Chapter - 2

Ecotourism Potentiality in the Coastal Belt With the Application of Geospatial Techniques

2.1 Geospatial Technology in Coastal Tourism

Ecotourism is an important and driving contributor to the world economy. It has a significant role in sustainable development, economic improvement and social benefits in the world tourism industry (Neto, 2003). Furthermore, it can utilize resources in wide range of the tourist destiny by utilizing financial involvement of the people through their contribution in the development of ecotourism infrastructure and providing facilities for the tourist even in the remote areas. Tourism is considered as an essential activity to the life of local people as well as the foreigner's as it has direct consequence in the social, cultural, educational and economic aspects of societies (Reddy, 2009; and Rule, 2017) . Nowadays, tourism is one of the fastest-growing industries in India which have vast potentiality for opportunities of new employment and amplify the foreign exchange earnings (Aruljothi and Ramaswamy, 2014; and Ahamed, 2018). Therefore, the overall economy as well as the societal development of a country is growing correspondingly.Tourism is the largest service sector in India, providing 8.78% of the total employment which contribute about 6.23% to the national gross domestic products (GDP) (RTSA, 2014). More than 5 million foreign tourists visit India every year, whereas, 562 million domestic tourists travel to different tourism destinations of the world (RTSA, 2014). West Bengal is prosperous in cultural values and glorified regional and historical diversities which create a center of attraction to the visitors. Moreover, tourists of different cultural and religious backgrounds are coming in distinctive places and regions to celebrate different regional rituals and festivals with the local people. Therefore, the preservation of the natural regions with its unique and traditional socio-cultural environment is an important aspect for the development of tourism in the state. But, the remote areas which have natural beauty and socio-cultural aesthetic values are somehow not easily accessible for the visitors. Also, there have not enough or even minimum accommodation facilities for overnight stay. So, the improvement of transport communication and infrastructural development in the tourist destinations are necessary for the influx of increasing number of tourist as well as regional economy, but obviously by avoiding large scale destruction and degradation of the surrounding environment.

In most of the cases, the mass tourism is vigorously growing at the cost of huge landscape and environmental degradations. Very interestingly, most of the mass tourism areas like Digha, Mandarmani, Bakkhali, Gangasagar and other areas of Sundarban are located in the fragile coastal environment which have sensitive ecosystem. So, it is important to develop the concept of ecotourism in a sustainable manner for protecting the fragile

environment of our sensitive coastal regions, through which it can protect the natural landscape and resources of any coastal region. In the present research, the study area is selected in the diverse coastal landscape set up of the West Bengal which is extended from Saptamukhi river mouth of southwestern Sundarban to the Jaldha river estuary of Kanthi coastal plain adjacent to Hugli estuary, the western limit of Sundarban deltaic landscape. All the tourist destination sites are situated in and around the Sundarban coast, with their sensitive habitats and ecosystems at the shorefront locations of the Bay of Bengal.

2.2 Physical Sensitivity of the Coast

The coastal tract of the Hugli estuary and Sundarban delta complex is highly sensitive in the physical process involving hydrodynamics and ecological concern. That coastal part is recently formed by the unconsolidated sand, silt and clay dominated coast is still not physically liable for the heavy and large scale structural construction and development. But, the dramatic infrastructural growth in the tourism area brings the fragility of the natural coastal landscape and ecological aspects (Das, 2015).

2.2.1 Unconsolidated Alluvium

The sea-beaches, dunes, and wetlands are the major landscape set up of the coastal tract. All these are recently formed and sufficiently susceptible of the large scale growth as a tourism center. The unconsolidated materials of different sand size particles are regularly entrained and deposited in the different positions of the beach. But, the activities of the mass tourists like beach riding, sand mining and sand arts are the common for accelerating the erosive nature of the beach. Also, in the muddy coast such activities are very much liable for the degradation of the beach. In similar manner, the hotels, restaurants, roads, and other amenities places are constructed over the sand dunes by degrading and flattening of the undulated dune surface. In this process, the natural dune vegetation and other faunal habitats are completely degraded and wiped out from that altered landscape. The coastal wetlands like mudflats, mangrove swamps and salt marshes are also degrading due to the activities of mass tourists and for providing the better facilities to the tourists by constructing infrastructures. The land filling and degradation of natural habitats are the major concerns on behalf of the degradation of natural wetlands (Boesch et al., 2000).

2.2.2 Dynamic and Active Processes

The recently developed coastal areas are more fragile and vulnerable to the regular coastal processes of waves, tides, and currents along with catastrophic events of floods,

cyclones, storm surges, and drought(Bl and Srinivas,2015). The regular events are quite natural in the process-response dynamism and landform formation and modification. But, the catastrophic events are suddenly happened with high magnitude energies that are responsible for the dramatic and accelerated change in the natural processes. These events are also very dangerous in forms of large scale devastation, not only in the shorefront part of the coastal areas, but also in the backshore areas. The people, their habitats and life supporting resources are completely smashed for a long time period. Therefore, the dwellers of the coastal areas are not able to regenerate their life supporting occupations instantly just after the catastrophic events (Shaw and Team, 2001). Also, the tourist destinations are indirectly affected from such degradations of the natural landscape and resources of the surrounding areas. The shorefront and near shore natural habitat and artificially constructed structures are degraded and somehow wiped out, that creates a harsh full impact upon the tourism sectors. The erosion of the dune cliffs, beach, mud banks, estuary and tidal creek mouth are more commonly associated with a catastrophic event. The infrastructures of hotels, parks, electric supply are instantly damaged by such events. The transport and communication, and other supply services are also degraded that are creating a pathetic impact in the tourism industry.

2.2.3 Habitat Instability and Fragility

In the way of growth of coastal tourism the natural landscapes are instantly altered into socio-economic landscape with huge infrastructural development. Therefore, the natural habitat of the different landscape is degraded at a cost of species extinction from their inborn habitats. In the coastal areas, the tourism is growing over the areas of sand dunes, mudflats, and salt marshes by directly degraded those landscape habitats (Ghulam et al., 2013). Also, mangrove areas are degraded with the indirect effects from the mass tourists by their unscientific and immature knowledge in the environmental concern. In that ways the natural landscapes are gradually altered and almost have ruined the natural set up all along the coastal areas of the study area (Craig et al., 2006).

2.3 Ecotourism Potentiality

The tourist destination sites of the study area are enriched with natural and cultural resources which signify them as a highly potential for the development of coastal ecotourism. The tourism potentiality of an area depends on three main aspects regarding unique coastal species and resources of the particular area, the scenic beauty and attractiveness of the place and the level of services and facilities for tourists. The coastal resource which attracts tourists

are intertidal mangrove forests, aquatic animals, various marine benthic algae, sea grass, natural beauty of the destinations, historical and cultural aspects of the place.

Table 2.1: Existing attractions of the different coastal tourist destination sites for the development of ecotourism potentiality.

Sl. No.	Tourist Destination Sites	Attractions of the Sites
1	Mandarmani	Sea side beach resort, nearest place to visit are (Digha, Tajpur, Sankarpur, Talsari)
2	Dadanpatrabar	Pristine sea beach and natural beauty of the place
3	Rasulpur	Religious heritage place, watch tower, Fishing harbor
4	Nayachar Island	Island landscape, Mud-bank, Mangrove, Fisheries, Haldia dock,
5	Mandirtala	Heritage temple, Archaeological remnants of potteries
6	Benubon	Mangrove canopy walk, Ferry ghat
7	Gangasagar	Kapil Muni temple, Pilgrim's tourist place, Light-house, Ramakrishna mission, Bharat Sevasharm Sangha, Omkarnath ashram, Mangrove, Sea-beach
8	Frejerganj	Sea-beach, wind mills
9	Bakkhali	Sea-beach, Bishhalakshmi temple, Crocodile park
10	Henry's Island	Kiran sea beach, Bird watching tower, Mangrove forest cover

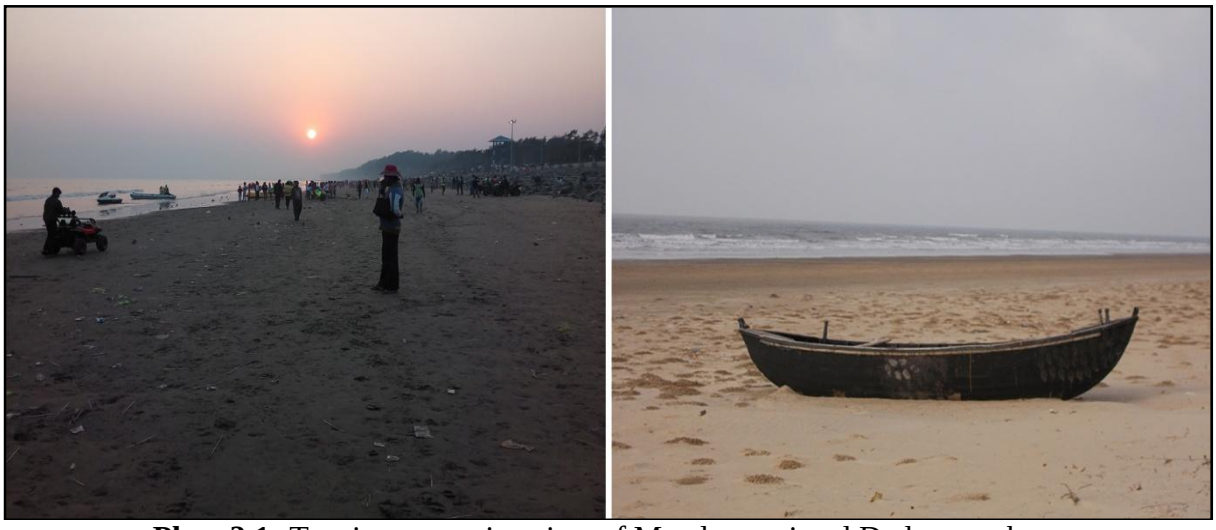

Plate 2.1: Tourism attraction sites of Mandarmani and Dadanpatrabar.

Plate 2.2: Tourism attraction sites of Rasulpur and Nayachar Island.

Plate 2.3: Tourism attraction sites of Mandirtala and Benubon.

Plate 2.4: Tourism attraction sites of Gangasagar and Frejerganj.

Plate 2.5: Tourism attraction sites of Bakkhali and Henry's Island.

Herein the study area, ten (10) main tourist destination sites are famous for their natural, socio-cultural, and heritage importance [Note: The potentialities are not estimated for the

destinations like Dakshinpurosuttampur, Boatkhali and Beguakhali due to their existing natural flavor of the environment]. Each and every place has unique attractions which act as a pull factor of the tourists (Table 2.1). Among the ten selective tourist places the Mandarmani, Gangasagar, Bakkhali, and Frejerganj are well known and famous in terms of annual number of visitors. The economic prosperity of these places mainly depends upon the tourism and related turnover. These places are somehow well decorated for the national and international level of tourists with adequate facilities of services.

2.3.1 Assessment of Ecotourism Potentiality

All the selected tourist destination sites of the study area are situated in and around the sensitive coastal region of the Bay of Bengal. But the increasing pressure of the tourist influx in the tourist destination damages the coastal environment. So, there is need to protect the coastal environment from the unnecessary harmful effect of the mass tourism. Ecotourism is one of the appropriate ways to achieve the sustainable tourism development with no or minimal degradation of the coastal environment. Therefore, it is important to identify the potentiality of the each tourist destination sites and develop the best suitable and possible ecotourism infrastructure. In this concern, the first attempt is to be identified the best suitable ecotourism areas through geospatial techniques and the potentialities of the each tourist destination sites. Also, all those selective places is to be categorized into different level of potentiality as high potential, potential, moderate potential, low potential, and very low potential sites on the basis of the potential indicators like environmental, physical and socio-cultural. As for example, if we consider the Sagar Island for its assessment of ecotourism potentiality, we must consider the pull factors of this tourist place and its surroundings. The natural landscape associated with calm sea beach, openness, mangroves, traditional cultural heritage of the Hindus as Kapil Muni temple, and Gangasagar mela, Manasa temple of Dhablat, Light-house of Beguakhali and other many aspects depends on the nature of tourists. But, the main aspect is how the Sagar Island is potential to survive and provide all the necessary facilities to the tourists with best possibilities. In this regard, there have lots of infrastructural and accommodating facilities to support the numbers of tourists throughout the year. Therefore, it is a high potential area for the development of ecotourism.

The coastal ecotourism potentiality aspects are physical, socio-cultural and environmental attributes that are selected for this methodology (Al Mamun and Mitra, 2012). In this concern, the selected physical aspects (W_p) are physical accessibility, versatility in accommodation system, vehicular accessibility, availability of quality of special food and the

market, guide and tourist information factors, car parking facility and local souvenirs. The socio-cultural aspects (W_s) including are annual tourist influx, average staying duration of the tourists, and frequency or intensity of fairs and festivals in the tourism destination sites. The environmental aspects (W_e) are natural beauty of the destinations, quality of natural beach and forest, nature conservation project for the development and protection of the area, quality of air and water, impact level of hazardous landuse, probability of natural calamity during a specific time, and anthropogenic threat of the area .Therefore, after calculating the furnished steps that is has been discussed in the methodology section, the results are assessed and described through which each of the tourist destination sites are differentiated in terms of their potential value.

2.3.2 Significance of Geospatial Techniques in Ecotourism Potentiality

This study is aimed to find out the potential areas for ecotourism development and in this regards the geospatial techniques are adopted. In this case the Weighted Sum Method (WSM) of multi-criteria decision making tool is considered of ranking and scaling to quantify the various aspects those are employed to categorize the sensitive coastal tourist destination sites (Al Mamun and Mitra, 2012).In this method, the categorical assigned weighted values are statistically processed and layout in mapping format through geospatial techniques (Arc GIS software). With the help of proper mapping it is quite easy to interpret the spatial diversities for the potentialities and possibilities of ecotourism development. Also, it can be understood in which tourism places we have need what kind of management policies for the proper ecotourism development, and in which deficit factor we should need more emphasis for betterment of that place.

2.4 Potentiality of Ecotourism Development

In the first step the result describes that, the study has been pursued by taking physical, social and environmental aspects of the tourist destination sites of the study area. After the respondent survey on tourists (Annexure 1), individual respondent suggests their opinion about different categories and make their decision on the different parameters of above three aspects. And finally the rank has been assigned depending on the respondent's remarks.

As per their opinion, herein the weights (W_i) have been assigned as for physical, environmental and social factors as 0.4, 0.6 and 0.8, respectively. After that the attributes under physical, environmental and social aspects are selected from an elaborate list through

opinion surveys from the selected ecotourism destination sites of Sundarban coast and its adjacent areas. As all tourist destination sites of the study area has their unique characteristics on the basis of their regional tourism resources, service and quality provider, attraction of the place and demand of the tourist. Therefore, the order of preference has been varied for different ecotourism destinations. From the opinion survey of 50 respondents from each site, the preference order and the weighted value for the selected attributes of the three aspects of ecotourism potential is shown in the table (Annexure 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 44, 46, 48, 50, 52, 54, 56, 58, 60 and 62)

The result shows that 5 point scaling of an individual attribute has been framed on the basis of suitable logical interpretations to quantify the qualitative aspects. Interpretations of comparative marking of 1 to 5 are based on availability of services in the exhibits the scaling of a single attribute of all three aspects of tourism potentiality and a colour range (deep brown to light brown) has been applied for 1to 5 scales, respectively, where the minimum value has been considered as 0.2 and the maximum of 1 (Annexure 22, 43, 64).

Finally, aggregate values of the potentiality of each tourist place in Sundarban coast and its adjacent areas have been calculated based on the following formula (Eq. 2) proposed by (Al Mamun and Mitra, 2012).

$$\text{Total Potential } (V) = W_p \times [W_1S_1 + W_2S_2 + W_nS_n]_{physical} + W_s \times [W_1S_1 + W_2S_2 + W_nS_n]_{social} + W_e \times [W_1S_1 + W_2S_2 + \ldots W_nS_n]_{environmental} \quad \ldots\ldots\ldots\ldots (1)$$

$$\text{The Eq. 1 can be rewrite as, Potential } (V) = \sum W_i \times [\sum w_j s_j] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, W_i is the weight of parameter level 1 for i^{th} attribute, w_i is weight of parameter level2 for j^{th} attribute and s_i is the scaling grade for j^{th} attribute of level 2. Value of W_i and w_j will range from 0-1 and $\mathbf{s_j}$ has 5different values (0.2, 0.4, 0.6, 0.8 and 1).

The adjusted formula (Eq. 1) is elaborated in following stages.

Stage 1: Estimation of potential values of three different aspects as physical (V_p), environmental (V_e), and social (V_s) aspects.

A. Potential value in physical aspects (V_p) is calculated by multiplying of 0.250 with grade in vehicular accessibility ($_{p1}$), 0.214 is multiplied with grade in physical accessibility ($_{p2}$), 0.178 is multiplied with grade in Carparking facility ($_{p3}$), 0.142 is multiplied with grade in food and market (p_4), 0.107 is multiplied with grade in local souvenirs (p_5), 0.071 is multiplied with grade in accommodation (p_6), and 0.035 is multiplied with grade in tourist information (p_7). Finally, all these multiplied values

are added to get the value of V_p as per the (Eq. 3) (Annexure 3, 5, 7, 9, 11, 13, 15, 17, 19 and 21).

$$VP = (\sum w_j p_j) \text{.....(3)}$$

Table 2.2: Potential values for the ecotourism destination sites.

Tourism Destinations	P1	P2	P3	P4	P5	P6	P7	V_p	e1	e2	e3	e4	e5	e6	e7	e8	V_e	s1	s2	s3	V_s	V
Mandarmani	1.0	1.0	0.8	1.0	1.0	1.0	1.0	0.384	0.2	0.4	0.2	0.8	0.4	0.6	0.2	0.6	0.232	1.0	1.0	0.8	0.193	0.809
Dadanpatrabar	0.8	0.6	0.8	0.2	0.8	0.4	0.2	0.248	1.0	0.8	0.8	0.8	0.4	1.0	1.0	1.0	0.497	0.4	0.2	0.6	0.073	0.818
Rasulpur	0.6	1.0	0.8	1.0	0.4	0.8	0.4	0.304	0.8	0.8	0.8	0.6	0.8	0.2	1.0	1.0	0.441	1.0	1.0	0.8	0.193	0.938
Nayachar	0.6	0.4	0.6	0.8	0.6	0.6	0.6	0.233	1.0	0.6	0.6	0.2	0.8	0.2	0.6	0.6	0.372	0.6	0.6	0.4	0.113	0.718
Mandirtala	0.8	0.2	0.8	0.6	0.8	0.2	0.2	0.230	0.2	0.2	1.0	0.4	0.6	0.4	0.6	0.4	0.268	0.2	0.4	0.2	0.053	0.551
Benubon	0.8	0.2	0.2	0.2	1.0	0.2	0.6	0.179	0.6	0.4	0.6	1.0	1.0	0.6	0.6	1.0	0.401	0.6	0.2	0.4	0.086	0.666
Gangasagar	0.6	0.4	0.8	0.8	0.6	0.8	0.6	0.254	0.2	0.2	0.8	0.6	0.4	0.4	0.2	0.8	0.245	1.0	0.8	1.0	0.186	0.685
Frejerganj	0.8	0.4	0.4	0.8	0.4	1.0	0.2	0.237	0.2	0.4	0.4	0.2	0.8	0.2	0.6	0.4	0.219	0.6	0.4	0.4	0.1	0.556
Bakkhali	1.0	1.0	1.0	1.0	0.8	0.2	1.0	0.367	1.0	0.6	0.6	0.4	0.2	0.6	0.8	0.6	0.375	1.0	0.8	0.6	0.173	0.915
Henry's Island	0.6	0.4	0.6	0.6	0.2	0.6	0.6	0.205	1.0	1.0	1.0	1.0	0.2	0.6	0.6	1.0	0.511	0.4	0.6	0.4	0.093	0.809

B. Potential value in environmental aspects (V_e) is calculated by multiplying of 0.222 with grade quality of beach ($_{e1}$), 0.194 is multiplied with grade in anthropogenic threat ($_{e2}$), 0.166 is multiplied with grade in hazardous landuse ($_{e3}$), 0.138 is multiplied with grade in natural calamity ($_{e4}$), 0.111 is multiplied with grade in natural beauty of the destination ($_{e5}$), 0.083 is multiplied with grade in quality of air ($_{e6}$), 0.055 is multiplied

with grade in quality of water ($_{e7}$), and 0.027 is multiplied with grade in nature conservation project ($_{e8}$). Finally, all these multiplied values are added to get the value of V_e as per the (Eq. 4) (Annexure 24, 26, 28, 30.32, 34, 36, 38, 40, and 42).

$$V_e = (\sum w_j e_j) \text{.....(4)}$$

C. Potential value in social aspects (V_s) is calculated by multiplying of 0.5 with grade annual tourist influx ($_{s1}$), 0.33 is multiplied with grade in average duration of stay ($_{s2}$), and 0.17 is multiplied with grade in frequency of fairs and festivals ($_{s3}$). Finally, all these multiplied values are added to get the value of $V_s$as per the (Eq. 5) (Annexure 45, 47, 49, 51, 53, 55, 57, 59, 61 and 63).

$$V_s = (\sum w_j s_j) \text{.....(5)}$$

Stage 2: Total potential (V) value is estimated considering the value of 0.40 for physical aspects (V_p) which is multiplied by potential values of V_p; the value of 0.60for environmental aspects (V_e) multiplied with potential value of V_e; and the value of 0.20 for social aspect (V_s) is multiplied with the potential value of V_s. Finally, all the products of multiplication values of three aspects are added as per the Eq. 2 to get the V (Table 2.2).

2.4.1 Physical Potentiality of Ecotourism Development

In connection with the parameters of the physical potentialities (Table 2.2), the physical potentiality analysis of the tourism sites in ten different places (Fig. 2.1 and 2.5) the result indicates that the sites of Mandarmani and Bakkhali are categorized as sites of highly potential (0.304 – 0.384) for ecotourism development. The site of Rasulpur is potential (0.254 – 0.304). Moderately potential (0.237 – 0.254) sites are Dadanpatrabar and Gangasagar. Nayachar Island, Mandirtala and Frejerganj are the places falling under the category of low potential (0.205 – 0.237), and Benubon and Henry's Island are very low potential (0.179 – 0.205) for the ecotourism development.

2.4.2 Environmental Potentiality of Ecotourism Development

From the environmental point of view (Table 2.2), the environmental potentiality analysis of the tourism sites in ten different places (Fig. 2.2 and 2.5) the result indicates that the sites of Dadanpatrabar and Henry's Island are categorized as highly potential (0.441 – 0.551) for ecotourism development. The site of Rasulpur is potential (0.401 – 0.441). Moderately potential (0.268 – 0.401) sites are Nayachar Island, Benubon and Bakkhali. Mandirtala is the only place resulted as low potential (0.245 – 0.268), and Mandarmani, Gangasagar and Frejerganj are remained under very low potentiality (0.219 – 0.245) for the ecotourism development.

2.4.3 Social Potentiality of Ecotourism Development

From the socio-cultural point of view (Table 2.2), the social potentiality analysis of the tourism sites in ten different places (Fig. 2.3 and 2.5) the result indicates that the sites of Mandarmani, Rasulpur and Gangasagar are categorized as highly potential (0.173 – 0.193) for ecotourism development. The site of Bakkhali is potential (0.113 – 0.173). Moderately potential (0.086 – 0.113) sites are Nayachar Island, Frejerganj and Henry's Island. Dadanpatrabar and Benubon are the places resulted as low potential (0.053 – 0.086), and Mandirtala is the only one place with very low potentiality (0.00 – 0.053) for the ecotourism development.

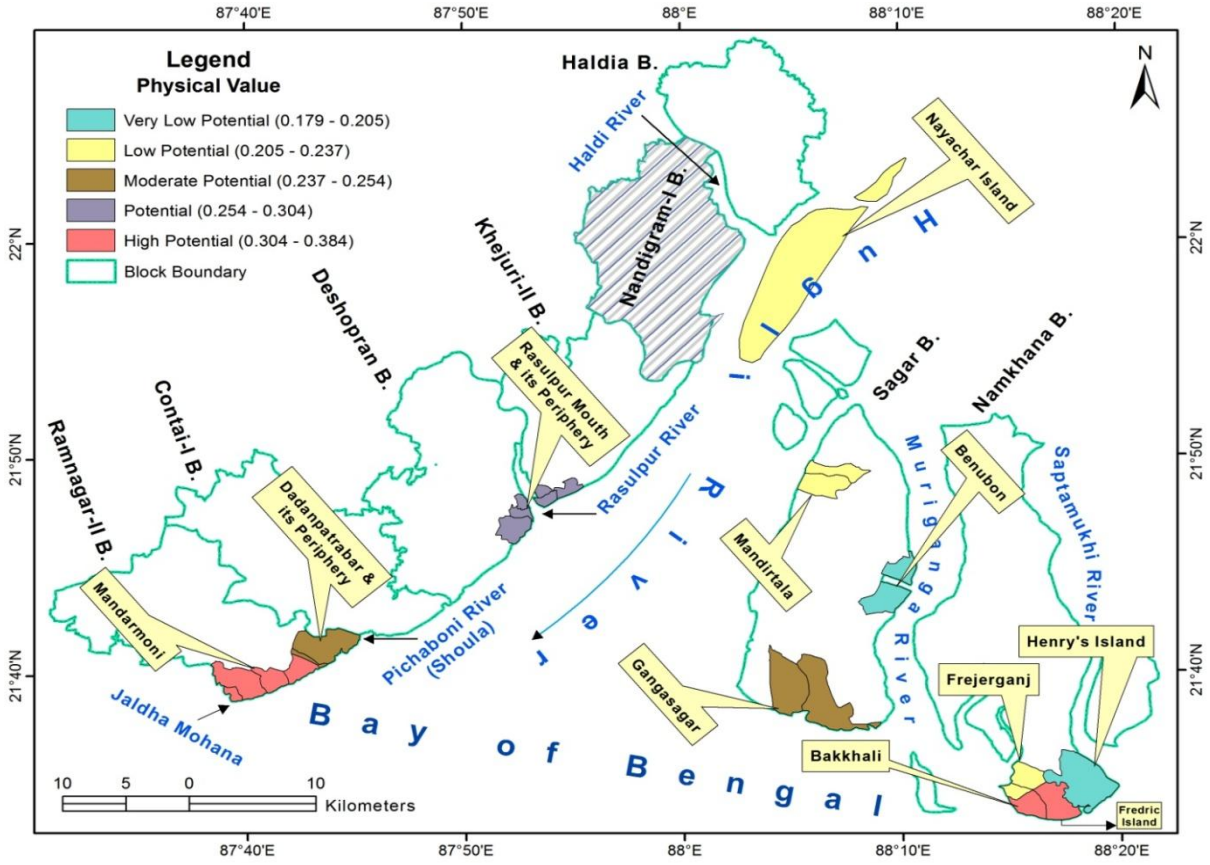

Fig. 2.1: Physical attributes potential Map of the Ecotourism destination sites.

2.4.4 Overall Potentiality of Ecotourism Development in the Coastal Belt

After compilation of potential values of three different aspects (physical, social and environmental) the overall ecotourism potentiality of each tourists spots are estimated (Table 2.2; Fig. 2.4 and 2.5). Here, the highly potential (0.818 – 0.938) sites are Rasulpur and Bakkhali. The potential (0.718 – 0.818) sites are Mandarmani, Dadanpatrabar and Henry's Island. The Nayachar Island is experienced as moderately potential (0.685 – 0.718). The low potential (0.556 – 0.685) sites are Gangasagar and Benubon. And the very low potential (0.551 – 0.556) sites are Mandirtala and Frejerganj.

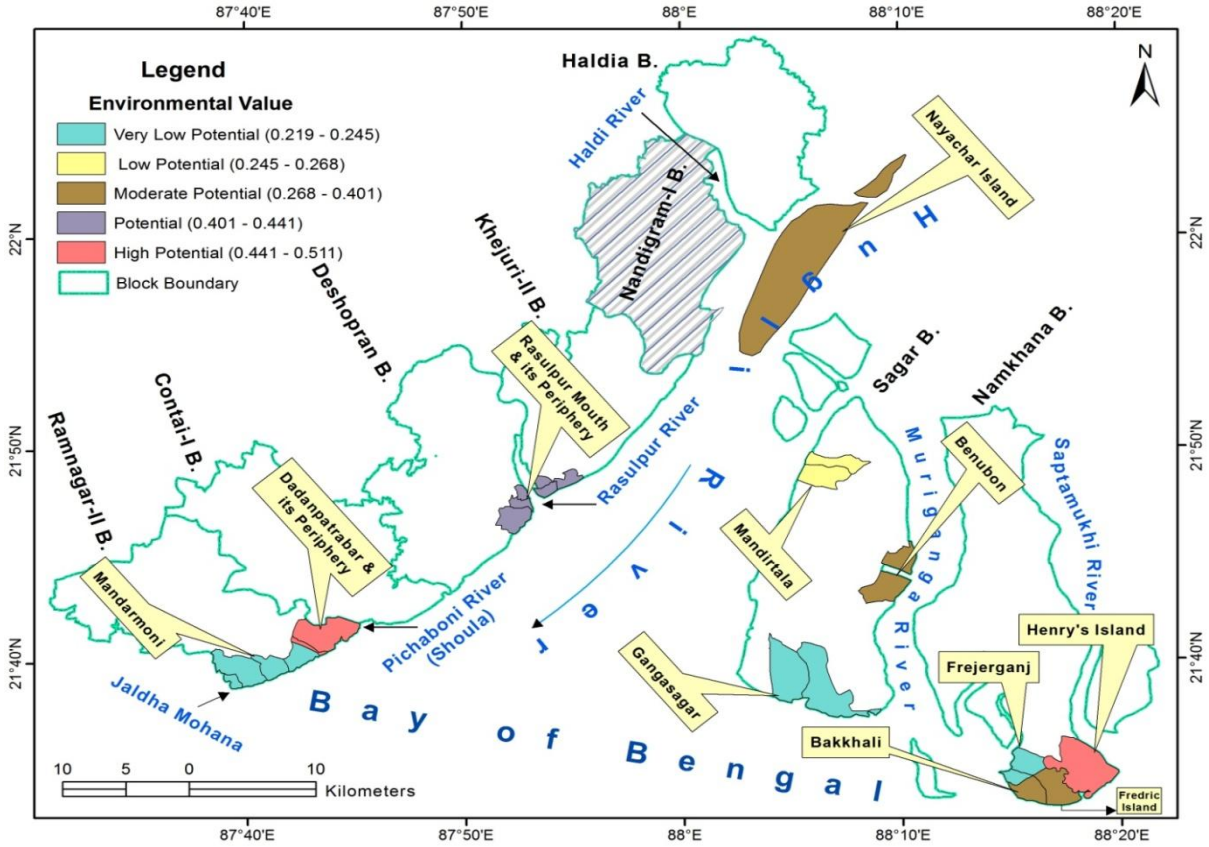

Fig. 2.2: Environmental Potential map of the Ecotourism destination sites.

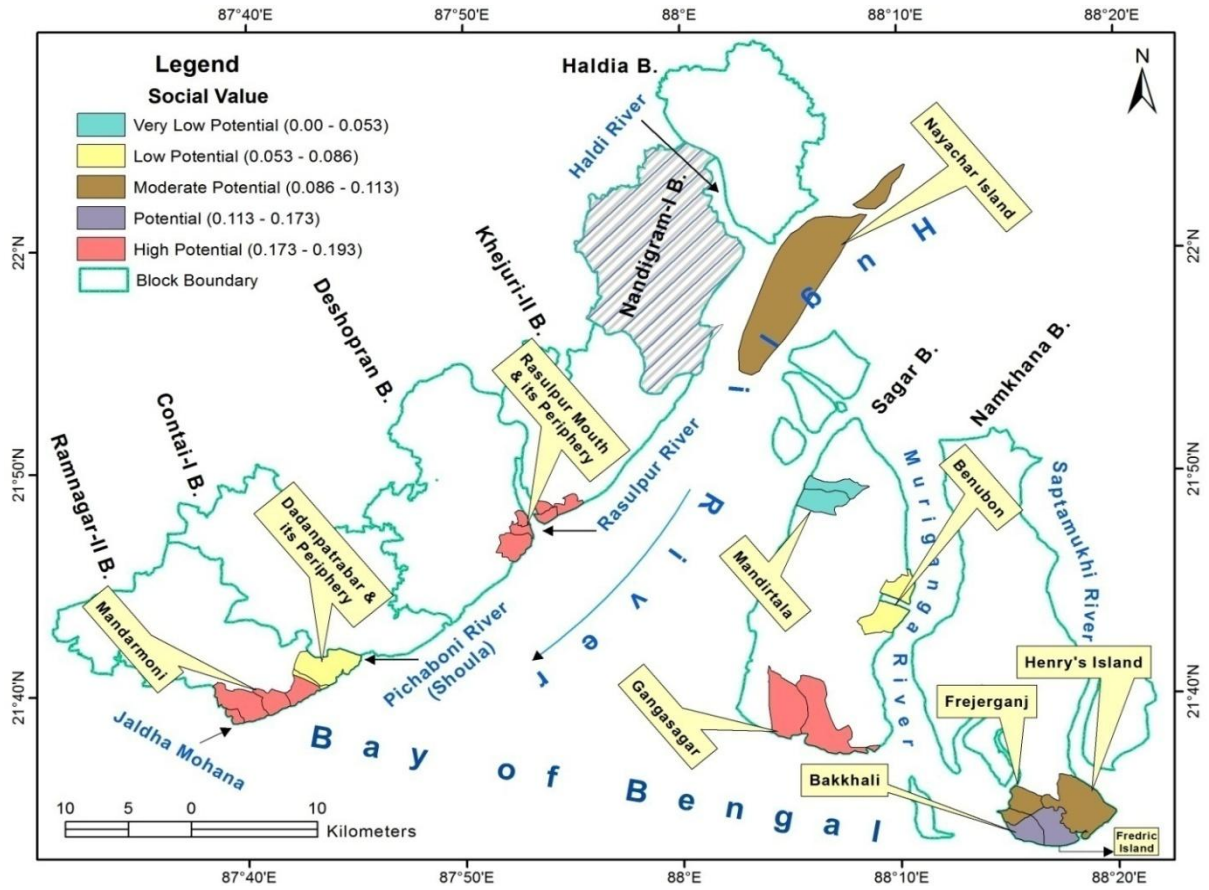

Fig. 2.3: Social attributes potential map of the Ecotourism destination sites.

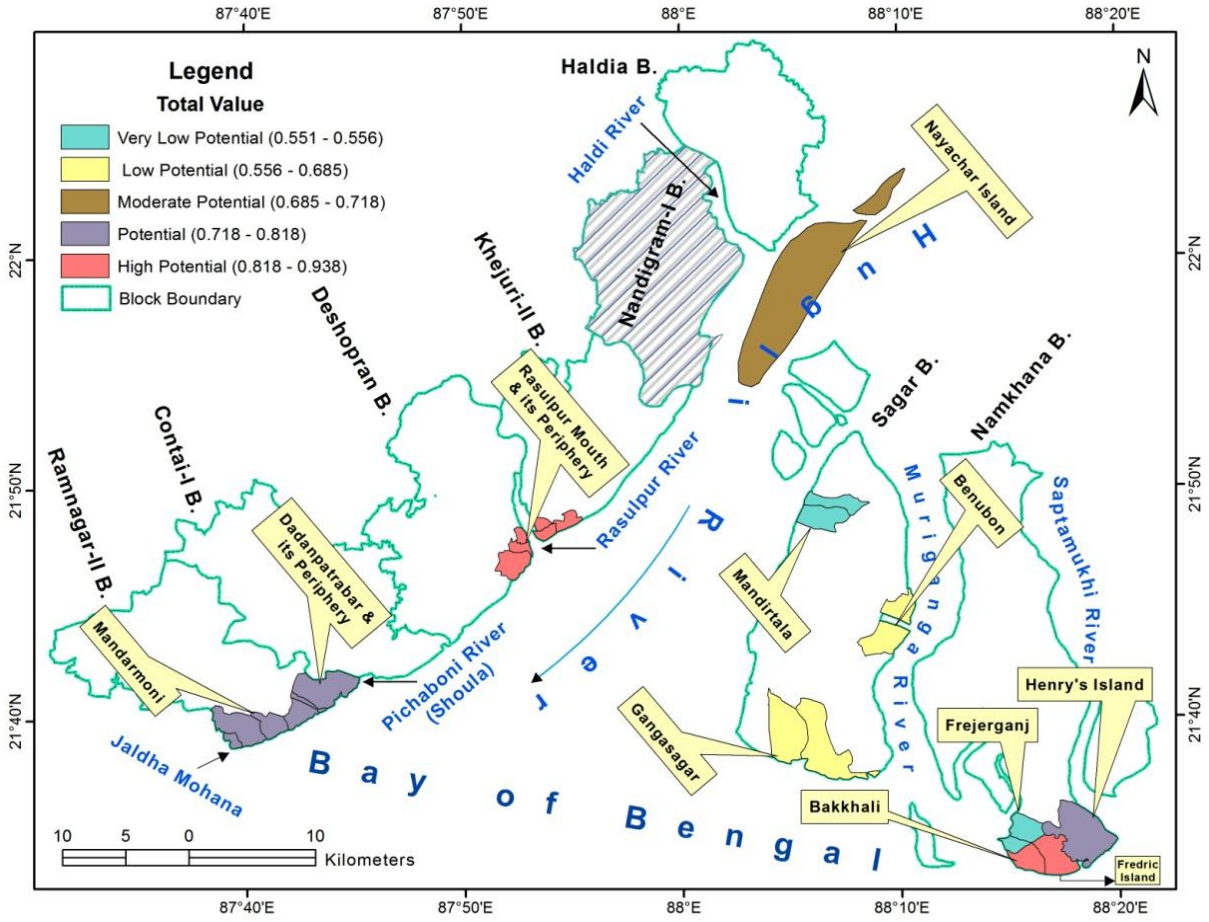

Fig. 2.4: Total potential value of the Ecotourism destination sites.

Table 2.3: Summary of cluster based potential data of the ecotourism destination sites.

Clusters The Ecotourism Destinations Sites	Potentiality Parameters			
	Physical	**Environmental**	**Social**	**Total**
Rasulpur	Potential	Potential	High potential	High potential
Bakkhali	High potential	Moderate potential	Potential	
Mandarmani	High potential	Very low potential	High potential	Potential
Dadanpatrabar	Moderate potential	High potential	Low potential	
Henry's island	Very low potential	High potential	Moderate potential	
Nayachar	Potential	Moderate potential	Moderate potential	Moderate potential
Gangasagar	Moderate potential	Very low potential	High potential	Low potential
Benubon	Very low potential	Moderate potential	Low potential	
Mandirtala	Low potential	Low potential	Very low potential	Very low potential
Frejerganj	Low potential	Very low potential	Moderate potential	

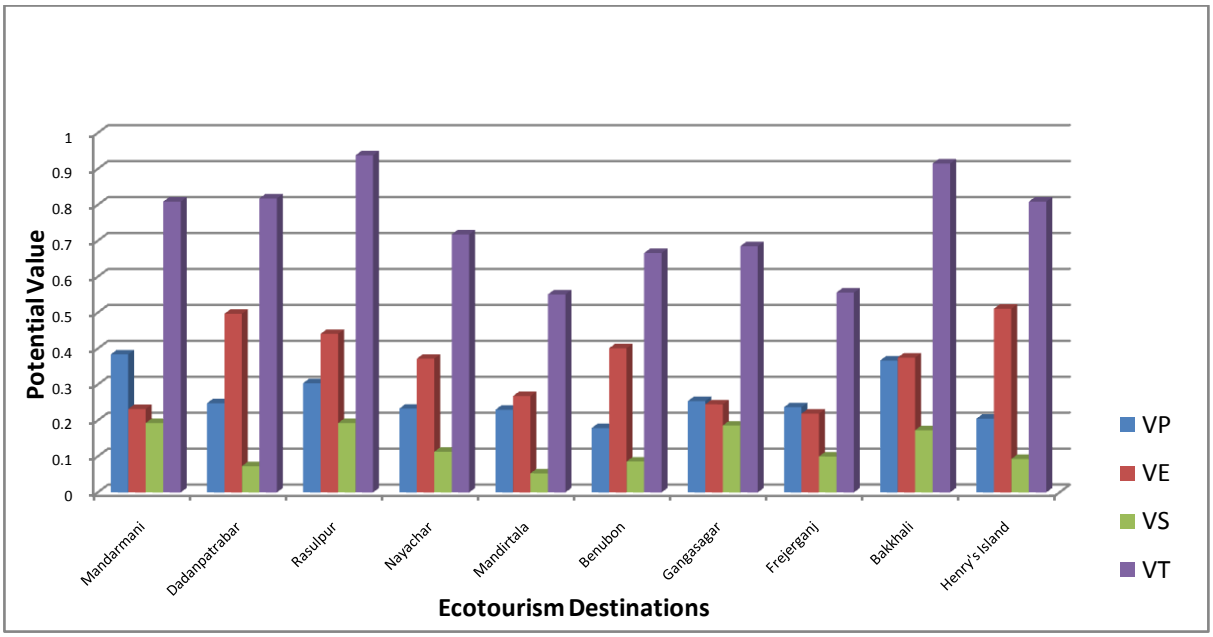

Fig. 2.5: All potential value of the Ecotourism destination sites.

2.5 Status and Prospects of Ecotourism Development in Different Destination Sites

Around the Sundarban coastal areas there have been the prospects and potentiality for the ecotourism development in the different sites. The scenic beauty of the nature, sea-beach, and natural mangroves forests, wetland, salt marshes, and other socio-cultural aspects are diversely distributed in the various tourist spots which attracts tourists throughout the year. Digha is the famous coastal tourism area and come up as the main competitor for the tourism development in the other places of the coastal West Bengal. In this regard, the introduction of ecotourism concept in the well organized manner it would be possible for the sustainable improvement of the tourism industry in this state.

2.5.1 Ecotourism Development in Mandarmani

In Mandarmani the potentiality for ecotourism development is high in connection with physical (0.384) and social (0.193) aspects, where as it is very low in environmental aspect (0.232) (Table 2.2). This area is potential (Table 2.3). form the overall perspectives with total potential values of 0.809. The physical attributes of Mandarmani tourist destination are very strong to reach at the tourist spots. This area is situated at the seaside with buildup of resorts over the coastal villages. The main attractions of that area are beautiful beach(Plate 2.1), marketing place such as local shops for selling shells, handmade jewelry and handicrafts that attract the foreigners as well as the locals. Also this place offers many recreational activities to the tourist. In Mandarmani the vehicular accessibility is good with accessibility

of cars, buses and railway (Mandarmani can be reached by road, the nearest railway station is Contai and the nearest airport is Kolkata) to reach at this place. Accommodations are also available as lots of resorts and hotels are available for the tourists, with car parking facility. The natural beauty of the destination sites is mesmerized and in the near future the biodiversity will be completely destructed by the mass tourist flow of the tourists. So it is important to conserve the nature with the immediate implementation of some rules and regulations in the way of ecotourism development.

2.5.2 Ecotourism Development in Dadanpatrabar

Dadanpatrabar is an important destination site in the so called Mandarmani sector, situated with moderate (0.248), high (0.497), and low (0.818) potentiality for the physical, environmental and social aspects, respectively (Table 2.2). From overall concern it is somehow potential (Table 2.3) for the ecotourism with its total potential score of 0.818. This destination site is not accordingly popular with Mandarmani as tourists are not well informed about the nature of this spot and also local souvenirs are not available for the tourists. Well accommodation of multi storied hotels and other tourism recreation activities are not available in the destinations sites. If the Government and the local stake holders can take necessary action then this site can be developed as one of the most important and favourable ecotourism destinations for the tourists. The natural beauty and the pristine sea beach(Plate 2.1), are fascinating for the tourist and environmentally it is high potential for tourist attraction. From the social concern this place is low potential. But, if the locals (Villagers) can organize the fair festivals, this place can turn out to be an important ecotourism destination.

2.5.3 Ecotourism Development in Rasulpur

At the right bank of the Hugli estuary the Rasulpur is grown up as a potential tourist spot as this site is physically (0.304) and environmentally (0.441) potential, and highly potential from social concern (0.193) (Table 2.2).The total potential value (0.938) shows that Rasulpur is the highly potential (Table 2.3) ecotourism destination in the sensitive coastal belt. This coastal ecotourism destination is one of the most important religious heritage place(Plate 2.2),and thousands of pilgrims visit this place every year. The tourists are attracted by the pristine sea beach and mangroves. This place is well vehicular accessible and tourists can easily reach that place. The required facilities and services for the tourists are present here. Local fairs and festivals attract the tourists and that generate the job opportunity

for the local dwellers, also which maintains the harmony between tour operators, tourists and the locals.

2.5.4 Ecotourism Development in Nayachar Island

At Nayachar the potential value of the physical aspect is (0.233), environmental and social potentiality is moderate with values of (0.372) and(0.113) (Table 2.2), and in the overall aspect is moderately potential (Table 2.3), (0.718). Nayachar Island is economically promising tourism spot. But due to the communication and accessibility problem, tourists cannot reach that tourist destination site easily. Good environmental quality(Plate 2.2), is increasing the potentiality of that place and social value also indicates the same. Improvement of vehicular accessibility, accommodation facility at the surrounding part of the mainland and some cottage at the island part, and improve the other tourist attractions can develop its potentiality. That can generate the job opportunity of the locals and improve the marketing strategies that improve the economical condition of that place.

2.5.5 Ecotourism Development in Mandirtala

Mandirtala is the heritage site of Sagar Island with the presence of ancient temple at the left bank side of river Hugli. This destination site is high and very low potential in connection with the physical (0.230), social (0.053), and environmental (0.268) aspects (Table 2.2) with overall status of very low potentiality (Table 2.3) as the resultant value of (0.551).The ancient temple(Plate 2.3), and remnants of potteries are the main attractions of this place. Due to the communication problem and the lack of advertisement this place is unknown to most of the visitors. The environmental condition is destructed in a massive way that can be harmful for the place. There are no tourist infrastructure is available, also there have not available any kind of service and facility for the tourists. Besides all those negative aspects, with the implementation of proper tourism management policies this area may become as an important ecotourism potential site.

2.5.6 Ecotourism development in Benubon

Benubon is also an important tourist destination of the Sagar Island, though it has resulted with low potential (Table 2.3) as per overall potential value of 0.666. The very low (0.179), moderate (0.401), and low (0.086) potentiality is observed from the physical, environmental, and social aspects respectively (Table 2.2). The enriched mangrove forest (Plate 2.3), and sand dunes are the main attraction of this place that creating the pull force for tourist. The vehicular accessibility, car parking facility is also present here. But other facility and service like (accommodation, restaurant service and washroom) for the tourists are not

present here. If this destination is well maintained and planned in a systematic way then it can be develop as a most important ecotourism sites in future.

2.5.7 Ecotourism Development in Gangasagar

The Gangasagar is low potential (Table 2.3) with overall potential value of (0.685).The physical, environmental and social potential values are (0.254), (0.245), and (0.186) respectively (Table 2.2) as moderate, very low and low categories. It is an important pilgrim tourist destination site. Due to huge flow of tourist during the time of Gangasagar fair and festival the environmental quality is polluted and destroyed its ecosystem and biodiversity. In this concern, it is very much important to protect the environment from the pollution and hazards. Many tourists attraction are present here like Kapil-muni ashram (Plate 2.4),light-house and the natural beauty and these can increase its potentiality of the destinations. Therefore, there should need to take necessary action by the government for the betterment of ecotourism development to make this place as a most favorite tourist's destination.

2.5.8 Ecotourism Development in Frejerganj

Frejerganj is resulted with very low potential (Table 2.3) (0.556) from the overall aspects, though the different categories of low (0.237), very low (0.219), and moderate (0.100) for the physical, environmental and social aspects, respectively (Table 2.2). The main attraction of this place is wind mill (Plate 2.4), attractive sea beach, and degraded police station. Environmental condition is not good because of the pollution and coastal erosion from the frequent natural hazards. There is a very minimum facility for accommodation. The socio-cultural potentiality may be improved by the fairs, festivals and local market. If the government can take the necessary steps for the betterment of the place in well manner then the ecotourism infrastructure will grow properly.

2.5.9 Ecotourism Development in Bakkhali

Bakkhali is a significant tourist destination of the Sundarban areas. In this area, the potential value of high (0.367), moderate (0.375), and potential (0.173) regarding physical, environmental, and social aspects, respectively (Table 2.2), with the total potential value of (0.915).All potential aspects for ecotourism development are available here (Plate 2.5).It is a well known destination for the tourists. The resorts of this place are accommodating a large number of tourists. Therefore, Bakkhali is the high potential (Table 2.3), ecotourism site among the other.

2.5.10 Ecotourism Development in Henry's Island

The beach and natural mangrove forest is the main attraction of the Henry's Island. The potential value of physical, environmental, and social aspects are very low (0.205), high (0.511), and moderate (0.093) respectively (Table 2.2), with the total potential value of 0.809 which signifies as potential (Table 2.3), category. The other attractions of that place are eco-huts, restaurants and the natural views of the surrounding from the top of the watch tower (Plate 2.5). All the potential aspects are present here that support the place as an important ecotourism destinations sites.

2.6. Major Findings

The following are the major findings of this chapter

- The increasing pressure of tourism in the coastal region damages its environment and ecosystem. Therefore, develop the ecotourism infrastructure in the sensitive area is the way to maintain the sustainability and protect the area from all the damages.
- Tourism potentiality is an important tool for develop the ecotourism infrastructure in the coastal area by assessing the potentiality of each tourist destination sites.
- The Rasulpur and Bakkhali are highly potential for the ecotourism development among the existing tourism sites in the study area. However, in Mandarmani, Dadanpatrabar, Henry's island is potential for ecotourism development. Nayachar Island is a moderate potential. Whereas, in Gangasagar, Benubon, Mandirtala and Frejerganj are low to very low potential for ecotourism development in the coastal belt of Sundarban coast and its adjacent area.
- All the ecotourism sites are enriched with cultural, historical and religious heritage, so promotion of fairs and festivals, cultural dances and events can promote the low potential tourism spots for further development.
- The main hindrance in the low potential tourism sites are lack of tourism infrastructures, lack of tourist information to the visitors and absence of proper management strategies in this destination sites.
- Proper use of the natural resources can improve the economic condition of the area. Therefore, it is important to properly use the tourism resources for the improvement of the economic structure and also important to protect the environment for the future tourists and maintain the sustainability of the low potential destination sites of the study area.