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TOURISM PLANNING IN SUNDARBANS THROUGH GEOGRAPHIC INFORMATION SYSTEM

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Abstract

Sundarbans is the most extravagant natural tourism destination located in Eastern India. The beautiful mangrove forest offers a vibrant flora and fauna to the visitors. A large number of tourists visit Sundarbans every year not only for its flora and fauna but also for the excellent blend of cultural and historical resources. Nevertheless, the tourism industry has not developed correctly due to the lack of proper tourism product classification and scientific planning. Geographic Information System can be one of the most useful tools for tourism development in Sundarbans. This chapter presents the process of tourism circuit development in the Sundarbans. The chapter also highlights the scope and possibility of scientific tourism planning by using the Geographic Information System. An interactive map of Sunderbans is prepared by using ArcGIS 10.0 software to showcase the conceptual architecture of tourist information management by using a GIS-based interactive portal.

Keywords

Sundarbans, Tourism product, Tourism planning, Geographic information system, Geoportal

Introduction

Tourism is a multidirectional phenomenon and a total of different activities. It has a significant contribution to the Indian economy. Around 6.8 per cent of Indian GDP is contributed by the travel and tourism sector, about 194US billion dollar. India ranked 10th out of 185 countries globally in travel and tourism spending in the year 2019. In the financial year 2020, the tourism industry has generated Thirty-Nine Million jobs for the nation, which accounts for 8.0 per cent of the nation's total employment. Being the most potential tourism destination of the Asian continent, India offers diversified tourism products to the world. India is highly appreciated in the world for its natural tourism resources like the great Himalayan range, beautiful lakes, rivers, valleys, terrains, deserts and flora and fauna. The country is also a paradise for wildlife lovers. Sundarbans is one of the prime touristic attractions for its natural beauty and rich wildlife. Nevertheless, the great reserve of unparalleled flora and fauna is not showcased correctly due to lack of proper scientific tourism planning in the region. In this chapter, authors have depicted a conceptual framework of how tourism can be planned, developed and promoted in Sundarbans by scientifically using Geographic Information System. Classification of Sundarbans' tourism products and a framework of tourist circuit development in the region are also sketched by using tourist information management through a GIS-Based interactive portal.

Overview of Sundarbans

Being the largest river delta in the world and a great mangrove forest, Sundarbans caught the eye of a large number of domestic and international tourists. The great national park is situated in the South Eastern tip of the 24 Parganas district of West Bengal. The name "Sundarbans" was derived from the famous mangrove plant of Sundari (Ishtiaque, S.W, & Wang, 2016). The famous river delta was formed by three major rivers, i.e. The Ganges, Meghna and Brahmaputra (Goodbred, et al., 2014). The total area of Sundarbans is about 10,000 Sq.km out of which 4,262 Sq.km is extending over West Bengal, and 6,017 Sq.km falls in Bangladesh. The Indian part of Sundarbans is laying in between latitude 21°13′-22°40′ North and longitude 88°05′-89°06′ East (Biswas, Rakshit, Sarkar, Sarangi, & Satpathy, 2014). The largest national park and Tiger reserve of India, The Sundarbans occupies a mangrove forest of 2585 Sq.km covering 56 islands (Raha Atanu Kumar, et al, 2015). The beautiful mangrove forest has been crowned with many conservation projects to protect its sanctity by the Govt. of India. Firstly, in 1973, it was declared as Tiger reserve followed by a Wildlife Sanctuary in 1977. To make it more protective, it was inscribed as National park in 1984. Sundarbans also enjoys the title of "UNESCO World Heritage Site" which was declared in 1987, and it was taken under Man and Biosphere reserve project in 1989. Recently, in 2019 it is also declared as Ramsar Site. The forest's core area is bounded by the Matla River in the west, Haribhanga River in the east and the land boundary of Netidhopani and Gosaba on the northern side. Out of the total area, only 885.27 Sq. Km area is defined as the buffer zone of Sundarbans.

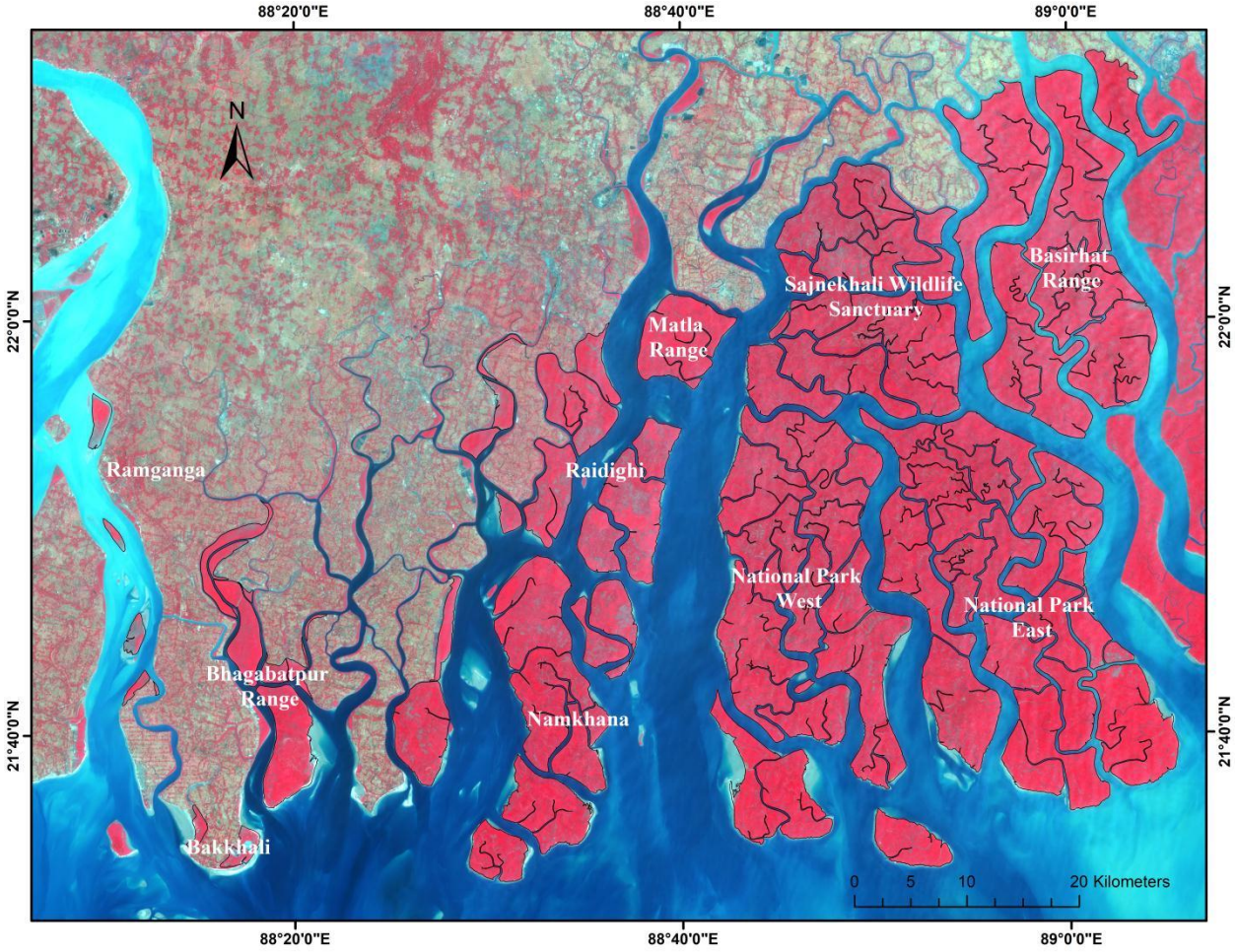

Figure 1. Map of Sunderbans

Flora and Fauna

The algal flora of Sundarbans has not been examined in detail; however, a total of 150 species has been identified in a study in the Indian part of Sundarbans (Sen, 2003). This famous mangrove forest of the Indian subcontinent is well recognised not only for its aerial size but also for its biological diversity. The Sundarbans is categorized under the 4B tidal swamp forest subgroup. It has few subdivisions like Mangrove type 4B/TS1 and 4B/TS2. Apart from these two, saltwater type mixed forest of 4B/TS3, Palm type 4B/E1 and Brackish type 4B/TS4 is also found here (Naha, et al., 2016). Total eighty-four species of mangroves are available in Sundarbans.

The biodiversity of Sundarbans includes numerous species of phytoplankton, zooplankton, micro-organisms, benthic invertebrates, molluscs, amphibians and mammals, and also known as the only mangrove tiger project of the world (Manna, Chaudhuri, Bhattacharyya, & Bhattacharyya, 2010). Apart from the Royal Bengal Tiger, it is the natural habitat of fifty-eight species of mammals, fifty-five species of reptiles and more than two hundred and fifty bird species. It is the den of some globally endangered animals like Estuarine Crocodile, Gangetic Dolphin, and Olive Ridley turtle to name a few.

Tourism Planning through Geographic Information System

For several decades, the planning of tourist destinations has been driven by an ideology of supporting existing attractions and service services, believing that the development of transport network facilities will be pursued. GIS is considered one of the most powerful tools for scientific tourism planning. The usefulness of GIS application in tourism planning has already been proved in different countries, though it was not widely implemented in India. GIS is a computational field that combines spatial features with tabular data to map, analyse and measure real-world problems (Bonham & Graeme, 2014). GIS is an information system capable of processing spatial data, linking it to other numerical or descriptive data and visually displaying the map's data. Geographic Information System can be used in tourism to promote decision planning, measurement of impacts, management of tourist flows and selection of tourism sites (Avdimiotis & Christou, 2004). It is also used to manage natural resources, develop land, land use management, and plan a transportation system. GIS has a remarkable contribution to sustainable and ecotourism planning. According to Boyd and Butler, the GIS application helps identify suitable areas for ecotourism (Boers & Cottrell, 2007). Their study has shown an inventory preparation by using GIS for endangered species in the remote area of Canada, which might not be associable by other means. In 1999, Bahaire and White also introduced inventory mapping, buffering and overlays mapping (Bahaire & Elliott-White, 1999). Identifying an unexplored destination for developing and promoting tourism is another remarkable contribution of GIS (Chandel & Kanga, 2018)**.** A planner can identify some inaccessible areas located in the most profound part of the forest by analysing satellite imaginaries as manual intervention by using the general survey method is highly impossible in these cases (Lange & Bishop, 2005). The geographic information system has another application related to impact analysis (Liu, Iverson, & Brown, 1993). It can effectively evaluate the result or potential impact on the natural environment caused by developmental activities.

Probably the most known and established GIS application is position suitability analysis. Tourism could not be excluded from this application, and many examples of tourism relate, directly or indirectly, to the identification of locations suitable for the development of tourism. Conflicting or complementary land uses and practices, the availability of facilities and the allowing or restricting natural assets are essential spatial variables used to assess the potential and capability of a location or region to be established as a tourist destination. GIS plays a crucial role in every emergency management procedure and helps send more concisely configured response units in the fastest way. Integration of Geographic Information System in the disaster management allows higher levels of planning, analysis, creation of awareness on the overall situation, fastest recovery operation. If the region is disaster-prone, preparedness for emergency actions could be taken well in advance, developing the most efficient and effective operational capabilities in the emergency. Community development and tourism infrastructure planning are also crucial for both local habitats and tourists. Excellent and spacious house building, proper drainage system, nicely built roads, comfortable space in the village is the basic features which attract people to a community. In recent days, most developers, city planners and Government mostly trust software like ArcGIS 10.0 which is

enable to produce high-quality maps, images and spatial analytics for planning and helps to build up a quality life for the people.

Research Methodology

The study is conceptual and descriptive, and secondary sources have been used to explain the significance of GIS in improving the tourism development at Sundarbans. Open source data has been used to create a conceptual model of geoprtal by using ArcGIS 10.0 software.

Tourism Planning for Sundarbans by Using Geographic Information System

From the analysis mentioned above, it is easily understood that the region has immense potentiality for tourism development, and it requires scientific planning at every level. GIS application is one of the most powerful tools that enable planners and developers to make planning more useful in remote areas using satellite imagery. A detail architectural framework is mentioned below:

Tourist Circuit Development

Sunderbans is very often pronounced as "Shunderbun" (Montgomery, 2009). The Indian part of Sundarbans is located between 21° 432′ – 21° 55′ N latitude and between 88° 42′ – 89° 04′ E longitude (Sahana & Sajjad, 2019). The elevation of the Indian part of Sundarbans ranges between 7.4 m to 7.5 m above MSL. It is a cluster of fifty-four islands intersected with some of the Ganges River's distributors. The famous river delta is spotted with some popular tourist destinations (both natural and human made). All the destinations are located in different parts of the delta. The distribution of those spots can be divided into few morphological zones to bring out the spatial perspective. The division can be done on a block basis. Using ArcGIS 10.0, (a sketch is shown in Figure 02) mapping and analysis can be done, and the location of the tourist's spots can be identified using a GPS (Hallo, et al., 2012); (Garc, Juan, Gutierrez, & Mnguez, 2015). It is always considered that distance between two or more places of interests is a relevant input. Once the entire circuit is identified like tiger circuit covering prominent watch towers, village circuit covering widow village etc., temple circuit covering Kapil Muni temple and so on, nearest neighbour analysis technique can be used to identify their surrounding area covering nearby accommodation, sightseeing, art and craft center, shopping facilities, hospital, banks etc. With this process, a useful digital map can be created for tourists.

Creating and Developing New Tourist Destinations

Sundarbans includes 102 small islands out of which 52 islands have habitats, and the rest of the islands is full of forest (Banerjee, 1998). By using the GIS application, the Government can identify new tourist spots and develop them for attracting tourists. This way, not only tourism in Sundarbans is developed, it creates regional development by generating employment.

Providing Information on Accommodation

It is well known that the delta does not offer 5 star or luxury accommodations. About 72 different categories of hotels are available in Sundarbans, including Government Tourist lodges. The major problem that tourists face in recent days is that their location is not mentioned on the webpage. Tourists face significant difficulties in finding suitable accommodation nearby the significant places of attractions. It is presumed that all information related to our states and cities is available on the internet and widely accessible when required by tourists. However, the same scenario does not apply to Sundarbans. With huge limitations, it becomes a herculean task for the tourists to find accurate information as the available date in the web source is confusing and time-consuming. The application of Geographic Information can be used to overcome these issues. By introducing the digital mapping system, Government can create an adequate inventory of accommodation for Sundarbans' tourist spots and made it available for the visitors.

Enhancement of Transportation facilities with Auxiliary Information

The main gateway of Sundarbans is just 112 Km away from Kolkata Airport, and the nearest railways station is canning about 50 KM from Kolkata. The gateway of Sundarbans also can be accessed by road up to Sonakhali, Namkhana, canning, Najat and Raidighi. Later visitors need to access motorboat to reach tourist spots like Sajnekhali, Netidhopani etc. Nevertheless, brief information about the road is available on the web. Using GIS and GPS, an exact digital road map can be created along with user credentials like a petrol pump, restaurants, and car repair facilities etc. which would open a new avenue and enhance the tourist experience.

Tourist Information Management through GIS-Based Interactive Portal

There has always been a need for an Integrated Tourism Portal based on GIS Technology. While planning a trip, tourists search for places of interest, accommodation, weather and environment condition, geographic condition, population, culture, cuisine, fairs, festivals and events. They also try understanding the aesthetic value of culture and local people. A map-based exclusive portal can be created for Sundarbans, which will help visitors enhance their experience, and the development of tourism will be inevitable in this region. A web application can be created to showcase information about various places of tourist interests and presently available infrastructure on the interactive map and software for route planning (Delorme, Gray, Autry, & Moulton, 2001). The major problems faced by the tourists and the planning authorities are route planning in the forest. The best solution is to create an exclusive geoportal for the tourists where all the forest area's digital maps will be stored. The portal should be made accessible to the tourists may be through the website or web application. The web portal's route planner will be capable enough to show the start and endpoints of the route, direction towards a particular selected destination or point of interests. It should also be able to search and select a particular destination along with distance, time and elevation level when

required. The web page or application must be able to find alternative routes, contrast features of all available routes, and suggested routes as per different categories of vehicles. A navigation system can be integrated with it for instant use of the tourists visiting Sundarbans.

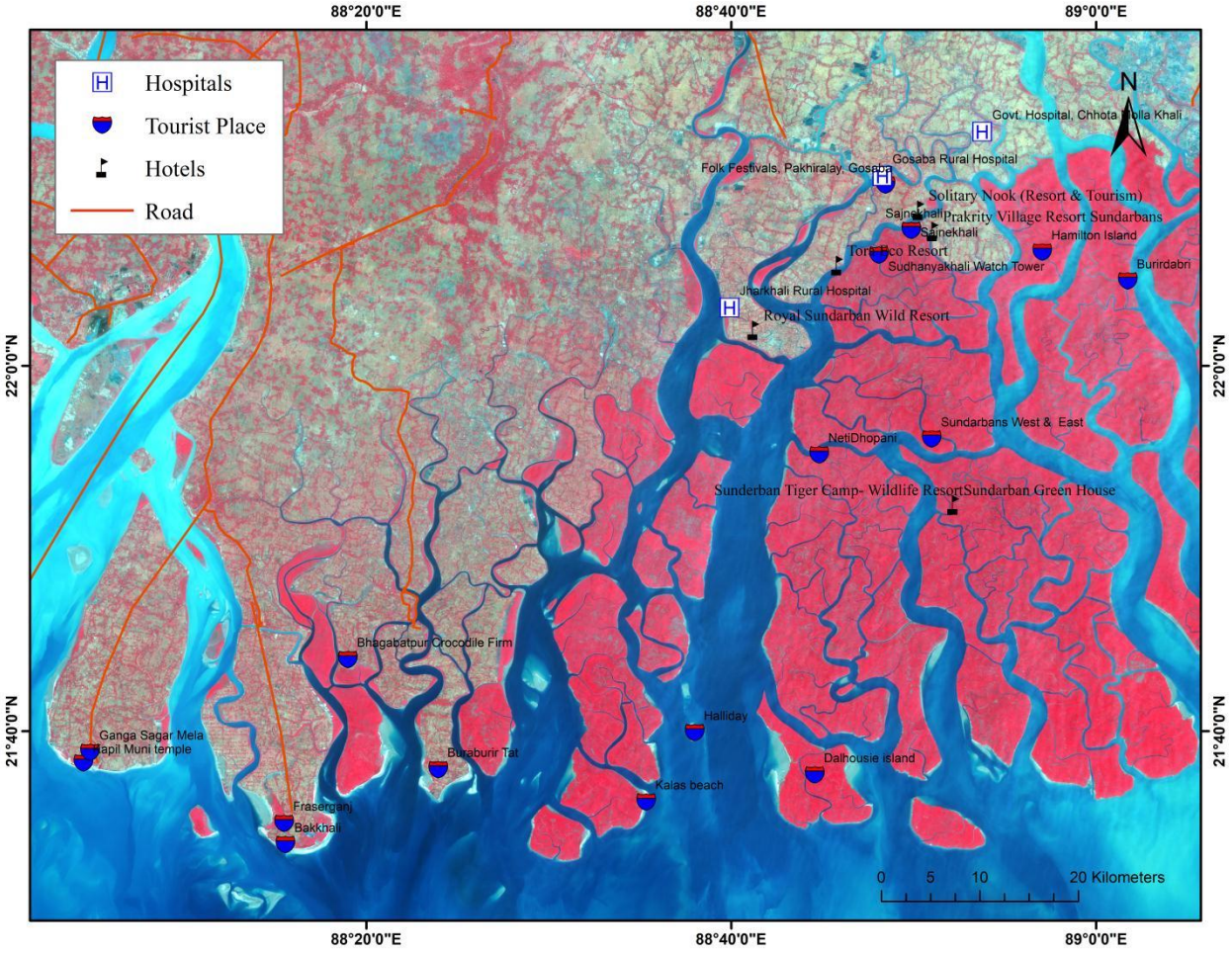

Figure 2. Proposed Architecture of GIS based Tourist Map for Sundarbans

Proposed Outcome (including Ecotourism Development in Sundarbans)

Geographic Information System can be used in Ecotourism planning (Fung & Wong, 2007). It will work as a decision-supporting tool. Land-use change over time can be identified using GIS (Li & Yeh, 2004). Geographic Information System enables to monitor the effects of tourism on the environment over a period in a sensitive environmental region like Sundarbans. Significant issues related to ecotourism planning like the change of land use over the years and its causes, measuring the existing tourism infrastructure, recent trends of tourism, lack of facilities, accessibility information can be encountered with GIS to prepare an eco-tourism map of the Indian Sundarbans region. The study carried out by renowned scientists and researchers revealed that the land use of Sundarbans has drastically changed over the period, and there was a severe decline in forest density. Various activities by human beings and the effect of climate change are responsible for the change. E-activities related to tourism is partly responsible for the destruction of the forest, but cannot be held heavily responsible for the effect. Though even is detected at the early stage, the rapid increase of

tourists in the region due to indiscriminate tourism development and massive promotion can invite amicable adverse effects in Sundarbans. As part of sustainable tourism development, the Government should bring strict laws for preventing endanger spices and flora for damages. The majority of the workforce in the tourism sector in Sundarbans is the local people as they are an inevitable part of tourism. The local workforce carries out activities like guiding, operating motorboats, working in hotels and guest houses, and providing education related to the environment for protecting nature and monitoring tourist activities. It is also recommended that the villagers of Sundarbans are involved in the tourism planning process, and they must have the liberty to express their disagreement whenever required. This will help to build up a host-guest relationship and enhance strong growth in regional tourism.

Conclusion

Tourism is a profoundly dynamic practice and involves tools to promote successful decision-making and satisfy the conflicting economic, social and environmental requirements of sustainable growth. The use of Geographic Information System in tourism and leisure planning demonstrates that GIS is a powerful and efficient tool that can assist in the tourism industry's strategic level decision-making. This technology will play a significant role in monitoring environmental factors, evaluating the suitability of areas for potential construction sites, determining the effects of tourism operations, controlling the influx of tourists and detecting disputes. Sundarbans is a high environment temperate region. Thus tourism-related activities only can be carried out when it is safe. Proper scientific planning by using GIS can lead to a sustainable environment, friendly tourism in the region.

The major problems faced by the tourists and the planning authorities are route planning in the forest. The study aims to resolve the challenges by offering a solution to create exclusive geoportal for the tourists. This portal shall contain all the forest area's digital maps and would be made available to tourists either through website or web application. The web portal's route planner will be capable enough to show the start and endpoints of the route, and further directions towards a selected destination. The web page or application must be able to find alternative routes, contrast features of all available routes, and suggested routes as per different categories of vehicles. An integrated navigation system for instant use by the tourists visiting Sundarbans could also be adopted.

Suggestion

This is the limitation of the work. The study is conceptual, and if GIS system is adopted in tourism planning at Sundarbans, a longitudinal study could be conducted in future to quantify the above-mentioned benefits for tourists, and the destination itself.

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