Lessons from Water Management in Bangladesh

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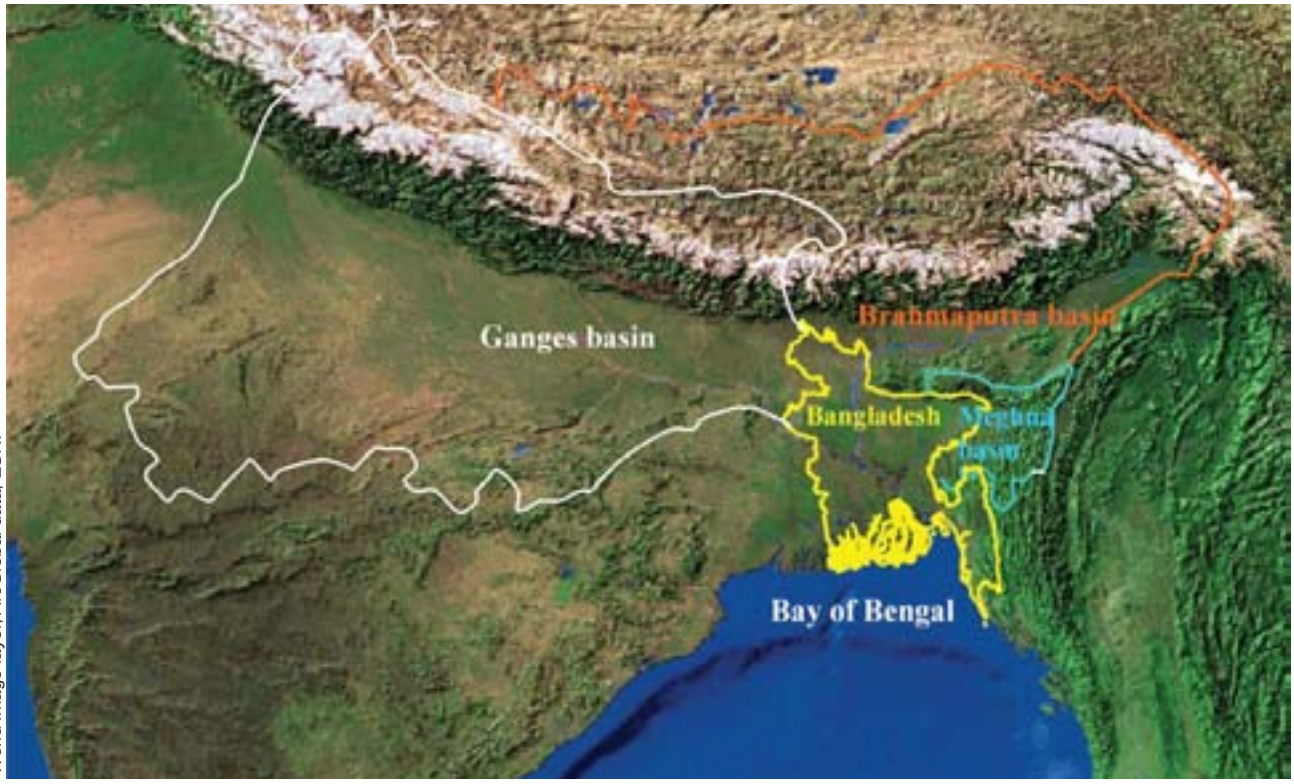


World image layer, ArcGlobal data, ESRI

Map of Bangladesh with the Ganges, Brahmaputra and Meghna river basins

Bangladesh is a lower riparian country in the basins of the Ganges, Brahmaputra, and Meghna (GBM) rivers. A major portion of the country is formed by the deltas of these large rivers. Tributaries of the Ganges and the Brahmaputra drain the southern and south-eastern slopes of the Himalayas, and the Meghna river system drains the Naga-Manipur hills of the Himalayan range.

The landscape and hydrology of Bangladesh

Approximately 7% of the GBM basins – a total area of 1.74 million sq. km – lies in Bangladesh. The country also has a tertiary hill region which is a part of the Himalayan range. This hill region is outside the GBM basins and covers approximately 9% of the country's area of nearly 0.15 million sq. km.

The water regime in Bangladesh is dominantly influenced by runoff generated outside the country in the upper catchments of the GBM rivers. About 80% of runoff is generated outside the country while 20% is contributed by local rainfall. Annual volume of runoff to the sea is equivalent to about 12 metres depth over the country's area under the GBM basins. More than 80% of annual rainfall occurs during June to October, and groundwater is recharged during this period. Because of snowmelt in the Himalayas, the Brahmaputra starts rising ahead of the monsoon in early April. The floodplains of the GBM rivers and their tributaries and distributaries form the main landscape of the country. Floodplains moderate flood flows by acting as detention reservoirs in flat topography, where drainage of floodwater to the Bay of Bengal is a slow process because of the backwater effect from the sea.

Water, ecosystems, and livelihoods

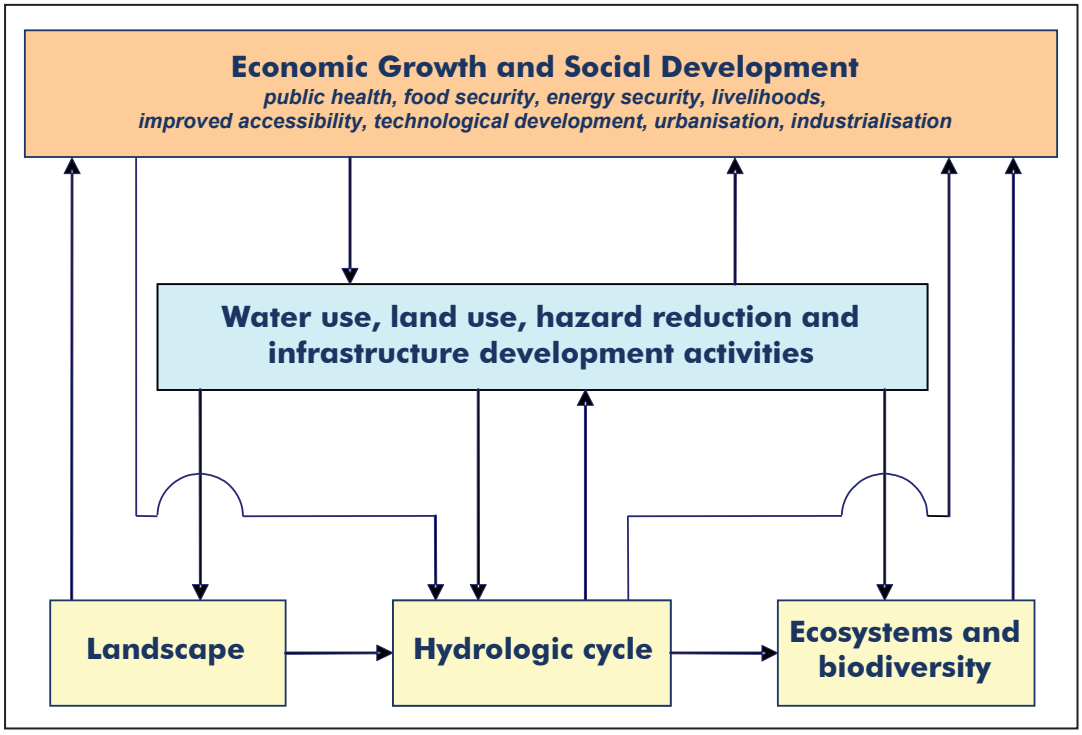
Agricultural projects play an important role in providing livelihoods since the agricultural sector is the largest employer in rural areas in Bangladesh. A large portion of rural livelihoods for the poor is dependent on ecological resources of the floodplains and the subsistence functions of the water resources system. The life cycle

of open water fisheries, a source of protein for the poor sections of society, is intimately related to inundation of the floodplains during monsoon floods. Floods during the monsoon link the floodplains, wetlands, and rivers, providing suitable aquatic habitats for reproduction, migration, breeding, and growth. Open water fisheries are a major source and supplier of protein for the poor in rural areas. Rivers and 'khals' (natural channels or canals) provide a cheap means of transport in riverine Bangladesh. Country boats have a significant role in socioeconomic activities in rural areas, and they are able to reach outlying rural areas which are otherwise inaccessible. The population of the highlands is dependent on shifting cultivation for subsistence food production, and the main source of income is genetic resources.

Experience in water management

Impact of water management projects. Driven by fears of food insecurity, water management in Bangladesh has been dominated by large investments in flood control and drainage and irrigation projects since the 1960s. Water regimes and ecosystems in alluvial rivers, hill streams, and tidal rivers are subject to growing stress and adverse impacts because of water management projects. The notion of flood control projects is that a flood-free condition in the floodplains would incur less damage to monsoon rice. Many floodplains wetlands have shrunk and lost hydraulic contact with the river as a result of flood control projects. Such projects have disrupted fish movement between rivers and floodplains and have adversely affected open water fisheries. Flood control projects in many places have actually only shifted the risk of floods elsewhere rather than reduce the risks, victimising poor sections of the society and generating social conflict. Large numbers of hand tube wells for rural water supply become inoperative towards the end of the dry season because of the excessively lowered groundwater level seeping through the shallow and deep tube wells for irrigation. Water, land, and ecosystems in the hill region are subject to stress because of land cover changes due to short cycle shifting cultivation, soil erosion, deforestation, migration, urbanisation, landslides, and stone mining by rock-blasting. Disruption of the storage function of the tidal floodplains by coastal flood control polders (low-lying areas of land defended from flooding) have caused the channel bed to rise, leading to serious waterlogging (where water cannot penetrate deeply) in adjacent areas. This has caused serious damage to agriculture, homesteads, forestry, fisheries, livestock, and physical infrastructures in Bangladesh.

Coastal flood control polders are also the main cause of the deterioration of the waterways due to siltation in rivers, often incurring huge dredging costs. Development of shrimp aquaculture in the areas covered by flood control polders in the coastal region has generated serious conflict with agricultural land use. Another major issue is transboundary water conflict between India and Bangladesh. Diversion of water from the Ganges at Farakka since 1975 has created severe water shortages and saline water intrusion in the Ganges-dependent area, leading to losses in agriculture, fisheries, and navigation, and damage to the Sundarban mangrove forest and biodiversity.



Interdependence of land, water, ecosystems and socioeconomic development

Interdependence of land, water, ecosystems, and socioeconomic development. Many water management projects in Bangladesh have not been able to achieve the desired objectives because of a lack of consideration of the interdependence of land, water, ecosystems, and socioeconomic development. On the one hand, water management projects create land use opportunities; on the other, water regime and water availability are affected by land use and infrastructure, which in turn affect aquatic ecosystems and livelihood activities. Rivers and wetlands perform a range of subsistence functions essential for a section of the rural population. Inequity in the distribution of social costs and benefits of water management and land use projects has deprived many rural people of their livelihood opportunities. Fisherfolk and boatmen suffer the most. While water management interventions bring economic benefit to one section of society, they cause economic hardships to other sections, especially the poor.

Integrated approach to water management for sustainable development

Experience with water management interventions in Bangladesh indicates the importance of preserving floodplains functions, protecting ecosystems, reducing vulnerability to water-related hazards, facilitating people's participation in planning and operating projects, ensuring equity in decision-making, and adopting an integrated approach to water management. Such observation is in congruity with the 'integrated water resources management' concept promoted by the Global Water Partnership (GWP 2000).

Integration of water use, land use, hazards reduction, and ecosystem protection. The National Water Policy of Bangladesh (Ministry of Water Resources 1999) recognises the need to frame rules, procedures, and guidelines for combining water and land use planning, and stresses the need for water development and management to include restoration and preservation of the environment and biodiversity. Water and land management decisions need to take into account the contribution to alleviating poverty, supporting livelihoods, strengthening economics, and sustaining ecosystems in order to make progress towards sustainable development. Regulation is needed to impose constraint of environmental flow in order to ensure in-stream flow requirements for the maintenance of river morphology, the sustenance of the ecosystem, and the prevention of saline water intrusion. Reducing vulnerability and increasing society's resilience to natural hazards like river floods, storm surge floods, riverbank erosion, and drought, among others, should be the focus of hazard management. Steps are necessary to make water control structures multi-functional and consistent with the water regime in the floodplains in order to satisfy the needs of agriculture, aquaculture, navigation, and the ecosystems. Integrated watershed management is essential to address land and water management issues in the hill region so that degradation of land and the environment is prevented.

Community participation and equity consideration. Community participation needs to be an integral part of identification, appraisal, and operational stages of water and land use planning and infrastructure construction projects. Multiple criteria decision-making that takes into consideration the principles of equity, livelihood security, ecosystem protection, and development goals, is the way to ensure social justice regarding costs and benefits. Water- and ecosystem-based local management zones can be formed to facilitate effective community participation and ecosystem maintenance. The negative impacts of irrigation projects on open water fisheries can be reduced by promoting complementary development of community-managed fish production schemes within irrigation systems in floodplains agricultural land. Large sections of the rural population and most highland populations suffer from a lack of water supply and sanitation facilities. Formulating and implementing regulations for water rights are necessary to provide protection for these basic human needs. Efforts are needed to introduce and strengthen community-based domestic water supply and sanitation facilities.

Integrated river basin management. Integrated river basin management (IRBM) is an important means of integrating water use, land use, and ecosystem maintenance, and in addressing competing upstream and downstream water interests. Enormous opportunities exist to bring prosperity to the people of the GBM basins through IRBM for dry season flow augmentation, agricultural water supply, hydropower generation, navigation, hazard management, ecosystems maintenance, and environmental conservation. IRBM is also essential to address issues related to the possible impacts of climate change over the basins. An institutional framework is necessary to provide the mechanism for conflict resolution and cooperative development of shared water resources through integrated river basin management.

References

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