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Population, development, and environment in India

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High population growth and continued economic development have caused serious environmental damage in the Asia Pacific region. However, the recent experience is that the pace of environmental degradation is faster in developing countries than in developed countries. To this end, the study seeks to assess the impact of population pressure on India's environment, with particular reference to the degradation of natural endowments like land and water resources and the resultant environmental pollution in the six regions of India. The rapid economic growth and expansion of infrastructure development in recent decades have not come without serious environmental consequences particularly in the southern, northern, and western regions. But in the eastern, north-eastern, and central regions of the country, environmental damage has been mainly due to rapid population growth.

Keywords: India; population; poverty; urbanization; development; environment

1. Introduction

In India, rapid population growth and expansion of developmental activities have both greatly aggravated resource depletion and degradation of the environment (Shaw 1989; Jodha 1990; Harte 2007). The extent of environmental degradation varies across countries and regions of the world (Shafix & Bandhyopadhyay 1992; Holtz-Eakin & Seldon 1995). For example, poverty has been the major cause of depletion of natural resources and environmental degradation in Africa (Kalipeni 1992), but in the Asia Pacific region both rapid population growth and continued economic development are found to be the major causes of environmental pollution (Duraiappah 1996; Dewaram 2007). In contrast, in the United States, where population density is much lower than in India, the main cause of environmental damage has been the extremely high per capita consumption of resources and the consequent high carbon emissions (United Nations 1997).

Two factors can be identified as environmental threats, viz: (i) proximate causes such as population growth, poverty, and population density and (ii) ultimate factors, i.e., developmental imperatives like urbanization, industrialization, and economic development, all of which often result in unsustainable use of natural resources and eventual degradation of the environment. India's economic development has accelerated in the past two decades. India's efforts to reduce population growth have been impressive, as shown by the steady decline in both growth rate and absolute numbers. This has not, however, been coupled with environmental conservation. The degree of environmental pollution differs across regions in accordance with characteristics such as poverty ratio, size and density of population, etc. Besides, economic development and reduction in population growth have not been uniform across regions and states in India. The skewed development across regions has aggravated regional inequality in socio-economic development, which has grave implications for environmental issues for obvious reasons.

Environmental issues have not received priority attention, apparently due to our preoccupation with economic development. The central, eastern, and north-eastern regions of India still have huge populations, which indeed cause higher levels of poverty (40% in central and 35% in eastern regions) and overuse of natural resources like forest, water, and land (Scott et al. 1997). Huge population, low quality of human resources, and inadequate levels of socio-economic development are the major challenges in the context of conservation of natural resources and protection of the environment in the central, eastern, and north-eastern regions of India. On the other hand comparatively low population growth and higher levels of economic development cause environmental stress in southern and western regions (Kumar 2001). This paper offers a qualitative assessment of the factors responsible for environmental decay, and its possible remedies, in India.

2. Data and conceptual framework

Data for the study come from census reports, statistical abstracts, and the Compendium of Environmental Statistics published by the Central Statistical Organization, New Delhi, and world population data sheets. Data such as population growth, density, share of

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urban population in the total, and poverty ratios have been considered to understand the links between population, development, and environment. In any region, the issue of population, development, and environment is complex. Figure 1 presents a conceptual model for these issues.

The extent of environmental damage in India caused by rapid population growth and increased economic development is well documented (Sharma 2008). There is also a contribution to environmental degradation from the economic power of different groups – low-, middle-, and high-income. For instance, high density of population invariably results in poor environmental quality. But, this does not mean that only the poor contribute to environmental degradation in India; even the middle class and rich groups have also been causing environmental degradation by using higher quantities per capita of energy such as fossil fuels, electricity, etc. In India (as elsewhere), development has caused rural–urban migration, urban poverty, and the unsustainable consumption of resources, with increased emission levels of greenhouse gases and other pollution (World Bank 2004). There has also been a widespread acquisition of consumer goods by the burgeoning middle and upper classes (Ganesh et al. 2007).

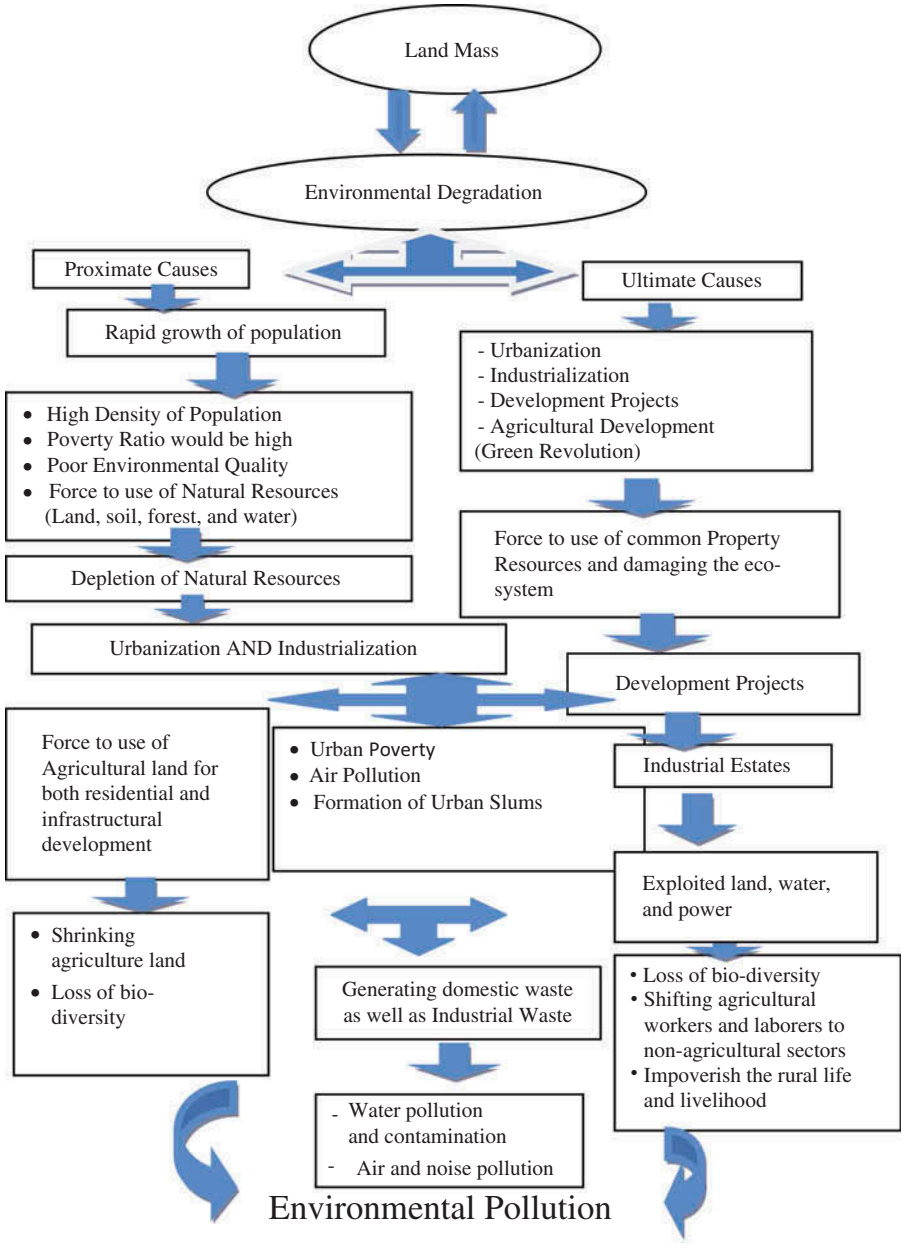

Figure 1. Conceptual framework of the process of environmental degradation.

Diversion of huge tracts of agricultural land for the establishment of industrial estates and special economic zones (SEZ) has directly resulted not only in the shrinkage of agricultural land but also in the migration of displaced agricultural laborers to non-agriculture activities, particularly in the towns (Lakshmana 2008). The craze for modern ways of life and the spread of corporate culture seem to have impoverished rural life and decimated rural livelihood systems, in addition to spreading discontent among the have-nots. Figure 2 shows a location map for regional analysis of environmental issues.

3. Population and environment

Population pressure naturally leads to overexploitation of natural resources like land, air, and water, and often results in contamination and exhaustion of scarce resources (World Bank 2004; Ganesh et al. 2007; Lakshmana 2008; Sharma 2008). India's landmass is only 2.4% of the global total, but it is currently home to 16.7% of the world's population (James 2011). Figure 3 illustrates the comparative figures of population growth by region in India.

Although the northern, western, and eastern regions have registered growth rates below the national average, they exhibit a high degree of environmental degradation. There are various reasons for this. Population characteristics, i.e., the proportion of poor, middling, and rich, seem to have distinct effects on the process of degrading the environment (National Council of Applied Economic Research 2011). Higher population density adversely affects environmental quality (Costantin & Martini 2007). In this regard, Figure 4 presents the man–land ratio for the years 2001 and 2011. This ratio was above

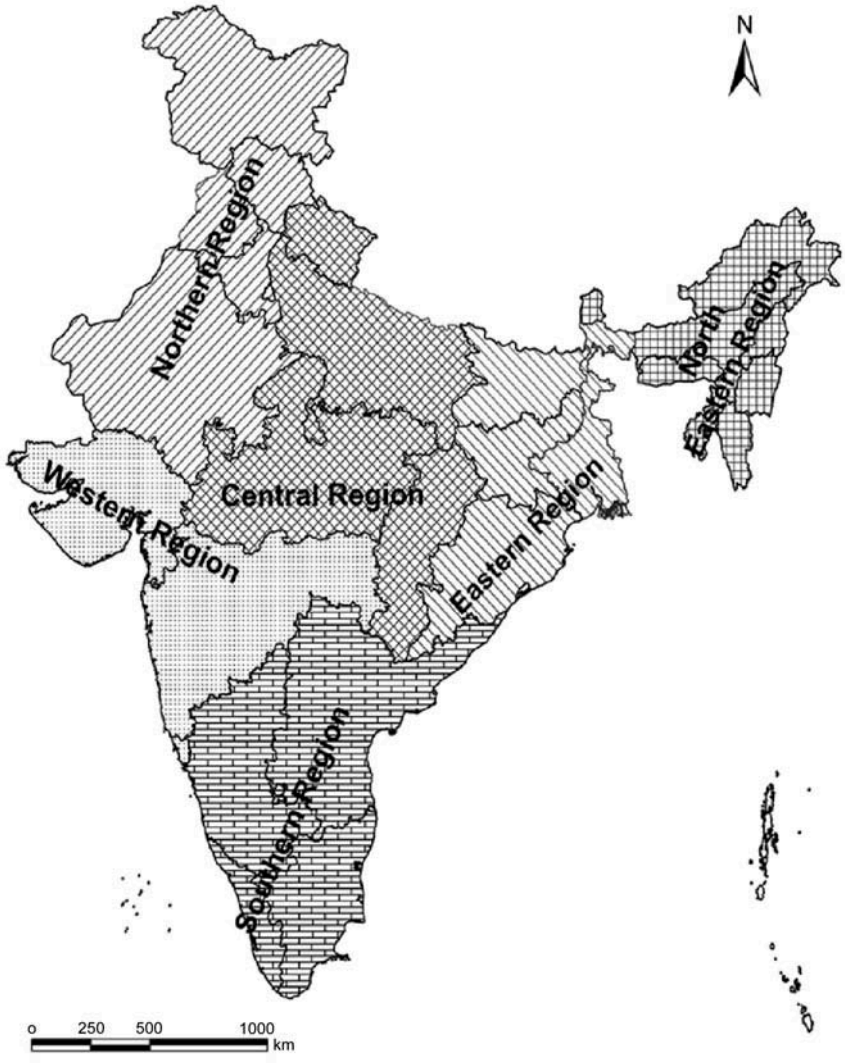

Figure 2. Location map of study regions in India.

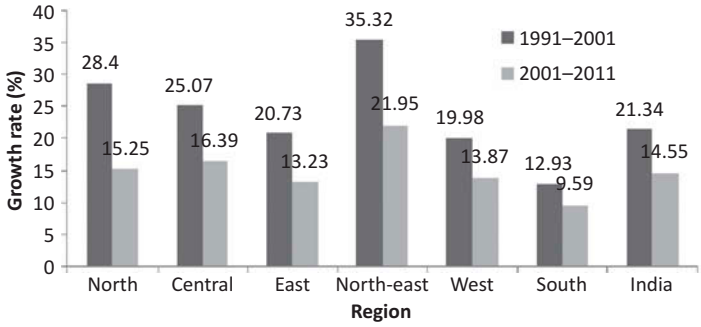

Figure 3. Decadal growth rate of population in India, by region.

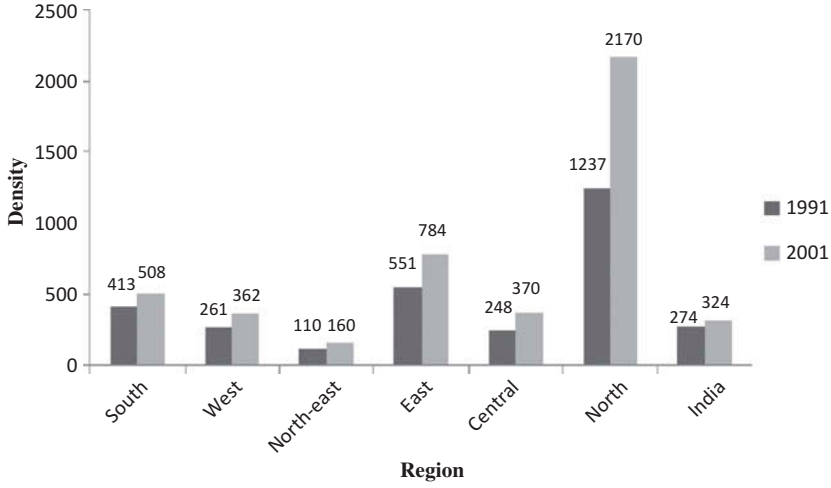

Figure 4. Man–land ratio in India, by region.

the national average of 366 in 2011 in all regions excepting the north-eastern region. The northern region, however, which includes the national capital of Delhi, has a higher density of population than the other regions.

The population pressure on land is much higher in the northern region than in other regions. This indicates that environmental degradation is mainly caused by population pressure on limited and un-expandable land in the north. The overall population pressure in the backward eastern region is acute, and the relationship of population and environmental decay is very high in this region as compared with other regions of India. The population density in the southern and western regions is also high, but second only to the eastern region. In absolute terms, the north-eastern region has comparatively lower population density. This region is relatively underdeveloped, and highly forested, with little population movement because of insurgency problems.

There is a general perception that economic growth, as measured by per capita national income, is a rough indicator of environmental quality (Costantin & Martini 2007). This view stems from the fact that in the rich countries of the world, carbon emissions and resource consumption have continued to increase beyond sustainable levels (Moran et al. 2008). Further, the higher the income inequality, the lower the status of environmental indicators such as waste production, meat and water consumption, biodiversity loss, and environmental composite indices (Nair 2001). Undoubtedly there is negative correlation between income inequality and environmental sustainability (Andrich et al. 2010).

India has 31.4 million middle-class households, and this figure is expected to increase to 53.3 million by 2015–2016. Currently, the middle class that represents about 13.1% of India's population owns 49% of the number of cars, 21% of TVs, 53.2% of computers, 52.9% of air-conditioning units, 37.8% of microwaves, and 45.7% of credit cards. The growing numbers of urban middle-class families in India have strong purchasing power, which is generally spent on consumer goods like electronics and electric goods which raises their per capita energy consumption and has a disproportionate environmental

impact. The increasing number of two-wheelers owned by the middle-class segment is adding enormously to air pollution. Table 1 mirrors the middle-class segments in India by state for both rural and urban areas.

4. Poverty and environment

It is generally accepted that environmental degradation, rapid population growth, and stagnant productivity are the causal factors for acute poverty in many countries of Asia (Senuguptha 2005; Saxena 2006; Sainath 2007). Most of India's poor live in rural areas and are engaged in agriculture (Senuguptha 2005). The efficacy of government intervention through various schemes implemented under Five-Year Plans to eradicate poverty and provide employment is a matter of debate (Senuguptha 2005). Nevertheless, the poverty ratios in India have been reduced over time (Figure 5). Traditionally the problem of poverty and unemployment was rampant in rural India but conditions in urban India were better; hence, due to rural influx into cites during recent decades, there has been a continuous rise in urban population and further it is accumulating in class I cites (Table 2). The rural–urban migration is mainly a result of rural failure and urban success: increased urban growth has resulted in uncontrolled migration into cities, which has created an unhealthy growth of cities. Further, the poor quality of urbanization has led to land degradation and air and water pollution in urban areas. Against this background, environmental damage due to overuse of natural resources is more acute in the central and eastern parts, followed by the western, southern, and north-eastern regions of the country. In fact, the northern region has experienced a lower degree of environmental degradation attributable to total poverty, unlike other regions.

5. Impact of growing urbanization on the environment

During the post-liberalization period, India has witnessed a rural influx into urban areas which has caused tremendous pressure on fertile agricultural land and resultant environmental degradation. The poor quality of India's urban centres has been worsened by the burden of this rural influx: there is environmental degradation on a large scale. In this regard, the region-wise urban population for comparative years is given for reference in Figure 6. Increased urban population over the past 30 years is of greater significance in the western region compared with other regions. However, there is also a big jump in the share of urban population out of the total population in the north-eastern region. Nevertheless, rapid urbanization in the north-eastern region seems to be mainly accounted for by an increasing rural–urban migration (Khongsdier 2008).

Table 2 shows the most populous cities in India. Population in the cities of the west region was the highest in the census of both 2001 (39.91 million) and 2011 (55

Table 1. Population class based on household monthly per capita consumer expenditure (MPCE) in India, by state (rural and urban).

Population class (rural)	States
Rs. 550–850 (average class)	Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Manipur, Orissa, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal
Rs. 851–1250 (middle class)	Haryana, Himachal Pradesh, Jammu & Kashmir, Maharashtra, Meghalaya, Sikkim, Uttarakhand
Rs. 1251–1550 (relatively rich class)	Kerala, Nagaland, Punjab
Income group (urban)	
Rs. 1100–1400 (average class)	Bihar, Jammu & Kashmir, Jharkhand, Madhya Pradesh, Manipur, Rajasthan, Uttar Pradesh
Rs. 1401–1700 (middle class)	Andhra Pradesh, Assam, Chhattisgarh, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Orissa, Punjab, Tamil Nadu, West Bengal
Rs. 1701–2000 (relatively rich class)	Delhi and Mizoram

Source: Population class categorized by the author, using NSS Report No-530: Household consumer expenditure in India, 2007–2008.

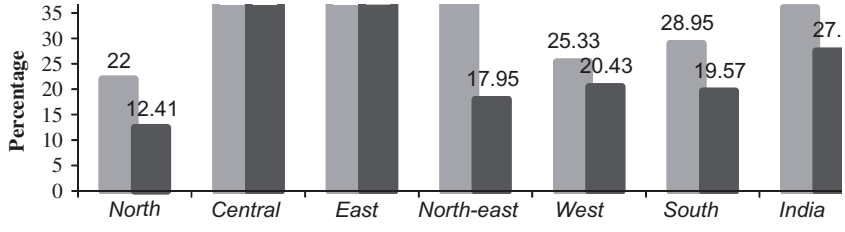

Figure 5. Percentage of population below poverty line in India, by region. The white represents the year 1994–1995 and black represents the year 2004–2005.

Table 2. Most populous cities in India and their population by region.

Region	No. of cities	2001 Population (millions)	2001 Percentage (%)	2011 Population (millions)	2011 Percentage (%)	Proportion of urban area to the total urban area (%)	Man–land ratio (per km^2)
Northern	28	24.61	17.90	31.65	18.03	14.00	2893
Central	46	27.28	19.85	34.62	19.72	23.00	1926
Eastern	32	16.36	11.90	19.93	11.35	10.14	2516
North-eastern	3	1.25	0.91	1.56	0.89	3.18	629
Western	36	39.91	29.04	55.01	31.33	16.76	4200
Southern	47	30.22	21.99	35.13	20.01	32.92	1365
India	192	137.45	100.00	175.57	100	100.00	2246

Source: Compiled by the author from census data.

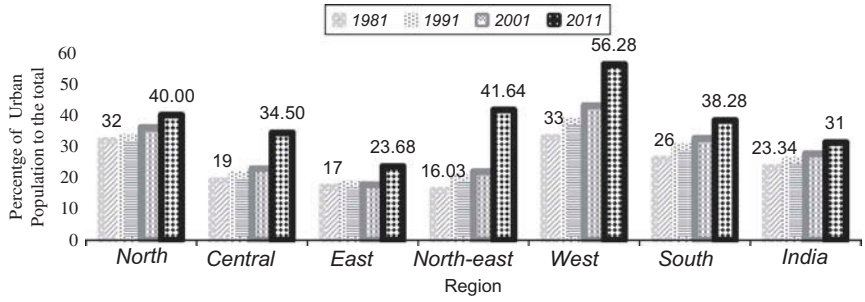

Figure 6. Region-wise urban population out of the total population in India, by region.

million). The southern region has the highest number of highly populous cities but ranks only second in terms of population size (30.22 million and 35.13 million in 2001 and 2011, respectively). The central, northern, and eastern regions come next, in that order.

In 2011 the western region, with 16.76% of the total land area, had double the proportion of population, i.e., 31.33% of the total. Similarly, the northern region with 14% of land area had 18% of population in the same time-span. This means that the most populous cities are located in the western and northern regions, and therefore one could conclude that urban growth and urbanization has led to increased use of natural resources; as a result, environmental pollution would be expected to be higher in the western and northern cities. In contrast, the southern, central, and north-eastern regions have a lower proportion of urban population and larger geographical areas. This indicates that the population pressure on urban land and its impact on environmental pollution in these regions would be relatively lower than in other regions of the country.

6. Development vs environment

In recent years, the creation of SEZ and population growth have resulted in diversion of huge tracts of agricultural land for non-agricultural purposes like construction of new industrial estates, peripheral roads, dams, railway lines, and residential use (Table 3). Diversion of considerable agricultural land for SEZ in the name of promoting exports through increased industrial development threatens biodiversity, and causes eco-degradation in the countryside.

At present there are about 762 SEZ throughout the country at various stages of completion, and for this purpose vast tracts of agricultural land have been acquired by the government. The total land area of India is 2,973,190 km^2, of which about 1,620,388 km^2 (55%) is currently used for agriculture. The area allocated to SEZ is about 2061 km^2, i.e., 0.12% of the total land area. This particular aspect has resulted in overexploitation of natural resources in the country. Shrinking of agricultural land has several adverse consequences, apart from environmental damage and ecological imbalance. Its ill-effects could manifest in various ways such as declining food production, movement of agricultural laborers into manufacturing and construction industries, decline in net sown area, etc. The high priority accorded to promotion of exports through increased industrial development has often resulted in the diversion of agricultural land to industrial and other purposes, and this has been to the detriment of

Table 3. Available cultivable/arable land for agriculture in India, by region.

State	Available land (in lakh hectares)		Shrinking arable land (in lakh hectares)	Availability of land per capita	
	1995–1996	2005–2006	1995–2005	1995–1996	2005–2006
Northern	355.84	355.92	0.08	0.35	0.27
Central	435.81	366.44	−69.37	0.21	0.13
Eastern	246.99	198.61	−48.38	0.13	0.1
North-eastern	62.55	61.67	−0.88	0.2	0.16
Western	337.27	337.67	0.49	0.28	0.23
Southern	395.76	391.64	−4.12	0.2	0.18
India	1834.22	1711.95	122.27	0.22	0.18

Source: Calculated by the author from census data.

agricultural production and food security (Shetty 2002). The possibility of serious food shortages in the future cannot be ruled out, and such shortages could cause several environmental problems in addition to the apparent human misery (Dasgupta et al. 1994).

7. Summary and conclusions

In India, all six regions have been experiencing environmental degradation to various degrees. The extent of environmental decay has been directly related to the physical characteristics of the region in question. For example, the north-eastern region has the highest growth of population, but due to its unique physical characteristics such as small population, low population density, and larger forested area, it has experienced a lower degree of environmental degradation. Though the eastern and central regions have higher population, they are however endowed with a larger geographical area and therefore have experienced relatively low levels of environmental degradation (excluding Kolkata). The same trend is visible in the southern and western regions. In contrast, environmental degradation is severe in the northern region due to overpopulation.

The urbanization effect on natural resource degradation and resulting environmental pollution in the western and northern regions are much higher than in other regions. Even the north-eastern region has experienced environmental degradation due to urbanization, though at a relatively lower level. The degree of environmental degradation due to urbanization is relatively moderate in the central and eastern regions, and comparatively low in the north-eastern and north regions. The huge shrinkage of agricultural land coupled with increase in population in the central and eastern regions has had a greater impact on their natural environment, as manifested in the reduction of bio-diversity in these regions.

Rapid population growth is directly responsible for higher environmental degradation in the central, eastern, and northern regions as compared to the other regions. On the other hand, economic development (ultimate cause) was found to be the main cause of environmental degradation in the western, northern, and southern regions. However, both proximate and ultimate causes are behind environmental degradation in the western region, which is the highest, followed by the southern and central regions. However, the situation is fairly well under control in the eastern (excluding Kolkata) and north-eastern regions. In view of the above observations, this study strongly suggests that policy makers take note of the situation and initiate appropriate remedial action. The current need is to take immediate steps through policy prescriptions to halt environmental damage and reverse these trends wherever possible.

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