ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 07, pp.53714-53718, July, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

SPECIFIC COASTAL ISSUES OF DIGHA COAST, WEST BENGAL

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ARTICLE INFO

Article History:
Received 14th April, 2017
Received in revised form
20th May, 2017
Accepted 10th June, 2017
Published online 22nd July, 2017

Key words:

Tourism and Urban development.

ABSTRACT

Coastal environment plays a vital role in a nation's economy by virtue of their resources, productive habitats and rich biodiversity. The coastal belt is about 14km length from the Orissa border to Jaldha mouja, situated in the district of Purba Medinipur of West Bengal, India, and it is well known as Digha coast. The coast is doubly vulnerable today on one hand, it is facing unprecedented pressures because of tourism and urban development; on the other hand, it is threatened by climate change related devastation from growing intensities of cyclonic storms to sea surges and eventual sea level rise. Frequent embankment failures, submergence and flooding, beach erosion and siltation at jetties and navigational channels, cyclones and storm surges are all making this area increasingly vulnerable. The present paper attempts to highlight the various coastal issues of Digha coast, West Bengal.

Citation: Subhankar Patra and Dr. Jitendra Shukla. 2017. "Specific coastal issues of Digha Coast, West Bengal", *International Journal of Current Research*, 9, (07), 53714-53718.

INTRODUCTION

The three drivers of environmental change that is climate change, population growth and economic growth - result in a range of pressures on our coastal environment. Events associated with variations in climate have been major pressures on West Bengal coasts over the last decade, and concern about preparing for possible future impacts of climate change and variability has been a strong driver of adaptation responses. Concern about changes in the size and composition of coastal populations has also been growing for several decades. Urbanisation and coastal development for tourism, farming and industry are a major pressure on terrestrial and marine biodiversity and environmental quality, water resources, air quality, and cultural and natural heritage. Any human activities may causes a dramatic change in the ecology function of the coastal habitats, coastal development contributes to habitat loss in a number of ways-destruction of wetlands, sand dunes and other habitats and degradation of nearby areas (through erosion, siltation, dune migration , changes in flow and current patterns and other physical factors) are the result of habitat conversion (for urbanization, settlement, agriculture expansion and shrimp farming) shoreline stabilization structures, dredging, filling and the dumping of the wastes (Cheshire, P. and Sheppard, S. 2002).

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Over 40% people heavily on coastal habitats and marine resources for food, building materials, settlement sites, agricultural and recreation ground and exploit the coastal plain areas as dumping site for urban – industrial sewage rural settlement, and agricultural land-washed sewage, garbage, and several toxic wastes (Paul, A., 2002). Today's people are attracted coastal zone for refreshment, and give their facilities and recreations there natural ecosystem are hampered gradually. Thus the past environmental facts, along with the present environmental problems, can help to predict the future change of the Digha coastal ecosystem. For the betterment of effective management strategies serious efforts are required to understand the coastal system of West Bengal or how the coast works in such a complex environmental setting. Immediate and scientific measures to monitor the future growth within the fast eroding coastal zone are of utmost importance.

The study area

India is blessed by a long shoreline enclosing the state from three sides, i.e. East, South and West. Compared to the western part, the eastern coast of the Indian subcontinent, experience lots of dynamism in terms of the coastal stability (Chatterjee, 1995). West Bengal has a substantially long coastline of almost 100 kilometres (including island) characterised by high floral and faunal biodiversity, diverse geomorphic features and anthropogenic intrusions (Bhattacharya, 2001, Bhattacharya et al., 2003). The area

selected for this study is the part of this extensive shoreline of Bay of Bengal along the West Bengal coast. Digha is a seaside resort city in the state of West Bengal, India. It lies in Purba Midnapore district and at the northern end of the Bay of Bengal. It has a low gradient with a shallow sand beach with gentle waves extending up to 14km in length. Geographical location of digha (old and new digha) ranges from 21°36'50'' N, 87°29' E to 21°39'N, 87°37' E from the Orissa border to Jaldha mouja (Fig. 1). The elevation of the coast in the southernmost region is <3m above the sea level (Umitsu, 1987, 1993). The beach material is generally siliciclastic, quartzo-feldspathic in composition with well sorted, medium to fine sand (Friedman and Sanders, 1978). The Digha beach, about 8 km long on the west of this coastal stretch, is dominated by sedimentation from the Subarnarekha River.

Fig. 1 Location map of the study area

MATERIALS AND METHODS

Intensive visits to the study area, extensive literature survey and experimental documentary analysis are three key measures to prepare this paper and for conducting this study. Primary data have been collected through field survey. Secondary data have been collected from different books, journals, published and unpublished reports of official sources. SOI toposheet and satellite imageries are used of the study area. Finally cartographic techniques have been used for preparing diagrams and maps.

RESULTS AND DISCUSSION

Coastal areas in West Bengal today face multiple environmental issues due to overexploitation of the natural resource base, conflicting uses among various stakeholders in addition to the natural and manmade disasters encountered in coastal areas of the country. Key environmental issues are described below:

Coastal pollution: Major sources of pollution in the coast of West Bengal are wastewater generated from domestic, agricultural and industrial activities. Status of these discharges and their load into coastal waters are detailed below. The sources of pollutants are two types:

Land-based sources of pollution

The coastal habitats are threatened by domestic, agricultural and industrial pollution as well as deforestation. Another, The tourist resort with respect to major pollution source is the Digha region. There are about 400 hotels, holiday homes, some eating joints and sweetmeat shops in Digha. Demographic pressure in the town of Digha has resulted in the production of enormous amounts of domestic waste materials. These materials reach the marine environment either directly or indirectly through rivers, creeks, bays, etc.

Sea-based sources of pollution

Operational activities at port (Shankarpur), shipping discharge from major fish centres at Shankarpur, Digha mohana and also from mechanized fishing and cargo boats form some sources of residual oil, grease and solid rejects in addition to material loss during loading and unloading activities (Fig. 2). A survey on the commercial fishes (marine) to ascertain their organ chlorine levels was done by the Department of Ocean Development in 1988 for the eastern coast of India covering 14 landing centres and two fish markets. For West Bengal, samples from fish market of Calcutta and the landing centre at Digha were collected and the range and mean values of t-HCH and t-DDT residue concentrations in 13 species are given in (Table 1).

Table 1. Range of pesticides (µg/g) in commercial marine fishes in West Bengal (1998)

Sl.No.	Species	Digha	
		t-HCH	t-DDT
1.	Lates calcarifer	6.7-28.	4.7-23.2
2.	Pampus argenteus	0.86-4.2	4.5-18.4
3.	Scomberomorus guttatus	0.36-6.9	12.8-48.4

Increasing no. of environmental refugees

Today, this is a major issue and problem of this coastal area settlements are already displaced and going to be displaced from the shores of this coastal area due to loss of habitable land by spectacular rate of erosion.

Impact tourism type

Digha and Shankarpur is the famous picnic spot of West Bengal. Picnicking under the shades of casuarinas trees on the dune surface, walking and bird watching on the Sand dunes, bathing in the beaches covered by sea water, car driving and horse riding on the beaches are the major features of recreational exploitation of the coast along this seaside tourist place (Chakraborty, S. K., 2010).

Tourism impact related issues type

- Growth in tourism activities, coastal areas are subjected to increasing anthropogenic pressures that lead to greater environmental stress (Fig. 3).
- Digha being the only developed sea resort in comparative sense in the state.
- Though the quality of ground water is good, availability of the same is insufficient.
- The open surface drain carries untreated waste water into the sea thereby polluting the coastal environment.

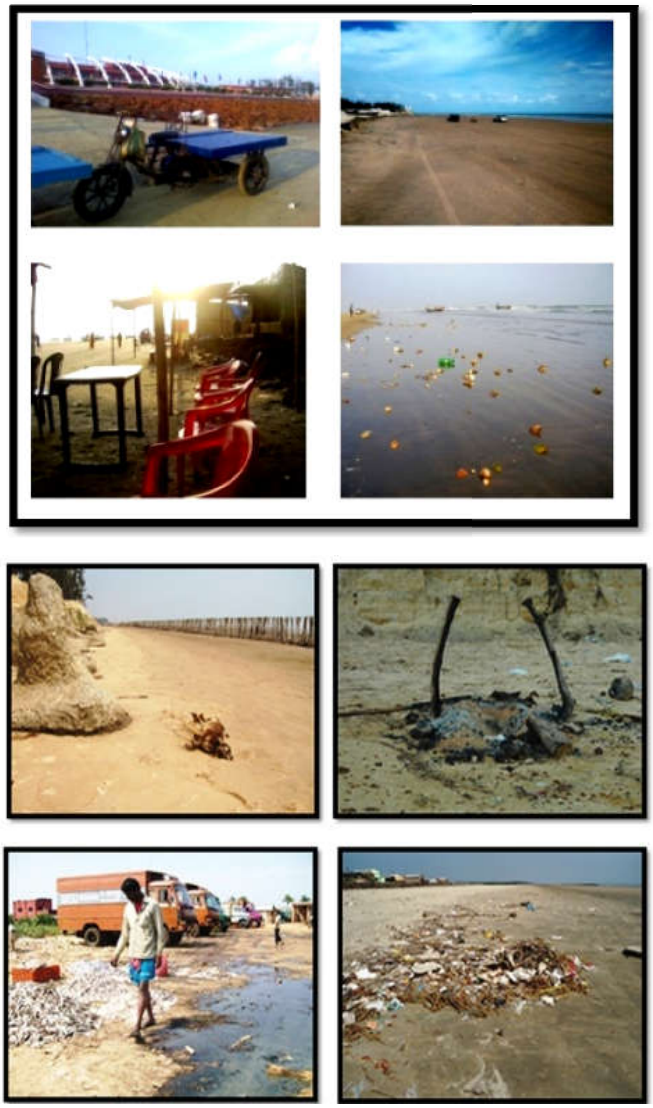

Fig. 2 & 3 Coastal pollution & environmental stress by anthropogenic activities

Barking, flattening of coastal dunes

The State Government to conserve the neo-dune fields by plantation and with bamboo and wire fencing but human interference in these areas often destroy the whole arrangement. Sand dunes are ideal places for building of hotels simply because they offer an open sea view in addition to their better basement stability in the high land areas. So the tops of dunes are generally flattened for building hotels at old Digha and new Digha (Fig. 4). Even the state Government had built a hotel at Digha barely 250 m from the beach front in utter violation of the Act (Bhattacharya, A. et al., 2002). All these constructions are against the principle of dune-sea dynamics. In other cases, dunes are often breached for easy access to the beach for bathing and recreation. There are cases of such breaching of dunes at Digha, Digha Mohana and Sankarpur beaches. So the Manmade infrastructure in the coastal region like harbour, road, sand mining, waste disposal site, tourism centre, industrialization, beach resort, fish landing station, demand of fire wood etc. and allied pollution are destroying the sand dune.

Loss of biodiversity

In recent time development of the coastal zone by means of habitat establishment or human settlement, harbour or industrial development, development of tourism, agricultural fields and fisheries must have caused population growth, which in turn have caused pollution and directly damaged the spontaneous food web/trophic level. Modern scientific based intensive and semi-intensive fish and shrimp farm require higher input of nutrients, feed and different chemicals, which also add to these surrounding environment and as such pollute the nature spontaneously. For intensive and semi-intensive culture demand for shrimp seed increasing day by day, this is also direct detrimental impact on these ecosystems. Crab catching is another activity affecting the biodiversity.

Changing land use pattern

The land use land cover changes due to natural causes like erosion, accretion, submergence due to sea level rise (SLR) and anthropogenic forces like population growth, conversion for quick economic return, urbanization etc (Table 2).

Table 2. Table 7.4b Changing land use pattern due to natural & anthropogenic forces

Natural Changes	
Mud flat	Sand flat
Beach	Increase & decrease
Sand dunes	Increase & decrease
Anthropogenic changes	
Mangrove/ Mudflat	Agricultural land
Agricultural land	Aquaculture
Mud flat	Aquaculture
Aquaculture	Brick kilns

Coastal floods

Belong a low land area; Kanthi coast is also prone to water logging, flood risk and storm hazards due to few estuarine locations like to Digha and Shankarpur are very high flood zones. Some devastating cyclones like Calcutta cyclone (1737), Midnapore cyclone (1864, 1942), Sundarban cyclone (1988 and 1989) and many other cyclones occurred during October and November and even 'Aila' of 2009 struck Digha coast due to its estuarine location(Paul A.K., 2002).

Saline water intrusion in paddy fields

Agriculture is extensively practiced in coastal areas of West Bengal. In the near absence of any surface water irrigation scheme and as ground water occurs at considerable depth, the agriculture is dependent on monsoon rainfall. However, the meso and macro tides along the West Bengal coast coupled with storm surges during the cyclone months tend to flood the agricultural fields with brackish to salt water.

Open sanitation

As per definition given by National Sanitation Foundation of USA, "Sanitation is the way of life''. The major child killer diseases due to unsafe water and poor sanitation are cholera, dysentery, typhoid, hepatitis, polio, etc. We observed some coastal villages and fishermen colony they are use low coast latrines. Sand dunes are ideal places for sanitation in. In picnic time around 50 lakh people visit this coastal spot annually and they use open sand dunes for sanitation.

Dune erosion and shifting of sand dunes

This is the major coastal issue in recent time. The Landward and Seaward movements of dunes are due to high wind speed

of pre-monsoon season. It has been observed that the front dune of this area also shifted Landward at the rate of 6 m to 12 m/year. And erosion by over wash might have been dominant between Shankarpur to Chandpur coastal tract, because deposition was made by the landward movement of eroded sand from the dunes. We observed that landward shifting of sands also capture the agriculture land, fishing ponds and grazing land (Fig. 5).

Fig. 4 & 5 Dunes are flattening due to built of hotels & shifting sand dunes are capture fishing ponds

Sea level rise

Regional sea level rise is a major problem for the coastal people now days it increases the rate of erosion which results in loss of assets and livelihood. Local sea level change and storm surge on seasonal effects or generation of waves of large height contribute to erosion over a time scale of hour to months. In the Ganga-Brahmaputra Delta, the suspended sediment load is high. If the Sea level rise is being considered due to sedimentation load at the rate of 0.1mm per year, the net rate of sea level rise would be 3.14mm per year (Hazra, et.al. 2002).

Coastal erosion

Before 1960s, there were an accretional zone in New Digha and erosional zone in old Digha. Recent analysis shows that along Digha-Sankarpur coast six contrasting accretional and erosional segments could be identified.

Cyclone and storm surge

According to researcher severe cyclonic storms over Bay of Bengal registered 26% increase over the last 120 years, intensifying in post monsoon (Singh, 2007). Under storm surge conditions seawater often floods vast land areas, not only those adjacent to deltas or riverbanks. Seawater penetrates far inshore and often destroys crops, livestock, infrastructure, and housing and may cause numerous casualties.

Destroyed existing seawall

The existing seawall has been extending from Jatra Nullah on the west and Sea Hawk hotel on the east and also the height of existing seawall almost 1.0m to 1.5m. It was reported that there was no overtopping or spilling of the ocean water over the seawall till 1990. But since 1991, when storm surges coincide with spring tide, there have been cases of overtopping during August and September every year (Hazra, 2009). So the existing seawall destroyed due to moving up and rolling down of laterite boulders by incident wave and back washes and also during a severe tidal activity some portions of seawall were severely damaged.

Conclusion

The coastal tracts are geomorphologically highly dynamic. The morphodynamics of geomorphic landforms and their environmental impacts are highly ironical. The Kanthi coast tracts are not only vulnerable to inhabitant but also it has deep-rooted impacts on the socio economic conditions being inhabitants of this coastal tract. The State Government has a master plan to develop the Digha sea resort and adjoining areas in near future.

The authors have certain recommendations in favour of protection and conservation strategies and reduced of pollution:

- Infrastructural development for tourism as a sea resort.
- To prevent the agricultural fields from salt water intrusion in the Kanthi coastal areas, extensive embankments have been constructed along the creeks high tide area.
- Stabilization/conservation of dunes; formations for neo dunes by artificial methods (creation of sand fences, brush barriers and plantation of dune vegetation).
- Anthropogenic activity (e.g. human settlement, fish drying etc.) to be warning to maintain natural eco-system.

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