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Decrease of Forest and its Impact on Villages around Simlipal National Park

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Abstract: ***Household economy in and around Simlipal Tiger Reserve very much depends on the forest that supports cattle and livestock rearing and level of milk production whichis the primary source of livelihood of those living in the reserve. However, families living in the buffer zone or adjacent Core-2 and Core-3 (can be called semi-buffer) earn a little from agriculture which is practiced on a limited revenue lands that has been restricted by the forest managements for the protection of forest from further degradation. Also, the villagers earn from the sale of cattle directly that is mainly limited to goat, whereas buffalo is sold in rare conditions when there is dire need for money to meet emergency expenditure like medical, marriage etc. Since Simlipal is rich in flora and fauna, families also generate some income from tourism as it attract good number of tourists throughout the year excluding the monsoon season when park is closed from July to September for breeding and seclusion of wildlife. Villagers sell their milk and milk derivatives like sweets, ghee, paneer and other milk delicacies in thenearby markets and also to the tourists during the tourist seasons, in the religious festival and mela (Fete) when park hums with devotees and tourists, who throng the park, Pandupole and Bharathari mela. During monsoon season as mentioned earlier park remains closed, but the temple visitors on the auspicious Tuesday and Saturday forthe regular religious ceremony of the Hindus are allowed to enter. However, forest safari and off road diversion in woods is not permitted. Yet, tranquility of the forest is disturbed and visitors come to the park throughout the year and support local market for the generation of meager income by the villagers. Villagers in the semi-buffer zone also earn on a limited scale from the activities like daily wage labour, hotel staffs, driver, guide etc., which is directly or indirectly dependent on the forest. Purely, off-forest***

Keywords: ***Biodiversity, SNP, psychological benefits, Abhayaranya***

I. INTRODUCTION

Forests play an important role in the economic development of any country. In India also, forests constitutes the backbone of many industries besides providing economic security to a large section of people who live in and around the forest areas. Apart from providing employment in the primary, secondary and tertiary sectors, forests also meet the needs of the social and domestic requirements of the vast section of rural population by providing fuelwood, timber, fodder from the grazing ground, recreation and so on. Conservation of forests is also important for its role in the prevention of soil erosion, checking of floods and conservation of moisture, facilitating recreation and maintaining overall environmental balance. Forest is also a source of non-market ecological services – local and global, which is crucial in giving life support to the biosphere and provision of habitat for biodiversity, which is a repository of genetic wealth.

All these eco-services provides indirect use value or some option value, but not readily transformable into exchange value. It also contributes to eco-tourism where recreation and tourism have become social, economic and environmental forces of almost unbelievable proportion.

Tourism is the world's fastest growing industry of the time, and in terms of jobs, much of it are based on natural environment, providing millions of people with important social,psychological benefits. But, at the same time, it leads to impact on ecology and cultures that are often pernicious and difficult to resolve. Particularly, pilgrimage tourism has ancient tradition in Asia, for example, Abhayaranya (Forest Reserves) were established in South Asia not only to protect forests but also for recreation, though in a different context Mishra (1988) and Nepal (2000).

Since forests constitute some of the most complex natural ecosystem, because of their multi-functional role in the viability of the biosphere life-support system, the preservation of forests is essential for the ecological health of the planet. Of late, the accelerated degradation and deforestation in the world over has become a matter of global concern and a major environmental crisis. Deforestation occurred in the world due to industrialisation and varied other factors like division of land, extensive agriculture use, pasture, urban development, excessive harvesting of forest and forest products, grazing, forest fires, etc.

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The objectives of this study are

1) To examine the nature and trend of degradation of forest and biodiversity in the SNP preferably during last three decades and also to relate the observed degradation with various potential reasons,
2) To examine the impact of degradation of forest and biodiversity on the economy of the villagers in the SNP
3) To analyse the effect of degradation and forest and biodiversity on the tourism and hospitality sectors in the area and finally
4) To analyse the possible impacts of the proposed relocation of villagers from the forest area on their economy.

II. LITERATURE REVIEW

A. *Measurement And Causes Of Degradation*

Various studies have highlighted the importance of forest resources on the economy of villagers living in and around the forest (Lyngkhoi, 2007; De, 2006). Thakur (2013) described how the livelihood pattern of the inhabited communities is affected due to the forest resource extraction in Terai Districts of Nepal. Also the extraction, management, livelihood and development of those forest communities are found to be affected by natural disaster, poverty, exclusion and gender based violence. It also showed how the livelihood diversification through various measures including entrepreneurship development and training, access to capital, institutional arrangements etc. can reduce the pressure on forest and better manage it. The analysis also showed that access to physical and human capital has a significant influence household activities and earning. The area owned the value of other assets possessed, as well as the number of livestock and family labourers positively influence household income (Stefan Schwarze, 2004). Excessive extraction of natural resources and the resultant degradation of forest and habitat in return threaten the survival of both human and in turn again wildlife (IUCN, 2001). Hardin (1968) observed the recklessness in the exploitation of common resources where the people irrespective of future gain tries to maximise the present benefits though it may be very negligible. This is characterised by the principle of tragedy of commons and resultant degradation of common resource. Studies by Thakur (1985), Mishra (1988), Singh (1990), Mehta (1993), Dandekar (1996), De (2006),Lyngkhoi (2007) also explained the problem of population growth, incidence of poverty and their impact on the environment, particularly on forest. The importance of biodiversity conservation and human needs conflicting with welfare maximization highlights the growing pressure of resource management and efficient transformation.

III. NATURE OF DEGRADATION OF FOREST AND BIODIVERSITY IN THE SNP

First of all, nature and extent of degradation of forest and biodiversity of Simlipal National Park is described through the comparison of satellite picture taken in 2010 with another picture of 1969 received from the park authority. Though the topographic picture is not very clear, it gives a rough idea of changes in quality of forest there. In order to have a better idea of degradation alternatively, changing labour time and distance travelled for the collection of required fuelwood and fodder during 1980-81 to 2010-11 is computed and compared across the villages. The spatial variation in degradation can be understood from the differences in growth of required labour time as family size is still large and requirement of fuelwood and fodder is almost identical) and distance travelled for the collection of materials. Moreover, the changing biodiversity is examined through the changes in species variety as well as through the variation in value of Shannon index of Biodiversity, which is SI = ∑Pi 2, where Pi is the proportion of ith species to total number of species in the park..

IV. IMPACT OF DEGRADATION OF FOREST AND BIODIVERSITY ON THE ECONOMY OF THEVILLAGERS IN THE SNP

First of all, the impact of degradation of forest on residents within the SNP is examined by taking into consideration of changes in income and share of income from resource derived from the forest directly and raising cattle etc. by the inhabited villagersover time. However secondary data on total income and its changes over time of those villagers is not available. Also it is very difficult for them to recollect and inform about changes in their income, earning from forest and other activities for a considerable period of time. Thus, earning or revenue generated from the forest resources (like fuelwood, grass and tree fodder, timber poles and thatching grasses) are estimated first and then compared across the zones with varied degradation level. A part of theproducts like milk, sales proceeds of cattle is generated from grazing or collected fodder, whose equivalent market value is also included in the calculation of direct contribution of forest and hence is deducted from the sales proceeds of milk in order to avoid double counting. Only net earnings from milk are considered. As the major products collected from the forest are not marketed and consumed at home, its equivalent value at the ongoing market rate in the outside areas are considered for estimation.

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Then, the proportional contribution of various components of income from forest is computed and compared across the zones. Variation in income of the villagers is compared with the variation in degradation faced by them who have been residing in forest villages with varied crown density or degradation measured in terms of changing travel distance and labour time used to collect the forest products and also grazing.

V. COLLECTION OF DATA

The study is based on both primary and secondary data. For the purpose of analysis, Secondary data on number of tourists in Odisha and in Simlipal is collected from the directorate of tourism, government of Odisha. Also, the strength of forest officials and information on relocation packages etc. are collected from various Management Plans of the Research Wing of Simlipal Tiger Reserve. Degradation of forest is examined on the basis of secondary data whatever available and primary data collected from the villagers by direct interview using a suitable interview schedule. Primary data is collected from a random sample of 16 villages drawn from the 28 villages (all belonging to different Core Zones within the park). Besides 2 villages from the Buffer Zone and one relocated village namelyBardodh Rudh, which is 75 Km away from the park are also surveyed. A total of 294 households from the Core area villages (Core I, II, III), 65 households from two selected villages of the Buffer Zone in addition 23 families of the newly relocated village Bardodhrudh, Behror, Odisha, have been selected by simple random sampling for the purpose of survey. The heads of the families are chosen as the respondents. Thus, overall 19 villages as mentioned above are chosen and 382 families are selected in total as final sample units for understanding their dependence on forest, nature of degradation across the zones, impact of degradation on their livelihood etc. Samples from all core zones, buffer area and relocated site are chosen to collect information that would help us to understand the differences in their economic conditions and livelihood opportunities in the park and relocated area. Also, it would help to find out the variation in economic condition and pattern of livelihood of the relocated families before and after the relocation.

VI. STATUS OF FOREST COVER IN INDIA

Table-4.1: Status of Forest Cover in India

	2005	2011	
Class	Area (Sq Km)	Area (Sq Km)	Percentage Variation (2005-11)
Forest Cover			
Very Dense Forest	54569 (1.66)	83471 (2.54)	53.01
Moderately Dense Forest	332647 (10.12)	320736 (9.76)	-3.55
Open Forest	289872 (8.82)	287820 (8.75)	-0.79
Total Forest Cover*	677088 (20.60)	692027 (21.05)	2.18
Tree Cover	91633 (2.79)	90844 (2.76)	-1.07
Total Forest and Tree Cover	768721 (23.39)	782871 (23.81)	1.79
Non- Forest cover			
Scrub	38475 (1.17)	42177 (1.28)	9.40
Non- Forest	2571700 (78.23)	2553059 (77.67)	-0.71
Total Geographical Area	3287263 (100)	3287263 (100)	0.00

Source: State of Environment Report India, 2009 and 2011.
Note: (i) *Figure includes 4662 Sq Km area under mangroves.
(ii) Figures in the parentheses represent percentage of total Geographical area.

A. Vegetation and Land Cover in Simlipal National Park:

The vegetation of Simlipal correspond to (1) Northern tropical dry Deciduous Forests (Subgroups 5B; 5E1 and 5/E2) and Northern Tropical Thorn Forest (Subgroup 6B) (Champion and Seth, 1986). Anogeissus pendula is the dominant tree species covering over 45 per cent area of the forest. Boswellia serreta and Lannea coromandelica grow at rocky patches. Acacia catechu and bamboo are common in the valleys. Some valley support Butea Monosperma and Zizphus mauritiana. Dendrocalamus strictus is strictly limited in distribution and is found along well drained reaches of the stream and most cooler part of the hills. Albizia lebbeck, diospyros melanoxylon, holoptelia integrifoli and ficus sp are found in most localities.

A number of exotic invasive species have become common in the degraded areas of the reserve such as the annual shrub Cassia tora and the short-statured trees Prosopis Juliflora. Adhatoda Vasica, though a native under storey species, has become very common in the disturbed and over-grazed areas, and appears to suppress grasses and other native herbaceous species (Figure-4.2). Nine different vegetation and land cover categories in the STR is presented Table-4.4 and its distribution is shown in Fig-4.3.

Table-4.4.: Vegetation and Land Cover Categories of STR

Vegetation/ Land cover type	Area (per Sq Km)	Percentage to Total
Anogeissus dominated forest	283.25	35.43
Scrub land	152.46	19.07
Boswelli dominated forest	123.54	15.45
Agriculture/ Habitation	74.68	9.34
Butea dominated forest	63.56	7.95
Zizyphus mixed forest	47.51	5.94
Acacia mixed forest	32.19	4.03
Barren land	20.63	2.58
Water body	1.62	0.20
Total	799.43	100
Source: WII, Ecological studies in Simlipal Tiger Reserve in Odisha, Final Report 2009.		

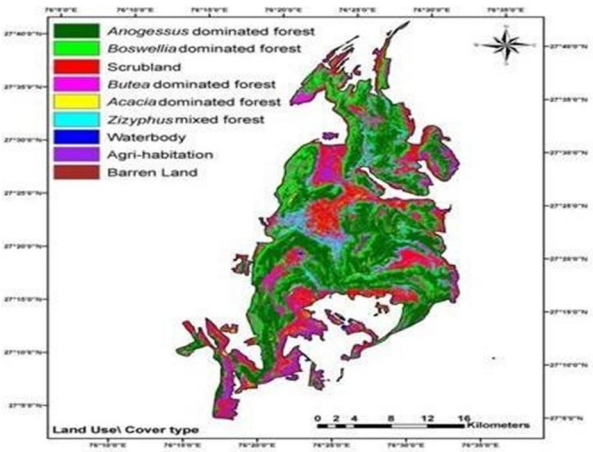


Figure-4.2: Vegetation And Land Cover Map Of Simlipal Tiger Reserve

VII. OBSERVATION AND ANALYSIS

Density of forest in Simlipal has been found to decrease significantly over the years. Though time series data on crown density, changes in forest cover is not available, the satellite imagery of the forest area taken in 1969 and 2010-11 is used to have a rough idea of the changes in forest cover in the park. From the Figures 4.4 and 4.5 it is clearly appeared that forest cover and its density has declined significantly in the area during 1969 to 2010-11. From the highlights of the forest map of two different time period it is observed that, there has been an increase in the area under scrub land (open forest) over the erstwhile dense forest area and buffer zone marked by brown patches has been widened, signifying an increase in fallow/barren land in the park. It provides an idea of rising pressure on this surrounding forest over the years exerted by the families living in and around the park.

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Table-4.5: Variation and Average Distance Travelled and Labour time Used by the Households for Grazing and Fodder Collection in the Surveyed Villages (Core and Buffer Zones).

		Dist. Travelled (km)		Labour Hour/Day		Fuelwood (kg)/day	Grass/Tree Fodder (kg)/day	Timber Pole (pe yr)	Thatching grass (per yr)	Change in Percentage	
Zone	Village	1980-8	2010-11	1980-8	2010-1	2010-11	2010-11	Number	(Kg)	Distance Travelled	Labour Hour/Day
Core-1	Umri, Deori	1.00	3.00	7.00	29.86	89.05	73.10	48.33	53.33	200.00	326.53
	Kraska	1.00	2.91	7.00	22.57	87.71	75.29	43.86	49.00	191.43	222.45
	Rotkayala	1.00	3.00	6.00	36.05	106.32	93.16	61.58	64.74	200.00	500.88
	Sukola	1.00	3.67	6.00	44.00	124.44	111.11	74.33	85.00	266.67	633.33
	Kankwari	1.00	3.00	5.00	33.29	105.00	83.57	60.71	70.24	200.00	565.71
	Haripura	1.00	2.82	5.00	24.27	80.45	74.77	54.77	59.32	181.82	385.45
	Leelunda	1.00	4.00	7.00	31.60	53.25	45.75	40.00	45.00	300.00	351.43
	Dabli	1.00	3.96	6.00	34.87	92.61	74.13	49.78	53.91	295.65	481.16
	Raikamala	1.00	5.13	5.00	32.88	70.63	68.13	40.63	47.50	412.50	557.50
	Average	1.00	3.50	6.00	32.15	89.94	77.67	52.67	58.67	249.79	435.90
Core-2	Raika	1.00	3.80	8.00	24.00	79.00	65.00	40.00	44.00	280.00	200.00
	Panidhal	1.00	3.89	8.00	26.44	63.00	59.00	38.00	41.00	288.89	230.56
	Kali Khol	1.00	4.94	8.00	24.00	60.00	51.00	38.00	44.00	394.44	200.00
	Kalachara	1.00	4.67	8.00	22.86	63.00	47.00	36.00	41.00	366.67	185.71
	Bairawas	1.00	4.25	7.00	20.00	59	53.00	42.00	46.00	325.00	185.71
	Average	1.00	4.31	8.00	23.46	67.46	58.44	38.59	42.72	331.00	193.25
Core-3	Kanyawas	1.00	3.56	8.00	20.00	70.00	70.00	35.00	44.00	256.00	150.00
	Mandalwas	1.00	4.00	8.00	20.00	60.00	54.00	39.00	43.00	300.00	150.00
	Average	1.00	3.78	8.00	20.00	65.00	61.88	37.08	43.36	278.00	150.00
Average of Cores		1.00	3.79	7.00	25.20	74.00	66.00	43.00	48.00	278.69	260.00
Buff. Zone	Syodanpura	1.00	3.00	3.00	6.00	20.77	20.00	12.83	0.00	200	100
	Ravandevri	1.00	2.00	2.97	5.90	19.67	16.17	11.30	0.00	100	100
Average of Buffer		1.00	2.50	2.98	5.95	20.22	18.08	12.06	0.00	150.00	100.00
Source: Calculated from Field Survey Data of STR during 2010-11.											

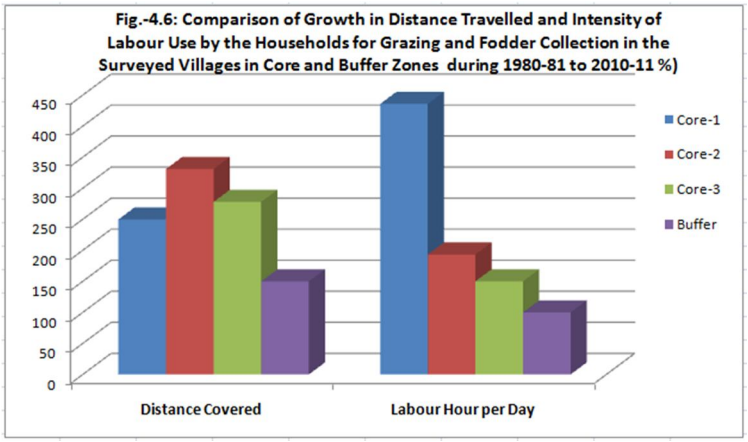


Table-4.5A: Comparative Difference of Core-1 from Core-2 and 3 in terms of Collection of various forest resources by an Average Family (%).

Table-4.5A: Comparative Difference of Core-1 from Core-2 and 3 in terms of Collection of various forest resources by an Average Family (%)				
	Fuelwood (Kg Per Day)	Grass/Tree fodder (Kg Per Day)	Timber Pole (No. Per Yr	Thatching grass (kg Per Yr
Compared to Core-2	42.36	38.52	38.4	35.00
Compared to Core-3	33.32	32.91	36.4	37.34
Compared to Buffer	344.81	329.59	336.7	---**
Note: Villagers of Buffer Zone now a day do not collect thatching grass from the forest due to non-availability and they purchase it from the market.				

Table-4.10: Average Share of Income of the Village Households from Different Sources in STR (%)						
Zone	Forest	Milk	L/stock	Agri.	Off-Forest	Total
Core-1	84.95	8.07	6.98	0.00	0.00	100.00
Core-2	67.62	17.80	7.99	3.01	3.58	100.00
Core-3	63.95	17.79	6.86	9.15	2.25	100.00
Buff. Zone	26.73	23.71	1.69	8.36	39.51	100.00
Over All	60.81	16.8	5.88	5.13	11.33	100.00
Source: Field Survey 2010-11.Note: Contribution of milk is calculated after deducting the market value ofthe fodder collection from the forest.						

Table-4.12: Percentage Growth in Tourist Arrival in SimlipalTiger Reserve during 1991-92 to 2008-09					
Year	1991-2 to 96-97	1996-97 to 2001-02	2001-02 to 2006-07	2006-07 to 2008-09	1991-92 to 2008-09
Simlipal	44.47	-19.54	-47.86	26.08	-23.58
Odisha	31.12	33.05	195.30	20.78	522.24
Source: Field Survey 2010-2011.					

Table-5.3: Per Capita Milk Production, Forest Product Collected, Distance Travelled and Labour-Hours Per Day in STR									
Zone	Popul.	Milk Production Per Unit of Cattl (Litres)	Avg. Family Member Involved	Distance Covered (Km)	Labour-Hours (Per day)	Fuelwood (Kg/day)	Grass/T fodder (Kg/day)	Timber/ Pole (Per yr)	Thatching Grass (Kg. Per yr
Core-1	1110	0.8	5.0	5.0	32.0	14.00	9.81	8.00	9
Core-2	569	0.6	4.0	4.3	23.0	9.00	7.51	5.00	6
Core-3	268	1.0	4.0	3.8	20.0	9.00	8.91	5.00	6
Buffer	324	0.5	1.5	2.0	4.5	4.06	3.65	2.43	0
Source: Field Survey 2010-11.									

Table-5.5: Average Share of Income of the Village Households Different Sources in STR (%)						
Zone	Forest	Milk	L/stock	Agri.	Off-Forest	Total
Core-1	84.95	8.07	6.98	0.00	0.00	100.00
Core-2	67.62	17.80	7.99	3.01	3.58	100.00
Core-3	63.95	17.79	6.86	9.15	2.25	100.00
Buff. Zone	26.73	23.71	1.69	8.36	39.51	100.00
Over All	60.81	16.8	5.88	5.13	11.33	100.00

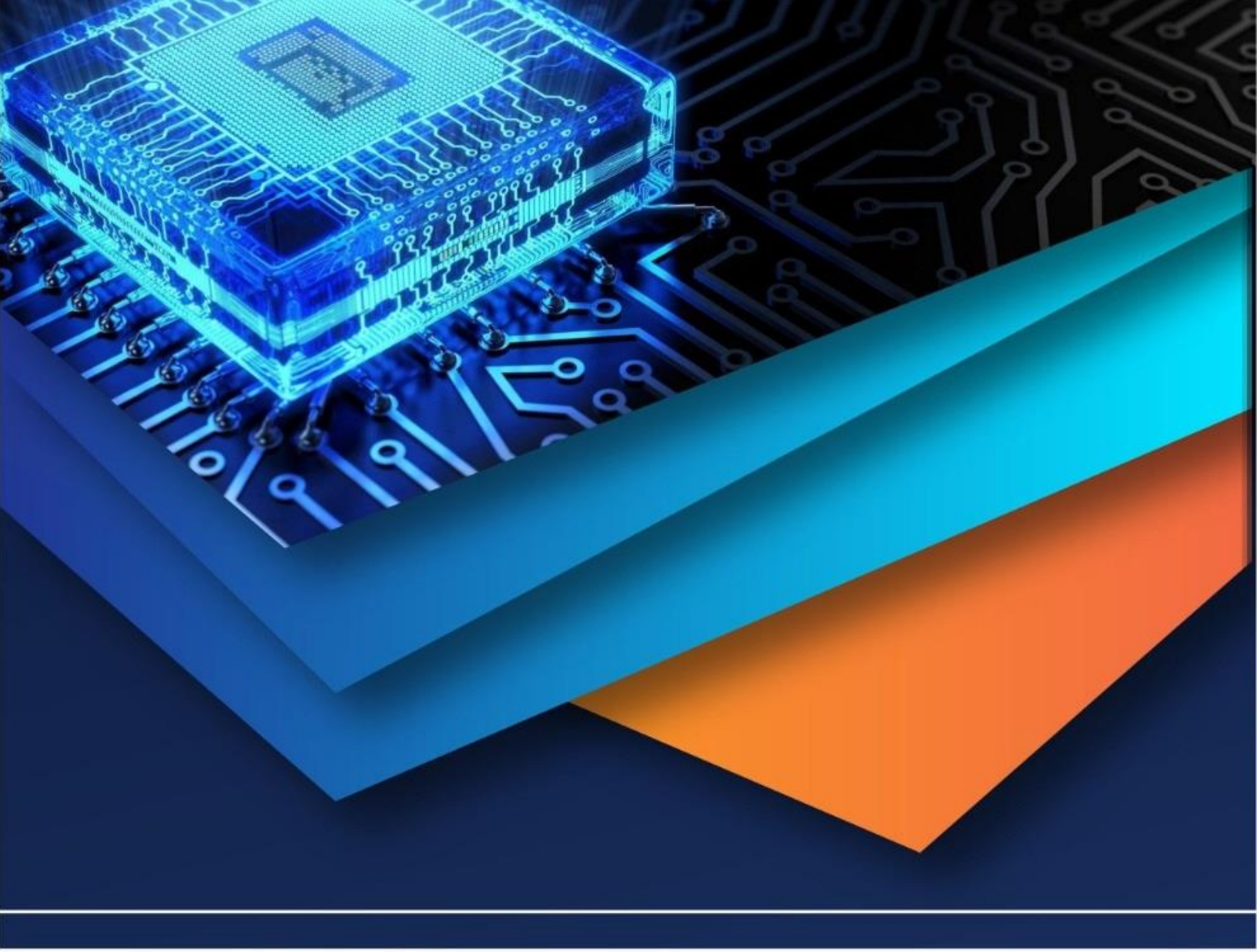
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Table-5.6: Percentage Growth in Tourist Arrival in Simlipal Tiger Reserve during 1991-92 to 2008-09					
Year	1991-92 to 96-97	1996-97 to 2001-02	2001-02 to 2006-07	2006-07 to 2008-09	1991-92 to 2008-09
Simlipal	44.47	-19.54	-47.86	26.08	-23.58
Odisha	31.12	33.05	195.30	20.78	522.24
Source: Directorate of Tourism, Govt. of Odisha.					

Overall, it can be argued that heavy dependence on forest beyond its carrying capacity leads to the degradation of it and its bio-diversity which in turn affects villagers‟ economy and that again leads to further rise in extraction over widened areas and further degradation. The process continues until and unless this vicious circle is broken down through the development of suitable alternative sector where these people can be engaged.

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