# IMPACT OF CLIMATE CHANGE ON URBAN DEVELOPMENT

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### **Climate is Changing because of Global Warming**

**MERCURY RISING** Global warming is caused when the Global average rise in -0.8 atmospheric concentration of greenhouse gases like CO<sub>2</sub> increases. sea levels (in metres) 0.7 Excessive burning of fossil fuels like petroleum is the main cause. **Compiled** projection -0.6 from several models Greenhouse Basi 0.5 Year Temperature 2100 19°C -0.4 -0.3 -02 2050 -0.1 2000 2050 2100 2000 14.43°C CO2 emissions across the globe apper 1950 (in billions of metric tonne) 6 From burning fossil fuels 5 1900 From burning 4 13.77°C liquid fuels HOW HOT IT From burning 3 WILL GET 1850 solid fuels From burning 2 Annual average gaseous fuel temperatures and projections worldwide 1850 1950 2000 1900

(Times of India, 2012)

## Green house gases are our friends up to limits---

- Natural greenhouse effect makes earth's average surface temperature about 33°C warmer than it would otherwise be (+14°C versus -19°C).
- But, we are increasing the CO<sub>2</sub> content of the atmosphere by a more than 0.5% per year through burning various fuels in large quantities.



# Scientist knew about the global warming for more than 100 years back



Svante Arrhenius (1859 – 1927), a Swedish chemist and a founder of the science of physical chemistry In 1896 Arrhenius first speculated that changes in the levels of CO<sub>2</sub> in the atmosphere could substantially alter the surface temperature through the GH effect and warned that if burning coal were to double the concentration of  $CO_2$  in the atmosphere, the temperature of the earth could rise by several degrees

#### Trend in Mean Temperature in India (1901 – 2012)



#### **Climate Change Impacts: Global**

- Change in rainfall patterns and melting of snow, glaciers and ice caps, affecting water resources,
- Increased frequency of heavy precipitation leading to heavy floods,
- Rising sea levels increased coastal and sea bank erosion and sea water ingress,
- More intense and longer droughts/ dry spells,
- Decreasing crop yields,
- Adverse impact on human health,
- Negative impact on human habitat, and
- Reduction in marine biodiversity.

Resilience refers to the ability to absorb and recover from change, stresses and shocks (from extreme events).

(CGIAR-CCAFS, Working Paper 96, 2015)

#### Climate Change Impact on Rainfall (2021 - 2050)



(CRIDA, 2014)

#### Impact on Floods and Dry Spells (2021-2050)



#### **Climate Change Impact on Temperature Increase (2021–2050)**



#### **URBANIZATION OF INDIA**

- India's urban population is expected to grow from 377 million in 2011 to 590 million by 2030,
- Cities are centers of economic growth of a country but also lead to enhanced energy use and higher GHG emissions,
- Rapid urbanization is placing a burden on infrastructure, energy and water consumption, and public services,
- Pattern of urbanization is lopsided- rapid growth of peri-urban areas,
- Economic, social and environmental cost of unstructured urban growth outweighs the benefits of urbanization,
- Cities face challenges of good governance, rapid population growth, migration, transport, water, energy, health, air and water pollution, waste disposal.

#### Water Resources and Use in Maharashtra



- Surface water allocated to the State =126 BCM
- ✤ Groundwater Resources = 33 BCM
- Water available for planned water use = 148 BCM (SW+GW)
- Water storages created so far = 33 BCM
- Present water use (SW+GW) = 40 BCM
- Estimated water demand in 2030 (SW+GW) = 103 BCM



#### **Rural - Urban Population Growth in Maharashtra**



#### Wastewater Generation and Treatment in Maharashtra

- No. of Municipal Corporations: 26
- No. of Municipal Councils : 212
- Wastewater Generated : 6383 MLD
- Wastewater treatment capacity: 58%
- About 80% of water pollution is due to discharge of untreated domestic sewage into rivers, lakes and ponds.
- Presently, only 18 municipal corporations and 10 municipal councils have made arrangement for sewage treatment and disposal.

#### **Climate Change Impacts in Maharashtra**

- Increased temperatures
- Increased frequency of occurrence of extreme temperature events
- Change in amount and timing of rainfall
- Increased frequency of intense rainfall events
- Warmer and wetter monsoon seasons
- Increase in number of days with high rainfall (>25mm/day)
- Increased risk of severe and widespread floods

Increase in temp. and rainfall over the year 2000	2021- 2050	2071- 2100
Max .annual temperature	1.8ºC	3.4 <sup>0</sup> C
Min. annual temperature	2.2 <sup>0</sup> C	14.5 <sup>0</sup> C
Annual rainfall	10.7%	8.9%

#### **Up-scale wastewater treatment and reuse**

- There is no proper assessment of wastewater generated and treated,
- Need to close the gap between wastewater generated, treatment capacity and actual treatment,
- Most cities do not have adequate sewage treatment facility or infrastructure for its safe disposal, thus aggravating the problem further,
- Increase investment in infrastructure, capacity building and education to address water and wastewater issues,
- Adopt decentralized and low cost technologies for WW treatment,
- Promote safe reuse of treated wastewater for irrigation, industry, and secondary domestic purposes,
- Develop guidelines and a coherent policy for wastewater treatment and use.



#### WATER MANAGEMENT INNOVATIONS FOR CITIES

- Use of non-potable/ grey water for cleaning streets and flushing toilets, go for dual pipeline system,
- Charging water to discourage wasteful practices,
- Encouraging more private investment to finance new infrastructure such as STPs and desalination plants,
- Increase transparency in urban water supply and sanitation,
- Emission-monitoring is an important step for building, environmentally sustainable cities. Prepare & publish City Green House Gases Emission Inventory Report,
- ICLEI HEAT+ software is a web-based system designed to help local government's benchmark emissions levels against local, state, national, provincial, and international standards.

(http://www.iclei.org/)

#### **TOWARDS ADAPTATION TO CLIMATE CHANGE**

- •Climate change risk can lead to a significant setback to the development gains. Efforts should be taken to create awareness on climate resilience and disaster management, sensitize citizens, decision makers, and city planners.
- As the pace of urbanization is increasing in Maharashtra, the challenge of domestic water supply and wastewater management is a serious concern.
- ULBs need to make assured arrangement of drinking water supply and sanitation by adopting various water saving/ conservation measures like reducing losses, non-revenue water, limiting water supply within prescribed norms, compulsory water metering, appropriately charging of water supply and wastewater disposal, rain water harvesting, promoting use of water saving devices and fixtures, etc.
- •Tree cover provides resilience to the urban landscape. They act as recharge zones, flood mitigation, coastal protection and improve water quality through carbon sequestration. Thus restoration of degraded watersheds around city areas provides multiple benefits towards better livelihoods and environment.

#### The BEST AND WORST PLACES TO LIVE AS A RESULT OF GLOBAL CLIMATE CHANGE



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