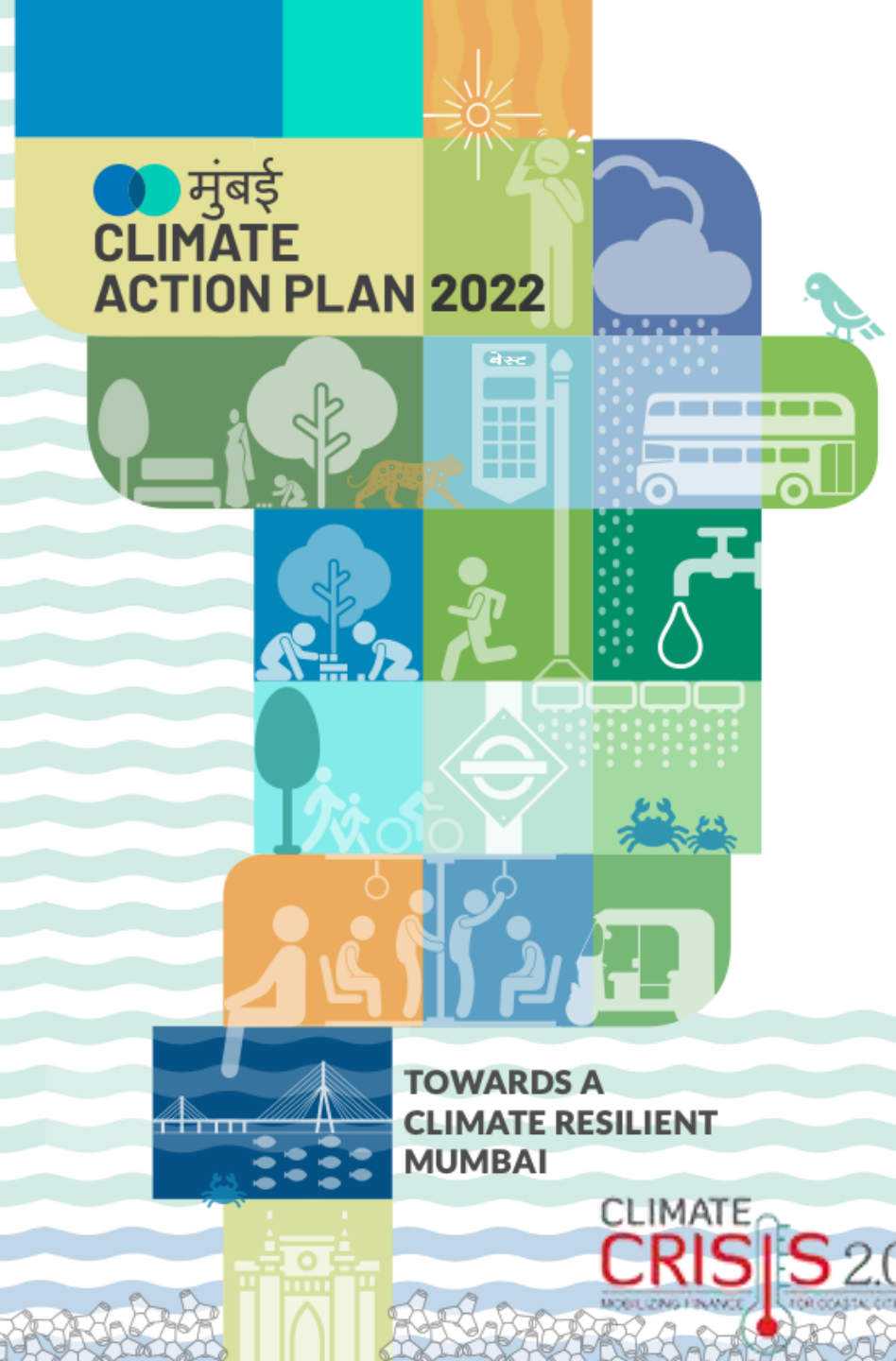




# MUMBAI: NET-ZERO BY 2050



मुंबई  
CLIMATE  
ACTION PLAN 2022

TOWARDS A  
CLIMATE RESILIENT  
MUMBAI

CLIMATE  
CRISIS 2.0  
MODULIZING FINANCE  
FOR COASTAL CITIES



# City Context

Mumbai is one of the densest mega cities in the world



With a population of **12.44** million (as per Census 2011)

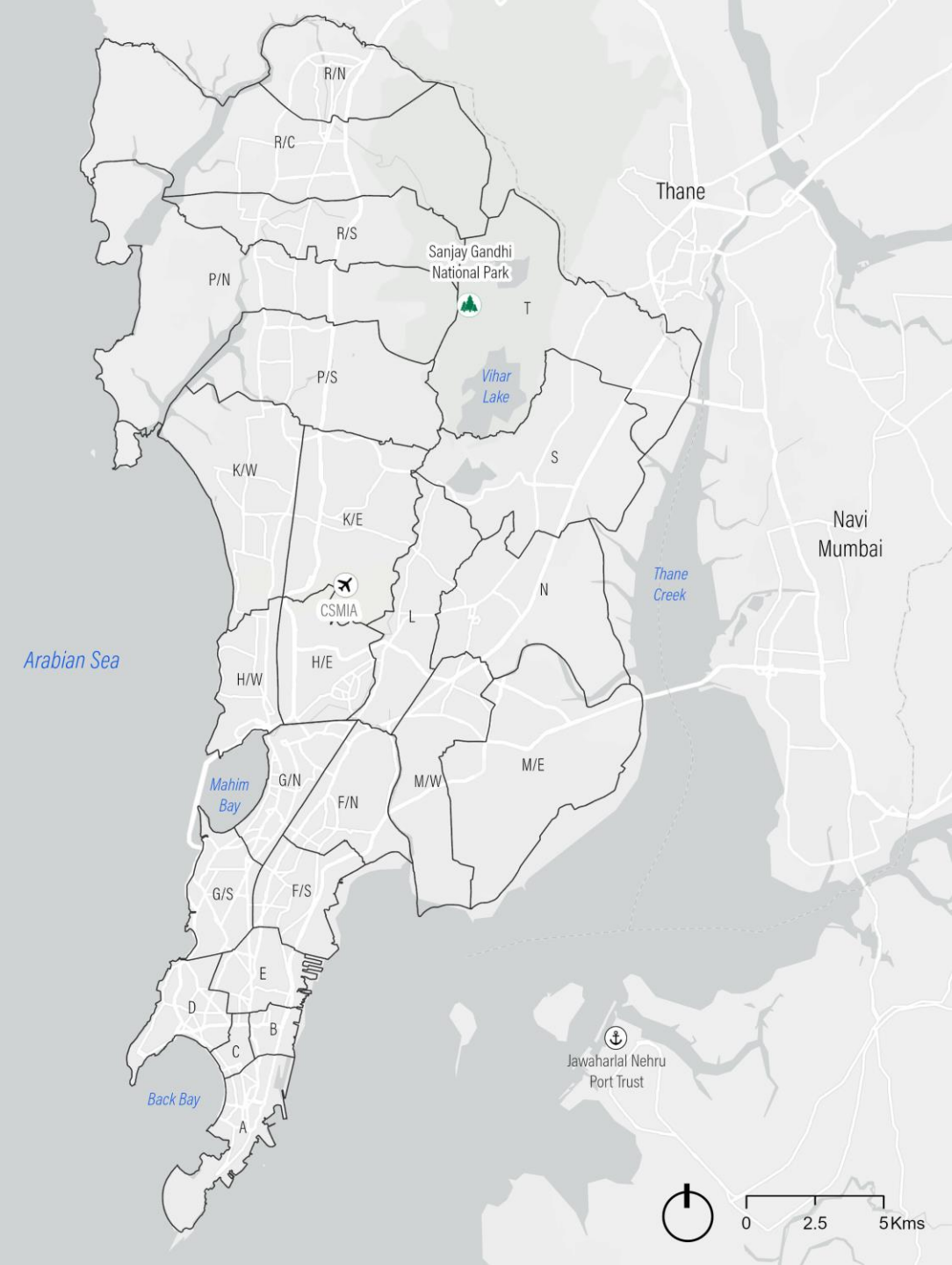


Population density of **28,426** persons/sq.km.

Mumbai is located on the windward side of the Western Ghats.

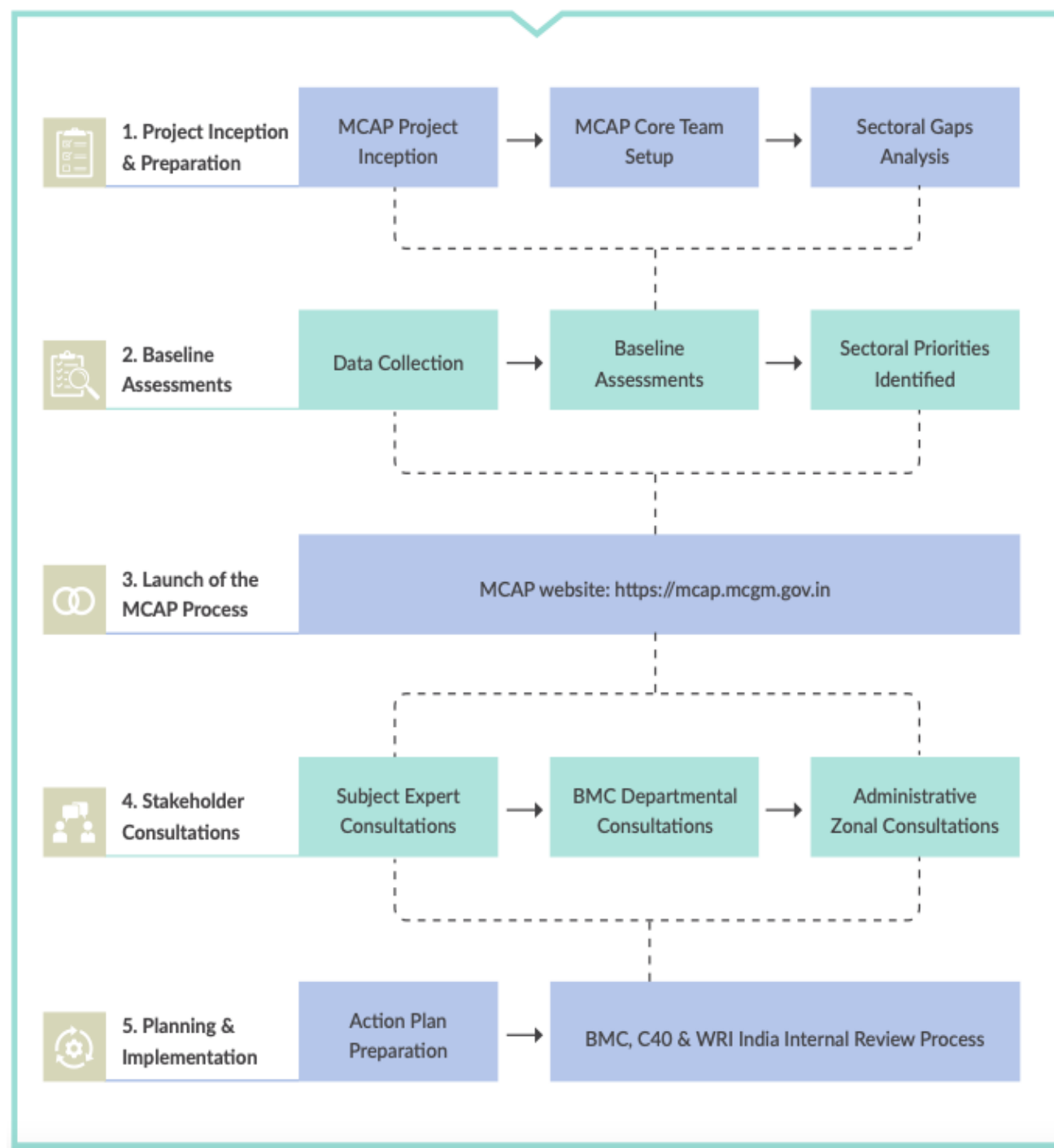
The city is divided into **7 zones** and **24 wards**, and **three geographic divisions** –

- **Mumbai City**
- **Western Suburbs**
- **Eastern Suburbs.**



# South Asia's first Net-Zero Climate Action Plan

## MCAP Planning Process



# Stage 1: Project Inception & Preparation

Core Team:



WRI INDIA



Mumbai's Commitments:



URBAN NATURE DECLARATION

# Stage 2: Baseline Assessment

## 1. Data Collection

Data was collected from **20** BMC departments and **26** parastatal, state and national government bodies and private agencies

Departments within BMC	Other Agencies
<ul style="list-style-type: none"><li>• Storm Water Drains</li><li>• Gardens &amp; Tree Authority</li><li>• Hydraulic Engineer</li><li>• Coastal Road</li><li>• Sewerage Operations</li><li>• Deonar Abattoir</li><li>• Parking Authority</li><li>• Building Maintenance</li><li>• Development Planning</li><li>• Environment Department</li><li>• Mechanical and El ectrical</li><li>• Solid Waste Management</li></ul>	<ul style="list-style-type: none"><li>• Mumbai Port Trust</li><li>• Mumbai Metropolitan Region Development Authority</li><li>• Central Pollution Control Board</li><li>• Maharashtra Pollution Control Board</li><li>• MMRDA Monorail</li><li>• Mumbai Metro One Private Limited</li><li>• BEST</li><li>• Reliance Metro</li><li>• Adani Electricity</li><li>• C40 Cities</li><li>• Tata Power</li><li>• Maharashtra State Electricity Distribution Company Limited</li><li>• Magenta Group</li><li>• Environment Department, GoM</li></ul>



# Tools used for MCAP

<u>Analysis</u>	<u>Tool Used</u>
Greenhouse Gas Inventory	CIRIS Tool, Global Protocol for Cities
Future Emissions Scenario Analysis	C40's Pathways Model
Inclusivity Analysis	C40 & WRI's Inclusive Planning Framework
Vulnerability Assessment	WRI's Framework & C40's City Climate Resilience Assessment



## Global Protocol for Community-Scale Greenhouse Gas Emission Inventories

An Accounting and Reporting Standard for Cities



Emissions Forecasts Trajectories and Targets Action Development Scenarios Set Up

Terms of Use



### EXECUTIVE GUIDE

How to tackle climate change and inequality jointly:  
practical resources and guidance for cities



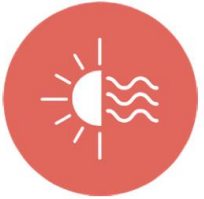
# CRITICAL CLIMATE RISKS FOR MUMBAI CITY



- Sea-Level Rise & Sea Surface Temperature Increase



- Landslides



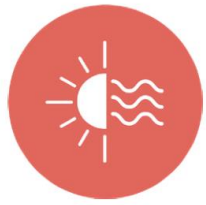
- Extreme Heat



- Air Pollution

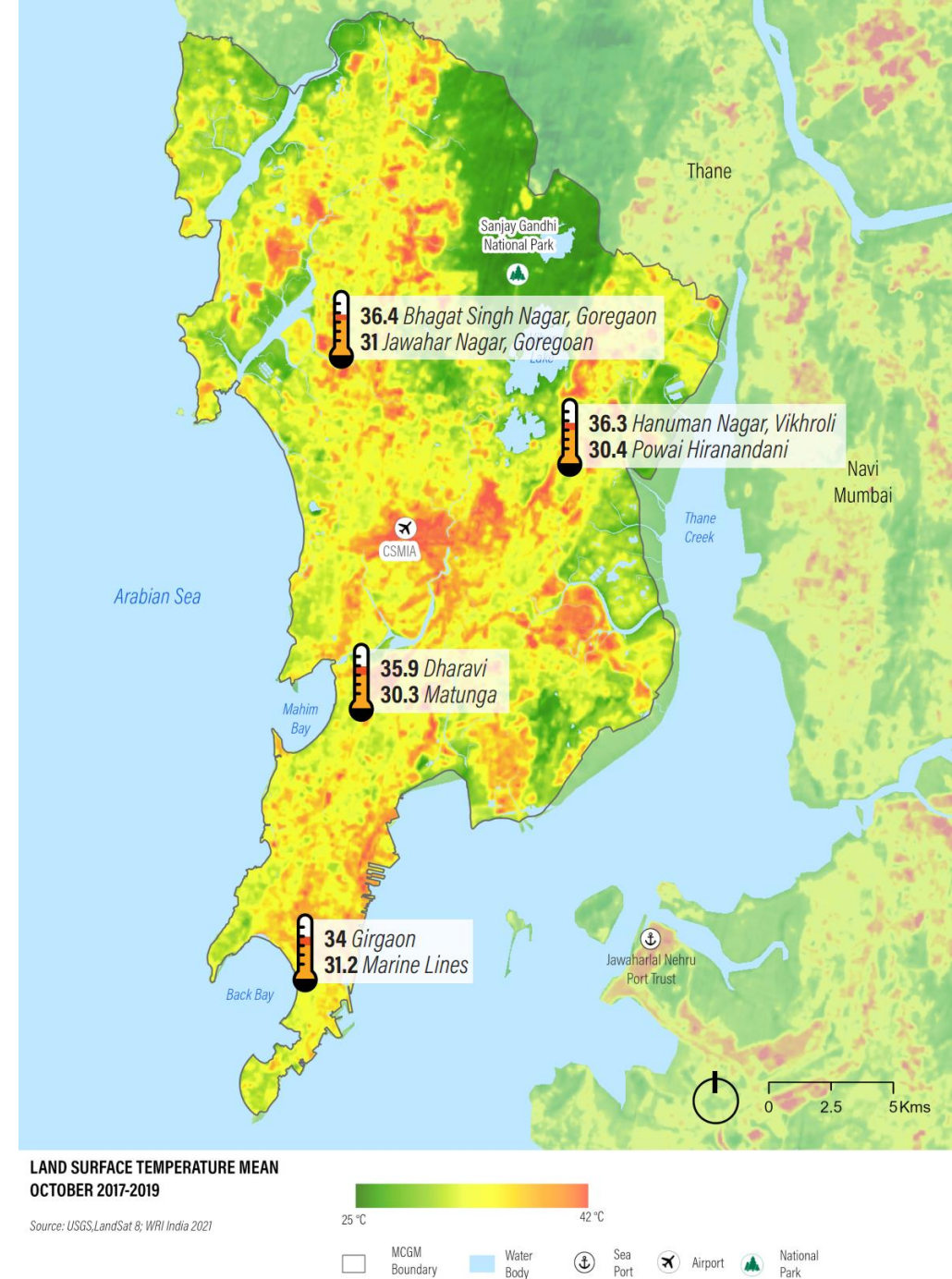


- Flood Risk



# Urban Heat

- An overall warming trend for Mumbai across **47 years (1973-2020)**
- **0.25°C** rise per decade between 1973 and 2020
- Between 1973 and 2020, **10 heatwaves** and **two extreme heatwave** events were observed – **7 of them in the last 15 years**
- Higher density informal settlements with very low vegetation cover and metal/asbestos roofing material are **6-8 degrees warmer** than residential neighborhoods

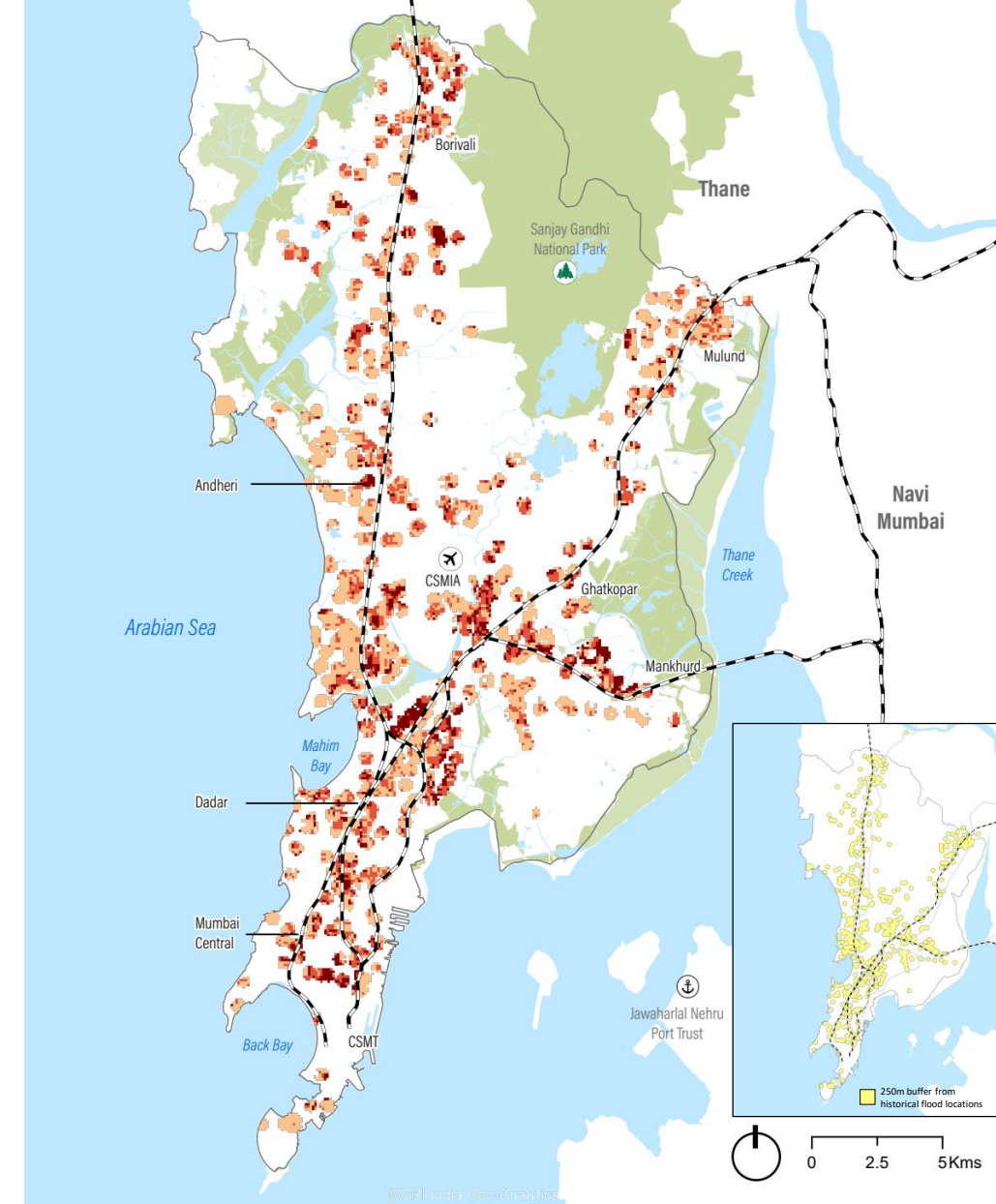






# Urban Flooding

- Mumbai experiences, on average, **six heavy** (64.5 – 115.5 mm), **five very heavy** (115.6 – 204.4 mm), and **four extremely heavy** (> 204.5 mm) rain events per year. 2017 to 2020 has witnessed a steady **increase in extremely heavy** rainfall events mostly around **central** and **western Mumbai**.
- Extreme rainfall Events (ERE) tend to last only a single day. But, in the last decade **14% of all heavy ERE**, **17% of very heavy**, and **21% of extremely heavy ERE** lasted more than a day.



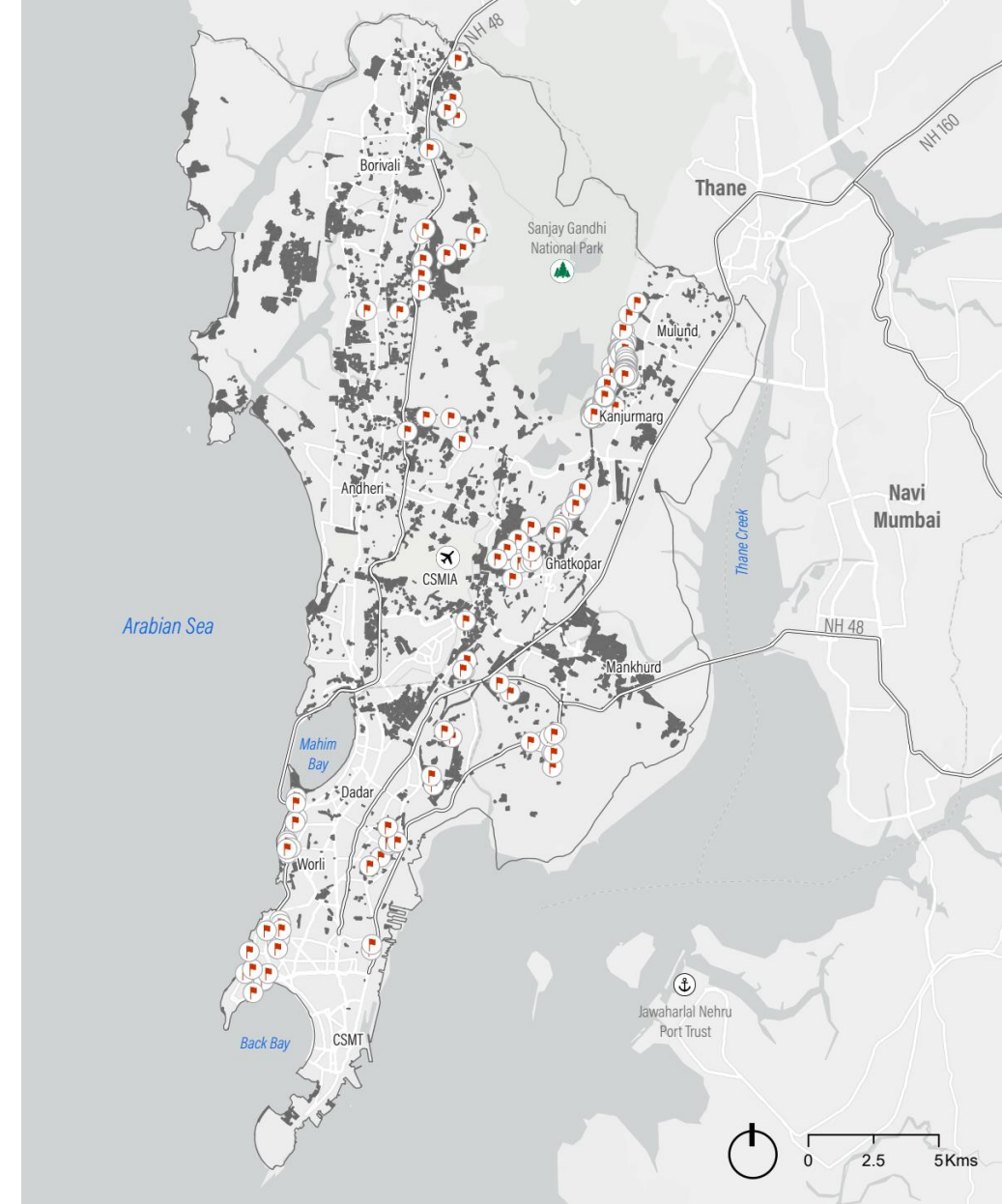
POPULATION WITHIN 250M FROM THE FLOOD LOCATIONS





# Landslide

- **287 locations** within Mumbai have been identified as **landslide prone**
- Out of these **209 locations** fall within the extent of **informal settlements**.



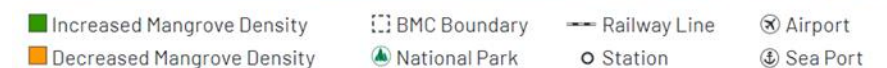
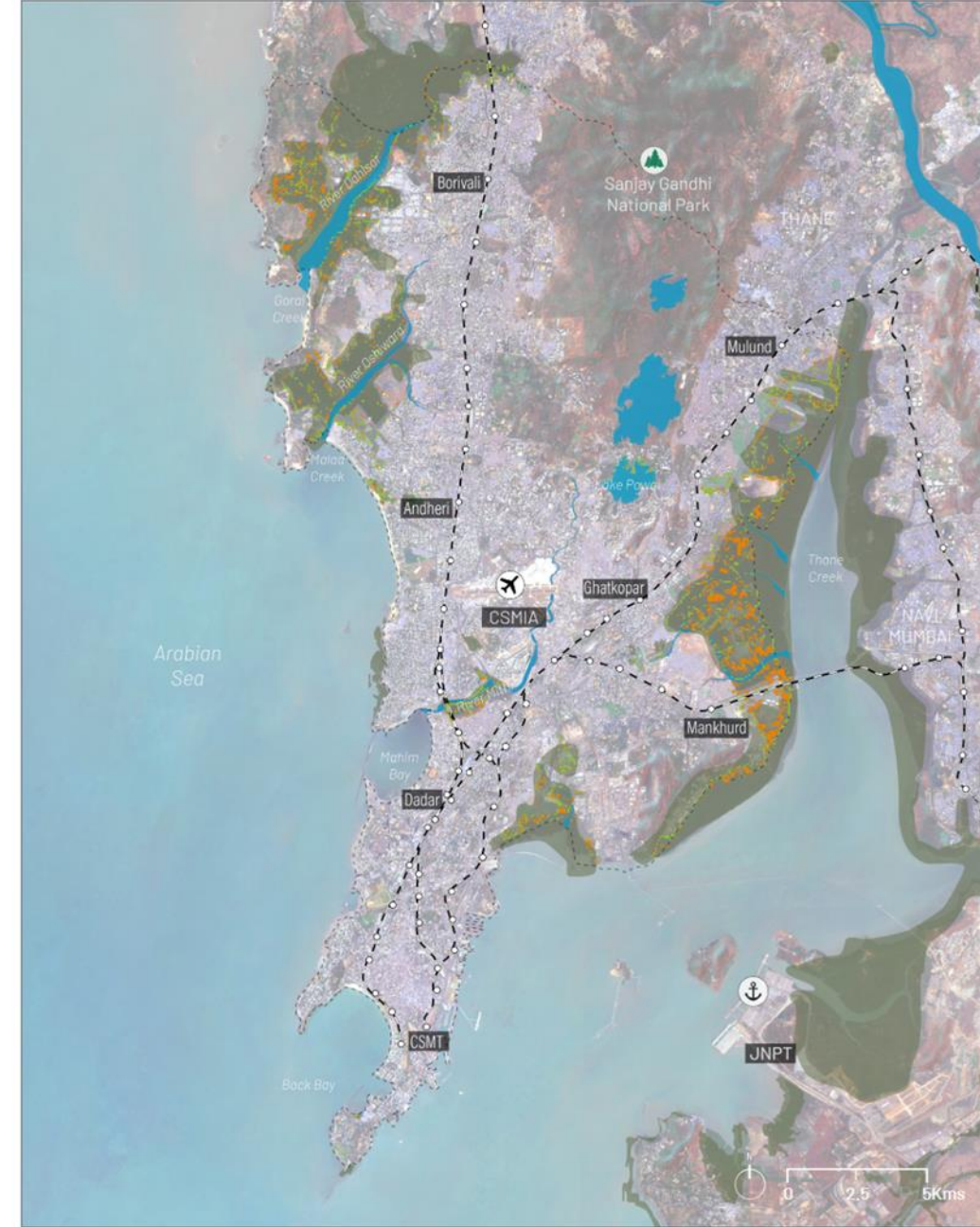
Landslide Locations With Slums





# Coastal Risks

- 2019 saw the **highest number of cyclones** in the region. Due to this **sea level rise can be as high as 1m**, posing a huge risk to the coastal communities and infrastructure.
- Between 2008 and 2021, **325 ha of dense mangrove cover** changed to **sparse mangrove cover** or **intertidal mudflats**. For 305 ha of mangroves, the density has increased.
- Between the years 1990 and 2020, the **Thane Creek on the eastern side has been shrinking**, and on the northwestern coast, the sea has been **eroding** and **accreting**.



Mumbai Mangrove Area Assessment, Year 2008-2010 vs 2018-2021

Source: WRI India; LandSat 5 & LandSat 8 (USGS) for years 2008, 2010, 2018, 2021

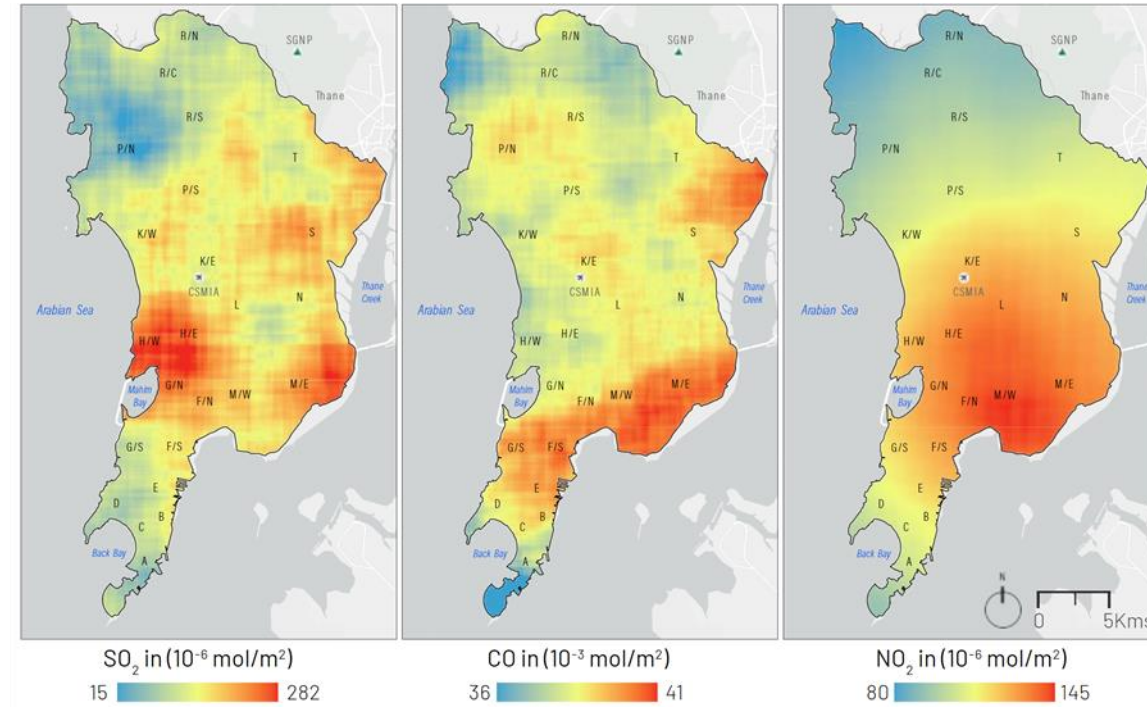




# Air Pollution

- The average annual concentrations of **PM2.5** and **PM10** have declined over the past few years but still remain **above the NAAQ standards**, making them **critical pollutants** for Mumbai
- The consistently growing concentration levels of **Nitrogen Dioxide (NO<sub>2</sub>)** makes it a **major air pollutant**

Pollutant	Concentration in MCGM (Apr 2018-Mar 2019)	Permissible concentration as per CPCB
Particulate Matter (PM) 2.5	60 (µg/m <sup>3</sup> )	40 (µg/m <sup>3</sup> )
Particulate Matter (PM) 10	101 (µg/m <sup>3</sup> )	60 (µg/m <sup>3</sup> )
Nitrogen Dioxide (NO <sub>2</sub> )	58.25 (µg/m <sup>3</sup> )	40 (µg/m <sup>3</sup> )
Carbon Monoxide (CO)	0.9 (8 hrs) (ppm)	1.78 (8 hrs) (ppm)
Sulphur Dioxide (SO <sub>2</sub> )	12.25 (µg/m <sup>3</sup> )	50 (µg/m <sup>3</sup> )
Ammonia (NH <sub>3</sub> )	87.5 (µg/m <sup>3</sup> )	100 (µg/m <sup>3</sup> )



Total Vertical Column Density of SO<sub>2</sub>, CO, & NO<sub>2</sub> – Mean of June 2019 to May 2020

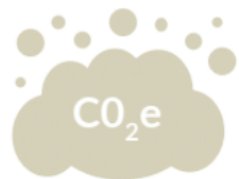
Source: WRI India using Copernicus Sentinel 5P (TROPOMI)



### 3. Mumbai's GHG Emissions Inventory

Mumbai's  
total GHG  
emissions  
for the base  
year 2019

**23.42** million  
tons CO<sub>2</sub>e



**1.8** tons  
CO<sub>2</sub>e per  
capita



The transport  
sector **20%**

The stationary  
energy sector  
accounts for **72%** of  
the total emissions



The waste  
sector **8%**



October 2021: **GPC Basic Compliant Greenhouse Gas inventory** completed

# EMISSION SCENARIOS








UNIT	SCENARIO	2019	2030	2040	2050
% reduction below base year level	E&P		 -43.3%	 -78.5%	 -119.4%
	Ambitious		 27.1%	 43.8%	 71.5%

Table 6: % emission reduction under E&P and Ambitious scenarios.

# Stage 3: Inauguration of the MCAP Process

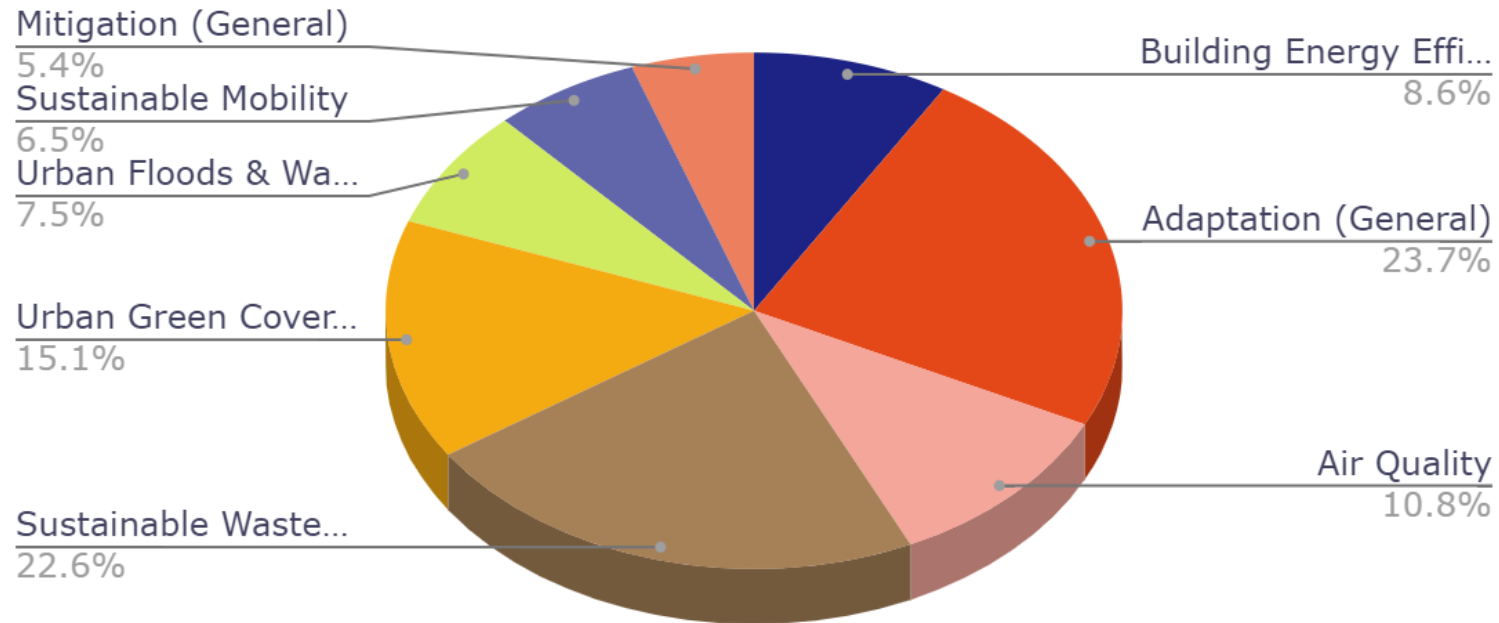
In August 2021, the **MCAP** process was inaugurated with a website:  
[mcap.mcgm.gov.in](http://mcap.mcgm.gov.in)



# Analysis of the Citizen's Feedback Form – “Talk to Us” page on MCAP website

Total responses received: 300

Focus Area





# Stage 4: Stakeholder Consultations

In total **15 consultations** were conducted

## 1. External Subject Expert (Public)



- ☐ **6 sector-wise** online public consultations

Experts from **NGOs, research organizations, citizen forums, international development agencies, municipal service providers and private companies**

- ☐ Attended by climate enthusiasts, other subject experts, students and citizens, with an average participation of **80-100 people**

In August 2021

## 2. BMC Interdepartmental



- ☐ **6 sector-wise** in-person closed-door consultations

- ☐ **Departments within MCGM and external service providing agencies**

- ☐ Overarching goals and actions were discussed

In September 2021

## 3. Administrative Zonal



- ☐ **3 division-wise** in-person consultations for Western Suburbs, Eastern Suburbs and Mumbai City

- ☐ **24 Assistant Commissioners and 7 Zonal Deputy Municipal Commissioners**

- ☐ Integrate perspectives on actions with respect to challenges and priorities at the grassroots level

In November 2021



# Stage 5: Planning and Implementation

## 6 Key Sectors with 24 Priority Actions

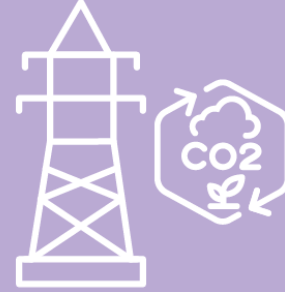


# 1. Energy & Buildings

Targets include:

- Increase RE to 50% by 2030 and to 90% by 2050 in Mumbai's energy mix
- 40% residential buildings to have solar PV by 2050
- 80% buildings with high efficiency chillers, 60% low flow fixtures by 2050

## Sectoral Action Tracks



Decarbonize electricity grid



Transition to clean fuels and resource efficiency



Promote low carbon buildings



Encourage passive design strategies

## 2. Sustainable Mobility

Targets include:

- 100% electrification of buses by 2030, 96% electrification of 4-wheelers by 2050
- 100% electric freight with shift to rail and water by 2050
- 85% mode share for public transport and NMT by 2050

### Sectoral Action Tracks



**Enhance public transport  
ridership**



**Improve access to NMT  
transport and infrastructure**



**Transition to zero emission  
vehicles**



**Shift to zero emission  
freight**



### 3. Sustainable Waste Management

Targets include:

- 80% paper and plastic recycling by 2050
- 60% organic waste composted by 2050

#### Sectoral Action Tracks



**Reduce landfilled waste**



**Decentralise waste management**



**Expedite remediation and scientific management of landfills**

## 4. Urban Planning, Green Cover & Biodiversity

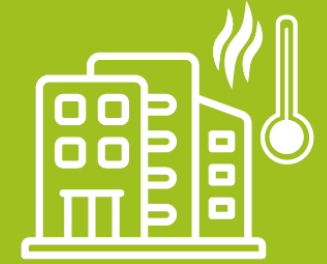
Targets include:

- Increase vegetation cover and permeable surface to 30-40% of the city surface area by 2030
- Increase per capita open space to 6 square meters by 2040

### Sectoral Action Tracks



Increase vegetation cover and permeable surfaces



Reduce urban heat island effect



Promote equitable access to green open spaces



Restore and enhance biodiversity

## 5. Air Quality

Targets include:

- Curbing air pollution level by 20-30% by 2030, keeping 2019 as the base year

### Sectoral Action Tracks



Curb pollution concentration levels



Improve monitoring and availability of information



Decentralise planning and increase awareness to enable community health resilience

## 6. Urban Flooding & Water Resource Management

Targets include:

- 50% of the city's water demand to be met through localized water conservation and efficient use initiatives by 2030
- 100% access to safe, affordable drinking water and clean toilets by 2030

### Sectoral Action Tracks



**Build flood resilient systems and infrastructure**



**Localize water conservation and efficiency**



**Reduce pollution and restore aquatic ecosystems**



**Provide safe and affordable drinking water**



**Ensure clean, safe and accessible toilets**



**Manage disaster risk and reduce impacts**





# Actions Table

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<u>Action</u>	<u>Stakeholders</u>	<u>Funds/Finance</u>	<u>Indicators</u>
Establish commuter helpline to address grievances around public transport safety, access, reliability, etc.  <b>Timeframe:</b> 2024	Lead: MCGM  Supporting: BEST, MMRDA, Railways	MCGM budget	Output: Common helpline desk, % mode share of public transport  Outcome: Increased commuter safety, ridership (disaggregated by gender and income level)
Biodegradable waste processing units in each ward  <b>Timeframe:</b> 2027	Lead: SWM Dept. - MCGM  Supporting: MPCB, Market Dept.	Majhi Vasundhara Abhiyan	Output: % of organic wet waste that composted/recovered, No. of ward-level waste management units with composts or OWCs  Outcome: % of population with waste processing units accessible within 500m of home, new jobs through expanded waste management infrastructure

# KPIs for Priority Actions

<u>Sector</u>	<u>Action Area</u>	<u>Key performance indicators</u>
Energy and green buildings 	Increasing renewable energy in the grid	No. of MW renewable energy capacity installed within city boundaries, % of renewable energy in the grid mix <b><i>Percentage of low-income population with electrical service supported by renewable energy</i></b>
	Energy-efficient infrastructure	Energy savings in buildings per year (MWh per annum) <b><i>Percentage of monthly income spent on energy costs</i></b>
	Passive design strategies and thermal comfort in buildings	Amount of MWh energy demand for cooling in buildings (in low and high income areas) <b><i>Availability of climate-resilient affordable housing</i></b>
Integrated transport 	Public transport	Annual no. of public transport trips per capita (disaggregated by gender and income level), % of mode share <b><i>Percentage of population within 500m walk of public transportation option (e.g., bus, metro, light rail)</i></b>
	Sustainable freight	% of low-carbon road freight <b><i>Percentage of monthly income spent on transportation/delivery costs</i></b>

# Mumbai's Initiatives on Climate Action



**WOMEN4CLIMATE** Cities**4**Forests



- **EV Cell** launched within MCGM
- BEST introduced **386 electric-buses**, procurement of **more 900 buses** underway towards achieving **50% fleet-electrification by 2023, 100% fleet-electrification by 2027**
- Participating in a pilot on **Climate Budget** along with 12 other cities globally
- Setting up the **Climate Action Cell** with designated staff to deliver on climate goals and track progress





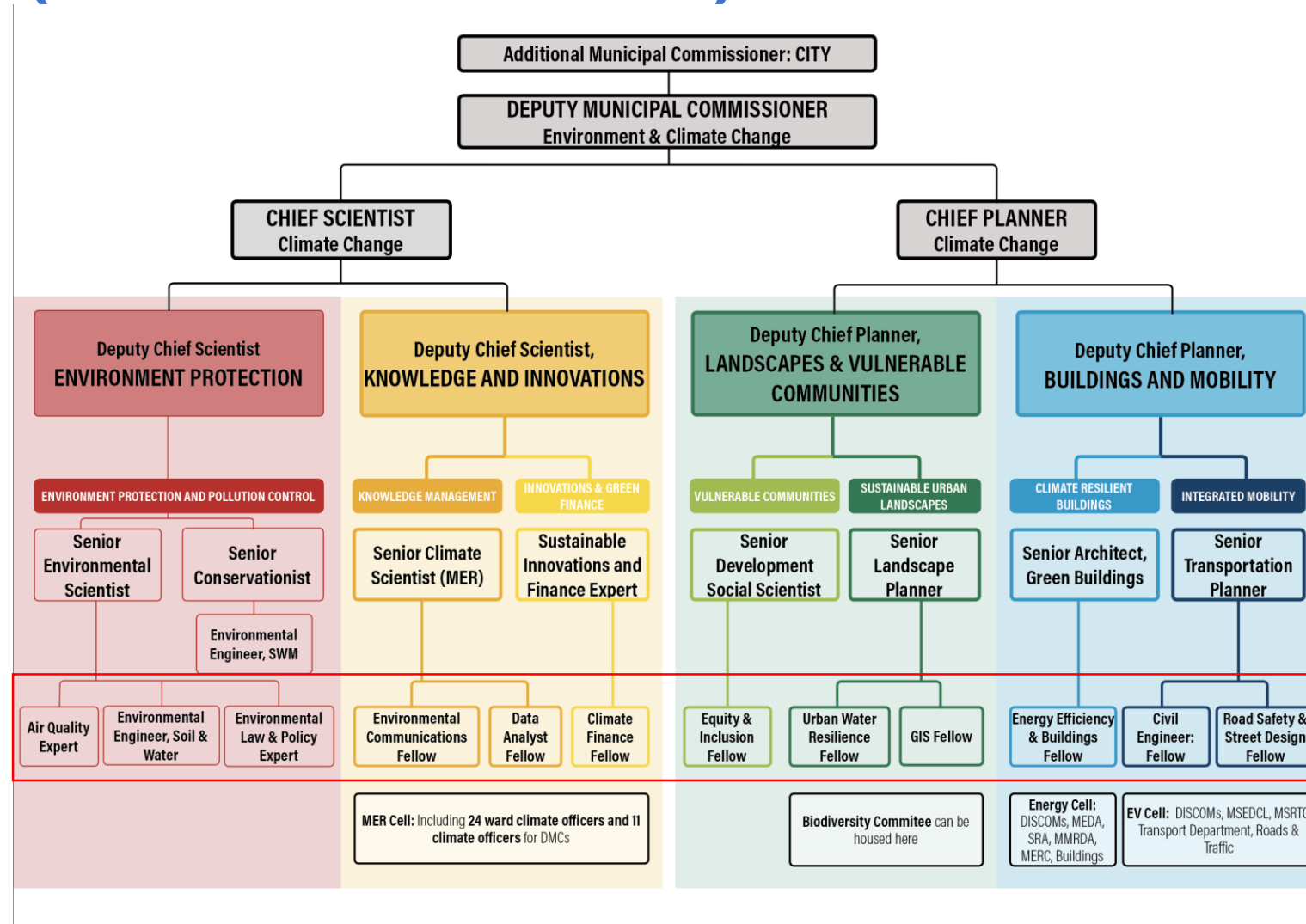
# 43 AMRUT cities in Maharashtra join Race to Zero



# OPPORTUNITIES FOR MUMBAI



# 1. Proposed Department of Environment & Climate Change (Climate Action Cell)





WRI INDIA



THANK YOU