



THE IMPACT OF BUILT-UP AREA EXPANSION ON ENVIRONMENT IN INDIA

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ABSTRACT

Rapid urbanization has led to loss of natural habitat worldwide. Expansion of built up areas causes destruction or covering of the soil surface with impervious materials, called soil sealing, which modifies the urban microclimate and produces urban heat island effect. These changes affect the surrounding soils as well. Hence, increasing built up areas is considered to give a negative impact on environment and ecology of a country, especially like India, where the population pressure is increasing at an alarming rate. India's built-up area has recorded tremendous growth of 172.2% during the period 1975-2014. The harm caused to natural environment due to this much increase in built up surface area would not have been overshadowed by the functions and services provided by highly urbanized centres. Moreover, the scorching temperatures in the hot regions are made worse by materials like concrete. Concrete, which is the most widely used in construction of modern structures retains and soaks up the Sun's heat. This research paper attempts to study and explore the hazardous effects of increasing built-up area on natural environment.

KEYWORDS

Built-up area, Natural environment, Urbanization



INTRODUCTION

The total additional land area required to meet various demands between 2000 and 2030 in the world is estimated to range from 285 to 792 million hectares (Meyfroidt and Lambin, 2011). This includes pastures, cropland, built-up land and several other land uses. India has recorded nearly 60% upsurge in its population during the period 1991-2021. The drastic population increase has led to constant change in the Land Use Land Cover in the country, especially the natural land surfaces are getting transformed into artificial impermeable surfaces. Expansion of built up area has emerged as a serious concern in the last few decades. The force of urbanization has become strong due to increase in large urban centres in the country and the factors such as rural to urban migration, population growth, economic development etc. have changed this scenario.

An increase of 1.86 billion people is expected in urban areas during the period 2009-2050, while the urban areas are expanding twice fast as that of population (Angel et al., 2011; Seto et al., 2012). These claims are especially relevant in case of India where there is high population pressure and rural-urban migration.

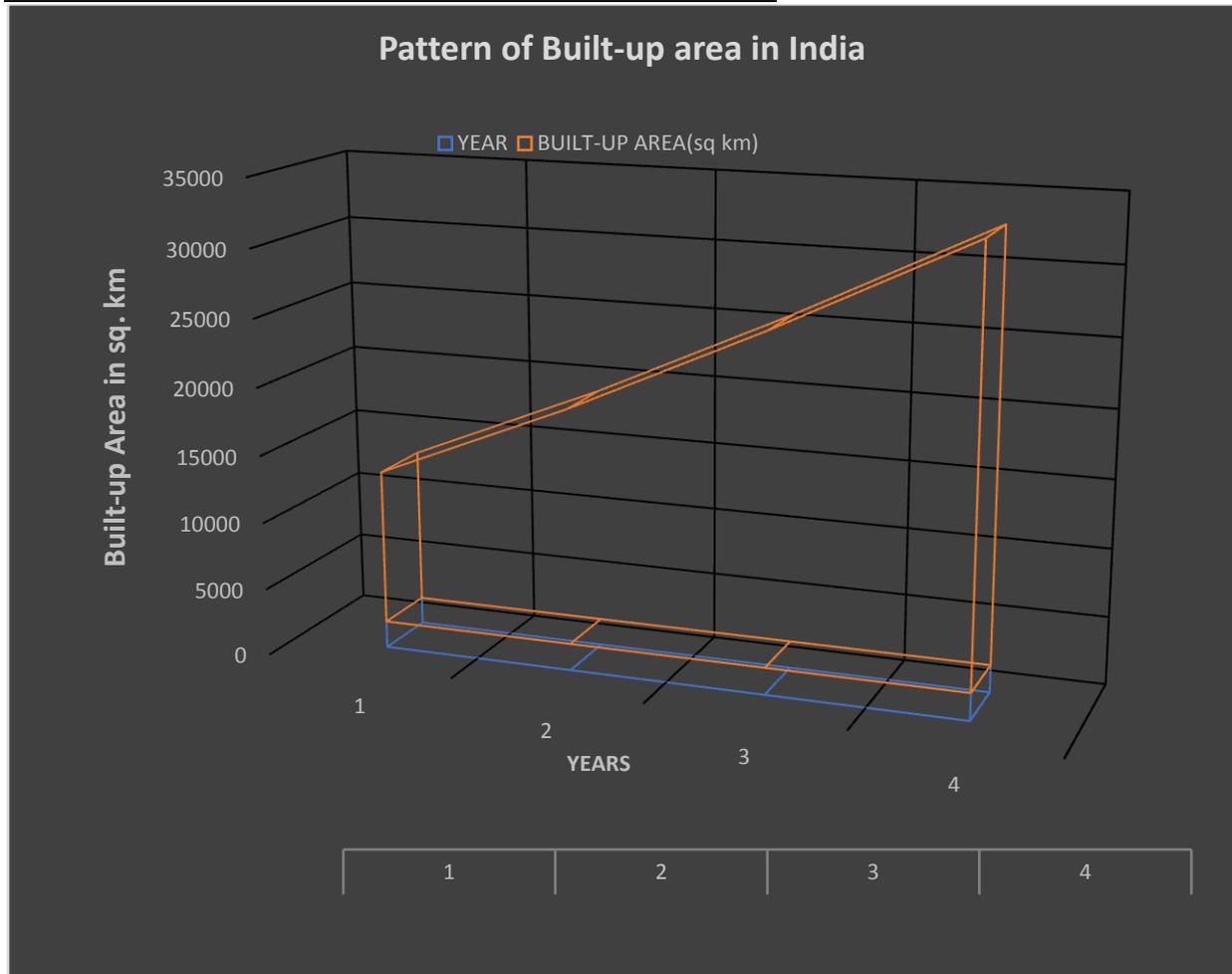
According to the latest data and reports, it is expected that by the year 2025, China will be overtaken by India as the most populous country. Also, a study by Institute for Health Metrics and Evaluation (IHME), University of Washington, Seattle, published in The Lancet describes that India is expected to reach its peak population of 1.6 billion by 2048.

OBJECTIVES OF STUDY

- To point out the adverse consequences of expansion of built-up area



EXPANSION PATTERN OF BUILT-UP AREA IN INDIA



Source: Organization for Economic Cooperation and Development (OECD)

IMPACTS ON ENVIRONMENT

The adverse consequences of built-up area on natural environment are as follows-

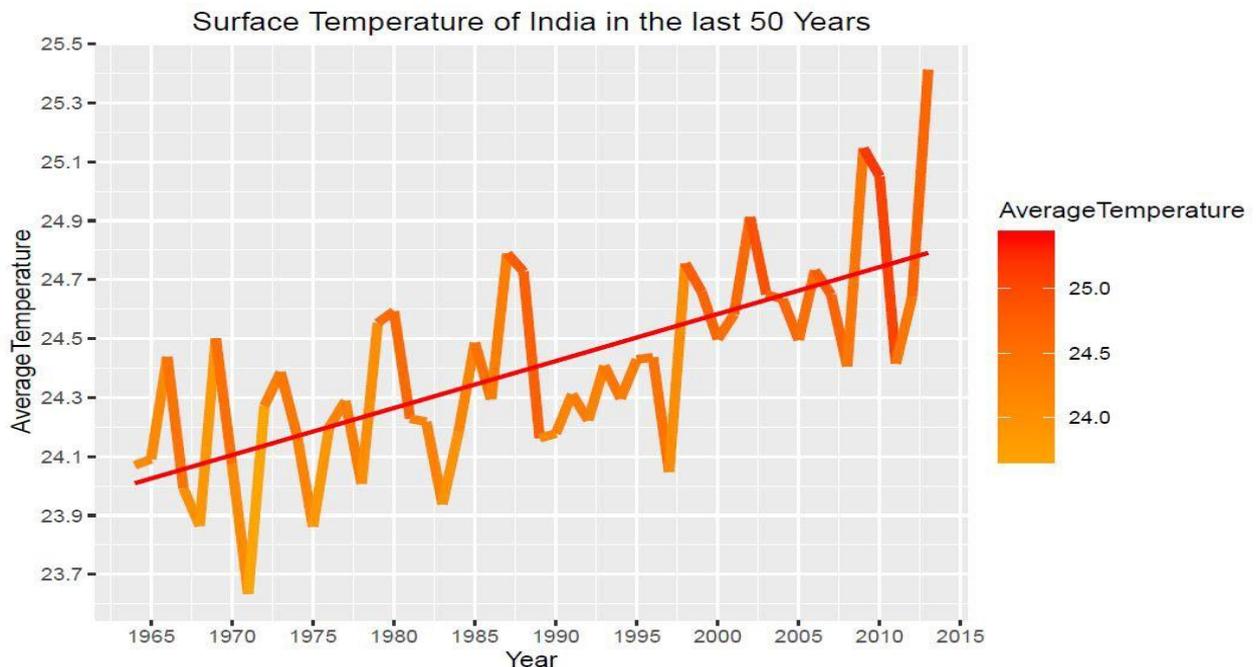
I. Weather Change

Urban heat islands (UHI) refer to the phenomenon of higher surface and atmospheric temperatures in urban areas than in the surrounding rural areas due to urbanization. The primary factor which creates UHI is impervious surfaces. Moreover, the thermal and radiative properties of materials used in construction of urban impervious surface are different from the natural land surface features. The following table shows thermal properties of some materials used in built-up areas-



Surface Type	Emissivity	Absorptivity
Grass	0.97-0.98	0.85-0.9
Brick or stone	0.87	0.6-0.8
Concrete	0.9	0.65-0.9
Asphalt	0.92	0.8-0.95
Dense canopy trees	0.95-0.99	0.82-0.85
Tar or Gravel	0.28	0.82-0.97
Water	0.99	0.95-0.98
White Tile	0.9-0.95	0.1-0.5
Galvanized Roof Sheets	0.25-0.28	0.85-0.9

The average annual temperature of India is on a constant rise in the span of last 50 years. Built-up area consisting of pavements, roads, buildings etc. tend to absorb more heat than natural land surface. The graph shows significant rise in land surface temperature in India in the last few decades.



Source: <https://medium.com/beginner-at-bi-data-science-and-big-data/climate-change-data-analysis-part-1-global-warming-in-india-3595d1e45fc8>



II. Hydrologic Effects

Expansion of built-up area has begun to disturb the balance of hydrological cycle. The watershed response to precipitation is now altered at a large scale, for eg. decrease in travel time, higher run off, urban flooding, reduced infiltration etc. Impervious surfaces such as pavements, roads allow no infiltration and lead to complete run off. During storms, high run off can lead to increase in stream flow, which further increases the risk of flash floods. Increase in built-up surface area reduces the recharge rate of groundwater by halting or reducing the infiltration of water. A recent analysis of groundwater level performed by the Central Ground Water Board (CGWB) indicates that about 33% of the wells have registered a dip in level of groundwater in the range of 0 to 2 metres. Metropolitan and Million cities like Delhi, Mumbai, Chennai, Madurai, Bengaluru, Ghaziabad etc. have shown a decline of more than 4 metres.

III. Soil Loss and Degradation

Constructing impermeable surfaces on the natural land surface locks and seals a certain area of soil. This is called soil sealing. Moreover, the soil of adjacent area also loses its quality, compaction, structure and faces nutrient degradation. These are at times very severe issues and can lead to decline in certain physical, biological or chemical qualities of soil.

IV. Effect on Water Quality

Built-up surfaces accumulate and gather the pollutants from various sources on land (like vehicles, man-made pollutants etc.) and atmosphere. Surface water run off caused by precipitation collects pollutants from surfaces like parking lots, pavements and other artificially created surfaces, which gets entered into other streams. Due to accelerated run off during storms, these pollutants are washed away and fall into some water body. Finally, this polluted water reaches the ocean. Hence extreme stream temperature, poor water quality can stress and damage the aquatic ecosystem.



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