



## TOURISM AND PHYSICAL ENVIRONMENT: A PERCEPTION STUDY ON WEST BENGAL COASTAL AREA

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### Abstract

*The present study discusses about the impact of tourism on physical environment of the West Bengal coastal stretch, as coastal areas consists valuable and fragile environments. Therefore balancing both growth and development at the same time is very difficult. The term 'environment' is considered as a key element in tourism as it has both positive and negative environmental impacts. The negative impacts which are frequently highlighted include littering, overcrowding, traffic congestion as well as pollution of, water and soil along with the deterioration of natural resources as a result of the constructions of tourism services, especially erection of hotels pose an adverse impact on the health of the coastal zones. The present study discusses about the impact of tourism on physical environment of the study area, where some environmental factors such as Forest clearance and loss of sand dunes, Air and noise pollution, impact of tourism on red crabs and small fishes, Beach litter, Water quality and Beach accommodation have been considered. Perceptions of both tourists and local communities have been considered. The impact is very significant and reflects a spatial and temporal variation among the tourist destinations.*

**Keywords:** Coastal tourism, Physical environment, perception study



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### Introduction

The scale of tourism growth in the relation to the carrying capacity of the environment greatly influences the extent of environmental impact. Ray (2007) said tourism is a pervasive rather than an intensive stress event. That is, its impact is cumulative over a long period which may be measured in years rather than, as in flood or hurricane, in hours or minutes. This slow onset is further intensified by the development of tourism related activities in the form of newer hotels, development of the transport and communication system, all because of the economic benefits associated with tourism. Thus the activities related to the tourism industry spread to vulnerable areas. Deterioration of surface waters quality: The direct and indirect exposure of population to sewage is of primary concern (Koivunen *et. al.*, 2003). The increasing demography and the growing water demand has lead to a global deterioration of

surface waters quality. So, Human pathogens, bacteria, protozoa, and viruses are related with coastal pollution and intense, unplanned tourism activities.

The main objective of the study was, to examine the impact of tourism on the economic condition of the study area, more specifically on the local community. The main issues that need to be addressed are- the impact of tourism on employment, labour supply, level of income.

### **Study area**

The study area comprises of Digha, Mandarmoni and Bakkhali-Frazerganj. Digha and Mandarmoni are located in Purba Medinipur district and Bakkhali-Frazerganj is located in South 24 Parganas district of coastal West Bengal, which are noted for their tourism and fish landing activities. Digha is the largest and most popular tourist destination of West Bengal at the same time, it is the largest and oldest tourist spot among Digha, Bakkhali-Frazerganj and Mandarmoni. Geographically the area extends between  $21^{\circ}37' N$  to  $21^{\circ}40' N$  and  $87^{\circ}30' E$  to  $87^{\circ}37' E$ . Since the work is extended to the effect of tourism on water quality (as another important part of physical aspect) which is a major concern of the present era, in terms of tourism, therefore, Satjelia Island (located in the fringes of Sundarban Biosphere Reserve), a zone devoid of any commercial tourism has been selected as the control zone to give a comparative outlook of the pollution level between the study areas.

### **Materials and methods**

The whole methodology followed by two basic steps, survey procedure and statistical analyses.

#### *Survey procedure:*

A perception survey of the local community was done based on the structured questionnaires. 15% of households were surveyed from each study area to find out the impact of tourism on (i) Forest clearance and loss of sand dunes, (ii) Air and noise pollution, (iii) impact on red crabs and small fishes, (iv) Beach litter, (v) Water quality (vi) Beach accommodation.

#### *Statistical analyses:*

The data collected for nutrient analysis, heavy metal and physico-chemical variable from WBPCB and other relevant journals were finally subjected to statistical analyses.

(a) Analyses of variance (ANOVA) were performed using SPSS 9.0 package to determine the spatial variation between the stations. ANOVA is used in the analysis of comparative experiments, those in which only the difference in outcomes is of interest. The ANOVA has used in the study to get the spatial variation of different parameters (temperature, salinity pH,

DO, BOD, COD, NO<sub>3</sub>, PO<sub>4</sub>, SiO<sub>3</sub>, Zn, Cu and Pb) of water quality between the stations (Digha-Mandarmoni and Bakkhali-Frazerganj). For convenience of study and considering the distance between Digha and Mandarmoni it has considered as one zone for water quality analyses only, and Bakkhali-Frazerganj has considered another zone.

(b) Correlations were also analyzed to get the relationship among different parameters of water quality as Correlation values are important to understand the strength of relationship between various parameters. If the value is significant ( $p < 0.01$ ) then the two variables are strongly related. This relationship is direct if the 'r' value is positive and inverse if the 'r' value is negative.

(c) Other parameters were represented through bar diagrams, pie charts etc. The identified items of beach litter have listed on a table format.

## **Results and Discussion**

### ***(i) Impact on forest clearance and loss of sand dunes:***

Digha, Mandarmoni and Bakkhali-Frazerganj have lost their dunes due to tourism related activities as revealed from the primary survey which is a perception survey of the tourists and the local people. The perception of visual change realized by them is indicating that tourism related activities are responsible for this. 10-12 meters high dunes have been flattened into plains at half the heights to make way for construction of the hotels and roads. This may severely affect the coastal ecosystem in adverse ways. Majority of the surveyed population of the local community at Digha (85.37%) and Mandarmoni (80.82%) agreed with the fact that, forest clearance and loss of dunes have occurred but at Bakkhali-Frazerganj majority of the surveyed population didn't agree with the fact. The reason behind forest clearance is an important factor to be considered to identify whether growth of tourism is responsible for this or not. Perception survey reveals that, construction of hotels is the main cause behind the forest clearance and loss of sand dunes at Digha and Mandarmoni, but people's perception at Bakkhali-Frazerganj reveal other reasons (such as collection of fuel wood, smuggling of wood from the forest etc) are responsible for the forest clearance, rather than tourism.

### ***(ii) Impact on air and noise pollution:***

Primary survey reveals the host community suffers from both air and noise pollution due to different types of tourism related activities, but it varied from one zone to another. Majority of the surveyed population (50% and 48.31% respectively) at Mandarmoni said that they do not suffer from air pollution as well as noise pollution. At

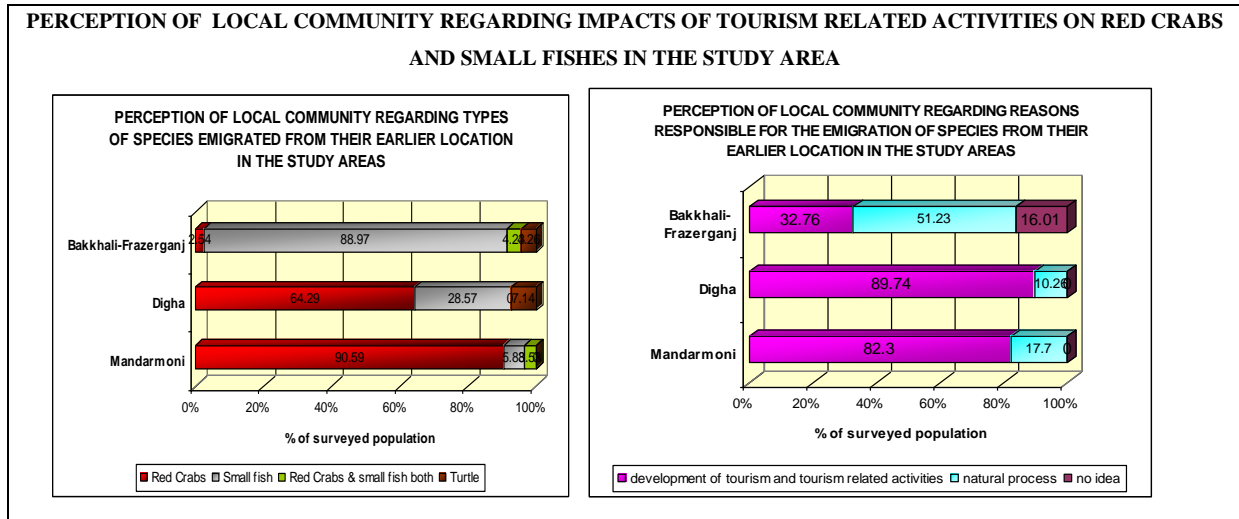
Digha majority of the surveyed population (50% and 44.44% respectively), said they do suffer from both air and noise pollution. Again, Bakkhali-Frazerganj shows another picture, where majority of the surveyed population (50%) do not have any idea about their suffering from air pollution, but they agreed about the fact, that they do suffer from noise pollution. Hence, the primary survey reveals, that host community of the study area suffers from both air and noise pollution, but they suffer from noise pollution more than air pollution. Primary survey reveals there are so many sources of air pollution in this region, but the major source of pollution is auto emission. Motor vans which are used for site seeing, bikes which are hired by tourists from some local people for bike ride on the beach as a recreational activity and increased number of vehicles to serve the tourism contribute considerably to level of air pollution. Another important source of air pollution is the use of generators. Mandarmoni is not electrified. So, generator is basically one and only source of electricity. All hotels and lodges at Mandarmoni are fully dependent on generators. Primary survey shows, in peak tourist seasons, at the time of heavy tourist influx these diesel generators run for 17 to 18 hrs per day, and in some hotels it runs for 22 hrs per day at Mandarmoni. Primary survey reveals the main source of noise pollution at Mandarmoni is generator, at Digha and Bakkhali-Frazerganj it is loud speakers which is used at the time of cultural programmes in the hotels on special occasions, but horns are another source of noise pollution at Digha. The time of occurrence of both kind of pollution as identified by the local community is the peak tourist season at Mandarmoni and Bakkhali-Frazerganj and it is remain same throughout the year at Digha. The noise pollution results headache and irritation among the local community of the study area. Like noise pollution, the local community also suffers from air pollution which causes health problems, such as, burning sensation in eye, nose, throat; lung problem etc.

***(iii) Impact on red crabs and small fishes:***

The sandy beaches of Mandarmoni, Digha and Bakkhali-Fraserganj are under pressure of expanding coastal population, ribbon development in the coastal strip and increasing recreational activities on the beach. Thus, human uses of beaches are increasing sharply. Such development and anthropogenic activities trigger significant changes in existing fauna. Red crabs and small fishes were selected to study the impact of tourism on them. Majority of the surveyed population (58.23% and 56% respectively) at Mandarmoni and Digha and a smaller part of population (32.5%) at Bakkhali-Frazerganj agreed with the fact that, emigration of species have occurred. Perception survey of the local community reveals that,

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not only red crabs, the small fish catch have also been reduced remarkably. Study reveals, a huge number of red crabs have been reduced at Mandarmoni, because of shifting from their earlier location. At Digha the amount of small fish catch has also been reduced along with the decline in the number of red crabs. Same trend of Digha is observed at Bakkhali-Frazerganj zone, but here small fish catch have reduced more than red crabs.



**Fig. 1.**

*Source: Primary survey (2009-2014)*

The reasons behind the above fact in the study area, are the development of tourism and tourism related activities, vehicular movement on beach, and over crowding of beach visitors. Majority of the surveyed population at Digha and Mandarmoni zone supported the said reason, with exception at Bakkhali-Frazerganj where people do not have any clear idea about the reasons responsible for the decline in fish catch (Fig.9). Primary survey reveals there is no road way to reach the hotels and lodges at Mandarmoni, because after Dadanpatra, the road ends and rest of the road is beach. The car rolls along the beach, which is another attraction as well as recreational activity for the tourists. Sometimes tourists hire two wheelers to enjoy the beach ride. Same as Mandarmoni, beach drive is followed as a recreational activity at Digha and Bakkhali-Frazerganj beaches too, which also cause a negative impact upon the red crabs on the beach. According to the perception survey of the local community at Mandarmoni, the small fish catch have reduced as they have retreated into the deep sea, as the water near the shore is getting polluted.

**(iv) Tourism and beach litter generation:**

The beach litter and related pollution is responsible for this which is generating from the tourism related activities on the beach. Beach litter accumulation is very important

aspects of beach degradation which have adverse effects on the users of the beach and marine life. 32 items of beach litter have been identified during the study. The litter found on the beaches of study area (Digha, Mandarmoni and Bakkhali-Frazerganj) is mainly plastic dominated. Most of the plastics are non-degradable. Majority of the surveyed tourists at Mandarmoni and Bakkhali-Frazerganj said that the condition of beach is clean but, this perception is completely opposite at Digha, where majority of the surveyed tourists think the beach is dirty. As per tourists perception, lack of consciousness of the tourists is responsible for the condition of the beach in the study area.

**(v) Impact on water quality:**

The key findings from the water quality data are as follows:

**(a)** At Digha-Mandarmoni belt dissolved Zn, Cu and Pb are negatively correlated with salinity and pH (Salinity×Dissolved Zn = -0.8017,  $p < 0.01$ ; Salinity×Dissolved Cu = -0.8351,  $p < 0.01$ ; Salinity×Dissolved Pb = -0.7592,  $p < 0.01$  and pH × Dissolved Zn = -0.6016,  $p < 0.01$ ; pH × Dissolved Cu = 0.5932,  $p < 0.01$ ; pH × Dissolved Pb = -0.6569,  $p < 0.01$ ).

**(b)** BOD and COD are indicators of aquatic health and their values increase, if the water deteriorates. Under this situation the Biological and Chemical Oxygen Demand (BOD and COD) greatly increase and the DO values decrease. This phenomenon is also confirmed by the significant negative correlation values between DO and BOD (DO×BOD = -0.7105,  $p < 0.01$ ) and DO and COD (DO×COD = -0.7087,  $p < 0.01$ ).

**(c)** The inter-relationships between  $\text{NO}_3$ ,  $\text{PO}_4$  and Dissolved heavy metals ( $\text{NO}_3 \times \text{Dissolved Zn} = 0.6891$ ,  $p < 0.01$ ;  $\text{NO}_3 \times \text{Dissolved Cu} = 0.6310$ ,  $p < 0.01$ ;  $\text{NO}_3 \times \text{Dissolved Pb} = 0.6674$ ,  $p < 0.01$ ;  $\text{PO}_4 \times \text{Dissolved Zn} = 0.4073$ ,  $p < 0.01$ ;  $\text{PO}_4 \times \text{Dissolved Cu} = 0.4043$ ,  $p < 0.01$ ;  $\text{PO}_4 \times \text{Dissolved Pb} = 0.4733$ ,  $p < 0.01$ ) reflect that the pollution in the present aquatic system are both from anthropogenic and industrial sources. Even the pollutants are of complex nature, where nutrients and heavy metals are related positively. The significant positive relationship of  $\text{NO}_3$  and  $\text{PO}_4$  reflects that human activities like bathing, defecation, washing clothes and utensils go hand in hand in the aquatic system. Such activities are common in and around tourism sites. The positive correlation of  $\text{NO}_3$  and  $\text{PO}_4$  with  $\text{SiO}_3$  is purely physical, where  $\text{SiO}_3$  increases in the water column due to churning action by the run-off that enters the aquatic phase and disturbs the river bed.

**(a)** At Bakkhali-Frazerganj salinity and pH has significant negative influence on most of the dissolved metals (Salinity×Dissolved Zn = -0.6959,  $p < 0.01$ ; Salinity×Dissolved Cu = -

0.4807,  $p < 0.05$ ; Salinity  $\times$  Dissolved Pb = -0.7410,  $p < 0.01$  and pH  $\times$  Dissolved Zn = -0.1261, IS; pH  $\times$  Dissolved Cu = 0.1033, IS; pH  $\times$  Dissolved Pb = -0.1672, IS).

(b) Significant negative correlation values between DO and BOD were observed (DO  $\times$  BOD = -0.8432,  $p < 0.01$ ) and DO and COD (DO  $\times$  COD = -0.8925,  $p < 0.01$ ), which signifies deteriorated water quality. This zone also sustains cluster of tourism units.

(c) The inter-relationships between  $\text{NO}_3$ ,  $\text{PO}_4$  and Dissolved heavy metals ( $\text{NO}_3 \times$  Dissolved Zn = 0.8069,  $p < 0.01$ ;  $\text{NO}_3 \times$  Dissolved Cu = 0.9154,  $p < 0.01$ ;  $\text{NO}_3 \times$  Dissolved Pb = 0.8526,  $p < 0.01$ ;  $\text{PO}_4 \times$  Dissolved Zn = 0.7486,  $p < 0.01$ ;  $\text{PO}_4 \times$  Dissolved Cu = 0.8966,  $p < 0.01$ ;  $\text{PO}_4 \times$  Dissolved Pb = 0.8132,  $p < 0.01$ ) reflect that the pollution in the present aquatic system are both from anthropogenic and industrial sources. Even the pollutants are of complex nature, where nutrients and heavy metals are related positively.

(a) At Satjelia Island (*control zone*) dissolved Zn, Cu and Pb are mostly negatively correlated with salinity and pH (Salinity  $\times$  Dissolved Zn = -0.6120,  $p < 0.01$ ; Salinity  $\times$  Dissolved Cu = -0.7456,  $p < 0.01$ ; Salinity  $\times$  Dissolved Pb = -0.6172,  $p < 0.01$  and pH  $\times$  Dissolved Zn = -0.5731,  $p < 0.01$ ; pH  $\times$  Dissolved Cu = 0.7042,  $p < 0.01$ ; pH  $\times$  Dissolved Pb = -0.5850,  $p < 0.01$ ).

(b) BOD and COD are indicators of aquatic health and their values increase, if the water deteriorates. Under this situation the Biological and Chemical Oxygen Demand (BOD and COD) greatly increase and the DO values decrease. This phenomenon is also confirmed by the significant negative correlation values between DO and BOD (DO  $\times$  BOD = -0.8606,  $p < 0.01$ ) and DO and COD (DO  $\times$  COD = -0.8509,  $p < 0.01$ ).

(c) The inter-relationships between  $\text{NO}_3$ ,  $\text{PO}_4$  and Dissolved heavy metals ( $\text{NO}_3 \times$  Dissolved Zn = 0.9465,  $p < 0.01$ ;  $\text{NO}_3 \times$  Dissolved Cu = 0.9316,  $p < 0.01$ ;  $\text{NO}_3 \times$  Dissolved Pb = 0.9152,  $p < 0.01$ ;  $\text{PO}_4 \times$  Dissolved Zn = 0.9202,  $p < 0.01$ ;  $\text{PO}_4 \times$  Dissolved Cu = 0.8644,  $p < 0.01$ ;  $\text{PO}_4 \times$  Dissolved Pb = 0.8088,  $p < 0.01$ ) reflect that the pollution in the present aquatic system are both from anthropogenic and industrial sources. Although no industries exist in Satjelia, but the antifouling paints used for conditioning fishing vessels and trawlers are the sources of heavy metals.

The tourism units are the sources of sewage and several anthropogenic wastes of complex character. Even heavy metals are also released from speed boats and small floating vessels that are used for recreation purposes. Conditioning these accessories with antifouling paints lead to leaching of Zn, Cu and Pb in the aquatic phase. It is observed that nutrients like  $\text{NO}_3$ ,  $\text{PO}_4$  and heavy metals are more in areas where the resources are aggregated like Digha-Mandarmoni and Bakkhali-Frazerganj zone. This may be attributed to intense human

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activities, and fish landing related activities in these zones. The Satjelia zone is adjacent to the forest area of Sundarban Biosphere Reserve (SBR). In this zone there is an almost negligible tourism activity which is reflected by the lower values of nutrients and heavy metals. ANOVA results also confirmed the spatial difference between sites ( $p < 0.01$ ) in the study area which is a reflection of intense human activities in Digha-Mandarmoni and Bakkhali-Frazerganj.

**(vi) Tourism and beach accommodation:**

In the initial states of tourism in the study zones, beach shacks became popular due to their small numbers, economical rates and simple decor. Primary survey in all three study area reveals that number of shops and shacks have increased day by day after development of tourism. So, these structures crowd the shorelines without any comfortable space among them, and they lack eco-friendly toilet facilities and proper refuse collection, all of which often result in waste invariably find its place in the coastal waters. Beach shacks along the beaches of Mandarmoni, Digha and Bakkhali-Frazerganj are responsible for the crowding on the beach.

**Conclusion**

Although tourism is concentrated along the coastal zone in West Bengal (Digha, Mandarmoni, and Bakkhali-Frazerganj), it has had a number of positive benefits in terms of increased incomes, increased employment, added avenues for upward mobility for locals, increased revenue. However, there are also some socio-economic and environmental impacts associated with these benefits that need to be taken care of. Ecotourism should be encouraged to combine environmental education to protect local flora and fauna and provide local people with economic incentives to safe guard their environment. Uncontrolled growth of beach accommodations should be checked in all three tourist centers, especially at Digha and Mandarmoni. Policies which recognize the type of interconnections among tourism, local communities and the environment of the study area, should ensure that tourism contributes to a sustainable development of the region.

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