What is Cities4Forests?

FARAWAY FORESTS
Carbon storage
Rainfall generation
Timber
Medicine
Biodiversity

NEARBY FORESTS
Clean air
Drinking water
Reduced flooding
Reduced soil erosion
Timber
Recreation

INNER FORESTS
Clean air
Shade from sun
Urban wildlife
Higher property values
Recreation

3 GOOD HEALTH AND WELL-BEING

6 CLEAN WATER AND SANITATION

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

15 LIFE ON LAND

Cities4Forests

Ninety-one member cities, and growing

Seattle, USA
Vancouver, Canada
King County, USA
Portland, USA
Salem, USA
Detroit, USA
Eugene, USA
Summit County (UT), USA
Montréal, Canada
Sacramento, USA
Salt Lake City, USA
Toronto, Canada
San Francisco, USA
New York City, USA
Oakland, USA
North Little Rock, USA
Philadelphia, USA
Los Angeles, USA
Baltimore, USA
Little Rock, USA
Raleigh, USA
Washington, DC, USA
Hermosillo, Mexico
Monterrey, Mexico
Honolulu, USA
Culiacán, Mexico
León, Mexico
Aguascalientes, Mexico
Mérida, Mexico
Guadalajara, Mexico
Xalapa, Mexico
Mexico City, Mexico

Barranquilla, Colombia
Cartagena, Colombia
Freetown, Sierra Leone
Bogotá, Colombia
Georgetown, Guyana
Accra, Ghana
Medellín, Colombia
Cali, Colombia
Macapá, Brazil
Quito, Ecuador
Barcarena, Brazil
Belém, Brazil
Abaetetuba, Brazil
São Luís, Brazil
Porto Velho, Brazil
Rio Branco, Brazil
Palmas, Brazil
Salvador, Brazil
Extrema, Brazil
Belo Horizonte, Brazil
Campinas, Brazil
São Paulo, Brazil

Oslo, Norway
Glasgow, UK
Dublin, Ireland
Greater Manchester, UK
Paris, France
Brussels, Belgium
Vienna, Austria
Barcelona, Spain
Skopje, North Macedonia
Tirana, Albania
Antalya, Turkey
Mersin, Turkey
Haifa, Israel
Amman, Jordan
Lin'an, China

Mumbai, India
Hyderabad, India
Kochi, India

Addis Ababa, Ethiopia
Brazzaville, Republic of the Congo
Kigali, Rwanda
Nairobi, Kenya
Bukavu, DRC
Uvira, DRC

Medan, Indonesia
Pekanbaru, Indonesia
Balikpapan, Indonesia
Manokwari, Indonesia
Jayapura, Indonesia
Jakarta, Indonesia
Semarang, Indonesia
Denpasar, Indonesia
Port Moresby, Papua New Guinea

Antananarivo, Madagascar
Fianarantsoa, Madagascar
Johannesburg, South Africa

Auckland, New Zealand

Cities4Forests is also endorsed by the Association of County Governments of Kenya, the Brazilian National Front of Mayors, and the Mexican States of Guanajuato and Jalisco.

Cities4Forests

Political Action & Engagement

- Building political support (untapped voices of Mayors)
- Resident engagement
- Sparking a global movement of cities

Technical Assistance & Capacity Building

- Policy and planning
- Mapping, measuring, and monitoring
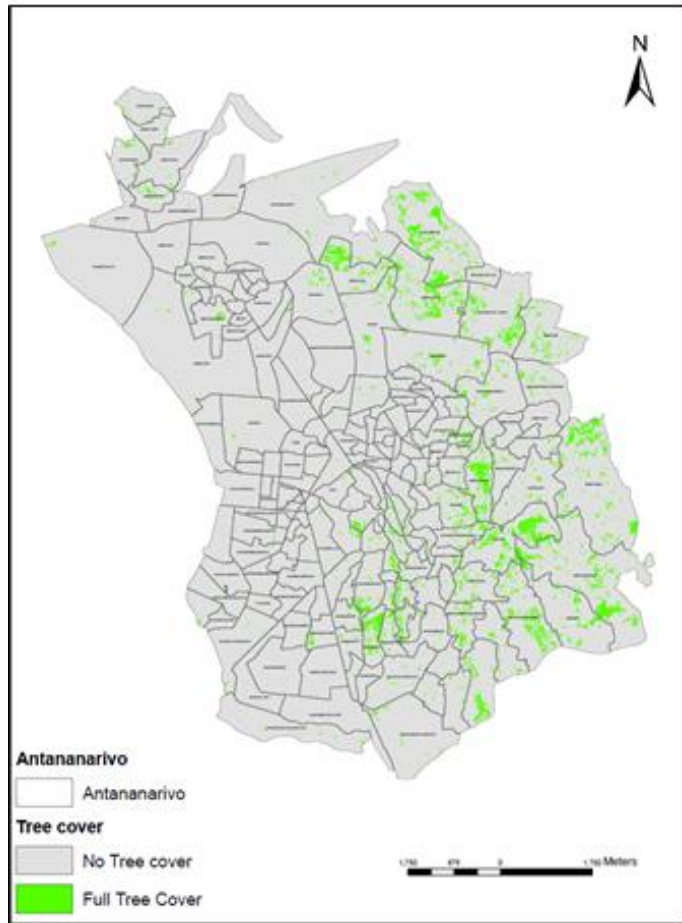- Leveraging new technologies
- Advancing gender and social equity

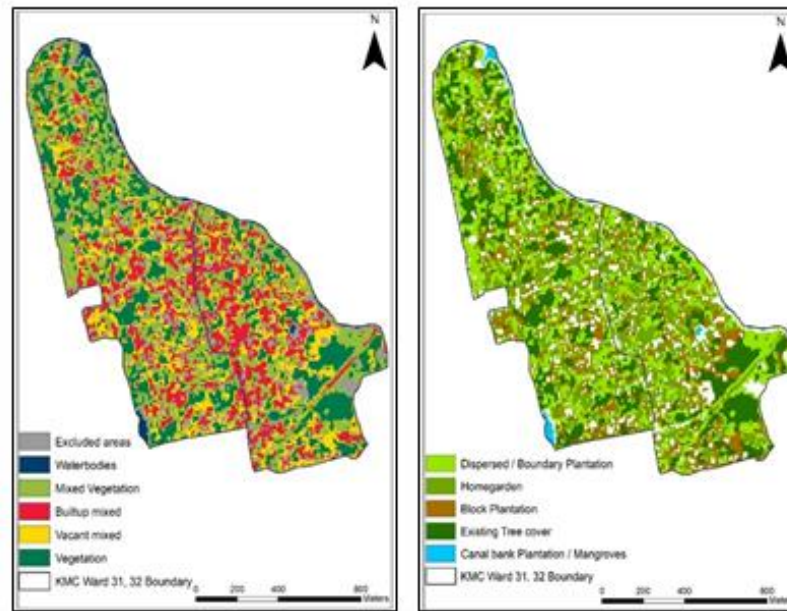# Economics, Finance, & Investment

- Economic analysis
- Enhancing project bankability and pipeline buildout
- Facilitating access to all forms of capital

Cities4Forests

Participatory Tree Cover Mapping Using Collect Earth Online

Antananarivo

Kochi
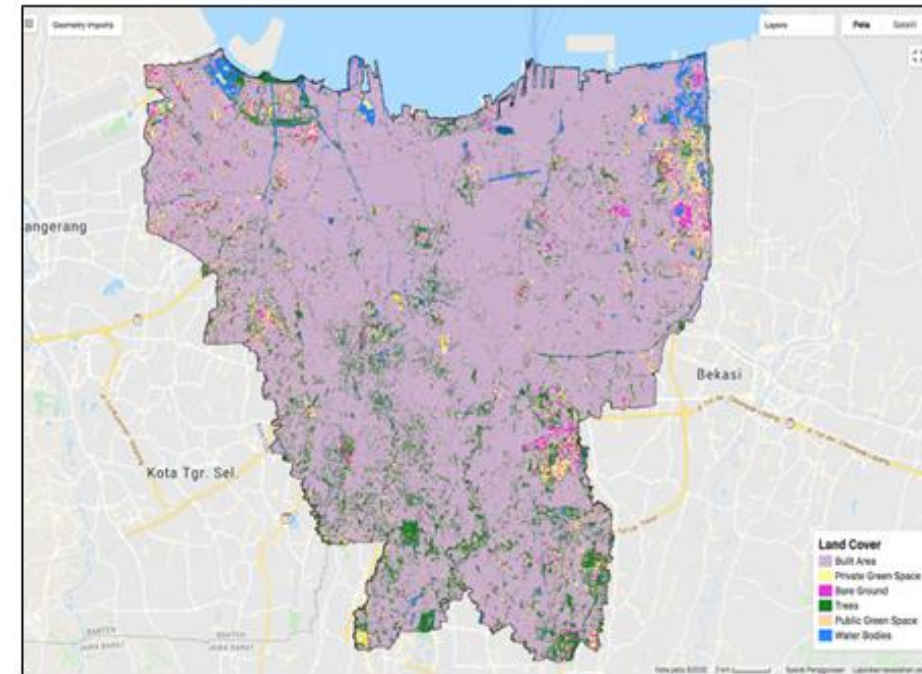
Jakarta

What is Collect Earth Online?
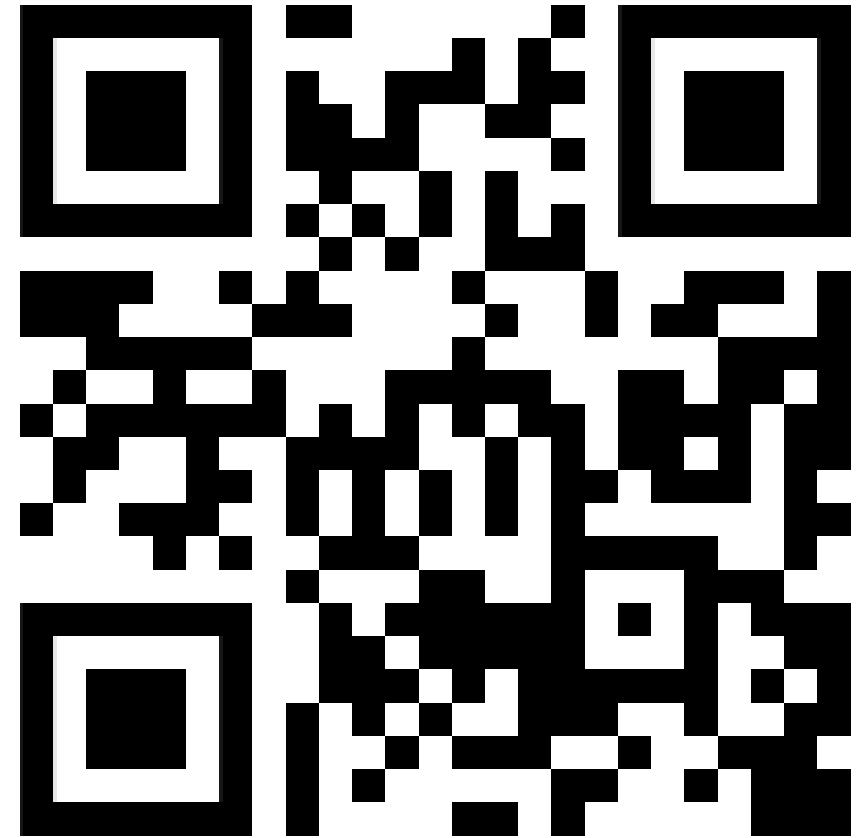
Uses of Collect Earth Online

Google Earth Image

Collect Earth Classified Image

WORLD RESOURCES INSTITUTE
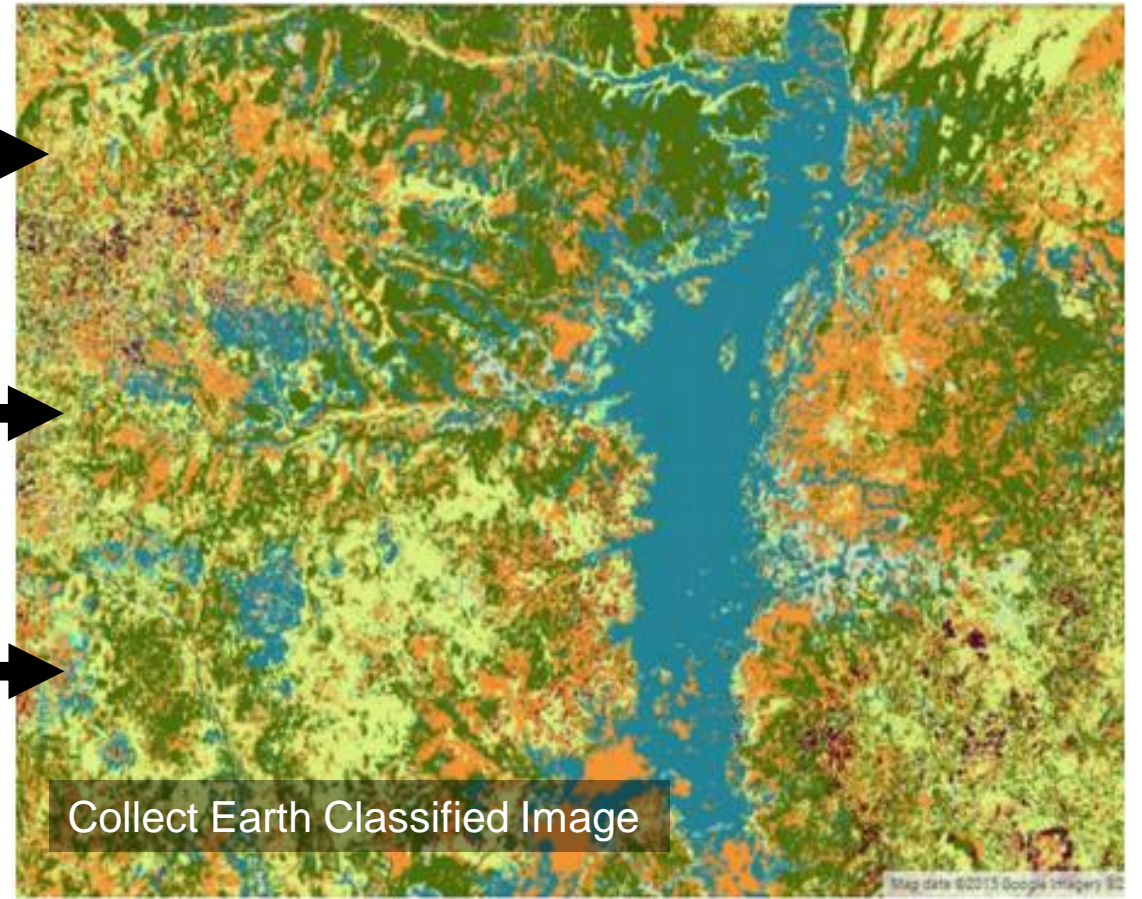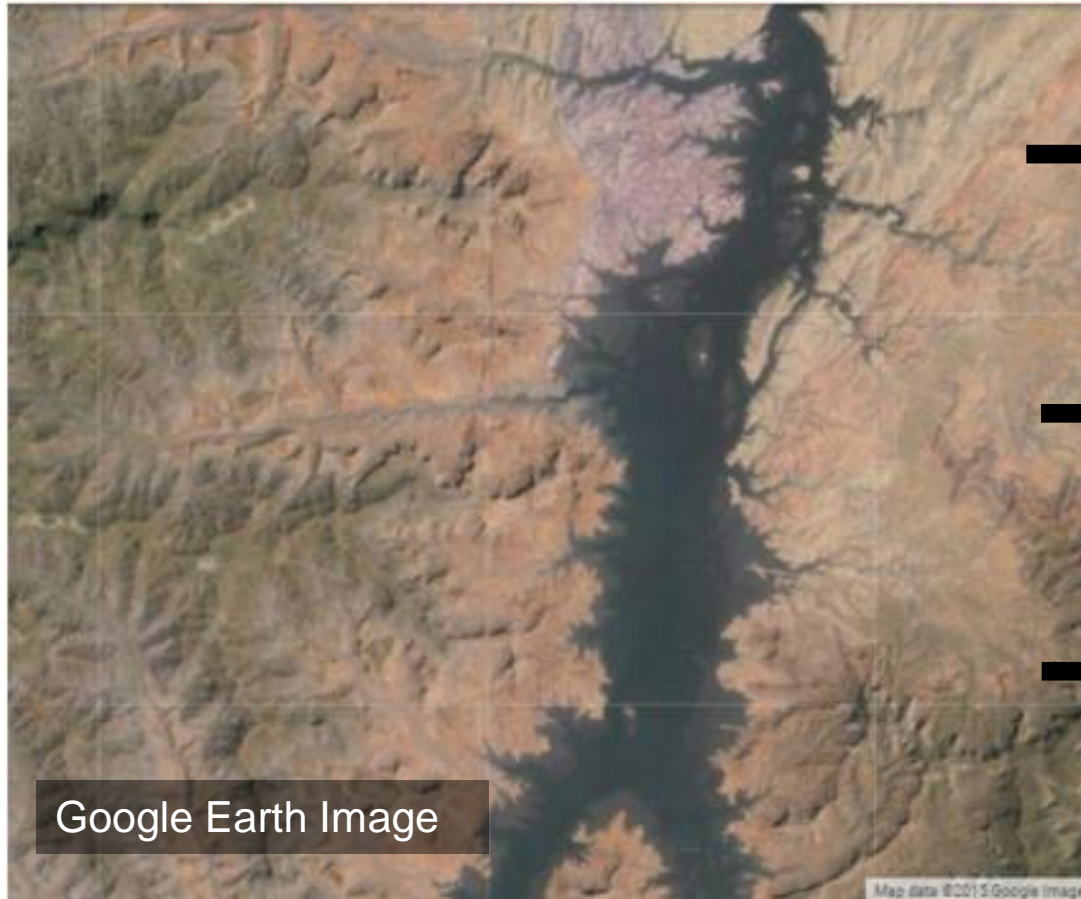
How Does Collect Earth Online Work?

COLLECT EARTH "MAPATHON"

1. Sampling Grid
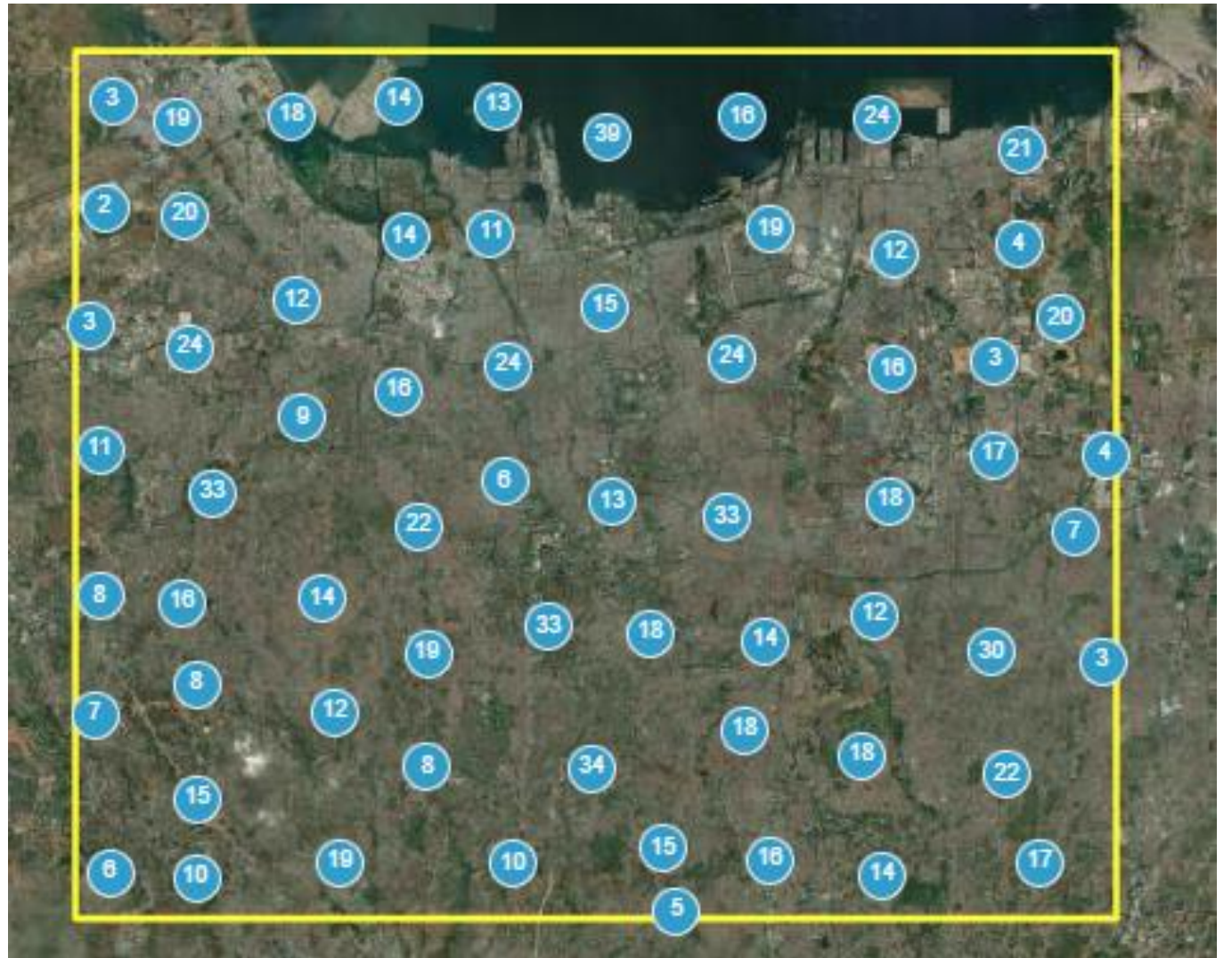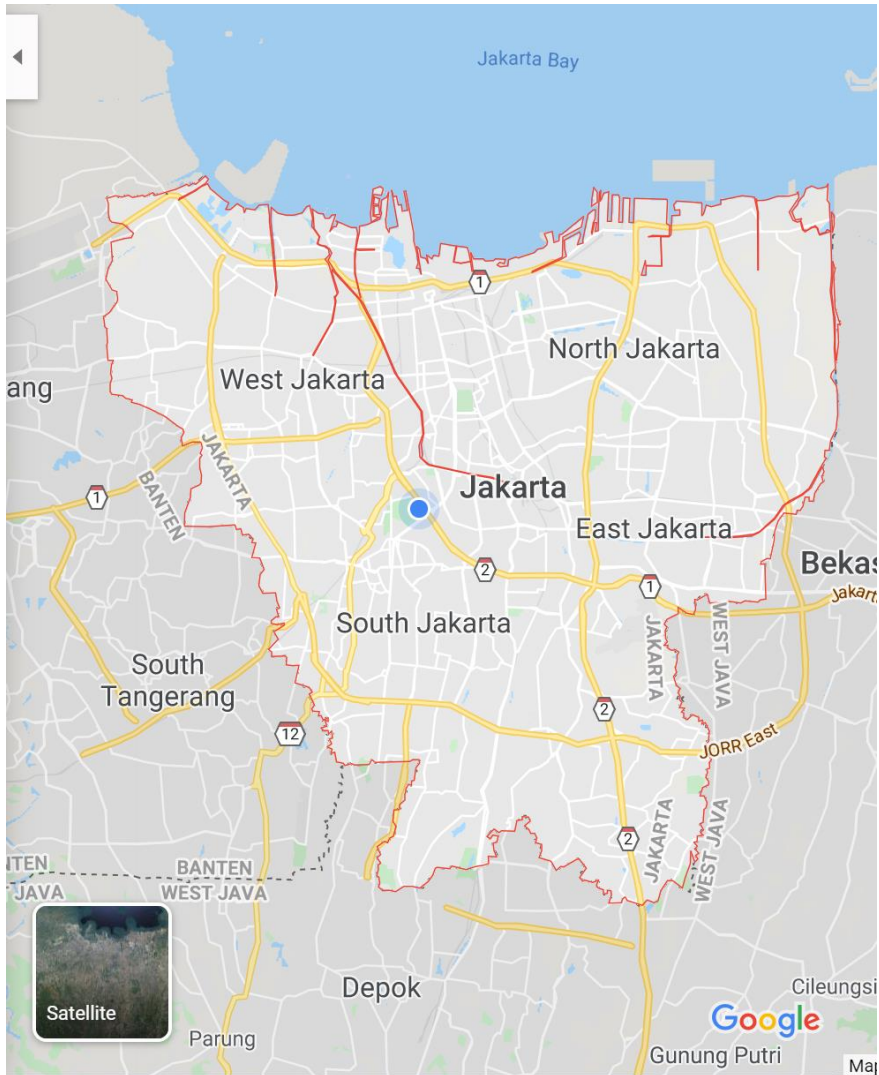
2. Survey Data Collection

3. Artificial Intelligence Model
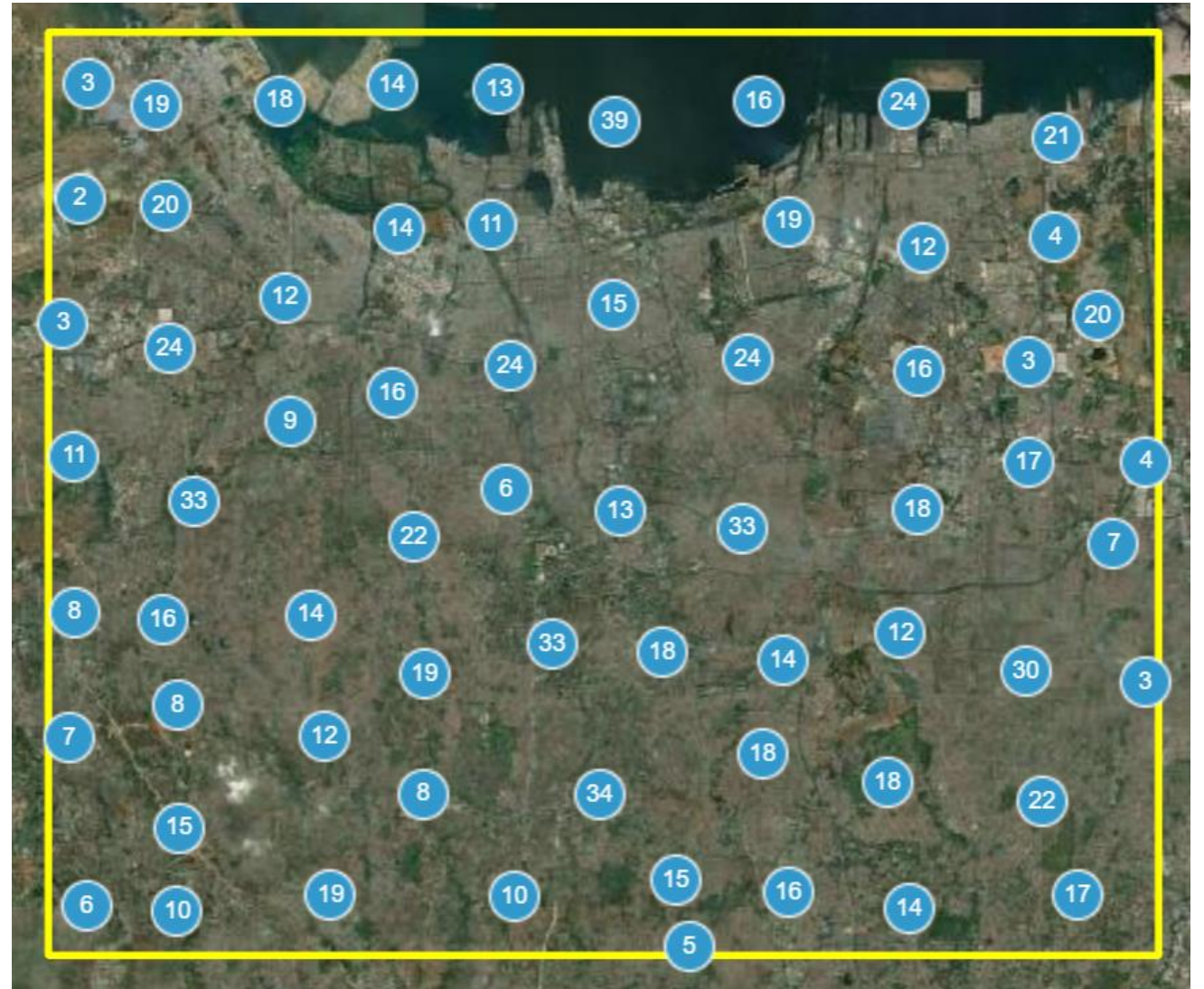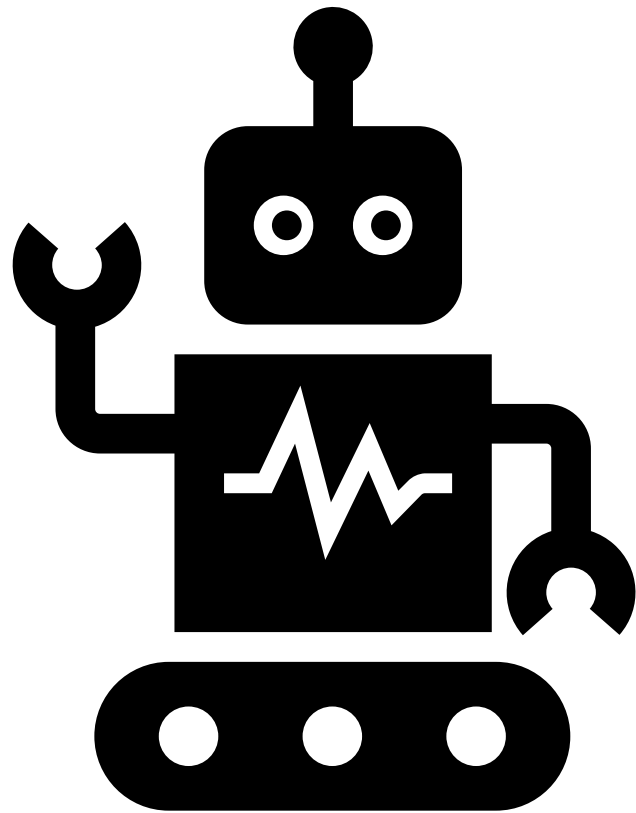
Constructing The Right Data Collection Survey For The Job

Cities4Forests Applications To Date

Antananarivo
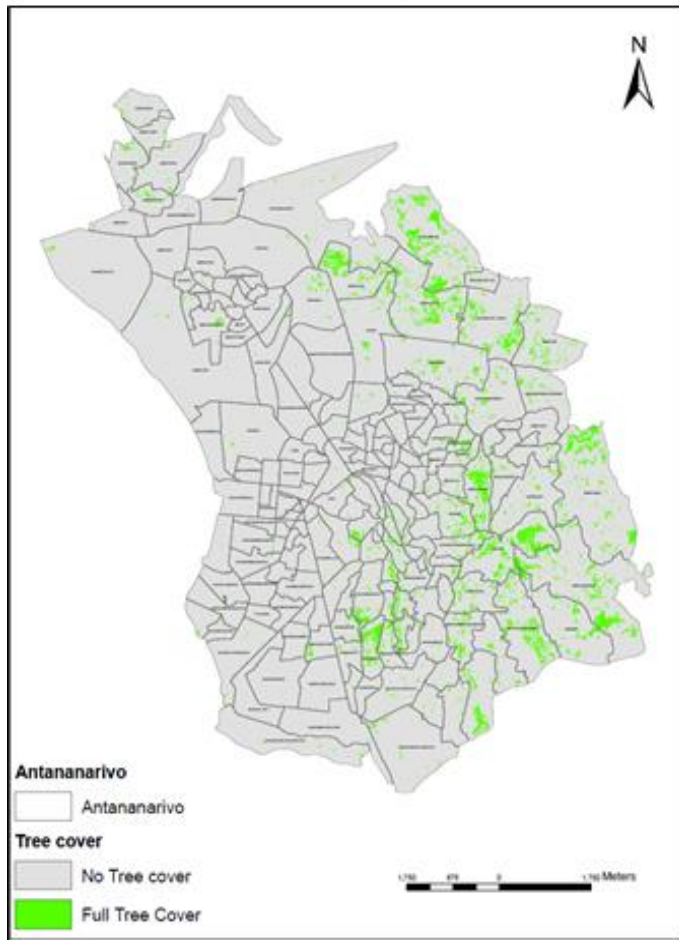
Kochi
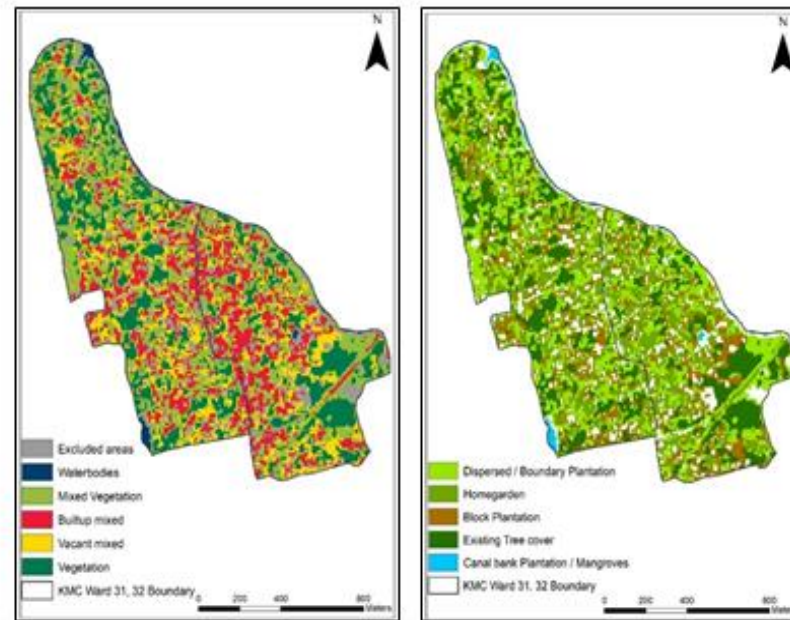
Jakarta
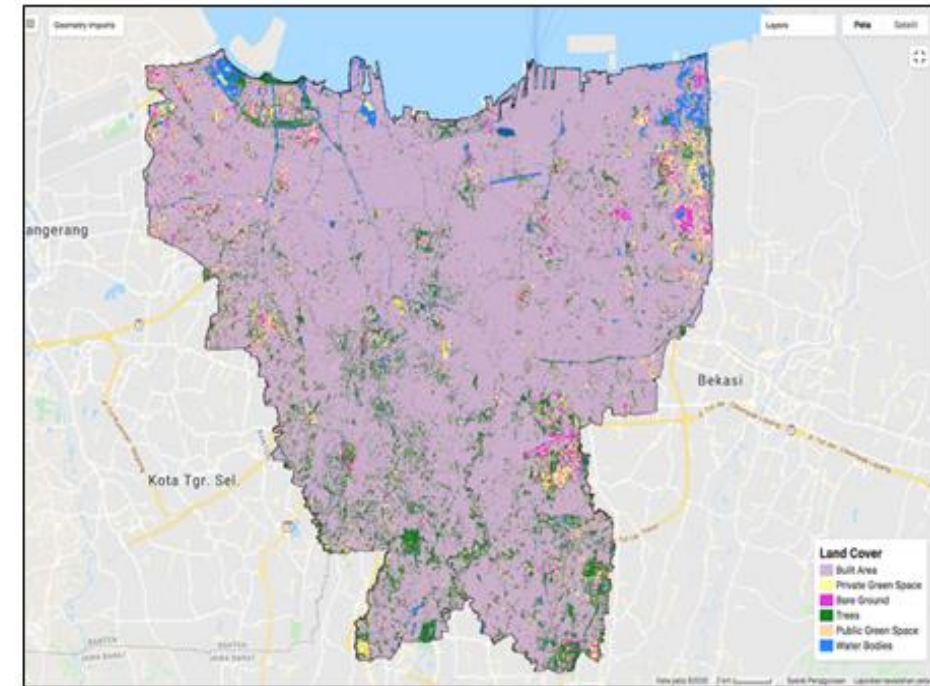
+ Addis Ababa, Dire Dawa, Balikpapan, Denpasar, Medan, Monterrey (ongoing)

In Antananarivo

Antananarivo

Partly Cloudy · 22°C
4:36 PM

Directions   Save   Nearby   Send to your phone   Share

Results: Land Cover

- Classified land cover map showing "opportunities" to plant trees and/or increase green space

Landcover of Antananarivo City, Madagascar

N

Legend

Landcover

- Built/Roads
- Crop
- Forest/Plantation
- OpenSpace/Other
- Water

Antananarivo

- Antananarivo

1,800   900   0   1,800 Meters

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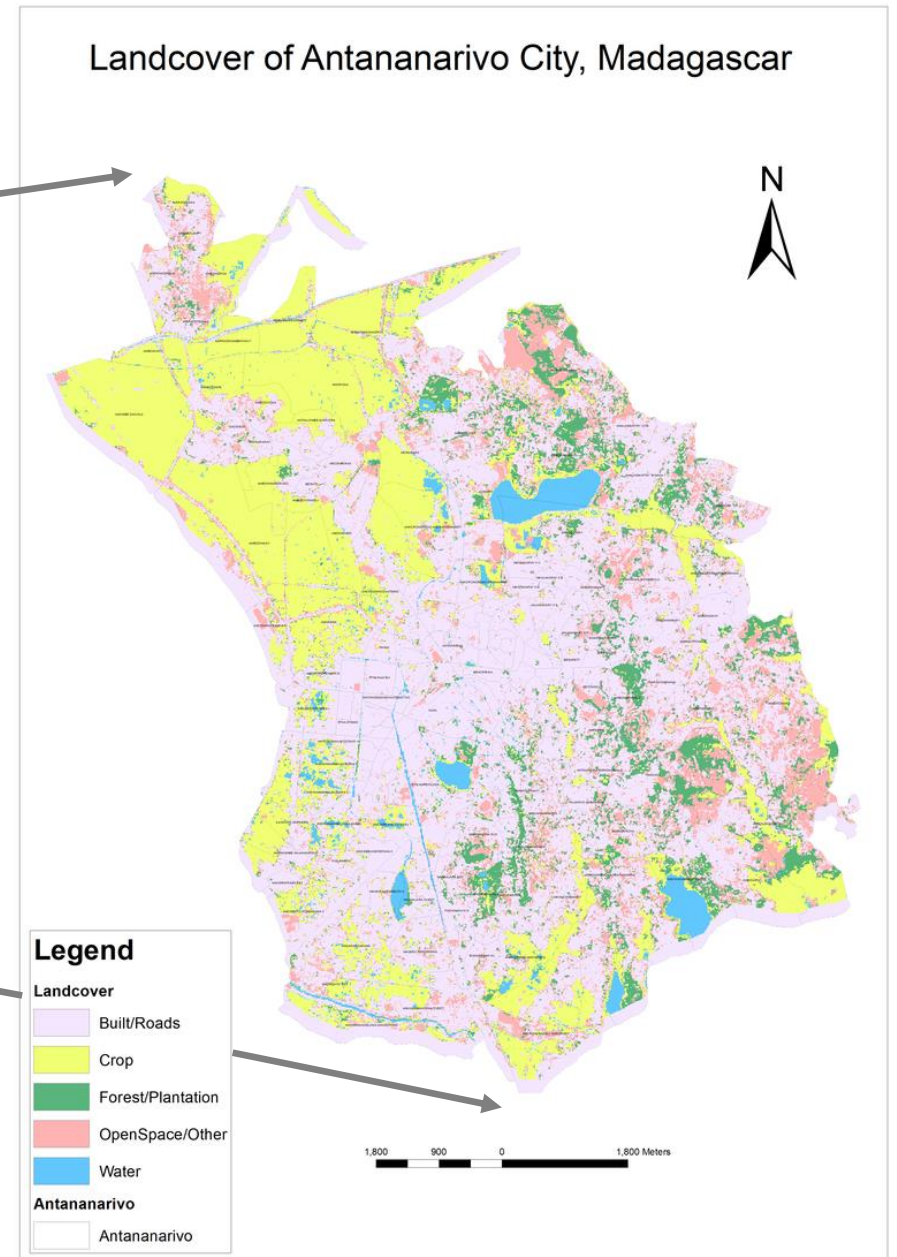
Results: Tree Cover

- Baseline "tree cover" as % of Antananarivo's total area

- Where there are trees vs where there aren't trees

Tree cover of Antananarivo City, Madagascar

N

Antananarivo

☐ Antananarivo

Tree cover

☐ No Tree cover

🟩 Full Tree Cover

1,750   875   0   1,750 Meters

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In Kochi

THE HINDU
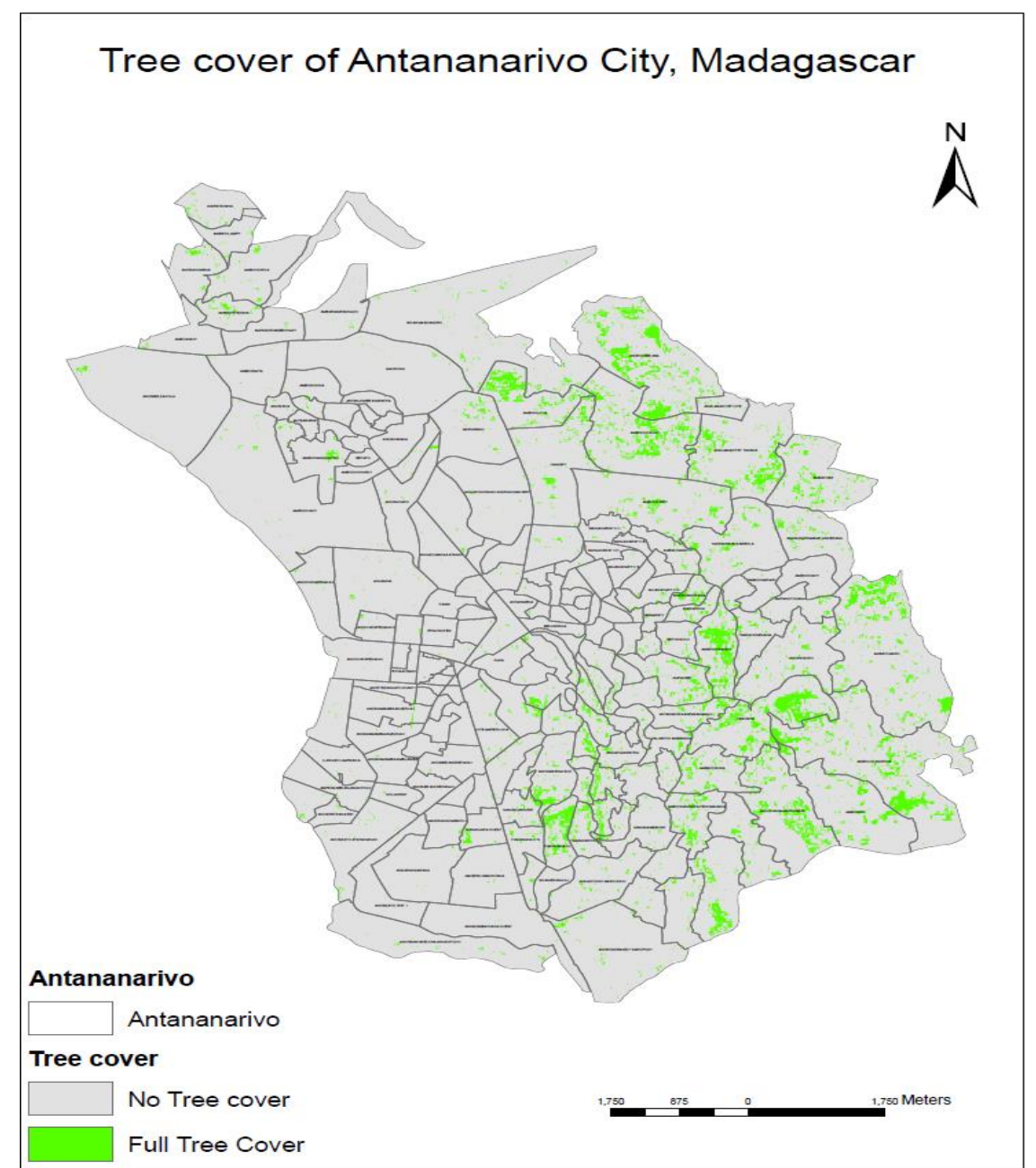
Mapathon begins today in Kochi

STAFF REPORTER

SHARE ARTICLE   f   🐦   ⑀   ☼   ✉   💬 0   🖨 PRINT   A | A |

A three-day mapathon to mark the city's existing green cover and devise strategies to augment it will commence at St. Teresa's College on Thursday. The mapathon is being conducted under the Cities4Forests project, a global initiative by the World Resources Institute (WRI) which has partnered with the Kochi Corporation. The project envisages expanding green patches in cities and mitigating the impact of climate change by protecting wetlands and biodiversity.

Opportunities for Improving Urban Tree Cover: A Case Study in Kochi

Kanchana Balasubramanian, Sidhtharthan Segarin, Priya Narayanan & Pulakesh Das

Abstract

The unprecedented nature of human action has a direct relation to increasing heat, and unlike many other natural disasters, heat risk can be mitigated. Our engagement in Kochi helped prioritize urban heat as a risk, enable identification of potential areas for improving urban tree cover, and facilitate and establish a community-based strategy for continued efforts under the Cities4Forests initiative. Sentinel-2 satellite data was employed to generate the land use land cover (LULC) map, while Land Surface Temperature (LST) map was prepared using Landsat data. Two participatory mapathons were conducted with the local residents and city councillors of Kochi to assess spatial baseline of trees, potential areas for improving tree cover and restoration interventions using Open Foris Collect Earth tool. Focussed analysis was carried out in two wards of Vaduthala, Kochi. The LULC class-wise maximum potential estimates shows higher potential to improve tree cover in the built-up area (49.59%), followed by vacant land (34.77%) in Kochi city. Similarly, Vaduthala region shows maximum potential for vacant land (42.31%) and built-up area (40.38% area), wherein home garden (42.32%), plantation in the entire plot (28.84%) and boundary plantation (23.08%) are recommended as the most suitable interventions. The spatial analysis in Vaduthala indicated the potential for home garden in 96.11 ha (94.75%), avenue/linear plantation in 2.97 ha (2.93%) and mangrove in 1.65 ha (1.63%). Areas of existing tree cover and mangrove (31 ha) in Vaduthala are identified for protection. The generated data suggests the potential for tree-based interventions, which can improve urban liveability and provide long-term heat resilience in Kochi city.

Keywords

Cities4Forests   Nature-based solutions (NBS)   Heat resilience

Community-based approach   Mapathon   Urban heat island

https://link.springer.com/book/10.1007/978-981-16-7128-9

In Jakarta

Jakarta's New Regulations on Tree Protection and Park Management

- **Legal protections for urban forests**

- **Integrates data about urban forests into city planning to reduce emissions by 30% by 2030**

- **Grow 200,000 more trees by 2022**

How to Get Started in Your City

1. Identify your need? What do you want to know?
2. Is Collect Earth the right tool for the job?
3. Do we have the ability to crowd collect enough data?
4. Are the needed stakeholders on board?
5. Can you analyze the results?
6. What does success look like for you?

Cities4Forests

Project Context

Environmental problems and solutions

- Addis Ababa is vulnerable to flooding, heat stress, and air pollution

  - These problems are projected to worsen with climate change and continued urban development

- The city plans to plant 25 million trees in the city over 5 years

- Goals of tree planting are:

  - Reduce runoff

  - Mitigate urban heat islands

  - Improve air quality

  - Sequester carbon

SAVi Assessment Goals

Assess impacts of land cover change on ecosystem services in Addis Ababa
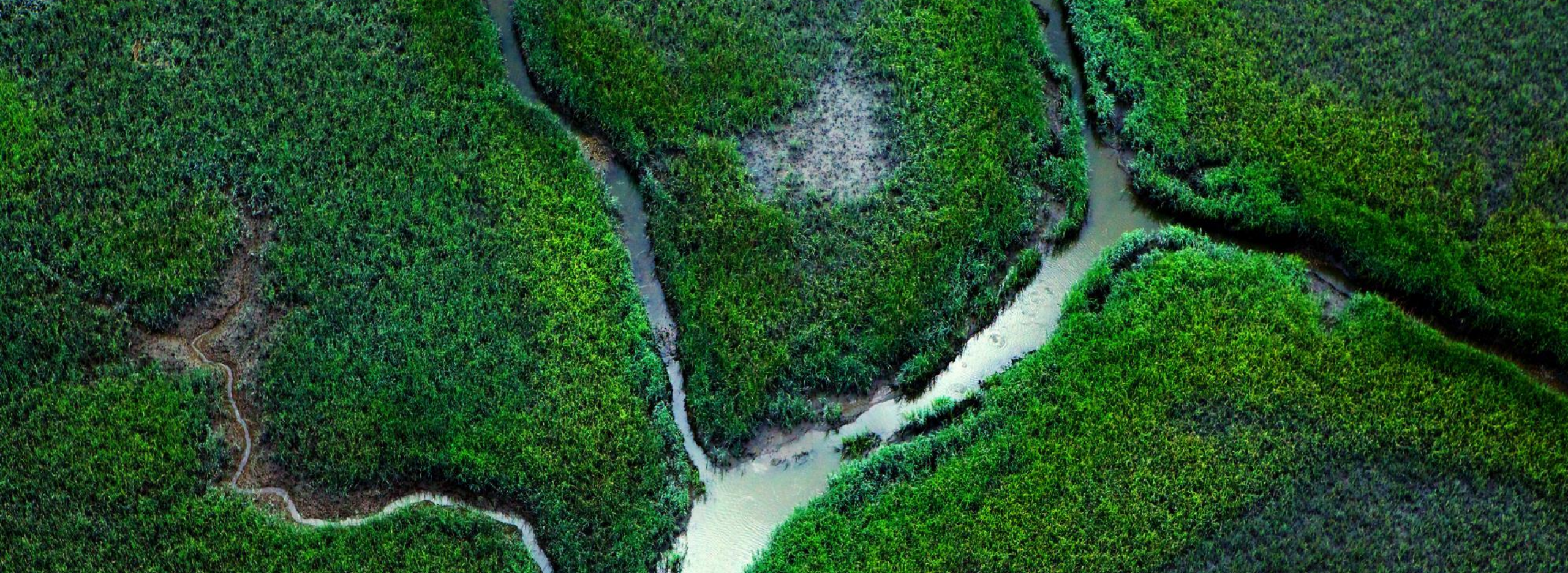
Quantify the costs, benefits, and financial performance of tree planting

Compare the economic performance of trees to grey infrastructure alternatives that provide similar services
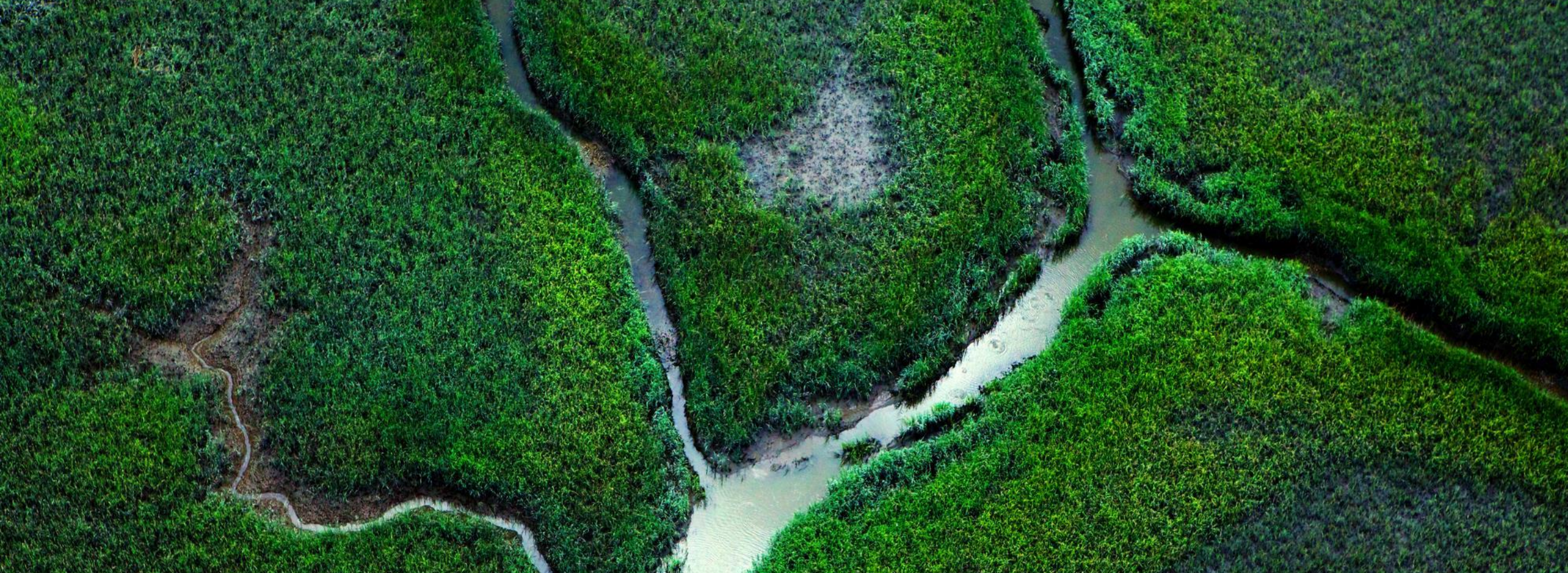
Scenarios and Assumptions

Tree Planting Scenarios

All scenarios compared to business-as-usual (no trees planted)

	Number planted (millions)	Survival rate	Number surviving (millions)	Percent maintained	Number maintained (millions)
High trees planted, high maintenance/survival	25	84%	21	50%	12.5
High trees planted, low maintenance/survival	25	30%	7.5	25%	6.25
Low trees planted, high maintenance/survival	11	84%	9.24	50%	5.5
Low trees planted, low maintenance/survival	11	30%	3.3	25%	2.75

Causal Loop Diagram

population
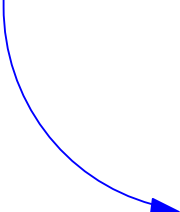
settlement
area

+
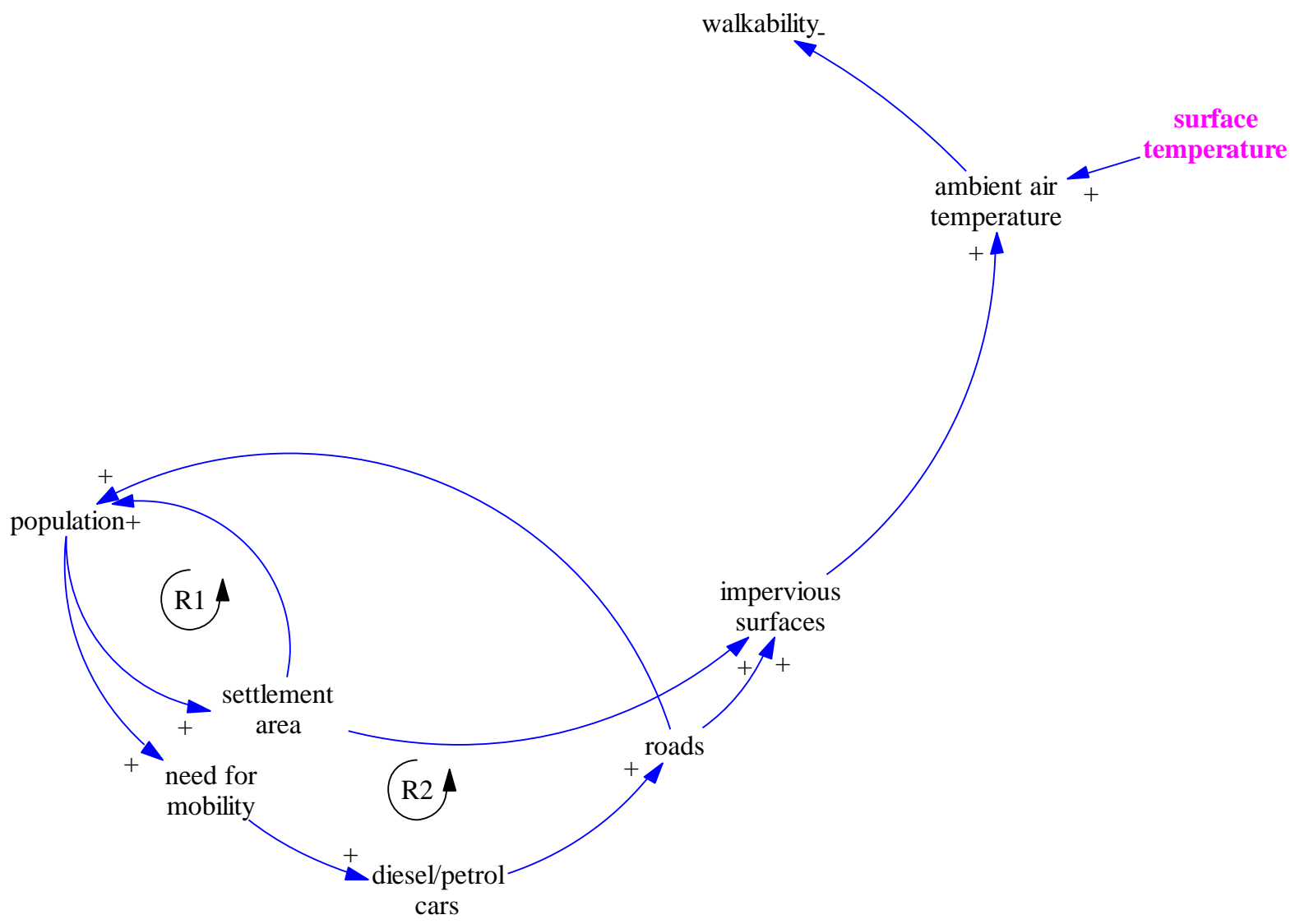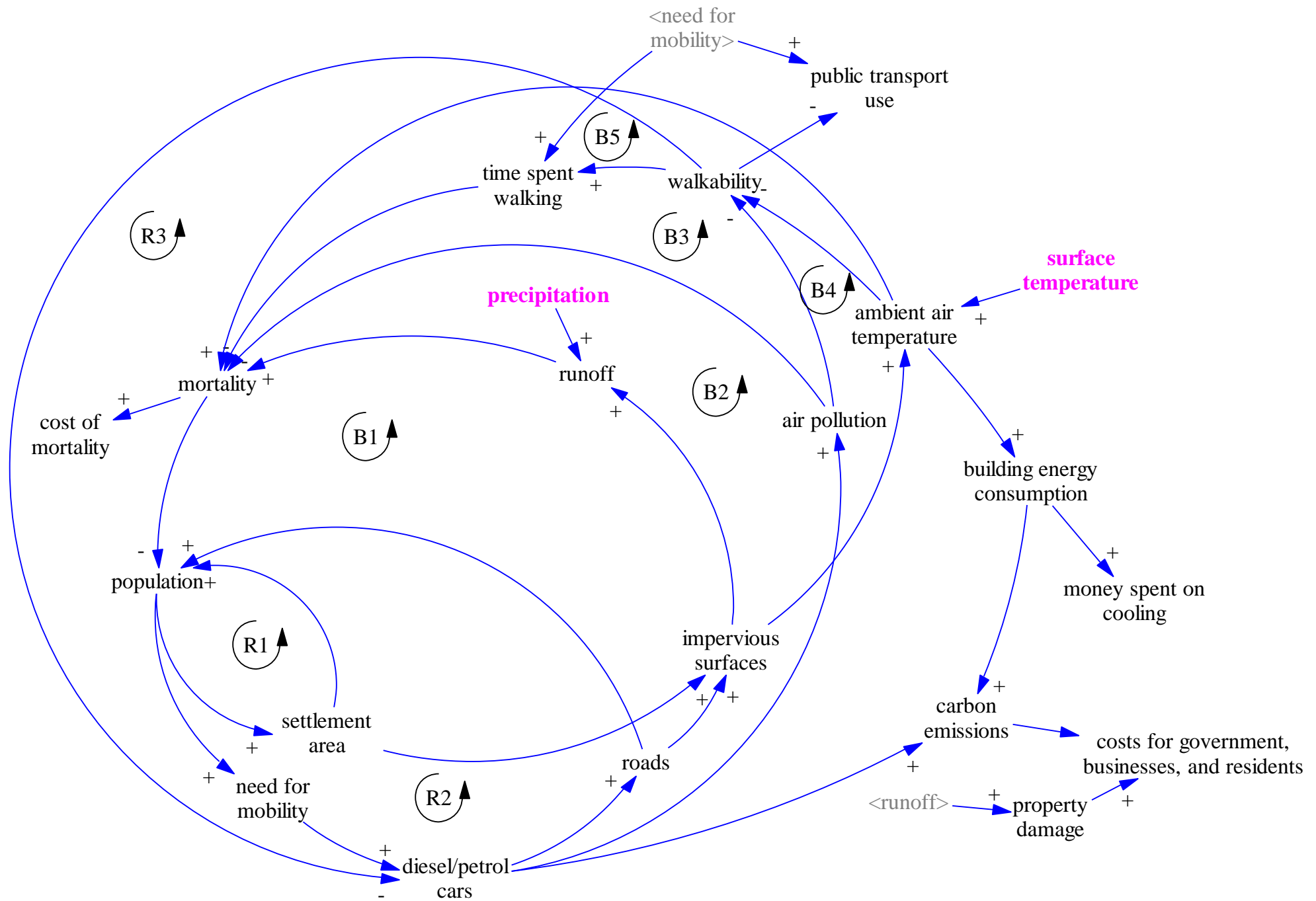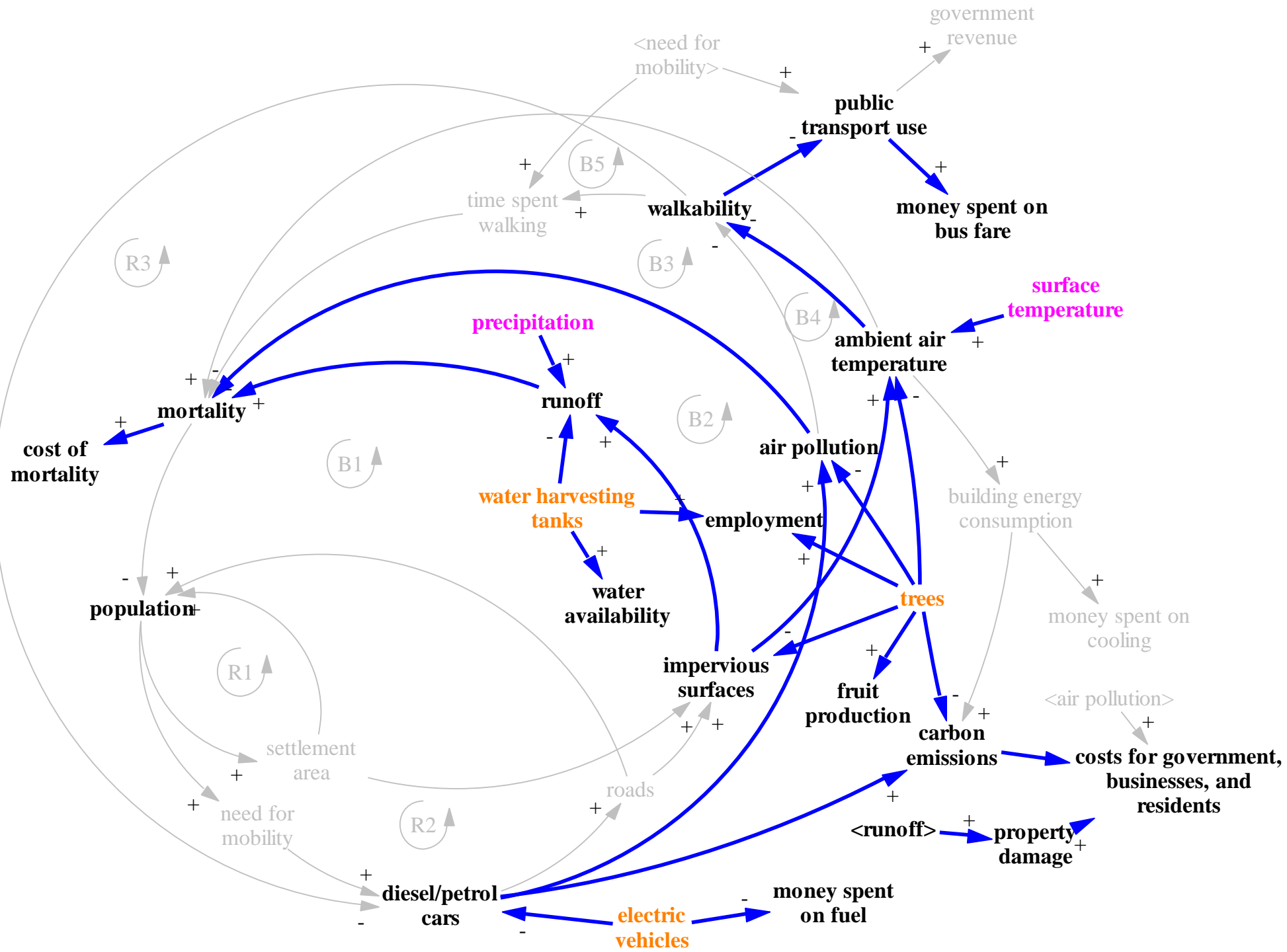
Integrated cost benefit analysis indicators

Added Benefits

Wages from tree planting and maintenance

Fruit production

Avoided Costs

Mortality from air pollution

Mortality from flooding

Property damage from flooding

Bus fares due to decreased walkability on hot days

Social cost of carbon

Direct Costs

Planting and maintenance costs

InVEST Results: Carbon Storage, Water Retention, Urban Cooling

Grey Infrastructure Comparison

Financial Analysis

Valuation Approach
Added benefits, avoided costs & direct costs

Integrated Cost Benefit Analysis Results

Million ETB

	RCP 4.5				RCP 8.5			
	25 million trees planted		11 million trees planted		25 million trees planted		11 million trees planted	
Tree survival rate	84%	30%	84%	30%	84%	30%	84%	30%
Total surviving trees (million)	21	7.5	9.24	3.3	21	7.5	9.24	3.3
Undiscounted Added Benefits								
Fruit production	607	217	293	105	607	217	293	105
Planting wages	95	95	42	42	95	95	42	42
Maintenance wages	3,335	1,668	1,584	792	3,335	1,668	1,584	792
Total added benefits	**4,037**	**1,979**	**1,919**	**938**	**4,037**	**1,979**	**1,919**	**938**

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Undiscounted Avoided Costs								
Mortality from air pollution	215	77	100	36	215	77	100	36
Flood damages to property	80	42	49	22	109	58	67	30
Mortality from flooding	224	119	136	60	333	177	202	90
Bus fares due to decreased walkability	55	45	51	25	55	45	51	25
Carbon sequestration	1,966	893	1,023	433	1,966	893	1,023	433
Total avoided costs	**2,539**	**1,175**	**1,359**	**576**	**2,678**	**1,249**	**1,444**	**613**

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Undiscounted Direct Costs								
Planting costs	500	500	220	220	500	500	220	220
Maintenance costs	4,400	2,200	2,090	1,045	4,400	2,200	2,090	1,045
Total direct costs	**4,900**	**2,700**	**2,310**	**1,265**	**4,900**	**2,700**	**2,310**	**1,265**

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Undiscounted Net Benefits (added benefits + avoided costs - direct costs)	**1,677**	**455**	**968**	**249**	**1,816**	**528**	**1,052**	**287**
Benefit to cost ratio	**1.34**	**1.17**	**1.42**	**1.20**	**1.37**	**1.20**	**1.46**	**1.23**
Benefit to cost ratio excluding avoided costs	**0.82**	**0.73**	**0.83**	**0.74**	**0.82**	**0.73**	**0.83**	**0.74**

Key Findings

Summary

- When accounting for direct value created for the local community and the avoided costs from air pollution, flooding, heat, and greenhouse gas emissions, trees have positive net benefits.

- Considering only cash flows, the benefits of tree planting do not outweigh the costs.

- Ensuring that planted trees survive by investing in maintenance generates more value than planting more trees with low maintenance/survival.

- Trees provide more value for money and create more jobs than installing rainwater harvesting tanks and replacing diesel/petrol cars with electric vehicles.

- Financially, the NPV is negative when considering only cash flows, **but when accounting for all outcomes of tree planting, the S-NPV of each tree planting scenario is positive.**

- **The S-NPV and S-IRR of trees are much higher than the S-NPV and S-IRR of the corresponding grey infrastructure alternative.**

NATURE-BASED INFRASTRUCTURE
GLOBAL RESOURCE CENTRE

Sustainable Asset Valuation (SAVi) of Tree Planting in Addis Ababa, Ethiopia

NBI REPORT

Supported by

gef
UNIDO
MAVA
FONDATION POUR LA NATURE

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March 2022
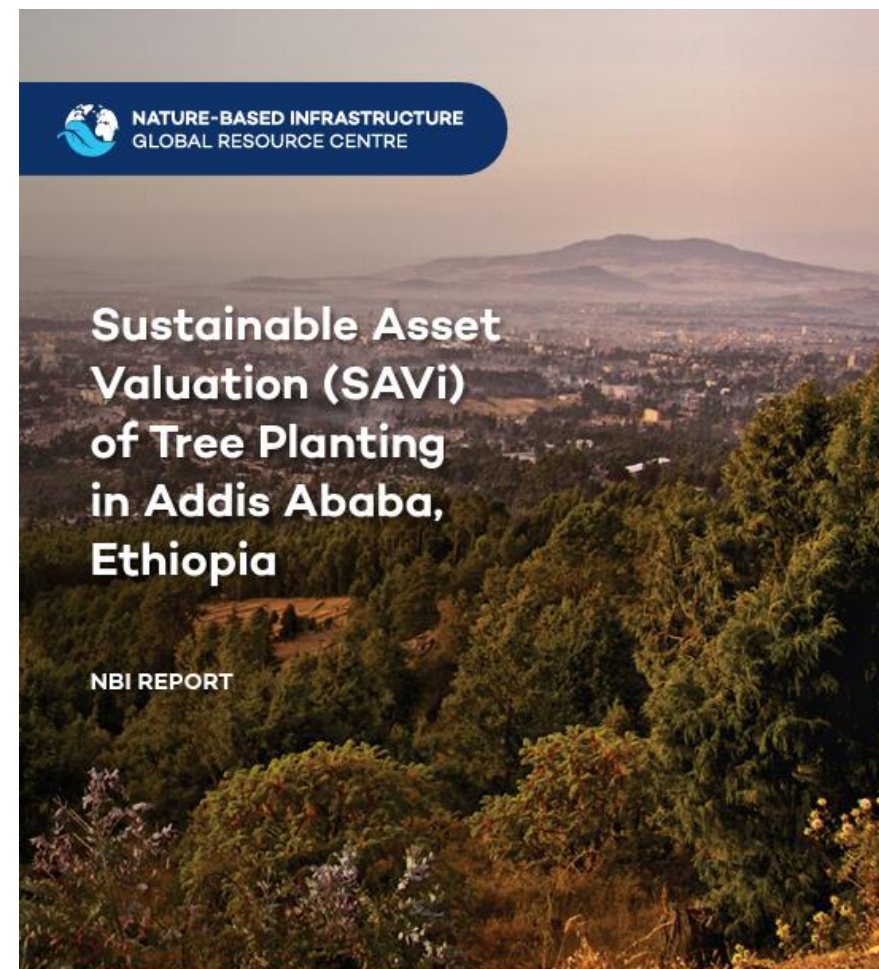
Conclusions

Tree planting in Addis Ababa

- Trees can increase climate resilience.

- It is important of include intangible impacts as part of a systemic valuation of nature-based infrastructure.

- Trees should be maintained to ensure long-term benefits.

- Tree planting may be a more viable option than grey infrastructure that provides similar benefits.

- Financially, trees have positive net benefits over a 20-year time frame and, in this context, perform better than grey infrastructure alternatives.

- **Growing trees in Addis Ababa is a good investment to manage stormwater, improve air quality, combat climate change and mitigate urban heat.**

New Guidance for Cities to Inventory GHG Emissions and Removals by Trees and Forests

GREENHOUSE GAS PROTOCOL

Global Protocol for Community-Scale Greenhouse Gas Inventories

Supplemental Guidance for Forests and Trees

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C40 CITIES

ICLEI
Local Governments for Sustainability
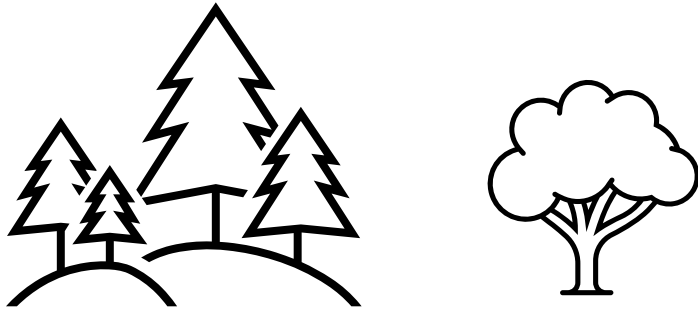
About the Guidance

State of Local Inventories

There are hundreds of cities, counties, land-based cooperatives, municipal governments, forest land managers and other subnational actors around the world developing climate targets and climate action plans...
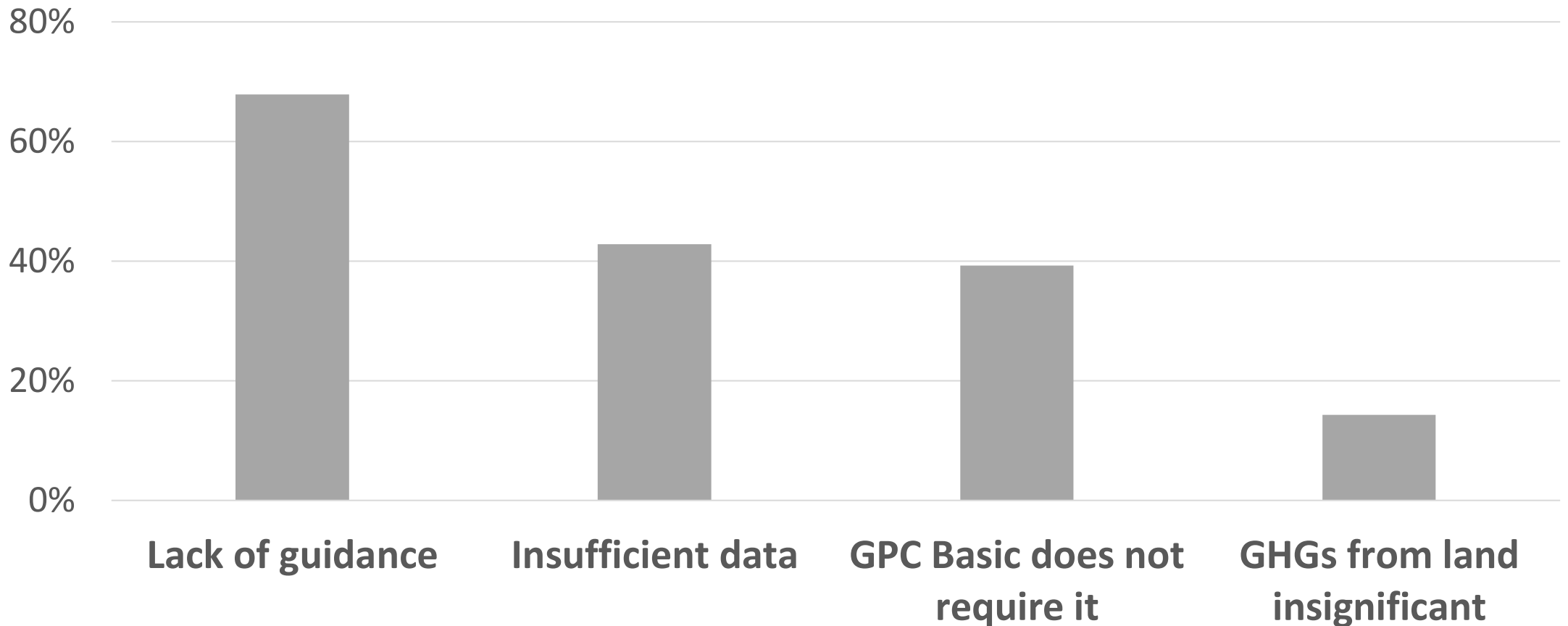
...yet very few include forests and trees.

Why communities should include forests and trees in their greenhouse gas (GHG) inventories

- Provides a more comprehensive GHG inventory
- Adds to community understanding of GHG emissions and sequestration
- Helps with developing policies and programs to meet GHG goals
- Facilitates conversations with other jurisdictions
- Some communities may have high mitigation potential

Forests and trees are different from other sectors

Forests and trees have some characteristics for which special guidance may be useful:

- Limited data
- New to communities
- Natural variability
- Emissions *and* removals

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wbcsd

Objectives of the supplement

- Publish methods that enable communities to cost-effectively include forests and trees in their local GHG inventories

- Create international consistency and transparency in the way communities develop GHG inventories for forests and trees

- Help cities and other communities understand how forests and trees can contribute to ambitious and transparent climate change mitigation goals

- Support the reconciliation of national GHG inventories and subnational monitoring to inform mitigation targets

Current coverage of the supplement

Covers:	Does not cover:
• Emissions and removals by forests and trees outside forests (e.g., urban tree canopy)	• Cover other non-forest aspects of AFOLU other than trees (e.g., soil GHG emissions)
• Provide cities with a framework to understand the magnitude and direction of GHGs from forests & trees	• Identify specific data sources or provide a tool or inventory calculator
• Provide information that can be used to inform climate-friendly policies	• Provide estimates that can be used for selling carbon credits
• Support the development of a GHG inventory consistent with IPCC national inventory methods	• Provide a methodology to estimate the GHG impacts of specific mitigation activities
• Estimate Scope 1 (within-boundary) emissions and removals from forests and trees	• Cover Scope 3 emissions or removals occurring outside the boundary
	• Estimate the indirect or non-GHG benefits of forests/trees

What's in the supplement
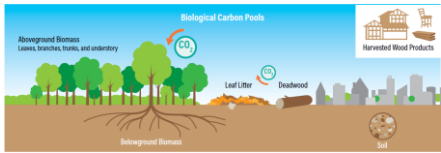
 Background

 Selecting inventory area and years

 Data needs

 Equations

 Reporting results and setting targets

Pilot Applications

Salvador, Brazil

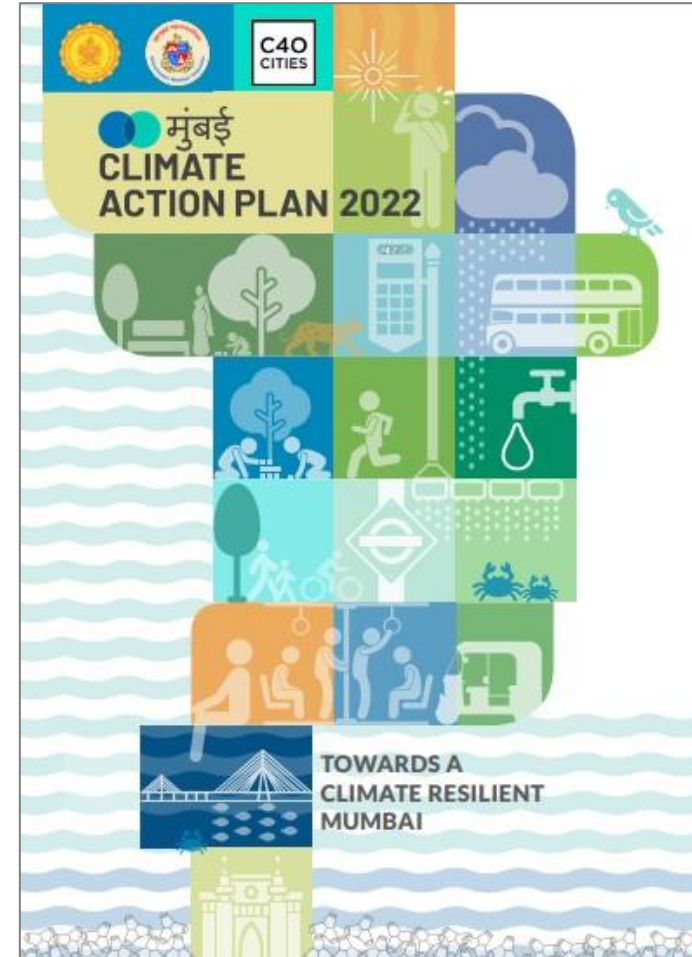**Mumbai, India**

Mexico City, Mexico

Jakarta, Indonesia

www.shutterstock.com · 1418187971

Mumbai Climate Action Plan

Better Forests, Better Cities

- This report provides an evidence base for how forests benefit cities.
- It brings together the science on the benefits of forests within, near, and faraway from cities.

Cities4Forests

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REPORT

Better Forests, Better Cities

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Cities benefit from inner, nearby and faraway forests

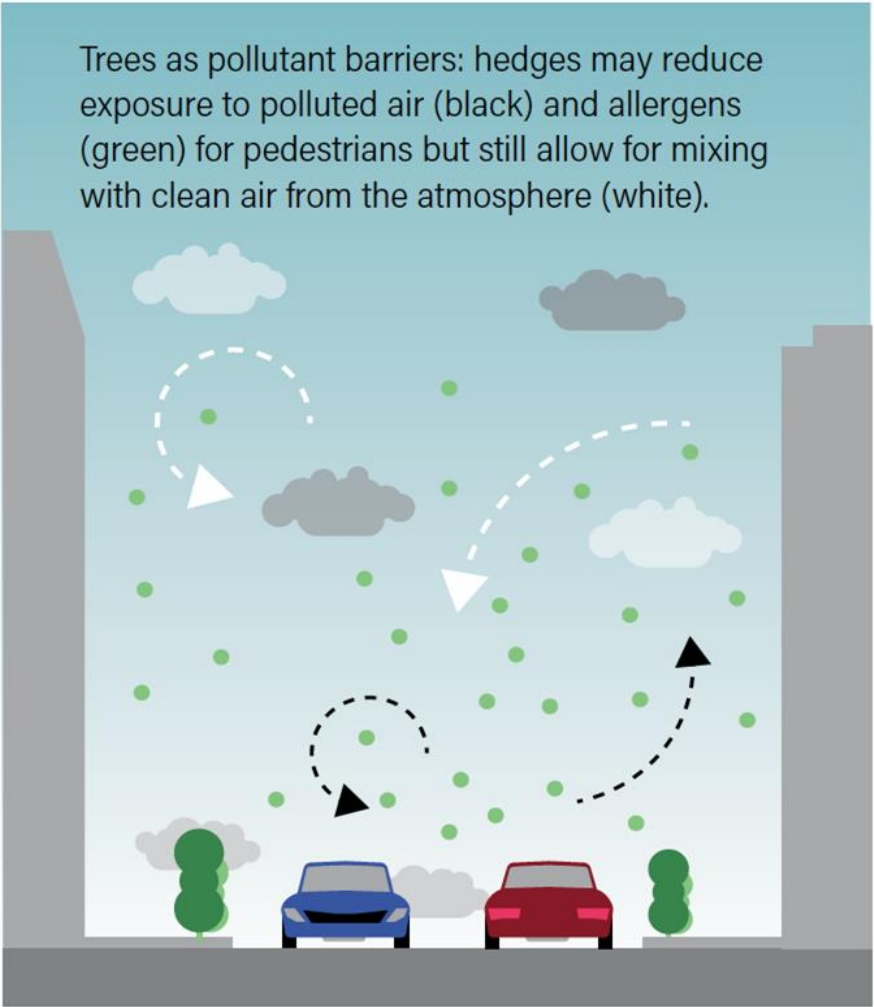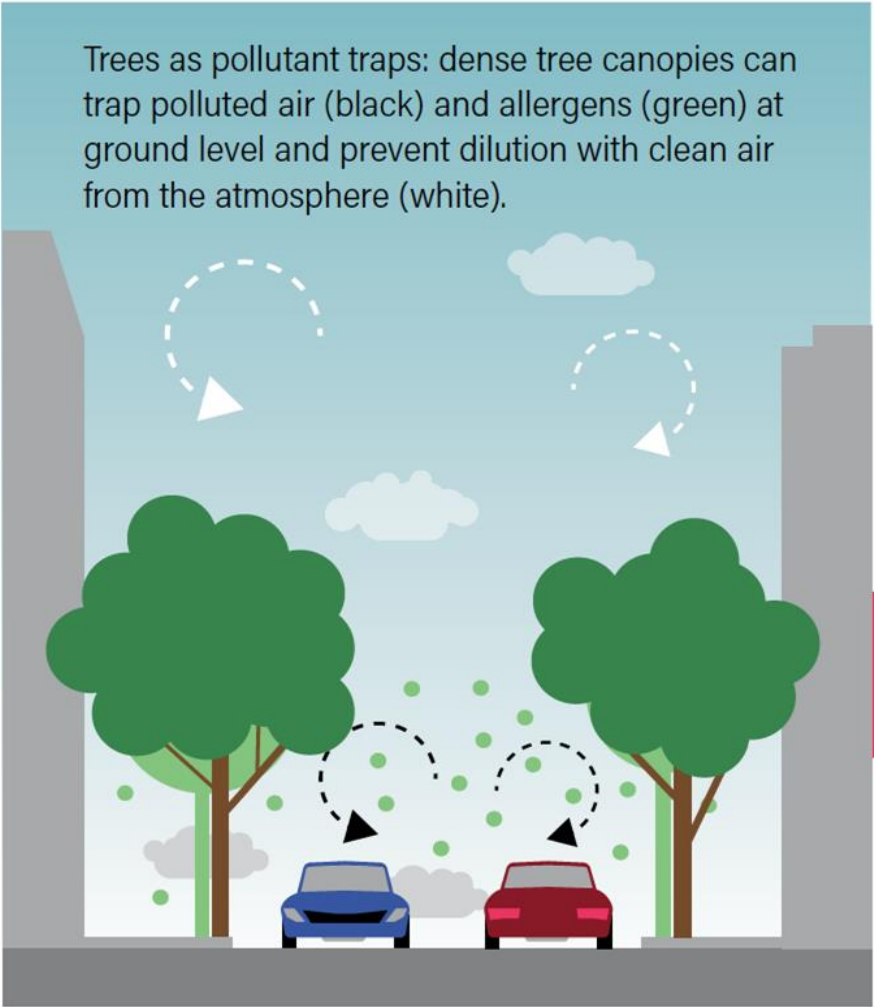|	*Inner* Forests	*Nearby* Forests	*Faraway* forests
Health + Wellbeing	Reduce extreme heat	Promote mental and physical health	Provide food, medicine, and raw materials.
Water	Prevent flooding and help with stormwater management	Providing clean, reliable drinking water & prevent flooding	Maintain global precipitation patterns
Climate	Decrease energy demands for cooling/heating	Sequester carbon	Sequester carbon
Biodiversity	Biodiversity reduces risk of blights and enhances other benefits	Biodiversity supports urban food supplies	House most of the world's on-land biodiversity

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Health and Well-being

Forests help cities:

1. Reduce extreme heat

2. Enhance urban air quality

3. Promote physical and mental health of city residents

4. Create walkable, safe streets

5. Support community connections

6. Reduce urban environmental inequity

7. Provide food, medicine, and raw materials

8. Enhance economic well-being

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Well-chosen trees and forests improve air quality

Trees as pollutant traps: dense tree canopies can trap polluted air (black) and allergens (green) at ground level and prevent dilution with clean air from the atmosphere (white).

Trees as pollutant barriers: hedges may reduce exposure to polluted air (black) and allergens (green) for pedestrians but still allow for mixing with clean air from the atmosphere (white).

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Spending time in forests boosts physical and mental health

Water

If water is: _Forests can:_

Too dirty ⟶ Provide cleaner water

Too much ⟶ Help reduce flooding

Too little ⟶ Protect water supply

Too erratic ⟶ Maintain and enhance local, regional and global hydrological cycles

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Nine key things cities should know about biodiversity

Biodiverse forests provide more goods and services to cities

Biodiverse forests store more carbon, more reliably

Biodiverse, intact forests protect watersheds

Forest biodiversity provides a template for new medicines and pharmaceuticals

Biodiverse forests support the world's pollinators—and urban food supplies

Protecting biodiverse forests can reduce risk of diseases and pandemics

Access to biodiversity in urban areas benefits physical and mental health

Urban forests can support biodiversity

Tropical forests hold the vast majority of earth's terrestrial biodiversity

Guiding Principles for Inner, Nearby and Faraway Forests

1. Conserve first, restore second

2. Protect large, old trees

3. Define forests as essential infrastructure

4. Create a clear vision for the role of forests

5. Give voice to communities

6. Emphasize equity

7. Collaborate across jurisdictions and city agencies

8. Use forests to complement other measures to reduce emissions

9. Prioritize biodiverse, native forests

10. Use the "right tree, right place" approach

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What Cities Can Do: Recommendations for Policy and Practice

|	*Inner* Forests	*Nearby* Forests	*Faraway* Forests
1. Measurement	Map, inventory, and monitor your city's urban forest	Map peri-urban and watershed forests and identify where forests are being lost	Conduct an analysis of city-wide consumption linked to tropical deforestation
2. Planning	Develop an urban forest management plan	Support the development of "nearby forest" management plans	Calculate and develop an action plan to reduce city-driven carbon dioxide emissions associated with tropical deforestation
3. Partnerships	Seek out organizations conducting innovative work on inner forests	Articulate and amplify shared goals	Establish a "partner forest"
4. Finance	Explore diverse, long-term financing mechanisms	Clarify that forest protection and management are eligible infrastructure expenses	Compensate for urban emissions by funding tropical forest conservation
5. Markets	Develop wood waste reuse programs	Implement a robust procurement policy for local, sustainably-sourced wood	Initiate tropical forest-positive procurement policies and campaigns

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Resources

Better Forests, Better Cities Report

https://bit.ly/BetterForestsBetterCities

Want to Grow Trees? Consider These 5 Lessons

https://www.wri.org/insights/want-grow-trees-consider-these-5-lessons
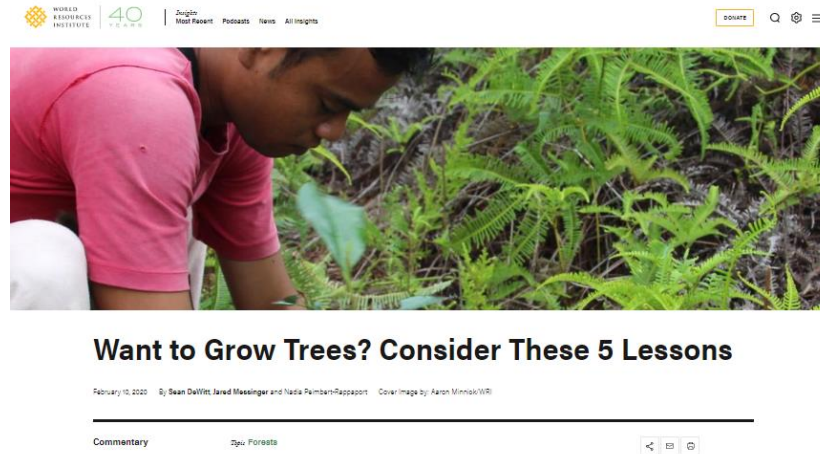
Better Forests, Better Cities *In-person* Launch
Thursday 15 December
CBD COP 15, Montreal

https://www.eventbrite.ca/e/better-forests-better-cities-report-launch-tickets-472863466357?

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Resources

GPC Supplemental Guidance for Trees & Forests

https://ghgprotocol.org/gpc-supplemental-guidance-forests-and-trees

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Four-page summary

How Cities and Communities Can Inventory GHG Impacts of Forests and Trees

Download here

Cities Should Account for Trees in their Greenhouse Gas Inventories. New Guidance Shows How

https://thecityfix.com/blog/cities-should-account-for-trees-in-their-greenhouse-gas-inventories-new-guidance-shows-how/

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END / ANNEX OF ADDITIONAL SLIDES

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