

# Assessing Tourism Potential in Bihar, India: A District-Level Evaluation Using Composite Indicators Influencing Tourism Growth

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## Abstract

Tourism has emerged as a prominent employment generation sector in recent years. Therefore, it's pertinent to explore the potential of concerned areas for enhancing their competitive edge and also to attract better tourism plans for the region. In this study, an attempt has also been made to explore the tourism potential of selected districts of Bihar, considering direct and indirect factors influencing tourism attraction. This study employed the Weighted Sum Method (WSM) and the Analytical Hierarchical Process (AHP) to compute the composite weight of 12 indicators under direct and indirect factors for each district, and based on the final weight, the districts were ranked accordingly. Further, the districts were clustered into 4 groups: very high potential, high potential, low potential, and very low potential. The result suggested that the districts classified into very high and high tourism potential were in par with core tourism districts of Bihar with the exception of Muzaffarpur and Rohtas, while the districts with low and very low tourism potential were located in peripheral areas. The study further paves the way for better tourism planning of the district, with an emphasis on collaborative and integrated development plans.

**Keywords:** Tourism Potential, Weighted Sum Method (WSM), Analytical Hierarchical Process (AHP), Composite Indicators, Bihar

## Introduction

Bihar has remained a cradle of knowledge, learning, and innovations since ancient times (Raju, 2019); that's truly reflected in the archaeological grandeur of Nalanda

University. It was in the holy land of Bodhgaya that Lord Buddha was bestowed with true knowledge and became the enlightened one (Singh, 2011). Today, the UNESCO World Heritage list includes these revered sites, drawing millions of tourists annually. On the other hand, Vikramshila University in Bhagalpur, another prominent ancient knowledge center, lags far behind in terms of tourism attraction. Similarly, there are numerous magnificent heritage, religious, and natural sites dotted across different districts in Bihar that tourists often let go by. This phenomenon is a reflection of a broader system of tourism attractions in different places (Fyall & Garrod, 2020), where the spatial structure assumes a complex and diverse topic that depends on many factors, like the availability of social and physical infrastructure (accommodation, transportation etc.), how resources are spread out, differences between regions, and their level of socio-economic development (Jin et al., 2024). Such a broader system of attraction impacts the overall tourism potential (Yan et al., 2017), which is defined as a capacious concept covering a sum total of the tourism resources pertinent for the organization of tourist activity in a particular area, though not necessarily restricting it within a resource-based perspective (Le et al., 2020; Neupane et al., 2013; Yan et al., 2017). Additionally, it is essential to analyze accompanying resources, including the supply analysis, competition assessment, market trends, and demand evaluation (Andrades-Caldito et al., 2013; Bassey, 2015; Shpak et al., 2021). However, the current tourism development often overlooks the broader aspect of tourism potential in planning processes (Ekong,

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2023), resulting in under-utilization of tourism potential (Imikan et al., 2022), especially in states like Bihar, which exhibit low overall development levels across different parameters but have large-scale regional (district) disparity. As for instance, the energy consumption in Patna is more than 5500 megawatts, whereas in Madhepura district it's only around 400 megawatts (IPS, 2024). Similarly, the disparities in other components may serve as 'enabling' factors for a particular district and simultaneously act as 'disabling' factors for another. Since tourism potential encompasses the aggregate of natural, cultural, historical, and socio-economic infrastructures, along with other operational factors, it becomes pertinent for the integration of these factors in analyzing the tourism potential at the district level in tourism planning processes and attracting plans for tourism development projects. Bihar was ranked 9<sup>th</sup> in foreign tourist visits and 15<sup>th</sup> in domestic tourist arrivals in the year 2019 (Baghel & Alam, 2020), reflecting the rapid strides made by this sector due to various state and central government initiatives. However, due to the underdevelopment of infrastructural facilities, including inadequate approach roads, insufficient government hotels, limited access to basic amenities such as electricity, and medical facilities, tourists constantly face challenges related to accommodation, transportation, and other aspects (Shpak et al., 2021). Moreover, tourists concern regarding the safety and security of the destination while travelling within the state or at different sites negatively impact the tourist retention and discourage them from exploring the region's rich destination. Since, in the contemporary context, tourism is a significant driving force for revenue generation and economic development, it is natural to shift focus on assessing tourism potential. A comprehensive analysis of development factors, along with the tourism resources at the site, may facilitate the identification of a new district for inclusion in the tourism map of Bihar. It may support government bodies in effective allocation of resources for district development in relation to their tourism potential (Yan et al., 2017). In the light of these facts, this study aims to identify the tourism-boosting indicators, including direct factors, such as tourism resources, and indirect factors, like development indicators. Further, the study aims to explore the tourism potential of selected districts in Bihar by analyzing composite weights of both direct factors (tourism resources) and indirect factors (development

indicators). Composite score facilitates the classification of districts into four groups, reflecting the existing pattern of high or low tourism potential and indicating future tourism development prospects for the identified clusters.

## Literature Review

### Themes Studied

The research on tourism can broadly be divided into studies that look at tourism potential in specific local or regional areas (Rozanova et al., 2018) or focus on different administrative areas like rural (Sergeevich et al., 2015), urban (Neupane et al., 2013), or district levels (Al Mamun & Mitra, 2012). On the other hand, there are several intrinsic factors enhancing the prominent tourism features, like religious, natural, or cultural ones. Scholars (McKercher & Ho, 2006; Atsbha, 2015) tried to assess the tourism resource potential of natural, cultural, and heritage attractions. Mamraeva and Tashenova (2020) tried to assess both regions' tourism and recreational resource potential.

### Indicators for Tourism Assessment

The significant literature concerning indicators selected for the tourism potential determination includes the framework of (McKercher & Ho, 2006), which consists of four dimensions: cultural, physical, product, and experiential value. Over time, various scholars have adopted these indicators in modified form. Al Mamun and Mitra (2012) and Popichit et al. (2013) considered physical, social, and environmental factors as key indicators. Konwar and Chakraborty (2014) classified indicators into primary products of tourism and secondary aspects like technical facilities and basic tourism infrastructure as a foundation of a tourist attraction for a given destination. Andrades-Caldito et al. (2013), distinguished between endowed (for measuring internal tourism potential) and created resources (for measuring external tourism potential). Trukhachev (2015), included six groups of factors: economic, distribution of population, environmental, cultural, infrastructural, and psychological. Herasymenko (2016) considered that the tourism potential of the territory is a set of four main components: natural resources, historical and cultural, economic, and social,

which are interconnected and interact with each other. Chen et al. (2021) employed the following indicators: the destination's supply and consumption capacity; the demand and purchasing power of the source place; the development value of the destination resource; and the contribution of the destination tourism industry. Irawan et al. (2023) employed four physical parameters: distance, amenities, accessibility, and attractiveness. The factors selected for the determination of tourism potential have expanded over time to include demand-side and supply-side factors, as these are part of the functioning tourism system (the FTS) (LE et al., 2020), in other words, how the tourism system works.

## Methods

A plethora of methodologies have been employed to assess the tourism potential of resources and destinations. The methodology employed in the determination of tourism potential can be categorized into the model of McKercher and Ho (2006) widely used in the determination of cultural tourism potential. Other methods include descriptive analysis and SWOT analysis. Collins-Kreiner and Wall (2007), remote sensing, and GIS (Mikhailidi, 2014). But the most popular method for potential determination has remained the weighted sum method (Al Mamun & Mitra, 2012; Neupane et al., 2013). Yan et al. (2017) modified WSM into a mathematical framework for evaluating tourism potential. This model has been employed by Petrović et al. (2020) to assess the tourism potential of the monasteries of the Ibrar cultural zone. Sergeevich et al. (2015), in his study, developed the WSM as a rating

assessment of agro-tourism potential by computing an integral score of the attractiveness. Augusty et al. (2022) employed a scoring analysis method to evaluate the development phases of tourism. In his study Bratić et al. (2020) utilized it as a modified geo-site assessment model (M-GAM) to assess the tourism potential of geo-heritage sites. Due to the popularity and user-friendliness of the weighted sum method (WSM), this technique was used in this study for calculating the composite weight of each district in evaluating tourism potential, while the Analytical Hierarchical Process (AHP) was incorporated to ascertain the weights of indicators.

## Material and Method

### Study Area-Selection of District

Bihar is an eastern state of India. The state ranks as the 12<sup>th</sup> largest by area and is organized into 38 districts. Historically, it has remained a notable administrative center and a revered site for three great religions of the world: Sikhism, Jainism, and Buddhism. Considering the region's religious and historical prominence, the selection of districts for this study was primarily based on the availability of a minimum of two sites of national or international significance. The second criterion chosen pertained to the availability for published data of the selected indicators on the official websites and reports. Using the two criteria, 16 districts were selected, with Rohtas and Kaimur and Jamui and Banka treated as a single unit due to their comparable landscapes. Table 1 presents the descriptions of tourism attractions.

**Table 1: Shows the Tourism Attractions in Selected Districts**

District	Description of Sites
Gaya	The religious site of Gaya is a revered site for three great religions: Hinduism, Buddhism, and Jainism. The Mahabodhi temple complex is also listed in the UNESCO World Heritage Sites. The geology and the topographical features of the district also qualify it to fit in the category of geo-heritage sites.
Nalanda/ Rajgir	The administration and cultural center of ancient India. It houses the renowned ancient university of Nalanda, the peace pagoda, and cyclopean walls. There are also eco-sites like Jungle Safari, <i>Ghora Katora</i> Lake, and a natural hot springs. The district has also flourished as a cultural center with the development of the craft village in Nepura.
Patna	The ancient city of <i>Patliputra</i> houses several historical, archaeological and religious landmarks. The notable sites being, Takhat Sri Harmandir ji Patna Sahib, Kumharar park, Maner sharif, iconic Golghar and several other sites.
Vaishali	Vaishali holds important historical and religious sites like Raja Vishal ka Garh, Vishwa Shanti Stupa, Ashokan pillar, etc.

District	Description of Sites
Bhagalpur	Vikramshila University, another prominent knowledge center of ancient India, is located at Antichak. There are several religious sites like Ajgaibinath Temple, Sultanganj, Colganj Rock Cut Temple, Vasupujya Janyalaya and Vikramshila Dolphin Sanctuary.
Rohtas/Kaimur	The Rohtas/Kaimur region represents the best amalgamation of religious, historical, and natural sites. Maa Mundeshwari temple at Kaimur hills is one of the oldest functional Hindu temples. The tomb of Sher Shah Suri at Sasaram is a notable historical site. The natural sites—Telhar Kund and Tutla waterfalls—are some of the breathtaking sites in the district.
Darbhanga	The royalty of Darbhanga <i>maharajas</i> can be seen in several palaces of the city. The intricate alignment of innumerable art and craft of the district has earned it the name of the cultural capital of Bihar. The district also consists of natural sites like <i>Kusheswarsthan</i> wetland.
East Champaran	The district houses the world's highest Kesaria stupa. It is the birthplace of notable English writer George Orwell and religious sites like the Areraj Shiv temple.
West Champaran	The location of the district at the foothills of the Shiwalik has bequeathed it with eco-sites like the Valmiki Tiger Reserve. There are also archaeological sites like Ashokan Pillar and Lauria Nandangarh.
Madhepura	The district is famous for the religious and cultural regions. There are sites like <i>Singheswarsthan</i> , Sri Nagar Gram Uttar, Guptakal Shiv Temple, and Vishu Raut Temple.
Munger	It is a confluence of the religious, historical and natural sites. The notable site of <i>chandika shaktipeeth</i> is highly revered among Hindus, while the presence of Sufi sites makes it equally pious for Muslims. The ghats and <i>yoga ashram</i> in the fort area makes it a unique attraction for tourists.
Muzaffarpur	Muzaffarpur is known for its religious and historical sites like the Garib Nath temple and the Khudiram Bose memorial, respectively.
Aurangabad	The district is known for the deo sun temple and sufi sites.
Nawada	There are noted natural and historical sites in Nawada district like Kakolat fall, caves, Sarvodaya Ashram, Apsar garh, and Haldiya hills.
Buxar	The district of Buxar is an eminent part of Ramayana Circuit. It is popularly known for its religious and historical sites.
Banka/Jamui	The districts of Jamui and Banka are bestowed enormous picturesque view of natural sites. There are several sites related to Jain and Hindu religion.

Source: Compiled by the author.

## Selection and Description of Factors

The existing literature suggests a plethora of indicators used to determine the tourism potential of various regions. Depending upon the objective of the study, the indicators were selected from the previous studies. Table 2 represents the sources of indicators chosen for this study categorized as direct and indirect factors. This study analyses the direct and indirect factors influencing tourism growth and development. The subsystem of the direct factors was obtained by conflating the tourist's

demand at the site, the availability of services, and the description of the factors in academic literature. The indirect factors, though not an essential or immediate requirement in tandem with the tourist's site, function as a catalyst, enhancing tourism experiences and significantly influencing tourists' site selection decisions. Consequently, due to their prominence, the factors were obtained from the contemporary subject matter of the research on tourism potential. Table 2 presents the description of the selected criteria.

**Table 2: Factors Impacting Tourism Development**

Target Layer	Sub-System	Indicator	Measuring Unit	Polarity	Source of Indicators
Direct Factors	Attraction	No. of surveyed tourists' site	tourist's site attraction	+	(Chen et al., 2021)
		No. of local guides	local guide	+	(Bassey, 2015; Bratić et al., 2020)
	Accommodation	No. of hotels recognised by government	Hotels	+	(Zhang et al., 2022)
	Transportation (Ease of access)	Distance of nearest airport from popular site	Kilometers	-	(Chen et al., 2021; Irawan et al., 2023)
		Distance of nearest railway station from popular site	Kilometers	-	(Chen et al., 2021; Irawan et al., 2023)
		Distance of nearest bus stop from popular site	Kilometers	-	(Chen et al., 2021; Irawan et al., 2023)
		Density of road including National highway, State highway and major district roads	Kilometers	+	(Chen et al., 2021; Irawan et al., 2023)
Indirect Factors	Social Infrastructure	Health Institution	Health Institution	+	(Kaynak & Kara, 2012)
		Energy consumption	Megawatt	+	(Rasool et al., 2023; Trinajstić et al., 2022)
		Crime	Crime	-	(Khan et al., 2022; Shpak et al., 2021b)
	Environment	forest cover	Per sq km	+	(Andrades-Caldito et al., 2013)
		green energy initiative	Megawatt	+	(Khan et al., 2022)

Source: Compiled by the author.

## Data Sources

The present study is based on the data obtained from secondary sources published by various government agencies from the year 2018 to 2023 (the latest available data for each indicator in the concerned year). The data concerning the indicator of attraction, i.e., the number of surveyed sites, the number of tour guides, the number of government hotels, and distances from popular sites

to roads, railways, and bus stops, were derived from the various publications of the Tourism Department, Bihar, on its website *Bihartourism.gov.in*. Transportation data relating to the density of different roads and social infrastructure data like health institutions, forest resources, and energy availability were obtained from the IPS (2024). The crime-related data was obtained from the Bihar Statistical Handbook (2018). Table 3 shows the selected district and indicators.

Table 3: Data for the Indicators of Selected Districts

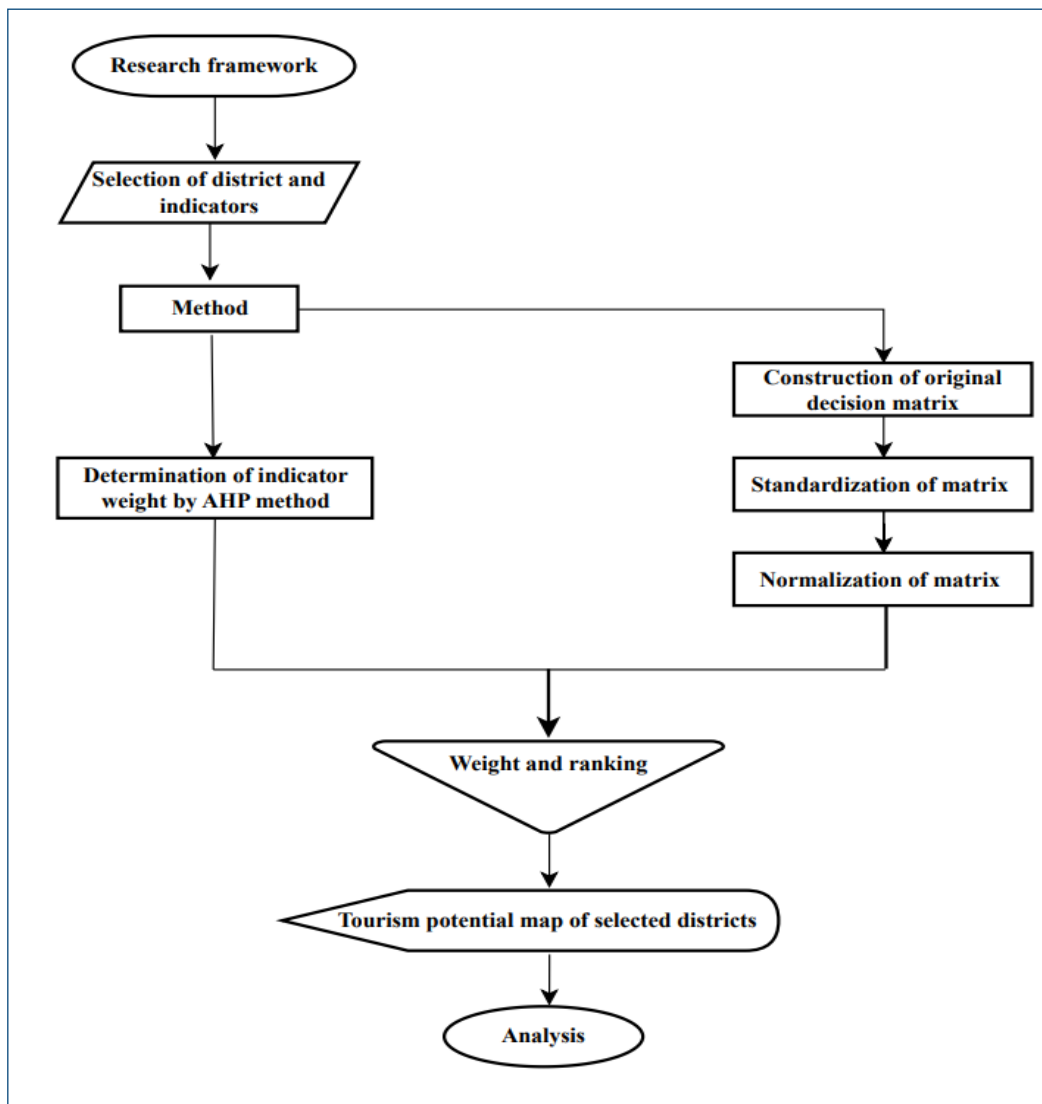
Name of District	No. of Surveyed Sites*	Local Guides*	Nearest Airport*	Nearest Railway Station*	Nearest Bus Stand*	Density of Road**	Hotels*	Health Institutions**	Energy Consumptions**	Green Initiative**	Forest Cover**	Crime***
West Champaran	18	2	265	40	1	752	4	610	825	40	903	8864
Vaishali	28	12	72	39	15	731	2	392	914	187	115.7	9668
Rohtas/Kaimur	23	4	164	44	44	1473	4	524	1901	48	1721	10982
Patna	38	5	20	3	7	1696	22	480	5437	3353	28	9581
Nalanda/Rajgir	33	16	105	6	4	839	9	437	1254	920	39	10533
Muzaffarpur	23	1	54	2	2	1002	9	622	1474	484	166	18611
Munger	24	3	175	56	57	238	4	187	451	36	286	4834
Gaya	36	59	10	17	1	1473	21	555	2018	196	603	14520
Buxar	12	1	119	2	1	366	2	190	693	18	6	5784
Bhagalpur	19	5	232	10	5	564	5	402	1127	143	69	8743
Aurangabad	8	1	61	3	2	903	2	324	977	67	160	5198
Darbhanga	15	1	5	3	4	622	2	330	891	97	138	8138
Nawada	13	1	62	17	4	652	2	227	705	93	517	6034
East Champaran	20	2	108	52	19	970	4	515	1168	64	165	2776
Banka/Jamui	5	1	200	10	11	1068	4	601	953	24	938	9805
Madhepura	7	1	110	6	1	334	5	316	369	9	53	5416

\*www.bihartourism.gov.in \*\* Economic Survey of Bihar, (2023-24), \*\*\*Bihar Statistical handbook, 2018.

## Methods

This study employed the weighted sum model (WSM) to evaluate the tourism potential of the selected district. The method's initial step involved arranging the obtained data for a given indicator of a concerned district in a matrix (1), followed by the standardisation (2, 3) and normalisation (4) of the values in steps 2 and 3, respectively. The sub-indicators' weight was determined in step 4 (5.a.,

5.b., 6, 7). Several methods have been devised for the determination of indicator weight, like the mathematical model proposed by Yan et al. (2017). But one of the most commonly used methods in determining indicator weight is the Analytical Hierarchical Process (AHP). In this study, the AHP method was used to calculate the sub-indicators' weights. The sub-indicator's weight obtained through this process was used to calculate the aggregate weight of a particular district in step 5 (8), reflecting its tourism prospects. Fig. 1 displays the study framework.



**Fig. 1: Research Framework**

**Step 1: Construction of Original Decision Matrix for Standardization**

In the given decision matrix, it is assumed that there are  $n$  number of objects and  $m$  evaluation index indicators. So, the original decision matrix is written as matrix  $X$  (1)

$$X = (X_{ij})_{m \times n} = \begin{pmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{pmatrix} \quad (1)$$

**Step 2: Standardization of Matrix**

The indicators selected contain two types: positive indicators (+) and negative indicators (-). A positive indicator indicates that the higher the index value, the better the indicator. A negative indicator indicates a smaller value is better. For the higher-the-better attribute, the standardized value  $Y_{ij}$  can be calculated based on Equation (2):

$$y_{ij} = \frac{x_{ij} - \min x_{ij}}{\max x_{ij} - \min x_{ij}} \quad (2)$$

For the smaller, the better attribute, the standardised value  $Y_{ij}$  can be calculated based on Equation (3):

$$y_{ij} = \frac{\max x_{ij} - x_{ij}}{\max x_{ij} - \min x_{ij}} \quad (3)$$

Where  $x_{ij}$  is the value of the  $j$ th indicator of the  $i$ th sample.  $\max x_{ij}$  and  $\min x_{ij}$  are the maximum and minimum values of the  $j$ th indicator, respectively.

**Step 3: Normalization of Matrix**

$$P_{ij} = Y_{ij} / \sum_{i=1}^m Y_{ij} \quad (4)$$

Equation (4) consists of the formula of a normalised matrix where  $Y_{ij}$  is a standardised value of the  $j$ th indicator in the  $i$ th criteria and  $P_{ij}$  is the normalised value of the  $j$ th indicator in the  $i$ th criteria.

**Step 4: Determination of Criteria Weight by AHP**

One of the main issues with MCDM problems is weight allocation, and the Analytical Hierarchical Process has much relevance for the problem, which is difficult to quantify in multi-criteria decision-making processes. It is an effective tool for determining criteria weight. This study also devised the Analytic Hierarchy Process (AHP) to allocate relative weights to various attributes, both direct and indirect, that impact tourism development. A pairwise comparison matrix was created to assign value (reciprocal value) to the relevant criteria on a scale of 1-9, as suggested by Saaty, 1987 and shown in Table 4. Thereafter, the matrix was normalized by dividing each value in the column of the pairwise comparison matrix by the sum of the column. Further, the weight of indicators was computed by finding the average of each row in the normalized pairwise comparison matrix.

**Table 4: Scale of Relative Importance**

Intensity of Importance	Definition
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extreme importance
2,4,6,8	Intermediate values
1/3, 1/5, 1/7	Values for inverse comparison

Source: Saaty, 1980.

After determining the weight of each criterion value necessary for tourism development, the consistency check of the factors was performed by computing the Consistency Ratio (CR). Equation (7) was used to calculate CR using the Consistency Index (CI) and Random Index (RI). Where CI was calculated, with the help of equation (6), and Random Index (R.I.) values were obtained from Table 5. These are standard values for a given number of matrices proposed by Saaty (1980), later improved by successive scholars. The value of Random Index (RI) for matrices of order 1 to 15 (1 to 15 elements in one level) is shown in Table 5.

**Table 5: Random Index (Standard values)**

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0	0	.58	.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.58

Source: Saaty, 1980 and Yap et al., 2018.

The original pairwise comparison matrix (without normalisation) was considered in this procedure; each column's value was multiplied by the weight of the relevant column (criterion), and then the weight was aggregated row-wise to obtain a weighted sum value. Thereafter, the lambda ( $\lambda$ ) value was calculated by dividing aggregate weight, i.e., weighted sum value, by the criterion weight as shown in equation (5.a.). Further, lambda ( $\lambda$ ) max was derived by computing the average of the lambda ( $\lambda$ ) equation (5.b.).

$$\lambda = \frac{\text{Weighted sum value}}{\text{weights}} \quad (5.a.)$$

$$\lambda_{max} = \frac{\sum \lambda}{n} \quad (5.b.)$$

After obtaining  $\lambda_{max}$ , Consistency index was calculated, equation 6.

$$\text{Consistency Index} = \frac{\lambda_{max} - n}{n - 1} \quad (6)$$

In the matrix, n represents the number of factors under comparison, while  $\lambda_{max}$  represents the highest eigenvalue of the pairwise comparison matrix. It is an important validating variable when using the AHP method. It acts as a reference index during the consistency check, as it is used to obtain the consistency index (CI).

The consistency ratio, CR, is the ratio of CI and RI as shown in formula (7).

$$CR = \frac{CI}{RI} \quad (7)$$

If the CR value exceeds 0.1 ( $CR > 0.1$ ), then it means that the pairwise comparison matrix needs to be reviewed, revised, and re-evaluated (Yap et al. 2017), while if the CR value is less than 0.1 ( $CR < 0.1$ ), it suggests that the pairwise comparison matrix has adequate consistency.

*Step 5: Calculation Of Score and Assigning of Rank for Each Selected District*

$$P(D_i) = \sum_{j=1}^n w_j P_{ij} \quad (8)$$

Where P(D<sub>i</sub>) is the tourism potential score secured by each district, P<sub>ij</sub> is the normalised value of the jth indicator in the ith criteria, and w<sub>j</sub> is the weight obtained for each indicator in each district.

*Step 6: Clustering And Mapping of the Districts with Similar Tourism Potential*

The obtained scores were used to group districts with comparable tourism potential into clusters. In order to classify the districts into common clusters, the quartile function was used in MS-Excel, resulting in four distinct categories: very high, high, low, and very low tourism potential. Districts within each cluster were accordingly designated as possessing very high tourism potential, high tourism potential, low tourism potential, and very low tourism potential.

## Result and Analysis

The final weight and value of each criterion (indicator) are displayed in Table 6, reflecting their estimated relative direct or indirect influence on the region's tourism growth prospects. The final weights assigned to the factor affecting tourism development are as follows: number of sites (17.5%), local guides (14.35%), nearest airport (11.55%), nearest railways (11.47%), density of road (9.79%), nearest bus stop (8.48%), hotels (7.14%), health institutions (6.47%), energy consumption (4.49%), green energy (2.80%), forest cover (2.94%), and less crime (3.35%). The table also reports the calculated consistency ratio (CR) value of 0.07 (7%), which is below the acceptable threshold of 0.10 (10%) and thus validates the composite weights derived for the indicators across districts.

**Table 6: Final Weight of Criteria and % Weight of Each Indicator**

	No. of Surveyed Sites	Local Guides	Nearest Airport in kms (Most Famous Site)	Nearest Railway Station from Famous Site (in kms)	Nearest Bus Stand	Density of Road in Kms	Hotels	Health Institutions	Energy Consumption	Green Initiative (Solar Power)	Forest Cover	Crime	Final Weight (Wj)	Weight In %
No. of sites	0.20	0.39	0.20	0.20	0.13	0.16	0.19	0.17	0.11	0.08	0.12	0.12	0.172	17.15
Local guides	0.07	0.13	0.30	0.20	0.19	0.23	0.10	0.09	0.11	0.10	0.09	0.12	0.144	14.35
Nearest airport	0.10	0.04	0.10	0.20	0.25	0.08	0.15	0.09	0.11	0.10	0.09	0.08	0.116	11.55
Nearest railway	0.10	0.06	0.05	0.10	0.19	0.16	0.15	0.13	0.15	0.13	0.09	0.08	0.115	11.47
Nearest bus stop	0.10	0.04	0.03	0.03	0.06	0.16	0.15	0.09	0.07	0.13	0.09	0.08	0.085	8.48
Density of road	0.10	0.04	0.10	0.05	0.03	0.08	0.15	0.22	0.07	0.08	0.14	0.12	0.098	9.79
Hotels	0.05	0.06	0.03	0.03	0.02	0.03	0.05	0.13	0.18	0.10	0.09	0.08	0.071	7.14
Health institution	0.05	0.06	0.05	0.03	0.03	0.02	0.02	0.04	0.11	0.13	0.12	0.12	0.065	6.47
Energy consumption	0.07	0.04	0.03	0.03	0.03	0.04	0.01	0.01	0.04	0.08	0.09	0.08	0.045	4.49
Green energy	0.07	0.03	0.03	0.02	0.01	0.03	0.01	0.01	0.01	0.03	0.06	0.04	0.028	2.80
Forest cover	0.05	0.04	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.03	0.08	0.029	2.94
Less crime	0.07	0.04	0.05	0.05	0.03	0.03	0.02	0.01	0.02	0.03	0.01	0.04	0.034	3.35
SUM	1	1	1	1	1	1	1	1	1	1	1	1	1.000	100.00

 Consistency ratio= 0.066; consistency index=0.099;  $\lambda=13.2$ ; R.I.=1.48.

Successively, the final weight was determined for each district using equation 8, followed by the ranking of the districts as listed in Table 7. The district with the highest

potential was accorded Rank 1, while the district with the least potential for tourism received Rank 16.

**Table 7: District-Wise Tourism Potential Based on Rank**

Name of District	Weights	Rank	Name of District	Weights	Rank
West Champaran	0.0313	13	Buxar	0.0291	15
Vaishali	0.0599	6	Bhagalpur	0.0423	9
Rohtas/Kaimur	0.0603	5	Aurangabad	0.0380	11
Patna	0.1246	2	Darbhangha	0.0495	7
Nalanda/Rajgir	0.0851	3	Nawada	0.0368	12
Muzaffarpur	0.0630	4	East Champaran	0.0453	8
Munger	0.0270	16	Banka/Jamui	0.0389	10
Gaya	0.1510	1	Madhepura	0.0294	14

Furthermore, based on the quartile values of secured weight, the districts were grouped into four clusters: very high tourism potential (Above 0.0609), high tourism

potential (0.0438-0.0609), low tourism potential (0.0354-0.0438) and very low tourism potential (Below 0.0354), as illustrated in Table 8 and presented in Map 1.

**Table 8: Tourism Potential Clusters Based on Potential Value Scale**

Value Scale	Tourism Potential	District Ranks	Observations
Below 0.0354	Very Low Potential-West Champaran, Madhepura, Buxar, Munger	13-16	Districts with some renowned historical, cultural, and religious sites but poor social and physical infrastructure. These districts are located at a great distance from the capital city and at the extreme periphery of core tourism districts.
0.0354-0.0438	Low Potential-Bhagalpur, Banka, Aurangabad, Nawada	9-12	In spite of better tourism sites, Bhagalpur and Banka/Jamui were identified with low potential. Aurangabad and Nawada are in spite of their proximity to core tourism, yet marred by their poor performance in other tourism development indicators.
0.0438-0.0609	High potential-Rohtas, Vaishali, Darbhanga, East Champaran	5-8	Mostly north Bihar districts with cultural and religious sites. Rohtas/Kaimur in the south -natural, historical, and cultural sites.
Above 0.0609	Very high potential- Gaya, Patna, Nalanda and Muzaffarpur	1-4	It is a core tourism area of international importance and is already attracting tourists. Muzaffarpur is the only district in north Bihar district to be identified as a very high potential district.

### Very High Tourism Potential

There were four districts identified with very high tourism potential, as illustrated in map 1.a. Gaya continues to hold the top rank on the tourism potential list, followed by Patna. The spiritual and religious confluences have

organically favoured Gaya to reinstate its position as a premiere tourism attraction in Bihar. Similarly, the city of Patna, leveraging its historical and administrative status as a capital city, has emerged as a better-performing district, surpassing other districts in tourism potential. The district of Nalanda, with its recent developments

in tourism resources, including the glass bridge, sports, educational complexes, and better road connectivity from the capital city, qualifies as a district with high tourism potential. While the first, second, and third ranked districts aligned the current tourism attractions, the appearance of Muzaffarpur in the fourth position was a matter of sheer astonishment, given that Munger—despite its lower rank—boasts more tourism sites. This disparity in tourism potential can be attributed to the recent development of industrial clusters, which enhance connectivity, health institutions, energy consumption, and green energy initiatives. Even according to the Bihar Statistical Handbook (2018), trade, restaurants, and hotels contribute 12.6% to the GDP of Muzaffarpur District. The enhanced infrastructural facilities have the capability to positively contribute to elevating the tourism potential of Muzaffarpur. Therefore, the inclusion of a district in various tourism schemes or circuits could generate new opportunities for tourism development in Bihar. The future prospects must prioritise historical sites, rural tourism, and agro-tourism, particularly to promote the GI tagged *sahi lychee* (a fruit).

### High Tourism Potential

The district of Rohtas (including Kaimur), securing fifth position, qualified as a district with high potential. Although it is not prominently marked on the tourism map of Bihar as a site of international or national significance—and neither foreign nor domestic tourists give much heed to historical or natural sites. However, the present study indicates that the district's diverse tourism sites, combined with moderate development of infrastructural facilities, enhance its overall attractiveness. The sixth position was occupied by Vaishali District. Although Vaishali is a prominent pilgrimage site for Jains and hosts several internationally renowned sites, it was identified with a lower tourism competitive edge compared to the Rohtas/Kaimur district.

Vaishali district was followed by Darbhanga. Despite its reputation as the cultural capital of Bihar, Darbhanga has not received significant promotion as a prominent tourism destination. However, this study suggests that its better social and physical infrastructure—coupled with

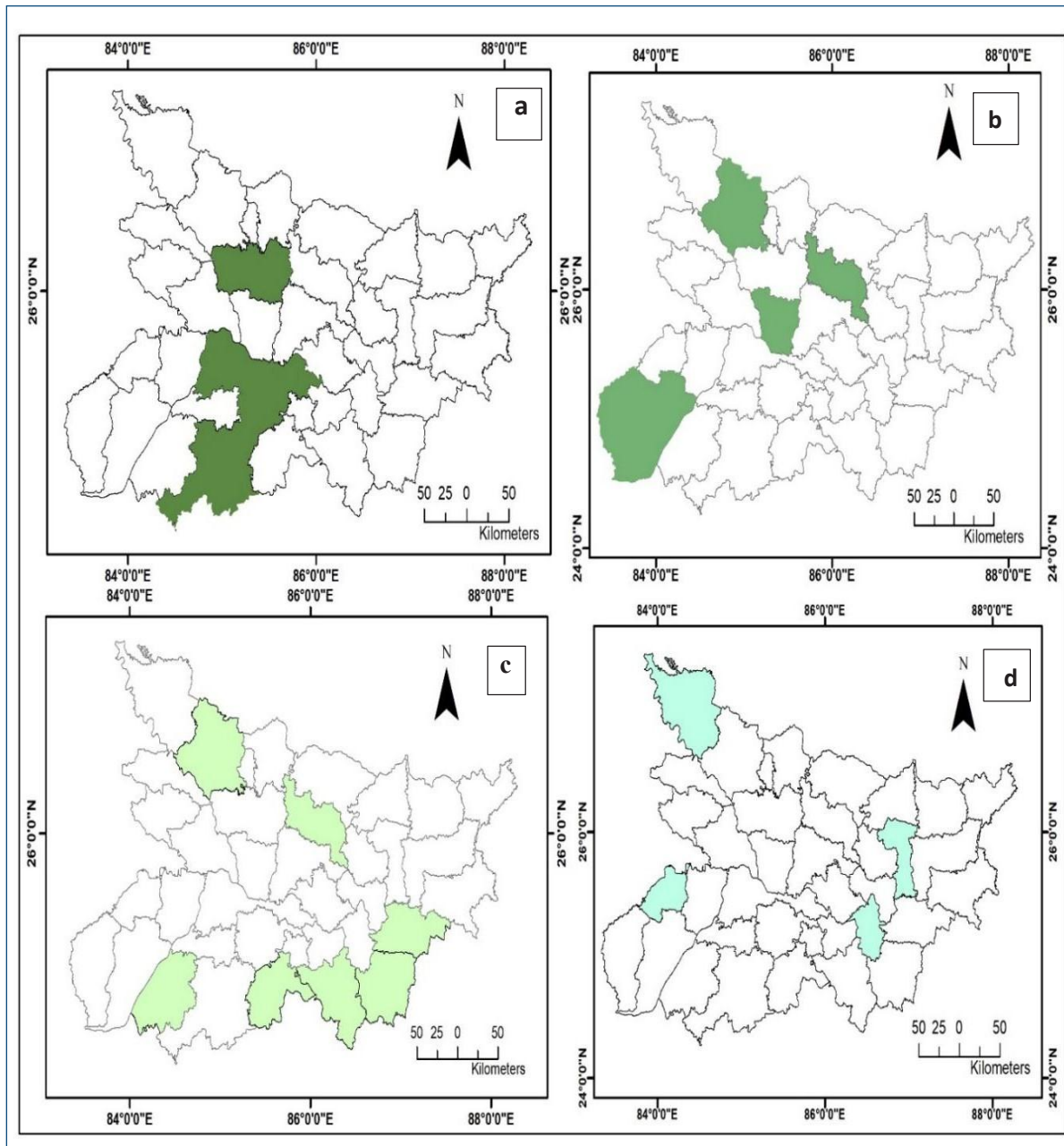
the forthcoming rural and cultural developments under various government schemes—will significantly boost its tourism potential. Trivedi (2020), in her study, also addressed the green energy initiatives in the rural tourism development of Darbhanga. East Champaran, with an adequate number of tourism sites and moderate levels of infrastructural development, was also categorized as a high-tourism-potential district. The district's attractiveness capability could be further enhanced by fostering a better transportation network and connectivity with nodal transit centers. Map 1.b. shows the high tourism potential district of Bihar.

### Low Tourism Potential

The districts with low tourism potential are depicted in Map 1.c. Bhagalpur, Jamui/Banka, Aurangabad, and Nawada were classified in this category and ranked ninth, tenth, eleventh, and twelfth, respectively. These districts host several globally recognised religious, historical, archaeological, and natural sites, supported by a moderate level of physical and social infrastructure developments. However, Bhagalpur and Banka/Jamui are disadvantageously positioned on the periphery of Bihar's core tourism districts and at a considerable distance from the capital city. Contrastingly, the districts of Aurangabad and Nawada—despite their proximity to these core areas—fail to utilize their locational advantage. Both districts currently experience precarious conditions in terms of approach roads, electricity supply, hospitals, and hotels. Consequently, they were designated as having a low tourism potential due to their inadequate availability of amenities.

### Very Low Tourism Potential

The four districts categorised as having very low tourism potential were West Champaran, Madhepura, Buxar, and Munger (Map 1.d.). Although these districts are renowned for their religious and historical sites, the current study identifies them as having lower tourism potential, attributed primarily to their extreme peripheral location and comparatively low level of development.



**Map 1: Clusters of Tourism Potential a. Very High Potential Districts, b. High Potential Districts c. Low Tourism Potential d. Very Low Potential**

## Discussions

The increasing significance of tourism as an economic driver has broadened the focus on improving destinations to enhance their competitive edge. Its prospects for regional development have spurred the scholars to explore tourism prospects and integrate these insights into strategies for improving the destination's performance. Bihar, the northeastern state of India, is

the least developed region of the country, characterized by limited economic prospects and an inadequate infrastructural facility. Under such circumstances, developing tourism in the region could serve as an elixir for the state's growth. Accordingly, the study proposes to explore the tourism potential at the district level by evaluating direct and indirect factors influencing tourism development across selected districts in Bihar. Further, the potential was determined by integrating the

Weighted Sum Method (WSM) and AHP (Analytical Hierarchical Process). The analysis revealed four distinct patterns of tourism potential in Bihar. First, the districts with very high tourism potential are in common parlance with the established tourism attraction and are drawing substantial tourist flow. Second, Muzaffarpur and Rohtas districts exhibit significantly higher potential than others, owing to better connectivity and availability of basic amenities. Under such circumstances, the strategies for district tourism development should prioritize innovative approaches, such as incorporating sites into government-sponsored schemes and circuits. Further to explore vast prospects in historical, religious, and rural tourism. For example, Muzaffarpur District offers ample opportunity in rural tourism, especially to showcase its orchards of *Sahi (noble) Lychee*.

Conversely, several districts, including East Champaran, West Champaran, and Bhagalpur, boasted rich tourism resources and moderate levels of physical and social infrastructural development. However, their tourism prospects are undermined by peripheral locations from core tourism districts. Here, efforts must be focused on fostering better inter-district connectivity between districts with lower tourism potential and core tourism districts. There must be a proper development of aviation infrastructures to enhance both national and international connectivity. Even the quality and quantity of accommodation facilities must be expanded. Klóska and Oleksiuk (2024) and Neupane et al. (2013) highlighted the importance of the development of the tourism infrastructure in unlocking the tourism potential in the eastern region. Furthermore, a collaborative development plan among similar sites is also essential; For instance, a joint framework can be drafted between the ancient university of Nalanda and Vikramshila University in Bhagalpur and other such sites, improvising development schemes of government functioning across different sectors. Lastly, it was observed that districts with lower tourism potential are located near core tourism areas. The extant literature suggests that the tourism sites possess low potential as they are marred by the structural incoherence and lack of social amenities. Crouch and Ritchie (1999) and Kaynak and Kara (2012) suggest that the structural improvements and the enhancement of the social amenities could substantially elevate the tourism potential.

## Conclusion

Tourism being multi-sectoral in nature, it is influenced by diverse determinants, which can be broadly categorised into tourism-resource-based perspectives and development levels. Effective tourism planning thus requires evaluating a region's potential through the lens of both dimensions.

Therefore, this study conducted a composite analysis of direct and indirect factors to assess the tourist potential of selected districts in Bihar. The findings suggest that South Bihar exhibits higher tourism potential than those in North Bihar. The districts located in the periphery of the capital city were recognized as having low and very low tourism potential. These issues can be addressed through targeted infrastructure development in less-performing districts and by fostering enhanced connectivity and linkages between districts with high- and low- potential areas. The result of the study offers a practical, adaptable managerial implication, particularly for resource allocation aligned with the concerned district's tourism potential and development prospects. Although the study successfully categorized districts to guide targeted development strategies, it further paves the way for the separate analysis of tourism resources and development level indicators of each district to identify the potential disparities in the direct and indirect factors.

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