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Mainstreaming Climate Change Action in Urban System in India

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Abstract

The world's climate is changing as a result of greenhouse gas emissions caused by humans. Changes in weather patterns, brought on by higher amounts of heat trapped in the atmosphere are affecting temperatures, sea levels, and the frequency of storms. This will have an effect on cities and other metropolitan areas, especially those near the coast. How cities are managed to address their growing vulnerability and development is critical in this context. Because there are more people, resources, and infrastructure in urban areas, these areas are predicted to suffer the most from climate change. Every city faces difficulties with managing catastrophic risk, the effects of climate change, and sustainable development. Urban development requires consideration of disaster risk reduction and the battle against global warming as essential components for managing urban areas, their growth, and spatial design. Climate change will cause disasters to occur in cities more frequently. Managing catastrophic risks effectively is essential to adapting to climate change. As a result of climate change, local governments and their allies will have to cooperate to manage an environment that is more invasive and changing. Encouraging civic engagement, technology improvements, and patterns of urban expansion are all important factors in explaining how urban populations act in ways that worsen climate change and increase their susceptibility to disasters. With these challenges incorporated into policy and practise, a sectoral approach to climate change is giving way to a holistic one. In order to lower the risk of disaster and fight climate change, coordinated international cooperation and city partnerships are required. In light of this, the current paper looks at how climate change adaptation is becoming more mainstreaming in urban system and explores opportunities for India to fully utilise the potential of circular economy. The primary sources of data for the paper are relevant literature and secondary data.

Keywords*: *Climate change, Greenhouse gases, vulnerability, Environment, Infrastructure

Introduction:

Both short-term and long-term changes in meteorological variables, such as temperature and precipitation, may put urban systems at risks. Changes in the climatic factors are expected to have an impact on future patterns of spatial expansion and development in cities, acting as an additional stressor on top of the ones that exist now.

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The people most at danger from climate change are those who reside in slums and other informal settlements, where access to basic services and infrastructure is usually limited (IDS, 2007). Urban settlements in low and middle income countries are often situated in areas vulnerable to flooding and landslides. Coastal towns are also at risk from storm surges, cyclones, sea level rise, and other related events. Rapidly shifting socio-economic, demographic, and land-use indicators, patterns of resource demand and utilization, changes in lifestyle, and other factors are the main causes of the complexity of urban environments. Climate change has increased uncertainty about changes in temperature, precipitation, and the frequency of extreme occurrences. There are also scale mismatches in terms of the timescales that policymakers and urban planners operate within and the scales that anticipated the consequences of environmental decisions, degradation, and climate variability and change. Urban systems should also be able to react to changes in a way that maintains their original structure and function, as well as adapt to changes as they happen. Laws and urban development initiatives make this possible. The primary initiatives, plans, and policies of the Indian government that offer several avenues for integrating resilience, adaptation, and mitigation into the agenda for sustainable urban development have been reviewed in this study. Eight major areas for adaptation and mitigation action are identified in India's 2008 National Efforts Plan on Climate Change (NAPCC). Among these missions is the National Mission on Sustainable Habitats (NMSH), which focuses especially on urban areas.

In order to enable proactive and educated responses to urban disasters, policymakers and developmental planners are finding that it is increasingly necessary to understand the notions of resilience, vulnerability, and adaptation (Dayton and Johnson, 2004). The term "urban resilience" refers to an urban area's capacity to bear the shock of an abrupt or unanticipated disaster produced by an occurrence without requiring the substantial addition of new territorial resources, which helps to maintain the area's urban performance quality. Natural or man-made disasters like landslides, tsunamis, cyclones, earthquakes, and floods could be the source of these shocks. Urban resilience, or more accurately, its absorbing capacity, is influenced by various factors such as the management quality of its governance system, the availability of resources, the manoeuvrability and infrastructure facilities, the participatory dynamics of its citizens, and most importantly, its visions and preparedness mechanisms at all levels to counteract disasters and emergencies. In actuality, an urban core is a sophisticated component of a bigger system composed of innumerable smaller systems, each of which represents a different facet of the metropolis. Many scientific methods and knowledge are available to understand, depict, and quantify these risks and mitigate their

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consequences on settlements. These include GIS, forecasting, scenario modelling, and the magnitude of the effects of disasters. To increase the resilience of settlement centres and deal with disasters, three key strategies need to be developed: (1) anticipating and visualising the "causes & effects" chain that comprises the settlement centre's entire urban system; (2) boosting infrastructure mobility and early warning capacity; and (3) incorporating the necessary corrective measures into the development programme to fix planning errors (Baral, 2014). The dependence on urban resources, infrastructure, economic possibilities, and services would grow as urbanisation increased. Due to a lack of proper infrastructure and financial resources, medium-sized and smaller towns in India are finding it difficult to keep up with population growth and the competition for resources, even though larger cities like Mumbai, Bangalore, Ahmadabad, and Chennai have made significant investments in their development. (Grahanan et. Al , 2007). It is a major effort to maintain environmental sustainability in cities experiencing rapid population growth. Because of the interdependencies of services in an urban context and the highly interlinked character of risks, policies related to urban resilience and sustainability must essentially target numerous sectors and dimensions (Nijkamp and Finco, 2000). This includes managing trash, providing clean water and sanitation, managing energy, managing housing and transportation, managing ecosystem services, and planning land use.

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as "a change in the state of the climate that persists for an extended period of time, typically decades or longer, and can be identified by changes in the mean and/or variability of its properties." It characterises any sustained change in climate, whether caused by natural variability or human activity. An increase in the amount of greenhouse gases in the atmosphere is considered to be one of the main drivers of climate change. Over time, the Earth's average surface temperature rises in tandem with rising greenhouse gas concentrations. The warming surface of Earth causes changes in weather patterns and sea levels. Between 1980 and 2003, India's contribution to global Co2 emissions was a pitiful 3.11 percent. For carbon emissions per capita, India comes in at number ten in the world, whereas the US, much of Western Europe, and Japan come in at number twenty. India has valid concerns regarding global warming. India's carbon emissions have been increasing lately, and these emissions are higher in urban areas. The average carbon emissions per person in the country are 0.93 tonnes, however in metropolitan areas, the average is higher

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(1.19 tonnes per person compared to merely 0.90 tonnes in non-metropolitan cities). This is because larger cities have higher concentrations of pollutants from both private and public transportation. However, it should be noted that, when stated as a percentage of city-level emissions, emissions at the municipal corporation level are substantially higher in nonmetropolitan areas than in metropolitan ones. Corporation level emissions include those from automobiles, buildings, other facilities, sewage and water supply systems, and street lighting.

South Asia is the region most vulnerable to climate change. There are significant climate change related development issues in the area. The effects of climate change are already being felt in South Asia, where they include rising temperatures, more unpredictable precipitation, and an increase in extreme weather occurrences. The region is known for its frequent natural disasters and fluctuating weather. The region has a long and densely populated shore line in addition to low-lying islands that are vulnerable to sea level rise. Urbanisation is another problem in the region. Women, the destitute and indigenous people are particularly vulnerable to the effects of climate change. Of the 32 states and Union territories that make up the Union, twenty-two are susceptible to multiple disasters. Nearly 40 million hectares of land in the country have been classified as flood-prone, and 18.6 million hectares flood annually on average. Approximately 57% of the country is vulnerable to seismic activity. A little over 18% of the country's total area is at risk of drought, which affects 50 million people annually and threatens 68 percent of the country's arable land. Tropical cyclones that form in the Arabian Sea, Indian Sea, and Bay of Bengal can affect India's 8040 km of coastline. The Indian Ocean is one of the six primary cyclonic-prone zones on Earth (Jain, 2004). The Coromandal coastline is especially vulnerable to storms because it generates 80% of all cyclones. A group of experts evaluated the risk to the existing housing stock in several states and union territories founded by the Ministry of Urban Affairs and Employment of the Indian government. Twenty million dwellings are susceptible to wind damage, 9.3 million homes are susceptible to flooding, and about 3.9 million homes are susceptible to very strong earthquakes. Apart from the potential for seismic activity, homes vulnerable to flooding and cyclones during periods of intense precipitation are also highly vulnerable to devastation. (2004, Jain). A little over 49% of all housing is vulnerable to severe damage from natural catastrophes, and 1 percent of all housing is destroyed every year. It should be noted that 80% of earthquake-related deaths occur from collapsing

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buildings. If not adequately supported, buildings composed of stone or brick are prone to collapsing. There is still construction going on for non-engineered buildings in areas susceptible to natural disasters. Due to a variety of circumstances, such as increased land and construction costs, poverty, unemployment, and migration from rural areas, millions of people live in areas that are susceptible to natural disasters. As a result, the population affected by disasters has increased by 6 percent. The changing terrain brought on by environmental degradation has further increased the country's vulnerability. In 1988, 11.2 percent of the land was at risk of flooding; by 1998, however, 37 percent of the area was underwater. Three of the most notable natural disasters that India has recently experienced are the super cyclone that hit Orissa in 1999, the earthquake that struck Gujarat in 2001, and the tsunami that hit Tamil Nadu, Pondicherry, the Andaman Nicobar Islands, and some other southern states in 2004. Frequent disasters put limited options in jeopardy and damage development successes.

Urban Vulnerability and Disasters:

Many densely populated urban areas with significant economic resources are located in high-risk areas, making them more vulnerable to hazards and the consequences of climate change (Munich Re, 2000). Risks such as droughts and floods have increased in frequency over time (De et al., 2005). In addition to 68% of the country being at risk of drought, over 40 million hectares of India's land are susceptible to flooding, with an average of 8 million hectares being destroyed annually (Ministry of Home Affairs, 2004). The microclimate of cities may be impacted by climate change, which could lead to extreme weather occurrences that could be harmful to the health and well-being of city dwellers. There are over 130 cities and towns along the 7500 km of coastline in India. A few of the low-lying, densely populated coastal cities that are vulnerable to cyclones and their attendant risks including storm surges, powerful winds, and torrential rain are Mumbai, Kolkata, Chennai, Surat, and Thiruvananthapuram (Parikh et al., 2013). Riverside cities like Delhi, Indore, Allahabad, Hyderabad, and Haridwar are extremely vulnerable to flooding. Even while some major rivers, like the Ganges and Brahmaputra, gave rise to communities along their banks, river deltas are some of the world's richest and most inhabited areas. Interior cities such as Jodhpur, Jaipur, Gwalior, and Bhopal are prone to heat waves and droughts. The frequency and intensity of the dangers will vary depending on the type of settlement, geographic

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variables, and local economy (IPCC, 2012). Certain consequences, including floods caused by overflowing storm drains and sewers rather than rivers flooding, may be more likely to affect urban areas. In the future, these could become more common (Tanner et al. 2009). Indian cities require extra care because millions of people reside there on flood plains and in coastal areas, making them both vulnerable. One of the main countries that commonly suffer from both man-made and natural disasters is India. Droughts, floods, cyclones, and earthquakes all drastically reduce the amount of material and human resources. The nation's persistent issues are exacerbated by acts of terrorism, fires, illnesses, accidents, moral disagreements, riots within communities, and insurgency-related tragedies. The disasters have the power to seriously undermine and harm the decades-long social and economic advancements (Singh, 2014). Businesses, private enterprises, and structured civil society organisations have been striving to prevent and lessen disasters because governments are unable to handle them on their own. India is among the world's most dangerous places for natural disasters. Natural catastrophes are common in Asia, with 24% of the region's fatalities coming from disasters in India. In India, floods and high winds are the primary causes of 60% of all disasters. Approximately 54 percent of the subcontinent's geographical area is prone to earthquakes. 58 cities and towns are situated in zones 5, 4, and 3, which are more prone to earthquake activity, according to the seismic atlas. Since 1988, there have been six significant earthquakes of various magnitudes all around the country. Of the all Indian states, 22 are more susceptible to several calamities. On an estimated 40 million hectares of flood-prone terrain, 18.6 million hectares of land in the nation flood every year. Approximately 18% of the country's total land area is prone to drought. Droughts affect more than 50 million people annually, and 68 percent of all cultivated land is vulnerable. The Indian Ocean is one of the world's six primary cyclone-prone regions. Eighty percent of all storms in this region originate from the Coromandel coastline in the eastern coastal region, which is particularly prone to cyclones. Many challenges need to be addressed in order to plan and strategize disaster management with a risk reduction focus. These challenges include quantifying, shifting temporal and spatial scales, and estimating costs and benefits (Gupta et al., 2010). Preparedness, prevention, and risk management are the three pillars of catastrophe mitigation. The functional structure of catastrophe mitigation consists of three parts- response, prevention, and rehabilitation. The reaction to disasters is handled by a multitude of autonomous entities. Community-based and non-governmental organisations need to be

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heavily involved in disaster management. Disaster management involves many steps and procedures. The three main phases are preparation for disaster response and relief, preventive and mitigation planning, and rehabilitation and reconstruction.

Rapidly shifting socioeconomic, demographic, and land-use indicators, patterns of resource demand and utilisation, changes in lifestyle, and other factors are the main causes of the complexity of urban environments. Climate change introduces another degree of uncertainty regarding variations in temperature, precipitation, and the frequency of extreme occurrences (Singh, 2014). Urbanisation poses a number of challenges for planners, politicians, and city administrators, among which the importance of urban floods is growing. Inappropriate design, encroachment on water bodies and sewers, occupation in low-lying regions, watershed modification, and climate change are all contributing factors to urban floods. The timescales that urban planners and policymakers operate within and the scales at which environmental effects, degradation, and climate variability and change are predicted to manifest also differ in terms of scale. Urban systems should also be able to react to changes in a way that maintains their original structure and function, as well as adapt to changes as they happen. Laws and urban development initiatives make this possible. Eight major areas for adaptation and mitigation action are identified in India's 2008 National Efforts Plan on Climate Change (NAPCC). Among these missions is the National Mission on Sustainable Habitats (NMSH), which focuses especially on urban areas. An additional noteworthy project of the Indian government was the Jawaharlal Nehru National Urban Renewal Mission (JNNURM), which commenced in 2005 and was implemented until 2012. The primary goal of JNNURM, which offered numerous avenues for achieving sustainability and climate resilience, is to construct economically viable, equitable, and resilient cities. Cities in India are become increasingly conscious of the consequences of climate change and the necessity of adapting and being resilient in these urban environments. India, a country that prioritised economic activities related to agriculture and rural areas, has not placed much emphasis on urban expansion. This changed in 2005 when Indian cities received funding under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). JNNURM became a flagship programme that adopted a reform-based funding approach, enabling ULBs to update their own systems and capacities through the implementation of mandatory reforms, while simultaneously receiving funding for the development of infrastructure and basic services for urban poor. This came about after a number of independent initiatives, programmes, and five-

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year plans to address urban issues. But given the current problems in Indian cities and the knowledge of climate change consequences that were vague, unknown, and seemed distant, it was reasonable that JNNURM did not view climate change as one of the cities' top priorities. The National Action Plan for Climate Change, which was released recently, is the result of a different mission that looked at cities and climate change from an all-encompassing perspective. The government has made provisions for developing seismic resistant urban infrastructure and sustainability of municipal services, including sanitation services, under AMRUT, Smart City Mission, Swachh Bharat Mission, Namami Gange, Prime Minister Housing for All, and HRIDAY, with an emphasis on capacity building and urban resilience.

Climate Change:

Uncertainty regarding variations in temperature, precipitation, and the frequency of extreme events has grown due to climate change. In terms of the timeframes that urban planners and policymakers work within and the sizes that projected the effects of environmental decisions, degradation, and climate variability and change, there are also scale mismatches. Cities will experience disasters more frequently as a result of climate change. Effectively managing catastrophic risks is crucial for climate change adaptation. Local governments and their supporters will need to work together to manage an increasingly invasive and changing environment as a result of climate change. Promoting civic involvement, technological advancements, and urbanisation trends are all significant variables in understanding how urban populations behave in ways that exacerbate climate change and heighten their vulnerability to disasters. The integration of these concerns into policy and practise is leading to the replacement of the sectoral approach to climate change with a holistic one. Coordinated international cooperation and city collaborations are needed to combat climate change and reduce the danger of disaster.

When it comes to cutting greenhouse gas emissions and lowering the risks brought on by climate change, cities are setting the example. Climate finance is therefore essential to enabling the large investments needed to implement measures that would drastically cut emissions and lessen the negative effects of climate change. Despite the concentration of loan portfolios by multinational development banks and the establishment of global funding agencies such as GEF, GCF, and AF, the amount of climate finance flows by 2017–18 was

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only about USD 384 billion annually, considerably short of the required amount. According to estimates, emerging countries alone might provide USD 2.5 trillion in sustainable investment opportunities up to 2030 in six urban sectors: public transport, electric cars, waste management, water management, and green buildings. Cities must be more prepared to draw in climate money if they are to have a significant impact from these tools, as they now lack the capacity to fully utilise these financial mechanisms. The notion that cities should spearhead reform in this area has gained more support in the wake of COP 27. Discussions at the U20 may lead to specific recommendations for mainstreaming climate money, especially for cities in developing nations.

Resilience in an urban context is defined as "maintaining and, in some cases, transforming the systems and conditions within a city that affect its ability to function and deliver essential services, especially to poor and vulnerable communities," by The Rockefeller Foundation (2014). A city is deemed resilient if it possesses all seven of the traits of resilient systems: robustness, redundancy, flexibility, resourcefulness, inclusiveness, and integration. According to the Rockefeller Foundation (2014), the Urban Resilience Index facilitates both the building and bolstering of resilience as well as the comprehension and analysis of the gaps in achieving resilience. Researchers have discovered a plethora of ways, including systems-based approaches and performance-based approaches. Urban assets or systems, including human behaviour, natural ecosystems, man-made infrastructure, and urban management, are the main focus of these approaches. Asset-based approaches prioritise material items over other assets, such as knowledge, social networks, and culture, which influence human behaviour. System-based approaches usually focus on systems like because social systems are influenced by urban physical systems, a sectoral approach is encouraged by taking into consideration the interdependencies and governance structures across different systems at different scales. Finally, an indicator technique provides an empirical framework that emphasises the qualities connected to resilience that a city needs to achieve while considering all of its elements. Based on the assessment (Lavelle M. et al., 2015), we ensure that solutions assist the city in achieving the seven resilience features in all aspects of the city.

India is one of the fastest growing economies in the world and the third-highest emissions of greenhouse gases (Timperley, 2019). The average temperature of the nation rose by 0.70C between 1901 and 2018 due to greenhouse gas (GHG) emissions, and by 2100, it is

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expected to rise by 4.4oC, according to the first-ever Ministry of Earth Sciences (MoES, India) climate change assessment study (Nithin, 2021). Due to its high population and 7500 km of coastline, the area is particularly vulnerable to extreme weather phenomena such as storms, floods, and sea level rise. The livelihoods of about one billion people who reside in rural areas are dependent on sectors including agriculture, forestry, fisheries, and livestock that are vulnerable to climate change. India ranked fifth in the 2019 Global Climate Risk Index. An early seasonal snowmelt, decreasing glaciers, and unpredictable monsoon patterns are putting freshwater resources and agricultural output at jeopardy. Rapid urbanisation, rising temperatures, shifting coastlines, erratic precipitation, heavy rainfall events, dropping water tables, and destroyed biodiversity hotspots all have an impact on migration, warfare, and the spread of diseases. Nearly 44 percent of India is experiencing drought to varied degrees. The most seriously affected groups, according to https://www.dailypioneer.com/2021, are women, the next generation, the poor, and marginalised Indigenous people. In order to lower their greenhouse gas emissions and get ready for the effects of extreme weather events like droughts and floods, developing nations use climate money from the Paris Agreement to invest in the production of renewable energy (Banga, 2019). India, a nation that is changing and developing quickly, should focus on reducing its greenhouse gas (GHG) emissions by implementing laws and agreements that are closely related to climate change and moving major industries towards low-carbon growth. India needs investments to boost its capacity for producing renewable energy, create sustainable food security-ensuring agricultural value chains, and build climate-resilient cities to tackle climate change. The platforms for innovation and funding that climate action companies now use are insufficient. Rich nations promised to pool USD 100 billion a year by 2020 to meet the needs of developing countries in the Cancun Agreements (2010) (Khan, et al. 2020). The Green Climate Fund (GCF) was created by the Cancun Agreement, which also named it the governing body of the financial system. Rich nations confirmed this goal and pledged to provide USD 100 billion a year until 2025 in the 2015 Paris Agreement. Even Nevertheless, wealthier countries are falling short of keeping their pledges to help underdeveloped nations cope with the climate crisis. India's potential for renewable energy (RE) could reach 500 GW by 2030, exceeding its original goal of 175 GW (Majid, 2020).

The catalyst for India's current climate transition is the country's Nationally Determined Contributions (NDCs) target by 2030. India made its bold climate ambitions

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public during the 2021 Conference of Parties (COP26). In order to reach a net zero economy across the nation by 2030, these objectives include lowering the nation's economic carbon intensity by 45 percent from 2005 levels by that year, cutting the nation's estimated carbon emissions by 1 billion tonnes between now and then, and sourcing 50% of the nation's energy needs from renewable sources by then. Sub national governments play a significant role in achieving national objectives, and funding is essential to propelling and quickening the process of transformation. Based on study findings, India will need to spend an extra US$ 1.4 trillion on low-emission technology in order to stay on a sustainable path for the next 20 years. This sum exceeds the current policy's requirements by seventy percent. Empirical studies reveal a 95:5 ratio in favour of subsidising adaptation over mitigation (Solanki, 2022). Climate change poses threats to municipal governments, although these are often countered from below. Notably, due to a range of factors including metropolitan demand and consumption, most of the cities that are located in the highly vulnerable zone have significant levels of greenhouse emissions. The existing energy basket, the transportation mix, and the lack of scientific or bi-remedial waste management are some of the sources of these emissions. Cities can effectively address the effects of climate change and integrate the goals and targets that India announced during the 26th Conference of Parties in Glasgow, thanks to their ideal positioning. India has declared its intention to work towards achieving net-zero emissions by 2070. At the national level, the combined estimated mitigation potential of all urban missions was found to be 133 million tonnes of Co2 by 2021 and 270 million tonnes by 2031. The AMRUT, Swachh Bharat, and smart city missions are a some of these.

Circular Economy:

The circular economy is an alternative to the linear economy. In the past, consumers have generated value in a linear process that begins with the extraction of raw materials and ends with the disposal of finished things when their useful life are coming to an end. This is the "take-make-waste" paradigm. A circular economy, on the other hand, encourages a closed-loop manufacturing approach that recycles materials to create additional value while keeping them in the production loop. Here, the objective is to preserve as much value as possible from materials, products, and resources in order to create an ecosystem that sustainably promotes recycling, reuse, refurbishment, and longevity. There wouldn't be any circular businesses or products without the three guiding principles that form the foundation

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of the circular economy. These include preserving the usage of products and materials, reducing waste and pollution, and focusing on regenerative systems (Kalaari, 2022).

The circular economy's main tenet is the pursuit of complete waste elimination, which is characterised as any kind of asset and resource underutilization as opposed to waste in the sense of trash. Resource efficiency initiatives are now often referred to as part of the "circular economy." The term "circular" is important here since these business models encourage a shift from linear to circular value chains, enabling a more thorough and efficient utilisation of resources. We believe that this is an urgent need in order to address the serious resource crisis the country is currently experiencing. By 2030, circular economy business concepts in India could unlock economic value of around half a trillion dollars, according to FICCI (2018). The manifestation of India's enormous cyclical opportunity would be different resources. Naturally, from a prioritisation perspective, companies should focus their circular economy operations on resources that have a big economic and environmental impact. Eight of these resources have been designated as India's top priorities by FICCI (2018). Petrochemicals come first, followed by plastics, food, food, gold, iron and steel, copper, fibres, and cement in the eighth place. It is crucial to keep in mind that opportunities are not uniform in nature and that no single model is appropriate for every industry. In India, there could be a $1 billion profit from the extraction of gold from technological garbage. Currently, almost 40% of India's plastic waste is not gathered for recycling. Proper management of this waste can result in around 14 lakh new jobs and perhaps a $2 billion opportunity. India's end-of-life automobiles may yield over 8 million tonnes of steel by 2025, representing a potential market valued at over $2.7 billion (FICCI, 2018).

These days, governments, businesses, NGOs, and academics all research the circular economy in great detail. Use of the following "5R" principles is the first step towards achieving circularity in any process, product, or service: (1) reduce, (2) reuse, (3) recycle, (4) re-manufacture, and (5) repair / refurbish. Nowadays, there is more evidence in favour of a circular economy than just moral business conduct or environmental concerns. It is thought to be a profitable tactic and a fresh business opportunity. The idea of a "circular economy" is gaining traction in politics and was a central theme discussed in the G-20 Agenda. The circular economy is being incorporated by G-20 countries into their strategies to carry out the Sustainable Development Goals (SDGs). In order to assist India in meeting its responsibilities under the Paris Agreement and the Sustainable Development Goals (SDGs), which both

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include circularity requirements (Teri-CBS), the current Indian government has launched a number of significant projects. India's economy and urbanisation are expanding at previously unheard-of rates, which has increased demand for natural resources like land, soil, water, and extracted minerals. Since there is a growing potential of severe shortage in the future and their supply is running low, we need to discover more efficient ways to use them. Another danger associated with urbanisation is the amount of waste produced, which is growing. Trash incinerators, disposal sites, and other outmoded practices only make the problems of today worse. Utilising state-of-the-art techniques and technology is therefore essential for waste management and resource conservation. Innovation that makes design for recycling, remanufacturing, and reuse easier may lead to the development of disruptive technologies and behaviours, which may ultimately aid in the decrease of waste (Teri-CBS).

Conclusion:

India's urban centres are the country's new engines of economic growth, but they are also beset by issues including poor urban planning, insufficient infrastructure, difficult access to basic services, and a general ignorance of the geographic and climatic diversity of the city. Climate-related disasters can cause tragedies in Indian cities, often leading to large-scale loss of life and property. Climate-resilient cities are able to withstand the institutional, structural, social, and economic repercussions of climate change. While measures to reduce greenhouse gas emissions can help mitigate the consequences of climate change, cities would benefit from climate change adaptation methods that would enable them to successfully resist major climate shifts. Therefore, to address future climate impacts, climate-resilient cities should include mitigation and adaptation strategies in addition to strengthening the capacities of people, infrastructure, institutions, and governance.

There is imperative need of responding to severe weather phenomena including floods, landslides, and storm surges. In India, the primary considerations for urban development are housing, transportation, health, sewage and water services, and social infrastructure in order to manage the country's rapidly increasing pace of urbanisation and population increase. Since climate change is still viewed as a problem for the future, its effects are usually ignored when making decisions about urban growth. Urban planners who fail to take climate change into account at the outset of planning may face severe financial setbacks, negative health consequences, and high social costs—particularly for the most

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vulnerable groups, which include the elderly, the poor, the disabled, and children. Effective climate-resilience building should be included into regular urban development planning procedures in order to further the larger goal of sustainable development. A policy to include climate resilience as a fundamental urban aim is a first step towards addressing climate-related consequences and preparing cities for unexpected extreme events and climate variability. India is becoming more urbanised at a rapid pace, which is increasing the need for water in cities. Ground water is currently more commonly used as a source of water due to the shortage of surface water supplies in many urban areas. The underlying aquifers are therefore under a lot of strain to meet the demand for water for household use. Not having enough access to clean water has been a persistent issue for many Indian cities. Urban water supplies are under stress as a result of pollution, urban population growth that is not planned, and unsustainable urban development. Rainfall accounts for 68 percent of the country's annual ground water resource; the remaining 32 percent is derived from various sources, including seepage through canals, irrigation return flow, recharge from tanks and ponds, and the combined use of water-saving structures. The nation's increasing population has resulted in a decline in the annual amount of water available per person. In the Union Territory of Pondicherry, Tamil Nadu, Uttar Pradesh, and the state of Himachal Pradesh, there is at least 70% ground water development. In the remaining states, ground water development makes up less than 70% of the total. Over time, ground water use has increased in areas where the resource was readily available.

Planning and policy analysis need a comprehensive, flexible, and easy-to-use framework in the event of climatic variability and uncertainty. Establishing inter-ministerial and interdepartmental communication is essential for addressing climate change problems and identifying vulnerabilities at both the state and federal levels. A fundamental paradigm shift in urban planning is urgently needed, and strategies for urban catastrophe management must be placed inside an all-encompassing framework. In order to reduce the demand for land in areas that are vulnerable to hazards, the focus should be on developing infrastructure and buildings outside the city centre. The establishment of the satellite towns should prioritise the finance and development of infrastructure in order to reduce the population pressure on megacities.

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