costs;
- Water companies need to see the added value of mobile payment.

Bangladesh: Low-income Customer Support Unit (LICSU)

Figure 13: Dhaka water supply

Introduction

Dhaka, the capital of Bangladesh, is one of world's most populated cities and is home to about 7 million people. Its metropolitan area (Greater Dhaka) is home to almost 17 million people. An estimated 400,000 migrants, mostly poor, arrive in the city each year. Estimates suggest that about 28% of the city's inhabitants are poor, and 12% are extremely poor. A recent survey indicates that around 35% of Dhaka's population live in slums, which can be defined as low-income communities. The low income communities were unable to access piped drinking water because the Dhaka Water Supply and Sewerage Authority (DWASA) requires customers to have a land title and registration number of the house, something slum dwellers do not have. Low income communities were therefore designated to illegal taps or expensive bottled water.

The DWASA established a Low-income Customer Support Unit (LICSU) in 2010 with permission from the Ministry of Local Government to coordinate services to low-income customers. The key functions of the unit are to facilitate new water connections to low income communities, coordinate the activities of the many NGOs working in low income communities, and reconcile these with the activities of the DWASA.

Community Based Organisations (CBO) and NGOs persuaded the LICSU to allow piped connections registered to CBOs instead of the slum dwellers. The slum dwellers consequently paid their bills via the CBOs, resulting in access to safe drinking water. Following this success, DWASA began encouraging slum residents living in close proximity to form customer associations/CBOs to function as one legal customer to pay a single bill for a shared connection. [41]

Stakeholders involved

- Dhaka Water Supply and Sewerage Authority (DWASA)
- Community Based Organisations (CBO)
- NGOs
- Slum residents
- Water Aid
- World Bank

[41] Wateraid (2016) Low-income customer support unit – case study Bangladesh

Financing mechanism

The model for providing a legal water connection to low-income communities in Dhaka is based on partnership between slum dwellers and their CBO, and NGOs and DWASA. The CBO functions as a single customer that represents a group of slum residents with a single bill. This allows slum residents to obtain a piped drinking water connection without the required land title and house registration number. The CBOs are responsible for collecting individual household payments of the residents.

What are the main success factors?

The model is being scaled-up to other cities and slums because of several (unexpected) successes[42]:

- Reliability of low-income customers in paying their bill: DWASA did not expect that slum dwellers were paying their water bills consequently on time.
- The model proved replicable in other slums
- As the connections were handed over to CBOs, community members began to develop a sense of ownership of the water connections, which lead residents to pursue a private legal connection.
- Extension of water lines and an increase in revenue as a result. Poor people access water at utility prices, and DWASA is reducing the proportion of non-revenue water lost to vandalism or water theft. Currently non-revenue water is 22% compared to 40.38% in 2008.

Conditions for applying this mechanism[43]

- Presence of external support and pressure: Even though DSK started and self-funded the pro-poor initiative by itself with two water connections, the involvement from the early stages of the World Bank and Water-Aid provided impetus for the whole process. These two entities acted as advocates and a pressure group for DWASA.
- Multi-stakeholder engagement: the project partners involved the DWASA staff and local counsellors in various events and workshops to engage them with representatives of the slums and development partners. During these engagements slum dwellers strongly expressed the opinion that they wanted water via a legal connection and were willing to pay all necessary fees to DWASA.
- Strong partnerships and cooperation: the model is based a reliable connection between the CBO, NGOs and the DWASA. Obtaining a legal water connection for slum residents begins with forming a CBO. A common vision and shared understanding in the community is therefore the foundation for a piped water connection.

2.5 Cost Reductions & Efficiency Improvements

Cost reductions by scaling up or cost sharing, preventing leakages and/or illegal tapping etc.

[42] Wateraid (2016) Low-income customer support unit – case study Bangladesh

[43] Wateraid (2016) Low-income customer support unit – case study Bangladesh

Figure 14: FIPAG Water supply tower

FIPAG Water supply tower (Source: www.dutchwatersector.com).

Mozambique: Institutional Strengthening of FIPAG

Introduction

The creation of FIPAG as asset manager of the water supply infrastructure for the larger cities of Mozambique was decided in December 1998 as part of the approved Delegated Management Framework. Since 1998 the Government of Mozambique is aiming at a separation of functions for the urban water supply, where FIPAG is responsible for the investment and management of the assets in the largest cities and towns in Mozambique. The regional offices are in a process of becoming more autonomous and are improving the performance of their respective urban water operators and promoting financial sustainability. One of the main objectives of the Institutional Support project is to capacitate these regional offices, and thus the operational performance of the urban water operators who reside under their responsibility mainly through training on the job. At national level FIPAG Headquarters is supported to optimize institutional structures, processes and policies for example Business Planning, ICT and training programs. This includes support in attracting investment funds to achieve a 70% water coverage in urban areas in 2015. The project is aimed to result in:

- Financially sustainable operation in the regions, with water operators that are enabled to cover the operational costs, debt services and asset depreciation;
- Improved operational performance indicators (Non-Revenue Water, water quality, billing and collection efficiency);
- Increased water supply coverage up to 70% in 2015.

Stakeholders involved

- FIPAG;
- Dutch Ministry of Foreign Affairs;
- Vitens Evides International (VEI).

Financing mechanism

The project is financed by a combination between the Dutch Ministry of Foreign Affairs via the Royal Dutch Embassy in Maputo (63%) and Vitens Evides International (37%). The total contract value is € 7.3 million.[44]

[44] http://www.vitensevidesinternational.com/wp-content/uploads/2015/08/Mozambique-Institutional-support-FIPAG.pdf

What are the main factors of success?

Especially three distinct measures made this project into a success: first, the project was able to increase the billing rate significantly by efforts in monitoring payments and closing off water connections in case of continuous non-payment. Reconnection to the water grid was only possible if all overdue bills were paid. Second, the water loss rate was significantly decreased by focused searches for leakages in grid. These two measures together proved very efficient in reducing costs and improving efficiency. Third and certainly not least important, a scheme was introduced to replace old, often malfunctioning water meters with new meters.

Conditions for applying this mechanism

This project was especially possible because of the combined expertise of VEI, which has an integrated approach to reduce NRW and to achieve cost reductions. An important aspect in the programme is the small scale local approach. Other conditions that are important for successfully applying this mechanism are good quality materials, availability of good labour and access to the community and the water infrastructure.

South Africa: Water Administration System (WAS)

Figure 15: South African agriculture field

Source: http://www.sabi.co.za/

Introduction

In South Africa, the water administration system (WAS) was introduced as a water quantity management tool for irrigation schemes, water user associations (WUAs) and water management officers to manage their water uses, water distribution and water accounts. The main purpose behind the development of WAS program was to minimize for irrigation schemes that work on the human system and distribute water through canal networks. The WAS is used for the efficient administration to address information, scheduled or rateable areas and water quota allocations. Irrigation water is delivered through pressure-regulated sluice gates, measuring structures and water meters. Other features include water transfers between users (Automatic and manually).[45]

Currently the WAS program is in use at all the major irrigation schemes cross South Africa and it manages an irrigated area of more than 142000 ha including 9500 farms. The main benefits of using the WAS program are: [46]

[45] Water administrative system (WAS). Retrieved via: http://www.solutionsforwater.org/solutions/water-administrative-system-was-for-reducing-cost-of-irrigation-water-management-in-south-africa

[46] ICID (2010) Water Administration System (WAS). Retrieved via http://www.icid.org/ws1_2006.pdf

- The minimising of water distribution losses.
- The excellent management of water quota allocations and water usage per farmer.
- The availability of an extensive list of water reports on farm and scheme level.
- The increased productivity of scheme management personnel.
- An integrated debit accounting system that improves debit management.
- The improvement of the overall water administration management on irrigation schemes.

Stakeholders involved

WAS is a uniquely South African water administration system aimed at increasing the productivity of water use in irrigated agriculture. Developed by Dr Nico Benadé, a Civil Engineer with funding mainly from the Water Research Centre (WRC), WAS essentially provides irrigation schemes with decision support for effective and efficient water management. The main actors involved in the implementation of WAS are:

- Water user associations
- Water management officers
- Farmers
- Department of Water Affairs

Financing mechanism

Farmers pay for the water they use by ordering the water via the water offices. The Water Administration System aims at finding solutions to lower the cost of water management so that food is produced at affordable prices. Previously, water quantity management was operated manually, innovations like WAS help to expand irrigated area with the same amount of water, while at the same time reduce the overall cost of operation and management of large-scale public operated surface irrigation schemes. The WAS is currently spread through a project funded by the Department of Water Affairs. The project includes workshops on WAS and further training[47].

What are the main success factors?

The computerised system in the form of the Water Administration System (WAS) has improved the operations of irrigation schemes in a tangible manner. In the case of the Vaalharts irrigation scheme for example, 11580 m3 per hectare instead of 12064 m3 per hectare now has to be released at the weir, to deliver the allocation of 9140 m3 per hectare at the farm edge. This is a saving of 14135 million m3 a year for the whole irrigation scheme.

If the WAS could be expanded from the current 143000 ha to the estimated 500000 ha of irrigation schemes in South Africa, with the support of water managers in water user associations and public servants in the regional and head offices, there will be significant saving of irrigation water, and improvement in performance of irrigation schemes.

Conditions for applying this mechanism

The WAS can be applied in other developing countries by tailoring it to suit the technical, socio-economic, and institutional situation of a given country. Physical system of irrigation schemes should be in good conditions and capable of operating on "demand" mode. Water user associations need to be functional and effective. Also the government should be willing to invest in modernization of irrigation infrastructure like flow measuring devices, etc. Training/ capacity development of irrigation staff and farmers/ WUAs is also necessary for the successful implementation of WAS.[48]

[47] Water Research Commission (2009) SA's farmers are saving water. *Water Wheel vol. 8 no. 6*.

[48] Water administrative system (WAS). Retrieved via: http://www.solutionsforwater.org/solutions/water-administrative-system-was-for-reducing-cost-of-irrigation-water-management-in-south-africa

2.6 Adaptive Community Approaches or Incentive Schemes for Resilience

Incentive schemes to stimulate actors to fund resiliency measures to a large extent themselves. Examples of resiliency measures are lifting plots, reinforcing houses, improving WASH services, etc.

Introduction

In Philadelphia storm water bills are introduced to reduce the negative effects in the city of storm water. Storm water runoff contains contaminants such as motor oil, pesticides, automotive fuel, industrial waste and other chemicals that pollute streams and rivers. Every parcel of land in the city, including residential, commercial, institutional and public properties, is billed by the Philadelphia Water Department for management of the storm water it produces. Philadelphia storm water fees calculated based on the amount of impervious surface (such as parking lots, sidewalks, driveways and buildings) that a parcel contains. Parcels with greater amounts of impervious surface produce larger amounts of storm water, and as such are charged higher rates for storm water management.

USA: Philadelphia storm water bills

Figure 16: Storm water bills

Source: http://www.phillywatersheds.org

The city of Philadelphia introduced an incentive system to ensure the effectiveness of the storm water program. Storm water discounts were introduced if individuals to increase the amount of green infrastructure. Green infrastructure projects include: Rain Gardens, Green Roofs, Basins and Ponds, Wetlands, Swales, Underground Projects, Downspout Planters, Rainwater Harvesting, Porous Pavement and Reducing Impervious Surfaces. Projects that reduce the amount of impervious surface on a site can result in a storm water credit that will permanently reduce the storm water bill of residents.

Stakeholders involved

- City of Philadelphia;
- Inhabitants of Philadelphia.

Financing mechanism

Storm water fee discounts are generally given based on decreases in impervious surfaces that a parcel contains, installation of particular controls, or by volume or pollutant-reduction performance. Philadelphia offers a storm water fee discount up to 80% of the impervious area charge or gross area charge, or both for customers who reduce

impervious cover with green infrastructure practices. If retrofitted with green infrastructure, the Philadelphia Water Department will recalculate that property's storm water fee.[49]

What are the main factors of success?

- By using a relatively easy monitoring system (GIS) the storm water bills are determined.
- By adding a (structural) financial incentive individuals are supported in green investments.

Conditions for applying this mechanism

- A fee reduction is only possible when the fee exists. A storm water fee needs to be implemented before this mechanism can work. A storm water fee can be implemented when there is a reliable monitoring system, when inhabitants are willing to pay and when institutions can manage the system.
- The fee reduction can only work when the incentive is well communicated and in proportion to the costs.

Bangladesh: Profitable Opportunities for Food Security (PROOFS)

Figure 17: Opportunities for Food Security

Source: http://www.bopinc.org/updates/news/proofs-project-launched

Introduction

PROOFS stands for Profitable Opportunities for Food Security. The objective of the project is to improve food security, improving Water, Sanitation and Hygiene (WASH), and prevent malnutrition for famer households in rural Bangladesh. The project has a target of reaching 80,000 Base of the Pyramid (BoP) households located in Northern (Gaibandha, Kurigram, Nilphamari, Rangpur) and Southern (Barisal, Bhola, Patuakhali) regions of Bangladesh.

PROOFS has an innovative approach that includes small scale farmers, retailers, traders, financial institutions and (local) government institutions. Smallholder farmers are being organized in competitive Farm Business Groups (FBGs). These will be linked to all actors who influence and can improve the capability of farmers to produce sufficient and nutrient food. The farmers can sell their food products at a better profit and improve their household nutritional and WASH status.

PROOFS identified consumer requirements at the rural household level for improved water safety and sanitation. Building on the needs for low-cost effective technology, the project is facilitating with WASH product firms to help

[49] http://stormwater.wef.org/2013/01/five-types-of-green-infrastructure-incentive-programs/

them develop low-cost WASH products. They are also working together through sanitation dealers to encourage the establishment of private latrine producers at the local level, who can reach the households located in remote areas.

Stakeholders involved

- Small scale farmers,
- Farm Business Groups (FBGs), in which smallholder farmers are being organized,
- Retailers,
- Traders,
- Financial institutions,
- (local) government institutions.
- ICCO, a Dutch NGO that positions itself as the enterprising connector, linking people and organisations in Bangladesh.

Financing mechanism

With financial support from the government of the Netherlands, PROOFS employs a Market Development Approach in acting as facilitator to deliver results by working through and strengthening private sector actors, rather than acting as a direct service provider. The central idea of this approach is that the poor are dependent on market systems for their livelihoods. Changing those market systems to work more effective and sustainable for the poor will improve their livelihoods and consequently reduce poverty. The additional assumption is that improved wealth will result in the uptake of better nutrition and WASH services.

What are the main factors of success?

- Total of 80,000 HHs reached by the project in two regions.
- Established 640 FBAs by the project
- Average monthly household income increased during the project from 8220 BDT to 8422 BDT.

Conditions for applying this mechanism

- Regional private sector demand for agricultural products of the small scale farmers.
- Smallholder farmer willingness to collaborate.
- Regional availability of WASH-retailers.
- It is assumed by this project that improved wealth results in the uptake of improved nutrition and WASH-facilities, this mechanisms is not yet confirmed.

3 Institutional arrangements

Institutional changes which result in additional funding sources from additional revenue streams, taxes or dedicated funds, decreasing risks or attracting private capital.

3.1 Taxation Models and Subsidies

Introducing more general taxes to fund water services.

Figure 18: Franklin Boulevard after drainage Improvements

Source: http://www.genesisgroup.com/projects/504.php.

USA: 1% 'extra penny' local sales tax

Introduction

The City of Tallahassee (the City) and Leon County (the County) manage storm water to reduce flooding and protect drinking water. Storm events in Tallahassee flood four major drainage channels. As a consequence, floodwaters frequently damage surrounding buildings and properties. Flash flooding is particularly problematic. For example, the Franklin Boulevard flooded within half an hour of strong storm events, endangering people and automobiles.[50]

In 1999, locally engaged stakeholders organized in the Economic and Environmental Consensus Committee (EECC) sought to unite disparate communities in Tallahassee through holistic projects that advance multiple goals.[51] Comprised of conservation, science, commercial, real estate, and planning professionals, the EECC developed a Blueprint 2000 and Beyond plan recommending the extension of a 1% sales tax to fund environmental infrastructure and transportation projects.

Upon passage of the 1% sales tax, the City of Tallahassee and Leon County created Blueprint 2000, a special purpose intergovernmental agency, to manage and plan the construction of EECC proposed projects. In November 2000, Leon County voters extended the existing one-cent sales tax, which will as a result expire on December 31, 2019.

Stakeholders involved

Involved in the project are the city of Tallahassee, Leon County, Blueprint 2000 & inhabitants and companies in Tallahassee.

Financing mechanism

To ensure funding for infrastructure projects, an 1% additional sales tax is imposed. This tax is managed a special purpose intergovernmental agency, Blueprint 2000. Blueprint 2000 receives an 80% share of extra sales tax revenues,

[50] City of Tallahassee. (n.d.). Flooding in Tallahassee. Retrieved Fall, 2012, from http://www.talgov.com/you/you-learn-waterfloodgen.aspx.

[51] http://consensus.fsu.edu/academic_directory/casestudies2000/Blais_Blueprint2000.pdf.

while the City and County each receive a 10% share for priority transportation and environmental infrastructure projects. Through 2011, Blueprint 2000 has received $198 million in sales tax revenues, averaging $28.4 million per year.[52]

Blueprint 2000 also received three below-market rate (2% interest) loans from the Florida infrastructure bank, totalling $49 million, for highway-related improvements that incorporated greenways. According to its 2010 Proposed Master Plan, 43% of its budget is dedicated to environmental projects while 54% is dedicated to transportation projects.

What are the main factors of success?

The main factor of success is that from the earliest beginning of the project local stakeholders were involved resulting in major support from citizens for the local sales tax. Besides, the organization Blueprint 2000 is functioning very well.[53] Last, the public authorities recognized the need of local citizens to be engaged and supported their ideas.

Conditions for applying this mechanism

Conditions that are needed for this mechanism to succeed:

- Locally engaged citizens;
- Public authorities which recognise the chances of citizen participation;
- Citizens who are willing to pay 1% extra tax for the purpose of flood prevention.

3.2 Dedicated Water Funds

Dedicated funds are funds with a clearly defined set of objectives and clear fund management and procedures. These funds can be either fed by taxes or specific levies etc.

USA: HMGP

Introduction

The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The program enables mitigation measures to be implemented during the immediate recovery from a disaster.

The HMGP was created in November 1988 by the Federal Emergency Management Agency (FEMA). The Program's objectives are to:

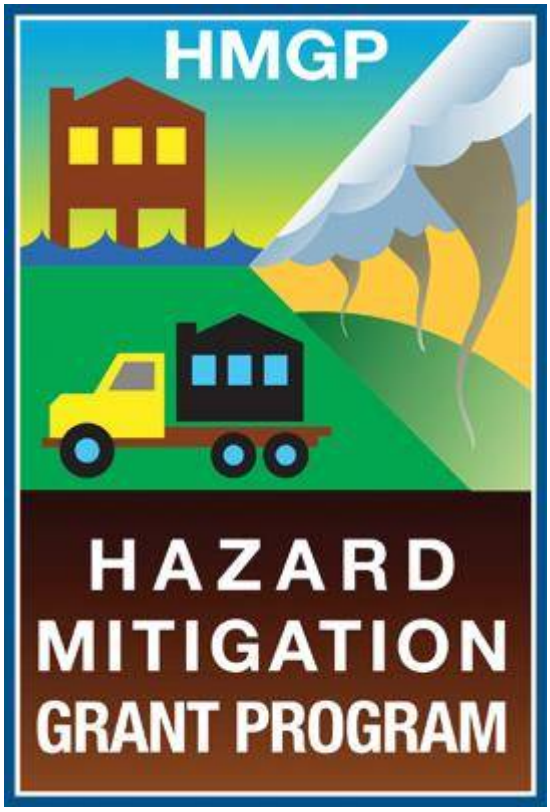
Significantly reduce or permanently eliminate future risk to lives and property from natural hazards;

Provide funds to implement projects in accordance with priorities identified in State, Tribal, or local hazard mitigation plans;

Enable mitigation measures to be implemented during the recovery from a disaster.[54]

[52] https://www.genesisgroup.com/news_items/greening_vacant_lots-tallahassee.pdf.
[53] http://www.businesswire.com/news/home/20151005006458/en/Fitch-Affirms-Leon-County-Tallahassee-FL-Blueprint-2000.
[54] http://www.dhses.ny.gov/oem/mitigation/documents/hazard-mitigation-grant-program(HMGP).pdf

Figure 19: HMGP



Source: http://www.iaedjournal.org/content/federal-agency-funding-places-stay-safe-weather-0

HMGP funds may be used to fund projects that will reduce or eliminate the losses from future disasters. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage.

Stakeholders involved

FEMA is the initiating actor. The following actors can apply for a grant:

- State and local governments
- Certain private non-profit organizations and institutions
- Indian Tribes and authorized Tribal organizations, and Alaska native villages and organizations
- Individuals and businesses may not apply directly to the State or FEMA, but eligible local governments or private non-profit organizations may apply to benefit the private entity.55

Financing mechanism

The amount of funding available for the HMGP under a particular disaster declaration is limited. The program may provide a state with up to 15 percent of the total disaster grants awarded by FEMA. States that meet higher mitigation

[55] http://www.dhses.ny.gov/oem/mitigation/documents/hazard-mitigation-grant-program(HMGP).pdf

planning criteria may qualify for a higher percentage under the Disaster Mitigation Act of 2000. FEMA can fund up to 75 percent of the eligible costs of each project.

The state or grantee must provide a 25 percent match, which can be fashioned from a combination of cash and in-kind sources. Funding from other federal sources cannot be used for the 25 percent share with one exception. Funding provided to states under the Community Development Block Grant program from the Department of Housing and Urban Development can be used to meet the non-federal share requirement. To be funded by the HMGP, a project is reviewed on five main issues that determine the eligibility of a proposed project:

- Does the project conform to your State's Hazard Mitigation Plan?
- Does the project provide a beneficial impact on the disaster area, i.e. the State?
- Does the application meet the environmental requirements?
- Does the project solve a problem independently?
- Is the project cost-effective?

What are the main factors of success?

Foremost, the fund is financially sustainable and has enough funding possibilities. Secondly, the fund applies five minimum criteria which determine the eligibility of a proposed project, making it transparent to the public and the actors that apply for grants. Thirdly, the state must provide a quarter of the grant, resulting in a shared responsibility and accountability of the FEMA, the State and the grantee.[56]

Conditions for applying this mechanism

- Sufficient funding and willingness to cooperate between the actors involved.
- A transparent organisation to allocate the grants and manage the fund.
- To ensure transparent spending of public money, the fund should be periodically checked and approved by impartial public authorities.

3.3 Emergency Relief Funds

Funds for emergency relief are often created by donors or governments to create a pool of liquidity immediate available when an events takes place. These funds often provide funding for specific damage and reconstruction support or immediate aid in terms of food and shelters.

[56] http://www.fema.gov/hazard-mitigation-grant-program

Figure 20: Jamaica after hurricane Sandy in 2012

Source: http://jamaica-gleaner.com/gleaner/20121128/business/business4.html.

Caribbean: CCRIF

Introduction

On average, at least one major hurricane and numerous tropical storms cross the Caribbean each year. The capacity of the Caribbean countries individually to absorb the financial impact of such disasters is limited. Damage to Grenada alone from just one of the major tropical storms in the Caribbean in 2004, Hurricane Ivan, was calculated at US$800 million[57]. This was a direct loss of 203% of the GDP of Grenada[58]. Nine countries in Central America and the Caribbean experienced a disaster which had an economic impact above 50 percent of their annual GDP since 1980[59]. What the small island countries in the Caribbean particularly lack is ready access to untied liquidity to support relief in the immediate aftermath of a natural disaster.

Therefore the Caribbean Catastrophe Risk Insurance Facility (CCRIF) was established in 2007. The CCRIF is the first end only multicounty parametric risk pool in the world. It is a regional catastrophe fund that provides coverage to Caribbean governments designed to limit the financial impact of disasters by quickly providing financial liquidity when a policy is triggered. CCRIF is in practice an insurance company owned by a special purpose trust. It is governed by a trust deed and the board must ensure that the CCRIF operates within the trust's parameters. The board consists of representation of participants (nominated by the Caribbean Community (CARICOM)), donors (nominated by Caribbean Development Bank (CDB)), two technical experts (also nominated by CARICOM and CDB), and an Executive Chairperson.[60] It operates thus as a public private partnership.[61]

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57 http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2012/07/31/000386194_20120731012634/Rendered/PDF/ICR23320P1080500disclosure070270120.pdf.

58 From "Financial Protection of the State against Natural Disasters," Policy Research Working Paper 5429; Francis Ghesquiere & Olivier Mahul; the World Bank; September 2010.

59 http://www.worldbank.org/en/news/feature/2014/04/21/caribbean-central-america-climate-catastrophe-risk-coverage.

60 https://unfccc.int/files/adaptation/cancun_adaptation_framework/loss_and_damage/application/pdf/ekhosuehi_iyahen_ccrif.pdf.

61 OECD (2013) Water and Climate Change Adaptation, policies to navigate uncharted waters.

Stakeholders involved

CCRIF was developed under the technical leadership of the World Bank and with a grant from the Government of Japan. It was capitalised through contributions to a multi-donor Trust Fund by the Government of Canada, the European Union, the World Bank, the governments of the United Kingdom and France, the Caribbean Development Bank, and the governments of Ireland and Bermuda, as well as through membership fees paid by participating governments.[62] As mentioned before, both the CARICOM and the CDB are involved in nominating the governing board.

Sixteen Caribbean governments are currently members of the facility: Anguilla, Antigua & Barbuda, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, St. Kitts & Nevis, Saint Lucia, St. Vincent & the Grenadines, Trinidad & Tobago, and Turks & Caicos Islands. Nicaragua is the first Central American government to become a CCRIF member.

Financing mechanism

CCRIF functions similarly to a mutual insurance company which is controlled by its participating governments. It was initially capitalised by the participating countries themselves, with support from donor partners. To better understand how CCRIF functions, one could consider a system by which several countries would agree to combine their emergency reserve funds into a common pool.

CCRIF keeps its assets relatively liquid to ensure quick pay-out if a member government's policy is triggered. At least US$20M is held as cash or cash-equivalent, while the remainder is managed by a specialist investment company. The turns on these investments are used to lower the long-term costs of premiums and to offset the Facility's operating costs.[63]

Since its creation seven years ago, CCRIF has made eight pay-outs amounting to US$32 million to help countries manage budget volatility in the aftermath of recent natural hazards. This mechanism has successfully leveraged capital and insurance market capacity to strengthen climate resilience in these countries.

What are the main factors of success?

The main factor of success of this project is that a group of countries is willing to cooperate in disaster management and that a good working tool is developed that can provide quick liquidity in case of a natural disaster, this already happened eight times since its creation.

Conditions for applying this mechanism

- Countries need to have the same problems and needs to not have the financial means to overcome the problem;
- Countries need to cooperate;
- In the case of the CCRIF, initial donations of donor countries were needed;
- Technical assistance is needed to set-up a fund

3.4 Scope extension to non water service provisions

Scope extension from water services to other services can create additional revenues from non water services (such as from land development/ land reclamation, urban development, energy production etc.). This changes the business model and might bring PPP or private finance options for the water sector.

[62] http://www.ccrif.org/content/about-us.
[63] http://www.ccrif.org/faq-questions-inline?page=3.

Nigeria: Eko Atlantic

Figure 21: Eko Atlantix

Source: http://www.rhdhvurbandevelopment.com/blog/eko-atlantic-city-lagos-nigeria/.

Introduction

Lagos, in the south-western region of Nigeria, is a city perpetually on the brink of flooding. Bounded in the South by the Atlantic Ocean, the city is situated on the mainland, home to 70 percent of the city's population with series of islands and a peninsula that holds the remaining 30 percent. Over the past 100 years, the Atlantic shore of Lagos has lost over 2 km in coastline; land that has simply vanished due to coastal erosion. The Eko Atlantic project is committed to bringing it back.

Stakeholders involved

- Lagos State Government;
- South Energyx Nigeria;
- Several local and international banks.

Financing mechanism

Eko Atlanic aims to combine flood protection together with residential, commercial, financial and tourist developments. The commercial developments (land sales) can be used to cross subsidise the flood protection measures within a Development Company concept. In February 2008, the project launched a massive and continuous seven-year dredging operation to create a foundation for Eko Atlantic. By the end of the project, nine million square metres of land ripe for residential, commercial and tourist development is available. A new city will rise from the Atlantic Ocean. To protect the newly reclaimed land from ocean surge, a powerful structure is being built along the entire coastline. It is called the Great Wall. The Great Wall will be fit to withstand and endure the most severe tidal surges forecast over the next 1,000 years.

Eko Atlantic is being developed and financed entirely by the private sector. It is a public-private partnership between the Lagos State Government and South Energyx Nigeria Limited. The certificate of occupancy given to South Energyx is for 78 years and it started counting from 2006. The project's main funders are three Nigerian banks: First Bank, First City Monument Bank (FCMB) and Guaranty Trust Bank (GTBank) – all publicly traded on the Nigerian Stock Exchange. The international banks BNP Paribas Fortis, and KBC bank also heavily invested. A large part of the financing will be

made possible from land sales. None of the funding will come from the government, whose role is limited solely to providing the concession for the project and receiving taxes on the land sales and development.

What are the main factors of success?

Important success factors for these types of projects are the involvement of relevant stakeholders from the beginning and the need for urban extension (demand for housing and land).

Conditions for applying this mechanism

- A governments that can manage concessions and develop land;
- Sufficient land to develop is required;
- Investors need to be willing to invest in the development;
- Demand for urban extension should be required;
- Valid especially for locations with potential for new to be developed areas with economic potential

3.5 Scaling

Scaling basically changes the scale of operations of water services. There are two possibilities: upscaling local models to regional scale or downsizing scale to simple more flexible small scale solutions. An example of small scale are recent developed plug and play water purification stations, which are often easier to operate and cheaper to install and maintain compared to large scale engineered treatment solutions.

Turkey: Market price waste water

Figure 22: Water treatment in Turkey

Source: http://www.waterworld.com

Introduction

In order to assess potential benefits of inter municipal cooperation in water and wastewater treatment in Turkey, a pilot study has been carried out. The potential benefits of cooperation within the pilot region of the Akarçay river basin in Turkey have been assessed. Nine municipalities from this area have been selected for the pilot study, namely: Afyon, Bolvadin, Çay, Suhut, Dereçine, Karaadilli, Akören, Düzağaç, and Sinanpaşa. The cooperation model selected fort his pilot study is a wastewater union.

The independence and self-governance of municipalities lie at the heart of a decentralized administrative system. Within such form of organization, each municipality is in theory independent from its neighbouring municipalities; it is free to

organize the delivery of services to its citizens, as well as to autonomously fulfil administrative duties. At the same time, however, municipalities too often struggle with the large number of various responsibilities that they need to manage, as well as to do so in an efficient way. Experience shows that municipalities are never totally self-sufficient – they often lack in size, or in resources, to undertake successfully all requisite tasks. On the other hand, there are many cases when cooperation with other municipalities can bring significant advantages and support building up on deficient capacity.

Stakeholders involved

The municipalities in the pilot area.

Financing mechanism

The cooperation model evaluated in the pilot study is a wastewater union. Several municipalities share one or more Urban Waste Water Treatment Plants (UWWTP) or participate in a regional wastewater treatment organization. The participating municipalities keep their autonomy but make long term agreements on financing, staffing, construction, utilisation and maintenance of UWWTP's. The financing of plant operations is handled through an extra fee for drinking water, paid by the consumer.

What are the main factors of success?

Inter-municipal cooperation brings a number of potential advantages, which can be broadly divided in financial and non-financial. The fact that many non-financial benefits ultimately result in commercial gains appropriates the cohesive discussion that follows next:

- Cost reduction: an important advantage of municipal cooperation is the potential for better economies of scale in many local functions. In a business context, economies of scale imply that with increasing scale of production, fixed costs are spread out over more units of output, resulting in lower per-unit fixed cost. Variable costs are also likely to decrease since increasing size is often (though not always) related to improved efficiency. In that respect, instead of having a number of small offices, each with its own staff, municipal duties can be organized from one (or at least fewer) location(s). Reducing the number of facilities through centralization implies more efficient administration and lower fixed costs, including lower rent and overhead spending. Human resource costs (e.g. wages and benefit packages) are also likely to decrease alongside a consolidation process. Reduced staffing expense due to more efficient task allocation among fewer employees is another potential advantage;
- Collective purchasing: Equally important, economies of scale can reduce materials expenses. Ordering large quantities of a product or material is known to be much cheaper than small-scale purchasing. When capital-intensive functions are concerned, order quantity discounts provided by raw-materials suppliers provide a good incentive for cooperative municipal organization;
- Sharing Information: By organizing various functions from a single centre, municipalities benefit from a better-informed decision-making process. Beside improved resource planning for the future, shared information brings about costs optimizations, e.g. by reducing bookkeeping and reporting time. Many small municipalities face similar problems, implying that shared information and best practice experience could also provide effective solutions;
- Improved environmental performance: Utilizing the force of well-trained high-quality workers and managers is likely to result in a better technical performance of the facilities. In relation to public water infrastructure, collaboration among municipalities (more specifically, the improved staffing) is likely to deliver enhanced environmental performance, meaning lower incidence of pollution and an improved rate of compliance to environmental standards;
- Education & training: Small municipalities often employ untrained or unprofessional staff because they do not have the access to skilled workers, or simply because they cannot afford them. Consolidation of staff from several municipalities provides a new opportunity to attract, train and retain full-time professional workers. The pooled financial resources, as well as the wider customer base, allow for additional costs of training to be incurred;

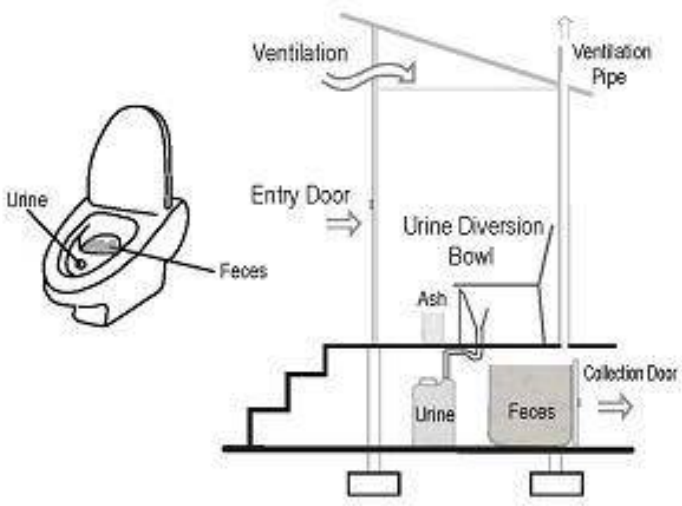
- Increased Bargaining Power: Individual municipalities often suffer from the absence of political power, especially due to their small size they often lack voice accountability. By combining forces, municipalities are better able to protect their collective interests, as well as to partake in policy development and legal decision-making;
- Better response to policy changes: The consolidation of municipal functions can introduce uniform standards and guides across individual systems. The resultant streamlined procedures allow for a better response to policy changes;
- Side effects: Some indirect effects of municipal cooperation are also worth to be mentioned. A key advantage of cooperation is the consolidation of resources. More formal types of cooperation imply the merging of financial budgets, resulting in better credit rating and lower interest rates. These factors appropriate for attracting investment funds, as well as applying for grants that may be reserved for projects of a specified minimum scale. Sharing best practice experience, as already mentioned, brings enormous potential for the effective management of problems commonly confronted by individual municipalities. Furthermore, sharing experience, information and resources is likely to bring a greater sense of solidarity within the partner community.

Conditions for applying this mechanism

For this mechanism to work, the main condition needed is that the individual municipalities want to cooperate and are supported in this effort. Secondly, the extra fee for drinking water needs to be paid for by the local people. These inhabitants need to be willing to pay for their water and need to have the financial possibilities to pay.

Philippines: decentralized sanitation

Figure 23: Schematic representation of latrine



Source: http://www.unep.org/ietc/OurWork/OtherProjects/Ecologicalanddecentralizedsanitation/tabid/104140/Default.aspx.

Introduction

Unlike Asian megacities, where sanitation coverage is relatively good, most peri-urban and rural areas lack appropriate wastewater management systems, as centralized treatment systems require dense population to be cost-effective and are not realistic solutions for these areas. Alternative solutions are needed: Decentralized Wastewater Treatment Systems (DEWATS) can be seen as a good option to balance socio-economic development and provision of basic services for less privileged communities.

DEWATS is based on a combination of treatment principles such as biogas digester, anaerobic baffled reactor, anaerobic filter and planted gravel filter. The selection of these components is determined based on their reliability, longevity and

tolerance toward inflow fluctuation. Most importantly, these treatment principles eliminate the need for sophisticated control, maintenance and technical skills.

DEWATS was implemented in Baladad Compound, Barangay Central West, in the Municipality of Bauang, Philippines, as the joint endeavour of CAPS and BNS-BORDA Philippines.[64]

Stakeholders involved

- Korean International Cooperation Agency (KOICA);
- Centre for Advanced Philippines Studies (CAPS);
- Basic Needs Services Philippines, Inc. (BNS-BORDA);
- City of Bauang, Philippines;
- Local inhabitants.

Financing mechanism

Financial support was provided by the Korean International Cooperation Agency (KOICA) and a small part of the costs was shared with the community. The local community agreed to participate for three percent of the total cost. This participation included the labour and cash contribution from the local government (the barangay).

What are the main factors of success?

The project owes its success to the active participation and involvement of stakeholders, included the participation of the community.

Conditions for applying this mechanism

- An initial investment is needed to start the project;
- The active involvement of the local community resulting in local ownership of the project;
- The system is valuable in areas without "regular" wastewater treatment systems.

3.6 Public Private Partnership Models

This concept introduces more private participation or PPP contracting modes (some form of private operations or service fee or availability payments based model under a contract with a public entity). Often PPP models enlarge the scope to attract private capital and obtain efficiencies in construction and or operations.

[64] http://www.unep.org/ietc/OurWork/OtherProjects/Ecologicalanddecentralizedsanitation/Pilotdemonstrationofecologicalsanitation/tabid/104207/Default.aspx.

UK: Pevensey Bay

Figure 24: 2014, dredger is about to start the annual beach recharge

Source: http://www.dredgingtoday.com/2014/09/02/sospan-dau-ready-for-next-phase-of-pevensey-bay-beach-recharge/.

Introduction

In the late 90s, the flood defence structure of Pevensey Bay, a nine kilometre area between Eastoune and Bexhill in East Sussex on the English channel coast, was reaching the end of its technical life. Due to lack of maintenance the embankment narrowed because of erosion and by 1997 it was expected that a storm with a return period of 1:20 years could significantly damage the defences.[65]

Stakeholders involved

Pevensey Coastal Defence Limited (PCDL), The Environment Agency (EA), East Sussex CC, Eastbourne BC, Rother DC, Wealden DC, several parish councils, residents associations and fishermen representatives; English Nature.[66]

Financing mechanism

The Pevensey Bay Sea Defence is a sea defence project funded as a Public Private Partnership (PPP) with an availability payment. Responsibility for the defences rests with the EA, a Non-Departmental Public Body of the UK government's Department for Environment, Food and Rural Affairs (Defra). The EA signed PPP contract with PCDL, which is a special purpose company formed solely for the purpose of performing the Pevensey contract. Following a tendering process, PCDL received an Invitation to Negotiate that ultimately led to a 25 year contract being signed on 1st June 2000, the contract is worth £27.4 million. PCDL actually undertakes none of the work, having subcontracted all obligations to the four shareholders. Each shareholder has a contract with PCDL backed up by a similar direct agreement with the EA, which would allow the EA to continue to maintain the defences should PCDL fail to perform. PCDL is required to carry out improvement works to raise the standard of protection and maintain the sea defences for a monthly` availability fee which is based on the condition of the beach. Goal of the PPP is to incentivise innovation and investment.[67]

What are the main success factors?

- A fairly small PPP with as a result that the four subcontracting firms were able to finance the expenses themselves, rather than borrowing money;
- The four subcontracting firms created a special company (PCDL) to deliver the contract;

[65] https://www.gov.uk/government/news/work-begins-on-new-flood-defence-schemes.
[66] http://www.pevensey-bay.co.uk/ppp.html.
[67] http://www.pevensey-bay.co.uk/ppp.html.

- Long term commitment and vision is created in the form of a 25 year PPP contract and the consortium has been contracted to provide protection against a breach of the shingle bank for any storm with a joint return period of one in 400 years or less. This gives the contractor time to evolve best practice;
- The key physical features of the beach are the basis for the availability payment, which allows allow the EA to continue to maintain the defences should PCDL fail to perform.

Conditions for applying this mechanism

- Sound key performance indicators based upon the quality specifications for the beach are important.

India: Viability gap funding of Kolkata Salt Lake Water Supply and Sewerage Network

Figure 25: View over Kolkata

Source: http://www.bharatonline.com/west-bengal/travel/kolkata/tourist-attractions/salt-lake-city.html

Introduction

Sector V is a district of the city of Kolkata, in Eastern India. Up till 2005, due to the lack of proper water supply and sewerage systems, the industries and residents of Sector V had to depend on ground water for water supply. This practice resulted in indiscriminate extraction of underground water. Neither was there a sewage system available. Some companies therefore developed on-site sanitation facility at their own costs. [68] To end this unsustainable practice, the Urban Development Department of the GoWB appointed the Kolkata Municipal Development Authority (KMDA) to lay out a comprehensive plan for the development of water infrastructure services in sector V.

The KMDA planned a combined water supply and sewerage project. This project was implemented under a Built-Operate-Transfer (BOT) PPP arrangement. The project was developed with financial assistance under the central

[68] Department of Economic Affairs, Govt. of India (2010) Case Study 4: Salt Lake Water Supply and Swerage Network. In: Public Private Partnership projects in India: Compendium of Case Studies

government's scheme of Jawaharlal Nehru National Urban Renewal Mission (JNNURM). This scheme operates as a viability gap funding scheme to overcome funding gaps.

Stakeholders involved

- Kolkata Municipal Development Authority (KMDA)
- Jawaharlal Nehru National Urban Renewal Mission (JNNURM)
- Consortium of private developers; Jamshedpur Utilities and Services Company Limited (JUSCO)

Financing mechanism

The private consortium is required to undertake the development, design, engineering, financing, procurement, construction, completion, commissioning, implementation, management, administration, operation and maintenance of the water supply network, sewerage network and the sewage treatment plant at the site. Against the capital investment made, the private developer is permitted to charge the consumers a tariff. The concession requires the private developer to operate and manage the water supply and sewerage system for a time period of 30 years.

The entire project, both the sewage and the water system, was estimated to cost 622 million rupees. 35% of the costs were funded by the Jawaharlal viability funding scheme, the remaining 65% were funded by the private concession consortium.

Viability Gap Funding (VGF) reduces the upfront capital costs of private infrastructure investments by providing grant funding at the time of financial close, which can be used during construction. The VGF 'gap' is between the revenues needed to make a project commercially viable and the revenues likely to be generated by user fees paid mostly by poor customers. Although the economic benefits of a private investment project may be high, in situations where the incomes of end users are low it may not be possible to collect sufficient user fees to cover costs. VGF is designed to make projects that are economically viable over the long term, commercially viable for investors. It helps mobilise private sector investment for development projects, while ensuring that the private sector still shares in the risks of infrastructure delivery and operation.

What are the main factors of success?

One of the parameters used for the assessment is the suitability of the project to be undertaken on a PPP basis. Discussions with KMDA officials indicate that development of the project on a PPP basis has been beneficial in raising significant private sector investment. At the inception stage of the project, there were apprehensions on the implementation of the project owing to the lack of adequate funds. The involvement of the private sector has suitably addressed this concern. Though there have been delays in meeting the target of execution of the construction works within the timeline of 18 months to almost 21 months, the discussions with the private developer do not indicate escalation in project cost. From KMDA's perspective, no additional capital costs other than that agreed to in the contract need to be borne by them.

The tariff determined has been found to be acceptable by the consumers and no issues relating to the same are envisaged during the O&M phase of the project. Additionally, critical concessions have been provided and extended to the private developers by KMDA in terms of land being made available free of cost, reduction in the cost of treated water supplied, permission to levy one-time connection fees, and capital grants under JNNURM.

Conditions for applying this mechanism

An evaluation of the project recommends to take the following considerations into account when engaging in similar projects in the future.

Feasibility assessment:

Before tendering out the project, it is important that the government undertakes a first level assessment of the project area. This assessment should be able to indicate the status of the physical infrastructure and the service delivery gaps and on the basis of the assessment, it should ascertain the nature of infrastructure required and the investment needed. Such an assessment would give a realistic picture of the on ground situation to the government and the private developer. Additionally, a detailed feasibility study should also be undertaken especially in the case of a greenfield project to determine the commercial viability of the proposed project.

Effective facilitation of project implementation by the government:

KMDA played a critical role in providing key concessions to the private developer to arrive at a rational water and sewerage charge. KMDA had several rounds of discussions with the stakeholders to ascertain the acceptable tariff.

Government needs to provide full cooperation to the private developer at various phases: The private developer needs to be provided with maximum cooperation in implementation of the project. There were delays in handing over of land free of cost to the private developer which resulted in delays in commencement of the construction works. It is important for the government agencies to avoid such delays. However, in all other areas, the private developer has received substantial assistance from KMDA to ensure smooth implementation of the project.

Philippines: Expressway Dike

Figure 26: Expressway Dike

Source: https://en.wikipedia.org/wiki/Laguna_Lakeshore_Expressway_Dike.

Introduction

The Laguna Lakeshore Expressway Dike aims to tackle two of the pronged problems in the area: economic development challenges and natural disasters and climate change issues. The project aims to provide a high-standard highway that

will speed up traffic between the southern part of Metro Manila and Laguna, as well as a dike that would mitigate flooding in the western coastal communities along Laguna Lake.

The Laguna Lakeshore Expressway Dike will start from the coastal area of Laguna de Bay from Taguig in Metro Manila to Calamba and Los Baños in Laguna. The project will involve the construction of a 47-kilometre-long, six-lane dike including bridges, pumping stations and ancillary flood gates.

Foreseen benefits of the projects are that the travel time between Bicutan and Los Baños can be reduced from 90 to 35 minutes, that there will be 700 hectares of land asset created, that Php 8.1B average annual flood damage will be avoided, and that an average of 800,000 people will no longer be affected by flood.[69]

Stakeholders involved

First, the United States Agency for International Development (USAID) provided a feasibility study for the project through the Advancing Philippine Competitiveness Project (COMPETE). Because of a lack of funding capacity of Philippine government, president Aquino decided to aim for a PPP to fund the project. This results in two main actors in the execution phase of the PPP arrangement, the Main Implementing Agency (DPWH) and the Coopering Agency for Reclamation (LLDA). The second agency is established to oversee the development and allocation of reclaimed land behind the dike.[70]

Financing mechanism

One of the major challenges is the financing of this project. Currently the projects is on the priority PPP list of the department of public works and highways of the Philippines.[71] The rationale behind the expected private investments in the project lie in the benefits of real estate development opportunities on reclaimed land and the collection of toll on the new high way. Since June 2014, The project is already approved by the National Economic and Development Authority (NEDA).[72] A consortium to implement the project will be chosen in the beginning of 2016.

What are the main success factors?

The use of a PPP, in combination with toll and land reclamation to fully cover the expenses of this large scale project can be regarded a significant success factor in the development of this project. The PPP approach to the highway allows the Philippine government to provide necessary infrastructure without committing to expensive built and maintenance costs of the dike-highway crossover. Adding these benefits to the prevented flood damages results in nett benefits for society.

Conditions for applying this mechanism

There are also considerations to PPP in infrastructure projects that should be taken into account. First, private partners demand a significant level of control of the end product in return for the high investment and risk that the they take. This can develop into unforeseen situations later on as infrastructure projects usually have a very long lifetime. In case of publicly funded projects, the government is able to do adjustments later on in the project. This is harder when it concerns a PPP infrastructure project. Secondly, thorough and solid contacts are required in a very early stage of the process, as private partners will do what they are paid for, and often no more than that. Otherwise one might end up with regrettable situations when undesirable developments for society occur. The government responsibility continues as people will keep their governments accountable for inconveniences in the public domain. Therefore a skilled agency with sufficient expertise is required to monitor the entire process.

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69 http://www.dpwh.gov.ph/PPP/projs/lled.htm.
70 http://ibtta.org/sites/default/files/documents/2015/Dublin/Cabral_Maria%20Catalina_Full%20Version.pdf.
71 http://www.dpwh.gov.ph/PPP/index.asp.
72 http://www.rappler.com/business/industries/208-infrastructure/61224-neda-biggest-ppp-project-approved.

Apart from the financial challenges, there are some social and environmental consideration to take into account for this particular project. First, the displacement of communities that are now living along the shore should be minimised by ensuring continuation of their existing livelihood. In this case it concerns mostly fishermen that are using the lake, therefore they should retain access to the lake to preserve their fishing activities.[73] Secondly, environmental impacts should also be minimised. This primarily concerns fish species that use the shore banks for spawning.

Philippines: Manila water

Figure 27: Engineers of Manila water

Source: Manila water.

Introduction[74]

This case illustrates ways to address the lack of access to water services related to the inability of disadvantaged residents of poor urban areas to pay for connections.[75]

Before 1997, the Manila's water supply and distribution were in disarray. Illegal connections ran rampant. Clean and potable water was a privilege that poor families simply did not have, and that others had to acquire at a steep price. In 1995, this situation prompted the Philippine government to enact the National Water Crisis Act, which paved the way for the turnover of the operation of water services from the government-owned Metropolitan Waterworks and Sewerage System (MWSS) to the private sector.

Manila Water Company (MWC) took over the East Zone of Metro Manila under a Concession Agreement that granted the company exclusive rights to the use of land and facilities for the production, treatment and distribution of water, as well as the rights to operate the sewerage system. The contract was signed for 25 years. MWC is the exclusive provider of water and wastewater services to more than six million people.

MWC has launched a "Water for the Community" program to speed up rollout of connections to poor households. However, the solution proposed to low-income areas, consisting of a bulk or community meter with shared connections after the meter and shared billing, created problems due to collection issues. Some customers were not making payments to the community collectors, while the company was demanding full payment for the entire invoice.

The tariff and connection fees are set by an independent regulator, so the company could not modify the fee conditions on its own. MWC did offer instalment plans for customers to pay the $167 connection fee. However, local government agencies and the MWC estimate that almost all households within the project's target communities would not be able to afford the connection fees (estimated to be $167), but could afford to pay for the required meter and guarantee

[73] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/362691/UK-Transport-Solutions_DPWH-__Presentation_to_UK_Transport_Solutions_September_18.pdf.

[74] http://www.manilawater.com/Pages/ManilaWaterStory.aspx.

[75] Source: Result based financing.

deposits (approximately $36) if this could be paid in instalments. GPOBA (a global partnership in the World Bank Group) therefore agreed to fully subsidise the connection fee for eligible households.

Stakeholders involved

- Manila Water;
- GPOBA is a global partnership program in the World Bank Group;
- 20,000 poor households.

Financing mechanism

The total cost of providing access to clean water to the over 20,000 poor households amounted at US$10.7 million, of which: MWC invested US$8.2 million, GPOBA provided subsidies for a total amount of US$2.07 million, and the user contributions amounted at US$0.43 million.

Under the terms of the concession agreement, the connection fee is indexed on an annual basis in line with consumer price index (CPI) data produced by the Regulatory Office. To mitigate the risk of cost inflation, it was agreed that the unit subsidy would be similarly indexed.

What are the main factors of success?

- Good financial situation: The utility (MWC) enjoys a strong financial situation. It had successfully negotiated several international loans and was generating positive cash flows. Its shares were being traded in the Philippines Stock Exchange;
- Credible targeting of poor customers: Given that the low-income households were located in compact pockets within the city, it was easy to use geographical targeting to make sure that resources were being used to benefit those that could not afford to pay the full connection fee;
- Availability of independent verification agent: Several reputable agencies were available to perform this task, including the National Engineering Centre of the University of the Philippines, which was selected to provide this service.

Conditions for applying this mechanism

The GPOBA grant in combination with inexpensive Manila Water loans as a result of the positive rating received from the Philippine Rating Services can be seen as two main beneficial conditions under which the Manila Water project succeeded. Favourable loans and grants can therefore be regarded as an important start-up condition for this financing mechanism.

Uganda: Small Towns Private Water Operators

Figure 28: Clean water in Uganda

Source:
http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/0,,contentMDK:21256361~menuPK:64282137~pagePK:41367~piPK:279616~theSitePK:40941,00.html

Introduction

The objective of the Water in Small Towns and Rural Growth Centres Project for Uganda is to support sustainable increase in access to piped-water for people living in selected small towns and rural growth centres through increased participation of local private operators. This objective has been largely achieved on two accounts: (i) water supply access, particularly in more rural areas in the country, the project has delivered nearly 2,000 water connections which represents over 90 percent of the project target, and (ii) further, the successful tendering of the sub-projects demonstrated that there is strong local private sector interest to expand and operate piped water supply systems.[76]

For a number of towns, private operators are invited to submit competitive tenders to operate the system, to connect new customers and to conduct the billing and cash collection for the services. Over the last decade, regulation has been developed and the skills of the operators increased. This demonstrates how capacity can be developed as experience grows and the benefits of external capacity building efforts of development agencies start to pay off.[77] One of the best results of the contribution that the private operators have made to improving access to the population is the progression in the numbers of active customer connections managed. This has risen from just 4,700 in 2002 to 34,631 in 2011. In the same period, the coverage in the towns has grown from an average of 215 to 394 active connections per town.[78]

Stakeholders involved

- Ministry of Water and Environment (MWE);
- Local communities;
- Town councils;
- Private operators of water systems;

[76] http://www.worldbank.org/projects/P102462/uganda-water-small-towns-rgcs?lang=en&tab=overview
[77] http://www.aquafed.org/pages/fr/admin/UserFiles/pdf/Uganda.pdf.
[78] http://www.aquafed.org/pages/fr/admin/UserFiles/pdf/Uganda.pdf.

- Global Partnership on Output Based Aid (GPOBA)[79].

Financing mechanism

In the past, contracts in the small towns have faced financing challenges for a number of reasons. These include:

- difficulty for small operators to obtain finance from overcautious commercial banks;
- unreliable power supplies causing loss of production or very high alternative fuel costs;
- inability of poorer customers to pay the connection charges;
- relatively high level of outstanding bills;
- slow growth of services resulting from the own levels of initial government investment, making the towns remain un-viable.

Output Based Aid (OBA) is named as one of the approaches to overcome this financing challenge. Output Based Aid is a results-based funding mechanism designed to improve access to basic services to the poor. The operator pre-finances the services delivery and is only reimbursed once the quality of the agreed on outputs has been verified by a third party.

Starting in 2005, 10 pilot schemes were initiated with the help and guidance of the GPOBA, which offered a $3.2 million investment grant to Uganda's Small Towns project. These pilots involved both contracts to extend existing infrastructure of 5 years duration and 7-10 year contracts to design-build operate new infrastructure. The contracts were signed in 2008 and are now well on track and are expected to benefit around 45,000 people. The private operators do not only build and improve the water infrastructure, they are also allowed to sell the water and collect fees for the water sold to local customers.

What are the main factors of success?

- Contracts are awarded on the basis of the lowest subsidy required. This tendering process has resulted in a 20% efficiency gain. The central government subsidy per person gaining access is significantly lower than for traditional input-based projects;
- The leveraging of private sector financing has been between 10-30% of the capital costs, thus reducing the subsidy required from the central government, which under the traditional approach would be 100%;
- The project has had an added benefit in that they have helped the private operators to develop competence in accessing finance and at the same time increased the willingness of local banks to lend to water projects. In the past banks were often unwilling to lend, or asked for high collaterals and interest rates to cover the risks.

Conditions for applying this mechanism

- An initial investment (in this case from GPOBA);
- A central government which can manage the initial investment for the water systems;
- A local municipality which is able to manage to contract private parties;
- Local consumers that are able and willing to pay for the water fees;
- An equal environment in which public and private parties are on a level playing field.

[79] http://dspace.library.uu.nl/bitstream/handle/1874/297352/Lotte-Marie%20Brouwer%20thesis%20IDS%202014.pdf?sequence=2.

The Netherlands: Harnaschpolder Wastewater treatment plant

Figure 29: Harnaschpolder wastewater treatment plant

Source: https://easy.dans.knaw.nl/ui/datasets/id/easy-dataset:33998.

Introduction

Harnaschpolder wastewater treatment plant, the first Public-Private Partnership (PPP) in the Dutch water treatment sector, was initially met with some scepticism. Especially since it concerns one of the largest wastewater plants in Europe. However, at the time of writing it is regarded as a success: The plant was less expensive than expected and the construction works were finished sooner than planned. At the beginning of September 2006, the plant received its first wastewater via an extensive new transport system. The extension and improvement of the wastewater treatment capacity is motivated by (i) European regulations, which impose ever stricter quality demands on purified wastewater, and (ii) the demand for high quality wastewater treatment against lower public costs.[80]

The Harnaschpolder wastewater treatment plant is constructed and operated under a Design Build Finance Operate (DBFO) contract. This type of PPP contract is new for the Netherlands in the sense that the executing consortium is also responsible for financing of the construction and management of the operations for a period of 30 years. According to the contract, the Delfland Water Board, as government body, remains ultimately responsible for the quality of the wastewater in the surrounding region of the Hague and Delft. At the end the of the 30 year contract, the plant will be handed back to the Delfland Water Board.[81]

Stakeholders involved

The Delfland Water Board acted as the main contracting agency. The contact was won by Delfuent, a consortium created to by Veolia Water, Strukton, Heijmans and a few subcontractors. This consortium is responsible for the construction of two WTTP plants and management of the wastewater treatment plants for a period of 30 years.[82] The European Investment Bank (EIB) and the Dutch Municipal Bank (Bank Nederlandse Gemeenten (BNG)) were involved in the project funding.

[80] http://vakbladh2o.nijgh.nl/algemeen/pdf/h2o/h2o_2007_06.pdf.
[81] http://www.traidwheel.nl/appropriate-finance/innovative-business-models/Private-sector-participation.
[82] http://www.traidwheel.nl/appropriate-finance/innovative-business-models/Private-sector-participation.

Financing mechanism

The Delfuent consortium was not able to finance the entire project from their own resources. Therefore a 365 million euro loan was negotiated with several European investment banks, a deal was eventually closed with the EIB BNG. The consortium expects to return the investments in less than 30 years. The PPP contract showed to be 10-15% cheaper than traditional procurement. The consortium receives a fee per cubic meter of treated water.

What are the main factors of success?

- Lifecycle costs asset management;
- Collaboration within consortium partners;
- The PPP contract showed to be 10-15% cheaper than traditional procurement.

Conditions for applying this mechanism

- Scale; the project needs to have a sufficient scale to reach economies of scale, the point at which it becomes interesting for private partner to invest. This is a problem with smaller projects;
- Continuous Risk Assessment and risk management;
- Well organized Open European Procurement, which stimulates private consortia to compete for the lowest price;
- Sufficient experience with contacting agents and staff;
- Proper preparation of feasibility, design and risk assessment before contacting a consortium.

Morocco: El Guerdane Irrigation system PPP

Figure 30: El Guerdane irrigation pipeline

Source: http://www.solutionsforwater.org

Introduction

The El Guerdane irrigation system, situated in Souss about sixty kilometers east of the city of Agadir, is known for its potential in the production of citrus. Overexploitation of groundwater for irrigation has led to an increased groundwater scarcity, leading to a decline of farming and even the abandonment of some orchards. To protect this irrigation system, the Moroccan government decided to allocate 45 million m3 per year of surface water through the development of a water supply system from the Aoulouz dam and its irrigation network.

In this regard, the Government of Morocco made a decision to implement this project in partnership with a private operator in order to ensure a timely funding, high quality of work and good irrigation service delivery. Construction was launched in 2006 and the project was completed in 2008.

The implementation of the El Guerdane project will allow to: (i) save 76 million m3 of ground water per year, (ii) reduce pumping costs by 50%, and (iii) to ensure use of localized irrigation on 10000 hectares. In addition, the project will allow: (i) an increase in production of citrus fruits by 22%, (ii) a 35%, increase of citrus exports, and (iii) ensured continuity of 11000 farming jobs.[83]

Stakeholders involved

- Ministry of Agriculture and Fisheries
- Regional Office of Agricultural Development of Souss-Massa
- Amensouss (private partner)
- Ministry of Economy and Finance
- Souss Massa Draa River Basin Organisation
- Local authorities
- The farmers' representatives

Financing mechanism

The El Guerdane PPP irrigation project is covering financing, design, construction and management of irrigation infrastructure of an area of 10,000 ha. The private operator has been contracted for the delivery of 45 million m3 of water per year. The financing was provided by the state (48%), the operator (44%) and farmers (8%). Farmers pay a single amount to be connected to the irrigation system and additionally a fixed price per cubic metre of water they use[84].

What are the main success factors?

Groundwater extraction from the Souss system for irrigation purposed resulted, over the years by a steady decline of 2.5 m per year of the water table, forcing farmers to heavily invest into additional deep well drilling and equipment for localized irrigation. The artificial ground water recharge from the Aoulouz dam had not been significant for the El Guerdane area. Without intervention to protect this area, the orchards are likely to be abandoned and even torn out, causing desertification of this area located at the edge of the desert. Financing, new development, and sound management of surface water irrigation system was required to provide water and off-set the over abstraction of groundwater and to ensure the production of Morocco's citrus crop.

Conditions for applying this mechanism

The delegated management of the project has established clear specifications that precisely define the standards, requirements and performance of implementation by the private operator. This is an essential precondition for a successful PPP.[85] Next to this, irrigation projects require sufficient initial investments or grants in the building phase to suppress the water costs for the farmers.

[83] http://www.solutionsforwater.org/solutions/public-private-partnership-for-the-construction-and-management
[84] http://siteresources.worldbank.org/INTMNAREGTOPWATRES/Resources/Guerdane.pdf
[85] Http://www.syngentafoundation.com/content/api/org_files/ppp_guerdane_morocco_mr_arrifi.pdf

China: BET Development Zone

Figure 31: BET Development Zone in 2008

Source: http://www.panoramio.com/photo/8518389.

Introduction

Beijing Golden State Engineering & Technology Co., Ltd. (BJET), a subsidiary company of a U.S. corporation, was awarded China's first municipal wastewater treatment build- operate-transfer (BOT) project in 2000. This municipal wastewater treatment plant is located in the Beijing Economic and Technological Development Zone (BET Development Zone). This zone is the sole state-level economic and technological development zone in Beijing, covering 6.8 square kilometres. The key industrial sectors include biological technology and medicine, digital technology and electronic information.

According to the contract, a joint venture company formed between the BET Development Zone and BJET became the operator of the wastewater treatment plant. The treatment capacity of this plant is 20,000 cubic meters per day, with a total investment of $3.86 million. The contracted operation period for this project is 20 years. During the operation period, the profits derive from levying wastewater treatment fees in the BET Development Zone. When the operation period terminates, the capital assets and management authority will be transferred to the BET Development Zone Management Committee.

Stakeholders involved

- Beijing Golden State Engineering & Technology.

Financing mechanism

The contract was signed in September 2000. In 2002 the project passed inspection and obtained approval to operate from the local environmental protection administrative authorities. The wastewater treatment fee was priced at $0.13 per cubic meter. Capital investment is to be recouped within 10 years. The relatively high wastewater treatment fee is the notable factor for generating revenue in this case study. The wastewater in the BET Development Zone is mainly industrial wastewater discharged from the enterprises located in the BET Development Zone. These enterprises are generally good business performers, making the wastewater treatment fees affordable for them. Thus, the BET Development Zone Management Committee priced the fee at $0.13 per cubic meter, much higher than the typical $0.04

per cubic meter for domestic water consumers as dictated by Beijing policies. The higher price provides the basis for a sound return on the company's investment.[86]

What are the main factors of success?

From this case, it is clear that success in BOT type wastewater treatment projects will mainly depend on wastewater treatment fees. A rational and higher price leads to successful business operations. The collection of wastewater treatment fees can be guaranteed only in areas with good economic success. A cautious approach should be taken for BOT investment projects in undeveloped areas.[87]

Conditions for applying this mechanism

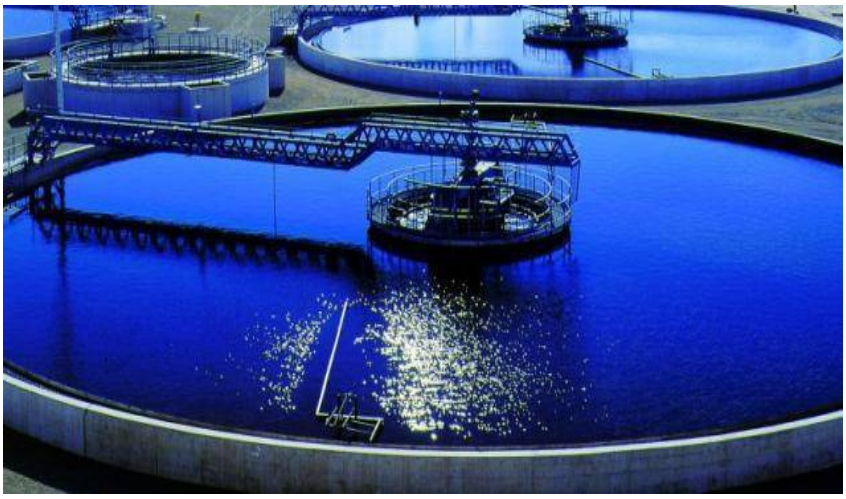
- This mechanism can only be used in areas where people/companies can and will pay the relatively high wastewater fees;
- The companies need to perform well to justify the higher costs.

3.7 Privatisation

Selling public utilities to the market (divestiture): full private ownership and operation.

Chile: EMOS, Sanitation Works Privatisation

Figure 32:Water plant in Santiago de Chile



Source: http://www.eleconomistaamerica.cl/empresas-eAm-chile/noticias/5183454/09/13/Agbar-limpia-las-aguas-de-Santiago-de-Chile.html.

Introduction

Whereas some regions naturally lack sufficient freshwater supplies, Latin America has abundant rainfall and freshwater sources. Nonetheless, over 77 million people lack access to clean water in the region. In most of Latin America, lack of access to clean water is a problem of poor governance, not a problem of water scarcity. Many public water companies in Latin America were bowing under the weight of corruption, inefficiency, and a lack of funding for public services, which had been drying up since the 1980s. As a result, Latin America became the testing ground for this new approach to water services, as several governments in the region agreed to sell shares in public water utilities to private water

[86] http://ita.doc.gov/media/Publications/pdf/chinawater2005.pdf.
[87] http://ita.doc.gov/media/Publications/pdf/chinawater2005.pdf.

companies. Especially Chile, which was one of the rare countries to fully privatise water supply services.[88] In Santiago, EMOS (metropolitan sanitation works utility, now called Aguas Andinas) was established in 1977 to serve drinking water to more than a million people. When it was fully privatised in 1999, it became the largest drinking water and sanitation company in Chile. EMOS operate in the four existing types of the sanitation services sector: drinking water production and distribution, and wastewater collection and disposal. From 1999 on, the number of connections rose from 1.130 to 2.004 thousand in 2012, a near doubling after privatisation of EMOS.[89] Furthermore, a 10, 33% rate of return over the invested capital in 2001 was obtained.

Stakeholders involved

- Superintendence of Sanitation Services (SISS);
- Ministry of Public Works;
- EMOS (Now Aguas Andinas).

Financing mechanism

The costs of the EMOS water and sanitation works are fully supported by the revenues from user fees.[90]

What are the main factors of success?

The privatisation process in Chile was carried out in separate stages, policy makers were therefore able to monitor the process and spot differences between privatised and public utilities. The privatised companies increased their spending, resulting in increased labour productivity, water quality and tariffs. Higher water tariffs were publicly accepted because of the significant improvements of the service and water quality.[91]

Conditions for applying this mechanism

- Tariff System: The laws enacted that water companies are mandated to grant services within their concession areas. The operation of these companies is based on a yardstick model, thus the price is a function of the marginal costs of development a model company;
- Companies Objective: The law states that the objective of water companies are as follows: "produce and distribute drinkable water, evacuate and treatment of sewage and carry out other services related with this activities under the conditions set by law." Although the law allows water companies to do other related activities, in practice they have found some constraints and obstacles since the superintendence has been very restrictive in this matter. The Superintendence argues that any related activities could introduced some noise in the definition of the model company as well as the relevant variables to determine tariffs. The law should allow to the water companies to own and operate branches, specialized in related business, but with independent accounting, thus, tariff setting process will not be affected and also it does not affect the definition of the model company;
- Experts Commission: The regulator as well as companies participate in the tariff setting process. This process implies technical reports and sharing information. If there are any difference between both technical reports and there is no agreement, an Expert Commission is called upon. This Commission has to decide between both technical proposals among every discrepancy, however it can not find an average position. The last modification

[88] Baer, M. (2014) Private Water, Public Good: Water Privatization and State Capacity in Chile. *Studies in Comparative International Development*. 49:141-167.

[89] World Bank (2016) EMOS. Private Participation in Infrastructure Database. Retrieved via: http://ppi.worldbank.org/snapshots/project/empresa-metropolitana-de-obras-de-santiago-de-chile-emos-2280.

[90] World Bank (2016) EMOS. Private Participation in Infrastructure Database. Retrieved via: http://ppi.worldbank.org/snapshots/project/empresa-metropolitana-de-obras-de-santiago-de-chile-emos-2280.

[91] Bitran, G.A. and E.P. Valenzuela (2003) Water Services in Chile. *Public Policy for the Private Sector.*

to the Regulation Document (regulate designation and functioning of this Commission) has improve the institutional framework[92].

3.8 Community/Entrepreneurial Models

Local entrepreneurs or collectives can operate some water services to obtain more community ownership and sustainability (better maintenance etc.)

Indonesia: Semarang Polder

Figure 33: Semarang Polder pumping station

Source: http://www.dutchwatersector.com/solutions/projects/278-banger-pilot-polder-semarang.html

Introduction

Flooding is commonplace in Java's northern coastal regions. To some extent, the floods are due to climate changes like increased precipitation and rising sea levels. But in the urban areas, there is the additional problem of large quantities of groundwater being extracted from the soil for use as drinking water. As a result, parts of the city of Semarang are steadily sinking, effectively ending up below sea level. The result is immediately visible: there is water in the streets during much of the day as the tide pushes the groundwater up to the surface. Some houses are now permanently flooded. The water sometimes remains in the city for days to weeks after a serious flood or storm. The only short-term solution to this water problem appears to be the construction of a polder. A polder is a low-lying area, surrounded by dikes, in which the water level is controlled artificially. Therefore a pilot polder is currently being established in Semarang with the advise of a Dutch polder board, which has over 800 years of experience with managing polders. The city of Semarang was chosen for this polder, mainly because of the governmental feasibility. A favourable governance conditions is essential for this project as the community aspect is thought to be the hardest part of the polder.[93] As the community is expected to organise the costs and management of the operation, maintenance connected to the polder.

Overall, the necessary activities include the construction of dikes, building of pumping stations, dredging rivers to create more drainage capacity and the revitalisation of the drainage system in the city. The complete drainage system in the

[92] de la Luz Domper, M. (2008) The Privatization of the Water Sector in Chile.
[93] http://www.partnersvoorwater2.nl/pdf_publicaties/2007-06_Holland_Water_Indonesie.pdf.

city needs to be cleaned and repaired. Within the polder the ground water level is controlled with water pumps. The project is aimed to be finished in the first quarter of 2016.[94]

Stakeholders involved

The project structure of the process was managed through three layers:

- A steering group to decide on the priorities, facilitating and manage the general course of the project implementation unit;
- A project implementation unit, responsible to cooperate on the operational level (PIU);
- A technical and institutional team to execute the daily works.
- Dutch Waterboard Groot Salland
- Dutch waterboard Hoogheemraadschap Schieland en Krimpenerwaard
- Municipality of Semarang

From the Netherlands, the Dutch ministry of PU, the water board Groot Salland and Hoogheemraadschap Schieland en de Krimpenerwaard (HHSK) were seated in the steering group and was present Witteveen & Bos as guest. From Indonesia the mayor of Semarang, the Directorate of research from the central government, PusAir, the Indonesian secretary for the 4P-Mou and the head of Bappeda Semarang (the department of spatial planning) were seated in this steering group.

This group of actors set-up and facilitated the agenda for the project implementation unit. The project implementation unit coordinated and facilitated the institutional and technical process. Bappeda arranged the institutional communication between the actors and PusAir acted as coordinator between all parties. The actors present in this body were heads of the local departments. Furthermore representatives of the technical and institutional teams were present in this body. Other stakeholders could be invited when needed to involve them in the process.

Witteveen & Bos was responsible for the design process and formed a technical team with actors from the local public works to develop the design. HHSK was responsible for the institutional process in cooperation with inhabitants of the polder area, Bappeda, the legal, and maintenance department of Semarang and formed an institutional team. Actors in these teams were from the operational levels of government and responsible for the day-to-day progress.[95]

Financing mechanism

Ultimately, the agreement stated that BBWS (the organisation responsible for river basin management) would improve the dike east of the area, IDR 2.5 billion has been allocated for this. The municipality contributed IDR 22.3 billion for the construction of the pumping station. The province funded an additional IDR 22.3 billion for construction of the Northern dike and the improvement of the secondary drainage of the river next to the polder (the Kali Banger). The upper structure, dam and retention basin is financed with through an Dutch development grant and executed by Cipta Karu.

Next to the investment cost, there are the costs of operation and maintenance of the polder. Managing the polder will cost money, which will have to be provided by local residents. A payment structure ('water rates') must be set up to cover all maintenance and operations costs.[96] Residents pay in this structure according to income level; the poorest pay the least, the richest the most. The payment structure is expected to be in working order by 2017 and to be led and charged by the top of the social hierarchy, as hierarchy is of major importance within this particular region.[97] The consortium does not intent to recover the initial investments. Once everything is working according to plan, the population will very likely be better off financially because there will be less damage to homes and infrastructure.

[94] Interview: Herman Mondeel, Witteveen &Bos.
[95] http://essay.utwente.nl/61728/1/MSc_R_Peters.pdf.
[96] Interview: Herman Mondeel, Witteveen & Bos.
[97] Interview: Herman Mondeel, Witteveen & Bos.

Despite these positive forecasts, the local residents would like to see concrete positive results before joining this payment structure. Therefore a small starting capital is raised by the consortium partners to provide for a smooth start. This is being raised by various parties, partly through donations and subsidies.[98]

What are the main factors of success?

- The local residents have been included through citizen participation events: elections, presentations, creating awareness;
- As a result of a large population, just a slight contribution per person will lead to major amounts;
- Concept of charging via electricity has been assessed; law did not allow. Within Indonesia, social hierarchy is very important. Thus the structure currently is that people on top of this hierarchy charge the taxes;
- Good supervision between different authorities; in some cultures people of higher ranks are not willing to cooperate with lower ones. Hierarchy is key;
- The cooperation with a water board works very well. This water board has been involved for the last 10 years, this long-term commitment works very well.[99]

Conditions for applying this mechanism

The foremost challenge to successful implementation and management of the polder project is the coordination among the various actors, and the responsibilities that come with the maintenance of the project. A second major challenge is ensuring enough funds to manage and maintain the polder, an obvious funding strategy is the raising of taxes from the benefiters of the polder. However, as usual when dealing with maintenance of common pool resources, there is a risk for free-riders when the foreseen payment structure is not properly executed.

Haiti: Rural Water and Sanitation Project

Figure 34: Haiti water tank

Source: http://watercharity.com/country/haiti

[98] http://www.witteveenbos.nl/nl/informatie-proefpolder-semarang.
[99] Interview: Herman Mondeel, Witteveen & Bos.

Introduction

While more Haitians have gained access to improved drinking water sources over the last decade, reducing the gap between urban and rural water access remains a challenge. In rural parts of Haiti, less than half of the population has access to improved water sources and only 17 percent of people have access to improved sanitation.

The Rural Water Supply and Sanitation Project in Haiti, initiated in 2007, introduced a management model involving local entrepreneurial water operators selected by the community to operate, maintain and manage the water supply systems, based on a contract signed with the local communities. The specific objectives of the project were to:

- Increase the sustained and effective use of safe drinking water in participating communities;
- Improve use of sanitation and hygiene practices in participating communities;
- Strengthen the capacity of the implementing agency, local water committees, and professional operators in cooperation with local government.[100]

Professional operators were trained to manage the sewerage systems and water basins built under the project, including billing, expansion of network and daily operations, and they are supported at the local government level by the National Water Directorate's (DINEPA) decentralised technical Rural Units and the National Service of Drinking Water (SNEP). The Project promoted cost recovery, metering, and the use of household connections and water basins, as well as sewerage systems, and where pumping was necessary and cost-effective. Upon completion in 2011, the project has been handed over to the Government of the Republic of Haiti.

Stakeholders involved

- World Bank;
- National Water Directorate's (DINEPA) decentralised technical Rural Units;
- National Service of Drinking Water (SNEP);
- Government of the Republic of Haiti;
- Local entrepreneurial water operators;
- International Development Association (IDA);
- State and Peace-Building Fund (SPF).

Financing mechanism

The project was financed by two sources, namely a 3.4 million dollar IDA Grant approved in December 2006 and a complementary US$5 million dollar SPF Grant approved in November 2008. The IDA eventually disbursed approximately 5.2 million dollars, whereas the SPF contribution rose to approximately 4.6 million dollar[101].

What are the main factors of success?

The project has succeeded in making improved water supply available to 28,500 people over the last year, and is likely to succeed in serving an additional 5,100 in the near future.[102]

[100] http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/LCR/2011/09/06/456FC8B00F27B69385257904000D8B32/1_0/Rendered/PDF/P0898390ISR0Di00620110131536247620 1.pdf.

[101] http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/07/01/000442464_20140701145221/Rendered/PDF/ICR29440P089830C0disclosed060270140.pdf

[102] http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/LCR/2011/09/06/456FC8B00F27B69385257904000D8B32/1_0/Rendered/PDF/P0898390ISR0Di00620110131536247620 1.pdf.

Additionally, The Project would contribute to 4 World Bank objectives: [103]

- Improved governance and public sector capacity: Build SNEP capacity; introduce transparent procedures for allocating infrastructure investment;
- Greater social stability and state credibility: Demonstrate quickly and effectively state capacity to provide jobs and services to vulnerable populations;
- Social cohesion: Improve community capacity to mobilize inhabitants to obtain and sustain water services;
- Improved health: Reduce diarrhea, particularly in children and infants, through integrated water supply, hygiene, and sanitation services.

Conditions for applying this mechanism

This project needs funding to start the project and funding to maintain and develop the model further. Furthermore collaboration with the local government is important for the adaptation of the project. Last, the professional operators need to see the added value of the project and need to collaborate.

Kenya: Maji Ni Majsha project

Figure 35: Maji Ni Majsha project

Source: http://aidkenyafoundation.blogspot.nl/2015/09/maji-ni-maisha-africa-water-and.html.

Introduction

The Maji Ni Majsha project, meaning 'Water is Life', aims to increase access to clean and reliable water supply for rural communities in Kenya. The project is financed by a blend of commercial finance and a World Bank output-based subsidy. The project's objective is to help small community-based water providers access the finance they need to improve water systems and connect poor households to piped water supply.

[103] http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/07/01/000442464_20140701145221/Rendered/PDF/ICR29440P089830C0disclosed060270140.pdf

Stakeholders involved

The output based aid is provided by World Bank's Global Partnership on Output-Based Aid (GPOBA). K-Rep bank is proving the loans. The output-based subsidy helped K-Rep to enter the sector. Community-based water service providers develop, own, and manage the water assets. World Bank PPIAF finances grants which enabled the communities to contract consultants for project development and implementation.

Financing mechanism

This project is facilitating access to finance for community-based water providers by blending output-based subsidies and commercial finance. It is the first GPOBA-funded project to use this combination of instruments. Under the scheme, the financing is provided on a project finance basis. The community provides equity (20 percent of project cost) and K-Rep finances the remaining 80 percent through a loan with a maximum tenor of five years. The longer tenor of the loan is made possible through the output-based subsidy which repays up to half the loan, typically after 18 months. It also makes the monthly repayments more affordable for the community.

The subsidy is released once a subproject achieves the agreed "outputs" which include number of new connections and average monthly revenue. Financing for the subprojects varies from US$60,000 to US$200,000. Connection targets also vary, from 50 new connections for a well-established system to almost 600 for a new system.

What are the main factors of success?

The provision of an output subsidy covering part of the loan repayments made it possible to use commercial loans for project financing. Important success factors are:

- World bank knowledge, grants and TA enabling private finance;
- Blending grants and loans;
- K-Reps will to enter this new market.
- "The output-based subsidy served a very important role in helping K-Rep to enter the sector and also to understand how to structure financial products for financing community-based water projects" Kimanthi Mutua, Managing Director of K-Rep Bank[104]

Conditions for applying this mechanism

- Target communities must be willing to pay for piped-water supply;
- Investments financed with commercial loans should generate revenue within a relatively short period of time, and outputs linked to the subsidy payment need to be achievable in a timely manner;
- The approach requires significant technical support, and a scale-up should be embedded in a programmatic water sector initiative.

Consideration should be given to institutionalising support mechanisms necessary to further develop such financing approaches.

[104] World Bank (2010) Maji Ni Maisha: Innovative Finance for Community Water Schemesin Kenya. Retrieved via: http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSDNET/0,,contentMDK:22563782~pagePK:64885161~piPK:64884432~theSitePK:5929282,00.html.

4 Financing Mechanisms

4.1 Revolving Funds

Revolving funds are funds based upon repayable finance or co-finance. Therefore, these funds are revolving based upon the repayments or co-finance by the applicants-beneficiaries. These funds in the water sector often provide loans to water related projects at more favourable conditions compared to commercial loans.

Uganda: ITF project

Figure 36 Water treatment on Lake Victoria

Source: http://www.eib.org/products/blending/mri/kampala-water-lake-victoria-water-and-sanitation-project-uganda.htm.

Introduction

This Infrastructure Trust Fund (ITF) project ties in with previous activities to rehabilitate the distribution network and extend water treatment capacity in Kampala. It aims at increasing coverage, reliability and access to water supply services for the population of Metropolitan Kampala, in particular the urban poor, living in informal settlements in the districts of Wakiso and Mukono as well as the towns of Nansana and Kira. Where up to 50% of the population live below the absolute poverty line.

Most of Kampala's 2.5 million inhabitants will benefit from this project which will greatly improve the capacity for water treatment and overall drinking water distribution. Works have started and are expected to last five years.

The project consists of upgrading and rehabilitating the Gaba water treatment plant, as well as the water distribution network itself, while extending water supply to the settlements and constructing a new water treatment facility east of Kampala. This will naturally also be linked into the supply network.

Water supply will be greatly improved in 20 selected informal settlements, through network densification and the construction of some 3.000 public water points and yard taps. These will ensure access for an additional 400.000 people to affordable, clean and safe drinking water.

Further development objectives are to promote better overall planning and enhance the financial and operational capacity of the project execution agency, the National Water and Sewerage Corporation (NWSC).

Stakeholders involved

- National Water and Sewerage Corporation;
- Agence Française de Développement (AFD);

- European Investment Bank (EIB);
- KfW;
- EU-Africa Infrastructure Trust Fund;
- Uganda's national government;
- The local community.

Financing mechanism

The three MRI partners combined their respective strengths and expertise for the financing of this project, with KfW and its local implementation team in the lead financier role thanks to their long-standing presence in the water sector in Uganda.

AFD and the EIB brought knowledge of water quality issues and experience with water and sanitation projects in the region, gained by supporting the rehabilitation of the water intakes of the main cities on the shores of Lake Victoria.

Detailed financing plan:

- AFD: EUR 75 million loan;
- EIB: EUR 75 million loan;
- KfW: EUR 20 million grant;
- EU-Africa Infrastructure Trust Fund: EUR 8 million investment grant;
- National contribution: EUR 34 million.[105]

The EU-AITF is supporting this project with two grant operations, a technical assistance of €8.000.000 for expert services to the National Water and Sewerage Corporation (NWSC) and an interest rate subsidy of €14.000.000 for subsidising AFD's loan financing.[106]

What are the main factors of success?

The grant brought about social benefits through the pro-poor focus of the project. In particular, the project improved the supply of drinking water and basic sanitation in the poorer areas around Kampala. The grant benefits were transferred to the final beneficiaries by providing water to the poorest households at reduced rates. Without the grant funding, the project would have focused solely on richer areas.[107]

Conditions for applying this mechanism

- Donors and local governments must be willing to pay for water treatment;
- Outputs linked to the subsidy payment need to be achievable in a timely manner;
- The approach requires significant technical support.

[105] http://www.eib.org/products/blending/mri/kampala-water-lake-victoria-water-and-sanitation-project-uganda.htm.
[106] http://ec.europa.eu/europeaid/blending/kampala-water-lake-victoria-water-and-sanitation-sector-watsan_en.
[107] Blending Finance Arrangements, EU.

World: lending schemes

Figure 37: Lending schemes

Source: https://c2.staticflickr.com/4/3598/3572916090_6d2cb965ab_z.jpg?zz=1.

Introduction

Water for People (W4P) has undertaken a number of lending schemes in Bolivia, Guatemala, India, Malawi, Peru, Rwanda and Uganda. These credit schemes aim to stimulate construction and use of latrines in developing countries. Traditionally many sanitation programs are NGO grant financed, which often leads to abandoned projects (a sustainability issue). The idea behind providing lending finance to more market or community driven initiatives is to foster sustainable sanitation products for lower and middle incomes.

The concept is in general to provide loans for latrine construction to either individual households or household collectives or in some cases to the sanitation company itself. Loans are often based upon a guarantee provided by W4P and provided by local micro-finance providers (MFIs or SACCOs) at below market interest rates in relation to the guarantees. Generally often in case of loan collectives some knowledge of NGOs or community institutions is needed regarding sanitation and function of the local community. Below the case of Malawi will be described. Most loans in Malawi are provided to household collectives (of 7-10 households), other cases consist for instance of loans provided to a local entrepreneur to expand his sanitation centre.[108]

Stakeholders involved

In Malawi the W4P initiative is organized with OIBM (Opportunity Bank) for the peri-urban area of Blantyre. W4P provided a guarantee for non-repayments also to reduce the interest rate to below market level. Local NGO hygiene village promoted loans to the communities and delivered loan trainings to the collectives.

[108] https://www.waterforpeople.org/where-we-work/malawi.

Financing mechanism

The scheme essentially acts as a microloan system. About 210 loans were provided at interest rates of 24% per year (market rates are about 48% per year). The payback period was 6 – 12 months. The management fee was 2,5% and OIBM required 20% of the loans to be held on its savings account. The repayment rate for the loans was 88%.[109]

What are the main factors of success?

The project was a success in terms of sanitation latrine construction and use. Less successful elements are the sustainability of the lending schemes due to the relatively low repayment rate. The disappointing repayment rate is believed to be a result of the unintended communication of the guarantee provided by W4P. To cover a part of the latrine expenses, the organisation set up a plan to harvest and sell the composted human manure ("humanure" in short) for agricultural purposes. In reality, this plan offered little promise as most projects could not harvest the manure because of community resistance and a lack of a demand market for the manure. A last distorting factor was the common expectation among the locals that latrines and slabs should be free, as they were offered before by other development programmes.[110]

Conditions for applying this mechanism[111]

Conditions required for applying this mechanism are:

- Micro-finance capacity building is often necessary, also for banks and community MFIs/ SACCOs. The risks and efforts for regular bank are often high, resulting in equally high interest rates;
- Sanitation market building (with low costs latrines) and firms platforms should go hand in hand with the micro-finance scheme;
- Use market interest rates as much as possible (avoid guarantees and such);
- Promotion to and capacity building of lenders is crucial (preferably not to be conducted by a NGO but by the financing partner who stays);
- Due to high non repayments the model showed not to be financial sustainable. Piloting with more market driven interest rates and individual contracts (instead of collective schemes) might lead to more financial sustainable outcomes;
- Lending partners need to be market driven, know the sanitation market and lenders/clients and minimize non-payments;
- Costs to form and manage lending groups should not be underestimated (NGO Hygiene Village undertook this).

Introduction

The Devolution Trust Fund in Zambia is a Basket Fund and provides loans and grants for drinking water and sanitation for the poor. The fund provides grants and loans based upon a call for proposal towards the 10 commercial water utilities (owned by municipalities). The Fund is operational since 2006.

[109] http://www.traidwheel.nl/media/files/Toolbox%20appropriate%20finance%20TRAID%202015%20Wheel.pdf
[110] Water for the People – Malawi. Rural Sanitation Marketing.
[111] http://www.traidwheel.nl/media/files/Toolbox%20appropriate%20finance%20TRAID%202015%20Wheel.pdf

Zambia: Devolution Trust Fund

Figure 38: Water kiosk in Zambia

Source: https://waterjournalistsafrica.files.wordpress.com/2011/07/water-kiosk.jpg

Stakeholders involved

DTF was established by NWASCO (National Water Supply and Sanitation Council) and is established as separate entity. The main sponsors are German Development Cooperation & KfW, DANIDA and EU.[112]

Financing mechanism

The Fund provides grants and loans to access to water and sanitation services in low income suburban and urban areas based upon competitive calls for proposals. Proposals are submitted by commercial utilities. Funds are released depending on milestones realized (output based funding). The Fund has two windows; a general fund and a performance enhancement fund. The performance enhancement fund is aiming to improve the commercial viability of utilities and is only available to utilities which have completed successful projects under the general fund. Grants and loans towards commercial water utilities based upon competitive calls. Contributions amount to 4 million USD per year.

What are the main factors of success

- Clear regulation and funded regulator in place for utilities;
- Good coordination between the donors;
- Clear predefined project selection criteria;
- Effective monitoring and reporting transparency.

Conditions for applying this mechanism

The main condition for the mechanism to be applied is that the fund needs to be managed well. This means that regulations need to be very clear, monitoring needs to be good and the project selection criteria need to be clearly defined and communicated.

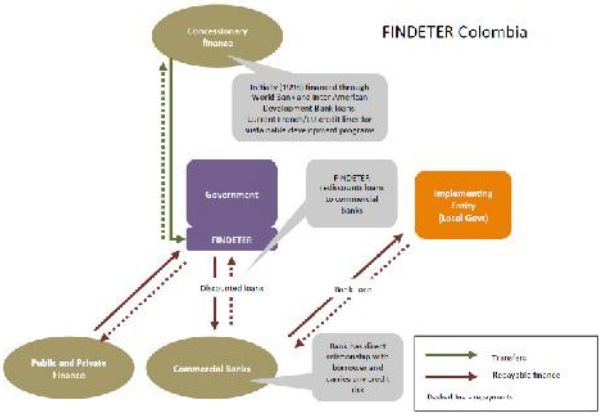
[112] http://www2.ohchr.org/english/issues/water/Iexpert/docs/StateActors/ZambiaHumanRightWSSGeneva2011.pdf.

4.2 Blending and Pooling Instruments (financial innovations)

Blending: by combining grants or government guarantees with repayable finance more private capital can be mobilized, Pooling: by pooling asset classes & sizes in one fund scale is reached: more risk diversification and reduced transaction costs.

Colombia: FINDETER Commercial bank loan matching

Figure 39: FINDETER Commercial bank loan matching



Source: SNV Financing Sanitation, page 38.

Introduction

The Territorial Development Financial Company (Financiera de Desarrollo Territorial S.A.) (FINDETER) is a corporation of national order, subject to the regime governing Industrial and Commercial State Companies attached to the Ministry of Finance. It is responsible for discounting loans to Territorial Entities, to its decentralized entities, to metropolitan areas, to municipal associations, and to regions and provinces to enable them to carry out programs or projects for public services, environmental and transportation amongst others.[113]

FINDETER is a mixed economy public corporation focused on development, within the Ministry of Finance and Public Credit. The national government of Colombia owns 92.5% of its shares, with the remainder owned by Colombia's government departments. The Colombian government established FINDETER (Financiera de Desarrollo Territorial) in 1989 to help support a major decentralisation program by lowering the cost of loans and incentivising commercial banks to lend to local governments who until then had no experience in borrowing from banks. It has been credited with making a significant contribution to the growth of sub-national lending by introducing a number of banks to municipal lending.

Stakeholders involved

National government of Colombia & local government departments.

Financing mechanism

FINDETER primarily operates as a second-tier development bank, which means its funds are lent to intermediary institutions (credit institutions such as commercial banks, financial corporations, commercial finance companies), which then lend those funds to local borrowers undertaking infrastructure development projects. Under this arrangement, sub-national entities including municipal service providers apply to a commercial bank for a loan. FINDETER appraises the proposal and authorises the first-tier lender to lend to the requesting entity, whereupon the bank makes the loan at a negotiated interest rate reflecting the level of risk of the borrower. The bank then receives a matching loan at a discounted rate from FINDETER. The bank remains responsible for repayment of its discounted loan from FINDETER, regardless of whether or not it receives repayment from the local borrower. This second-tier role distinguishes FINDETER from most municipal development funds (MDFs) that lend directly to local governments and assume the credit risk.

[113] http://www.partnersvoorwater.nl/wp-content/uploads/2012/09/2108993011_FinalReport_v_17.pdf.

FINDETER finances up to 100% of eligible project costs, with loan terms up to a maximum of 15 years, including up to 3 years of grace period. Without FINDETER, local governments would usually not be able to access loans longer than 5 years. FINDETER also provides support to municipalities to define, structure and implement their development projects and priority investments, which make them more attractive to the banking sector. Large numbers of municipalities have made borrowings over the life of FINDETER, for example in 2012, COP$ 2.3 billion (approx. US$ 1.2M) was disbursed to 26 Departments in Colombia and 107 municipalities through FINDETER for 1,469 eligible development activities.

FINDETER was initially set up with the aid of concessionary finance from both the World Bank (through the Colombian Government) and the Inter-American Development Bank (IDB) but has successfully established itself as a viable financial institution, raising funds from both public and private sources through the securities market (primarily through certificates of deposit). It has maintained a triple-A credit rating for the last 16 years (to 2014) (SNV, 2007).

What are the main factors of success?

The main factor of success is that because of FINDETER local municipalities are able to fund local water projects of maximum 15 years without having major credit risks.

Conditions for applying this mechanism

- An initial investment is needed, either from the country itself or from a donor;
- An organization needs to be set up, best with governmental support.

This is not a needed condition, however this is a reason to start this program: local governments have difficulties in lending from commercial banks.

Kenya: Kenya Innovative Financing Facility for Water (KIFFWA)

Figure 40: KIFFWA focus

Source:http://image.slidesharecdn.com/65fb1a4c-242b-4e6d-83f4-cd2b47699aa9-160401125216/95/kiffwaflyerdigitaal-1-38.jpg?cb=1459515153

Introduction

Kenya faces water security problems resulting in an array of social, environmental and economic issues. Water use and water demand for different purposes (drinking, agricultural, industrial etc.) is expected to rise significantly in the coming years. Addressing these problems requires huge investments. The National Water Plan 2030 indicates that over USD 2 billion annually is needed for the coming years. As public budget cannot cover these investments for water alone, other sources are needed. Kenya has been at the forefront of innovative financing of infrastructure, including blending various public and private sources. KIFFWA like to add to that notion.

KIFFWA (Kenya Innovative Finance Facility for Water) is a co-developer of water initiatives in Kenya. It provides early stage capital and finance expertise to support the creation of viable water investment opportunities and attract (private) providers of finance. KIFFWA is currently being set up as a local organization in Kenya by the Netherlands Water Partnership with funding of the Embassy of the Kingdom of the Netherlands in Nairobi.[114]

Stakeholders involved

- Kenya Innovative Finance Facility for Water (KIFFWA)
- Netherlands Water Partnership (NWP)

[114] http://www.kiffwa.org/

- Embassy of the Kingdom of the Netherlands in Nairobi

Financing mechanism

KIFFWA is a new approach to financing for future water projects, and an alternative for the traditional public private cooperation. In essence, KIFFWA is establishing a water project developer, the Kenya Pooled Water Fund, which ensures project feasibility by bringing together relevant actors and financial partners. Just like project developers in real estate markets do. Specifically, KIFFWA aims to ensure financial capital and expertise in the start up phase of the projects, making them attractive to private investments (see picture below title). "Its all about achieving 'financial close'", according to account manager Joris van Oppenraaij[115]. KIFFWA assists in creating a business plan, identification of opportunities and establishing a self sustaining local organisation to bear responsibility for the project.

What are the main factors of success?

By providing early-stage capital and finance expertise to implementers, KIFFWA supports initiatives across all water sub-sectors to reach financial close. Projcets will be able to achieve lower cost of financing, making utility financing affordable at lower tariffs. KIFFWA will become a self-sufficient organization and therefore seeks refunding at financial close in the form of a success fee or an equity stake in the initiative.

Conditions for applying this mechanism

The programme through which KIFFWA is realized is funded by the Embassy of the Kingdom of the Netherlands in Nairobi for approximately EUR 10 million over the period 2016 – 2019. The Netherlands Water Partnership is appointed to implement the programme.

Costa Rica and Kenya: Guarantee funds

Figure 41: Nakuru slum

Source: http://practicalaction.org/media/download/18588/WyI2MDB4NjAwIiwiY3JvcCJd.

[115] https://www.nwp.nl/nieuws/weblog/nieuwe-financi%C3%ABle-oplossingen-voor-watersector-kenia

Introduction

Basically the approach for sanitation uses experiences from the value chain of solid waste management. In solid waste there are businesses both in the service and in the value chain. This opens the door to many different types of finance.

The vision of NGO WASTE is 'People in urbanized areas living dignified lives in balance with their environment and the mission is 'to empower and support stakeholders to create cleaner, better-functioning, and healthier cities which contribute to alleviating poverty and the effects of poverty in low- and middle income countries. To strive for a balance between financial, institutional, environmental, technological and social aspects of sustainability'.

Cases are described in Costa Rica and Kenya on a guarantee fund for enterprises in solid waste and sanitation.

Stakeholders involved

All material presented is based on original work done by WASTE and its partners and supported by a host of organisations: DGIS, SNS Asset Management, Banco Popular, FODEMIPYE, ACEPESA, PA, Family Bank, L&T insurance, Grameen Kota, NABARD, RDO Trust, NHB, UNU-MERIT, AMREF, Kenyan Ministry of Health, KWFT, K-REP Bank, Goodwell Investments, Social Equity Foundation, PLAN, OMFI, Arba Minch Municipality, Triodos Facet, Fair & Sustainable, PfW and Aqua for All.

Financing mechanism

Guarantee (1) Costa Rica features a national guarantee scheme for small and medium enterprise support of Euro 24 Million. Agreement was reached between WASTE, its local partner (ACEPESA), the Banco Popular and the national guarantee scheme (FODEMIPYE). Initial coverage by the Waste Venture Fund (WVF) for urban environmental enterprises was 50% of the loan amount with the national guarantee and the enterprise each backing 25%. One year later the bank requested that their share in the guarantee would be increased to 50% and the WVF share reduced to 25%. Two years later the bank and the national guarantee scheme were sufficiently convinced about viability of small scale urban environment enterprises that they no longer require the WVF.

Guarantee (2) The WVF objective in Kenya was to support durable solutions to sanitation funding. A market demand assessment was carried concurrently together with the assessment of financial institutions in Nakuru that would be best suited to administer WVF. Its purpose was to provide guaranteed credit loans for hardware investments in waste management and sanitation activities. The Family Bank was selected as the financial partner. Experiences so far show that over 40 clients have received WVF loans, with 5 being solid waste and 35 sanitation loans.

What are the main factors of success?

- Willingness of banks to extend their services to the water sector;
- Cooperate with banks or MFIs with experience in the relevant regions;
- Guarantee funds fed with grants from interested donors;
- Proper risk allocations, banks need to contain some risks for defaults.

Conditions for applying this mechanism

It is important to have a number of banks and microfinance banks willing to extend their services to the water and sanitation sector and with expertise in the relevant regions. In case banks are not interested or if the institutions lack expertise in the region, the model can not be replicated. Secondly, private sector entrepreneurship is essential. The model will not be easily replicable in regions of countries with a lack or entrepreneurship.

5 Synthesis

The synthesis aims to provide a comprehensive overview of the main similarities and trends in international case studies for water funding and financing arrangements. The findings are split up according to the three clusters in the case study report: marked based mechanisms, institutional arrangements, and financing mechanisms. Within each cluster, the main trends on mechanisms, stakeholders, and lessons learned are discussed.

5.1 Market Based Mechanisms

The dominant finance and funding instruments within the market based mechanisms are based on cost recovery and several forms of effect charging, all aimed to improve the financial performance of the operations. Throughout the cases, there is a trend noticeable regarding the actors involved. Although most mechanisms are aimed to recover costs from industry and citizens, the majority of market based mechanisms is initiated by public actors: local, regional or national governments. Especially the flood insurance category are in all three cases initiated by the national governments. Also in case of protecting water resources and environmental quality, governments take responsibility to arrange cost recovery mechanisms. Issues in relation to drinking water are accounted for by both governments and drinking water companies, also when the drinking water is in private hands.

Next to the observed trends on involved actors, there are also similarities notable in the lessons learned. Apart from the case specific preconditions for success, there are a number conditions consistent throughout all cases. Willing governance, sufficient monitoring, and political commitment and leadership are repetitive lessons learned as a consequence of the prevailing and successful government initiatives. Second, proper stakeholder communication and participation is highly valued in throughout the cases, mainly because of the diversity and number of stakeholders involved. Lastly, sufficient charges and incentives are often cited as a requirement to treat water to a decent desirable level, especially when dealing with industry wastewater.

Concluding, the main reoccurring lessons learned on market based mechanisms include:

- Willing governance, political commitment and leadership,
- Sufficient and fair monitoring,
- Proper stakeholder communication and participation, and
- Sufficient and realistic charges and incentives.

5.2 Institutional Arrangements

Institutional arrangements are aimed to result in funding sources from additional revenue streams, taxes or dedicated funds, to decrease risks or attracting private capital. A wide variety of different arrangements is included in the this chapter, ranging from privatisation to scaling, scoping and taxation. Next to individual cases addressed in the chapter, the main body consists of cases which seek connection to private actors and capital. The fact that Public-Private Partnerships (PPP) take up a large share of the cases indicates that the PPP is widely recognised as a promising contracting and funding arrangement in the water sector, both in developed as in developing countries. Scope extension and privatisation are arrangements that show similar incorporation of private actors. Scope extension projects are innovative arrangements which extent their 'business scope' by including revenues from non water services such as land development, land reclamation, urban development, and energy production. Whereas privatisation implies full private ownership.

Consequently, private stakeholders are more and more involved in institutional arrangements that seek additional funding sources and revenue, especially in the scope extension and PPP arrangements. Governments are still involved in these projects, but often take on the role of process facilitator, rather than process driver. Aid organisation and NGOs also engage in scoping by aiming for integral development approaches.

Securing the involvement of private capital is the main recurring theme throughout the lessons learned of the institutional arrangements. Cooperation with private partners can lead to significant (public) cost reductions and efficient management. However, the downside of cooperation with private actors is that private actors do exactly what they are paid for, but no more than that. Lessons learned therefore additionally include the need for strong monitoring mechanisms, sound performance indicators of quality specifications, and decent contracts. The reoccurring preconditions for effective institutional arrangements are therefore active multi-stakeholder engagement and capable and solid governments. Sufficient demand for urban development and traffic volumes in PPP and scope extension projects are furthermore an important precondition for success as these are required to balance the budget.

Concluding, the main reoccurring lessons learned on institutional arrangements include:

- Strong monitoring mechanisms, sound performance indicators of quality specifications, and decent contracts,
- Active multi-stakeholder engagement and capable and solid governance and governments, and
- Sufficient demand for the project's additional revenue sources (land reclamation, toll roads, urban development, tourism)

5.3 Financing Mechanisms

Financing mechanisms aim to attract more private finance in the water sector through innovative financing mechanisms aiming at reducing risks or losses, decrease transaction costs and diversification of risks. Mechanisms include revolving funds, blending instruments, and pooling assets. Revolving funds provide loans to water related projects at more favourable conditions compared to commercial loans. Additionally, constant replenishment of the revolving fund means that there is a constant amount of funding available. Blending mechanisms mobilise private capital through combining grants and government guarantees with repayable finance. Last, additional scale is reached by pooling asset classes and sizes in one fund. This enables more risk diversification and reduced transaction costs.

The main actors in these arrangements are aid and development banks, private banks, governments, and (local) NGOs, The (local) NGOs, take the role to connect the funds to local actors. These often use micro-credit like mechanisms to ensure sustainable development projects. In case of every development loan, it is important to account for a clear aim and goal of the fund or loan. There has to be a distinct market failure that is to be fixed with a particular finance arrangement, for instance a lack of finance for water and sanitation in slums. If not, favourable loans end up at places where they are not necessarily needed, resulting in unfair competition with private banks. Lastly, it is important that at least the majority of projects is profitable, private capital will probably be withdrawn from the funds.

Concluding, the main reoccurring lessons learned on institutional arrangements include:

- Favourable finance mechanisms should only be used to fix distinct market failures to prevent harm to the local financial system.
- A sufficient level of private sector expertise is required to sustain blending and pooling mechanisms.
- Initial finance to set up funds and loans with the backing of private or public actors is required.

6 References

Abou-Seada, M., C. Cooper, F. Ghaffari, R. Jones, O. Kyriacou and M. Simpson (2007) The Economic Consequences of Accounting in the English and Welsh Water Industry: A non-shareholder perspective. Retrieved via:

http://www.st-andrews.ac.uk/business/ecas/7/papers/ECAS-Cooper-et-al.pdf.

Abrami, G., N. Ferrand, S. Morardet, C. Murgue, A. Popova, H. De Fooij, S. Farolfi, D. Du Toit, W. Aquae-Gaudi (2012) Wat-A-Game, a toolkit for building role-playing games about integrated water management. *International Congress on Environmental Modelling and Software*. Retrieved via: http://www.iemss.org/sites/iemss2012//proceedings/E2_0811_Abrami_et_al.pdf.

ACTeon (2010) Economic Instruments for Mobilising financial resources for supporting IWRM – Additional information and illustrations for the OECD initiative.

Administrația Canalelor Navigabile (2016) Transit tariffs available from 01.07.2014. Retrieved via: http://www.acn.ro/index.php/en/transit-tariffs-available-from-01-07-2014

Administration du Genie Rural (2007) The Guerdane project. Retrieved via: http://siteresources.worldbank.org/INTMNAREGTOPWATRES/Resources/Guerdane.pdf

Antea group (2012) Colombia water sector market survey 2012. Retrieved via: http://www.partnersvoorwater.nl/wp-content/uploads/2012/09/2108993011_FinalReport_v_17.pdf.

Aquafed (2011) Uganda, Small Towns with private operators. Retrieved via: http://www.aquafed.org/pages/fr/admin/UserFiles/pdf/Uganda.pdf.

Asian Development Bank – Independent Evaluation Department (2009) Urban Sector and Water Supply and Sanitation in Bangladesh, An Exploratory Evaluation of the Programs of ADB and Other Aid Agencies.

Asian Development Bank (2009) Proposed Supplementary Loan Republic of the Fiji Islands: Suva–Nausori Water Supply and Sewerage Project. Retrieved via: http://www.adb.org/sites/default/files/project-document/64066/32200-02-fij-rrp.pdf.

Asian Development Bank (2012) China, People's Republic of: Henan Wastewater Management and Water Supply Sector Project.

Brocklehurst, C. and J.G. Janssens (2004) Innovative Contracts, Sound Relationships: Urban Water Sector Reform in Senegal. Water Supply and Sanitation sector board discussion paper series. Retrieved via: http://www.energytoolbox.org/library/incentive-based_operating_contracts/reference+background_documents/Innovative_Contracts_Sound_Relationships_Urban_Water_Sector_Reform_in_Senegal.pdf.

Brouwer, L. (2014) Public Private Partnerships in small town piped water supply. Retrieved via: http://dspace.library.uu.nl/bitstream/handle/1874/297352/Lotte-Marie%20Brouwer%20thesis%20IDS%202014.pdf?sequence=2.

Bennett, O., C. Alesi and P. Bolton (2013) Water bills – are they affordable to all? House of Commons Library. Retrieved via:

http://researchbriefings.files.parliament.uk/documents/SN06596/SN06596.pdf.

Blais, D. (2000) Tallahassee's Blueprint 2000 and Beyond. An analysis of a Citizen-Led Planning Effort. Retrieved via: http://consensus.fsu.edu/academic_directory/casestudies2000/Blais_Blueprint2000.pdf.

Burwell, K. and P.D.R. Lao (2004) Comparative competition in the water supply sector in the Lao PDR. 30th WEDC International Conference. Retrieved via: http://wedc.lboro.ac.uk/resources/conference/30/Burwell.pdf.

BusinessWire (2015) Fitch Affirms Leon County-Tallahassee - FL Blueprint 2000 Sales Tax Revs at 'AA'. Retrieved via: http://www.businesswire.com/news/home/20151005006458/en/Fitch-Affirms-Leon-County-Tallahassee-FL-Blueprint-2000.

Cabral, M. (2015) Presentation Laguna Lakeshore Expressway – Dike Project. Retrieved via:http://ibtta.org/sites/default/files/documents/2015/Dublin/Cabral_Maria%20Catalina_Full%20Version.pdf.

Caribbean Risk Managers Ltd. (2012) A Range of Approaches to Address Loss and damage at the Macro Level: Experiences and lessons learned from the Caribbean Catastrophe Risk Insurance Facility (CCRIF). Retrieved via: https://unfccc.int/files/adaptation/cancun_adaptation_framework/loss_and_damage/application/pdf/ekhosuehi_iyahen_ccrif.pdf.

Castro, V., N. Wsuya and C. Makoye (2009) Sustainable Community Management of Urban Water and Sanitation Schemes (A Training Manual). Retrieved via: http://www.wsp.org/sites/wsp.org/files/publications/africa_training_manual.pdf.

CCRIF (2015) About us. Retrieved via: http://www.ccrif.org/content/about-us.

CCRIF (2015) FAQ. Retrieved via: http://www.ccrif.org/faq-questions-inline?page=3.

Dasgupta, A., M. Singh Babel, X. Albert & O. Mark (2005) Water Sector of Bangladesh in the Context of Integrated Water Resources Management: A Review. *International Journal of Water Resources Development*.

DEFRA (2011) Work begins on new flood defence schemes. Retrieved via: https://www.gov.uk/government/news/work-begins-on-new-flood-defence-schemes.

DEFRA (2012) Waste water treatment in the United Kingdom – Implementation of the European Union Urban Waste Water Treatment Directive. Retrieved via: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69592/pb13811-waste-water-2012.pdf.

DEFRA (2015) Policy paper – 2010 to 2015 government policy: water and sewerage services. Retrieved via: https://www.gov.uk/government/publications/2010-to-2015-government-policy-water-and-sewerage-services/2010-to-2015-government-policy-water-and-sewerage-services

Department of Economic Affairs, Govt. of India (2010) Case Study 4: Salt Lake Water Supply and Sewerage Network. In: Public Private Partnership projects in India: Compendium of Case Studies

Department of Public Works and Highways (2014) LLEDP – A Public Private Partnership Project. Retrieved via: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/362691/UK-Transport-Solutions_DPWH-__Presentation_to_UK_Transport_Solutions_September_18.pdf.

Department of Public Works and Highways (2015) Public Private Partnership. Retrieved via: http://www.dpwh.gov.ph/PPP/index.asp.

Drinking Water Inspectorate UK (2015) About us. Retrieved via: http://www.dwi.gov.uk/about/index.htm.

Dutchwatersector (2014) Unesco-IHE leads public-private initiative to bring sustainable change in Mara river basin Kenya. Retrieved via: http://www.dutchwatersector.com/news-events/news/11136-unesco-ihe-leads-public-private-initiative-to-bring-sustainable-change-in-mara-river-basin-kenya.html.

DPWH (2016) Laguna Lakeshore Expressway Dike. Retrieved via: http://www.dpwh.gov.ph/PPP/projs/lled.htm.

DWP (2015) Safe and affordable drinking water solutions for everyone. Retrieved via: http://dutchwaterpartners.nl/#/front.

EC (2015) Kampala Water - Lake Victoria Water and Sanitation Sector (WATSAN). Retrieved via: http://ec.europa.eu/europeaid/blending/kampala-water-lake-victoria-water-and-sanitation-sector-watsan_en.

Ecorys (2006) Technical assessment for the development of Inland Waterway Transport Romania.

Ecorys (2012) Quick scan economic instruments integrated water management - Discussion note.

El Mahdi ARRIFI (2007) The Guerdane Irrigation Project. Retrieved via: Http://www.syngentafoundation.com/content/api/org_files/ppp_guerdane_morocco_mr_arrifi.pdf

Embassy of the Kingdom of the Netherlands (2013) Project Document for the Formulation of the Delta Plan Bangladesh 2100. Retrieved via: http://bangladesh.nlembassy.org/binaries/content/assets/postenweb/b/bangladesh/netherlands- embassy-in-dhaka/import/water-management/project-documents/bangladesh-delta-plan-2100/delta- plan-bangladesh-2100-final-project-document--28-may-2013.pdf.

EIB (2015) Kampala Water - Lake Victoria Water and Sanitation Project (Uganda). Retrieved via: http://www.eib.org/products/blending/mri/kampala-water-lake-victoria-water-and-sanitation-project-uganda.htm.

FEMA (2015) Hazard Mitigation Grant Program. Retrieved via: http://www.dhses.ny.gov/oem/mitigation/documents/hazard-mitigation-grant-program(HMGP).pdf.

Fernandes, G. (2015) Economics aspects in water management in Israel. Retrieved via:

http://www.water.gov.il/Hebrew/ProfessionalInfoAndData/2012/10-Israel-Water-Sector-Economics-Policy-and-Tarrifs.pdf.

Ferrand, N., S. Farolfi, G. Abrami and D. du Toit (2009) Wat-A-Game: Sharing water and policies in your own basin. Retrieved via: http://www.gwp.org/Global/ToolBox/Case%20Studies/Africa/Southern%20Africa.%20Innovative%20Methods%20in%20Water%20Management%20Decentralisation%20(%23387).pdf.

Ghesquiere, F. and O. Mahul (2010) Financial Protection of the State against Natural Disasters. Policy Research Working Paper 5429. the World Bank. Retrieved via: http://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-5429.

Gonga, S. (2011) Devolution Trust Fund Zambia. Retrieved via: http://www2.ohchr.org/english/issues/water/Iexpert/docs/StateActors/ZambiaHumanRightWSSGeneva2011.pdf.

Government of the Netherlands (2015) Roles and responsibilities of provincial government, municipal governments and water authorities. https://www.government.nl/topics/environment/contents/roles-and-responsibilities-of-provincial-government-municipal-governments-and-water-authorities.

H2O (2007) Thema opening Harnaschpolder. *H2O tijdschrift voor watervoorziening en waterbeheer*. Retrieved via: http://vakbladh2o.nijgh.nl/algemeen/pdf/h2o/h2o_2007_06.pdf.

Holland Trade (2015) Key sectors in the Netherlands, retrieved via:

http://www.hollandtrade.com/sector-information/water/water-technologies/?bstnum=4931.

Howarth, W. (2015) Cost Recovery for Water Services and the Polluter Pays Principle. *Pre-submission draft*. Retrieved via: https://kar.kent.ac.uk/23840/1/Pre-submission%20Draft%20Cost%20Recovery%20&%20Polluter%20Pays.pdf.

ICID (2010) Water Administration System (WAS). Retrieved via ttp://www.icid.org/ws1_2006.pdf

ITU (2010) ICT as an Enabler for Smart Water Management. Technology Watch Report. Retrieved via: http://www.itu.int/dms_pub/itu-t/oth/0B/15/T0B1500000D3301PDFE.pdf.

Interview (2015) Herman Mondeel, Witteveen+Bos.

Khoury-Nolde, N. (2015) Water resources, water costs and tariffs in Germany. Retrieved via: http://www.ime-medawater-rmsu.org/archive/projects/ZER0-M%20project/reports/01%20water%20in%20each%20country/Water%20costs%20and%20tariffs%20in%20Germany.pdf.

LAIF (2012) Operational Annual Report. Retrieved via: http://eucelac-bizsummit2015.eu/sites/default/files/LAIF_annual_report_2012_en.pdf.

Little, A. (2015) Israel's Water Ninja. Retrieved via: http://www.bloomberg.com/bw/articles/2015-01-08/takadu-helps-israel-be-a-most-efficient-water-manager.

Loughlin, C. (2012) Presentation Water Industry Experience in the United Kingdom. Retrieved via: http://www.jwwa.or.jp/english/kaigai_shiryou/IWA_workshop_7th_2-3.pdf.

Manila Water (2015) Manila Water Story. Retrieved via: http://www.manilawater.com/Pages/ManilaWaterStory.aspx.

McClain, M. (2014) Making Kenya's Mara river basin a model of sustainability for Africa and the world. Retrieved via: http://www.unesco-ihe.org/news/making-kenya%E2%80%99s-mara-river-basin-model-sustainability-africa-and-world.

MLIT (2011) Ubiquitous Flood Hazard Maps start in Takeo, spring 2011. Retrieved via: http://www.qsr.mlit.go.jp/takeo/english/eng_03/eng_03_02.html.

Möller-Gulland, J., K. McGlade and M. Lago (2011) EPI Water – Evaluating Economic Policy Instruments for Sustainable Water Management in Europe. Retrieved via: http://www.feem-project.net/epiwater/docs/d32-d6-1/CS14_Germany.pdf.

Mobile Water Management (2015) Game-changing monitoring method. Retrieved via: http://www.mobilewatermanagement.com/.

Minnatullah, K.M. and A. Orsola-Vidal (2009) Achieving the Water and Sanitation MDGs in Bangladesh. Water and Sanitation Program for South Asia. The World Bank.

National Water Commission (2011) Water Markets in Australia. Retrieved via: http://www.nwc.gov.au/__data/assets/pdf_file/0004/18958/Water-markets-in-Australia-a-short- history.pdf

Naughton, M. (2013) Innovative Ways to Manage Rural Water Supply – World Bank. Retrieved via: http://blogs.worldbank.org/water/3-innovative-ways-manage-rural-water-supply.

NWP and Vewin (2007) Holland Water Indonesia. Retrieved via:

http://www.partnersvoorwater2.nl/pdf_publicaties/2007-06_Holland_Water_Indonesie.pdf.

NWP, Joris van Oppenraaij (2016) Nieuwe financiële oplossingen voor watersector in Kenia. Retrieved via: https://www.nwp.nl/nieuws/weblog/nieuwe-financi%C3%ABle-oplossingen-voor-watersector-kenia

OECD (2010a) Taxation, innovation and the environment, OECD Publishing.

OECD (2011b) Environmental performance review: Israel 2011, OECD Publishing.

OECD (2012) A framework for financing water resources management.

OECD (2013) Water and Climate Change Adaptation. Policies to Navigate Uncharted Waters.

OECD (2013) Water and Climate Change Adaptation, policies to navigate uncharted waters.

OECD (2015) Isreal Water Resources. Retrieved via: http://www.oecd.org/israel/Water-Resources-Allocation-Israel.pdf.

OECD & World Water Council (2015) Water: Fit to Finance? Catalysing national growth through investment in water security. Report of the High Level Panel on Financing Infrastructure for a Water-Secure World.

Peters. R (2012) Factors that contribute to effective Dutch-funded international water projects – a case study: Banger Pilot Polder Project in Semarang, Indonesia. http://essay.utwente.nl/61728/1/MSc_R_Peters.pdf.

Pevensey Coastal Defence Ltd. (2015) Pevensey Bay Sea Defences. Retrieved via: http://www.pevensey-bay.co.uk/ppp.html.

Philadelphia, City of (2015) Residential Stormwater Billing. Retrieved via: http://www.phila.gov/water/wu/stormwater/Pages/ResidentialSWBilling.aspx.

Philadelphia Water (2015) Reduce Your Stormwater Fees. Retrieved via: http://www.phillywatersheds.org/whats_in_it_for_you/reduce-your-stormwater-fees.

Rappler News (2014) NEDA OK biggest PPP project: Laguna Lakeshore Dike. Retrieved via: http://www.rappler.com/business/industries/208-infrastructure/61224-neda-biggest-ppp-project- approved.

Rijkswaterstaat (2011) Water Management in the Netherlands. Retrieved via:

https://staticresources.rijkswaterstaat.nl/binaries/Water%20Management%20in%20the%20Netherlands_tcm21-37646.pdf.

Rodriguez, D.J., C. van den Berg and A. McMahon (2012) White Paper - Investing in Water Infrastructure: Capital, Operations and Maintenance. World Bank.

Rogers, P., R. Bhatia and A. Huber (1998) Water as a Social and Economic Good: How to Put the Principle into Practice. *Global Water Partnership*. Technical Advisory Committee.

RvO (2015) WaterHealth Ghana WASH Project. Retrieved via: http://www.rvo.nl/subsidies-regelingen/projecten/waterhealth-ghana-wash-project-2.

Steen, P.J.M. and P.H. Pellenbarg (2004) Water Management Challenges in the Netherlands. *Tijdschrift voor Economische en Sociale Geografie*. Vol. 95. Royal Dutch Geographical Society.

Stevens, R. and T. Fenn (2014) Funding Flood and Coastal Erosion Risk Management Maintenance: Learning from Existing and Past Practice. HaskoningDHV UK Limited – Rivers, Deltas & Coasts. Retrieved via: http://evidence.environment agency.gov.uk/FCERM/Libraries/FCERM_Project_Documents/fd2678_report.sflb.ashx.

Stormwater Report (2013) Five types of green infrastructure incentive programs. Retrieved via: http://stormwater.wef.org/2013/01/five-types-of-green-infrastructure-incentive-programs/.

Solutions for Water (2016) Public Private Partnership for the construction and management. Retrieved via: http://www.solutionsforwater.org/solutions/public-private-partnership-for-the-construction-and-management

Special Unit for South-South Cooperation (2015) Dakar, Senegal – Case Study Water. Retrieved via: http://www.esc-pau.fr/ppp/documents/featured_projects/senegal.pdf.

Tallahassee, City of (n.d.). Flooding in Tallahassee. Retrieved Fall, 2012, from

http://www.talgov.com/you/you-learn-waterfloodgen.aspx.

Tallahassee, City of and Leon County (2000) Retrieved via: https://www.genesisgroup.com/news_items/greening_vacant_lots-tallahassee.pdf.

Tchobanoglous, G., F.L. Burton and H.D. Stensel (2003) Wastewater Engineering, Treatment and Reuse. Metcalf & Eddy. 4th edition. Retrieved via:

https://courses.edx.org/c4x/DelftX/CTB3365x/asset/Wastewater_Lecture_Note.pdf.

Traidwheel (2015) Private Sector Participation: PPP contract for Waste Water Treatment Plant Harnaschpolder. Retrieved via: http://www.traidwheel.nl/appropriate-finance/innovative-business-models/Private-sector-participation.

UNEP (2015) Pilot demonstration of ecological and other decentralized sanitation in Bauang Municipality, Philippines. Retrieved via: http://www.unep.org/ietc/OurWork/OtherProjects/Ecologicalanddecentralizedsanitation/Pilotdemonstrationofecologicalsanitation/tabid/104207/Default.aspx.

United Nations Conference on Trade and Development (2011) Water for Food – Innovative water management technologies for food security and poverty alleviation. *Current Studies on Science, Technology, and Innovation*. No 4. Retrieved via: http://unctad.org/en/docs/dtlstict2011d2_en.pdf.

U.S. Department of Commerce – International Trade Administration (2005) Water Supply and Wastewater Treatment Market in China. Retrieved via: http://ita.doc.gov/media/Publications/pdf/chinawater2005.pdf.

Uswitch (2015) Water prices – how UK water rates are calculated. Retrieved via: http://www.uswitch.com/water/price-of-water/.

Van der Veeren, R. and X. Keijser (2011) Financing Water Resources Management in the Netherlands. *RWS Waterdienst*.

Vewin (2013) Reflections on Performance 2012. Association of Dutch Water Companies.

Water for People (2015) Malawi. Retrieved via: https://www.waterforpeople.org/where-we-work/malawi.

Water Research Commission (2009) SA's farmers are saving water. *Water Wheel vol. 8 no. 6*.

Wateraid (2016) Low-income customer support unit – case study Bangladesh

WHO (2015) Improving Nutrition Outcomes with better Water, Sanitation and Hygiene: Practical Solutions for Policies and Programmes. Retrieved via: http://www.who.int/water_sanitation_health/dwq/S19.pdf.

Witteveen+Bos (2015) Informatie Proefpolder Semarang. Retrieved via: http://www.witteveenbos.nl/nl/informatie-proefpolder-semarang.

World Bank (2011) Implementation Status & Results – Haiti Rural Water and Sanitation Project. Retrieved via: http://www-

wds.worldbank.org/external/default/WDSContentServer/WDSP/LCR/2011/09/06/456FC8B00F27B693852
57904000D8B32/1_0/Rendered/PDF/P0898390ISR0Di00620110131536247620 1.pdf.

World Bank (2012) Implementation Completion and Results Report. Retrieved via: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2012/07/31/000386194_20120731012634/Rendered/PDF/ICR23320P1080500disclosure070270120.pdf.

World Bank (2014) Caribbean and Central American countries teaming up for seismic and climate catastrophe risk coverage. Retrieved via: http://www.worldbank.org/en/news/feature/2014/04/21/caribbean-central-america-climate-catastrophe-risk-coverage.

World Bank (2015) Uganda Water Small Towns and RGC. Retrieved via: http://www.worldbank.org/projects/P102462/uganda-water-small-towns-rgcs?lang=en&tab=overview.

World Bank (2015) Fixing Senegal's Ailing Water Sector. Retrieved via: http://web.worldbank.org/WBSITE/EXTERNAL/EXTABOUTUS/IDA/0,,contentMDK:22229744~menuPK:4754051~pagePK:51236175~piPK:437394~theSitePK:73154,00.html.

WMO and Global Water Partnership (2008) Organizing Community Participation for Flood Management. Retrieved via: http://www.apfm.info/publications/tools/Tool_04_Organizing_Community_Participation_for_FM.pdf.

BASELINE STUDY: 26

Private Sector Engagement in Deltas

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Executive Summary : Study 26

Water sector in Bangladesh has been predominately led by the public sector. With increasing needs of the country, and growing gaps in public expenditure, the role of private sector has become significant. However, the private sector growth is constrained by a less than satisfactory investment climate as doing business in Bangladesh remains costly and lacks an effective structure of public private partnership. In recent times there has been a growing realization that involvement of the private sector in infrastructure investments and operations, including in the water sector, needs to be increased if the country is to meet the demands it faces in establishing strong infrastructure facilities.

Despite significant challenges in doing business, Bangladesh consists of large private sector entities who are already engaged in development of private economic zones, container terminals, carriers, cargo, ships and others. The water sector covers a range of different markets and themes, coupled by enormous opportunities.

Over the years, the Government of Bangladesh (GoB) has taken a number of measures to create an enabling environment for attracting private investments on a sustainable basis. Public Private Partnership (PPPs) has become a major area of focus within the national agenda, along with various measures in place. There are many challenges: Pricing and financing aspects, regulatory and legal framework, and competitiveness in bidding process, careful match between asset and liability and cash flow, and finally the reality issue on the country's perspective. The government has to review the financial and economic viability of a PPP project because success will depend largely on costing and pricing issue. In addition to this how revenue will be generated is crucial along with cost sharing where private sector lacks trust and unable to engage fully.

Water markets in Bangladesh, being one of the significant sectors for both livelihood and protection have demands and needs that far exceed the current expenditure and donor financing. It is here that private sector engagement, investment and opportunities for PPPs become even more significant. As part of Bangladesh Delta Plan 2100 vision for long term delta management framework, this section forms a centre piece for future outlook, long-term planning and sustainability. The Bangladesh economy has been growing at an average rate of 6.5% in the last decade. Growth of the manufacturing and services sectors is increasingly altering the structure of the economy. This growth has been driven by the private sector through the continued robust performance of exports in the face of a global economic crisis, particularly textile and apparel sector and remittances. In addition to this, the private sector has been engaged in large scale investments chiefly in Economic Zones, and other non-traditional sectors such as water markets. With a growing gap in public expenditure, there is a significant scope for private sector engagement through technology, financing and investment in the broader Delta Management scheme.

Over the past few decades government has taken several reform measures to ensure appropriate regulatory and incentive regimes in the textile and apparel, pharmaceuticals, shipping, and financial sectors, while ensuring stronger participation of the private sector in the economy. Compared to a decade ago the private sector in Bangladesh is now more robust and several business houses have become key players in the economy with significant investments, diversified portfolio, and employing a significant number of workers.

Although private sector has been a key player in Bangladesh's achievement of sustained economic growth, its involvement in the water sector has been limited yet vibrant. The water policy emphasizes private involvement in the water sector, but defines it in terms of providing specific services in carrying out public institution's mandates. Involving beneficiary groups and local community organizations in order to carry out O&M is included as a provision of the policy, as well as public water schemes that could be operated by the private sector through leasing, concession, or management contracts. The Water Policy does not mention the potential role of the private parties in financing or operating water infrastructure. A lack of clear policy and investment program by the government on PSP in the water markets is the principal reason for limited involvement of the private companies. Investment data regarding water markets is challenging to track – this is specifically true in case private sector engagement since there are no direct partnership between public and private sector in terms of financing and investment. On a national level, during 2007 to

2011, the government invested US$ 259.30 million (in constant 2010 US$) on average per year on water-related infrastructure and programmes. During the same period, social development assistance (ODA) gross disbursements amounted to US$ 177.69 million on average per year. Throughout this period, the government's total water-related investments accounted for an estimated 5.1 percent of the government's total expenditures. Over half of this government expenditure was channelled into water resources protection (25.1 percent) and disaster prevention and preparedness and flood prevention and control (23.9 percent). The disasters category received over half (52.3 percent) of the ODA disbursements during this period[5].During the period 2007 to 2011, government investments have been allocated mainly to water resource protection, disaster prevention and preparedness and flood prevention and control water resources policy and administrative management, and river development. Agricultural water resources received the lowest priority in government expenditures and ODA alike. Government budget and expenditure data is not available for certain water-related investment categories, namely basic drinking water supply and basic sanitation as well as hydroelectric power plants.

The overarching goal of the Bangladesh Delta Plan 2100 will have to include a long term strategy that broadly outlines the different interventions and measures that need to be taken to have an integrated and inclusive role of the private sector in the water markets. As Bangladesh makes strides towards the vision of becoming a middle-income country as outlined in Vision 2021 there are a number of vital steps that need to be enacted sooner rather than later. These interventions and measures are not things that will bring short run gains, instead they will prepare the ground for long term benefits that will have a cascade effect.

The draft strategy is outlined below and is broken down into six broad categories of interventions. These categories are not necessarily exclusive i.e. some interventions are a mix of two or more; but for the purposes of clarity they have been rolled up into one. All these interventions are linked and some of them can be considered critical for future growth. They types of interventions are as follows:

- Infrastructure: these interventions require physical and technical infrastructure to be built or established. Infrastructure includes land reclamation to training institutes or research laboratories
- Institutional: these interventions require establishment of new organizational arrangements and could entail aspects such as setting up new departments in existing institutions to reorganization and reforms. Institutional interventions may include the creation of new mandates for ministries to creating an established forum for public-private dialogue and research.
- Regulatory: these interventions require regulatory reforms, the passing of new acts and laws and policy changes
- Procurement: these interventions require reforms in relation to public procurement of technologies, establishment of innovation funds etc.
- Knowledge: these interventions are knowledge gaps and research topics covering everything from primary and secondary studies to product development and cutting edge technology research and development
- Financing: these interventions focus on establishing or fine-tuning financing mechanisms to creating highly favourable foreign investment climates in particular.

The strategy has been broken down into short run (2016-2030) and medium run (2030-2050) interventions. The strategy is outlined below;

[5] UN COUNTRY BRIEF 2011, Bangladesh

The Short Run: 2016 to 2030

Initially what the strategy calls for is the establishment of a Delta Fund and the Project Cell. Market Consultations would lead to filling up some of the knowledge gaps and research needs. Following the establishment of the Delta Fund, Institutional Engagement on Information is needed to identify more research topics and knowledge gaps.

Given Government's recent announcements, and clear scarcity of land, we have identified land reclamation process to start around this time which will lead the establishment of Economic Zones and private sector engagement possibilities in other industrial activities. Market Consultations will establish the most necessary infrastructure interventions required the institutional engagement and information with the Delta Fund should lead to more public-private dialogue. After this ground is prepared, a knowledge portal with an online information system would lead to more streamlined and coordinated research being done on the various aspects of the water market with the view to expand the role of the private sector

To effectively engage the private sector, Innovative models of Financing are very important. These include areas such as revolving fund and other forms of financing such as matching grants, innovation fund to kick of pilot programmes in relation to water markets.

At this stage emphasizing Risk Mitigation Practices that will allow private sector players of all sizes to effectively and efficiently engage in Risky water markets would need to be established and this is more of a knowledge agenda item or intervention that will lower the costs of private sector engagement and investment in the water markets. This could lead to contracting opportunities for smaller-scale players and eventually improve the existing market so that there is more scope for foreign investment. Foreign investment would require a good deal of infrastructure Support Services, e.g. business houses, research and development firms, and other management consultancy firms.

Targeted regulatory reform need to be implemented in order to make the markets much more attractive to the private sector. Some of these regulatory reforms could include a simplified revision of the PPP Law 2015 or could include more refinements of the PPP regulatory systems in order to attract small-scale PPP. This would encourage a large number of smaller firms to engage in the various water market segments improving the level of skills and technology that is available. At the same time with the attraction foreign investment you also have the possibility of international technology transfer which will lead to more competitive and effective markets.

In relation to PPPs we understand that the country should move towards development of DBFM(O) standard model which is further outlined in the report.

The Medium Run: 2030 to 2050

In terms of knowledge interventions, water saving practices will need to start coming into effect in the early 2030s. This is mainly because by that time water scarcity is going to start becoming a problem for industrial firms and the adoption of water saving practices will lead to new water-saving industrious growing in response to demand. The next stage would be a proliferation of sustainable water use practices followed by in the long run with restorative water use practices. In line with growing demand and awareness of the importance of treating water as a valuable and expensive resource, new firms that offer these kinds of services (everything ranging from factory retooling, to management reorganization will be in high demand by the medium run period)

Diplomatic and inter-governmental agreements and efforts should lead to trans-boundary agreements on water sharing and Water Resources. These trans-boundary agreements should smooth the way for long-term planning to be effectively done

In the early 2030s, wide scale PPP engagement should become more common, especially in ports and shipping infrastructure. Alongside International Market promotion in decentralized Water Management practices should bring in further foreign investment.

Regulatory reform, more specifically in terms of a Water Tax and improved regulations and certifications should improve the available funds for water market interventions.

In order to ensure greater PSP and a better enabling environment in the water sector it is important that a forum for dialogue and discussions between the public and private sector is established. It would be beneficial to have this forum only focused on the water sector and not developed around a general public private forum, whose establishment at this stage may be more complex and difficult. GED should support the secretariat of such a forum and assist in its organization and deliverables.

As a final contribution this report distils from the above a range of primary recommendations for the Bangladesh Delta Plan 2100 to, over time, successfully engage the private sector in forms of PPP, based upon a preliminary understanding of the current political, commercial and legal environment in Bangladesh.

1. Introduction

Bangladesh is the largest River Delta in the world. Situated between the Himalayas and the Bay of Bengal with three major rivers and an extensive network of 700 rivers, water of Bangladesh is a major resource that needs management and more importantly, strategic investments. In Bangladesh water provides livelihood to millions of people and contributes significantly to economic growth. Over the last four decades, the government has adopted considerable efforts with support from donor and multilateral financing organizations to manage Bangladesh's water resources and water use to sustain a fragile environment.

Water sector in Bangladesh, while vast, has been predominately led by the public sector. With increasing needs of the country, and growing gaps in public expenditure, the role of private sector has become significant. However, the private sector growth is constrained by a less than satisfactory investment climate as doing business in Bangladesh remains costly and lacks an effective structure of public private partnership. In recent times there has been a growing realization that involvement of the private sector in infrastructure investments and operations, including in the water sector, needs to be increased if the country is to meet the demands it faces in establishing strong infrastructure facilities.

Despite significant challenges in doing business, Bangladesh consists of large private sector entities who are already engaged in development of private economic zones, container terminals, carriers, cargo, ships and others. The water sector covers a range of different markets and themes, coupled by enormous opportunities.

Over the years, the Government of Bangladesh (GoB) has taken a number of measures to create an enabling environment for attracting private investments on a sustainable basis. Public Private Partnership (PPPs) has become a major area of focus within the national agenda, along with various measures in place.

There are many challenges: Pricing and financing aspects, regulatory and legal framework, and competitiveness in bidding process, careful match between asset and liability and cash flow, and finally the reality issue on the country's perspective. The government has to review the financial and economic viability of a PPP project because success will depend largely on costing and pricing issue. In addition to this how revenue will be generated is crucial along with cost sharing where private sector lacks trust and unable to engage fully.

Water markets in Bangladesh, being one of the significant sectors for both livelihood and protection have demands and needs that far exceed the current expenditure and donor financing. It is here that private sector engagement, investment and opportunities for PPPs become even more significant.

As part of Bangladesh Delta Plan 2100 vision for long term delta management framework, this study forms a centre piece for future outlook, long-term planning and sustainability.

1.1 Objectives

As outlined above, water sector is traditionally dominated by a long standing legacy of public sector engagement and ownership. Private sector is needed for other ways of thinking and acting, new knowledge, additional financial resources coupled by innovation. Execution of BDP 2100 investment portfolio will be a huge task and this study provides the foundation for engaging private sector to bridge the gap under the Delta management framework.

The objective of this study is to provide:

- An overview and analysis of the private sector market in Bangladesh
- Identification of key market segments that are critical in the long-term planning process
- Assessment of existing PPP framework and status in Bangladesh
- Best practices from Netherlands to encourage new arrangements with new contracting concepts
- Recommendation to steer water markets towards innovation, technology transfer and PPPs

1.2 Approach and Methodology

This Private Sector Participation (PSP) analysis was conducted using:

- **Identification of water market segments:** The water sector covers a range of areas and it was important to develop specific boundaries and definition of specific markets. This was done through one-on-one consultations, pilot testing and comprehensive assessment of the market. The final selection was based on relevance to large scale investment and PPP opportunities. The selection below is based on:
    - Relevance to thematic areas within the BDP2100
    - Clear PSP/engagement that exists in Bangladesh currently
    - Determination of potential investment projects where PSP is necessary

The water sector covers a range of different markets and themes. The water sector is defined by positing an outline of the water chain and combining product types such as services, works, and goods/supplies. These water market segments include:

Water Chain	Market segment
Water Resource	▪ Surface water ▪ Ground water ▪ Water Harvesting
Water use (consumptive)	▪ Drinking water ▪ Industrial water ▪ Agricultural water
Water use (non-consumptive)	▪ River ▪ Sea Transport ▪ Fisheries
Discharge	▪ Sewerage ▪ Drainage ▪ Waste Water

The focus was to:

- ✓ Clarify the areas of opportunities
- ✓ Understand key modalities for engagement
- ✓ Understand Unique Selling propositions for each areas/boundaries
- ✓ Understand preconditions (regulations, transparency, among others)
- ✓ Brainstorming for out-of-the-box and innovative ideas for engagement

- **Development of questionnaire:** The questionnaire (Annex 1) consists of several parts such as characteristic of the company or Business, positioning, and a set of issues related to the opportunities and challenges of the water sector in Bangladesh. In addition, we attempted to explore market opportunity perceptions, barriers to present operations and market entry, market entry strategies, risk mitigation, competition, support measures among others.
- **Technical transformation:** The final questionnaire was transformed as an internet based survey. This survey could be accessed by a link and could only be used once. It is important to note that this was more in case of private sector companies who were not available to meet in person. For majority, we focus on face to face consultations or where not possible via telephone
- **Sample frame:** Initially it was expected that a sample size of 200 to 350 would give the best understanding of the trends and perceptions. The initial sample frame constructed comprised of 240 firms. This sample frame was created using a variety of different sources e.g. business registries, yellow pages, member lists of relevant trade associations, contractor lists from government agencies (these were outdated). After this, the second phase was to determine the size of the companies (i.e. the second criteria). This was done via initial telephone conversations with each of the companies in the sample frame to determine the correct water market segment and size of the company. However it was found that given the requirements of respondent selection, i.e. the companies selected

for the interview had to be in the requisite water market segment and of medium to large size, it was exceedingly difficult to find companies that met the criteria.

- **Scope:** The overall PSP assessment included medium to very large private sector players. The PSP survey was targeted at specifically medium to large private sector water market players.
- **Pilot testing:** Pilot test was carried out with a total of 76 firms, based on which the questionnaire was further refined. For some of the market segments (such as Waste Water Treatment) there were only a few companies that fell within the medium to large band; either the majority of the companies were below the medium size band or fell into the very large size band. For other water market segments, such as riverine transport, the nature of the market itself resulted in most companies being homogeneous. This meant that it was not useful to expand the sample size as the results were very similar.
- **Consultations:** One-on-one consultations with large private sector players. The consultations followed a structured questionnaire and combination of open ended questions. After initial piloting and refinement (and non-responses), a total of 76 companies were interviewed via in-depth face to face interviews. The interviews lasted on average, two and a half hours.
- **Survey:** A survey following structured questionnaire method that was utilized for face-to-face meetings. The questionnaire itself consisted of a combination of closed and open-ended questions. Given that these were mainly perception and knowledge based questions, a significant portion of the questions were expected to be qualitative in nature.
- **Analysis:** The quantitative results was analysed, complemented and followed up with more in-depth one-on-one consultations with CEOs or managers of the private sector entities
- **Best practice assessment:** A case for PPP framework was used – in this case Netherlands was used a best practice case, due to the relatively emerging PPP market
- **Validation:** A validation workshop consisting of 50 participants representing private sector, Banks, public sector, donors and other actors took place to validate the initial findings in August 2015.

The results and questionnaires are included the in the relevant annexes. This output will assist us not only detailing out modalities for private sector engagement within the overall Delta vision but also assist us in identifying and facilitating two large investment programs.

1.3 Limitations of the Study

While this study has been comprehensive in various ways, there are specific limitations:

- Small sample of survey due to budget limitations
- Time limitations: This study was prepared following an assessment carried out in six months, while the coverage of this report has been comprehensive, it should be treated as a living document and a foundation for analysis on specific bankable segments.
- Confidentiality: This assessment was carried out with a number of reputed and large scale companies in Bangladesh. The team would like to maintain confidentiality in relation to specific details per company in relation to specific quotes, pricing and confidential information. Attempts have been made cover the key aspects of each segment, without mentioning specific names, where sensitive information is connected.

Part I: Private Sector in Bangladesh Water Markets

2 Private Sector in Bangladesh

Bangladesh economy has been growing at an average rate of 6.5% in the last decade. Growth of the manufacturing and services sectors is increasingly altering the structure of the economy. This growth has been driven by the private sector with continued robust performance of exports in the face of a global economic crisis, particularly textile and apparel sector and remittances. In addition to this, private sector has been engaged in large scale investments chiefly in Economic Zones, and non-traditional sectors such as water markets. With growing gap in public expenditure, there is a significant scope for private sector engagement through technology, financing and investment in the broader Delta Management scheme.

Over the past few decades government has taken several reform measures to ensure appropriate regulatory and incentive regimes in the textile and apparel, pharmaceuticals, shipping, and also financial sectors, as well as ensuring stronger participation of the private sector in the economy. Compared to a decade ago the private sector in Bangladesh is now more robust and several business houses have become key players in the economy with significant investments, diversified portfolio, and employing a significant number of workers.

> "We are just as many describe Bangladesh - a resilient player. Despite enormous challenges and barriers, we continue to engage and continue to contribute to the growth of this economy. Of course, water market is a public good but the need in this market is enormous. Given appropriate support and regulation, we will be more than interested to contribute. We are yet to see actions and frameworks in concrete terms. These must be in place, for us to invest and commit."
>
> *Quote from one of the largest private sector operator in Bangladesh*

Although private sector has been a key player in Bangladesh's achievement of sustained economic growth its involvement in the water sector has been limited yet vibrant. The water policy emphasizes private involvement in the water sector, but defines it in terms of providing specific services in carrying out public institution's mandates. Involving beneficiary groups and local community organizations in order to carry out O&M is included as a provision of the policy, as well as public water schemes that could be operated by the private sector through leasing, concession, or management contracts. The Water Policy does not mention the potential role of the private parties in financing or operating water infrastructure. A lack of clear policy and investment program by the government on PSP in the water markets is the principal reason for limited involvement of the private companies.

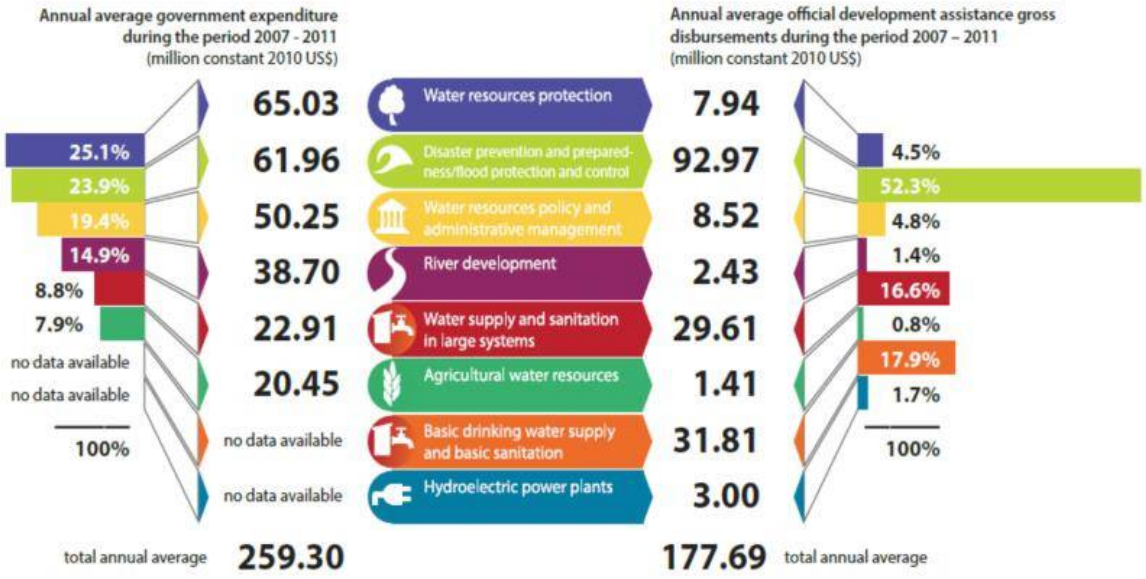
2.1 Investments in Water Markets

Investment data regarding water markets is challenging to track – this is specifically true in case private sector engagement since there are no direct partnership between public and private sector in terms of financing and investment. There, we provide separate overviews of private and public sector investments. On a national level, during 2007 to 2011, the government invested US$ 259.30 million (in constant 2010 US$) on average per year on water-related infrastructure and programmes. During the same period, social development assistance (ODA) gross disbursements amounted to US$ 177.69 million on average per year. Throughout this period, the government's total water-related investments accounted for an estimated 5.1 percent of the government's total expenditures. Over half of government expenditure was channelled into water resources protection (25.1 percent) and disaster prevention and preparedness

and flood prevention and control (23.9 percent). The disasters category received over half (52.3 percent) of the ODA disbursements during this period[6].

While there is not a long historical trend available on water-related investments data in Bangladesh, during the period 2007 to 2011, government investments have been allocated mainly to water resource protection, disaster prevention and preparedness and flood prevention and control water resources policy and administrative management, and river development. Agricultural water resources received the lowest priority in government expenditures and ODA alike. Government budget and expenditure data is not available for certain water-related investment categories, namely basic drinking water supply and basic sanitation as well as hydroelectric power plants. Although more recent data in relation to investments is not available, the table below provides an indication that this has been consistent and on the rise in the years 2012-2015.

Table 1 Annual Average expenditure (UN COUNTRY BRIEF 2011)



2.2 Public Sector and Policy Issues

One cannot see the water sector in Bangladesh without looking at the long standing legacy of the public sector. The public sector within the water market plays a dominant role in overall planning, design, and implementation of programs and projects. In the majority of the cases, the agencies within the public sector act as the regulatory body and ensure the management and operation of relevant activities. Public sector is directly and indirectly involved in the planning, programming, management and operations of all activities for water resource management, water and sanitation supply, flood protection and drainage, and coastal zone management.

It also through its policy and regulatory roles impact other areas such as shipbuilding, inland water transport, tourism, wastewater, and water treatment where increasingly private sector engagement is seen. A large number of departments and agencies supporting 10 different ministries have shared responsibility for such an extensive engagement of the public sector. It is to be noted that success has been achieved in terms of managing cyclones and disasters, tackling

[6] UN COUNTRY BRIEF 2011, Bangladesh

emergency issues, establishing decentralized planning and community based participation that has increased accessibility of water and sanitation services.

However, performance of most agencies is challenged by lack of resources and governance remains weak. Before we provide an overview of private sector and it's existing role, the below outlines some critical issues relating to public sector institutional performance.

- Until recently even within areas of the water sector such as inland waterways, wastewater, tourism, the public sector is engaged in direct management and operations. Private sector contractors are engaged in works and services mostly restricted to small-scale contracts awarded to small and medium size firms. Selection of contractors/service providers is based on low cost proposals resulting in low quality construction and maintenance works. Where large-scale schemes exist, for example in case of BWDB and BIWTA, contracts are fixed terms and there is a tendency to break the overall value into smaller parts. A lack of forum to hold dialogue with private sector operators exacerbates a long-tradition of distrust between the two parties making it difficult to jointly pursue challenges of and solutions for the water sector by attracting private sector management and finance.
- The PPP Act is still at draft stage as outlined in further detail section 6. Without a strong PPP law or pertinent regulation that underpins any envisaged PPP it still is not sure how much of investment in infrastructure, particularly in the water sector could be attracted. There are several PPP frameworks arrangements being implemented such as in power generation (IPP), central effluent treatment plants in Export Processing Zones, water treatment plants, and these may provide further boost and lessons for increased PPP arrangements in water infrastructure projects.
- Although private sector has been a key player in Bangladesh's achievement of sustained economic growth its involvement in the water sector has been limited. The water policy emphasizes private sector involvement in the water sector essentially to provide specific services in carrying out public institution's mandates. It does not mention the potential role of the private parties in financing or operating water infrastructure. A lack of clear policy and investment program by the government on PSP in the water markets is the principal reason for limited involvement of the private companies. Findings from the market research indicate substantive involvement of the private sector in non-consumption areas such as in shipbuilding, river port and transportation, dredging, industrial wastewater treatment, water-based tourism, pump technology, and water treatment. Commercial prospects and increased growth in those markets are attracting private sector activity and interests with the ability to provide better technology, management, and financing. In the traditional water sector such as water resources, coastal zone management, drinking water and sanitation, flood protection and drainage private businesses provide consultancy services and contract works and that will continue in the future. Unless there is a change in business models under which the public sector operates the above sectors and fair and transparent procurement processes are established private sector participation in traditional water sectors would remain local and within small and medium size contracting companies and drive out the large scale players that exist in the market.
- A sound enabling environment and investment climate is key to attracting any foreign investment, including Dutch private sector investments. Bangladesh has a good investment code comparable to regional country codes and it has appropriate incentive structures in place to attract foreign investment. There are though several investment climate constraints that thwart increased foreign investments in the country. Lack of serviced land and availability of land at an economic price, increased shortage of electricity, gas, and water, poor road network and transportation, difficulties with financial transactions such as L/C guarantees, customs regulations, all are contributing to a low level of investments, poor image that is further exacerbated by unstable political and security issues. With increased level of foreign investments in the country exploiting its comparative advantage of inexpensive labor, strategic location, and a long-term growth prospect, the removal of investment climate constraints could usher the country in sustainable growth path. The investment climate constraints that has created an image of the country as a difficult place to work in and operate impacts the perceptions of the International private sector.

2.3 Market segments

The water sector covers different water market segments and themes. In developing a long-term partnership on delta management between the Governments of the Netherlands and Bangladesh, it is clearly important to define the areas and themes of the water sector where cooperation would result in feasible and viable outcomes, specifically in relation to PPPs. Although within the scope of BDP 2100, the water sector includes a wide range of areas such as river/water management, and drinking water supply and sanitation (surface drainage, solid waste, and sewerage), and others, there was a need to identify specific markets where Private Sector Participation (PSP) is significant. To assess the PSP, a typology was produced to understand the levels of engagement and specific opportunities for long term investments. The typology as outlined in table 3, further allows investigations of the:

- Operation by the Bangladeshi private sector in specific markets and products;
- Levels of engagement in the form of Large (L), and medium (M) scale of operation
- Quick scan of the specific market in order to assess product types, market opportunities, market specific incentives and barriers;

Before we move into the specific typologies and analysis of the findings of the private sector survey, we have highlighted the most significant and priority sector where private sector participation is significant, both in terms of scale, operation, contribution to growth and finally in relation to upcoming investment opportunities.

Based on analysis of quantitative data and in-depth research in water market, our finding reveal that the key segments of private sector participation include:

- Dredging
- Shipbuilding
- River Port
- Inland Water Ways
- Flood Protection and Drainage
- Land reclamation
- Agriculture

2.4 Key segments of private sector participation:

Section 2.4 provides a snap shot of private sector engagement across all market segments through the analysis of our survey. This section details out the key segments that are have a direct link with large scale interventions. These sectors, due to their characteristics, high levels of investment, present the strongest opportunities for PSP and possible long-term PPP arrangements.

2.4.1 Dredging

Dredging has an important role in all works connected with flood control, drainage and irrigation. The PSP survey revealed significant levels of private sector engagement in this area- an analysis of responses are provided in the next section. While different sources have identified dredging as a priority agenda for poverty alleviation and ensuring food security, dredging has only received due importance from 2010, following government's initiative in chalking out a BDT 12,000 crore equivalent to € 1,270 million (project for dredging more than 300 rivers within the next eight years), as the length of navigable waterways in the country nearly halved in just two decades. The project proposal of Bangladesh Inland Water Transport Authority (BIWTA) titled Capital Dredging on Inland Waterways which was approved by the Planning Commission in July 2009 for implementation in two phases, identified 2,393km of waterways on 53 major river routes for dredging, to improve and restore navigability by 2018. The first phase that started in January 2010 and

concluded by December 2013, marked 24 routes for dredging at an estimated cost of Tk 4,201 crore (€440 million). The second phase, which was scheduled to start in January 2014 and to be concluded in December 2018, planned to dredge 30 river routes at an estimated cost of Tk 7,271 crore (€770 million). With this significant pipeline of projects, it was estimated that at least 100 dredgers are needed. The government itself has approximately 18 dredgers, while the private dredgers have a total of twelve dredgers. In 2013, the private companies operating in the dredging market were expecting business worth BDT 15,000 crore (€1,590 million) in the coming years, as mentioned by the large private sector groups. In response to this expected expansion, a number of companies bought a fleet of dredgers from Netherlands and USA. However, according to private sector responses, a number of these estimated projects have not materialized or have been broken down into small contract sizes. BIWTA, which is the key government entity for such procurements, despite the planned schedule, have not moved forward with one fourth of the planned investment, leading to significant losses among the private sector. The private sector sold off their cutter suction dredgers 20" and 24" made by IHC Holland to India and Malaysia due to lack of dredging jobs.

The private sector dredging market has for around a decade been operated by major players, namely: Abdul Monem Ltd., Bongo Dredgers Ltd., SS Dredgers &Engineers Co. Ltd., Reza Construction Ltd., and Pacific Marine Ltd. In spite of the presence of such key players in the private sector dredging market, the private sector has yet not been able to provide sufficient dredging services for national projects because international tender for such projects have been floated requesting bidders with 10 years' qualification in government dredging projects and a bidding rate of **BDT 120 per cubic metre**. Such qualification requirements have made it difficult for the local private companies operating in the dredging market to bid for government projects. SS Dredgers & Engineers Co. Ltd., a strong player in the dredging market, informs that there has been hardly any fund or activity for dredging in the past few years.

> *"Once the government announced the need for dredging in 2012, we immediately started large scale investment. But, there were hardly any activity moving forward at the pace it was planned, which meant we did not have any returns on our investments. Many of us had to sell our dredgers due to serious losses"*

Bangladesh Water Development Board (BWDB) has also not been able to operate efficiently since out of the 15 dredgers (each measuring 18") only five to seven are operational. In a letter recently addressed to the Prime Minister, the private Cutter Suction Dredger Owner's Association of Bangladesh requested for tenders with suitable sized dredging packages which will allow local dredging companies to qualify for bids and carry out dredging activities throughout the year, and increase the existing dredging rate per cubic meter as offered by different public organizations. Large initial investments in purchasing dredgers (BDT30 crore, equivalent to € 3.2 million, per dredger) and a high interest rate (13%) make financing of dredging operations costly for the private sector. In the letter to the PM requests were made for lower interest rate and reduction in duty and taxes (by announcing dredging as a separate industrial sector) for the purchase and procurement of more dredgers. While reduction in duty and taxes have materialised following continuous lobbying, there is a need for efficient planning and implementation process.

Due to lack of resources in the principle government agencies and the inherent demand that exists for flood control, drainage, irrigation among others, the key will be to engage these large scale Bangladeshi Private Sector players in smooth, efficient and quality dredging activities.

2.4.2 Shipbuilding

Bangladesh is a maritime nation with 166,000 2 km area of sea and about 90% of all foreign trade is moved by sea transportation. There are some 200 shipbuilding and repairing yards in various locations in the country. Much of these shipbuilding yards are engaged in building and repairing small inland and costal vessels up to 3,500 DWT. About 90

percent of all foreign trade is moved by sea transportation. There are some 200 shipbuilding and repairing yards in various locations in the country. Much of these shipbuilding yards are engaged in building and repairing small inland and costal vessels up to 3,500 deadweight tonnage (DWT.), while several modern and internationally standard shipyards are building small-sized ships for exports. There are 124 registered shipyards in Bangladesh. Some nine to ten of those shipyards are ready for construction of ships (small and medium size) of international standards. Most others are repairing yards and cater to the domestic market. More than 8,000 inland/coastal ships ply through its rivers carrying more than 90 percent of total oil product, 70 percent of cargo and 35 percent of passengers.

Table 2 Number of Inland/Coastal ships in Bangladesh

Type of Ships	**Number**
Cargo	2321
Sand Carrier	3436
Passenger Carrier	974
Barge & Dumb Barge	192
Dredger	742
Tug Boat	79
Oil Tanker	192
Speed Boat	210
Others	135
Total	8281

Approximately 70 percent of the shipyards are located in and around Dhaka and Narayangong along the side of the riverbanks of Buriganga, Shitalakha and Meghna. About 20 percent shipyards of Chittagong division are located along the side of River Karnaphuli and 6 percent are located along the bank of River Poshur of Khulna division and remaining 4 percent are located in Barishal division. During the past decades two local shipyards, Ananda Shipyard, Slipways Limited and Western Marine Shipyards Limited, developed shipyards with the ability to manufacture ships of 10,000 DWT and they are expanding their facilities to upgrade to 25,000 DWT. Currently, About 7 percent of the 124 shipyards have the capability to entertain quality shipbuilding. Another 19 percent of the shipyards will be ready for construction of ships (small and medium category) of international standard with some renovation and expansion program and also improvement of the organization, especially quality management system.

> *"We have been operating in this sector for decades, and we have the required investments and technology. The key for us is the support and commitment. We are ready"*

A number of diversified types of vessels such as: multipurpose vessel, fast patrol boat, container vessel, cargo vessel, tanker, dredging barge, ro-ro ferry, passenger vessel, landing craft, tourist ship, tug, supply barge, deck loading barge, pleasure craft/yatch, crane boat, speed boat, deep sea trawler, self-propelled barge, inspection vessel, cargo coaster, troops carrying vessel, double decker passenger vessel, hydrographic survey boat, pilot boat, hospital ship, water taxi, pontoon, are built in various shipyards in Bangladesh. The order so far received from overseas countries mainly is for multipurpose cargo ship. Other types include container ship as well as ferry, landing craft, water taxi, floating reception vessel.

The major players in the industry are:

- Ananda Shipyard and Slipways Limited

- Western Marine Shipyard Limited
- High Speed Shipbuilding & Engineering Co
- Khan Brothers Shipbuilding Ltd
- Meghna Ship Builders and Dockyard
- Dockyard & Engineering Works Limited

In addition to the above, a key new entrant in the market is the AK KHAN Transport and Logistics that is set to engage in large levels of investments in inland water-ways. The sector has grown significantly during the past few years which is reflected by the fact that a number of new shipyards have been built. However, because of the European economic crisis that came around the time when the construction of the shipyards was completed, work orders for ships stopped. This temporarily put a dent to the planned investments and investors were being cautious of making further investments not until clear signals on the economic recovery of Europe was well established. In the past few years, following moderate recovery from the crisis, there has been renewed interest in the sector, and the estimated amount of investment is expected to grow. There is also future potential for the shipyards in Bangladesh including within the small ship sector. Even if any FDI or JV is created, they will perhaps only be focused on small ships and container terminals. With growth in the global economy and the domestic market it is expected that investments in shipyards will be robust in the near future.

2.4.3 Other modes in Inland water ways

Inland waterways in Bangladesh cover some 11% of its total surface area. With some 700 rivers and tributaries and 24,000 km long network Bangladesh has one of the largest inland waterways networks in the world. A developed Inland Water Transportation (IWT) could substantially contribute to economic growth, bring rural households within reach of easy transportation facilities, and play a strong role in the transport sector of the country. Despite it being such an asset very little has been done to develop and maintain IWT. Over the past two decades IWT cargo traffic has stagnated, passenger traffic has decreased at 1.3% per year, and the waterways network has dwindled to some 6,000 km. Studies reveal that IWT is a less expensive mode of transport compared to rail and road5. Considering the facts of low land-man ratio and scarcity of land for further expansion of road networks in the country, IWT will gain importance. The Dhaka-Chittagong economic corridor contains 32% of population, generates 50% of GDP, and about 85% of the country's international trade through the Chittagong Port. A report by the Asian Development Bank (ADB) also stated that Bangladesh could raise its GDP by 1% and foreign trade by 20% if the inland water transport logistics systems are made efficient and competitive.

Assessments reveal that BIWTC currently operates 47 ferries in different routes, and ocean shipping performs 80% of the export-import trade. The IWT sub-sector suffers from (i) siltation problem in inland waterways, (ii) day & night navigational problems of waterways, (iii) shortage of passenger & cargo handling facilities including transit sheds at river ports, (iv) presence of manual loading/unloading of cargo at river ports, (v) underdeveloped rural launch landing stations, inadequate number of river and ocean going water crafts, etc. Inland ports have been inadequate and in poor condition, while rural landing facilities - pontoons and jetties – are scarce compared to the needs. The private sector plays a dominant role in the country boat sector and passenger and freight services on the main river ways, but the public sector has a virtual monopoly for ferry services. There is ample scope for private sector participation in providing ferry services.

There are three main ports in Bangladesh: Chittagong, Mongla, and Dhaka–Narayanganj, with 80% of the trade flowing through the port of Chittagong. Chittagong Port is an integral part of the sub regional transport and logistics chain connecting north-eastern India, Bhutan, and Nepal to Europe, North America, and Southeast Asia. The efficiency of the transportation system in the Dhaka–Chittagong corridor and the port of Chittagong in particular, is considered vital for sustained economic growth9.

More than a third of the Bangladesh's economic activity was located within the Dhaka–Chittagong corridor, where the bulk of international trade through PSP is generated. Three modes of transport serve the corridor—road, rail, and inland waterways, which together account for 20 million tons of freight annually. There are three main ports in Bangladesh: Chittagong, Mongla, and Dhaka–Narayanganj, with 80% of the trade flowing through the port of Chittagong. Chittagong Port is an integral part of the sub-regional transport and logistics chain connecting north-eastern India, Bhutan, and Nepal to Europe, North America, and Southeast Asia. The efficiency of the transportation system in the Dhaka–Chittagong corridor and the port of Chittagong in particular, was considered vital for sustained economic growth.

Container dwell times at Chittagong Port remain to be high, and continue to follow an upward trend due to manual operations management and document processing methods. Under the manual methods, documents passed through various stages, requiring 48 endorsements, which increased dwell times and created opportunities for corruption. The manual container tracking system delays container movements in the yard. Without information technology, berth productivity was expected to further decline and add to shipping costs. Even with a computerized port management system, a few customs processing rules in force could limit port capacity. Delays on taking delivery of import cargoes and the inefficient auctioning rules of the Customs House of Chittagong (CHC) for unclaimed consignments added to container dwell times.7

In the year 2000, a **National Shipping Policy** was adopted to introduce reform and private sector participation (PSP) in development of ports and inland waterways. The projected container traffic flow at Chittagong Port is expected to cross two million TEUs mark at the year-end 2014, with a growth rate of 11% in average per year since 2004. The planned CTG Deep Sea Port in the year 2020-22 will bring in additional capacity and will consequently pave the way for increased transportation of containers by inland river ways. Moreover, in the Forum discussants also mentioned that the upcoming inland container terminal projects - the Dhaka ICT at Pangaon (116,000 TEU), Rupayan Ports and Logistics ICT at Dhamgarh (156,000 TEU), and Summit Alliance ICT at Muktarpur (100,000 TEU) will add up to 372,000 TEUs catering for 27% of the available capacity (1,299,000 TEUs) in 2012. The CTG Port Container Terminals in 2008 functioned at 60% capacity level. With the inclusion of New Mooring Container Terminal in service in 2011 and planned Karnaphuli Container Terminal and Patenga Container Terminal in service by 2016-17, Chittagong Port Authority is poised to handle the additional containers resulting from the demand of the country's expanding economy.

Based on assessments with the private sector, the following challenges for IWT are identified:

- channelling of the existing waterways through massive dredging and procurement of dredgers;

- Construction of deep sea port to streamline international trade;

- Improvement of day and night navigation for water crafts by providing navigational aids; and

- Construction of inland container river ports for transportation of containers by waterways to/from sea ports etc

Our assessment further suggests that despite these challenges, private sector investment is set on port development and technology transfer.

2.4.4 Flood protection and drainage

The three river systems of the Ganges, the Brahmaputra and the Meghna and their tributaries together cover a drainage basin of about 1.72 million sq km and 7% of these basins lie within Bangladesh. The combined annual discharge passing through the system into the Bay of Bengal reached up to 1,174 trillion cubic meters. The three river systems including

7 http://www.adb.org/documents/bangladesh-chittagong-port-trade-facilitation-project

Chittagong region river systems drain an area of some 1.72 million sq. km. During the wet season the rivers of Bangladesh flow to their maximum level at about 140,000 cumec, and during the dry period, the flow diminishes to 7000 cumec. Because of its low-lying topography, at least 20% of the area of the country is flooded in a normal year. In 1993, the total area of wetland was 3,140,000 hectare of which 1,545,000 hectare were cultivated and 1,383,000 hectare were drained through surface drains. The flood-protected area in 1990 was estimated at 420,000 hectare. The growth potential of the urban sector in Bangladesh is severely undermined by frequent flooding. Most urban centres suffer from erosion and destruction of physical infrastructure caused by river flooding and water logging. Flooding is a perennial problem and the urban areas are more prone to economic and human losses due to high density of population and industrial sites. Lack of flood protection and inadequate drainage facilities lead to water logging and overflowing of latrines and cause wide spread environmental degradation and deplorable unsanitary living conditions. Whilst this market segment has been identified as a key area for PSP, at the moment, it is fully led by the public sector. The sector engages private sector through small scale contracts which are further broken down to small packages of works and goods, deterring large scale and efficient private sector players to enter into the market. Various large private sector entities who are specifically involved in inland waterways, among others, have expressed their interest in bringing the required technology and investment in developing protection systems in Bangladesh. However, this would require a large number of changes in the systems, management and overall planning processes within this domain. More importantly, this will require a significant change in mind set and attitude towards PSP both from Bangladesh and Netherlands.

2.4.5 Land Reclamation

Coastal Bangladesh consists of accreted land masses, which are highly dynamic, with increasing population. The districts of Faridpur, Barisal, Noakhali, Patuakhali, etc.along the coastal belt were formed over time in this manner and following a natural pattern. It is evident that with increasing trend of population and industrialization, land scarcity is an enormous challenge facing Bangladesh. The country needs to take on strategic directions that address the issue of land use management in a strategic manner if it continues to achieve 6% economic growth or higher.

Next to the natural process of accretion, land formation can be realised by man-made elevation through land fill. This option is not only of great importance for the coastal areas, but also for the upstream areas along the rivers.

It is in this context that land reclamation is gaining high attention and is being discussed as a significant prospect for future exploration. In the upcoming five year plan of the Bangladesh Government, The Delta Plan 2100 team[8] has already incorporated comments that address the long term strategic directions towards water resource management including the issues and opportunities for land reclamation. Within the earlier Poverty Reduction Strategy Paper (PRSP) the area of Land reclamation has been identified as a pillar for poverty reduction within the country.

There are promising opportunities for land reclamation within the geographical areas of Bangladesh port cities and other coastal and river areas, which are fast becoming centres of economic activity and can act as motors for national prosperity.

While water resources, morphological and engineering aspects are crucial in the improved navigation and land reclamation process, there is a heavy requirement on a business case for economic benefits- this can only be realised through active engagement of the private sector who can balance off the high costs against the ultimate economic utilisation and net revenues. Our assessments in land reclamation opportunities reveal a strong linkage with economic zones (which ensure start of productive use of reclaimed land).

[8] Bandudelatas.bd.org

The recent trends with Economic Zones (EZs) indicate strong opportunities in this relation. The EZs now being established are an opportunity to move beyond EPZs and to accelerate GDP growth by building on best practice elsewhere and adapting it to circumstances in Bangladesh. The economic zones act passed in 2010 moves beyond the traditional EPZ regime to be a part of a broader SEZ or economic zone model, specifically it allows much larger scale zones and takes on a flexible approach to types of activities that can be undertaken with greater emphasis on private participation. It ensures private provision of public goods in the zones as well as PPPs.

In brief the Economic Zones Act has the following strategic provisions:

- Establish one law to govern all economic zones programs in the country.
- Create a broader and more flexible model for zones allowing exports as well as local sales.
- Bring larger areas under special regimes, which may include existing EPZs and industrial estates.
- Set clear and objective criteria for site selection and mandatory feasibility studies to eliminate discretionary powers and erratic decision making.
- Facilitate an increased role of the private sector in ownership, management and operational zone.
- Allow light-headed approach to the regulation.
- Ensure that all zones are approached are operated on commercial principles and the market to drive the prices of services.
- Make a provision for decreasing large geographic areas to be brought under special administrative and incentive regimes to allow "brown field" approach.

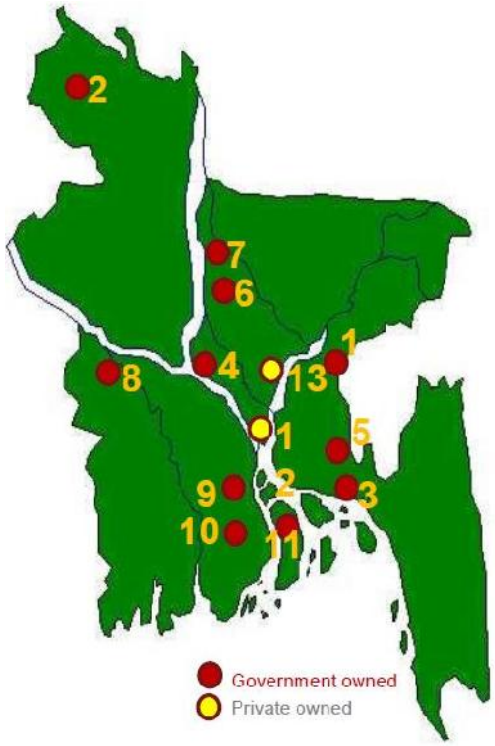


Figure 1 Economic Zone

"We are already involved in economic zones. We have been hearing about land reclamation processes but do not see any actions. If this is going to move forward, we also need to know that this will be a clear, efficient and transparent process. Only then we will be interested. I am not sure if we have the complete faith and trust to co-invest with the government allocated water agencies. We need to see an independent framework and process. Only then we will commit fully."

The figure above provides an indication on the levels of private sector engagement in EZs. Two economic zones are already privately invested and operated. In addition to this, as of 2015, the following locations have been approved economic zones sites, within which four are being privately invested by the large PS players in Bangladesh.

Figure 2 Economic Zone

The opportunities in land reclamation and EZ development are immense in Bangladesh, and there are strategic opportunities in engaging private sector both in the medium and long term.

2.4.6 Agriculture

Although agriculture is not a large market segment in terms of investment, it remains to be closely connected with water and also is the lifeblood of the economy. For this purpose, the team interviewed large players and covered specific segments of this sector. This included seeds and irrigation, due to its linkage with technology transfer and investment. Every year, Bangladesh suffers from floods that often threaten to destroy crops across vast areas. Over 1.2 million hectares of land are low laying flood prone areas within the country. The Bangladesh Rice Research Institute (BRRI) in collaboration with the International Rice Research Institute (IRRI) has developed a variety that is able to withstand germination for 15 days under water compared to 3 days for non-flood resistant types. Increasing salinity of coastal land is also a growing concern, a phenomenon that is exacerbated when a cyclone hits the country. Each year from November to May, a white film of salt envelops over paddy fields in the 1,120km-long, mostly unprotected coastal belt in the south. Upwards of one million hectares of land are seriously affected by salinity, according to some estimates.

BRRI has recently developed a saline resistant rice variety which has nearly 3-4 times the resistance to salinity compared to non-resistant varieties. The development of the Bangladesh seed sector is deterred by several constraints. For instance, the sector has only a few high quality seed companies compared to large numbers of small and poor-quality seed companies. This leads to adulteration of the seeds at different stages. Weak marketing and distribution networks, inadequate knowledge on quality seed production (HYV & Hybrid), absence of proper R&D and quality control systems and a shortage of skilled and qualified human resources hinder the growth of the sector. Farmers' lack of awareness of the greater yield and environmentally resistance qualities of seeds makes market penetration of quality seeds difficult. Additionally, there is lack of lab facilities in Bangladesh that can provide internationally recognised Orange Certification for locally developed seed manufacturers. The private firms are also at a disadvantage as government subsidies makes it difficult to compete with Bangladesh Agriculture Development Corporation, even after producing seeds that are as good or even better in terms of quality. According to the Ministry of Agriculture, the total requirement of seeds in 2012-

13 was over 1.17 million tons of which only 20% was supplied by commercial ventures by both public and private entities while the rest 80% are farmers' retained seeds. The government has around 60% of the commercial seeds business compared to the private sector. The private sector is comprised of multinational corporations as well as local companies, with more than 100 companies involved and over 5,000 registered seed dealers operating across the country. The biggest private companies in the market are Getco, Lal Teer, and Syngenta. Among the local companies, only Lal Teer produces seeds locally while the other private companies import from India, Pakistan and China.

To facilitate local seed production, the Government provides financial incentives in the form of Government backed loans for research and development and a 5% incentive on agricultural produce. The seed producing companies are also eligible for funds from the Equity and Entrepreneurship Fund provided by the Investment Corporation of Bangladesh. Under this fund's terms and conditions, a project worth at least BDT 2 million may receive 49 percent financial aid if it invests the remainder from its own funds. Given the importance of the sector, for both food security and livelihood, PS engagement must continue and be strengthened to realise long term benefits.

2.5 Analysis of private sector participation

This section presents the findings of the private sector engagement survey. The findings have been categorized into the follow:

- Company distribution
- Size distribution
- Product offering
- Market segments
- Investment patterns
- Sources of Finance

Findings from the market research indicate substantive involvement of the private sector in non-consumption areas such as in shipbuilding, river port and transportation, dredging, industrial wastewater treatment, water-based tourism, pump technology, and water treatment. The table below provides a high level overview of the water markets. The summary of our assessment reveals the following key issues:

Based on the typology presented below further investigations and assessments are carried out. Business opportunities exist in several markets but not in all. The next section provides a detailed overview of background and opportunities. The typology presented below has been categorised in each market segment below and further provides an overview in relation to:

- Market segment
- Definition of each segment
- Scale of engagement in terms of Small (S), medium(M) and large scale engagement (L)
- Type of engagement
- Category of engagement has been divided into works, supplies/goods and services
- Interest in scale up
- Opportunities in long term investment

Table 1 Overview of water market

Sector	Market segment	Definition	Scale of engagement	Type of engagement	Category of engagement	Interest in scale up	Opportunities for long term investment	Types of arrangement
Water Resource	Surface water	Operation & Management of Flood control	S	Erosion control	Works	N/A	N/A	N/A
			S	Data Management	Works	N/A	N/A	N/A
			S	Coastal Zone Protection	Supplies/goods	X	X	X
			S	Flood control/protection	Supplies/goods	X	X	X
			S	Management Information Systems	Supplies/goods	N/A	N/A	N/A
			S	Spatial Planning	Services	N/A	N/A	N/A
			N	Water Resource Planning	Services	N/A	N/A	N/A
			S	Remote Sensing	Services	N/A	N/A	N/A
			S	Climate adaptation/proofing	Services	X	X	Technology
		Drainage & Irrigation (FCDI) projects either	S		Works	N	X	Works
		Small hydro power generation	S		Works	X	X	Services
	Ground water		M	Purification/filtration	Supplies/goods	X	X	Technology
			M	Extraction	Supplies/goods	N/A	N/A	N/A
			M	Pumps	Supplies/goods	N/A	N/A	N/A
			S	Geo-hydrology services	Services	N/A	N/A	N/A
			L	Pump Technology	Services	X	X	Technology
			M	Contamination	Services			
	Water Harvesting	Rain water harvest	S			X	X	Technology
		Use for drinking	M	Bottled water	Supplies/goods	X	X	Investment
		Agriculture, fisheries purpose	M					Investment
Water use	Consumptive	Desalinization	S			X	X	
		Urban Wash	M	Planning and feasibility		X	X	Investment

Sector	Market segment	Definition	Scale of engagement	Type of engagement	Category of engagement	Interest in scale up	Opportunities for long term investment	Types of arrangement
		Rural Pipes Water Supply	S			N/A	N/A	
		Faecal Sludge Management	S			N/A	N/A	
	Industrial water					X	X	Investment
	Agricultural water					X	X	
Water use (non-consumptive)	River	River Stabilization	S					Investment
		Land Reclamation from the river	S			X	X	Investment
		River transport	L			X	X	Investment
		Maintenance of navigation routes linked to trans boundary river transportation	S			X	X	Investment
		River Port establishment and operation	L			X	X	Investment
		Dredging	L			X	X	Investment
		Sand mining	S			X	X	
			L			X	X	
	Fisheries (deep sea fishing)		S					
Water Discharge	Sewerage		S					
	Drainage		X					
	Waste Water	Effluent Treatment Plant	M					
		Central ETP	S			X	X	Investment
Others	Economic Zones		M					Investment

2.5.1 Company Distribution

Company distribution shows the breakdown of the responses from the firms indicating their market segment. Around 22% of firms interviewed operated in two or more market segments. The most common combination were firms that acted as distributors of bottled water and dealers of pipes and equipment (mainly related to water supply) as well as selling and installing water treatment plants/water purification plants. In the Bangladeshi market this combination of "product retailer" and "service provider" roles indicates that firms that wish to remain competitive must be able to provide a package of both equipment and technical/engineering services. The demand side of the market, at least till date, does not favour more specialized firms. This particular aspect can be expected to change as the market for grows. We would expect to see some far thinking firms tending towards much higher technical specialization (e.g. focusing on servicing small to medium commercial water purification plants) in order to position themselves well in this changing market.

Within the "distribution" category, a large number of companies did not have much large investments; they tend to outsource the design of their plants and then do construction using local engineers. This links back to the idea that there is market for some firms becoming more specialization in engineering. This is one aspect that there is a significant space for collaboration between public institutions with technical expertise (such as WASA and LGED that have highly experienced water infrastructure engineers) and "distribution" firms. The category "Drinking water distribution" includes companies that treat, bottle, and distribute. Some companies only distribute in local areas and rely on nation-wide distribution logistics companies for large level distribution.

One glaring problem that these firms face are that companies that bring in good equipment end up losing out in price wars with companies that use lower quality equipment (have less stringent quality standards). They are able to keep a higher margin that better quality companies. This is caused by a lack of regulation.

"Pipes and equipment" segment are mostly related to provision of goods and include a range of markets in the WASH segment. Due to break down of large sums into small contracts, these are mostly medium to small companies. This segment rarely consists of large players as the segment remains to be characterised by low quality and cheap products. River transport and dredging as can be seen represented a large segment of companies interviewed due to the inherent importance and scale as outlined in section 4.4.

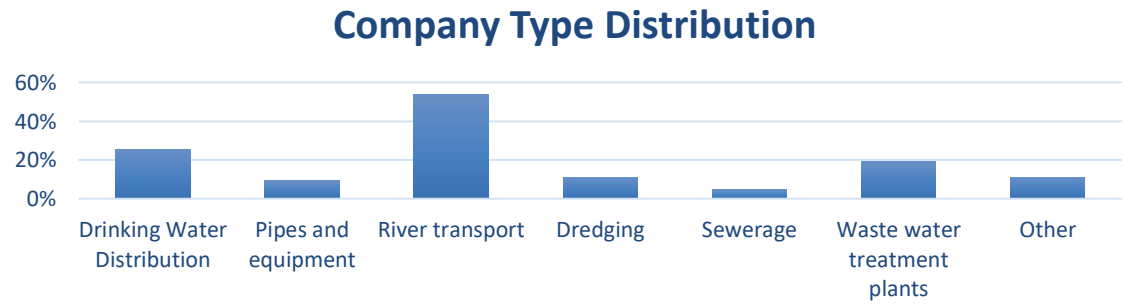


Figure 3 Company Type Distribution[9]

[9] The "Other" category includes: Water resource- surface water, Water harvesting, Water use (consumptive), Water use (non-consumptive) and Drainage

2.5.2 Size distribution

As outlined in the methodology, the selection of key private sector players was chiefly based on size. While focus was placed on large scale private sector entities due to their inherent contribution and engagement in large scale national investments and PPP programs, the survey also extensively covered the medium sized private sector players to provide a balanced and representative assessment. We specifically looked at medium and mainly large private sector entities based on the Bangladesh Bank definition.

Based on the above definition, size distribution across market segments are presented below:

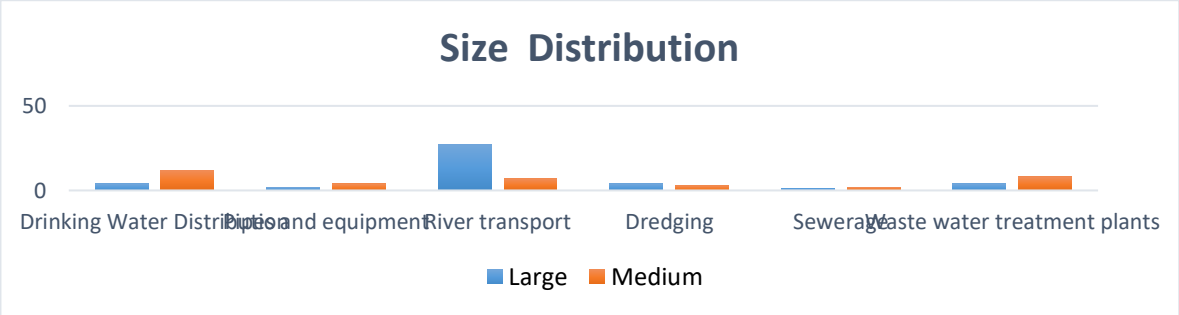


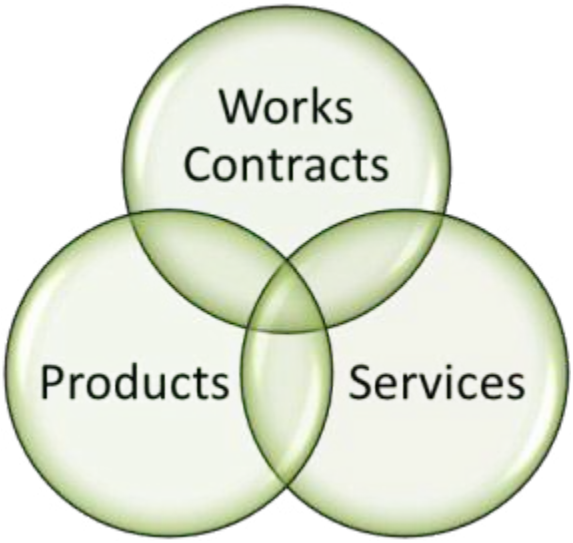
Figure 4 Size Distribution

It is important to note that the River Transport market is dominated by large players. In addition, the medium players are only considered such by a small margin. This is more of a definitional issue than it is a characteristic of this particular segment. To explain, the size definition used is based on either an assessment of fixed assets *or* labour count. For the River Transport market the fixed assets refer to the ships themselves which are (obviously) very expensive. The difference in *firm size* stems from the *number of ships* each of the different firms own. As most of the firms have been operating for a significantly long period of time, they have at least two to three ships which put most of them in the "large" category. The other firms fit well in the standard definition which is why we see a more even distribution of medium and large firms in them.

2.5.3 Types of Market offers

The types of market offers were categorized into the following areas:

- Works Contracts
- Products
- Services



As can be seen in figure 6, a significant portion of companies interviewed consisted of services which are directly linked with opportunities for investment and technology transfer. Next to this, those involved in works and contracts and products, were also interviewed. The most common pairing is services & work contracts.

Around 20% of companies had two different types of market offers, and therefore overlaps can be seen in this segment.

The overlap between different types of market offers again indicates that across the board in the water market, there is a demand for firms that provide a package or a bundle of both products and services. The expectation is that with the growth in the water market coupled with necessary regulation and deregulation the various segments will see increased specialization. Again, this trend indicates that there is indeed significant space for public-private partnerships to flower and prosper.

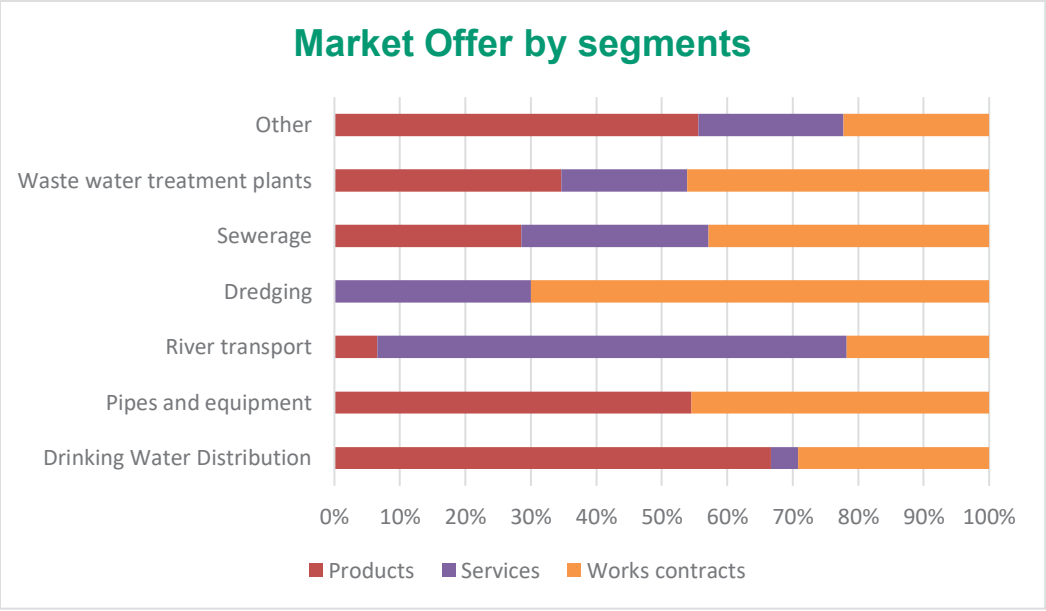


Figure 5 Market offer by segments

Market offer by segments of products, services and works contracts illustrated above provide an picture of the spread of the work and further define some of the key characteristics discussed earlier in section 4. A significant portion of the market offer consisted of products and works contracts. In case of products, we see in particular "waste water treatment", "pipes and equipment" and "sewerage" segments, which should split up into more specific sub-sectors/markets and firms who have the ability to adapt and specialize as the market grows.

2.5.4 Investment Patterns

The below analysis of investment patterns in the last five years provide an indication of strong case for private sector engagement in technology and innovation. A signification portion of the firms as indicated in figure 7 and 8 showcase private sector investing heavily on technology.

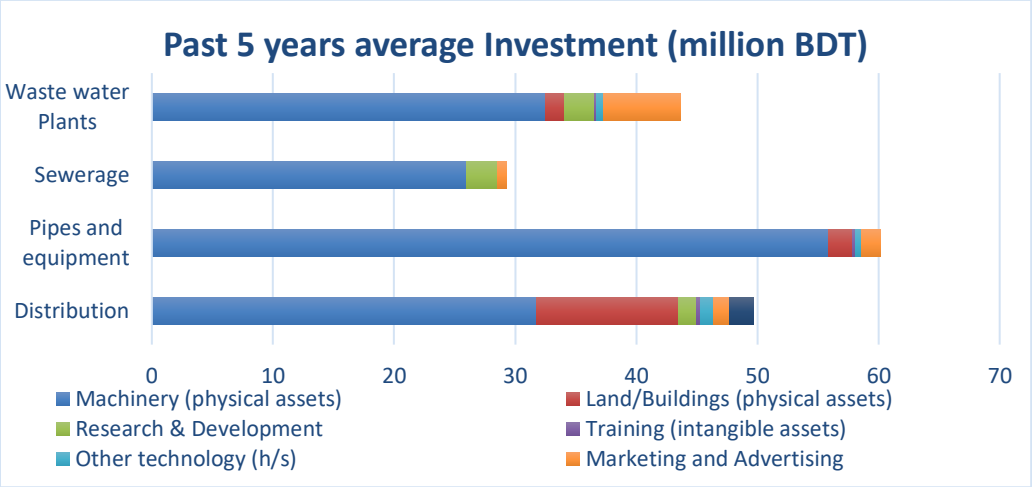


Figure 6: Past 5 years Average Investment

The investment patterns for "Waste Water Plants", "Sewerage", "Pipes and equipment" and "Distribution" are all for firms that are medium or lower end of large. Their initial investment is low as is level of investment over their operating period. Keeping this in mind it is important note that their investment has still been largely on "machinery or equipment". One would expect this to be the case as these water market segments can still be considered to be in the initial growth phase. In and of itself this pattern tell us that the firms in these are still consolidating their presence and scaling up their operations to match demand, not necessarily focusing on marketing and research and development which is something we would we expect to see in a more mature water market. To gain further insights it would be much more efficacious to focus on a few key subsectors that can act as a proxy for the entire market and then focus on their year on year average investment patterns. This would give us a good perspective on how far along the market actually is in terms of forecasting future growth opportunities. However these survey results lends further credence to the assertion that there is a great deal of scope for growth and partnership opportunities.

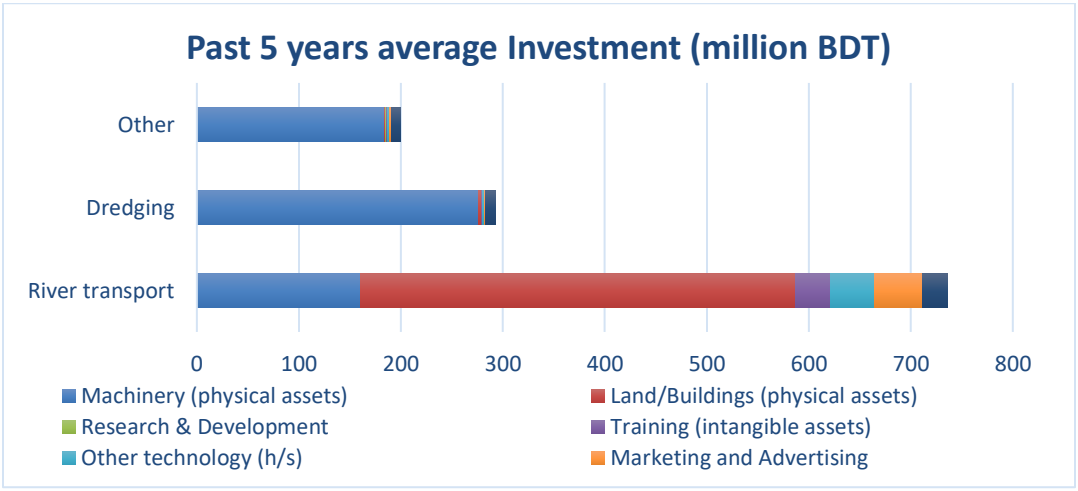


Figure 7: Past 5 years Average Investment

The firms in the "Dredging" and "River Transport" segments are already quite large players and thus have appropriately large levels of investments. It is easy to see why the "River Transport" has such a large "physical assets" investment, i.e. those represent the new ships that they have purchased. Training and marketing are also important for the river transport segment as skilled manpower is necessary to helm the ships while marketing is necessary for a market that has so many competitors; the firms need to distinguish themselves in order to retain market share.

Sources of finance

The source of finance is particularly linked with assessing private sector's ability to invest in long term investments in the key market segments. Figure 8shows a breakdown of this.

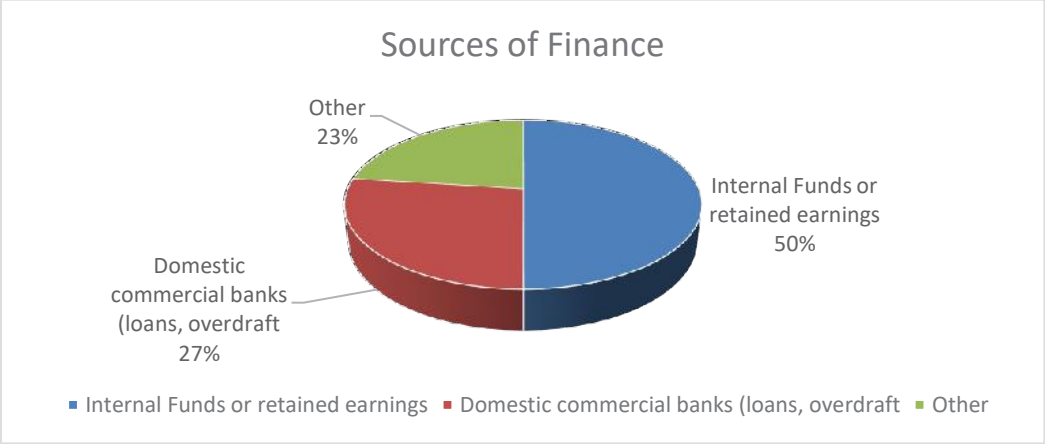


Figure 8 Sources of Finance

Of all sources investment mentioned; internal funds or retained earnings accounted for 50% of all responses. A more interesting data is the following table which shows a breakdown of what percentage of the total investment was from a particular source (given that the firm reported that particular source as something that they availed).

Average % of total investment by source	**Large**	**Medium**
Internal Funds or retained earnings	63.5%	64.2%
Domestic commercial banks (loans, overdraft	48.1%	43.2%
International commercial banks	73.3%	
Public financing (govt. agencies) or other public services		20.0%
Private Investment Funds	16.7%	8.3%
Trade credit (supplier or customer credit)	66.7%	50.0%
Credit Cards	30.0%	
Equity, sale of stock	20.0%	50.0%
Family, friends	6.7%	7.7%

This shows that there is a clear difference between large and medium firms when it comes to the use of different sources of finance. Medium firms do not have access to international commercial banks nor do they use existing credit card facilities. Another interesting difference is that large firms don't raise capital by equity sales as much as medium firms do. This this important when developing public private partnership frameworks; medium firms would be eager to take loans (at lower interest rates than offered by domestic commercial banks) from international commercial banks.

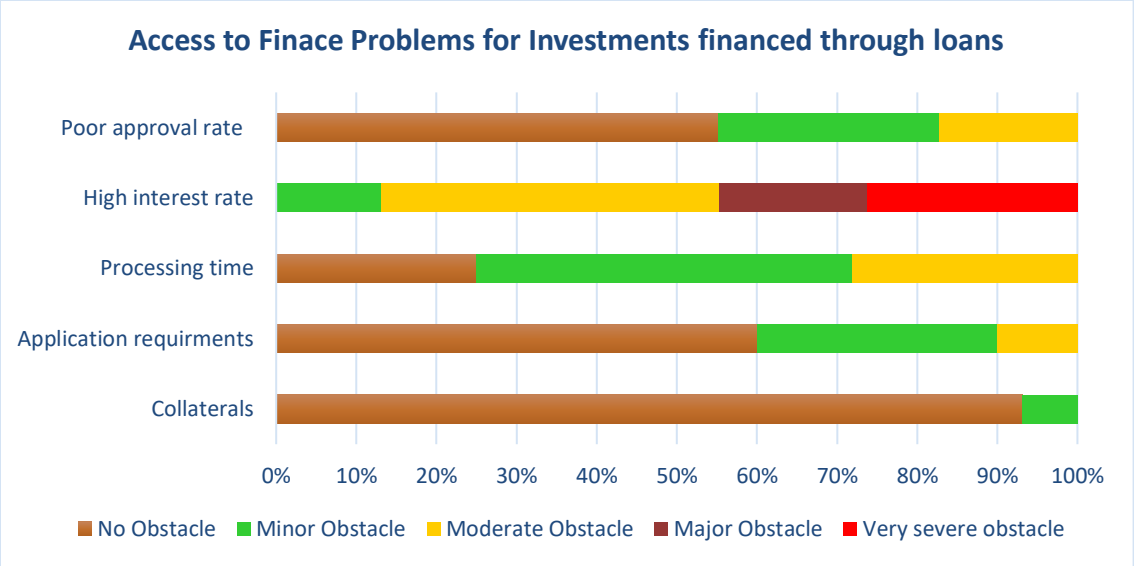


Figure 9: Access to Finance Issues

As can be seen in Figure 9, the only major obstacle, across the board among all water market segments, is the high prevailing interest rate. This is less of a problem for large firms as they can take loans at lower interest rates from international commercial banks; high interest rates are a prevailing issue for domestic commercial banks. This high interest rate has been cited as a major reason why medium firms are hesitant to expand their business.

2.5.5 Annual Turnover

The below chart shows the average annual turnover from 2010 to 2014. River Transport companies saw a fall in their turnover between 2013 and 2014. However, Dredging companies have seen a jump in their average turnover between the same periods. It is important to remember however that given the small number of dredging companies operating the increase represents a few large contracts won by a handful of companies.

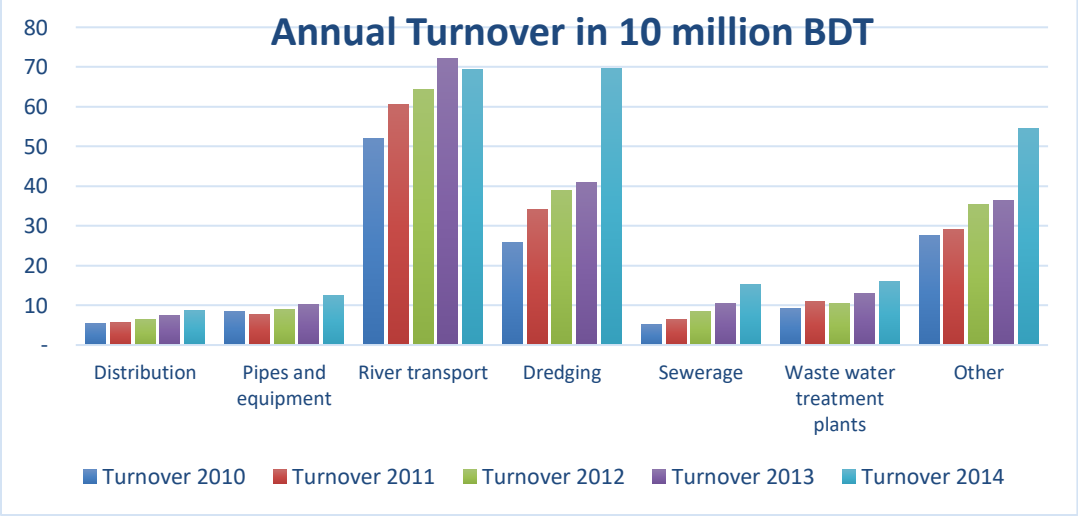


Figure 10 Annual Turnover

2.5.6 Challenges in water market

For Private Sector, the challenges question was left as an open-ended question with around 50% of the firms working with private companies reporting delayed payments as the main challenge (rated as a minor to moderate obstacle). These included mostly companies from "waste water treatment plants" and "sewerage" market segments.

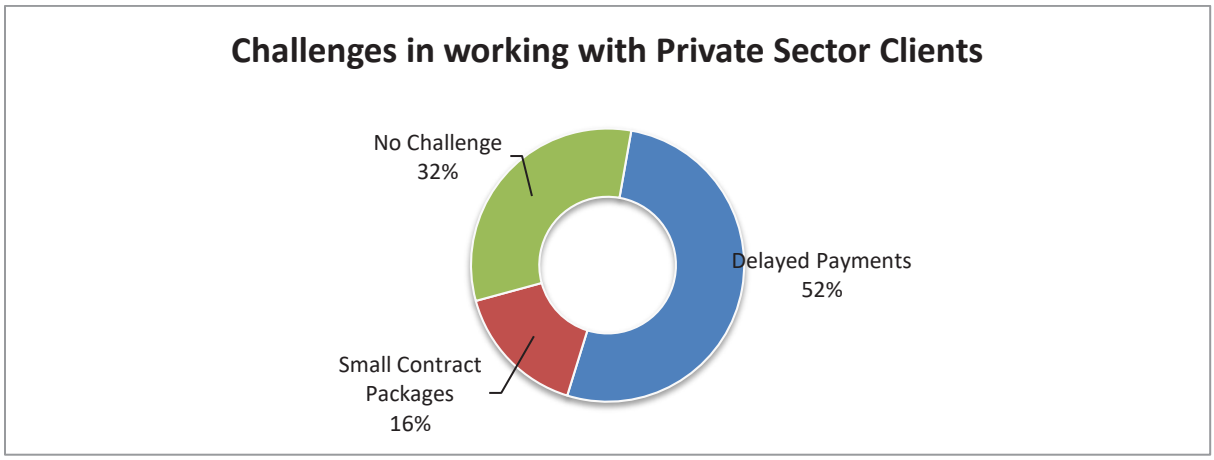


Figure 11 Private Sector Clients

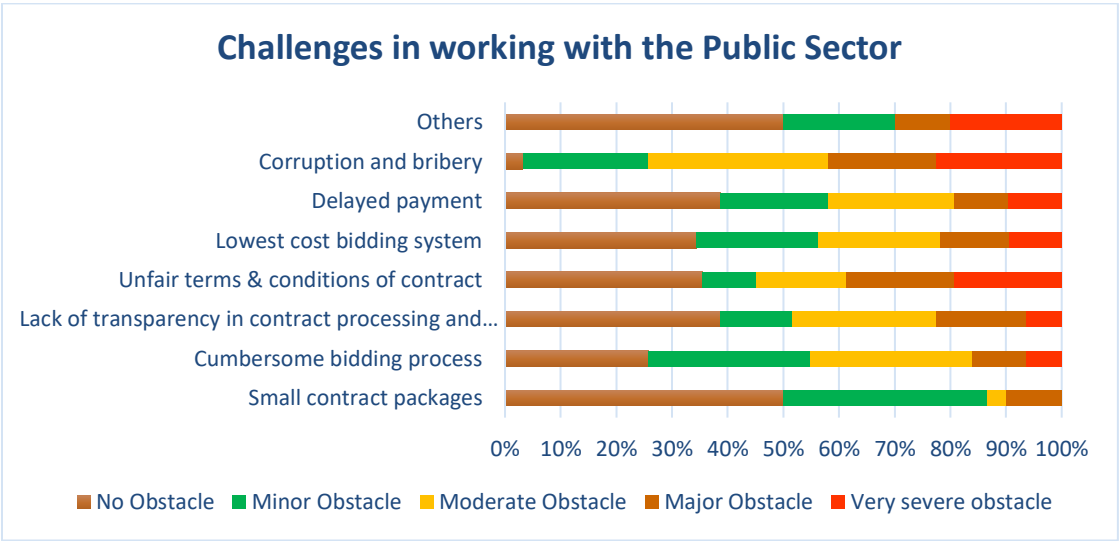


Figure 12 Public Sector Clients

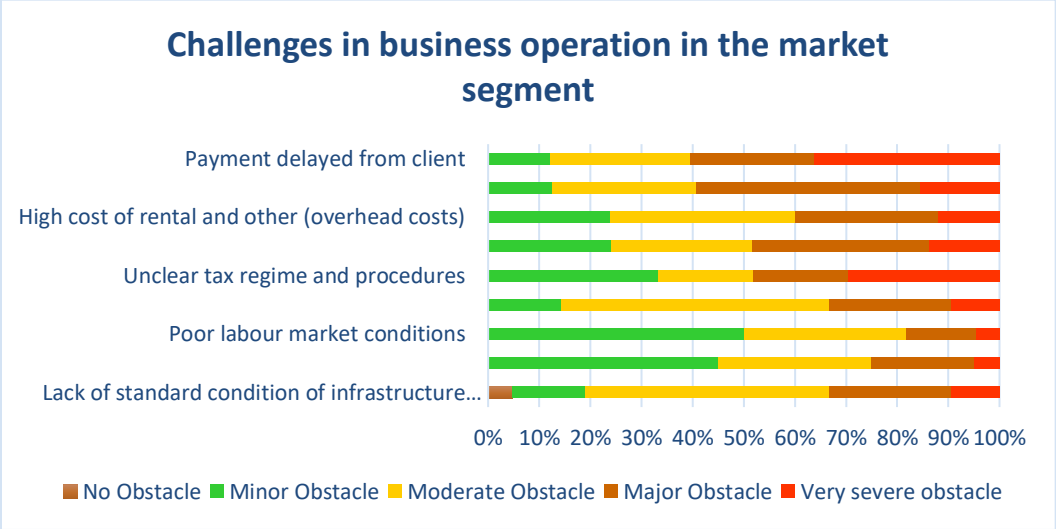
For companies that worked with public sector clients; it was not unexpected that the respondents indicated that corruption and bribery were major issues. Cumbersome bidding processes were also noted to be a problem. Small contract packages, at least to medium to large companies were not considered to be a major challenge.

Dredging and River transport market segment companies are the only ones that listed "Only Public" clients which included the following:

- Bangladesh Inland Water Development A
- Bangladesh Water Development Board (dredging)
- Bangladesh Roads and Highways Division (dredging)
- Mongla port Authority, Chittagong port Authority (dredging)

- Government run sugar mills & BCIC for fertilizer (river transport)

Almost all respondents leaned towards key doing business issues as key challenges faced in the water market. A significant proportion of the companies revealed payment delays from clients as a key challenge- this is significant in case of the inland water



In general; companies felt that there were numerous challenges in working in the water market segments. Further issues included:

- Projects are selected based on political decisions and do not follow existing plans and programs: Sector agencies like BWDB and other organizations/departments of the government and the local bodies are expected to prepare micro level planning in conformity with the NWMP and approved government guidelines and implement the plan accordingly. However, project selection is ad hoc, politically motivated, and bears little resemblance to sector development strategy, planning and programming. Without clear market opportunities private sector engagement and investments remain weak.
- Faulty procurement practices and irregularities in tendering process by public sector agencies continue on a large scale: (i) Selection of contractors and contract award is slow and at times takes 9 to 12 months from bid submissions date with frequent cancellations and rebids; (ii) Low bid requirement provides incentives to poor quality; and (iv) Corruption is pervasive resulting in poorly organized firms/contractors to bid and poor execution of projects. It is to be noted that these practices and irregularities distances professional private sector firms, local and international, from doing business with the public agencies. When asked about the top three obstacles to doing business private sector respondents engaged in the water sector identify corruption as one of the significant issue among the first ranked obstacles to doing business. The above issues are also a reason for many international firms, previously doing business in Bangladesh, to fold their operations and not show interest in bidding for tenders. Some of the few international firms operating in Bangladesh also refrain from bidding for tenders executed by the public agencies.
- Weak institutions resulting in regulatory uncertainty, the proliferation of red tape and administrative complexity causes informal private sector business practices: Enforcement and supervision of regulatory regime is weak allowing corrupt practices by the private sector.
- There is no forum for private sector to engage in dialogue/discussions with the public sector: In view of the fact that information regarding projects, programs are hard to obtain or available a forum and dialogue could play a key role in building better business relationships between public agencies and the private sector.
- Enforcing contracts is a major issue for local private sector operators and lengthy court proceedings keeps businesses distanced from taking formal juridical services in case of disputes.

- Private sector organizations are not represented in the water sector: Majority of the companies surveyed stated they are not member of any business associations. Inability of existing chambers and business organizations (BO) to provide any tangible benefits is stated as a principal reason why firms are not members of any BOs. Although there are trade organizations in some of the market segments such as Association of Export Oriented Shipbuilding Industries of Bangladesh, The Cutter Suction Dredger Owner's Associations, lack of representation in a business chamber/association prevents private sector to lobby, hold dialogue, and pursue common business interests with the public agencies. The engineering consultancy firms in Bangladesh have not formed a network organization, such as NL Ingenieurs (ONRI) in the Netherlands. Formation of such an organization could bring more consolidation, professionalism, and initiate more competitive strategies for projects and technical assistance in the water sector.
- The provisioning of infrastructure facilities is inadequate and poor facilities are substantially constraining growth Companies rely on their own facilities that increase the initial investment for the investors as well as the operational cost of the business. Majority of industries view infrastructure services provided by the public sector as inadequate. Lack of transportation facility with inadequate road network and inefficient rail system, hamper goods and materials movement and to meet timely delivery schedules
- Unavailability of serviced land more generally lack of access to land is a severe constraint and barrier to business growth

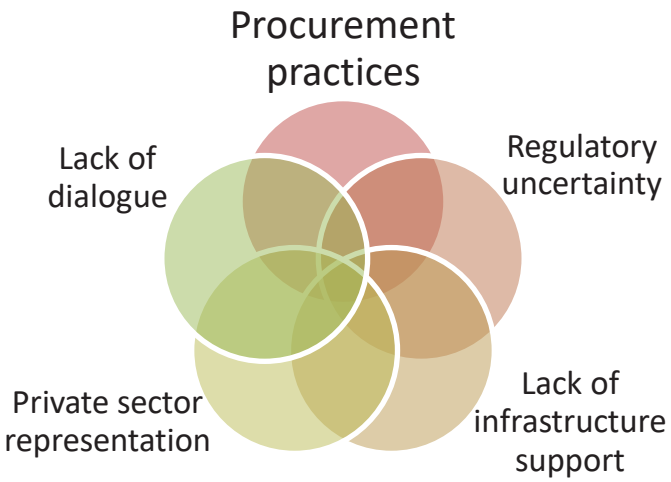


Figure 13 Challenges in water market

Part II: Public Private Partnerships in Bangladesh

3 Public Private Partnership: Where is Bangladesh?

3.1 PPPs in Bangladesh

The Government of Bangladesh (GoB) has taken a number of measures to create an enabling environment for attracting private investments on a sustainable basis. In 2004, the Bangladesh Private Sector Infrastructure Guidelines (PSIG) was issued to facilitate projects in line with PPP concepts. Since then, there were some extent of success in attracting private investment in some sectors such as power, gas, and telecommunications. However, much more investment is required in these sectors and several priority sectors in order to accommodate economic growth.

For FY 2009-2010, through its national budget, GoB made significant allocation of funds for PPP projects, demonstrating their commitment to the implementation of PPPs in the country. A position paper on PPPs entitled, 'Invigorating Investment Initiatives through Public-Private Partnership,' was issued in June 2009.

In spite of these measures, the PPP initiative did not achieve significant results in terms of project work on the ground. This was mainly due to the absence of a clear policy and strategic guideline. To fill this gap, in August 2010, the Government of Bangladesh issued the Policy and Strategy for Public Private Partnership (PPP).

The survey carried out by the team indicates that there is a lack of a full understanding of PPP arrangements; there is a reluctance to work in partnership with the public sector; a certain lack of confidence in getting involved in this sector that may have historical roots, and lastly, the structural constraints explained earlier relating to bureaucratic processes and decision-making.

The government's PPP Office's effort to date has been to hold 23 PPP awareness Seminars to inform the private sector on their portfolio of projects and have also presented project profiles to stakeholders. Though between 2012 and 2014, 63 events covering over 3,600 participants have been held including tailored training programs, PPP capacity building workshops, policy level consultations and the aforementioned PPP awareness seminars, it is time for the PPP Cell to take on stronger engagement strategy, specifically with public and private sector actors. It may well be more useful for it to initiate a continuous dialogue and interaction with the private sector in order to fully bring them within the PPP fold.

According to the latest (November 2015) reports from the PPP Cell, there are

- 47 projects estimated at EUR 12.4 billion in the approval stage
- 9 projects estimated at EUR 3.61 billion in the project development stage
- 12 projects estimated at EUR 0.97 billion in the procurement stage
- 6 projects worth approximately EUR 1.15 billion that are currently under implementation.

There are 74 PPP projects currently being processed through the PPP Cell and this is excluding power sector projects. Most of these projects are in the Transport Sector with Heath and Economic Zones being the second most common sectors.

The PPP Office has not had a stellar track record. There is professional management running the PPP Office. In discussions with major players in the international infrastructure arena, it was clear that unreliability and uncertainty about project processes deter private sector from participating in the Bangladesh market. Delays in procurement ranging from nine to 12 months, shelving downstream work after conducting initial studies, abrupt cancelation of projects are common complaints, which however could be easily addressed through turnkey procurement, more effective implementation arrangements, and commitment to the work.

The weak capacity of the public sector cannot be strengthened overnight simply through training and advice. There are many competent, qualified technical and engineering professionals in the country's private sector, and an additional resource base among Bangladeshis residing and working overseas. It is high time that appropriate incentives and an encouraging environment was established in order to engage these private sector professional in key posts and areas. The current gap between the public and private sector capability, confidence and trust levels can be reduced significantly through such private sector participation within key public jobs and projects.

The Public Private Partnership Law 2015 has indeed been passed. A parliamentary committee was formed that assessed the PPP Law 2015. Research has been done regarding the Act by visiting various countries and their PPP departments and understanding their local Acts. Thus far, feedback of the Act is that it is too dense, and that more power should be given to the PPP Office[10]. Essentially, an independent party should have more autonomy for PPP projects. The 1st Draft of the Act was done with help from Consultants, financed by ADB. It was cabinet approved, then sent to the Ministry of Law, and then to the parliamentary committee. It is expected to be passed by the end of this year.

All projects above 6 million dollars requires Cabinet approval, below that a Line Ministry can approve.

Policies and Strategies

The overarching policy on PPPs in Bangladesh was adopted in 2010 titled Strategy and Policy for PPP and Guidelines for formulation, appraisal and approval of large, medium, and small projects, 2010. The PPP policy 2010 defines PPPs, here (legally) relevant as:

(i) Contractual private service delivery (of a public function/competency), sharing risks PPP may include and the private sector being the "active part": design, construction, delivery of services and maintenance

(iii) PPP sectors include: business where the government holds control over infrastructure or service (meant is a public function or competency)

(iv) The public sector retains a significant role in the partnership, either as the sole purchaser of the services provided or as the main enabler of the project. The private party commonly provides the detailed design, construction, operation and financing for the PPP project, and is paid according to the performance

(v) Simple outsourcing is not a PPP, neither are State Owned Enterprises (where the government holds more than 50% of the shares and/or the majority at the Board of Directors)

(vi) The water and wastewater sector is expressly mentioned as a priority sector for PPP

(vii) Private sector consortia need to establish a local SPV or company to implement PPPs

(viii) There is a system of "special incentives" which, if detailed in the RfP, can apply to projects; this can be tax breaks and "unique incentives" and applies also to non-resident companies

Three types of public financial participation in PPP projects are possible:

(i) Technical Assistance Financing: concerning feasibility

(ii) studies and tender documents

(iii) Viability Gap Financing: this can be a capital grant or annuity payment or both. VGF is only possible if the private party has affected its equity contribution

[10] Meeting, PPP Office, 2015

Infrastructure Financing: is public injection into the PPP projects infrastructure in the form of debt or equity through the Bangladesh Infrastructure Finance Fund (BIFF) and/or the Infrastructure Development Company Limited (IDCOL). Issues pertaining to the acquisition of land, rehabilitation and resettlement, provision of utility services, access road construction, and activities of similar nature may be effected through the Line Ministry under the last and so-called "linked-component" financing.

Public-Private Partnerships Act 2015. The government, representing any public statutory body such as the Dhaka Water Supply and Sewerage Authority, may enter into a PPP Contract with a private enterprise. The initiation of any procedure for selecting private enterprises for a PPP is subject to the approval of the CCEA. Before the CCEA approves a selection procedure for a PPP, the PPP office determines (i) if the PPP provides value for money, (ii) if the PPP allocates risks in an appropriate manner, (iii) the public contribution to the PPP (nature of incentives, source, etc.) and finally, (iv) checks the overall economic and financial implications of the project. Chapter II specifies the tender procedure, either open or competitive tender, and outlines the circumstances permitting unsolicited proposals, which is consistent with best international practice.

JV Option: A "PPP project" means an infrastructure project, or the provision of services not associated with any infrastructure facility. An "infrastructure project" is defined as the design, construction, development and operation of any new infrastructure facility or the rehabilitation, modernisation, expansion or operation of any existing infrastructure facility. An "infrastructure facility" means physical facilities and systems that directly or indirectly provide public services. Specifically excluded are infrastructure facilities owned or operated by a state-owned industry or enterprise slated by the Government of Bangladesh to be privatised under the Privatisation Act 2000.

Thus all traditional forms of PPP are, *prima facie*, possible, save as to those governed by the Privatisation Act 2000 and those that would be implemented under a Joint Venture where the State holds more than 50% of the shares. Section 2(h) defines a 'private partner' in a PPP as a company registered under the Companies Act 1994 of Bangladesh, provided that no more than 49% of the shares in the company are owned, directly or indirectly, by the government, a local government, or a foreign government. Generic PPP options using a corporate Joint Venture will require at least 51% private ownership.

Mixed Assets Ownership: The act provides for PPP options such as the BOT models under the laws of Bangladesh. This is because certain assets may be the property of the private enterprise (such as machinery) and certain assets may be the property of the contracting authority (such as acquired land leased for the purposes of the project). Furthermore, as per Section 33(b), the contracting authority may choose to purchase assets from the private enterprise (such as the machinery) in the event of transfer of the facility, or commodities such as power or water that may be the output of the project.

The rest of the provisions under the act take into account the acquisition of land property for the purposes of the PPP project in line with the provisions of the Acquisition and Requisition of Immovable Property Ordinance 1982.

3.2 Institutional Set-up

The following institutions have been established:

(i) Public-Private Partnership Advisory Council (PPPAC)

(ii) Cabinet Committee on Economic Affairs (CCEA)

(iii) Office for Public-Private Partnership (PPP Office)

The PPP Advisory Council (PPPAC) advises on PPP policy, accelerates PPP Projects, and coordinates public institutions for PPP projects. The PPP Office supports the Line Ministries in identifying, formulating, selecting, contracting, and

monitoring implementation of PPP projects; coordinates various government and private agencies, fast tracking PPP projects and is headed by a CEO who reports directly to the Prime Minister of Bangladesh.

The Finance Division examines PPP proposals and, amongst other functions, arranges for the annual allocation for VGF for PPP projects; appraises and approve funds for VGF for the selected projects as per concession agreement and organises funds for infrastructure financing. The PPP Policy 2010 separates PPP projects by total investment: (i) Large, for those exceeding BDT 2.5 billion (>$31 million)

3.3 Status of PPPs

The status of PPPs in Bangladesh has evolved in the last five years and it is anticipated that it will still take substantial time for the concept to gain traction. There is no precedent in Bangladesh for this concept, the CEO of PPP cell is new, it took some time for the department to come together and gain the acceptance of all Line Ministries. The actual power of the PPP office staff, including the CEO, has taken time to figure out[11].

Generally, there is a top-down approach to management – without top-level support (i.e. Prime Minister), things do not gain as much momentum. For example, the PPP Office may even want to reject certain projects, but pressure from political influence may cause the projects to be pursued (i.e. 3rd Sea Port, not yet proven if this will even be utilized or prove beneficial, or even if feasible under PPP).

The Line Ministries themselves have taken some time to be supportive of the PPP concept; government bodies are used to working in a certain way, traditional bureaucratic systems, and engaging with private stakeholders is a new process. In addition, it is difficult to understand if certain projects are even applicable for PPP structuring, not all feasibility studies are robust and a general lack of experience makes it more difficult to make good decisions.

> For example, "perception" is a huge issue. A Line Ministry may look at their own budget and think "we have plenty of money," why bother with PPP?
>
> *Government Agency Representative*

Additionally, the success of a project can be extremely reliant on an individual person, and government posts change often – sometimes projects die with individuals. Some individuals are more accepting of the idea of PPP, others not so much. Issues with land, implementation delays, or financing are separate from these internal fundamental issues which can be considered the primary challenge.

To add, not all projects have multiple bidders. Some have attracted interest from many private parties, including international parties. However, some barely have more than 1 bidder. For example, the Jetty project had only 1 bidder, BEZA project had 1 bidder, Kidney Dialysis Center had 2-3 bidders (eventually awarded to an Indian company), etc. Interest is highly dependent on financial viability; also for the PPP concept to progress, the private sector must realize that they need to decrease their expectations of financial gains in order to contribute to social welfare and public good, i.e. taking a 3% margin vs. traditional 11% and up. Many investors in Bangladesh also do not have long-term investment ideals; they expect returns now, not 20 years from now. The power and telecom sector has been more successful as PPP as they receive substantial revenues soon after implementation; this is not the same for many other projects, especially large infrastructure projects (i.e. Mayor Hanif Flyover).

Few PPP projects have progressed (not included power or telco.). There is only the Mayor Hanif Flyover – which was done before/without involvement of the PPP Office and then the current Dhaka Elevated Expressway project;

[11] Meeting with PPP Cell, August 2015

construction has barely begun for this project, whereas contracts were signed back in 2011. As of 2015, the only other project that progressed was a Kidney Dialysis Center. Additional 5 contracts have been signed till date.

The water related projects on the list are the only water projects that the PPP Office is aware of. Essentially, it is up to the Line Ministry to suggest which projects from their own sector they believe should be PPP, the PPP Office does not suggest projects for PPP. If they have any other water related PPP projects that they will soon suggest to us, only they are aware of them. The Ministry of Water Resources, Ministry of Shipping, Water Development Board, and BIWTA would be better to speak to regarding this.

Sewerage and water salinization projects have been discussed in meetings (proposed by RAJUK), but no feasibility studies have been done – and therefore discussions never continued.

"Also with water management there is the issue of who will participate in such large water scale infrastructure projects? If the treatment plant is in an area with no existing buildings, utilities, why would the private sector want to be involved? For such projects, it is suggested that the Government first does the initial work – setting up the land, buildings, utilities, and then get the private sector involved."

Government Agency Representative (Anonymous)

The Government must maintain a strong commitment to the concept of PPP. There must be examples of successful projects being completed in Bangladesh in order for the sector to grow and to instil confidence in the private sector. Private sector must accept lower rates of return over longer time horizons.

Development banks should also help finance these private companies; however this is very dependent on the country's relationship with development banks and the confidence in stability that development banks have in Bangladesh. For this, the Government needs to show total commitment as well as show that regulatory inefficiencies have been fixed. The Government generally does not give the sovereign guarantees that most Development banks seek.

So far, Dhaka Elevated Expressway has shown that confidence is low. Land acquisition process was difficult, little due diligence was done – therefore banks were apprehensive to invest. Many times feasibility studies of which quality and robustness is lacking. Water sector projects through PPP will likely take some time to develop or gain ground. The current Jetty project was half completed by the Government, now the idea of having it finished by the private sector

has been introduced. However, other jetties aren't even used to their full potential and the current authority in charge of the project is weary of introducing a third party. The private sector would go into a revenue sharing through tolls understanding with the Government for such a project.

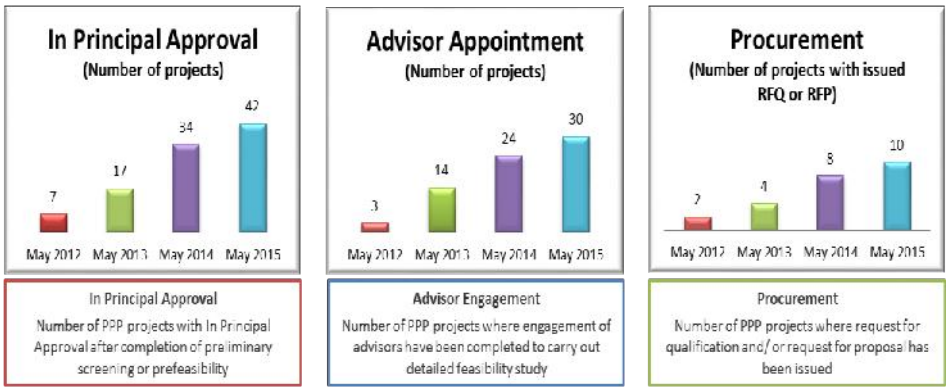


Figure 14: Pipeline Projects

Another project that was once brought up was the idea of water distribution from the Meghna River to be channelled into Dhaka. This distribution line would be completed by the Government but the operations and maintenance of it would fall under the private sector.

The project, New Mooring Container Terminal, is currently sitting in the High Court due to internal issues, something related to the private company involved. Now the Port Authority is considering doing it themselves. It was initially set for a (supply-operate-transfer) SOT basis. A project that was inclusive of multiple agencies was once floated, the Dhaka Eastern/Western Bypass which would include water treatment plants, roads, flood control - everything under one wing. This would have required RHD, RAJUK, DWASA, WDB, to all work together – however, this idea never got far due to its scale and reliance on too many parties interacting together efficiently (not realistic). Instead, the components of the project have been split up with only the Road part of the project on the radar. Many private companies effectively "steal waterways" making it a difficult sector to be involved in. The dredging/navigation sector generally has remained with BIWTC, Ministry of Shipping. WDB is responsible for flood control. Issues such as dredging, navigation, and irrigation, and flood control are water issues that mostly remain under the responsibility of the Government – very difficult to make revenues from such projects to satisfy the private sector - should be the types of projects that are funded by tax collection.

3.4 PPPs perceptions

Aside from companies operating in the River Transport market segment, most companies are not aware of what PPP projects are nor are they aware of how they would engage in PPP projects in the first place. Furthermore even if when they know what PPP projects are, none have reviewed the Government's PPP guidelines nor the Government's PPP manual. This indicates a massive knowledge gap that should be very easy to remedy.

Furthermore the common perception among the firms interviewed is that there is no real scope for PPP projects in the water sector. Very few responses indicated that large scale construction projects might be an area where there could be PPP given the right conditions. This is an interesting knowledge gap. In general; after a primer on PPP projects were given to the respondents; they were asked what they considered to be the major problems in implementing PPP projects in Bangladesh. The responses strongly indicated that a lack of knowledge was a primary concern coupled with a lack of confidence in the Government as a "partner".

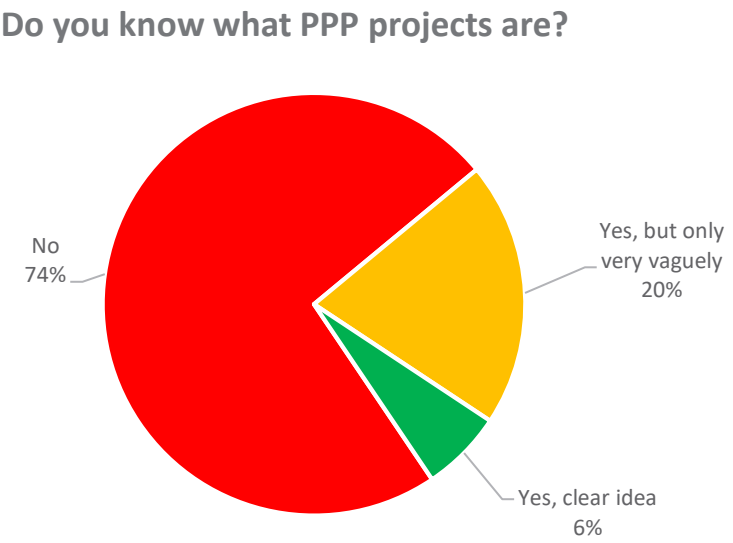


Figure 15 Knowledge on PPPs

> *"How can the private sector be expected to engage in PPPs, when there is no clear communication or forum to explain the processes and market routes clearly. There is also no clear communication in relation to risks which is the key issue for private sector"*
>
> *Large Private sector player in In-land Water ways*

When asked what could be the possible problems, and issues that hold the private sector being fully committed to PPPs. A significant portion of the private sector expressed the lack of information in relation to PPPs as a key issue.

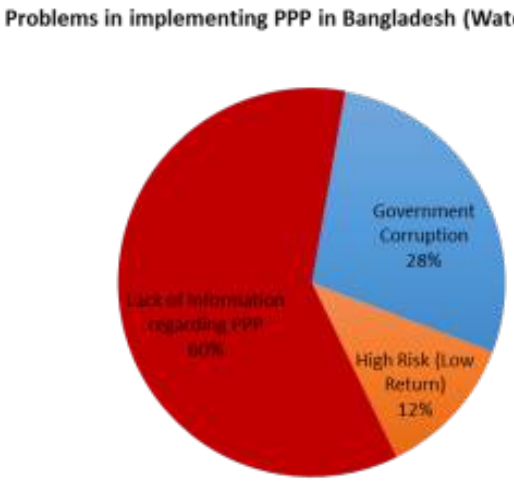


Figure 16 PPPs in water sector: Challenges

"We hear so much about PPPs. PPP is the way to go and PPP is the answer to our solutions. But, never have we heard from the key agencies about what is on the table, what is there for the private sector. There is no information and clear communication. There are of course tenders, but there is just no early market engagement or a consultation process."

4 Future of Public Private Partnership

The private sector in Bangladesh is still in a nascent stage of growth. Although several business groups are showing signs of being modern corporate structures, reaching parity with many such corporations in other South Asian and Southeast Asian countries can only be attained through collaboration with those foreign entities. Attracting well-known foreign corporations also is a necessity for bringing in financing for infrastructure as well as providing better branding for Bangladesh. Infrastructure investments, either through public, private, or public private partnership arrangement are the best way to boost economic growth, employment, technological upgrades and management opportunities. Unless these investments and partnerships are skilfully planned and managed, objectives in infrastructure will remain distant and unrealized. Given the current investment environment, with its long delays and uncertainties in procurement, a dysfunctional investment board, overly bureaucratic decision-making process, and lack of technical knowledge among senior public sector officials – it is difficult to see how potential investors can be attracted. It is obvious that along with a quickening of the current pace of infrastructure investments our investment regime also needs the implementation of an intense and complete reform packageee.

Over the last 4 years BDT 30 billion (equivalent to US $375 million) has been allocated each year to support various investment projects in infrastructure and other related programs. Each year these funds remain unutilized while infrastructure bottlenecks accumulate, hurting business operations and performance. The country's critical infrastructure needs require a total investment of over US $15 billion and it is recognized that unless a large portion of these funds are attracted from the private sector, financing the much needed investment in infrastructure will falter. In 2010, Bangladesh Business had pointed out that the government's reliance on the Independent Power Producer (IPP) program for power generation would only be partially achieved since it would not be possible to obtain finances from the domestic private sector. Whether any foreign investor would show a willingness and interest to finance power projects in Bangladesh was also questioned. It has become clear now that unless appropriate foreign investors are attracted, the large financing gap that exists in the country cannot be filled.

Aside from finances, the lack of management capacity and technology to develop necessary infrastructure facilities cannot be addressed without foreign investors. Foreign investment in Vietnam and Bangladesh in 1987 was US $3,115 million and US $600 million, a fivefold difference. That figure for Vietnam has skyrocketed and now it stands at US $10,460 million whereas Bangladesh consistently remains at a low level of US $ 300 million per year, resulting in a thirty fold difference. This investment discrepancy doesn't only exist with Vietnam – a comparison with any South East Asian country shows a similar absence of investment. In 2012 the number of projects sponsored by foreign investors increased by 66.6%, but that indication hides the fact that each year since 2005 foreign direct investment (FDI) as a percentages of GDP and aggregate investment is declining. The fact that in the last 17 years there were substantial increases in FDI in only three years (1997-1998, 2000-2001, and (2004-2005), does not bode well for the economy. The failure to attract FDI and investors to the country has far reaching consequences that, although not visible now, will hamper economic growth in the near future.

A glance at the type of investment taking place indicates foreign investment has been driven by the telecommunication sector. That too in the past five years has dipped from a high of US $600 million to a mere US $50 million. In manufacturing it was restricted to the textile and apparel sector and a few other industries. Again, this does not indicate that FDI growth in the country is gaining momentum, as many journalists, public officials, and economists would make us believe. This trend in FDI cannot be sufficient to achieve a growth rate of over 6% needed to catch up with the country's neighbors.

The shift in global economic growth from North America and Europe to Asia has great significance for foreign investment in Bangladesh. Companies and investors from China, Korea, Japan, Taiwan, Singapore, and India are aggressively taking up investment opportunities in other Asian countries. In Vietnam, all of the above five countries with the exception of India, make up over 52% of the total foreign investment. Increasingly Korea and Japan is making

slow inroads in Bangladesh but the meagerness of these investments needs to be turned around. Otherwise, the low and declining trends will continue to haunt the economy.

Attracting investment in large infrastructure projects through viable PPPs have been seen as one way to move forward. PPPs, if successful can also act as a catalyst for further growth in foreign investment. With the adoption of a sound PPP Act, together with a well-established and working Foreign Private Investment Act, one can expect that gradual increases in PPP projects are in the offing. On the other hand, the failure to pilot even one significant PPP project does not bode well for the government. The question is what can the country do about this? Practitioners, academicians, and experts point out that the capacity and knowledge of the public sector is poor, hurting the development and formulation of PPPs. It is useful to acknowledge this lack of capacity, but one need to go beyond such assessments and look into some fundamental issues that constrains private sector participation in infrastructure.

One senior official from an institution playing a major role in FDI promotion remarked that as long as foreign aid and loans from multilateral institutions continue to be the main driver of public sector financing and operations, foreign investment would stay low. The official was referring to the existing mind-set of the public sector that is at odds with the skills and rules of business that goes along with developing, procuring, and negotiating successful PPP projects. Typically, public procurement using government funds or loans from multilateral institutions follow lengthy, bureaucratic processes. Over the last three decades, officials have learnt the requirements of such processes in preparing procurement documentation, and development project pro forma, as well as following a quality cost based system. These processes are antithetical to PPP arrangements and direct foreign investment. Until and unless a more investment-friendly approach towards the investors is provided even the most committed investor will find it impossible to do business in Bangladesh.

Developing large infrastructure projects requires land acquisition, at times a large amount. Land acquisition is already a major problem and a great barrier to successful PPP deals and processes. The practicalities of acquiring land by relocating people through various compensation schemes in many instances are impossible, particularly when civil society, activists, and media carry messages that generate emotions and sympathies towards people who are likely to be moved. If Illegal occupiers of land are to be evicted, that should be done well before the process of land acquisition. There has been very little attention paid to this very significant issue that over time will be more complicated as the population density continues to increase. The IFC Equator Principle (http://www.equator-principles.com) sets out eight environmental and social sustainability performance standards that are now followed by many international financial institutions and investment banks. Land acquisition and these social safeguard issues will be key fundamentals that have to be addressed to ensure successful PPP projects.

Although it is essential now to ensure the availability of finances for large infrastructure projects, it is even more urgent is to create an appropriate environment to attract investors into the country. For this to happen we have argued that we need to change the mind-set of officials in the public sector to create a “hospitable” environment showing a commitment and desire to welcome investors. Once we do so, there is absolutely no reason why funds should not flow into Bangladesh instead of in Vietnam. The question one can still pose is “will we be able to make those changes in the coming years?

Part III: Best Practices in PPP

Here we present the current Dutch PPP framework and its evolution of over the last 15 years that shaped the current private sector engagement success of the Dutch PPP market. Furthermore we describe the foreign interest in the Dutch PPP pipeline and pay attention to the strong ongoing movement towards new PPP areas such as (waste) water treatment, locks, ports and flood protection. Finally provide an overview of the key success factors and main lessons learned we.

5 The Dutch PPP framework

The Dutch PPP framework keeps relatively close to the theoretical model, compared to PPP frameworks in many other countries. It is first and foremost designed and used as a value adding enterprise and not as a financing gap solution. The taxpayers' interest is leading. This means that decision making is mostly done on a technocratic basis and the market has only a government controlled amount of influence in deal making. Projects and their financing is procured in a competitive market due to the highly competitive construction industry and financiers' appetite for bankable projects.

In this section the current Dutch PPP framework is discussed in more detail; which projects would apply as PPP and what are the legal, contractual and organisational frameworks.

5.1 Budgeted financing and MIRT[12]

To facilitate decision making in an environment with limited space and financial resources the Dutch Government introduced the Multi-year schedule for Infrastructure, called "MIRT" in Dutch. The MIRT is a budget that stipulates infrastructure investments (projects) by the Dutch Government for the next five years. The budget includes the programs and projects, including PPP projects, of the Dutch Government itself as well as the programs and projects of local authorities that are subsidised by the Dutch Government. The MIRT further details the duties and roles of the involved (local and national) government agencies and the decision-making requirements for the Dutch Government for providing subsidies. The MIRT also defines and records planning procedures and research into (potential) projects. As such, the MIRT makes decision-making transparent and accountable and creates a shared vision for Dutch Government and local authorities; its main objective.

Because the PPP projects are included in the annual and five-year look-ahead budgets (MIRT) the costs for these PPP projects are recorded as an expenditure of government at the moment these are incurred as bullet payments and availability payments; meaning liabilities for these projects are not being credited to an unidentified later time but calculated in economic models for the country. This has been confirmed by Eurostat[13] and provides backing for this type of procurement from both the left and right side of the political aisle, meaning PPP projects are less likely to be influenced by changes in the political arena.

5.2 Starting point for PPP projects

As determined by the Dutch government, federal government projects have to be considered for PPP (DBFM(O)) by contracting authorities if the projected investments surpasses:

- EUR 60 million for *infrastructure* projects;
- EUR 25 million for *government building* projects.

Contracting authorities are allowed flexibility below these thresholds, meaning they can chose to research PPP possibilities but do not have to.

Two gates have to be cleared to respectively determine to tender a project as a PPP and proceed as a PPP after the bids have been submitted:

[12] The Dutch Multi-year Infrastructure Budget called "MIRT" in Dutch, see for example the MIRT Project Book 2014

[13] Eurostat News Release - 10 February 2015

1. Since 2002, the main tool to assess whether or not to procure a project as a PPP in the Netherlands is the Public Private Comparator (PPC)[14]. This quantitative and qualitative tool compares the added value of PPP against a traditional Design & Build (D&B / D&C) approach. It presents the pros and cons of procuring the project as a PPP and covers both financial and non-financial considerations.
2. Once a choice has been made for PPP a life cycle cost assessment has to be done, called a Public Sector Comparator (PSC)[15]. According to the World Bank[16] a PSC "provides an insight of the total costs, income and risks over the project life using public procurement. The results can be used as a benchmark in the subsequent public procurement. The results can be used as a benchmark to make a comparison with the final PPP tender proposal. The results of the comparison show whether the bids resulting from a PPP procurement are better value for money compared to a public procurement option. A prudent [contracting] authority will reserve the right to terminate a public (PPP) tender procedure and not to award a contract if the tenders are higher than the PSC."

5.3 Legal framework

The Dutch cabinet has formally transferred a prejudice for more market involvement in the development of infrastructure into a policy that actively pushes for PPP (also refer to section 7). For example, Rijkswaterstaat (RWS), the executive body of Waterways and Public Works for the Dutch Ministry of Infrastructure and Environment, applies a principle called "the market, unless"[17], meaning that it will expedite as many responsibilities relating to design, construction and maintenance as possible to the market[18]. Under this principle RWS prescribes time, quality and budget constraints for one project that includes for a multiple disciplines (design, build and maintain). Following a competitive bidding procedure RWS then expects one market party to execute the entire package within the set constraints (typically a DBFM contract).

The Dutch Parliament actively and regularly, in two year intervals, monitors the progress of PPP in the Netherlands (refer to section 7).

PPP projects are procured through a competitive dialogue procedure, following standard EU guidelines and legislation[19]. This allows for the necessary competition and, if implemented well, can be a drive for innovation and quality. In the Netherlands this is done by adding Most Economic Advantageous Tender (MEAT) criteria in the tender guidelines that stimulate the bidding contractor to plan and design for contracting authority risks and how it will plan for the main design, construction and operations & maintenance risks. The score of the bidders on these MEAT criteria will be translated in a fictional discounted value of their bid (the bid price is assessed as being less). One of the benefits is that the risk transfer is being further reviewed and rationalised, in open dialogue with the authority, dedicated to the specific high risk project aspects. Well established MEAT criteria have proven to drive up quality whilst simultaneously stimulating competition in the bid (price). Here we find controlled influence of the private party mentioned in the introduction of chapter 3.

The tender procedure (competitive dialogue) can be organised as follows[20]:

[14] Public-Private Comparator Manual 2013 – Dutch Ministry of Finance

[15] Public Sector Comparator 2002 – PPP KnowledgeCenter

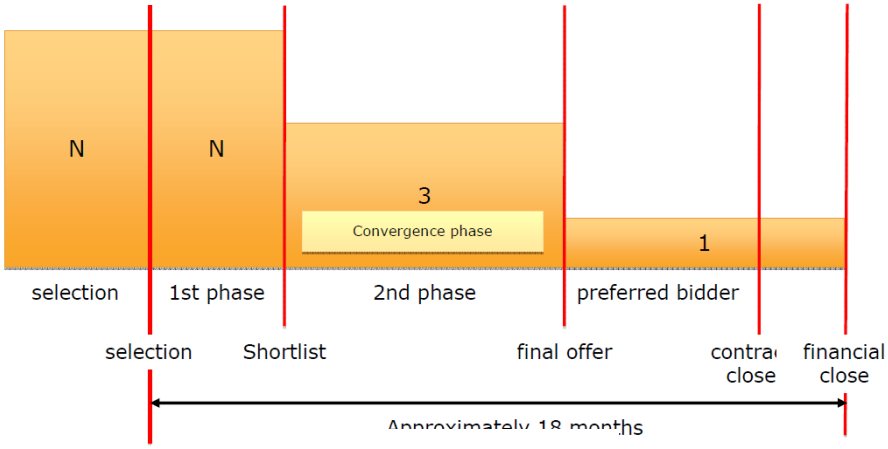
[16] Public Sector Comparator for Highway PPP Projects – Henry Kerali of the World Bank

17 http://aanbestedingswijzer.nl/markt-tenzij/

18 http://www.rijkswaterstaat.nl/over_ons/missiekerntaken/publiek_private_samenwerking/

[19] European Parliament and Council Guidelines 2004/18/EG d.d. 31 March 2004 (Pb. L 134/114, 30 April 2004)

[20] Contract & Tender procedure presentation A9 Gaasperdammerweg Industry Day – Yke Norg (RWS), November 2012



Approximately 12 – 18 months

5.4 Contractual framework

Over the years the Dutch Ministry of Finance developed and maintained a standard model DBFM(O) Agreement. This model differs slightly between infrastructure projects (DBFM contracts[21]) and government office projects (DBFMO contracts[22]).

Here we discuss how the Ministry of Finance evaluates and evolves the standard model, its contractual organisation, payment mechanism, risk demarcation and its securities.

Evaluates and evolution of the standard DBFM(O) model

A selection of the Dutch DBFM(O) projects have been / are being evaluated by the Ministry of Finance at multiple stages (after tender, after completion). These evaluations consist of data analysis and a wide range of interviews with involved staff from both the public and private side, including financiers. Lessons learned are included in the above mentioned progress reports and as updates in the standard Dutch DBFM(O) model.

The Ministry of Finance may revise the model, for example due to developments on the financial markets such as the involvement of institutional investors or due to discussions with the market on risk allocation. This standardization significantly limits development and transaction costs for both the authorities and private parties. Local, regional and national governments can use the Ministry of Finance's of-the-shelf standard DBFM(O) model and adapt to their specific requirements, which limits their development costs.

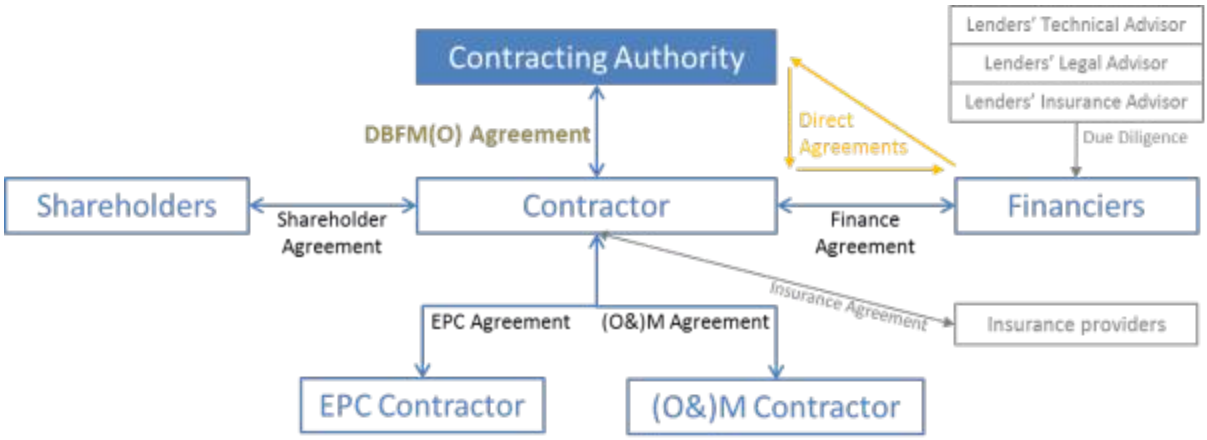
Another added benefit is that during the tender stage and contract management the existence of a carefully thought out and developed standard limits discussions on the content of the DBFM(O) Agreement to only the project specific adjustments.

Contractual organisation

A typical contractual framework would resemble the following overview, which is in line with international standards:

[21] DBFM model 4.1 for Infrastructure – Dutch Ministry of Finance: http://www.rijksoverheid.nl/onderwerpen/publiek-private-samenwerking-pps-bij-het-rijk/documenten-en-publicaties/richtlijnen/2014/12/19/rijksbrede-modelovereenkomst-dbfm-infrastructuur-2014.html

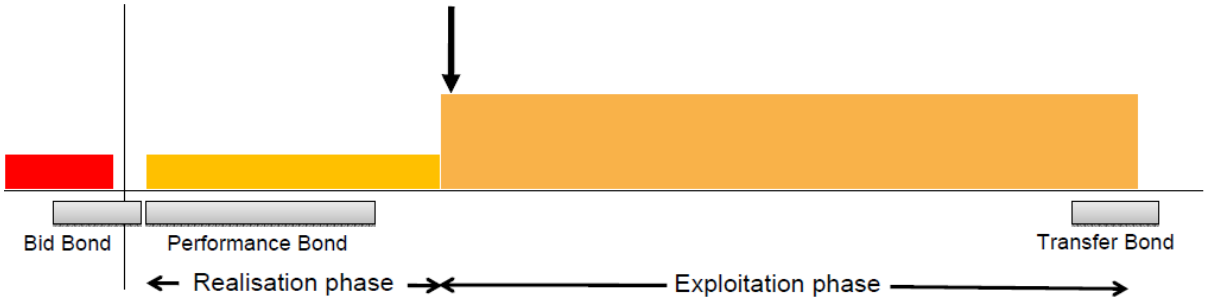
[22] DBFMO model 4.1 for government buildings – Dutch Ministry of Finance: http://www.rijksoverheid.nl/onderwerpen/publiek-private-samenwerking-pps-bij-het-rijk/documenten-en-publicaties/richtlijnen/2014/12/19/rijksbrede-modelovereenkomst-dbfmo-huisvesting-2014.html



A typical trend noticed in the Dutch market is the integration of the EPC Contractor and O&M Contractor in one entity.

Payment mechanism and deductions

The standard contracts are availability based contracts, meaning the contractor will get a fixed reimbursement over time for delivered services (availability of a road, lock or a building), minus availability and performance deductions (for non-availability or defaults). A typical payment structure would resemble the following abstract overview[23] with in yellow the availability based payments over time and in red the authority's tender development costs:



In the Dutch model it is custom to apply bullet payments on obtaining availability and completion of the project in order to stimulate on-time delivery and lower finance costs.

Risk demarcation

The contracting authority will inter alia take on the following risks, that a private sector party cannot effectively control:

(i) Planning procedure
(ii) Ecological permits up to commencement
(iii) Uncontrollable third parties such as competent bodies unreasonably withholding permits or uitiliy owners refusing cooperation on utilities relocation
(iv) Stakeholder agreements
(v) Environmental impact studies
(vi) Force majeure (terrorism, war and explosions, natural disasters)
(vii) Changes in law and regulation
(viii) Major changes in the financial markets

The Contractor will have to inter alia take on the following risks:

(i) Financing
(ii) Design and planning
(iii) Construction

[23] Contract & Tender procedure presentation A9 Gaasperdammerweg Industry Day – Yke Norg (RWS), November 2012

(iv) Construction permits
(v) Stakeholder management
(vi) Environmental compliance risks
(vii) Maintenance
(viii) Hand back

Securities

Termination triggers can be compared to those used in PPP projects in other countries worldwide and typically relate to incurring high levels of performance deductions, late delivery, failure to remedy, contractor's bankruptcy, failure to deliver bank guarantees and performance bonds, etc.

Security packages (performance bonds, liability caps, latent defects periods, liquidated damages, etc.) are in line with standard international PPP principles. The security packages and due diligence required by the financiers ensures market discipline, as non-compliance could lead to severe financial loss and termination for the contractors involved.

Key success factors for public and/or private party support for the standardised contractual framework often cited:

- Standard and tested contracts make for very predictable projects;
- Standard and tested contracts reduce transaction costs significantly;
- Standard and tested contracts leave little room for fraudulent behaviour and misinterpretation;
- Open book financial models and open book contract changes provide transparency;
- Profit sharing of refinancing costs and costs savings through contract changes provide goodwill;
- Strict refinancing conditions under threat of immediate contract termination limits abuse of project finance.

Some general lessons learned

Initially the contracting authority transferred all **permitting risk** towards the contractor. However, this appeared a too heavy and uncontrollable burden for the contractor, leading to losses and delays, for instance in the MaVa A15 motorway project near Rotterdam being realised between 2011 and 2015. Lessons were learned and for every project tendered since 2013 is now determined in detail which permitting responsibilities are best left with the authority and which can be best mitigated by the contractor.

Output specifications are functionally stated, meaning as much design freedom as possible remains. Not specifying designs into the smallest detail has been a difficult exercise for many contracting authorities, since this meant they could not fully foresee what they would end up with. Contracting authorities were anxious they would not get the project they had envisioned if they could not prescribe in detail what they want. After 15 years of experience contracting authorities are now actually looking favourable to **functional specification** because in more cases than not they would actually get more quality and better solutions then they could imagine themselves. To achieve this, healthy competition amongst tendering contractors has proven to be the key factor. Most Economic Advantageous Tender (MEAT) principles leading to virtual discounts on bids has proven an effective method to stimulate the market to deliver innovation and quality delivery. These MEAT principles are now the main focus of the tender procedure. In the locks projects starting in 2014, which are tendered by contracting authorities who are still relatively unfamiliar with PPP, this lesson had to be learned all over again.

5.5 Organisational framework

The **Ministry of Finance** maintains, evaluates and updates the standard Dutch DBFM(O) model[24]. Changes suggested during the tender phase of individual projects have to be approved and amended by the Ministry of Finance. The Minister of Finance is end-responsible. The Ministry of Finance also tests correct implementation and management of the DBFM(O) contracts and pricing in actual projects. Motorway and locks DBFM projects are initiated by the **Ministry of Infrastructure and Environment** and executed by Rijkswaterstaat (RWS), the executive body of Waterways and Public Works for the Dutch Ministry of Infrastructure and Environment. RWS prepares, procures, manages and owns these projects. Note that these projects do not include operations, since RWS believes that (i) these responsibilities (inter alia de-icing, wreckage hauling, road closing) are an intrinsic government responsibility that cannot be extended to the market and (ii) the government can achieve better economies of scale on these very standard and project boundary crossing services.

Government office building DBFMO projects are initiated by the **Ministry of the Interior** and executed by Rijksvastgoeddienst (RVD, the executive body of Real Estate for the Dutch Ministry of the Interior) prepares, procures, manages and owns these projects. These projects transfer operational responsibilities such as cleaning, facilities management and catering to the private party.

Barracks DBFMO projects are initiated by the **Ministry of Defence**. These projects transfer operational responsibilities such as cleaning, facilities management and catering to the private party. The Ministry of Defence also contracts PPPs for IT and vehicles, but does so under different frameworks.

[24] https://www.pianoo.nl/rijksbrede-leidraden-voor-dbfmo-aanbestedingen

Part III: Best Practices in PPP

6 The evolution of PPP in the Netherlands

The evolution of PPP in the Netherlands towards its currently, and by many considered very successful, PPP programme has been a delicate interaction between a number of driving forces, set out in the following paragraphs.

6.1 The route to the first PPP projects

PPPs were relatively scarce in the period prior to the second millennium. The first step to the implementation of PPPs was initiated with the Noordtunnel and Wijkertunnel projects in 1988 and 1992. These projects have been financed with shadow tolls and as such have a separate DBM and F contract. Although these cannot be considered as 100% PPPs, these projects were the only two DBFM-like PPPs that have been initiated in the Netherlands prior to the second millennium.

According to a former director general of RWS, the limited use of PPPs can be explained by the lack of sufficient funds and because PPPs were not considered a solution for the mobility issues at that time. Furthermore, he stated that ministers had other priorities at that time (Eversdijk and Korsten, 2015[25]).

In the first years of the second century the political pressure to apply PPPs was increasing as the national politics were of the opinion that RWS was too cumbersome. PPPs were considered to be the tool to resolve this issue (Eversdijk and Korsten, 2015).

The first DBFM projects to be procured in the Netherlands were a high speed rail in 2001 (HSL-Zuid, with a capital value of approximately EUR 1 billion) and a motorway project in 2003 (the A59, with capital value of approximately EUR 130 million)[26]. The development of the Dutch DBFM(O) standard can be traced back to this period.

High Speed Rail South

The HSL-Zuid PPP project between Amsterdam and the Belgium border is one of the largest high-speed railway projects in Europe to date. The DBFM contract for the project resulted in a reduction of 5% on the project costs compared with traditional tendering. Despite the complexity and size of this high-speed rail project the line has been delivered according to schedule.

A59 Motorway

The A59 motorway was the Netherlands' first DBFM contract for road infrastructure. In March 2006, this project received the European Construction Industry ACTIVE Project of the Year Award because of:

- its safety record;
- a reduction of 14% on the project costs compared with traditional tendering;
- excellent community relations and traffic management;
- integrated risk management;
- completion ahead of schedule

These successful first DBFM contracts played a huge role in the further development of PPP in the Netherlands. They stimulated the Dutch Government for further investigation of the PPP principle and the development of a PPP project pipeline, refer to section 6.2. Fully budgeted procurement of PPP (refer to section 5.1), the "market, unless"(let the market take care of it, unless the government absolutely has to do it) mantra (refer to section 5.36.2) and detailed Parliamentary involvement (refer to section 6.37) adopted by the Dutch government created the required political backing and consequently "sealed the deal". Market engagement *refer to section 7.3) was prevalent from the start.

Initially only motorway projects were considered, but soon government buildings followed suit. By the end of 2014 an additional 8 motorway and 10 building projects had successfully reached financial close. By 2013 costs savings on EUR

[25] Arno Eversdijk and Arno F.A. Korsten, 'Motiveven en overwegingen achter publiek-private samenwerking', Beleidsonderzoek Online februari 2015, DOI: 10.5553/Beleidsonderzoek.000515.

[26] www.bamppp.nl

4 billion in projects are estimated to constitute EUR 700 million[27]. Between 2014 and 2020 a pipeline of projects worth EUR 6 billion is foreseen, that should lead to a similar reduction in costs.

The government stated in public policy statement its intention in 2010[28], and again in 2012[29], to continue and increase PPP as a main procurement method.

6.2 Ruding Committee[30] - engage the market!

On 7 November 2007 the Dutch Ministry of Infrastructure and Environment and the Dutch Ministry of Finance installed the Ruding Committee in an advisory capacity to investigate potential of further private market involvement in the development of infrastructure. The Committee was named after its president and former Dutch Minister of Finance and banker Onno Ruding, who gave the Committee credibility as having served on high levels on both the public and private side.

The Ruding Committee's objective was to investigate possible value for money opportunities through the private financing of infrastructure projects. Value for money for the taxpayer can be expressed in social-economic benefits, lower costs and/or better services and quality. The Ruding Committee's secondary objective was to analyse the organisational implications of private financing of infrastructure projects. The results of the Ruding Committee were presented in May 2008 and gave strength to the development of a stable pipeline of PPP projects in the Netherlands.

The Ruding Committee identified the potential added value of private financing of infrastructure projects due to the;

- ✓ possibility to increase the price quality ratio during the entire project lifecycle;
- ✓ possibility to accelerate the realisation of infrastructure projects; and there is the,
- ✓ possibility to increase the volume of infrastructure projects.

The main recommendations of the Ruding Committee were (non-exhaustive list):

- ✓ Reduce transaction costs due to standardisation of contract- and tender documents;
- ✓ Standardisation and transparency of the tax treatment;
- ✓ Risk allocation based on the principle that individual risks are borne by the party best suited to carry these risks;
- ✓ Revitalize the PPP Knowledge Centre at the Ministry of Finance, also in support to local authorities in applying private financing, and to collect, retain and spread knowledge within and between governmental organisations;
- ✓ To create more opportunities for local authorities and other stakeholders to contribute to the financing of projects within the Multi-year Infrastructure Budget ("MIRT" in Dutch, refer to section 5.1) to accelerate the realisation of these projects;
- ✓ Establish a form of regional PPP fund for the realisation of local PPP based infrastructure projects;

[27] Procurement of PPP in the Netherlands, EPEC Private Sector Forum, Brussels 18 April 2013, Ministry of Finance

[28] http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2010/09/30/regeerakkoord-vvd-cda.html

[29] http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2012/10/29/regeerakkoord.html

[30] "Op de goede weg en het juiste spoor" – May 2008

- ✓ Use the financial benefits of PPP projects for the realisation of more infrastructure projects within the overall budgetary framework;
- ✓ Involve institutional investors in the financing of infrastructure projects.

The Ruding Committee report was carried by a broad spectrum of political parties, private entities and public executive arms. This led to most recommendations being followed to some extent and to official government policy. RWS adopted the "market, unless" policy (refer to section 5.3) following Ruding Committee recommendations.

6.3 Parliamentary involvement and national auditing

Since 2010 the Ministry of Finance reports bi-annually[31] on the progress and developments in the field of DBFM(O) policy and actual DBFM(O) projects to a special committee within the Dutch Parliament. These progress reports look one year back and one year forward. This allows direct information sharing with and involvement from Parliament into the progress of DBFM(O). Parliament members can ask questions to the responsible Minsters (Internal Affairs for government buildings, Infrastructure and Environment for roads and locks, Defense for barracks, Finance for the contracting standards and financial implications). Consequently they can insert motions to adjust PPP legislation and contracting standards.

Furthermore the Dutch National Audit Office (the "Algemene Rekenkamer") in 2013 released an in-depth audit32 of the added value and potential areas for improvement for the Dutch DBFM(O) model. This critical address showed that added value was indeed obtained, but that contract management could be done in a more straightforward and structured manner to increase the performance of the DBFM(O) model even further. The audit report was covered in depth by the Dutch Parliament. Responsible ministries (refer to section 5.5) have formally responded on which lessons they take from the audit report and how they will implement these in future projects.

These two measures provide a substantiated overview to Dutch Parliament on PPP progress and issues. This promotes transparency, good governance and upward progress of the Dutch PPP programme.

7 Decision making

7.1 Motives for application in the Netherlands

Motives to apply DBFM in the Netherlands have been changing from year to year (Eversdijk and Korsten, 2015). The introduction of DBFM in the early 1990s was driven by financial need and restructuring of the governmental bodies. The RWS organisation had to downsize and the governmental policy required private funds. From the early 2000s the application of DBFM was mainly driven by a need to improve the quality of public service. The financial added value (i.e. Value for Money: ratio of improved quality of services versus costs) was the main argument to apply DBFM. Around 2010, increased project control and success were put forward as a reason to apply DBFM. The general opinion was that by using DBFM in a project would more likely be finished within schedule and budget.

The application of DBFM in the Netherlands is driven by a multi-motive-policy and budgetary shortfalls and financial considerations have been a common thread throughout the years (Eversdijk and Korsten, 2015). Anno 2015, Value for Money is still the main motive for the Dutch government for the application of DBFM(O). Value for Money is defined by the Public Private Comparator (PPC, section 2.3) that estimates the added value a PPP will realise compared to a traditional Design & Build (D&B / D&C) approach. The PPC outcome however is not always determining in the decision

[31] Voortgangsrapportage DBFM(O) 2010, 2012 and 2014

[32] Contractmanagement in DBFMO projects- Algemene Rekenkamer 2013

for PPPs. Eversdijk and Korsten (2015) argue that up to 2011, 40% of the projects with a positive PPC outcome the government chose not to use PPP. In these cases the decision was influenced by other factors, such as:

The political rationale was more important than the PPC outcome. In those cases the PPC outcome was overruled by political and administrative considerations. Existing agreements between national and local governments for the opening date of the road resulted in traditional procurement due to the more time consuming preparation time for a PPP. Other arguments were considered more important such as the lack of expected private sector optimisations, little time gains one expects PPP to achieve, and a lack of PPP knowledge at the relevant governmental body.

This analysis shows that the decision to apply PPPs in the Netherlands has been based on a balance of motives intrinsic to the project (weighted by the PPC) and political-administrative motives. However, neither Value for Money, nor political considerations by themselves have been determining for the decision to apply PPPs. This was always combined with additional argumentation (Eversdijk and Korsten, 2015).

7.2 Political backing

Political backing on a national level, from the Dutch Parliament and from a Ministry level, appears to be primarily founded on three pillars:

1) Budgeted procurement, meaning filing financing gaps is not the "raison d'être" for PPP (refer to section 5.1).
2) Open book standard model PPP contracts which progress is regularly monitored by and reported on by the Ministry of Finance and the National Audit Office (the Dutch "Algemene Rekenkamer") (refer to section 6.3) leads to a comparatively transparent and predictable PPP project pipeline.
3) The authority knows exactly how much it will have to pay and when, since this is fully determined in the contract; design, construction and operations & maintenance changes are mostly a contractor risk. Only limited budgets are required to cover changes in law, planning procedures and policies and due to contractual inconsistencies.

These three pillars allow for rational and technocratic discussions and decision making on the actual merit and added value for taxpayers when deciding to procure a projects as a PPP. Emotion and ideals are replaced with substantiated assumptions, facts and real figures. As long as no additional national debt is (inadvertently) being invited and factual representations prove added value for taxpayers then it is reasonable to assume that "both sides of the political aisle" remain in support.

In more detail, the political backing rests on:

- ✓ Reliable and consistent PPP policy for almost 15 years with all projects so far provided substantiated Value for (taxpayers') Money.
- ✓ Proven added value according to multiple evaluations and the National Audit Office[33];
- ✓ PPP projects so far have all been delivered on time and within budget against required or sometimes even better quality;
- ✓ Progress is monitored by and reported on by the Ministry of Finance on a two-yearly basis force transparency;
- ✓ Transparency is guarded inter alia by open-book financial models, standard contracts and competitive dialogue tender procedures;

[33] Contractmanagement in DBFMO projects - Algemene Rekenkamer 2013

- ✓ Continuous evaluation and standardisation by authorities and Ministry of Finance leads to (i) improved performance of PPP tenders and projects and (ii) to decreased transaction costs;
- ✓ Profit sharing of refinancing costs (up to 70% of financial gain can go to the government since it is a government owned / taxpayer funded project) and costs savings through contract changes provide goodwill whilst strict refinancing conditions under threat of immediate contract termination limits abuse of project finance, such as distorted profits for banks paid for by taxpayers;
- ✓ PPP projects are procured through a competitive dialogue procedure, following standard EU guidelines and legislation. This allows for the necessary competition and, if implemented well, drives innovation and quality.

7.3 Private sector engagement

The private sector has expressed interest in the Dutch PPP model because of inter alia:

- ✓ Reinforced government policy in favour of the use of PPP and a stable and formally announced pipeline leading to a healthy and investment worthy business environment;
- ✓ Strong credit rating of the Dutch government;
- ✓ Standardised, transparent and stable tender procedures;
- ✓ Deadlines set by the authority are being upheld (give or take several weeks);
- ✓ Partial tender costs reimbursements for non-preferred bidders;
- ✓ Standardisation of the contracts;
- ✓ Reasonable guarantees and protection provided by contracting authorities for financiers against uncontrollable (mainly third-party, planning procedure and force majeure) risks;
- ✓ Highly developed Dutch construction industry;
- ✓ Excellent ethical reputation;
- ✓ Availability based schemes (i.e. no earning or tolls risk).

These strong points lead to a relatively stable and predictable project pipeline and project lead times whilst lowering transaction costs, providing reasonable protection against uncontrollable risks and ah high guarantee of payment at performance.

This has so far led to fully committed and compliant competitive bids on every project to date.

The main concrete examples for pro-active market engagement by contracting authorities are:

Market consultations

Rijkswaterstaat (RWS), the executive body of Waterways and Public Works for the Dutch Ministry of Infrastructure and Environment regularly (at least once a year) organises market consultations on specific projects and/or programs, for instance the locks programme of 6 potential locks PPP projects (refer to section 8.2). The aim of these market consultations is to test the feasibility and practicability with market parties of:

1) the proposed scope of projects; and
2) the corresponding proposed substantive or procedural solutions.

During market consultations the participants are asked to assist RWS in the development of an idea, plan or procurement initiative. A market consultation can be seen as a preparation for a tendering process, but is otherwise completely separate from it. Participation is completely voluntary and therefore without obligation. Any ideas uttered during the consultation will become part of public record.

During Market consultations RWS will also investigate the interest and possibilities with the participants for the development and realisation of the scope and presented solutions of these projects. This will help them determine whether the foreseen procurement strategy and project scope and risk demarcation can be feasible and where adjustment may be required.

Industry days

At the start of major tenders RWS organises so called "Industry Days" to engage private parties, elaborate on primary objectives and the contract and payment mechanism and ask for input from the private parties. See for example http://www.rijkswaterstaat.nl/images/Presentatie%20contract%20en%20procedure_tcm174-333475.pdf for a presentation by RWS on the EUR 700 million A9 Gaasperdammerweg motorway DBFM project.

"PPS Works!" conferences

Organised annually by RWS for nine years between 2004 and 2013, the PPS Werkt! (PPP Works!) conferences are an example of the collaboration between Dutch authorities and market parties to exchange PPP experience and PPP knowledge. Exchanging experience and knowledge is part of the improvement cycle and part of the success of the Dutch PPP market. Both RWS and the Dutch Government Real Estate Agency (Rijksvastgoedbedrijf or RVB) participate in PPS Werkt! (also refer to section 5.3).

PPS Werkt! 2012

Locks programme market consultation 2012

IPFA[34]

The International Project Finance Association (IPFA) is an independent, not-for-profit, professional members association dedicated to promoting and representing the interests of both public and private sector organisations involved in project finance and Public Private Partnerships (PPPs) worldwide. It members are key players within the infrastructure and energy industry, including authorities, financial institutions, project sponsors, law firms, construction companies and operators active in PPP and project finance markets globally.

[34] http://www.ipfa.org/about-ipfa/

Established in 1998, the IPFA aims to raise awareness and understanding about project finance and PPPs and their crucial role in infrastructure and economic development. The principle objectives of the IPFA are to:

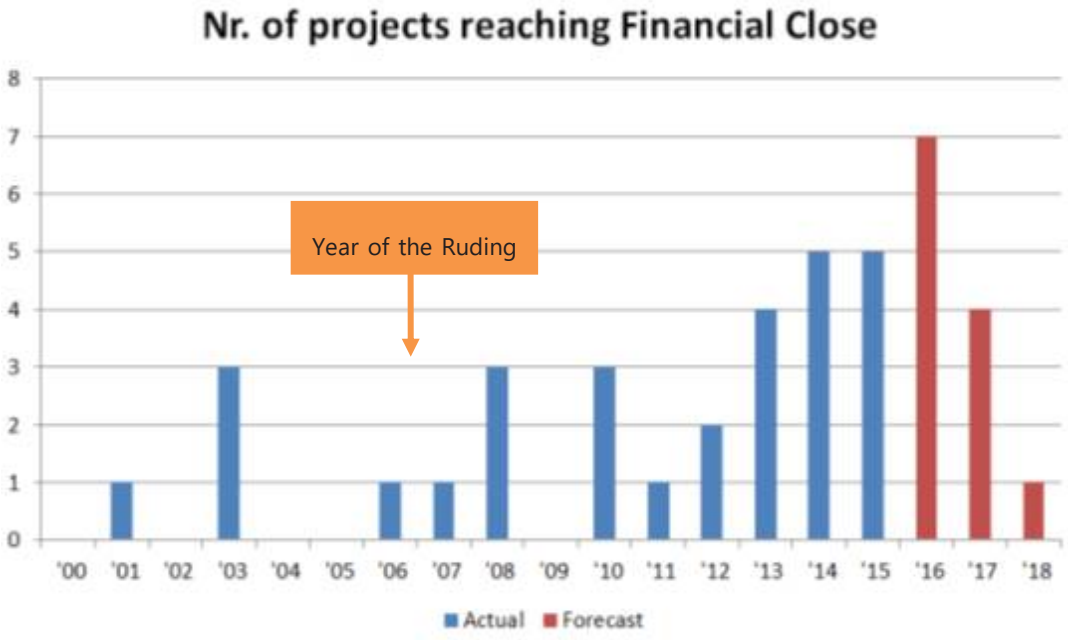
1) Encourage networking and dialogue between the public and private sector.
2) Provide up-to-date information on best practice, industry trends and new developments that can be immediately applied to projects.

Successfully achieving these objectives since its inception has not only built political support for project finance and increased public awareness regarding the vital role that project finance can play in seeking more cost effective ways to provide essential economic infrastructure services; it has also created a truly integrated working relationship between the IPFA, the private sector and governments both at local level and on a global scale.

In the Netherlands RWS and the Ministry of Finance regularly meet with representatives of IPFA to discuss trends, issues and potential solutions for PPP projects in the Netherlands. RWS and the Ministry of Finance also attend IPFA meetings regularly.

7.4 Project pipeline development

The below figure sets out the DBFM(O) projects reaching Financial Close in time, including a forecast of projects currently in (preparation for) tender. The figure marks when the Ruding Committee report (refer to section 6.2) discussed in the next paragraph was published, with the consequential surge in DBFM(O) projects reaching Financial Close from 2010 onwards. The downward trend after 2016 can be explained by the fact that over 12 projects are being considered as a PPP (in PPC stage or leading up to the PPC) but not yet confirmed[35]. The current expectation is that the pipeline will continue on a similar scale.



[35] www.ppsbijhetrijk.nl

8 PPP Moving into New Areas

PPP has also gained traction in other "wet" infrastructure disciplines following the proven success in motorways and buildings projects. After all, many of the same principles that apply for these "dry" infrastructure projects should also apply for "wet" infrastructure; although the discipline of the projects changes, the contracts, risk demarcation and leveraging between authority and contractor and financing remain very similar up to a detailed level.

As such the Dutch government reasoned that for these "wet" projects added value can be gained similarly to motorways and buildings projects. Especially since lessons learned from the motorways and buildings projects can be applied.

8.1 Waste water treatment

In 2005 Delfluent[36] initiated Harnaschpolder waste water treatment plant near The Hague reached financial close; the first of its kind.

Harnaschpolder waste water treatment plant PPP
The Harnaschpolder waste water treatment plant is a PPP first. It has a treatment capacity of 1.3 million pollution equivalents (p.e.), which makes it the largest in the Netherlands and one of the largest in Europe. On a site that covers 25 hectares, Delfluent Services treats the waste water from more than 1 million inhabitants and around forty thousand companies in the region of The Hague.
The Ministry of Finance proposed a PPP-scheme for this project, which could result in a cost saving for the Delfland Water Board of 70 million Euros due to the intrinsic advantages of PPP.

8.2 Locks[37] and primary flood defence

After a multi-year preparation and two year roadshow to test market engagement and contractual assumptions 2014 saw the first three locks projects being tendered as a DBFM, adopted from the Dutch motorway DBFM model. The threshold was relatively low since RWS – having had 10 years of experience in motorways – is also the contracting authority for these locks.

One of these locks projects, the IJmuiden sea lock (Zeetoegang IJmond) connecting Amsterdam with the North Sea, concerns the largest individual lock chamber in the world and doubles as a primary flood barrier.

Two more locks projects and one project concerning the Afsluitdijk – a 35 kilometre dyke and flood protection system separating the fresh water IJssel Lake from the North Sea, including a 2x2 lane motorway and the world's largest sluices – will be tendered end of 2015.

The first two tendered locks projects, Limmel and IJmuiden, were bid for by multiple parties with committed commercial financing and the expectations are the same for the third lock project (the Beatrixsluis).

[36] http://delfluent.nl/en/ppp-organization/
[37] Lock Program Workshop TEN-TEA Brussels, RWS 2013

Locks PPP Programme

The 2.2 billion euro locks PPP programme consists of six projects, five of which dedicated lock projects and one flood barrier (the Afsluitdijk) that has two locks and two sluices. One of the five dedicated locks is the new IJmuiden Sea Lock (IJmond), the largest lock in the world at 500 x 70 x 20 meters.

These locks projects concern the gates, electro-mechanical machinery, lock chambers and surrounding infrastructure, but also primary flood defence systems.

8.3 Water Authorities

In 2014 High Water Protection Programme[38], PPP Support[39] and four Water Authorities created an integrated assessment framework to assess which contract would be best for any high water protection project[40]. It covers the benefits and stimuli provided by traditional, D&C and DBM and DBFM contracts for specific types of projects, based on which governments can assess which type of contract could potentially be most beneficial.

The integrated assessment framework depicts how a clear shift can be noticed from traditional contracts to more integrated contracts.

No specific high water protection PPP projects have yet been announced, but reportedly a range of Water Authorities have been assessing whether to procure projects as a DBFM, based on the Dutch standard model.

8.4 Provinces and municipalities

Following the success of the national level PPP projects, local governments are slowly moving towards adopting PPP as a tool to bridge investment gaps and add value to their infrastructure procurement. The Dutch Government introduced the collaboration platforms PPS Netwerk Nederland[41] (PPP Network the Netherlands) and PPSsupport[42] (PPP support). These platforms provide information and start-up support for PPP projects to local, regional and central (semi-) authorities, like provinces, municipalities and healthcare institutions.

So far three schools and one city hall (for the municipality of Westland) have been tendered. A tender for the extension of an existing inland port and its facilities for the city of Waalwijk is currently on the market.

[38] www.hoogwaterbeschermingsprogramma.nl – a cooperation between the official Union of the Dutch Water Authorities and RWS

[39] www.ppssupport.nl – a Dutch government organisation that supports local authorities (|provinces, municiaplites, water authorities) with assessing and implementing PPP opportunities.

[40] Afwegingskader geïntegreerde contractvormen Hoogwaterbeschermingsprogramma, June 2014

[41] http://www.ppsnetwerk.nl/Frontpage

[42] http://www.ppssupport.nl/

New port in Waalwijk

The municipality of Waalwijk wants to grow its harbour and logistical significance in order to grow its economy. The new harbour should allow larger vessels to moor off.

Waalwijk has chosen to procure the project as a PPP to help shape this ambition in an affordable and qualitative value adding manner.

9 Success factors and lessons learned

9.1 Key success factors

- ✓ PPP projects are developed to have a number of advantages over traditional projects:
  - All parties should be forced, through the contract, to focus primarily on the services and products they are best equipped to provide (i.e. contractors are responsible for design build and maintain and government is responsible for planning procedures and setting quality and environmental constraints). During contract development and the competitive dialogue tender procedure the involved authorities and contractors, together endeavour, for the best possible allocation of tasks and risk;
  - Frontloading of due diligence, security packages (market discipline, requested by financiers during the tender stage) and dialogue between authority and contractor on risk management plans (functional objectives are served, drafted by contractors as part of the bid during the tender stage) ensures that risks are transferred as effectively as possible under relevant circumstances;
  - On-time delivery, under threat of delayed bullet and availability payments, penalties and one-sided termination of the contract. The discipline imposed by financiers increases the pressure for contractor to deliver on time;
  - The authority provides contractors with a controlled amount of freedom to invest in new technologies and innovative solution in order to reduce life cycle costs through an effective combination of the long duration of the contract and functional specifications.
- ✓ The successful first DBFM contracts, delivered on time and on budget against desired or even better quality, played a huge role in the further development of PPP in the Netherlands. They stimulated the Dutch Government to further investigate the potential merits of PPP and the development of a PPP project pipeline. The Ruding Committee pushed PPP further.
- ✓ Continued explicit support for PPP in latest government policies of 2012 and 2014 that pro-actively stimulates PPP and the "market, unless" policy adopted by RWS makes government policy predictable.
- ✓ The Ministry of Finance maintains, evaluates and updates the standard Dutch DBFM(O) model. Material changes suggested by contractors and authorities during tendering of individual projects have to be approved and amended by the Ministry of Finance, especially when they influence project financing. Key factors for public and/or private party support for the standardised contractual framework is that standard and tested contracts:
  - Make for very predictable and transparent projects;
  - Significantly reduce development and transaction costs for both the authorities and the market;
  - Significantly limit discussions on the content of the DBFM(O) Agreement to only the project specific adjustments;
  - And as such leave little room for fraudulent behaviour and misinterpretation on a project-by-project basis.

- ✓ Political support rests on *proven added value*, *transparency* and *budgeted funding* caused by inter alia:
  - Budgeted procurement of PPP projects means filing financing gaps is not the "raison d'être" for PPP in the Netherlands. PPP is considered by both the left and right side of the political aisle as a practical solution to add value to projects that would have been realised anyway;
  - Reliable and consistent PPP policy for almost 15 years with all projects so far provided substantiated Value for Money for taxpayers' money. PPP projects are normally delivered on time and within budget against required or sometimes even better quality;
  - Standardized and open-book PPP contracts of which progress is monitored by and reported on by the Ministry of Finance and National Audit Office on a two-yearly basis enforce transparency;
  - The authority knows how much it will have to pay, since this is fully determined in the contract; design, construction, maintenance changes are mostly a contractor risk. Only changes in law and planning procedures, unreasonable acts by third parties and force majeure (uncontrollable risks for contractors) lead to additional costs for the authority;
  - Continuous evaluation and standardisation of the DBFM(O) model by the Ministry of Finance leads to (i) improved performance of PPP tenders and projects and (ii) to decreased transaction costs;
  - Transparency is guarded inter alia by open book financial models, standard contracts and competitive dialogue tender procedures;
  - Profit sharing of refinancing costs (up to 70% of financial gain goes to the government since it is a government owned project) and costs savings through contract changes provide goodwill whilst strict refinancing conditions under threat of immediate contract termination limits abuse of project finance, potentially leading to distorted profits for banks paid for by taxpayers;
  - PPP projects are procured through a competitive dialogue procedure, following standard EU guidelines and legislation. This allows for the necessary competition and, if implemented well, drives innovation and quality.
- ✓ Private sector engagement rests on a *predictable healthy pipeline* with relatively *low costs* because of inter alia:
  - Reinforced government policy in favour of the use of PPP has led to a very stable and formally announced project pipeline;
  - Strong credit rating of the Dutch government;
  - Transparent and stable (in time and specifications) tender procedures and standardisation of the contracts reduce costs;
  - Partial tender costs reimbursements for non-preferred bidders;
  - Reasonable guarantees and protection provided by authorities for financiers against uncontrollable (mainly changes in law, unreasonable third-parties, planning procedure and force majeure) risks;
  - Highly developed Dutch construction industry;
  - Use of availability based schemes (i.e. no earning or tolls risk and assurance of cash flow under solid performance);
  - A wide range of market engagement activities by the contracting authorities.

9.2 Hard lessons learned

The hard lessons learned are perhaps best described using three often cited Dutch examples of where PPP can go wrong, namely the Wijker motorway tunnel project, Regiotram Groningen and the A15 Maasvlakte – Vaanplein (MaVa) motorway DBFM project.

Please note that the below examples intend to provide an indication based on publicly available information, primarily newspaper articles.

The Wijker motorway tunnel project

Lesson learned = unreasonable profits for financiers paid for by taxpayers

Although not a pure PPP project, it has separate DBM and F contracts, and as such not treated earlier in this report, the 2 kilometer Wijker motorway tunnel was realised in 1992 as a first experiment with privately financed infrastructure in the Netherlands. It provides one major lesson learned; do not apply unpredictably fluctuating payment mechanisms.

The project has been financed for approximately 80% by the Dutch ING bank and German Commerzbank. In return, the Dutch government provides a fixed shadow toll (fluctuating payment) for every vehicle that makes use of the tunnel. After several years it became apparent that the vehicle usage almost doubled the expectations, leading to an exorbitant amount of shadow tolls that the government has to pay the two banks, meaning massive profits for the banks paid for by the Dutch taxpayer.

This is a prime example of where modelling vehicle usage based on uncertain assumptions by a too eager Ministry can lead to enormous profits for banks against enormous costs for taxpayers. Since the Wijker motorway tunnel the government has only procured privately financed infrastructure through availability based schemes only, and thus against very predictable cost. Furthermore profit sharing clauses are included as a standard to avoid enormous profits for the private market on government owned projects at the expense of the taxpayer.

The Minister of Infrastructure required private funding for the tunnel since there was no room in the budget to realise it. This is a practice that since has not been accepted; all projects must be included in the MIRT.

It has to be noted that for two upcoming projects, the ViA15 motorway and the Blankenburg Tunnel, approximately 25% to 33% of the project costs have to be paid for through tolls. These tolls are purposely kept out of the PPP (DBFM) contract and its financing as to avoid risk-averse (protection seeking) influence of private financiers in the bid and invitation of tolls risk into the project. The authority will collect these tolls and will continue until the investment gap is closed.

The Regiotram Groningen project

Lesson learned = lacking political stability and support on a local government level

The Regiotram Groningen DBFMO project involved the design, building (including rolling stock supply), financing, maintenance and operations during a 22,5 year period for two new to build tram lines in the city of Groningen. The tender of this estimated EUR 300 million contract started in 2010 for which the municipality of Groningen, Assen-Groningen region and the province of Groningen acted in Project Organisation Regiotram Groningen as the contracting authority. During the final stage of the tender, in December 2012, the tender was cancelled. This was caused by political disagreements within the municipality of Groningen about the budget for 2013 that included costs for the Regiotram project. The coalition parties of the municipality's executive board (College van Burgemeester & Wethouders) disagreed with the costs of the project and therefore refused to approve this budget. This discussion resulted in resignation of the executive board and resulted in insufficient support within the executive board to continue with the tender.

It appeared that at the start of the tender there was limited political commitment for the project. Nevertheless the three governmental bodies commenced the tender without formal agreement on the financial involvement of each party. This made it possible for the local politics to postpone the financial commitments to the end of the tender procedure. As a result, a public investment of EUR 40 million perished (mainly spent on relocation of utilities and advisory services). The financial loss of the two remaining bidders is unknown. They have each received EUR 2 million compensation but it is expected this is nowhere near the amount invested in the tender.

This case shows that stability and support of the involved governmental bodies should be considered as a precondition to start with the tender. Any disagreements not taken care of prior to the start of the tender, might result in cancellation of the tender (and thus the project) when significant investment are already made.

The A15 MaVa project

Lesson learned = project size and complexity vs. too much risk allocated towards private party

In this largest ever single contract procurement for the Dutch government (worth approximately EUR 1.5 billion in 2011) many risks were incurred, predominantly for the contractor. The project, procured by RWS and including approximately 40 kilometers of motorway, the world's largest lifting bridge and two tunnels, was tendered from 2009 onwards with contracts signed in 2011.

The preferred bidder underbid its two competitors by approximately 20-25% whilst taking on board more risk than the competition. Even though the authority arranged special meetings with this contractor to discuss this significant undercutting of the price before formally granting the project, the contractor stated confidently that it could perform well for the bid price and accepted risks. At this date, four years later, the losses for the contractor are reportedly EUR 250 million, a little more than the initial price difference with its competitors' bids. The loses were inter alia caused by:

- Over 1,500 permits were required and for a significant amount of these the contractor underestimated what it needed to do to get these granted. As a leading example, permits for the bid foundation design of the lifting bridge were not granted by the local municipality. This meant that the contractor had to redesign and increase the foundations and bridge which lead to a budget increase for the bridge by 100% according to some estimates.
- The project is located in the Port of Rotterdam, at that time the largest port in the world. The port is riddled with heavy utilities, complex transport modalities and a wide range of powerful stakeholders. The contractor had severely underestimated these environmental risks and has had to implement an unforeseen amount of mitigating measures in order to reach agreements with stakeholders. Especially the utilities have proven to be troublesome
- The Port of Rotterdam area has been heavily bombed during World War 2. The contractor underestimated the amount of research and effort it would take to be able to design and realise a safe project without accidentally setting of non-detonated explosives.
- The project houses the largest moveable bridge in the world in an immensely complex environment, having to account for multiple motorway streams, railways and waterways. It also houses two tunnels that have to adhere to complex legislation and over 200 structures. This makes the design and build and phasing challenge in this elaborate and difficult environment abnormally complex.

Since this project concerns a DBFM project and these were all risks that were allocated to the contractor (the contractor took these on as part of their bid), most of these additional costs will have to be borne by the contractor, causing heavy losses. This has led to one of the partners in the contractor consortium having to fight of bankruptcy and other partners to incur heavy losses. It was covered in-depth by the media, creating a PR issue for the Dutch DBFM.

The Dutch PPP market learned, with RWS implementing the necessary changes in consequent DBFM projects, that the A15 MaVa project may have been too big for one contractor with far too many design and

construction challenges and third party – and thus very difficult to control – risks allocated towards the contractor.

The market furthermore learned that undercutting the price can lead to serious issues. RWS is now exploring possibilities to exclude a contractor's bid that severely undercuts the average bidding price. Financiers are pushing due diligence to review the risks of a contractor undercutting the price by too much.

Part IV: Recommendations and Strategy

10 Towards a Private Sector Strategy

The overarching goal of the Bangladesh Delta Plan 2100 will have to include a long term strategy that broadly outlines the different interventions and measures that need to be taken to have an integrated and inclusive role of the private sector in the water markets. As Bangladesh makes strides towards the vision of becoming a middle-income country as outlined in Vision 2021 there are a number of vital steps that need to be enacted sooner rather than later. These interventions and measures are not things that will bring short run gains, instead they will prepare the ground for long term benefits that will have a cascade effect.

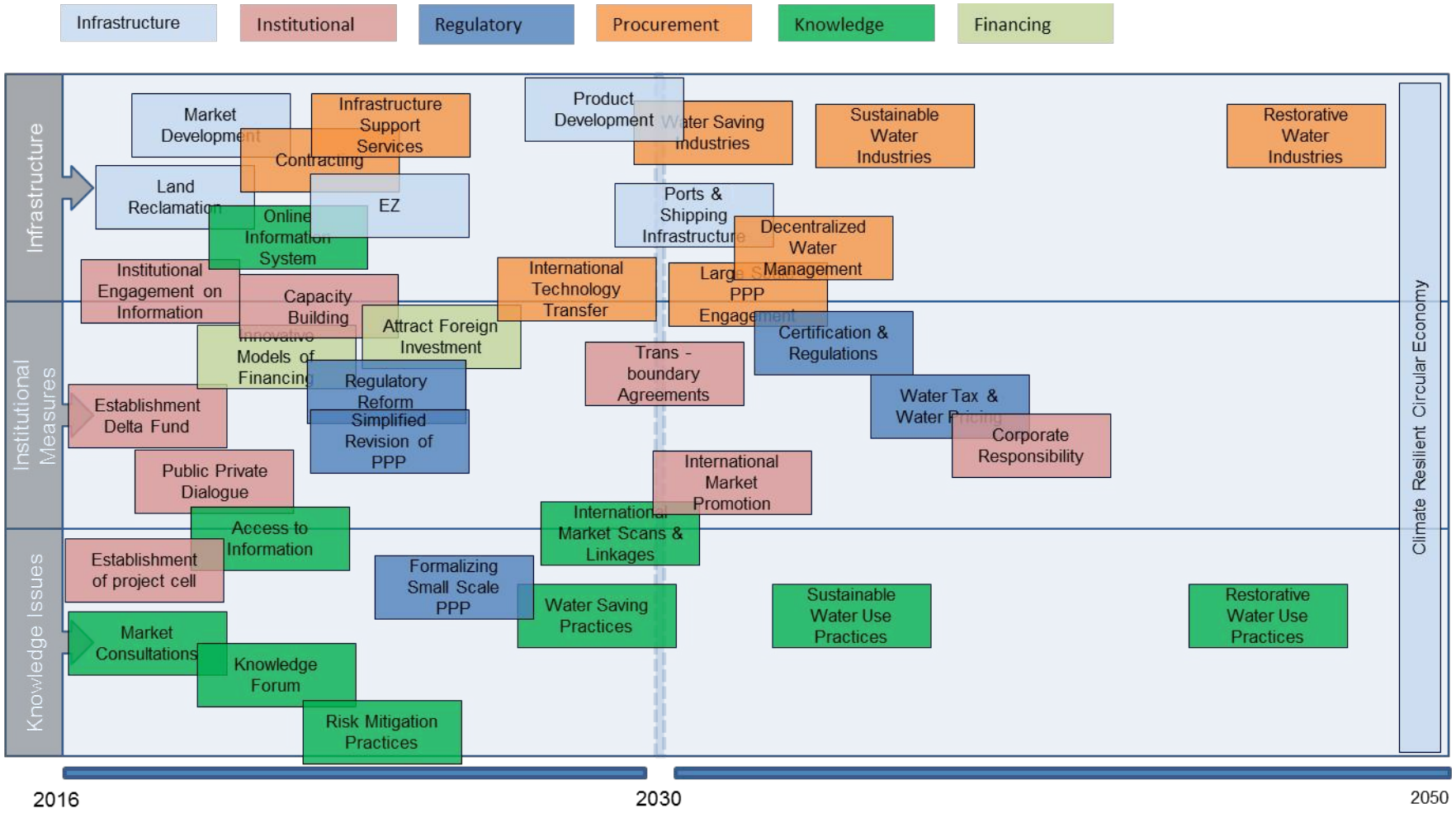
The draft strategy is outlined below and is broken down into six broad categories of interventions. These categories are not necessarily exclusive i.e. some interventions are a mix of two or more; but for the purposes of clarity they have been rolled up into one. All these interventions are linked and some of them can be considered critical for future growth. They types of interventions are as follows:

- Infrastructure: these interventions require physical and technical infrastructure to be built or established. Infrastructure includes land reclamation to training institutes or research laboratories
- Institutional: these interventions require establishment of new organizational arrangements and could entail aspects such as setting up new departments in existing institutions to reorganization and reforms. Institutional interventions may include the creation of new mandates for ministries to creating an established forum for public-private dialogue and research.
- Regulatory: these interventions require regulatory reforms, the passing of new acts and laws and policy changes
- Procurement: these interventions require reforms in relation to public procurement of technologies, establishment of innovation funds etc.
- Knowledge: these interventions are knowledge gaps and research topics covering everything from primary and secondary studies to product development and cutting edge technology research and development
- Financing: these interventions focus on establishing or fine-tuning financing mechanisms to creating highly favourable foreign investment climates in particular.

The strategy has been broken down into short run (2016-2030) and medium run (2030-2050) interventions. The strategy is outlined below;

10.1 Vision: Stronger engagement and cooperation between public and private sector leads to inclusive growth

10.1.1 Timeline of Important Interventions



10.1.2 The Short Run: 2016 to 2030

Initially what the strategy calls for is the establishment of a Delta Fund and the Project Cell. Market Consultations would lead to filling up some of the knowledge gaps and research needs. Following the establishment of the Delta Fund, Institutional Engagement on Information is needed to identify more research topics and knowledge gaps.

Given Government's recent announcements, and clear scarcity of land, we have identified land reclamation process to start around this time which will lead the establishment of Economic Zones and private sector engagement possibilities in other industrial activities. Market Consultations will establish the most necessary infrastructure interventions required the institutional engagement and information with the Delta Fund should lead to more public-private dialogue. After this ground is prepared, a knowledge portal with an online information system would lead to more streamlined and coordinated research being done on the various aspects of the water market with the view to expand the role of the private sector

To effectively engage the private sector, Innovative models of Financing are very important. These include areas such as revolving fund and other forms of financing such as matching grants, innovation fund to kick of pilot programmes in relation to water markets.

At this stage emphasizing Risk Mitigation Practices that will allow private sector players of all sizes to effectively and efficiently engage in Risky water markets would need to be established and this is more of a knowledge agenda item or intervention that will lower the costs of private sector engagement and investment in the water markets. This could lead to contracting opportunities for smaller-scale players and eventually improve the existing market so that there is more scope for foreign investment. Foreign investment would require a good deal of infrastructure Support Services, e.g. business houses, research and development firms, and other management consultancy firms.

Targeted regulatory reform need to be implemented in order to make the markets much more attractive to the private sector. Some of these regulatory reforms could include a simplified revision of the PPP Law 2015 or could include more refinements of the PPP regulatory systems in order to attract small-scale PPP. This would encourage a large number of smaller firms to engage in the various water market segments improving the level of skills and technology that is available. At the same time with the attraction foreign investment you also have the possibility of international technology transfer which will lead to more competitive and effective markets.

In relation to PPPs we understand that the country should move towards development of DBFM(O) standard model. From a general and high level viewpoint the following phases can be suggested, to be further developed:

(i) Phase 1 = Gain experience with integrated contracts with zero project financing responsibilities for the contractor: a simple form of Build-Operate-Transfer (BOT) for the short-term (up to 5-10 years) as simplest and lowest threshold step to increase added value, to

The authority takes on board the project financing risk and the contractor receives payments for services delivered: bullet payments for availability and completion and periodic capped payments from commencement until completion to cover development costs and management fee until transfer, under threat of deduction for non-compliance.

(ii) Phase 2 = Gain experience with limited project financing responsibilities: increase the BOT to BOT+ in the mid-term (15 years) as a logical and natural evolution step.

The authority is still responsible for attracting and contracting financing, predominantly under its own guarantees and name. The contractor will form part of consortium wherein the project finance is integrated and it becomes subject to availability payments and deductions, but the financier / authority provides most of the guarantees and securities. Under such a scheme the authority will also be the lender. To avoid double roles the authority can implement a dedicated fund that provides for and manages the F- responsibilities under these schemes.

(iii) Phase 3: Implement a full DBFM(O) model following Dutch standards in the long-term (up to 100 years) as most complex, but also most value-adding form.

Following below preconditions (with concrete tools highlighted):

1. Open book with profit sharing:
    a. reasonable (additional) financial gain / loss sharing
    b. based on open book financial models.
2. Effective risk allocation:
    a. Reference **Most Economic Advantageous Tender** mechanisms in Dutch standard DBFM(O) tender guidelines and– establish preferred quid pro quo levels;
    b. Reference **risk allocation and reward mechanisms** in Dutch standard DBFM(O) model – establish preferred quid pro quo levels;
    c. **Size and complexity** fits level of risk demarcation to the private sector.
3. Clear legal / regulatory structure:
    a. **Create and update standard contract models.** Start simple, based on Dutch DBFM(O) models. Update as you mean to go along, including practical lessons learned from:
        i. Dialogue discussions in tender procedures;
        ii. Project evaluation and audit reports, based on data review and interviews with both public and private party representatives;
        iii. Private sector engagement sessions;
        iv. Actual projects and their contract management.
    b. **One public office responsible** for initiating, reviewing, updating standard contract models. This office should then also have a final say on major changes to the standard model in every singular contract;
    c. Establish a knowledgeable and experienced **PPP support organisation;**
    d. **Transparent policy and contracts**, formal policy notifications, meaning formally announced dates and timelines for tenders and projects, standard contracts, etc…
4. Political and financial stability:
    a. Develop **protection mechanisms** at **pipeline level** for private sector against:
        i. changes in law and policy;
        ii. (uncontrollable) third party risk
        iii. force majeure.
    b. Develop sufficiently rated **authority guarantees**.
5. Governmental support:
    a. Ensure that the application of PPPs is a (local and national) **political priority** and that politics consider the decision for PPPs as a political issue rather than one

b. Ensure **administrative support in favour of PPP** at the governmental body that will be applying PPP.

c. Secure **Technocratic approach** in legal and standard procedures, focussed on value for money for taxpayer *only*. This means that ideology and emotion will need to be written out in legislation and procedures. This can be done by:

   i. including projects in the governmental budgets;

   ii. not using private finance to fill financing gaps; and

   iii. include the Public Private Comparator as main decision criteria to seek private sector engagement.

d. Regular **third party audits addressed to Parliament** on added value and where this could have been better, for example in line with the Dutch National Audit Service.

6. Private sector engagement:

   a. Dedicated private sector engagement sessions:

      i. Industry Days;

      ii. PPP Works! Conferences;

      iii. Sector specific market consultations;

      iv. Establish a local Bangladesh IPFA branch.

   b. Develop **protection mechanisms** at **project level** for private sector against:

      i. changes in law and policy;

      ii. (uncontrollable) third party risk

      iii. force majeure.

For example, include private sector protection, such as make-whole provisions in reimbursement schedules to contracts, delay and compensation events, guarantees + add letters of intent of policy bureaus and ministers.

7. Predictability of transaction costs and timelines:

   a. Provide partial reimbursements for tender costs for non-preferred bidder;

   b. Authority must adhere to established timelines. **Do not establish a timeline until you are certain you can adhere to this**. For example, avoid election cycles;

   c. When significantly overrunning the authority can **reimburse the bidding private parties up to a cap**;

   d. **Pre-tender market consultations** / **industry days** can help assess reasonable timelines and concerns.

The above three phases set against the 7 preconditions lead to the following preliminary model, wherein the comments provide initial reasoning:

Preconditions	Phase 1 BOT	Phase 2 BOT+	Phase 3 DBFM	Comments
1- Open book with profit sharing				When more financial obligations are allocated to one private party the authority will need to increase transparency and control
2- Effective risk allocation				Agreement must exist what risks can actually be controlled by the private sector what quid pro quo levels are acceptable
3- Clear legal / regulatory structure				When financing responsibilities increase, the consequential increase in legal due diligence will require a clear legal framework.
4- Political and financial stability				In order to increase private engagement in project finance, proven political and financial stability, or, if lacking, a form of recourse, are essential.
5- Governmental support				The decision to apply PPPs is dependent on the political and administrative opinion on PPPs. One of the most volatile risks is declined political support for a project. Substantiate how the next election will not uproot the project.
6- Private sector engagement				The more complex projects and their financing, the more important an established and experienced private sector will become to assess risks.
7- Predictability of transaction costs and timelines				Increasing the finance scope will increase due diligence and risk management costs. Reliable timelines then decreases budget overrun risk.

Legend:

Legend:

	Not critical
	Basic requirements
	Fully developed

10.1.3 The Medium Run: 2030 to 2050

In terms of knowledge interventions, water saving practices will need to start coming into effect in the early 2030s. This is mainly because by that time water scarcity is going to start becoming a problem for industrial firms and the adoption of water saving practices will lead to new water-saving industrious growing in response to demand. The next stage would be a proliferation of sustainable water use practices followed by in the long run with restorative water use practices. In line with growing demand and awareness of the importance of treating water as a valuable and expensive resource, new firms that offer these kinds of services (everything ranging from factory retooling, to management reorganization will be in high demand by the medium run period)

Diplomatic and inter-governmental agreements and efforts should lead to trans-boundary agreements on water sharing and Water Resources. These trans-boundary agreements should smooth the way for long-term planning to be effectively done

In the early 2030s, wide scale PPP engagement should become more common, especially in ports and shipping infrastructure. Alongside International Market promotion in decentralized Water Management practices should bring in further foreign investment.

Regulatory reform, more specifically in terms of a Water Tax and improved regulations and certifications should improve the available funds for water market interventions.

In order to ensure greater PSP and a better enabling environment in the water sector it is important that a forum for dialogue and discussions between the public and private sector is established. It would be beneficial to have this forum only focused on the water sector and not developed around a general public private forum, whose establishment at this stage may be more complex and difficult. GED should support the secretariat of such a forum and assist in its organization and deliverables.

As a final contribution this section distils from the above a range of primary recommendations for the Bangladesh Delta Plan 2100 to, over time, successfully engage the private sector in forms of PPP, based upon a preliminary understanding of the current political, commercial and legal environment in Bangladesh.

List of Dutch PPP projects over time[43]

Discipline	Project	Financial Close	
Rail	High Speed Rail south	2001	
Roads	A59 motorway	2003	
	N31 highway	2003	
	A15 Maasvlakte-Vaanplein motorway	2010	
	A12 Lunetten-Veenendaal motorway	2010	
	Second Coen Tunnel	2008	
	N33 highway	2012	
	A1-A6 motorway	2013	
	A12 Ede-Grijsoord motorway	2014	
	A9 Gaasperdammerweg tunnel	2014	
	A6 motorway (in tender)	2016	Planned
	A1/A27 motorway (in tender)	2016	Planned
	N18 highway (in tender)	2016	Planned
	A13/A16/A20 motorway (prep for tender)	2017	Planned
	ViA15 motorway (prep for tender)	2017	Planned
	Blankenburg Tunnel (prep for tender)	2016	Planned
	A9 Amstelveen motorway (prep for tender)	2018	Planned
Government buildings	Ministry of Finance	2006	
	DUO Groningen	2008	
	Doetinchem tax office	2007	
	Detention Centre Rotterdam	2008	
	International School Eindhoven	2011	
	School Joure	2013	
	Detention Centre Zaanstad	2013	
	Detention Centre Schiphol	2010	
	Soesterberg museum	2012	
	Supreme Court	2013	
	RIVM	2014	
	Rijnstraat 8	2014	
	B30	2014	
	Westland	2015	
	Knoop barracks	2015	Planned
	Courthouse Breda (in tender)	2015	Planned
	Courthouse Amsterdam (in tender)	2016	Planned
	Michiel Adrsz. De Ruyter barracks (prep for tender)	2017	Planned
Locks & Flood protection	Limmel	2015	
	IJmuiden	2015	Planned
	Beatrix (in tender)	2016	Planned
	Eefde (prep for tender)	2016	Planned
	Afsluitdijk (prep for tender)	2017	Planned
Waste Water Treatment	Harnaschpolder	2003	
Ports	Waalwijk (prep for tender)	2017	Planned

[43] As per August 2015

Dutch private sector engagement in Dutch PPP

A2.1 Contractors

The key Dutch contractors active in the Dutch PPP market are:

BAM (Joint venture BAM PPP and PGGM Pension fund)

In May 2011 BAM PPP and PGGM Fondsenbeheer BV created a joint venture ("JV") for making equity investments in primary and secondary PPP transactions to provide a long-term partnership to invest in the developing social infrastructure and transport PPP markets in the Netherlands, Belgium, the United Kingdom, Ireland, Germany and Switzerland.

BAM PPP will retain full responsibility for bid management for new projects and the provision of asset management services to the JV, and will represent the JV in its transactions. New projects will be funded on a 20:80 basis between BAM PPP and PGGM. The board of the JV is formed on an equal basis between the parties.

PGGM Fondsenbeheer BV is an affiliate company of PGGM NV ("PGGM"), a leading pension fund administrator with origins in the care and welfare sector. PGGM provides pension management, integrated asset management, management support and policy advice for pension funds and manages around EUR 182 billion of pension assets (2014 figures).

BAM PPP BV ("**BAM PPP**") is an operating company of Royal BAM Group, founded in 2006 to optimise the utilisation of knowhow and experience available within the Group. Royal BAM Group, a stock listed company, ranks among the largest construction firms in Europe, with sales of around EUR 7.3 billion (2014 figures). Royal BAM Group is market leader in the Netherlands, has significant market positions in the United Kingdom, Ireland, Belgium and Germany and employs 23,300 staff. Royal BAM Group unites operating companies in construction and property development, civil engineering, mechanical and electrical contracting, and consultancy and engineering. These companies have been active in the PFI/PPP marketplace since the mid-1990s with their first contract signed in 1999. BAM is active in at least 12 PPP projects in Europe.

Heijmans A Dutch-based company listed on the Amsterdam Stock Exchange. The company offers a wide range of products and services related to construction and is primarily active in the Dutch market. Its major fields of business comprise Property Development, Residential Building, Non-residential Building, Technical Services and Infrastructure. Outside the Netherlands, Heijmans operates in Belgium and Germany. The 2013 turnover is for 71% attributable to the Netherlands, 12% to Belgium and 17% to Germany. Heijmans is involved in at least 5 PPP projects in the Benelux.

VolkerWessels

VolkerWessels is a leading Dutch construction company (2nd largest after BAM) with some EUR 4.4bn turnover (2014 figures) and employs approximately 14,900 FTE staff and holds branches in the Netherlands, the United Kingdom and Canada/United States. Activities are divided into three sectors: Construction, Infrastructure, Energy & Telecom - onshore and offshore. VolkerWessels is active

Van Oord

Van Oord is privately owned company that operates around the world as a leading contractor for dredging, marine engineering and offshore energy projects (oil, gas and wind), offering innovative solutions to marine challenges. The company operates with 4,800 employees in more than 50 countries and has an annual turnover of EUR 2.1 billion (2014 figures). Van Oord has extensive worldwide experience. Successful projects include:

- ✓ Das Island expansion, Abu Dhabi
- ✓ Dredging of access channel, Darwin/Ichthys Australia

- ✓ Sand Engine Project, Hoek van Holland/Scheveningen, the Netherlands
- ✓ Dune compensation and strengthening Delftland, the Netherlands
- ✓ Deepening of the access the port of Suape, Brazil

Boskalis

The listed company Royal Boskalis Westminster N.V. is a leading global maritime services company operating in the dredging and inland infra, and offshore energy sectors. Through SMIT Boskalis is also active in towage and salvage. Boskalis is active in projects in the energy and ports markets. Their main clients include oil companies, port operators, governments, shipping companies, international project developers, insurance companies and mining companies. Boskalis has 8,500 employees, excluding the share in partner companies. The company operates in some 75 countries across six continents and has an annual turnover of EUR 3.2 billion (2014 figures). The company's versatile fleet consists of over 1,000 vessels and equipment. Boskalis is and recently has been active in several ports, lock and water barrier projects such as:

- ✓ Harbour deepening & Berth Works, Fremantle, Western Australia
- ✓ Deeping and extending the Port of Genoa, Italy
- ✓ Completing a flood protection barrier, a navigation channel and tunnel construction pit, St. Petersburg, Russian Federation
- ✓ Port maritime access improvement campaign stage 1: Lock, Seville, Spain
- ✓ Maasvlakte 2, the largest Dutch hydraulic engineering project since the delta works, Port of Rotterdam, the Netherlands

Dura Vermeer

A Dutch contractor and development firm, active in construction, property development and infrastructure. Dura Vermeer has an operating income of € 1.0 billion and approximately 2,478 employees in 2013. The group has over 30 subsidiaries in the Netherlands, and a proven track record as a competent highways contractor. It has not won any PPP projects to date.

Strukton

Strukton Integrale Projecten is part of Strukton Groep NV, an international full-service provider of infrastructure solutions. Since 1999 Strukton Integrale Projecten has been actively engaged in the development, acquisition, management and financing of PPP concession projects, in the fields of government accommodation, infrastructure, (light)rail, care and education. Strukton is active in at least 8 PPP projects in the Netherlands.

Ballast Nedam

A Dutch group of companies that was created by means of a merger in 1969 and is listed on the Amsterdam Stock Exchange since May 1994 The company offers a wide range of products and services related to construction and is primarily active in the Dutch market. Ballast Nedam's organisational structure comprises the major business lines, Infrastructure, Building & Development, Specialised Companies and Supplies. Ballast Nedam is active in at least 6 PPP projects in the Netherlands.

A2.2 Financiers

The key Dutch financiers active in the Dutch PPP market are:

1. BNG (Bank Nederlandse Gemeenten – a bank owned by Dutch municipalities)
2. NIBC
3. Rabobank

4. ING
5. ABN Amro
6. DIF (private equity)
7. PGGM (private equity)

International private sector engagement in Dutch PPP

A3.1 Foreign Contractors

Foreign contractors appear more interested in larger and more complex projects since they believe this is where they can have competitive advantage over well-established Dutch contractors. It is well worth noting that all of these contractors have always partnered with a Dutch contractor in order to engage local knowledge and expertise such as local standards, language skills, environmental management and network within and understanding of ways of working of the contracting authorities.

Germany:

1. Hochtief
2. Zublin

Austria:

3. Strabag

Belgium:

4. CFE
5. Besix
6. Jan de Nul

France:

7. Vinci

Spain:

8. FCC
9. Cintra

A3.2 Foreign Financiers

In general, the below parties are involved in all types of projects being tendered in the Netherlands; motorways, buildings and locks. They are more interested in the highly rated Dutch construction market, Dutch financing conditions and governmental credit rating, standardised methodology and contracts, transparency and predictability and stable pipeline than in any specific type of project.

Japan:

1. Sumito Mitsui Banking Corporation (SMBC)
2. The Bank of Tokyo Mitsubishi (BTMU)

Germany:

3. Bayerische Landesbank
4. KfW IPEX-Bank

5. DZ Bank
6. DekaBank
7. Deutsche Bank
8. Helaba Landesbank Hessen-Thüringen
9. Nord/LB Covered Finance Bank
10. Allianz

UK:

11. Royal Bank of Scotland (RBS)
12. Lloyds
13. 3i (private equity)
14. Macquirie (private equity)
15. John Laing (private equity)

Belgium:

16. KBC Bank
17. AG Insurance
18. Belfius
19. TDI (private equity)

France:

20. BNG Paribas
21. Société Generale
22. Crédit Agricole

Italy:

23. UniCredit

Europe:

24. European Investment Bank (EIB)

List of Notable Publications By General Economics Division (GED) Bangladesh Planning Commission since 2009

1. Policy Study on Financing Growth and Poverty Reduction: Policy Challenges and Options in Bangladesh (May 2009)
2. Policy Study on Responding to the Millennium Development Challenge Through Private Sectors Involvement in Bangladesh (May 2009)
3. Policy Study on The Probable Impacts of Climate Change on Poverty and Economic Growth and the Options of Coping with Adverse Effect of Climate Change in Bangladesh (May 2009)
4. Steps Towards Change: National Strategy for Accelerated Poverty Reduction II (Revised) FY 2009-11 (December 2009)
5. Millennium Development Goals: Bangladesh Progress Report 2009 (2009)
6. Millennium Development Goals: Needs Assessment and Costing 2009-2015 Bangladesh (July 2009)
7. এমডিজি কর্ম-পরিকল্পনা (৫১টি উপজেলা) (জানুয়ারি-জুন-২০১০)
8. MDG Action Plan (51 Upazillas) (January 2011)
9. MDG Financing Strategy for Bangladesh (April 2011)
10. SAARC Development Goals: Bangladesh Progress Report 2011 (August 2011)
11. Background Papers of the Sixth Five Year Plan (Volume 1-4) (September 2011)
12. 6th Five Year Plan (FY 2011-FY 2015) (December 2011)
13. Millennium Development Goals: Bangladesh Progress Report-2011 (February 2012)
14. Perspective Plan of Bangladesh 2010-2021: Making Vision 2021 a Reality (April 2012)
15. Public Expenditure for Climate Change: Bangladesh Climate Public Expenditure and Institutional Review (October 2012)
16. Development of Results Framework for Private Sectors Development in Bangladesh (2012)
17. ষষ্ঠ পঞ্চবার্ষিক পরিকল্পনা (২০১১-১৫) [মূল ইংরেজি থেকে বাংলায় অনুদিত] (অক্টোবর ২০১২)
18. Climate Fiscal Framework (October 2012)
19. Public Expenditure for Climate Change: Bangladesh CPEIR 2012
20. First Implementation Review of the Sixth Five year Plan -2012 (January 2013)
21. বাংলাদেশের প্রথম প্রেক্ষিত পরিকল্পনা (২০১০-২০২১) রূপকল্প ২০২১ বাস্তবে রূপায়ণ (ফেব্রুয়ারি ২০১৩)
22. National Sustainable Development Strategy (2010-2021) (May 2013)
23. জাতীয় টেকসই উন্নয়ন কৌশলপত্র (২০১০-২০২১) [মূল ইংরেজি থেকে বাংলায় অনুদিত] (মে ২০১৩)
24. Millennium Development Goals: Bangladesh Progress Report 2012 (June 2013)
25. Post 2015 Development Agenda: Bangladesh Proposal to UN (June 2013)
26. National Policy Dialogue on Population Dynamics, Demographic Dividend, Ageing Population & Capacity Building of GED [UNFPA Supported GED Project Output 1] (December 2013)
27. Capacity Building Strategy for Climate Mainstreaming: A Strategy for Public Sector Planning Professionals (2013)
28. Revealing Changes: An Impact Assessment of Training on Poverty-Environment Climate-Disaster Nexus (January 2014)
29. Towards Resilient Development: Scope for Mainstreaming Poverty, Environment, Climate Change and Disaster in Development Projects (January 2014)
30. An Indicator Framework for Inclusive and Resilient Development (January 2014)
31. Manual of Instructions for Preparation of Development Project Proposal/Proforma Part-1 & Part 2 (March 2014)
32. SAARC Development Goals: Bangladesh Progress Report-2013 (June 2014)
33. The Mid Term-Implementation Review of the Sixth Five Year Plan 2014 (July 2014)
34. Millennium Development Goals: Bangladesh Progress Report 2013 (August 2014)
35. Population Management Issues: Monograph-2 (March 2015)
36. GED Policy Papers and Manuals (Volume 1-4) (June 2015)
37. National Social Security Strategy (NSSS) of Bangladesh (July 2015)

38. MDGs to Sustainable Development Transforming our World: SDG Agenda for Global Action (2015-2030)- A Brief for Bangladesh Delegation UNGA 70th Session, 2015) (September 2015)
39. 7th Five Year Plan (2015/16-2019/20) (December 2015)
40. সপ্তম পঞ্চবার্ষিক পরিকল্পনা ২০১৫/১৬-২০১৯/২০ [মূল ইংরেজি থেকে বাংলা অনূদিত] (অক্টোবর ২০১৬)
41. জাতীয় সামাজিক নিরাপত্তা কৌশলপত্র [মূল ইংরেজি থেকে বাংলা অনূদিত] (অক্টোবর ২০১৬)
42. Population Management Issues: Monograph-3 (March 2016)
43. Bangladesh ICPD 1994-2014 Country Report (March 2016)
44. Policy Coherence: Mainstreaming SDGs into National Plan and Implementation (Prepared for Bangladesh Delegation to 71st UNGA session, 2016) (September 2016)
45. Millennium Development Goals: End- period Stocktaking and Final Evaluation Report (2000-2015) (September 2016)
46. A Handbook on Mapping of Ministries by Targets in the implementation of SDGs aligning with 7th Five Year Plan (2016-20) (September 2016)
47. Data Gap Analysis for Sustainable Development Goals (SDGs): Bangladesh Perspective (January 2017)
48. Environment and Climate Change Policy Gap Analysis in Haor Areas (February 2017)
49. Integration of Sustainable Development Goals into the 7th Five Year Plan (February 2017)
50. Banking ATLAS (February 2017)
51. টেকসই উন্নয়ন অভীষ্ট, লক্ষ্যমাত্রা ও সূচকসমূহ [মূল ইংরেজি থেকে বাংলায় অনুদিত] (এপ্রিল ২০১৭)।
52. Exploring the Evidence: Background Research Papers for Preparing the National Social Security Strategy of Bangladesh (June 2017)
53. Bangladesh Voluntary National Review (VNR) 2017: Eradicating poverty and promoting prosperity in a changing world, (June 2017)
54. SDGs Financing Strategy: Bangladesh Perspective (June 2017)
55. A Training Handbook on Implementation of the 7th Five Year Plan (June 2017)
56. 7th Five Year Plan (FY 2015/16-FY 2019/20): Background Papers Volume 01: Macro Economic Management & Poverty Issues (June 2017)
57. 7th Five Year Plan (FY 2015/16-FY 2019/20): Background Papers Volume 02: Socio-Economic Issues (June 2017)
58. 7th Five Year Plan (FY 2015/16-FY 2019/20): Background Papers Volume 03: Infrastructure, Manufacturing & Service Sector (June 2017)
59. 7th Five Year Plan (FY 2015/16-FY 2019/20): Background Papers Volume 04: Agriculture, Water & Climate Change (June 2017)
60. 7th Five Year Plan (FY 2015/16-FY 2019/20): Background Papers Volume 05: Governance, Gender & Urban Development (June 2017)
61. Education Sector Strategy and Actions for Implementation of the 7th Five Year Plan (FY2016-20)
62. GED Policy Study: Effective Use of Human Resources for Inclusive Economic Growth and Income Distribution-An Application of National Transfer Accounts (February 2018)
63. Monitoring and Evaluation Framework of Sustainable Development Goals (SDGs): Bangladesh Perspective (March 2018)
64. National Action Plan of Ministries/Divisions by Targets for the Implementation of Sustainable Development Goals (June 2018)
65. Bangladesh Delta Plan 2100: Baseline Studies: Volume 1: Water Resources Management (June 2018)
66. Bangladesh Delta Plan 2100: Baseline Studies: Volume 2: Disaster and Environmental Management (June 2018)
67. Bangladesh Delta Plan 2100: Baseline Studies: Volume 3: Land Use and Infrastructure Development (June 2018)
68. Bangladesh Delta Plan 2100: Baseline Studies: Volume 4: Agriculture Food Security and Nutrition (June 2018)
69. Bangladesh Delta Plan 2100: Baseline Studies: Volume 5: Socio-Economic Aspects of the Bangladesh Delta (June 2018)
70. Bangladesh Delta Plan 2100: Baseline Studies: Volume 6: Governance and Institutional Development (June 2018)

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