

SESSION II- Rising Tide: Navigating the Future of Asian Coastal Cities

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Research domain




3 GOOD HEALTH AND WELL-BEING



Good health and well-being through design

This vertical informs the SDG3. We investigate how building design effects health and well-being in resource constrained settings.

11 SUSTAINABLE CITIES AND COMMUNITIES



Sustainability in low-income habitat through design

This vertical informs the SDG11. We derive data-driven solutions for vulnerable communities to tackle problems of climate change : heat island effects, flooding, for climate sensitive urban planning.

7 AFFORDABLE AND CLEAN ENERGY



Energy efficiency through design

This vertical informs the SDG7. We use state-of-the-art building simulations and experimental methods to derive demand side energy efficient solutions.

5 GENDER EQUALITY



Gender equality through design

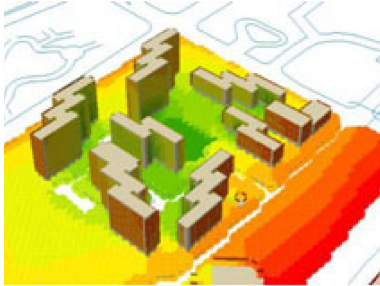
This vertical informs the SDG5. We aim gender mainstreaming through participatory housing design for sustainability.



data-driven built environment design

DESIGN □ POLICY

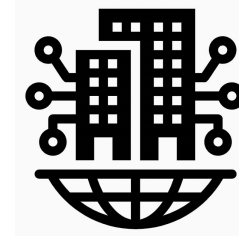
Innovative datasets



Environment



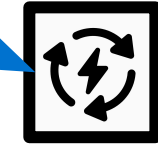
Sensors



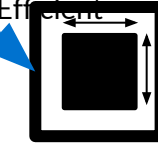
Zero-carbon



Occupant Well-being



Energy Efficient



Space Efficient

Human-centric datasets

Energy intensive



cooking



cleaning



Child care



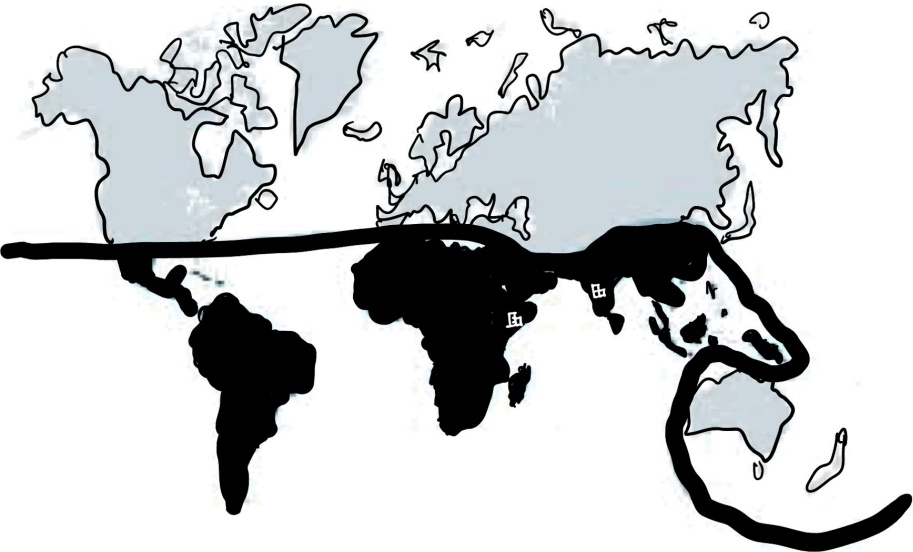
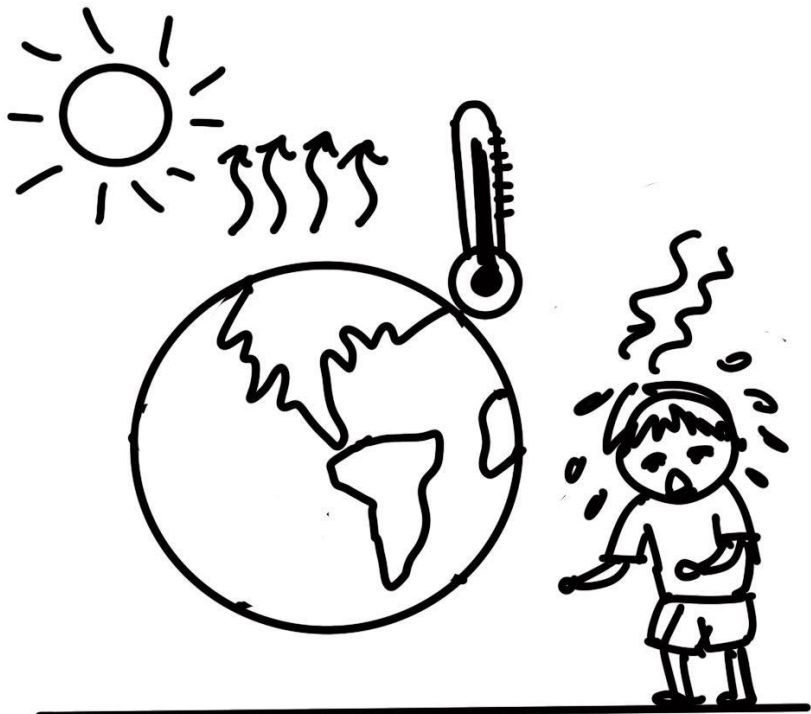
recreation



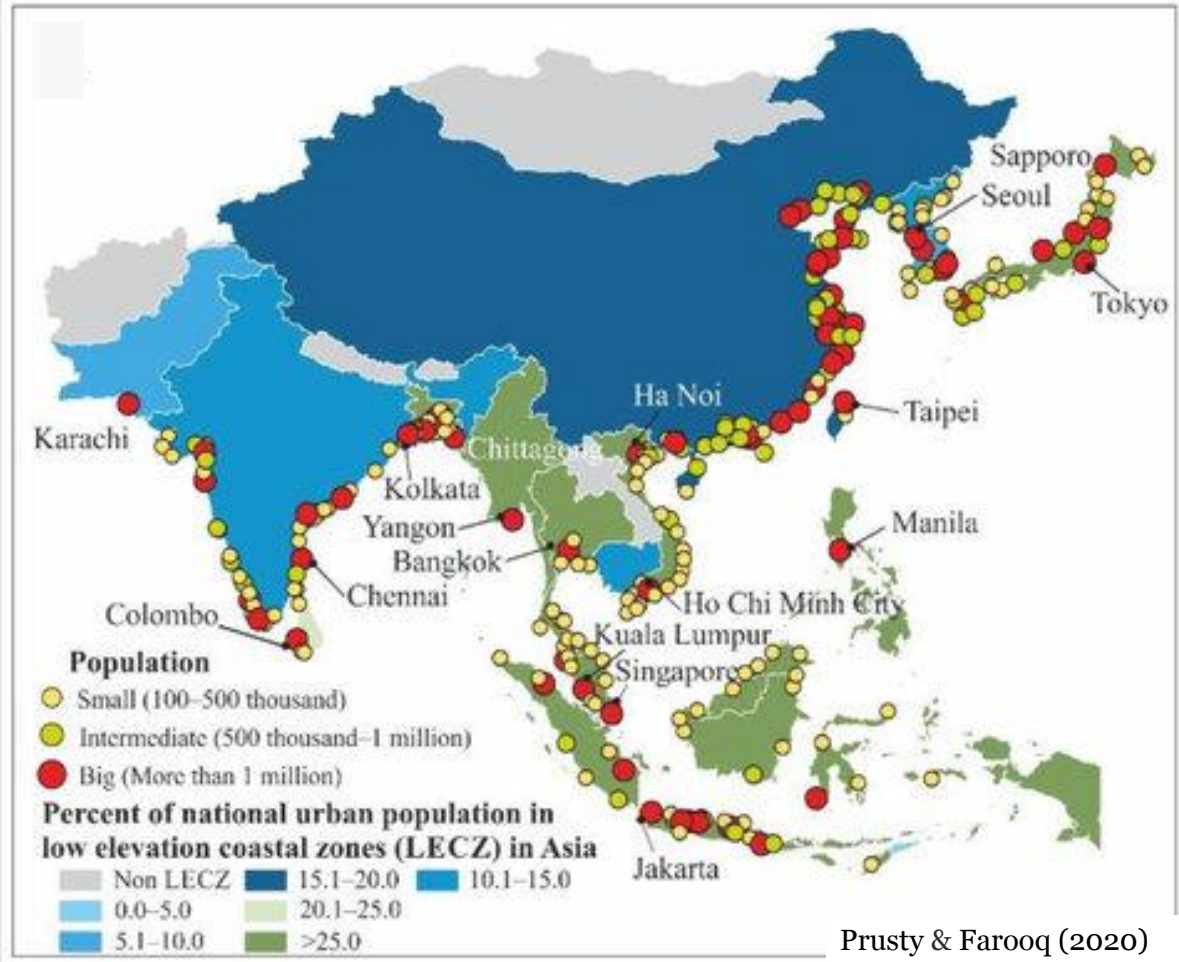
Perception to health risks

People + practices

2 great challenges



Asian Cities at Risk



Prusty & Farooq (2020)

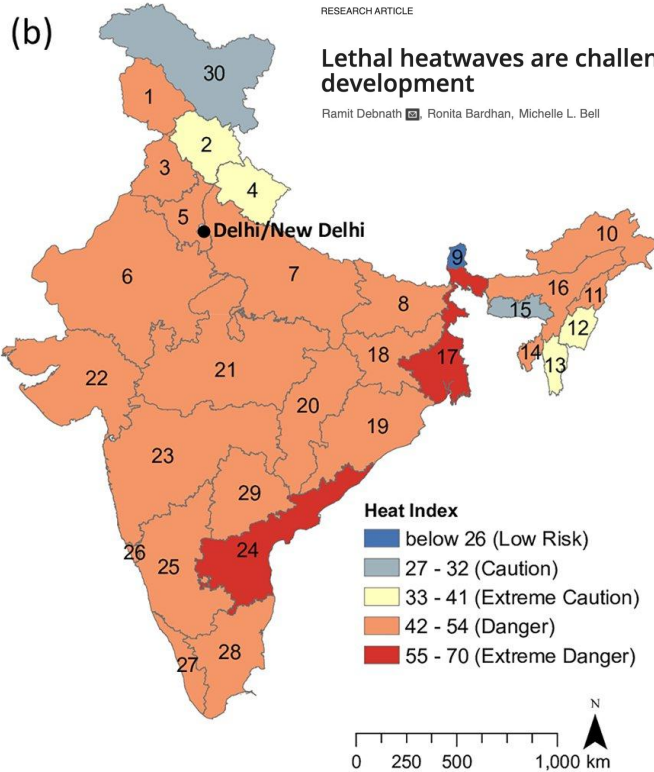


Heat Stress

OPEN ACCESS PEER-REVIEWED
RESEARCH ARTICLE

Lethal heatwaves are challenging India's sustainable development

Ramit Debnath, Ronita Bardhan, Michelle L. Bell



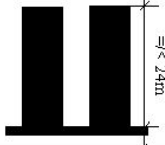








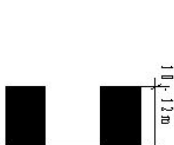





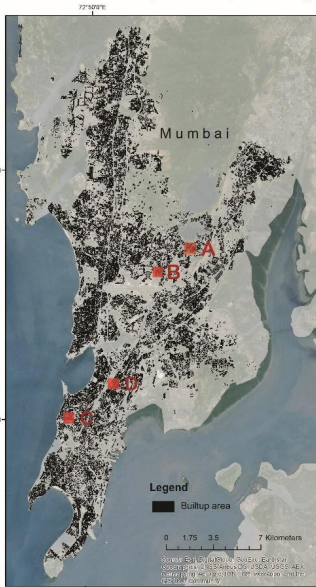
90% of India in heatwave 'danger zone': Study shows extreme weather threatening country's progress, 480 million lives

It will decline work capacity by 15% GDP by 2.8% till 2050.

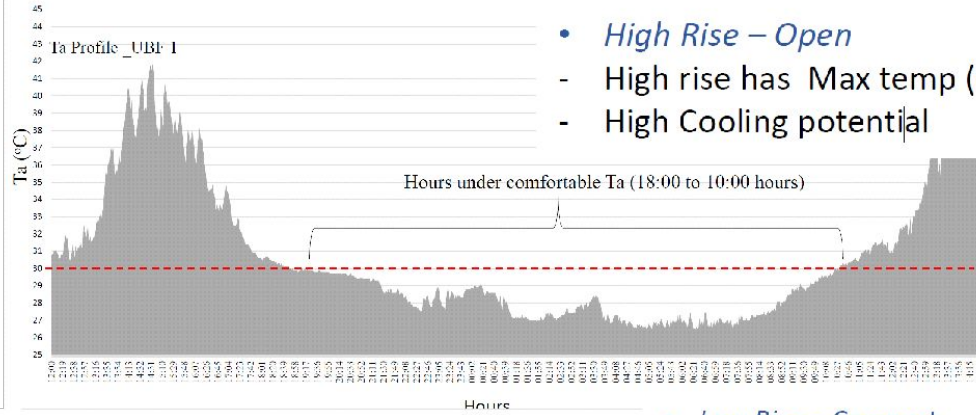
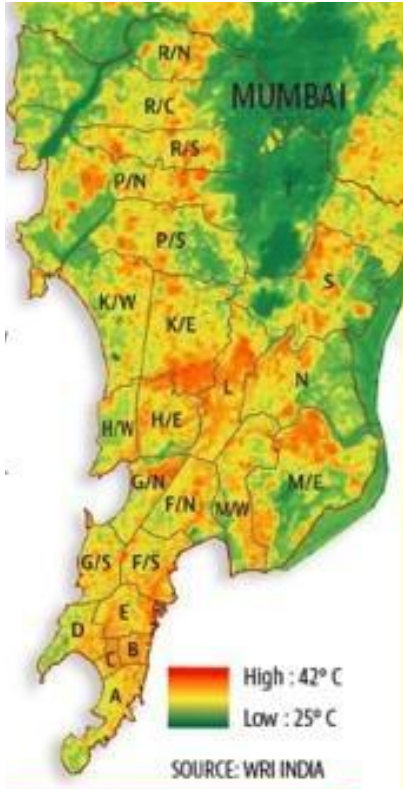


India-Mumbai - Cooling Potential of cities

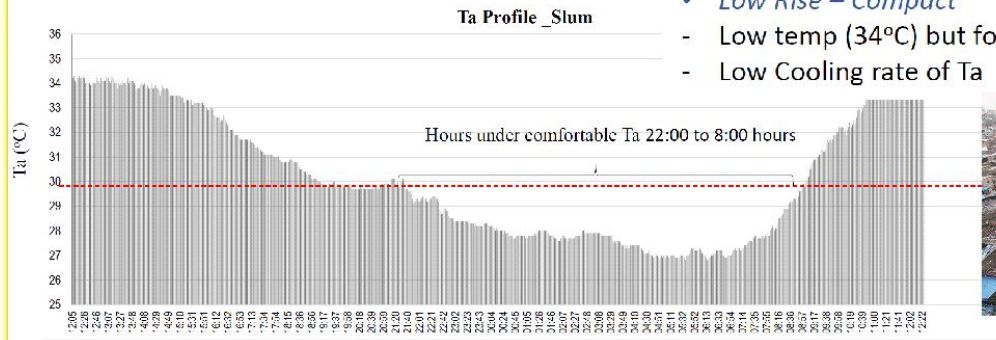
Urban form Typology			Description
Footprint	Representative 3d view	Sectional view	
			<p>high-rise compact type with high aspect ratio (i.e height of building \geq distance between buildings). Height of the buildings are $\approx < 24m$.</p>
			<p>high-rise open type with low aspect ratio (i.e height of building \leq distance between buildings). Height of the buildings are $> 24m$.</p>
			<p>low-rise compact type informal settlements commonly known as <i>slums</i> with extremely low aspect ratio. Height of the buildings are $\leq 5m$</p>
			<p>mid-rise open type representing the low-income social housing. Height of the buildings are in between $10m \leq 12m$.</p>
			<p>mid-rise compact type with extremely low aspect ratio. These were developed for the low-income group under slum rehabilitation policy. Height of the buildings are $\leq 24m$.</p>



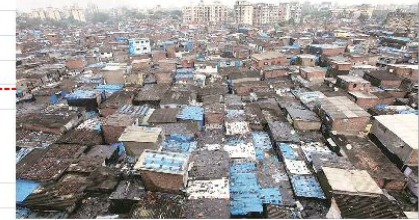
Thermal response of the urban forms



- *High Rise – Open*
- High rise has Max temp (42°C) but for less duration
- High Cooling potential


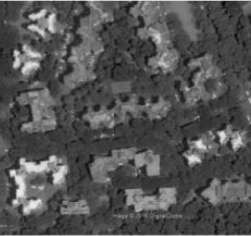


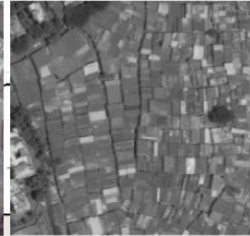


- *Low Rise – Compact*
- Low temp (34°C) but for less duration of comfort hours
- Low Cooling rate of Ta



Mehrotra, S., Bardhan, R., & Ramamritham, K. (2019). Urban form as policy variable for climate-sensitive area planning under heterogeneity: a geographically weighted regression approach. *Area Development and Policy*. <https://doi.org/10.1080/23792949.2019.1609368>

Heat Stress in different building archetypes

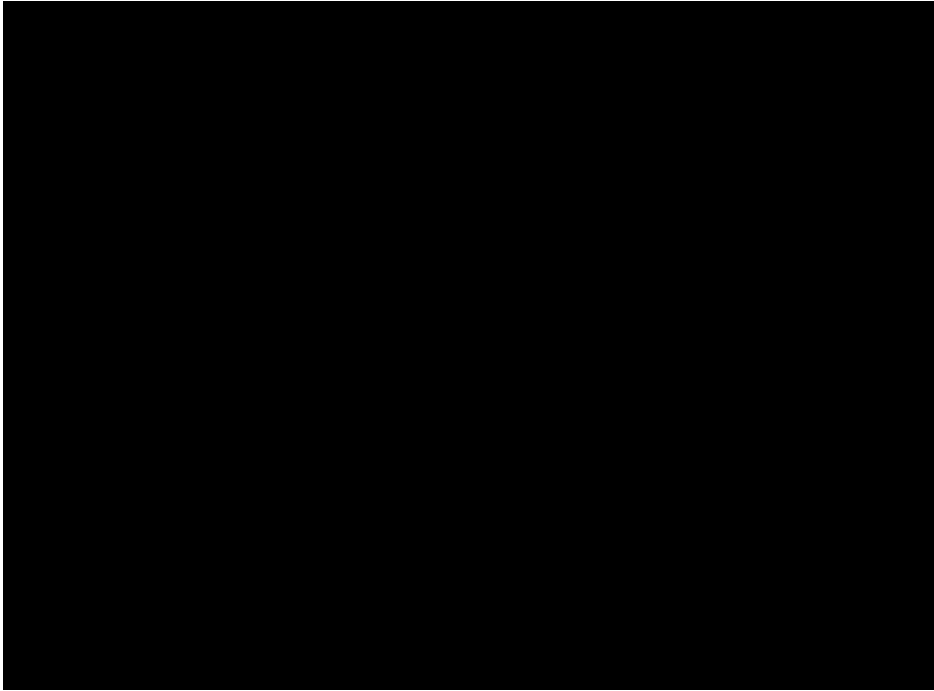
					
Temp	High	High	High	High	Low
Cooling Potential	Low	Low	Low	Low	High
Humidex	Low	High	Low	High	High
HSRI	Low	Medium	Low	High	Medium

Mehrotra, S., Bardhan, R., & Ramamritham, K. (2019). Urban form as policy variable for climate-sensitive area planning under heterogeneity: a geographically weighted regression approach. *Area Development and Policy*. <https://doi.org/10.1080/23792949.2019.1609368>

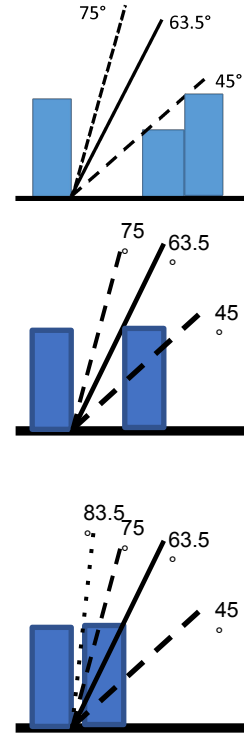
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Asian Coastal Cities – Heat Stress

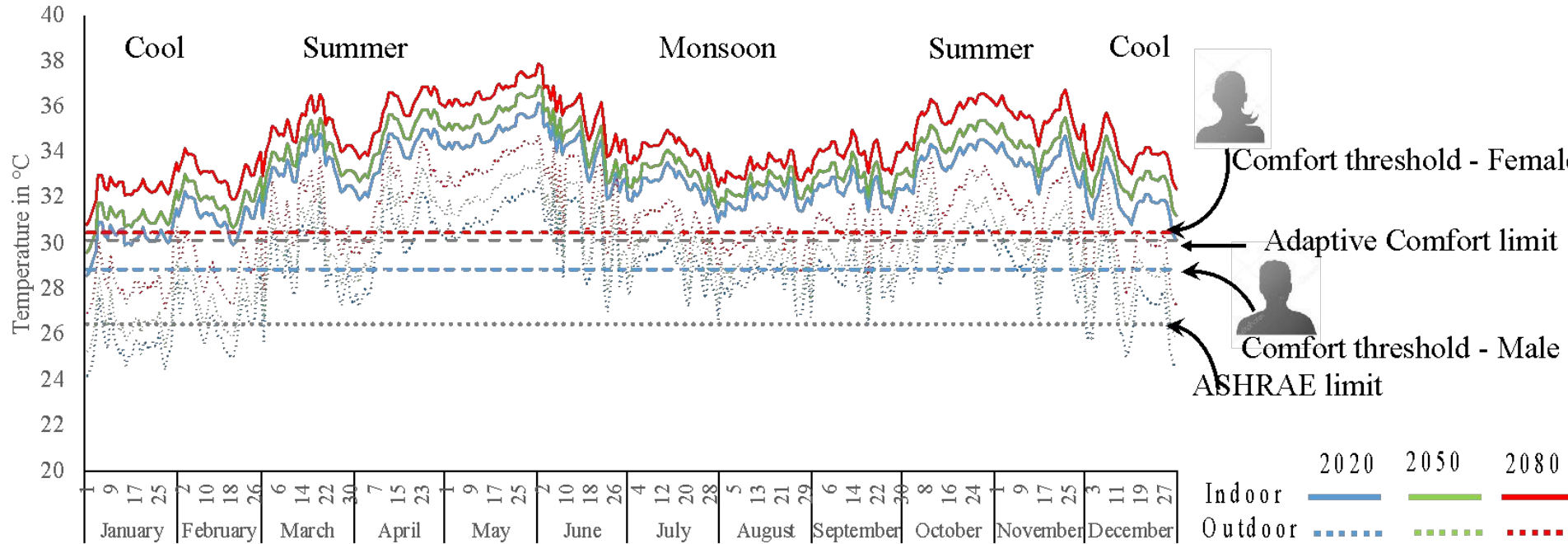
Across Global South Slums are being replaced by affordable housing



National Building Code
NBC for High rise buildings
Low-income buildings

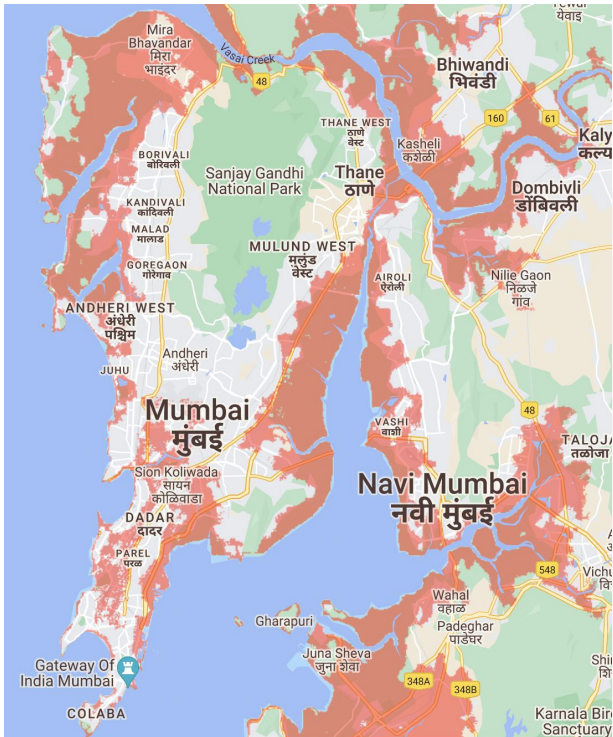


Predicting for future: Under climate change scenario RCP 8.5





Threats from Flooding



Land Projected To Be Below Annual Flood Level In 2050

Climate and Nature | Climate Change | SDG 13: Climate Action

Rate of sea-level rise doubles in a decade, and the other nature and climate news you need to read this week

