



GLOBAL COOLING PLEDGE ASSEMBLY

SINGAPORE 15 - 18 SEPTEMBER 2026

Parallel Session: Beat the Heat Training

Session 1: Urban Heat Planning and Integration into Policy Frameworks

15:00-16:30, 15 September 2026



Ministry of Sustainability
and the Environment
— SINGAPORE —

BEAT THE HEAT

Facilitator



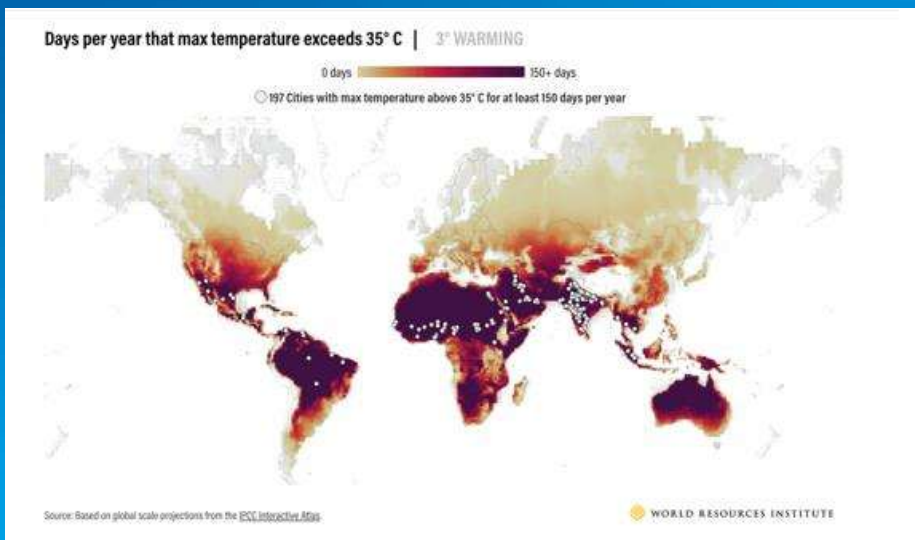
Dr. Eleni Myrivili

Global Chief Heat Officer,
Strategic Lead Beat the Heat,
UNEP



Extreme heat is a silent killer

The deadliest climate hazard → half a million deaths per year



July 2026: 2nd-warmest on record globally, +1.47°C vs pre-industrial; highest July sea surface temps ever recorded

3.79 billion people exposed to extreme heat if warming passes 2°C 41% of global population in 2050



US: 1,500+ daily heat records broken in June; Philadelphia/DC
France: 2,025 excess deaths in one June heatwave, hardest on 45+

India: by late April, 98 of world's 100 hottest cities were Indian; highs above 46°



Huge impacts on productivity → 2–3% productivity drop per degree above 20°C (ILO)

Strained power grids, transit; widespread outages

Beat the Heat A mutirão against extreme heat

A COP30 - UNEP Cool Coalition
flagship implementation drive,
launched in 2025,

Objective: accelerate local-level
solutions for extreme heat and
sustainable cooling.



Beat the Heat
operationalises the Global
Cooling Pledge, turning
commitments into scalable
cooling action.

Survey results:

Cities already recognize extreme heat as a major risk, but most still lack the basic planning and data foundations needed to respond.

*Survey conducted with Beat the Heat cities and states between February and June 2026.
About 150 respondents*



High Urgency, Low Readiness

Percentage of surveyed cities reporting heat as a priority risk versus lack of foundational action.

64.2%



Extreme heat as a top 3 priority risk

45.0%



Have not yet started heat mapping or planning

40.4%



Have not yet started nature-based solutions and passive cooling

250+

Cities joining forces to
Beat the Heat



100+ Partners

Driving the mutirão



ARUP



BNDES



COUNT US IN



+CIFRC



URBAN SH/FT



100+ Partners

Driving the Mutirão



A CIDADE
PRECISA
DE VOÇÊ

AGC



AMBIATOR



CECOS
UNIVERSITY



CITIES CLIMATE
FINANCE
LEADERSHIP
ALLIANCE



FORTYGUARD



geres
LA SOLIDARITÉ
CLIMATIQUE
EN ACTION



GSMA



SPACE COOL

BOERI
STEFANO
BOERI
INTERIORS



Beat the Heat focus areas*



Conduct urban heat assessments and prepare action plans — identify hotspots and integrate heat into urban and climate plans.



Implement nature-based and passive cooling solutions, including through building codes.



Procure low-GWP, high-efficiency cooling technologies for public buildings.

(* corresponding to the subnational commitments of the Global Cooling Pledge and two of the national commitments of the Global Cooling Pledge)

Survey results:

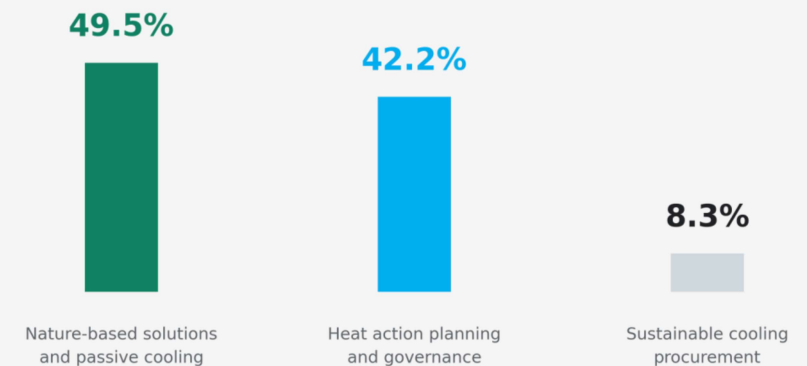
Over 90% of cities are asking for foundational heat planning and nature-based solutions.

Cities recognize that to survive extreme heat, they must first establish core governance (Heat Action Plans) and deploy nature-based & passive cooling solutions.



High Demand for Infrastructure and Planning

Percentage of cities prioritizing each commitment if they could only receive support for one.



Survey results:

Planning is a catalyst for action

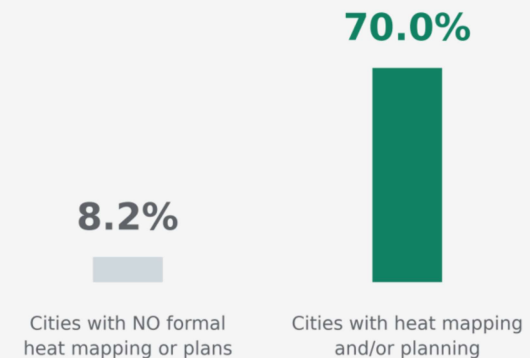
Cities with heat mapping and planning are significantly more likely to move toward implementing cooling solutions.



Planning is the Catalyst for Action

Percentage of cities actively designing, strategizing, or implementing physical cooling solutions.

Over 8.5x more likely to be advancing
NbS strategies, passive designs, or pilot projects

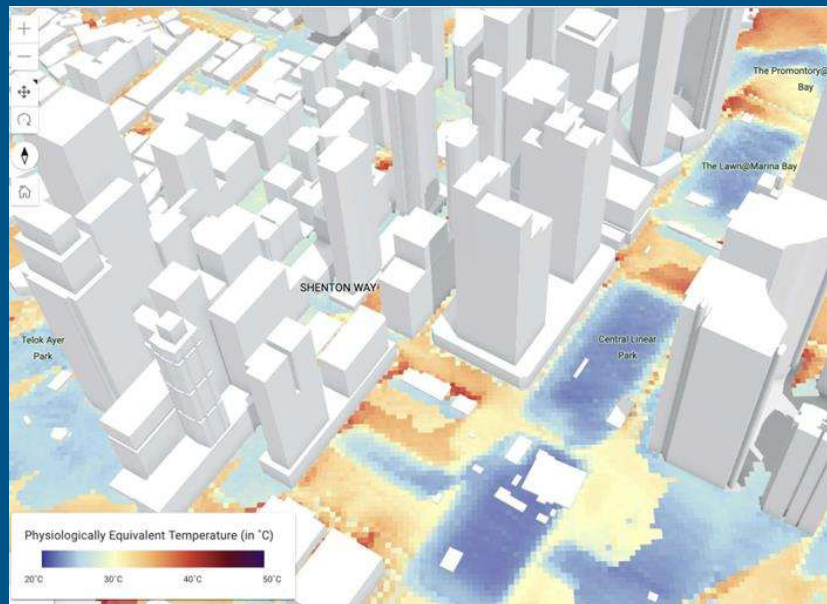


Agenda - Beat the Heat Training

15 Sept 15:00-16:30	Session 1C. Urban Heat Planning and Integration into Policy Frameworks
15 Sept 17:00-18:15	Site Visit 1: BCA Braddell Campus (or for registered partners: Heat Resilience & Performance Centre (HRPC))
16 Sept 09:00-10:30	Session 2C. Implementing Nature-Based and Passive Cooling Solutions
16 Sept 11:00-12:30	Session 3C. Financing and implementing urban heat and cooling resilience
16 Sept 14:00-17:30	Site Visit 2: Punggol Digital District Site Visit 3: Sentosa Island



Session 1C. Urban Heat Planning and Integration into Policy Frameworks



Singapore's Digital Twin

What this session looks at:

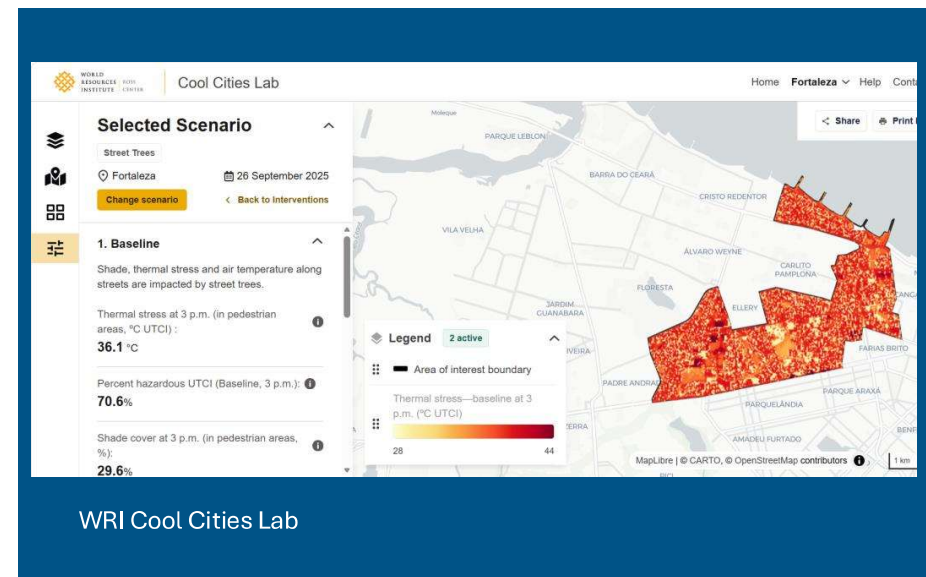
- How cities can integrate urban heat considerations into planning, strategies, and policy frameworks
- Some of the tools and data now available to identify heat hotspots and target interventions (satellite data, digital twins, heat-risk mapping: e.g. see Keep Cool Hub)
- Real examples of cities embedding heat into governance
- Explore how different contexts are addressing this issue

Session 1C. Urban Heat Planning and Integration into Policy Frameworks



Key considerations from existing city experience

- Start with assessing the current situation
- Embed heat into existing planning and building codes, as much as possible not as a standalone document
- Prioritize the most exposed — outdoor workers, elderly residents, informal settlements
- Sequence solutions: passive and nature-based first, mechanical cooling as a complement to avoid maladaptation
- Assign clear ownership — someone has to act on the data, convene different stakeholders, and keep the plan current

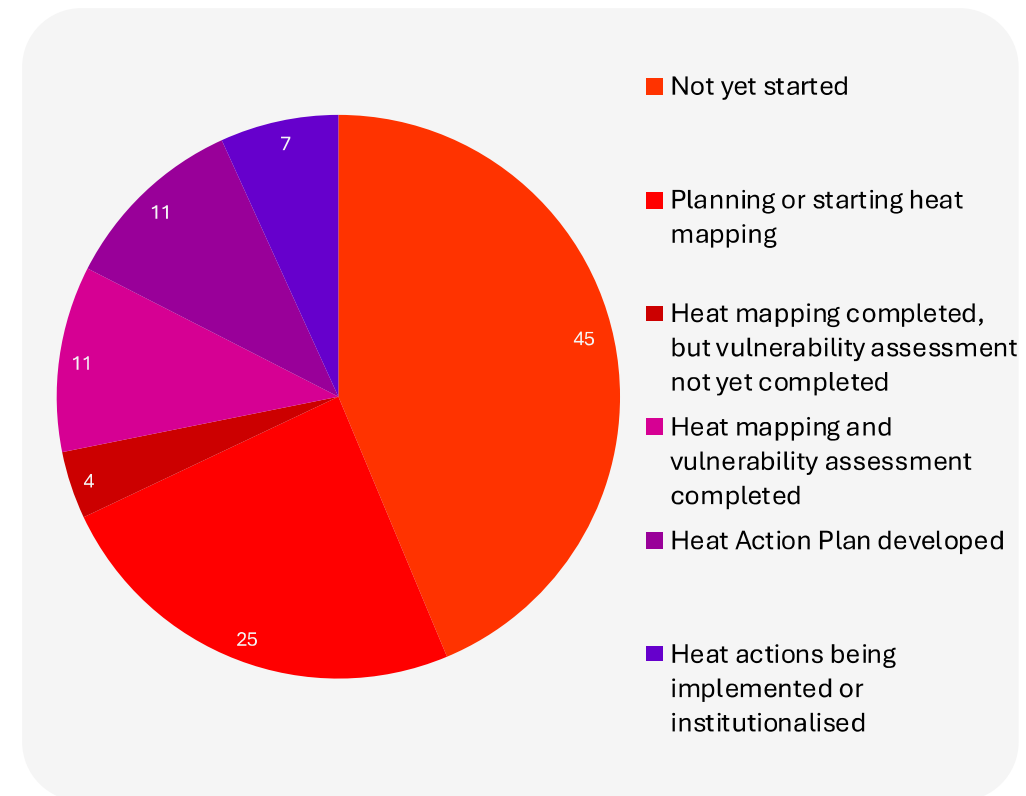


Survey results:

Heat action planning

Only 7% of respondents have implemented or institutionalized heat actions.

44% have not yet started to plan for or implement heat actions

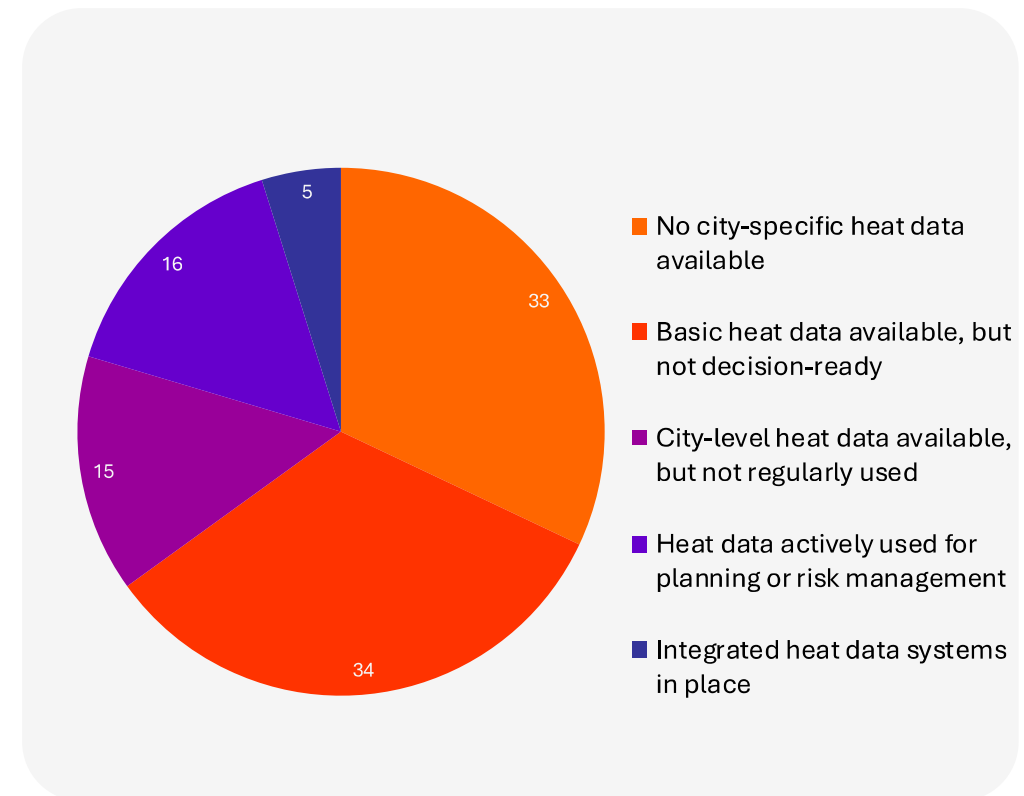


Survey results:

Availability of heat-related data

65% of respondents do not have usable heat data available.

21% actively use the available data



Extreme heat preparedness & Urban Heat Management Handbook



Shi Hui Phua

Urban Specialist, World Bank
Group



GLOBAL COOLING PLEDGE ASSEMBLY

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BEAT THE HEAT TRAINING

Extreme Heat Preparedness & Urban Heat Management Handbook

Phua Shi Hui
Urban Specialist, The World Bank Group

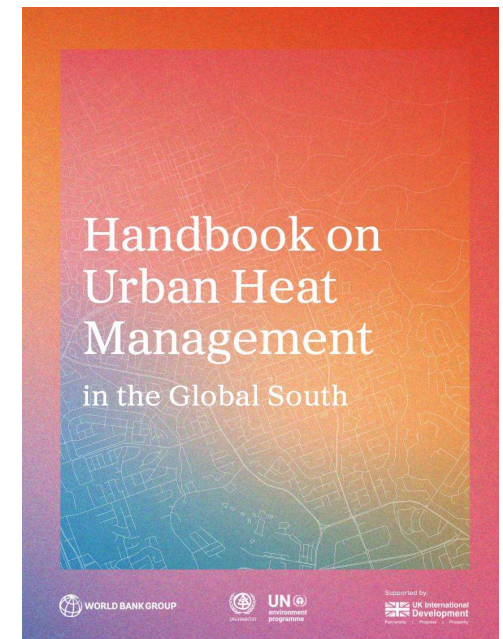
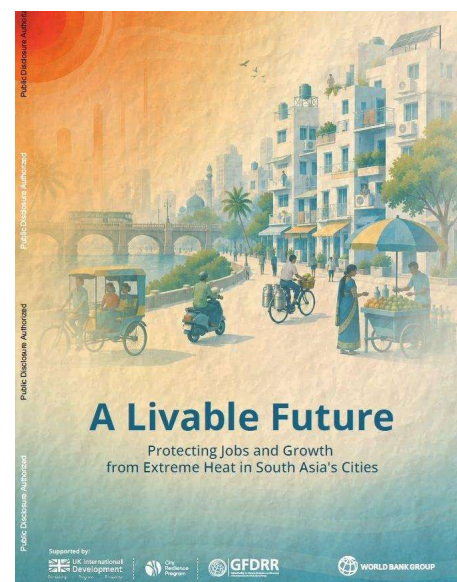
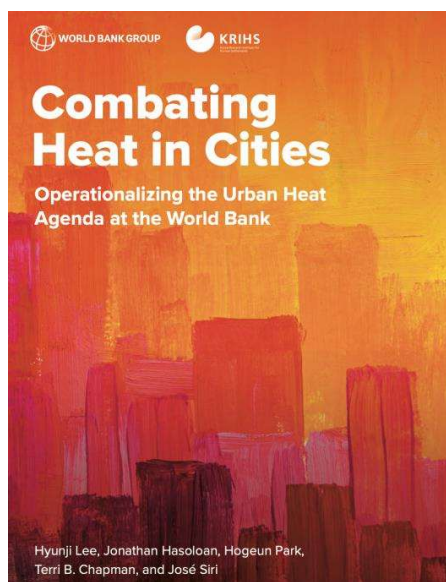
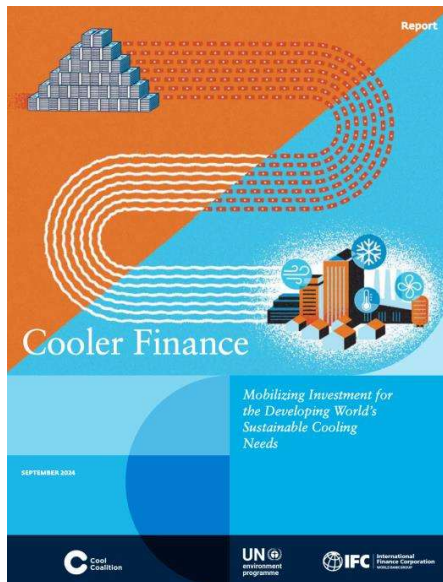
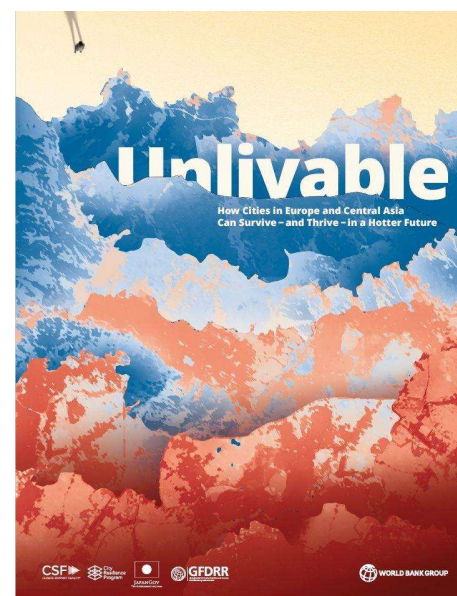
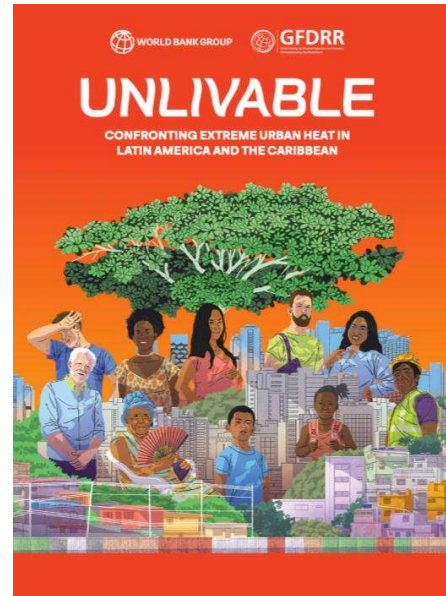
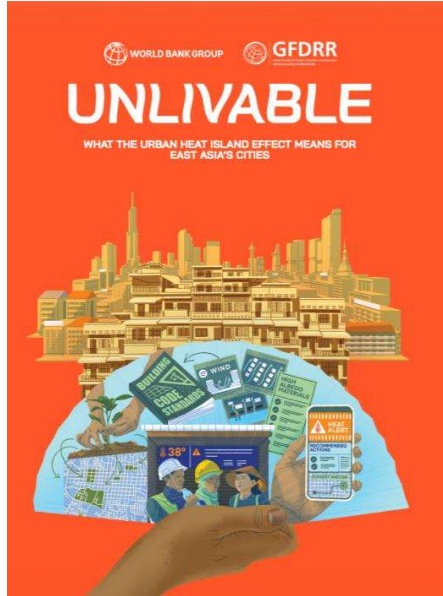


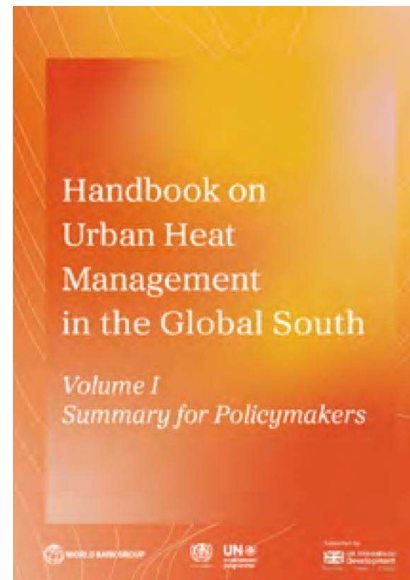
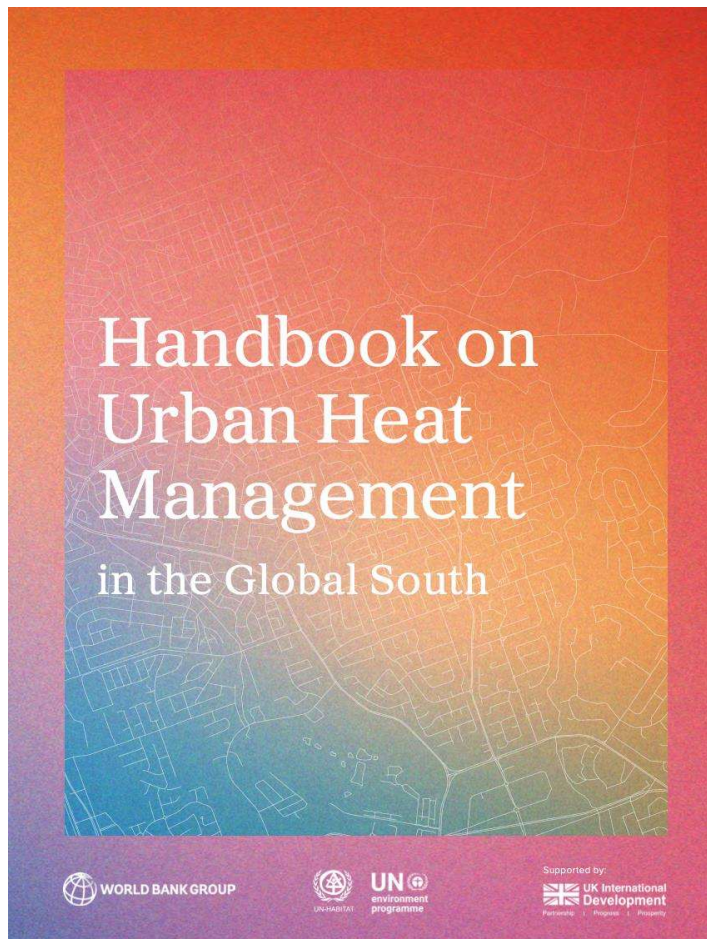
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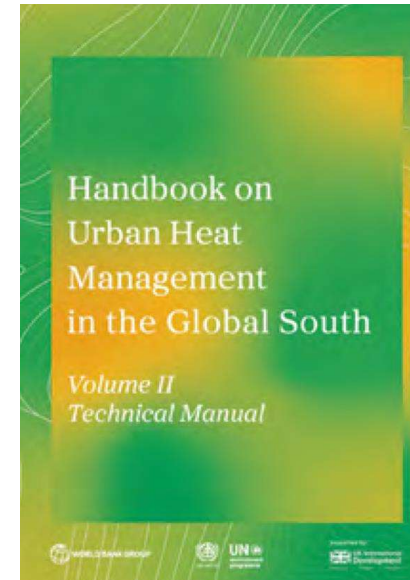
WORLD BANK GROUP



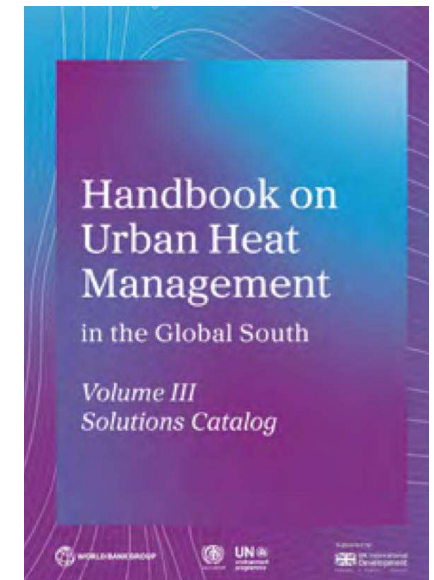




1. Summary for Policymakers



2. Technical Manual



3. Solutions Catalog

Urban Heat Management Handbook



5 Principles

1. Start now – if Needed, Start Small
2. Make the Journey Together
3. Establish Clear and Funded Mandates for Long-term Action
4. Tailor Heat Management to the City
5. Build on What Has Worked Well in the Past

ACTIVITIES AND TOPICS	1 UNDERSTANDING HEAT RESILIENCE	2 ASSESSING HEAT RISK	3 PLANNING FOR HEAT RESILIENCE	4 RESPONDING TO HEATWAVES
	Introduction to key concepts and terms around urban heat resilience and management	Creating an evidence base to inform action on heat resilience	Developing heat management plans and implementing interventions for heat resilience	Implementing actions to respond to heat waves and reduce heat-related impacts
	1.1 <i>What is heat risk?</i>	2.1 <i>Assess Context and Capacity</i>	3.1 <i>Communicate Heat Risks and Impact</i>	4.1 <i>Preparing for Heatwaves</i>
	1.2 <i>What are the impacts of extreme heat in cities?</i>	2.2 <i>Assess Hazards</i>	3.2 <i>Set Objectives for Heat Management in your City</i>	4.2 <i>Respond during the Heatwave</i>
	1.3 <i>Why is heat risk becoming more important?</i>	2.3 <i>Assess Exposure</i>	3.3 <i>Outline and Prioritize Heat Resilience Solutions</i>	4.3 <i>Learning from the Heatwave</i>
	1.4 <i>How are cities in the Global South particularly affected?</i>	2.4 <i>Assess Vulnerability</i>	3.4 <i>Develop Prioritized Heat Resilience Solutions for Implementation</i>	
		2.5 <i>Assess Impacts</i>	3.5 <i>Monitor and Evaluate Heat Risk and Resilience</i>	
		2.6 <i>Combine Heat Risk Assessment</i>		

Feels like over 52 deg C: Bangkok boils with heat index hitting 'extreme danger' level

Sign up now: Get insights on Asia's fast-moving developments



Bangkok's maximum heat index has exceeded 52 deg C and fallen into the "extreme danger" category. PHOTO: EPA

Bangkok heat index reaches 51.9 deg C, heightening heatstroke risk

Sign up now: Get insights on Asia's fast-moving developments



Bangkok set for region-topping temperatures in years to come: Study

Experts say the Thai capital must act now or face a much hotter future, with projections of up to 120 extreme heat days a year by 2050.



Bangkok has some 1.3 million outdoor workers who are exposed to rising heat. (Photo: CNA/Jarupat Karunyaprasit)



Jack Board

29 Apr 2026 06:00AM
(Updated: 29 Apr 2026 07:51AM)

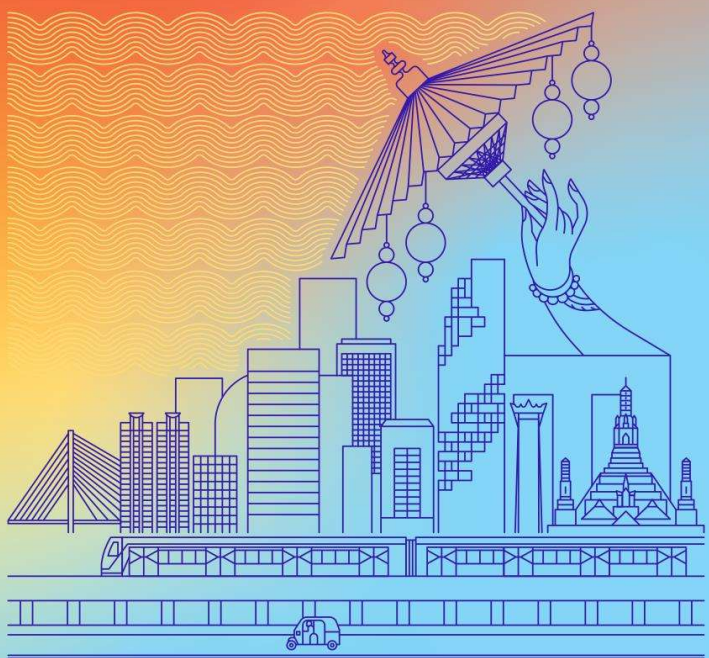


+ Set CNA as your preferred source on Google



SHAPING A COOLER BANGKOK:

Tackling Urban Heat for a More Livable City



Understanding urban heat in Bangkok



Measuring its impact on health, infrastructure & the economy



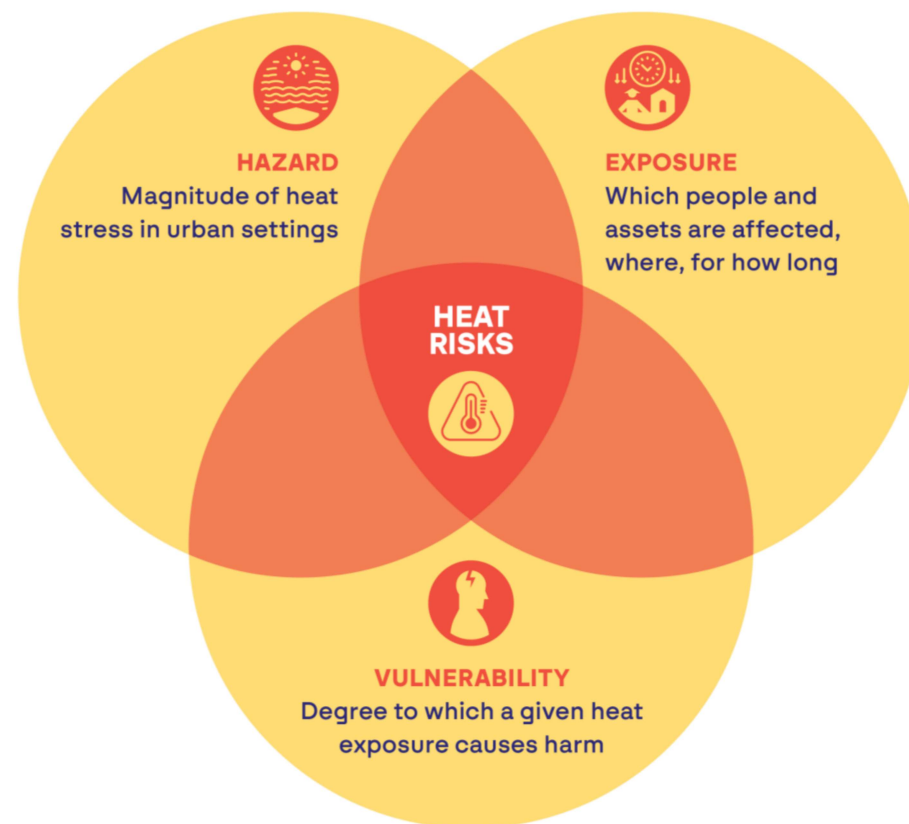
Identifying gaps for improving Bangkok's measure for heat management



Proposing strategic actions for better heat resilience



Bangkok at risk:



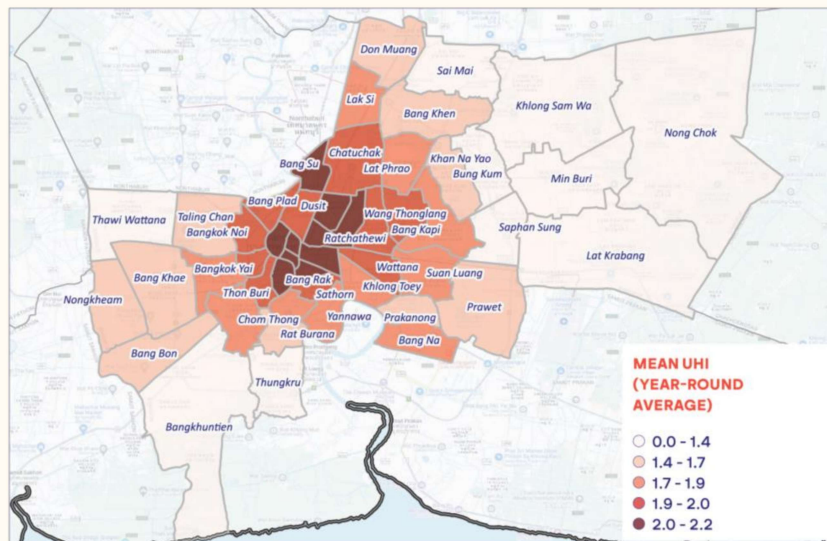


strong UHI effect at ~2 °C

built-up areas

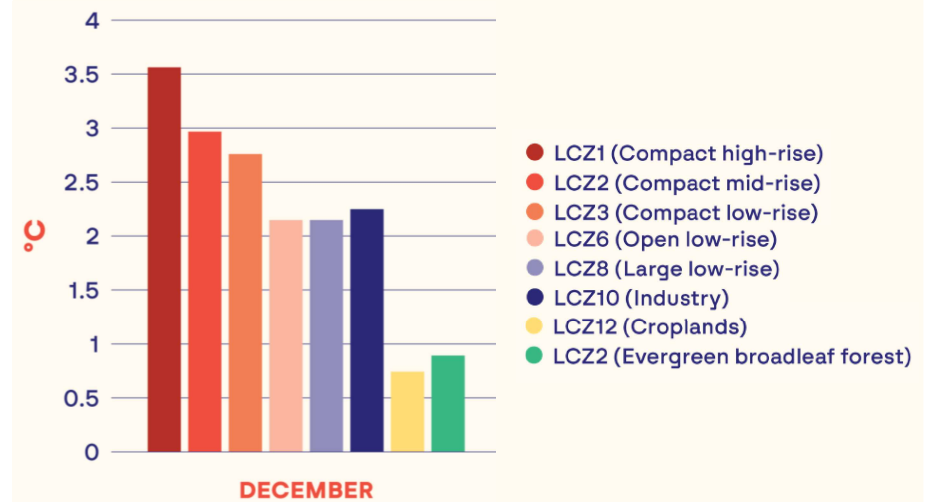
compact

Urban heat island intensity by district



Source: World Bank / National University of Singapore

Mean UHI intensity, December 2019



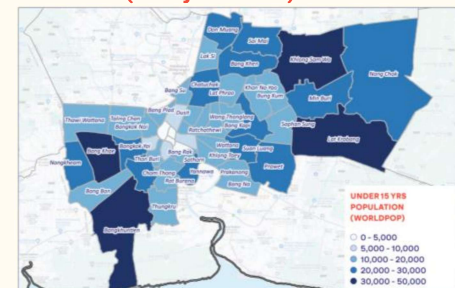
Source: World Bank / National University of Singapore

Bangkok's vulnerability to heat

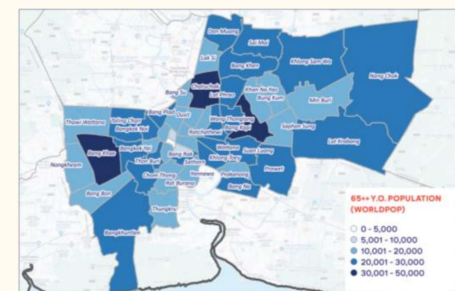


Children & elderly population by district, Bangkok

Children (<15 years old)



Elderly (>65 years old)



Source: WB staff calculation based on WorldPop (2024)

Who is most at risk?

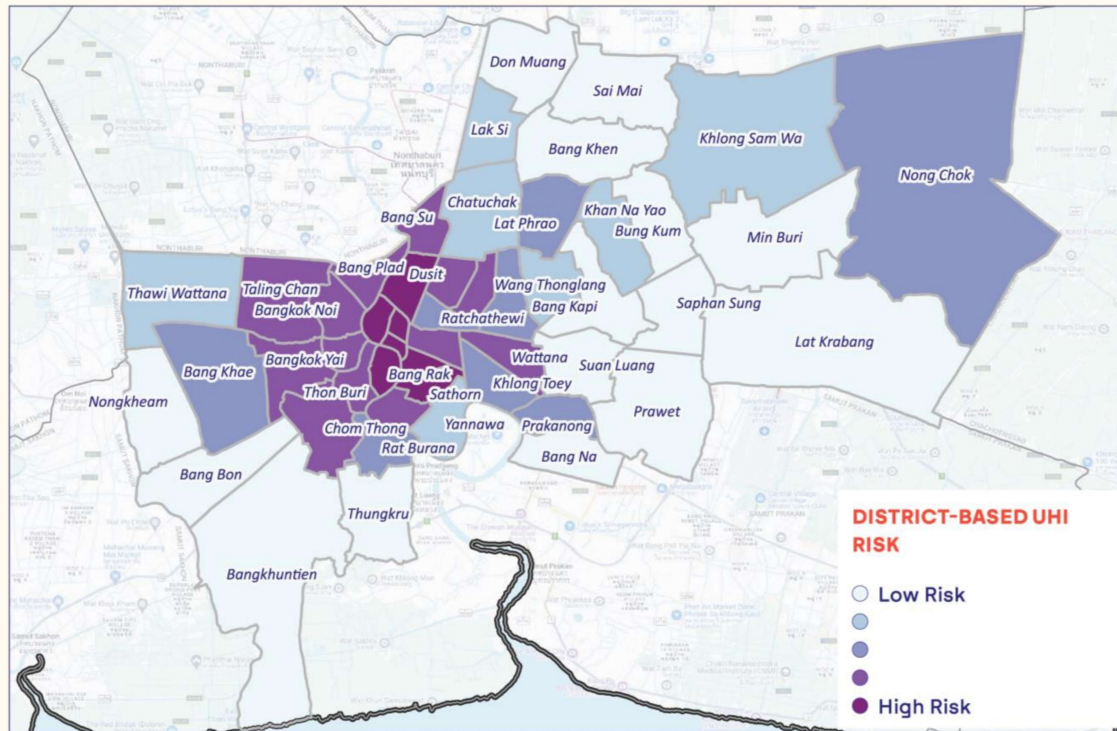


Challenges ahead





Heat risk classification for districts of Bangkok



Source: World Bank

- Combining UHI level & vulnerable population density to map high-risk districts
- District with highest UHI risk for the elderly & children:



 **1°C
increase**



Health

2,300 lives lost



Productivity

~3.4%

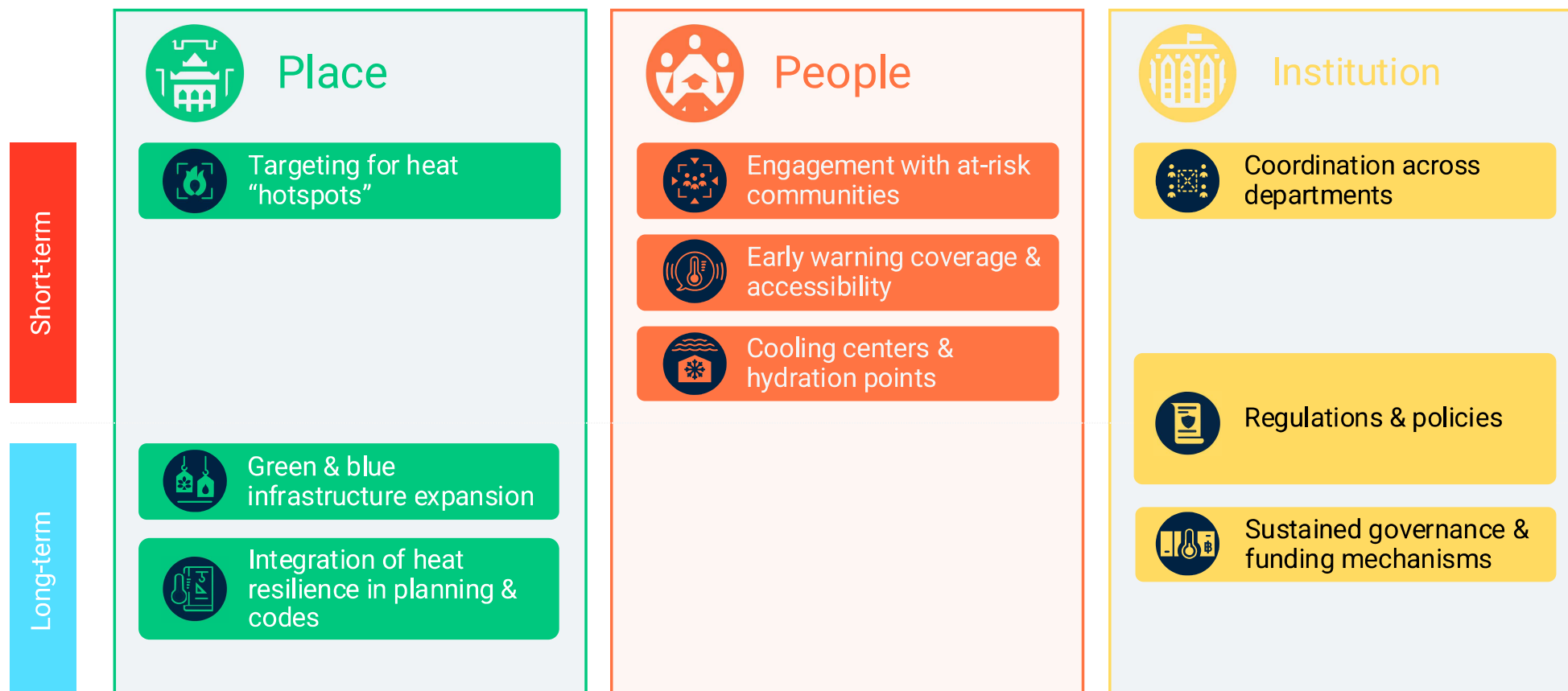
THB 44 billion

annually



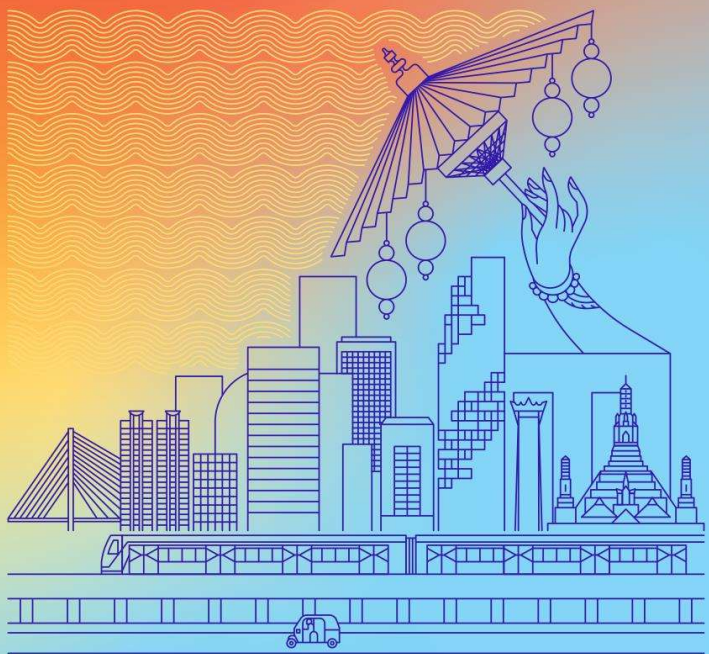
Energy

~THB 450 per month
THB 17 billion annually



SHAPING A COOLER BANGKOK:

Tackling Urban Heat for a More Livable City



Find out more about our work ↓





UN@
environment
programme

Cool
Coalition
a UNEP-led coalition



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— SINGAPORE —

Thank you.



Case study 1: Accessing data for planning through Google



Rajroshan Sawhney

Research & Applied AI Partnerships lead,
APAC, Google

Google Research Heat Resilience

Our Website

Scan to access interactive models, tools, and downloadable datasets.



Frontier & Applied AI Research Partnerships Lead, Google APAC



heat-resilience-contact@google.com

Supporting Action on Urban Extreme Heat

Heat Resilience is Part of Google's Broader Commitment to Applying Machine Learning to Urgent Global Challenges

Flood Forecasting



Forecasting & mitigating floods

Wildfires



Detecting & forecasting wildfires

Green Light



Reducing vehicle-based emissions & harms

Skai



Post-disaster damage assessment

Open Buildings



Mapping the African continent

Weather



Skillful weather forecasting for Africa and the Global South

Food Security



Forecasting food insecurity and Computer Vision for plant phenotyping

African Languages



Urban Warming is Accelerating, Creating an Urgent Humanitarian and Economic Crisis

Extreme heat is a silent killer. It is responsible for an estimated 0.5M deaths annually.

The impact is large and growing. 1.6B urban residents will face regular, extreme heat waves by 2050. Cities heat up at twice the global rate

Cities are ready to act. We see strong demand and willingness to adapt.

Heat Deaths Have Doubled in the U.S. in Recent Decades, Study Finds

The finding comes as a late-August heat wave bears down on a significant part of the country.



Over 60,000 Europeans died from heat during 2024 summer: study

Paris (AFP) - More than 60,000 people died from heat in Europe during last year's record-breaking summer, a benchmark study said Monday, in the latest warning of the massive toll climate change is having on the continent.

How Extreme Heat Kills, Sickens, Strains and Ages Us

Researchers are drilling down into the ways life on a hotter planet will tax our bodies, and looking for protections that, unlike air-conditioning, don't make the problem worse.

The New York Times

Earth's 10 Hottest Years on Record Are the Last 10

A report from the World Meteorological Organization confirms that 2024 was the hottest year on record and the first year to be more than 1.5 degrees Celsius above the preindustrial era.

Heat Is Costing the U.S. Economy Billions in Lost Productivity

From meatpackers to home health aides, workers are struggling in sweltering temperatures and productivity is taking a hit.

Google's Goal is to Close the Data Gap to Support Cities Resilience to Heat

gps_off

Precise Data is Lacking

While active, long-term urban redesign (trees and reflective roofs) is highly desired, cities face significant hurdles in planning and execution because they lack hyper-local, parcel-level data to target high-return interventions

monetization_on

The Resource Barrier

Collecting actionable, neighborhood-level environmental data typically requires commissioning expensive municipal LiDAR flights and custom thermal surveys, which strains local public budgets

auto_awesome

Closing the Gap with Google AI

Scale: Fuses global machine learning models with high-resolution aerial and multispectral satellite pixels to automatically map urban structures, vegetation, and reflectivity

Democratization: Replaces high-cost custom monitoring with open, address-level spatial indicators—delivered as a free public good to empower every municipality, regardless of budget size

Supporting UNEP's Vision for Global Cool Cities

public

Supporting the Global Cooling Pledge

Global Target: At COP28, UNEP's Cool Coalition launched the Global Cooling Pledge (signed by 70+ member states) to cut cooling-related emissions by 68% by 2050

Google's Role: Google Research provides hyper-local environmental data needed to deploy passive, zero-emission cooling solutions to support these critical subnational goals

wb_sunny

Aligning with "Beat the Heat"

Joint Collaboration: We partner to align our open-science datasets with UNEP's Beat the Heat initiative

City Mobilization: The initiative mobilizes over 250+ cities and 100+ partners around nature-based cooling and climate-resilient urban design

We Currently Support Users Through 3 Primary Products



Tree Canopy

Provides data on urban tree cover

Helps cities understand current tree canopy coverage, identify planting opportunities, prioritize expansion in vulnerable communities, and track progress against urban forestry goals



Cool Roofs

High-resolution rooftop albedo (reflectivity) data.

Helps cities understand their current baseline albedo, identify and prioritize neighborhoods for cool roof interventions (often using equity filters), and monitor albedo changes over time to inform policy



ThermoKnob

Scenario modeling tool that allows users to estimate the potential land surface temperature reduction from cooling interventions (eg. "What is the cooling effect of increasing tree canopy by 15%?")

Decision-Making & Data Gaps

help_outline

Empirical Planning Questions

- *Where should we plant trees to maximize shade in highly exposed pedestrian corridors?*
- *Which commercial buildings have large, flat roofs that are prime candidates for cool roof coatings?*
- *How many degrees of land surface temperature reduction will we get for a given budget?*

insights

Dismantling the Analytical Bottleneck

Address-Level Precision: Google's tools resolve these questions by moving from coarse, regional heat estimates to address-level and neighborhood-level precision.

Quantitative Metrics: Provides the quantitative metrics needed to justify capital budgets and align stakeholders around concrete targets.

Tree Canopy

Proprietary machine learning models segment high-resolution aerial imagery to detect individual tree crowns, separating tree canopy from low-lying grass, shrubs, and structures.

What Planners Can Do with the Data

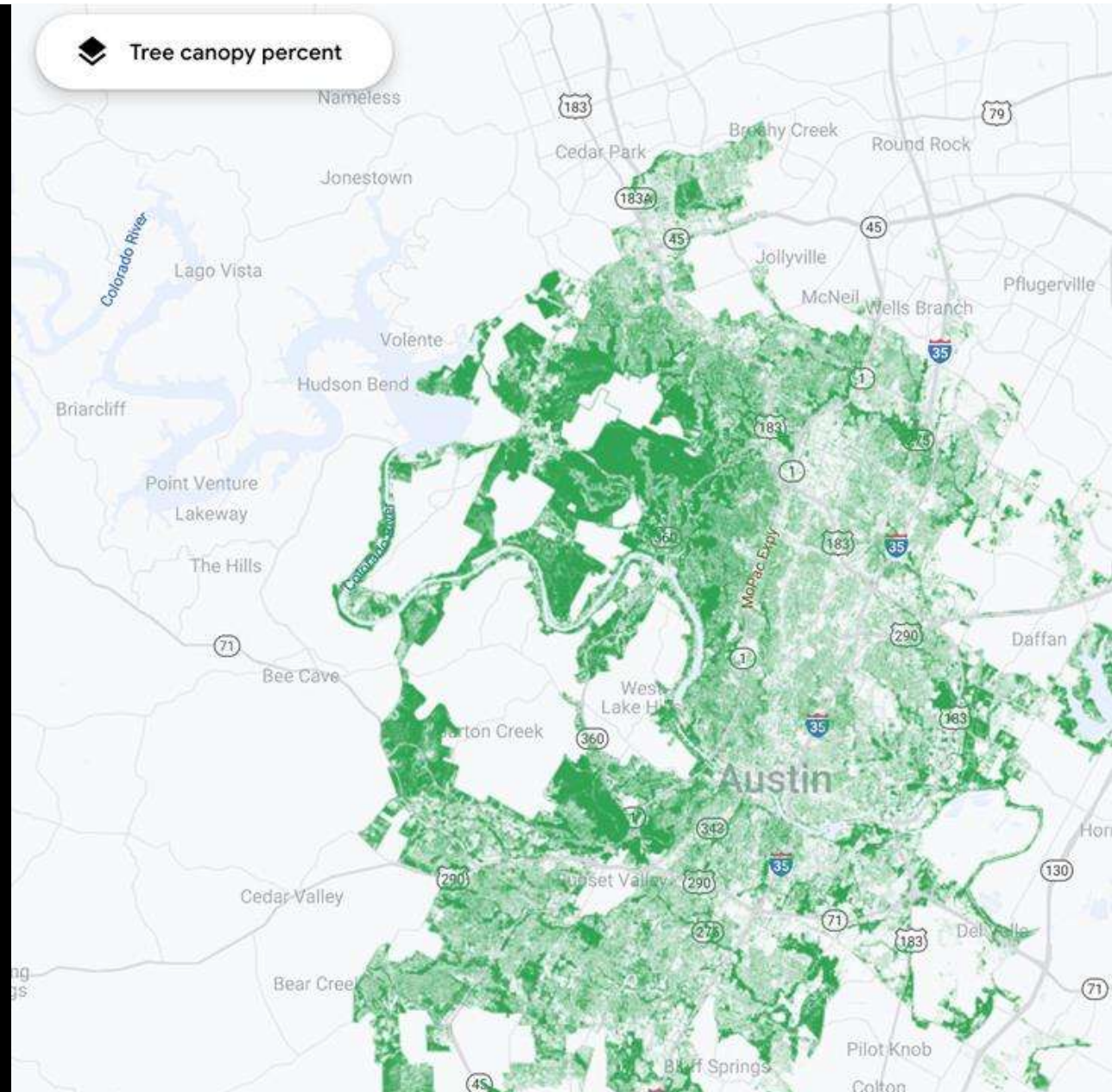
Map Coverage: Understand current tree canopy coverage aggregated at neighborhood and census block levels.

Identify Opportunities: Pinpoint non-forested, permeable ground and right-of-way spaces available for planting.

Prioritize Equity: Overlay canopy deficit maps with demographic filters to prioritize vulnerable neighborhoods.

Scale & Access

Available in **2,000+** cities, directly in Environmental Insight Explorer (<https://insights.sustainability.google/>)



Cool Roofs

Estimated rooftop reflectivity in select cities, based on AI algorithms trained on high-resolution aerial imagery combined with satellite reflectivity measurements.

Why Cool Roofs

Roofs comprise 20% to 25% of the total surface area in typical cities. Conventional dark roofs absorb 85% to 95% of solar radiation, heating up to 150°F (65°C) or more.

Regional Impact

Models and observations suggest that local cooling of 1 °C or more is highly feasible if municipalities manage to significantly increase regional reflectivity (albedo).

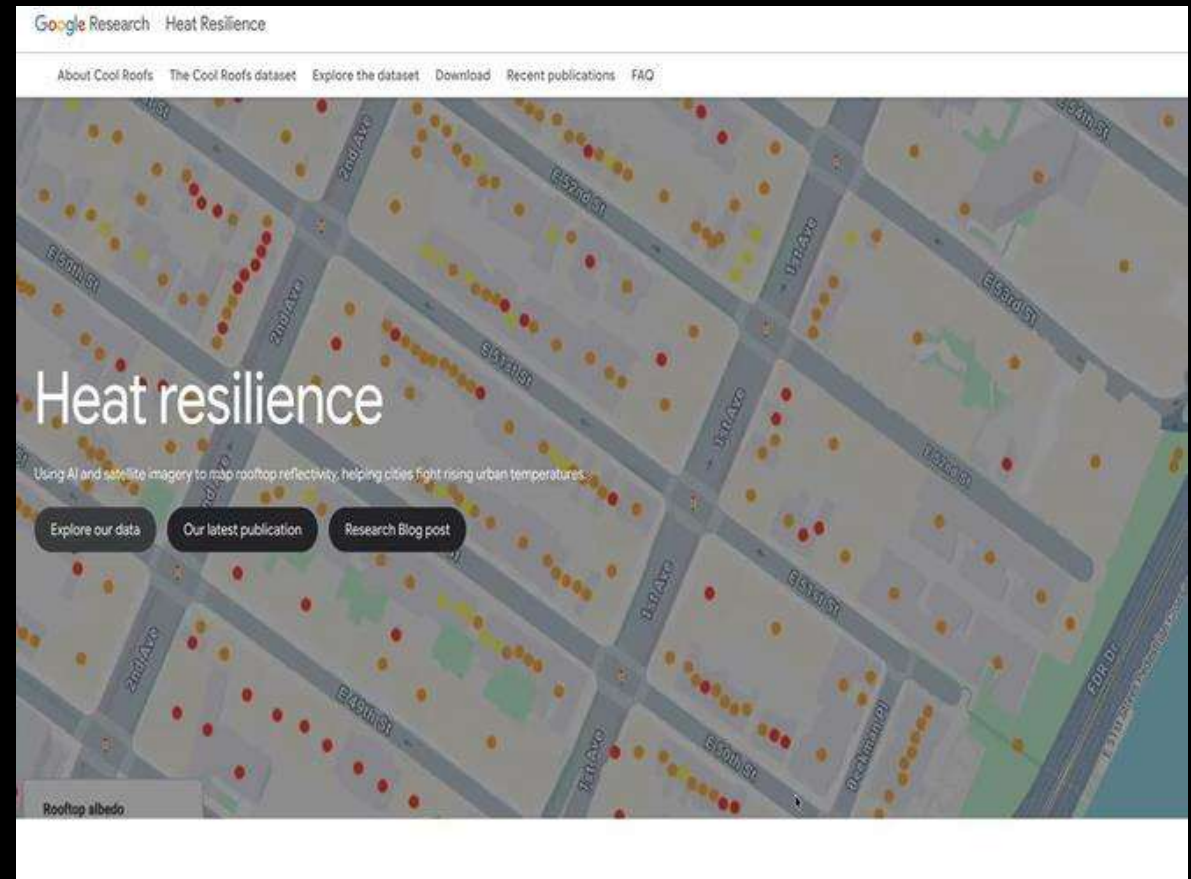
Google's Mission

Address the urban heat island effect by quantifying solar radiation management potential per building, integrating albedo management into natural roof resurfacing cycles.

50+ Cities



Cool Roofs



<https://sites.research.google/gr/heat-resilience/>

ThermoKnob

Overview

Estimating the temperature reduction potential of trees and cool roofs to empower decision makers.

Planners cannot afford trial-and-error with million-dollar capital improvement budgets. ThermoKnob simulates physical thermal changes in advance.

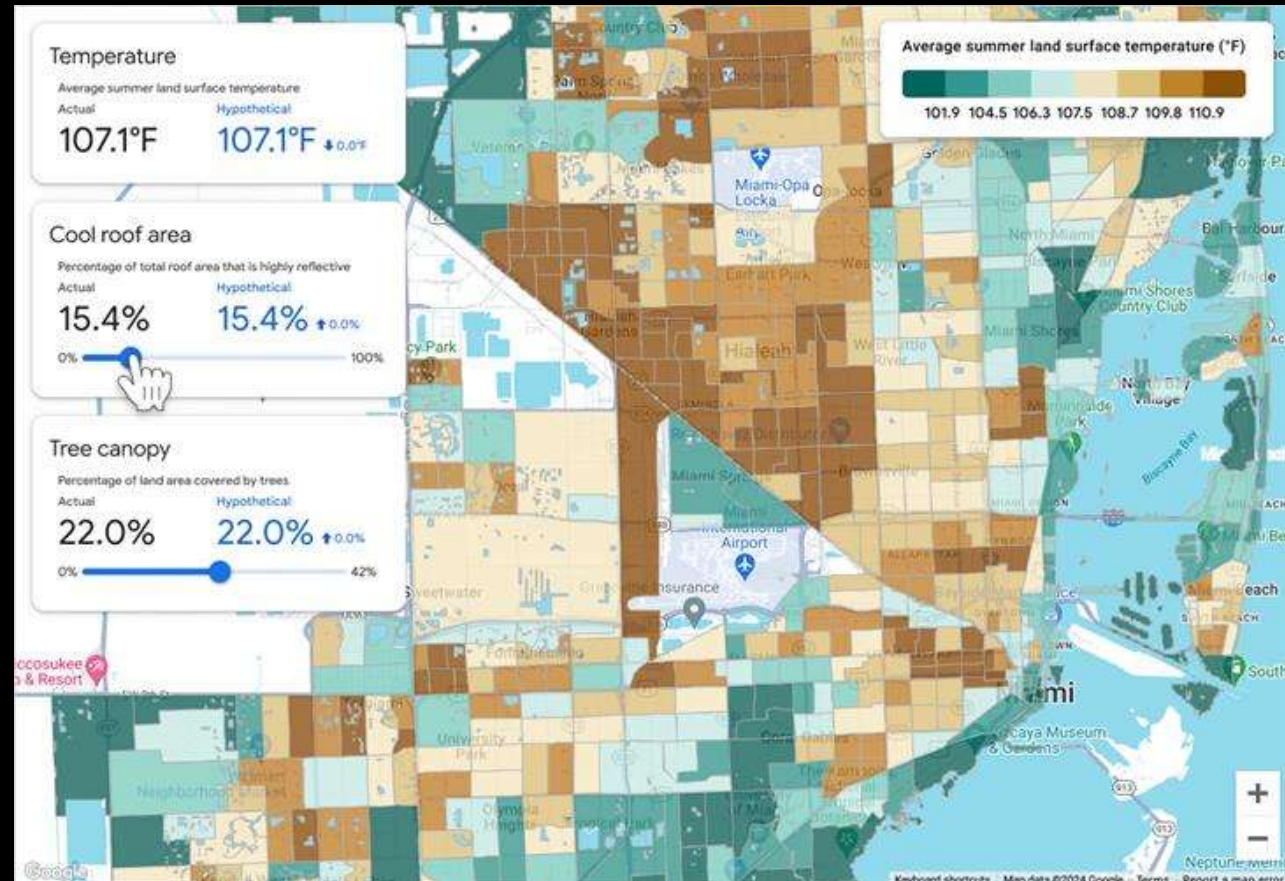
Key Capabilities

- **Interactive "What-If" Sliders**
Model tree canopy percentage and cool roof area changes instantly.
- **Localized Temperature Simulations**
Predicts surface temperature drops in °F/°C at census tracts levels.

14

US Cities

Targeting global expansion scheduled for 2027



How to access our data

Cool Roofs

50+ Cities

sites.research.google/gr/heat-resilience/

- Interactive visualization
- Direct raw data download available

Google Earth

All US census tracts mapped and accessible

Tree Canopy

2000+ Cities

insights.sustainability.google/

Google Earth

- All US census tracts mapped
- Includes 18 other countries worldwide

ThermoKnob

14 US Cities (Pilot) + Hyderabad, India

Pilot Locations: Los Angeles, Phoenix, Austin, Miami-Dade, Baltimore, Boston, Boulder, Colorado Springs, Melbourne, Nashville, New York, San Antonio, Stockton, Tempe, Washington DC, Hyderabad

Case Study: Stockton, CA

1

The Challenge

Stockton's Office of Environment and Sustainability was developing a proposal for a new cool roof ordinance. To gain support, they needed compelling, visual data to demonstrate the potential benefits to city leadership and the community.

2

The Action

Using the Heat Resilience tool's temperature effect modelling, the planner modeled scenarios to quantify the local temperature reduction that could be achieved by increasing the number of cool roofs across the city

3

The Impact

The data and visualizations from the tool became the foundation of a formal ordinance proposal. This data-backed plan is now being used to advocate for a cool roof requirement in Stockton's Climate Action Plan (2024-2026)

“

I'm really heavily relying on the Heat Resilience Lab to showcase the visual data to back the policy.

Senior Management Assistant, Stockton's Office of Environment and Sustainability

Connect & Access Resources

Our Website

Scan to access interactive models, tools, and downloadable datasets.



Frontier & Applied AI Research Partnerships Lead, Google APAC



heat-resilience-contact@google.com



Case study 2: Athen's extreme heat services

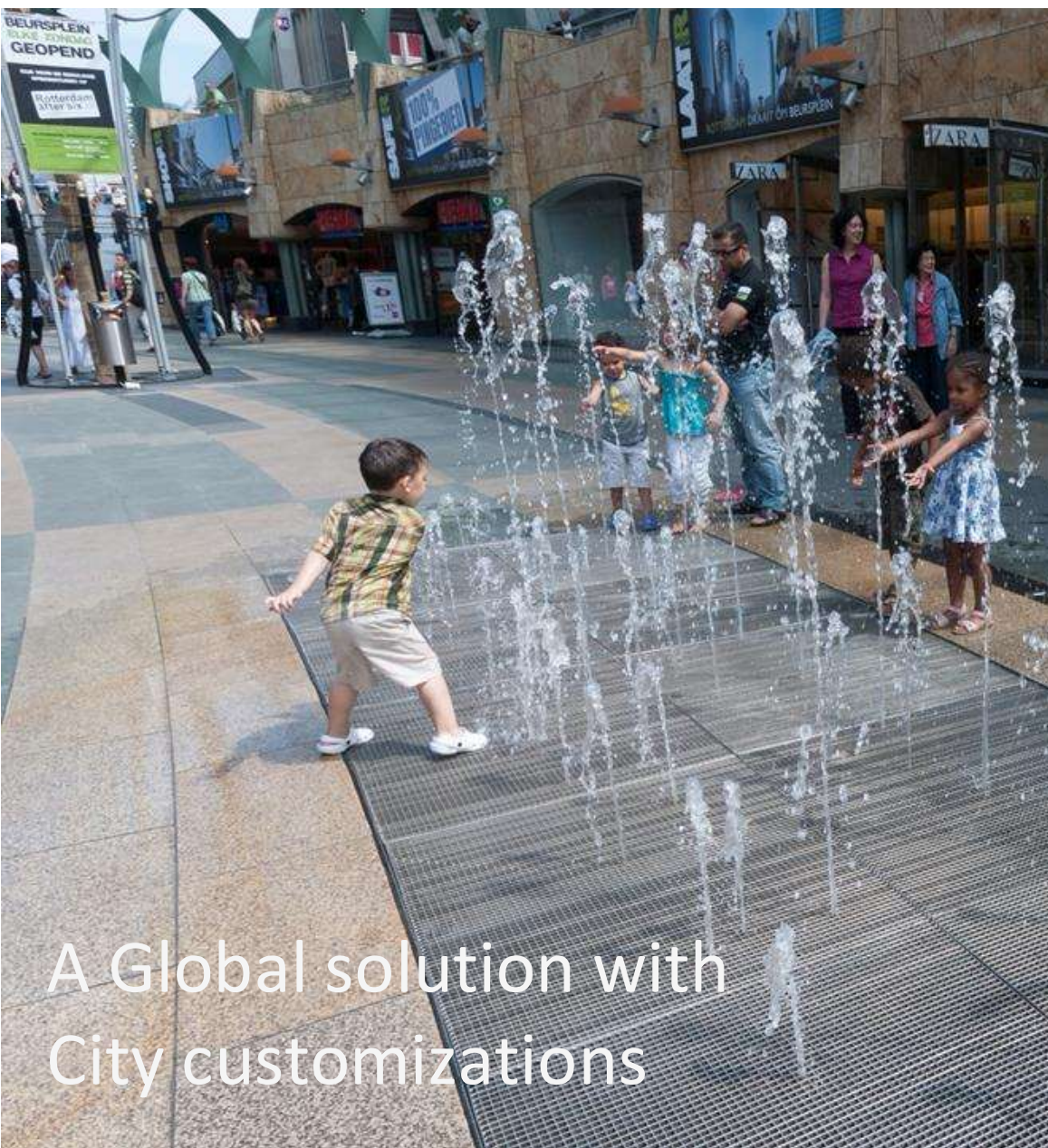


Iphigenia Keramitsoglou

Research Director,
National Observatory of Athens (NOA)



For cities and citizens.
Transferable.



A Global solution with
City customizations



Digital tools for City and Citizens

to tackle **extreme**
temperatures
towards **Climate**
Resilience



Complete solution

◆ Before the heat season

Identify underserved neighbourhoods, analyse cooling-space accessibility and test intervention scenarios.

◆ During heatwaves

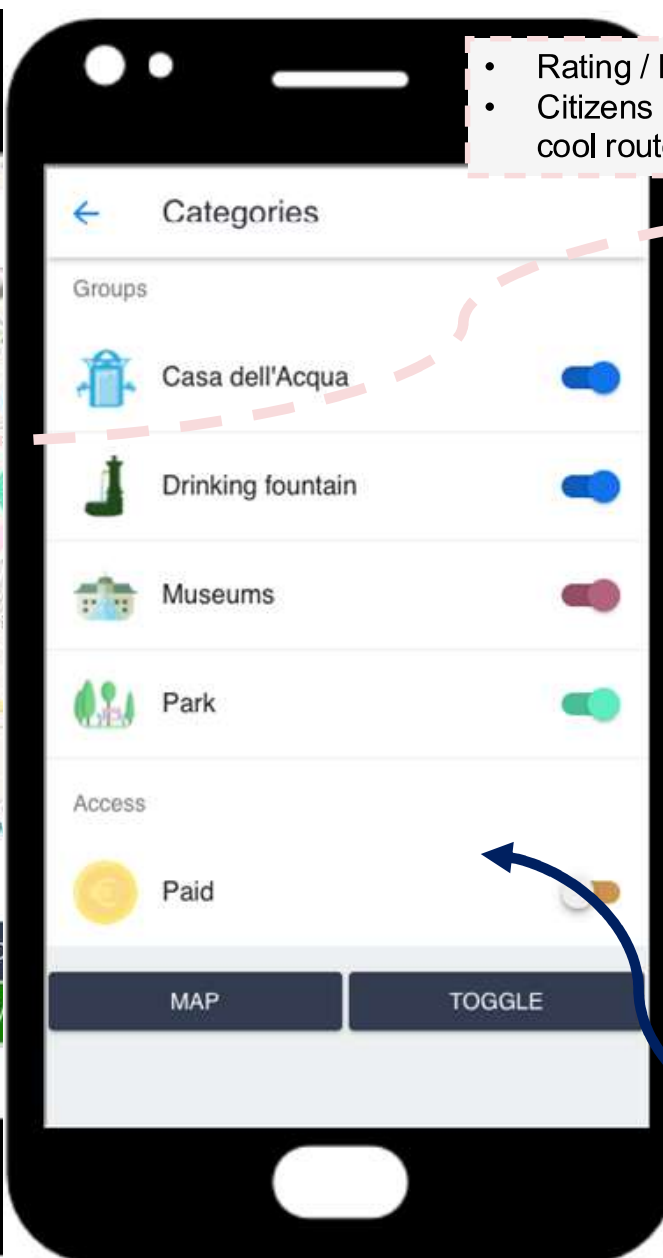
Manage cooling spaces in real time, update operational status instantly and communicate directly with citizens and visitors via a dedicated mobile app.

◆ After the heat season

Understand how services were used, collect citizen feedback and make evidence-based decisions for future investments.

◆ At the same time, **citizens and tourists** receive personalised heat-health information, access to cooling spaces, cool routes, protection features for vulnerable people and direct participation through feedback and reviews.





- Rating / Review of cooling spaces
- Citizens give cooling spaces and cool routes



City Dashboard

Central management tools. An information management tool for the management of cooling spaces.

- Cooling spaces
- Drinking water spots
- Cool routes
- Heatwave categorization
- Add-ons (air quality, bicycles, customisations)
- Suggestions to protect

CITIZEN



Climate Change > Climat

メニュー **NHK ONE** ログイン

NHKプラス ▼ ニュース・防災 ▼ 教育 ▼ 医療・健康 ▼ 福祉 ▼ ラジオ ▼

< NHKスペシャル

NHKスペシャル 地球超解析



「熱波は沈黙の殺人者」と語る地球観測研究者

と学ばひ、その証に起っている。それは、手付かず地球とあるこ、超解析
は、遠く離れた場所の変化が、日本の豪雨や暑さへと結びつく巨大な異変の連なり....。私たちの“今後”
を読み解く!(初回放送日 2026年8月23日(日))

シェアする



雨が激
行星の
アテネで都市生活に潜む熱リスクを検証

GLOBAL ΜΠΟΡΟΥΜΕ ΝΑ ΔΟΥΜΕ ΤΑ ΔΡΟΣΕΡΑ ΜΕΡΗ ΤΗΣ ΠΟΛΗΣ»

FACEBOOK: KoinoniaOraMega

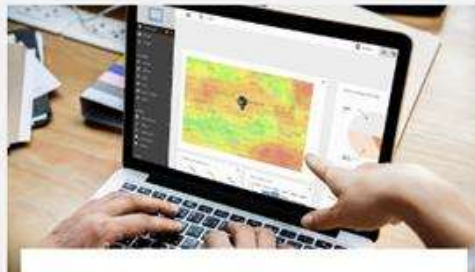
TWITTER: @κοινωνια_ωρα ΜΕΓΑ



EXTREMA Global Mobile App

Multilingual, city customised mobile app working seamlessly worldwide. It supports multiple profiles and special features.

[Learn More](#)



City Dashboard

Central management of Heatwave events. An information management tool is provided to the City officials for the management of the cooling spaces.

[Learn More](#)



Cool Routes

Provision of alternative walking routes in the city via the mobile app through shaded streets, via cooling spaces or drinking water spots.

[Learn More](#)



Bike Routing

Cyclists request to reach their destination safely, via designated bike lanes as much as possible. Provision of 3 routes: the shortest, coolest and via bike lanes. Add-on or separate software service.

[Learn More](#)



Planning and Analytics

Where is the vulnerable population? How hot is there? Are there enough cooling spaces for them? Where was the app mostly called from? Get an exhaustive report for your city.

[Learn More](#)



Rating and Review

Find out what citizens think about the cooling spaces that the City provides. Were they able to relief them from heat? Did they find it easily? Was the accommodation proper and as expected?

[Learn More](#)



Intra-urban temperature variability

Plan actions and services around the city based on high resolution map with hot spots based on summer temperatures from the last five summers.

[Learn More](#)



Air Quality

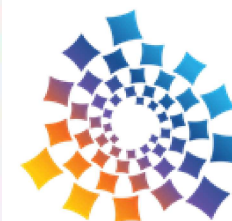
Mobile app add-on. Get the current air quality index for the city based on Copernicus Air Monitoring Service and get recommendations for your outdoor activities, safety measures.

[Learn More](#)

environment
programme

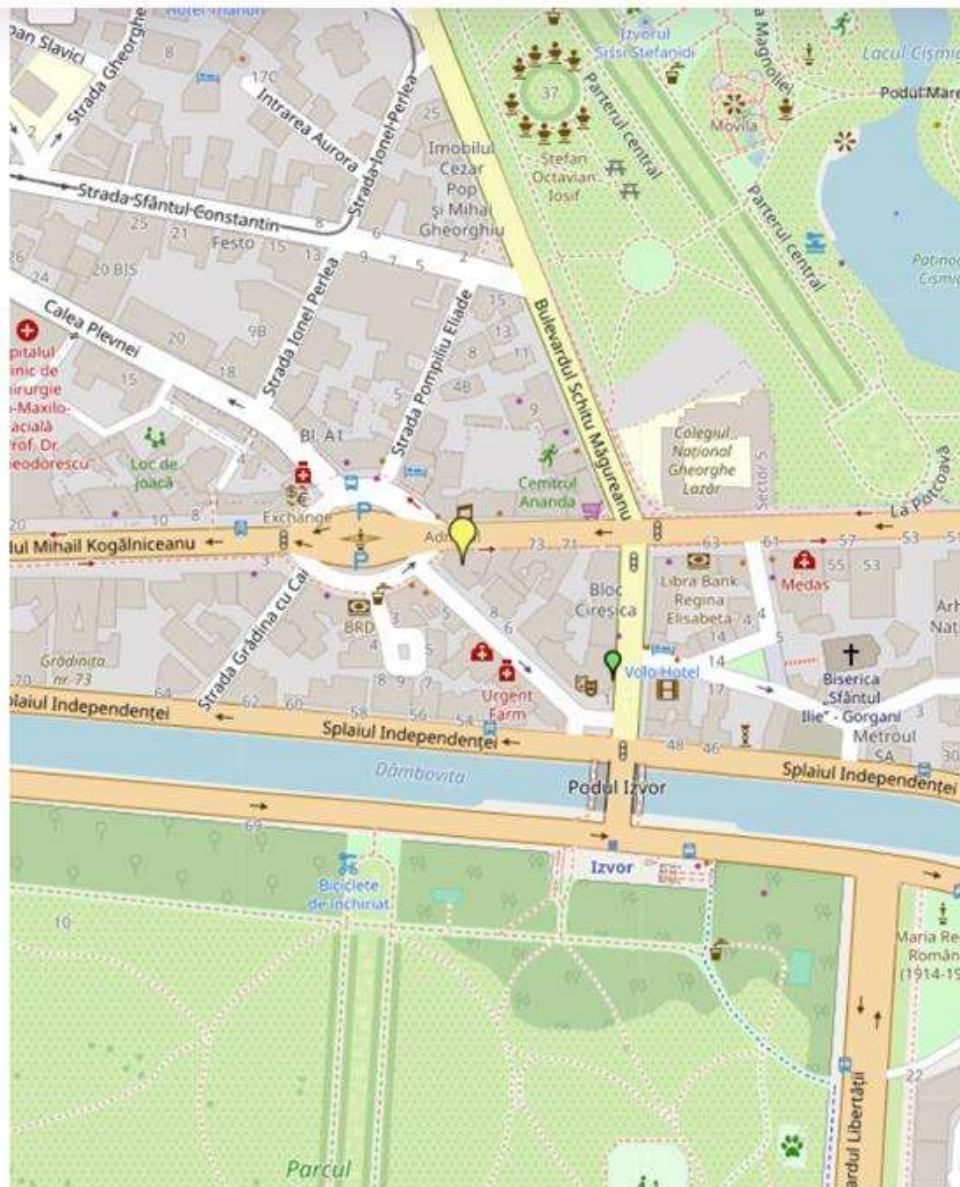
Coalition
a UNEP covered initiative

Ministry of Sustainability
and the Environment
SINGAPORE



PORTFOLIO

Management of Cooling Spaces



#	Status	Name	Type
1	Deleted		Administration
2		PMB	Administration
3		Cantina Socială GRIVIȚA	Social & Comm
4		Centrul de Zi pentru Persoane Vârstnice PERLA	Social & Comm
5		Centrul de zi pentru consiliere și sprijin pentru părinți și copii	Social & Comm
6		Spălătoria Socială - Drumul Taberei	Social & Comm
7		Centrul integrat de Economie Circulară	Administration
8		Centrul - Bebe de București are Hăinuțe	Social & Comm
9		D.G.A.S.M.B.	Administration
10		Centrul de Informare și Sprijin pentru Femei	Social & Comm
11		Centrul Respiro pentru copiii cu dizabilități și familiile lor	Social & Comm

Centrul - Bebe de București are Hăinuțe

Give Cooling Center Name

Social & Community Service

Day

Free

Give Cooling Center Type, Schedule and Access

Give Cooling Center Opening Hours ...

Give Cooling Center Opening Hours

Search

Reverse

Copy

Select the Marker. Then Either Type an Address and Press Search or Move to a Location and Press Reverse

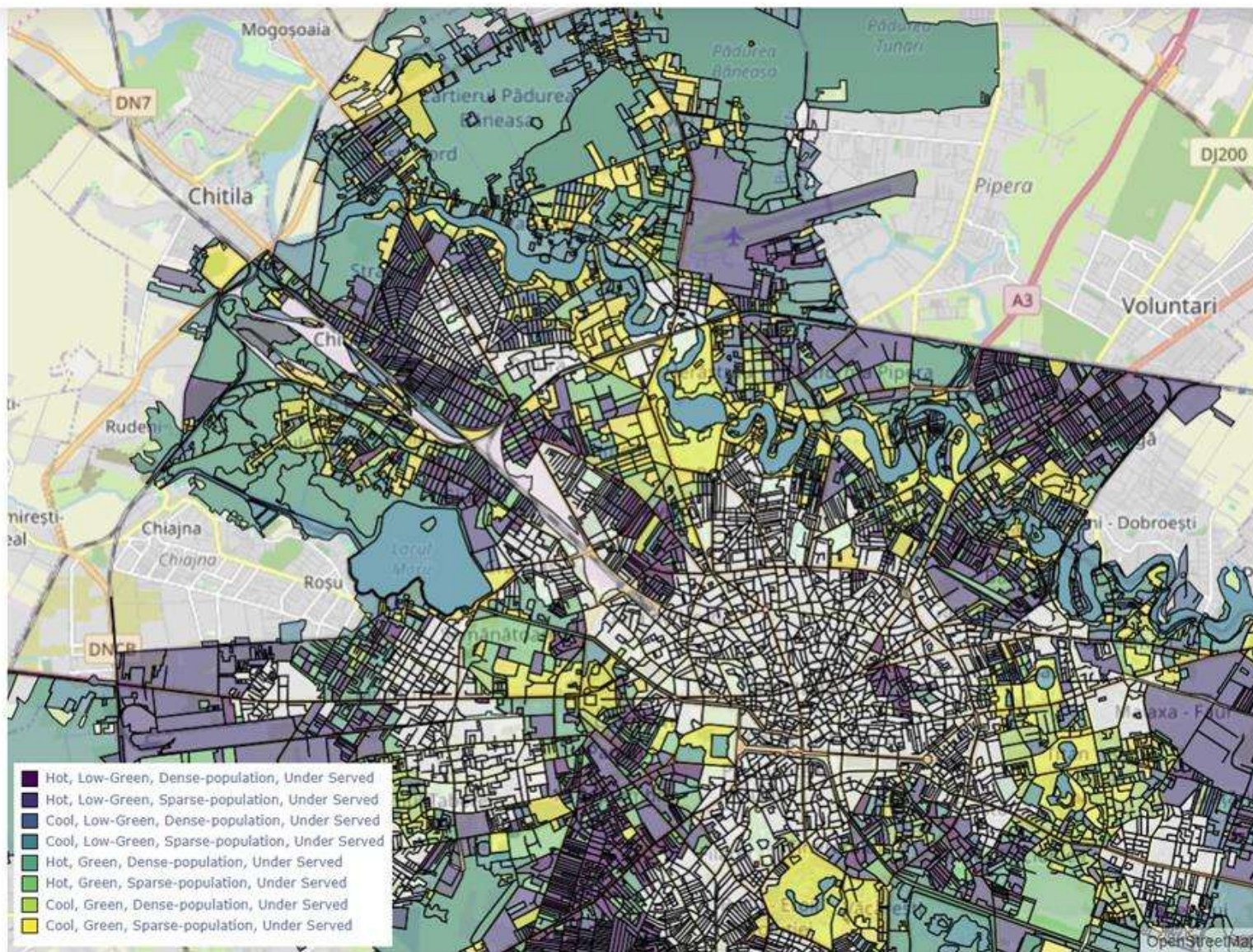
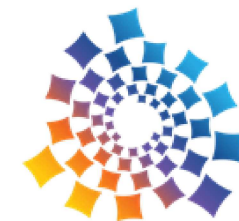
Update Record

Remove Record

Add New Location

Remove Current Location

Add New Coolspace



Underserved areas

1. Temperature
2. Trees
3. Population
4. Distance to Cooling Spaces

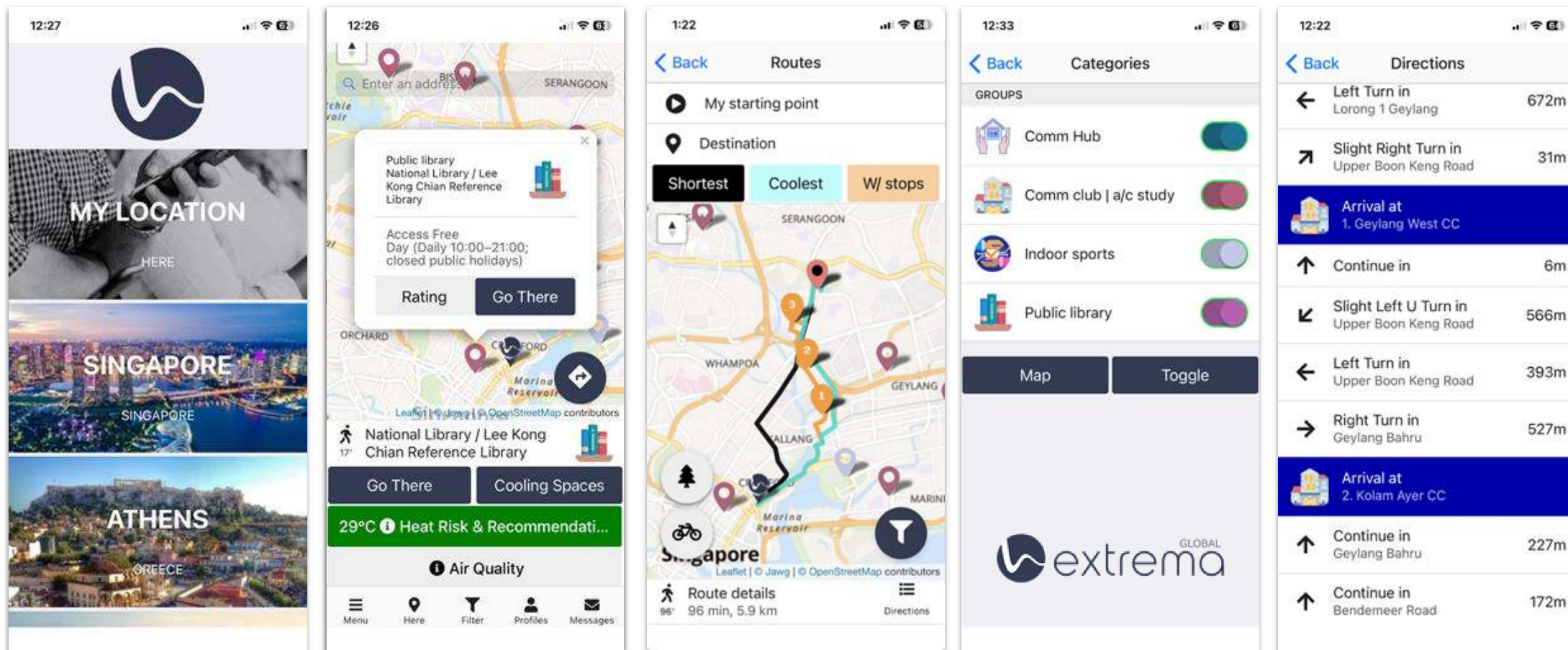
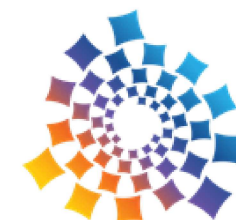
What-if
SCENARIOS

Cooling Spaces

- Add
- Edit
- Remove

Singapore Demo

prepared for the Global Cooling Pledge Assembly 2026, 15–18 September 2026

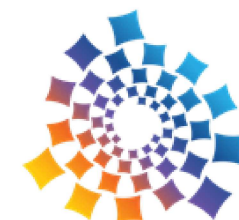
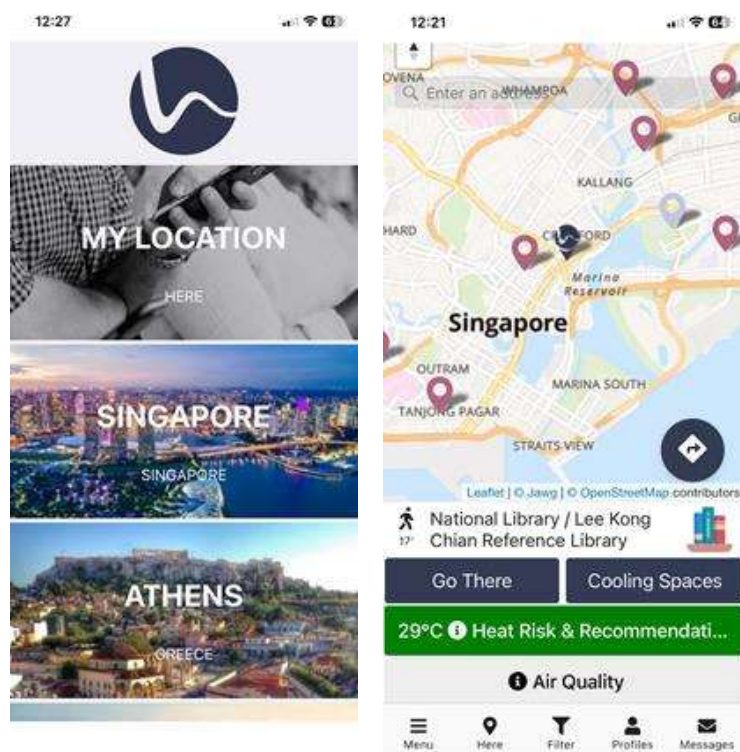


DISCLAIMER: The app provides indicative heat-health risk information and nearby cool places and cool routes via cooling spaces for demonstration purposes only in Singapore. The displayed locations are publicly accessible, air-conditioned facilities and are not currently officially activated cooling centres under Singapore's national heatwave response plan. Information may not reflect current conditions, opening hours or access restrictions. EXTREMA Global does not replace official warnings, public-health guidance or medical advice. Always follow instructions issued by Singapore authorities and seek professional assistance when necessary.



Demo

EXTREMA Global mobile app SINGAPORE DEMO



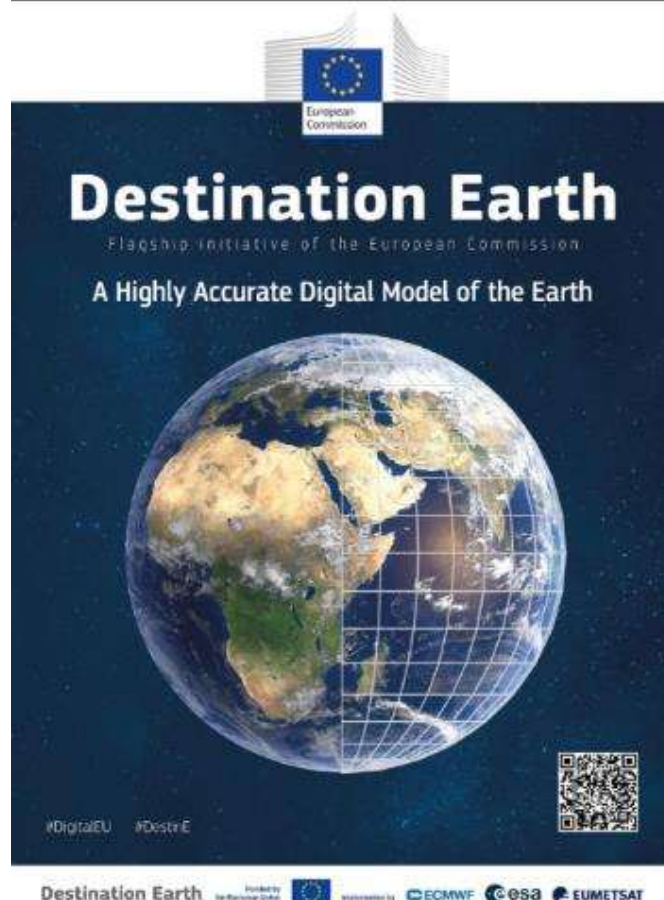
<https://www.extrema-global.com/>

[Private Link](#)





ANNOUNCEMENT

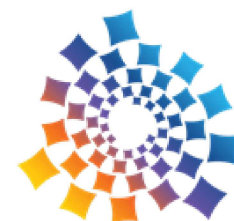


Destination Earth

Funded by the European Union



represented by



Destination Earth

*EXTREMA Global AAS
Advanced Application Service*



Contract starts: October 1st, 2026

Send your interest to: extrema@noa.gr

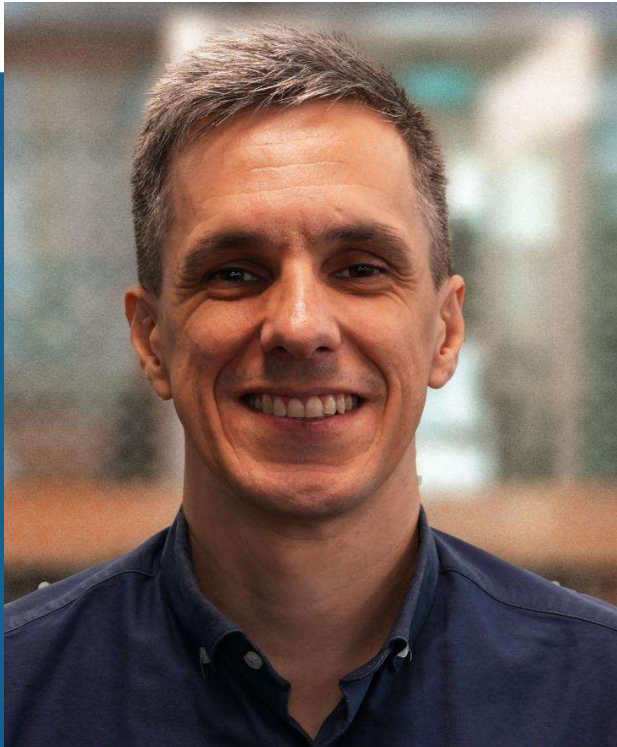


Funded by the
European Union



Ministry of Sustainability
and the Environment
— SINGAPORE —

Case study 4: Singapore's Digital Twin



Ander Zozaya

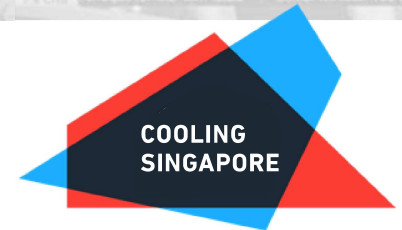
Lead, Project Management and Research
Translation, SEC Singapore

From Models to Decisions: Tools for the Climate-Ready City

Cooling Singapore 2.0

Ander Zozaya

Lead, Project Management and Research Translation

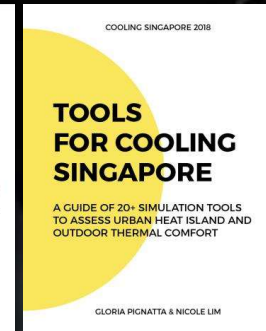


**Cooling Singapore
(CS) is a research
project dedicated to
developing solutions
to address the urban
heat challenge in
Singapore.**

CS 1.0

Jan 2017 – Dec 2018

(24 months)

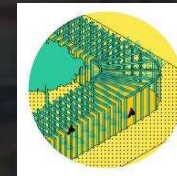


CS 1.5

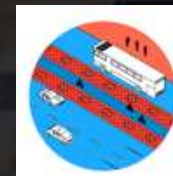
Apr 2019 – Sept 2020

(18 months)

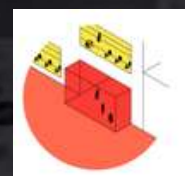
Shading



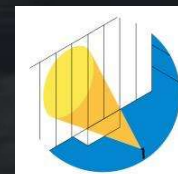
Transportation



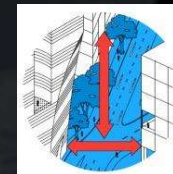
Energy



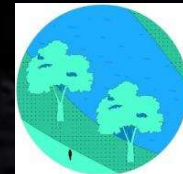
Materials
& Surfaces



Urban Geomet



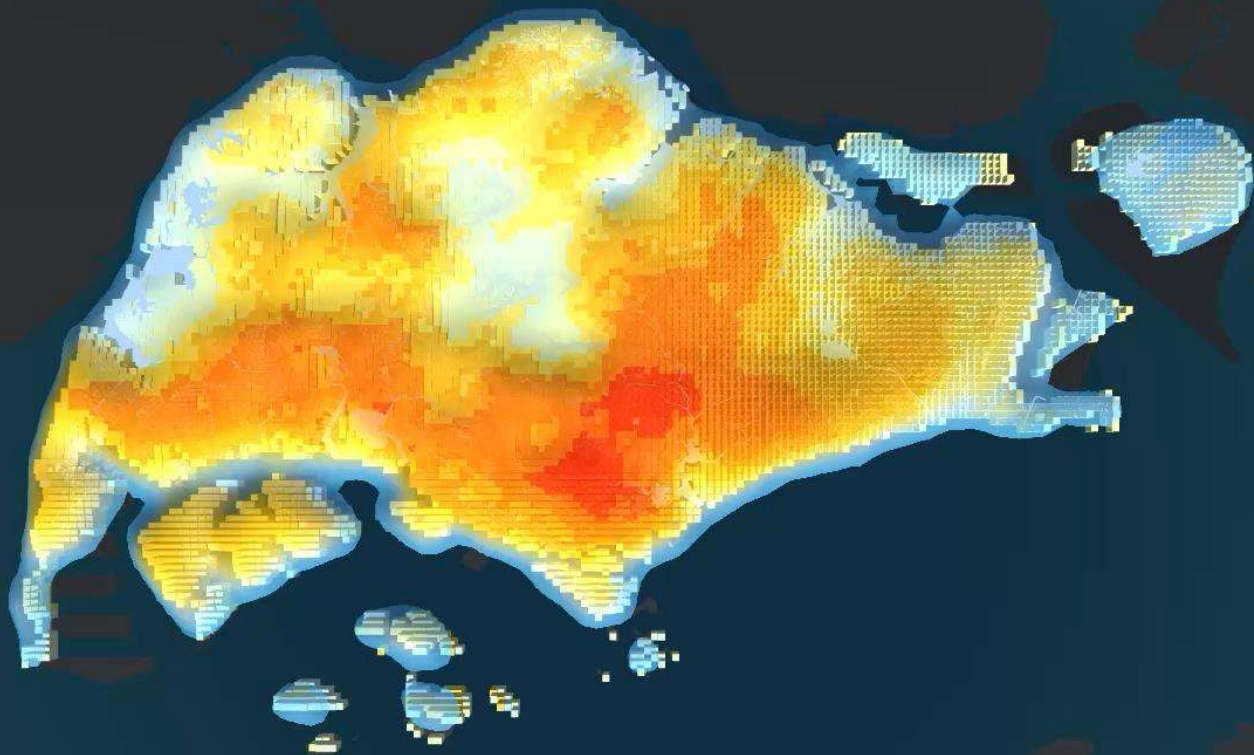
Water Bodies



Vegetation



The Urban Heat Island (UHI) effect



Local Climate Zones

- | | |
|--------------------|----------------------|
| Water | Large low-rise |
| Bare Soil or Sand | Lightweight low-rise |
| Bare Rock or Paved | Open low-rise |
| Low Plants | Open mid-rise |
| Bush, Scrub | Open high-rise |
| Sparse Trees | Compact low-rise |
| Dense Trees | Compact mid-rise |
| Heavy Industry | Compact high-rise |
| Sparsely Built | |

Baseline



Current (2016)



Urban Heat Island (UHI) [°C]

-2 0 2 4 6

Insufficient Data

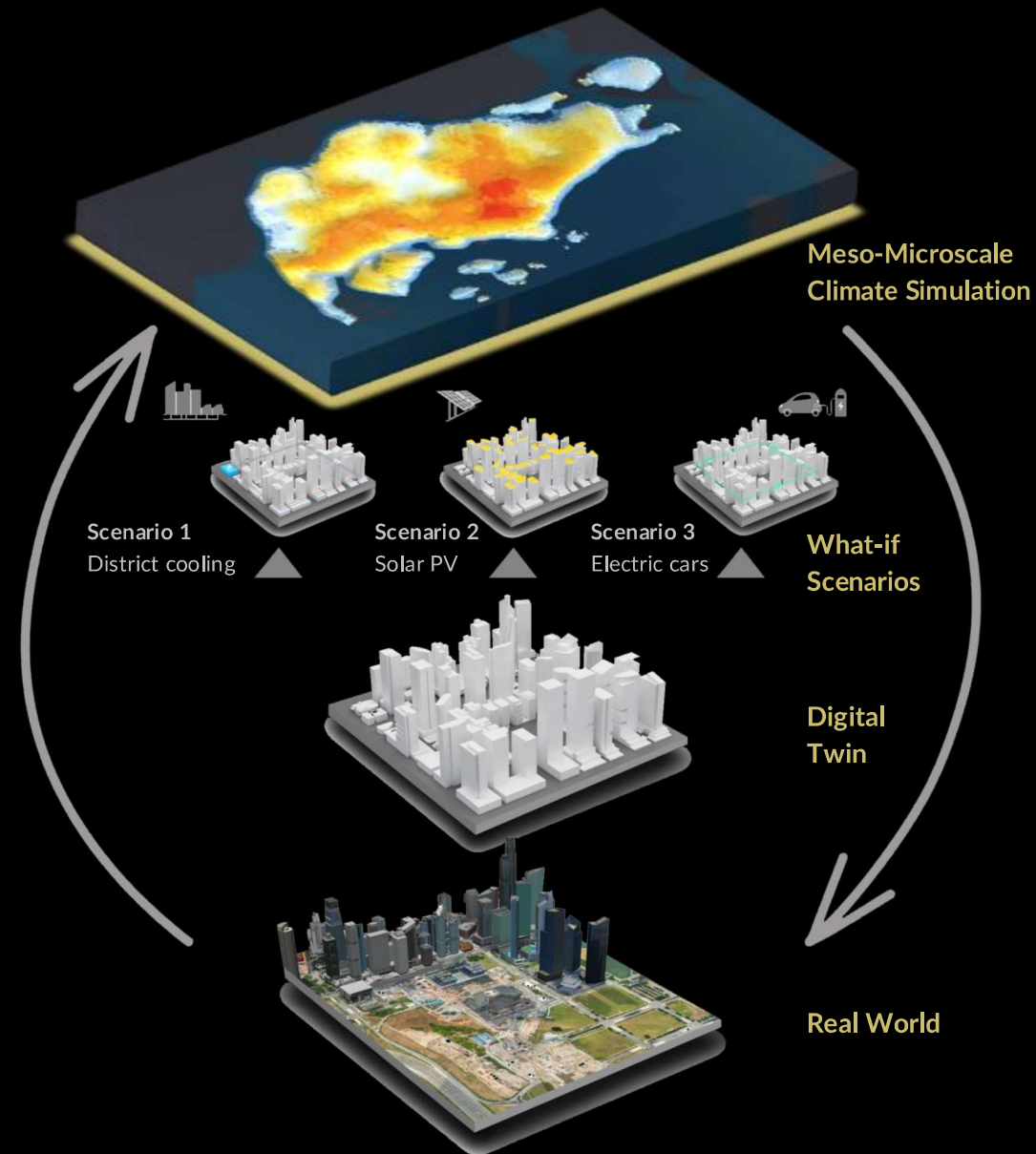


Cooling Singapore 2.0 (WP. A)

Sept 2020 – Aug 2024

How can we help planners to better understand the impact of new policies and plans on the urban climate?

1. Build a **Digital Urban Climate Twin (DUCT)** for Singapore, which includes various computational models.
2. Use the DUCT to evaluate quantitatively **what-if scenarios for future Urban Heat Island (UHI) and Outdoor Thermal Comfort (OTC) analysis**.



Developing a Digital Urban Climate Twin (DUCT)

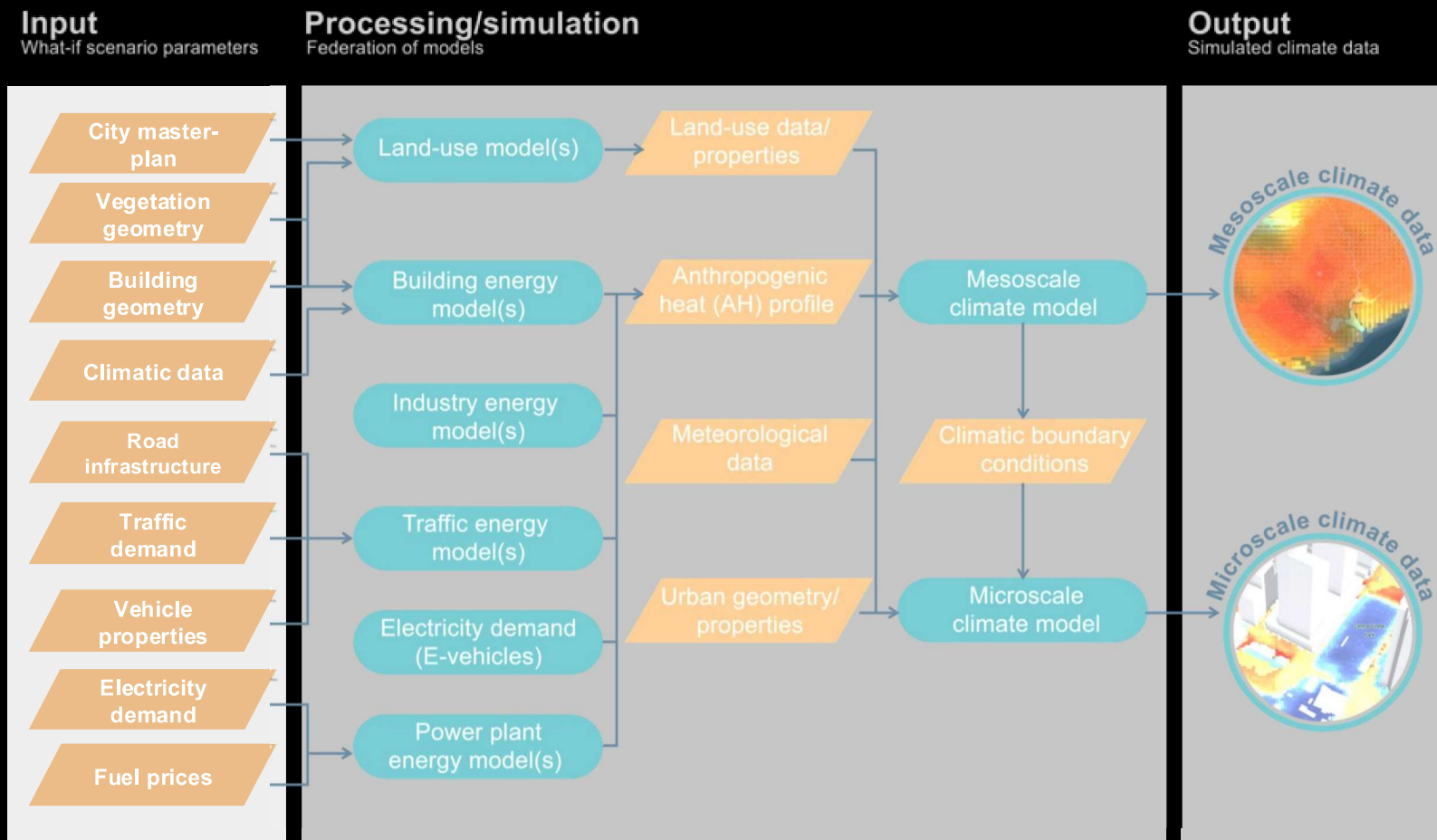
DUCT is a tool that is capable to model the **passive factors** such as urban morphology, blue-green infrastructure and land cover, and **active factors** such as waste heat generated by buildings, transportation, etc.

DUCT includes various computational models:

1. Urban Climate Models (meso- and micro-scale)

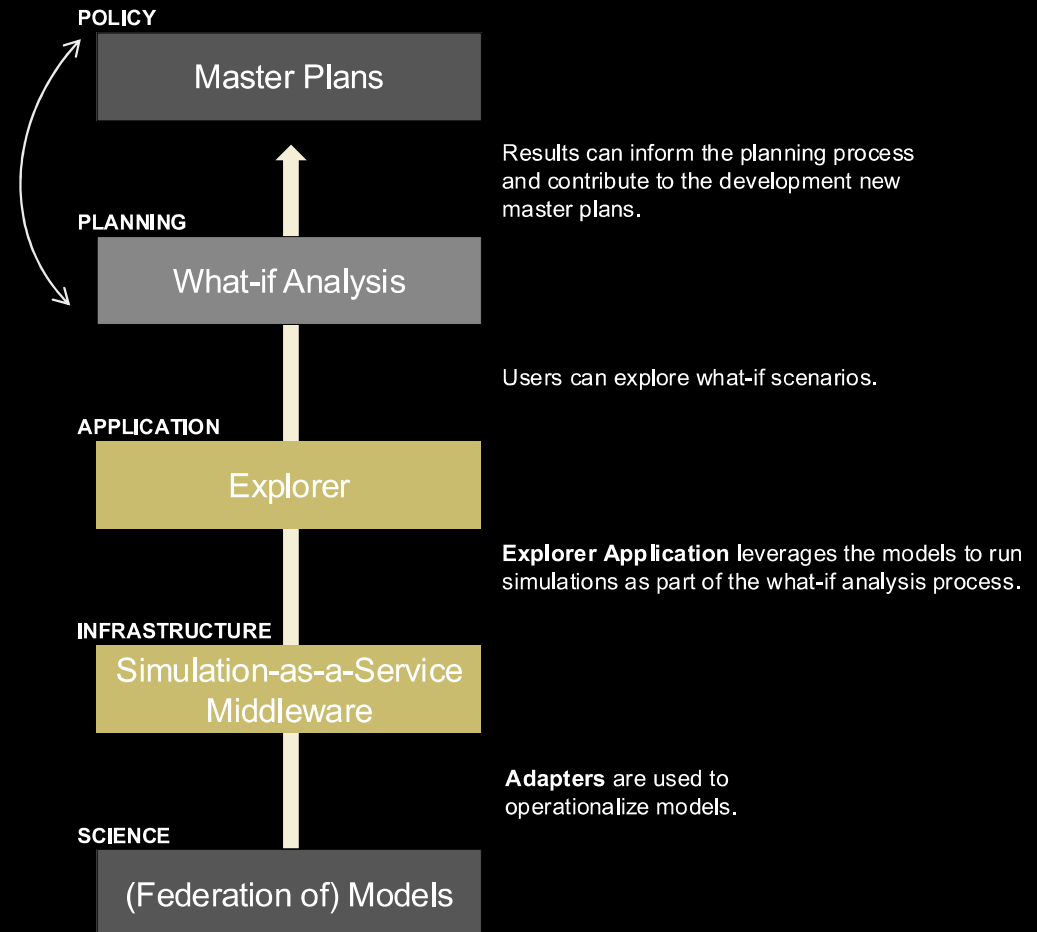
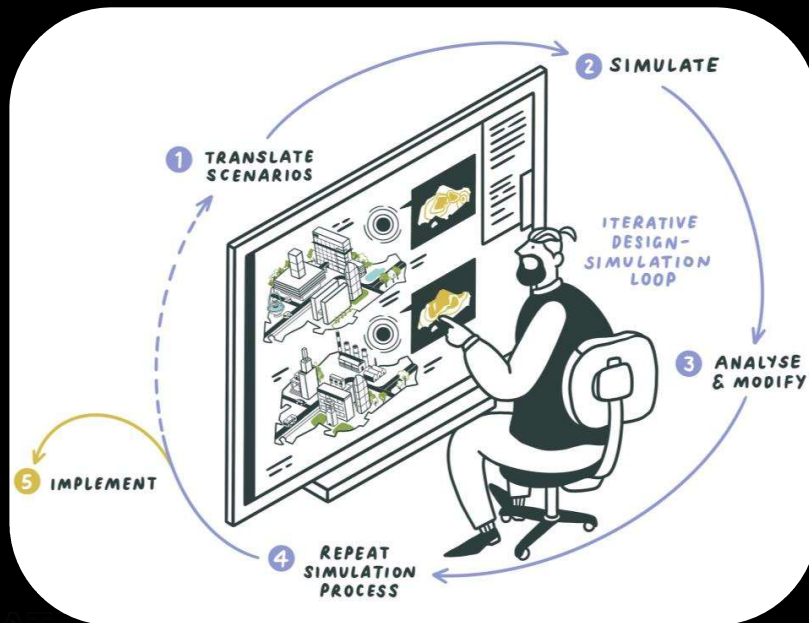
2. Anthropogenic Heat Emission Models (e.g., industry, traffic, building air conditioning)

To allow users to evaluate quantitatively what-if scenarios for future **Urban Heat Islands (UHI)**, **Outdoor Thermal Comfort (OTC)** and **Energy Efficiency (EE)** analysis.



From Science to Policy -How to bridge the gap?

Users (e.g., planners) can ask what-if questions and explore how the new master plans and policies perform in the simulation before implementing them.



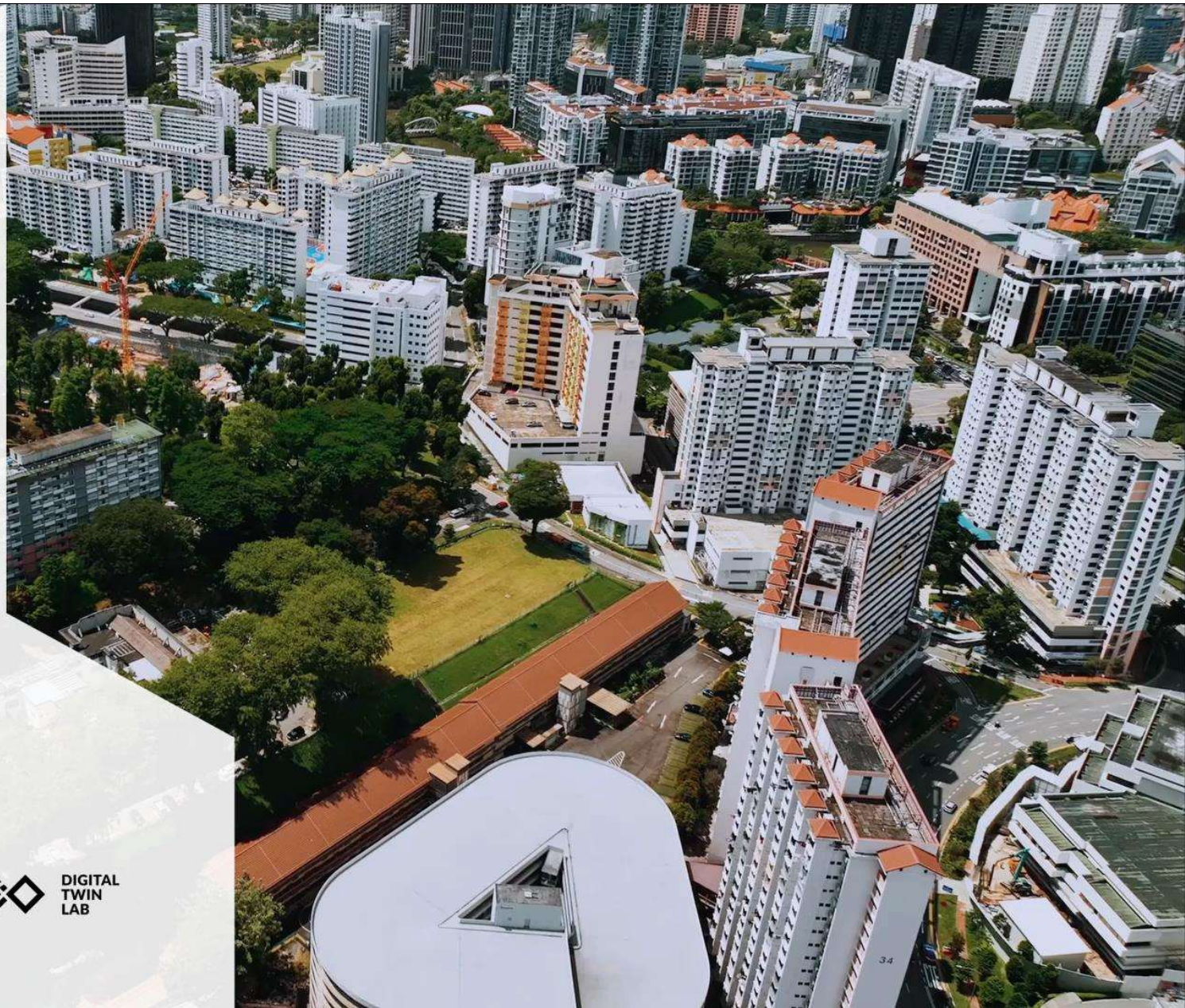
DIGITAL URBAN CLIMATE TWIN EXPLORER



(SEC) SINGAPORE-ETH
CENTRE



DIGITAL
TWIN
LAB



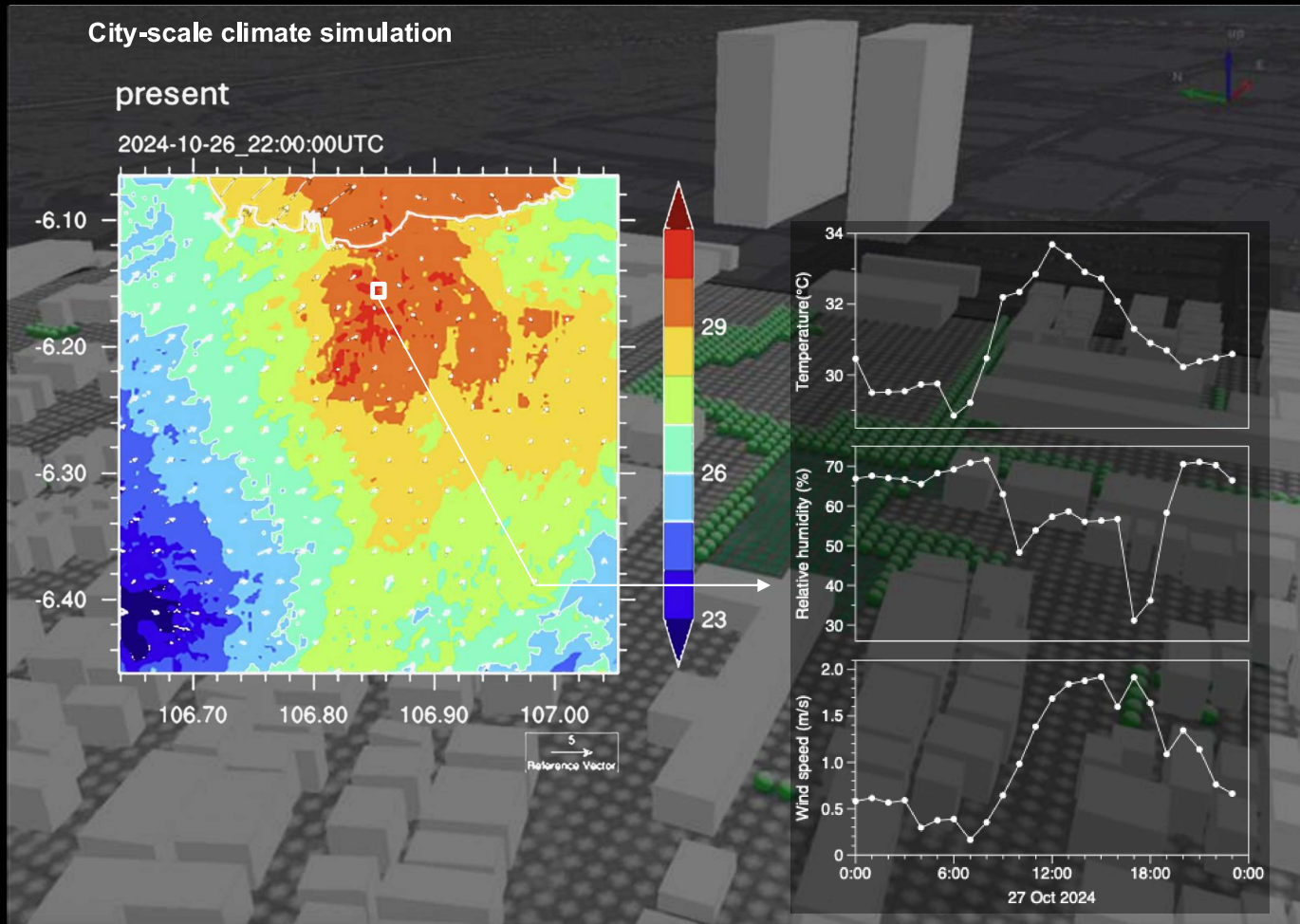


DUCT Use Cases

The flexible setup of the DUCT allows for additional model onboarding and extension to other cities or climatic regions.

The team has further extended and tested the DUCT's capabilities in other cities, such as Madrid, Vienna, Bhubaneswar, Belo Horizonte and Jakarta

Jakarta: city-scale climate analysis for prioritization of high-risk areas



Objective:

To run the “Baseline” simulation that represents the present-day condition, using the dynamic forcing imported from the mesoscale climate model output.

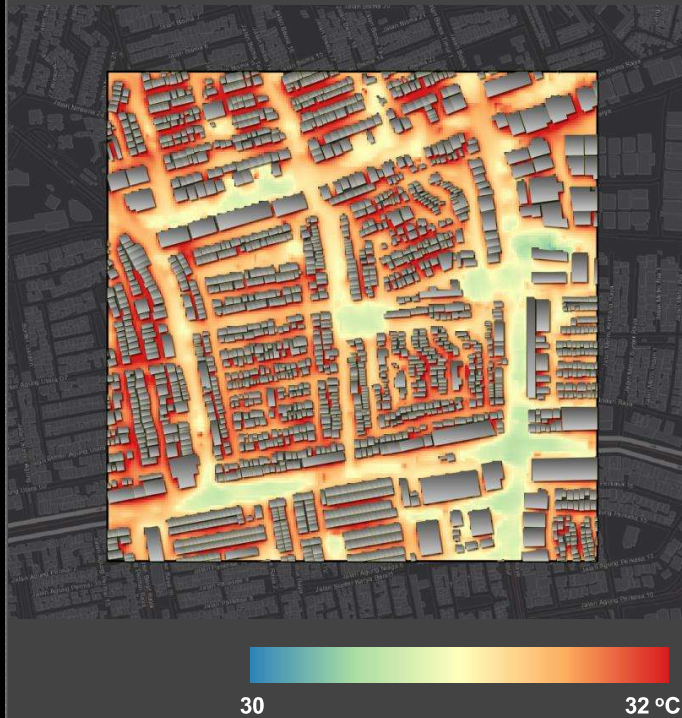
Data Layers:

Static layer (Land cover, land use, 3D buildings & tree canopy)

Dynamic layer (Spatio-temporal boundary conditions)

District: Potentials for heat mitigation

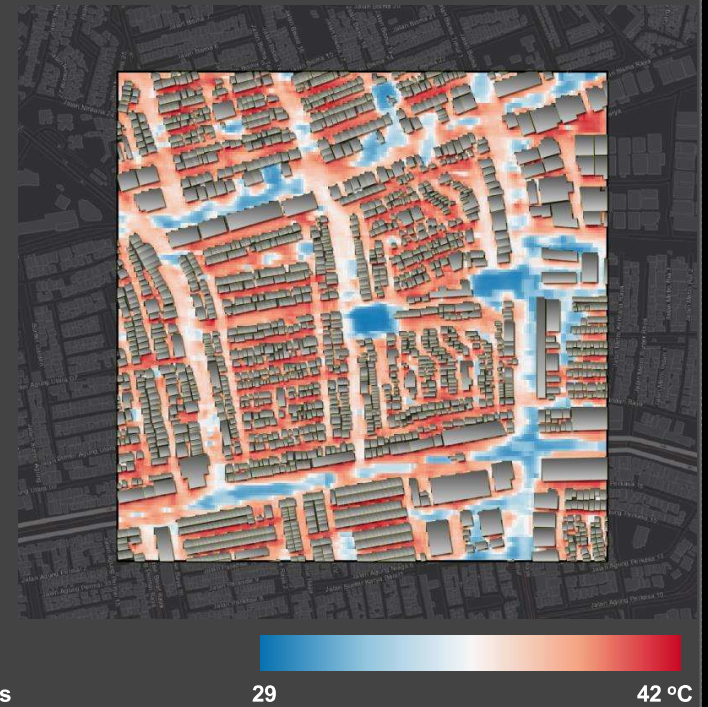
District-scale climate simulation
Air temperature (°C)
at 2.5 meters above ground
24-hr average



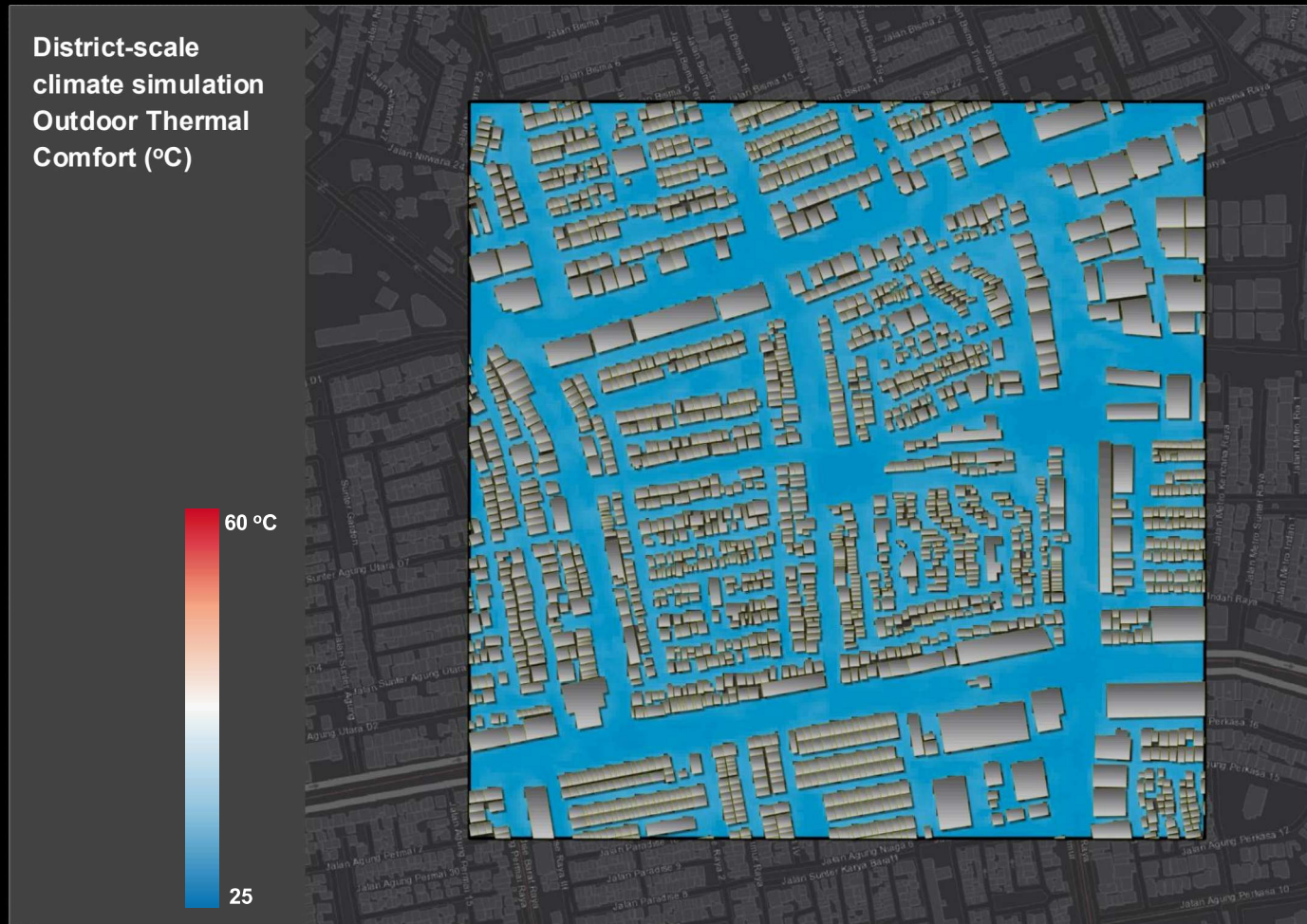
District-scale climate simulation
Wind speed (m/s)
at 2.5 meters above ground
24-hr average



District-scale climate simulation
Outdoor thermal comfort (°C)
at 2.5 meters above ground
24-hr average



District: Potentials for heat mitigation



Objective:

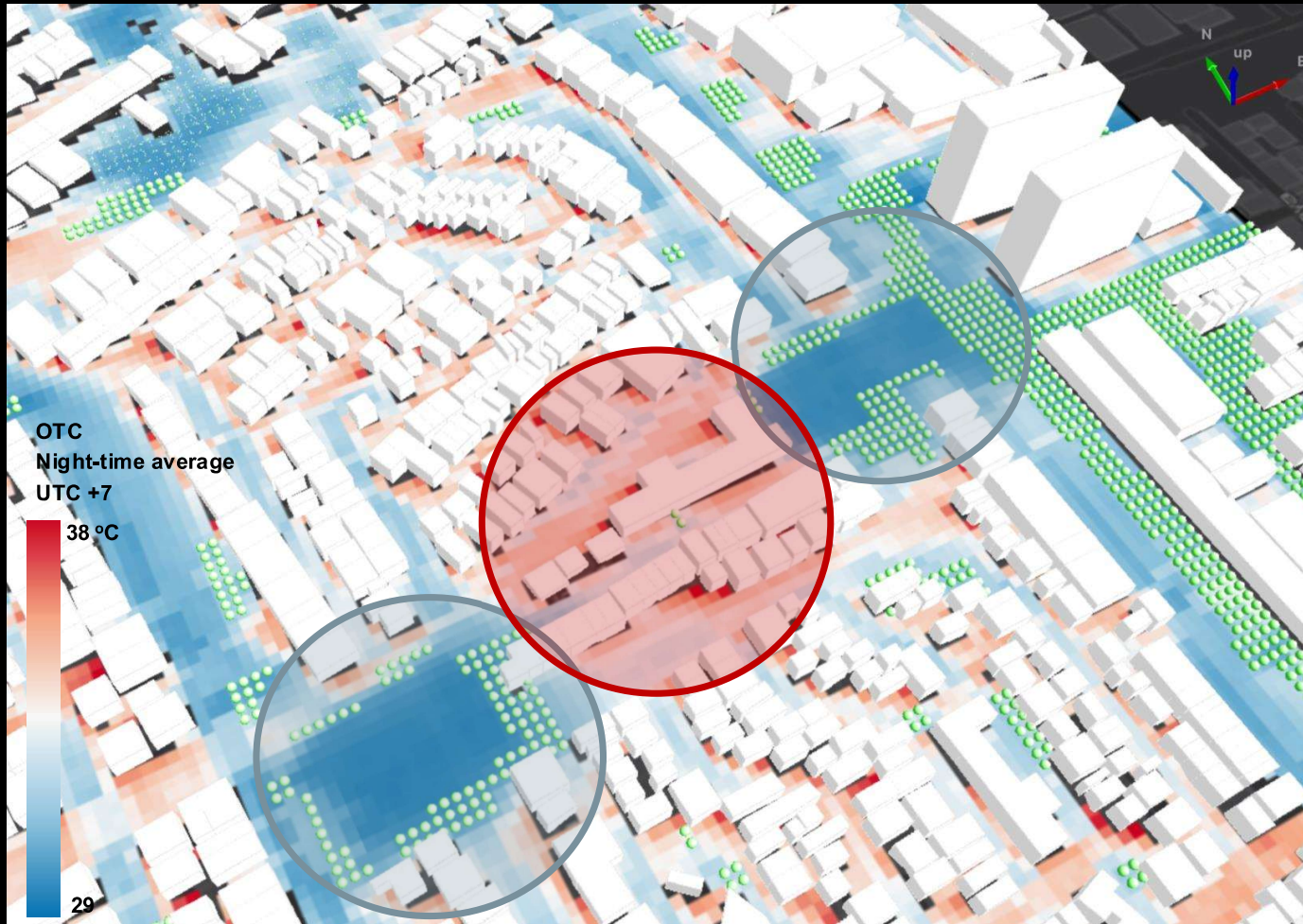
To analyse hotspots and cold-spots in terms of outdoor thermal comfort and identify potential what-if scenario.

Data Layers:

Static layer (3D buildings)

Dynamic layer (District-scale climate simulation output)

District: Potentials for heat mitigation



Objective:

To analyse hotspots and cold-spots in terms of outdoor thermal comfort and identify potential what-if scenario.

Data Layers:

Static layer (3D buildings & tree canopy)

Dynamic layer (District-scale climate simulation output)

District: Potentials for heat mitigation from ground-up

2.5m Outdoor Thermal Comfort (°C) | night-time average



Objective:

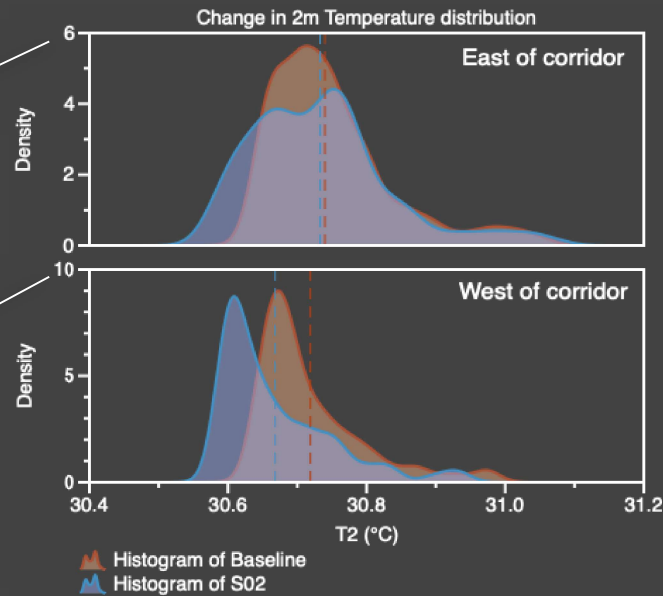
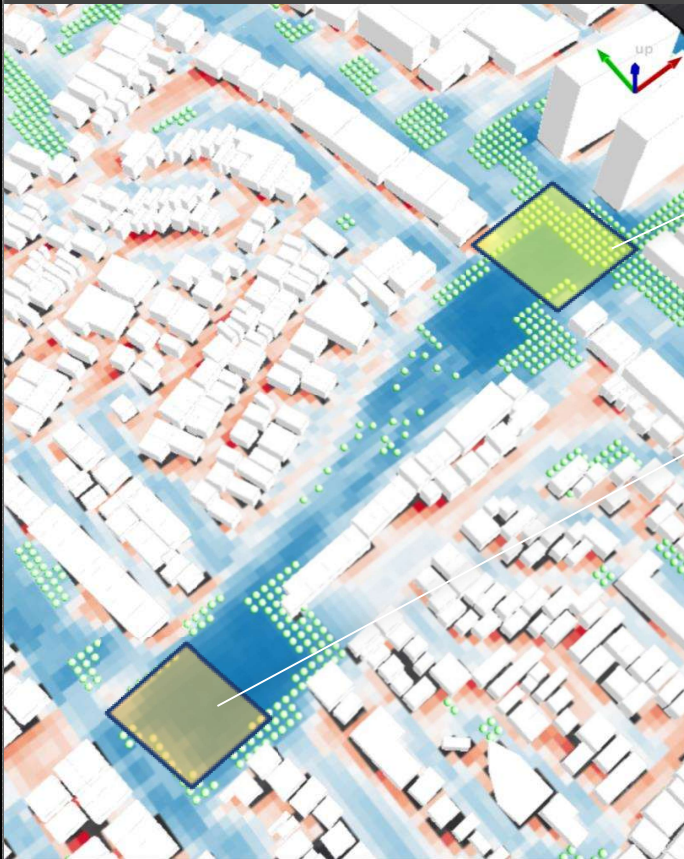
Proposing appropriate data-informed solutions to cool down its immediate surroundings, with 10% increase of “comfortable” area during night-time.

Datasets:

Microclimate simulations (before and after)

District: Potentials for heat mitigation from ground-up

2.5m Air Temperature (°C) | Change in temperature distribution



Objective:

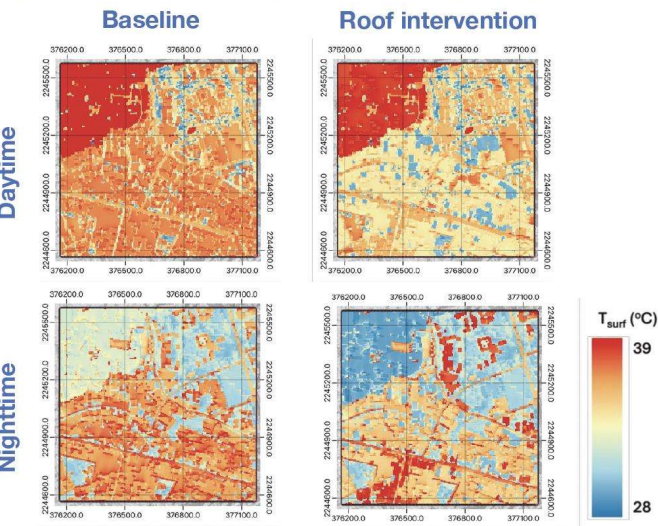
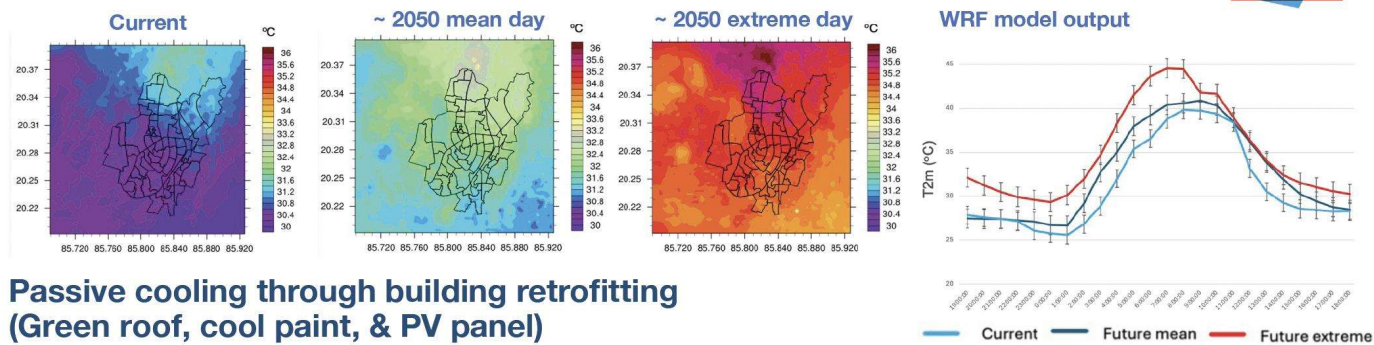
Simulation of wind corridors resulting in measurable localised cooling effects and an increase in areas experiencing lower average ambient temperatures.

Datasets:

Subset of microclimate simulations (before and after)

DUCT, the use-case for climate and energy systems

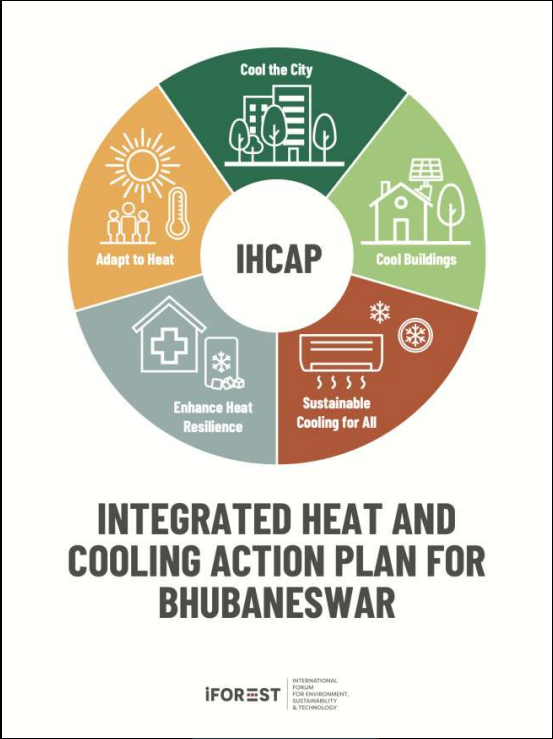
Measuring the climate change impact on energy consumption in Bhubaneswar (India)



Direct climate-driven changes in Energy Use Intensity (EUI)
Rise in cooling-driven energy demand across all building types due to higher projected temperatures by 2050.

Building Type	EUI Change due to 2050 warming	EUI Change due to high efficiency-HVAC
Commercial	Ave : +4.5%	Ave : -20.39%
Residential	Ave : +6.8%	Ave : -8.02%
Office	Ave : +5.32%	Ave : -19.15%

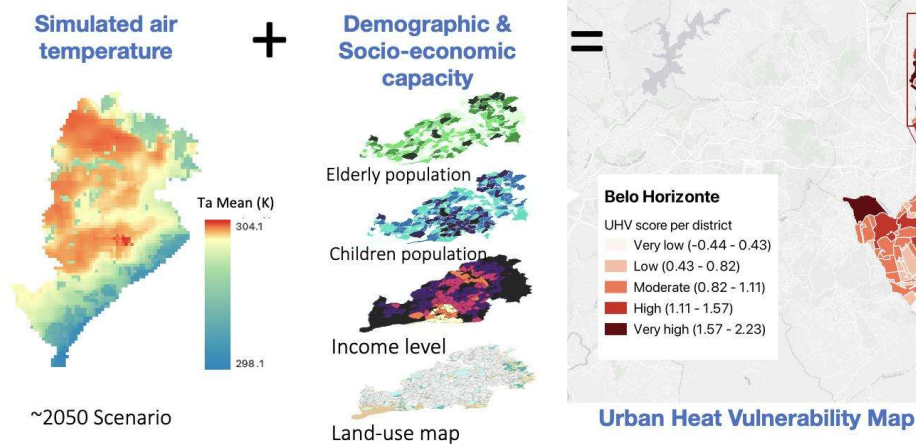
The results of Cooling Singapore's collaboration with IFOREST are integrated into Bhubaneswar's first Integrated Heat And Cooling Action Plan (IHCAP).



[Report link](#)

DUCT, the use-case for heat vulnerable populations

Understanding heat-risk vulnerability in Belo Horizonte (Brazil)



Greening strategies to provide urban 'cool' spaces

Baseline – Current Scenario



Scenario 1 – Future city plan



Greening along existing local centralities

Scenario 2 – Urban parks



Creating urban 'pocket parks'

Scenario 3 – Wind corridor

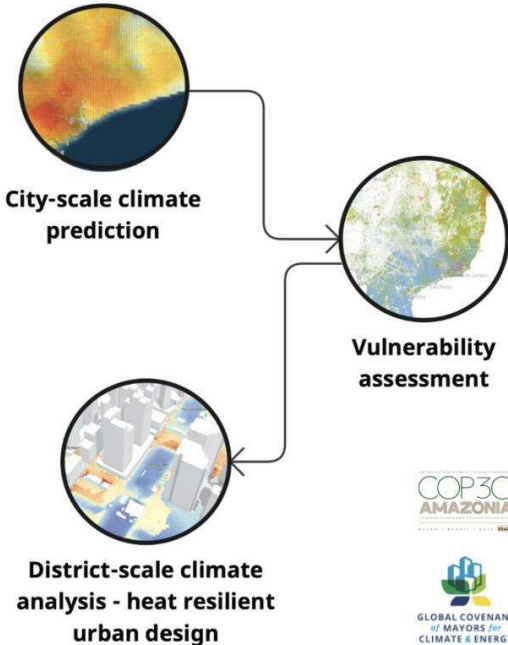


Creating a central wind corridor



Greening efforts show potential of strong localized cooling effects. New green areas in Scenario 1 show reductions in PET by ~4.14 °C and in Scenario 2 by ~4.60 °C.

District: Padre Eustaquio (2 x 2 km²)



Cooling Singapore at COP30, Belem

(SEC) SINGAPORE-ETH CENTRE

For more information please contact:
ander.zozaya@sec.ethz.ch

Or visit
<https://sec.ethz.ch/research/cs.html>



Case study 5: Cox's Bazar Urban Heat Action Plan



Tanvir Hasan Rezaul

Deputy Town Planner and Project Director,
Cox's Bazar Development Authority (CoxDA),
Bangladesh

COX'S BAZAR: FROM HEAT ASSESSMENT TO LOCAL URBAN ACTION

Urban Heat Action Plan (UHAP) for Cox's Bazar

CoxDA experience with ESCAP-supported heat
assessment, local planning and pilot implementation

Presented by:

Md. Tanvir Hasan Rezaul

Deputy Town Planner and Project Director, Cox's Bazar District Master Plan Project

Cox's Bazar Development Authority (CoxDA)

Ministry of Housing and Public Works

Government of the People's Republic of Bangladesh



SESSION 1C 15:00–16:30

Beat the Heat Training and Study Tour,
Singapore
15–16 September 2026

Cox's Bazar: a growing coastal tourism hub

The local heat challenge reflects coastal geography, rapid urban growth and an economy that depends heavily on outdoor activity.

Geography and climate

- Bay of Bengal coastal setting
- Hot, humid tropical conditions

Economy and exposure

- Tourism, fisheries, dry-fish processing and salt production
- Rapid infrastructure growth
- Outdoor workers and seasonal visitors

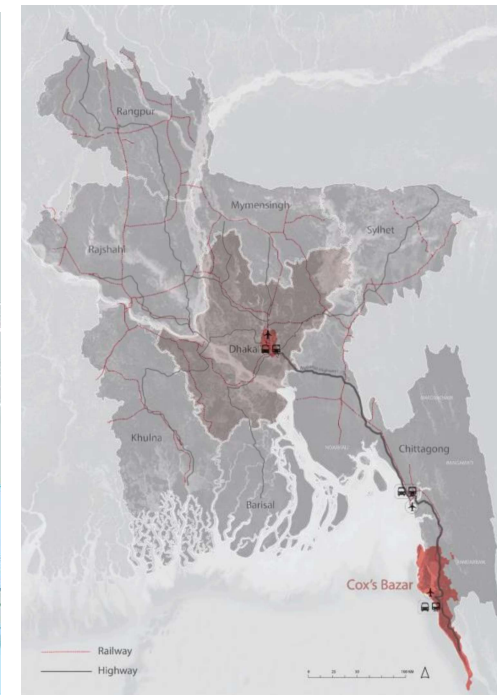
Priority groups

- Low-income and fragile-housing communities
- Older people, children and persons with disabilities
- Indigenous, displaced and host communities

Bangladesh in South Asia



Cox's Bazar in Bangladesh



Source: Britannica

Heat assessment and evidence priorities

The assessment provides an initial evidence base. The draft UHAP proposes more detailed ward-level mapping and monitoring to target future action.

Humid coastal heat
At 33°C and 80% humidity, the Heat Index can reach approximately 48°C.

Livelihood exposure
Fishing, dry-fish processing, tourism, transport and construction involve prolonged outdoor work.

Evidence gap
No ward-level heat measurements currently exist. The UHAP proposes heat maps for 12 wards and 10 union areas.

Unequal vulnerability
Older people, children, persons with disabilities and low-income households face greater risk.



From heat assessment to a locally owned Urban Heat Action Plan

ESCAP and United Cities and Local Governments Asia-Pacific (UCLG-ASPAC) supported CoxDA and local partners to connect heat evidence with implementation priorities.



Local ownership

CoxDA, the Pourashava, national counterparts, sector agencies and community groups have complementary roles in validation and future implementation.

Proposed heat alert and emergency response system

The draft UHAP proposes a locally calibrated system for endorsement, technical validation and operationalization.

Proposed Heat Index alert levels

- Yellow: Heat Index at least 40°C for two days
- Orange: Heat Index at least 45°C
- Red: Heat Index at least 50°C
- Provisional WBGT Red trigger: at least 33°C at monitored sites
- Technical validation and annual review required

Dissemination and protective action

- Daily temperature and humidity data from BMD
- Ward, union and mosque announcements
- Coast Guard VHF radio for fishing vessels
- BFDC Jetty and health-sector notifications
- Alerts activate cooling, health and worker protection

BMD data informs local alerts and protective action

Community preparedness and local implementation

Local institutions and communities connect the Urban Heat Action Plan with protective action during extreme heat.

Community response

- Use public spaces and existing facilities for shade, water and temporary cooling
- Prioritize workers and communities with high outdoor heat exposure

Capacity building

- Orient institutional focal points and Red Crescent volunteers
- Prepare simple guidance for cooling-station operation, first aid and referral

Heat communication

- Share clear heat-health messages through posters and local channels
- Reinforce hydration, shade, work-rest timing and signs of heat illness

LOCAL PREPAREDNESS

COMMUNITY RESPONSE → CAPACITY → COMMUNICATION

Pilot package under preparation

CoxDA is moving from planning toward early implementation with support from ESCAP and UCLG ASPAC.

Heat awareness
500 outdoor-grade posters

Cooling stations
Equipment for four
educational institutions

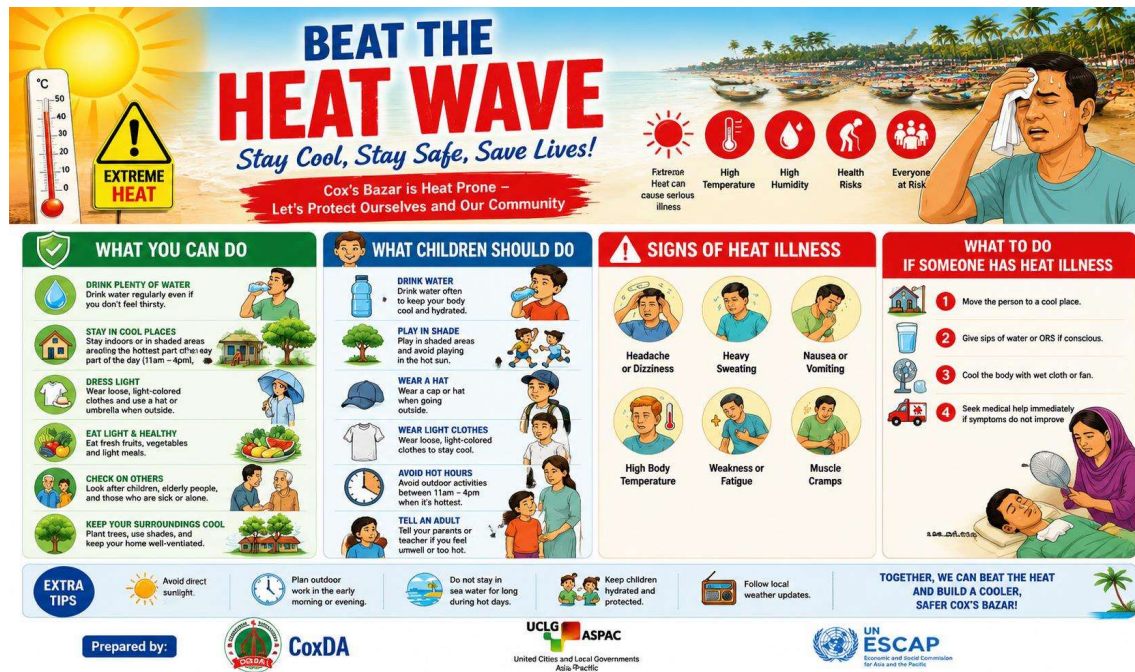
Dry-fish workers
Water filters and sun-
protection hats or mathals

Public shade
One demonstration structure

Red Crescent support
Megaphones and emergency
health kits

Pilot examples: heat awareness and cooling stations

Two complementary measures will support public communication and access to temporary cooling.



Possible sites include educational facilities that can provide water, fans, basic first aid and heat information.

Illustrative poster design; final materials will be produced in Bangla

Dry-fish worker protection

Targeted support for one of Cox's Bazar's major outdoor livelihood groups.



Nazirertek Dry-Fish Area (Shutki Polli)



INTERVENTION

Nazirertek dry-fish community

PURPOSE / SCOPE

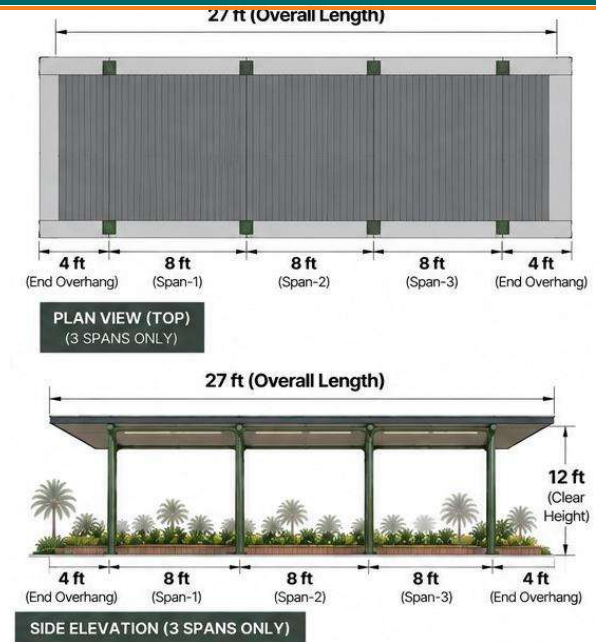
50 water filters + 300 sun-protection hats / mathals

Public shade and Red Crescent support

The pilot combines a demonstration canopy with volunteer response equipment.



Illustrative design



PUBLIC SHADE

One demonstration canopy

RED CRESCENT SUPPORT

Megaphones and emergency health kits for volunteers

Next steps for institutionalizing heat resilience

The draft UHAP provides a proposed roadmap, subject to endorsement, institutional confirmation and available resources.

1 Endorse and integrate the UHAP

- Seek formal institutional endorsement
- Integrate heat priorities into the District Master Plan and DAP
- Translate priorities into development review, public-space standards and investment planning

2 Operationalize, learn and adapt

- Establish institutional roles and data-sharing arrangements
- Test the alert system and pilot measures
- Use monitoring and peer learning to refine effective approaches before wider scaling

ENDORSEMENT → IMPLEMENTATION → LEARNING → SCALE

Key takeaways

Cox's Bazar is building a locally grounded pathway from heat evidence to planning and early implementation.

- | | | |
|----------|--|--|
| 1 | Coastal humidity changes the risk | Heat Index can show physiological stress that dry-bulb temperature alone may understate. |
| 2 | Evidence must become more local | Ward-level mapping and monitoring can guide investment and alert calibration. |
| 3 | Institutions and communities shape the plan | Local government, sector agencies and community groups have complementary roles. |
| 4 | Pilots can test the wider system | Preparedness measures can generate lessons for implementation of the UHAP. |

THANK YOU

