



Climate Change and **Cities**

Climate Change will have an impact globally, but the majority vulnerable areas are the urban areas. They are also the ones contributing the most to global warming. Cities have to take initiatives to reduce GHG emissions and grow on a sustainable path. This factsheet informs the readers about the changes taking place in cities and how they are dealt with by different authorities. Along with mitigation, the cities also have to adapt to the probable impacts of Climate Change. The plan for mitigation and adaptation should ideally be a municipal authority initiative which encompasses the needs of all kinds of stakeholders. The city should start with measuring emissions and setting targets and then move on to reducing GHG emissions. For adaptation, they should start with risk assessments and then develop sustainable adaptation plan. It should be noted, however, that it is vital to build capacities of the local authorities to ensure Climate Change responses are integrated effectively in city level planning.

Climate Change is affecting cities and their residents, especially the poor, more severe impacts are expected as climate extremes and variability increase. Cities are often already overwhelmed by the number and complexity of services they need to provide. Adding Climate Change mitigation and adaptation to the other challenges facing cities is an enormous burden; and at the same time cities must accommodate another three million new residents every week. Climate Change threatens all countries, with developing countries being the most vulnerable. Developing countries are likely to bear 75 percent of the costs of damages produced by Climate Change. Even a 2°C warming above preindustrial levels could result in permanent Gross Domestic Product (GDP) reductions of 4 to 5 percent in Africa and South Asia.¹

The impacts of Climate Change are already evident. According to the latest Intergovernmental Panel on Climate Change (IPCC) report, the average global temperature has increased by 0.76°C and sea level has risen by 17 cm since the 19th century². The key CC related impacts are presented in Figure 1.

Cities all over the world have started the rigorous activity of strengthening the city against Climate Change. Here are some examples from all over the world and country.

City of Melbourne - Climate Change Adaptation Strategy³

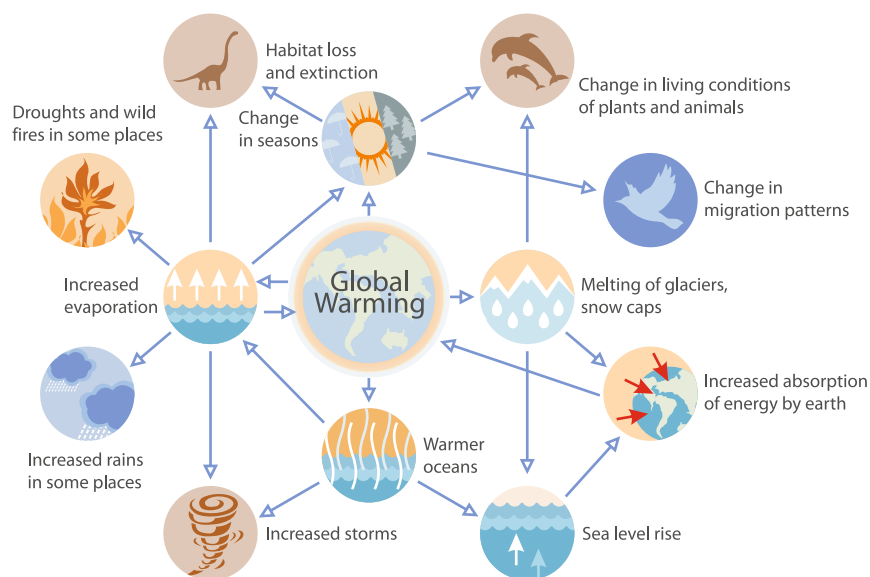
Four potential extreme event scenarios for Melbourne were identified that together embody the range of Climate Change risks for the municipality. These are:

- Reduced rainfall and drought;
- Extreme heat wave and bushfire;
- Intense rainfall and wind storm; and
- Sea level rise.

Impacts or risks occurring due to climate events often have cascading consequences or implications. A comprehensive Climate Change risk assessment was undertaken by the city of Melbourne, wherein each risk was assessed on a scale of ten based on the likelihood of the risk occurring and the potential cascading consequences of the risk mapped out (see Figure 2). For instance, for flash flooding and inundation occurring due to intense rainfall event, road traffic blockages and disruption of train or tram services were initial

Figure 1
Impacts of Global warming

Adapted from : <http://epa.gov/climatechange/kids/basics/concepts.html>



consequences identified (implications-1). These can result in mass passenger stranding, pedestrian congestion and hindrance in emergency services (implications -2) which can further lead to issues in public safety and health or loss of life.

Based on the risk assessment exercise, the city narrowed down to two most significant extreme weather events having critical risks-extreme heatwaves and intense rainfall. This approach helped the city develop its adaptation or risk management strategy to prioritize effective or 'high value' interventions.

Two key adaptation measures identified having the 'highest value' for the two significant climate events, in the sense that they reduce multiple risks across numerous scenarios are:

- Expansion of stormwater harvesting and re-use: This measure is a valuable resource assisting in both flash flooding events and insufficient water supply. Additional capacity in stormwater harvesting can also put less pressure on drainage systems during intense rainfall events.
- Increasing passive cooling efficiency across the city: The heat island effect in Melbourne city substantially heightens the vulnerability of people in the city to heat stress and other health impacts along with higher cooling energy demand. Measures to reduce the city temperature, both inside buildings and at street levels, can provide considerable benefits in reducing risks from extreme heat events.

Two other high value adaptation measures identified were developing more sophisticated communication and warning systems, and community knowledge and

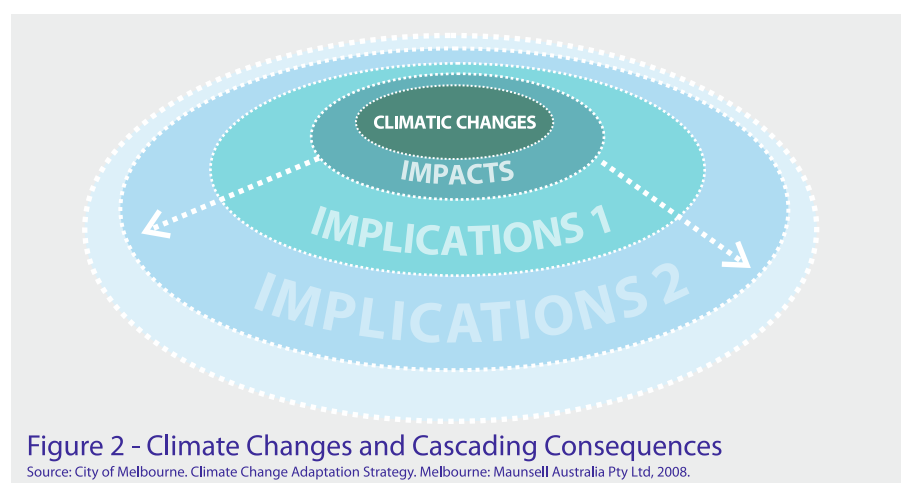


Figure 2 - Climate Changes and Cascading Consequences

Source: City of Melbourne. Climate Change Adaptation Strategy. Melbourne: Maunsell Australia Pty Ltd, 2008.

¹ World Bank. *Cities and Climate change: An urgent agenda*. Washington : The world bank press, 2010

² IPCC. *Climate Change 2007: The Physical Science Basis*. Contribution of

Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge : Cambridge University Press, 2007.

³ City of Melbourne. *Climate Change Adaptation Strategy*. Melbourne : Maunsell Australia Pty Ltd, 2008.

capacity building. The city is undertaking specific actions in line with the high value adaptation measures, such as the 'Heat Wave Response and Action Plan' which includes a retrofit program to make commercial buildings in the municipality climate resilient as well as mitigating carbon emissions; commissioning research on 'Cool or White' roofs to reduce heat intake in buildings; and developing a state of the art GIS based inundation visualization tool.

Copenhagen Climate Adaptation plan⁴

The aim of the Copenhagen climate adaptation plan is to protect the city, its citizens, the business community and the city's many assets while also acting as a development plan, focusing on opportunities. The plan is developed to deal with uncertainties over the expected climate change and establishes flexible solutions, which take account of both the timing and potential damage.

The city of Copenhagen sets a priority based approach to select the right adaptation measure, depending on the scale of the climate induced risk (see Fig 3).



Figure 3 : Risk based prioritization approach for Adaptation Responses

Adapted from: City of Copenhagen. "Copenhagen Climate Adaptation Plan." Copenhagen, 2011.

If the risk of damage resulting from the climate is unacceptably high, it is the strategy of the City of Copenhagen to choose first and foremost those initiatives which prevent the damage. This is climate adaptation level one, where you can find, amongst other actions, the building of dykes, building higher above sea level, the expansion of the sewers' capacity and local management of rainwater. If it is impossible, for either technical or financial reasons, to prevent the damage, those initiatives which minimize the extent of the damage will be prioritized.

This is level two, where warning systems for rain, establishing waterproof cellars and adapting areas where rainwater can be stored are taken. Those measures which reduce the city's vulnerability have the lowest level of priority i.e. third priority. This includes, amongst other measures, equipping cellars so they can cope with flooding and being prepared with pumps.

Surat City Resilience Strategy⁵

The city resilience strategy (CRS) development was taken up by Surat City Advisory Committee (CAC) and key stakeholders including the Surat Municipal Corporation (SMC) and Southern Gujarat Chamber of Commerce and Industries (SGCCI), Industry groups, academic institutions and individual experts. The CRS seeks to put together the findings of city risk and vulnerability to Climate Change impacts, the likely impacts on crucial sectors of the city's socio-economic life, and the identification of short, medium and long term strategies to be implemented in the city.

An integrated approach was adopted by understanding the current and future socio-economic conditions in terms of urbanization (i.e. aspects of population, industrial and economic growth, land use-land use change) and poverty/informal settlements (i.e. aspects of living environment, livelihood, migration, access to resources) along with changes in climatic parameters like temperature, precipitation and sea level rise (see Figure 4). For the city of Surat, the river flow and peak discharges of the Tapi river and sea level rise are significant climatic issues.

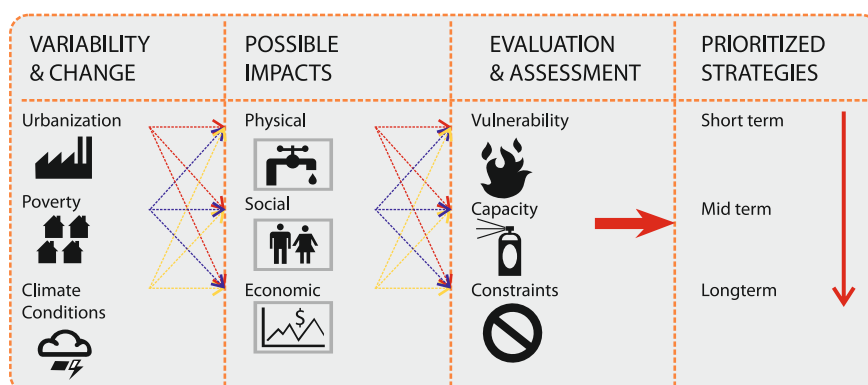
Stakeholder interactions and studies were conducted across sectors such as water, energy, industry, environment, transportation, flood risk management,

health to understand different physical and socio-economic dimensions of the current situation. This enabled a detailed assessment of the climate change impacts to be undertaken. Moreover, the city wide vulnerability was assessed using Geographic Information System (GIS) based tools to gain knowledge about current vulnerability of different sections of population across locations and socio economic groups.

Subsequently, prioritized strategies across all the sectors were rolled out over the short, long and medium term; with short term strategies targeted at issues with high priority and long term strategies looking at issues with either lower priority or longer roll-out times. For instance, for flood management the short term strategy involves setting up an advance warning system at key locations to ensure an increased respite time, protect the community and reduce economic losses. The medium term strategy involves detailed flood modeling to aid the identification of flood prone areas and framing land use policy and building regulations to minimize flood risks. The long term strategy looks at measures such as diversion of flood water from river Tapi through provision of drains/culverts along roads, railways and canals wherever drainage is not feasible; ground water charging for local low lying areas etc.

Figure 4 : Surat climate resilience strategy development process

Source : ACCCRN. "Surat City Resilience Strategy." Surat, 2011



⁴ City of Copenhagen. "Copenhagen Climate Adaptation Plan." Copenhagen, 2011.

⁵ ACCCRN. "Surat City Resilience Strategy." Surat, 2011



Benefits of Climate Action Plan

○ The **costs of inaction are very high.** Rapidly growing cities will need to take urgent actions to guide building codes and practices, density, and connectivity infrastructure. Delay will result in a path that will increasingly diverge from the optimal high density, low-carbon trajectory and make mitigation increasingly expensive and inaccessible.

○ The **co-benefits** of green action often more than cover the costs. Reducing pollution has a direct impact on health, quality of living, attraction of private capital and human resources.

○ **Low-carbon emissions and low pollution** levels are essential components of the quality of life in cities. Cities that are eager to attract human and financial capital to promote jobs and prosperity need to curb air pollution and ensure a healthy environment.

○ **Cities are also good pilots** for action on Climate Change and have key competencies to act on Climate Change.

○ **Cities can promote green growth** through their screening of investments in infrastructure and transport, financial and tax incentives, partnerships, regulation of energy suppliers, increased consumer awareness, and job training.

Mumbai Metropolitan Region (MMR)

MMR is one of the largest metropolitan regions of India. It houses 20 million people in an area of about 4355 sq.km. with density as high as 20,694 sq.km. in the urban areas. Moreover, 60% of the population in Mumbai lives in slums and informal settlements, with poor housing conditions and having poor availability of urban basic services (water supply, sanitation, sewage & drainage). The existing socio-economic conditions make these sections of the population highly vulnerable to the impacts of Climate Change.

Moreover, the location of MMR makes it vulnerable to extreme precipitation events, sea level rise, landslides, and cyclone. The region is environmentally sensitive due to its long coastline to the west and the Western Ghats to its east.

Mumbai city located in MMR is India's financial capital, thus any impact on the society, and economy resonates to the whole country. It acts as the linchpin in Indian economy.

The region houses a large number of industries and vehicles making it a large GHG contributor. Thus, the region should develop mitigation and adaptation plans for secure sustainable development.

For further information, refer to :

1. City of Melbourne. *Climate Change Adaptation Strategy*. Melbourne: Maunsell Australia Pty Ltd, 2008.

2. 1.City of Copenhagen. "*Copenhagen Climate Adaptation Plan*." Copenhagen, 2011.

3.ACCCRN. "*Surat City Resilience Strategy*." Surat, 2011

4.Website of C40 Cities Climate Leadership. Available at: <http://www.c40cities.org/>

5.World Bank (2010) Cities and Climate Change: an Urgent Agenda
 Available at :
<http://siteresources.worldbank.org/INTUWM/Resources/340232-1205330656272/CitiesandClimateChange.pdf>