

Chapter 2

Urban Environmental Governance: Global Experience



Abstract This chapter is intended to present strategic approaches and an overview of urban environmental governance from global perspective. It provides a brief overview of the evolution of global environmental governance concomitantly the interface with urban transformation. The chapter briefly discusses the complex issues associated with environment from a global economic growth and urbanisation lens. This evolution is related to environmental governance in terms of practice with a broader context of sustainable development which was initially associated with developed countries and later by developing countries. Further, the chapter proceeds to highlight the nexus between ‘urbanisation’ and ‘environment’ in terms of how it has drastically changed the quality of urban life in India and argues that environmental issues are inextricably linked to urbanisation.

Keywords Urbanisation · Environmental governance · City · Environmental challenges · Urban poverty · Urban development · Ecological hazards

2.1 Introduction

The world is getting rapidly urbanised. By 2030, particularly, developing countries of Asia and Africa will have more people living in urban areas than rural (UN-HABITAT 2008). Cities are reconfiguring on a massive scale at both spatial and demographic levels in the form of clusters, urban corridors, suburban sprawl and agglomeration. Such an urban transformation drastically impacts the territorial, economic, political, sociocultural and ecological systems in terms of generating negative externalities. Similarly, cities in the Asia-Pacific region constitute not only engines of economic growth but also reflect interconnectivity between global and regional economies. Certainly, they reflect the emerging links between urbanisation and interdependence among cities of the globe besides symbolising new patterns of increased economic activities. Such global and regional convergence can trigger imbalance for urban regional development besides leading to a diffused spatial development by way of prioritising economic centres rather than environmental and ecological concerns.

2.2 Need for Urban Environmental Governance: The Global Context

The unprecedented urbanisation process is a remarkable phenomenon of the twenty-first century (UNEP 2002) as reflected in the fact that nearly 82% of the urban population live in the developing countries and that the aggregate annual population increase in the six developing countries' cities like New Delhi and Mumbai (India), Dhaka (Bangladesh), Lagos (Nigeria), Kinshasa (Democratic Republic of Congo) and Karachi (Pakistan) is higher than the entire population of Europe (UNHSP 2013: 25). Some of the fastest-growing cities have emerged in Asia and Africa (Bangalore, Mumbai, Seoul and Tokyo). Not only they differ in size and density, but also their urban development which is mostly unplanned and uncoordinated, hence facing severe social, environmental and ecological crisis. Thus, urban development in the developing countries is most ambivalent underlying the dynamic process of diversification, capital accumulation, specialisation and spatial expansion (Nas and Veenman 1998: 102).

The process of globalisation includes two distinct broad processes: (i) movement of commodities, capital, people and information technology through space referred to as 'deterritorialisation' and (ii) spatial reconfiguration which allows these flows to happen referred to as 'reterritorialisation' (Brenner 1999; Marcotullio 2003: 226). Concomitantly, the cities' physical transformation, as a part of reterritorialisation process, embarks on changes in land use pattern such as creation of (i) 'industrial parks' in major metropolitan cities like Singapore, Taipei, Bangkok and Seoul; (ii) urban corridors like Bangalore-Mysore corridor, Bangalore-Tumkur corridor and IT corridor in Bangalore; and (iii) building special zones or industrial enclaves like special economic zones (SEZs) around Bangalore or export process zones (SPZs) located next to the megacities (Shanghai, Singapore, Hong Kong and Tokyo). Such a territorial convergence inevitably leads to the overlapping of ecological and environmental crisis (Nas and Veenman 1998: 102) like the destruction of ecosystems, spread of diseases, pollution, concentration of energy supplies, climate change and so on. The question is how does the 'global processes' impact the local ecology and environment.

Post-globalisation studies have, in fact, elaborated on the relationship between environmental issues and urban development in the context of developing countries (McGranahan et al. 2001; Marcotullio 2003; UN-HABITAT 2008). As the global economic process deepens and identifies with the 'world-city' formation (Harvey 1985; Marcotullio 2003), such process emphasises international standard of infrastructure development. The cities, therefore, often act as administrative/financial/economic as well as cultural high points with high value-added activities (like business, communication, services, information technology, research, etc.). For instance, the table below (see Table 2.1) provides top 20 cities of the world evenly spread across Asia-Pacific, Europe and the America. These cities are ranked by Global Cities Index (GCI) based on their global engagement in five different areas, i.e.

Table 2.1 Top global cities (ranking for 2014)

Cities	Ranking – 2014	Asia-Pacific cities	Ranking – 2014
New York	1	Jakarta	1
London	2	Manila	2
Paris	3	Addis Ababa	3
Tokyo	4	Sao Paulo	4
Hong Kong	5	New Delhi	5
Los Angeles	6	Rio de Janeiro	6
Chicago	7	Bogota	7
Beijing	8	Mumbai	8
Singapore	9	Nairobi	9
Washington	10	Kuala Lumpur	10
Brussels	11	Bangalore	11
Seoul	12	Beijing	12
Toronto	13	Johannesburg	13
Sydney	14	Kolkata	14
Madrid	15	Istanbul	15
Vienna	16	Cape Town	16
Moscow	17	Chennai	17
Shanghai	18	Tunis	18
Berlin	19	Dhaka	19
Buenos Aires	20	Caracas	20

Source: A.T. Kearney, Global Cities Index and Emerging Cities Outlook (2014)

business activity, human capital, information exchange, cultural exchange and political engagement.

For Asia-Pacific region, three cities are ranked as global cities, i.e. Mumbai (ranked 8th), Bangalore (ranked 11th) and Chennai (ranked 17th). With the emergence of such functional city system, it is clear that global cities are not uniform and well equipped with respect of ‘innovation’ and ‘competition’. Due to the functional uniqueness of global/world cities, they differ in their physical, spatial density and overlapping infrastructure. With the overlapping multilevel jurisdiction (legal, administrative, political, etc.) of the cities, the available socioeconomic opportunities further deeply influence the urban development. Arguing further on the inter-linkage between urban development and urban environment, environmental problems are categorised into (i) green and (ii) brown agendas clearly suggesting a shift in the environmental problems from the local to global further threatening the ecosystem (Marcotullio 2003; UNHSP 2009). The categorisation of environmental agendas signifies (i) citizen challenges and (ii) scale of environmental problems. Certainly, the process of global integration of cities has not only increased inequalities and levels of poverty but has severely impacted on the relationship between urban development and environment (UNEP 2002). But shifts in the environmental agendas of developing countries differ from the experience of Western countries. The environmental problems are ‘sequential’ over a long period of time in Western

countries, while they are overlapping and accumulating unfinished agendas in the developing countries (Marcotullio 2003). The reason is technological intervention that has changed the relationship pattern of uneven urban development and environment. Thus, the debate has shifted away from the conceptual and theoretical models of environment towards outcomes such as sustainability across a number of sectors and spatial dimensions.

2.3 Global Environmental Threats and Challenges

The Brundtland Commission report, 'Our Common Future', critically remarked that 'the future will be predominantly urban and the most immediate environmental concerns of most people will be urban one's' (UN 1987: 255; Satterthwaite 2003: 74). Nearly two-thirds of the world population will be living in the cities¹ consuming 80–90% of the global energy for immediate use while contributing 70–80% of greenhouse gas emissions (Otto-Zimmermann 2011). Similarly, world population, now at over six billion, is expected to reach around nine billion by 2050.² Nearly half of the earth's population is living in cities (Goffman 2005). Population growth is mostly concentrated in the developing world, particularly in Asian region which is estimated to home to more than 50% of the global urban population by 2050 (State and Outlook 2010).

Rapid urbanisation puts severe pressure on access and quality of services available to its population. For example, it is estimated that 80% of the global greenhouse gas emissions originate from cities (UNEP City Alliance Programme). The interface between cities and urban development produces and reproduces environmental and ecological impact at global, national and regional/local scale which include climate change, different kinds of pollution, loss of biodiversity and destruction of sensitive ecological systems altering not only natural features such as erosion and loss of habitat of species but also straining access to and quality of urban services like water, sanitation, land, fuel, transportation and other resources for their survival (see Table 2.4). Such phenomenon is generally referred to as 'urban footprint' (UNESCAP 2005; Satterthwaite 2003). In addition, the urban sprawl has a damaging effect on environment and ecology at the local level. Lack of effective urban management and planning initiatives and incoherent urban policies accentuate the environmental problems. Governing institutions, legal systems and political will are seldom reformed to the changing urban scenario (Hardoy et al. 2001).

Such global environmental challenges are critically linked to urban poverty and sustainability of cities. This ultimately further increases the pressure on the local

¹ 3.5 billion people at present live in cities, and by 2055 an estimated 75% of the world population will live in urban areas. Cities occupy 2% of the earth land accounting for over 70% of both energy consumption and carbon emission (<http://www.sustainablecities2013.com/>).

² By 2025, there will be 37 megacities with populations of over ten million; 22 of those cities will be in Asia (www.sustainablecities2013.com).

Table 2.2 Environmental disasters across major cities of the world

	Population in millions	Earthquake	Volcano	Storms	Tornado	Flood	Storm surge
Tokyo	35.2	X	–	X	X	X	X
Mexico City	19.4	X	X	X	–	–	–
New York	18.7	X	–	X	–	–	X
São Paulo	18.3	–	–	X	–	X	–
Mumbai	18.2	X	–	X	–	X	X
Delhi	15.0	X	–	X	–	X	–
Shanghai	14.5	X	–	X	–	X	X
Kolkata	14.3	X	–	X	X	X	X
Jakarta	13.2	X	–	–	–	X	–
Buenos Aires	12.6	–	–	X	–	X	X

Source: UNHSP (2009: 39)

environment and ecosystems, especially their capacity to promote access³ to basic amenities (State and outlook 2010). Cities are often prone to various kinds of environmental and ecological disasters like earthquake, volcanic eruptions, storms, tornadoes and flood and storm surge (see Table 2.2). There has been considerable threat to climate in terms of 60% of degraded ecosystems, loss of 35% of mangroves and destruction of 20% of world's precious coral reefs. Similarly, a potential threat to the loss of natural species has increased by 100%. It is estimated that each year 150,000 sq. kms of forest is lost. Similarly, one out of every four households is living in poverty especially in Asia and Africa (see Table 2.3). Nearly 65% of cities in the developing countries do not treat their waste water resulting in various environmental and ecological hazards within household, at neighbourhood level, even at workplace, at the city/municipality levels, at city region or periphery region as well as in connected linkages between city and global levels.⁴

With increasing urbanisation, cities in Asia are increasingly prone to threats from climate change. Similarly, exploring the impacts of climate change on metropolitan cities is gaining prominence due to rapid changing urban environment. Unmet demands of growing urban population in terms of lack of access to water, sanitation, energy has eventually exposed urban poor being the most exposed and hence, highly vulnerable to the present unique challenges. The impact can manifest in terms of direct or indirect physical, social, economic and health-related problems. Some include (i) rise in sea levels, (ii) tropical cyclones and (iii) heavy precipitation leading to urban floods and landslides, heavy heat islands and drought (Table 2.4).

³As per the Food and Agriculture Organisation (FAO) of UN, demand for food supplies, feed and fibre would grow by 70% by 2050 (State and Outlook 2010: 142).

⁴Please see Annexure Table 2.7 for more details on the classification of environmental and ecological hazards suffered by cities of the world.

Table 2.3 Global environmental issues/threats

Global environmental threats	Environmental threats
Global climate change	<p>60% of the ecosystems are either being degraded or used unsustainably</p> <p>35% of the world's mangroves have been lost</p> <p>20% of the world's precious coral reefs have been destroyed</p> <p>Species extinction rate is still 1000 times higher than what would be occurring naturally</p> <p>An estimated 90% of the total weight of large predators in the oceans – such as tuna, sharks and swordfish – have disappeared</p> <p>Loss of 150,000 square kilometres of forest each year</p> <p>In India, the rise in air pollution in cities such as Bangalore outpaced even those in China between 2002 and 2010, according to a report by <i>Time</i> magazine citing a Tel Aviv University study (www.sustainablecities2013.com)</p> <p>The <i>Wall Street Journal</i> reported that in the Indonesian capital of Jakarta, particulates, carbon monoxide and nitrogen dioxide increased by between 40% and 85% in 2011 (www.sustainablecities2013)</p>
Urban poverty	<p>One out of every four households live in poverty</p> <p>40% of African urban households and 25% of Latin American urban households live below poverty line</p>
Urban waste water	<p>65% of cities in the developing countries do not treat their waste water</p>
Greenhouse gas emission	<p>While large cities of the world consume 75% of the world energy contribute, 75–80% of the heat-trapping greenhouse gases are released into our atmosphere affecting the climate</p> <p>Carbon dioxide from fossil fuel use accounted for only 57% of the global anthropogenic greenhouse gas emissions in 2004</p> <p>In 2004, agriculture and gases released from land use changes and forestry accounted for 31% of greenhouse gas emissions</p> <p>In 2004, carbon dioxide emissions contributed around 77% of the global anthropogenic greenhouse gas emissions (methane contributed 14.3%, nitrous oxide 7.9% and fluorinated gases 1.1%)</p> <p>20–25% of carbon dioxide emission is caused by small and rural areas from developed countries</p> <p>Cities probably emit between 30% and 40% of all anthropogenic greenhouse gas emissions</p> <p>While lower-middle income nations contribute 53.2 and high-income nations contribute 29.1% of GHE between 1980 and 2005</p>

Source: Satterthwaite (2008: 239–240), and Satterthwaite (2009: 258)

Table 2.4 Impact of climate change upon urban areas

Ranking by population exposure	Ranking by value of property and infrastructure assets exposure
Kolkata (India)	Miami (USA)
Mumbai (India)	Guangzhou (China)
Dhaka (Bangladesh)	New York (USA)
Guangzhou (China)	Kolkata (India)
Ho Chi Minh City (Vietnam)	Shanghai (China)
Shanghai (China)	Mumbai (India)
Bangkok (Thailand)	Tianjin (China)
Rangoon (Myanmar)	Tokyo (Japan)
Miami (USA)	Hong Kong (China)
Haiphong (Vietnam)	Bangkok (Thailand)

Source: UN-HABITAT (2011: 71)

2.4 Evolution of Global Environmental Governance (GEG)

Broadly, ‘environmental governance’ has been defined in terms of (i) institutions and ‘processes’ and (ii) outcomes. From an institutional perspective, ‘environmental governance’ has been defined as ‘the establishment, reaffirmation or change of institutions to resolve conflicts over environmental resources’ (Paavola 2005). Similarly, Najam et al. (2006) define global environment governance ‘to the sum of organisations, policy instruments, financing mechanism, rules, procedures and norms that regulate global environmental protection’. A study by deLoe et al. (2009) defines ‘environmental governance’ as a specific form of broader ‘governance’ and refers to processes and institutions through which societies make decisions that affect the state of environment. Thus, environmental governance has been understood as offering institutional solutions for solving environmental crisis or challenges. The institutions can be in the form of ‘policies, financial mechanisms, rules, norms, regulations, distributive and procedural justice’ which influences the governance outcomes. Diverse studies have looked into environmental governance in the context of ‘process’ issues such as community participation, participation of stakeholders including the indigenous communities and minorities in the natural resource management, access to information, capacity building, transparency, accountability and so on. Hardin’s (1968) analysis of ‘tragedy of commons’ highlights appropriation and overexploitation of natural resources due to increasing interdependence. Ostrom (1990) and Ostrom et al. (1994) highlight the successful community governance of common-pool resources (such as fisheries, pastures and groundwater reservoirs) by agreed-upon rules and regulations without government policy intervention to overcome the ‘tragedy of commons’. The study by Ostrom (2000) provides an overview of the evolution of social norms and how they enable collective action. Similarly, ‘good environmental governance’ not only leads to environmental goals, such as conservation and sustainable development, but also how decisions are taken to achieve environmental goals (Jeffrey 2005).

Through the years, Global Environmental Governance has grown both in size and scope by evolving through a number of global/international/multilevel conventions/ treaties/ agreements that guide the process of governance with regard to environmental and ecosystem decline/threats.⁵ A series of multilateral environmental agreements (MEAs) have provided the basis for an international environmental regime and regulation. These conventions and treaties are implemented with the help of small organisations called secretariats. Major international organisations such as World Bank, UN-HABITAT, UNEP and ADB and many regional associations/organisations have made substantial efforts towards promoting sustainable development in urban areas. The collective international environmental institutions are composed of organisations/NGOs/civil society and regional organisations, including private sector, multi-national corporation and business community. Major institutional decisions on environmental policy came out during the United Nations Conference on the Human Environment (Stockholm 1972 conference), constituted as a part of the United Nations Environment Programme (UNEP). Some of the major global environmental initiatives⁶ such as ‘The Rio Earth Summit 1992 and Johannesburg Summit on Sustainable Development 2002’ are considered landmark summits on the evolution of GEG system (Najam et al. 2006). Thus, the evolution of global environmental governance is located and traced within a broader context of sustainable development.

The international conventions, treaties and agreements manifest into 900 multilateral environmental agreements (MEAs) (Wingqvist et al. 2012). The question of implementation of these mandates and its effectiveness is measured not simply in terms of ecology and environment but also in terms of ‘development’ and outcomes like ‘equity’ which is embedded within the concept of sustainable development (Najam 2005). Yet, most of the agreements and treaties are declaratory in nature. And many environmental regimes are in terms of rules and norms created by non-environmental organisations like World Trade Organization, the Millennium Development Goals (MDGs), lending policy safeguards of the International Finance Corporation (IFC), major private banks and so on. In addition to the agreements and treaties, multiple sources of funding through donor aid flow, international financial organisations, UN agencies and international NGOs for environmental governance were given to the national governments across developing countries (Najam et al. 2006). Too many agreements, actors and resources have inevitably led to fragmentation and inefficiency (Najam et al. 2006). Similarly, many global-level reform⁷ initiatives were undertaken for the promotion of global environmental governance, which were launched under the guidance of UN and international NGOs.

⁵ See Annexure Table 2.10 on environmental threats across different regions of the world.

⁶ Refer Annexure for Table 2.7 which provides a glimpse of the global environmental governance through treaties, conventions and organisations.

⁷ Refer Annexure for Table 2.8 on the evolution of global reform initiatives with respect to global environmental governance.

Despite the pervasive nature of GEG encompassing various dimensions of environmental governance, it is ineffective in controlling or alleviating global environmental concerns and damages. GEG is yet to get standardised and is still evolving in nature. Some of the defects identified with respect to GEG are (i) complex international regimes⁸ which lack cooperation and coordination for effective implementation or enforcement, (ii) ineffective use of resources, (iii) multiplication of civil societies and NGOs both at the national and international levels, (iv) institutional fragmentation and, (v) finally, international courts and tribunals. Such an institutional fragmentation leads to conflicting agendas, duplication of work, geographical dispersion and inconsistency in rules and norms (Najam et al. 2006). One of the strongest criticisms voiced with respect to GEG has been its high dependency on voluntary funding and a short-term implementation of projects. In addition, the signatory nations have completely failed to integrate environmental stipulations into their planning and governance processes. Therefore, a plethora of multilateral and bilateral funding and private funds coupled with a variety of financing instruments (grants, loans, guarantees, technology transfer, etc.) have inevitably led to administrative and institutional fragmentation for the recipient countries (Wingqvist et al. 2012).

2.5 Urban Environmental Governance in India: Issues and Challenges

Indian cities⁹ have for long witnessed a steady increase in urban¹⁰ population,¹¹ i.e. from 27% in 1901 to 38% in 2001 (MoEF 2011; Vishwanath et al. 2013) and, similarly, from 13% in 1900 to 49% in 2005 which is projected to escalate to 60% by 2030 (Bharath et al. 2012). There are 48 urban agglomerations/cities having a population of more than one million in India (in 2011) (ibid). Thus, urbanisation¹² in India is characterised by ‘unplanned and unmanageable growth’ leading to urban sprawl (Pandey et al. 2006) and an exponential growth of informal or slum¹³ settle-

⁸There are more than 500 MEAs registered with the UN, including 61 atmosphere-related; 155 biodiversity-related; 179 related to chemicals, hazardous substances and waste; 46 land conventions; and 196 conventions that are broadly related to issues dealing with water (Najam et al. 2006: 30).

⁹According to 2011 census, 90 million people have been added to Indian urban areas since the previous census in 2001 (Vishwanath et al. 2013: 15).

¹⁰Indian cities as drivers of economic growth contribute 60% of national income (Pandey et al. 2006: 208).

¹¹Indian urbanisation pattern is often referred to as ‘agglomeration economies’. As per the Agglomeration Index, Indian urbanisation has reached to 52% (ibid: 24).

¹²Total urban population has increased more than ten times from 26 million to 285 million, an increase of 28% by 2001. An increase from 23% in 1991 to 65% in 1991 is found in respect of Class I cities in India (MoEF 2009: 134). Similarly, as per 2001 census, there are 35 million plus cities in India (ibid 136).

¹³Total slum population in the country is 40.3 million comprising 22.6% of the total urban popula-

ments.¹⁴ Such settlements face a high risk of health hazardous such as tuberculosis, malaria, dengue, cholera, typhoid and plague adversely impacting the environment (MoEF 2011). The trends of urbanisation such as ‘agglomeration, conurbation, sub-urbanisation, peri-urbanisation and urban sprawl’ have adverse ramifications such as spatial and vehicular density and growing demand for energy and food. The changing land use pattern, particularly, in metropolitan cities of India has a considerable impact on local environment. Thus, since the last three decades, the interface between the ‘process’ of urbanisation and environment has seriously impacted the quality of urban (Maiti and Aggrawal 2005). Moreover, environmental governance in India suffers from poor urban planning and command-and-control type of environmental management (Pandey et al. 2006).

Environmental deterioration has been closely linked to unsustainable production and consumption patterns (MoEF 2011). Consequently, access to and quality of basic urban services are very poor and do not match the rapid economic growth scenario of India cities (ibid). Various environmental problems plague India,¹⁵ particularly metro cities (coastal), which are vulnerable to cyclones and annual monsoon floods, rapid population growth, increase in household consumption, industrialisation, poor access to infrastructure and unequal distribution of resources (Anand 2013). Most often, unplanned urbanisation in India has led to specific environmental and ecological impacts such as shortage of housing, worsening of water quality, various types of pollution, problems associated with disposal of waste and hazardous wastes most common in metro cities like Mumbai, Kolkata, Chennai, Delhi, Bangalore, Kanpur, Hyderabad and so on (Maiti and Aggrawal 2005; MoEF 2009; Sridhar and Kashyap 2012).

2.5.1 Major Urban Challenges in India

Indian urbanisation is often referred to as an ‘agglomeration economy’ pushed by various external and internal factors such as urban-rural migration, concentration of industrial/IT/BT clusters, creation and implementation of large-scale infrastructure projects and creation of special economic zones (SEZs) that have eventually spurred a spatial and territorial transformation seriously posing threats to environment and ecology. Some of the challenges of Indian urbanisation include the following:

tion of cities or towns (MoEF 2009: 140).

¹⁴The United Nations Human Settlements Programme (UNHSP) states that 43% of urban residents in the developing countries like Brazil and India live in slums.

¹⁵On 2.4% of land area, India sustains 16.7 of the world population exerting a tremendous pressure on its natural resources (MoEF 2011).

2.5.1.1 Cities as Engines of Economic Growth

More than 90% of the world's urban population growth is taking place in the developing countries coupled with increasing number of largest cities¹⁶ (UN-HABITAT 2010: 4; UNHSP 2011: 2). It is estimated that 'half of the world's megacities (12 out of 21) are now in Asia. Similarly, seven out of ten most populous cities of the world are now in Asia (Tokyo, New Delhi, Mumbai, Shanghai, Kolkata, Dhaka and Karachi). Irrespective of the nature of countries (high/middle/low income), cities in Asia¹⁷ have recorded the highest growth rate for the past two decades, contributing as much as 30% of the global economic output (in 2008). Asian cities are most often referred to as 'agglomeration economies', 'factory of the world' for international financial centres and 'knowledge economies' (ibid). In Asia two most significant reasons for registering a high economic growth are (i) migration (rural-urban or urban-urban) and (ii) reclassification of 'rural' to 'urban' (UN-HABITAT 2010). A high economic growth rate has led to an increased demand for better infrastructure and resources (physical and basic amenities) particularly land. In fact, the entire process is a defining feature of the rapid urbanisation pattern in Asia. One of the most threatening features of India's urbanisation process is population/demographic explosion in cities¹⁸ (Maiti and Aggrawal 2005). The total urban population has increased from 26 to 285 million.¹⁹ Concomitantly, a vast majority of migrant population has settled in slums and informal settlements of India's metro cities, such as New Delhi, Kolkata, Mumbai and Chennai (see Table 2.5). The total slum population in India has recorded an increase of 41% in million plus cities.

This unabated urbanisation has unleashed serious environmental problems in terms of inadequate housing, spatial density, lack of access to basic services,²⁰ excessive pollution, degeneration of nonrenewable resources and an increase in informal activities. Indeed, urbanisation has propelled the urban territorial restructuring in terms of 'agglomeration, urban corridors, conurbation, special zones and suburbanisation' instigating transition in the land use management. Besides, megacities or million plus cities do not adequately practise sustainable measures, thus grossly affecting the local environment. Therefore, the capacity of local governance

¹⁶The number of million plus cities has drastically increased from 75 in 1950 to 447 in 2011, while simultaneously there is an increase in the average size of the world's 100 largest cities from 2.0 to 7.6 million. By 2020, it is projected that there would be 527 cities with a population of more than one million (UNHSP 2011: 2).

¹⁷Asia constitutes the second largest urbanised region with 42.2% of the population living in urban areas which is slightly more than Africa's 40% (UN-HABITAT 2010: 6). It is further estimated that between 2010 and 2020, a total of 411 million people will be added to Asian cities or 60% of the growth in the world's urban population (ibid).

¹⁸The number of million plus cities has increased from 23 in 1991 to 35 as per 2001 census. Population growth is recorded from 19% in 1951 to 33% in 1991 (Maiti and Aggrawal 2005: 279).

¹⁹There is a continuous increase in urban population from 11% (in 1901) to 17% in 1951 to 28% in 2001. Similarly, nearly 60% of the urban population live in Class I cities (Maiti and Aggrawal 2005: 278).

²⁰See Annexure Table.

Table 2.5 Growth of slum population in the four metropolitan cities in India

Metropolitan cities	1981(%)	1991(%)	2001(%)
Greater Mumbai	30.8	43.2	48.9
Kolkata	30.3	36.3	32.6
New Delhi	18.0	22.5	18.9
Chennai	13.8	15.3	17.7

Source: Maiti and Aggrawal (2005): 281

in terms of planning, management and governance is part of an urban growth crisis triggering ‘negative externalities’ on environment and ecology.

2.5.1.2 Rural-Urban Migration

One of the chief characteristics of India’s urbanisation is rural-urban migration.²¹ Some of the major cities or million plus cities of India like New Delhi, Mumbai, Bangalore,²² Chennai and Kolkata are experiencing an increase in migration from rural to metropolitan cities. The percentage of urban population in India²³ (million plus cities) have risen from 6% in 1901 to 19% in 1951 and further to 33% in 1991 (Maiti and Aggrawal 2005: 280; Sridhar and Wan 2014). A high percentage of population (68.7%) is concentrated in Class I cities²⁴ of India leading to the deficiency of urban basic services (Kundu 2006). A vast migrant population²⁵ is attracted to urban centres in search of jobs or income-generating opportunities due to expanding infrastructure facilities and access to better basic services. They inevitably settle in temporary or informal dwellings resulting in the swelling of slums in metro cities. According to 1991 census, slum population in India swelled to 41% residing in the million plus cities (ibid: 281; MoEF 2009: 138; Khan et al. 2011). Such a dramatic increase in migrant population²⁶ has exerted an adverse impact on the environment as this increase causes varying degrees of land degradation and inappropriate land management and unsustainable practices such as land shortage, encroachment, insecure land tenure and poverty. The impact is irreversible in terms of both spatial and temporal, particularly the loss of local ecosystems (in the form of physical

²¹As per Census 2001, the share of rural-urban migration population constituted 16.4% in India. Especially, Karnataka accounts for 11.9% of rural-urban migration.

²²As per Census 2001, there is an upward trend of migration in Karnataka between 1991 and 2001 which is 34%. Rural-urban migration is basically labour migration (Roychowdhury et al. 2012: 13–16).

²³India constitutes one of the ten megacentres of biodiversity (Singh 1995: 57).

²⁴The number of Class I cities has increased from 24 in 1901 to 393 in 2001 (Kundu 2006: 29).

²⁵‘Migration can be seen as livelihood and income diversifying criteria’. Economic reasons constitute one of the major factors for rural-urban migration in search of income-generating opportunities in metro cities (Roychowdhury et al. 2012: 31–33).

²⁶As per Census 2001, 36 million intrastate migrations to urban centres have been observed (MoEF 2009: 139).

changes like pollution/encroachment of lakes, tanks, urban floods, urban heat islands, climate change and so on.).

2.5.1.3 Unplanned Urban Development

Urban centres constitute hub of ‘economic activities’, because of rapid industrialisation and migration resulting in a huge population. Nearly 50% of the urban population comprises migrants (MoEF 2009) who resort to excessive consumption of untapped natural resources inadvertently producing pollution and illegal waste in the process. However, such an increase in per capita resource consumption makes India highly susceptible to environmental degradation (Singh 1995). These problems are associated with unplanned development and unabated urban growth.²⁷ Such an unregulated high urban growth rate in India, particularly over the last two decades, has led to a skewed access to and quality of urban basic services.²⁸ The problem of poor management is usually associated with a contagious outgrowth of cities’ high urban spatial density and proliferation of unplanned settlements/slums²⁹ which largely do not have access to an adequate water supply, sanitation, housing, waste disposal or electricity. The problem is further compounded by inadequate resources/finances of urban local bodies to cater to the growing demand for services and infrastructure. Any combination of these factors gives rise to urban health problems and new disease patterns mainly due to unhygienic living conditions, pollution, inadequate access and malnutrition. The concentration of unplanned settlements like urban slums leads to the spread of communicable and infectious diseases such as tuberculosis, hepatitis, dengue, malaria, pneumonia, etc. (Pandey et al. 2006: 211; Bhandari 2006; MoEF 2009).

2.5.1.4 Changing Land Use Pattern

An indiscriminate urbanisation process has a tremendous impact on the urban land use pattern. While promoting ‘world-city’ infrastructure in Indian metropolitan cities, infrastructure projects on a massive scale have been implemented (such as metrorail, urban corridors, ring-roads, IT/BT industrial zones, special economic zones (SEZs) and so on in addition to huge commercial and residential complexes bringing about tremendous changes in the land use pattern. In addition, vast tracts of vacant land are occupied or absorbed by the slums (essentially migrant population) while further getting relocated to urban peripheries or marginalised land

²⁷As per Census 2001, 27.8% of Indian population lives in urban centres (MoEF 2009: 134).

²⁸Refer to Table 2.11 for more details on the status of urban basic services in India.

²⁹The estimated slum population has increased from 46.26 million in 1991 to 61.82 million in 2001 showing a growth of 15.56% (CSO 2011: 123). The NSSO data for July 2008 to June 2009 reveal that 49,000 slums exist in urban areas of India (including both notified and non-notified) and they have increased to 50.6% for 2002 (ibid: 123).

contributing to city segmentation (Kundu 2006). For example, half of the city population in New Delhi and Mumbai lives in unauthorised areas (Toutain and Gopiprasad 2006). Such development and redevelopment projects cut across geographical boundaries in the form of continuous and discontinuous urban sprawls which pass through administrative jurisdictions of many municipalities and villages. The increasing population and competing demands for land have resulted in a significant decline in the per capita availability of land from 0.89 ha in 1951 to 0.3 ha in 2001 (MoEF 2001, 2011).

Delivery of services is also affected by the segmentation of urban areas across metropolitan cities in India more than 70% of non-notified slums do not have access to basic amenities (CSO 2011). The proliferation of multiple agencies for land use through conflicting legislations, without clear defined role complicates the protection of environment. Moreover, the emergence of master plans (such as city development plan, comprehensive development plan, JNNURM and so on) for addressing the urban issues has never prioritised local environment and ecology. Urban land is often tagged as 'real estate value' with a high priority given to the 'economic' value of land while improving their current or future infrastructure and functioning capacity but completely neglecting the environment and biodiversity of the city (Toutain and Gopiprasad 2006). The city-level zonal regulations, by-laws and norms are barely followed for all types of development projects, subsequently resulting in land encroachments or illegal occupation. There is no coherent policy addressing the issue of interlinkage of urban land use and local development which presuppose the integration with environment parameters (such as water bodies, spatial, biosphere, climate factors, power, solid waste, waste management, transport). This offers a fresh challenge to the ecosystem and nonrenewable resources in terms of disintegrating the balance between urbanisation and preservation of environment in India.

2.5.1.5 Urban Informal Economy

'Informal economy'³⁰ has been the key feature of Asian cities (UN-HABITAT 2010: 87). In India 86% of the total workforce is employed in the informal sector (between 2004 and 2005) (Naik 2009; Chandrasekhar and Ghosh 2013). The presence of the informal sector is characterised by the dynamics of urbanisation process (UN-HABITAT 2010). Particularly, the share of the informal workers is highest in the states of Andhra Pradesh, Himachal Pradesh, Karnataka and Madhya Pradesh in India (Naik 2009). The participation of women in informal jobs has increased substantially in Asian cities, particularly, in the form of 'invisible' jobs, i.e. menial jobs like domestic labourers, piece-rate workers and assisting to small

³⁰Often 'informal sector' or 'unorganised sector' has been used synonymously. Those employed in the informal sector do not have job security or social security benefits.

family enterprises with low wage rates without social security to the agony of women besides contributing to the deterioration of health and poverty (Kundu 1999; Roychowdhury 2004; UN-HABITAT 2009). As informal workers³¹ do not enjoy job or income security (low income) and lack of secure property rights, as such they are excluded from or have inadequate access to basic amenities or infrastructure facilities in cities. Most of them live in extremely unhygienic conditions, and the condition has further deteriorated with the segmentation of cities into formal and informal settlements further accentuating the situation (Kundu 1999). Therefore, there is a significant correlation between informal sector employment and an increase in the incidence of urban poverty (Kundu 1999; Naik 2009; UN-HABITAT 2009).

2.5.1.6 Urban Poverty and Environment

Urban poverty³² is one of the major problems in Asian cities³³ (UN-HABITAT 2009). It is estimated that at least a billion urban dwellers³⁴ have a very poor access daily needs, often in temporary shelters/shacks and overcrowded houses, often leading a life of very poor quality termed as ‘slums/informal settlements’ (Satterthwaite 2003; Satterthwaite et al. 2011). The conditions of slums in metropolitan cities of India are very deplorable (see Table 2.6) as these settlements generally occupy either vacant or private lands without a secured tenancy, again termed as ‘illegal’, which does not authorise them to access basic services (such as water, toilets, drainage, waste collection, electricity supply or housing) (see Table 2.6). Between 1990 and 2008, the shares of urban population in terms of access to safe drinking water³⁵

³¹ Informal sector jobs constitute (i) daily wage in construction, rickshaw pulling, hawking and street vending, jobs in textile/garment sector, carpet making, agarbathi/cigarette/beedi making or garbage collection.

³² UN-HABITAT (2009: 109) defines poverty as one of the social exclusionary approaches which refer to the ‘phenomenon whereby individuals or groups are unable to fully participate in political processes’. In India, particularly, poverty is measured in terms of consumption and levels of income. The study by Satterthwaite (2003) provides a broader definition of poverty by including eight parameters which include (i) inadequate income, (ii) risky assets, (iii) inadequate shelter, (iv) inadequate provision of public infrastructure, (v) inadequate provision of basic amenities, (vi) no safety net to ensure basic consumption, (vii) inadequate protection of rights of the poor and (viii) powerlessness and voicelessness of the poor and lack of means to ensure accountability from donors, public agencies and NGOs.

³³ Satterthwaite et al. (2011). Engaging with the urban poor and their organisations for poverty, reduction and urban governance, an issue paper for the United Nations Development Programme.

³⁴ Most of the slum dwellers/informal settlements are located near drainage channels, under bridges, near open waste sites or low-lying areas.

³⁵ It is estimated that over the next 20 years, the global demand for water will increase by 40% while by more than 50% in the developing countries (State and Outlook 2010: 143). Similarly, an average annual investment would amount to USD 772 billion for water and waste water management around the world by 2050 (ibid).

Table 2.6 Environmental conditions in urban slums of India

Environmental conditions	Urban poor NFHS* 2	Urban poor	Urban nonpoor	Overall urban	Overall rural	All India
	2000	2005–2006				
Households with access to piped water supply at home (%)	13.2	18.5	62.2	50.7	11.8	24.5
Households with access to public tap/hand pump for drinking water (%)	72.4	72.4	30.7	41.6	69.3	42.0
Household using a sanitary facility for the disposal of excreta (flush/pit toilet) (%)	40.5	47.2	95.9	83.2	26.0	44.7
Median number of household members per sleeping room	3.5	4.0	3.0	3.3	4.0	3.5
Infectious diseases						
Prevalence of medically treated TB (per 100,000)	535	461	258	307	469	418
Prevalence of HIV among adult population (age 15–49) (%)	–	0.47	0.31	0.35	0.25	0.28

*National Family Health Survey

Source: UNHSP (2013: 128)

declined by between 3% and 12% in Bangladesh, Indonesia, Myanmar and Nepal (UNHPS 2013: 143). A study by Sridhar and Kashyap (2012) reveals that Kolkata has the highest density of slums followed by Chennai. Although New Delhi has the highest number of slums in absolute numbers, the city of Mumbai supports large number of slum dwellers (a staggering 57.7%).

Studies clearly point to the fact that there exists a strong evidence to prove that the urban environmental crisis is a major contributory factor to urban poverty in Asia and African cities (Satterthwaite 2003). Although the positive role of slum or urban poor in the protection of local ecology is recognised (as waste pickers, recyclers or reclaimers of waste from domestic or commercial/industries), they suffer from multiple deprivations that include unsure jobs vs low income, unsure housing, lack of access to amenities and infrastructure and so on. Most often the urban poor residing in informal settlements face serious environmental hazards like urban floods, homelessness and health-related issues that significantly contribute to poverty. Dimensions of the urban poverty-environmental nexus include (Satterthwaite n.d.; 2003):

- (i) Inadequate access to basic amenities: Most of the urban poor living in informal settlements do not have access to drinking water and sanitation facilities; they consequently suffer from innumerable health issues and diseases such as dengue, malaria, cholera, TB and so on.
- (ii) Occupational hazards: As most of the urban poor are employed in the informal sector, they are mostly exposed to various kinds of pollution, and particularly

those employed in industrial/energy or transport sectors suffer from various kinds of health problems.

- (iii) Urban vulnerability to natural disasters: Since unabsorbed populations from slums live mostly in unhygienic or congested or substandard settlements, they are often victims of natural disasters like floods, rising heat/temperatures and earthquakes and subsequently are exposed to epidemics, premature deaths and injuries due to accidents in cities.

The problem is further accentuated by global warming (Satterthwaite 2003), structural issues and apathetic institutions underpinning poverty, for instance, who fight against polluter industries, donors and sometimes government. Therefore, a range of environmental crisis faced by the urban poor in urban areas overlap socio-economic and political factors (ibid). In addition, four kinds of environmental degradation have been identified with respect to urban development including (i) high use or waste of nonrenewable resources, (ii) high use of renewable resources, (iii) high levels of biodegradable waste generation and (iv) generation of high levels of non-biodegradable emissions (Satterthwaite 2003).

2.6 Conclusion

The obvious pressure and the resultant devastating effect on the environment are most pronounced due to unabated urbanisation in the twenty-first century not only in respect of the developed but also developing countries. The inevitable linkages between the urbanisation process and environment and ecology continue to bother the present generation as well as the generations to come. Therefore, the system of environmental governance has gained significance within a broader framework of sustainability.

Due to rapid urbanisation, the metropolitan cities of India are facing daunting task of accommodating the needs of people on the one hand and addressing the challenges posed by environmental degradation on the other. In these conditions, how do the world cities cope up with environmental crisis unleashed by urbanisation? Are there any tangible efforts made towards promoting sustainable cities? Therefore, Chap. 3 provides a glimpse of sustainable city models across the world including India (Tables 2.7, 2.8, 2.9, 2.10, and 2.11).

Table 2.7 Global environmental governance: treaties/conventions/organisations

Conference reports	
Early 1970s	<i>UN Conference on the Human Environment, 1972, Stockholm</i> Discussed environmental degradation and transboundary pollution, began United Nations Environment Programme <i>Vancouver Declaration on Human Settlements, 1976</i> Recognises the serious condition of many human settlements and recommends strengthening international cooperation, particularly regarding the basic needs in developing countries
1980s	The Brundtland Report (Our Common Future), 1987 Defined sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'
1990s	<i>United Nations Conference on Environment and Development (UNCED): Earth Summit, June 1992, Rio de Janeiro</i> Established Agenda 21, established the term 'Sustainable Development' <i>Agenda 21, 1992</i> A global blueprint for sustainable development on national, regional and local levels that has become the basis for many plans <i>International Conference on Population and Development, 1994, Cairo</i> Discussed relationships between population, sustained economic growth and sustainable development; affirmed right to education <i>Earth Summit +5, New York, 1997</i> Reviewed and appraised the implementation of agenda
2000s	<i>The World Summit on Sustainable Development (Rio + 10), Johannesburg 2002</i> Refocused attention on Rio commitments and Agenda 21. Worked on access to safe water, proper sanitation and clean energy, as well as reversing ecosystem decline <i>International Treaty on Plant Genetic Resources for Food and Agriculture, 2004</i> Provides for conservation and sustainable use of plant genetic resources for food and agriculture and the sharing of derived benefit
Treaties, Conventions and Organisations	
1970s	<i>Antarctic Treaty, 1959</i> Ensures 'in the interests of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord' <i>Ramsar Convention on Wetlands, 1971, Iran</i> Provides an international framework for the conservation and use of wetlands and their resources; emphasises wildfowl habitat
	<i>Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972, Paris</i> Sets up an international committee to protect historical and natural sites, requires an inventory of endangered world heritage sites. Recognises that nature and culture are complementary <i>Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973, Washington</i> Enforces international trade in wild animals and plants; establishes global list of endangered species <i>Convention on Long-Range Transboundary Air Pollution, 1979, Geneva</i> Combats acidification on a broad regional basis, brings together research and policy. Has been extended by eight new protocols

(continued)

Table 2.7 (continued)

1980s	<p><i>UN Convention on the Law of the Sea, 1982, Montego Bay (not fully ratified)</i> Develops principles from the 1970 resolution that the seabed and ocean floor, beyond the limits of national jurisdiction, are the common heritage of mankind</p> <p><i>Convention on the Protection of the Ozone Layer, 1985, Vienna</i> Encourages research and cooperation; set a precedent for early response to environmental problems</p> <p><i>Montreal Protocol on Substances that Deplete the Ozone Layer, 1987</i> Protects the ozone layer by controlling total global emissions of substances that deplete it, particularly chlorofluorocarbons</p> <p><i>Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 1989, Basel</i> Encourages disposal of hazardous wastes within country of origin; provides for waste reduction and disposal</p>
1990s	<p><i>United Nations Framework Convention on Climate Change, 1992, New York</i> Recognises that global warming is a problem and sets an objective of stabilising greenhouse gas emissions, requires regular inventories of such emissions and places heaviest burden on industrialised countries</p> <p><i>Convention on Biological Diversity, 1992, Rio de Janeiro</i> Regulates the conservation and sustainable use of biological diversity, the equitable sharing of genetic resource benefits and appropriate transfer of relevant technologies</p> <p><i>Kyoto Protocol to the United Nations Framework on Climate Change, 1997, Kyoto (entered into force 2004 but never ratified by the USA)</i> Sets targets on greenhouse gas emissions. See CSA's Global Warming and the Kyoto Protocol</p>
2000s	<p><i>Cartagena Biosafety Protocol, 2000 (implemented 2003)</i> Ensures protection in the transfer and use of living modified organisms that may have adverse effects on conservation and biological diversity and on human health</p> <p><i>Doha Declaration, 2001</i> Links international trade, development and the environment within the context of the World Trade Organization</p>
Global organisations working on environment	
1970s	<p><i>Intergovernmental Oceanographic Commission (IOC), 1960</i> Provides for global cooperation in the study of the ocean. Coordinates national programmes and knowledge sharing</p> <p><i>United Nations Environment Programme (UNEP), 1973, Nairobi, Kenya</i> Provides leadership and encourages partnership in caring for the environment; coordinates information and programmes</p> <p><i>United Nations Human Settlements Programme, UN-Habitat, 1978</i> Ameliorates problems stemming from urban growth, especially in the developing world; promotes sustainable development</p> <p><i>GEMS/Water Programme, 1977</i> Provides data and information on inland water quality</p>
1980s	<p><i>World Commission on Environment and Development (WCED), 1983</i> Promotes sustainable development; developed Brundtland Report</p> <p><i>Intergovernmental Panel on Climate Change (IPCC), 1988</i> Assesses information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation</p>

(continued)

Table 2.7 (continued)

1990s	<p><i>Global Environment Facility (GEF)</i>, 1991 Helps developing countries fund environmental programmes</p> <p><i>Commission on Sustainable Development</i>, 1992 Ensures effective follow-up of UNCED; monitors and reports on implementation of the Earth Summit agreements</p> <p><i>Committee on Trade and Environment</i>, 1994 The part of the World Trade Organization that concerns itself with environmental issues, including ruling on trade disputes over the environment</p>
2000s	<p><i>Pew Oceans Commission</i>, 2000 Assessed policies on marine resources and an array of problems facing oceans</p>

Source: <http://www.csa.com/discoveryguides/ern/05aug/chart.php#unced>

Table 2.8 Global reform initiatives on global environmental governance

Global reform initiatives	Aims
UN Secretary General, Kofi Annan, launched a UN-wide reform initiative (1997)	To improve the coordination and effectiveness of environmental institutions by releasing 1997 programme for reform
The Nairobi Declaration on the Role and Mandate of UNEP	The declaration was adopted by the UNEP Governing Council and endorsed by the UN General Assembly to revive UNEP
The UN Task Force on Environment and Human Settlements (1997)	Created two new coordinating bodies: the Environmental Management Group (EMG) and the Global Ministerial Environment Forum (GMEF)
The Inter-agency Environment Management Group (1999)	To provide UNEP with an effective and strong coordinating role within the UN system on environmental matters
The Malmo Declaration (2000) was adopted by the GMEF	To strengthen UNEP and broaden its financial base and how to better incorporate non-state actors into the GEG system
The Cartagena Process (2000–2002)	To improve international policymaking coherence
The Johannesburg Plan of Implementation (2002)	For the full implementation of the Cartagena decision
The Eighth Special Session of the UNEP Governing Council/Global Ministerial Environment Forum Jeju, Republic of Korea	To discuss progress on the Cartagena decision
French President, Jacques Chirac, calls for creation of a United Nations Environmental Organization (UNEO) at the UN General Assembly (2003)	Informal working group was set up to facilitate dialogue among governments on UNEP reform
The Bali Strategic Plan for Technical Support and Capacity-Building was adopted by the GC/GMEF (2004)	The Bali Plan outlined proposals for improving the capacity of developing countries and economies in transition to implement MEAs
The UN Summit (2005)	To strengthen coordination within the framework of international environmental governance and for the integration of environmental activities at the operational level into a broader sustainable development framework

(continued)

Table 2.8 (continued)

Global reform initiatives	Aims
A High-Level Panel on UN-Wide Coherence in the Areas of Humanitarian Assistance, the Environment and Development (2006)	It was created after the World Summit in New York (2005)
International NGOs	The World Resources Institute (WRI) – USA The Institute of Sustainable Development and International Relations (IDDRI) – France The Ecologic Institute: Science and Policy for Sustainable World – Germany The Global Environmental Governance Project – Yale University

Source: Najam et al. (2006): 22–23

Table 2.9 Environmental and ecological hazards in cities

Scale	Type of hazard	Specific hazards
Within household and its plot	Biological pathogens	Water-borne, water-washed (or water-scarce), airborne, food-borne and vector-borne, including some water-related vectors (e.g. <i>Aedes</i> mosquitoes breeding in water containers where households lack reliable piped supply)
	Chemical pollutants	Indoor air pollution from fires, stoves or heaters. Accidental poisoning from household chemicals. Occupational exposure of home workers
	Physical hazards	Household accidents – burns and scalds, cuts and falls. Physical hazards from home-based economic activities. Inadequate protection from rain, extreme temperatures
Neighbourhood	Biological pathogens	Pathogens in waste water, solid waste (if not removed from the site) and local water bodies. Disease vectors, e.g. malaria-spreading <i>Anopheles</i> mosquitoes breeding in stagnant water or filariasis-spreading <i>Culex</i> mosquitoes breeding in blocked drains, latrines or septic tanks
	Chemical pollutants	Ambient air pollution from fires, stoves, etc.; also perhaps from burning garbage if there is no regular garbage collection service. Air and water pollution and wastes from ‘cottage’ industries and motor vehicles
	Physical hazards	Site-related hazards, e.g. housing on slopes with risks of landslides; sites regularly flooded, sites at risk from earthquakes
Workplace	Biological pathogens	Overcrowding/poor ventilation aids transmission of infectious diseases
	Chemical pollutants	Toxic chemicals, dust, etc.
	Physical hazards	Dangerous machinery, noise, etc.

(continued)

Table 2.9 (continued)

Scale	Type of hazard	Specific hazards
City (or municipality within a larger city)	Biological pathogens	Pathogens in the open water bodies (often from sewerage), also at municipal dumps, contaminated water in piped system
	Chemical pollutants	Ambient air pollution (mostly from industry and motor vehicles, motor vehicles' role generally growing), water pollution, hazardous wastes
	Physical hazards	Traffic hazards. Violence. 'Natural' disasters and their 'unnaturally large' impact because of an inadequate attention given to prevention and mitigation
	Citizens' access to land for housing	Insecure land tenure experienced by the urban poor and migrant settlers in cities
	Heat island effect and thermal inversions	Raised temperatures a health risk, especially for vulnerable groups (e.g. elderly, very young). Air pollutants may become trapped, increasing their concentration and the length of people's exposure to them
City region (or city periphery)	Resource degradation	Soil erosion from poor watershed management or land development or clearance, deforestation, water pollution, ecological damage from acid precipitation and ozone plumes, loss of biodiversity
	Land or water pollution from waste dumping	Pollution of land from dumping of conventional household, industrial and commercial solid wastes and toxic/hazardous wastes. Leaching of toxic chemicals from waste dumps into water. Contaminated industrial sites. Pollution of surface water and groundwater from sewage and surface run-offs
	Pre-emption or loss of resources	Freshwater for city pre-empting its use for agriculture; expansion of paved area over good-quality agricultural land
Links between city and global issues	Nonrenewable resource use	Fossil fuel use, use of other mineral resources, loss of biodiversity, loss of nonrenewable resources in urban waste streams
	Nonrenewable sink use	Persistent chemicals in urban waste streams, greenhouse gas emissions, stratospheric ozone-depleting chemicals
	Overuse of 'finite' renewable Resources	Scale of consumption that is incompatible with global limits for soil, forests, freshwater, etc.

Source: Satterthwaite (1999), *The Links Between Poverty and the Environment in Urban Areas of Africa, Asia and Latin America*, New York: United Nations Development Programme (UNDP) and the European Commission (EC).

Table 2.10 Environmental threats across different regions of the world

	Land	Forests	Biodiversity	Freshwater	Coastal and marine	Atmosphere	Urban areas	Disasters
Africa	Land use degradation, sealing and contamination Soil erosion	Loss of natural forests Forest degradation Sustainable forest management	Agricultural intensification Genetically modified organisms	Water quantity and quality Policy and legislative framework	Coastal erosion Pollution	Air pollution Stratospheric ozone depletion Greenhouse gas emissions	Air quality Noise Pollution Solid waste	Storms and floods Earthquakes Human-caused disasters
Asia and the Pacific	Land degradation Land tenure	Deforestation Forest degradation	Habitat loss and degradation Overexploitation of resources and illegal trade	Decreasing water available per capita Water quality	Habitat conversion and destruction Pollution Overexploitation of fisheries	Air pollution Ozone depletion Air quality	Solid waste Water supply and sanitation Air quality	Drought Hurricanes Floods Earthquakes Spills of hazardous substances
Europe	Land use degradation, sealing and contamination Soil erosion	Loss of natural forests Forest degradation Sustainable forest management	Agricultural intensification Genetically modified organisms	Water quantity and quality Policy and legislative framework	Coastal erosion Pollution	Air pollution Stratospheric ozone depletion Greenhouse gas emission	Air quality Noise Pollution Solid waste	Storms and floods Earthquakes Human-caused disasters
Latin America and Caribbean	Land degradation Land tenure	Deforestation Forest degradation	Habitat loss and degradation Overexploitation of resources and illegal trade	Decreasing water available per capita Water quality	Habitat conversion and destruction Pollution Overexploitation of fisheries	Air pollution Ozone depletion Air quality	Solid waste Water supply and sanitation Air quality	Drought Hurricanes Floods Earthquakes Spills of hazardous substances

(continued)

Table 2.10 (continued)

	Land	Forests	Biodiversity	Freshwater	Coastal and marine	Atmosphere	Urban areas	Disasters
North America	Land degradation Pesticides	Forest health Old growth forests	Habitat destruction and degradation Bioinvasion	Groundwater Great Lakes water quality	Conversion of fragile ecosystems Overexploitation of marine resources Pollution	Stratospheric ozone depletion Greenhouse gases and climate change	Urban sprawl Ecological footprint	Floods and climate change Forest fires
West Asia	Land degradation Rangeland deterioration	Degradation Overexploitation Sustainable forest management	Habitat Degradation and loss Overexploitation of species	Increasing water demand Overexploitation of groundwater Water quality	Coastal development and urbanisation Overexploitation of resources Marine pollution	Air pollution Ozone- depleting substances Climate change	Land conversion Solid waste	Drought Oil discharges Armed conflict
Polar region	Degradation Erosion Climate change	Boreal forest issues Threats to forest tundra	Climate change Ozone depletion Overexploitation	Alien species Pollution	Overexploitation of fisheries Pollution Climate change	Stratospheric ozone depletion Long-range air pollution Climate change	Sanitation and waste	Floods Oil discharges Pest invasion

Source: UNEP (2002:31)

Table 2.11 Status of urban environment in India (Kamyotra and Bharadwaj 2011)

Urban services	Access and quality	Environmental impact
Water	<p>Water availability on a per capita cubic metre basis is estimated to decline from 1730 to 1240 in India</p> <p>The average availability of water is less than 4 h a day, some areas receive water only for 1 h on alternate days</p> <p>The per capita water supply ranges from 9 lpcd to 584 lpcd across urban India</p> <p>Poor quality of operation and maintenance costs leads to wastage of water to the extent of 25–50%</p> <p>Low pressure and intermittent supply lead to the contamination in the distribution network</p> <p>Increase in domestic consumption of water over the next 20 years will double from 25 billion m³ to 52 billion m³</p> <p>As per the 54th NSS round (National Sample Survey), 59% of households share public water and 15% do not have access to drinking water</p> <p>As per the World Bank (WB) report, 27 Asian cities, with over 1 million population including Chennai, Delhi, Kolkata and Mumbai are ranked worst performing in terms of hours of water availability per day</p> <p>The capacity utilisation has been reported to be less than 50% in 40% of the towns and less than 75% in a further 20% of towns</p> <p>Due to old and rusted pipes or poor maintenance of the system, these losses sometimes go up to 50%</p> <p>A study by Sridhar and Kashyap (2012) points out that the availability of water is below the specified norms. While water supply coverage in the city of Kolkata is very low with just 27.3% of the city households being connected</p>	<p>Wastage of water</p> <p>Contamination of water in the distribution network</p> <p>90% of water supplied is polluted in class two cities of India</p> <p>Water-borne diseases are the major cause for mortality rate in India</p> <p>Sanitation-related diseases are responsible for 60% of the environmental diseases</p> <p>Decline in access and quality of water seriously affects food and biomass in the country</p> <p>In India almost 70% of its surface water resources and a growing percentage of its groundwater reserves are contaminated by biological, toxic, organic and un-organic pollutants</p> <p>In 1995, the Central Pollution Control Board identified severely polluted stretches across 18 major rivers in India</p> <p>Long-term intake of fluoride can cause tooth decay and crippled bones. Arsenic can cause skin cancer and skin pigmentation</p> <p>The overexploitation of aquifers, depletion of water resources and pollution by urban human wastes are causing serious health problems</p>

(continued)

Table 2.11 (continued)

Urban services	Access and quality	Environmental impact
Sewerage	<p>Combined, the 22 largest cities in the country produce over 7267 million litres of domestic waste water per day</p> <p>72 of 4400 towns in India have partial sewerage facilities, and 17 have some form of primary treatment facilities before disposal</p> <p>While waste generation in Class I cities more than doubled from 1978 to 1995</p> <p>The treatment capacity decreased from 39% to 24% during 1995</p> <p>Of the total waste water generated in the metropolitan cities in India, barely 30% or 30% is treated before disposal</p> <p>Out of 345 towns, 95% do not have waste water treatment plants</p> <p>Cities and townships of Karnataka state generate approximately 2260 million litres of sewage per day. Only 80% is collected and treated less</p> <p>Only 36 out of 218 urban local bodies in Karnataka have underground drainage system (UGD)</p> <p>65% of urban households do not have closed drainage facility</p> <p>Collection systems exist for only about 30% of the waste water through sewer lines and treatment capacity exists for about 7000 million litres/day</p> <p>In Class I cities of India, more than 71% of waste water is not treated, while in Class II cities, more than 97% of waste water is not treated (up to 2009)</p> <p>Out of 300 Class I cities, about 70 have partial sewerage systems and sewage treatment facilities</p> <p>Only 54% of New Delhi has sewerage coverage</p>	<p>In 118 cities, it is discharged indirectly into rivers, lakes, ponds or creeks, while in 63 cities it is used for agriculture</p> <p>Pollution of urban water bodies (like tanks, lakes and groundwater)</p> <p>It is estimated that 75 to 80% of water pollution by volume is caused by domestic sewage</p> <p>Large urban population is at risk of being exposed to water-borne diseases of infectious (bacterial, viral or animal infections) or chemical nature (due to fluoride or arsenic).</p> <p>Water-borne diseases are still a great health concern in India</p> <p>Hazardous wastes are a source of groundwater pollution</p> <p>It has been assessed that 80% of pollution is caused by sewage alone</p>

(continued)

Table 2.11 (continued)

Urban services	Access and quality	Environmental impact
Solid waste ^a	<p>About 48 million tonnes of solid waste are generated in the urban areas every day, an eight-fold increase since independence</p> <p>Only 72% of waste is collected daily</p> <p>Non-degradable waste is increasing in an alarming proportion, and the production and consumption of plastic have increased more than 70 times between 1960 and 1995</p> <p>Seventy per cent of Indian cities have inadequate waste transportation facilities</p> <p>Lack of common disposal sites</p> <p>Absence of secure landfills</p> <p>E-waste worth US\$1.5 billion was generated in India in the year 2003</p> <p>Cities' generated overall quantity of solid waste amounts to about 5%</p> <p>Indian industries are generating nearly 7.66 million metric tonnes (MT) of hazardous waste. Only 73 hazardous dumping sites are available for Indian cities</p> <p>For the year 2005, 1.46 lakh tonnes of e-waste were generated and were expected to reach 8.0 lakh tonnes by 2012. About 65 cities in India generate more than 60% of total e-waste in India</p> <p>Out of 115 sewage treatment plants in major Indian States, 35% continued to discharge polluted water beyond the stipulated norms</p> <p>49% (11% (Urban) and 65% (Rural) do not have access to toilets in India</p>	<p>Accumulation and decomposition of waste on streets and public places with adverse effect on public health</p> <p>Public littering</p> <p>Exacerbating unhygienic environmental conditions are leading to both physical and health problems of the urban poor. Often they suffer from respiratory disorders, diarrhoea, fungal and other skin infections, transient loss of memory and depression</p> <p>Rampant illegal dumping of industrial hazardous waste leads to biological contamination of rivers, lakes and canal pits and groundwater source with high pollution loads</p> <p>Uncontrolled release of chromium-contaminated waste and sludge contaminates aquifers</p> <p>E- and plastic waste containing lead, cadmium and mercury are negatively affecting India's ecological systems besides posing challenges to sustainable development</p>
Health care	<p>0.1–1.5 kg per bed per day of health-care waste (HCW) is generated. Total HCW generated increased from 890 tonnes to 920 tonnes per day between 1997 and 2002</p> <p>25% of health waste generated is hazardous^b</p> <p>About 42% of health-care workers do not have knowledge on classification and segregation of biomedical waste</p> <p>Open dumping and burning of waste is a common practice</p>	<p>25% of HCW is infectious</p>

(continued)

Table 2.11 (continued)

Urban services	Access and quality	Environmental impact
Air pollution	<p>Data from 36 cities indicate that ambient air pollution far exceeds the WHO guidelines</p> <p>The percentage of cities with 'dangerous' air has increased from 15% to 21%</p> <p>More than 35% of urban households are exposed to high levels of indoor air pollution</p> <p>During 2007, the highest concentration of NO among all two residential areas was observed at Town Hall, Delhi</p> <p>Death due to air pollution in Indian cities increased by 30% between 1992 and 1995</p> <p>Conformity to the RSPM standards well above the National Ambient Air Quality (ABAQ) in New Delhi is the worst and closely followed by Mumbai</p>	<p>Respiratory and lung problems</p> <p>Standards regarding the main air pollutants of public health concern were violated at most of the monitoring stations</p> <p>The health of over 900 million urban population around the world is deteriorating on daily basis due to high levels of air pollution</p> <p>SO, NO and suspended 2 x particulate matter (SPM) damage the human respiratory and cardiorespiratory systems in various ways contributing to respiratory-related morbidity</p> <p>In Mumbai alone, the prevalence of respiratory diseases amounts to 22.2%</p> <p>Urban air pollution is estimated to cause over 250,000 deaths and billions of cases of respiratory illnesses every year</p>
Urban transportation	<p>The total number of motor vehicles increased from 0.3 million in 1951 to 67 million in 2003</p> <p>There is a drastic increase in the number of two-wheelers from 8% in 1951 to 70.9% in 2003</p> <p>India's total SO₂ and NO_x emission increased from 7.12 million metric tonnes to 9.82 million metric tonnes between 1992 and 2005 with a CAGR of 3.63%</p> <p>Total vehicle population of India is more than 85 million (about 1% share of the world)</p> <p>An average 10% increase has been found in each year, which is a serious concern for air pollution</p> <p>Urban transport constitutes 60 to 80% of motor vehicles</p>	<p>Traffic congestion, increase in accident rates, wastage of fuel and environmental pollution (emission of carbon monoxide, hydrocarbons, nitrogen oxides and other toxic substances)</p> <p>Rate of accidents has gone up from 16,000 in 1981 to 80,000, respectively, post-2001</p> <p>Respirable suspended particulate matter (RSPM) levels are fairly high, and SPM exceeds national standards in many cities</p> <p>Vehicular emissions containing pollutants such as sulphur dioxide, nitrogen oxides, carbon monoxide, lead, ozone, benzene and hydrocarbons pollute urban areas</p> <p>Encroachment of footpaths/roads</p>

(continued)

Table 2.11 (continued)

Urban services	Access and quality	Environmental impact
Land	Per capita availability of land declined from 0.89 ha in 1951 to 0.3 ha in 2001 Land degradation is between 16 and 57% of total geographical area	High storm intensity, soil erosion, climate change
Energy	35.5% of the population still lives without access to electricity in India Transmission and distribution loss of electricity in New Delhi is as high as 19.64%	Use of wood fuel and kerosene Increase in gas emissions

Source: Planning Commission (2002), Pandey et al. (2006), Planning Commission (2002), Environmental Management and Policy Research Institute (2012), MoEF (2009, 2011), CSO (2011: 111), Sridhar and Kashyap (2012)

India produces about 42 million tonnes of urban solid waste annually. The per capita waste generation varies between 0.2 kg. and 0.6 kg. per day, and the current municipal solid waste generation is estimated to be approximately 0.4 kg per capita per day (Planning Commission 2002: 652). Every year eight million tonnes of plastic waste are generated in India (Annual Report 2011: 138)

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