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Dynamics of Population and Land Use towards Sustainable Development in Patna Planning Area

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Abstract: ***This study examines the impact of population growth on the land use pattern of Patna Planning Area, in the context of urban geography. Patna, the capital city of Bihar state in India, has experienced significant population growth over the past few decades, leading to changes in its land use pattern. The objectives of this research include analyzing the historical population growth trends in Patna, identifying the key factors that have contributed to this growth, and assessing its impact on land use. The study takes into account various factors such as residential, industrial, commercial, and agricultural land use, as well as the infrastructural developments associated with population growth. To achieve these objectives, both primary and secondary data sources are utilized. Primary data is collected through surveys, interviews, and observations, while secondary data is obtained from existing literature, government reports, and demographic databases. The findings of this study reveal that the population growth in Patna has led to a changing land use pattern. The expansion of residential areas and the conversion of agricultural land into residential and commercial zones are noted as significant transformations. Additionally, industrial growth has resulted in the emergence of new industrial zones and the conversion of agricultural land into industrial areas in the suburbs. Furthermore, it is observed that population growth has put pressure on infrastructure such as transportation, sewage and water supply systems, leading to the need for their expansion and development. This study highlights the need for urban planning and policies to accommodate the growing population while ensuring sustainable land use.***
Keywords: Population growth, land use pattern, sustainable development, urban planning, demographic trends.

I. INTRODUCTION

Land use/ land cover change is a very common phenomenon which drives global environmental change and sustainable development (Lambin et al. 2000). The land-use/ land-cover change deals with the alteration of the land surface and its biotic cover. Environmental changes of either kind become global change in one of two ways by affecting a globally fluid system (the atmosphere, world climate, sea level) or by occurring in a localized or patchwork fashion in enough places to sum up to a globally significant total. The human reshaping of the earth has reached a truly global scale, is unprecedented in its magnitude and rate, and increasingly involves significant impacts on every aspect of living and non-living. Population as a driving force of environmental change is unique in its plausibility and ease of quantification. This role of population is not in dispute: what is controversial is its relative importance among the other forces generating environmental pressures and the conceivably positive character of its role in resource use. In the neo-Malthusian position, global population increases are accorded primary importance in most environmental change because of the resources required to sustain the demands of eight billion people. Population growth is seen as having exceeded the capacity of the biosphere, as managed by society, to sustain it. The agricultural lands are significant contributor for economic development, it is dramatically replaced by artificial surfaces such as roads, urban areas and industrial zones due to anthropogenic activities (Su et al. 2014). These activities not only cause loss of farmlands but also physical degradation and fragmentation in agricultural lands. Bihar had a total road density of 3166.9 kms. per 1000 sq. kms. of geographical area and ranked third in India, after Kerala and West Bengal in 2019. Patna district has longest national highway constructed in Bihar which is 506 km in length till September 2022 (Bihar Economic Survey 2022-2023).

Neoclassical economics typically accounts for the role of population change through its influence on demand as manifested through the market. As market signals change, so does land use. Land-use/ land-cover change is a hybrid category. The antiquity of land-cover changes is reflected in their prominence in the early classics of geography. Land-use change contributes to both kinds of global change to such systemic changes as the scenario of society, economy and space and locally in patchwork impacts as biodiversity loss, soil degradation, and hydrological change. Agricultural land transformation for the alternative use of population due to growth causes principal alteration impacts on the land cover.

Core agricultural lands that represent the main stable and big contiguous pieces are affected by fragmentation vulnerably (Cheng et al. 2015). The rapid urban sprawl and scattered industrial areas are the primary factors for the decline of agricultural lands which also generate high entropy areas. The entropy reflects the effect of human action on landscape integrity (Bogaert et al. 2005). To understand anthropogenic activities and its interactions with agricultural systems, investigation of agricultural landscape fragmentation and disorder that influence climate change, hydrology (Brabec and Smith 2002), biodiversity and ecosystem functions (Mitchell et al. 2015).

Neo-marxist political economy emphasizes the role of the means of production in the global economy of international capitalism. Profit-seeking and capital accumulation require the unsustainable exploitation of natural resources, and socioeconomic differentiation creates a situation in which the "haves" place heavy demands on the world' s resources, driving environmental change, while the subsistence needs of the "have-nots" put marginal environments under stress. Although the urban area occupies just 3 percent of the earth's surface, but have significant impacts on bio-diversity (Muller, et al., 2013). Among the various kinds of environmental change, none is so plausibly linked to population as the land use and cover changes associated with agriculture.

A. Aims And Objectives

1) To assess the population growth from 1991 to 2021.
2) To understand the conversion and modification of agricultural land.
3) To analyse impact of growing population on the land use pattern.

B. Research Hypotheses

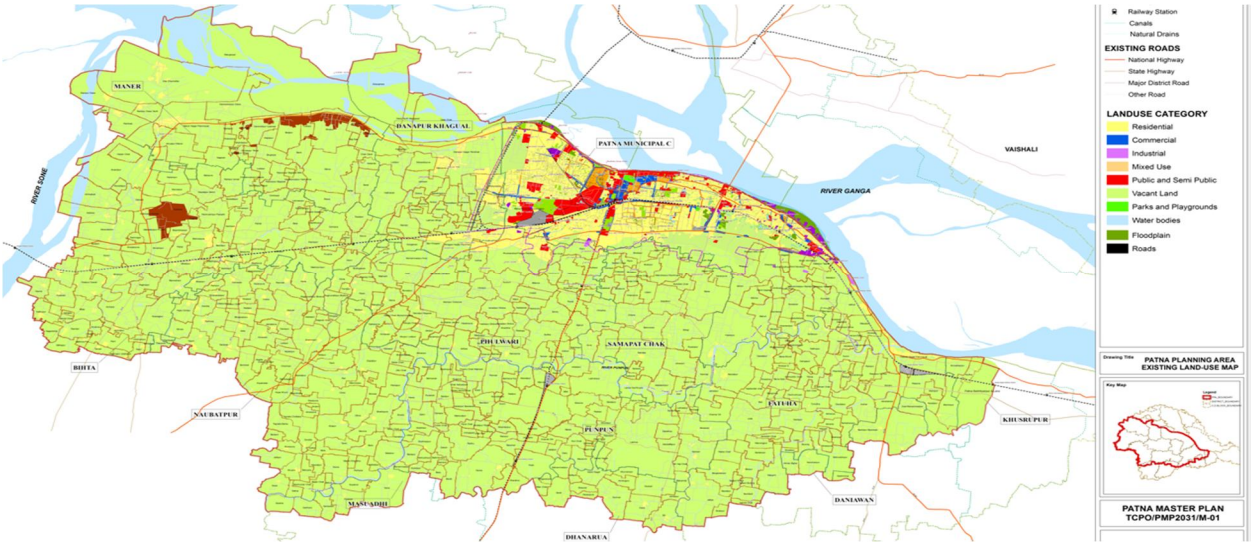
1) There is a rapid urban population growth in the city of Patna.
2) The increasing urban population pressure engenders land use change.

II. METHODOLOGY

This research paper incorporates primary and secondary source of data to analyze prevailing condition of the land use due to population pressure. The methodology of the present study entails conceptual as well as exploratory techniques of research

III. STUDY AREA

The study area comprises jurisdiction of erstwhile Patna Regional Development Authority Area and its influence area. Patna district includes 15 CD blocks (5 fully and 10 partially falling in the area), Saran district (3 partially falling in the area) and Vaishali district (3 fully falling in the area.



The total population of Patna Planning Region is 42.35 lakhs of which 20.36 lakhs (48.1%) is urban and 21.98 lakhs (51.9%) is rural. This area comprises 1167.04 sq. km of land which is 1.15% of land of Bihar.

A. *Population growth from 1991 to 2021*

Population increases stimulate technological and social advances that improve the conditions of life: greater numbers can transform the environment for the better.

The past 300 years, but particularly the latter half of this century, have witnessed an unparalleled magnitude of human-induced environmental changes, including those of land cover. Patna Municipal Corporation comprises population of 917234 in 1991. Patna Urban Agglomeration Area had a population of 16.97 lakhs as per the 2001 Census while the PMC had a population of 13.66 lakhs (2001 Census). Migration and floating population are also changing the land use causing slums and other temporary situations. The population of the PUA is expected to be 22.50 lakhs in the year 2011 and 28.01 lakhs in the year 2021. Limited scope of Patna for lateral expansion as it surrounded by rivers from three sides.

B. *Basic Factors behind Land Use Change*

Historically Patna earlier named as Patliputra is an ancient city. Rural Urban migration i.e. migration of people working in unorganised sector as there are meagre job opportunities in rural area. Better connectivity between rural urban areas increased the job opportunities and increase of population pressure. All these changes are happening because Patna is a Primate City of Bihar and one of the most important cities of East India after Kolkata. Student migration is again a paramount factor in increasing population of Patna as it is an educational hub of East India after Prayagraj (Allahabad). Health Services and Administrative Purpose are also causing high migration rate in Patna. The State government has decided to upgrade some rural areas to urban areas. 111 new Nagar Panchayats have been set up, along with 9 new Nagar Parishads. Because of the above decision and natural growth of population in urban areas, the projected urban population of Bihar in 2022 is 20.2 million. This will raise the urbanization rate in Bihar from 11.3 to 16.2 percent.

Land use denotes the human employment of the land according to the need of men. Land cover signifies the physical and biotic character of the land surface conversion of land is regularly compromising the utilization of land. These activities reflect human goals that are shaped by underlying social driving forces. Proximate sources change the land cover, with further environmental consequences that may ultimately feed back to affect land use. Contemporary global environmental change is clearly unique.

C. *Impact on the land use pattern*

The study area has abundance of fertile agricultural land as it has situated among flood plains of three rivers. The stakeholders are regularly participating in the conversion and modification of land use. The data shows that government is also an active participant in changing the land use to fulfill demand of growing population by accommodating industrialization in the economy. The total acquisition and allotment of land and sheds for industrialization by BIADA in Bihar is 8231.9 acres.

Patna district has total 317200 ha of land. The total uncultivable land is 146.3 ha (46.1%) and the net sown area is 170.9 (53.9%) together becomes the total area of Patna. The conversion and modification of uncultivable land is not possible easily. In this context it is easy to understand that the agricultural land i.e. net sown area is easy to modify. Urban area is expanding on the agricultural land and the secondary and tertiary activities are also dependent on these land (Bihar Economic Survey 2022-2023).

Table: Acquisition and allotment of Land and Sheds for industrialization by BIADA

Cluster	Total land	Acquired land sheds	Land reserved for infrastructure	Total and	Allotted land sheds	Litigated land	Total and	Vacant land sheds for allotment
	Land (acres)	Sheds (Nos.)	Administrative blocks, roads etc. (acres)	Land (acres)	Sheds (Nos.)	(acres)	Land (acres)	Sheds (Nos.)
Begusarai	739.3	68	67.3	389.7	66	53.2	229.1	2
Bhagalpur	856.6	72	29.9	34.3	65	787.9	4.4	7
Gaya	528.5	84	44.8	329.4	76	14.7	139.7	8
Patna	2439.7	136	159.6	1636.8	136	115.3	528	0
Darbhanga	530.3	95	51.1	240.2	95	11.1	227.9	0
Hajipur	456.2	0	88.3	217.7	0	2.1	148.1	0
Muzaffarpur	1950.2	158	150.2	512.4	140	23.4	1264.1	18
Purnea	559.5	18	45.3	253	18	71.4	189.9	0
Saharsa	171.6	49	4.8	9.7	38	5.5	151.5	11
Total	8231.9	680	641.3	3623.2	634	1084.6	2882.7	46

Source: Bihar Economic Survey, 2022-2023

The data in the table shows that some of the land is transformed due to the acquisition of land by the government. The study reflects that the study area which is Patna has largest number of land and sheds acquisition for industrialization. From total land acquisition for industrialization in Bihar 30% of acquisition and allotment of land and shed for industrialization has been done in Patna. Business corporate also acquired large number of land from land owners directly for industrialization.

IV. CONCLUSION

Land cover changes take two forms: conversion from one category of land cover to another and modification of condition within a category. Each category of land cover change is associated with a number of secondary environmental consequences: wetland drainage, for instance, can affect biodiversity, trace gas emissions, soil, and hydrological balance. Comparative assessments assume that if population is a key driver of environmental change, then the pressures of population (e.g. density) should closely match the magnitude of various kinds of environmental change across regions and locales. A recent work analyzes the interactions of population growth and land cover change in several developing countries, and concludes that population growth is an important factor but one significantly modified by natural and institutional context.

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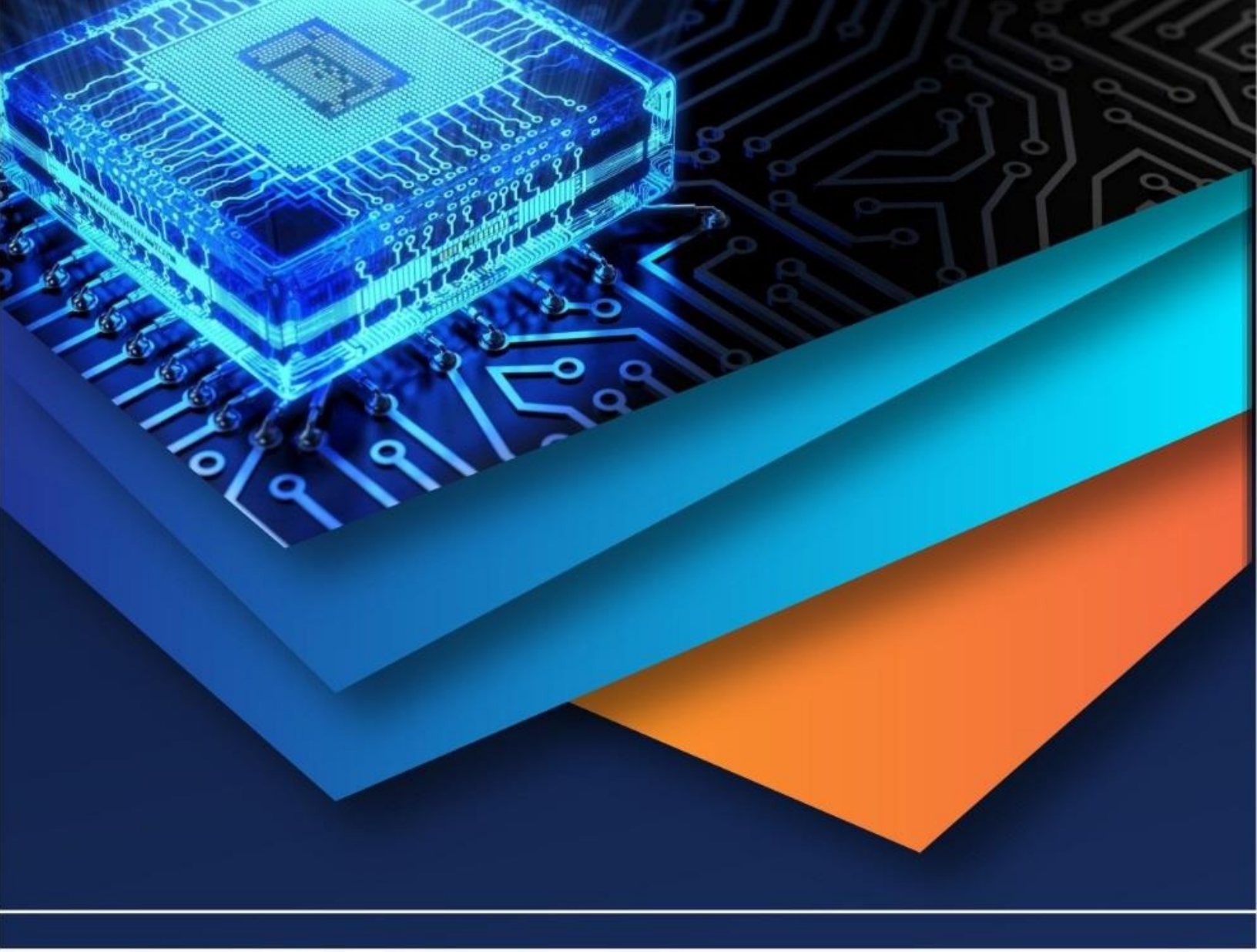

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