PLANNING FOR A RESILIENT AND LOW CARBON CITIES IN INDIA – A WAY TOWARDS SUSTAINABLE FUTURE - A Base Case of Indore

Ar Suman Sharma & Ar Yashika Garg

SOA , IPS Academy

सर्वेभवन्तुसुखिनःसर्वेसन्तुनिरामयाः।सर्वेभद्राणिपश्यन्तुमाकश्चिद्दुःखभागभवेत्।।

May all sentiments beings be at peace, may no one suffer from illness, may all see what is auspicious, may no one suffer.

ABSTRACT

India's economy is expanding at the quickest rate in the world. As a result of rural-to-urban migration and an increase in the working population, per capita energy demand has increased with urbanization and development, placing more strain on urban infrastructure and raising levels of air, water, and soil pollution. The situation has gotten so bad that we now need to find ways to turn cities into places that are low-carbon, resilient, and livable. Therefore, the focus of development currently is on circular economies and sustainable solutions, where development will occur in harmony with the environment rather than at its expense. This paper will explore the key factors and strategies necessary to pave the way for low-carbon Indian cities.

Keywords: urbanization, livable, low carbon foot prints

INTRODUCTION

Over 66% of people are predicted to reside in urban areas worldwide by 2050, according to forecasts from the United Nations and the Federation of Indian Chambers of Commerce (FICCI). Through 2050, India's urbanization rate might grow at a CAGR of 2.1%. Eighty-five percent of the GDP comes from these urban areas, which are centers of socioeconomic strength. Consequently, they play a pivotal role in propelling resource consumption and the consequent implications for sustainability. Consequently, they also hold great significance in executing sustainable solutions. Most of the increase in urban regions is the result of rural-to-urban migration, as the agriculture sector has a limited capacity for absorption. Urban infrastructure is under strain as a result of the increasing population density in metropolitan regions. A number of human-caused factors, including the burning of fossil fuels, leaving carbon footprints, and increasing air conditioning use, have contributed to climate change. It is predicted that global temperatures might rise by 3 to 4.8 degrees Celsius, which would have a negative impact on life as we know it. Honorable PM Narendra Modi correctly noted at COP 26 that "We need to deal with cities by applying climate lens because there is a need for a mindful balance between development & environment."

THE CRISIS: APPRECIATING THE GLOBAL PROBLEM VIZ A VIZ LOCAL SCENARIO.

A state of living environment that provides an acceptable standard of living for the residents of a specific area is known as livability, or it can be defined as the "quality of life" that a citizen experiences. Because of the poor quality of life in big cities, livability has become a crucial emerging issue in developing nations. Climate change poses extraordinary risks and challenges to our cities, including extreme weather events, rising sea levels, water stress, desertification, and conflicts over scarce resources. Massive fossil reserves have been created by the slow locking of carbon in the earth over millions of years. The issue is that the atmosphere is receiving carbon dioxide from these carbon reserves.

CARBON FOOTPRINTS

The total amount of greenhouse gas emissions is known as one's carbon footprint. The Indian Network for Climate Change Assessment states that the energy sector accounts for 58% of total emissions, with the industrial sector accounting for 22% and solid and liquid wastes, agriculture, and forestry accounting for the remaining 20%. Climate change and disasters are related to it and have an effect on housing, livelihoods, and infrastructure services.

GHG EMISSIONS

The gases in the earth's atmosphere that trap heat and warm the planet are referred to as greenhouse gases, or GHGs.

The name "greenhouse gases" comes from the way the gases behave, much like the glass walls of a greenhouse. Temperatures would drop to as low as -18˚C (-0.4˚F) without the greenhouse effect, making it too cold for life to exist on Earth.

However, due to a sharp rise in greenhouse gas emissions, human activity is altering the planet's natural greenhouse effect. Scientists concur that greenhouse gases are the primary driver of climate change and global warming. The last 30 years have seen an acceleration in global temperatures, which are currently at an all-time high.

The composition of a city is reflected in its greenhouse gas emissions, which are influenced by its energy sources, inhabitants' lifestyles, resource and water consumption, waste water generation, toxic releases, and solid waste generation. Between 2005 and 2016, India's GDP (gross domestic product) emission intensity decreased by 24%. India is on course to fulfil its voluntary commitment to lower its GDP's emission intensity by 2050.

REIMAGINING URBAN PLANNING - THE SOLUTION

A change in our lifestyle that is resilient, sustainable, and equitable should go hand in hand with the development of our cities and communities. It is not only economically sound, but also in line with the socioeconomic, cultural, environmental, and humane aspects of development. The Indian government has introduced multiple urban initiatives since 2014. These include the Swachh Bharat Mission (SBM), Pradhan Mantri Awas Yojana, Historic City Development and Augmentation Yojana (HRIDAY), Smart Cities Mission, and Atal Mission for Renewal and Urban Transformation (AMRUT). Both the SBM 2.0 and AMRUT 2.0 are still in operation as of October 2021.These missions aim at low carbon urbanization and the provision of core infrastructure services like water supply, sanitation and solid waste management, efficient urban transport, affordable housing for the poor, 24x 7 power supply, IT Connectivity and e-governance. These missions emphasize upon participatory planning and governance, livelihoods, connectivity and providing better education, healthcare, urban safety These missions are focused on low-carbon urbanisation and the delivery of essential infrastructure services, such as water supply, solid waste management and sanitation, efficient urban transport, affordable housing for the underprivileged, round-the-clock power supply, IT connectivity, and e-governance. The aforementioned missions place a strong emphasis on the following topics: smart services—intelligent, connected, and instrumented—better education, healthcare, and urban safety; livelihoods; and participatory planning and governance. Public-private partnerships (PPPs), value-capture financing, transfer of development rights (TDRs), and tax-incremental financing are also encouraged by these missions. In addition, GIS-based land pooling and town planning schemes have been suggested for the planned development and management of land.

LOW CARBON CITIES: A KEY TO TACKLE CLIMATE CHANGE

A low-carbon city is an eco-friendly urban development plan that places a strong emphasis on reducing or eliminating the use of energy derived from fossil fuels. Encouraging ties between the public, private, and civil sectors, it embraces the traits of a society and economy with reduced carbon emissions.

Cities consume 78% of the world's energy and produce 60% of its greenhouse gas emissions, according to the UN. The five main sectors that contribute to carbon emissions from cities are: buildings, transport, municipal services, infrastructure development, and the use of goods and services by locals.

Therefore, accomplishing energy transition in urban areas necessitates a multifaceted strategy that incorporates different players and approaches. India is a vulnerable nation with respect to extreme weather events such as cyclones and intense rainfall as well as ongoing climate change with increased impacts in the future. • Approximately 30 per cent of India’s population is dependent on the rich, exploitable coastal and marine resources, • A number of urban and economic centers of strategic importance,

including two of the megacities of India, Mumbai and Chennai, are located along the coast.

Resilience can be defined as a city's capacity to absorb shocks, recover as a socio-ecological infrastructure system and its constituent parts while maintaining core functions, and adapt to stresses by reorganizing, developing, and transforming to respond to changes in the socio-economic and environmental domains across temporal and spatial scales.

Adopting an integrated approach to ecology, the preservation of natural resources, and sustainable urban development—which includes services like drainage, water supply, sewerage, solid waste management, transportation, and energy—is the cornerstone of building a resilient and low-carbon city. These parameters on which a city can be made low carbon & resilient are as follows:-

- Local economic promotion & jobs
- Urban restructuring for socio economic growth, decentralization, economy of scale, better quality of life, mixed land use and compact urban form.
- Biodiversity and greenery
- Urban heal island mitigation
- Water conservation & management
- Decentralized and intelligent services
- Air quality
- Clean transport and transit oriented development
- Energy
- Green & resilient buildings
- Gender equity
- Low carbon lifestyle
- Local economic promotion & jobs

CASE STUDY – INDORE THE CLEANEST CITY OF INDIA

Indore the only smart city in country to trade carbon offset in International Market. Indore Municipal Corporation (IMC) has become the first civic body in the country to start generating revenue by selling carbon credits. It has generated revenue of 50 Lakh by selling credits against 1.70 lakh tones of carbon dioxide received from United nations framework convention on climate change (UNFCCC) under the verified carbon standard (VCS) programme.

<u>CLIMATE SMART CITIES ASSESSMENT FRAMEWORK ANALYSIS FOR INDORE</u>

Indore has been performing well under the CSCAF 2.0, particularly in waste management and urban planning. It ranked as the cleanest city in India for five consecutive years. However, there is scope for improvement in sectors such as energy and green buildings, and water management.

Emissions Scenario Modeling for Indore as published in WRI Report

According to the CIRIS tool's 2019 greenhouse gas emissions inventory, which

was created for Indore in accordance with GPC guidelines, the city's overall emissions were 3.6 million tonnes of CO2 e. Of these, stationary energy accounted for 59%, transportation for 30%, and waste management for 11%. Including emissions from industry and manufacturing, per person emissions came to 1.6 tCO2 e. Buildings used for commercial and institutional purposes account for the majority of these emissions, with residential buildings following closely behind. Of all emissions, emissions from the use of electricity make up 57%.

The business-as-usual emissions for Indore are projected to increase by 10% by 2025 and 18% by 2030, as compared with baseline emissions in 2019 Thus, the city urgently needs to implement the measures in order to achieve its vision of low carbon and climate-resilient development.

EMISSIONS SCENARIO MODELING FOR INDORE

Using the Climate Action for Urban Sustainability (CURB) tool, an interactive Excel-based tool created by the World Bank in collaboration with the Global Covenant of Mayors, C40 Cities Climate Leadership Group, and AECOM Consulting, an emissions scenario analysis was created. It aids in the development of emissions reduction goals for important industries, the evaluation of necessary investments, and the prioritization of low-carbon interventions according to factors like cost, payback time, viability, and the effect on energy use and emissions reduction.

This tool was used to develop three main scenarios:

- Business-as-usual scenario: In the event that no mitigation measures are taken, this estimates the decrease in GHG emissions. Emissions are predicted to increase 1.5 times in this scenario between 2019 and 2050.

- Existing and planned scenario: This scenario illustrates the city's trajectory for emissions reductions through 2050 using current or planned city, regional, and national actions, policies, and programmes. In comparison to the BAU scenario, the city could reduce emissions by 44% by the year 2050 if this scenario comes to pass. Achieving a 38% mode share for public transportation by 2050, electrifying 40% of 4-wheelers and 2-wheelers, 70% of buses, and 35% of electricity from renewable sources by 2050 are important goals.

- Ambitious scenario: The majority of the time, there is a big difference between the 1.5°C Paris Agreement and the 2020 Deadline trajectory and the current and proposed policies. This scenario examines the reduction in emissions brought about by bold yet doable actions. It may be guided by goals set by states, suggested projects, etc. Following stakeholder consultations with city-level experts, the targets were further evaluated. Under this scenario, the city could achieve a 78% reduction in emissions by 2050, mostly as a result of increasing rooftop solar adoption, energy-efficient building solutions for heating and cooling, and decarbonization of the electrical grid.

VULNERABILITY ANALYSIS FOR INDORE

- According to the city's vulnerability analysis, the mean temperature is predicted to rise by 1.3°C by the 2030s and 2.6°C by 2050 if current trends continue. By 2050, the city might experience up to 45 more warm nights, 32 more warm days, and a 22% increase in total precipitation if this trend line holds true.

- The weather in Indore changes significantly from year to year, especially in terms of rainfall. It is therefore necessary for this Smart City to be resilient to this natural variability even in the absence of anthropogenic climate change.

- The Indore region's records for the past few decades clearly indicate a trend towards higher temperatures and an increase in the frequency of high temperature extremes. •

- Climate projections indicate a tendency towards more frequent and intense rainfall as well as a strengthening of the observed temperature trends, especially with higher GHG emissions. The effects of climate change would be significantly lessened for Indore if global warming is limited to 2°C or less over preindustrial levels, especially in the second half of the century.

ES Table 1: CSCAF analysis *(Source: CSCAF data from the city)*

Overall Score as per CSCAF 2.0	Energy and Green Buildings	Urban Planning, Green Cover and Biodiversity	Mobility and Air Quality	Water Management	Waste Management
★★★★	★★★	★★★★★	★★★★	★★★	★★★★★
CSCAF 2.0 Score	330.5	404	362	350	581
Current measures being undertaken in the city	• 98% LED streetlights. • The city is promoting adaptive reuse of older buildings. • 65% of terraces of redeveloped buildings to have solar PV. • Pioneering a floating solar funding model	• 20% of the municipal area is under green cover. • Vertical gardens on the rivers/ nullah bridges, Miyawaki plantations being implemented.	• 10% of public buses run on low-carbon fuel. • Metro is proposed. • Clear Air Action Plan is in place. • Shared scooter service in the city.	• 629 traditional water supply sources along with wetlands being restored. • City has a water resources management plant and has identified future water demand.	• 100% of door-to-door collection. • 92% of dry waste is recycled • Bioremediation already in practice in Devguradia trenching ground, 550 TPD plant inaugurated in February 2022
Areas of improvement	• Reducing high Transmission and Distribution losses which is currently 24%. • Increasing power generation from RE sources. which is currently 0.8%.	• Inequitable green and open spaces. • Need to integrate green infrastructure within lake redevelopment.	• Augmenting bus fleet and NMT coverage • Improving last-mile connectivity • Increasing uptake of EVs particularly for shared mobility and public transport (10% of buses run on clean fuels)	• Reducing NRW (currently 30%). • Poor access of tap water, 46% as of 2019. • Increasing use of treated water (currently 11% wastewater is recycled)	• Biomedical waste treatment to be made scientific. • Capturing of methane gas from STPs.

Indore has been performing well under the CSCAF 2.0, particularly in waste management and urban planning. It ranked as the cleanest city in India for five

consecutive years. However, there is scope for improvement in sectors such as energy and green buildings, and water management.

CONCLUSION

Smart and environmentally friendly energy, water, sanitation, drainage, buildings with net zero carbon emissions, and transport are all components of a resilient and low-carbon city. All carbon emissions related to transportation, construction, industry, and buildings are offset by the excess energy produced from renewable sources. Through decarbonization, net zero energy development produces benefits for the environment beyond carbon neutrality. Jobs, diversity in urban areas, gender equality, digital planning and governance, the use of microclimatic design principles, and intelligent services are all encouraged in such a city. Resilient, low-carbon habitats require smart systems, innovative partnerships, and the best use of land and other resources.

References

1) A K Jain "Planning for a resilient and low carbon urban India". by, institute of town planners , india journal 19 x 1 , january – march 2022 ISSN:L0537 – 9679
2) Planning for low carbon and Livable cities in India: challenges and opportunities for smart applications. Institute of town planners , india journal 18 x 4 , october – december 2021 ISSN:l0537 – 9679
3) Peter f. Smith "Architecture in a climate of change 'a guide to sustainable design"
4) Ralph Horne "Housing Sustainability in Low Carbon Cities"
5) Https://www.nationalgrid.com/stories/energy-explained/what-are-greenhouse-gases
6) https://earth5r.org/indore-circular-economy/
7) https://epco.mp.gov.in/uploads/media/1__Indore_MPCAP.pdf