

# Climate Change Mitigation and Adaptation through Nature Based Solutions - Select Case Studies from Indian Cities

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Climate change is a global phenomenon with several ramifications, including sea level rise, increase in extreme weather events such as floods, droughts and storms, air pollution and the spread of tropical diseases. Right now almost half of the world's population lives in urban areas. They consume three fourth of the energy production and account for almost equal share of global CO<sub>2</sub> gas emissions. In case of India, urban areas contribute to nearly 44% of India's carbon emissions, driven by transport, industry, building and waste<sup>1</sup>. Since, most of the cities are densely populated and located either in coastal or floodplain areas, rise in sea level or frequent floods have huge impacts on cities' basic services, infrastructure, housing, human livelihoods and health. At the same time, most of the cities are dependent on distantly located water resources, even a small drought creates water crises for cities. The other consequences of climate change are urban heat island effect and air pollution which has increased the risk of health hazards in cities.

Past experiences suggest that there are no shortcut solutions for climate change. Therefore, government across the countries, states and cities are devising innovative and nature based approach to mitigate the negative impact of climate change. They have recognized the role and contribution of urban areas to achieve its climate commitments and improve climate resilience, like decentralized waste management, smart mobility, reducing GHG, energy efficient equipments, green buildings; biodiversity, green cover, installation of solar panels, etc. Similarly, India's National Climate Action plan (NDC) aims to reduce Green House Gas emissions by 45 percent by 2030, from 2005 level and achieve about 50 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030<sup>2</sup>.

Since last few years, many of the city governments have prepared nature-based comprehensive plans for climate change mitigation and adaptation. Based on those plans few initiatives have already been

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taken in many cities. In this article, we will discuss following two '**Nature Based Solutions**' projects which have been prepared by our city governments.

1. Blue-Green Masterplan of Delhi
2. Rajkot City Climate Change and Environment Action Plans

### **1. Blue-Green Masterplan of Delhi**

Improving the Blue-Green Infrastructure (BGI) in cities is now becoming an important component for climate change mitigation at city level. BGI aims to enhance the ecosystem services, biodiversity and water management in urban and rural environments. The blue-green infrastructure is relatively a new approach and primarily focuses on sustainable urban living and planning.

As defined by the European Commission, BGI is a multifunctional planning approach to address the challenges of Climate change both at local level and global level<sup>3</sup>. It focuses both on the blue (water) or the green (vegetation) elements. The Green-based projects aim to increase the vegetation density (such as trees, parks, gardens, playgrounds and forests) in urban areas including the growing sector of greening buildings. In blue-based projects emphasis is given on sustainable water management through water conservation and waste water treatment in the cities.

Keeping in view the future environmental and developmental challenges of National Capital Region, Delhi Development Authority (DDA) has recently drafted a Master Plan of Delhi (MPD)-20414. This Draft Report aims to build a sustainable "green and blue" infrastructure in the national capital to curb local sources of pollution such as dust from construction sites and vehicular emissions, as well as redeveloping the city's forest and green cover and its water bodies. According to this green and blue concept, water bodies and land are interdependent and grow with the help of each other while offering environmental and social benefits<sup>5</sup>, which are currently missing in Delhi. Notably, the environmental strategies cannot be treated in isolation with other segments; instead, they align with transport, heritage and industries to address overall environmental issues. The new MPD recognizes the existing voids in environmental strategies. As per new strategy, rejuvenating of river Yamuna floodplains includes creating greenways along the drains' buffer and sensitively converting those into public waterfronts along water bodies previously neglected.

MPD draft has comprehensively laid out strategies to redevelop,

enhance and preserve the green-blue assets in the city. Few of them are as follows:

1. Comprehensive framework to treat green and blue assets (natural and planned) as green-blue infrastructure to facilitate better continuum and strategies for tackling pollution.
2. Protection and enhancement of natural assets with public interface.
3. Creation of new city-level assets - greenways along natural drains, repurposing underutilised sites and wastelands as green-blue assets.
4. Greening of plots/buildings and introduction to Green-Blue Factor (GBF) for plan approval.
5. Improvement of parks and provision for special abilities parks.
6. Dedicated Green Development Area for incentivizing large-scale implementation of green economies, clean energy generation and promoting green developments.
7. Unified institutional framework for mobility management.
8. Transit-oriented development aligned with mass transit.
9. Identification of strategic mobility corridors.
10. Focus on improving walking and cycling.
11. Encouraging mainstreaming electric vehicles and other green mobility options.
12. Variable parking norms linked to availability of public transport, earmarking space for electric vehicles, parking and parking management.
13. Multi-modal integration (including development of multi-modal hubs) and facilitation of first and last mile connectivity.
14. Integrated water resource management (combined policy for water supply, wastewater management and storm water management) for long term water security.
15. Rationalisation of supply norms for water INF1 Norms for decentralisation of wastewater treatment, recycling of wastes and maximum reuse of recycled water and solid waste.
16. Production and use of clean energy.

17. Provision for community level water harvesting and aquifer recharge facilities.

## 2. Rajkot City Climate Change and Environment Action Plans

Rajkot is one of the important cities in the western state of Gujarat. As in the many parts of the Globe and India, the average temperature is rising in Rajkot. Increase in temperature due to climate change is affecting the health, livelihoods and productivity of the vulnerable population in Rajkot city. Therefore, it is critical for the city government to adapt a comprehensive action plan to reduce/mitigate the consequences of rising temperature. This year Rajkot District has prepared a comprehensive Climate Change and Environment Action Plan (CCEAP)<sup>6</sup>. With this Rajkot is emerged as an important climate player amongst Indian cities. The CCEAP of Rajkot has been developed in collaboration with the Climate Change Department, Government of Gujarat and Gujarat Ecological Education and Research (GEER) Foundation, Forests and Environment Department, Government of Gujarat.

The CCEAP bring forth a comprehensive set of recommendations for various climate-relevant sectors and environmental issues of the districts, along with case examples and estimated mitigation potential. The main objectives are as follows:

- Reducing energy consumption by;
  - (a) Increasing the share of RE generation in the district by advancing on-grid and off-grid solar rooftop, ground-mounted installations and other RE installations;
  - (b) Encouraging faster penetration of energy efficient, star-labeled fixtures and upgrading existing power-grid infrastructure to advanced metering infrastructure (in public, institutional and commercial setups);
  - (c) Promoting energy efficiency in the residential sector by encouraging the incorporation of ECBC in the building bye-laws, implementation of India Cooling Action Plan, 2018, etc.; and
  - (d) Promoting energy conservation in the industrial sector by introducing measures such as a “cap and trade” system for MSMEs at the district level, encouraging industries to follow the Gujarat Industrial Policy, 2020, etc.
- Adopting a holistic approach to water conservation and wastewater management, including conservation techniques such as rainwater harvesting, net zero water infrastructure,

minimising losses in water supply, installing water-efficient fittings, water metering and adoption of inclusive and sustainable water governance.

- Developing extensive infrastructure to monitor air pollution and suggestions on interventions for preventive measures.
- Restricting methane emissions by reducing landfill disposal of waste and managing wastewater
- Reducing GHG emissions from them through measures such as:
  - (a) Reducing waste at source;
  - (b) Proper segregation, collection and channelisation of different categories of waste (including bio-medical waste and e-waste) for recycling and treatment;
  - (c) 100 percent conversion of organic waste to compost and gas management of composting units;
  - (d) Recycling, recovery and reuse of 100 percent inert waste (plastic, construction waste, etc); and
  - (e) Setting up of centralised aerobic wastewater treatment plants with closed sewer networks and periodical sludge removal facility.

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