

ASSESSMENT OF TRENDS AND MAJOR DRIVERS OF WATER POLICY TO INFORM SCENARIO DEVELOPMENT FOR INTEGRATED WATER RESOURCES MANAGEMENT IN BANGLADESH

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Introduction

- **Water is central in the development of Bangladesh.**
- The intimate interaction of water and livelihoods now challenges the traditional perception that water equals floods and water policies equal flood protection
- Growing scarcities of water and land are projected to increasingly constrain food production growth, causing adverse impacts on the goals for food security and human well-being.
- The strategy of water resources development has so far been mostly centered on flood control and irrigation expansion to promote food grain production
- A well-recognized approach to plan for **future uncertainty** and develop robust integrated water management strategies is to formulate long-term scenarios, which address the demands of all water using sectors in order to maintain the environment in a sustainable manner.

Introduction contd.

- This paper reviews **trends in four important themes for IWRM in Bangladesh: water safety, sediment transport, food security and land-use change.**
- In addition it reviews the use of scenarios and projections in policy development in IWRM
- This paper advises on scenario development for IWRM and a research agenda to support scenario development and use
- Despite the existence of sufficient policy and legislative support, water management in Bangladesh is becoming increasingly complex
- **The competition between different uses** of space, such as living, industry, agricultural production and the environment, is one of the major issues in Bangladesh.

Methodology

- This research is based on an **extensive review of water policy development policies and projects** in Bangladesh related to the development and use of scenarios in IWRM in Bangladesh
- From literature, the key drivers were assessed for water management in relation to four themes essential for IWRM.
- Formulation of **further research agenda** for scenario development in IWRM

Drivers for change

- 1. Water safety*
- 2. Food security*
- 3. Sediment transport*
- 4. Land use change*

Drivers for change contd.

1. *Water safety*
2. *Food security*
3. *Sediment transport*
4. *Land use change*

1. Water Safety : Main drivers

- Climate and climate change
- **Upstream development**
- Willingness to invest in water infrastructure
- Livelihoods perspective in water management
- **Water pollution due to industrial development**
- Groundwater exploitation
- **Problems resulting from implemented plan and projects, such as salinization in coastal polders**
- Sedimentation rates in the tidal rivers
- Morphological changes of river rivers due to interventions (e.g. Brahmaputra embankment)
- **Connectivity** of the floodplain and wetlands, retention area in urban areas, and how the polders manage the excess of rainfall under high-water and siltation

Drivers for change contd.

1. *Water safety*
2. *Food security*
3. *Sediment transport*
4. *Land use change*

2. *Food Security : Main drivers*

- **Population growth**
- Purchasing power
- Adaptive capacity to cope with changes in irrigation demand and water availability (ground and surface water)
- Changes in food patterns, and associated water requirements (including for livestock feed)
- **Competition over land use with river erosion and non-agricultural uses**

1. *Water safety*
2. *Food security*
3. *Sediment transport*
4. *Land use change*

3. *Sediment Transport: Main drivers*

- **Climate change** and its impact on the hydrology of rivers and estuaries
- Subsidence
- **Upstream development**
- Geomorphological activity

Drivers for change contd.

1. *Water safety*
2. *Food security*
3. *Sediment transport*
4. *Land use change*

4. *Land use change*

➤ The land use pattern of Bangladesh is highly influenced by **agro-ecology, soil physiographic and climatic factors.**

□ Main drivers are:

- **Population growth**
- Subsequent reduction of per capita agricultural land
- **Drainage congestion in the coastal areas**
- Salinization in the coastal areas
- Competition for land aggravated by the interaction of land erosion and accretion,
- **Competition and conflict** for land for agricultural and non agricultural uses (shrimp culture, industrialization and others)
- The needs of landless people.

Major Studies and Plans Reviewed:

- Krug Mission Report(U N Mission), 1957
- EP WAPDA Master Plan, 1964
- Land and Water Sector Strategy,1972(prepared by International Bank for Reconstruction and Development (IBRD)
- Flood Action Plan (FAP) ,1989-95
- Bangladesh Water and Flood management Strategy,1995
- National Water Policy (NWPo),1999
- National Water Management Plan (NWMP) ,2004
- National Fisheries Policy,1998
- National Safe Water Supply and Sanitation Policy,1998
- Coastal Zone Policy,2005
- Master Plan for Agricultural Development in the Southern Region of Bangladesh,2013

Major organizations of water sector

About 53 central government organizations and 13 ministries of Bangladesh are now involved in flood and water management (WMO, GWP, 2003).

The Bangladesh Water Development Board (BWDB) is the principal institution involved in the flood management of the country.

The Flood Forecasting and Warning Cell (FFWC) of the BWDB provides real time flood forecasting with lead-time of 24, 48 and 72 hours (FFWC, 2012).

Scenarios use and policy development (for water, food, sediment and land use)

Table 1: Use of scenarios and projections in major water related policies and plans

Flood Action Plan-25 (FAP 25)

Integrated planning approach started to take shape during the last part of Flood Action Plan. Many trend analysis in climate changes were carried out still climate change issue in the overall planning and design were not considered seriously in the Flood Action Plan.

Flood Forecasting and Warning System (FFWS)

No scenarios used for long-range flood forecasting.

Secondary Towns Integrated Flood Protection Project (STIFPP)

No scenarios considered

Scenarios use and policy development (for water, food, sediment and land use) contd.

Table 1: Use of scenarios and projections in major water related policies and plans contd.

National Water Management Plan (NWMP)

The plan assumes that population would increase up to 218 million by 2025, GDP would increase annually by 6-7 percent till 2025, The plan recognizes potential change in monsoon, and that increased water use in the upstream can reduce the availability of surface water during dry season. The plan considered sea level rise, erosion and accretion processes of the rivers, estuaries and coast, but did not consider the subsidence issue in their planning processes

Integrated Coastal Zone Management Project (ICZMP) & Coastal Zone Policy

A range of environmental hazards (both shocks such as cyclones and trends such as erosion, mangrove destruction and saline intrusion) was identified as focal point for the development challenge of the coastal zone. In the policy there is a clear recognition of cyclone and salinity, which are likely to increase with sea level rise and climate changes.

Scenarios use and policy development (for water, food, sediment and land use)

Table 1: Use of scenarios and projections in major water related policies and plans contd.

Bangladesh Water Act (2013)

No scenarios considered.

Coastal Embankment Improvement Project (CEIP)

The project recognizes sea level rise and increased occurrence of cyclones due to climate change. It uses GSLR based on the IPCC and subsidence rate of 12 mm per year for designing coastal embankments.. Sediment management is excluded from the options for improvement of coastal embankment or compensation

Char Development and Settlement Project Phase-IV (CDSP-IV)

No scenarios considered. Does not refer to any information on climate change impact (GED, 2014)

Research agenda for scenario development & long term planning

Research questions for further work on water safety

- What are the **main uncertainties** regarding flash flood and long range forecasting and how can forecasting performance in this regards be improved?
- What are the **implications of climate changes** for flood management and what are consequences of different return periods in planning, considering the vulnerability and economic aspects?
- What is the **vulnerability of urban areas** of Bangladesh under high intensity of rain floods?
- What would be the best approach to develop scenarios for estimating flood risk in Bangladesh?

Research agenda for scenario development & long term planning contd.

Research questions for further work on water safety contd.

- What are robust flood management schemes for Bangladesh' coast considering **climate scenarios**?
- How will withdrawal and reuse develop under different water rights and pricing schemes?
- How were **scenarios taken into account** in upstream investment plans and transnational policies and treaties, such as the **Indo-Bangladesh Joint River Commission Statute (1972)** and the **Ganges Water Sharing Treaty (1996, Agreed distribution of Ganges water between India and Bangladesh).**

Topics for further study on Sediment transport

- Holocene development of the Bengal delta
- **Vertical adjustment processes** of the tidal plain with rising of relative sea level rise with special attention to the sedimentation rates in the Aila affected areas of the southwest region,
- **Morphological time-scale** of the rivers, estuaries and tidal plain to adjust with the sea level rise and increased flood discharge
- Management of the tidal plain through **Tidal River Management** for combating against sea level rise and subsidence,

Topics for further study on Sediment transport contd

- Availability of sediment in the context of **climate change and human interventions**
- The main rivers of Bangladesh transported about one billion tons of sediment every year, out of which one-fourth consists of fine sand and the rest consists of silt and clay. **Knowledge is needed on the role of the fine (silt + clay) and coarse (fine sand) sediments on the lateral and vertical accretion process**
- **Development of a model for sediment processes in the delta.**

Research questions for further study on Food security

- What are the **dynamic climatic parameters** that influence crop-water requirement?
- What are the **future projections** of economic development, food habit and food requirement under climate change and population growth?
- What will be the possible changes in agro-climatic condition and land use pattern?
- What will be the agricultural water demand for different land use scenarios under **climate change**?
- What will be possible crop scenarios based on water availability and demand?
- How do the **salinity level change** land use (shrimp and rice) and **affect the poor**?
- How does surface water and groundwater **salinity in coastal regions** affects food and water security?

Research questions for further study on Land use planning

- Will Bangladesh **invest pro-actively** in the expansion areas?
- Will there be a policy to attract people to other centres than the major cities? How would this be brought about?
- What inter-sectoral considerations are relevant? And **what conflicts can occur** between land uses, including urban versus agriculture and crops versus aquaculture?

Activities for further study on Scenarios and policy development

- Promote the **use of scenarios** in policy development
- **Build capacity for the development of land use change scenarios for Bangladesh** in support of long term planning and the Delta Plan formation in particular
- **Build scenarios around the competition between different uses** of space, be it for living, industry, agricultural production or the environment.

Conclusion

- ❖ **Scenario development** is a means to embrace uncertainty.
- ❖ **Identified key scenario parameters** to prepare for future change in integrated water resources management in Bangladesh:
 - **Water safety: connectivity** of the floodplain and wetlands, retention area in urban areas, and how the polders manage the excess of rainfall under high-water and siltation.
 - **Sediment transport: the upstream development and water management**, such as dam building, and the amount of sediment transported by the rivers following geomorphologic activity, such as an earth quakes.
 - **Food security: agricultural output and food security** under different fresh water availability and salinity levels.
 - **Land use change: competition** between urbanisation and agriculture.

Conclusion contd.

- ❖ Further **intensive and interactive research** works are to be carried out.
- ❖ It is urgently advised to **include sediment transport as a key uncertainty** in future scenarios for integrated water resources management.
- ❖ A multifaceted complex and **adaptive system of infrastructure, management and governance**, with a changing role of government and private sector is becoming essential to meet the current and future challenges

Thank You

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