

# Assessment of Local Residents' Perception of Selected Waterfall Sites in Eastern Chota Nagpur Plateau, India

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## Abstract:

The waterfalls are one of the geo-heritages, having the power to display a spectacular view through natural forces, attracting tourists to visit those sites. But it has not gained much recognition in terms of tourism development since there is very limited research done considering the views of the local people on such sites. Therefore, the current research focused on the perceptions of local residents on tourism development at selected waterfall sites in the Eastern Chota Nagpur plateau covering the states of Jharkhand and West Bengal. The local residents' perception on tourism development was tested using 19 variables. Descriptive statistics and inferential statistics were used to see the nature of the dataset. Exploratory factor analysis was applied to extract the factors. Then, multiple regression analysis was used to analyse the relationship between extracted factors as predictors and tourism perception as outcome variable. Kruskal Wallis test was applied to test the hypotheses and weighted composite mean score was prepared to rank the selected waterfall sites in Eastern Chota Nagpur plateau. The results indicate that the local residents see the tourism as socio-cultural, economic and environmental aspect which influence the tourism development. But attention should be taken by the authority to create jobs, involvement of local people in decision making, infrastructural development, local culture protection etc., to harness the potential of selected waterfall sites.

**Keywords:** Tourism; Local residents' perception, Waterfall, Exploratory factor analysis; Eastern Chota Nagpur plateau

## 1. Introduction

Natural Tourism Attraction is a major appeal for tourists, and Waterfalls are one of the significant destinations visited by many tourists for their natural beauty and its photogenic view (Muna et al., 2020). Waterfalls are effective as Geographic heritage, pondering physical features, geological events, tectonic movements and long-term erosional activities (Inoue et al., 2024). With the progress of tourism activity, Waterfall locations have become significant geo-tourist spots (Rutynskyi & Kushniruk, 2021). Waterfalls are considered nature's breathtaking resource, valued for their height, volume of water, sound, aesthetic beauty in Paksong District, Champasack Province (Sengduangchanh et al., 2025). Besides their visual

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allure, waterfall also has stimulated nature based recreational activities like swimming, trekking etc., thereby it enhanced the tourists' interest, which was the major pull factor for the visitors at Oluminrin Waterfalls in Nigeria (Arowosafe et al., 2022). Just to enhance the development of tourist sites, local residents' initiative and support were very fundamental by (Bhata et al., 2020).

Globally, in many countries, tourism destinations are renowned by locals as well as travelers such as at Tegenungan and Blangsinga waterfalls in Bali. Their active participation of local communities, tourists visit has considered as a key to tourism development and expanded its popularity (Amir & Semadi, 2021). In case of Asik Asik waterfall in North Cotabato, Philippines, local people have witnessed tourism as their source of income which raised their support towards tourism (Galleto & De Leon, 2022). Currently tourist destinations are mostly dependent on social media influence. Word of mouth suggestion to attract more tourists at Tumpak Sewu Waterfall, Lumajang (Syarofa et al., 2025). At Bogor Regency in Indonesia, tourists were the central character who have made major prospect in this industry (Kristiana et al., 2024b). But their development was actually dependent on local residents, like how tourism has reflected in their lives (Alrwajfah et al., 2019).

Local people's perception study is very common in cultural, heritage, and archaeological tourism sites. For example, in the Petra region in Jordan, where locals are motivated by gender and economic factors, there were also some negative effects, which are negligible in front of their level of satisfaction with tourism (Alrwajfah et al., 2019). According to Rasoolimanesh et al. (2016), Local residents were more involved with heritage tourism sites because of their cordial attitudes towards one another. In the urban and rural heritage world, the economic value and the involvement of the community have been important in the development of tourism but have not been emphasized enough in terms of environmental awareness and community values (Rasoolimanesh, Roldán, et al., 2016). Similarly, Chang et al. (2018) indicated that the indigenous community has considered tourism for economic support, even they could bear the negative effects of the environment for their sustenance.

Few studies have been conducted on local communities' opinions in waterfall sites, but there were some aspects that negatively affected them. Besides being potent, the collaboration between the local government and the community lagged behind at Jumog waterfall, Indonesia (Kristiawan, 2025). Similarly, more investment was required to make the destination attractive and improve the community's social life at Oluminrin waterfall in Nigeria (Owagbemi & Bazunu, 2022). According to Gursoy et al. (2019), perceived cost did not affect the perception of tourism, but the attitude of locals played a significant role in tourism. At Palani Jharna, in Jharkhand, tourism enhanced financial stability, employment, and the reputation of natives, but the socio-cultural aspect underwent challenges (Monu & Chatterjee, 2023). Although some of the studies have focused on tourism development, most of the cases depended on tourists' perspectives. Existing empirical studies are based on international settings, but there is very limited study in the Indian context. In this context, waterfall tourist sites in the Eastern Chotanagpur plateau are under-researched except for the Geotourism potential of waterfalls and their management in the Eastern Chota Nagpur plateau (Dutta et al., 2025).

The Inclusion of local stakeholders in tourism planning is very understudied told by Angessa (2025), but they have an essential role in the betterment of tourist sites (Fang et al., 2025). So, the main aim of the study is to analyze the local residents' perception of tourism development at selected waterfall sites of the eastern Chota Nagpur plateau through several objectives. Primarily, the aim of the study is to identify the major dimensions of tourism development, and then to identify the strengths and predictions of those dimensions on tourism development. Afterwards, to explore the significant differences among selected waterfall sites based on each and every factor extracted. Lastly, to measure the ranking status of each waterfall site within the study area, and to highlight their overall performance. It will say which region requires the most location-specific attention and what measures should be taken for the expansion of that tourist site.

## 2. Study Area:

The Chotanagpur Plateau is situated in the eastern part of the Indian subcontinent, which is the repository of valuable rocks and minerals of the oldest Precambrian terrain (Pandey et al., 2012; Ghosh & Bera, 2023). Apart from these, parts of Bihar, western West Bengal, Odisha, and Chhattisgarh are also considered part of the Chota Nagpur Plateau. The area of interest is located in Eastern Chota Nagpur Plateau with rich biodiversity and its cultural aspect, which attracts tourists easily (Ghosh et al., 2023). Hereby, this study belongs to the administrative unit of Jharkhand and Purulia district of West Bengal (Fig.1), which is part of the Ranchi Plateau of eastern Chota Nagpur (Kumar Patra et al., 2020). This region is well known for its complex drainage system with the Subarnarekha River and its tributaries. The region falls under a subtropical climate, with temperatures varying from 10 °-45 °c and average annual rainfall of approximately 1000-1500mm, from which almost 84% is driven by the south-west monsoon (IMD,2021).

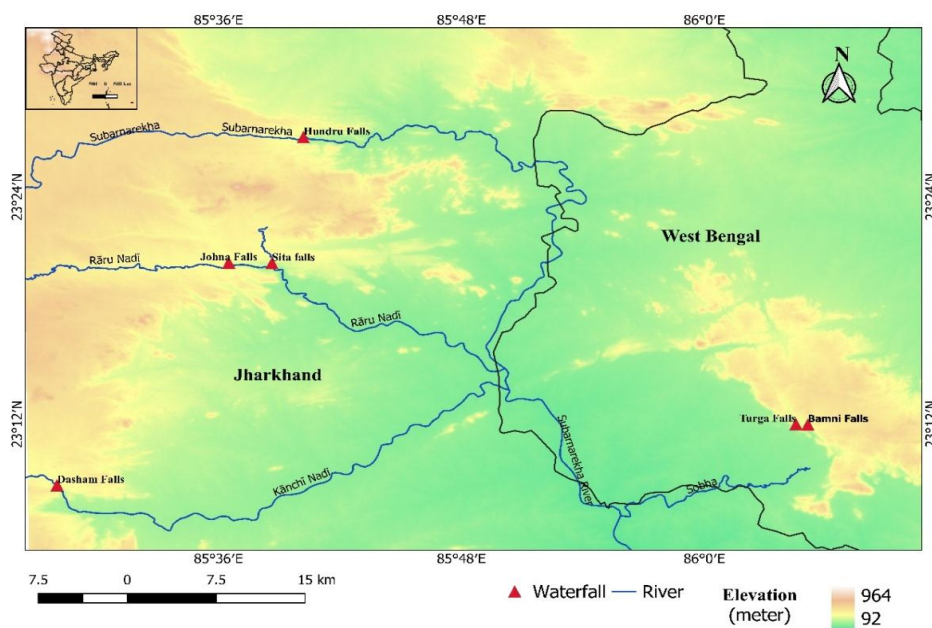


Fig. 1. Location map showing elevation with selected waterfall sites (DEM-ALOS PALSAR, Acquisition date: 10/3/2009)

Furthermore, as this region is also famous for tourism activity, which currently affects its ecosystem service, it needs to be balanced with economic benefit (Mandal et al., 2025). The eastern Chota Nagpur region has several waterfall tourist sites like Hundru Falls, Jonha Falls, Dasham Falls, Sita Falls, Bamni Falls, Turga Falls, and many more, but the mentioned waterfall sites are considered the area of interest of this study. So, the diversification of the community and their variety of artistic endeavors, festivals, enhances awareness of environmental conservation, and they started engaging with tourism apart from traditional livelihood activities (Sarkar & Modak, 2022).

Therefore, local residents' perception is important in all waterfall tourist sites because they are the key stakeholders whose support determine the sustainable and successful tourism management.

### **3. Description of selected waterfall tourist site:**

#### **3.1 Hundru Falls**

The Hundru Falls is an abrupt fall in the altitude of the Subarnarekha River (Sinha, 2021), 45 km distant from the main city of Ranchi, the capital of Jharkhand. The location of Hundru Falls is in a steep hill within the Singhbhum Shear Zone (Sinha, 2021). It is famous for its charming natural scenery, having hills and a height of 98 meters. As a result of its beauty and excellent accessibilities, the Hundru Falls has been attracting many tourists each year. The place has falling maximum water during the monsoon, surrounded by green vegetation that constitutes the Sal tree (Dutta et al., 2025). Indigenous tribes like the Munda and Oraon living in villages near Hundru Falls rely on tourism as their source of income.

#### **3.2 Jonha Falls**

The distance between Jonha Falls and Ranchi is around 45 kilometers through the Ranchi-Purulia Road. Jonha falls have been given the name due to Gautamdhara village at is considered sacred for Lord Budha. This place is situated along the Ranchi plateau. It is a beautiful sight to see where the water flow from a height of 43 meters through Raru, which is a tributary of Subarnarekha River. This magnificent site is surrounded by lush green forests. Many times, the Jonha Falls have been highly polluted as it attracts many tourists (Das & Chatterjee, 2025). The nearby village communities have an essential role towards making the tourism destination.

#### **3.3 Sita Falls**

Sita Falls is located in Bokaro district of Jharkhand state. The place can be reached easily from the capital city of Bokaro and from Ranchi which is around 47 km from there. Sita Falls forms a water fall which comes from the river Raru, which in turn is a tributary of river Subarnarekha, falling down to a height of around 44 meters. The name Sita Falls has come from the name of the heroine of Ramayana and people here have a belief that Goddess Sita has blessed these waters after leaving the palace for exile. It is situated amidst a dense forest and because of its serene nature and the sound of the cascade attracts people to the place.

### **3.4 Dasham Falls**

For thinking of visiting waterfalls, one can choose the best destination in Dasham from the perspective of every single tourist (Kumar, 2018). Dasham Falls can be found 34 km away from Ranchi city in Jharkhand, situated on the Ranchi-Tata Road (Kumar, 2018). River Kanchi descends from a height of 144 feet to form a water pool, where people are energized enough to dive into the water and swim. The above example is the creation of nick point due to rejuvenation. The term "Dasham" originates from the local language word "Ten," which shows that it consists of 10 streams coming together and descending from there. In general, this is the most visited site by tourists because of relaxation and sound of gargling water.

### **3.5 Bamni Falls**

Bamni Falls are regarded as the deepest waterfall on the Ajodhya Hill. The staircase is not properly made to descend the waterfall (Mohan Hazari & Bhui, n.d.). Bamni Falls are situated at a distance of approximately 90 km from the Purulia city center. The waterfall flows from a height of 60 meters because of the river Bamni that passes through it. The sound of nature generated by the waterfall sounds magical and is adorned with vegetation.

### **3.6 Turga Falls**

Turga Falls is situated 57 kilometers from Purulia at the edge of Ayodhya Hills within the Bagmundi pediplain (Dutta et al., 2025). The waterfall is caused by the tributary river of the Subarnarekha River called the Turga Nala. It is an area covered with forests and hills around it. As per Kar et al. (2024), the nearby village (Gosaidih) is experiencing a problem with the availability of water for drinking purposes after the diversion of small water channels, including Turga Falls. It is falling down from 22 meters of height which create a plunge pool attracts the locals as well as tourists to experience this spectacular view.

## **4. Materials and Methods**

In order to assess the perceptions of local people about the phenomenon of tourism at selected waterfalls in Eastern Chota Nagpur Plateau, the researcher employed the method of a quantitative survey. The raw data were gathered in relation to 19 different variables through the use of a structured questionnaire survey that was inspired by some previous research (Muresan et al., 2016; Arowosafe et al., 2022). The selection of these variables was justified through the results of literature review that included regional aspects of tourism, economic, environmental, socio-cultural, community development and conservation aspects of tourism (Pizam & Milman, 1986; Sinulingga et al., 2024; Kumar & Mandal, 2025). A 5-point Likert Scale was utilized where 1 is Strongly disagree, 2 is disagree, 3 belongs to neutral, 4 is agree, and 5 is strongly agree (Joshi et al., 2015; Koo & Yang, 2025). Negatively Phrased questions were reverse coded to ensure the consistency in the results (Weems & Onwuegbuzie, 2001). Secondary data were obtained from books, journals, Government report etc. Both Stratified and Convenience sampling techniques were used to determine the perception of local people at selected waterfall sites (Thetsane, 2019; Wani et al., 2022). Total 250 questionnaires were selected for survey, of which 205 questionnaires were accepted from the local households for

analysis after ensuring the validity. Face-to-face interaction and interview were mostly used in the survey to put respondents at ease while communicating verbally.

Descriptive statistics were employed to discover the socio-demographic details of the indigenous local community to describe their perception on tourism development (Muresan et al., 2016). Then Exploratory factor analysis was applied to reduce dimensionality and identify major dimensions of tourism perception among local people (Kambhatla & Leen, 1997; Kim et al., 2020). The extracted factors were rotated using Varimax Orthogonal Rotation with Kaiser Normalization to obtain a justified factor structure independently (Forina et al., 2005). In order to evaluate the extracted factors with respect to the perception of local residents, multiple regression analysis was performed (Ozturk et al., 2015; Wani et al., 2023). The Regression Analysis allowed the prediction power of each extracted factor to be established for overall tourism perception.

The normality of the dataset was assessed using the Shapiro-Wilk test. As the data were not normally distributed, the Kruskal-wallistest, which is a non-parametric test, was employed to investigate the differences in perception of extracted factors among the chosen waterfall destinations (Pasaco-González et al., 2023) based on three hypotheses. To measure the relative status of the selected waterfall sites as per local residents' perception, a composite mean score using the weightage method was applied (Chen et al., 2021; Otokiti et al., 2026). Here Weight of each factor was calculated by this method like Weightage for factor 1 = (Variance % explained by factor 1)/ variance % explained by (factor1 + factor2 + factor3). Factor analysis is an exploratory technique used to reduce variables into factors.

All data analyses were performed in IBM SPSS 26 software and Microsoft Excel. Furthermore, ArcGIS was employed to generate map of the study area. Waterfall sites were identified using Google Earth. To know the elevation of selected study area, ALOS PALSAR DEM (12.5 m spatial resolution) was utilized.

## **5. Result and Discussion:**

### **5.1. Local residents' characteristics**

The socio-demographic attributes of indigenous local respondents are reported in Table- 1. As per the characteristics of respondent 59.5% belongs to male, where rest of the respondents are female. Almost 76% people from the respondents were 36 to more than 55 years old. The result can be said to the inadequacy of better employment opportunity. Another main problem is the less education. Almost 32% of the respondents had no education while 5% of respondents had graduated. So, there is a distinct variation of education among the respondents. The monthly household income levels stated were less than 5000 rupees (10.2%), 5000-10000 rupees (43.9%), 10001-15000 rupees (33.2%), 15001-20000 rupees (9.8%) and more than 20000 rupees (2.9%). It can be concluded that the local residents were fallen under middle-aged to aging population and less educated with the low monthly household income.

**Table- 1 Characteristics of the respondents**

Variables	%
<b>Gender</b>	
Male	59.5
Female	40.5
<b>Age</b>	
Up to 25	4.9
26-35	18.5
36-45	35.6
46-55	33.2
Above 55	7.8
<b>Education</b>	
Illiterate	32.2
V pass	13.7
VIII pass	30.2
XII passed	18.0
Graduation	4.9
Higher Studies	1.0
<b>Household income per month</b>	
<5000	10.2
5000-10000	43.9
10001-15000	33.2
15001-20000	9.8
>20000	2.9

Source: Primary data, results computed by author.

## **5.2 Local Residents' perception factors towards Tourism Development**

Descriptive statistics was analyzed 19 basic variables to know the characteristics of the responses of tourism perception by local household. Under this mean and standard deviation have been calculated and shown in table Table-2.

**Table-2**

**Descriptive Statistics for Local residents' perception of various Waterfall Tourist sites**

Variable No.	Details	Mean	Std. Deviation
VAR1	Tourism has led overall economic development (X1)	3.30	1.157
VAR2	Tourism plays important role in social improvement (X2)	3.55	0.848
VAR3	Tourism has impacted on local culture and tradition (X3)	3.55	.972
VAR4	Local residents have a positive mindset on tourists(X4)	4.33	.661
VAR5	Tourism has negative impact on local environment(X5)	2.41	.827
VAR6	The community participates in tourism site management(X6)	3.23	.996
VAR7	Residents actively participate in sustainable practices at the tourist site management(X7)	3.09	.998
VAR8	Tourism development is encouraged in future at tourist site(X8)	3.74	1.150
VAR9	Tourist behavior is acceptable and responsible (X9)	3.95	.742
VAR10	Tourist show respect to our culture(X10)	3.62	.863
VAR11	Tourist are less aware in maintaining cleanliness at the tourist site(X11)	2.18	.799
VAR12	Tourism has improved the income opportunity for local residents(X12)	3.34	1.112
VAR13	Tourism has improved the Standard of Living in the selected tourist spots(X13)	2.39	1.063
VAR14	Tourism has created employment opportunity to the local residents(X14)	3.35	1.198
VAR15	Tourism leads overcrowding and environmental pressure(X15)	2.61	.750

VAR16	Tourism promotes cultural exchange between locals and visitors(X16)	3.72	.978
VAR17	Tourism contributes waste generation and pollution(X17)	2.09	.814
VAR18	Tourism has led to increase the price of goods and services(X18)	2.36	.501
VAR19	Overall perception of Local Residents on Tourism(X19)	3.96	.914

Source: Primary data, results computed by author.

Variables influencing local residents’ perception are listed in Table- 2. The mean responses of the variables 1,2,3,4,6,7,8,9,10,12,14,16,19 are 3.30, 3.55, 3.55, 3.23, 3.09, 3.74, 3.95, 3.62, 3.34, 3.35, 3.72 and 3.96 respectively. With being midpoint, all above the variables are closer to a positive dimension. Thus, local residents are in the favour of above variables. On the other hand, the mean of the variables 5, 11, 13, 15, 17 and 18 respectively. Local residents are not in the favor of these variables. Thus, it may be inferred that Local Residents have mixed perception towards tourism.

After performing Descriptive statistics, Exploratory Factor Analysis was carried out to find out the crucial factors having maximum variation. The Barlett test of sphericity is significant less than 5% level of significance (Chi-square = 2023.220,  $p < 0.000$ ) (İncekırık et al., 2024). The Kaiser-Meyer-Olkin sampling adequacy measure is 0.909, showing the data was appropriate for Factor Analysis (Kaiser, 1974; Goodwin & Chaudhary, 2017). Values more than 0.6 from KMO measures indicating that the data are suitable for factor analysis (Burgess & Steenkamp, 2006). Thus communalities, variance percentage these are the crucial factors for this analysis have been computed in Table- 3.

**Table-3**

**Exploratory Factor Analysis on Local residents’ perception of Tourism**

Variable	Components			Communalities
	1	2	3	
Tourism has impacted on local culture and tradition (X3)	0.832			0.792
Tourism promotes cultural exchange between locals and visitors (X16)	0.803			0.777
Tourist show respect to our culture (X10)	0.683			0.649
Tourism plays important role in	0.656			0.632

social improvement (X2)				
Tourist behavior is acceptable and responsible (X9)	0.624			0.453
Tourism contributes waste generation and pollution (X17)		0.846		0.820
Tourism helps in maintaining cleanliness at the tourist site(X11)		0.840		0.780
Tourism leads overcrowding and environmental pressure (X15)		0.726		0.682
Tourism has negative impact on local environment(X5)		0.710		0.673
Tourism has improved the Standard of Living in the selected tourist spots(X13)			0.812	0.854
Tourism has improved the income opportunity for local residents(X12)			0.808	0.831
Tourism has led overall economic development (X1)			0.690	0.841
Tourism development is encouraged in future at tourist site(X8)			0.598	0.792
% of variance	27.741	24.421	21.485	73.648

Source: Primary data, results computed by author

Table- 3 explains that the variables, grouped into 3 (three) main factors have been extracted through Varimax, which is considered the best orthogonal rotation procedure for its interpretability of the factors (Kaiser, 1958; Gerbing & Hamilton, 1996). The first factor has maximum variance followed by second and third. The factor extraction, factor loading and percentage of variance with respective variables have been mentioned in Table- 4

**Table- 4**

**Factor loadings based on Factor Analysis**

Factor	% of variance	Factor Interpretation	Variables included in the factor	Loadings
1	27.741	Social and cultural	1. Tourism has impacted on local culture and tradition	0.832

		impact	2.Tourism promotes cultural exchange between locals and visitors	0.803
			3. Tourist show respect to our culture	0.683
			4. Tourism plays important role in social improvement	0.656
			5. Tourist behavior is acceptable and Responsible	0.624
2	24.421	Environmental effect	6.Tourism contribute waste generation and pollution	0.846
			7.Tourist are less aware in maintaining cleanliness at the tourism site	0.840
			8.Tourism leads overcrowding and environmental pressure	0.726
			9.Tourism has negative impact on local environment	0.710
3	21.485	Economic impact	10.Tourism has improved the Standard of Living in the selected tourist spots	0.812
			11.Tourism has improved the income opportunity for local residents	0.808
			12. Tourism has led overall economic development	0.690
			13.Tourism development is encouraged in future at tourist site	0.598

Source: Primary data,results computed by author

The first factor labelled “Social-Cultural Impact” explains 27.741% of variance which shows their cultural eagerness of local community. This factor groups the items related to local culture and tradition (factor loading 0.832), Cultural exchange between locals and visitors (factor loading 0.803), tourist show respect to local culture (factor loading 0.683), tourism brought social improvement in the community (factor loading 0.656) and the tourist behavior acceptability by locals (factor loading 0.624). The second factor explains 24.421% of variance labelled as “Environmental effect”. This component focus on the negative impact of

tourism on natural settings. Environmental effect is observed as negative for the local residents such as waste generation and pollution contribution (factor loading 0.846), maintenance of cleanliness (factor loading 0.840), overcrowding and environmental pressure (factor loading 0.726), impact on local environment (0.710). The third factor explained 21.485% of variance labelled as “Economic impact” and this factor group relates standard of living (factor loading 0.812), income opportunity of tourism (factor loading 0.808), overall economic development (factor loading 0.690), future tourist site development (factor loading 0.598) (Table 3 and 4). This has shown a diverse result where social cultural factor shows the maximum variance, economic factor has shown less variability which is different from (Bakari et al., 2024; Piras & Pedes, 2025) etc.

**5.3 Multiple Regression Analysis between Dependent variable and independent variables:**

In Regression Analysis Variance Inflation Factor (VIF) (Akinwande et al., 2015), multiple correlation coefficient (R), coefficient of determination ( $R^2$ ), Adjusted  $R^2$ , **Durbin-Watson** statistic (Vinod, 1973), and F statistics have been calculated (Halinski & Feldt, 1970; Berry & Feldman, 1985). Multiple regression analysis has been carried out between dependent variable and independent variables in Table- 5.

**Table – 5**

**Table of Multiple Regression Analysis**

Analysis Between	R	R Square	Adjusted R Square	Durbin-Watson	Std. Error	F statistics & (Prob)	Remarks
Dependent Variable and Independent Variables (Predictor)	.723	.523	.516	1.890	.636	73.495 & (0.000)	Independent variables significantly associated to predict the behavior of Dependent variable (Y)

Predictors: Economic impact factor, Environmental effect factor, Social and cultural impactfactor  
Outcome variable: Overall perception of local residents on tourism(Y)

Source: Primary data, results computed by author

Table- 5 shows that multiple regression analysis has been done between independent variables and dependent variable. Above Table- 5 also summarizes the value of R 0.723. It means there is close relationship between independent variables and dependent variable (Croux & Dehon, 2003). On the other hand,  $R^2$  (value **0.523**) shows dependency between

both variables. Adjusted R<sup>2</sup> (Value 0.516) describes the better regression model fitted to the data points (Harel, 2009) and Durbin-Watson test Statistics reveals no autocorrelation exists in residuals as this statistics value near 2 indicate the absence of autocorrelation in residuals (Vinod, 1973). Standard error of regression coefficient is as low as 0.636 and it indicates that the observed variables are closer to the fitted line. Also, F Statistics value is significant as it is less than 5% level of significance. It means dependent variable is more reliable (Halinski & Feldt, 1970). Hence it examines the influence of extracted factors on tourism development shown in Table- 6.

**Table- 6**  
**Regression Coefficients**

Model	Factors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.956	0.044		89.031	0.00
	Social and cultural factor	0.441	0.045	0.482	9.897	0.00
	Environmental factor	0.246	0.045	0.269	5.523	0.00
	Economic factor	0.427	0.045	0.467	9.593	0.00

Dependent variable: Overall perception of local residents on tourism

This analysis is carried out to find out the influence and the predictive power of the extracted factors towards the total perception of local households towards tourism development in the selected tourist spots. Based on the table of regression coefficients, social – cultural is a good predictor of residents’ perception of tourism (0.482), where larger the value of the standardized beta coefficient, the greater the influence on the variable (Van Ginkel, 2020). It means thepreservation of cultural tradition, cultural exchange, positive social change, positive behavior of the tourists. Economic factor also was a good predictor of the overall perception of local residents (standardized beta coefficient value 0.467). This indicates some local residents respond to the income generation, employment, economic benefit and future tourism support. The environment factor was identified as less important as a driver of residents' perceptions of tourism, however. The influence is relatively small compared to the other two factors with the standardized beta coefficient value of 0.269. This means that the environment is somewhat influential for the resident, as in the case of overcrowding,

pollution, cleanliness problems, and waste generation. If preventive measures are not taken, the outcomes will be unfavorable.

#### 5.4 Hypotheses Testing

The following hypotheses have been formulated and tested at a 5% significant level. Kruskal-Wallis test as a non-parametric test has been carried out (Macfarland & Yates, 2016) between grouping variable (independent variable) and the test variable (dependent variable), viz. Overall perception of local residents towards tourism in selected tourist sites of eastern Chota Nagpur region.

##### Hypothesis- 1

H0: There is no Statistically significant difference in social and cultural factor scores among the selected Waterfall sites of the eastern Chotanagpur Plateau.

H1: There is Statistically significant difference in social and cultural factor scores among the selected Waterfall sites of the Eastern Chota Nagpur Plateau.

Social cultural factor which is extracted from factor analysis includes the variables 2,3,9,10,16 viz. positive social change, local culture and tradition, touristbehavior acceptance, respect for culture, cultural exchange. Kruskal Wallis test has been shown and tabulated in Table- 7.

**Table- 7**

##### **Kruskal Wallis Test (Among selected waterfall sites and the social cultural factor)**

Kruskal Wallis H	14.236
Df	5
Asymp. Sig.	0.014

Grouping variable: Specific waterfalls

Source: Primary data,results computed by author

Table- 7 discloses that p value is less than the significance of 5% and hence, the decision is to accept Alternate hypothesis. It means there is significant difference in social cultural factor scores among the selected waterfall sites of Eastern Chota Nagpur Region. As per mean rank, Dasham Falls has taken the highest score (134.21) showing better result followed by Jonha Falls (112.39), Hundru Falls (111.74) and Sita Falls (90.68). Surprisingly Bamni and Turga Falls have taken lowest score (80.23 ,84.06) showing lower respondent agreement on social cultural dimensions towards tourism development.

##### Hypothesis- 2

H0: There is no Statistically significant difference in Environmental factor scores among the selected/ Waterfall sites of the eastern Chotanagpur Plateau.

H1: There is Statistically significant difference in Environmental factor scores among the selected Waterfall sites of the eastern Chotanagpur Plateau.

Environmental factor which is extracted from factor analysis includes the variables 5,11,15,17 viz. Negative environmental impact, Cleanliness at tourist site, overcrowding, waste generation. Kruskal Wallis test has been shown and tabulated in Table- 8.

**Table- 8**

**Kruskal Wallis Test (selected waterfall sites and the environmental factor)**

Kruskal Wallis H	14.236
Df	5
Asymp. Sig.	0.014

Grouping variable: Specific waterfalls

Source: Primary data, results computed by author.

Table- 8 discloses that p value is less than the significance of 5% and hence, the decision is to accept Alternate hypothesis. It means there is significant difference in Environmental factor scores among the selected waterfall sites of Eastern Chota Nagpur Region. As per mean rank, Turga and Bamni Falls secured lowest score (83.06,84.10), so environmental effect is comparatively higher around these 2 waterfall sites. While Hundru Falls has taken highest mean rank score (127.08) followed by Dasham Falls (113.76), Jonha Falls (104.14) and Sita Falls (100.12) respectively securing better respondent agreement on tourism site development.

**Hypothesis- 3**

H0: There is no Statistically significant difference in Economic factor scores among the selected Waterfall sites of the eastern Chotanagpur Plateau.

H1: There is Statistically significant difference in Economic factor scores among the selected Waterfall sites of the eastern Chotanagpur Plateau.

Economic factor which is extracted from factor analysis includes the variables 1,8,12,13 viz. overall economic development, future tourism support, income opportunity and standard of living. Kruskal Wallis test has been shown and tabulated in Table- 9.

**Table- 9**

**Kruskal Wallis Test (Among selected waterfall sites and the economic factor)**

Kruskal Wallis H	13.159
Df	5
Asymp. Sig.	0.0140.022

Grouping variable: Specific waterfalls

Source: Primary data, results computed by author.

Table- 9 discloses that p value is less than the significance of 5% and hence, the decision is to accept Alternate hypothesis. It means there is significant difference in Economic factor scores among the selected waterfall sites of Eastern Chota Nagpur Region. As per mean rank, Dasham Falls has taken the highest score (126.44) showing better result followed by Jonha Falls (112.06), Hundru Falls (102.89) and Sita Falls (104.21). Surprisingly Turga Falls has taken lowest score (77.50) showing lower respondent agreement on economic factors towards tourism development followed by Bamni Falls (91.90).

### 5.5 Weighted Composite mean for Overall Tourism Perception

A weighted composite score has used to analyses the status of selected waterfall sites in terms of local residents' perceptions of tourism development. The weightage has calculated by explained variance of each factor. Composite weighted mean score has shown in Table- 10.

**Table- 10**

**Weighted Composite mean score**

Around selected waterfalls	Jonha Falls	Hundru Falls	Dasham Falls	Bamni Falls	Turga Falls	Sita Falls
Mean	0.1318	0.1672	0.3551	-0.337	-0.3261	0.0673
Std. Deviation	0.57131	0.5836	0.51969	0.48136	0.48421	0.50837

$$\text{composite Index} = (0.3767 * \text{Factor 1}) + (0.3316 * \text{Factor 2}) + (0.2917 * \text{Factor 3})$$

(Where 0.3767, 0.3316, 0.2917 are the weights)

The weights derived by normalizing % of variance explained by extracted rotated factor from component analysis

The selected waterfall sites are analysed from Table- 10 which shows the spatial variation of waterfall sites in the Eastern Chota Nagpur region. In terms of composite mean score, Dasham falls has the highest mean score (0.3551) indicating more favourable attitude of the local population on tourism around the area as compared to Hundru and Jonha Falls. Bamni and Turga Falls on the other hand had negative composite mean score of -0.3370 and -0.3261 respectively which implied less favourable perception by the local residents on the tourism development. The overall perception of Sita Falls was neutral (0.0673). Even if Sita Falls shares the proximity with Jonha Falls, it has failed to achieve a similar outcome in the eyes of the locals about the development of tourism. These differences indicate that there is a spatial variation in the selected waterfall sites of Eastern Chota Nagpur among the local residents towards development of tourist site.

## **6. Finding:**

As per the results and discussion, it can be clearly stated that the Eastern Chota Nagpur Plateau (Both the Jharkhand and Western West Bengal) has good potential for tourism. As waterfall sites are one of the attractions of tourists, local people's perception and their cooperation with tourism are very important as they hold the position of primary stakeholders. From a step-by-step analysis of responses among the different selected waterfall sites of Eastern Chota Nagpur Plateau, Dasham Falls has been pointed out as a better tourist location as per the local residents' perception. At Dasham Falls, some respondents shifted their occupations from traditional livelihood activities to tourism-related activities. The number of visitors to this waterfall site was also at the maximum and the locals around the waterfall supported tourism as it brought them a better livelihood. They are respected by tourists. The economic impact has been beneficial as some of them have better living standards, have received income from tourism activities, and so, they are welcoming tourism as their part of lives. The environmental impact is comparatively less due to better management by local residents, such as better waste management and cleaning activities. According to the local residents' responses, Jonha and Hundru Falls have taken the next respective position in tourism development. As per the opinion of local residents around the villages of these two waterfall sites, they encouraged tourism because it increased their source of income, since most of the respondent's primary occupation is agriculture and labour activity, but their family members also started working in tourism activities like shopkeeping, selling handcrafted products, cultural dances, tourist guiding, tour driving, boating, and interaction with tourists. Therefore, their support has automatically increased in terms of sociocultural aspects. However, some of the cases experienced traffic in the city, cleanliness issues around tourist spots, and lack of waste management. The most repeated opinion of local people was to do 'cleanliness mission around tourist spot', 'appropriate training', and 'more job creation'. Sita Falls also showing better results but found less popularity like Dasham, Jonha, Hundru Falls located in Jharkhand.

Turga and Bamni Falls, located in the Purulia district of western West Bengal, showed less beneficial responses from local residents. The number of tourists at these falls is comparatively lower than that of the aforementioned waterfalls. Few local people supported tourism because of its benefits, but people who were not associated with tourism gave negative responses regarding it. It can be critically assumed that the local people associated with traditional livelihood activities apart from tourism had negative concerns about tourism development. Most of the time their opinion was 'job creation', 'protection of local culture', 'development of better drinking water facility', 'cleaning project around the tourist site' etc. towards tourism.

## **7. Conclusion:**

The eastern part of Chotanagpur plateau is the home of spectacular waterfall sites, surrounded by natural and human resources. If it could be promoted in a better way, the potentiality of waterfall-based tourist sites would be increased. As per the findings of significant analyses regarding local residents' perception on tourism development, it has clearly been identified that Dasham Falls emerged as the significant tourist site. But as per

the result it can be said that some potentiality is still unexplored here as per local residents' responses. Similarly, Jonha, Hundru Falls also secured better position, but according to locals' perspective, lot of the potentials are not yet explored. So, tourism related stakeholders including locals had to play significant role in shaping this industry. Besides that, Bamni and Turga Falls has shown the less comeliness by the local residents. These waterfalls are not that much famous by the tourists as like as Dasham, Jonha and Turga Falls because of their lack of management, improper construction of staircase at Bamni falls, less accessibility, lack of hotel accommodation near tourist spot, waste generations, less marketing strategies on social media, less travel related promotion and branding by travel agents etc. Due to less attraction by the tourists compared to other waterfall sites, local residents are also less advantageous economically, maybe this is the main reason of their variable perception. Although Sita Falls has better responses but some necessary steps need to be implemented to enhance the more potential of this tourist site.

Since all of the selected waterfall sites has different residents perception, sustainable tourism planning and protective implementations like fencing , guard wall has to be implemented for safety of tourists, better staircase, good marketing, better hotel accommodation, afforestation, more recreational activities, clean washrooms, changing room, rest room for elders, availability of good food, first aid facility, better drinking water facilities, some alternative slopes for handicaps all these things need to be established. So that tourist will be fascinated more in this waterfall sites, automatically it will lead the better perception of local residents due to their dependency on tourism.

The government should listen to the local people. They must organize tourism in such a way that local people must be involved and aided positively from tourism. More small-scale businesses around the tourist spot, association with hotels, licensed skilled drivers, good platforms to show the cultural music and dance, giving jobs to locals in the tourism industry, and good tourist-resident relations should be highly encouraged. In addition, community participation, locals' involvement in tourism-related decision-making, sustainable tourism site management, afforestation, environmental education, and cleaning awareness are alternative initiatives that must be taken by the local government, integrated with state and national levels for local residents.

However, this study has some limitations like, tourists' perception is not included here. As the local residents' responses was recorded with perception scale, their degree of tourism support has acknowledged with some errors. This study mentioned some variable to prepare the constructs, but more variables could be added in different dimensions to determine the extract factors associated to local residents' perception. Some more advance statistical implications like Confirmatory factor analysis followed by Structure equation model etc. could be applied for further analysis. In this way, alternative ideas should be carried out towards future tourist site development considering the local residents insight.

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