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Population Growth and Its Impact on Forest Resources: A Geographical Case Study of Namkum and Mandar Blocks, Ranchi District

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Abstract: The dynamic interplay between population growth and environmental sustainability poses significant challenges, particularly in regions heavily dependent on forest resources. This study investigates the impact of population growth on forest resources in the Namkum and Mandar blocks of Ranchi district, Jharkhand, India. While Namkum reflects rapid urbanization and land-use change, Mandar remains largely rural with continued dependence on forests for livelihood. Using a combination of demographic data, satellite imagery, field surveys, and interviews with local stakeholders, this research analyzes patterns of deforestation, forest degradation, and changes in land use over recent decades. Findings reveal that population pressure has led to agricultural expansion, illegal encroachments, over-extraction of resources, and heightened human-wildlife conflict, resulting in both ecological degradation and socio-economic vulnerabilities. The study also examines the role of policies, community management initiatives, and awareness programs in mitigating these impacts. By comparing urban and rural dynamics within the same district, this research offers practical insights for policymakers, planners, and environmentalists focused on sustainable forest management and community resilience.

Keywords: *Population Growth, Forest Resources, Deforestation, Land-Use Change, Ranchi, Namkum, Mandar, Jharkhand, Environmental Sustainability, Human-Wildlife Conflict, Forest Management, Community Livelihoods, Urbanization, Rural Dependence*

I.INTRODUCTION:

The dynamic relationship between population growth and environmental sustainability has long been a subject of global concern. Among the most visible consequences of unchecked population growth is the pressure it exerts on natural resources, particularly forest ecosystems. Forests play a crucial role in maintaining ecological balance, supporting biodiversity, regulating climate, and providing livelihoods to local communities. However, rapid population growth often leads to increased demand for land, fuelwood, timber, and other forest products, thereby accelerating deforestation and forest degradation. In India, where a large proportion of the population still depends on forest resources for their daily needs, this issue becomes even more critical.

Ranchi district, the capital region of Jharkhand, is a vivid example of this phenomenon. With its rich forest cover and a rapidly growing population, the district presents a compelling case for understanding how human expansion impacts forest resources. Within Ranchi, the blocks of Namkum and Mandar offer contrasting yet complementary case studies. Namkum, being closer to urban Ranchi, is witnessing rapid urbanization, infrastructure development, and land-use changes. In contrast, Mandar retains more rural characteristics, with a significant portion of its population still directly reliant on forest resources for agriculture, fuel, and subsistence.

Over the past few decades, both Namkum and Mandar have experienced significant demographic changes. Population pressure in these blocks has led to the expansion of agricultural land, illegal encroachment into forest areas, over-extraction of minor forest produce, and an increase in human-wildlife conflict. Additionally, the decline in forest density and quality has affected not only the ecological health of the region but also the socio-economic well-being of the communities who depend on forests for their livelihood. This geographical study aims to explore and analyze the extent to which population growth has impacted forest resources in Namkum and Mandar blocks. By integrating demographic data, satellite imagery, field surveys, and interviews with local residents and forest officials, the study seeks to provide a comprehensive picture of forest resource degradation in these areas. The research will also examine how land-use patterns have changed over time and what implications these changes have on forest conservation and community development. Furthermore, the study will explore how governmental policies, community forest management initiatives, and awareness programs have influenced forest use and protection. It will also highlight the differences in forest pressure between urbanizing and rural zones within the same district, providing valuable insights for planners, policymakers, and environmentalists.

1.1. Study Area Overview

The study focuses on two distinct blocks within Ranchi district of Jharkhand—Namkum and Mandar. These blocks represent contrasting socio-economic and ecological settings: one being semi-urban and rapidly urbanizing, the other largely rural and forest-dependent. This contrast provides an ideal framework to analyze how population growth affects forest resources in both urban-fringe and rural-tribal contexts.

1.1.1 Namkum Block

Namkum is a key administrative and semi-urban block located on the eastern periphery of Ranchi city, forming part of the expanding Ranchi Urban Agglomeration. It has experienced substantial transformation in recent decades due to its strategic location and improved connectivity.

Namkum is traversed by National Highway 33 (Ranchi–Tata Road) and is well-connected by railway lines and close to Ranchi Airport, making it a hub for infrastructural development. The region has seen rapid urban expansion, with a noticeable increase in residential colonies, commercial establishments, and educational institutions. This growth has been fueled by a high rate of in-migration, with people attracted by job opportunities, education, and better living conditions.

Environmental issues such as soil erosion, groundwater depletion, and a noticeable decline in green cover are becoming more prevalent. Despite hosting several government and private institutions, which influence regional planning, Namkum is grappling with the challenge of balancing development and ecological sustainability.

1.1.2 Mandar Block

Mandar, located about 35 kilometers west of Ranchi, is a predominantly rural and tribal-dominated block. Its population includes significant numbers of Oraon, Munda, and Kharia communities, many of whom depend heavily on the forests for their livelihoods.

The local economy is driven by subsistence agriculture, collection of non-timber forest products (NTFPs) like mahua, tendu leaves, and medicinal herbs, as well as livestock rearing. Forests in Mandar remain relatively dense compared to Namkum, but are increasingly threatened by shifting cultivation (jhum farming), overharvesting, and growing population pressure.

Mandar plays an important ecological role, acting as a biodiversity-rich zone and catchment area for nearby rivers and streams. However, the block faces numerous developmental challenges, including limited access to healthcare, education, and employment, leading to high out-migration rates.

II.LITERATURE REVIEW

The relationship between population growth and forest resource degradation has been extensively studied in various regional and ecological contexts. In the case of Ranchi district, particularly in blocks like Namkum and Mandar, research reveals a growing pressure on forest ecosystems due to both urban expansion and rural forest dependence.

Kumari (2017) conducted a detailed socio-economic and agroforestry study in Namkum Block, focusing on eight villages with predominantly Scheduled Tribe populations. Her findings indicated that most households had marginal landholdings (less than 1 hectare), and a significant portion of their livelihood (about 37.5%) depended on agroforestry practices involving species like Shorea robusta (Sal) and Madhuca indica. The study also highlighted issues such as inadequate fodder, limited income from timber species (mostly under ₹10,000 per year), and overexploitation of nearby forest resources. This points to how urban peripheries like Namkum, while benefiting from infrastructural development, simultaneously witness declining green cover and overused agroforestry systems.

In more rural blocks like Mandar, forest-based livelihoods remain a cornerstone of the local economy. Somra Bedia (2012–13) observed that tribal communities in Ranchi, including in areas similar to Mandar, depend heavily on forest produce such as mahua, aonla, kend, and medicinal plants like Asparagus racemosus. Income from these sources ranged from ₹13,800 to ₹27,700 per household annually, yet many families remained food-insecure and economically vulnerable. This high dependence on forest ecosystems without adequate support for sustainable harvesting increases the likelihood of forest degradation.

Shashi Ranjan (2015) extended this line of inquiry by comparing forest product usage and market patterns in Namkum, Mandar, and two other blocks. His research found that Mandar residents often traveled long distances (8–10 km) to collect non-timber forest products such as bamboo, sal leaves, and mahua, with little market infrastructure to support fair pricing. This further emphasizes the burden placed on forests in rural blocks due to population pressure and lack of livelihood alternatives.

In terms of forest cover and ecosystem health, Gupta and Saikia (2009) explored carbon storage dynamics in Ranchi's forests. They found that while Sal-dominated forests experienced biomass decline between 1981 and 1996, mixed forests showed modest carbon gains. Their study suggests that mixed-species reforestation may offer better ecological stability under increasing anthropogenic stress, a valuable insight for forest management in regions like Mandar and Namkum.

Urbanization trends have also been documented. Gupta (2021) investigated land use and land cover changes in Ranchi and found rapid urban expansion in areas like Namkum, contributing to significant forest fragmentation. As population density increases in peri-urban areas, forest patches are replaced by residential, industrial, and commercial developments—posing long-term threats to biodiversity and ecological balance.

Adding to these concerns, Minz et al. (2020) mapped forest fire risks in Ranchi district using Landsat data, noting that Ranchi had among the highest fire incidences in Jharkhand. Forest fires, often triggered by human activity, are another consequence of increased land-use pressure, especially in areas undergoing population growth and land-use change. Taken together, these studies reveal a clear pattern: Namkum faces forest fragmentation due to urban sprawl, while Mandar experiences forest stress from over-dependence and limited development alternatives. The literature highlights the urgent need for integrated land-use planning, sustainable livelihood programs, and participatory forest governance to mitigate the adverse impacts of population growth on forest resources in Ranchi district.

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III.OBJECTIVE OF THE STUDY

1. To analyze the trends in population growth in Namkum and Mandar blocks.
2. To study land use/land cover changes with emphasis on forest areas.
3. To assess the extent and causes of deforestation and forest degradation.
4. To understand the socio-economic implications of forest loss on local communities.
5. To propose sustainable forest management strategies.

IV.STUDY AREA AND RESEARCH METHODOLOGY

This study is focused on Namkum and Mandar blocks of Ranchi district, located in the Indian state of Jharkhand. These two blocks were selected due to their contrasting characteristics in terms of land use, population dynamics, and forest dependence, which provide valuable insights into the spatial variation in human-forest interactions.

Namkum Block

Namkum is located on the eastern outskirts of Ranchi city and forms part of the Ranchi Urban Agglomeration. It is characterized by rapid urbanization, with expanding residential colonies, commercial hubs, and institutional areas. The block has experienced a significant population increase due to rural-to-urban migration, infrastructure development, and proximity to the Ranchi Municipal Corporation. The forest cover in Namkum is fragmented, and land use is increasingly dominated by built-up areas and transport corridors. However, small patches of forest remain, often under pressure due to encroachment and developmental activities.

Mandar Block

Mandar lies approximately 35 km west of Ranchi and is a predominantly rural and tribal-dominated block. The block is rich in natural vegetation, with relatively dense forest cover compared to Namkum. The population here is largely dependent on agriculture, livestock, and forest-based livelihoods, including the collection of Non-Timber Forest Products (NTFPs) such as mahua, tendu leaves, and bamboo. Shifting cultivation practices and limited access to modern agricultural methods, along with increasing population pressure, are major concerns for sustainable forest use in Mandar.

In Conclusion, Jharkhand's abundant natural resourcesranging from minerals and forests to its fertile soils and river systems

form the foundation of its socio-economic and environmental identity. The state's mineral strength, combined with its ecological richness, places it in a unique position to drive industrial development while also preserving ecological balance. Harnessing these resources responsibly will not only benefit the present generation but will also secure a prosperous future for the people of Jharkhand.

Table. 1 Minerals of Jharkhand, Location and its uses

Minerals	Location	Uses
Apatite	Singhbhum	Mineral fertilizers, gemstones
Asbestos	Roroburu, Singhbhum	Pipes, sheets, gloves, ropes
Barytes	Singhbhum	Hydrated alumina
Bauxite	Palamu, Ranchi, Gumla, Lohardaga	Alum, aluminium, refractory industry, emery
China Clay	Lohardaga, Ranchi, Dumka, Sahibganj, Singhbhum	Crockery, glass
Chromite	Singhbhum	Chrome magnesite refractory
Coal	Jharia, Bokaro, Karanpura, Hutur, Auranga, Daltonganj, Deoghar, Rajmahal Coalfields	Fuel, power generation, steel industry
Cobalt (mt)	Singhbhum	Extraction of cobalt oxide
Copper Ore	Singhbhum, Giridih	Copper production
Dolomite	Palamu, Garhwa	Cement, magnesia, building stone

Jharkhand, rich in natural resources, plays a crucial role in India's mineral economy due to its wide variety of mineral deposits. The Singhbhum region is notably mineral-rich, with reserves of apatite, chromite, barytes, asbestos, cobalt, manganese, nickel, kyanite, and quartzite, supporting industries such as fertilizers, refractories, and metallurgy.

Bauxite, essential for aluminium production, is found in Palamu, Ranchi, Gumla, and Lohardaga. China clay, used in ceramics and glass, occurs in Lohardaga, Dumka, Sahibganj, and Singhbhum. The state's vast coal reserves, located in Jharia, Bokaro, Karanpura, and Rajmahal, fuel power and steel industries.

Copper is mined in Singhbhum and Giridih, while dolomite, used in cement, is found in Palamu and Garhwa. Other important minerals include felspar (Dumka, Hazaribagh), fireclay (Dhanbad, Bokaro), and garnet (Hazaribagh). Gold, though limited, occurs in Ranchi and Singhbhum, and granite is quarried in Dumka, Deoghar, and Ranchi.

Graphite from Palamu, iron ore from Singhbhum and Palamu, and limestone from Hazaribagh and Ranchi support steel and cement industries. Mica, quartz, soapstone, and talc are also mined in various districts, while vermiculite from Singhbhum is valued for insulation.

IV.METHODOLOGY

4.1.1 Data Collection

In this study, data collection plays a pivotal role in exploring the intricate relationship between population growth and forest resources in Ranchi district, with a specific focus on the Namkum and Mandar blocks. To ensure a comprehensive and accurate understanding, the research relies on both primary and secondary sources of data. Emphasis has been placed on primary data collection to capture direct perspectives from local communities, stakeholders, and subject matter experts.

4.1.2 Primary Data

Primary data serves as the cornerstone of this research, offering original insights into population dynamics, livelihood strategies, forest resource dependence, and socio-economic conditions. A combination of qualitative and quantitative methods has been employed to gather this information, ensuring that the findings are both in-depth and reliable.

4.1.3 Interview Schedule

A structured interview schedule was developed and implemented to collect data from 200 respondents, selected through a stratified random sampling method. These interviews were designed to extract detailed information on demographic profiles, forest resource reliance, observed environmental changes, and the socio-economic challenges experienced by local communities. The schedule comprised 106 questions, covering both quantitative metrics and qualitative responses. This face-to-face method facilitated clearer communication, allowing for clarification where needed and resulting in robust and meaningful data aligned with the research objectives.

4.2 Secondary Data Collection

Alongside primary data, secondary data collection is vital to this study, providing essential background information and corroborative evidence. Secondary data consists of information previously collected, compiled, and published by credible sources, which forms the basis for detailed analysis. For this research, extensive secondary data was gathered from diverse sources, including government reports, official census documents, district statistical handbooks, records from the forest department, and environmental surveys relevant to Ranchi district—especially the Namkum and Mandar blocks. The 2011 Census of India offered comprehensive demographic details, while data from the Forest Survey of India and the Jharkhand State Forest

Department provided valuable insights into forest cover and ecological changes over time. Additionally, various academic books and peer-reviewed journals were consulted to incorporate theoretical frameworks, historical context, and comparative studies on population growth, geography, forest resource management, and socio-economic factors in Jharkhand. These scholarly sources helped situate the research within the broader academic dialogue and informed the study's methodology. Utilizing secondary data from authoritative publications ensures the research is grounded in validated knowledge and benefits from expert evaluations and earlier findings. It also aids in identifying gaps in existing research and contextualizing the study's outcomes within wider scientific and social perspectives. By combining secondary data with primary fieldwork, the study attains a comprehensive and nuanced understanding, improving the accuracy and reliability of conclusions regarding the effects of population growth on forest resources in the target area.

4.2.1 Data Analysis

Data analysis constitutes a crucial step in this research, involving the systematic examination of collected primary and secondary data to uncover significant patterns, trends, and relationships. This stage includes organizing raw data into coherent formats and applying suitable qualitative and quantitative analytical methods to interpret the results effectively.

V.POPULATION GROWTH AND ITS IMPACT ON FOREST RESOURCES

5.1 A Geographical Case Study of Namkum and Mandar Blocks, Ranchi District

Population growth is one of the most critical factors influencing land use patterns and natural resource availability in many parts of India. In the context of Namkum and Mandar blocks within Ranchi district, Jharkhand, rapid demographic changes over recent decades have significantly impacted the region's forest resources. These two blocks, which lie in proximity to the state capital Ranchi, have experienced increasing pressure on their natural environment due to both natural population increase and migration driven by urban expansion and economic opportunities.

The population growth in Namkum and Mandar blocks has been driven primarily by natural increase coupled with rural-to-urban migration. Namkum, being adjacent to Ranchi city, has seen substantial in-migration as people move seeking better livelihood opportunities. Mandar, while more rural, has also experienced growth due to agricultural and local industrial development. According to census data over the last few decades, the population density in these blocks has steadily increased, resulting in an expansion of human settlements. This population surge has created intense demand for housing, infrastructure, and agricultural land, all of which have led to the encroachment of forested areas.

Forests in Namkum and Mandar have historically been an essential part of the local ecology and economy. They provide vital ecosystem services such as biodiversity conservation, climate regulation, and resources like timber, fuelwood, and non-timber forest products (NTFPs) to the local communities. However, the growing population has led to significant deforestation and degradation of these forest resources. The conversion of forest lands into agricultural fields and residential colonies has diminished forest cover, threatening biodiversity and disrupting ecological balance. Satellite imagery and land use data indicate a marked decline in forest patches over the past two decades, with some areas witnessing fragmentation that hampers wildlife movement and forest regeneration.

Socio-economic interactions between the growing population and forest resources reveal complex dynamics. Many local inhabitants depend on forests for their livelihoods, particularly tribal and rural communities in Mandar who collect firewood, fodder, medicinal plants, and fruits. With population growth, these resources face over-extraction, making sustainable use increasingly difficult. Additionally, forest degradation has exacerbated problems such as soil erosion and reduced water retention capacity in the region, thereby affecting agricultural productivity and the broader rural economy. In Namkum, urban expansion has not only resulted in direct forest loss but also pollution and disturbance that indirectly stress forest ecosystems.

The pressure on forests from population growth is compounded by limited forest management and conservation efforts. While government and non-government initiatives exist to protect forests, enforcement challenges and the competing needs of a growing population often limit their effectiveness. The socio-economic conditions in these blocks also dictate resource dependency, with poorer households relying heavily on forests for subsistence needs. This creates a cycle where population growth leads to forest depletion, which in turn affects livelihoods and prompts further exploitation of natural resources.

To mitigate these impacts, integrated approaches combining population management, sustainable forest use, and community participation in conservation are critical. In Namkum and Mandar, promoting alternative livelihoods, afforestation programs, and awareness campaigns about forest preservation can help balance the needs of the growing population with environmental sustainability. Furthermore, spatial planning that restricts forest encroachment while supporting economic development will be vital for the long-term ecological health of the region.

In conclusion, the geographical case study of Namkum and Mandar blocks in Ranchi district clearly illustrates the intricate relationship between population growth and forest resource dynamics. The expanding human population has placed considerable stress on forest ecosystems, leading to deforestation, resource depletion, and environmental degradation. Addressing these challenges requires coordinated efforts that integrate socio-economic development with ecological conservation to ensure sustainable management of the valuable forest resources in these rapidly changing landscapes.

5.2 Impacts of Population Pressure on Forest-based Livelihoods

The rapid increase in population across both Namkum and Mandar blocks has exerted unprecedented pressure on livelihoods connected to forest resources. The growth in the number of households, rising consumption demands, and shrinking land availability per person have collectively intensified the exploitation of forest products. In Mandar, the division of joint families into smaller nuclear units has heightened the need for additional timber, grazing lands, and farmland—much of which is being cleared from the edges of forest areas. Meanwhile, Namkum's proximity to urban expansion has led to both sanctioned and illegal encroachment of forest land for residential and commercial developments. As forest patches that are easy to access continue to shrink, competition for these resources among local residents has increased, resulting in conflicts, early harvesting practices, and disruption of natural forest regeneration. The traditional communal systems that once regulated resource use—such as rotational harvesting and collective discipline—are eroding, especially as younger generations grow detached from these customs.

VI.CONCLUSION & RECOMMENDATAIONS

This study highlights the strong link between rapid population growth and forest resource depletion in Namkum and Mandar blocks of Ranchi district. Increasing population has intensified pressure on forests, causing land use changes, habitat loss, and declines in biodiversity and soil health. Most local residents acknowledge the negative effects on forest cover, wildlife, and essential resources like water and fertile soil. This strain threatens both ecological balance and the livelihoods of forest-dependent communities. The findings emphasize the urgent need for sustainable forest management that balances conservation with human development through community involvement, awareness, and effective policies.

To address these challenges, the study recommends:

Integrated Forest Management: Involving local communities, especially women and tribal groups, in forest conservation planning tailored to local conditions.

Population Stabilization: Expanding reproductive health and family planning awareness to reduce population pressure on resources.

Alternative Livelihoods: Promoting skill development in non-forest sectors like eco-tourism and handicrafts to lessen dependency on forest resources, supported by government initiatives such as Skill India and Start-up India.

These strategies aim to protect forest ecosystems while improving socio-economic resilience, ensuring sustainable growth for future generations.

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