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Challenges of Urban Environment in India

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ABSTRACT

Growing urbanization is posing serious environmental concerns in India in terms of changing land use pattern, increasing carbon emissions, solid waste generation and disposal, air and water pollution and poor sanitation amenities. A large segment of urban population in India resides in slums, squatters and informal settlement. These settlements are often located in low laying areas prone to direct and indirect risks due to environmental degradation including changes in the climate and lack of basic urban services. An urban environment is complex primarily because of rapidly changing variables such as socio- economic and demographic indicators, land-use patterns, resource demand and utilization patterns, lifestyle changes etc. In the light of climate change, a new layer of uncertainty is added in terms of changes in precipitation, temperature and occurrence of extreme events. Furthermore, there are scale mismatches; in terms of the timescales over which policymakers and urban planners operate, and scales over which projected impacts of environmental decisions, degradation, climate variability and change will manifest. Against this backdrop, present paper purports to review the urban environment in the context of green and clean city development.

Introduction

India has witnessed remarkable progress in human and economic development since Independence, however, the path of economic development and growth has been challenging. The concept of sustainable development is buzz word now-a-days which has emerged due to increasing problems of environment and ecology. The inter-related issues emerged from economic growth; environment and ecology are affecting the human population. The human activities are adversely affecting the environment and ecology while the global issues like ozone layer depletion, greenhouse gases affect, global warming, climatic change, etc. cause concern. There is degradation of natural resources due to over exploitation, unsustainable economic and commercial activities as well as poor governance of environmental regulations, policies and enforcement of environmental

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legislations. Environmental pollution is one of the major challenges of the present day. A greater attention is being paid to global environmental change, biodiversity conservation, environmental toxics, ecological restoration, and sustainable development with particularly emphasis on human well-being. Most of the global environmental problems fall within the gambit of ecological studies and require a thorough understanding of ecological principles for resolution. The understanding of ecological principles is important for sustainable use of resources and to evolve strategies for mitigation of environmental problems at local, regional and global regions. The ecologists are required to interpret the human induced environmental changes and postulate varied scenarios for alternative policy options for legislative and implementable administrative decisions. Thus, ecology has grown by internalizing different disciplines of natural and social sciences.-

Increasing urbanization, expansion of habitat into unsuitable vulnerable areas, higher population density, higher housing density, vulnerable housing and buildings construction, non engineered unsafe construction, and aging buildings and other infrastructure are some of the factors that have increased the vulnerability of hazards and disasters in urban areas. Growing urbanization is posing serious environmental concerns in India in terms of changing land use pattern, increasing carbon emissions, solid waste generation and its disposal, air and water pollution and poor sanitation amenities. Major challenge for cities in the face of rapid population growth is to maintain sustainability within the social, economic and environmental dimensions. The accelerated and uncontrolled urban growth has contributed to the ecological transformation of the cities and their immediate surroundings resulting in flash floods and water scarcity. Furthermore other factors depending on the local circumstances contribute to the urban vulnerability, hazards and risks.

Cities may be viewed as hubs of the intensive resource demand, environmental degradation and greenhouse gas emissions. However, cities may play a critical role in promoting low carbon development through use of renewable energy, energy efficiency, green buildings and mitigating emissions from urban transport. The immediate problems of states' cities relate to inadequate institutional arrangements for solid waste management, drainage, sewage treatment and disposal and sanitation services. Thus, it is imperative to improve the municipal services, particularly sanitation services and urban local governments adopt the integrated urban planning for climate resilience and addressing the environmental problems.Cities are the engines of growth. Besides, they have widespread implications on environment and human society. There is large scale incidence of urban poverty and slums in cities. This has resulted in mismatch between infrastructure, resources and

population, leading to degraded and unsustainable urban environment. The footprints of urbanization, concretization and land use conversion are visible in the form of urban heat island formation that poses threat to human health and wellbeing. The vegetation cover is imperative for balanced atmospheric temperature and sustenance of Life. Water bodies are crucial for sustainable urban eco-hydrology. The land surface temperature is a critical indicator of urban environment. It is a phenomenon, whereby city experiences elevated temperature in comparison to the surrounding hinterland due to trapping of insulation by atmospheric gases, high rise buildings and concrete surfaces of asphalt, metal, tiles and bricks. It causes heat waves in summers and leads to heat stress and mortality. It changes the micro climate, hence, changes in transmission and life cycle of many diseases (McGeehin & Mirabelli, 2001). The satellite data is widely used for understanding urban micro-climatology and urban heat islands (Singh & Grover, 2014). The land surface temperature, in October, range between 23 to 46°C with lowest value for water bodies and highest for fallow land (Mallick, Kant & Bharath, 2008) and urban heat islands was intense in dense commercial areas (Mohan, Kikegawa, Gurjar, Bhati & Kolli, 2013). There are seasonal and diurnal variations in land surface temperature and urban heat islands (Singh, Grover & Zhan, 2014). It is less intense on summer owing to aerosol distribution and presence of water bodies. The higher temperatures are associated with fallow agricultural land, industrial and concrete surfaces. There is formation of urban heat belts corresponding to high density areas across the city. Increased land surface temperature coupled with atmospheric pollutants is menace to human health. The modifications in atmospheric composition, surface geometry and characteristics, urban heat islands creation, increased pollution, land use alterations have global impacts as the scale of urbanization is widespread in the developing countries. The changing city environment has implications on ecology, human morbidity and mortality. There is wide array of problems faced by urban centers. Therefore, there is need for creating efficient sustainable plans to overcome the challenges. There is encouragement on public private partnership like for river cleaning and Swachh Bharat Abhiyan. Further, green buildings and eco-roofs along with wall gardens need to be promoted. The improvements in living conditions like improved transportation, sanitation, clean drinking water, improved sewage and solid waste management and well-managed infrastructure lead to preventive measures.

Climate Change

Urban centres have been impacted by weather changes. Chandigarh, a city of open parks, was submerged in water in August, 2017 as it got 115 mm of rain in just 12 hours in August, 21, constituting roughly 15 per cent of its

annual monsoon rain in just a few hours. Bengaluru hardly had any rain and then it poured. It got 150 mm of rain in just about a day, constituting about 30 per cent of its annual monsoon rain. Similarly, Mount Abu got over half its annual monsoon rain in 2 days. Hyderabad to Chennai, the storey has been same in 2017 (Narain, 2018). We have failed in our water management. We are constructing buildings in flood plains, destroying our water bodies and filling up our water channels by municipal waste. This combined with adverse climate change is likely to increase catastrophic events. India is considered as the fourth most vulnerable country as it witnessed unusually high occurrence of extreme rain events with major flooding reported across the country (Venkatesh, 2018). Currently, about 150 million people live in cities with perennial water shortage and it is likely to increase the figure in near future. Indian cities have more problems due to large unplanned urban sprawls and densely packed population. The repeated events of flood of Mumbai and Bengaluru, 2010 flash floods in Leh, the 2013 Uttarakhand flooding and in 2015 Chennai floods were exacerbated by poor planning of urban settlements. Similarly, heat waves have affected urban areas such as Bhubaneswar, Hyderabad, Ahmadabad, Surat and Jaipur repeatedly over the last several years. It is to be noted that urban infrastructure projects under Smart City Mission, AMRUT, Swachch Bharat Mission, HRIDAY, etc. lack climate change resilience. A study conducted by TARU, Delhi has demonstrated that there is no explicit focus on climate change in any of the approved smart city plans in India. These cities included in the study are Mumbai, Kolkata, Chennai, Surat, Indore, Kochi, Guwahati, Bhubaneswar, Aizwal and Panaji. Development strategies including building climate resilience and enhancing knowledge of urban risk and their impacts have been sideline. It is estimated that Chennai and its massive infrastructure would be in high risk zone. In summer of 2017, Chennai witnessed its worst drinking water crisis as all the surrounding lakes and reservoirs dried up (Roul, 2018). It is to be noted that plastic waste chocking drainage system of disappearance of wet lands are squarely blamed for Chennai floods in 2015. After 2015, Chennai floods, road rehabilitation work was unable to make the city climate proof and urban city planning had no integration with climate change and resilience.

Water Resources

India is experiencing rapid urbanization and consequently water demand in urban areas is escalating. Due to shortage of surface water sources in many urban centers, ground water is now increasingly tapped for water supplies. As a result, there is lot of pressure on underlying aquifers for fulfilling the domestic water demand. Inadequate access to improved water has been a persistent challenge for many Indian cities. Urban water resources are

overstressed due to increase in urban population, pollution and unplanned as well as un -sustainable urban growth. Moreover, over exploitation of ground water resources in urban centers for quenching the thirst of increasing urban population, changing lifestyle, and water uses for various purposes is cause of concern. Due to unregulated housing and building construction, lack of proper drainage and sewer network and also ineffective functioning of sewerage system, urban centers are at high risks .The blockage and choking in drainage sever system leads to water logging and flash flood in urban centers. Increasing urbanization, expansion of habitat into unsuitable vulnerable areas, higher population density, higher housing density, vulnerable housing and buildings construction, non engineered unsafe construction, and aging buildings and other infrastructure are some of the factors that have increased the vulnerability of hazards and disasters in urban areas. The accelerated and uncontrolled urban growth has contributed to the ecological transformation of the cities and their immediate surroundings resulting in flash floods and water scarcity.

As of April 2015, the water resource potential or annual water availability of the country in terms of natural runoff (flow) in rivers is about 1,869 Billion Cubic Meter (BCM)/year (Central Water Commission, 2015). However, the usable water resources of the country have been estimated as 1,123 BCM/year. This is due to constraints of topography and uneven distribution of the resource in various river basins, which makes it difficult to extract the entire available 1,869 BCM/year. Out of the 1,123 BCM/year, the share of surface water and ground water is 690 BCM/year and 433 BCM/year respectively. Setting aside 35 BCM for natural discharge, the net annual ground water availability for the entire country is 398 BCM (Central Water Board, 2015). The overall contribution of rainfall to the country's annual ground water resource is 68 percent and the share of other resources, such as canal seepage, return flow from irrigation, recharge from tanks, ponds and water conservation structures taken together is 32 percent. Due to the increasing population in the country, the national per capita annual availability of water has reduced from 1,816 cubic metre in 2001 to 1,544 cubic metre in 2011. The level of ground water development is very high in the states of Delhi, Haryana, Punjab and Rajasthan, where ground water development is more than 100 percent. This implies that in these states, the annual ground water consumption is more than annual ground water recharge. In the states of Himachal Pradesh, Tamil Nadu and Uttar Pradesh and the Union Territory of Puducherry, the level of ground water development is 70 percent and above. In rest of the states, the level of ground water development is below 70 percent. Over the years, usage of ground water has increased in areas where the resource was readily available. This has resulted in an increase in overall ground water development from 58 percent in 2004 to 62 percent in 2011,

Groundwater is one of the most precious natural resource and has played a significant role in maintenance of India's economy, environment and standard of living. Besides being the primary source of water supply for domestic and many industrial usages, it is the single largest and most productive source of irrigation water. India is a very vast country having diversified geological climatologically and topographic setup, giving rise to divergent groundwater situation in different parts of the country. The CGWB has categorized 62.2 percent of the total assessment units of 6,600 blocks, mandals and taluks as over exploited. The report also said that 276 districts have high levels of fluoride, 387 report nitrates above safe levels and 86 districts have high levels of arsenic. According to Government excessive withdrawal of ground water were responsible for decline in ground water levels and in many areas groundwater recharge was reduced due to varied and erratic rainfall pattern as well as change in land use. In Out of 75 districts of Uttar Pradesh, exploited or groundwater on the basis of 2011 assessment report. According to report, Shamli and Pratapgarh districts top the list, with groundwater exploitation rate exceeding 140 percent followed by Saharanpur, Firozabad and Agra. State capital Lucknow along with Aligarh, Allahabad, G B Nagar, Ghaziabad, Kanpur city, Kasganj, Kaushambi, Mathura, Meerut, and Varanasi are over exploited district among others. According to Jal Nigam, Agra is losing 700,000 liters of groundwater reserves daily because of indiscriminate extraction. In Agra, the situation is grim as the groundwater level continues to deplete at an alarming rate due to unregulated and excessive extraction and relentless concretization of green zones. According to officials, out of the 15 blocks in the districts under Agra division, 10 are in over exploited category while one block has been listed as critical. A recent survey has also found that industrial units are consuming excessive quantity of groundwater. On a daily basis, they are taking 18 times more water than the total water requirement of the entire human population of the district. It is to be noted that more than half of the world's major aquifers which store ground water are depleting faster than they can be replenished (Down to Earth,March,16-31,2017). Only three percent of the world's water is freshwater, about 30 percent of which comes from aquifers. Ganga-Brahmaputra basin in India has the faster rate of depletion in the world. Mountain glaciers provide the resource base upon which social and economic development in mountain regions is dependent. Seasonal melting of frozen water stores , such as glaciers and snow packs , smoothes the effect of highly variable summer rainfall, and glaciers play a crucial role in supporting ecological , social and economic systems in mountains and down streams. With the increasing level of global warming and climatic change, glaciers are melting which will lead to short term increase glacial runoff and in long term eventually lead to decreased summer runoff. This will reduce water security (Down to Earth, May1-15, 2017).

Environmental problems including water quality degradation from agro-chemicals, industrial and domestic pollution, ground water depletion, water logging, soil Stalinization, siltation, degradation of wastelands, eco system impacts and various health related problems have caused concern to policy makers and administrators. Thus, management of water resources is imperative rather than development of the resources. Water borne diseases of a wide spectrum and are caused by direct transmission though water containing a variety of pathogens such as viruses, parasites or bacteria. These diseases are most commonly manifested as acute diarrhea, dysentery, dengue, malaria, hepatitis, typhoid and cholera. Water gets contaminated either at source or while passing through poorly laid and maintained water pipes or in the homes when it is not stored properly. A major contributing factor for the incidence of water borne diseases is lack of hygiene such as the absence of the habit of washing hands with soap after going to the toilet. Water quality can be affected by naturally occurring factors and by externally introduced pollutants. Natural water contains inorganic and organic matter, which may get dissolved in the water or remain as suspended particles. Inorganic matter is derived from the rocks and soils through which water percolate or over which it flows. Organic matter is derived from the breakdown of plant material or from algae and other micro organism that grow in the water or on sediments in the water. Natural pollutants are mainly arsenic, fluoride, iron, etc. while external pollutants include dumping of sewage, domestic waste, industrial effluents, nitrogen, pesticides and other chemicals into the water bodies. Thus, changes in water policy and evolving strategies for water management are imperative. Similarly, legal framework for coping with climate change is also to be amended. There is more need on institutional building to enhance capacity of the state governments and stake- holding agencies to cope up with climate change and also to regulate the water use for various purposes. More decentralized mechanism for water development and management will be required.

River Ecology

Central Pollution Control Board Report of 2015 has highlighted the fact that 61948 million liters of urban sewage is generated on daily basis in India. But the cities have an installed sewage treatment capacity of only 38 per cent of it. This shows that a large amount of untreated sewage is being thrown into rivers and water bodies as treatment capacity of major sewage treatment plants in the country is around 66 per cent of the installed capacity. Thus, about 38,000 million liters of waste water goes into major rivers, water bodies and even waste water percolates into the ground water (Sengupta, 2018). There has been significant increase in the polluted stretches on major rivers in India. The top five states of Maharashtra, Assam, Madhya Pradesh, Gujarat and West Bengal have maximum number of polluted stretches on major rivers.

It is said that have large number of sewerage projects and STPs will not clean the rivers as sewerage systems are not connected to rivers. A large amount has been spent to clean rivers however; we failed to mitigate the river pollution. The sewerage networks are poorly designed without specific plans for controlling pollution. Most of the sewerage projects are centralized systems conveyed through pipelines and pumping stations to STPs where it is supposed to be treated and disposed off. Though, rivers in the Indian society form an integral part of life, deeply interwoven with beliefs and customs. The unchecked urbanization has resulted in rivers no longer being a source of water but a dump yard receiving and transporting urban waste (Sharma, *et.al.,* 2018). The urbanization near the rivers is likely to deteriorate the river water quality. It is to be noted that natural flow of rivers in India has been challenged by various hydro power, diversion and river linking projects as well as river front development projects. The river front development schemes have failed to ensure river restoration and natural flow of water. The river front development projects ignore treating the sewage that flows into the river through natural drains and faced to provide a holistic system that ensures river functions and their integrity (Dutta, 2018).

Water Pollution

Water is one of the most abundant compounds found in nature, covering approximately three fourths of the surface of the earth. However, potable water availability is limited. Water is distributed in nature in different forms such as rainwater, river water, spring water and natural water. Rain water is in the purest form of naturally occurring water. However, the human activities contribute impurities in the form of industrial and domestic wastes, agricultural chemicals and other contaminations. Water pollution may be defined as the presence of impurities in water in such quantity and of such nature as to impair the use of the water for a purpose. Water pollution may be classified mainly into four categories viz., physical pollution, chemical pollution, biological pollution and physiological pollution. The physical pollution of water brings about changes in water with regard to its colour, order, density, taste, turbidity and thermal properties etc. The chemical pollution of water is due to the presence of inorganic and organic chemicals such as acids, alkalis, toxic inorganic compounds, dissolved inorganic compound and dissolved organic compounds. The biological pollution of water refers to the bacteriological pollution of water due to presence of pathogenic bacteria, certain fungi, pathogenic protozoa, viruses, parasitic worms, etc. The important sources of bacteriological pollution are domestic sewage and industrial waste. Physiological pollution of water is caused by several chemical agents such as chlorine, sulphur dioxide, hydrogen sulphide, merceptions, and phenols quohydroxy benzene.

Water pollution is a phenomenon that is characterized by the deterioration of the quality of land water (rivers, lakes, marches and ground water) or sea water as a result of various human activities. Water pollution is any physical or chemical change in the water that can adversely affect organisms. The major sources of water pollution include (i) sewage and domestic wastes; (ii) industrial effluents; (iii) agricultural discharges; (iv) fertilizers; (v) agro chemicals – pesticides, insecticides, fungicides, etc.; (vi) detergents; (vii) toxic metals; (viii) siltation; (ix) thermal pollutants; (x) radio-active materials. Water pollution can be defined as any unfavorable change in physical, chemical and biological properties of water that makes it harmful to humans and other life forms. Human actions reduce the use of water as a resource. However, the decrease in usefulness is in a relative term. A water source may be fit for navigation and fishing, but not for irrigation, or drinking which requires pure water. Examples of polluted water include, red, lifeless, acid mine drainage water, raw sewage-laden waters that enter the Ganges in Varanasi, or any other city, turbid domestic waters full of detergents containing phosphate, the rust-coloured, opaque water of a lake, full of toxic metals, Microcystis and Escherchia coli or a highly nutrient-rich village pond water, coated with Lemna or Azolla, the heated water from the cooling towers of an electric-generating plant, and of the lake superior contaminated with asbestos fibres. Thus, water pollution is common in all the regions of the world; the magnitude and the type of pollutants may vary.

Sewage invariably goes into streams, ponds, lakes and rivers of the city, polluting the water bodies in urban areas. It is no surprise that surveys of groundwater are finding higher and higher levels of microbiological contamination due to sewage contamination. Currently, we assume that 80 per cent of the water officially supplied by municipalities is returned as sewage. No Indian city is in a position to boast of a complete sewerage system, which can keep up with the sanitation and pollution challenge. Large parts of the modern cities remain unconnected to the sewage system as they live in unauthorized or illegal areas or slums, where the municipal sanitation services do not reach. Moreover, there are also zones within the growth pockets of a large city where even authorized housing remain unconnected to both water supply and sewage systems.

Wastes Disposal & Environment

Waste generation is associated with human civilization. In India, average per capita waste generation ranges in between 400 to 700 gms. per day. However, the quantity of waste generation depends upon the life style and economic activities. Waste disposal in urban areas is the main responsibility of urban local governments. The wastes may include municipal solid waste,

hazardous waste, sewage, sludge, clinical waste, agricultural and industrial waste as well as commercial waste. There has been a significant increase in the generation of municipal solid waste in India over the last decades. India generates more than 48 million tons of solid waste per year. The waste generation has been reported significantly high in the metropolitan and larger cities and low in the small cities. Out of total waste generation in urban areas, about 25 per cent waste is reported to be hazardous. The hazardous waste is mainly generated by high polluting industries, hospitals, medical centres and nursing homes. The quality of waste generation in South Asia has been reported to be poor and thus, it cannot be converted into fuel due to its low calorific value. Most of the waste generated so far may be categorized into biodegradable and non-biodegradable. Most of the studies have highlighted the poor infrastructure and facilities for collection, segregation, transportation, handling and disposal of the waste. There are several technologies for the disposal of the waste, however, landfill is the most important technique for disposal of the waste. However, land filling in India lacks the scientific processing for disposal of the waste. Other technologies include pulverization, baling, compositing, incineration, briquetting, pyrolysis, gasification, and biogas (Singh and Khanna, 2005). When plague spread in Surat City, scientists explored that due to failure of proper handling and management of the solid waste, the problem emerged after a long time. Thus, Government is equally conscious for the proper handling and management of the solid waste. Ministry of Environment & Forest, Government of India has already formulated Municipal Solid Waste, (Management & Handling) Rules, 2000. These rules are applicable to every municipal authority that is responsible for collection, segregation, storage, transportation, processing and disposal of municipal solid waste. The rules have made provisions that waste will not be incinerated and municipal authorities will make the necessary arrangements for proper handling and management of solid waste including collection, segregation, storage, transportation, processing and disposal. Except in case of bio-medical waste which is supposed to be incinerated, the rest waste is supposed to be safely disposed off by the municipal authorities. The standard norms and practices for the safe disposal of the waste are also being given in the rules.

Urban Sanitation

Providing environmentally safe sanitation to the people of world's second most populous nation is a challenging task. The challenges that urban sanitation sector faces mainly relate to the low priority accorded to it by the municipal governments. This task becomes more intricate in context to the country like India where introduction of new paradigms of plans, policies or projects can challenge people's tradition and belief. Widespread open

defecation has major consequences for health and human capital in India. Inadequate sanitation has a great environmental economic and health impacts in India. In order to minimize these impacts, Government of India has under taken several measures including increased investment in urban sanitation, policy initiatives, regulations, and public campaigns to improve sanitary conditions in the country. This has resulted in raising the sanitation status during the last two decades but a marked improvement is yet to be achieved. Individual health and hygiene is largely dependent on adequate availability of drinking water and proper sanitation. There is, therefore, a direct relationship between water, sanitation and health.

With the passing of 74th Constitutional Amendment Act, Metropolitan Planning Committee and District Planning Committee have been formed to take up developmental activities in the concerned region in place of the parastatals (Singh, 2014). The ULB's have also been empowered to take up development functions. States have responded in diverse manner with regard to the status of parastatal agencies in the post decentralized period. Many state governments like Kerala and Karnataka have recommended the abolition of the parastatals while some have recommended for a change in their functional role like in Tamil Nadu, Uttar Pradesh, Maharashtra, West Bengal and Andhra Pradesh. The parastatal agencies have also been merged with Urban Development Department. The 74th Constitutional Amendment Act has also transferred administrative and financial process and created an enabling environment for the local bodies to undertake planning and development responsibility. Sanitation brings heavy return on investment of any development intervention, however, in India; it has been remained neglected for most of the post independence history. Millions of Indians are subjected to grave ill health, increasing threats to safety, lower spending on education and nutrition, reduced productivity and lower income earning potential resulting into a deepening cycle of poverty due to lack of sanitation facilities (Dasra, 2012). Growing slum population and lack of adequate sanitation force over 50 million persons to defecate in the open every day. The poor bear the worst consequences of inadequate sanitation in the form of ailing children, uneducated girls and unproductive people, making these populations even more vulnerable and costing India 6.4 percent of its GDP (Dasra, 2012). Inadequate sanitation is much more than just an inconvenience. As urban population increases, demand for water and sewage treatment will increase. Census data demonstrate that slum population has tripled in the last three decades, intensifying the strain on insufficient urban resources. Moreover, 7 million people continue to migrate to urban areas every year with most of them finding their way to slums within and on the fringes of cities. Slums are typically overcrowded, lack basic services and facilities, and hence are unhygienic and unsafe.

Until recently, urban local bodies were not mandated to provide non notified slums with any services. Thus, slum localities bear the worst consequences of inadequate sanitation facilities. Sanitation is urban slums is a complex and pressing issue. Existing unhygienic standards, crowed conditions and poor sanitation contribute to frequent and rapid outbreaks of diseases, lack of access to healthcare facilities compounds health problems. About 18 per cent urban households reported that there is no drainage system in India. This was reported significantly high in the state of Tripura (46.55 per cent) followed by Kerala (45.45 per cent), Assam (43.65 per cent), Odisha (40.95 per cent), Arunachal Pradesh (33.79 per cent) and West Bengal (33.17 per cent). About 2/5th urban households further reported that waste water outlet is connected to closed drainage. This was recorded high in the state of Gujarat (69.44 per cent), Himachal Pradesh (65 per cent), Maharashtra (62.70 per cent), Delhi (60.31 per cent) and Punjab (57.63 per cent). The proportion of households reporting open drainage was recorded high in the state of Nagaland (67.88 per cent), Manipur (64.36 per cent), Meghalaya (62.45 per cent), Mizoram (59.05 per cent) and Chhattisgarh (51.42 per cent). Open defecation is still prevalent in urban areas as about 13 per cent urban households reported that they are defecating in open. This was recorded significantly high in Chhattisgarh (34.44 per cent) followed by Odisha (33.17 per cent), Jharkhand (30.99 per cent) and Bihar (28.88 per cent). Overall, 81.36 per cent urban households reported that they own latrine facility within their housing premises. This was found significantly high in the state of Mizoram (98.52 per cent), Tripura (97.88 per cent), Kerala (97.43 per cent), Meghalaya (95.74 per cent), Manipur (95.77 per cent), Nagaland (94.60 per cent) and Assam (93.71 per cent). Thus, about 19 per cent urban households do not own latrine facility within their housing premises. This was recorded significantly high in the state of Chhattisgarh (39.80 per cent), Odisha (35.22 per cent), Jharkhand (32.83 per cent) and Bihar (31.04 per cent). Overall, about 6 per cent urban households are using public latrine facility. This was recorded significantly high in the state of Maharashtra (21.04 per cent), Tamil Nadu (8.65 per cent), Delhi (7.12 per cent) and Chhattisgarh (5.36 per cent).The accessibility of toilets is found significantly high in the urban areas as compared to slums. Similarly, the proportion of households admitting that they are defecating in open has been recorded high in the slums as compared to urban areas in most of the states. However, the proportion of slum households defecating in open has been reported low where government and other non-government agencies have ensured the construction and functioning of public toilets. The proportion of households reporting non-existence of drainage was found significantly high in the slum areas as compared to urban areas in most of the states.

The water supply projects in major states are based on pipe water supply which is based on ground water as well as surface water however, surface water has gradually contaminated and even sources have been dried due to extreme weather conditions. Community participation, revival of traditional systems and sustainability has not been ensured by the Public Health Engineering Departments. Water quality has deteriorated gradually and there are no serious efforts to address the issues. Similarly, water harvesting structures under various schemes have less attention. Toilet construction will not serve the purpose of making India open defecation free as water supply and sanitation has direct linkages and in absence of sustainable water supply, sanitation projects are likely to be defunct. As less than 1/3rd toilets are connected with sewerage network and in absence of sewerage system, there is need to focus more on septage and faecal sludge management. The sanitation condition may be improved through social mobilization and therefore, community led total sanitation campaign will be required.

Asia accounts for 34 percent open defecation, of which India accounts for 26 percent. In order to achieve the target of Swachh Bharat Mission, 65000 toilets have to be built every day by September 2019. India has spent huge amount on construction of toilets, however, about 40 percent toilets built free or with subsidy, were reported to be not used at all. A major paradigm shift was seen in the early 2000 with the emergence of Community Led Total Sanitation. The need to achieve sustained and collective behavioral change through community involvement was acknowledgement globally. It is to be noted that about India has the capacity to treat only 30 percent of its waste water. Large cities have comparatively higher capacity to treat waste water while in small cities the facility of waste water treatment is lacking. Using septic tanks may not be the perfect solution of urban sanitation as huge quantity of faecal sludge is likely to be released from septic tanks and there is no proper system for collection, transportation and treatment of faecal sludge in most of the urban local bodies in India. Thus, it is imperative to emphasize on septage and faecal sludge management in urban centres. Most of the ULBs do not have skills to construct, operate and maintain septic tanks.

Status of Municipal Solid Wastes

The Central Pollution Control Board has reported that 1, 33,760 metric tons of waste is generated daily in urban areas in the country. There are several deficiencies in the current system and they do vary across states and cities. In general, there is low primary collection at the doorstep; little storage and segregation of recyclables; poor secondary storage, mostly by the road side in open spaces or in derelict concrete of bricked in containment areas; no regular sweeping of streets; transportation of waste in open tractors /trucks;

little processing of waste; and unscientific disposal of MSW at dump sites. Uncontrolled dumping of wastes on precious land resource in and around towns and cities has created huge piles of waste, some running into millions of tones and are a source of contamination of ground water and air pollution posing a risk to public health. These dumping yards are breeding grounds for many infectious agents causing diseases like cholera, dysentery, jaundice, typhoid and diarrhea.

In comparison to the levels of the developed world, of 1-2.5 kg capita/ day, our per capita average generation of 450 gm/day of MSW is of course, lower. The per capita municipal solid waste generation rate reported for small towns is 200-300 gm/capita, 300-400 gms/capita for medium cities and between 400-600 gms/capita for large cities. The total quantity of waste currently handled each day in the urban areas in the country is estimated to be 1, 70,000 metric tons *i.e.* about 62 million ton per year. As per 2011 census, 31.16 per cent population of India *i.e.* 377 million people live in 7,935 urban areas with 4041 municipal authorities. It is estimated that by 2050, 50 per cent of the population will be living in urban areas. Considering that the volume of waste is expected to increase by 5 per cent per year on account of increase in the population and change in lifestyle of the people. The CPCB report also reveals that only 68 per cent of the MSW generated in the country is collected of which, 28 per cent is treated by the municipal authorities. Thus, merely 19 per cent of the total waste generated is currently treated. The remaining waste is disposed off at dump sites / landfill sites untreated. The enormous quantity of MSW i.e. 62 million tons per year, generated will dramatically reduce the potential of disease burden and provide a huge public benefit.

Various components of MSW have an economic value and can be recovered, reused or recycled cost effectively. Currently, the informal sector picks up part of the resources from the streets and bins to earn their living. However, a sizeable portion of organic waste as well as recyclable material goes to landfills untreated. Over 81 per cent of MSW annually is disposed at open dump sites without any treatment. With planned efforts to Reduce, Reuse, Recover , Recycle and Remanufacture and appropriate choice of technology, the country can profitably utilize about 65 per cent of the waste in producing energy and/or compost and another 10 to 15 per cent to promote recycling industry and bring down the quantity of wastes going to landfills/ dumps under 20 per cent . The percentage of wet biodegradable waste is high in Indian waste and is a source of contamination of soil, water and air, if it is disposed indiscriminately Biodegradable waste has a good potential for generating biogas, which can serve as fuel, can also be converted to energy as well as to compost which can improve soil health and lead to

increased agriculture production. This wet waste must therefore be processed either through bio- methanation or composting technology for generating biogas, electricity or compost for use as nutrient and prevent such wastes reaching the landfill. Considering that reusable and recyclable wastes form 20-25 per cent of the actual waste generated (which does not include the wastes collected by the kabadiwalas from source of generation). Plastics, paper and glass constitute 17 per cent of the recyclable wastes. Plastic wastes including composites are high calorific value material and crucial ingredient for MSW based waste to energy plants. This material also needs to be fully recovered and profitably utilized. The next step should be to strengthen segregation of the non-recyclable dry combustible MSW at secondary storage depots/transfer stations and optimally utilize this material in the form of RDF which can be fed to waste to energy plants waste to energy plants power plants and as auxiliary fuel in cement and metallurgical industry. Setting up of small to large plastic waste to liquid fuel plants, thereby utilizing the plastic not picked up by kabadiwalas and rag pickers, also needs to be encouraged.

Urban India faces an enormous challenge in managing its gigantic load of solid waste. The urban waste is increasing by 5 per cent per annum and cities do not have space for disposal of wastes. As per report of Central Pollution Control Board, 2016, urban India produce about 52 metric ton of waste each year, of which roughly 23 per cent is processed and taken to landfills or disposed off. More than 90 per cent of Indian cities have system of collection and disposal of solid waste in landfills and majority of them are not scientifically designed. The villages can no longer be taken for granted to be the dumping grounds of urban wastes (Sharma, et.al., 2018). About 16 states have reported cases where people stood up against solid waste dumping in their locality in the past 3 years. More than 50 major protests happened across the 16 states over solid waste dumping. The worst affected states are Maharashtra, Tamil Nadu, Karnataka, Uttar Pradesh, Delhi, Goa and Gujarat. Nationwide, the practice of segregation of waste at source is still minimal. As India moves towards urbanization, waste management infrastructure has to be developed simultaneously for a sustainable future (Sambyal and Agarwal, 2018). The government has revamped the Municipal Solid Wastes (Management and Handling) Rules, 2000, and notified the new Solid Waste Management Rules, 2016 which are applicable beyond municipal areas. The source segregation of waste has been mandated to channelize the waste to wealth by recovery, reuse and recycle. There are various schemes launched by Union Ministry of Housing and Urban Affairs which focus on solid waste management. However, almost 71 per cent money for solid waste management under Swachch Bharat Mission is still lying unused. Moreover, Assam, Tripura, Dadra and Nagar Haveli and Daman and Diu have not

received any funds under SBM for solid waste management (Henam, 2018). Swachch Sarvechan, launched in 2015 focused on fostering healthy competition among cities for improving cleanliness standards. During 2016-17, the focus was on solid waste management and sanitation in Swachch Sarvechan. There is urgent need to introduce policies that promote waste minimization, decentralized technologies for waste management and promoting responsibilities towards the conservation of environment. It is to be noted that waste to energy projects in India have failed to yield desired results. Even these projects have faced public protests due to increasing pollution and destruction of ecology. Thus, cities require better management and planning strategies to tackle urban waste.

Conclusion

Cities may be viewed as hubs of the intensive resource demand, environmental degradation and greenhouse gas emissions. However, cities may play a critical role in promoting low carbon development through use of renewable energy, energy efficiency, green buildings and mitigating emissions from urban transport. Mainstreaming climate resilience into urban development is essential because climate risks may only be one of the several factors defining poverty level, well-being, economic growth and development in an urban environment. Strategic urban planning directly supports urban resilience as a tool for sustainable development. Urban local governments must actively coordinate and mainstream mitigation, adaption and resilience into urban planning process to prepare cities to deal with climatic risks and impacts. Thus, changes in water policy and evolving strategies for water management are imperative. Similarly, legal framework for coping with climate change is also to be amended. There is more need on institutional building to enhance capacity of the state governments and stake holding agencies to cope up with climate change and also to regulate the water use for various purposes. More decentralized mechanism for water development and management will be required. The governance of urban water sector is non-transparent and unaccountable with no mechanism for the citizens to participate in the governance in a bottom of, direct, legally enabled way. Sewerage treatment has not been a priority for the majority of the utilities across India. The sewerage treatment facilities are grossly inadequate besides low level of sewerage network in India. The sewerage treatment plants are not effective functioning due to several reasons. Cities may be viewed as hubs of the intensive resource demand, environmental degradation and greenhouse gas emissions. However, cities may play a critical role in promoting low carbon development through use of renewable energy, energy efficiency, green buildings and mitigating emissions from urban transport. Mainstreaming climate resilience into urban development is essential because

climate risks may only be one of the several factors defining poverty level, well-being, economic growth and development in an urban environment. Strategic urban planning directly supports urban resilience as a tool for sustainable development. Urban local governments must actively coordinate and mainstream mitigation, adaption and resilience into urban planning process to prepare cities to deal with climatic risks and impacts. The Supreme Court of India has played a catalytic role for greening cities in the country. The court identified critically polluted cities and suggested an action plan to reduce the level of pollution in these cities. The immediate problems of India's cities relate to inadequate institutional arrangements for solid waste management, drainage, sewage treatment and disposal and sanitation services. Thus, it is imperative to improve the municipal services, particularly sanitation services and urban local governments adopt the integrated urban planning for climate resilience and addressing the environmental problems.

In order to maintain the resources for use of future generations, strict policy and planning implementation is required. The 3 R's- reuse, recycle, reduce need to be asserted and reflected in all development plans. The initiatives of corporate social responsibility for improvement in urban environment should be promoted. Plastic should be banned with the provision of availability of low cost substitutes of plastic. The general public should be involved in urban sustainable development. The behavioural changes and a sense of belonging to the city need to be inculcated among the potential development actors. Public transportation should be made more affordable, efficient and safe. Car pooling and training of drivers on air pollution and fuel use may be promoted. Besides, strict policy control measures like polluters pay and firm inspection of vehicles and industries needs stringent implementation. It is important to abolish the burning of garbage and biomass and focus on less-polluting better ventilated kitchens. The indigenous pollutant tolerant tree species like Mango, Peepal, Neem, Babool etc, should be planted (Firdaus, 2010). This will help maintain green cover, control pollution and also lead to health, happiness, wellbeing and sustainable city. Urban sustainable development is a collective concept that underpins within it the individual wellbeing. It is important to meet the needs of present generation, especially poor, keeping in mind the environment's ability to meet the needs of future. Three perspectives of sustainable urban planning viz. resource and consumption, good environment and social capital should be incorporated in planning process. Wellbeing and happiness can be achieved only when the urban environment is socially, ecologically, economically and politically sustainable.

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