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Elephant Habitat Suitability using Geoinformatics for Palamau Tiger Reserve, Jharkhand (India)

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Abstract: ***Geoinformatics plays an important role to understand human wildlife conflicts and the conservation of various natural resources. There have been increase in the incidents of human animal conflicts due to human encroachments in the forest areas and habitat degradation. The objective of the study is to analyze the habitat suitability factors i.e. Forest type, drainage, slope, aspect, contour and elevation were analyzed. The utilization of RS and GIS advances in untamed life mapping, characteristic asset arranging and administration especially in creating nations, is as yet constrained by absence of fitting size of information, equipment, programming and skill. The utilization of GIS to systematize, institutionalize and deal with the huge measures of spatial information produced by the development of elephant out of sight of unsettling influence to the scene. Continuous natural surroundings utilize data by elephant alongside the spatial appropriation of environment and fleeting changes has been broke down for territory assessment. Impediments of customary techniques for physical overview have been evaded by utilizing remote detecting and GIS innovation. By utilizing GIS for coordination and investigation of natural components related with elephants.***

Key words: Geospatial techniques, Habitat suitability, GIS, Overlay, Elephant

I. INTRODUCTION

The fragmentation of wildlife habitats is one of the major threats to the long-term conservation of species. Emerging effective prevention and mitigation plans for human wildlife conflicts is a top conservation priority in many areas of the world [1], large animals like elephants, which require extensive areas for survival, are more affected because of loss of habitat contiguity. The adverse effect of fragmentation leads to isolation. The long-term survival of a large-bodied, long-ranging animal such as the elephant can be ensured only through maintaining viable populations within viable habitats. For maintaining viable habitats it is vital that we maintain large, unfragmented landscapes [2]. How large these landscapes should be is open to discussion, but it is clear from studies of the elephant's home range, population dynamics and elephant human conflicts that this should be of the order of several hundred square kilometers at a minimum in the short term, and certainly several thousand square kilometers to ensure long-term viability. The Asian Elephant is directly threatened today by the fragmentation and degradation of its natural habitats, and by killing of elephants both for ivory, and also as a result of human-elephant conflicts [3]. Human-elephant conflict refers to negative interactions between wild elephants and people, such as crop damage, human death and injuries caused by elephants, and elephants being killed by people [4]. India holds by far the largest number of wild Asian elephants, estimated at about 26,000 to 28,000 or nearly 60% of the population of the species [5] [6]. Fragmentation and shrinkage of wildlife habitat has threatened the existence of many species. Mega-herbivores like the elephant with a large home range and equally large food requirements have been among the most affected species. This is one of the causes of increased human -elephant conflict and damage to property and life [7] [8]. Strategies to reduce the adverse effect of habitat fragmentation have been widely discussed and one proposed method for moderating the negative effects of habitat fragmentation is the preservation and restoration of biological corridors or the linear landscape between any two habitats. In India, male elephants regularly enter villages at night, destroying homes and killing people. Elephants killed around 300 people between 2000 and 2004 in Jharkhand, while in Assam 239 people were reportedly killed between 2001 and 2006 [9]. The population of elephants in Palamu has increased substantially during the past 50 years. Prior to 1920, this area had no elephant population but the 20 odd elephants released by the Maharaja of Surguja turned feral, subsequently increasing in number. The present elephant count exceeds 104 elephants which show addition of herds from the Singhbhum district of Jharkhand [10] [11]. The estimated 28,000 wild elephants in India are distributed over an area of about 109,500 sq [12] km., about three per cent of the country's geographical area. In some of these tracts, a segment of the elephant population killed an

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average of 350 people annually over the last five years (2005-2010), and damaged an average of 330 sq. km. of crops every year for the last three years (2007-2010) [13]. In Jharkhand and Orissa, 2,000 and almost 5,000 hectares respectively, of prime Elephant habitat is now under the miners' shovels, erasing all signs of the forest corridors that have been used by elephants for thousands of year. This has forced the wild elephants to move into areas where they have not been recorded in the recent past, and has resulted in a phenomenal rise in human-elephant conflict [14] [15].

II. STUDY AREA

The Palamau Tiger Reserve is located in the districts of Latehar and Garhwa in Jharkhand (India), extending from $23^0$25'N and $23^0$55'N latitudes to $83^0$50'E and $84^0$36'E longitudes and having an area of 1129.93 Km^2. It comprises the Palamau Wildlife Sanctuary (979.27 Km^2) and Betla National Park (226.32 Km^2). The altitudinal variation in the reserve ranges from 300m to 1140m above MSL (Fig.1). According to the All India Tiger Estimate, 2010, Palamau is believed to have a mean population of 10 adult tigers (range 6-13) with tiger occupancy spread over 1116 Km^2. It is surrounded by River Koel on its west and River Auranga on its north. There are many streams, nallahs and chuans as well. All major rivers from extensive alluvial deposit in PTR. Most of the cultivation is carried out here as the lands are very fertile. The climate here can be classified into four distinct seasons i.e. winter (Mid-November to Mid-February), summer (Mid-February to Mid-June), Rains (Mid-June to mid-September) and autumn (Mid-September to Mid-November). Winter in Palamau are usually quite cold particularly at night, and the occurrence of frost is noticed in late December and early January. The summer seasons is very hot and dry from late April to early June. At the time temperature can reach 50^0C in the northern portion of the reserve. The rainfall is higher in southern portion of the reserve than the northern portion. Mean annual rainfall estimated at 1075mm. whereas periodic drought have been noticed every five years. The area is dry and humidity is low during the months from March to early May. The humidity in the mornings is higher than that in evenings throughout the year. Depending upon the season relative humidity in morning ranges from 68% to 83% where as it is 25% to 75% in evenings. Hot winds blow during day, in months of April and May. Major forest types of the area are Dry Mixed Forest, Dry Sal Forest, Moist Sal Forest, High level Plateau Sal Forest, and Moist Mixed Forest.

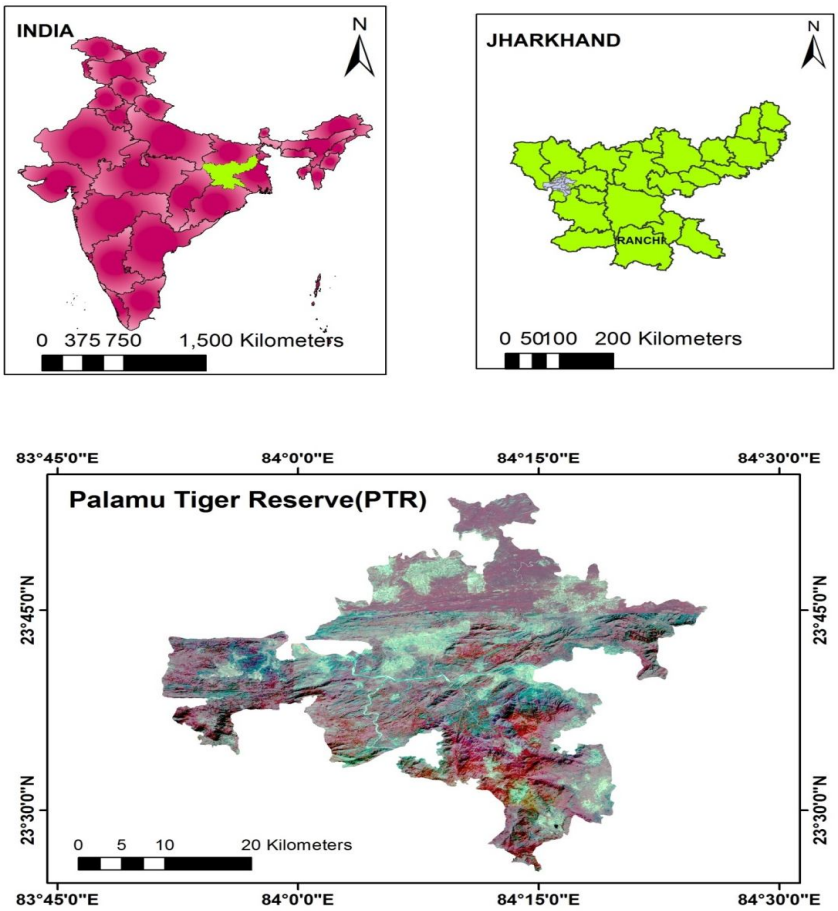

Fig.1: Study area map

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III. MATERIAL AND METHOD

Visual interpretation is done based on the spectral signature of a particular feature on satellite image or topographic maps the combination of spectral signatures with the knowledge of the ground provides the keys to interpret the satellite imagery in meaningful manner. The interpretation of image is a deductive process and identification of certain features leads to the recognition of others. Using the visual interpretation keys we easily demarcate the features such as forest, road, settlement etc. based on the nine interpretation keys i.e. Shape, size, texture, tone, patter, association, color, site, shadow etc. Road and settlement Maps; DEM, Elevation and Aspect maps; Forest Type and Density maps. The road and settlement maps are prepared using the SOI toposheet (scale 1:500000) which was georeferenced and digitized using Arc GIS software of the PTR. CARTOSAT DEM 1.1 was used to generate a relief map of PTR. With the use of Arc GIS software for on screen digitizing and on screen visual classification of maps were carried out attributes were given in order to input the data in GIS. Digital elevation model (DEM), contours slope and aspect of the area were extracted. Forest type map was created using the JSAC map as Secondary dataset and on screen digitization with the ground truthing assessment using the GPS instrument for locating the pure patches of different forest types. The forest density map was created using the NDVI indices and the classes were defined based on the FSI forest density type classification using the Erdas Imagine software. Methodology is divided into four broad spectrums, 1. Field work 2. Creation of basic layer using GIS 3. Creation & Analysis of Habitat Suitability Map. Field work is one of the main components in research for the ground truthing and accuracy assessment of the maps. GPS device was used to collect the data such as elevation, vegetation type and density and locating the conflict villages. Habitat suitability map was created using the overlay analysis method by assigning weightage to the each unit of thematic layers (Fig. 2, Table 1).

Table 1:- Data sets used during the study

Satellite Data						
S.No	Spectral Resolution	Spatial Resolution	Temporal Resolution	Radiometric Resolution	Sensor Name	Maps
1. 2.	SWIR BAND 6 1.6-1.7 0.52-0.59 (green) 0.62-0.68 (red) 0.77-0.86 (near IR)	30m 23.5m	16 days 24 days	8 bit 10 bit	Cartosat 1.1 LISS III	Aspect Contour Elevation
3.	0.52-0.59 (green) 0.62-0.68 (red) 0.77-0.86 (near IR) 1.55-1.70 (mid-IR)	56m	5 days	12 bit	Awifs	NDVI LULC
Secondary Data					Source	Maps
4.	Toposheet				SOI	Transportation Drainage
5.	Seconadary Data				JSAC	Forest Type map Village Map
					Project Tiger	Crop raiding data PTR Boundary Movement map Beat map Range map

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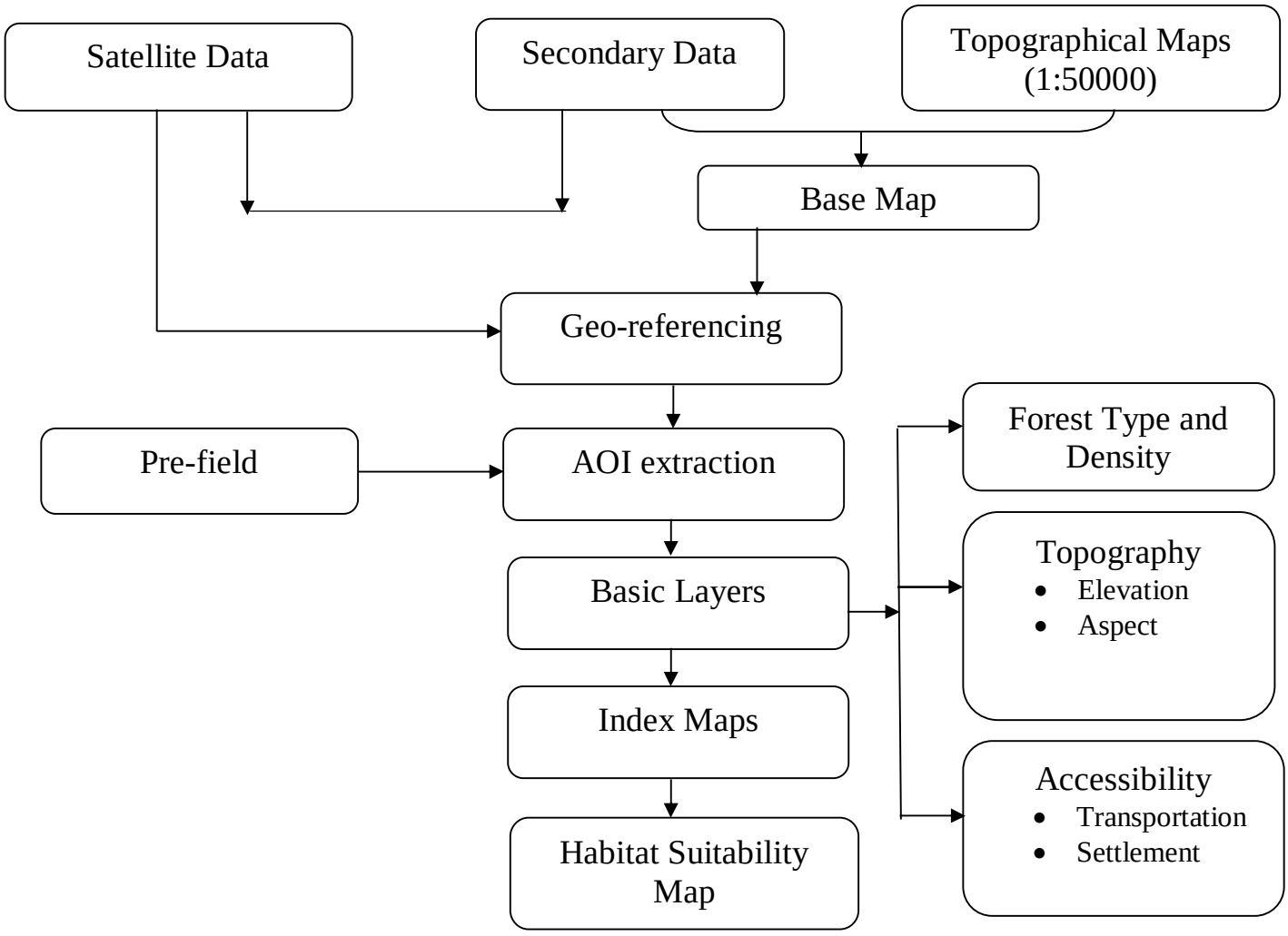

Fig. 2: Methodology Adopted for the study

IV. RESULT AND DISCUSSION

The principle target of the review was to create a natural surroundings reasonableness delineate on overlay examination. Natural surroundings appropriateness guide was made utilizing weightage examination strategy in light of learning. The distinctive topical layers were made. Seepage design in the region is dendritic (Fig.3). The significant waterways are North Koel River and Burha River alongside some major nalas, demonstrates high seepage in the north western and eastern piece of PTR. The southernmost piece of PTR has less thickness, while the focal piece of PTR has high thickness in some little fixes. The backwoods sort in this area is fundamentally Sal and Bamboo brakes (Fig.4). In the north and North-eastern piece of PTR is fundamentally secured with the Sal patches, while the focal and western part are secured with the Bamboo breaks, some little fixes of teak and blended deciduous woodland. The viewpoint guide was made utilizing the CARTOSAT Digital Elevation Model which demonstrates the distinctive degree and bearing of the PTR (Fig.5). The rise guide was made utilizing the CARTOSAT Digital Elevation Model which demonstrates the diverse elevational estimation of the PTR (Fig.6). The form guide was created utilizing the CARTOSAT Digital Elevation Model with a distinction of 50m shape line (Fig.7). The suitability analysis took into account information relating to forest type and density, elevation, slope, source of water, human activities in terms of settlement, agriculture, tea plantations, roads, and railways. Satellite imagery, data from topographical maps, digital elevation data, and global positioning system readings formed the major data inputs that were incorporated into a GIS. Various decision rules were created and confidence levels assigned to the input layers to generate high, medium, and low habitat suitability (Fig.8). Future research in untamed life demonstrating ought to concentrate on growing more practical dynamic models of natural life in space and time. Since the environments to be displayed can

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be altogether influenced by knowledge based occasions and the reactions of untamed life are non-straight in frame, models must be dynamic and plan to give forecasts of known accuracy that are testable. Untamed life administration requires dependable and predictable data on the wealth, dispersion of species and their living spaces and in addition dangers.

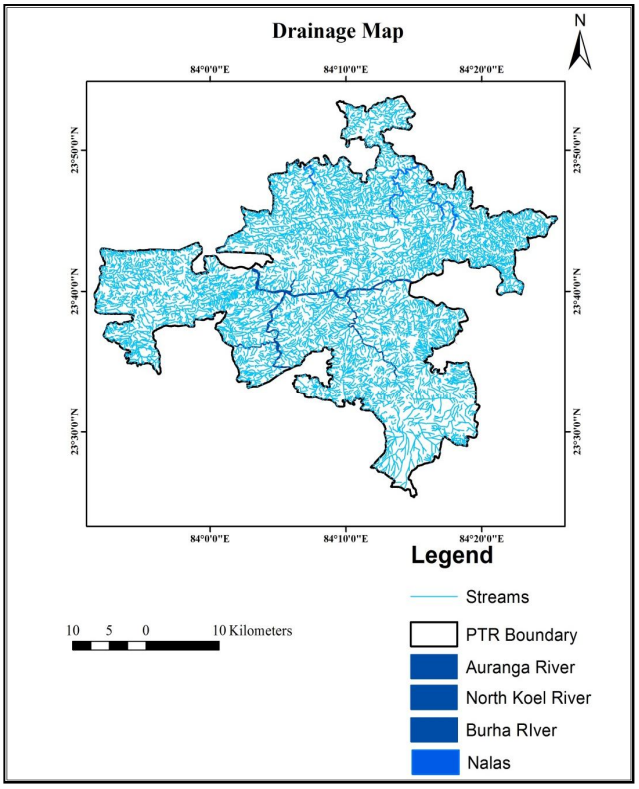

Fig. 3: Map showing drainage map of PTR

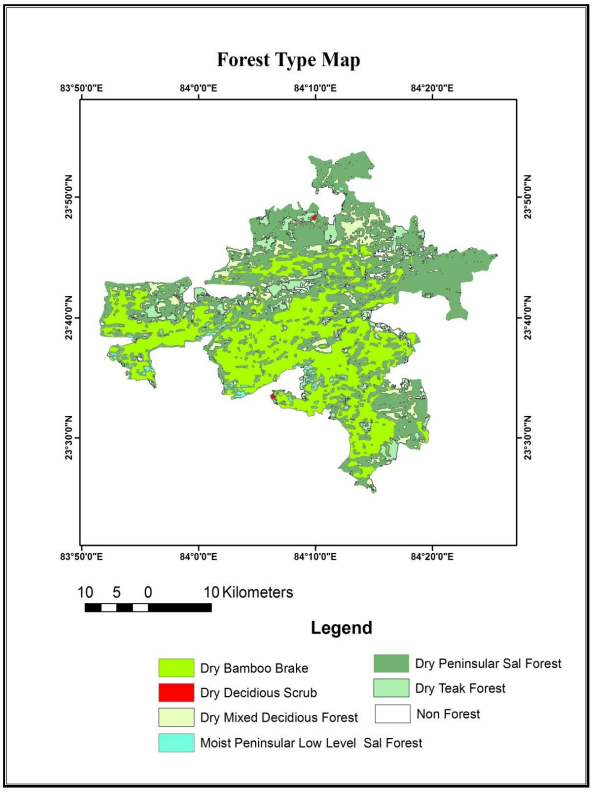

Fig.4: Map showing forest type of PTR

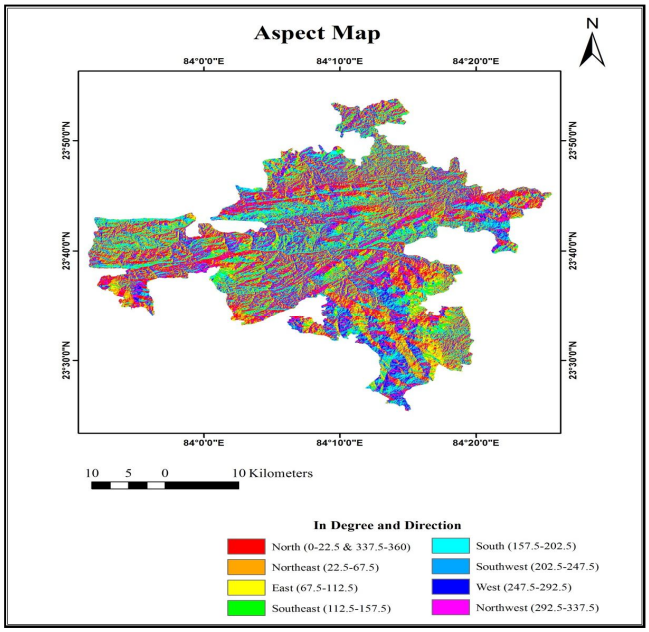

Fig.5 Map showing aspect of PTR

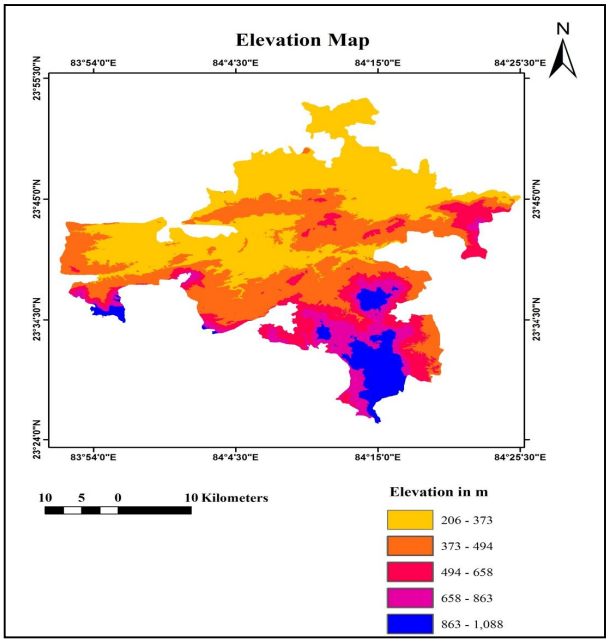

Fig.6 Map showing elevation of PTR

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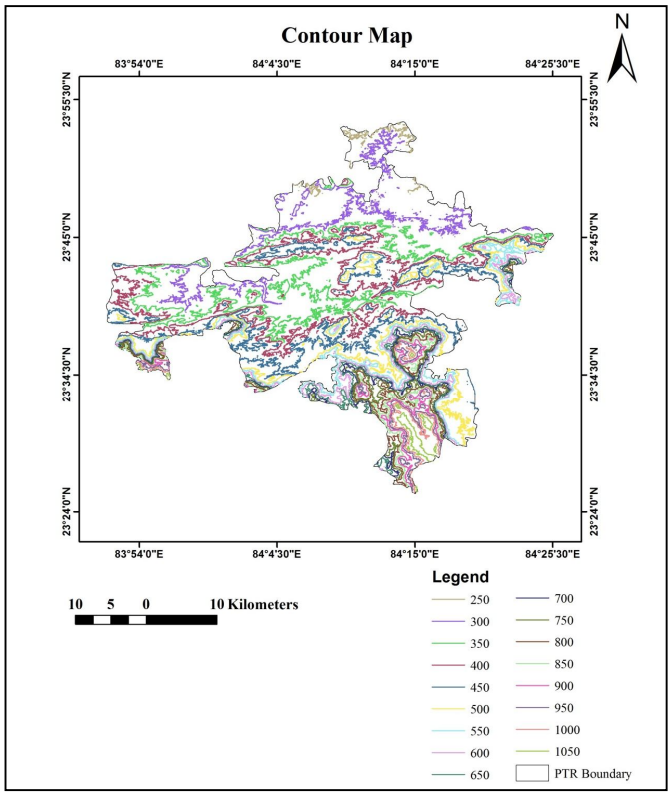

Fig.7 Map showing contour of PTR

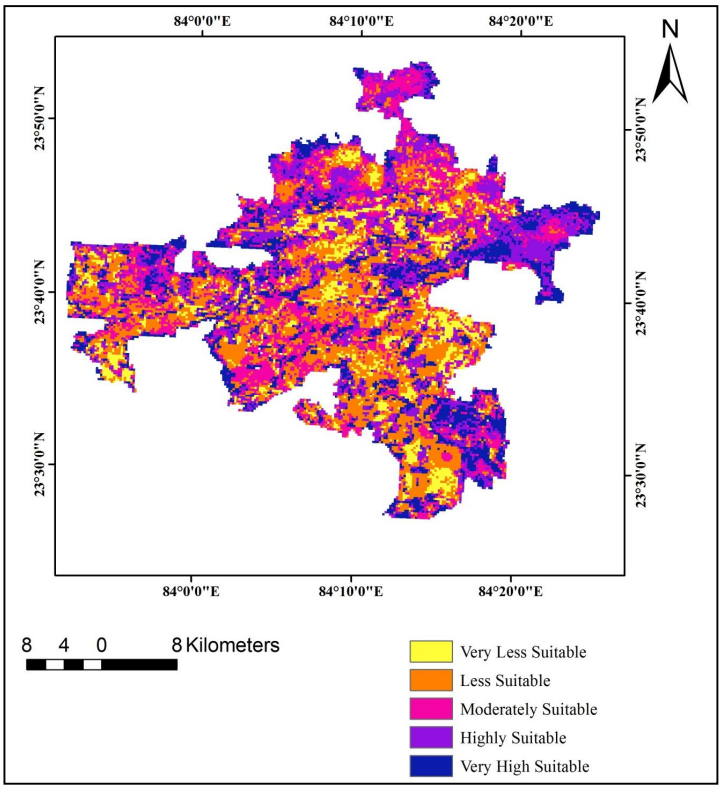

Fig.8 Map showing Habitat Suitability of PTR

V. CONCLUSION

The use of RS and GIS innovations in untamed life mapping, normal asset arranging and administration especially in creating nations, is as yet restricted by absence of proper size of information, equipment, programming and skill. Future research in natural life demonstrating ought to concentrate on growing more practical dynamic models of untamed life in space and time. Since the biological communities to be displayed can be altogether influenced by stochastic occasions and the reactions of untamed life are non-straight in shape, models must be dynamic and mean to give expectations of known exactness that are testable. Untamed life administration requires dependable and predictable data on the plenitude, circulation of species and their natural surroundings and also dangers. The natural surroundings appropriateness concentrate included an investigation of the unpredictable interrelationship among different conditions and life essentials for the elephants over a geological range. The ranges along the line crossing point made crosswise over assorted qualities of the timberland were examined and the untamed life tracks were recognized. The conditions favored by the Asian elephants were recorded in connection to areas. Furthermore, the data gotten from the Landsat TM, topographic guide and GPS were accumulated to make the topical layers. The topical layers incorporate sustenance and cover, physical scene and separation to human movement locales. Lattice overlay on the layers was carefully performed to produce environment reasonableness outline the Asian elephant. Field check, in light of the guide yield and recurrence of the elephant tracks, was led to approve the subsequent guide.

REFERENCES

[1] Treves, A. and K. U. Karanth, “Human-carnivore conflict and perspectives on carnivore management worldwide”. Conservation Biology, 17(6), pp. 1491-1499, 2003.
[2] Schmiegelow, F.K.A. and Monkkonen, M, “Habitat loss and fragmentation in dynamic landscapes: Avian perspectives from the boreal forest”. Ecological Applications, 12, pp. 375-389, 2002.
[3] Recher, H.F, Shields, J, Kavanagh, R. and Webb, G, “Retaining remnant mature forest for nature conservation at Eden, New South Wales: A review of theory and practice”. In Nature conservation: The role of remnants of native vegetation, ed. D.A. Saunders, G.W. Arnold, A.A. Burbidge & A.J.M. Hopkins. Surrey Beatty & Sons, Chipping Norton, pp. 177-94, 1987.
[4] Hoare, R, “Projects of the Human-Elephant Conflict Task Force (HETF) – Results and Recommendations”, 2000.

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Volume 5 Issue VI, June 2017
ISSN: 2321-9653

[5] Bist, S.S, "Elephant conservation in India - an overview". Gajah, 25, pp. 27-37, 2002
[6] Choudhury, A, "Status and conservation of the Asian elephant Elephas maximus in northeastern India". Mammalian Review, 29, pp. 141-171, 1999.
[7] Johnsingh, A.J.T, Prasad, S.N. and Goyal, S.P, "Conservation status of the Chila-Motichur corridor for elephant movement in Rajaji Corbett National Parks area, India". Biological Conservation, 51, pp. 125-138, 1990
[8] Menon, V, Tiwari, S.K, Easa, P.S. and Sukumar, R, (eds) "Right of Passage: Elephant Corridors in India". Conservation Reference Series 3, Wildlife Trust of India, New Delhi, 2005.
[9] Ramakrishnan, U, Santosh, J.A, Ramakrishnan, U. and Sukumar, R, "The population and conservation status of Asian elephants in the Periyar Tiger Reserve, southern India". Current Science, 74, pp. 110-113, 1998.
[10] Sukumar, R, "Ecology of the Asian Elephant in Southern India. II. Feeding Habits and Crop Raiding Patterns'. Journal of Tropical Ecology, 6, pp.33-53, 1990.
[11] Canters, K, Piepers, A. and Hendriks-Heersma, A, "Habitat fragmentation, infrastructure and the role of ecological engineering". - Proceedings of the international conference on Habitat fragmentation and infrastructure in Maastricht & DenHague 1995. Delft, The Netherlands:Ministry of Transport, Public Works and Water Management, Road and Hydraulic Engineering division, 1997.
[12] Chaudhuri, Kisor, "Singhbhum Elephants: Study of the habitat & seasonal activity". Wildlife Protection Society of India, New Delhi.
[13] Goswami, R, "Forest cover loss sets off alarm bells", The Telegraph, 2015.
[14] Saikia, A, "A mammoth disaster: The task of managing wild and domestic elephants", Hindustan Times, New Delhi, 2015.
[15] Karanth, K.K, Gopalaswamy, A.M, Prasad, P.K. and Dasgupta, S, "Patterns of human–wildlife conflicts and compensation: Insights from Western Ghats protected areas". Biol Conserv, 166, pp.175-185, 2013

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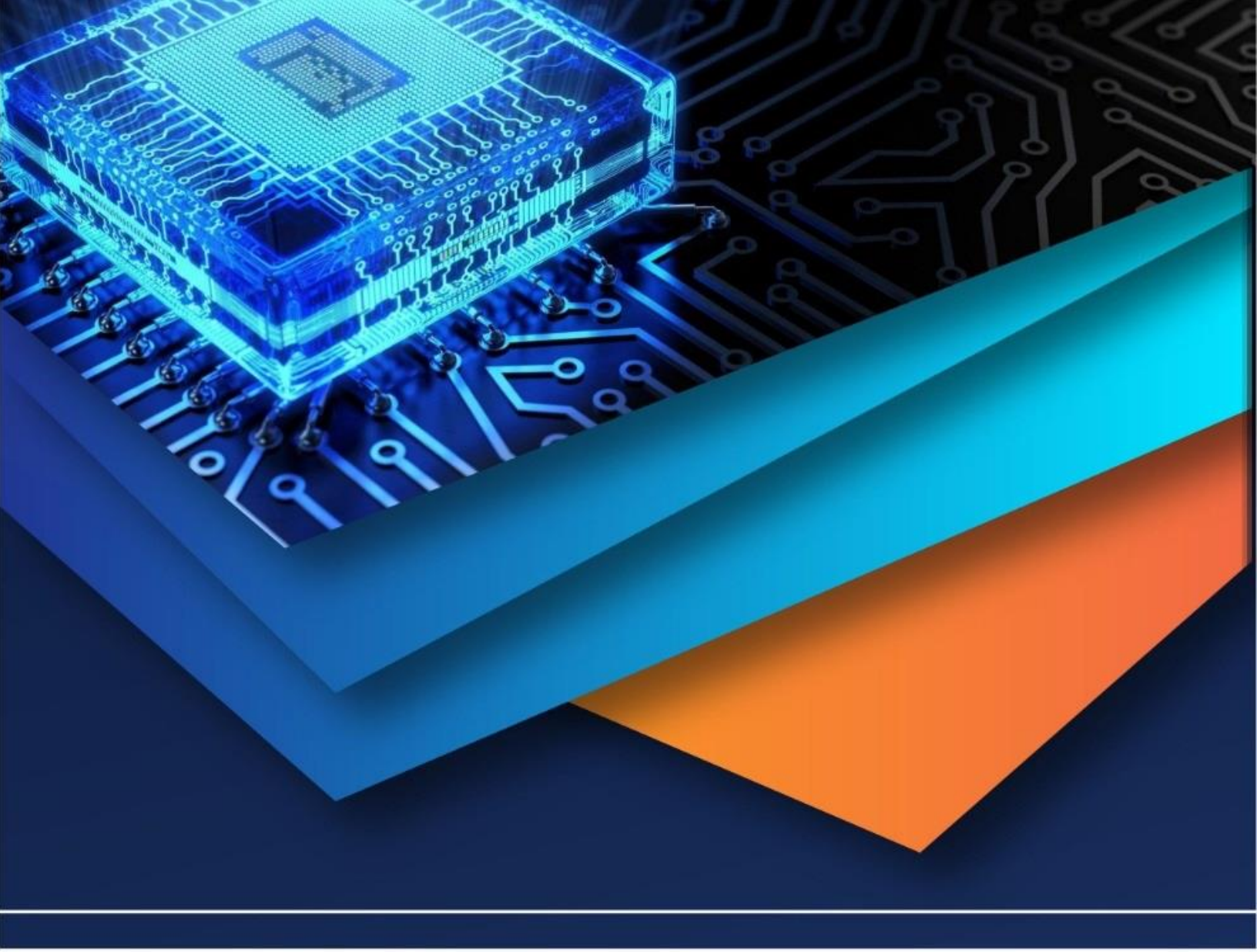

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