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Impact of Tourism on Coastal Ecology in the Coastal Region of Digha (West Bengal)

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Abstract: ***The coastal regions are most suitable for biodiversity, because it acts as the interlink between ocean and land biomass. The sustain ecosystem in the coastal region is most important condition to have a stable ecological succession in its neighbour habitats. The coastal belt is about 14km length from the Orissa border to Jaldha mouja, situated between 21°36'50"N to 21°41' 59.52"N and 87°29'40"E to 87°37'00"E in the district of Purba Medinipur of Westbengal, India, and it is well known as Digha coast. It is a hot spot for biodiversity. As well as a very popular coastal tourist spot in the North East India. Almost every days of the year it is crowded by domestic and international tourists. The newly taken government plans is increasing its importance of tourist. In the respect the construction of resorts, lodges, roads, shopingmals, parking zones, the used and rejected materials by the tourists etc. Are gradually affecting the coastal ecosystem, both Geomorphologic ally and culturally as well environmental. In my present work it is found that different flora and fauna species are in great trouble, some are going to be abolished, some are finished. The environmental balance or equilibrium and biological balance have been lost. This in turn is destroying the natural beauty. This was the main reason for it to become a tourist spot. In the present work both primary and secondary data have been collected by me. The thematic map technique, cartographic technique and statistical methods are used to interpret the collected data. The founding is very significant to make decision to create a eco-friendly situation in spite of the development of tourism in this site.***

Keywords: Environmental in equilibrium, Coastal change, Survey on flora and fauna species, Significance of result, Future plans.

1. Introduction

Tourism is now recognized as an industry, generating a number of social and economic benefits. Its promotes employment opportunities and arguments foreign exchange earnings. Tourism is as much a part of socio economic development as any other relative activities. The advanced economics of the west and the emerging economies of south East Asia underline the linkage between tourism and growth.

Coastal sand dunes, sandy sea beaches, tidal flats of finer sediments, salt marshes and mangrove swamps and estuaries, buffer island and the coastal low lands provide a particular set of environmental conditions for the organism inhabiting there. Geomorphology or the non living factors of these diverse coastal habitats are in delicate balance under the dynamic processes of wave's tides, currents winds, riverine freshets of the coastal zone changes in the extent and condition of these habitats are relatively easy measure with the use of satellite imageries at present. Thus the decline of critical habitats implies that species dependent on such areas may also be in danger coastal zones are platforms for complex, diverse and fragile ecosystem. With crucial coastal different man activities involved and protection functions, and they also provide rich spawning and breeding grounds for fish and other aquatic organism. Fishing communities are dependent on such fishing ground provided by various eco-systems, such as mangrove, backwater, estuaries, lagoons and shallow offshore banks.

Any human activities may cause 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, and 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.

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. Today's people are attracted coastal zone for refreshment, and give their facilities and recreations there natural ecosystem are hampered gradually.

The geological, geo-morphological, cultural and historical facts of the coastal plain areas can provide information on past coastal systems and their evolution over time under several natural changes in the region. Such estimation is available as a source of information of the changing ecosystem setting over the coast. Several schemes have been implemented by irrigation department, forest department and Digha development board to protect this second highest revune earning tourist centre of the state after darjelling.

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.

Objectives

A few objectives of this current works are-

(i) To find out the factors both physical and cultural which are responsible for creating diversified habitat characteristics with in a small sea beach town environment and nature.
(ii) To trace the biodiversity both in flora and fauna of the study area.
(iii) To study importance of tourism on coastal ecology.
(iv) To assess the biological diversity in terms of species richness ecosystem, uniqueness and disturbance index.

2. Study Area

Digha is a seaside resort city in the state of West Bengal, India. It lies in East 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 14 km 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. The climate of this region is not very harsh (annual average rainfall is 1750mm, with annual mean temperature 27°c) but the sandy terrain covering the beach & the dunes is found without any soil cover at same places. Very thin clayey soil profile is found which is entisol to inseptisol in character and composed of very thin clayey loam. Economic background of a place is an important criteria which reflects overall development of a place mainly tourism activities. Digha coastal belt being situated in coastal location, are geomorphologically dynamic, ecologically sensitive, biologically productive and rich in habitat biodiversity, are attractive for domestic and international tourists.

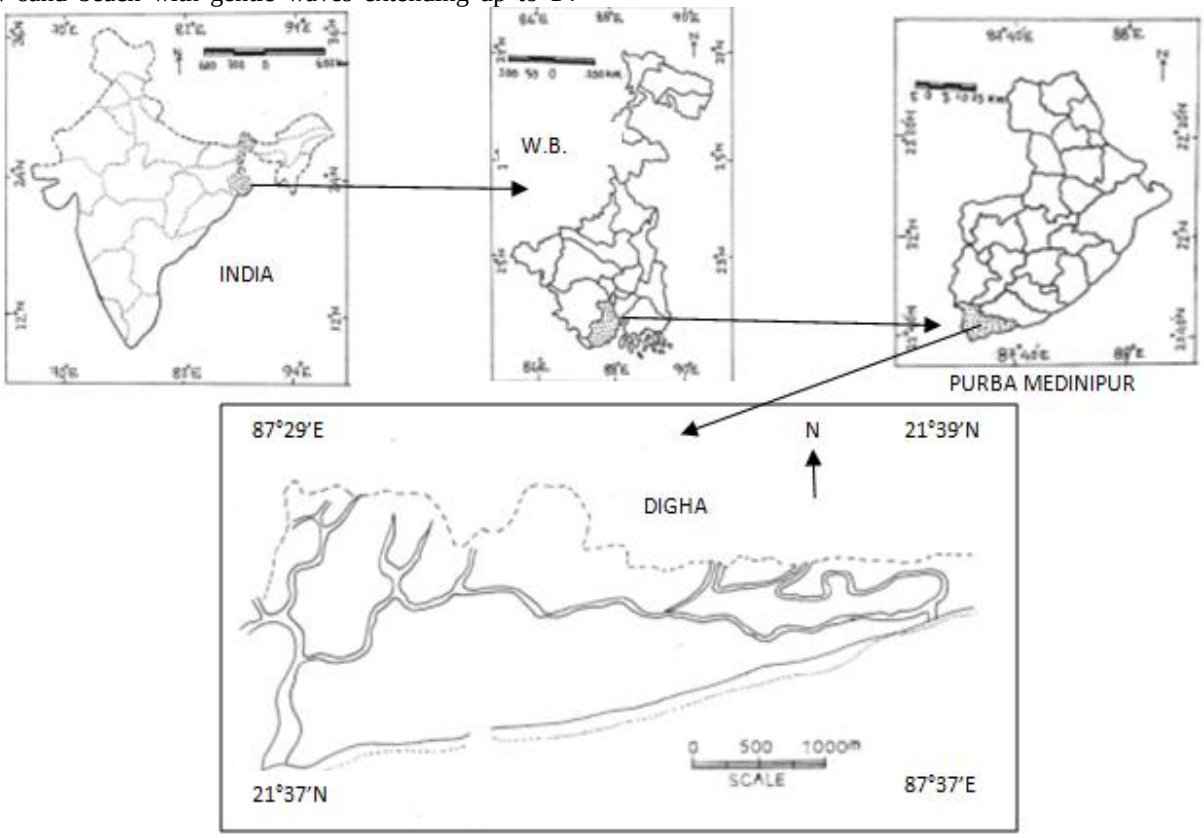


Figure 1: Location of the Study Area

Digha is originally known as "Beerkul". It was mentioned as the Brighton of the East in one of Warren Hastings letters (1780 AD) to his wife. In 1923 an English tourist John Frank Smith was charmed by the beauty of Digha and started living there. His writing about Digha slowly gave exposure to this place. After independence he convinced West Bengal chief minister Dr. Bidhan Chandra Roy to developed Digha as a beach resort. Now Digha coastal beach in India which is called as the Goa of West Bengal because of its scenic beauty.

3. Methodology

A well define methodology has been followed investigation were carried out to assess the coastal ecology changes by the tourist and their activities. This work is based on deductive methodology of investigation. Primary data have been collected through field survey. Secondary data have been collected from different books, journals, published and unpublished reports of official sources. Remote sensing data have also been used to support the field observation. SOI toposheet and satellite imageries are used of the study area. Finally cartographic techniques have been used for preparing diagrams and maps.

4. Result and Discussion

a) Major tourist activity zones-

I have selected four types of major tourist activity zone namely religious, attraction of refreshment, viewing point attraction and natural surrounding zones. It is found that there are Lord Siva temple of Chandaneswar and Chirulia. The tourist come to Digha also visit these two religious attractive zone, which is a regular fact. Digha beach is very popular and common as attraction of refreshment zone for tourist. The beach is crowded from sunrise to sunset by the

peoples for bathing, swimming; about 35000 peoples came to Digha per day on average. About 70% of them get bath, and the rest obviously use the shore to enjoy the beauty of Digha. And use the same place for entertainment purpose (fist, drinking, dancing, playing etc). The important viewing point attraction zone are Marine aquarium and research centre, National Cashew Garden, Science centre, Amravati lake, and Dipak Mitra Snake Farm, this number is enough for the size of the Digha coastal area. But the main point here is to be noted that the specimens, contents here for the purpose of exhibition are not of the local source, but buying. This indicates that the viewing point attraction zone is artificial. The important natural surrounding are Udaipur, junput, Subarnarekha River Mouth and Talsari. No doubt these are pleasant places of natural beauty. But the problem is that these places are not reserved these open for fishing, specially Subarnarekha river mouth is a source of good quality sand for domestic and contraction purpose. This involves a beneficially business. And pupils used these places arbitrarily which cause impact on physical environmental condition of the concerning area.

b) Coastal ecology:

Coastal ecology is an account of coastal morphology features, flora, fauna, and associated environment and their interaction:-

- **Morphology**
- Beach is more dynamic part of the coastal region where hydrology and morphology interact with each other and form beach morphodynamics. And other hand our study area Digha 31.9 sq. Km. Area composed different types of geomorphic features like- Berm, Beach face, Runnel, Ridge Low tide terrace, trough, long shore bar, Ripple, Cusp, Small tidal pool, Cresent mark, Horn, Crabsholes, Mud ball, Small scouring dune etc.
- **Coastal flora and fauna:**
- Coastal environment is a hostile environment. Here that vegetation is found which can adjust with this system. The coastal vegetation species found in our study area have given in detail with remark in table.

Table 1: Coastal ecology:

Terrain unit	*Morphology*	*Types of plant*	*Name of plant*	*Plant habitat*	*Remark*	*Fauna species*	*Remark*
Dune base	Slope 1°50'10'' Height 2-3m.	creepers	Ipomoea pescaprae	Lee ward side, sand spray, high temperature, wind stress, seepage water, high nutrients.	Overall open lee ward side, high sand spray, moderate seepage water and nutrients.	Coastal fauna includes mainly on the digha coast rabbits rats, snake, crabs, starfish, Horseshoe crab, limpet, clam, snail, sea urchin and other various types mammals, reptiles and insects.	Habitat conversion, loss of fauna habitat. Some fauna species are vanished.
Dune crest	Slope 14°5'10'' Height 7-13m.	Shrubs Small tree Large tree	Pandanus Opuntia Calotropis Datura Phoenix sp. Azadirachta Indica Acacia moniliforms Casuarinas Equisitifolia.	Exposure to the atmosphere, high wind spit, high soil moisture, decomposition and nutrients.	Moderate soil moisture		
Dune back	Slope 7°37' 00''height 6-12m.	shrubs	Pandanus Opuntia Lantana camara	Platform surface, sheltered area.	Network, hotel, lodge, settlement, buildup.		
Dune tail	Slope 2°00'00'' Height 2.5-4.5m.	Large tree	Azadivachta Indica Acacia moniliformis Casuarinas Equistifolia	Sheltered zone, sand siding, water table close to the surface.	Salinization, vegetation loss.		

c) Litters and Its Impact

It is found that different types of litters such as polybag, bottle, plastic, glass, etc are found in the coastal belt, these litters are varieties of sources-

(i) A litters rejected by the tourist
(ii) Litters from the shops, hotels etc.
(iii) Litters from the hookers
(iv) Litters rejected by the rivers as sediment at the river mouth.

So index of damage rate is high of this zone.

Types of Litter Thrown at Digha Beach tourist spot %.

Type of litter	Percentage
Ramper	82.92
Bottle	3.41
glass	13.67

Source: Field Survey

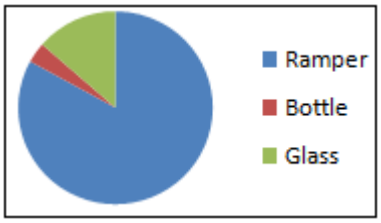
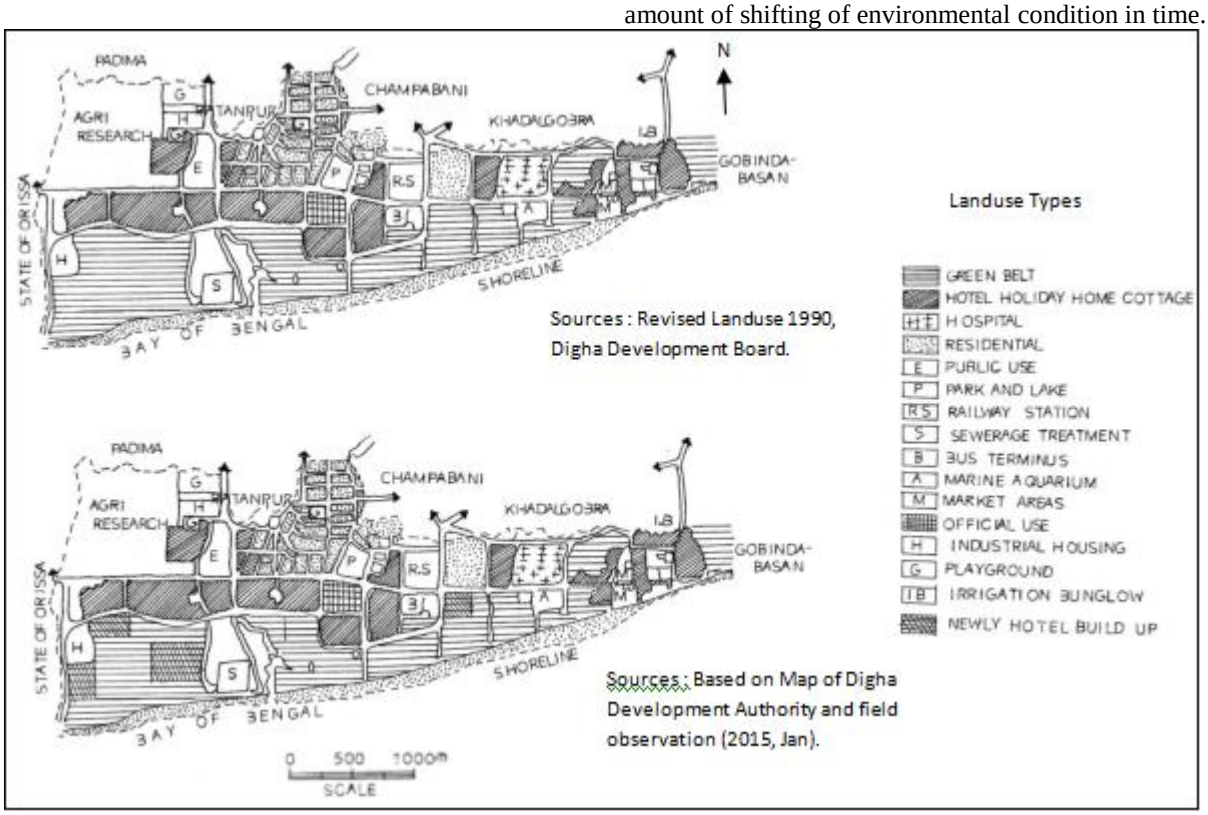


Figure 2

These non bio-degradable litters are very harmful for both the flora and fauna species in the coastal ecosystem. The huge amount of ramper, bottle, glass make a obstacle to the flow of soil surface flow and base flow. Stagment water causes dampness as a result during heavy rain time soil erosion is a common fact. A huge number of minor soil slip are found in micro scale case study. Dew to dynamic morphology of the coastal belt these soil slip are not noticeable easily.

d) Hardware construction and its impact

Here are the maps for land use relating to hardware construction which gives a rough outline about the huge amount of shifting of environmental condition in time.



Changing Landuse Pattern of Digha in the Year of 1990 And 2015.
Figure 3

For the people of the coastal belt, sand dunes were nothing but sandy wastes in the context of land use pattern. Even today people do no understand the significance of sand dunes in the coastal belt. Entire study area coastal belts were vegetated by indigenous plant species even in the first half of the last century. But now it is use for the sites of settlement, pasture land, Farm forestry, Casuarina tree stands and for other tourism purposes. Digha beach resort is situated and expanded over the dune belt. Dune belts are reclaimed by the Forest Dept, Digha Development Board, and Irrigation Dept. for different land use facilities for tourism activities. Land use complexity for the fauna species and origin patches, and its effect to their genetic evaluation.

For comfortable and hospital accommodation for hosting of tourist is not sufficient in this area. To accommodate huge amount of tourist in this small area guest houses, lodges, hotel, resorts are densely situated. This is out of the capacity to maintain a ecofriendly environment. Its bad impact are listed below-

Table 3: Coastal tourism and Environment and their impact

Recreation sites	Location types	Period of emergence	Accommodation capacity at present	Impact types
Old digha	Water front location, dune surface built up area.	1957-60	Pvt. Sector 193 hotels. Govt. Sector 15 hotels.	Alternation of shoreline water table, vanishing sea beach, various failure modes of the sea wall structure, flooding and inundation pollution.
New digha	Dune surface built up area, backshore location.	1985	Pvt. Sector 52 hotels. Govt. Sector 17 hotels.	Wind erosion of the sand dune, alternation of the water table, waste product.
New digha N2 sector & bus stand.	Backshore location.	1990	Pvt. Sector 137hotels. Govt. Sector 52 hotels.	Various failure modes of the sea wall structure, Waste product.

e) Tourisms impact on Economy:-

The uncontrolled use of natural resources and exploitation of natural beauties always create a good economically profitable trading situation. The local area peoples and the peoples from the remote areas come here for different business. More than two thousand permanent shops of stationary goods, craft, and restaurants are situated here. The tourism in Digha has created a good transport business. About 150 private buses and 50 state govt. Buses, three local train and two express train per day business here. The agricultural production like Casuarina, groundnuts and fishing been made very popular to the tourist. This economy development is further attracting peoples to gather here.

Table 4: Digha decadal year population

Year	Population
1951	7190
1961	10535
1971	14692
1981	17426
1991	22386
2001	30336
2011	46532

Sources: Govt. of West Bengal Census Report.

This population growth is indication of a further risk for a man made ecological problem. Tourism, ecology and geomorphology are closely related by their mutual interaction. In the study area we see that the effect of tourism affected the ecology and geomorphology badly. A poor environmental situation has originated as a result of uncontrolled tourism. The flora and fauna species are facing trouble, some species have been vanished. This man made ecological crisis is a painful situation.

5. Conclusion and Remarks

Digha and its coastal region is a great resource to our state, we are proud of it. A proper maintained from the government side and responsibilities from tourists and inhabitants of this area must be taken to create a good healthy tourism here. Provided to the reconstruction of the sustain ecofriendly environmental condition. According to my view point the reconstruction process should be forwarded and completed by Environmental zoning and vulnerable zone analysis.

5.1 Environmental Zoning

Environmental zoning is a management option for coastal management. Environmental zoning refers to the categorization of coastal area according to its environmental importance and its subsequent utilisation.
We can identify following environmental zones in our study area-

- Undisturbed area: it is most sensitive zone from ecological point of view comprised of the zone between HTL and LTL. So it should be remained always undisturbed.
- CRZ-I: It is the zone between HTL and LTL and up to 500 m. Distance from HTL. It is also a fragile zone and is a area of scenic beauty. Hare any kind of development should be prohibited.
- CRZ-II: It comprises developed units of coastal area. There also should be some limitations on intensive development and new constructions. This zone should be developed behind CRZ-I.
- Village settlement sector: it comprises undeveloped areas along coastal area i.e. village units. It should be kept free from construction.
- Tourism sector: it should be developed at the back of CRZ-II & CRZ-III so that coastal systems remain undisturbed.
- Fishing sector: The wetlands should be utilized for fishery sector with their sustainability with some restrictions so that hydrological parameters remain unchanged.

5.2 Vulnerable Zone Analysis

The term zonation applies in a general sense to categories to the land surface into study areas and arrange them according in to degree of actual and potential biodiversity loss on Digha coastal belt.

Table 5: Risk Identification, Estimation, and Evaluation.

Phases of analysis	*Risk assessment processes*	*Risk perception process*
Risk identification	Event monitoring, statistical inference of this coastal belt.	Individual intuition, personal awareness.
Risk estimation	Magnitude of biodiversity loss	Personal experience intangible losses.
Risk evaluation	Cost/ benefit analysis, community policy.	Personality factors individual action.

Risk zone mapping involves a detail assessment and analysis of land use and land cover as well as biodiversity loss, on that particular area which is included in our study area. Risk zonation and risk perception have a role for creation of hazard zonation.

With the analysis of these phases vulnerable zone can be determined. According to my view point in Digha coastal belt, mainly two CRZ zone one and two are very harmful impact on coastal ecology. That's why some scientific systematic step is listed below.

ZONE –I : This is more vulnerable zone where the storm hazard are occur with great devastated power in view of placement of maximum settlement sector. And also it is ecologically sensitive, biologically productive and rich in habitat biodiversity. The area is almost degraded due to any storm event. The area has to be entirely avoided for settlement, recreation or other development purpose. Preferably left out regeneration of natural vegetation and attainment of natural stability in course of time through the both physical & human process active in the area.

ZONE-II : This area included the zone of economic activity such as fishery, salt processing, tourism recreation centre and infrastructures development. This area was inundated about 3-4 mt. during or after storm hazard and damages the occupational structure. Land use activity is to be properly planned so as to maintain its present status. Construction along the margin of this zone should not create.

Now New Digha is a dissipative coast with wide gentle beach. It is an important tourist centre. According to CRZ notification it is under CRZ- II which is developed in nature. But there should be limitation on construction and zone of development.

But actual scene is reverse where human intervention is much more higher having a population density greater than its capacity. Constructions are going on in high rate whereas Old Digha is a reflective beach due to greater slope. Here type of breaker is mainly is surging & planning. The engineering construction and human intervention have intensified these characters. As a result more and more reflection of energy occurs and consequently coaster erosion is common with high rate.

The rules for CRZ have been relaxed and diluted since 1991 through several amendments in 1974, 1977, 2001, 2002 & 2003 by which limit of no development have been relaxed. Thus coastal system and ecology have been systematically eroded by the government.

So it is the crucial time to take necessary step and strategies against such vulnerable condition, otherwise inhabitants of there have to pay the penalty of Government negligence and deliberate action as did during killer Tsunami on 26th December,2004.

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