LIVING ON THE EDGE

CLIMATE CRISIS
ACTION FOR TROPICAL COASTAL CITIES

MUMBAI first
To make the city a better place to live, work and invest in

CSIR NEERI
Knowledge Partner

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1. BACKGROUND

Climate change has rapidly, and undeniably, become the defining issue of our times. From shifting weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change have put humankind at the crossroads where the decisions of today will shape the immediate and long term future of the world.

Climate change catalysis and amplifies the scale of natural disasters and it is attributed directly or indirectly to human activity. Temperatures of both,the ocean and atmosphere are higher than they have been in the last five centuries and climate patterns the world over have been more erratic and unpredictable since the turn of the millennium.

Drawing on global trends from climate scienceand knowledge-sharing platforms, there is an urgent need to come together to mitigate the impacts on all facets of human life and well-being. Within this effort, thematic areas of impact warrant special attention - the most central of which is the impacts of climate change on urban populations. Cities, the engines of mankind, are home to over half the world's population and will continue to grow rapidly in the decades to come. Consequently, any approach towards making cities resilient, must identify and focus on key material issues and stakeholder groups to find holistic, inclusive, and sustainable roadmaps for the future. With a peninsular coastline of 7,500km, climate change is set to become an increasingly important, strategic, economic, and political concern as it starts to eat into India's high economic growth rates and affect the lives and livelihoods of millions of people.

Tropical coastal megacities with rapid growth like Mumbai were identified by the Stern Review as being at high-risk from rising sea levels. More generally, low-income countries have a large proportion of the world's population, most at risk from the effects of climate change. In low-elevation coastal zones, urban settlers account for the larger share of these populations at risk.

Every monsoon, Mumbai and cities in the Mumbai Metropolitan Region (MMR), suffer from chronic flooding and a cyclic loss of property, productivity and human life that seems to grow exponentially. This region is especially vulnerable, given its high population densities, and large investments situated in low lying areas, and predominantly reclaimed land that is surrounded by the ocean on three sides. With a population in excess of 20 million, Mumbai accounts for approximately 17% of the national GDP and contributes about a fourth of its industrial output.

Vulnerabilities in the MMR vary for different stakeholder groups based on several factors. One of the most striking realities is that 60% of the population lives in informal housing and have poor access to basic urban services compared to their counterparts in the formal city. In contrast, this aspirational city is working tirelessly to modernize and improve the qualities of life for millions. Inevitably, it remains intertwined with broader political, social and environmental contestations, and is equally enmeshed in layers of colonial and postcolonial pasts while engaging with contemporary challenges of climate change, resilience and sustainability. The distribution of vulnerabilities and environmental risks are mediated not only by biophysical conditions and technical responses but also by social capacities and inequalities, which differ from house to house (Tonkiss, 2013).

2. CLIMATE CHANGE AND THE ENTANGLED URBAN

Agriculture

The climate change impacts on agriculture will be one of the important deciding factors influencing the future of global food security. Coastal urban agglomerations like MMR also tend to have a sizable share of agriculture. The variation in the inter-annual rainfall can adversely impact crop yield. A study done by the Indian Agricultural Research Institute (IARI) indicated that with the rise of 1 °C of temperature, there will be a reduction of 4-5 million tons in wheat production in the country.

Health

The United Nation warns that risks to human health due to changing climate are on the rise across the globe. The changing climate increases the duration of transmission season and expands the spatial range of many diseases like dengue and malaria and may change the distribution of vector-borne diseases (malaria & dengue) and increase their expansion to new regions. Overall death rates, diseases and injury due to various extreme events (i.e. heat waves, storms, forest fires, floods and droughts) will magnify proportionally.

Losses have been computed using disability-adjusted life years (DALYs) for all the major illnesses likely to impact the population. Incidence of all these illnesses will increase steadily with increase in income loss; a sharp increase is likely from 2045 to 2055. By 2050 the cumulative income loss due to malaria, diarrhoea and leptospirosis, is estimated at 155, 597 and 2401 crores rupees, respectively.

Infrastructure

Climate change is likely to impact infrastructure sectors like transport networks (roads, rail etc.), construction and allied industries. Built infrastructure is also vulnerable to flooding and sea-level rise. Climate change-related events will inevitably raise the socio-economic costs of these infrastructures. Every year during the monsoon period, the suburban rail and bus services in the Mumbai are heavily disrupted, impacting millions.

Women and Climate Change

Several studies have demonstrated that impacts of changing climate disproportionately affect women and exacerbate gender-based inequalities. (Manata & Papazu, 2009; Arora-Jonsson, 2011). Women are also more susceptible to health implications of climate change. According to the World Health Organization (WHO) pregnant women are at higher risk from climate change leading to an increase in maternal death, spontaneous abortion, premature delivery, stillbirth and low birth weight.

In low-income geographies, girls are more likely to drop out from schools to assist in domestic chores in the aftermath of disasters (Nishat & Rahman, 2017). In most of the developing countries, women must walk a long distance to fetch clean water for their families. During the dry season in rural India and Africa, 30% or more of a woman's daily energy intake is spent fetching water. Carrying heavy loads over long periods of time causes cumulative damage to the spine, the neck muscles and the lower back, thus leading to early ageing of the vertebral column (Seaforth, 2001).

Women in coastal and rural areas in developing states are particularly vulnerable because they are highly reliant on the coastal natural resources to sustain their livelihoods (Boetto & McKinnon, 2013). The cyclone in 1991 caused 140,000 deaths in Bangladesh. 90% of the victims were women (Aguilar, 2004). The World Health Organization universalized the vulnerability of women by explaining that “Globally, natural disasters such as droughts, floods, and storms kill more women than men, and tend to kill women at a younger age” (WHO,2014).

Urban Poor

With an increase in urbanization the population of the urban poor is continuously growing in developing countries. Climate change and crop failure exacerbate rural-urban migration. Informal settlements are frequently located in regions most exposed to the impacts of changing climate, notably steep slopes, low-lying areas and ravines. Their houses are of poor quality and have a low resistance to extreme weather events. The poor communities have a limited adaptive capacity as the changing climate affects the human settlements and these communities cannot afford the improved adaptive measures. Therefore, adaptation to moderate impacts on the urban poor should be an urgent part of the adaptation agenda.

Fisheries

Small scale and artisanal fishing communities in developing countries are highly vulnerable to the impacts of climate change. The number of people directly employed in fisheries and aquaculture is estimated at 43.5 million, of which over 90 % are small scale fishers (FAO, 2005). The vulnerability of these fishing communities is due to their geographical location as well as their poor economic condition. As the fish farming communities are located near the coast, they are more exposed to extreme weather events, such as cyclones, floods, sea-level rise, hurricanes and coastal erosion.

For centuries, the Kolis, an artisanal fishing community, has lived in fishing villages along the coast of Mumbai and MMR. The changing climate is directly affecting the livelihood of the Koli community by changing the weather pattern and altering fish behaviour. According to the World Economic Forum, India's coastal water temperatures have increased by half a degree, due to which the number anchovies fishes become very low, sardines fishes are migrating to cooler waters, while others still are moving into deeper waters (mackerel), where the fishermen don't have the deep sea fishing equipment to reach them. The destruction of coastal ecosystems, coastal erosion, and destruction of mangroves have resulted in the depletion of fish stock and diversity.

The Koli's are going through a radical change in terms of their occupation due to the increasing demand for commodities, which has led to inflation and environmental problems, further affecting their livelihoods. Increasing demand for fish has attracted mechanized trawlers which have made it difficult for the Kolis to remain competitive while maintaining their sustainable ways of life.

Dying Oceans

Anthropogenic greenhouse gas emissions have caused a rise in the global surface temperature of approximately 1°C resulting in mass coral bleaching. According to the International Union for Conservation of Nature (IUCN) reefs across the world have suffered from mass bleaching. Iconic reefs such as the Northwestern Hawaiian Islands (United States) and the Great Barrier Reef (Australia) have faced their worst bleaching on record with shocking effects. For instance, in the year 2016-17 the bleaching of the Great Barrier Reef, killed around 50% of its corals. In the first scientific assessment report published by UNESCO (Heron et al., 2017), predicts that the coral reefs in all 29 reef-containing world-heritage sites would cease to exist as functioning coral reef ecosystems by the end of this century if the emission of anthropogenic greenhouse gas emission continued unchecked. According to the World Wildlife Fund (WWF), the estimated loss of reef ecosystems due to changing climate will cost 500 billion USD per year by 2100 (Hoegh-Guldberg, 2015).

Marine biologists have recently discovered a multitude of corals, crustaceans, bivalves, arthropods and other marine life along Mumbai's coastline and have begun to document these treasures to make a case for their conservation.

3. ACTION AND ADAPTATION

The IPCC defines adaptation as comprising of actions taken to reduce the adverse effects of changing climate, e.g. relocating the people living near the seashore to tolerate the effects of rising of sea level, or planting crops that can withstand higher temperatures. Mitigation includes the measures to decrease the emissions of greenhouse gases (GHGs) that cause a change in climate, e.g. by switching to renewable energy sources (i.e. solar, wind, nuclear) in place of burning fossil fuel in thermal power stations.

Parties to the UNFCCC through its Paris Agreement identify that adaptation is a major global challenge. Adaptation is a critical global response to changing climate to protect people, livelihoods and ecosystems. Parties acknowledge that adaptation action should follow a country-driven, gender-responsive, participatory, and fully transparent approach. It should be inclusive and account for vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions.

Adaptation to extreme climatic events like coastal floods is critical because of the multifaceted nature of related causes and impacts, which will be further exacerbated due to the rising population and changing climate (Jongman 2018). The primary objectives of flood adaptation strategies are to minimize the impacts on various sectors such as infrastructure, human health, water quality and transportation (Wilby and Keenan 2012). Adaptation approaches in a developing country like India can bring in immediate community benefits (Mathew et al. 2012) which can lead to a reduction in future impacts of climate change and flooding.

National Action Plan on Climate Change (NAPCC):

The NAPCC outlines various steps to simultaneously improve India's development and achieve objectives of adaptation and mitigation related to a changing climate. There are eight thematic National Missions forms the core of NAPCC that include clean energy, sustainable habitats, water, afforestation, sustainable agriculture and knowledge-sharing platforms.

4. INTERNATIONAL LEGAL FRAMEWORKS AND POLICIES

There were 72 climate laws and policies in 1997 but now the number has increased to 1,500. According to UNFCCC, presently, there are 192 Parties to the Kyoto Protocol. Kyoto Protocol sets compulsory emission reduction targets for 36 industrialized countries and the European Union. During the period 2009-2015 that included the Copenhagen climate summit and ended with the Paris Agreement, between 100 and 143 new climate change laws were passed every year. A report entitled “Global trends in climate change legislation and litigation: 2018 snapshot” indicated that all 197 signatories to the Paris Agreement explicitly address climate change or transitions to low-carbon economies in national laws or policies.

5. CONCLUSION

The world is facing the crippling effects of climate change. This has mandated an urgent and immediate response across the globe. Increasing urbanization and industrialization, particularly in developing economies are often at cross purposes with mitigation measures. Yet, many such countries have ambitious policies to reduce GHG emission. The UNFCC and the Kyoto Protocol provide a basis for international co-operation, along with a range of partnerships and other approaches. At the heart of this movement is international cooperation, indicative of a threat and response that will determine the collective future of all mankind.

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