

Using GIS for Identification of Potential Ecotourism Sites: A Case Study of Jamui District of Bihar

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Abstract – The primary focus of nodal tourism development agencies is on the development of pilgrimage (Buddhist, Jain) destinations, while the ecotourism site development initiatives have taken a back-seat, in the on ground implementation of the policy. The major natural areas of the state having good potential to become ecotourism sites are pristine and untouched by tourism activities. The present study aims to identify the potential ecotourism sites in the Jamui district of Bihar, using Geographic Information Systems. The 1992 Rio declaration and Agenda 21 focuses on special objectives, and the ways to be followed to pursue these objectives. The special objectives are related to solving spatial problems, while the ways implies sharing knowledge for collaborative, transparent, and participatory decision making. In planning, decision-making, and management GIS is considered most advance tool available to deal with complex problems- the spatial problems- in a balanced mediation of economic, environmental, and social objectives. It is an essential tool though, which, when properly used, may offer effective support to geospatial planning and decision making, because the geographical components are the key elements, while dealing with sustainable development. In spite of having variety of tourism opportunities, from, destinations of religious and spiritual interest like Kakan and Lachuar to the picturesque scenic locations of Simultala to the places of historical interest like Gidhour Fort and Minto tower the district has failed to harness its tourism potential. It has meagre share in the overall tourist arrivals (domestic and foreign) to the state of Bihar. It is essential to create congenial environment through confidence building among the local community and socially excluded and economically deprived communities through tourism as an agent and to attract those who have chosen the path of violence to bring them back into the mainstream.

Key Words – Geospatial, Ecotourism, Pilgrimage, Sustainable Development, Natural Areas

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INTRODUCTION

A general perception of people regarding Tourism in Bihar, is limited to Buddhist, Jain and Hindu pilgrimage destinations, a very few of them are aware that Bihar also consist of exquisite and ravishing natural locations that includes dense forests, wildlife, water falls, hot and cold springs and fluvial landforms. These locations are predominantly concentrated along the bordering areas of Jharkhand, which got the lion's share of mineral resources and natural locations after its separation from Bihar in the year 2001. Ever since after recognising the significance of Tourism for the natural resource starved state to the economic development, the state government has been emphasizing on tourism development to increase employment opportunities and enhance income generation. Tourism worldwide is now the second

largest source of foreign earnings in the 49 least developed countries (LDC's). Tourism has become the main source of income as well, for the under developed regions of large countries. (UNWTO,2014). Tourism sector is increasingly important source of employment, including the tourism related sectors, such as construction, primarily for the unskilled labour, migrants from poor rural areas, people who prefer to work part-time, and notably women. This sector is relatively labour intensive, investment in tourism tend to generate a larger and rapid increase in employment than equal investment in other economic activities. Keeping all these factors in mind, the government of Bihar came up with a comprehensive tourism policy. (Bihar Tourism Policy, 2009). Following that, tourism has been given the status of an industry. The formulated state tourism policy document does emphasise

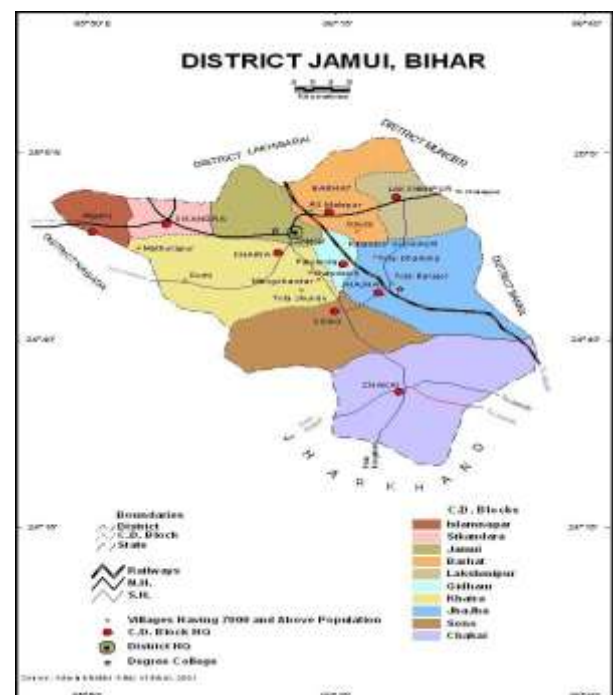
the need to promote ecotourism in the state. The primary focus of nodal tourism development agencies of the union and the state is on the development of pilgrimage (Buddhist, Jain) destinations, while the ecotourism site development initiatives have taken a back-seat, in the on ground implementation of the policy. The major natural areas of the state having good potential to become ecotourism sites are pristine and untouched by tourism activities. They lack basic tourism infrastructure. So, it provides ample scope of developing those natural and fragile regions on the basis of guidelines underlain by the WTO and United Nations for promoting sustainable tourism, as intensive tourism activity in natural areas can interfere with fragile vegetation and wildlife and cause irreversible damage to the ecosystems. Uncontrolled tourism activities can lead to severe disruption of wildlife habitats and increased pressure on endangered species. During the seventh session of the United Nations Commission on Sustainable Development (CSD) in 1999, UNEP emphatically accentuated the growing recognition that the involvement of local communities in tourism development and operation appears to be an important condition for the conservation and sustainable use of biodiversity. Guided by the principles of sustainable development a new form of tourism has been conceived called ecotourism, as 'responsible travel to natural areas which conserves the environment and improves the welfare of local people'. (UNEP,1999). Ecotourism also emphasizes on the integration of local communities in the development process and sharing the benefits arising from the tourism. 'Ecotourism enterprises that are owned and managed by the community, implies that a community is taking care of the natural resources in order to gain income through operating a tourism enterprise and using the income to better their lives. It involves conservation, business enterprise and community development' (Sproule 1995) The present study aims to identify the potential ecotourism sites in the Jamui district of Bihar, using Geographic Information Systems. The 1992 Rio declaration and Agenda 21 focuses on special objectives, and the ways to be followed to pursue these objectives. The special objectives are related to solving spatial problems, while the ways implies sharing knowledge for collaborative, transparent, and participatory decision making. In planning, decision-making, and management GIS is considered most advance tool available to deal with complex problems- the spatial problems- in a balanced mediation of economic, environmental, and social objectives. It is an essential tool though, which, when properly used, may offer effective support to spatial planning and decision making, because the geographical components are the key elements, while dealing with sustainable development.

STUDY AREA

The name of 'Jamui was derived from "Jambhiya Gram" or "Jribhikgram" village, which has the place of attaining 'Omniscience' (Kevalaygnan) of Vardhaman Mahavir, few Historians also believe that the name Jamui is originated from Jambuwani'. The District was formed on 21st February, 1991 after it got separated from Munger district. Jamui district is bounded by Munger and Lakhisarai District in its north, by Giridih district of Jharkhand in its south, by Deoghar and Banka district in its east and by Nawada district in its west. This district of Bihar occupies a total area of 3,122.80 Sq. Km At present Jamui district has one subdivision and 10 revenue block with 153 Panchayats. As per 2011 Census statistics, total population of Jamui district is 17,60,405 (Census of India, 2011).

GEOGRAPHY OF JAMUI DISTRICT

The district is mainly hilly with plain areas in the western blocks like Khairai, Sikandra and Jamui. The hilly areas are considered to be the extension of the Vindhya Range. Gidheshwar Pahar is a tall hill accentuating the topography of the area. Kiul and Ulai with their small streams and provide the fluvial characteristics to the area. The area receives monsoonal rain and the climate is hot and dry influenced by the proximity to Bay of Bengal. With 1000mm of annual average rainfall, August is the wettest month. Being fluvial landscape with rich alluvial soils in the western part, the major economic activity is agriculture. However, in the hilly areas of Chakai and surrounding blocks, the thick forests provide minor forest produce such as Tendu leaves that are mainly used in making the local beedis.



Tourism in Jamui

Tourism in Jamui district offers the travelers to explore its various and historical, religious sites as well as picturesque natural locations for nature lovers. The prominent tourist destinations situated in the district are:

Kali Mandir Malaypur: This temple dedicated to Goddess Kali is situated close to the Jamui Railway station and boasts of an important religious fair that is organized each year.

Giddheshwar Nath Temple: located at a distance of about 15 Km from Jamui District headquarter, the temple is mentioned in the religious texts as Shaiva Tirtha Sthala and holds historical and religious importance. Annual fair is organised on occasion of Mahashivratri.

Lakshmi Narayn Temple: Southwest of the Sono Block, this Temple is dedicated to Laxmi-Narayan and place of pilgrimage on Kartik Purnima.

Patneshwar Temple: Located on top of Patneshwar hill, this temple witnesses a mega fair on Makar Sankranti.

Jhumraj Asthan: Temple made for Baba Jhumraj, where devotees flank with goats after their wishes are fulfilled.

Patsanda: Popularly called Gidhour, it is the seat of the Rajas of Gidhour, where Durga Puja is celebrated with great fervour.

Mahadeo Simaria: East of Sikandra block, it houses the temple of Shiv and Parvati where big celebrations are held in Phalgun month.

Lachhuar and Kshatriya Kund: The most prominent of the Jain temples is located in Lachhuar. It can be accessed from Sikandra that is 5 kilometres away. It was also known as lichanyalaya. According to the locals the temple was established for Trishal – mother of Vardhaman Mahavir. Some believe that Mahavira attained enlightenment at Lachhua.

Kakan Temple: Jain temple with red stone work is believed to be the birthplace of the ninth Tirthankar of Jains – Suvidhanath.

Amrath (Choti Dargah & Badi Dargah): Jamui is also a sacred place for Sufi Muslims due to the presence of Amrath village, which is located 8 Km Northwest of the district headquarters. The village is famous for the tomb of Hazrat Syed Ahmad Khan Jajneri baba.

Simulatala: Considered to be a hill station of Jamui district and located on close to Jhajha, it has pristine and splendid view. Many abandoned villas can

be seen which once belonged to persons of affluence from Bengal.

There are man-made dams like Giddheshwar; Naga Natti Dam at Jha Jha, Kukurjhap dam at Barhat is famous for their migratory birds.

Fort of Giddhaur, Minto Tower and Indpe are other important sites

Jamui Museum: Founded by Prof. Dr. Shyamnandan Prasad on 16 March 1983. Total number of archaeological remains in this museum is 178. Various statues of Lord Vishnu, Lord Bhudha, Goddess Uma, Durga, Surya, ancient rocks and terracotta seals etc. are on display.

METHODOLOGY

The study is primarily related to the identification of potential eco-tourism sites, using Geographic Information Systems. The methodology adopted to achieve the objectives may be divided into three stages.

Data Preparation

It involves collection of data from number of sources. Most of the data used in the present study is secondary in nature. It includes:

Data Sources

- 1) Survey of India Topographical Sheets No. 72 L, 72 H13, 72K8, 72L5, 77L9, 72L7, 72L2, 72L11, 72L10, 72L3, 72L6
- 2) District Census Handbook, Census of India, 1991, 2001, 2011
- 3) Village and Town Directory, Census of India, 2001, 2011
- 4) Reports published by the Jamui district administration and the Government of Bihar
- 5) Economic Survey, Bihar

All the maps and the topographical sheets have been scanned in Raster image format, these images were then exported to ERDAS Imagine 8.4 (Software) environment. The images have been geometrically corrected by referencing them on the basis of pre-geo-referenced map available, providing it the basic projection information and coordinates. The geometrically corrected topographic sheets of Jamui district were clubbed to get a comprehensive view of the entire district for the purpose of digitization and the creation of

DEM's (Digital Elevation Model) of the district, depicting the relief and topography.

The clubbed topographic sheets and the raster images (maps) were further opened on GIS Platform, using Arc View 3.2a (Software) and digitized to carve out different themes and layers (or spatial data), significant for the present study in the form of point, line and polygon, followed the addition of attribute information in the attribute table of the respective themes to generate thematic maps.

Analysis

These thematic maps have been refined using the geo-processing tools. Buffer technique has been used for the accessibility analysis. Finally, all the maps, including the Buffer maps were overlaid to find out the areas which have potential for the development of eco-tourism sites in the Jamui district.

Triangulated Irregular Network (TIN) has been prepared using the surface creation option available in the GIS Platform; with the help of TIN a detailed relief map of the district was also generated. A Digital Terrain Model (DTM or DEM) have also been generated using the surface option available in the ERDAS Imagine 8.4 to get the precise analogue model of the topography of the district and to remove the ambiguity of TIN, due to its irregular shape.

IDENTIFICATION OF POTENTIAL ECOTOURISM SITES

SPATIAL DATA SOURCE

Relief

The relief of Jamui district exhibits a mosaic of plain and hill topography. The North-western portion of the district consists of plains, the elevation ranges from 20-200 metres above MSL. The North-western plain area is covered with alluvium soil deposited by the rivers. These plains are good for the paddy cultivation. The South-eastern part of the district has moderate relief with the elevation range from 200-300 metres above MSL. The South-western and Western part of the district is dominated by hills, elevation ranges from 350-500 metres above MSL, especially along the bordering Giridih district of Jharkhand. These hills are mainly concentrated in four blocks, Khaira, Sono, Chakai and Aliganj. The famous hills situated in Khaira block are Dhamna Pahar, Chakri Pahar, Murli Pahar, Sandela Pahar, Basanti Pahar, Narela Pahar, Barwa Pahar, Deoasthan Pahar and Gidheshwar Pahar. Sono block is also dotted with several hills, Bhangwadol, Khandoraja to name a few. The hills with highest elevation range (over 550 metres above MSL) can be found in very small pockets of eight, among the total ten blocks of the district.

Slope

The entire Jamui district may be divided into two broad slope categories. North-western plain area has a relatively flat slope (below 10 m). These areas with flat slope are mostly located between the two hilly tracts. The remaining portion of district has relatively steep slope (above 80 m) is spread throughout the district. The area with moderate slope (10-80 m) can be found in very tiny pockets.

Transport Network

Jamui is well connected with cities of Bihar and Jharkhand. Except a few inaccessible areas due to the undulating relief and topography, most of the district is covered with a good network of roads. The prominent category of roads is state highways and Major district roads. The rural areas have been connected to major state highways and district roads under the Pradhanmantri Grameen Sadak Yojana. State highway no. 8 connects Sikandra to Jamui block; SH-6 connects Jamui to Aliganj. State highway no. 18 links Jamui to Majhwe through Dhandh. The state highway no. 72 connects Jamui to Laxmipur. State highway no. 18 also connects a series of destinations like Jhaja, Sono, Chakai, Madhopur and Bishanpur to Jamui. Lachaur is linked to Sikandara and Mahadeo Simaria through major district road. There is no state highway link to Barhat block headquarters. It is connected to the district highway with MDR; similarly, Khaira block is also connected to Jamui, Garhi, Sono and Mahadeo Simaria with MDR, in the absence of state highway. All the villages, towns and hamlets of the district are connected with each other through a network of metalled, un-metalled roads, cart track and pack tracks.

Jamui district is also well connected with the capital city of Patna and other cities of Jharkhand through Indian railway Network. North Eastern railways cover the entire North-South stretch of the district having stations and halts like Malaypur, Gidhaour, Simultala, Jhajha. Jhajha is an important railway terminal of Eastern Railway having a loco shed.

Settlements

The settlements types found throughout the district is compact, characteristic of the alluvial plains. The town and block headquarters like Jamui, Jhajha and Chakai are densely populated, while Khaira, Sono, Barhat, Aliganj and Lakshimpur are sparsely populated. Sikandra is one of the blocks that are moderately populated. Majority of the towns and cities of the district are located along the state highways and major district roads.

Forest Area

Jamui district contribute in a huge manner to the total forest area of the Bihar state. One third of the

total forest area of Jamui district is covered with forest area. In the total notified area of 303630 hectare, 61961.13 hectare comes under forest landuse (Economic Survey, Bihar, 2011). The forest areas of the district overlap the hills topography because majority of hills of the district are covered with forests. The western, south, south-western and few part of eastern portion of the entire district is covered by one or other type of forests. Khaira block consist of large areas of dense forests, comprising Sal trees. There are pockets of open jungle throughout the district. Other parts are covered with partially dense and mixed forest types. Sal is the most important tree with Sakhua, Kathal, Khair, besides that Pipal, Gular, Banyan and Mango are also found.

ANALYSIS

Buffer Analysis

Buffer Zone Analysis is used to define spatial proximity. Many GIS support the automatic compilation of the Buffer Zones, there, the operator interaction usually consist of keying in specific zone parameters, such as stipulating a zone with defined width on the either side of the feature.

In the present study the Buffer analysis has been used to find out the accessibility of features like roads, railway stations to the sites available for the development of eco-tourism destinations. Buffer analysis is also been carried out to get the spatial proximity of major river banks, lake and dam sides to be selected for promoting sustainable ecotourism. The Buffer analysis of major roads shows the proximity of areas to the state highways and major district roads. The spatial proximity defined in this case is 2 Km, the three buffer rings reflects the hierarchy of accessibility. The ring closer to the road stands for high accessibility; the areas lying in the highest accessibility zone may be considered as the most valuable for the development of eco-tourism sites. As the distance increases from the road the chances of selection of the area, lying in the second and third ring of spatial proximity, to be converted as ecotourism sites diminishes. Buffer analysis, has also been carried out to know the accessibility of areas from the major railway stations situated in the district. The spatial proximity defined in this analysis is 3 Km. The concentric ring zone, which is 3 Km from the railway station has high accessibility, the zone which has 3-6 Km has moderate accessibility and 9 Km has the lowest accessibility in terms of converting the area into a eco-tourism destination. Similar exercise has been done to identify the areas which have good proximity to the rivers and major water bodies (including man-made and natural). The spatial proximity defined in this case is 1 Km. Only two rings have been created to find out the accessibility, to develop areas close to them for promoting eco-tourism.

Overlay Analysis

Overlay analysis is a spatial operation in which a first thematic layer containing polygon, line or area is superimposed into one another to form a new thematic layer with new polygons. The thematic layers and information relevant (i.e. settlements, transport network, forest areas, population density) for the present study have been opened on a GIS platform and overlay analysis has been conducted using the geo-processing tools. The three buffer zone maps depicting the accessibility of areas to roads, railway stations, major rivers and water bodies were also brought to the same platform which finally generated the potential areas that can be converted into eco-tourism destinations.

A Digital Terrain Model (DEM) has been generated using the contour values to develop an in-depth understanding of the topography of the region. The relevant themes like roads, forest areas and settlements were draped on the DEM to further enhance the ability to make an assessment of the topography and other landuse of district in delineating the potential zones of eco-tourism development.

LOCATION OF POTENTIAL ECOTOURISM SITES

On the basis of accessibility and availability of resources two types of sites have been identified to be developed as ecotourism sites.

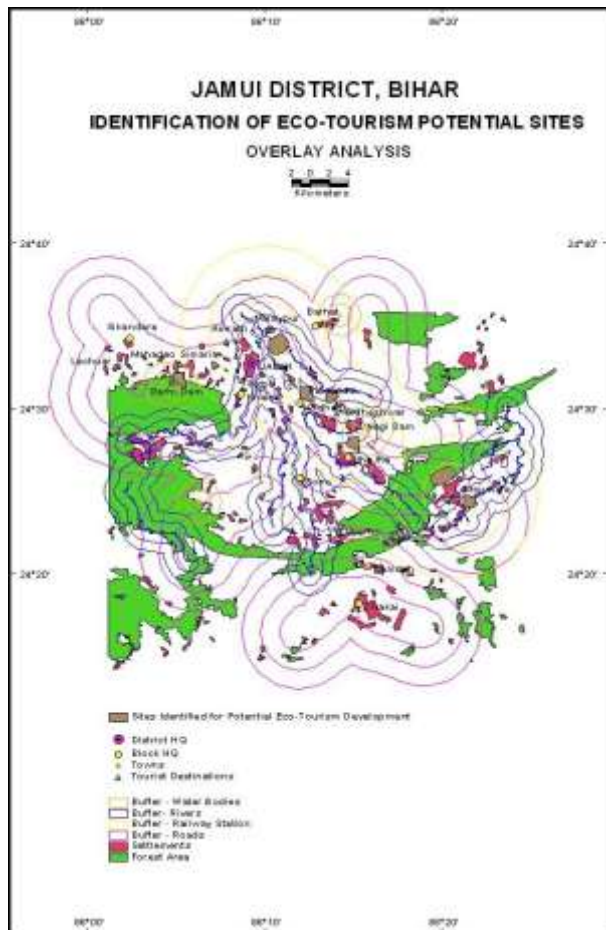
Most Suitable

- The area near the district headquarters of Jamui along the Kiul River.
- Hills around Patsanda and Gidhour.
- The stretch between Jhajha and Nagi Dam
- The hilly and forest areas lying between Simultala and Jhajha

Moderately Suitable

- The area around Garhi Dam, which has been constructed over Kiul River, that supplies drinking water to the town of Jamui and water for irrigation purposes.

Garhi Dam and its vicinity is incredibly exquisite in terms of the natural beauty but it has been put in the category of moderately suitable locations due of its lack of connectivity to the major transport network (road and railway) available in the district.



PROBLEMS OF TOURISM DEVELOPMENT IN JAMUI DISTRICT

In spite of having variety of tourism opportunities, from, destinations of religious and spiritual interest like Kakan and Lachuar to the picturesque scenic locations of Simultala to the places of historical interest like Gidhour Fort and Minto tower the district has failed to harness its tourism potential. It has meagre share in the overall tourist arrivals (domestic and foreign) to the state of Bihar. Earlier, it was considered that the main reason behind the lack of tourism development is the unavailability of tourism infrastructure i.e. transport and communication. Over the years this problem has been largely addressed and the condition of tourism infrastructure has improved a lot. However, tourism superstructure (hotels, restaurants, public utility) is still limited to the district headquarters. When the condition of tourism infrastructure and superstructure is drastically improving in the other tourist destinations of the state, the rate of growth of tourism industry is sluggish and almost stagnant in the district of Jamui. The reason hindering the growth of tourism in the district is also the cause of concern for the country as well as the state. Jamui district is one among the 19 districts of the state that are immensely affected by the menace of the left wing extremism. It lies in the portion of Bihar that is part of 'red corridor' of India, the region infested with heavy Maoist and Naxal violence. Incidents of kidnapping for ransom, landmine explosion, uprooting of the railway tracks,

mass killing and burning of property in the name of people's war is quite common in the district.

The district has a undulating terrain and hilly topography, bordering the state of Jharkhand, which is also badly affected by Maoist violence. As a matter of fact, these hills are also covered with dense forests. The hills and dense forests are the prominent hideouts and training ground for the Maoists. It is easier for them to carry out their cowardly act of violence in the plains and disappear in the forests and hills. It is well known that any kind of political instability, war, acts of violence directly influence the travel propensity and hinders all kind of non-essential travels to these areas. Jamui is presently bearing similar sort of image imprinted on the mind of tourists, as a reason the tourists fears to visit the destinations situated in the district, making the development and promotion of any kind of tourism a daunting task.

CONCLUSION

It is a known fact that poverty and social exclusion are the main force that pushes people, resorting towards violence. All over the world tourism has been used as a tool to eradicate poverty and generate good will among people. Tourism, in sustainable form should be promoted in the district to integrate local communities in the development process and to distribute fruits of development with equity. It is essential to create congenial environment through confidence building among the local community and socially excluded and economically deprived communities through tourism as an agent and to attract those who have chosen the path of violence to bring them back into the mainstream.

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