



ORIGINAL RESEARCH PAPER

Engineering

PLANNING URBAN INFRASTRUCTURE IN INDIA TO MITIGATE IMPACTS OF CLIMATE CHANGE

KEY WORDS: Climate change, urban infrastructure, regulatory measures, urban local bodies, climate proofing, resilient.

Dr. Jyotirmoy Sarma

Supertech Icon, Nyay Khand 1, Indirapuram, Ghaziabad-201014

ABSTRACT

In India, inhabitants of urban areas are facing adverse impacts of climate change. Such impacts include very high temperature in summer, drought, high rainfall and urban flooding, high air pollution, etc. To mitigate such impacts, there is an urgent need to take up infrastructure works and regulatory measures on land use, utilization of natural resources, etc. There is lack of scientific understanding amongst policy and decision makers, experts and concerned persons, on measures to be taken up to mitigate the impacts of climate change. Much research works are needed to derive and implement effective interventions. In the research paper, the author highlights some infrastructure works and regulatory measures that can be taken up for the purpose.

INTRODUCTION AND CONTEXT

Urban areas in India are facing adverse impacts of climate change such as unprecedented increase in temperature, extreme rainfall, flooding and draught, high air pollution, etc. As a whole, in the country, about 75% of the districts are affected by climate change. Urban areas are the key contributor to the climate change due to reduction of vegetation and green areas, high energy consumption by large number of vehicles and industries resulting in greenhouse gas emissions. In attempts to address the challenges posed by the climate change, serious attention needs to be given to works such as development and conservation of trees, parks, gardens, playgrounds, forests, lakes, wetlands, rivers, etc. Attempts on climate proofing of urban areas need to be made by adequate planning, design and operations of infrastructure and appropriate regulatory measures. It has become an urgent need that climate risks and climate policy are integrated into decisions on future infrastructure programs for urban areas.

PRESENT URBAN INFRASTRUCTURE DEVELOPMENT STRATEGY TO ADDRESS CLIMATE CHANGE

Due to increased awareness on climate change, Central and State Governments and urban local bodies in India have started incorporating some measures for climate mitigation and adaptation in development programs and schemes. At national level, in year 2008, National Action Plan on Climate Change (NAPCC) was initiated in response to the UN Framework Convention on Climate Change. The NAPCC includes 12 missions. They are National Mission for Green India, National Solar Mission, National Water Mission, National Mission for Sustainable Agriculture, National Mission on Sustainable Habitat, National Mission for Enhanced Energy Efficiency, National Mission for Himalayan Ecosystem, National Mission on Strategic Knowledge on Climate Change, National Wind Mission, Mission on Health, National Coastal Mission and the Waste-to-Energy Mission. Some of these missions are multisectoral in nature. As reported, the missions are affected by institutional, systemic and process barriers, financial constraints, lack of inter-ministerial coordination, lack of technical expertise, project clearance delays, etc. Also, performance of the missions is affected by top-down approach.

In addition to the NAPCC, there are state-level action plans on climate change prepared by respective states. Ministry of Environment, Forests and Climate Change (MoEFCC) of Government of India called on all the states to develop their climate action plans in line with the objectives of the National Action Plan on Climate Change. The State Action Plans on Climate Change (SAPCC) are intended to support environmental policy of Government of India by integrating climate change concerns into state level policies, plans and programs.

In addition to the above, some actions to mitigate impacts of climate change are taken up in large urban infrastructure development programs such as Smart Cities Mission and Atal Mission for Rejuvenation and Urban Transformation (AMRUT). Works under AMRUT mission are for improvement of water supply, sanitation and green space or park upgradation. Infrastructure works under Smart Cities Mission include information and communication technology based infrastructure, works for improvement of water supply and sanitation, preservation of open spaces, development of parks, rain water harvesting, solar power generation, etc. A few works implemented in such programs have partially addressed the real issue of impacts of climate change. The programs are mainly for providing urban infrastructure to improve quality of life of citizens. Climate change issues are not main targets. In addition to the above programs, some large urban local bodies in India have initiated specific works to address climate issues. Such works include, the Heat Action Plan by Ahmedabad Municipal Corporation, Early Warning System for floods developed by Surat Municipal Corporation, Rain Water Harvesting for recharge of borewells in Solapur, etc.

RECOMMENDED STRATEGY AND ACTION PLAN:

Present approach for development of urban infrastructure definitely needs to be changed to incorporate actions for mitigating climate change impacts and climate proofing of infrastructure. Climate proofing requires that infrastructure are designed, planned and built keeping in mind the environmental alterations that will take place due to climate change. Simultaneously, urban infrastructure works also need to be planned and designed to mitigate climate change impacts in urban areas. To address climate change issues, urban Infrastructure planning should be based on ecological considerations and adoption of nature based solutions. Works to mitigate impacts due to climate change can include the followings:

- i) Works for preservation of natural ecosystems. Such works are to be treated as essential urban infrastructure. Adequate investments are to be made towards restoration and rejuvenation of the natural ecosystems. The works need to protect hydrological and ecological elements of the urban landscape.
- ii) Infrastructure works with the following purposes and methods:

Reduction of ambient temperature in urban areas and urban heat island effect by planting trees, building green roofs, vertical gardens, lawns, hedgerows, parks, and forests.

Lower building energy demands

- by shading building surfaces.

- Rehabilitation of water supply systems to reduce leakages in pipelines and adoption of measures to reduce water demand. Such works will ease water scarcity and pressure on existing water sources.

- Reduction of rainwater flows into sewer systems.
- Work to improve energy efficiency through solar power and solar water heating.
- Utilise energy-efficient appliances and equipment to reduce energy consumption.
- Works for management of water bodies like rivers, canals, ponds, wetlands, floodplains, water treatment facilities to protect and improve urban water quality.
- Works for reduction of air and water pollution.
- Works to increase permeable areas, bioswales, permeable pavements, engineered wetlands and absorbent landscapes.
- Holistic and sustainable stormwater management through onsite detention and retention methods, holistically integrate canals, drains and reservoirs with the surrounding environment to improve the quality and aesthetic value of streams, rivers and lakes.
- Treatment of drain water through constructed wetlands, sedimentation basins, vegetated swales, bioretention swales, etc.
- Conduct public campaigns on the benefits of climate resilient infrastructure.

(iii) Management within Construction Sector: Apart from taking up infrastructure works, actions within the construction sector need to be taken to manage climate change challenges actively. Such actions are:

- Use of lower carbon intensity of building materials in the upstream production process of construction materials.
- Ensure of climate-smart, low, and clean energy consumption in use phase of real estate and infrastructure.
- Design and use of more recyclable materials for high recirculation of building materials.
- Increasing the durability of materials against extreme weather conditions.
- Overhauling of heating, cooling and insulation concepts.
- Utilisation of smart water management systems during the construction and use phases of buildings.
- Lowering the potential negative effects of the construction sector on the environment from soil sealing. This will have to be achieved by innovative designs in the construction sector.

iv) Modification of Design Codes

There is an urgent need for modification of design codes as most of existing codes and standards do not take climate change scenario into account. This modification work is time consuming and not easy. Much research works will be necessary for modification of existing codes and standards.

v) Institutionalize Appropriate Urban Framework: In India, urban local bodies (ULB) are recognized by the constitution as the primary planning agency in urban areas. Therefore, ULBs must be empowered to take decisions on taking up climate resilient infrastructure and provided adequate access to funds. Such effort will have to be incorporated in masterplans of cities and urban areas. For taking up climate resilient infrastructure by ULBs, capacity building and training of their staff will be necessary.

vi) Generation of Digital Data of Urban Areas: Digital data of existing infrastructure, natural resources and eco-systems in urban areas should be generated, which will be useful for planning of climate resilient infrastructure. Advanced training must be imparted to staff of ULBs and concerned agencies to

generate such data. Such generated data can be integrated into a national level data bank or depository.

vii) Sustainable Land Management and Control Regulation: Climate change cannot be mitigated only by taking up infrastructure works. This will have to be coupled with sustainable land and natural resource management strategies and regulations. Management of land and natural resource and their effective regulations are critical to alleviate climate change impacts. These are essential to achieve environmental sustainability and climate proofing of urban areas.

xiii) Reducing Emissions by Carbon Pricing: Carbon pricing reflects the environmental externalities of producing and consuming carbon intensive products and creating an incentive to invest in low carbon alternatives. Carbon pricing scheme need to be initiated in urban areas for new infrastructure including public buildings, mass transit systems, etc. Such effort will be useful in reduction of emission of greenhouse gases.

CONCLUSIONS:

Mitigation of climate change impact and climate proofing of urban infrastructure are essential duties of Governments at different levels starting from Central Government to urban local bodies. Therefore, ongoing and upcoming infrastructure development programs need to include project components for the purpose. Such programs will have to achieve the dual objectives of providing essential infrastructure combines with measures to address climate change issues faced by people. Also, new infrastructure programs solely for mitigating for climate change impact need to be initiated. Apart from infrastructure works, climate change challenges are to be addressed by effective regulations of land use, natural resources, etc.

Disclaimer: The findings and conclusions presented in the paper are personal opinion of the author.