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Research Article

## Population Growth and the Environmental Issues of Bihar, India

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### Abstract

In complex ways, Bihar stands out in India as a distinctive case because of its demographic intensity, which intersects with ecological vulnerability. Because of the pressure of the economy on agriculture, a growing population and a less industrial base, the stress on land, water, and forest resources is facing an immense load. This study examines how demographic expansion influences environmental conditions in Bihar and how environmental degradation, in turn, shapes patterns of livelihood insecurity and regional imbalance.

Based on the reports of census, economic surveys, environmental assessments, the landholding patterns, extraction of groundwater, forest reserves, and urbanisation analysis shows changes in these areas. Only population increase alone is not responsible, but the evidences say that it has broader structural constraints, such as less technological awareness, poverty, and no control over environmental governance. Rural areas are facing many issues like shrinking landholdings, aggressive cultivation, which reduces soil resilience, whereas in urban areas lack of infrastructure planning has contributed to pollution growth and results in the failure of waste management.

The paper argues that sustainable development in Bihar cannot rely solely on population control measures. Instead, a balanced strategy combining demographic stabilisation, resource-efficient agricultural practices, environmental regulation, and community-level awareness is essential. The population–environment relationship in Bihar must therefore be understood as mutually reinforcing rather than unidirectional.

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**KEYWORDS:** Population Growth, Environmental Degradation, Natural Resource Pressure, Agricultural Land Fragmentation Sustainable Development in Bihar.

## INTRODUCTION

More than demographic statistics, population growth affects economic practices, settlement patterns, and ecological balance. The majority of the population in Bihar relies directly on agriculture; demographic expansion has uncovered a fragile environmental setting. High rural settings, concise landholdings, and limited non-agricultural employment have overloaded dependence on natural resources.

Over time, dependence on agriculture has created measurable ecological stress. Agricultural lands have become immensely fragmented, groundwater extraction has reached beyond sustainable practice, and forest resources are under stress from both livelihood needs and urban expansion. Urban growth, though relatively adjustable as compared to other Indian states, has also generated environmental issues due to the lack of planned infrastructure development.

A nuanced perspective is needed to understand Bihar's environmental challenges. Population growth should interact with institutional capacity, economic structure, and technological adaptation. The challenges are not only the number of people, but the conditions under which demographic expansion takes place, and the system's adaptive capacity is ready to manage natural resources sustainably.

## REVIEW OF LITERATURE

- Ehrlich, P. R., & Holdren, J. P. (1971) <sup>[3]</sup>. Impact of population growth. *Science*. Ehrlich and Holdren put forward the basic idea now common in ecology that environmental impact is a function of population, affluence, and technology. Their work highlights the ways in which rapid population growth and increasing pressure on natural resources and ecosystems are compounded in the major world regions where technological capability is low. The study is still relevant if one is to understand the types of environmental stress in states such as Bihar, where population growth is directly linked to fragmentation of land, water scarcity, and an increase in pollution. It offers a theoretical framework with which one can analyse the issue of demographic pressure increasing environmental degradation in developing economies.
- Bongaarts, J. (1992) <sup>[1]</sup>. Increase in population and global warming. *Population and Development Review*. Bongaarts looks at the part population growth has played in exacerbating problems for ecosystems, such as climate stress and resource depletion. The authors contend that a high population density makes the population more vulnerable to environmental hazards and has less capacity to adapt. For Bihar, such a view is especially pertinent because densely populated areas in the flood-prone and agrarian areas increase the effects of climate variability, water stress and degradation of land. The research adds to the argument of why population stabilisation is at the heart of environmental sustainability.
- Rees, W. E. (1992) <sup>[10]</sup>. Ecological footprints & appropriated carrying capacity. *Environment and Urbanisation*. Rees defines the term ecological footprint to

describe the problem of human populations exceeding the carrying capacity of our ecosystems. The framework has utility in assessing the environmental challenges of Bihar, essentially where population demand for land, water and energy exceeds the available resources. The study illustrates the ecological effects of unsustainable patterns of consumption together with population growth. It strengthens the need to match population dynamics with environmental limits.

- Government of India. (2011). *Census of India 2011* <sup>[2]</sup>. New Delhi: Registrar General and Census Commissioner of India. The Census of India is a source of authoritative demographic information needed for population-environment analysis. Census 2011 underscores the high density of population, fast growth rate and basically rural nature of the Bihar population. These demographic characteristics account for the tremendous pressure on agricultural land, water resources and forests. The census is a very important empirical foundation for the critical understanding of population dynamics of environmental stress in Bihar.
- World Health Organisation. (2013) <sup>[13]</sup>. *Population dynamics and the environment*. Geneva: WHO Press. The WHO report highlights the relationship between population growth, environmental degradation, and public health. It covers the fact that water pollution, poor sanitation and air pollution are particularly affecting dense population areas. This perspective applies to Bihar, where the decline in the environment is directly linked to threatened health, especially in the vulnerable group. The work highlights the need for population management to be part of integrated policies on environmental and health issues.

### Changing Demographic Pattern in Bihar

Bihar continues to rank among the most densely inhabited states of India. Although improvements have been recorded in literacy levels and basic healthcare facilities over the past decades, population growth remains relatively high. Social practices such as early marriage, uneven access to reproductive health services, and persistent economic deprivation contribute to sustained fertility levels in several districts.

The demographic increase has translated into a steady rise in the demand for essential resources. Food requirements have expanded, housing needs have multiplied, and pressure on water and energy supplies has intensified. In rural Bihar, where livelihoods are closely tied to agriculture and natural ecosystems, this expanding demand directly influences the ecological balance. The growing population does not merely add numbers; it alters patterns of land use, resource consumption, and settlement distribution.

### Impact on Land Resources

Among the most visible consequences of demographic expansion is the strain on land. With each generation, agricultural holdings are subdivided into smaller parcels due to inheritance practices. As a result, a significant proportion of

farmers now cultivate marginal and fragmented plots that limit productivity and increase cultivation intensity.

Continuous cropping without adequate soil restoration has weakened land fertility in many regions. Farmers, facing shrinking plot sizes, often depend heavily on chemical fertilisers to sustain output, which gradually affects soil health and contaminates groundwater reserves. In and around expanding towns, fertile agricultural fields are increasingly converted into residential colonies, commercial establishments, and transport infrastructure. This transformation reduces green cover and disrupts local ecological systems.

Additional pressures arise from deforestation, erosion along riverbanks, and construction activity undertaken without environmental planning. The gradual reduction of cultivable land poses long-term concerns for food security and ecological sustainability in the state.

### **Pressure on Water Resources**

Water availability has emerged as a critical concern in several parts of Bihar. As population density rises, so does the demand for drinking water, irrigation, and household consumption. Tube-well irrigation has expanded considerably, leading to significant groundwater extraction in many districts. In certain areas, falling water tables signal the growing imbalance between withdrawal and natural recharge.

Moreover, water quality presents another challenge. In parts of northern and central Bihar, groundwater contamination by arsenic and fluoride has been reported, creating public health risks. Major rivers, including the Ganga and its tributaries, face increasing pollution loads from untreated sewage, agricultural runoff, and improper waste disposal. Settlements along riverbanks intensify this stress, affecting aquatic ecosystems and reducing water quality for downstream users.

### **Forest Depletion and Biodiversity Concerns**

Population expansion has also influenced forest cover in Bihar. In regions where livelihood options are limited, forest land is often encroached upon for cultivation, settlement, or fuel wood collection. Although forests occupy a relatively small proportion of the state's area, they play an important ecological role by regulating climate, conserving biodiversity, and preventing soil erosion.

The decline in tree cover has contributed to habitat loss for wildlife and reduced the availability of forest-based resources for local communities. Ecological resilience weakens when biodiversity declines, making the region more vulnerable to floods, droughts, and climatic irregularities. Changes in vegetation patterns may also influence local temperature and rainfall distribution over time.

### **Urbanisation and Environmental Stress**

As compared to many Indian states, urban growth in Bihar is lower but has accelerated in recent years, particularly in cities such as Patna, Gaya, and Muzaffarpur. The growth of the population in these cities has outstripped infrastructure development in several ways. As a result, unrest related to

waste management, traffic congestion, sanitation, and air quality has become more irritable.

Solid waste disposal continues to be a pressing issue, with open dumping and continuous burning adding to both land and air pollution. Vehicle emissions, construction dust, and the non-stop use of biomass fuels in highly populated neighbourhoods further lower urban air quality. These environmental conditions are not merely ecological concerns, but they directly affect public health, especially rising respiratory and water-borne diseases.

### **Climate Vulnerability**

The demographic concentration of Bihar intersects with its exposure to climatic risks. Northern districts often experience floods, while certain southern regions experience periodic drought-like conditions. Population settlements in flood-prone zones quantify human and economic losses during the worst weather conditions.

Wetland shrinkage, deforestation, and unusual land-use patterns have reduced the natural living capacity of ecosystems. Consequently, it has weakened the ability of communities to adapt to climate variability. Population pressure, therefore, quantifies existing environmental risks rather than living risk-free.

### **Social and Environmental Consequences**

The link between population growth and environmental degradation carries significant social implications. Economically weaker and marginalised groups, due to the scarcity of land and water resources, are affected, who depend directly on natural assets for survival. This leads to long-term migration, affects employment stability, and occasionally generates local struggles and conflicts over acquiring resources. In this way, ecological distress and socio-economic vulnerability affect one another. Without appropriate policy inclusion and intervention, this interaction may accelerate cycles of poverty and environmental strain.

### **Population Density and Resource Pressure**

Bihar absorbs a very high density of population, despite a lack of natural resources and a relatively low level of industrialisation. This pressure of density asks for continuous demands on land, water systems, and public infrastructure. The challenge lies not solely in population size but in ensuring that resource management, urban planning, and environmental governance run at a pace capable of handling sustainable demographic realities.

### **Population Growth and Environmental Strain in Bihar Pressure and Density of Population**

Bihar is one of the most densely populated states in India, despite having limited natural resources and also not much urbanisation. High population concentration has increased pressure on land, water and the public infrastructure.

**Table 1:** Population Growth and Density in Bihar

Indicator	Value
Total Population (2011)	104.1 million
Decadal Growth Rate (2001–2011)	25.4%
Population Density (persons/sq. km)	1,106
Rural Population (%)	88.7
Urban Population (%)	11.3

Source: Census of India (2011) [2].

### Land Use Stress from Agriculture.

Agriculture is the major source of livelihood for people in Bihar. However, population growth has resulted in the fragmentation of land, over-cultivation and reduced soil fertility. Forest cover is low, and ecological balance is threatened.

**Table 2:** Land Use and Agricultural Pressure Indicators

Indicator	Status
Net Sown Area	~57%
Average Landholding Size	0.39 hectares
Marginal Farmers	>90%
Forest Cover	~7.7%

Source: Ministry of Agriculture, India, State of Forest Report.

### Water Resources and Environmental Degeneration

Population growth has resulted in a drastic increase in the demand for groundwater and surface water. An excessive amount of extraction and pollution of the rivers has increased the risk of environmental and health hazards.

**Table 3:** Water Resources and Environmental Stress in Bihar

Indicator	Observation
Groundwater Dependence	High
Declining Water Table	Central & South Bihar
Arsenic Contamination	North Bihar
Polluted Rivers	Ganga, Kosi, Gandak

Source: Central Ground Water Board; Government of Bihar Reports.

### Integrated Analysis

The available data shows an association between demographic density and environmental strain in Bihar, though the connection is neither automatic nor uniform. Generally, areas with high population concentration experience more intense land fragmentation and groundwater extraction. However, the severity of environmental decline particularly depends on farming practices, irrigation technology, and regulatory oversight.

The intensive use of chemical fertilisers in rural regions results in declining soil productivity, which in turn affects long-term soil health and water quality. The districts prone to flooding, dense settlements are vulnerable to natural disasters, resulting in continuous repeated cycles of economic loss. Whereas urban centres face a different set of pressures, including solid waste accumulation, vehicular emissions, and inadequate drainage systems.

**What emerges is a cyclical dynamic:** demographic pressure fastens ecological stress, and environmental deterioration,

which reduces livelihood options, provoking migration and further strain in the region. This cycle requires continuous attention not only to fertility trends but also to governance quality, infrastructure planning, and environmental education.

### CONCLUSION

The environmental challenges disturbing Bihar cannot be separated from its demographic realities. Rapid population growth is putting intensified pressure on the demands of land, water, and forest resources, yet ecological stress is also shaped by economic limitations and institutional weaknesses. Soil degradation, groundwater depletion, deforestation, and urban pollution represent interconnected results of demographic expansion occurring within constrained development conditions.

Sustainable progress in Bihar requires an integrated demographic policy with environmental management. Measures promoting women's education and access to reproductive healthcare remain important, but they must be complemented by sustainable agricultural practices, regulated groundwater use, expanded afforestation efforts, and environmentally responsive urban planning.

Ultimately, sustainable environmental balance in Bihar depends on aligning human aspirations with ecological capacity. It needs a development model that can balance demographic trends with responsible resource management, which can offer the most viable path toward long-term social and environmental resilience.

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