

Cities Adaptation for Climate Change - Issues, Challenges and Opportunities

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Our world is increasingly becoming urban. The growth of cities is inevitable in the near future. Technological advances, comfortable lifestyle, new and better job opportunities and a popular notion that cities can always sustain one's life will continue to lure more and more people towards cities. Cities are energy-intensive and transform land use in and around them and play an important part in the overall phenomena of emissions of green house gases, in turn leading to global warming and subsequent climate change as they house great industries, automobiles and vehicles. 3/4th CO₂ released in the world is from the urban areas and cities are responsible for 26 % of direct greenhouse gas emissions. Research from all over the world has proved that urban development is a key contributor to climate change. Current urban development patterns encourage sprawling and auto-dependent development leading to increase in the GHG emissions and consequent climate change.

The risks from climate change are many, and vary from region to region. Sea level rise, glacial lake out burst; rainfall extremes involve risks of flooding. Some regions would face reduced rainfall whereas some would witness increase in incidences of extreme events. Urban areas would experience heat waves, particularly the enhanced heat island effect. Projected impact on coastal cities are even worse – loss of coral reefs, beaches, loss in tourist activities, floods and storms which would lead to complete devastation of settlements and livelihoods. Tropical areas with warmer temperature are projected to face incidences of malaria, dengue and filariasis.

Indian cities are predicted to be at high risks due to climate change. This situation is accentuated due to expected 500 million people which are predicted to be added in 7000 urban settlements by 2060 (McGranahan and Mercurtollio, 2007). The predicted regional temperature rise along with the changes in the global climatic system would alter the monsoon system leading to increase of 7 to 20 % in the mean annual precipitation. A 10 to 15 % increase in monsoon precipitation, a decline of 5 to 25% in semiarid and drought prone central India and a decline in winter rainfall in northern India is also projected (Revi, 2008). The risks include decline in winter rainfall in northern India (Rupa Kumar et al., 2006), extreme precipitation events near the west coast (including Mumbai) and central India (Rupa Kumar et al., 2006) and a mean Sea Level Rise (SLR) up to 0.8 meters over the century (Aggarwal and Lal, 2001). In addition, hazards like expected cyclones and storm surges and glacial melt would result in high losses in infrastructure, livelihood and population. Expected increase in incidences of drought due to climate change leads to increased seasonal migration from rural to urban areas. These migrants in turn form the most marginalized and highly vulnerable groups in cities having limited skills, education, capital and limited social and economic mobility. Besides this, extreme precipitation-led floods have earlier caused large economic losses, particularly in State of Gujarat, and City of Mumbai. Earlier such events caused great losses of people, buildings, lifeline infrastructure and economic assets across ten coastal and six inland districts including number of towns and cities (TARU/BMTPC, 2000). Cyclones and storm surges could have devastating impact on coastal

metropolitan cities of Mumbai and Chennai, million-plus cities of Vishakhapatnam, Surat, Bharuch, Bhavnagar, and Jamnagar. Vulnerable stretches to sea level rise lie along the western coast, Mumbai, parts of Konkan coast and South Kerala. Significant settlements would be lost in the deltas of Ganga, Krishna, Godavari, Cauvery and Mahanadi on the east coast.

These risks pose challenge to resource management and infrastructure planning and display urgency of the need to adapt city level operations to both current climate variability and future climate change. As against mitigation, which is primarily greenhouse gas reduction, adaptation is a fast emerging issue towards responses to climate change. This is because the cities that are greatly impacted by climate change are not the ones which are high emitters of greenhouse gases.

Intergovernmental Panel on Climate Change 2007 describes adaptation as adjustment in natural or human systems in response to actual and expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities. Primarily three types of adaptation interventions exist. Anticipatory adaptation, also known as proactive adaptation, is the approach where adaptation is anticipatory to the impacts of climate change. Autonomous adaptation is spontaneous adaptation, which does not involve a conscious response to climate stimuli but is triggered by either ecological or human system changes. Planned adaptation involves deliberate policy decision based on the understanding that conditions have changed or are about to change and an action is required to either return to the original state or maintain the present state to avoid any further harm. At an operational level though, as Hannah et al. (2007) describe, the interventions involve technological changes, behavioral changes and policy decisions to support them. In the context of cities the intervention involves targeting land use, infrastructure, transport, and social and economic security.

The following interventions are particularly important in cities' adaptation:

- Relocation of residential population and economic activities to less vulnerable parts of the urban area
- Channelization of investments and new land uses towards less vulnerable areas
- Assisting poor and informal settlements to vacate vulnerable areas
- Sea surge protective barriers and dams
- Reconstruction of harbor facilities
- Building flood barriers and tsunami-prevention facilities
- Land use planning and building codes that internalize climate change constraints
- Use of vegetation and light colored surfaces reduce heat island effect
- Use of suitable design techniques to reduce energy consumption
- Climate proofing of infrastructure systems
- Protection/relocation of waste management facilities
- Hydro-geological consolidation work - flood defense system
- Emergency preparedness mechanisms
- Health facilities

The issue of institutional setup to support adaptation is one of the foremost to confront while planning adaptation interventions. This holds particularly true in the Indian context as there are many challenges and development priorities that need to be addressed and climate change adaptation is not amongst them presently. However, the awareness and willingness towards this has increased and is reflected in India's National Action Plan for Climate Change (NAPCC) which clearly articulates adaptation as an important area of intervention for

Indian cities and towns. However, institutionalizing adaptation in Indian cities is necessary as well as is a challenge due to the following:

- Lack of understanding of the impacts of climate change and the fact that adaptation interventions are best employed and covered at the local level
- Creating awareness amongst the local government that adaptation is synonym to their functions and their development goals
- Translation of global impacts of climate change to local level has been missing
- Already pressing development pressures might overlook adaptation issues
- Lack of capacity within the local government
- Development plans of cities do not factor climate change related factors
- Integrating adaptation at municipal level would be difficult because of the perception of contest for budget
- Lack of data and modeling framework at the city level

There is therefore a strong need to understanding impacts of climate change on Indian cities and assessing interventions to counter these impacts. The cities should be made resilient to climate extremes. This brings forth the need to mainstream adaptation in local governance. There is also the need to understand what adaptation planning entails, and how its components are in line with the development priorities of an urban area. This is also to understand that adaptation planning at city level is not a hindrance; rather it is an essential component of sustainable development and growth. Substantial research and development effort is required to better understand city specific impacts of climate change and to be able to design precise adaptation plans for them. The need is to recognize urban areas as important areas for research and identify the components for adaptation.

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