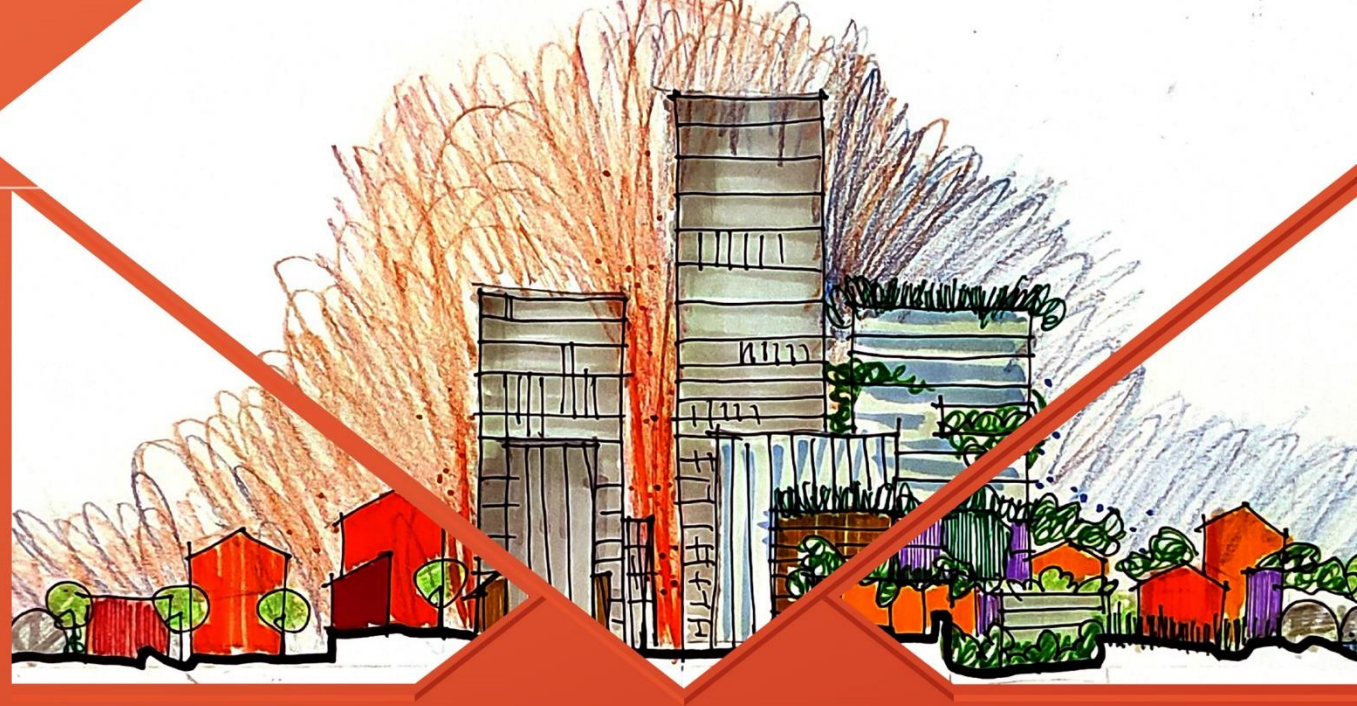
SILVIA IODICE

3 April 2025

EU cities and heat extremes



Cooling Down Day

Tackling the Cooling Demand for Urban Heat Islands, Grids, and Data Centres

SESSION 4 | COOLING OUR CITIES

European Commission

Joint Research Centre

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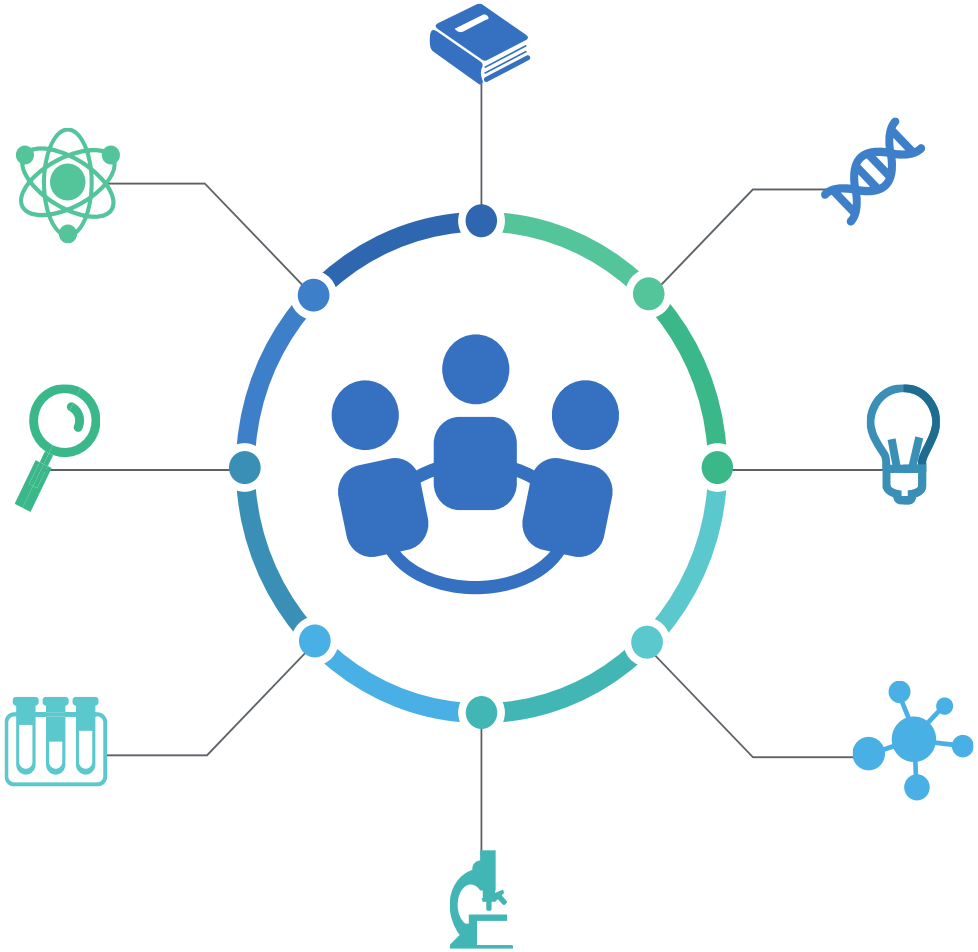

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Territorial Development Unit (JRC.B3)

- To support the territorial articulation of the EU policy agenda, its external investment and global outreach
- To deliver world-class science-for-policy support to bring Europe closer to citizens and places, turning territorial diversity as well as urban-rural interactions into value

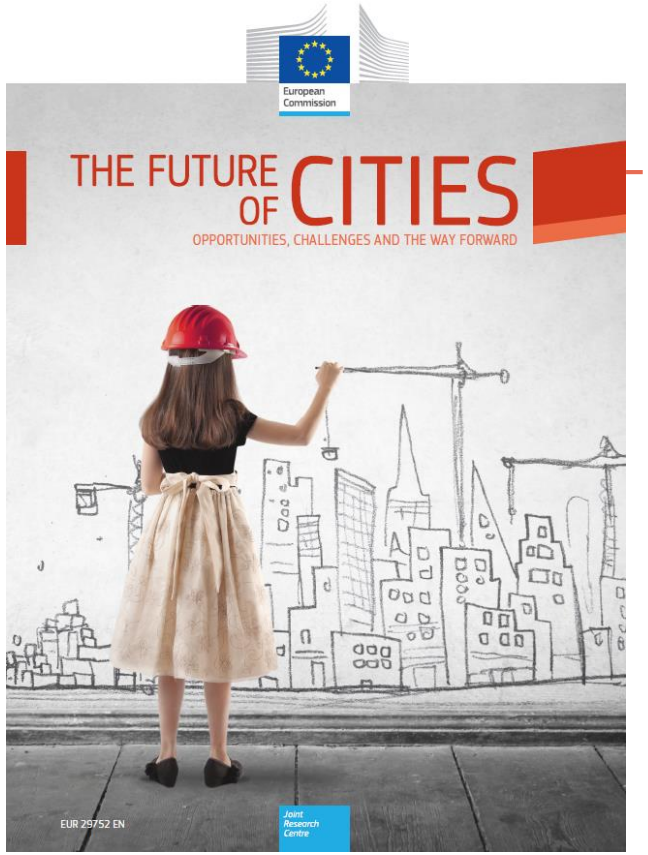
Urban Data Platform

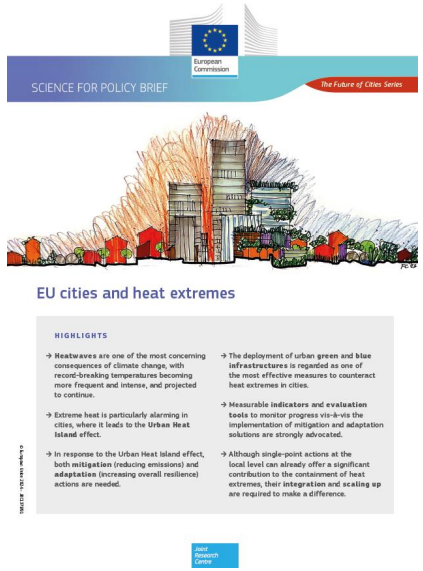
ARDECO

Rural Observatory

EU Tourism Dashboard

The Future of Cities





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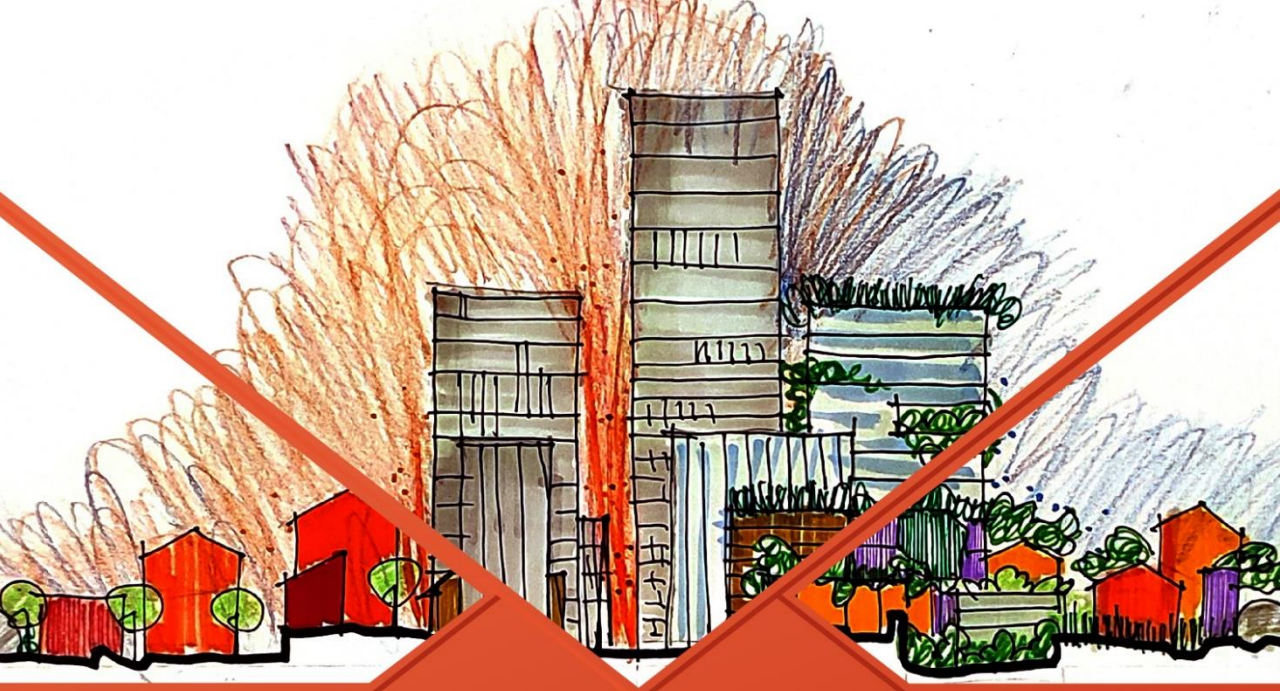

EU cities and heat extremes

Ways to tackle extreme heat in cities

- Strategic recommendations
- Analytical approaches
- Best practices

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Heatwaves and their local manifestations are some of the most **severe consequences** of climate change

© vecteezy

Extreme weather and climate-related events:

- Around **half a trillion euros** over the past 40 years
- Between **85 000** and **145 000** human fatalities. **85%** for heatwaves
- Potential exposure to extreme heat exceeded **1.7 billion people**

Extreme heat is particularly alarming in cities, where it leads to the **Urban Heat Island effect**

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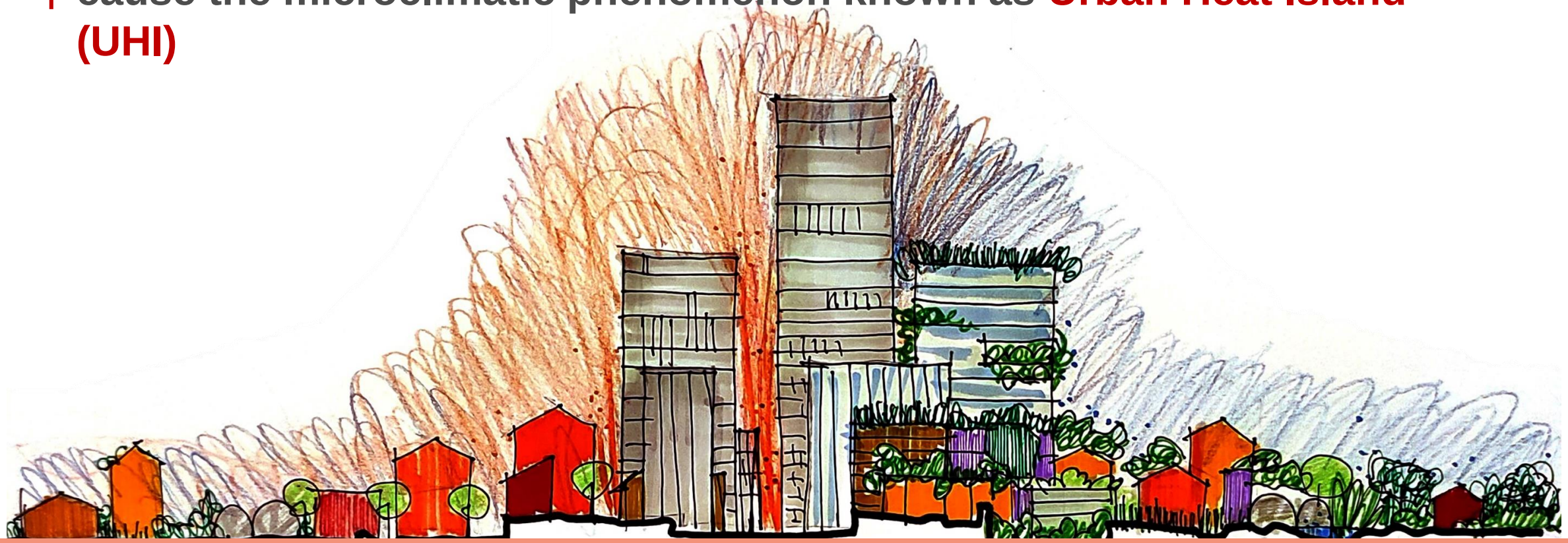
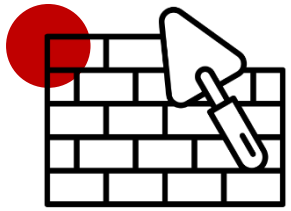
Heatwaves refer to prolonged, extremely high temperatures that can cause the microclimatic phenomenon known as Urban Heat Island (UHI)

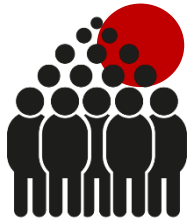


By altering the nature of the city's surface, and generating large amounts of anthropogenic heat, cities modify the microclimate and air quality, **increasing their ecological footprint**

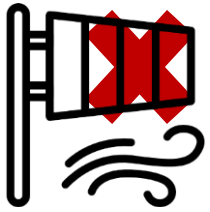
Cities become **hotter** than surrounding suburban regions and rural areas due to



More **sealed surfaces**

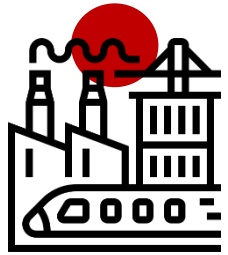


High **people density**



Low **ventilation**

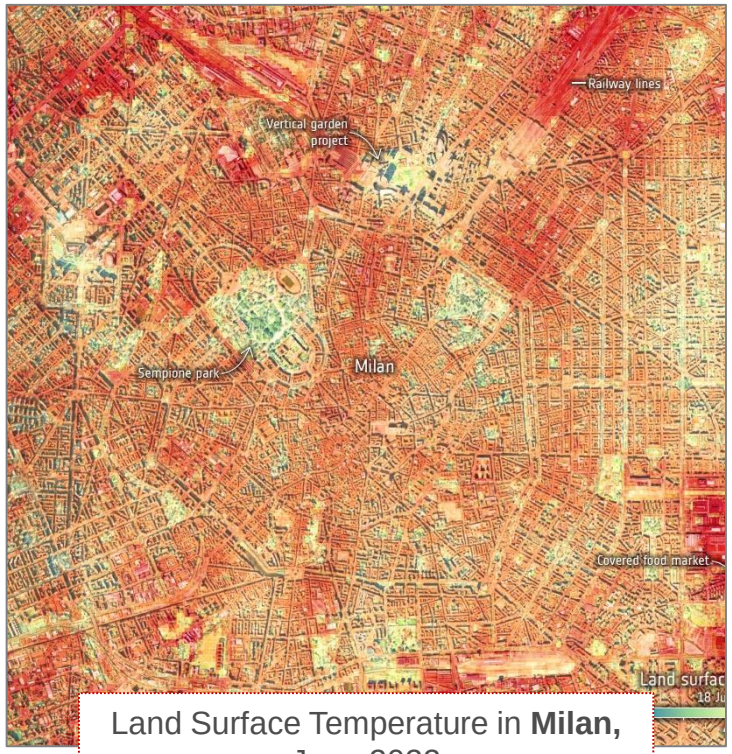
Fewer **green areas**



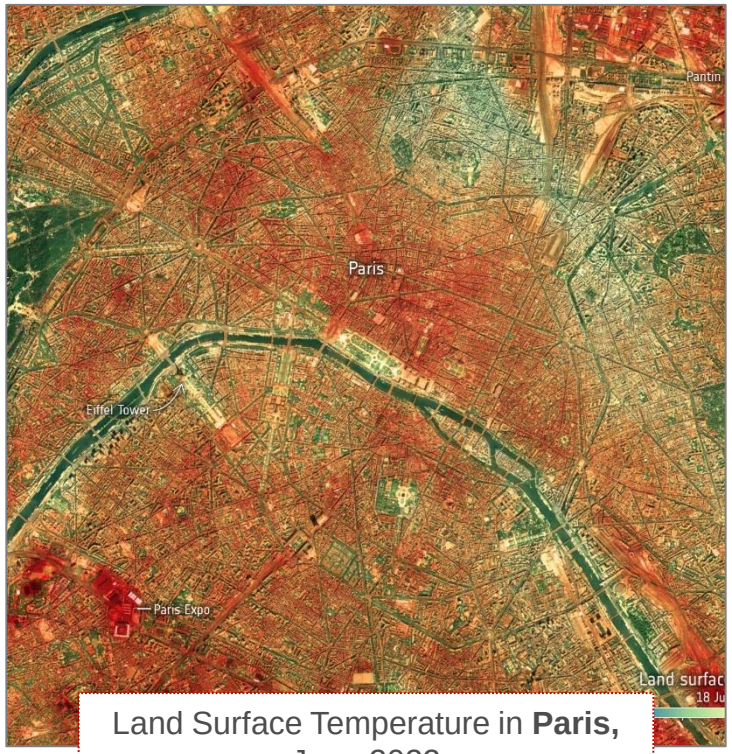
High **heat emitting** infrastructures density

Peak temperatures may be up to **10°C** higher than in surrounding rural areas with an average between **4 and 6°C**

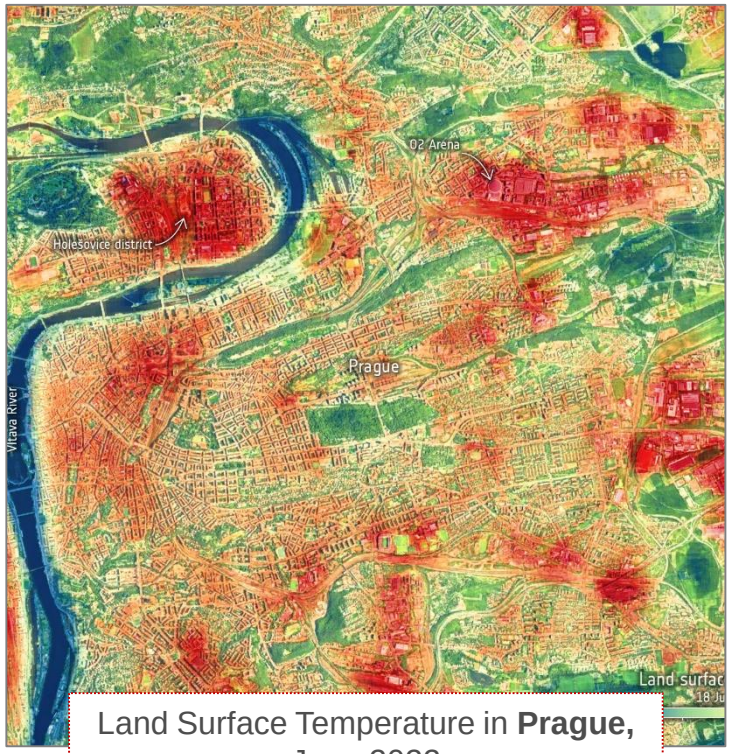
The intensity of an UHI is usually quantified through the Land Surface Temperature (LST) and is referred to as Surface Urban Heat Island



Land Surface Temperature in **Milan,** June 2022



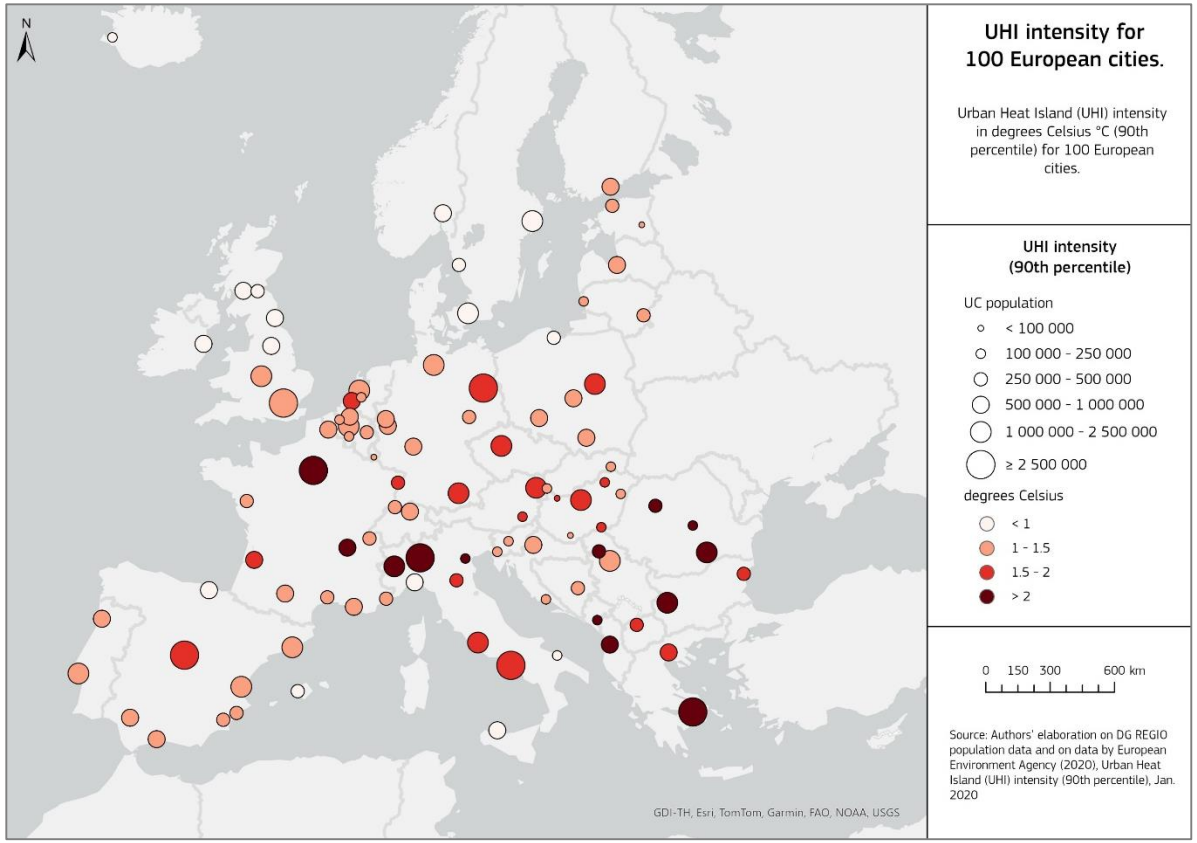
Land Surface Temperature in **Paris,** June 2022



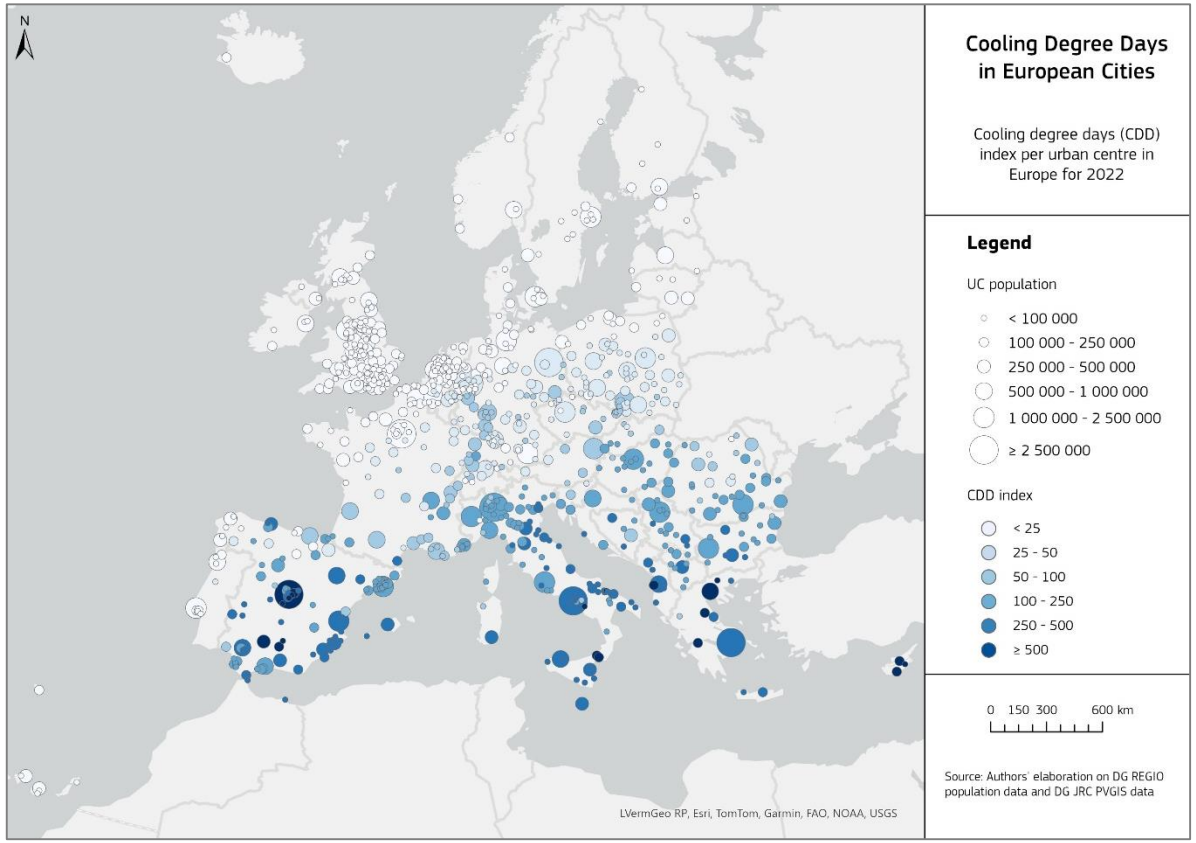
Land Surface Temperature in **Prague,** June 2022

Measuring and identifying **thermal hotspots** at different spatial granularities could support policy interventions.

When addressing the issue of extreme urban heat, the **energy sector** is an important perspective to consider.



Urban Heat Island Intensity for 100 EU cities



Cooling Degree Days

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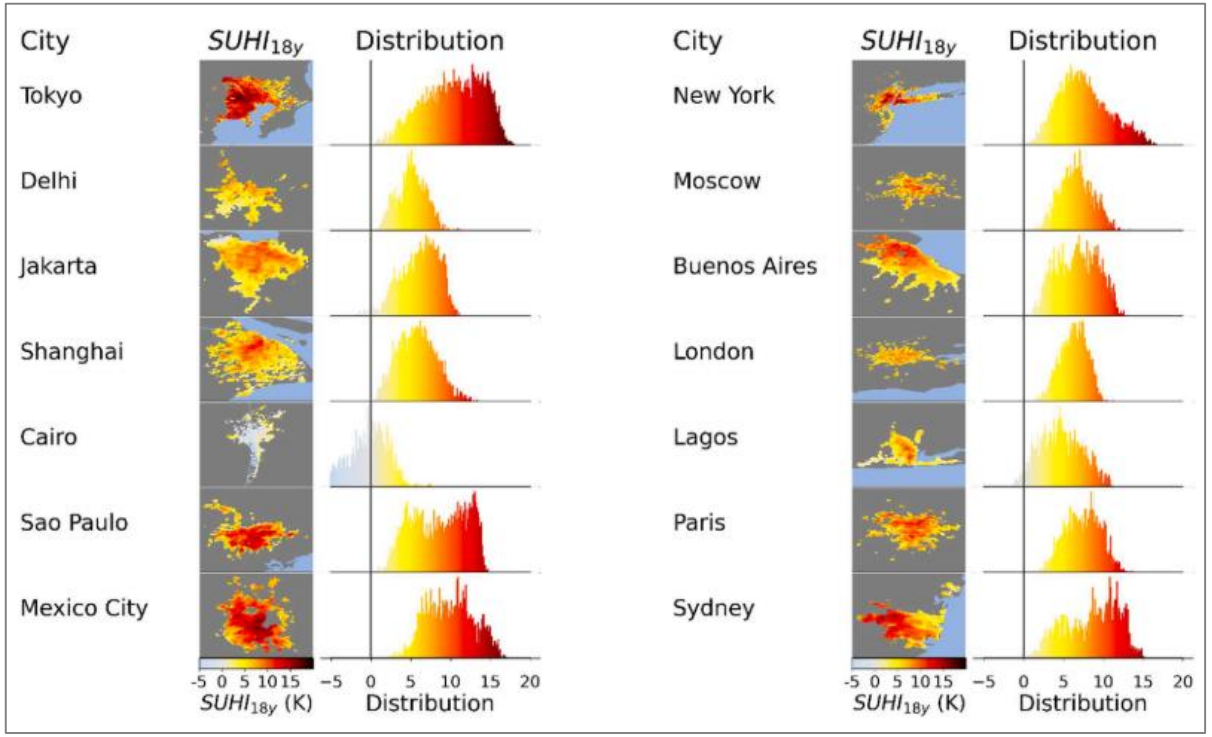
Notwithstanding the unique characteristics of each city, due to a combination of climate, geography, morphology, and structure, some common patterns also emerge



Distribution of warm-season extreme SUHI in megacities.
Source: Mentaschi et al., 2022.

Urban hotspots tend to concentrate in:

- Industrial areas
- Areas with unregulated urbanisation

Cooler conditions in correspondence of:

- Green zones
- Water bodies
- Drier climate and desert areas

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Which strategic recommendations?

To exploit the **existing data** as well as **monitoring and modelling systems**

To target **high exposure areas** and **vulnerable neighbourhoods**

To map the wide availability of **underused** portions of urban territories

To design urban adaptation plans sensitive to the **spatial dimension**

To ensure a balanced combination between **buildings**, **green spaces**, and **pavement**

To implement **behavioural change**

To enhance **citizens' participation**

To look at different **spatial scales**

To establish **heat action plans** and **heat officers**

Icons © Freepik

To ensure the **combination** of several **strategies** adapted to the local circumstances in a holistic way

What can we do?

Some **effective responses** have already been identified

- Green infrastructure
- Trees and vegetated surfaces
- Policies for green walls and roofs
- Water features and flowing water
- Retrofitting and renovation of buildings
- Public health measures and timely healthcare

Icons © Freepik

Mitigation is essential to limit the impact of climate change by reducing emissions.

At the same time, we should **adapt** by diminishing exposure and vulnerability and increasing the overall resilience and adaptive capacity of cities.

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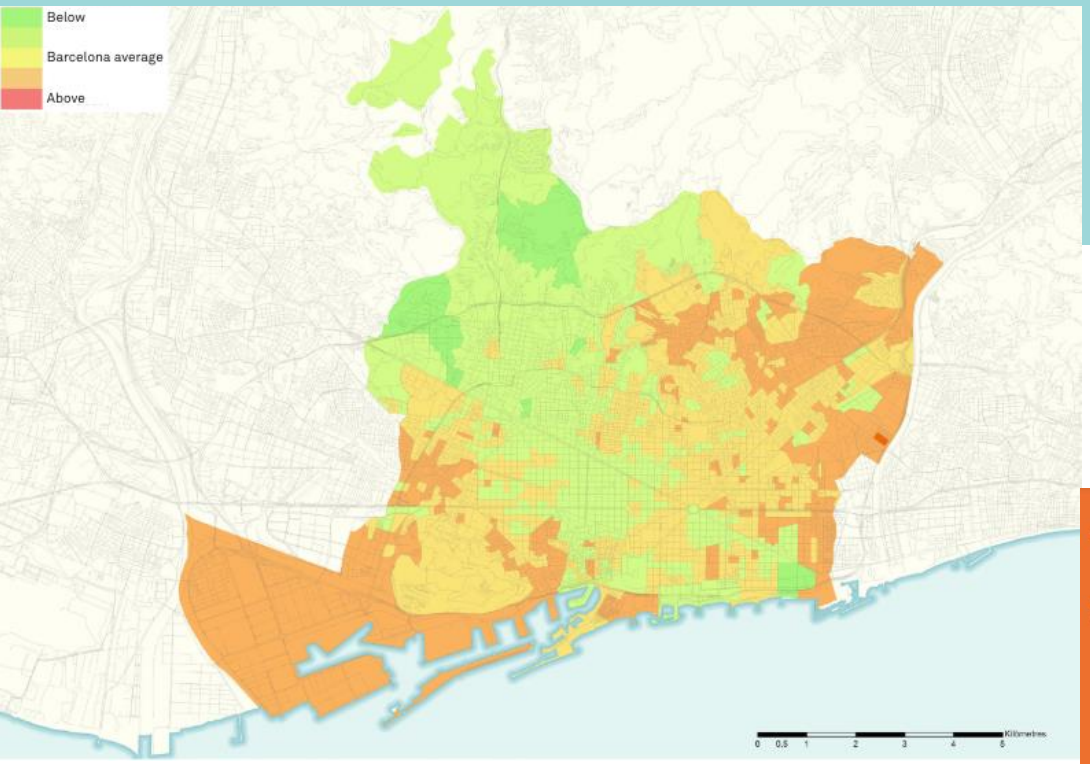
Which best practices?

Climate shelters in Barcelona



© Barcelona climate plan 2018 - 2030

Barcelona spatial vulnerability to heatwaves

Development of a network of cooling centres, transforming pilot schools through:

- One public school per district
- 75 schools transformed so far
- Plan to tranform all schools by 2030

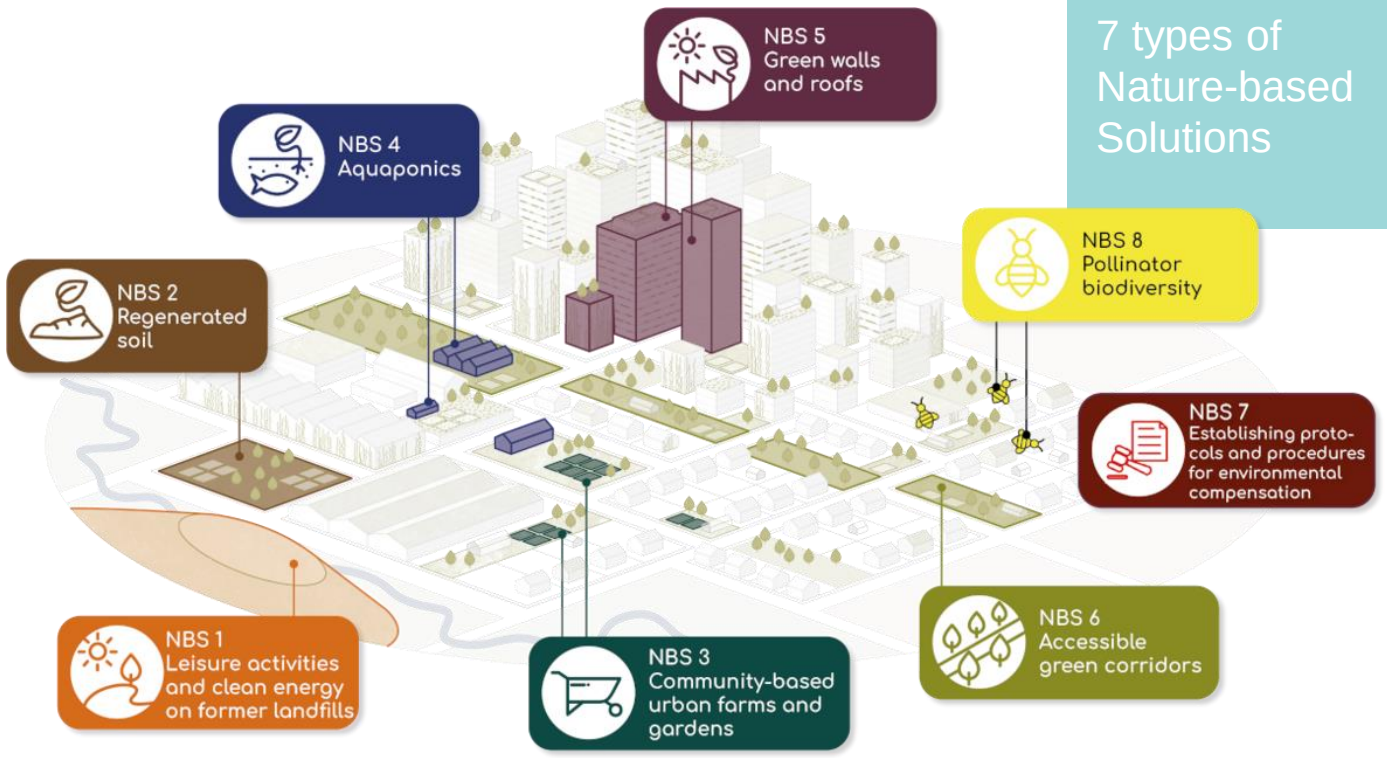
Water points

Green solutions

Grey solutions

Which best practices?

Greening Torino and replication of Nature-based solutions



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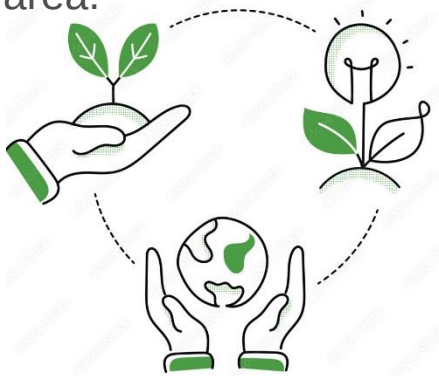
The city of Turin took concrete action to adapt to the increasing effects of climate change in one of the most vulnerable areas, the neighbourhood of Mirafiori Sud.

Torino has joined a **replication process** – led by ICLEI Europe – to recreate proGIreg solutions within and beyond the metropolitan area.



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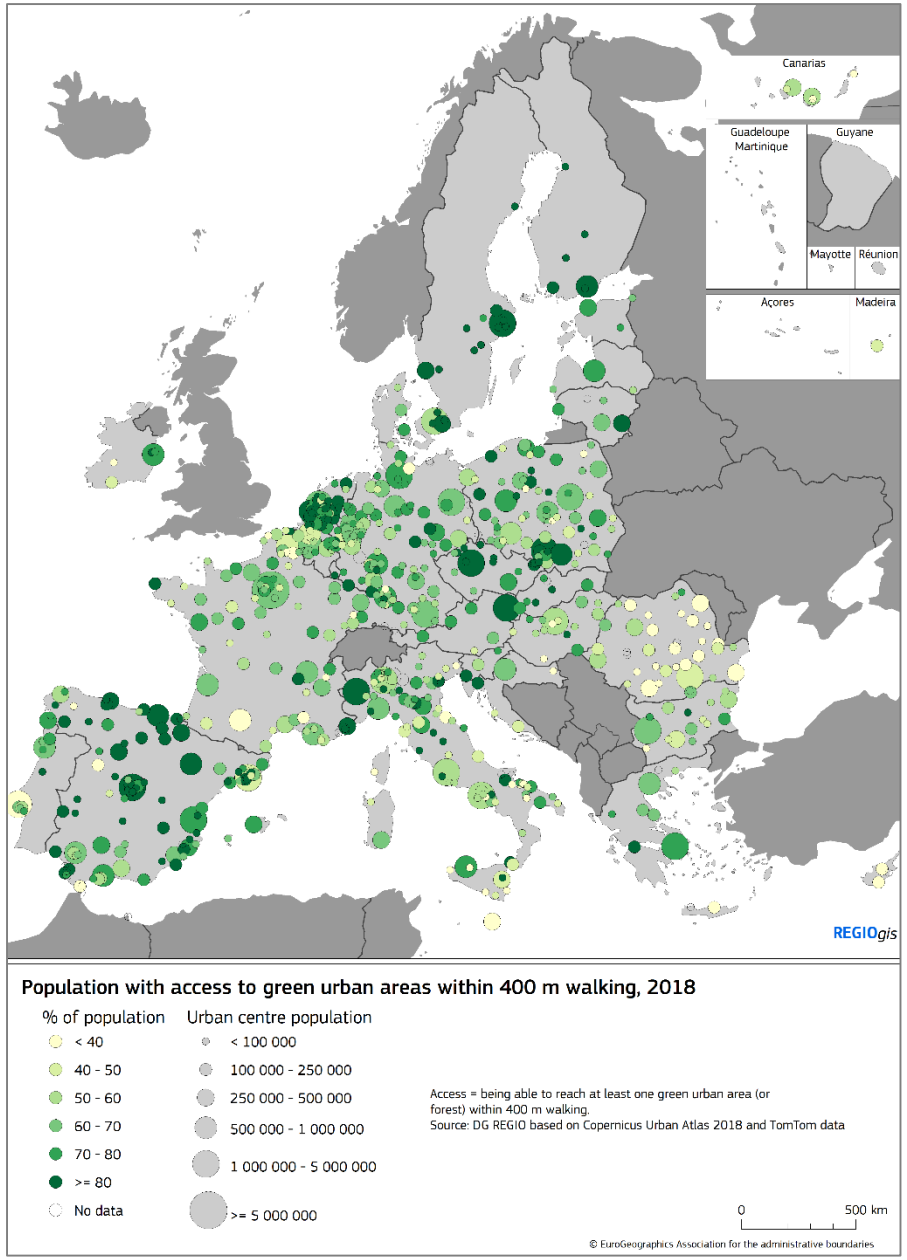
Which **indicators**?

Measurable indicators and **evaluation tools** are valid ingredients when it comes to monitoring progress, enhancing the knowledge base of a specific urban context, and the assessment of future scenarios.

Indicators are also useful instruments to **support the decision-making phase** when it is necessary to compare and select different adaptation options.



SDG 11 includes targets and indicators related to urban planning, green spaces, and disaster risk management.

Population with access to green urban areas within 400 m walking.
Source: Poelman, 2018

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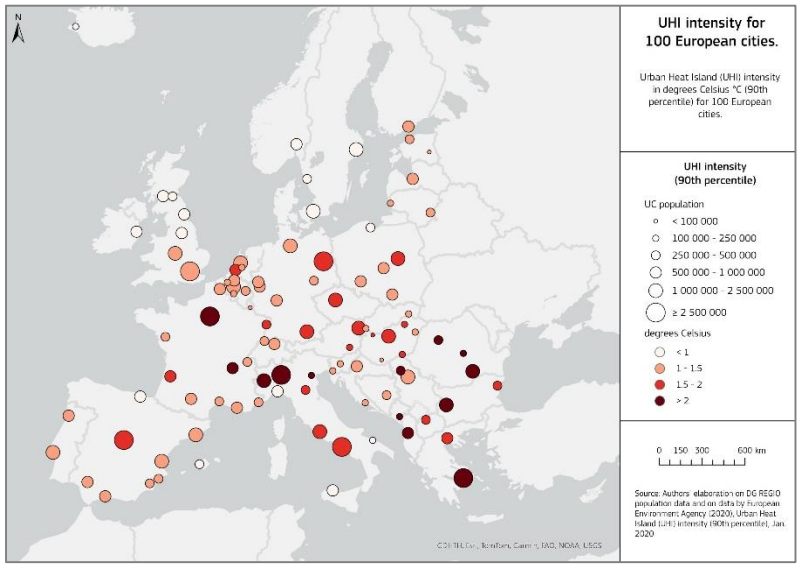
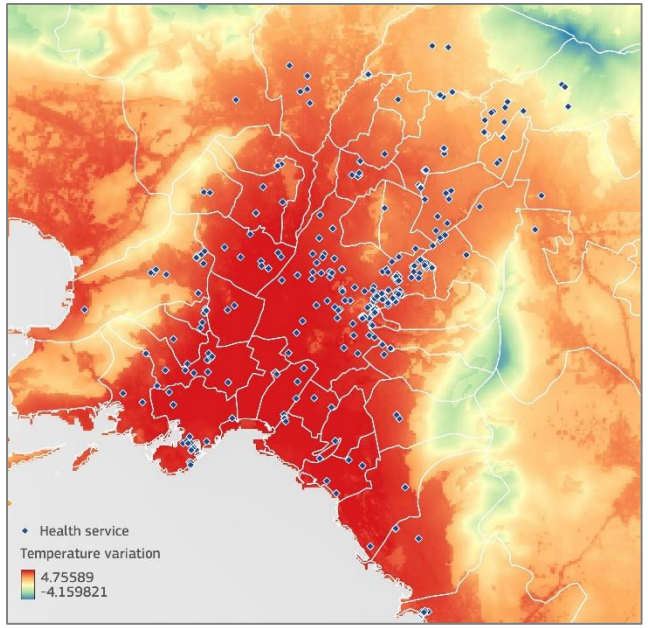
Which indicators?

Measurable indicators and **evaluation tools** are valid ingredients when it comes to monitoring progress, enhancing the knowledge base of a specific urban context, and the assessment of future scenarios.





Urban Heat Island Intensity and hospitals, Athens (EL)

- **Spatial indicators** through the use of maps.
- More layers in one single map at **different granularities.**
- Granular visualisations to uncover **hidden dynamics**.

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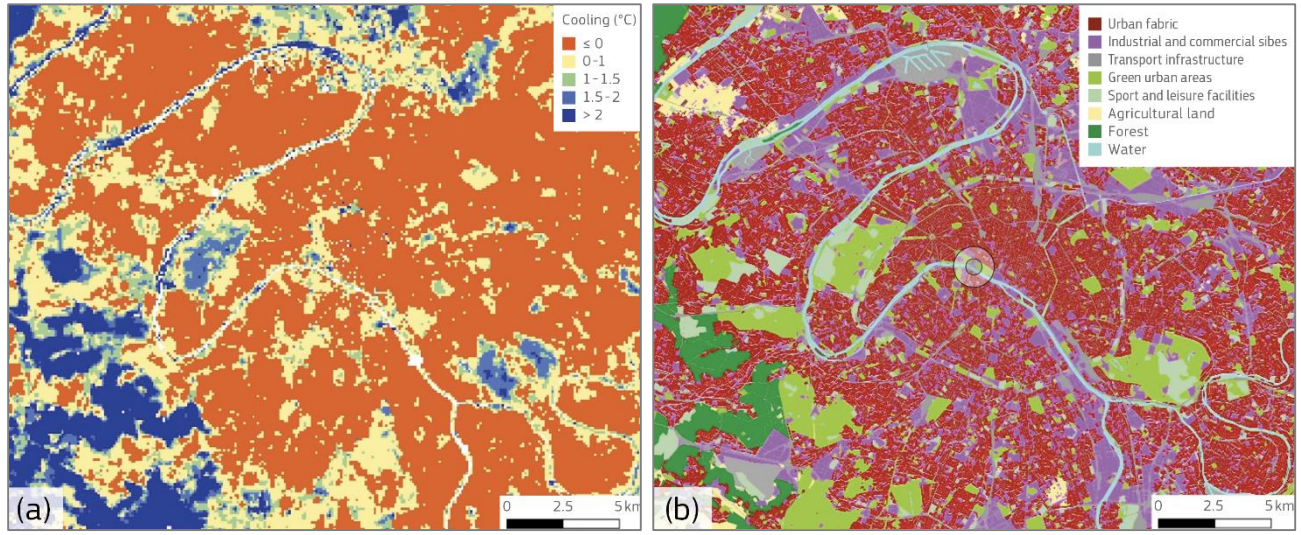
Which measurements?

Given the capacity of trees to cool the air, the **deployment of green spaces** in cities is regarded as one of the most effective measures to counteract the UHI effect

In a study carried out in more than 600 European cities, **the role of urban green spaces in reducing air temperature** was analysed.



Close up of the cooling effect (a) and main land cover classes (b) in the city of Paris. Sources: Marando et al. (2022) (a), Urban Atlas (b)

- Urban trees reduce the air temperature by **0.8 °C on average**, with **peaks up to 7°C**.
- Areas where the cooling effect is more pronounced are those **where large parks are situated**.

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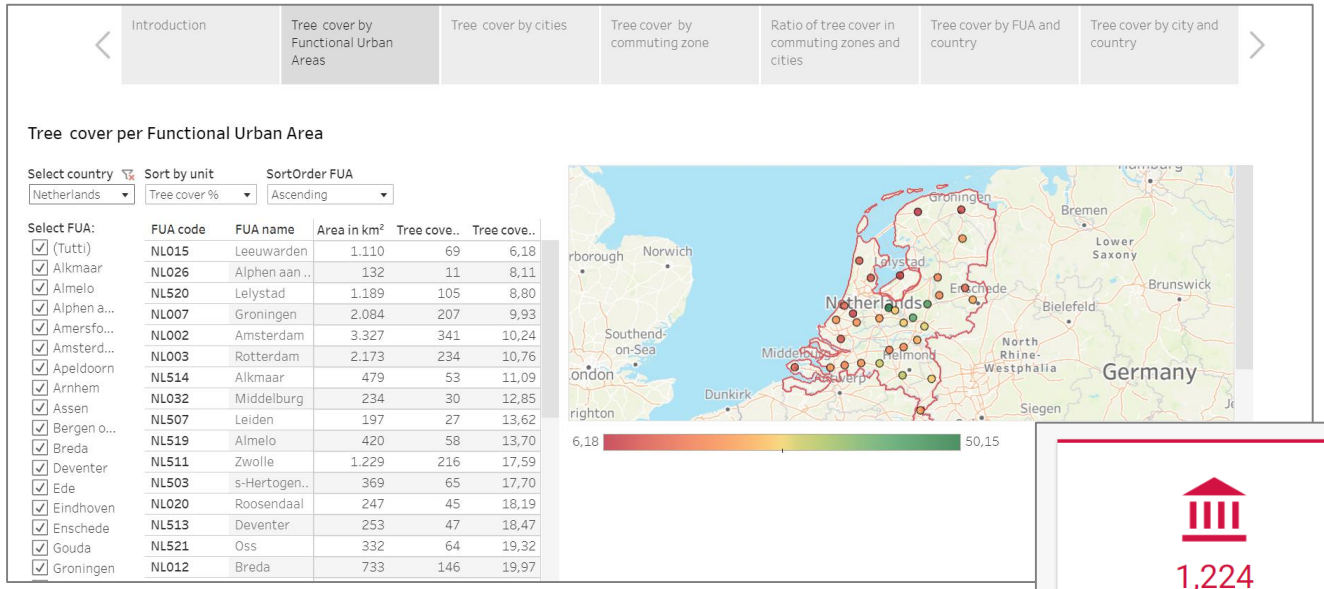
Which tools?

EEA – Urban tree cover

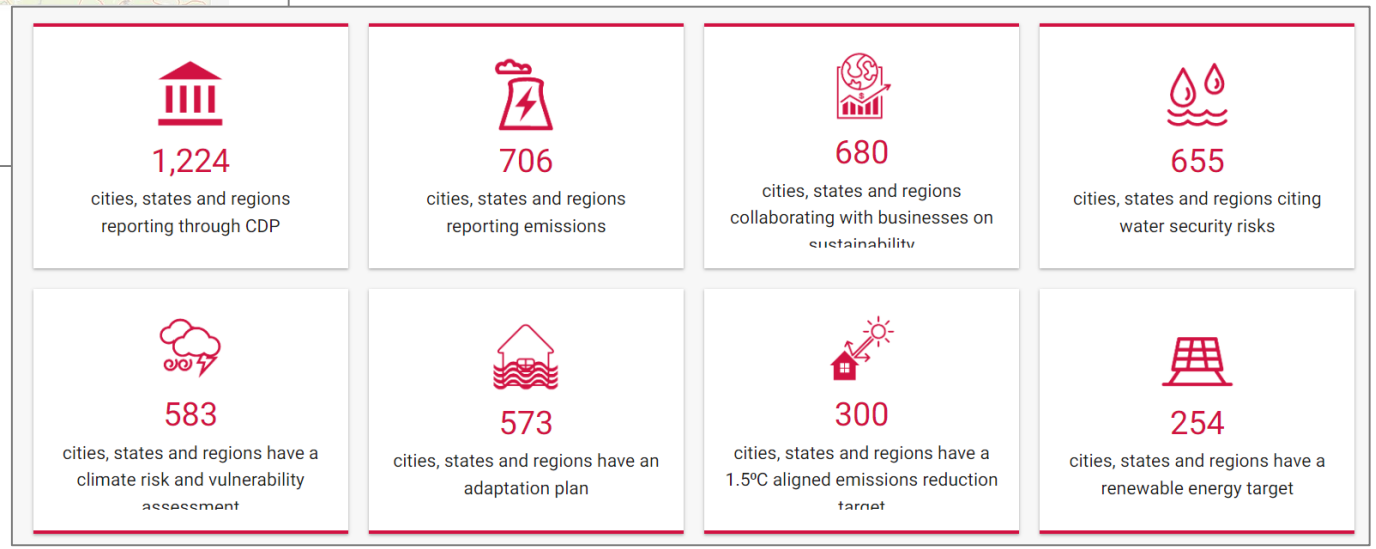


The European Environment Agency (EEA) monitors **tree cover** and **urban green spaces**.

Cities can report on adaptation and mitigation measures results through the **ICLEI/CDP Track** and **MyCovenant**.

The **consultation of dedicated dashboards** for the monitoring of climate-related achievements.

CDP Cities, States and Regions Open Data Portal



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The way forward:

How to let cities remain livable and sustainable while becoming more resilient and fit for climate-related events

Heat extremes and the consequent UHI phenomenon will persist and as predicted by climate models, are even expected to worsen in the future.

- Need for equity-oriented policies
- Integrate in the urban policy agenda diversified and place-based solutions
- Exploit the already available knowledge, tools, and measurement techniques
- Adopt an integrated perspective and formulate science-based policies sensitive to the spatial dimension

Look granularly at the urban scale with finer data, without losing touch with the European-wide perspective

Adopt common strategies and mutual learning practices between urban areas with similar characteristics

Keep in touch

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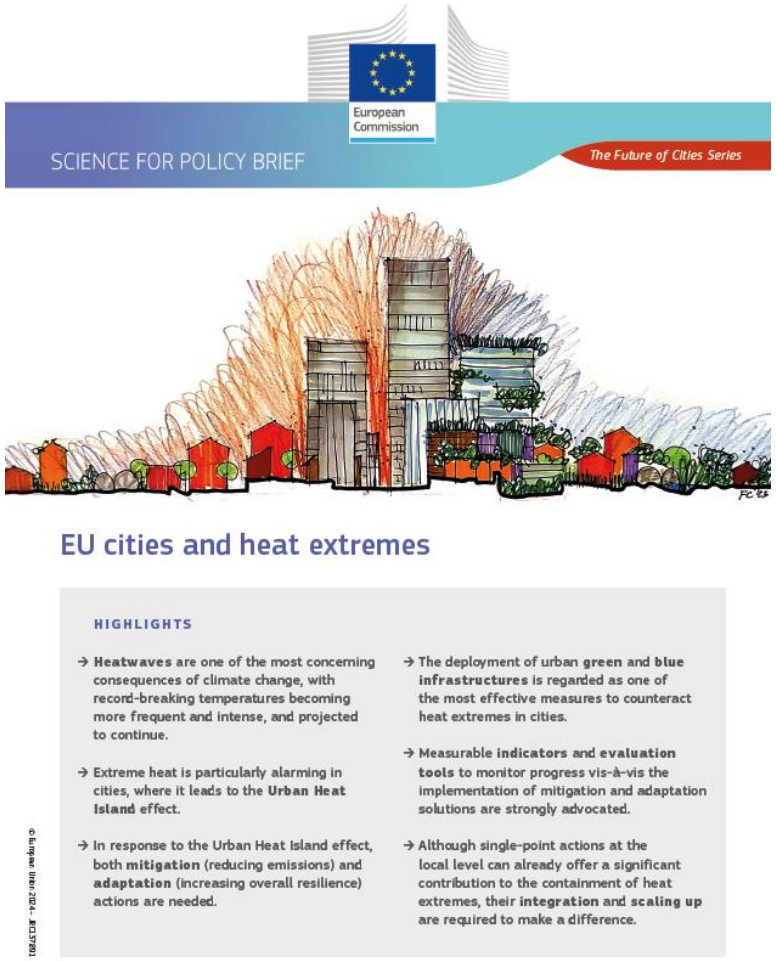

Iodice, S., Arbau, L.C., Maistrali, A., Marando, F., Melchiorri M., Proietti, P., Sulis, P., Tainguy, O., Vandecasteele, I., EU cities and heat extremes, European Commission, Ispra, 2024, JRC137891.

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Thank you

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