

RIVER ECOSYSTEM SERVICE IN SETTLEMENT DEVELOPMENT AND HISTORY OF COASTAL BANGLADESH: A CASE STUDY ON KACHUA UPAZILLA

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Abstract

In Bangladesh every single settlement whether it urban or rural is situated alongside a form of inland water network. Livelihood, culture and civilization of this settlements maintains an intrinsic relationship with the Ganga-Brahmaputra-Meghna river basin system. Inland water eco-system service plays a significant role in the setting of a settlement and its socio-economic activities. The traditional role of this water network is often deteriorated over the years due to the lack of ecological knowledge, dearth of proper strategies and policy guidelines and various anthropogenic activities in the face of accelerated climate change scenarios. This study is attempted to find out the ecosystem services of Bhiarab river in the context of the national river management strategies and policies in cooperation with river-dependent community and challenges thereof. The paper explains the background of this river channel-based navigation along with the discussion of issues and challenges faced by the settlements. The findings reveal various strategic policies have been taken over the years on piecemeal basis to manage water resources which did not end up well due to the absence of a holistic approach. Future management plans for this river should involve local communities to avail their willingness to conserve this river while making them resilient against anthropogenic and natural impacts through enhancement of socio-economic output from it. The community willingness and its dependence, as unearthed in this research, provides compelling ground for the authors to state that integrated planning with proper respect for local ecology is a mandatory strategic element to successful implementation of the policies in this regard.

Key Words- River Ecosystem, Coastal settlement, National Policies, Structural Development

Introduction

River is often regarded as life-blood of human settlements. It provides necessary support to the basic functions of life, such as drinking, washing, agriculture, and industrial production. The life and culture of Bangladesh people is intertwined with Ganga-Brahmaputra-Meghna (GBM) river basin system. This river network changed its course from time to time (Rudra, 2018). Average human settlement density within 50 km of the coast is to be higher in large river basin than in smaller coastal basin (Fang et al., 2018). Coastal river-based settlements were usually established for reasons of accessibility, navigation control, trade, and agriculture. Historically there tends to be a symbiotic relationship between these settlements and their associated river ecosystem. The South West region of Bangladesh is a unique brackish water ecosystem interspersed with

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sensitive tide-dominated rivers, streams and water-filled depressions. The river system of this region is altered due to national policies and strategies taken from time to time and now this age old river system is now taking its toll by damaging settlements and its tradition, agriculture, transport and disaster management system (Dempster & Brammer, 1992), (MOWR, 2001).

This study has taken Bhairab river in Kachua upazilla as a case study to review the historical and ongoing process of rationalization of national policies regarding river management in South West coastal on the basis of environmental auditing along with national priorities and people's perceptions. Priorities were given to the various aspects of targeted and achieved objectives following the functionalities of national policies.

Study Area

Bhairab river has played a predominant role in settlement development in this Kachua upazilla. Over time, people have grown and adapted to the natural characteristics of this water systems and fluid landscapes. Locals have used this physical environment in different ways to gain advantages in trade, communication, and production. Climate, life style, and geomorphology of this region have produced different responses, cultural practices, and eventually distinctive settlement forms that may be described as the defining patterns or cultural products of historically-developed coastal river-based civilizations.

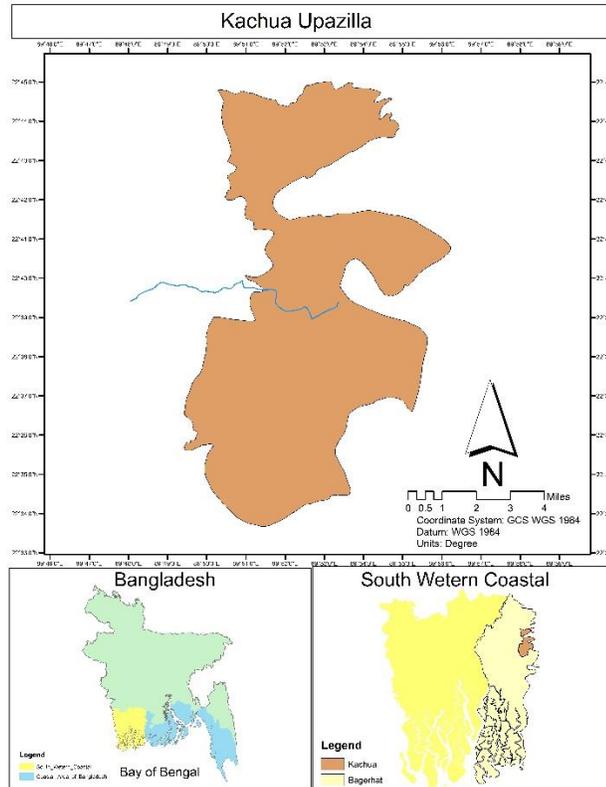


Figure 1 Study Area

Methods

The study includes interpretive historical research and case studies. The research employs a range of tactics, including a questionnaire survey of local residents; semi-structured interviews of various actors from the realms of design, planning, and policy; and an analysis of relevant mouza maps (Both cadastral survey and revised survey) and satellite imagery (Landsat-5 WRS-2 and Landsat 7 TM) and shapefiles by ArcGIS 10.4. and Erdas Imagine 2014.

History and An Overview of National River Management Policy

For millions of years GBM carried sediments from Himalayan which formed the largest deltaic plan of the world- Bangladesh. From the beginning of time locals had to negotiate with this river network for settling in this region. In pre-colonial time, farmers used to collect levies from riverine crafts over the water course as per instruction from ‘Zamindars’ or local landlords. During the colonial period the system continued only the ‘Lords’ were changed. After the end of colonial rule, government authorities took control over river management. The main objectives of these authorities were to ensure maximum agricultural production and minimum damage due to natural calamity. River management planning has changed over time to time according to socio-economic needs mainly (GED, 2018). The different phases of water resources planning processes and its main features are described in the following sections.

Initial Phase: Krug Mission

Krug Mission Report (1959) is the first major study which addressed the problem of flood control and water resources development of the country. Based on the recommendations of the Krug Mission, East Pakistan Water and Power Development Authority (EPWAPDA) installed a structural solution in the South West tidal areas called polder (circular embankment) for protecting land from flood inundation and saline intrusion. The report of the Krug Mission effectively discussed the principles governing delta development by large rivers and pointed recommendations, suggestions and observations of the report. It introduced the ‘polder’ enclosure system, a Dutch term., (EPWAPDA, 1968).

IECO Master Plan

The main focus of IECO Master Plan (1964) was on flood control and drainage as well as irrigation in a limited way. Following the Plan, the construction of large flood control, drainage and irrigation (FCDI) projects began in earnest. The objective of that plan was only to protect the area from flood and coastal storm surges and produced agricultural crops (Y. Ahmed, Choudhury, & Ahmed, 2017).

NWP Phase

The first National Water Plan (NWP-I) (1989) developed a number of numerical models and analytical tools for defining and evaluating strategies. The NWP I and II emphasized the role of minor irrigation with low lift pump and shallow tube wells. Both phases of the NWP recognized the importance of fisheries and recommended several basic policies to strengthen fisheries institutions, improve the design of water control structures for providing fish migration, improve the management of FCDI projects to enhance fish production, and the need to reserve certain water bodies for fisheries development (Hossain, 2016).

FAP Phase

A number of projects was selected under Flood Action Plan (1989) addressed the aforementioned problems and issues. Short-term projects would address problems where there was clearly a need for early action, and medium to long-term projects included those which the regional studies showed generation of significant social and economic benefits while causing least damage to the environment (Custers, 1993).

NWMP Phase

National Water Management Plan (2004) provides the guidelines for agriculture, fisheries, industry, navigation, environment, basin-wide planning, water rights and allocations, public and private investment, water supply and sanitation. The policy underscores the broad principles of water resource development and its rational utilization. It emphasizes both public and private actions and highlights the importance of conjunctive use of ground and surface water (WARPO, 2004a).

Coastal Zone Policy and Strategy

Coastal Zone Policy (2005) was developed, for implementing the policy, as to select strategic priorities and actions on the creation of the institutional environment that will enable the Govt to embark on a continuous and structured process of prioritization, development and implementation of interventions for the development of the coastal zone (Ahmad, 2019).

Master Plan for Haor Area

The overall goal of Master Plan for Haor area (2012) is to achieve sustainable development by integrated planning and implementation through multi organizational involvement and community participation for optimum utilization of resources and reduction of poverty. To be more precise, integrated development would comprise mainly flood management, environmental sustainability, production of crop, fisheries and livestock expansion of education, settlement and health facilities, road communication, navigation, water supply

and sanitation, industry, afforestation, and generation of power and energy (MOWR, 2012).

National Water Act

National Water Act (2013) formulates policies and guidelines for integrated development, sustainable use, equitable distribution and conservation of water resources (GOB, 2013).

Participatory Water Management Act

Participatory Water Management Act (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 PAs, (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 (Dewan, Buisson, & Mukherji, 2014)

BDP 2100

In Bangladesh Delta Plan 2100 (2018) main focus is given to the role of Bangladesh Water Development Board, Water Resource Planning Organization. Local Government and Engineering Department and Bangladesh Agricultural Development Corporation in water resources development planning (GED, 2018).

Impacts of River Management Policies

‘River Management’ refers to national and regional development intrinsically associated with river ecosystem. The term defines a conception of making in which both natural and manmade water systems are integrated in the process of development. Impacts on settlement development of Kachua Upazilla for undertaken national policies and projects to manage Bhairab river has been described in following sections:

Settlement Pattern and Cultural Tradition

Prior to post-colonial period river Bhairab was managed local communities. They would build temporary earthen embankments only permitted to enter the depressions during the monsoon. But after three devastating floods in the 1950s, installation of a large number of polder dykes took place by the Government authorities. Siltation in channel beds due to these projects resulted in shrinkage of river Bhairab. And after the installation of switch under the Tidal River Management (TRM) project, flow of Bhairab was fortified to a great extent.

In the early stage, the settlers of this regions made canal network surrounding the river as foci of nuclear pattern settlements (Figure-2a). These canals were used as a defense mechanism for the safety of households against flood. Even after the Krug Mission and IECO Master Plan projects, lands would get inundated in monsoon flood and people used canals as an adaptation process. Due to TRM projects, flood risks were reduced and people started settling beside rivers linearly (Figure-2b). Intrusion of road infrastructural development by LGED and RHD without respecting the canal-based settlement ecology also triggered road side ribbon development (Figure-2c). All these alteration in the water network of this region deteriorated the relationship of water and human settlements.

Bhairab river had significant impact in cultural and traditional development in Kachua Upazilla. A sport called ‘Nouka Baich’ were a part and parcel of cultural tradition of this region which is now being extinct due to the fortification of river water. Dwellers used to arrange local swimming competition before this incident. Reduction of these cultural events are having great impacts on the psychology of new generation. A floating group of people used to catch fish coming from the river through canals and made their living in this region are now migrated to other regions for survival. People who earned their living by the blessings of river became unemployed and forced to migrate to urban areas in search of a livelihood. Many people moved onto embankments and roadsides. The cumulative impact was felt in terms of Strong competition for the rapidly diminishing resource base heightened tensions and conflicts between sectors of society and created a volatile social situation (Hoque, Quinn, & Sallu, 2018).





Figure 2 Human Settlement Pattern

Agriculture

Prior to post-colonial period the local practice of ‘Doshier Badh’ (Community embankment) and ‘Oshtadoshi Badh’ (8 months embankment) made by temporary earthen embankments, low dykes and wooden sluice gates around the area to protect the arable land from saline water intrusion and allow water in monsoon when salinity in the river was low. Thus, they enjoyed good harvests in the dry period and a variety of fish in the monsoon. Due to flood mitigation Government authorities started installing dykes and emphasized on increasing agricultural productivity in this region. The plan worked well till 1980’s and gave high amount of rice production.

Stage/Time Frame	Before 1960	1960s to 2000s	2000s to date	
			Legal Framework	Framework in Practice
Planning and Design	Local Community	BWDB, Donor	BWDB, Donor	BWDB, Donor
Construction	Local Community	BWDB, Donor	BWDB, Donor	BWDB, Donor
Operation	Local Community	Water Management Organization (Mainly Local Elites)	Mainly BWDB’s WMOs, and in some places BWDB handed them over to LGED’s WMO’s	Over 10,000 hectares: periodically by WMOs (mainly local elite) Less than 10,000 hectares: Regularly by WMAs (most often run by representatives of local people)
Maintenance	Local Community	Periodically: BWDB Regularly:	Over 10,000 hectares: periodically by	Over 1000 hectares periodically by BWDB

		Formation of LGED's Water Management Organization to Handover	BWDB Less than 10,000 hectares: Regularly by LGED's WMO's	Less than 10000 hectares: Regularly by WMO's
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But as the world price of shrimp got higher, saline water was allowed to enter and converted croplands into shrimp farming land. Where the embankments were installed to protect crop lands, they were turned into large shrimp ghers forcibly. Extensive shrimp culture changed the crop pattern of this region drastically (A. Ahmed, 2011).

As crop production reduced in a large scale, cattle industry faced a significant threat. Grazing land for cattle were converted into ghers and due to shortage of foddering people lost interest in cattle farming.

Traditionally this region was famous for betel-nut production in large scale. Almost all the homestead gardens were full of betel-nut trees. Biggest betel-nut market of the country resides in Bagerhat and Kachua is one the major supply source. Due to saline intrusion quality and production of betel-nut is degrading day by day and this industry is now in the face of extinction. People now planting variety of trees which can survive in salinity.

Transport

Bhairab river-based canal network navigation played a big in the development of settlements in Kachua Uapzilla. This canal networks not only served regionally but also extended its service nationally. Pirojpur district of Barisal division and Bagerhat district of Khulna division were connected through the Baleshwar-Bhairab-Doratan channel. It used to be the main route of the communication between these two interdivisional districts prior to the installation of Bagehrat-Pirojpur highway road. Many drainage canals became inoperative due to siltation, Before the TRM sluice gates installation on river Bhairab, he had an average width of 885 ft long in Kachua channel. Now the average width is 50 ft which turned it into a canal and unfit for large scale water navigation. The policy of connecting Bagerhat-Pirojpur via road network ignoring the water-based navigation has lessen the significance of Kachua as intermediate region. Local businesses are facing serious trouble to establish a market place and hindering the development of Kachua Upazila.

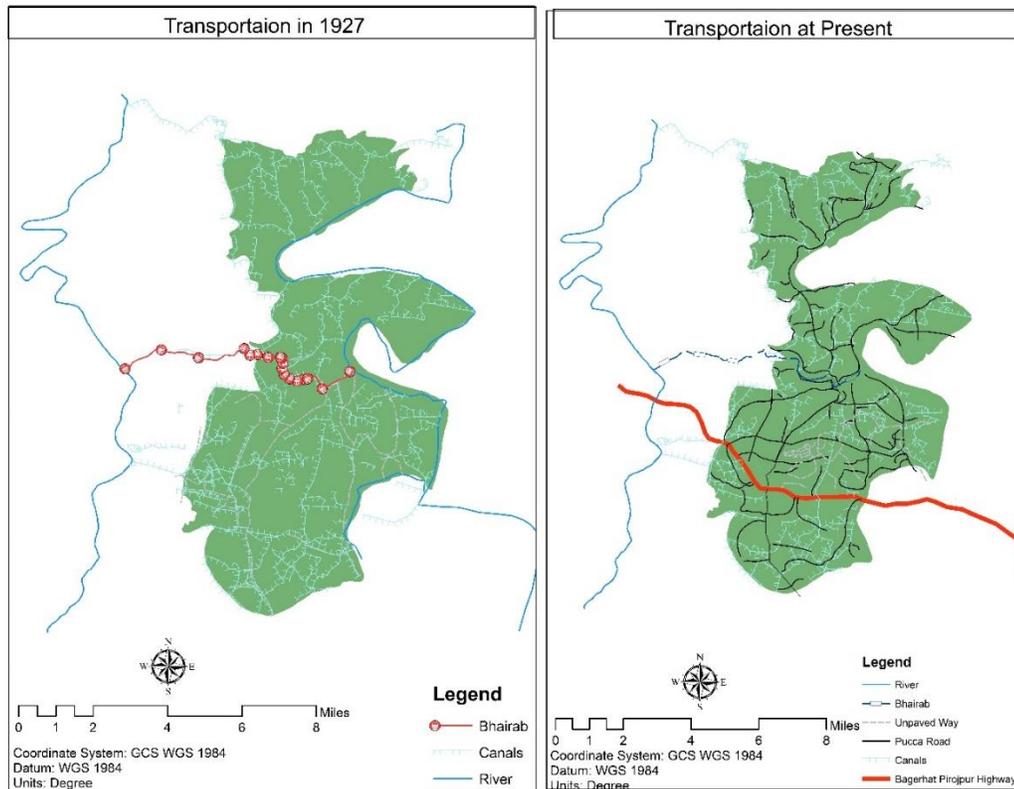


Figure 3 Transformation in transportation system of Kachua Upazilla

Drainage Management

Since the 1980s, the polders have become a serious concern for drainage system. The polders have caused a siltation in the channel beds which, in turn, has resulted in rendering vast tracts of lands waterlogged all year round. The situation was further exacerbated by the absence of any provision for regular and routine maintenance dredging in the CEP. The polders and other structures impeded vast volumes of sediment-laden monsoon flood flows. The floodwaters started to accumulate upstream of the polder embankments and the drainage structures. This caused widespread flooding and consequently deposited silt and sediment in the riverbeds and channels. The effect caused a reduction in the bulk-carrying capacity of the water by the rivers and channels, leading to further flooding due to severe congestion of drainage, which progressively became worse.

Conclusion and Recommendation

River management policies and projects focusing on higher rice-production may not be the most suitable development option for coastal communities, especially when these are threatening the existing conventional, sustainable structure of ecological river ecology-

based livelihoods. So, there has been a shift in water policy concepts from single-objective to multiple-objective. The South West Area Integrated Water Resources Management Project (WARPO, 2004b) highlighted the impacts that brought drastic changes to the natural water regime, resulting in an imbalance in the river ecosystem. National studies such as those by the Department of Fisheries (Department of Fisheries, 2017), the Bangladesh Water Development Board and the Water Resources Planning Organization and have identified issues such as structural interventions disrupting the free-flowing environment of the floodplains, continued stagnation preventing natural flushing and the entry of fingerlings into the floodplains, etc. Shifting the concept towards multiple objectives however still fails in terms of considering the river ecosystem. Many infrastructural developments without due consideration of the river ecosystem have led to degradation of living (Uddin, 2005), (Sanwar, 2010). Hence, the developments lack long-term vision, boosting economic activity in a region temporarily but ending up making its supposed beneficiaries more vulnerable in the long run. Meanwhile, institutional weaknesses in the public sector have been a major constraint on the effectiveness of any project because of improper implementation, overrunning costs and inadequate operation and maintenance (O&M).

It is apparent from the above discussions that national river management policies in a river ecosystem based coastal settlements like Kachua Upazilla has enormous consequences. However, the population generally demand protection against flood damage and it is therefore essential to take an integrated view of the hydrologic cycle and the interactions of human interventions. Implemented polder systems have previously failed to perform as intended due to a lack of understanding of the Bhairab river relationships with the development of settlement and the role of culture. Accordingly, local initiatives were found to be sustainable and effective in the local social reality. Negative impacts on agriculture, navigation and drainage system were identified as the potential adverse river ecosystem effects where such initiatives were not followed. This reflected the need to include the interests of all water resources stakeholders in future projects and to seriously consider the local people's participation in planning and management as essential input for both efficiency and solutions of water development projects. An integrated water resource planning approach is required to optimize needs of river-based settlement ecosystem. Moreover, proper river management planning and projects requires development of an institution capable of dealing with a task which is multi-dimensional and multi-disciplinary in nature.

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