

Leveraging India Bangladesh Relationship for Improved Coastal Zone Management in Upper Bay of Bengal

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Abstract

Urbanising coastal areas of Bay of Bengal basin have witnessed rapid growth and changes over the past few decades. Home to the highest density of poor people in the world, the region is prone to severe natural disasters like cyclones, storm surges, floods, erosion, soil salinity and adverse impacts of climate change, particularly sea rise will further aggravate the situation. Facing similar kind of challenges, rather than working in silos, Bangladesh and India would do better by joining hands to form policies and reform the institutional structure for improved management of coastal resources. Settlement of maritime dispute and of late bonhomie between the two nations has raised the prospect of joint coastal resource management for shared growth and prosperity. The aim of the paper is to diagnose the prospects of India Bangladesh cooperation in coastal zone planning and management of the Upper Bay of Bengal region and explore various areas where India and Bangladesh can tap their present relationship to jointly address the challenges, needs and possibilities. In this endeavour, the paper details the present status of various components of coastal resources and their uses and the challenges. Further by expounding different collaborative actions between two countries, the paper comes up with a set of recommendations.

1. Introduction

Urbanising coastal areas of South Asia have witnessed rapid growth and changes over the past few decades. Situated at the northeastern basin of the Indian Ocean, the Bay of Bengal is adjacent to Ganga-Brahmaputra delta, one of the largest deltas in the world (M. R. Rahman 2017). It is also one of the 17 climate change hotspots among the world oceans (Hobday et al. 2008). Bay of Bengal covers entire Exclusive Economic Zones (EEZs) of four coastal countries – Bangladesh, Maldives, Myanmar and Sri Lanka and a large amount of territorial water and EEZs of four other countries - India, Indonesia, Malaysia and Thailand (Vivekanandan, Hermes, and O'Brien 2016).

India and Bangladesh are the most populous countries in the region. Uninterrupted emigrations in the coastal areas of Upper Bay of Bengal for livelihood and rapid population growth have put tremendous pressure on the already deteriorating coastal areas of these countries. Although the ever increasing number of natural disasters affecting the developing world in general, their impacts on Bay of Bengal are more severe.

Impacts of anthropogenic pressures include the decline of fish stocks, sediment contamination from inland or marine pollution, waste disposal, etc. Both

the countries are also prone to severe natural disasters like cyclones, storm surges, floods, erosion, soil salinity, etc. (Rashid, Hoque, and Akter 2015). Large cities of the region – Kolkata, Dhaka, Chittagong and Cox's Bazar are all awfully exposed to sea-level rise and storm surges (Nicholls 1995).

Despite the recent developments of both the countries, the region is still home to the highest density of poor people in the world (De and Bhattacharyay 2007). A large number of people living in these coastal areas are facing severe air and water pollution, land degradation and other environmental problems (Marquet and Mirando 2012). Overexploitation of natural resources, rapid yet unplanned urbanisation, industrialisation and economic development have compounded the vulnerability of the region and adverse impacts of climate change, particularly sea rise will further aggravate the situation.

In this rapidly changing environment, the existing policies and institutions are unable to ensure the equitable and sustainable management of coastal resources and prevent further degradation. Facing similar kind of challenges, rather than working in silos, joining hands to form policies and reform the institutional structure for improved management of coastal resources will have more far-reaching impacts.

The relationship between India and Bangladesh is unique in nature. Sharing common values and principles, the people of two countries are attached with a very special bond of common history and cultural heritage. Despite their huge size-imbalance i.e. land area, population and real Gross Domestic Product (GDP), their economies are complementary to a large extent and stand to benefit substantially from economic integration and mutual cooperation (De and Bhattacharyay 2007). Notwithstanding several recent collaborations, there still exists much potential for developing cooperation in many areas for mutual benefit. Joint coastal zone management is one such area.

2. Objective of the Paper

The discussion of this paper will focus on various aspects in the context of joint coastal zone management between India and Bangladesh. The paper spells out major efforts being undertaken between the two countries and explores how these interlinked synergies can be expanded for better coastal zone management. Maritime security constantly featured in the centre of agenda in bilateral cooperation between these two countries. However, the scope of cooperation in blue economy extends beyond the movement of cargos and people to the potential of joint management and sustainable development of ocean resources.

The paper thus underpins the necessity of delving further beyond the singular focus of security and sets forth the need to adopt a holistic cooperation framework which addresses the regional imbalances of natural resource management. In that endeavour, the paper provides brief portray of principal coastal resources of the region and portends the need for their better management by laying out the specific challenges. Finally, considering the present geopolitical scenario and cooperation arrangements between the two countries, the paper comes up with a few specific suggestions for improved cross border coastal zone management.

3. Coastal Zone Management

Coastal zones play a major role in economic growth of a country by providing renewable natural resources such as productive fisheries, soils and forests. Unsurprisingly, many developing countries bank on

various scarce coastal resources for their economic growth (Rahman 2017, Sarker 2010, Thia-Eng 1993). Coastal zones are also profusely endowed with beaches, and shore lands adding the recreational value (Klein 1997, Sorensen 1993). With roughly half of the world population living in coastal lowlands, coastal zones are also the most populous regions across the world (Thia-Eng 1993).

However, this intensive concentration of population and excessive exploitation of natural resources are putting unprecedented pressure on the coastal ecosystems. Global climate change is expected to exacerbate the situation and affect coastal communities, some of which are already suffering from the increasing climatic vulnerability (Mirza 2003). Conventional coastal management practices which focusses principally on landside coastal management initiatives are unable to cope up with this increasing anthropogenic and climatic pressures leading to biodiversity loss, habitat destruction and conflicts over the control of the resources (Islam 2003).

Conventional coastal vulnerability studies have primarily focussed on building scenarios of climate-induced changes, especially sea level rise of a particular study area and accordingly site-specific adaptation strategies were devised (Klein and Nicholls 1999). Dominant community level adaptation strategies have been either planned adaptations like insurance to spread risk, structural shoreline protection, development setbacks or spontaneous reactions, such as timing of harvest activities, alternate choice of resource in sectors, such as fisheries and forestry (Dolan and Walker 2006).

Notwithstanding the importance of site-specific community-based adaptation, it is often not enough, especially when the scale of the problem goes beyond the local level, sometimes outside the purview of national jurisdiction. In the same vein, many studies such as Vallejo (1993) attempted to explore the interplay between coastal zone management (CZM) and national development planning (NDP) but studies on regional governance approach with a specific coastal orientation is rare.

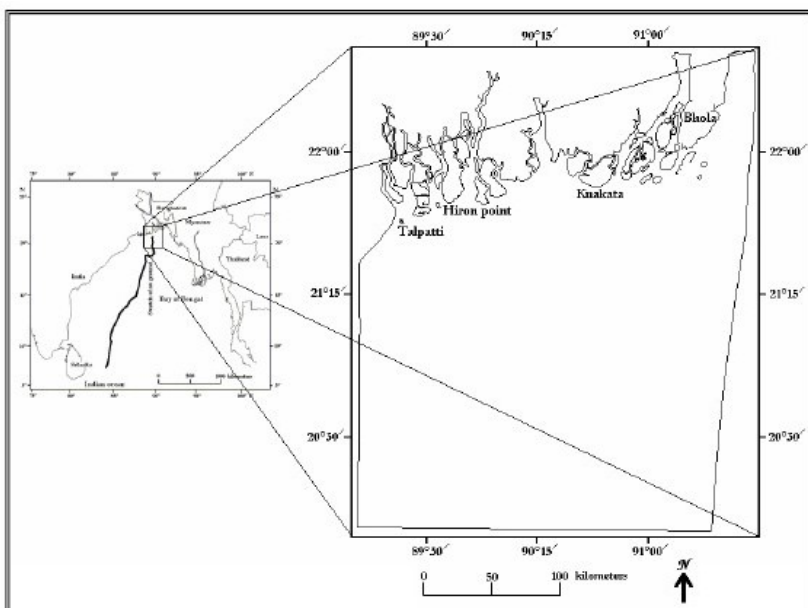
One possible explanation of this dearth of interest in conducting cross-boundary coastal zone governance studies can be that the replication of any local model of collective action, in global or even regional scale is neither feasible nor appropriate (Adger 2001, Ostrom 1999). Secondly, as distinct dynamics are associated

with different regional cooperation, it is futile to scale up a study for another region. Moreover, prevalent literatures on trans-boundary governance studies have mostly focussed on wildlife, forestry and protected areas. Other extremely important trans-boundary resources, such as water, aquatic and marine resources, are somehow scarcely studied.

With the growing number of international disputes over fishing activities, trans-boundary pollution, maritime boundaries, passage of ships, and other issues, cross-border cooperation in coastal zone management becomes necessary for the sustainable coastal zone management.

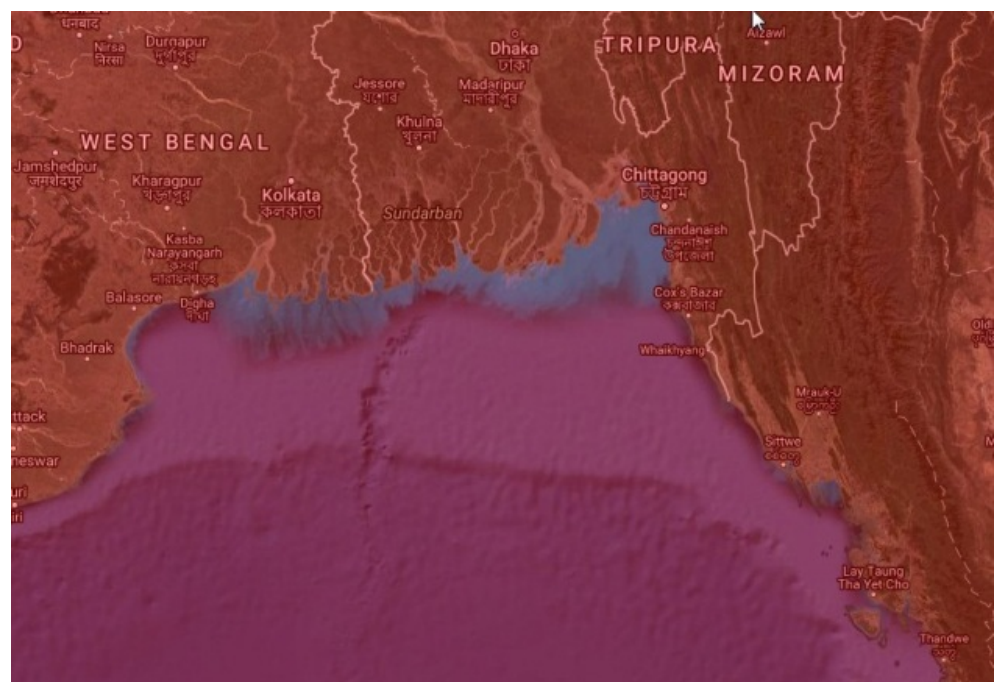
As per United Nations Convention on the Law of the Sea (UNCLOS) of December 10, 1982, coastal and ocean management for the purpose of exploring, exploiting, conserving and managing natural resources within national jurisdiction zones i.e. 200 nautical mile, Exclusive Economic Zones (EEZs) and extended fishery zones remains within the purview of national and sub-national governments (UNCLOS 1984). However, as environmental issues do not have any administrative boundaries, this implies that a country can suffer the consequences of harmful activities by their neighbours and thus need internationally negotiated solutions.

Upper Bay of Bengal



Source: Roy 2003

Source: Roy 2003



Source: Landsat Image

4. Overview of the Upper Bay of Bengal

Roy (2003) defined Upper Bay of Bengal in his study as areas falling between 20°N and 22°N latitudes and 89°7'E and 91°20'E longitudes covering an area of about 32400 square km (figure 1). It consists of 19 southern districts of Bangladesh and two eastern states of India i.e. West Bengal and Orissa. Both Bangladesh and India are among the most populous countries in the world (Marquet and Mirando 2012). Although agriculture is still the principal source of livelihood, the rate of industrialisation and economic development is high among both the countries. Both the countries are blessed with several major rivers passing through the region, and these rivers contribute significantly in their respective economies. India and Bangladesh shares two of the three biggest rivers of the region – Ganges (2,525 km) and Brahmaputra (2,900 km). India's share in the coastline of Upper Bay of Bengal is approximately 600 km (West Bengal 220 km and Orissa 480 km) (World Bank 2010) where Bangladesh has a coastline of 710 km¹.

5. Coastal Ecosystems, Interactions and Processes of Upper Bay of Bengal

The coastal ecosystems in the upper Bay of Bengal are extremely rich with natural resources and provide countless and important ecosystem services to human (Venkataraman 2005). The coastal and marine areas of the Bay of Bengal contain some of the world's most diverse and rare habitats, such as the littoral mangrove forests of Sundarban, world's largest known nesting beaches of olive Ridley sea turtles and several other threatened species, such as the Royal Bengal Tiger, the estuarine crocodile, the Indian python, etc. The most recent census which concluded in 2015 recorded a tiger population of 106 in the Bangladeshi Sundarbans, and 76 in the Indian counterpart, making it the largest surviving tiger population in the world. Considering the overall ecological interest of forests of Sundarban, it has been declared as a World Heritage Site.

In West Bengal, coastal habitats of two districts present high contrast as Midnapore district is characterised by sand dunes, long shore currents, high salinity, low turbidity and low vegetative coverage while South 24

Parganas District is characterised by Sundarban Mangrove Ecosystem (Chakraborty 2010). The coasts of Orissa and West Bengal are popular tourist destinations and also possess a number of key industries like petroleum refineries, fertilisers, pesticides, battery, detergent, etc. Bangladesh holds 10 wildlife sanctuaries, five national parks, 17 fish sanctuaries, 4 Ecologically Critical Areas (ECAs) and 1 Ramsar site in their coastal zone.

5.1. Use of Coastal Resources

5.1.1 Fisheries and Mariculture

Around 475 fish species have been recorded from the marine waters of Bangladesh (MEF/GoB, 2010). 2,546 marine fish species have been recorded from India (MoFE/Gol, 2014). Every year, coastal and marine fish production in Bangladesh accounts for around 6 million tonne and is source of direct livelihood for half a million people. However, inadequate capacity in relation to long line fishing is deterring the sector from attaining its full potential.

5.1.2 Tourism

Many tourists visit coastal areas of these two countries every year and there are many hotels alongside the beaches. Digha coast, Jagannatha's temple in Puri and Chilika which is the largest brackish water lake in Asia are the most popular tourist attraction. In Bangladesh, Cox's Bazar is the most frequented tourist spot (Pernetta 1993). Scientific research and conservation education along with infrastructure development, such as sea water recreational facilities can attract more domestic and international tourists in the region.

5.1.3 Ports, Industrial Development and Shipping

Ports are a vital part of countries economy and crucial link for integration in the expanding world economy (Dwarakish and Salim 2015). Ports also play a social role in creation of jobs through backward and forward linkages like shipping agencies, agents, stevedoring, ship shendler, freight forwarder, banking and insurance business. Despite the potential, the lack of investment in port infrastructure development, particularly in Bangladesh, is restricting the country from harnessing its vast marine resources. Bangladesh has two sea ports: Chittagong and Mongla. But with increasing load and decreasing navigability, the country urgently needs a deep-sea port for handling large container ships. India has 13 major seaports out of which Kolkata, Haldia and Paradip are located in Upper Bay of Bengal.

Traffic Handled by Major Ports in India and Bangladesh (2012-2013 to 2014-2015)			
(In ' 000 Tonne)			
Major Ports	April to March		
	2012-13	2013-14	2014-15
Kolkata Dock System	11844	12874	15283
Haldia Dock Complex	28084	28511	31010
Paradip Port	56552	68003	71011
Chittagong Port	43371	47298	54781

Source: Indian Port Association

(<https://www.indiastat.com/transport/30/shippingandports/253/stats.aspx>) and (Lagos and Hossain 2016)

6. Impacts of Anthropogenic and Climatic Pressures on the Coasts of Bay of Bengal

Unsustainable fishing practices, tourism and recreation, urban development, shipping and transportation, industrial and manufacturing and shoreline protection are the anthropogenic challenges causing several negative impacts on the region, such as:

6.1 Erosion and accretion

In the Upper Bay of Bengal region, the rate of shoreline retreat due to local sea level change and storm surge has been increased sufficiently, by 17.5 m per year (Chakraborty 2010). Rahman, Dragoni, and El-Masri (2011), in their study of the Sundarbans, indicated significant variation in erosion and accretion trends, upto 23.2 km² /yr of land loss. High suspended sediment load of Ganga-Brahmaputra delta also significantly contributes to the high accretion (Sarwar and Woodroffe 2013, Hazra et al. 2002). Every year, between 50,000 and 200,000 people are displaced due to riverbank erosionⁱⁱ.

6.2 Depletion of fisheries stock

Fish production in the Upper Bay of Bengal region has substantially increased over the past few decades. However, climate change can adversely impact the outcome of the sector through decrease in production and value of coastal and inland fisheries; and a decline in the economic returns from fishing operations (Vivekanandan, Hermes, and O'Brien 2016). Huge

amount of eroded sediments, fly ash along with several other industrial discharges have made this vast sheet of water bodies almost unsuitable for living species. This is reflected by the steady decline of the abundance of fin fish and shell fish seeds, smaller fishes and other nektonic forms (Chakraborty 2010).

6.3 Marine pollution

In Upper Bay of Bengal, marine pollution stems from multiple sources with the territorial limits of the region. Agricultural run-off, discharge of nutrients and pesticides goes directly into the sea and degrade the marine ecosystem. Many industries such as fertiliser, cement, pulp and paper, food processing, pharmaceuticals, metal, textile, chemical, petroleum, and lubricant plants are also directly discharging their untreated effluents into the coastal water (Rashid, Hoque, and Akter 2015). Plastic bottles and other plastic products are the most common litter in the coastal water. The rapid and unplanned increase in shrimp culture and their use of antibiotics and other chemicals is causing pollution in the water, harming other aquatic lives. Marine pollution is a constant threat in the upper Bay of Bengal region and needs immediate intervention.

Both Bangladesh and India have dumping grounds for ships that need to be scrapped. Over the years, the sector has turned out to be a lucrative sector for the development of both the countries. However, there are serious allegations that this sector has been accelerating the menace of marine pollution (Arif and Karim 2013).

6.4 Salinity and Water Logging

The coastal areas of Upper Bay of Bengal have already been facing salinity problem. In dry season, when the flows of upstream water reduce drastically, the saline water goes inside the country, degrading the agricultural lands. Many coastal areas are already uncultivable due to soil salinity. In last 20 years, 8-16 cm of sea level rise has occurred in Bangladesh.ⁱⁱⁱ Further sea level rise would negatively impact surface water, groundwater and soil, significantly reducing food grain production and exacerbating the present food insecurity. Continued water salinisation will also alter the aquatic ecosystem and lead to loss of many freshwater fish species. Further work is required in line of Dasgupta et al. (2014) to quantify this effect.

6.5 Waste disposal

The water quality of the coastal Bay of Bengal has deteriorated considerably because of unregulated discharges of untreated or partially treated sewage from the industries, municipalities, coastal towns. In the absence of adequate waste management system and lack of awareness among people about the importance of waste management, most of the wastes produced in domestic or industrial sector find their way into the sea.

6.6 Hazards and disasters

Every year, tropical cyclones and storm surges are claiming several human lives and causing economic losses in India and Bangladesh (Sato and Mimura 1997). Over the past few decades, both the countries were several times hit by tropical cyclones, some of the most devastating natural disasters recorded in the history with high casualties. Bangladesh is among the countries most prone to natural floods, tornadoes and cyclones (Marquet and Mirando 2012). Each year, roughly 18 percent of the country is flooded, killing over 5,000 people and destroying 7 million homes. During severe floods, the affected area might exceed 75 percent of the country. While the impact of tsunamis is not yet significant the region as the tsunami's path did not reach upper Bay of Bengal, the frequency of its occurrence is raising concerns regarding the future of upper Bay of Bengal.

6.7 Land use conflicts

Coastal lands of Bay of Bengal is used for agriculture, shrimp cultivation and fish farming, forestry, salt production, ship-breaking yards, ports, industries, human settlements, wetlands and increasingly on tourism infrastructure. This diverse and competitive demand for land, often creates conflict (Ahmed 2011, Islam 2003). For example, the unprecedented construction boom, particularly multi-storeyed hotels within the range of few hundred metres behind the sea in India, is leading to the degradation of its pristine coast. The indiscriminate installation of heavy tube wells into the dune bank in Bangladesh has led to the collapse of subsoil layers and the resultant seepage of saline water into the drinking water. Temporary fishing villages constructed on the dune slopes of Orissa as tourist attraction has been destroying the dune.

7. India-Bangladesh Cooperation in the Coastal Management

7.1 Regional cooperation in Bay of Bengal region

Regional cooperation is formed on the basis of homogeneity of interests, traditions, and values within small groups of neighbouring states (Hassan 2004). Regional initiatives can play a very important role in coastal management and marine resource governance. Ocean regionalism is defined as "the management of the oceans and their resources at the regional level" (Alexander 1982). United Nations Convention on the Law of the Sea (UNCLOS) has put particular emphasis on regional cooperation in formulating and elaborating rules, standards and recommended practices and procedures for the prevention, reduction and control of marine pollution (UNCLOS 1984).

South Asian Association for Regional Cooperation (SAARC) is the principal regional organisation with a view to building cooperation between and among the member states in the economic, social, cultural, technical, scientific and other areas of common interests. When established in 1985, marine pollution control was one of its initial objectives (Arif and Karim 2013). However, despite developing a Road Map on marine pollution, SAARC has failed to achieve any regional collaboration in the field of coastal management (Karim 2008).

Apart from SAARC, Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) is another important regional organisation which has the potential to play an important role in regional ocean governance. Comprising of five countries- Bangladesh, India, Myanmar, Sri Lanka and Thailand BIMSTEC can acquire a profile larger than SAARC, working as a bridge between South-Asia and South-East Asia, between SAARC and Association of Southeast Asian Nations (ASEAN) (Baru 2001). Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO) is another four country organisation, between Bangladesh, India, Sri Lanka and Maldives. Evolving from erstwhile Bay of Bengal Programme of the Food and Agriculture Organisation of the United Nations, BOBP-IGO is mandated to provide technical and management advisory services for sustainable coastal fisheries development and management,

particularly small-scale and artisanal fishers in the Bay of Bengal region.

Both India and Bangladesh are members of Indian Ocean Rim Association (IORA), a regional cooperation initiative of the Indian Ocean Rim countries. Although established in March 1997 with the aim of promoting economic and technical cooperation, the work of the association has been slow. It has taken pace recently when first Indian Ocean Rim Association (IORA) Leaders' Summit took place on March 07, 2017 in Jakarta. During the event, Indian government has pledged to institute IORA Centre of Excellence (ICE) in Kochi, India. The centre will work as an observatory for compilation and distribution of resources available with all the 21 present member states. On the maritime front, India also offered to set up an Information Fusion Centre to coordinate Maritime Domain Awareness (MDA) which would be extended to all Member States.

7.2 Present status of Indo-Bangla relationship and opportunities

In a historic verdict announced on July 2014, UN tribunal put an end to 40-year-old India-Bangladesh maritime dispute in the territorial sea, Exclusive Economic Zone (EEZ) and continental shelf within and beyond 200 nautical miles, where Bangladesh was awarded 19,467 sq. km of the 25,602 sq. km EEZ. Concerning the land boundary, in June 2015, two countries exchanged the instruments of ratification on the historic land boundary agreement. The only remaining apple of discord is the sharing of waters of the Teesta River and both the countries are trying to develop a balanced treaty in order to ensure equitable sharing of the water, thereby enhancing bilateral ties and reducing the possibility of water conflict.

The amicable settlement of land and maritime boundary has opened up vast sea areas which were not available to them in the last four decades. In the light of new development, both the countries can enhance their cooperation in sustainable coastal zone management and thereby, the conservation of the rich biodiversity of the region, particularly of Sunderbans.

Following the clear delineation of maritime boundary, the verdict could bolster coastal and maritime security in the region. Before the award, both India and Bangladesh could not undertake cooperative measures due to the procedural bottlenecks. The verdict has now cleared the hurdles of strengthening security in the

maritime front. In 2015, India and Bangladesh signed a Memorandum of Understanding (MoU) on Blue economy promoting joint exploitation of hydrocarbons and other marine resources, deep sea fishing, preservation of marine ecology, mitigating climate change by addressing environmental issues and disaster management and development of a joint roadmap in this regard is underway.

Bangladesh holds a strategic wedge to India for the implementation of India's Act East Policy (AEP). Bangladesh is the key gateway for India's several sub-regional initiatives such as the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) and the Bangladesh-Bhutan-India-Nepal (BBIN) initiative. Finally, a stronger bond with Bangladesh is a crucial element for India to subjugate the dominance of China and assert its leadership position in the region.

Both the countries are part of several multilateral and plurilateral treaties on coastal resource management, such as UNCLOS 1982, Food and Agriculture Organisation (FAO) Code of Conduct for Responsible Fisheries, 1995, United Nations Fish Stock Agreement, Ramsar Agreement on Wetland issues, Convention on Biological Diversity 1992 and Paris Climate Agreement of 2015. In addition, both the countries are integral part of UNEP's Regional Seas Programme (RSP), UNEP Marine and Coastal Strategy (2009), The Bay of Bengal Large Marine Ecosystem (BOBLME) Strategic Action Plan (SAP).

7.3 Framework Agreement on Cooperation for Development between India and Bangladesh

In 2011, the historic Framework Agreement on Cooperation for Development has been signed between the two countries with primary objective to promote trade, investment and economic cooperation. Divided in twelve articles, the Framework reiterates the importance of sustainable development and the importance of jointly working for environmental protection and responding to the challenges of climate change through adaptation have been reiterated multiple times. Given the importance of sharing waters, the agreement underpins the necessity of common basin management plans for common rivers. Flood is a common problem in Ganga basin, across the border and thus developing mechanisms for technical cooperation and exchange of advance information concerning the natural disaster is pivotal step towards

prevention of social instability. As climate-induced migration and the possible ripple effects of food insecurity because of climate change is a joint concern, flood forecasting and control can go a long way as a tool for climate change adaptation.

The framework also speaks of training and capacity building initiatives and cooperation between respective disaster management authorities, with a view to upgrading response mechanism. The framework goes further in underlining the importance of collaboration on projects of mutual interest which will help to preserve common eco-systems and, as far as practicable, coordinate their response in international conventions.

Unfortunately, the discourse related to climate change at present is mostly constrained to extreme weather events and to their response. While the security cooperation is discussed in order to maintain social order and regional stability, the role of modern military technologies that can play larger role in climate science and the fight against the negative impacts of climate change is surprisingly ignored.

7.4 Coastal Shipping Agreement

Giving a boost to regional connectivity, in June 2015, two countries signed Coastal Shipping Agreement with the objective to bring down the logistic costs of export-import cargos. The agreement enables the River Sea Vessels (RSV) to carry cargos between the two countries. Further in November 2015, the 'Standard Operation Procedure' for the implementation of the subject Agreement has also been signed. In early 2016, coastal shipping service from Chittagong port has been formally launched by Bangladesh Shipping Minister.

On October 2017, the first cargo vessel set off from Chennai port in India to Mongla port in Bangladesh, carrying a consignment of 185 trucks. A net saving of 15-20 days and about 3 lakh vehicle km of road travel from this single trip underpins the economic scope of the agreement. This is a major development in the regional connectivity as in addition to saving time and money, coastal transport will also bring environmental benefits, leaving lesser carbon footprints. This will also help India in its objective to enhance short sea shipping in the Bay of Bengal linking northeastern states with various parts of India and abroad, saving huge time and money.

7.5 Cooperation on Inland waterways

The Indo-Bangladesh Bilateral Protocol on Inland Water Transit and Trade (PIWTT) has been operational since 1972. Renewed in 2015 for five years, the latest version of protocol will facilitate the operation of inland vessels on the river protocol routes between river ports of Haldia, Kolkata, Pandu, Karimganj and Silghat in India and Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj in Bangladesh, enabling the movement of EXIM trade as well as cargo. India has already started to use transit facility by sending cargoes from Kolkata to northeastern states using Bangladesh territory, drastically reducing distance and transportation costs. India and Bangladesh are also in discussion to divide the maintenance cost of approximately 1.25 million annually to keep the transit route navigable at a share of 80 to 20 percent respectively. In addition, the possibility of crew members of vessels, possessing a valid passport but having no visa, to embark and disembark at the identified ports of call and bunkering stations in both countries for 72 hours after completion of immigration and customs formalities, is also discussed.

Besides PIWTT, in November 2015, two nations have also signed a memorandum of understanding (MoU) for passenger ferry service. The operationalisation of this MoU, expected by the end of 2018, will generate employment opportunities for the people of India and Bangladesh and promote people to people contact and cooperation for economic, social and cultural advancement.

7.6 Port Management

India and Bangladesh together are endowed with about 9,000 km of coastline and more than 250 ports. However roughly 27 of them are in operation at present and can be treated as prominent ports of the region. All these ports taken together handle over 500 million tons of cargo including over 5 million twenty equivalent units (TEUs) of container. India has planned to invest approximately US\$125bn over the period 2015 to 2035 under Sagarmala project for port modernisation and new port development, port connectivity enhancement, port-linked industrialisation and coastal community development. The project also aims to contribute to India's Act East Policy (AEP), expanding India's economic linkages with ASEAN countries through maritime connectivity.

The container volume of Chittagong port is steadily increasing and in 2016 surpassed its capacity by more than a third. The country's second seaport, Mongla also needs to improve its yard capacity which will enable it to handle increased volume of goods. In that respect, Dredging Corporation of India (DCI) has signed an agreement worth approximately US\$15mn with Mongla Port Authority and is likely to start the work by February 2018. In October 2017, Indian government has approved a credit line of US\$450mn for Chittagong port's Bay Terminal, US\$250mn for Mongla port and US\$750 million to develop some segments of the Payra Port Project, a new port in Bangladesh. India also expressed its interest in developing the port under a government-to-government (G-to-G) deal. Bangladesh government envisages making the Payra port a centre for disaster preparedness and maritime surveillance and India contemplates to assist Bangladesh in such capacity-building efforts.

8. Conclusion and Recommendations

The world currently is at crossroads between relatively modern open-regionalism and increasingly populist isolationism. With shifting geopolitics and fast changing power dynamics, governance structure of transnational resources needs to be revisited. Bilateral or sub-regional cooperation will contribute, through economic cooperation, to structural reforms in participating countries. In turn, these reforms will facilitate international integration of coastal zone management.

Therefore, bilateral economic cooperation between Bangladesh and India certainly has a great potential to enhance trans-boundary coastal zone management initiatives. This can ensure natural resource management and biodiversity conservation, in addition to promotion of regional economic development, and paving the way for peace building. Regional and bilateral cooperation in various sectors related to blue economy presents ample opportunity for both the countries to achieve economic growth and development. Considering the trans-boundary nature of activities, India and Bangladesh needs to join hand and coordinate to develop a common framework on coastal planning across sectors comprising economic and demographic projections, developing future scenarios, and using similar analytical techniques for analysing benefits and costs of alternative

management strategies across the boundary. Achieving such a common framework is difficult, since at the national level several institutions are involved for integrated planning and development of action programmes. Thus, it is important to attain institutional convergence at the national level before developing the trans-boundary common framework.

Finally, the key to improve joint coastal zone management will rely on mutual trust and benefit and the willingness of both sides to sit down across the table and jointly arriving at a positive sum game. The aim of the paper is to diagnose the prospects of India Bangladesh cooperation in coastal zone planning and management of the Upper Bay of Bengal region and explore various areas where India and Bangladesh can tap their present relationship to jointly address the challenges, needs and possibilities. In this endeavour, the paper details the present status of various components of coastal resources and their uses and the challenges. Further, by expounding different collaborative actions between two countries, the paper comes up with a set of recommendations.

8.1 Recommendations

India's goal of asserting itself as a rising maritime nation generates myriad interests in the Upper Bay of Bengal including energy security, economic growth, and safety of the sea lanes. Bangladesh on the other hand, boosted by their recent economic elevation and relative political stability, aspires to transform their economy using diverse ocean resources. Settlement of maritime dispute and of late bonhomie between the two nations has raised the prospect of joint coastal resource management for shared growth and prosperity. India, being the preponderant nation, has bigger role to play in deepening bilateral cooperation with Bangladesh in coastal zone management. To begin with, India may invest, in consultation with Bangladesh, in coastal infrastructure as a response to prevent negative impacts of climate change for both the countries.

This infrastructure will also work as an engine for bilateral and regional development. This implies the need for an active strategy for inducing private investment. Bilateral trading infrastructure networks will also pave the way for faster enhancement of bilateral cooperation in other areas, such as developing and implementing framework on cross-country coastal management. By assisting Bangladesh in their different initiatives and ensuring cross-border learning, India

has the opportunity to take bilateral ties between the two neighbours to a new high.

For effective environmental management among neighbouring countries, it is primordial to harmonise policies. Jointly establishing quotas for harvesting living resources, especially on migratory and highly threatened species or drafting policy framework for coastal development are such examples. Policy harmonisation, though, is a necessary condition, but not a sufficient one. To achieve any substantial progress in sustainable coastal zone management in Upper Bay of Bengal the countries need to collaborate also at the implementation stage to ensure that policies do not get stuck in various procedural bottlenecks. Some of the specific areas where immediate cooperation can be envisaged are:

Water transport infrastructure

Despite the presence of strong inland water network, the share of organized inland water transport (IWT) remains insignificant. Absence of all-weather navigability as well as lack of awareness concerning the energy conservation potential of water transport is the principal reason behind this apathy towards inland water transport. Development of inland waterways infrastructure can reduce the cost of transport and assist in reaching the last mile of Bangladesh and India, thus contributing to the reduction of poverty; and reduce the burden on road infrastructure.

Joint port management

Ports play an important role in economic development of a country. Ports also add social value by creating various direct and indirect jobs. Bangladesh Government is in dire need to finance its several port development projects which includes the development of new deep-sea port. The existing Payra port which started its operation on in August 2016 with ship-to-ship cargo transfer on a limited scale will be dredged, so that it will have a draft of 16 m (52.5 feet). Discussion between two countries is ongoing for the creation of a joint consortium between both the countries in an effort to ensure better use of Payra port. With several lines of credit, India is already making serious attempts towards joint port management and this holistic approach will go long way in ensuring security in the Upper Bay of Bengal region.

Sustainable agriculture

Along with tourism, transport, industry and urbanisation, intensive agriculture practices in the coastal areas also have a significant environmental impact. Residues from fertilisers, pesticides and other agrichemicals are major sources of coastal water pollution. Using participatory approach, clear steps needs to be taken to prevent all sources of pollution, both from the land or the sea. Sustainable farming systems using site specific natural remediation techniques can avert nonpoint source pollution from agricultural lands. Cropping practices might also be changed in the coastal area. Both the countries are undertaking considerable research on new crop varieties that can withstand higher salinity and higher temperatures and be grown and harvested during the non-cyclonic period. Research cooperation on sustainable and innovative technologies for crops and animal products, through advances in breeding and biotechnological innovation will benefit both the countries.

Sustainable tourism

Tourism contributes significantly in economic terms. However, different tourism infrastructures and tourist movements and actions impact the coastal habitats and species negatively. Moreover, since tourism uses already scarce resources, this may lead to conflict with other sectors and put the industry in danger. Hence, policymakers from both the nation need to consult all the stakeholders like hotels, restaurateurs, tour operators, park authorities, etc. to devise specific measures. Two countries need to jointly carry out various exercises, such as Strategic Environmental Assessment (SEA), Carrying Capacity Assessment (CCA), Environmental Impact Assessment (EIA) and the Eco-Management and Audit Scheme (EMAS) in order to address the competitive nature of the sector and ensure that the environmental implications are thoroughly analysed before the development of any new tourist infrastructure.

Recycling of dredging materials

While regular dredging is essential for safe navigation in all the ports of Upper Bay of Bengal, the dredged materials often contain pollutants and have a harmful impact on coastal ecosystems and water quality. Instead of conventional practice of landfilling, these materials can be reused. Using the concept of circular economy, these dredged materials can be turned into construction material and put into use. Besides,

development of a trans-boundary sediment management system and the implementation of appropriate treatment techniques can reduce the exposure of coastal ecosystems to hazardous wastes. At present, 70 km of Krishna river is being dredged for the movement of river ships and the dredging material will be used to build Amravati, the capital city of newly found state, Andhra Pradesh.

Fight against coastal erosion

While coastal erosion is a natural phenomenon, in recent years the pace of erosion has been accelerated by climatic and anthropogenic factors. Different solutions have been tried in the past without success. Construction of different structures such as dykes or concrete seawall has probably aggravated the situation in the long term. In many developed countries, land-use planners have accepted the futility of the act and preparing to abandon human activities in the coastal areas.

Highly populated countries like India and Bangladesh can hardly afford to lose their terrain. Scaling down the economic activities and planting mangroves and other trees in the recovered land, could be a solution. Bangladesh has adopted mangrove plantation programme, and currently holds world's largest areas of new mangrove plantations. However, to make this initiative more effective, people living in the coast adjacent areas need to be sensitised concerning the benefits of mangrove in tangible terms.

Information development and awareness raising

In order to develop effective climate change adaptation strategies, it is important to improve the knowledge and understanding of the nature by incorporating climate change data and scenarios into coastal risk mapping and long-term planning. With more technical knowledge and capacity, India can assist Bangladesh by enhancing capacity for environmental emergency preparedness and by putting in place a set of different measures, amongst other early warning and disaster management systems, the sanitation and reforestation of river banks, the setting up of spatial plans across borders and training and awareness raising of civil society.

Maritime research and education

India has made significant progress in maritime research. India needs to share and develop scientific knowledge as well as develop skilful human resource

with Bangladesh in order to exploit benefits from the ocean realm. In that respect, India is setting up International Training Centre for Operational Oceanography (ITCOcean). The ITCOcean would cater as the specialist institution for Operational Oceanography and it can serve as a regional hub for collation and dissemination of scientific data among the regional science centres and communities. Through ITOcean India aims create a human resource base in South Asia that can lead in trans-boundary coastal zone management.

Going further, India can also establish vocational institutions to promote, train and skill workers that are adept at understanding the oceans and working in industries that support Blue Economy. In 2013, Bangladesh government has established a specialised maritime university to train specialised maritime manpower who can effectively protect and harness ocean resources in a scientifically updated manner. India can contribute towards building an efficient maritime education sector by strengthening the university.

Joint Monitoring

In the absence of adequate regional reporting and monitor system among the littoral states of the Bay of Bengal. Indian and Bangladesh can undertake spatial planning initiatives, in order to harmonise land and sea use across borders. With the help of high resolution satellite data, both the countries can jointly monitor the evolution of coastal resources. Indian Institute of Remote Sensing in Dehradun and Jagannath University in Dhaka with the support of Vrije University in Brussels has recently introduced satellite imagery study to detect the changes in mangrove forest density across the border. India is also offering its regional satellite navigation system Indian Regional Navigation Satellite System, popularly known as NavIC to Bangladesh and other south Asian countries.

Adaptation Strategies at the Community level

At a micro level, India and Bangladesh can collaborate to build infrastructure for community-based adaptation given as following:

- **Cyclone shelters:** These specially built shelters will be used as shelters for human beings, animals, and property during cyclonic periods and as community centres, schools, and so forth during normal times.

- **Embankments:** Embankments will obstruct the penetration of surge water; and even if the surge overtops them, the water energy will then be greatly reduced.
- **Climate insurance:** Despite being one of the most vulnerable regions to the changing climate, insurance against climate risks in both the countries still remain abysmally low. Both the countries can work together to introduce a combination of innovative products supported by risk models and reinsurance pools that could reduce the adverse impacts of extreme event.

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