The Mapathon Method: Greening India's underutilized open spaces

A participatory approach to community-led urban greening

WRI INDIA

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PRESENTATION FLOW

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02 Urban Greening Challenges

03 What is a Mapathon?

04 Three cities. Three approaches

05 Q / A

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01

India’s Climate Narrative

Impact and progress

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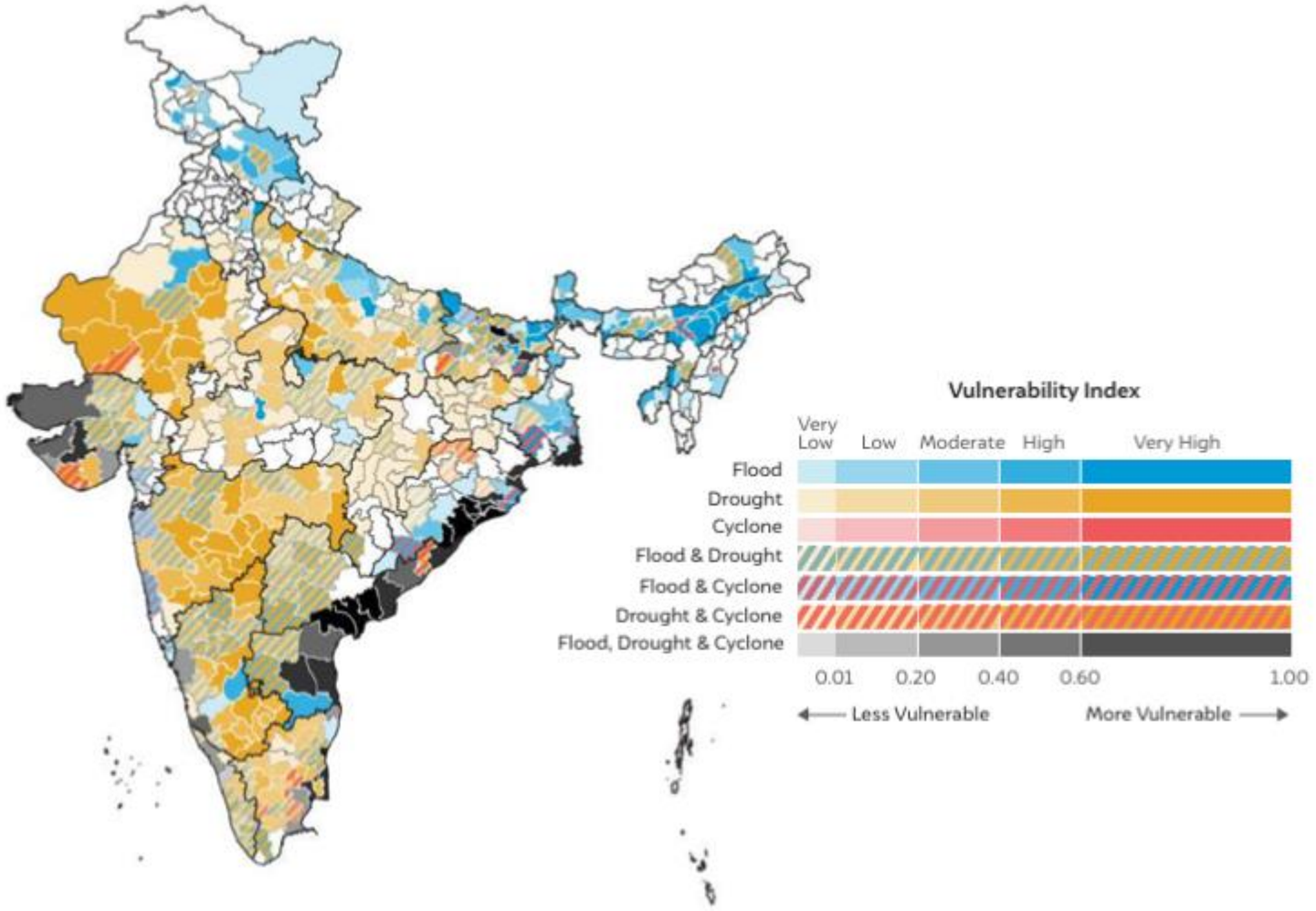

Source: Mapping India's Climate Vulnerability: CEEW, 2021

India is the 7th most vulnerable country with reference to climate induced risks.

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What does that look like?

Indian Navy personnel conduct rescue and relief operation in flood affected areas of Vijayawada, Andhra Pradesh. (PTI Photo)(PTI)

Scientists warn that prolonged exposure to high temperatures both day and night can exacerbate heat stress, increase mortality rates and reduce agricultural productivity.

What does that mean?

Earth's average temperature for 2025-29 likely to exceed 1.5°C limit: WMO

The WMO report also said there is a 70% chance that the average temperature for the entire five-year period will be more than 1.5 degrees higher than the 1850-1900 average

Updated - May 28, 2025 11:34 am IST - New Delhi

State of India's Environment in Figures 2025 warns of worsening climate, health and development indicators

No state excels across all themes; record displacement, air pollution and forest diversions underline urgency for action

27/ 35
states and UT's are vulnerable to extreme hydro-met disasters

8/10
Indians reside in districts that are vulnerable to extreme climate events

India may face 24.7% GDP loss by 2070 thanks to climate change: ADB report

Source: CEEW Analysis 2021

India is seeing the third highest number of internal displacements due to disasters, after China and the Philippines.

Source: Internal Displacement Monitoring Centre (IDMC) 2022 report

How did we get here?

India lost 18 times more forest than it gained between 2015–2019, study finds

From 2015 to 2019, all States in India experienced a net loss in forest cover; overall, India lost 18 square kilometres of forest for every 1 square kilometre gained.

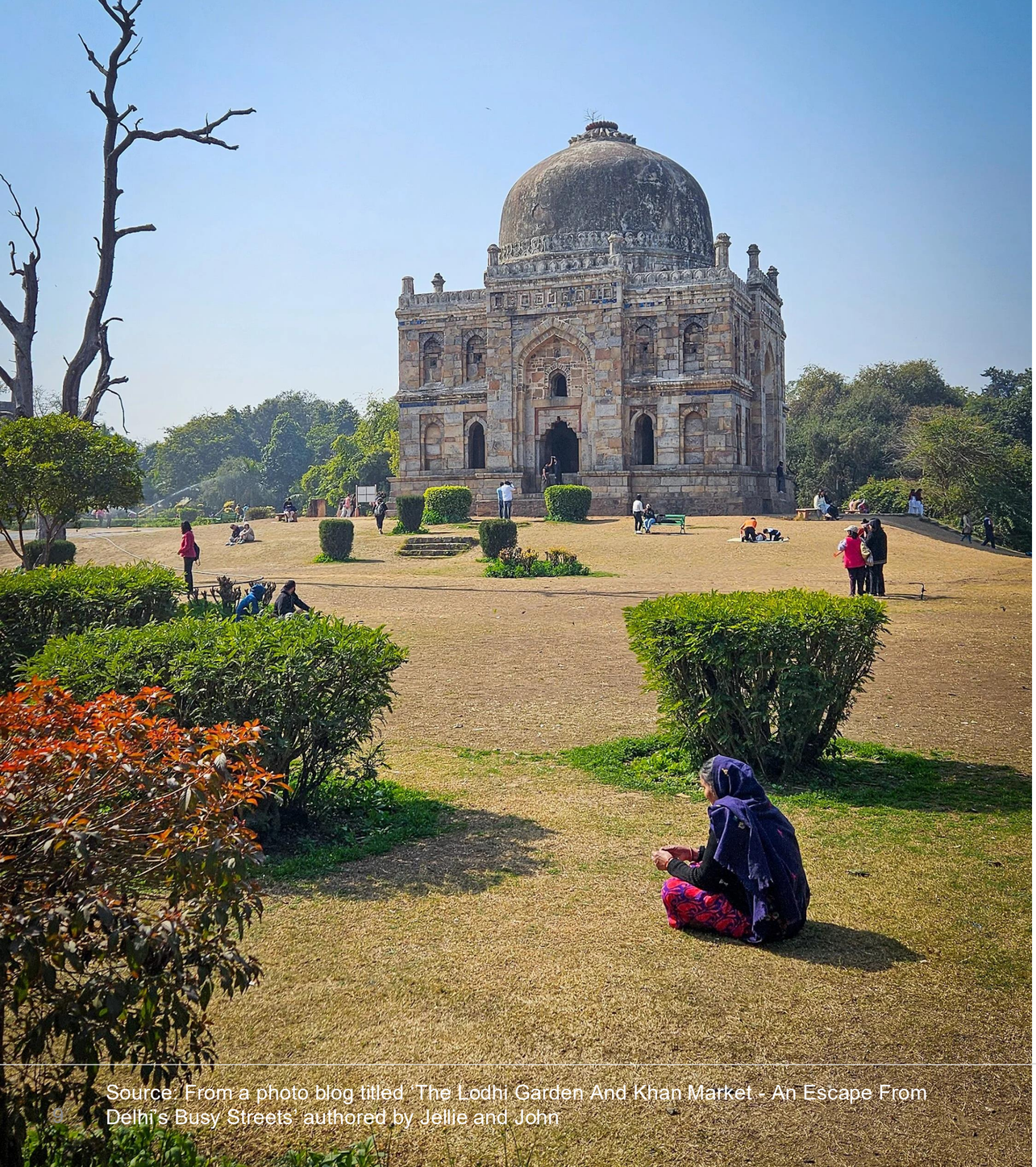
Updated - August 07, 2025 04:28 pm IST - MUMBAI

PURNIMA SAH

According to a 2020 survey conducted by the Ministry of Environment, Forest and Climate Change in India, over the past decade, urban green cover has decreased by 23%, leaving only a meagre 2.07% of urban land area covered with green spaces.

According to MoUD, there is now 17.43 square meters of open space per person in cities with listed master plans as of 2014, with 14% of green areas having been altered because of development activities.

Source: Singh, Prakash & Sharma, Pradeep Kumar. “Contested Urban Green Spaces in India: Complex Dynamics of Environmental Development.” *International Journal for Multidisciplinary Research (IJFMR)*, vol. 6, no. 5, Sept-Oct 2024. DOI: 10.36948/ijfmr.2024.v06i05.29663.



Source: From a photo blog titled 'The Lodhi Garden And Khan Market - An Escape From Delhi's Busy Streets' authored by Jellie and John

According to the URDPFI Guidelines, how much open space is recommended per person in Indian cities?

A. 6-8 sq.m
B. 10-12 sq.m
C. 14-16 sq.m

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City	Per capita open space (sq.m)
Mumbai	1.28
New Delhi	22
Bengaluru	2.2
Chennai	0.81

Most Indian cities fall below the recommended per capita of accessible open spaces due to urban expansion

Source: WRI India Blog titled ' **Reconfiguring public spaces within the new normal' auhtored by Mehta. P and Dhindaw. J (2020)**

02

Urban Greening Challenges

Need for a systemic approach

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Unprecedented Urban Growth

Leading to reduced open spaces

01

Lack of imagination for limited space

Not everything needs to be a park.

02

Poor Site Selection for Planting

Lack of data-driven - site scoping leads to planting in unsuitable locations

03

Community never involved

Limited understanding of how individual projects contribute to the larger green network, affecting connectivity and overall ecological /social benefits.

04

03 What is a Mapathon?

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What is a Mapathon?

A **Mapathon** is an example of a **citizen-science tool**, combining community involvement with evidence driven technology inputs.

It is a **community-led** initiative that engages local stakeholders in **identifying and documenting potential sites.** It capitalizes on **technology and scientific methods** to create a structured repository of sites ideal for restoration.

Objectives of Mapathon

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Our Journey

Our journey with the **Mapathon** began with a simple but powerful idea that people can come together to map, understand and restore the landscapes they live in. The approach is inspired by the *"Mapping Together"* guide developed by the **World Resources Institute** and the **Food and Agriculture Organization (FAO)** , a global framework that shows how collective mapping can become an evidence-based, participatory tool for restoration for trees outside forests

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What is the process?

Pre-Mapathon

- Area selection
- Venue selection
- Resource allocation
- Awareness campaigns

Data Collection Preparation

- Survey design
- Downloading and setting up the required software
- Preparing & printing detailed maps, stickers, sticky notes

Data Collection

- Digital data collection
- Hands-on data collection

Repository Creation and Results Documentation

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Who are the stakeholders?

1

Public Departments
Forest
Horticulture
Garden
Or other interested departments

2

Citizen Groups
RWA's
CSO's
Apartment federations

3

Local Community
Neighborhood
Volunteers and residents

4

Organizations
CSR Initiatives
Think tanks
NGO's
Academic institutions

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What are we trying to solve?

Identifying neglected/underutilized open spaces for urban greening thereby building climate resilience 01

Bridging gaps between local insights to implementation strategy thereby prioritizing greening based on climate vulnerability and accessibility 02

Making urban greening efforts backed by evidence-based decision 03

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04

Three cities
Three approaches

KOCHI | BENGALURU | MUMBAI

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KOCHI

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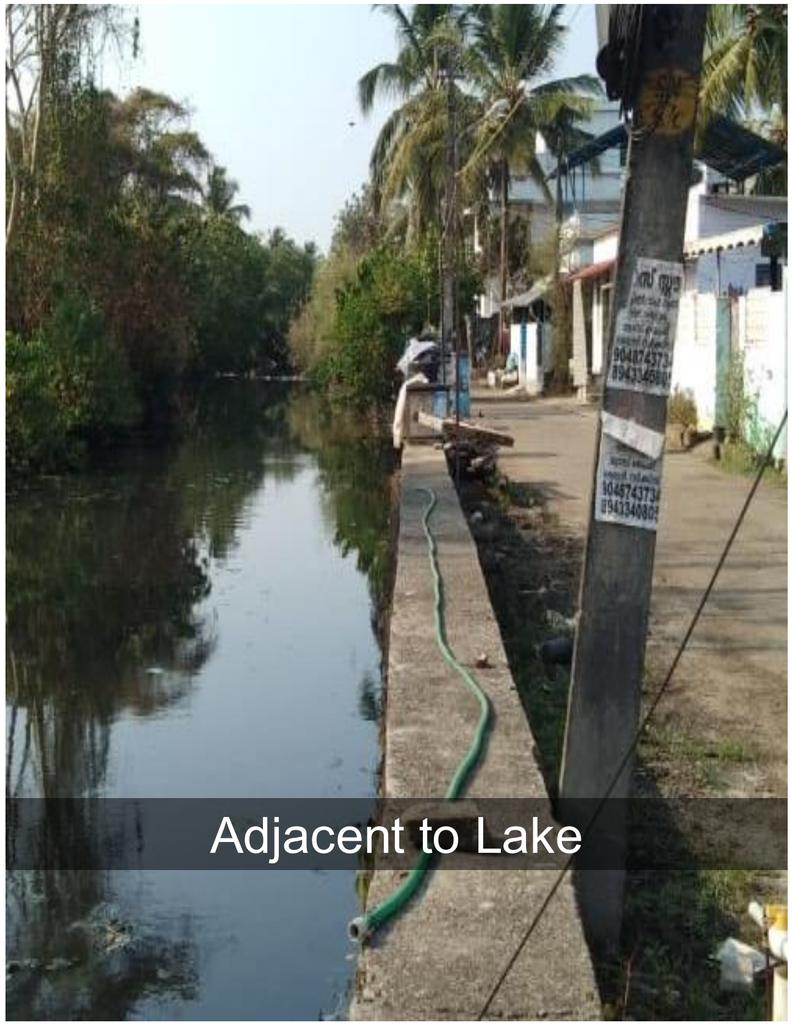
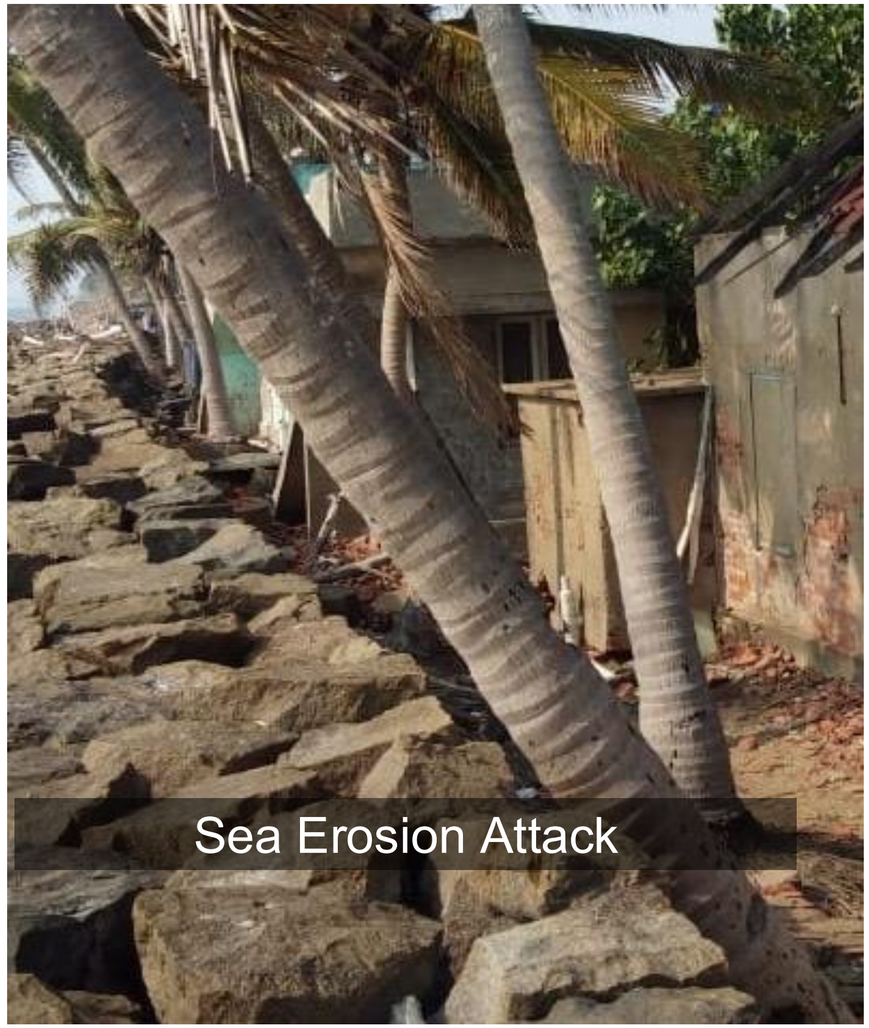
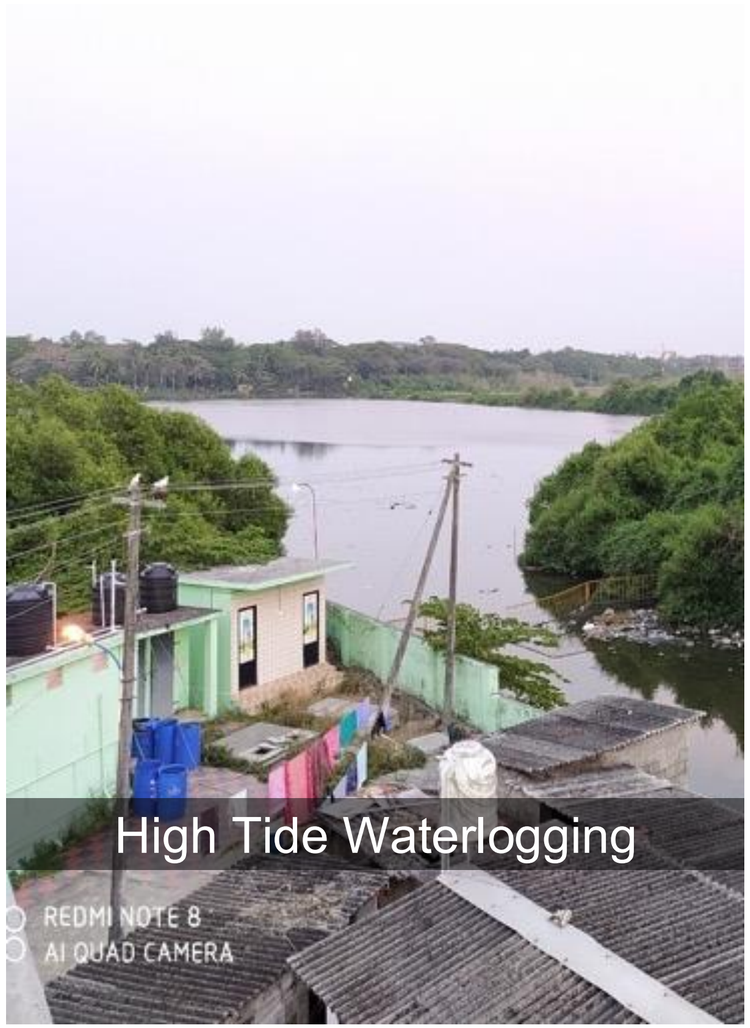
Kochi: Communities At Risk



Adjacent to Lake



Sea Erosion Attack



High Tide Waterlogging

Our Approach In Kochi

Data-driven decision making

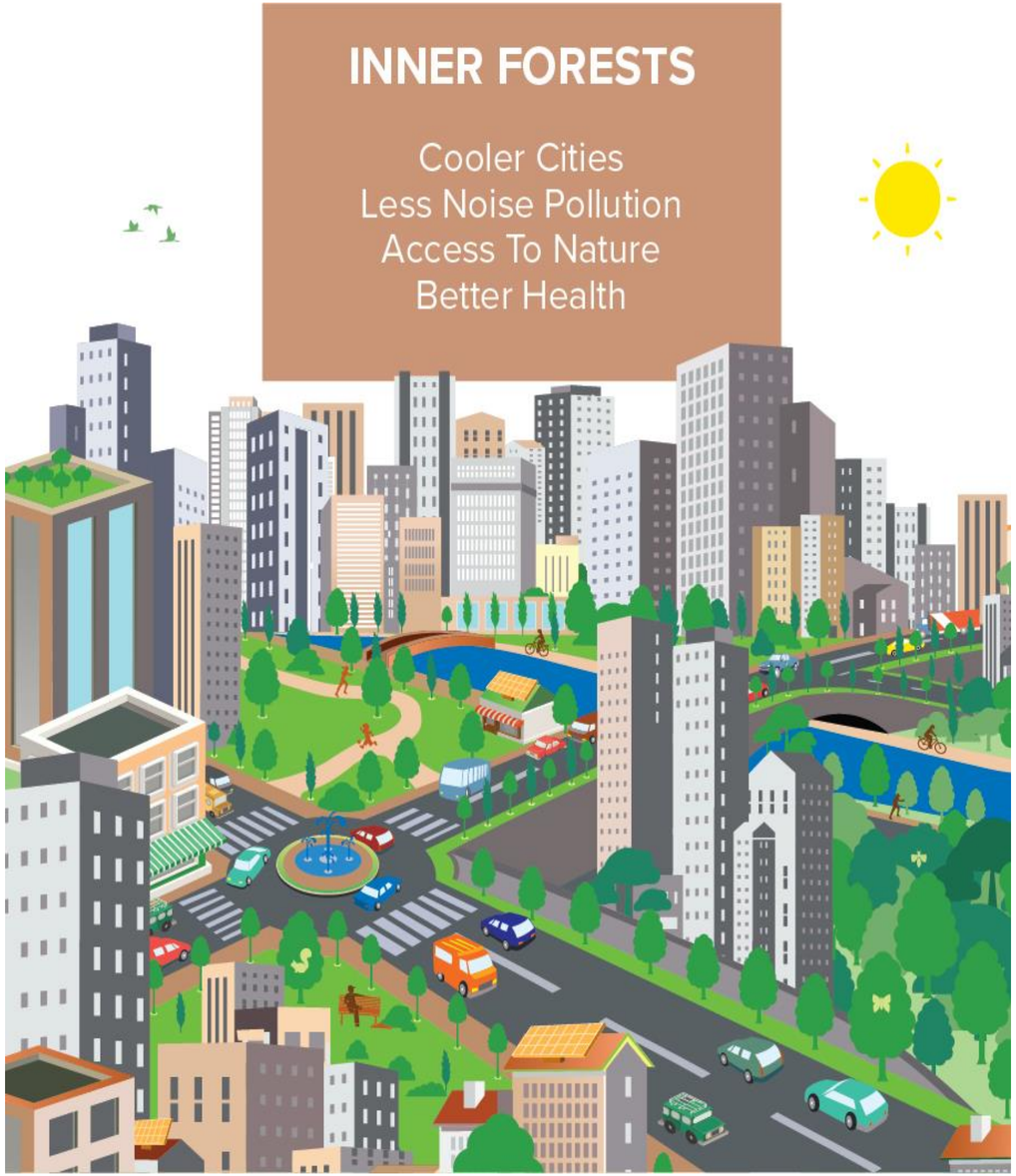
Multi-stakeholder process

Institutional integration

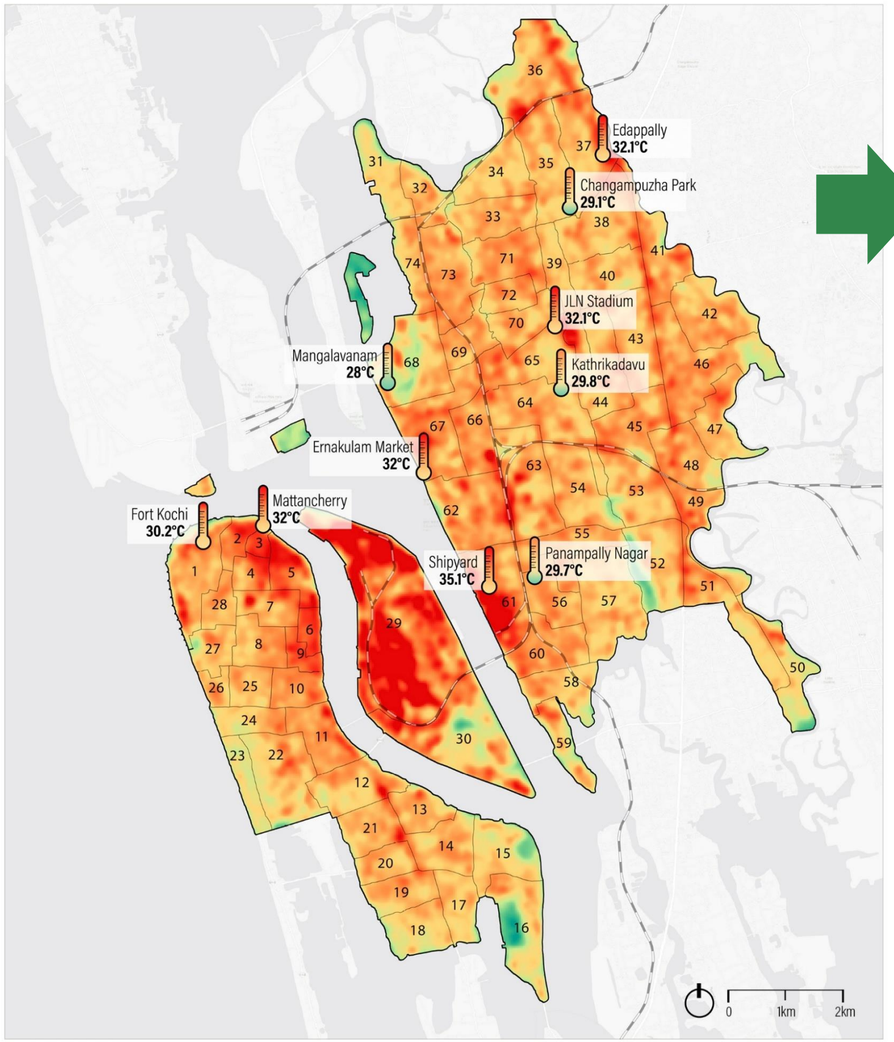
Long-term preparedness through NBS

Localized disaster preparedness through strong community

Roadmap for city resilience to inform the CDMP



Mean Land Surface Temperature observed for 2017 - 2020



Source: WRI India 2021; Landsat USGS/NASA, ESRI grey base map.
Note: Each pixel in the map represents the overall average LST computed using LandSat 8 imagery for the following dates: Jan/Feb 2017-02-03, 2018-02-06, 2019-01-08, 2020-02-12.

About 31 % of the city's population is exposed to temperature above 30 °C

About 26% of the city's population lives within the flood plains

Potential Flooding Risk Areas in Kochi Municipal Corporation

Source: WRI India 2021; NCESS 2010; Sentinel ESA.

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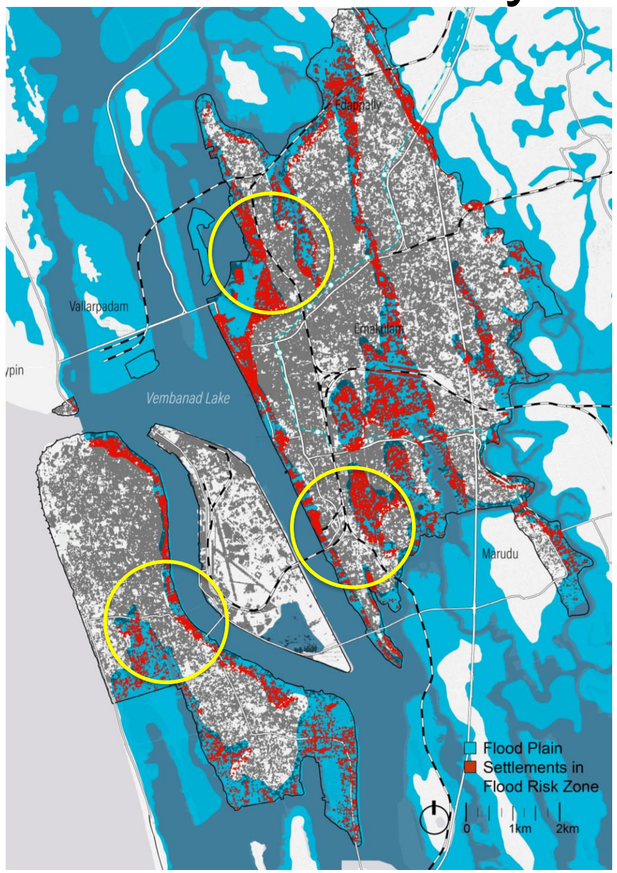
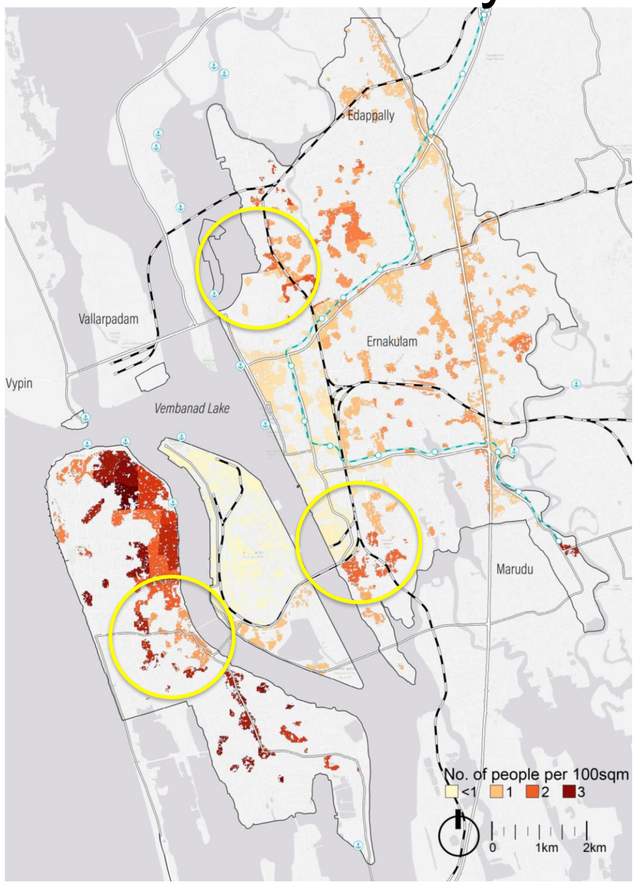
Vulnerability Assessments

Flood Vulnerability



Heat Vulnerability



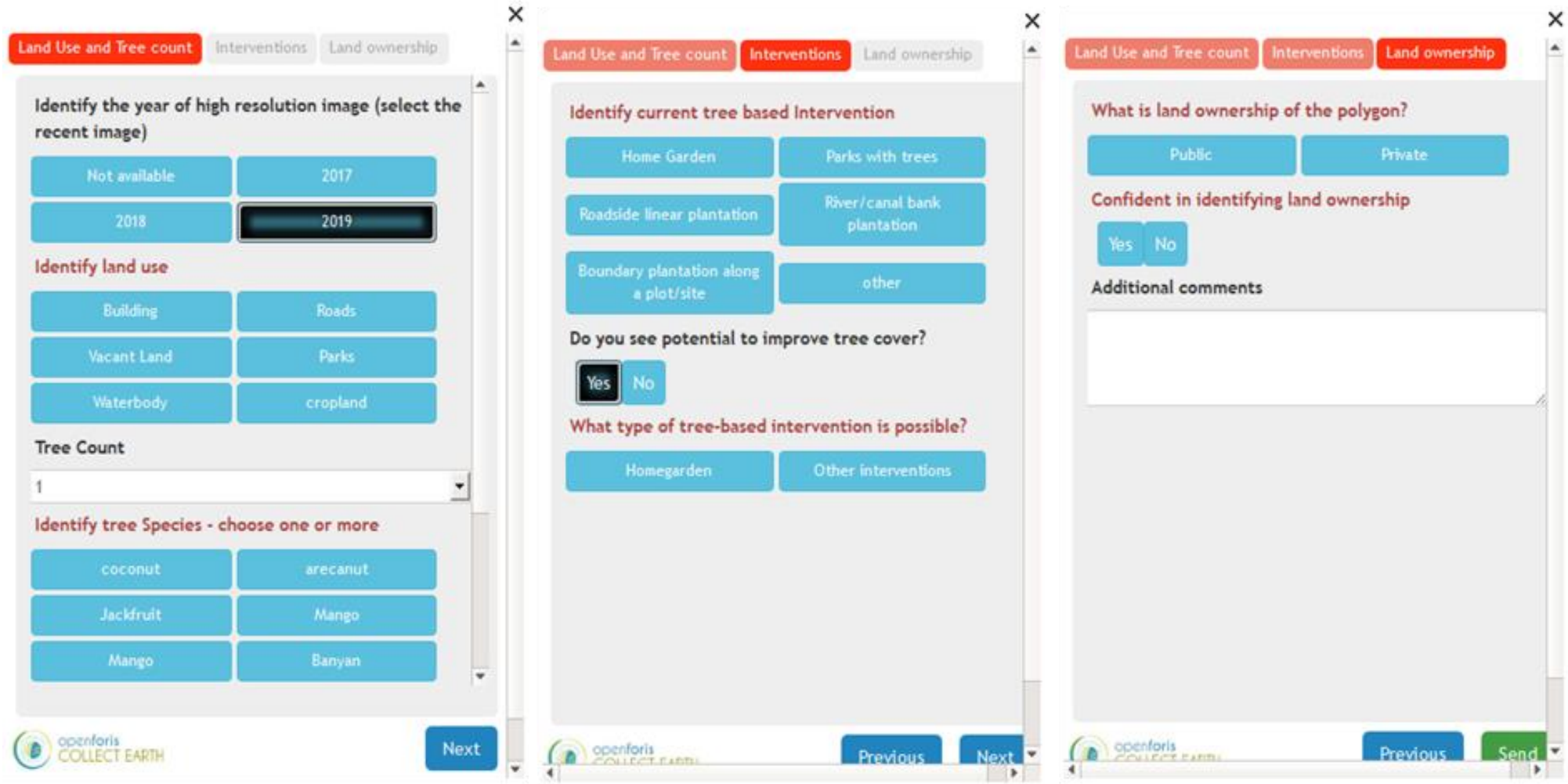
Access to public spaces

Encircled: Most vulnerable population – very poor access to public spaces and high exposure to heat and flood

Kochi Mapathon

WHAT	HOW	WHOM
To assess- spatial baseline number of trees, potential areas for restoration and restoration interventions	*Collect Earth* [*http://www.openforis.org/tools/collect-earth/*](http://www.openforis.org/tools/collect-earth/) *Data collection platform developed by OpenForis Initiative of the Food and Agriculture Organization (FAO).Collect Earth enables assessing a landscape using very high-resolution satellite images available in Google Earth and Bing maps in conjunction with Google Earth Engine.*	*Students – trained in data collection process* *Local councillors, Resident welfare association members and other local experts – with local knowledge*

Survey Card Template With Collect Earth



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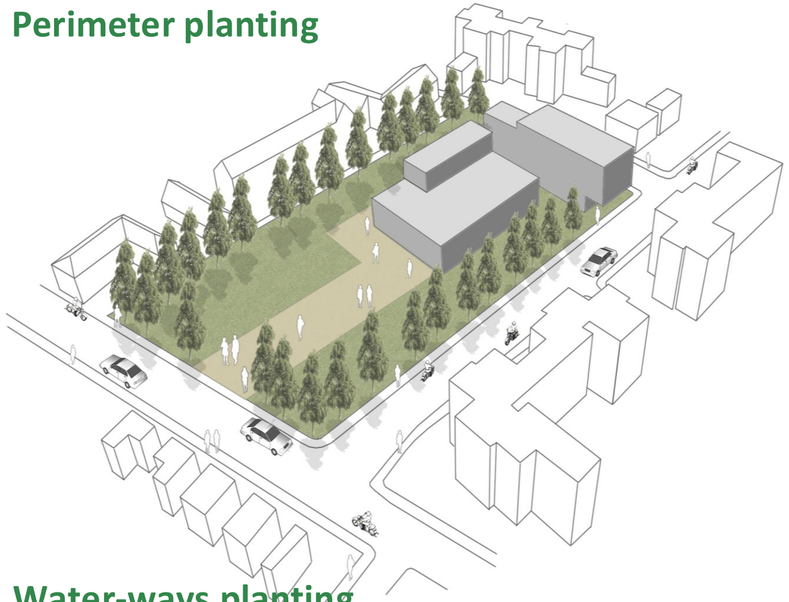
Avenue planting/Green Streets

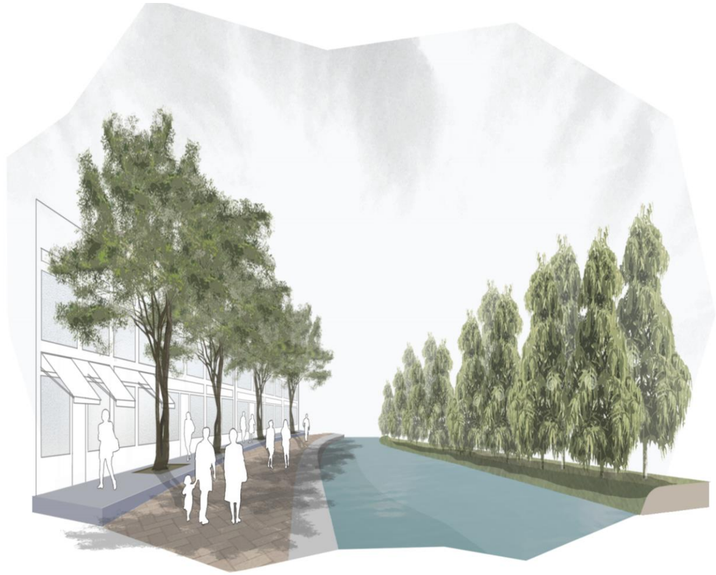
Perimeter planting



Community/home-gardens/rooftops

Block planting

Water-ways planting



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KFRI

c-hed

ONE TREE PLANTED

A project to mitigate impacts of climate change, plant native trees, adpat to urban flooding, and raise awareness about urban heat & flooding.

LOCATIONS IDENTIFIED FOR PLANTING

Total estimated trees - 2900
Locations - Wards 12, 13, 22, 25, 27, 31, 32, 36, 62, 73

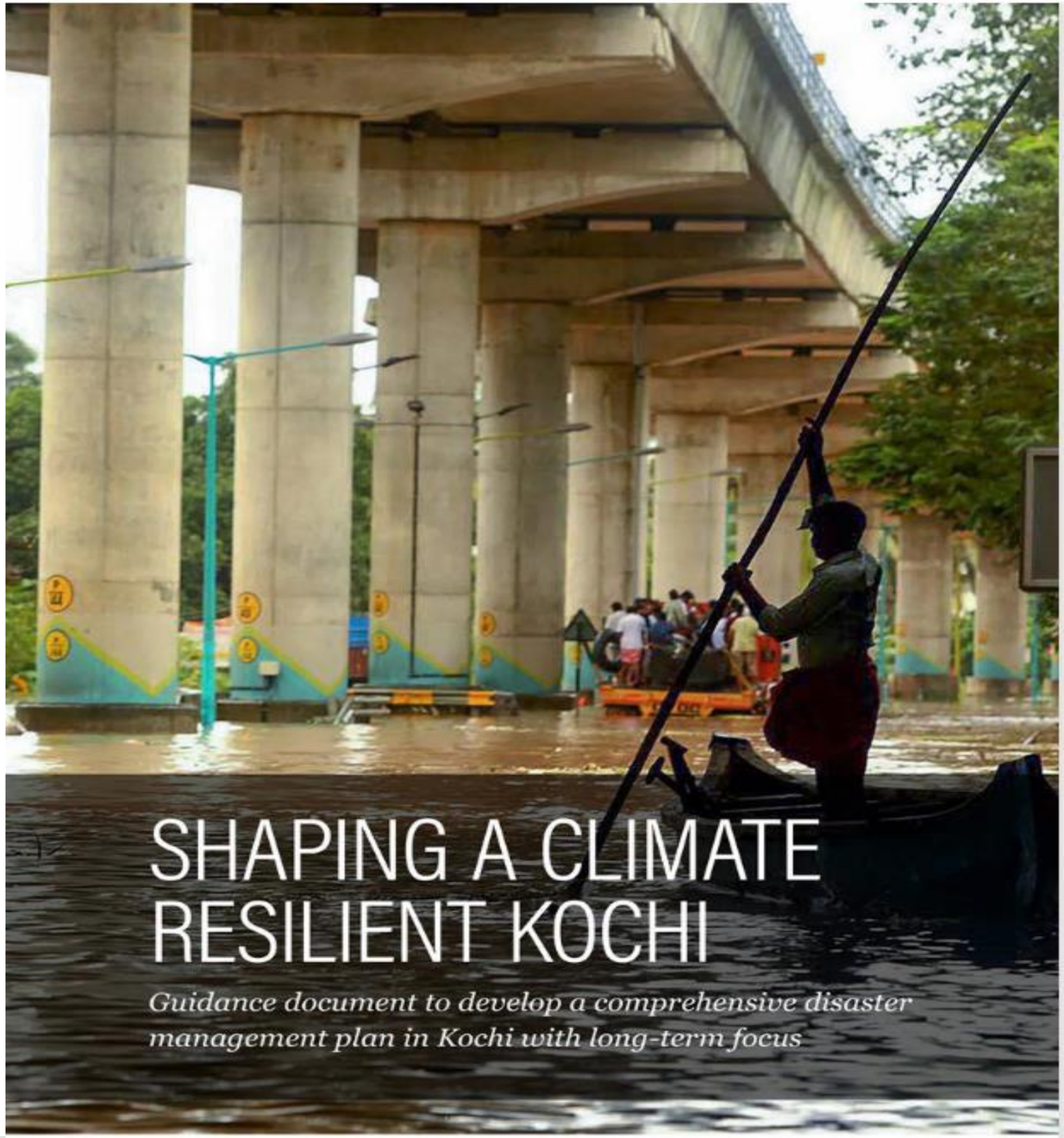
Kawaki Planting Sites

Kochi Municipal Boundary	Kawaki at public properties	0 - 50	50 - 200	> 200
Ward Boundary	Kawaki at private properties	0 - 50	50 - 200	> 200

Notes: Kawaki at Public Sites are maintained by Ayyankali Mission (Government Organisation)

Linking Livelihoods

FROM KAWAKI TO POLICY: THE RESILIENCE GUIDANCE DOCUMENT



BENGALURU

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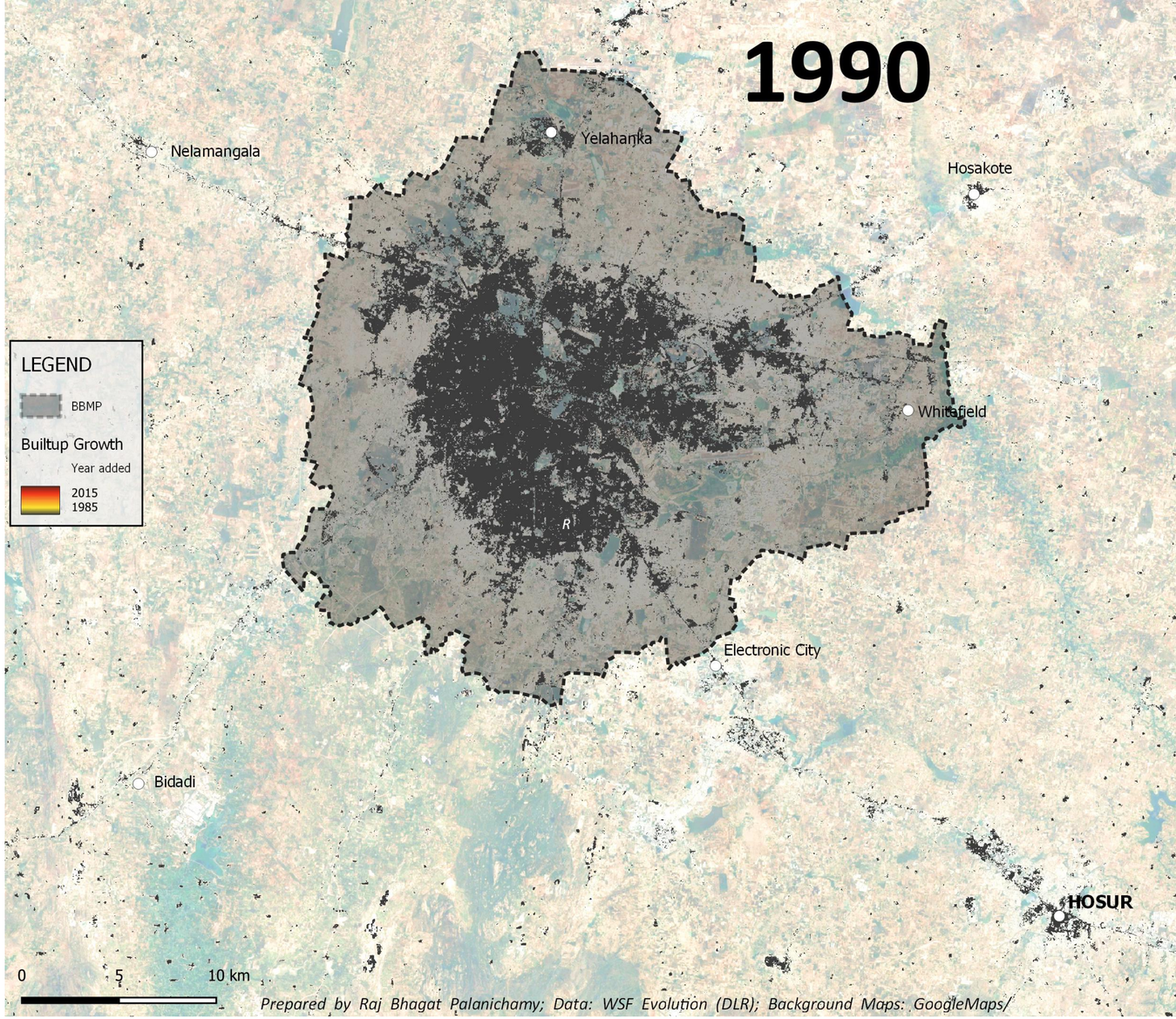
Setting the context

- **Fifth most populous** urban agglomeration and one of the **fastest growing** metropolises in India
- Population (2019): ~10.2 Million
- Increase in Population: 95% (1991 to 2011)
- Increase in Built-up area: 170% (1985-2015)
- Bengaluru is located in the heart of the Mysore plateau, and at an elevation of 920 m above MSL
- Bengaluru falls within the Cauvery-Ponnaiyar river basin



Gif: Bengaluru's built-up area increase from 1990-2015.

Map source: WRI India Geoanalytics

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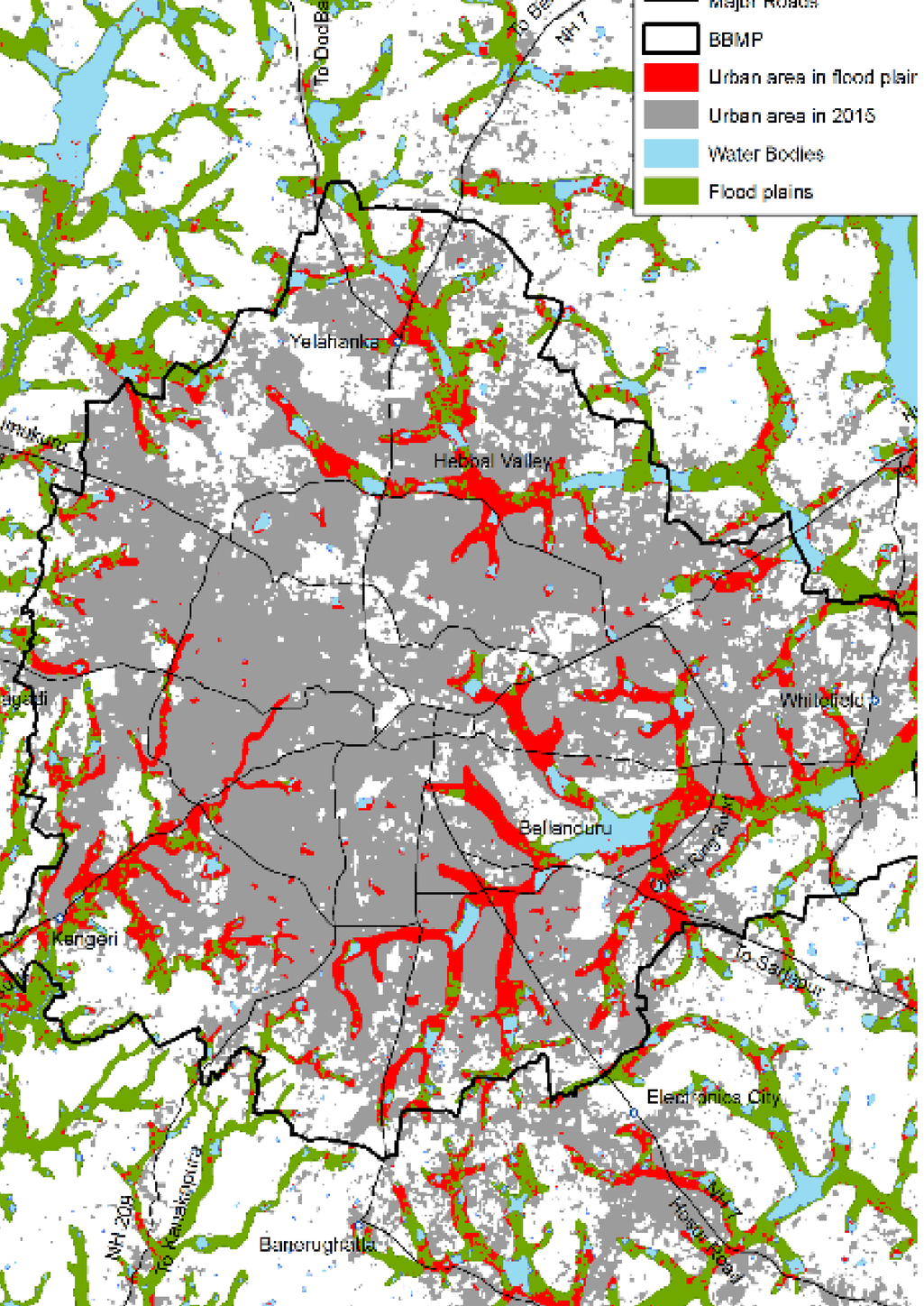
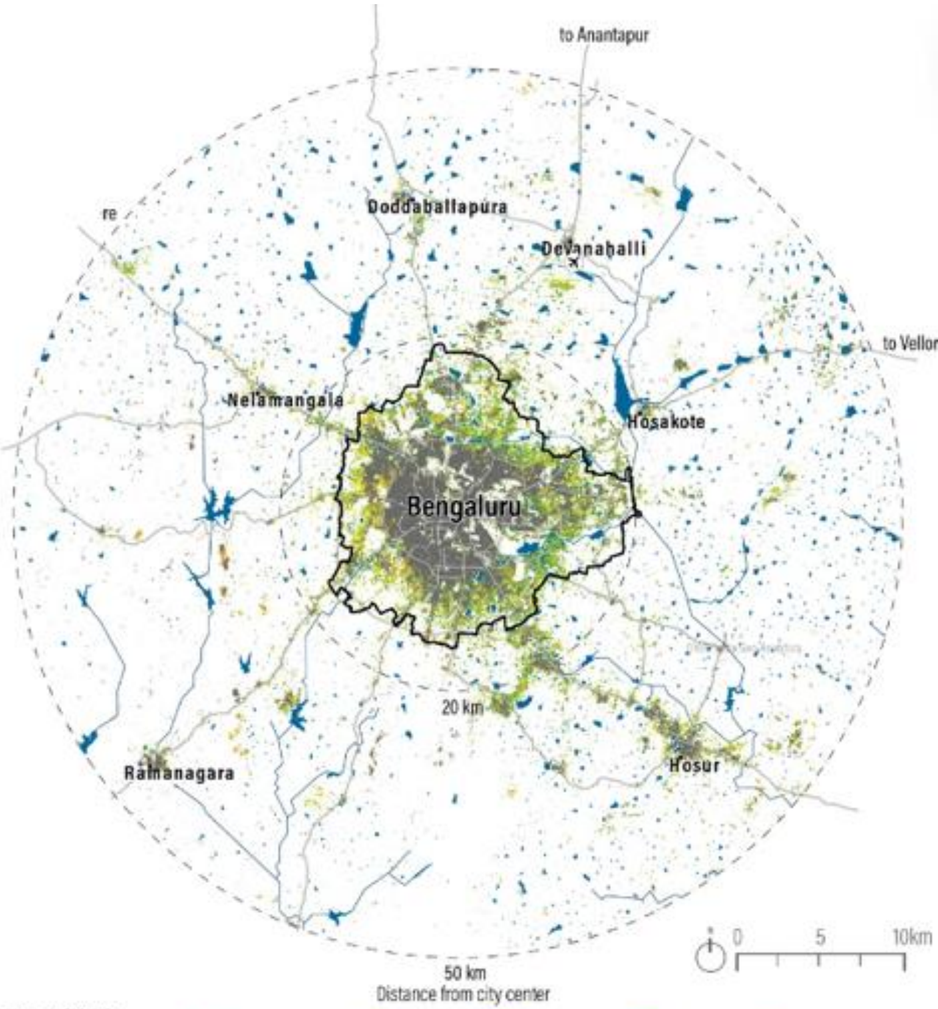


85% of floodplains in Bengaluru are encroached upon/built-up



Groundwater recharge potential in the year 2000 for the areas with built expansion between 2000-2015: Very High | High | Medium | Low | Very Low

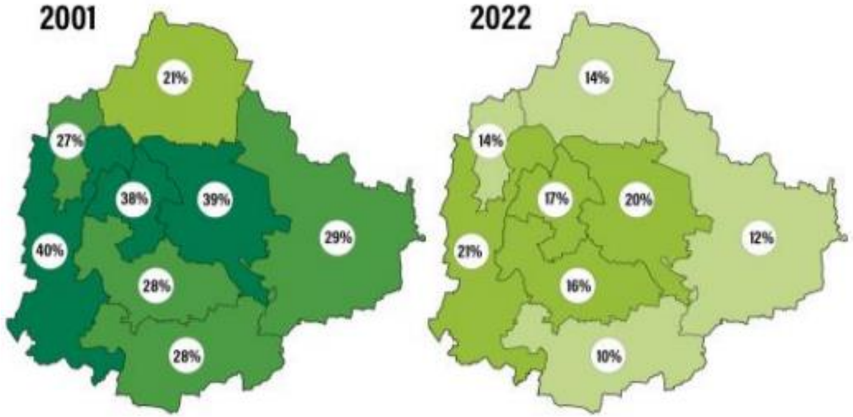
BBMP Boundary — River Network — Major Road — Built extent till year 2000 — Water Extent

No Color - Areas with no urban development until 2015

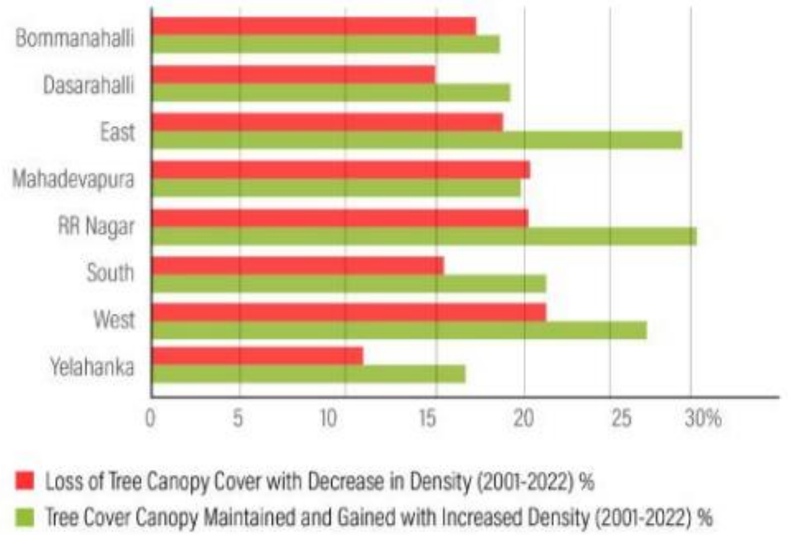
Note - 1. The stats are estimated basis the analysis for Bengaluru and its surrounding region, i.e. 0-50 km from the city center.
2. Map illustrates the various categories of Ground Water Recharge Potential (GWRP) for the year 2000 clipped to the built growth between the year 2000-2015. It indicates the substantial new development cited on High and Very High GWRP Zones.
3. The recharge potential is estimated across five classes: very low, low, medium, high, and very high. The 'very low' recharge potential class corresponds to areas with less green cover and steeper slopes, indicating higher runoff and less infiltration. Conversely, the 'very high' recharge potential class corresponds to areas with more green cover and flatter terrain, indicating high water infiltration.

Source: Urban Blue-Green Conundrum Report - 2023, WRI India

Percentage of Tree Cover Canopy Density



Zone-wise Increase or Decrease in Canopy Cover Density



Source: Google Earth Engine; i-Tree Canopy Cover, 2022
*Calculations are based on the extent of canopy cover for Trees outside Forest

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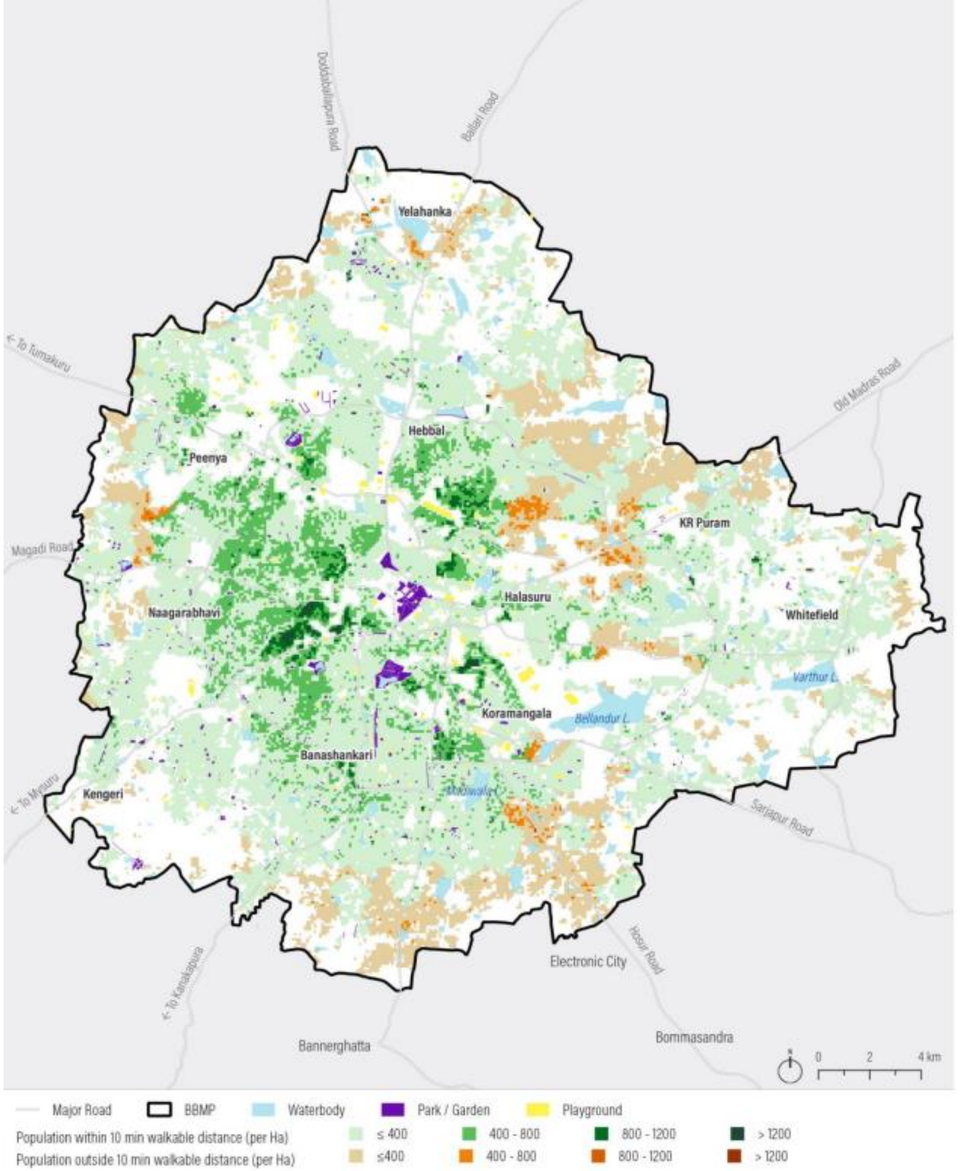
ROSS CENTER



Map source: WRI India analysis using KSARC building data, BBMP landuse data and estimate population density from 2011 census

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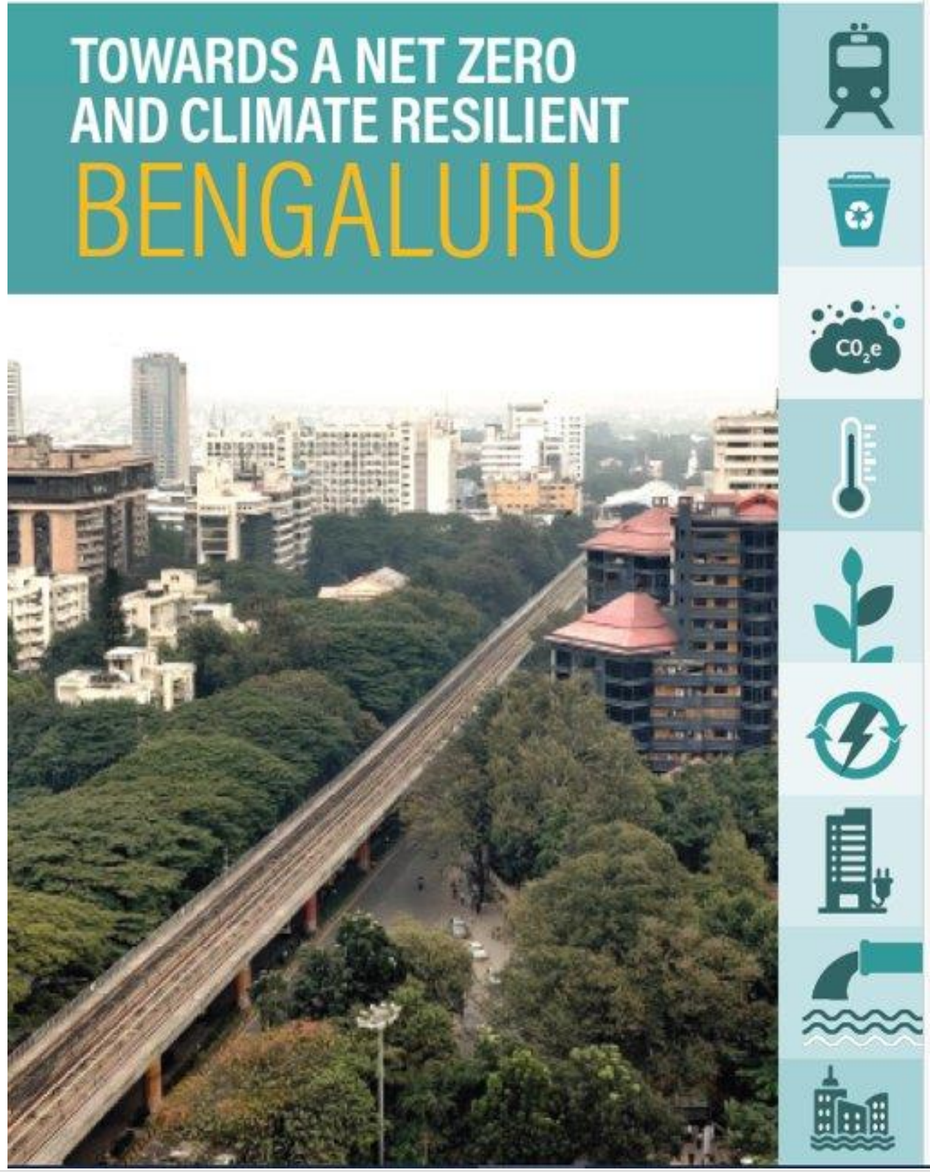
What is the city doing?

1. **Launch of the Bengaluru Climate Action and Resilience Plan (BCAP)**
2. **Formation of a dedicated Climate Action Cell (CAC)**
3. **Raising community awareness through BluGreenUru campaign**
4. **Bengaluru joined Cities4Forests a global alliance of cities pledging to conserve, restore and promote urban green**



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Greening goals from BCAP

1

Increase tree cover canopy

10% by 2030
20% by 2024

2

Expand green and permeable areas

40% of the city by 2040

3

Increase accessible open space

From 2.2 sq,m to 6 sq.m per capita

4

Implement Nature Based Solutions (NbS) for urban resilience

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How did we plan Bengaluru Mapathon?

1

Stakeholder Mapping

- Bengaluru Climate Action Cell (CAC)
- Forest Department
- Horticulture Department
- Lakes Department
- Residents from the chosen zone
- CSO's and RWA's

2

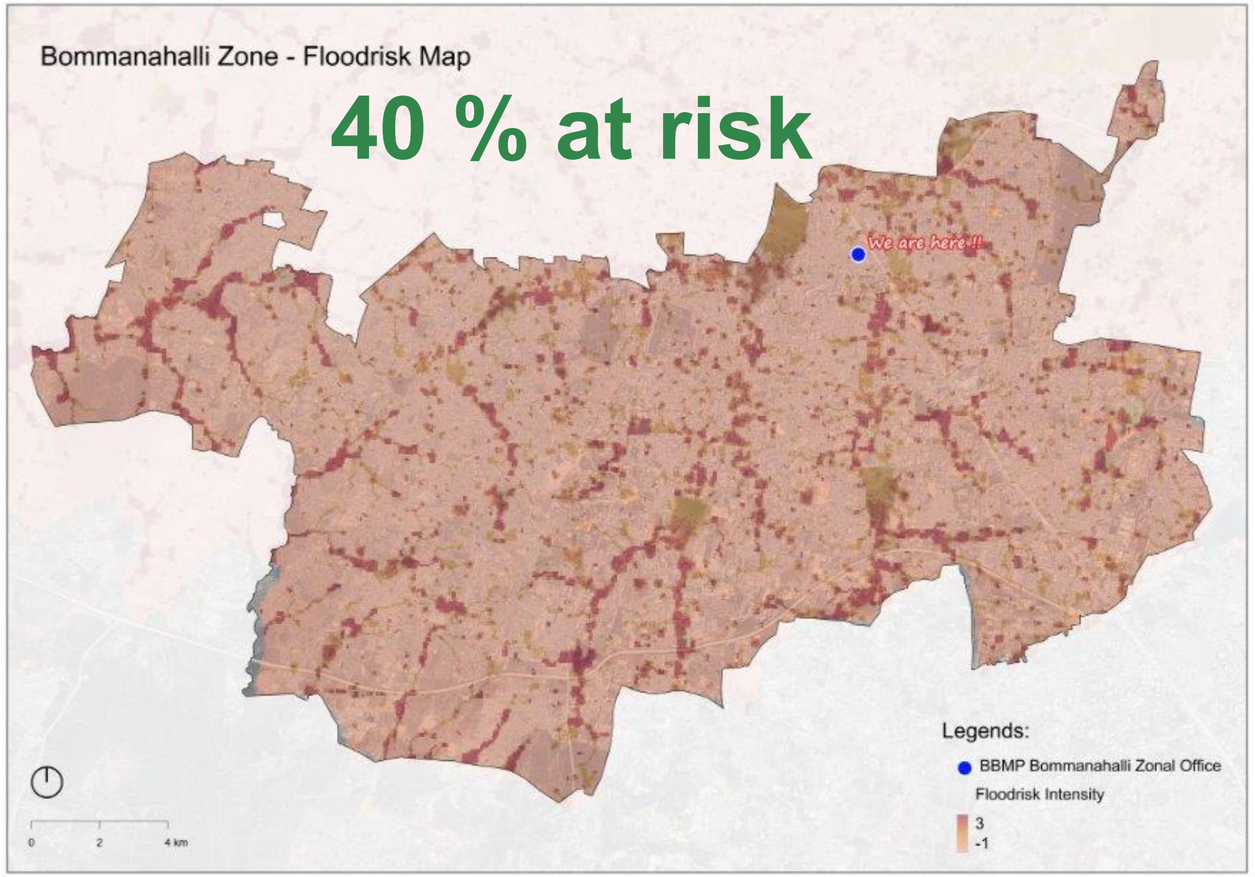
Understanding climate vulnerability

- Land surface temperature
- Urban Floods
- Potential for ground water recharge
- Vegetation trend
- Percentage of most vulnerable population

3

Selecting a zone to conduct Mapathon

- Choosing a zone climate vulnerable zone
- Identifying venue for Mapathon
- Identification of potential planting sites through machine learning



More than 40% of Bommanhalli residents are exposed to flood risks

How did we plan Bengaluru Mapathon?

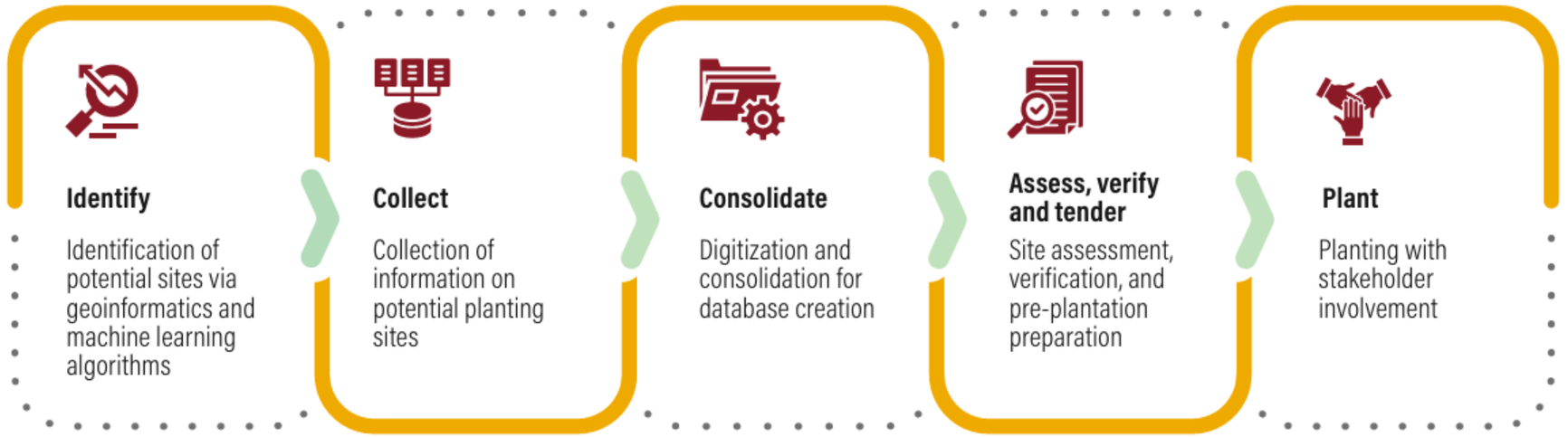
4

Community outreach

- Creating social media posts for participation
- WhatsApp messages as forwards

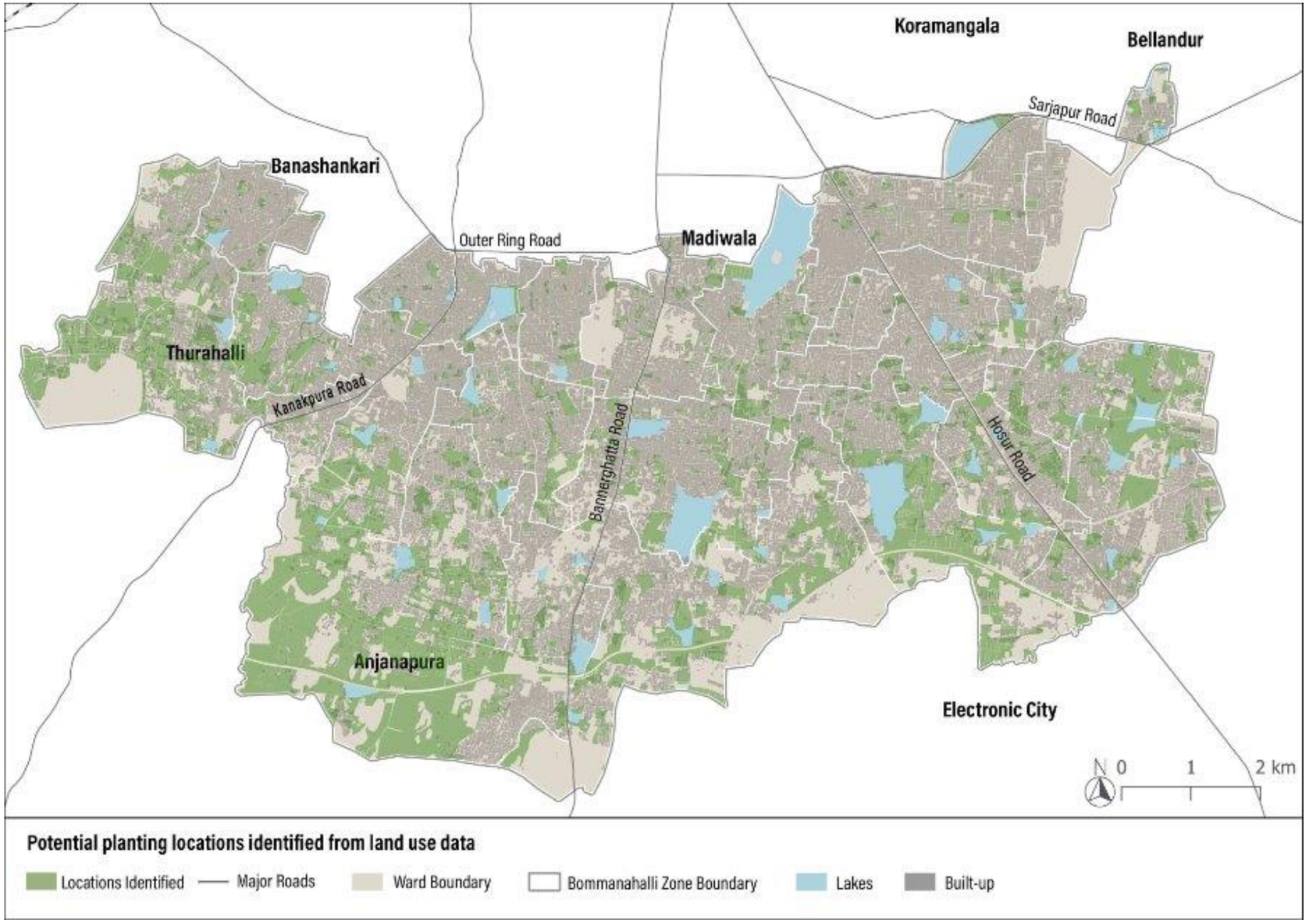
5

Conducting Mapathon



Identify

Identification of potential sites via geoinformatics and machine learning algorithms



Collect

Collection of information on potential planting sites

Hands-on Mapping Method:

Participants engage in interactive mapping exercises, using stickers to identify and mark potential planting or greening sites on city maps.

Collect

Collection of information on potential planting sites

Digital Mapping Method:

Participants use *Collect Earth* and *Google Earth Pro* to evaluate potential greening locations by responding to structured survey questions. This approach requires basic training in spatial mapping tools and ensures systematic data collection for site assessment.

Collect

Collection of information on potential planting sites

Digital Mapping Method:

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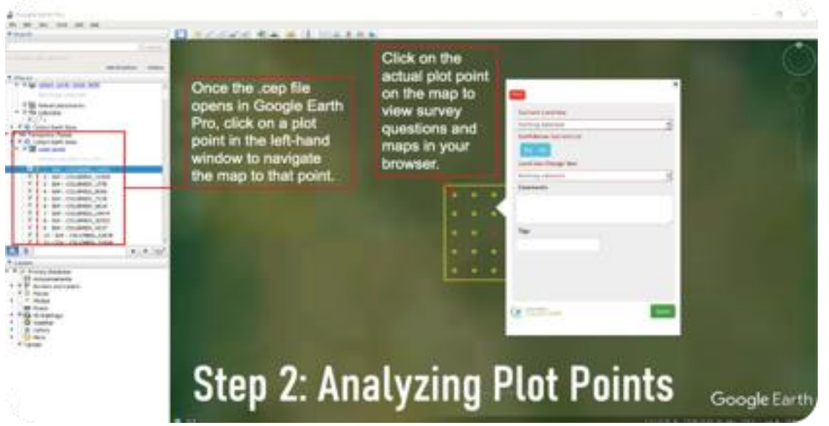
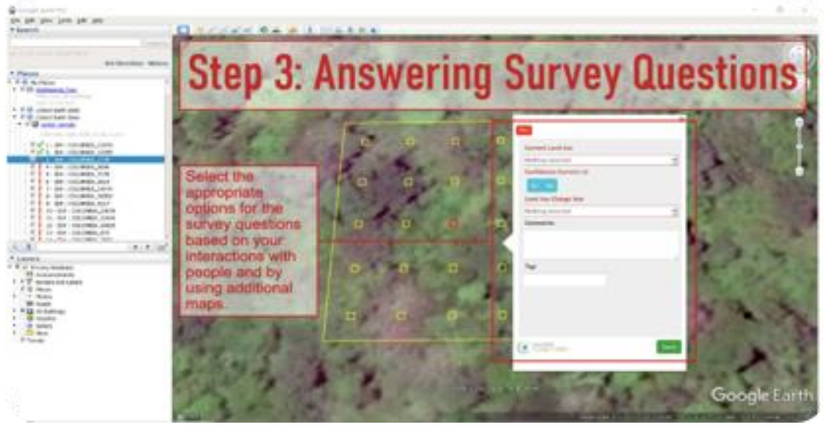
CATEGORY	QUESTION	OPTIONS
Land Use and Tree Count	1. What is the land use in the polygon?	1. Building 2. Roads 3. Vacant land 4. Park 5. Waterbody 6. Land Fill
	2. Number of trees already existing in the plot	1. 0 2. 1 3. ...>30 4. Unknown
Interventions	3. What tree-based intervention do you identify?	1. Home garden 2. Parks with trees 3. Road-side linear plantations 4. Waterway plantations 5. Boundary plantation along a plot/site 6. Others
	4. Can you improve the tree cover in this plot?	1. Yes 2. No
Land Ownership	5. What is the land ownership of the plot?	1. Public 2. Private
	5.1. (If public) Identify	1. Institutional 2. Parks/Waterbody 3. Open Spaces/Parking Spaces 4. Roads 5. Railway 6. Other, specify _____
	(If private) Identify	1. Residential 2. Institutional 3. Industrial 4. Other, specify _____
	6. What is the soil type in the area?	1. Sandy 2. Clayey 3. Loamy 4. Rocky 5. I do not know
	7. Are there any existing water bodies nearby?	1. Yes 2. No
	8. Is the area prone to flooding during heavy rains?	1. Yes 2. No 3. Not sure
Community Engagement	9. Are there any existing community initiatives for tree planting or environmental conservation in the area?	1. Yes 2. No
	10. What are the main challenges faced by the local community in tree planting or environmental conservation efforts?	1. Lack of awareness 2. Limited resources 3. Policy constraints 4. Others, specify: _____
Tree Health and Maintenance	11. What is the condition of existing trees in the area?	1. Healthy 2. Diseased 3. Stunted growth 4. Dead 5. Others, specify: _____
	12. Is there a need for tree pruning or maintenance activities?	1. Yes 2. No
Future Planning and	13. Are there any plans for future urban development or infrastructure projects in the area?	1. Yes 2. No 3. Not sure
	14. How can tree planting and restoration efforts be integrated into future urban planning initiatives?	1. Incorporating green spaces in infrastructure projects 2. Implementing tree planting requirements for new developments 3. Creating urban forests or green corridors 4. Others, specify: _____
	15. Any other comments on the plot:	





Consolidate

Digitization and consolidation for database creation

Digitization
All mapped data were digitized and consolidated into a comprehensive database.

Details Recorded
- Location
- Coordinates and Google Maps pin
- Plot type
- Information source
- Feasible plantation types
- Additional remarks

Bengaluru CLIMATE ACTION & RESILIENCE PLAN

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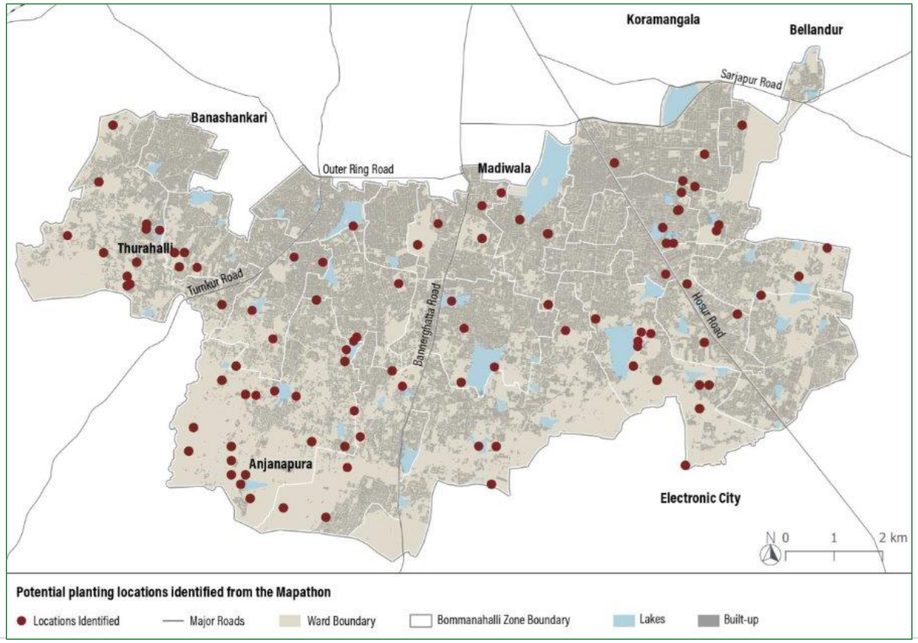
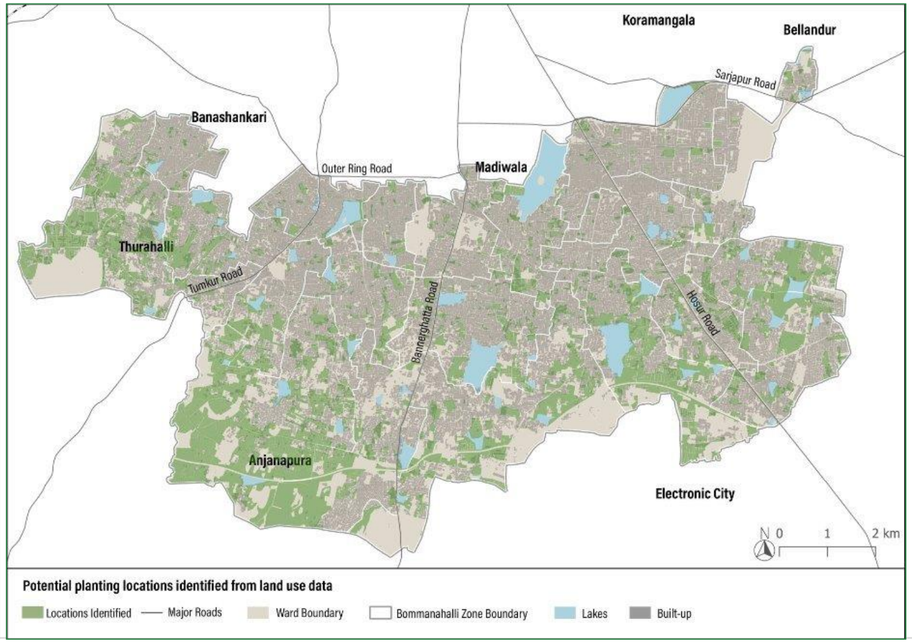
Mapathon 2024: Potential Planting Sites Identified in the Bommanahalli Zone

SL.No	Landmark/Nearby Location/Locality	Latitude	Longitude	Google Map Pins	Type of Plot	Source	Type of Potential	Remarks
1	ITI Park	12.900204	77.641267		Park		Park with trees	
2	Approach Road to ITI Park (5th Main Road)	12.900323	77.641502	https://maps.app.goo.gl/BzQgk8pbKDb1ATZk6	Road		Roadside plantation	
3	27th main road	12.903634	77.642004	https://maps.app.goo.gl/iHKXzGCS2MRdWvLW8	Road		Roadside plantation	Some part of the road is sharing land owned by the Army. May need to take permission from them
4	KCDC Compost Plant near Somasundarapalaya Lake	12.896353	77.648657	https://maps.app.goo.gl/UyuQawWFGnKSJzmt9	Empty patch of land infront of KCDC		Block plantation	
5	Road near the Somasundarapalaya Lake	12.897456	77.649097	https://maps.app.goo.gl/hGHWsE7r2F7ugsuX9	road between KCDC Compost Plant & Somasundarapalaya		Roadside plantation	
6	IGRA Games Village	12.8862396	77.64306939	https://maps.app.goo.gl/EVD7UeW33er6GMH78	Empty Plot		Block plantation	Perimetre planting also possible
								A large plot of land is seen behind the



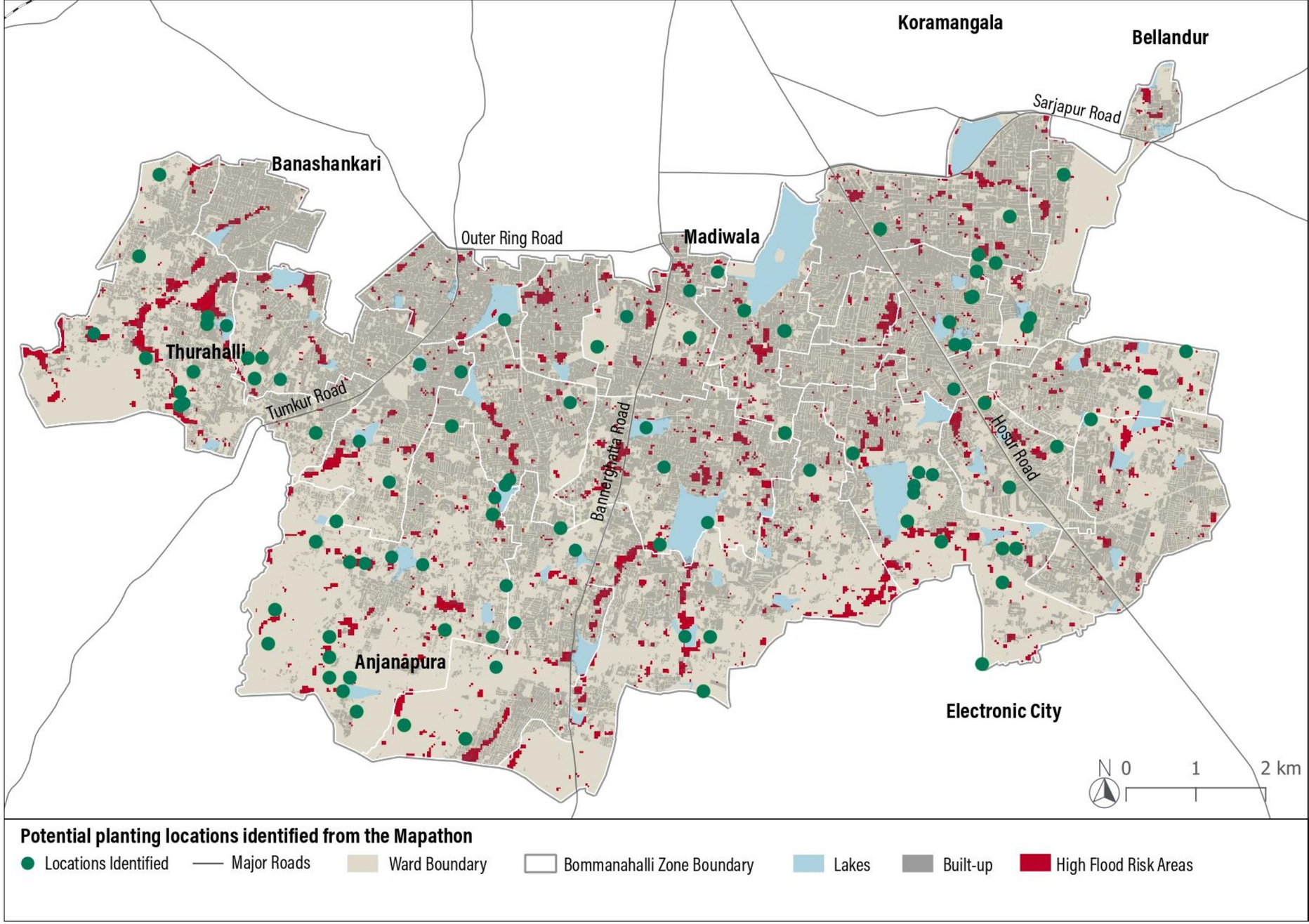


Consolidate

Digitization and consolidation for database creation

Overlay

All identified locations were mapped on the flood risk and heat risk zones. This helps in prioritizing urban greening efforts



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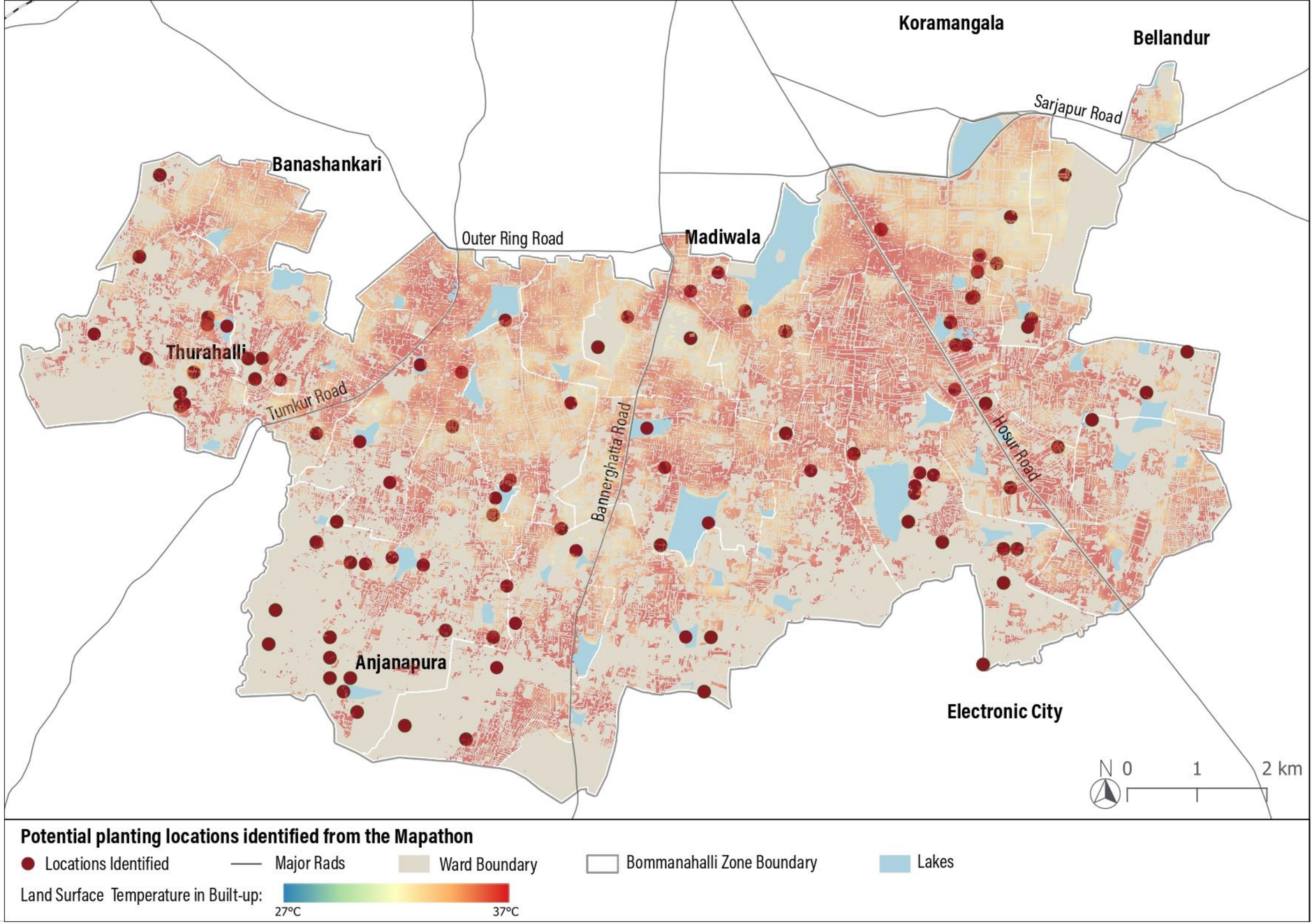

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Assess, verify and tender

Site assessment, verification, and pre-plantation preparation

Feasibility Assessment
Each identified site was evaluated for its suitability for planting based on physical conditions such as soil type, existing vegetation, accessibility, and proximity to infrastructure. Verification of **land ownership and jurisdiction** was a key step to ensure legal feasibility and alignment with local authorities before implementation.

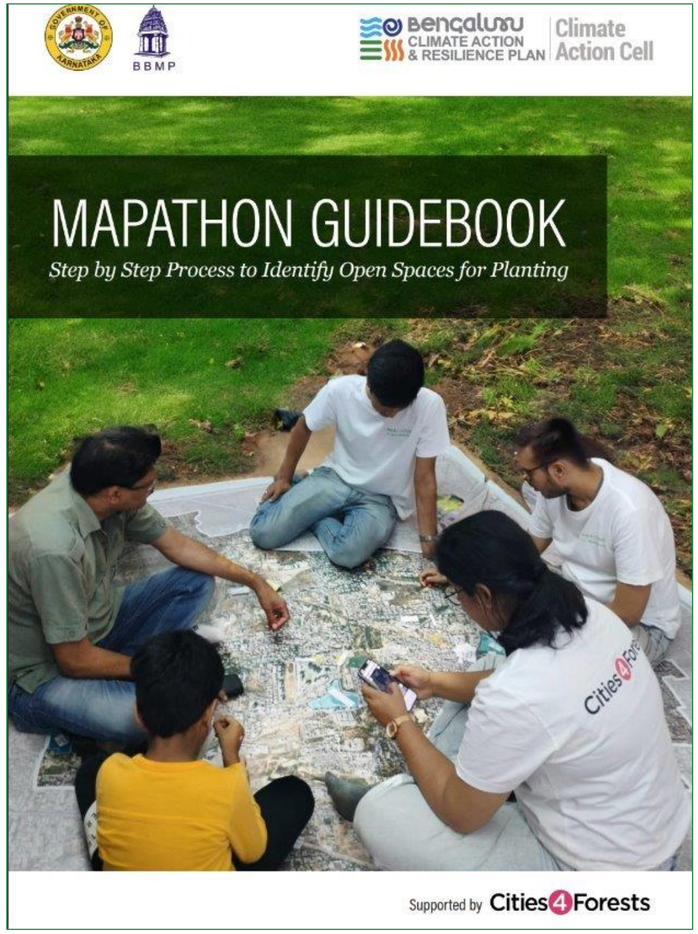
Plant

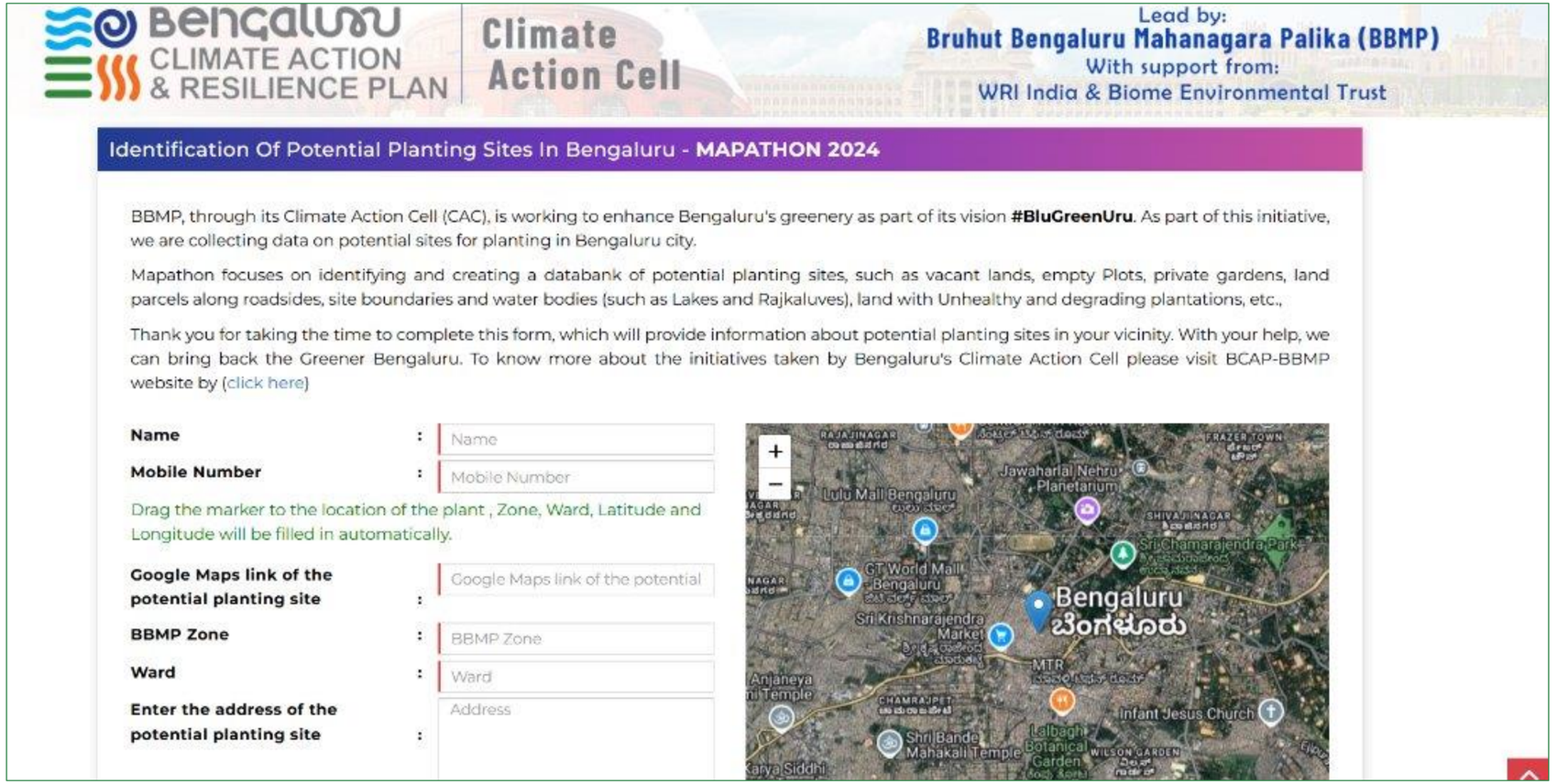
Planting with stakeholder involvement

The final step involved on-ground planting through collaborative efforts with local communities, ward officials, and other stakeholders,ensuring shared ownership, long-term stewardship, and sustained maintenance of the greening sites.

Together, we mapped over 200 hectares of open spaces, leading to the planting of 8,000 saplings across some of Bengaluru’s most climate-vulnerable areas , guided by data and driven by community action.

Way forward to localized Mapathons





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Mapathon in Mumbai's H/East Ward

In collaboration with Garden Department – BMC, TISS Mumbai, and Mumbai University

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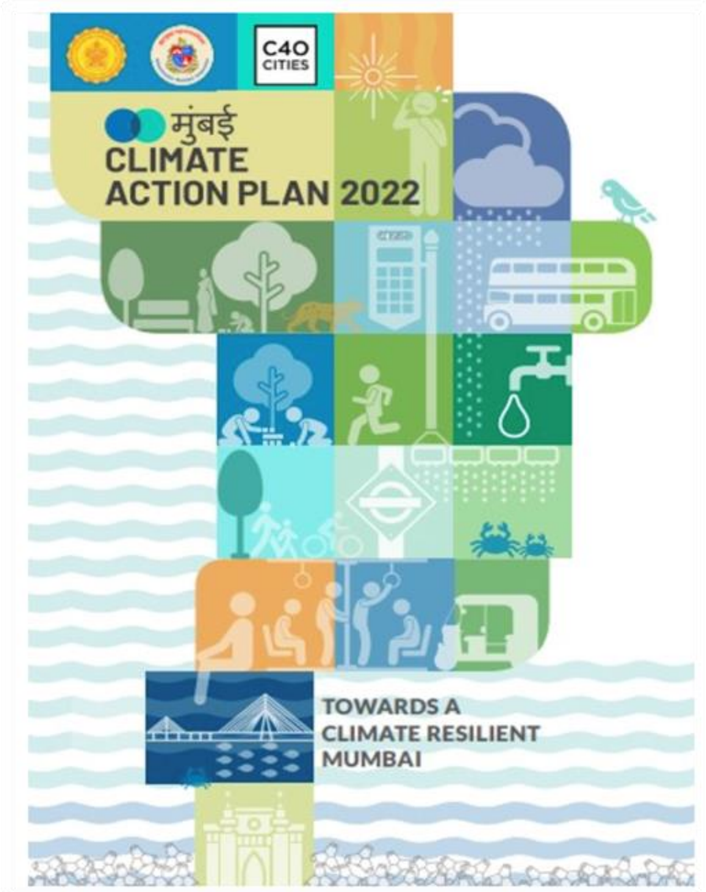
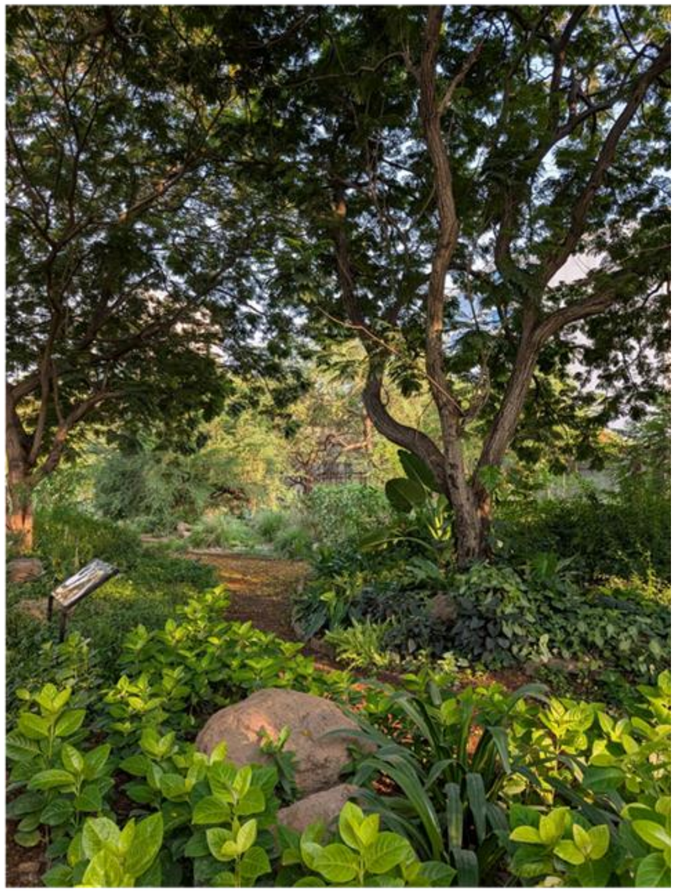
Mumbai's Climate & Air Pollution Risks and Vulnerability Assessment has been the backbone of our climate work in the city.

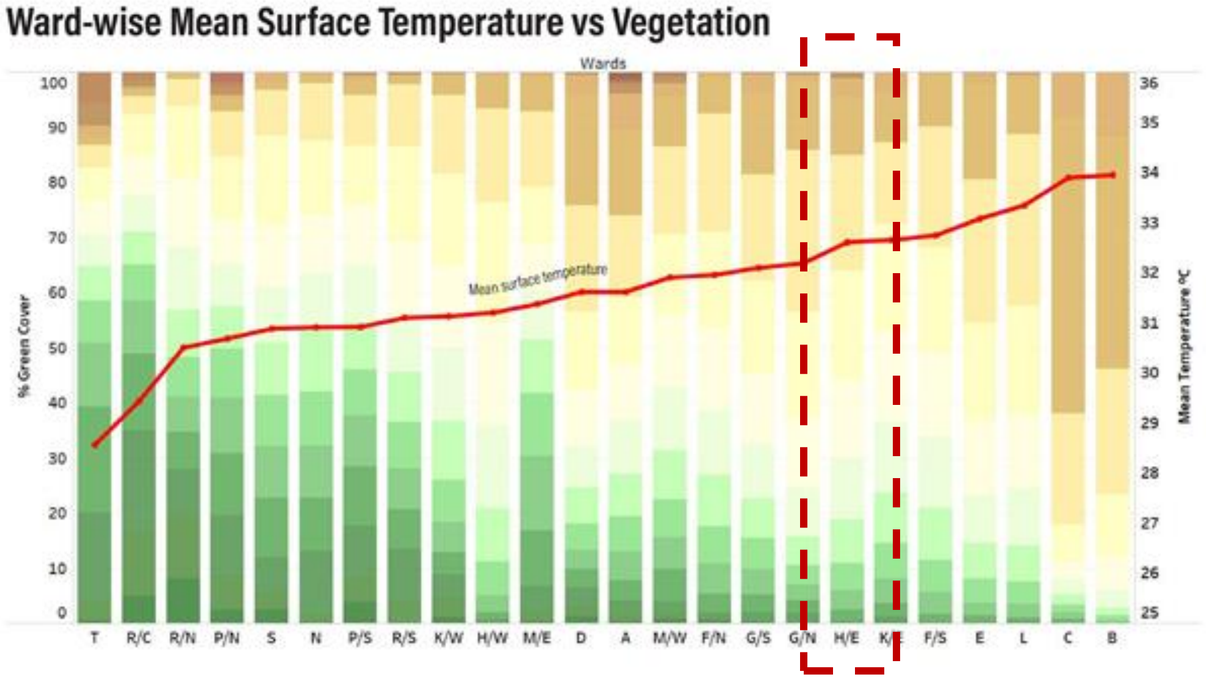
Assessment → **Planning** → **Implementation/Policy**

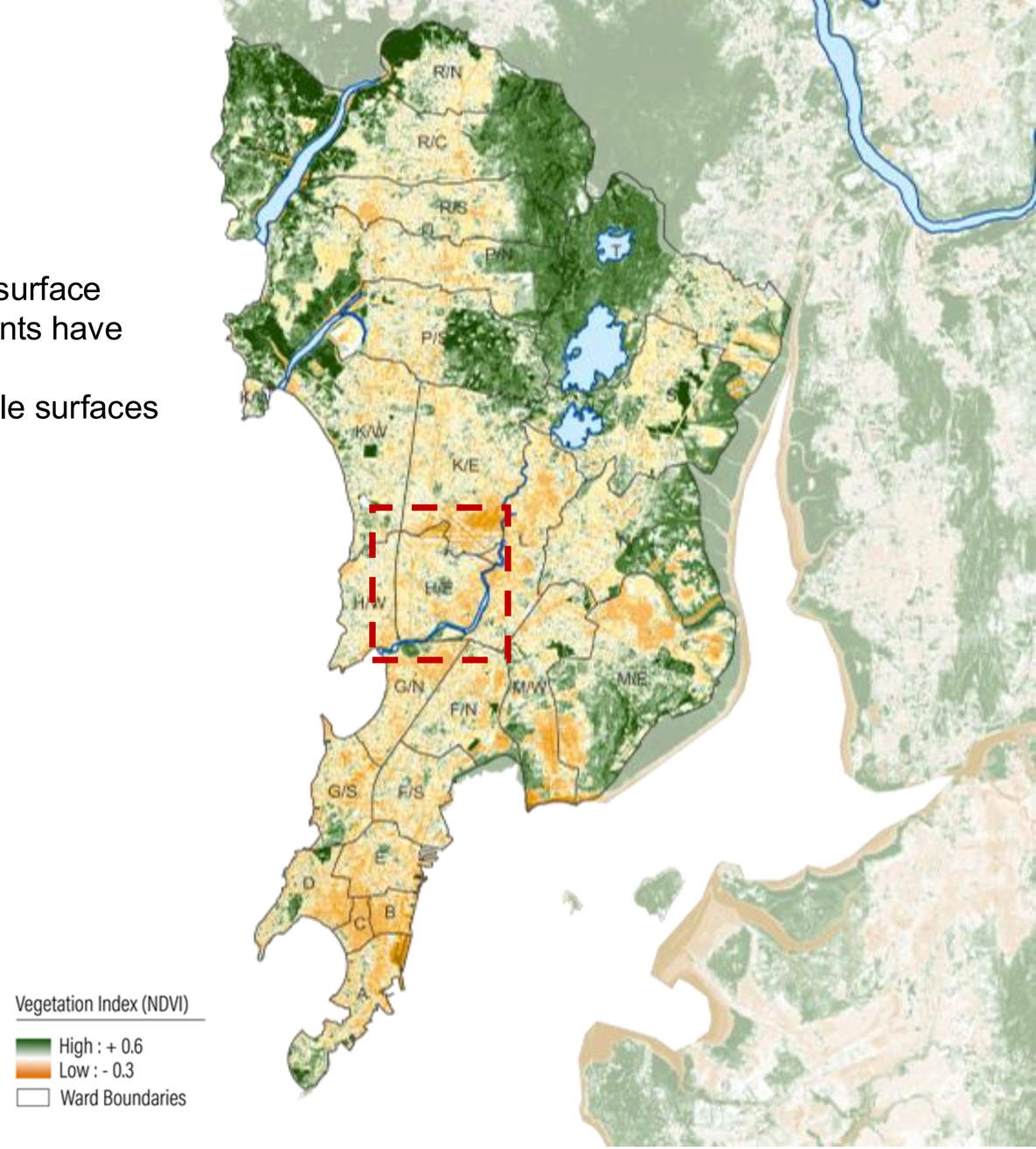




Priority wards for Greening

- **C, B, G/S, G/N, H/E, K/E wards** with lesser vegetation experience higher surface temperature. **Industrial, commercial and high-density** informal settlements have less green cover
- As per MCAP, Mumbai's goal of increasing vegetation cover and permeable surfaces is **30 - 40%** by 2030





Source: Mumbai Climate Action Plan, 2022

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Role of Open Spaces in Climate Adaptation

As per MCAP, Mumbai's goal of increasing vegetation cover and permeable surfaces is 30 - 40% by 2030

Open spaces, such as parks, green corridors, and water bodies, play a crucial role in mitigating the impacts of climate change. They can:

- **Reduce Urban Heat Island Effect:** Absorb heat and cool the surrounding environment.
- **Improve Air Quality:** Filter pollutants and enhance air quality.
- **Manage Stormwater Runoff:** Reduce flooding and improve water quality.
- **Provide Ecosystem Services:** Support biodiversity and enhance community well-being.

Source: Johnny Miller Photography

The Mapathon: A Community-Driven Initiative

A community-driven initiative through a process of ground-truthing and semi-structured interviews, to gather information on:

- ***Local knowledge of open spaces***
- ***Current and Desired uses***
- ***Diversity of users***
- ***Access and ownership issues***
- ***Pressing environmental issues***
- ***Potential for natural interventions (e.g., greening, wastewater treatment, food gardens)***
- ***Community stewardship***

Source: Anjali P and group, Tata Institute of Social Sciences

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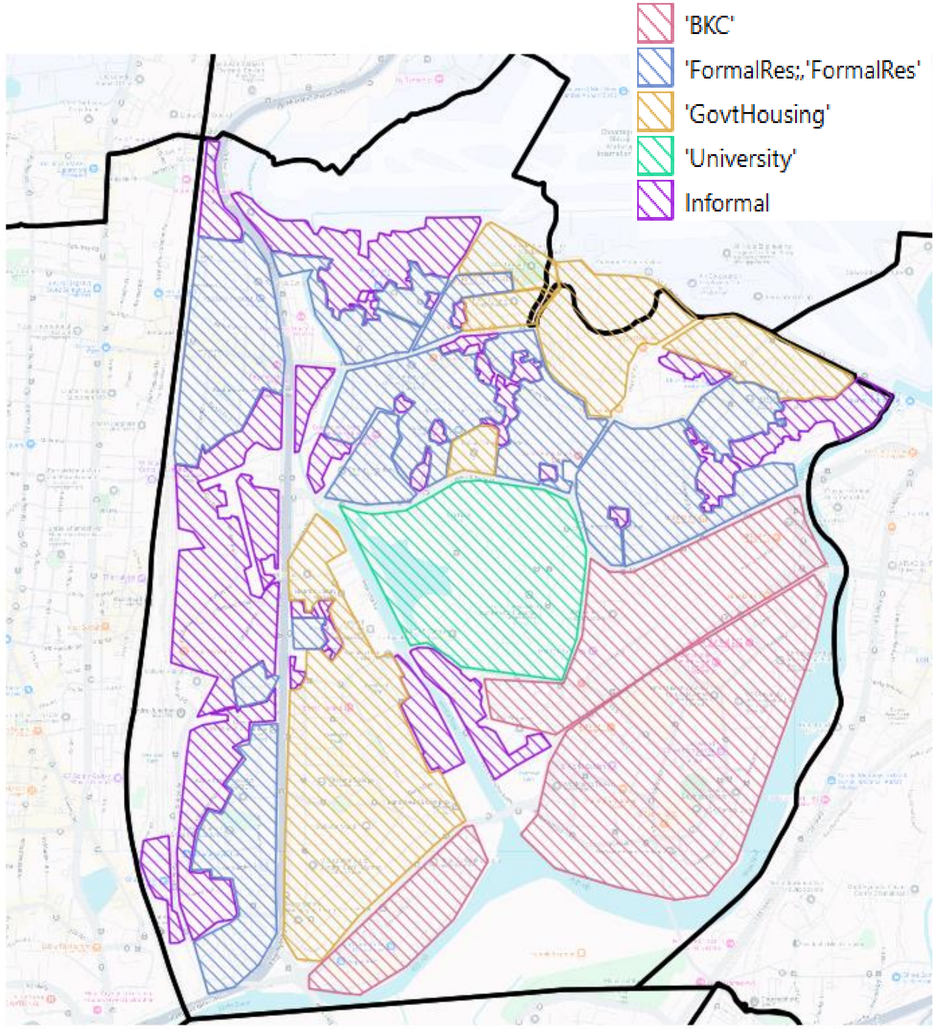
Mapathon Scope

- **Objective:** Map open spaces and related information
- Ward divided into 6 subwards
- Based on mix of urban fabrics



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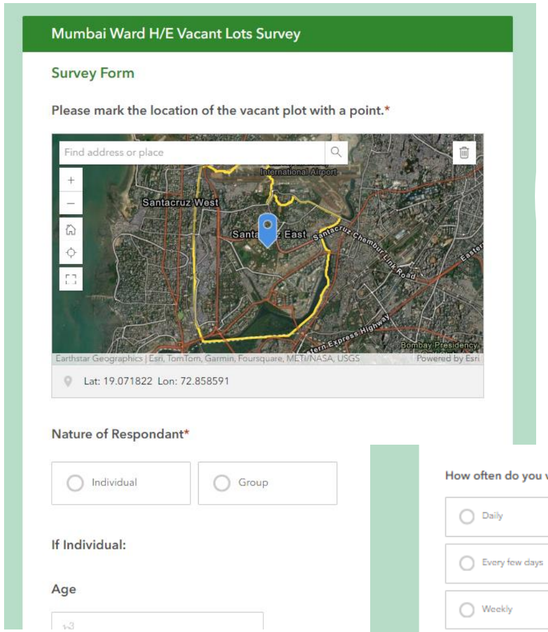
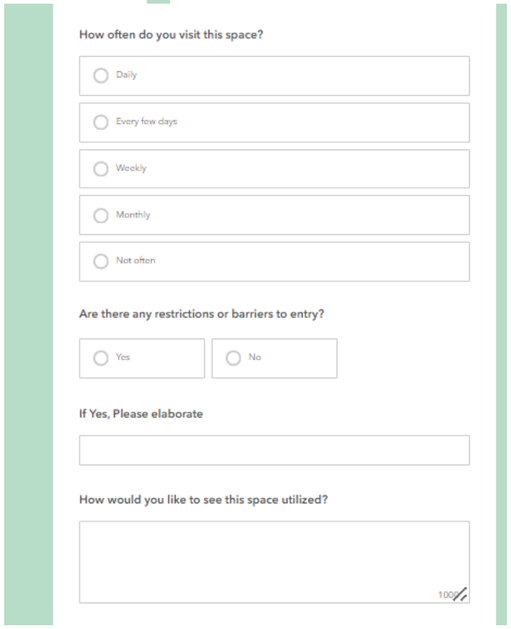
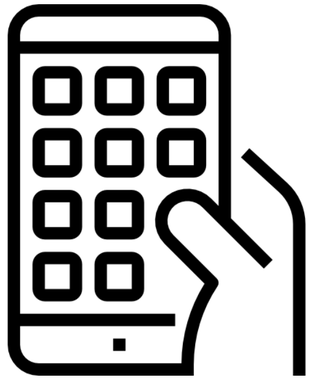
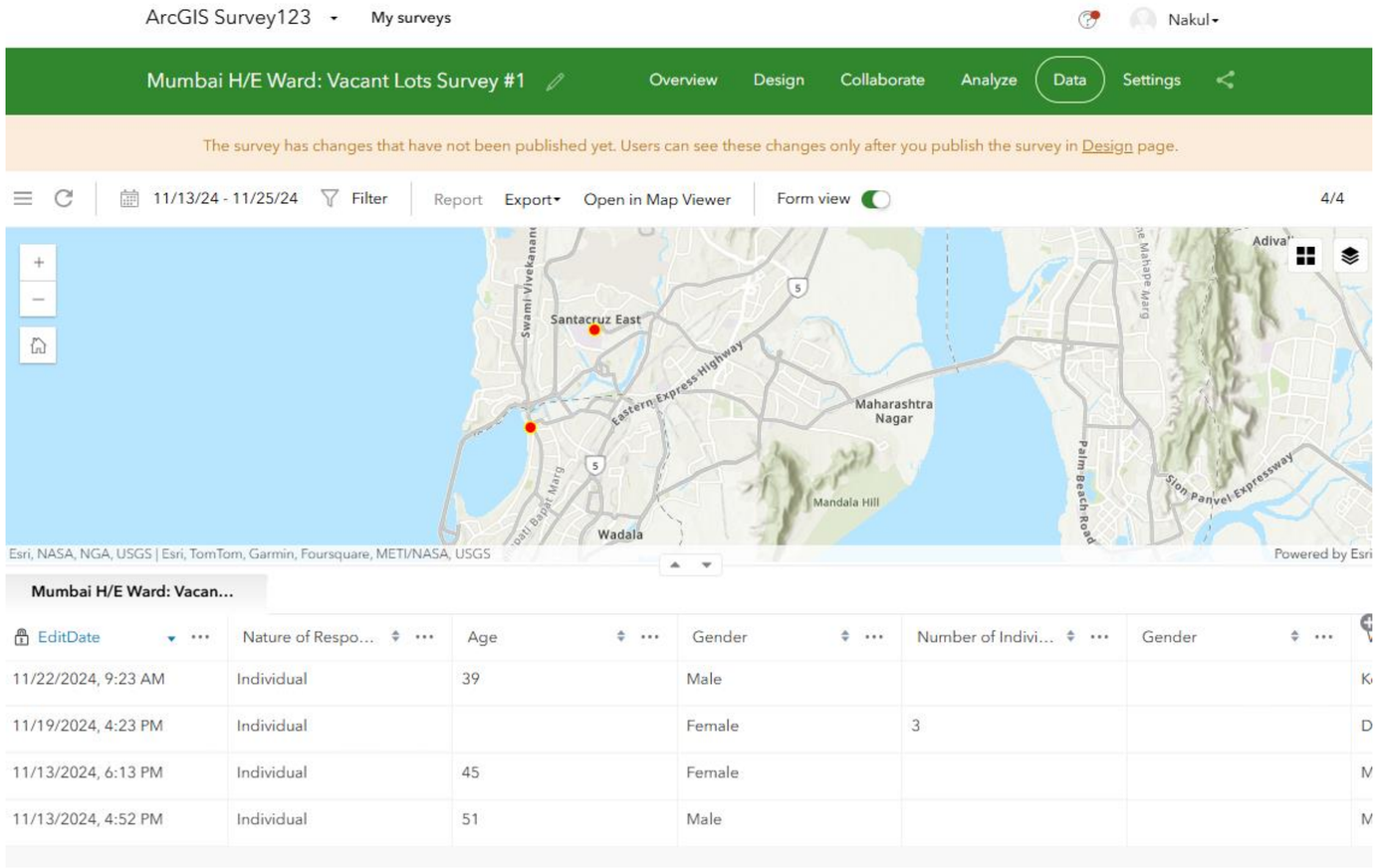
Interview collection









Tool : https://arcg.is/1efeby0

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Process

- Induction
- Field Days x 5
  - Interview collection
- Govt Survey
  - Conducting interviews with Govt Agencies
- Secondary data Survey
  - Reviewing Plot dataset with secondary data
- Field Days x 2
- Data session
  - Data cleaning, analysis discussions
- Concluding Session

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Mapathon Components

***Objective**: Assess potential for implementation of BGI on vacant plot*

Sample vacant plot

Ward

DP Remarks website + Garden Department Data

On ground

6-7 days

Community Surveys

Observational survey

Garden Dept

Land records office

1/2 days of interaction

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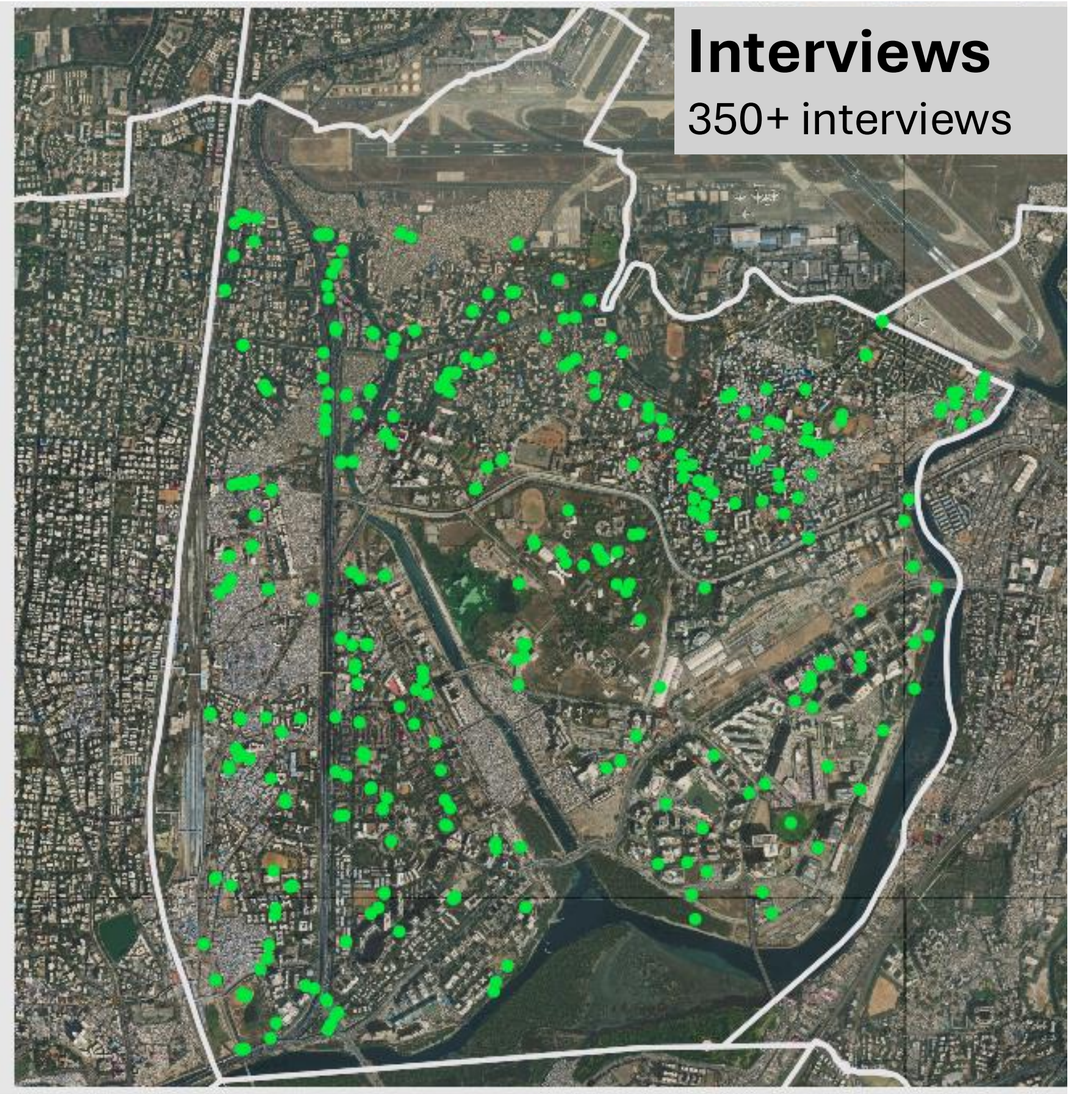
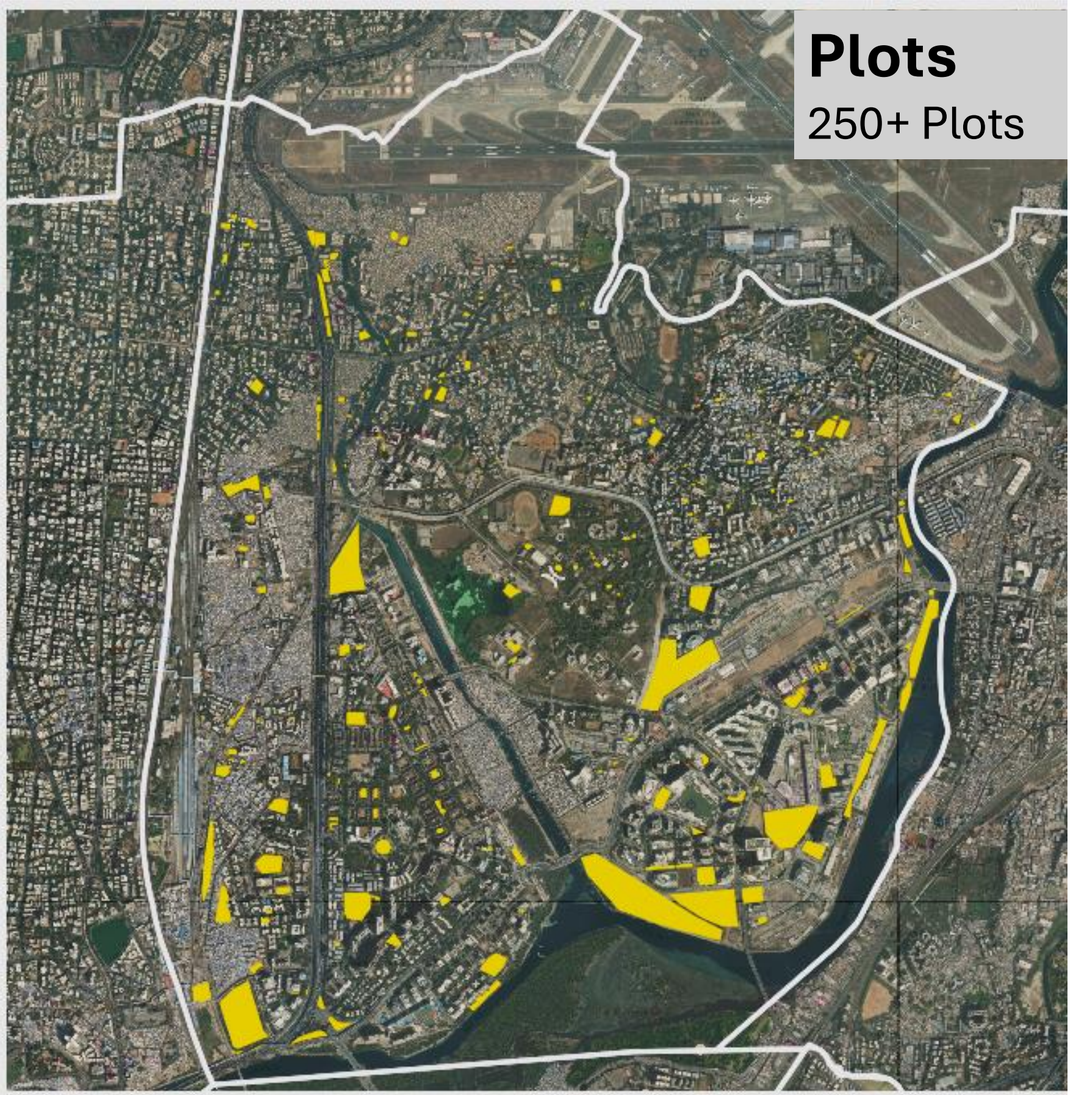
Mapathon: Logistical Support

- Tool creation and testing
- Tool Training for students
- PoC's to support students on the field
- Backend Data compilation and cleaning
- Venue and planning

Date	TISS Mapathon Agenda	Venue
26-11-2024 (Tue)	Orientation and Induction: Introduction to Mapathon Exercise by WRI India and Training (Mock interviews / Process of conducting / Field challenges)	TISS campus/ WRI Mumbai office/ Garden Dept. (TBD)
27-11-2024	Orientation and Induction: Introduction to Mapathon Exercise by WRI India and Training (Mock interviews / Process of conducting / Field challenges)	TISS campus/ WRI Mumbai office/ Garden Dept. (TBD)
28-11-2024	Day 1 of interviews	On Site
29-11-2024	Day 2 of interviews	On Site
30-11-2024 (Sat)	Day 3 of interviews	On Site
01-12-2024 (Sun)	-	On Site
02-12-2024	Day 5 of interviews	On Site
03-12-2024	Day 6 of interviews	WRI Mumbai Office
04-12-2024	Collation and Review, Cleaning and Finalization of data collected	WRI Mumbai Office
05-12-2024	Meeting Garden Department, City Survey Dept, DP Department for secondary research	BMC Offices
06-12-2024	TISS Internal Meetings	TISS Campus
07-12-2024 (Sat)	Preparing for Mapathon 2-day event	WRI Mumbai Office
08-12-2024 (Sun)	-	
09-12-2024	Mapathon Day 1	H/E Ward Office (TBD)
10-12-2024 (Tue)	Mapathon Day 2	H/E Ward Office (TBD)
11-12-2024	Conclusion and Summary - Learnings	WRI Mumbai Office
12-12-2024	Conclusion and Summary - Learnings	

Spatial Mapping





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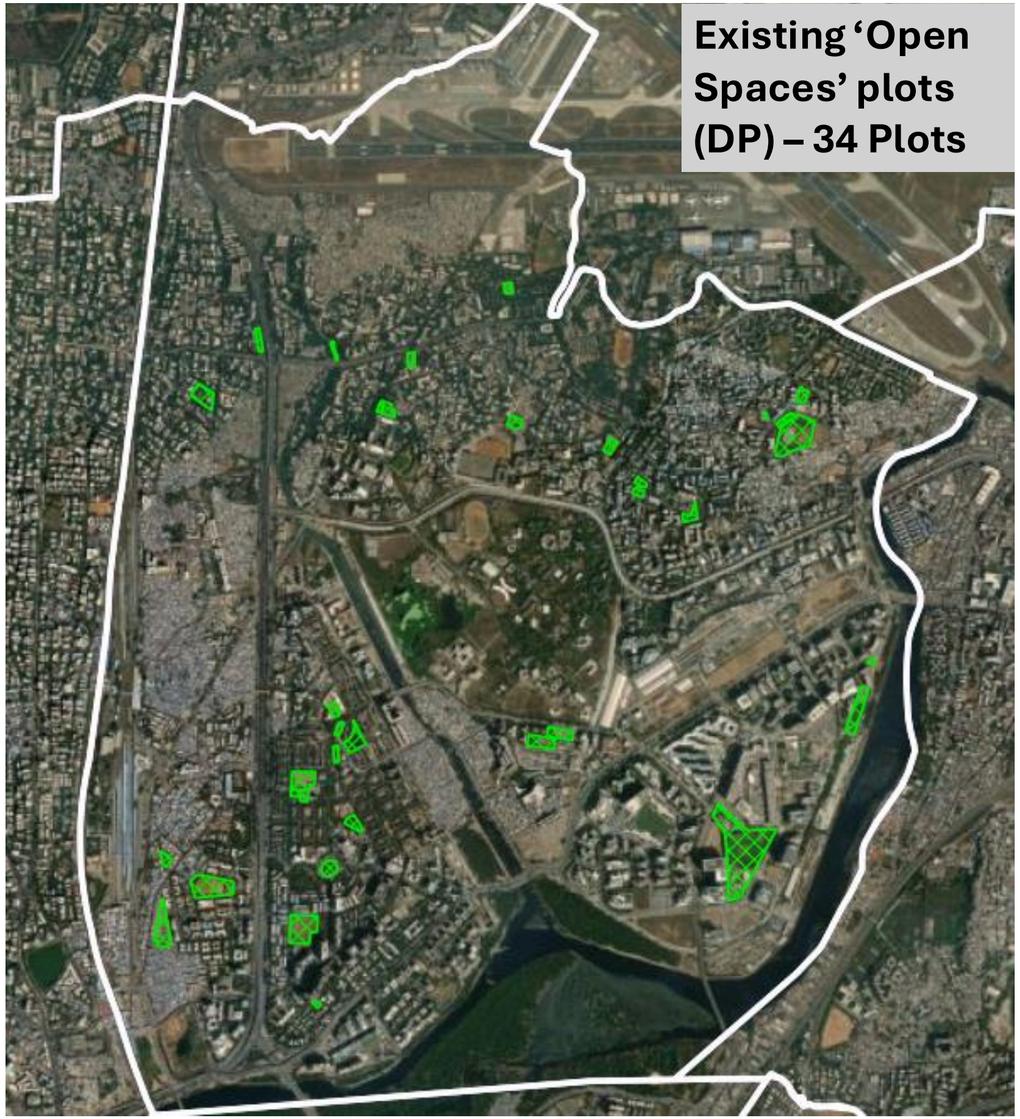
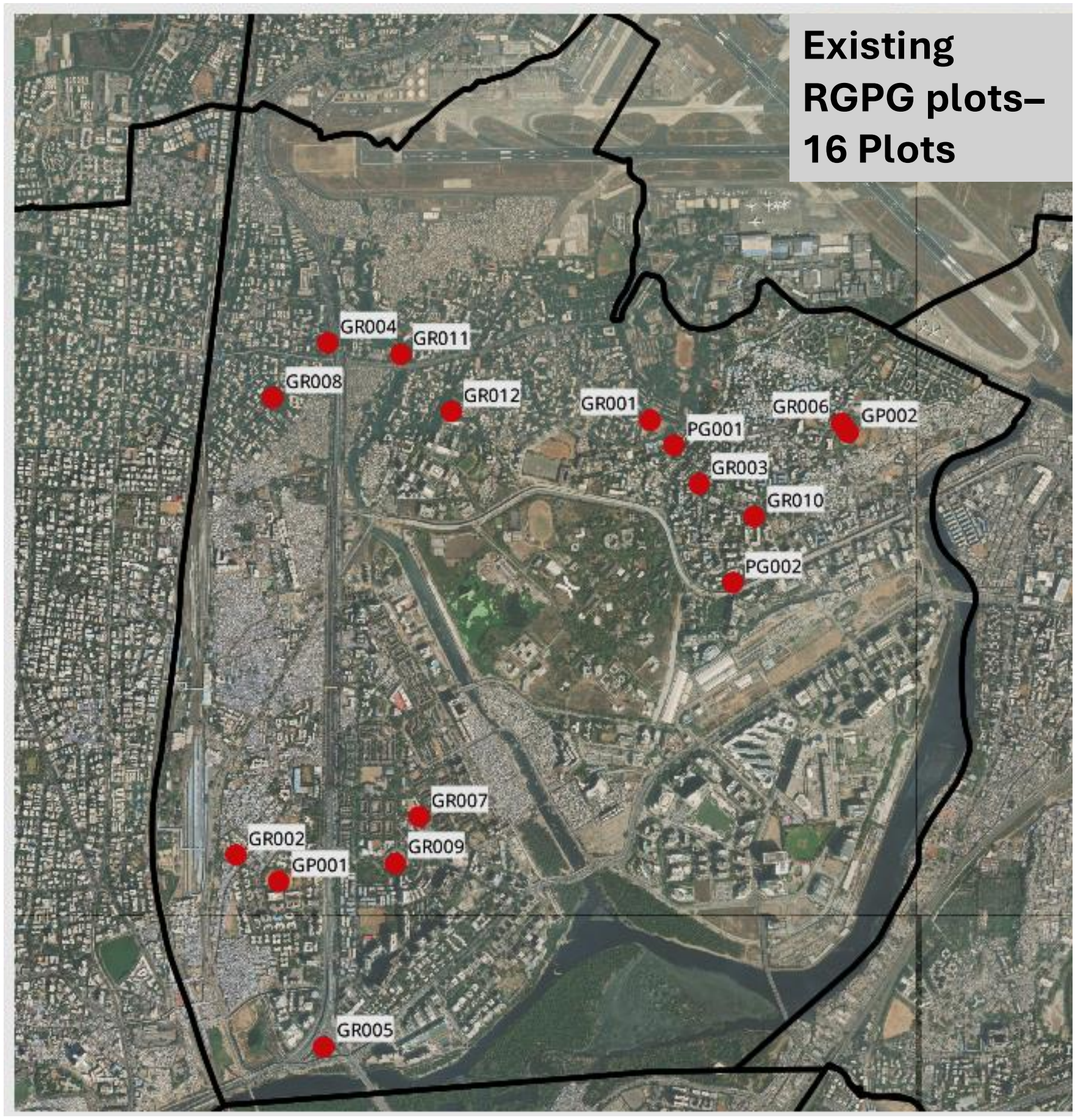
Spatial Mapping – as per BMC





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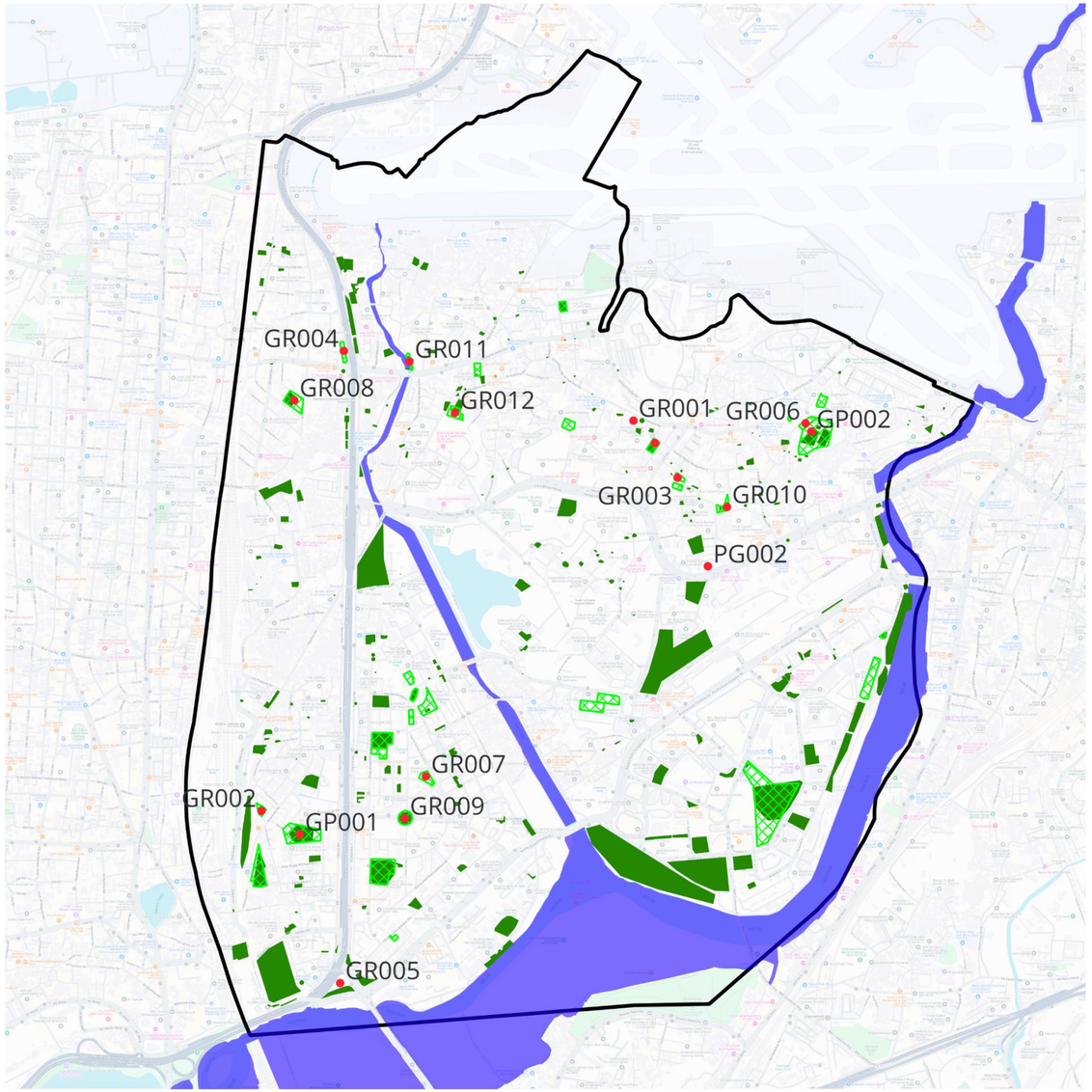
Mapping potential open spaces



OpenSpaces
- Existing RGPG Plots
- DP 2034_Existing_OpenSpaces
- Mapathon Plots
- Mithi River

Basemap
- HEast Ward Boundary

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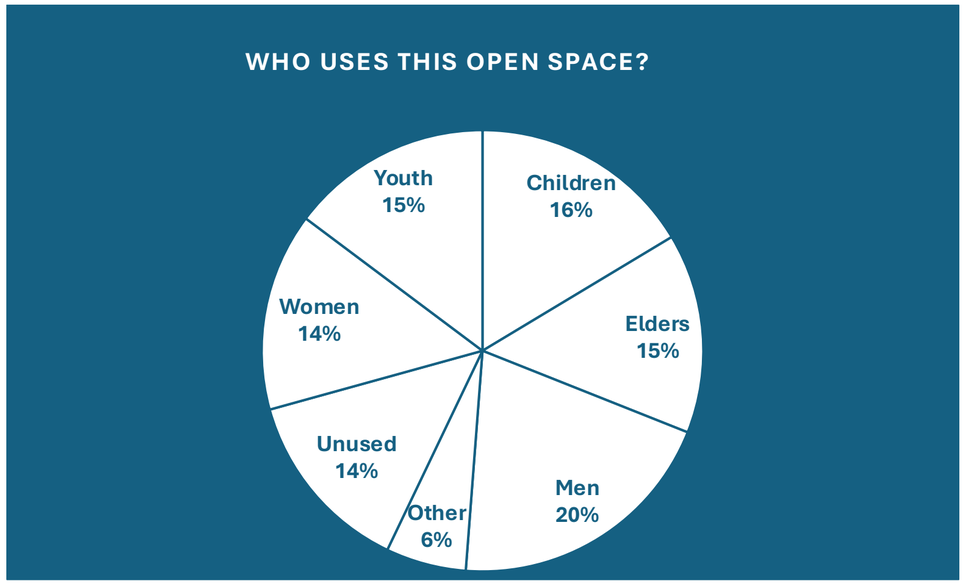
Analysis

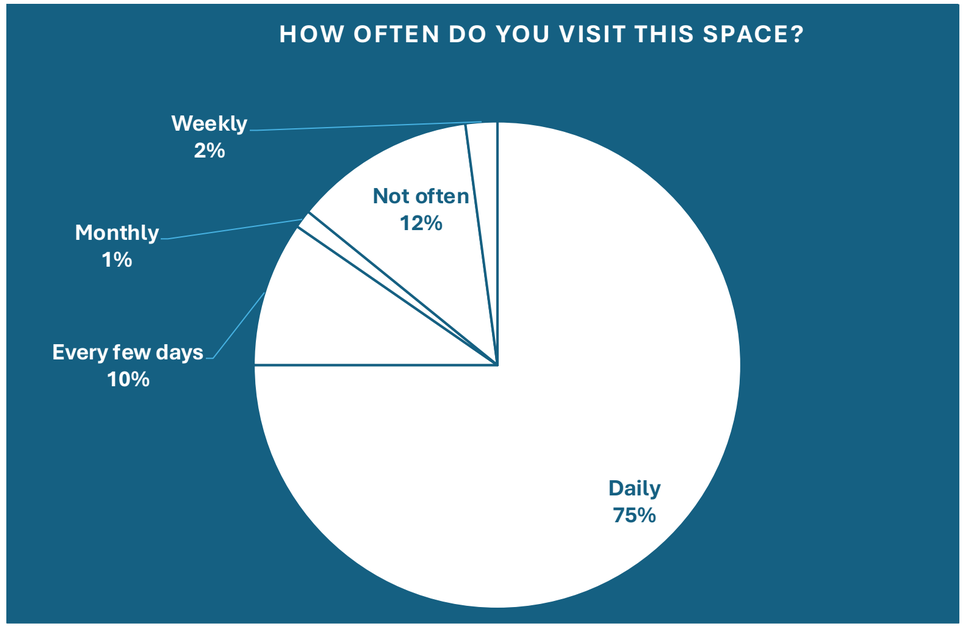
Data Collection

- 357 interviews (individual and group)
- 262 open spaces
- Interviewees spanned age groups (elderly, middle-aged, youth) and were predominantly male.

Usage, Users, and frequency of usage

- Spaces used for positive activities (play, sports) and negative ones (dumping, illicit activities).
- Key issues include improper waste disposal, poor maintenance, restricted access.
- Open spaces serve varied demographics (men, women, youth, children, elders) with diverse needs (recreation, gatherings, parking).
- 75% of the open spaces are used daily





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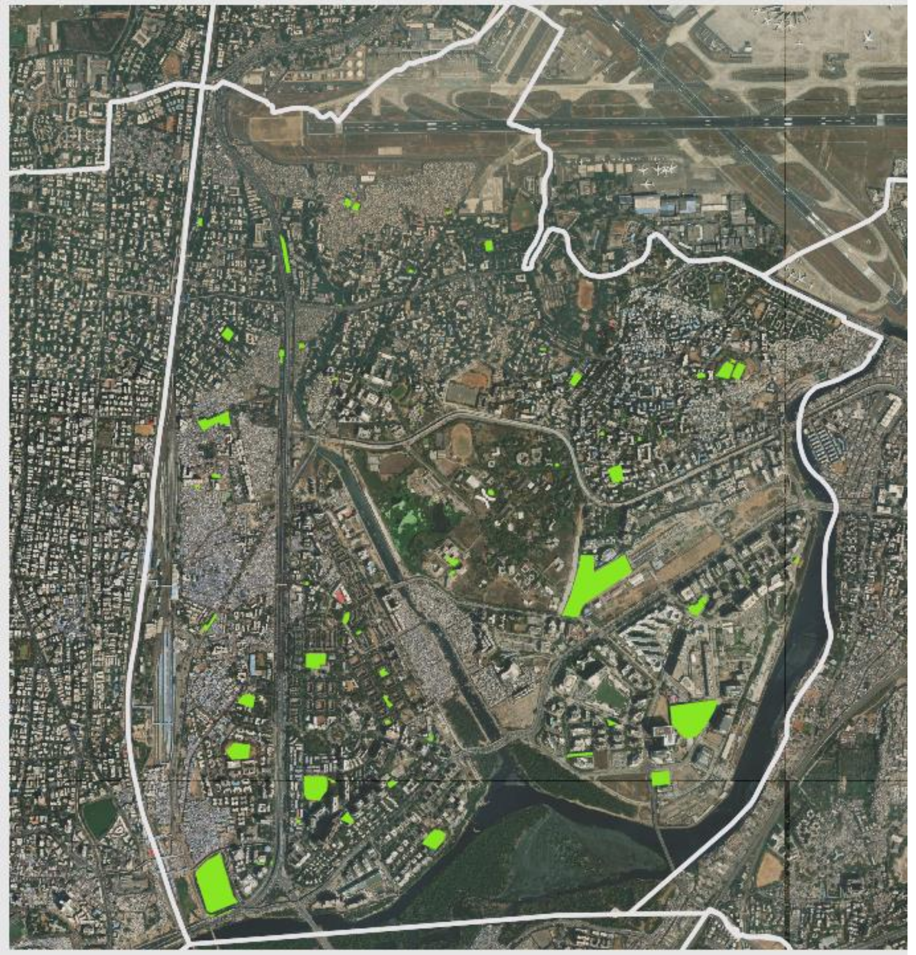
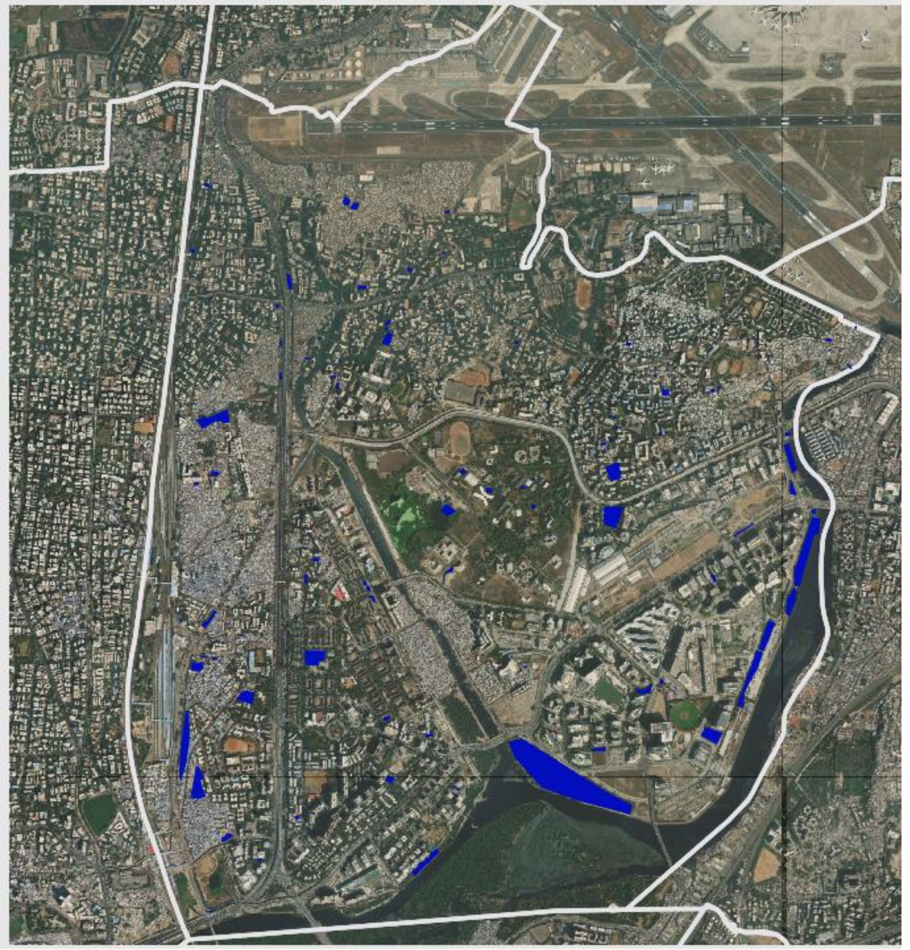
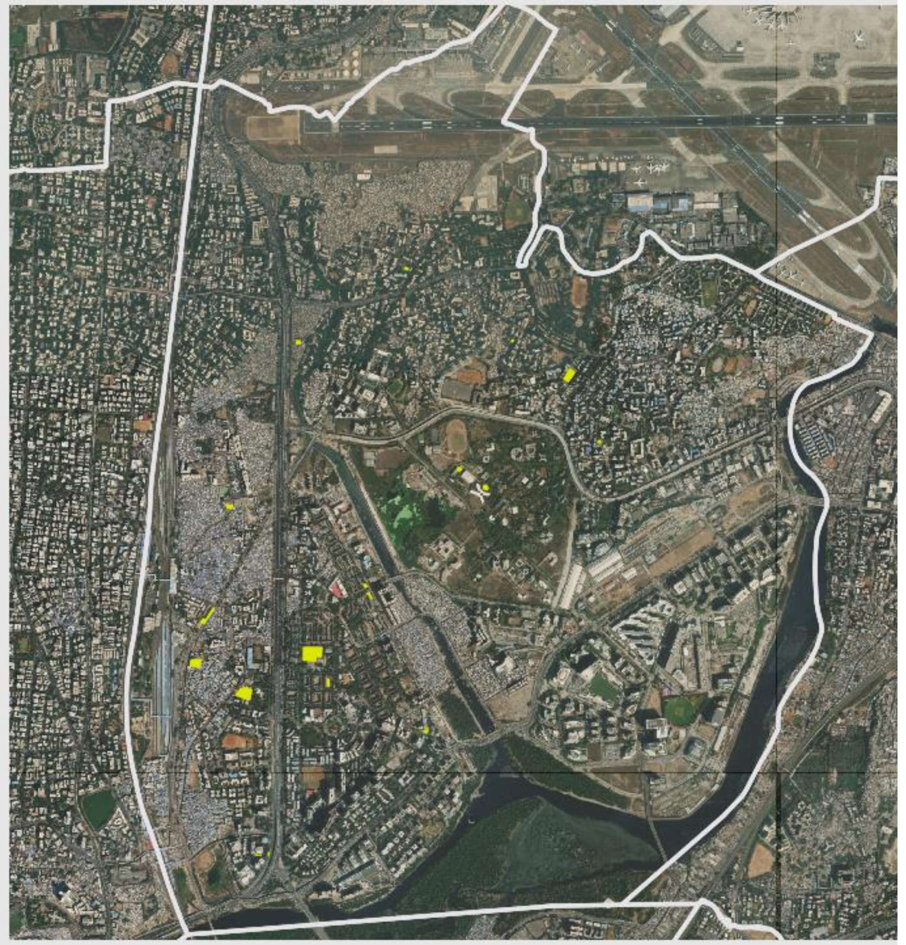
Spatial Mapping Analysis - Usage



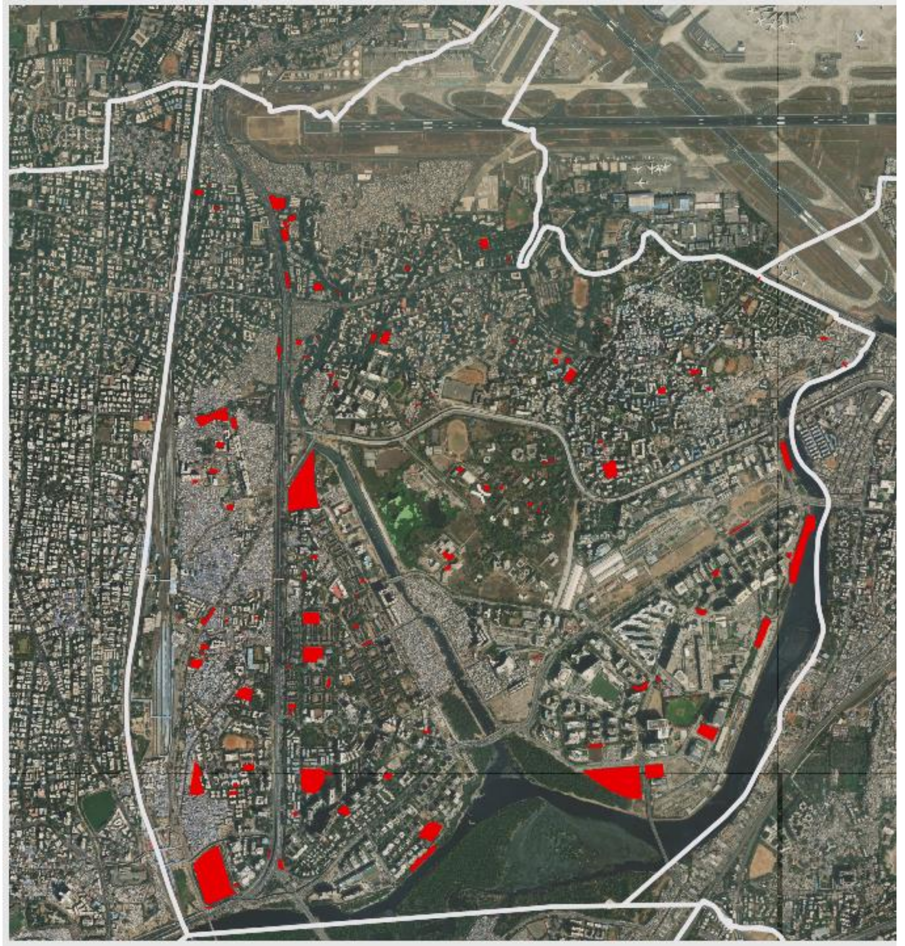
Informal Recreation



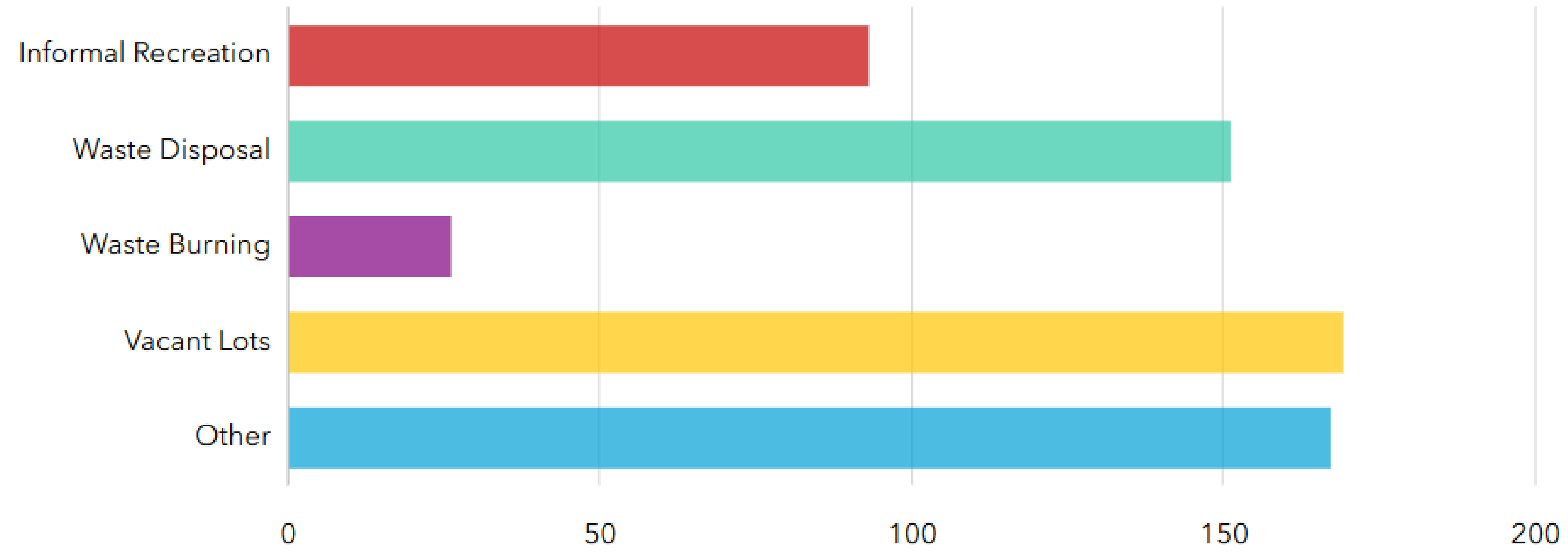
Waste Disposal



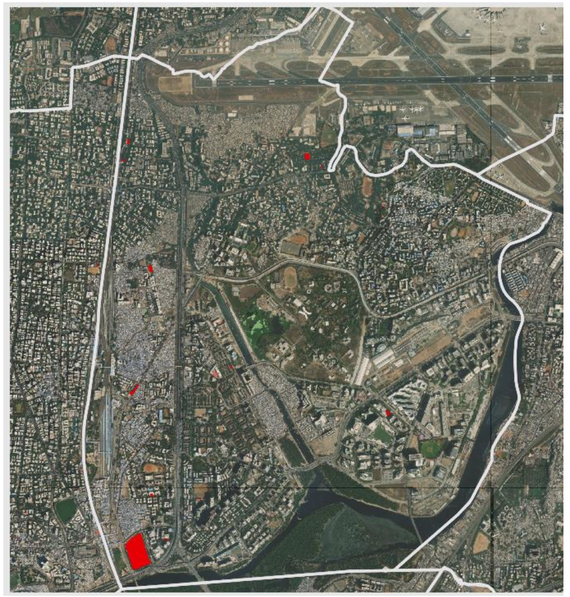
Waste burning



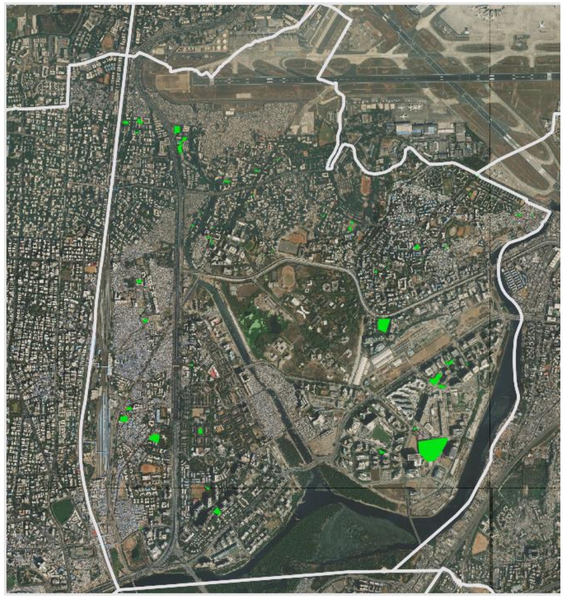
Vacant



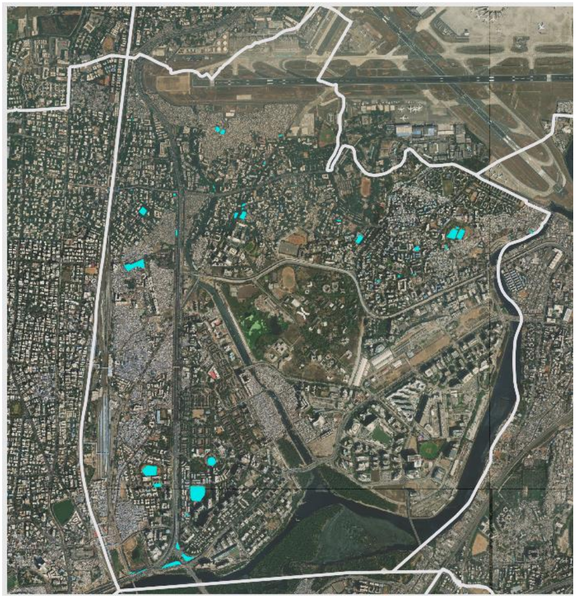
Spatial Analysis – Perceived Ownership



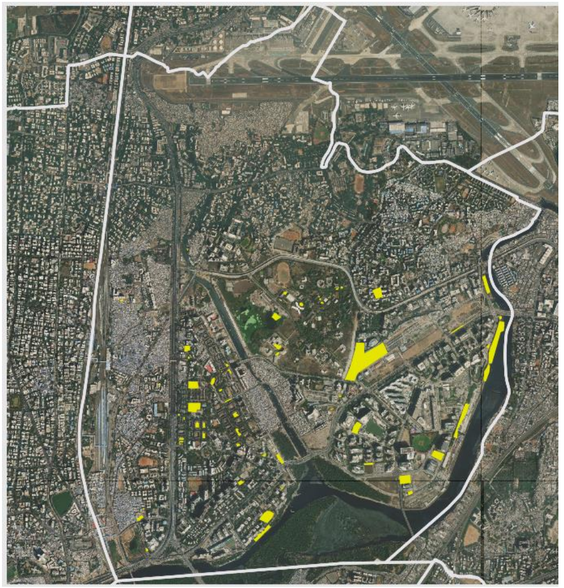
Central Govt.



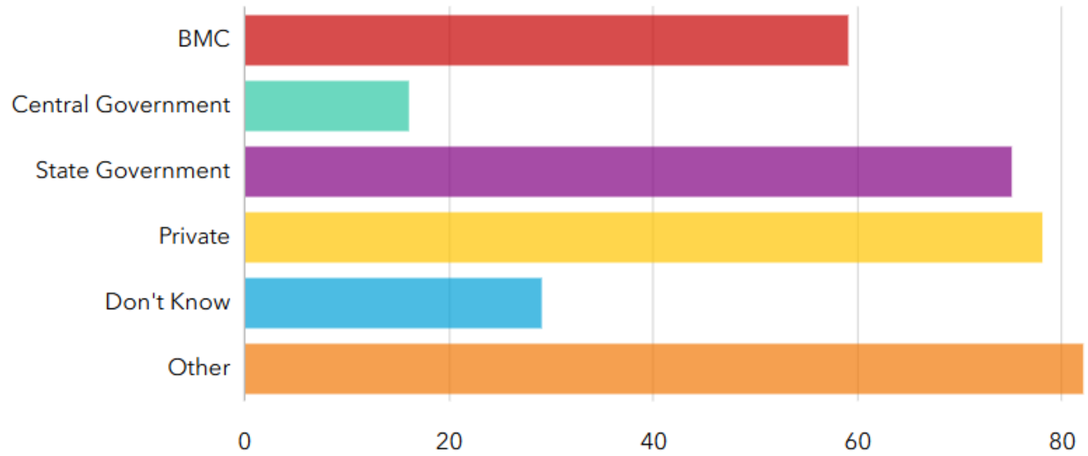
Private

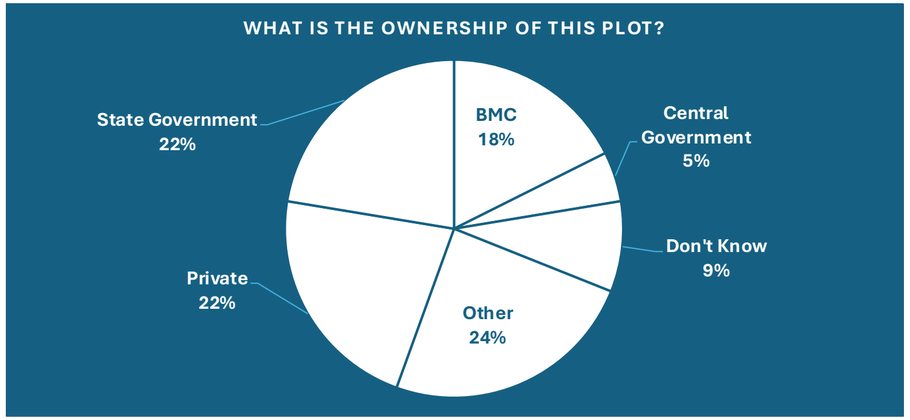


BMC



State Govt.





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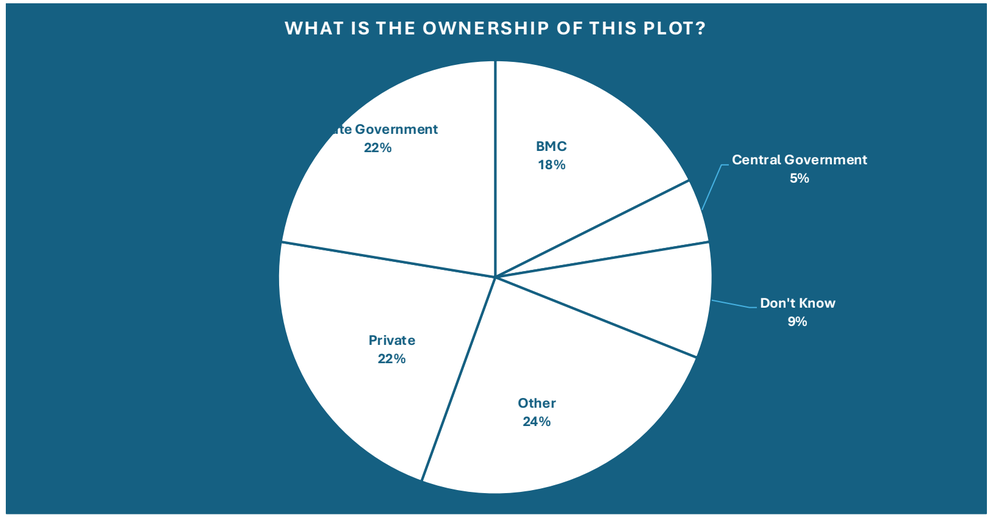
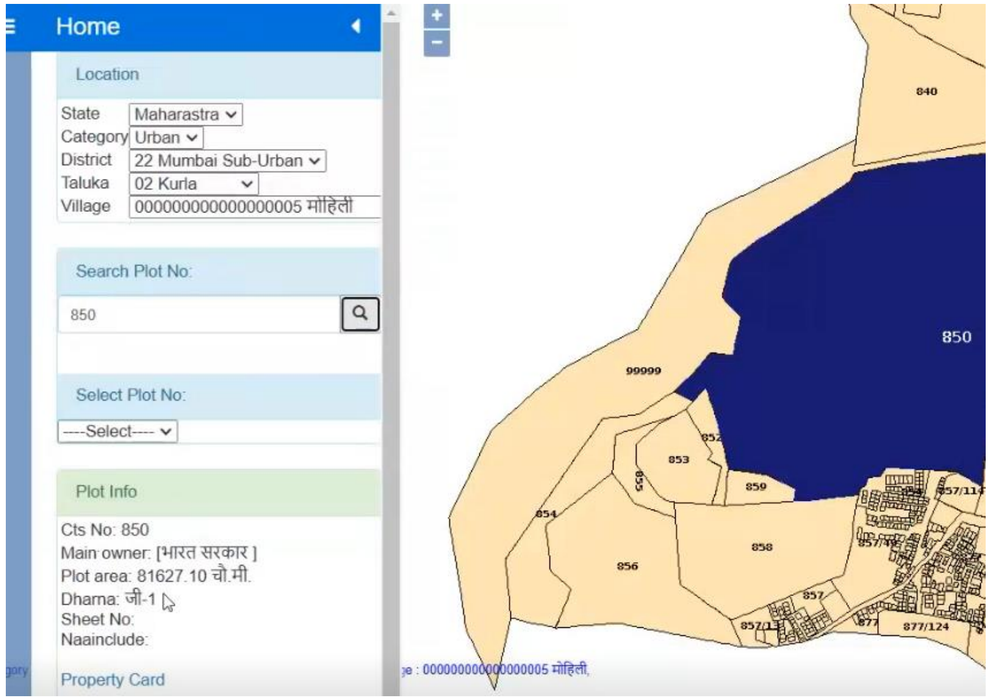
Landownership

- Unclear or varied ownership of open spaces – “perceived” ownership
- Ownership disputes, ongoing construction, usage disagreements complicate management.
- To check landownership status, following formal platforms can be used:
  - https://mahabhunakasha.mahabhumi.gov.in/27/index.html: To view and download cadastral maps of both rural and urban areas in Maharashtra
  - https://geoportal.mrsac.org.in/smartvillage/: To access geospatial data and information
  - https://digitalsatbara.mahabhumi.gov.in/dslr : To access land records, specifically the 7/12 extract (Record of Rights)





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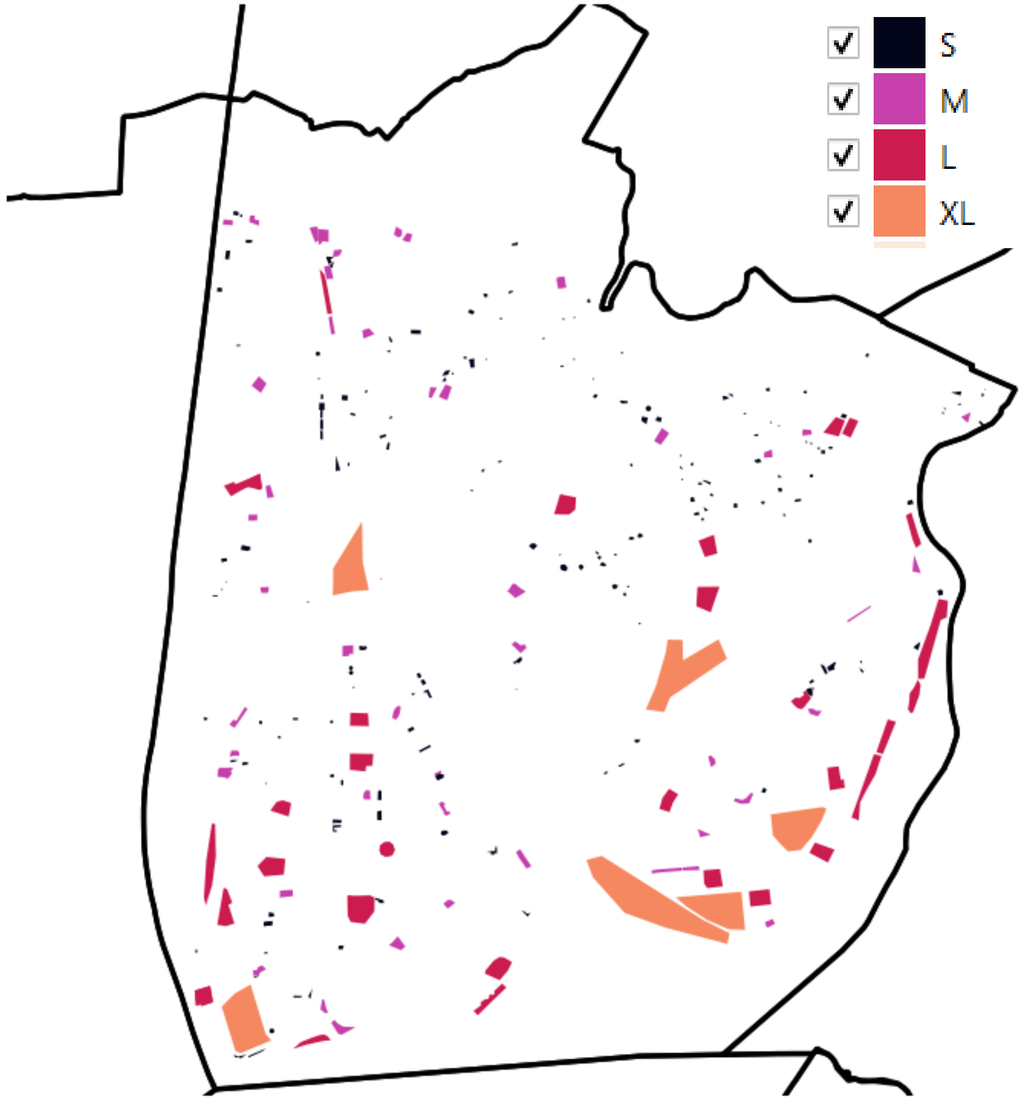
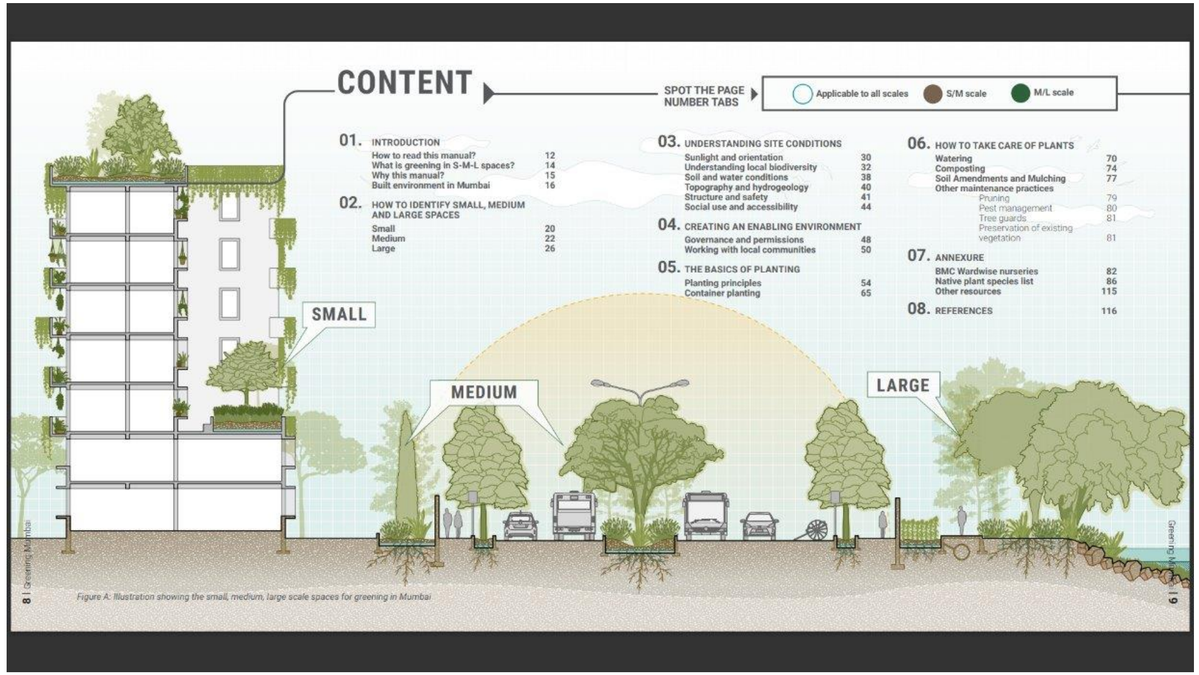
Spatial Mapping Analysis





Size	Number	Area
S	180	Less than 830sqm
M	48	830 – 2,700 sqm
L	33	2,700 - 15,500 sqm
XL	6	Above 15,500 sqm

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Anecdotes

- "***All sections of society involved in gym, exercise, in morning time to use this space. Childrens were playing in the playground . Youth used this space for discussions, checking mails, messages,for finding sukoon, peace before. They start their day by walk***" – Highlights the positive use of an open space as a hub for community activity, providing a space for exercise, socializing, and relaxation for people of all ages.
- "***Earlier the govt building was located here. Earlier the place was used as playground for cricket and sometimes the plants were grown in their childhood but now the whole open space has been encroached.***" – Shows how the use of open spaces can change over time, often due to development and encroachment, leading to the loss of recreational areas.
- "***Dring school days/hours- by the bodyguards and security personnels of celebrities. During weekends - used by the public for resting purposes.***" – Highlights how even seemingly public spaces can have restricted access and be used differently by different groups depending on the time of day.
- "***This is a land proposed for the new High Court building which is now being used by the locals to hangout, park their vehicles and play at times. Earlier it used to be cricket ground used by the youth and children.***" - Demonstrates the conflict between planned land use and the current needs and desires of the local community.

Local pathways to shared challenges

Across **Kochi, Bengaluru and Mumbai**, the **Mapathon method** emerged in response to shared urban challenges such as **rapid expansion, shrinking open and green spaces and rising climate vulnerability impacting communities.**

Despite diverse geographies, the common thread lies in an **evidence-based approach** to **map open spaces**, **analyze climate vulnerable hotspots** and **place communities at the heart of decision making**.

1

KOCHI

- Mapathon is the starting point.
- Shaped long-term disaster management through Nature-based Solutions
- Supported local livelihoods
- Greening became part of the annual budgets

2

BENGALURU

- Mapathon embedded into city's existing climate goals and governance
- Leveraged the technology and smart city initiatives to scale efforts such as Virtual Mapathon
- Led to embedding Mapathon as decision-making tool for city department to approach greening
- Developed resources like guidebooks for localized Mapathon for communities and active citizenship to green their neighborhoods

3

MUMBAI

- Mapathon set a process for using a combination of tools to better map our cities
- Engaged multiple partners to demonstrate the ability to ground truth data along with collection
- Focused on embedding local knowledge into the data especially from communities which are unable to attend the public meetings format

Cities4Forests

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05

Q/A

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Thank You.

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