



ECOTOURISM AESTHETICS AND PROSPECTS: A GEOSPATIAL ASSESSMENT OF RAJAJI NATIONAL PARK

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ABSTRACT

There are 32 National parks, 92 Wild life sanctuaries located in 11 Himalayan states of India. Uttarakhand is the northern Himalayan state of India, where 6 National parks and 6 wild life sanctuaries established by the national and international organizations. These sites are well preserved, most beautiful attractions nationally and internationally among the tourists community for their amusement, knowledge and awareness regarding conservation of natural heritage. Rajaji National Park is one of the famous for his natural beauty, the prosperous diversity of flora, fauna and topographic landscape, which is located between Latitude 29° 56' 40" N to 30° 20' N and Longitude 79° 80' E to 78° 01' 15" E in Pauri, Haridwar and Dehradun districts. It occupies around 820 Km² areas in 9 forest ranges and situated in the lower Shiwalik range, foothills and Gangetic plains. Terrain relief of the park ranges between 271 m to 1381 m. from mean sea level. Shiwalik range passes from east to west from the park and River Ganga flows from North South and cut Shiwalik range in North East part of the park and makes flood plain in Southern part of Park. In the present study various aspects of the park such as topography, vegetative cover and Species, fauna species, Climate, accommodation facilities, transport and tourist attractions have been described using Remote Sensing and GIS geospatial tools and techniques. The annual tourist flow of the park has been statically evaluated to show the potential as an economic resource and the growing interest of tourists towards this sector of the state economy.



KEY WORDS : RINP, Ecotourism potentials and resources, Geospatial Techniques.

1. INTRODUCTION

The concept Ecotourism is an abbreviation of ecological tourism, which refers to understand and protect the freedom of tourism in Nature. According to the Nature Conservation Union (IUNC), the definition of ecotourism includes having fun while supporting the protection of the Natural and Cultural resources. This involves maintaining a low visitor impact and provides the local community with socioeconomic benefits. Furthermore, ecotourism refers to traveling in environmental – responsible ways to limit the impact to the area visited (Cetin & Sevik, 2016).

Ecotourism is a form of tourism that involves traveling to peaceful and unpolluted natural areas. According to the definition and principles of ecotourism established by The International Ecotourism Society (TIES) in 1990, ecotourism is "Responsible travel to natural areas that conserves the environment and improves the well-being of local people." (TIES, 1990) (Sayyed, Mansoori, & Jaybhaye, 2013). Himalayan region is very prosperous in Natural biodiversity because of its terrain landscape feature. It is enchanting natural beauty attracts people to visit. That reflects the conservative approach of the visit communities

towards the natural heritage. Its dynamic fauna, flora and wildlife species Terrain landscape is the district traits of attraction among the tourists. Himalayan region extended in viz. *Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Assam, Arunachal Pradesh, Nagaland, Manipur Mizoram* state from the west to east. *Uttarakhand* alone occupies 5 national parks and 6 wildlife sanctuaries of the Indian Himalayan region. *Uttarakhand* mainly knows for its Natural Environment of Indian Himalaya, the *Bhabhar*, and the *Terai*. Physiographically, Himalayan region divided into four regions from south to north *Shiwalik*, Lesser Himalaya region, Greater Himalaya region and Trans Himalayan region. *Uttarakhand* as a tourist Destination offers a lot to the prospective as the land is enriched with Natural, Cultural Heritage and religious ethnicity. State *Uttarakhand* provides various modes of tourism activity as like Leisure tourism, Adventure tourism, cultural tourism, Nature-wildlife tourism (Ecotourism), the master plan (2007-2022) prepared by *Uttarakhand* Tourism Department Board also focus on the need and development of these tourism activities in the state so that the state can lure much more amount of domestic and foreign tourists thereby helping in profound jobs opportunity and infrastructural facility.

Rajaji National Park situated in the Shiwalik range and its Piedmont region of the Himalaya of the *Uttarakhand* state includes *Chilla, Motichur* and *Rajaji* sanctuaries and falls under the Indus-Ganges Monsoon Forest Bio-geographical Province. (*Rakesh K. Singh*,) With rich and glorious flora, fauna RJNP is one of the most meritorious destinations for tourism activity in Northern India. Megafauna, namely Tiger, Leopard, and Elephant and the typical diversity of vegetation species on geographical locations are raising RJNP as the Ecotourism destination site. *Rajaji* National Park also established as a part of the *Rajaji*-Corbett Elephant Reserve which is an important area for Elephant conservation in Northwest India. 90 percent of the entire northwest elephant population has been residual in The *Rajaji*- Corbett Elephant Reserve. The elephant population in the eastern (c. 200 elephants) and western (c. 400-500 elephants) (*Johnsingh* and *Williams*, 1999) portions of the park (separated by the river *Ganga*) face various threats. RJNP was declared a Tiger Reserve on 20th April 2015 by the National Tiger Conservation Authority/ Project Tiger, statutory Body under the Ministry of Environment, forest and Climate Change (Government of India) and RJNP becomes the 2nd Tiger Reserve of *Uttarakhand* State (1st is Jim Corbett) and the 48th Tiger Reserve of India. RJNP is a well-known tourist destination for wildlife lovers keen to have a glimpse of the tiger. After declared the extended area of Raja Ji Tiger Reserve becomes 1075 Km². previously it was 820 Km². In the buffer zone of *Rajaji* National Park 18 Tiger were identified (RJNP).

2. REVIEW OF LITERATURE

Nandy et al., 2017 in his study are mainly focused on *Chilla – Motichur* wildlife corridor of RJNP. In his study author discuss the losses of the corridor in last few years which was attributed to various development projects, as like Roads, rail, Hydropower projects, expansion of Townships of *Haridwar* and *Rishikesh*, resettlement of people displaced by the construction of *Tehri* Dam, the creation of army cantonments. the author used three-period satellite imagery from 1972, 1990 and 2005; all images were rendered to atmospheric correction using the dark pixel subtraction method. The used images for the study are the Landsat MSS satellite image (Red band), 1972, Land sat TM satellite image (Red Band). 1990 and IRS – P6 LISS IV satellite image red band, 2005 with processing this imaginary evaluated the land use land cover changes in *Chilla – Motichur* corridor during the period of 1972-2005. The author examines the changed land in the form of Nonforest area, Grassland, Agriculture, Settlement, Scrub and army contentment by the field visit. Author correlated the image characteristics to forest and convent categories. The author also discusses the urgent to the restoration of *Chilla – Motichur* corridor.

(*Joshi, 2014*) in his study deals with the exploration of Ecotourism potentials in *Rajaji* National Park and evaluated the perception of the local community towards tourism, conservation of wildlife and their livelihood substitutes. In the study author discuss the many important features of RJNP as like Historical evidence. Jeep Safari, Elephant Safari, Bird watching, livelihood substitutes, Man-Animal conflicts, community participation and perception, the *Gujjar* rehabilitation program, temples, risk management etc.

are the main issues regarding heritages in the park. The study also examines the potential of Ecotourism and concentrate on wildlife conservation and Man-Animal conflict minimization. The author approaches for promoting Ecotourism through community participation and cooperation among various stakeholders. Basically, the author stated for the development of community-based Ecotourism in RJNP. The author discusses the key features of different potentials ranges and some potentials sites where watchtower are constructed for promoting Ecotourism activity. Wildlife conservation, environment, biological diversity awareness, are the main sources sustaining economy of park. All these factors are also the beneficial factor in promoting Ecotourism in RJNP.

In his study (Naithani Suneet, 2013), studied species-wise distribution of vegetation and landforms. The study explains that a particular landform is preferred by specific species as like Sal grew on heavy drained soil, Riverine on Piedmont and chirpiness on highly dissected hills. For the study author used both the Aerial photograph and Satellite Data. Satellite image of IRS – 1B LISS-II, (fcc, 2, 3, 4, RGB, Geocoded), 1993 and Land sat TM, FCC of 1988 was used along with SOI Toposheets (53 J/4). The author used aerospace interpretation techniques to determine the forest density classes. The author deals with dense forest and open forest and scrub determine the distribution of vegetation with respect to Aspect, physiographic and Geology with this study author is likely to give valuable and significant inputs to develop better conservation strategies for RJNP.

The study done by (Minica Ogra, 2009) understanding local attitudes towards human-wildlife conflict is key to developing successful conflict mitigation strategies. The author discusses the resolution of the human-wildlife conflict with these factors, namely Gender, Wealth and Literacy for enumerating attitude. In study author deals with many features like people and animals separate spaces, activities are done to minimize human man conflict, responsibility for resolving the human-wildlife conflict problem, willing to participate in a cooperation management institute to reduce human man conflict. The study based on primary survey methods includes participant observation, in-depth individual – level interviewing, focus group interviewing, participatory rural appraisal activities and open-ended and structural survey interview both qualitative and quantitative questions. The author using Snowball sampling and Door to Door interview approaches. The author applies a mixed – methods approach to both the Data collection and Analysis.

Johnsingh & Negi, 2003 in his study contributes a status report of Tiger and Leopard and discuss the 11th (Level I) Tiger Conservation unit of Indian subcontinental established for the long-term conservation of Tigers. The author selected 52 *raus* of RJNP and Corbett tiger reserve for the study and discuss the counts and encounter rates of Tiger and Leopard Pug marks which is cattle and people seen. The author also counts the pugmarks of tigers and Leopard in *Rajaji* - Corbett tiger reserve conservation units those data were collected from the forest department census during the years 1984 – 2001. Data of disturbance factors as like Livestock and people were collected from the assistance of staff working with a Non –Government organization (NGO), “Operation Eye of the Tiger India” and Uttar Pradesh Forest department. The study also based on Camera Trap studies to estimate the number of Tigers and Leopard. In the recommendations, the author discussed some important facts as like Poaching control, run eco-development programs and relocate the people, to the monitoring use user-friendly method, conservation of Monoculture to poly culture, establish mini-core area, corridors establishment, grater Corbett tiger reserve conservation, the creation of *Nanda* valley National park (*Haldwani* Division).

Singh and A. Prakesh (1994) in his study discuss many types of forest which are mainly six namely Sal forest, Mixed forest, Riverine forest, Scrubland, Grassland and Subtropical pine forest and provide an ideal habitat for many wild Animals. Basically, the study based on Physiognomy and Floristic composition. The author stated that as a tropical ecosystem park has many characteristics which have both scientific importance and practical significance for overall Eco development.

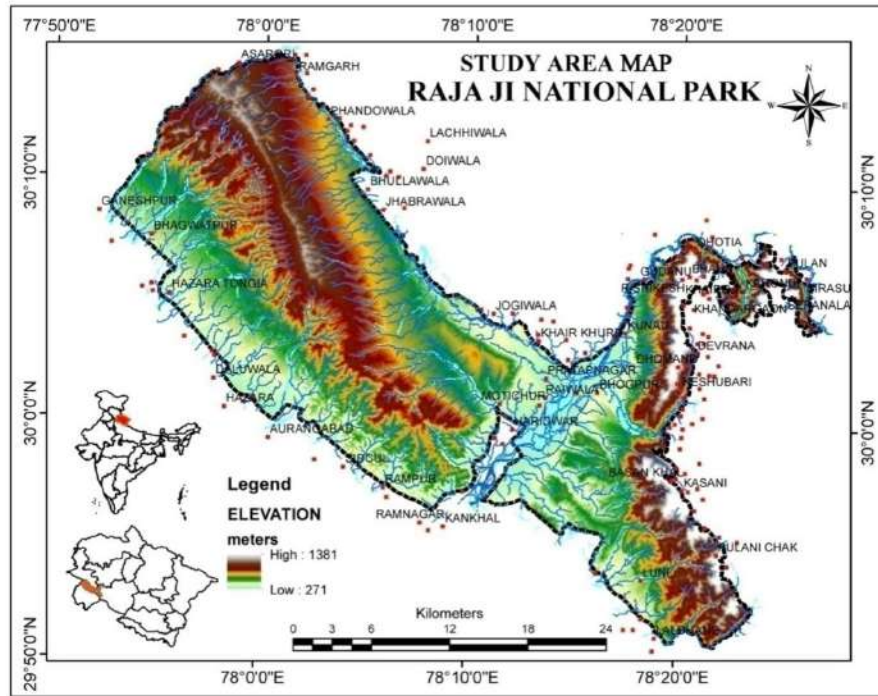


Figure 1: Study Area Map

3. STUDY AREA

RJNP is situated along the hills and foothills of *Shiwalik* ranges in the Himalayan foothills and represents the *Shiwalik* eco-system. On the map it is, extended between Latitude 29° 56' 40" N to 30° 20' N and Longitude 79° 80' E to 78° 01' 15" E in *Pauri, Haridwar* and *Dehradun* districts. Altitude of *Rajaji* National Park is respectively 271 meters to 1381 meters (Figure 1). RJNP is an Indian National park which is also known as a Tiger Reserve. The RJNP is encompassed shiwalik region near the foothills of the Himalaya. The RJNP is spread in three districts of Uttarakhand, namely *Dehradun, Haridwar, Pauri Garhwal* and respectively comprises total area 820 Km². RJNP was three separate sanctuaries before 1983 first on is *Raja Ji* sanctuary which is established in 1948, second on is *Motichur* sanctuary which is established in 1964 and third is *Chilla* sanctuary which is established in 1977, by the amalgamation of these three sanctuaries RJNP has been created in 1983. The name of RJNP has been named after C. *Rajagopalchari (Raja Ji)*, a prominent leader of freedom struggle, the second and last Governor – General of independent India and one of the first recipients of India’s highest civilian award *Bharat Ratna* in 1954. *Rajaji* National Park occupies about 856.05 Km² (calculated by GIS Analysis) areas and divided in nine forest ranges (Table 1). The largest forest range in RJNP is *Chilla* Range which is carrying 150.89 sq km (17.63%) area and situated in a portion of the *Pauri* district. The smallest forest range in RJNP is *Dholkhand* Range carrying 59.64 Km² (6.97%) area and situated in a portion of the *Hardwar* District (Figure 3). If we discuss about the division of forest ranges on the basis of District boundary premises in the respect *Pauri* District put across Two Ranges *Chilla* and *Gohri* ranges occupies 281.19 Km² (32.85 %) area, *Dehradun* District put across Three Ranges namely *Motichur, Kanasar* and *Ramgarh* Ranges occupies 241.50 Km² (28.21%) area, *Hardwar* District put across Four Forest ranges namely *Chillawala, Dholkhand, Beribara* and *Hardwar* Ranges occupies 333.36 Km² (38.94 %) area.

Table -1: Forest Ranges In Rajaji National Park

Sl.No.	Forest Range Name	Area (Km ²)	Area (%)
1	Chilla Range	150.89	17.63
2	Dholkhand Range	59.64	6.97
3	Beribara Range	73.82	8.62
4	Chillawli Range	114.45	13.37
5	Ramgarh Range	77.04	9.00
6	Kansrau Range	79.54	9.29
7	Hardwar Range	85.46	9.98
8	Motichur Range	84.91	9.92
9	Gohri Range	130.30	15.22
	Total area	856.05	

Source Calculated from GIS Analysis

4. MATERIALS AND METHODS

The study basically focused on ecotourism development in RJNP, tourist arrival and the future trend of tourists. Secondary data of tourist arrival, accommodation facilities (GMVN) collected from the *Rajaji national park*. The Location of forest rest houses (FRH) collected from *Bhuvan online Portal*. To examine the weather conditions Climate data derived from **chelsa-climate**. The Vegetation diversity of *Rajaji national park* achieved from biodiversity information system in raster form. To show the physiographic characteristics e.i. elevation, slope aspect and drainage system of area.

5. RESULTS AND INTERPRETATION

5.1. Topography of RJNP

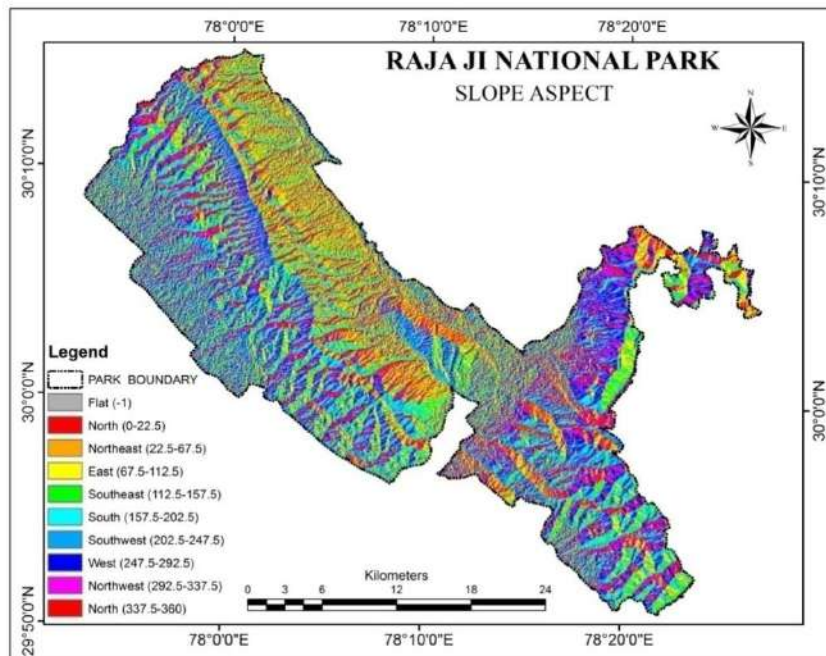


Figure 2: Slope aspect map

RJNP extended in 820 Km² areas and located in the southern aspect of *siwalik* range and piedmont, Elevation in ranges from 1381 m to 271 m from mean sea level (MSL) (**Figure 1**). In the northern part of the

park is covered with precipitous hills with the elevation of about 1381m (Figure 2). Show the directions of slope aspect distributed all along the direction in the northern part of park. Figure shows the *shivalik* range passes from the park from east to west in the northern part of the park. Hills in the park are highly inclined towards NNE in the northern part and NNW in southern part.

5.2. Drainage

RJNP having a dense and complex drainage system, River Ganga is the main river which flows through this region from north-east to south-west in among four forest ranges namely *Hardwar*, *Motichur*, *Chila*, and *Gohri*. There are a number of streams and tributaries are also contributed in this drainage system (figure 2). *Mohan Rao*, *Sukh Rao*, *Chillawali Rao* and *Gaj Rao* are in the **Chillawa range** in **Dholkhand Range** *Andheri Rao*, *Dholkhand Rao* and *Malawala Rao*, in **Beribara Range** *Bam Rao*, *Betban Rao* and *Dhulan Rao*, in **Hardwar Range** *Harnoul Rao*, *Chhirak Rao*, *Rawli Rao*, *Ranipur Rao*, *Bjhag Rao* and *Sukh Rao* are flowing in north-east to south-west direction. In *Ramgarh Range* *Rangarh Rao*, *Sukha Rao*, *Sorpur Rao*, *Phandowala Rao*, *Bulinawala Rao* and *Kuawala Rao*, in **Kansrau Range** *Bullawala Rao*, *Suswa River*, and *Kans Rao*, in **Motichue Range** *Kalakund Rao*, *Motichur Rao*, *Pirbakhsh Rao* and *Jamni Rao* are flowing in the south-east to north-west direction.

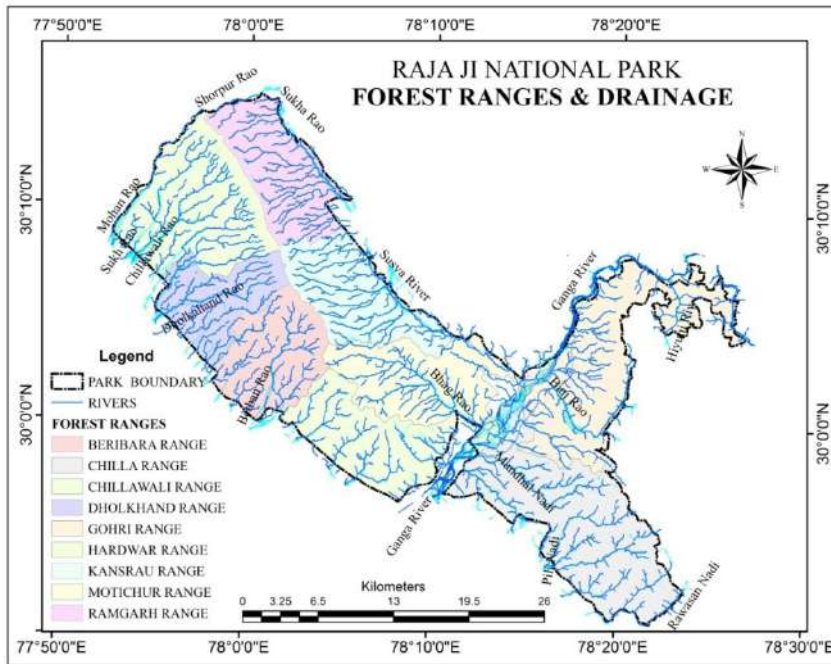


Figure: 3 Forest Ranges and Drainage of RJNP

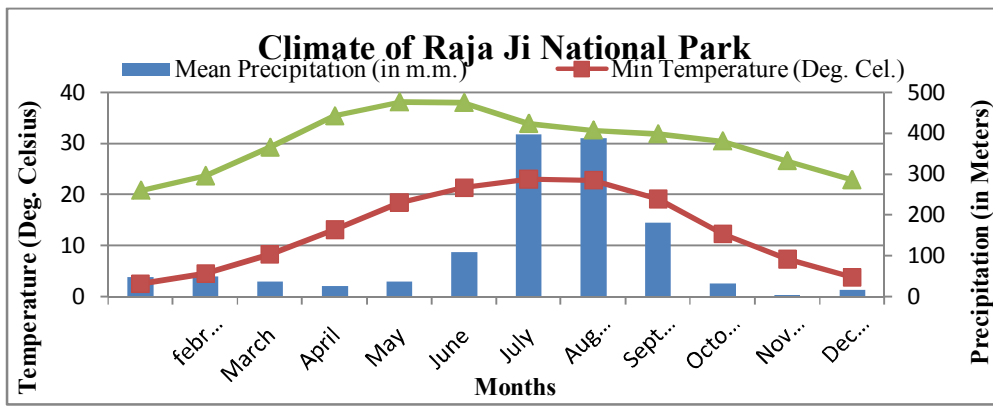
In *Gohri range* and *Chilla Range* river tributaries are flowing in different directions in **Gohri Range** *Chndrabhaga Nadi*, *badsani River* and *Bing rao* are flowing in the north-west to south-east direction and *Hiyuni Nadi* flows from south to north direction. In **Chilla Range**, *Mundal Nadi* flows from south-east to north-west direction and *Pili Nadi*, *Khara Nadi*, and *Rawasan River* flow from north-west to south-east.

5.3. Climatic Conditions

Table 2: Climate Temperature (Precipitation in mm & Temperature in °C)

Months	Jan	Feb	March	April	May	June
Mean Precipitation	48.57	50.42	36.36	26.19	36.63	109.03
Min Temperature	2.54	4.52	8.28	13.18	18.46	21.44
Max Temperature	20.83	23.67	29.26	35.39	38.09	38.00
Months	July	August	Sept	Oct	Nov	Dec
Mean Precipitation	397.03	388.23	180.64	31.95	4.43	16.27
Min Temperature	23.04	22.80	19.20	12.35	7.40	3.88
Max Temperature	33.91	32.61	31.87	30.49	26.63	22.90

Source: Extracted from <http://chelsa-climate.org>



Extracted by author from Chelsa Climate (Details are in parenthesis)

Figure 4: Climate

The climate in RJNP is mostly warm and dry with a few months of rain. The winter months between October and March are moderately cold with maximum temperatures ranging between 29.26 to 30.49°C and minimum temperature reaches up to 8.28°C to 12.35°C (Table 2). There is a heavy chance of spotting migratory birds during this time of the year. The summer months last between May and June with the highest sighting of wild animals along the water-bodies. The monsoon at RJNP lasts from July to September. The Park is usually closed at this time to help rejuvenate the forest and let the flora develop again. RJNP in summer (March - June) the overall climate is quite moderate during this time. The temperature ranges from 8.28°C to 38°C. In Monsoon (July –Sept.) during the month of Monsoon, this area receives a mild to medium amount of rainfall from 180.64mm to 397.03mm. This area becomes even more beautiful during these months. In winter (Nov.-Feb.) during the winter season, the temperature ranges between 20.83°C to 26.63°C degrees Celsius during the day but in the night temperature falls from 7.40°C to 2.54°C (Figure4).

5.4. Suitable Time to Visit

The spring season between the months of March and April is arguably the best time to visit the park. The weather is cool and temperatures range between 29.26°C to 35.39°C degrees throughout the day. Many animals can be spotted out in the open during this time due to the absence of very strong heat. 15 Nov.-15 June is the best time to visit *Rajaji* National Park. The best time to visit RJNP is from 15th November to 15th June as the park is closed in the other months. April to June are a bit warm, however, this is a better period to spot animals as they come out more often to drink water.

5.5. Status of RJNP as an Eco-tourist place

Ecotourism Society defines Ecotourism as "responsible travel to natural areas which conserves the environment and improves the welfare of the local people". Traveling to tranquil, peaceful and unpolluted natural areas define as Ecotourism; it is a form of Tourism includes Environment in itself. Due to enriched marvelous floral, faunal heritage, peaceful environment, both mountainous and Gangetic plain location RJNP have waste potential capacity in respect of Ecotourism. Establishment as Tiger Reserve and a part *Rajaji-Corbett* Elephant reserve RJNP swiftly boosting in Ecotourism activity in his provenance. RJNP is one of the most attractive places because of its natural floral and faunal heritage. It is also a favorable habitat for the wild animals such as Asian Elephant (*Elephas Maximus*), Royal Bengal Tiger (*Panthera Tigris Tigris*), Panther or Leopard (*Panthera Pardus*), Yellow Throated Marten, Striped Hyena (*Hyaena hyaena*), Common Jackal, Indian Porcupine (*Hystrixindica*), Barking Deer (*Muntjac*), Goral, Blue Bull, Spotted Deer, Wild Boar (*Susscrofa*), Sambhar deer (*Rusa unicolor*), Rhesus Monkey, Common Langur, Jungle Cat (*felischaus*), Himalayan Black bear (*vsusthibetanuslaniger*) etc.

Jeep Safaries are offered for 3 hrs each time in morning and evening from sunrise to sunset twice every day inside park approximately in open jeeps through rugged terrain on unmetalled treks through *Raus* and over hills giving opportunity to see wildlife and birds in different habitats in Mundal, Mithawali, Khara and some other ranges of peak. Therefore Jungle Safari is initiated officially by the RJNP authority that helps state government in earning revenue each year. It is the most attractive place not only among the national tourists but also for the foreign tourist's community. Increasing interest towards this type of Eco-tourist place can revel through the annual tourist flow growth rate from 2005-06 to 2015-16. It was 3.17% in 2005-06 but reached up to 72.93% in 2015-16. Very high flux in tourist growth rate can be seen during the revenue year 2015-16, it was 27.01% in 2014-15 but it reached up to 72.93% into 2015-16 General growth rate of 16%.

Elephant Safari is the new way to explore possibilities of Ecotourism in the park and we see wild animals very near. In the Park 60-90 minutes Elephant safari is available in both morning and evening as following time 07-09 AM and 03-05 PM everyday in tourist season, now a day's elephant safari is delectable tourist activity in the park.

Rafting is working as another factor to promote Ecotourism in RJNP. 40km stretch along the Ganga river NH-58 passes from RJNP which is provides favorable sites for the development of rafting and adventure tourism activities. There may well known places established for the purpose namely *Shivpuri, Singtalli, Brahmपुरi, Bijni, Malakhunti, Paliyalgaon, Kudiyala, Jhald Namaktok*, Private land and *Neerghar*, where many camp and rafting operator provides this facility.

RJNP is also a prominent region for spotting birds to watch and watch towers established in the forest ranges gives opportunity to site the birds. *Chila* and *Gohari* ranges are well known for bird watching. These are also highly suitable for bird habitation and over 350 bird species found in RJNP, which makes it a perfect bird watching destination that attracts tourist inward.

5.6. Ecotourism Potentials and Attraction of RJNP

In the present time, RJNP is a worthy site for eco-tourism due to the floral, faunal and terrain heritage. In the floral heritage RJNP cont about 128 species of trees, 63 species of shrubs and herbs, 38 species of grass and 63 types of climber's plant species. In the faunal characteristics, RJNP consists of 25 species of Mammals, 08 type species of reptile, 06 species of Amphibians, 09 species of fishes and 315 species of birds. With these floral and faunal characteristics now a day's RJNP is huge potential for eco-tourism.

In other hands, terrain characteristics are also accountable for promoting ecotourism in RJNP. The national park situated in the lower shiwalik range, shiwalik foothills and Gangetic plain in between 1381 m (highest) to 271 m (lowest) terrain Elevation from MSL. The shiwalik range passes west to east from RJNP respectively. The River Ganga passes from RJNP north east to south west and divided the park into two

parts. Now we are discussing Flora and Fauna enveloped land and terrain elevation features in RJNP. As we know RJNP having a rich amount and differentiation about flora and fauna. It is an enormous quality of RJNP makes an attraction site of oneself for the tourist.

5.7. Vegetation cover and floral diversity in RJNP

RJNP contains tropical and subtropical moist broadleaf forests, in particular, those of the Upper Gangetic Plains moist deciduous forests ecoregion. The forest ecosystems of the Park are quite varied and diverse. RJNP is situated in the Siwalik Forest Division, Uttar Pradesh, and has an area of approximately 820.40 Km² the diverse forest ecosystem of the park provide an ideal habitat for many wild animals. RJNP is a Natural heritage site which is distinguished as a tourist place and vast potential for Ecotourism activity. RJNP occupies various floral diversity make a spectacle of oneself.

Table 3: Vegetation Type

S.N.	Vegetation Types	Area Km ²	Area (%)
1.	Sal mixed moist deciduous	291.14	33.72
2.	Dry deciduous	192.42	22.29
3.	Sal	191.37	22.16
4.	Riverine grasslands	58.65	6.79
5.	Sub alpine/Teak/Degraded forest/Wet grasslands/Swampy grassland	12.96	1.50
6.	Moist deciduous/Pine mixed/Pine	7.84	0.91
7.	Dry deciduous scrub	7.18	0.83
8.	Mixed plantation	3.70	0.43
9.	Himalayan moist temperate/Temperate coniferous/Eucalyptus/ Ziziphus	1.87	0.22
10.	Agriculture/Barren land	22.40	2.59
11.	Water body	6.95	0.80
12.	Settlement	5.30	0.61
13.	River bed	61.56	7.13
		863.34	100.0

The forests are classified under the Northern tropical moist deciduous types having varied and diverse ecosystems (**Table 3**). A general survey of the forests revealed some important types of plant associations like Shorea, Mallotus and Adina community; Shorea-Terminalia and Bridelia community - Syzygium, Phoebe and Drypetes community etc. (Singh, K.K., Prakash, A. 1994).

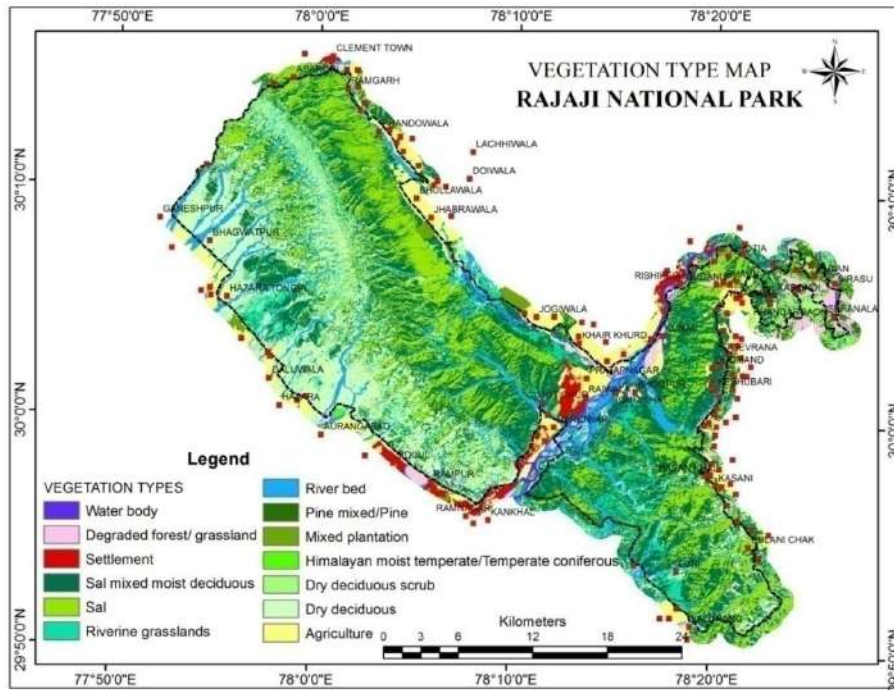


Figure 5: Vegetation Type

Source: Biodiversity Information System (<http://bis.iirs.gov.in>)

RJNP have major forests type and vegetation based on the physiognomy and floristic compositions cover in RJNP as following **Sal mixed moist deciduous** forest were occupies 291.14 Km² (33.72%), with this type of forest found sparsely in a spatial pattern. It is mostly found in the moderate slopes of the southern shivalik foothills and few patches are found in south-east parts of the park, **Dry deciduous vegetation** occupies 192.42 Km² (22.29%) area, It is densely found in small patches of south-west and northeast parts of the park and it is largely extended in the Gangetic plain of the park, **Sal forest** type occupies 191.37 Km² (22.16%) area, the Sal forest occupies the major forest part of the National Park and consist of two types, **Tropical Moist Deciduous** and **Tropical Dry Deciduous**. Which is largely found in the upper region of the park from where Lower Siwalik range passing from east to the west, **Riverine grasslands** occupies 58.65 Km² (6.79%) It is mostly found around the river channels of the Gangetic plain in the western part of the park. Some other small patches found in North West, **Subalpine, Teak, Degraded forest, Wet grasslands and Swampy grassland** occupies 12.96 Km² (1.50%) area, largely found in the upper region of the park from where Lower Siwalik range passing from east to west, **Moist deciduous/Pine mixed/Pine** occupies 7.84 Km² (0.91%) area largely found in upper region of park from where Lower Siwalik range passing from east to west, **Dry deciduous scrub** spared in 7.18 Km² (0.83%) area it is mostly found in the southern *Bhabar* region of the National park where fluvial Processes, river erosion, waterlogging and flood accord during the Monsoon season that largely diminish the forest cover and resulted in to scrubland. It occupies about 7.18 Km² (0.83 %) area in RJNP, the **Mixed plantation** type of vegetation occupies 3.70 Km² (0.43 %) area Having a small amount of partition, **Himalayan moist temperate/Temperate coniferous/Eucalyptus/ Ziziphus** vegetation occupies 1.87 sq km (0.22%) area it is mostly found in the upper region and lower hill slope of RJNP. This type of forest fragmentally extended in small patches from west to east in the southern part of the National park (Figure 5).

5.8. Wildlife species and fauna diversity –

RJNP is predominantly formed from dense green jungles, and this environment forms a habitat for a number of animals. The wild animal species found in the Park include: Asian Elephant, Bengal Tiger, Leopard, Jungle Cat, Striped Hyena, Goral, Indian Hare, Sloth Bear, Himalayan Black Bear, King Cobra, Jackal, Barking Deer, *Sambhar*, Wild boar, Rhesus macaque, Indian *Langur*, Indian Porcupine, Monitor lizard, Python It also the bird watcher paradise as there are 315 species of birds are found in the Park. The most prominent avian species include peafowl, woodpeckers, pheasants, Hornbill, kingfishers, and barbets, supplemented by a number of migratory species during the winter months. The rivers which flow through the Park harbor species of fish such as trout and *Mahseer*. As we know the RJNP is famous as a House of Elephants and leopards and a reservoir of the Tigers. Now a day there is above 420 Elephant, 200 leopards and about 18 Bengal Tigers alive in RJNP. About 3256 *Sambar* also living in the park.

5.9. Habitats in RJNP

The various habitats i.e. caves, crags, cliffs, overhangs, dens, burrows and trees for shelter, are abundantly spread over the park which is used by many fauna and organism. There are two well-known **caves** in the *Rajaji* national park which are located in the compartment no. 3b, which are the habitat of Bat roosts. Caves create a special microclimate that caters to the needs of a large number of plants. **Steep cliffs** formed by water and wind erosion in the *Shiwalik* ridge are important natural features in the Park that provide nesting sites for birds such as owls, eagles, bee-eaters and mynas, and even snakes. Cliffs also provide a special microclimate for threatened plant species such as *Catamixisbaccharoides* and *Ougeiniadalbergioides*. There are some of the important overhangs in the park are in *Gaj*, *Andheri*, *Thanda sot*, *Harnol*, *song*, *suswa*, *Motichur*, *Ranipur*, *Kansrao* and *Ghasiram rau*, which are a major part of the attraction for tourists in the park. Careful inspection of burrows made by many small life forms and reptiles and which provide shelter for various endemic species. It also reveals many interesting facts about smaller life forms useful for educating the society. **Tree hollows** constitute an important wildlife habitat for many birds' species such as parakeets, hornbills, woodpeckers, owls, and along with smaller mammals such as bats, squirrels and other rodent use of tree hollows to breed and roost. These hollows provide shelter for die out species and make people aware regards their protection and conservation. The management should also be aware of the importance of such tree hollows and their protection against forest fires and poaching of eggs and young once should be ensured. *Rajaji* National Park diary reported about the **dens** located in the *Chillawali* Range, *Kansaro* range habited by leopards while Tigers dens in the *Chilla* Range and the *Dholkhand* area of the *Dholkhand* Range. Hyena also lives in dens exist close to *Chilla* Forest Rest House in *Chilla* Range and in *Chirak Khol* in the *Haridwar* Range. There are several patches of swampy habitat in the park, having distinct and diverse floristic composition, mostly on the southern slope of the shiwalik and the eastern bank of Ganges. These areas come under the Sub-Montane Hill Valley Swamp forest type ([Champion and Seth, 1968](#)) and are found along the Song and Suswa rivers, the *Banbaha* and *Bahera* beat in *Kansrao*, *Motichur* and *Ramgarh* ranges and the *TunChaur* and *Jamania Bagh* areas of the *Chilla-Gohri* ranges. Perennial streams originate from some of the swamps. The trees found in the swamps are low, crowned and branchy and there is usually a dense growth of *Calamus tenuis* (Cane).

5.10. Transport Network and Route of Arrival in RJNP

Infrastructure facilities are playing an important role in the development of tourism activity. The RJNP is situated in the *Shiwalik* range, Piedmont and Ganga plains in respect three districts of *Uttarakhand* state, namely *Dehradun*, *Hardwar*, and *Pauri*, which is providing three dimensional (Airways, Road, and Railways) accessibility in respect of Routs and Transportation facility. RJNP has a well-developed road network; most of the area is accessible by the Road. National Highway NH-58 is passing through the RJNP from *Motichur* and *Hardwar* Ranges. The way from Delhi to RJNP is via *Meerut*, *Khatauli*, *Muzaffar Nagar*, *Roorkee*, *Hardwar* to *Chilla* located on the other side of the river Ganges (Figure 6).

There are several ways to reach *Rajaji* National Park as like Air, Rail, and Road. The all ranges of park well connected to major cities. Jolly Grant airport is the nearest airport to the national park which is located in Dehradun cities, 35 Km away from park. From New Delhi, the Dehradun airport has 55 minutes flight daily. There are three railway routes available to reach *Rajaji* National Park, *Hardwar* 24 Km, Dehradun 56 Km and *Rishikesh* 18 Km away from the National park. By road *Rajaji* National park is approachable by many roads; the national park is 220 far from Delhi which is covered by NH-58, the *Chilla* range is 8 Km away from *Hridwar* and 24 Km away from *Rishikesh*. The NH-72 covers the distance between Dehradun city and *Gohri* range and NH- 74 covers distance between *Nazibabad* and *Chilla* range. *Kotdwar*, Dehradun, *Mussouri*, *Rishikesh*, *Nizibabad* are major access of *Rajaji* National park.

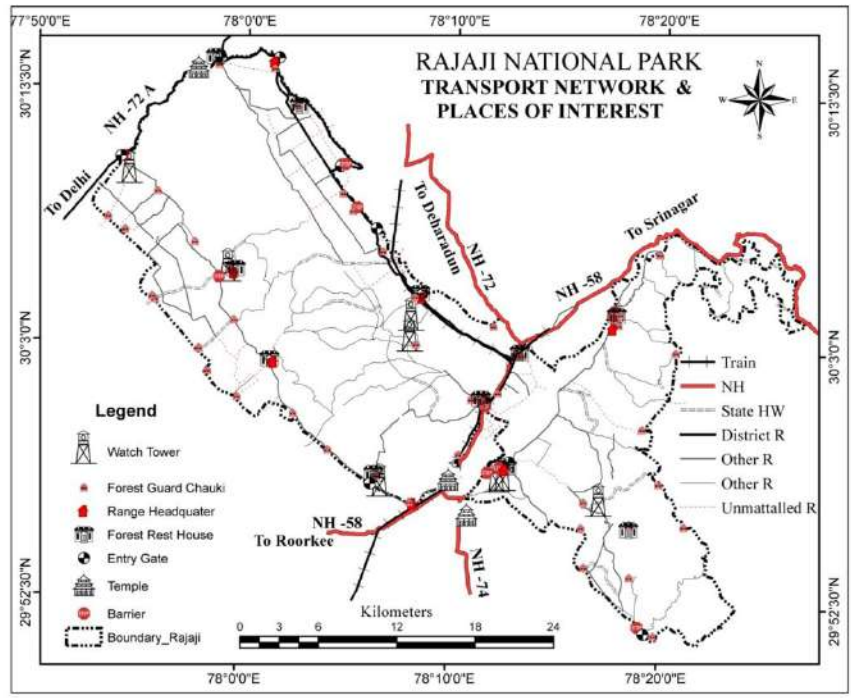


Figure 6: Transportation Network and Place of interest

5.11. Accommodation Facility in RJNP

RJNP provides accommodation facilities as lodging and food in their forest rest houses for tourists during the tourism season. There are 11 FRH’s is situated in the park which is located in Eight ranges except for chillawala range as following *Ramgarh*, *Kansrao*, *Motichur*, *Gohri*, *Cilla*, *Hardwar*, *Beribara* and *Dholkhand* (Table 4). The FRH’s has a total of two rooms in each and also provides hired and self-cooking facility in every FRH’s. *Kansrao*, *Motichur*, *Gohri*, *Hardwar*, *Beribara* and *Dholkhand* these given Forest ranges in RJNP having only One in each FRH as following *Kansrao*, *Motichur*, *Kunao*, *Ranipur*, *Beribara* and *Dholkhand*, *Ramgarh* Range having two FRH’s namely *Asarori* and *tha Phandowala* and *Chilla* Range having Three FRH’s namely *Mithawali*, *Chilla* old FRH and the *Chilla* old FRH Annex. The table also shows a brief detail about the room Charges in FRH’s for both as well as Indian Tourists and Foreign Tourists.

Table 4 Accommodation: Forest Rest Houses in park and facilities

SN	Range	Forest House Rest	No. of Rooms	Room Charges		Catering Facility
				Indian	Foreigners	
1	Ramgarh	Asarori	2	1000	2000	Self-cooking or hired

						cook
		Phandowala	2	750	1500	Self-cooking or hired cook
2	Kansrao	Kansrao	2	750	1500	Self-cooking or hired cook
3	Motichur	Motichur	2	1000	2000	Self-cooking or hired cook
4	Gohri	Kunao	2	750	1500	Self-cooking or hired cook
5	Chilla	Mithawali	2	750	1500	Self-cooking or hired cook
		Chilla old FRH	2	1500	3000	Available
		Chilla old FRH Annex	2	750	1500	Available
6	Hardwar	Ranipur	2	750	1500	Self-cooking or hired cook
7	Beribara	Beribara	2	1000	2000	Self-cooking or hired cook
8	Dholkhand	Dholkhand	2	750	1500	Self-cooking or hired cook
9	Chillawala	No FRH				

Source: Raja ji National Park

Table: 5 Entry Gate of Rajaji national Park

Name of Entry Gate	Approach Town and Distance Gate	Route
Ramgarh Gate	From Dehradun 14 km	Delhi- Dehradun highway via Clement Town
Mohand Gate	From Dehradun 25 km	Delhi-Dehradun highway.
Ranipur Gate	From Haridwar 9 km	Haridwar-BHEL Mohand Road.
Motichur Gate	From Haridwar 9 km	Haridwar-Rishikesh or Dehradun Haridwar Highway.
Chila Gate	From Haridwar 9 km	Via private bus route to Rishikesh.
Kunao Gate	From Rishikesh 6 km	Via private bus route on Rishikesh-Pashulok route
Laldhang Gate	From Kotdwara 25 km	Via private bus route to Kotdwara Chila

Source: office of RJNP

5.12. Entry Gates in RJNP

Table 5 represents the presence of Entry Gates in RJNP which provides all around accessibility to the park. There are total seven entry gates, namely *Ramgarh Gate*, *Mohand Gate*, *Ranipur Gate*, *Motichur Gate*, *Chila Gate*, *Kunao Gate*, *Laldhang Gate* located in the park which provides all around accessibility to the park. The table also shows the distance from the nearest approach town and routes are available to access these entry gates. *Dehradun* is approachable to *Ramgarh Gate* with the distance of 14 km and *Mohand Gate* with the distance of 25 km. All three gates i.e. *Ranipur Gate*, *Motichur Gate*, *Chila Gate*, are approachable from *Haridar* in with the distance of 9 km, *Kunao Gate* and *Laldhang Gate* are approachable from *Rishikesh* and *Kotdwar* with the distance of 6 Km and 25Km respectively.

5.13. Tourist Arrival in R J N P (flow) (2005-16)

Table 6: Tourist Arrival (2005-16)

Year	Indian Tourist			Foreign Tourist			Total Tourist Arrival	Growth %	Revenue
	Total	%	Growth%	Total	%	Growth %			
2005	11030	90.32	-	1182	9.68	-	12212	-	907668.0
2006	11388	90.39	3.25	1211	9.61	2.45	12599	3.17	2352638.0
2007	15228	89.22	33.72	1840	10.78	51.94	17068	35.47	2372568.0
2008	18233	89.41	19.73	2159	10.59	17.34	20392	19.48	2036300.0
2009	17366	90.39	-4.76	1847	9.61	-14.45	19213	-5.78	1956435.0
2010	16820	89.04	-3.14	2071	10.96	12.13	18891	-1.68	2715588.0
2011	12532	87.57	-25.49	1779	12.43	-14.10	14311	-24.24	3936505.0
2012	19268	91.49	53.75	1793	8.51	0.79	21061	47.17	5242205.0
2013	21538	93.64	11.78	1463	6.36	-18.40	23001	9.21	5437941.0
2014	19674	94.79	-8.65	1081	5.21	-26.11	20755	-9.76	4620933.0
2015	25308	96.01	28.64	1053	3.99	-2.59	26361	27.01	5756006.0
2016	42666	93.60	68.59	2919	6.40	177.21	45585	72.93	10202739.0
Mean Tourist Arrival	19254	91.32	16.13	1700	8.11	17	20954	15.72	47537526.0

Source- office of statistics of conservator of forest, Uttarkhand, Dehradun

Tourist arrival is an unpredictable phenomenon of tourism activity, which is supported by the current weather condition, transport facility, accommodation facility and many other factors helping in tourism development. RJNP is well-known Natural heritage site and tourist spot where tourist flows were growing rapidly. RJNP tourist arrival report (2004-2016) reveals a great increment in the growth of tourist in last decade. RJNP receives highest Indian and foreigner tourists in 2015-16 as following 93.60% (42666) and 06.40% (2919) of total tourist arrival with respect growth rate of 16.13% and 17% (Table 6). The decadal growth rate of tourist arrival is recorded 15.72% in last decade. RJNP experienced highest annual growth 72.93% in 2015-16 and lowest 1.68% in 2009-10 in tourist arrival. As an ecotourism site RJNP has a bright future because as tourist flow is growing rapidly the collection of revenue is also increasing (Table 6). As we see in the table the total revenue which is collected in 2004-05 are 907668.00 and it is increase by 10202739.00 in 2015-16.

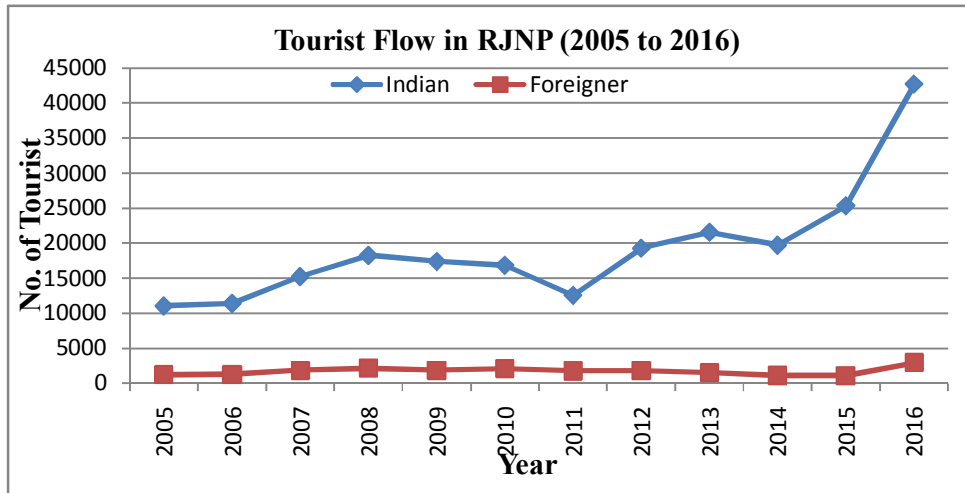


Figure 7- Tourist Flow in RJNP

Table 7- Future Forecasting for Tourist Arrival in RJNP

Future Forecasting for Tourist Arrival in RJNP			
Year	Indian tourist	Foreigner tourist	Total Tourist
2020	34778	1980	38585
2025	43910	2128	47864
2030	53042	2275	57144
2035	62174	2423	66423

5.14. Tourist arrival trend in RJNP

There are some variation are shown in Indian tourist arrival trend in RJNP (figure 8). Some small fluctuation are shown in graph as like in 2008 tourist flow is grow up from the trend line , in 2011 and 2014 tourist flow is drop down from the trend line and a major fluctuation is shown in 2016 tourist arrival flow is increases rapidly. As we calculate in graph trend line for future tourist arrival in RJNP, it is increasing every year.

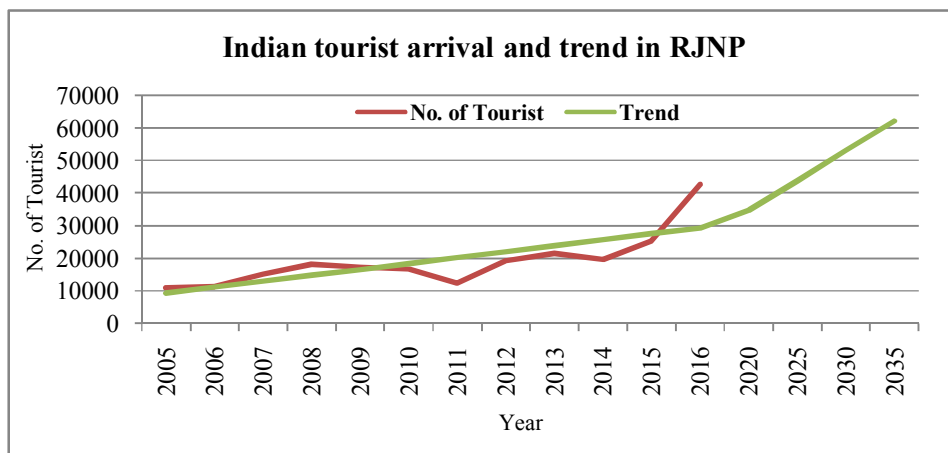


Figure 8 Indian Tourist arrival trend in RJNP

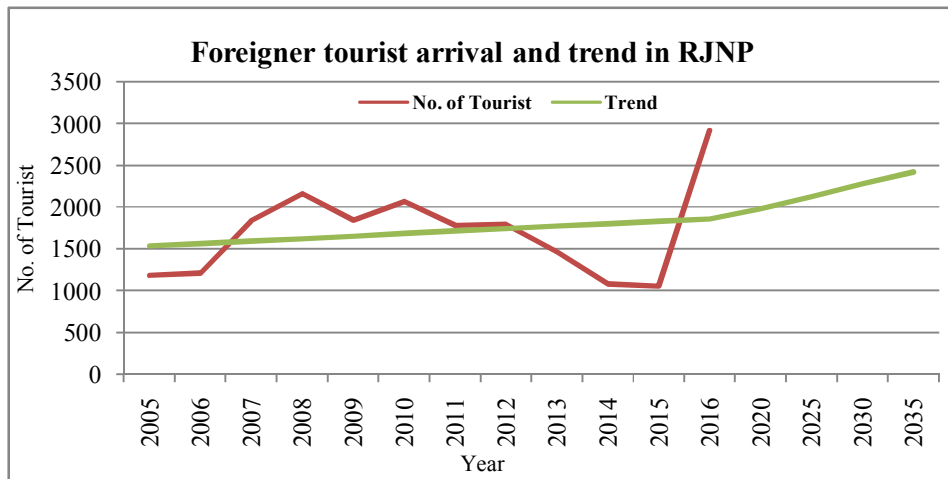


Figure 9 Foreigner tourist arrival and trend in RJNP

There are several major variation are shown in foreigner tourist arrival trend in RJNP (figure 9). Some major fluctuation are shown in graph as like in 2005 tourist flow is drop down from the trend line , from 2007-2011 tourist flow is grow up down from the trend line, but once again a major fluctuation is shown in between 2013-15 tourist arrival flow is decreases rapidly and in 2016 tourist flow is increase rapidly. As we calculate in graph trend line for future tourist arrival in RJNP, it is increasing slowly every year.

6. CONCLUSION

Ecotourism potential in RJNP forest ranges is highly associated with drainage, transport network, physiographic, slope aspect, point of Interest and floral and faunal diversity can be used as important parameters, with these results obtain by data interpretation explained that the Rajaji National park has vast potential for ecotourism activities like bird watching, wildlife watching, Jeep and Elephant safari, scenic beauty and Natural heritage, rafting. For the study map layers are used Elevation, Forest range, drainage, slope aspect, vegetation cover, road network and point of interest (watchtower, accommodation facility). Present study is support to give significant and precious information to develop policy and strategies for ecotourism development in RJNP. It can be helpful to generate employment for local community and increasing revenue which helps to the growing state economy. Basically Ecotourism also work as a significant tool for socioeconomic development of local community and ecological wellness of the national park. The rapid boosting of tourist flow is enlightened that the RJNP has an attraction toward the tourist which is also support to park develop as the sustainable ecotourism site.

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