Cooling cities

Eugenio Morello
Laboratorio di Simulazione Urbana Fausto Curti
Dept. of Architecture and Urban Studies
(DAStU) Politecnico di Milano

Need for new

socio-ecologic
&
socio-economic

models
for urban transition

ECOLOGICAL TRANSITION AS A COMMUNITY CHALLENGE

INNOVATIVE ECO-SYSTEMS ARE POSSIBLE IF THE PUBLIC LEADERSHIP IS STRONG

INTEGRATION OF MITIGATION & ADAPTATION STRATEGIES: ENERGY & CLIMATE PERFORMANCE ARE STRONGLY CONNECTED

SPACE MATTERS AND URBAN FORM IS A KEY COMPONENT OF THE TRANSITION

Policy integration to contrast climate change

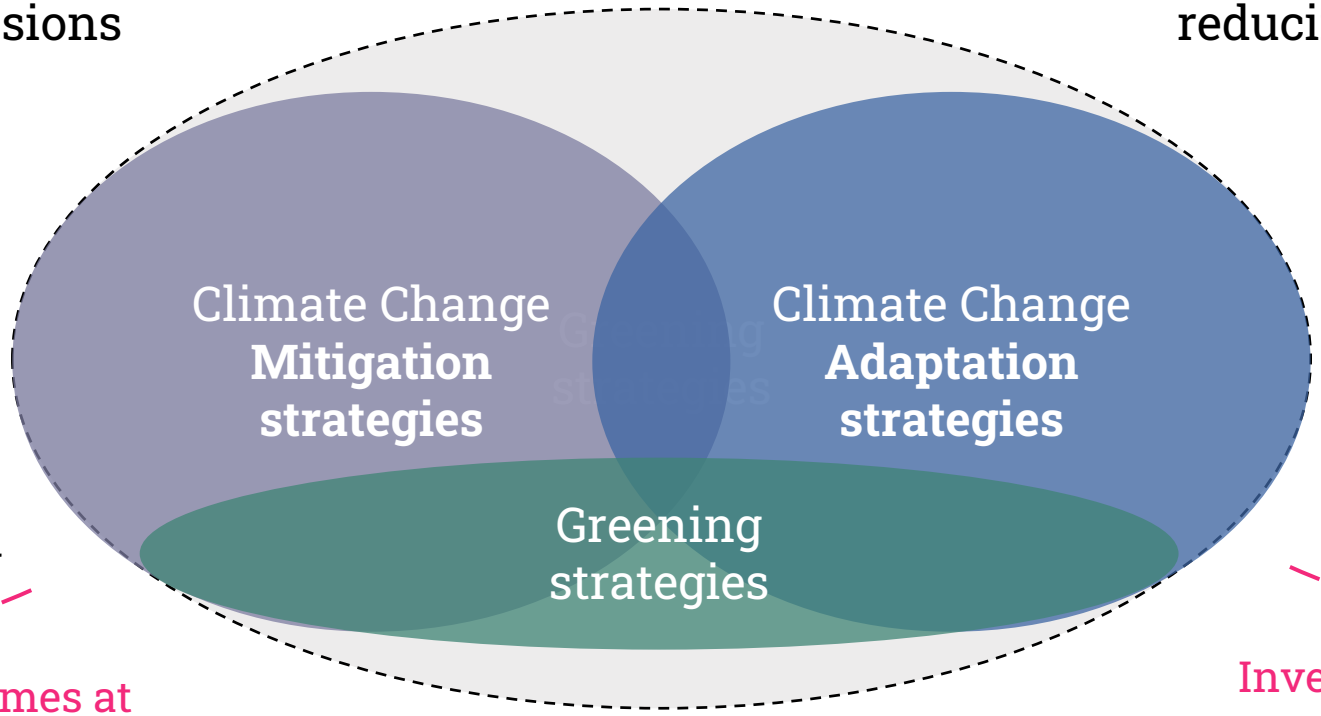
Acting on the causes of climate change, limiting GHG emissions

Reducing energy demand

Improving Energy efficiency

Producing Renewable Energy

Consolidated financial schemes at the individual building level, lack of larger scale business models



Afforestation

Diffusing NBS

Growing investments (PES, CSR, ESG)

Adjusting to the impacts of climate change, reducing the vulnerability of communities and ecosystems

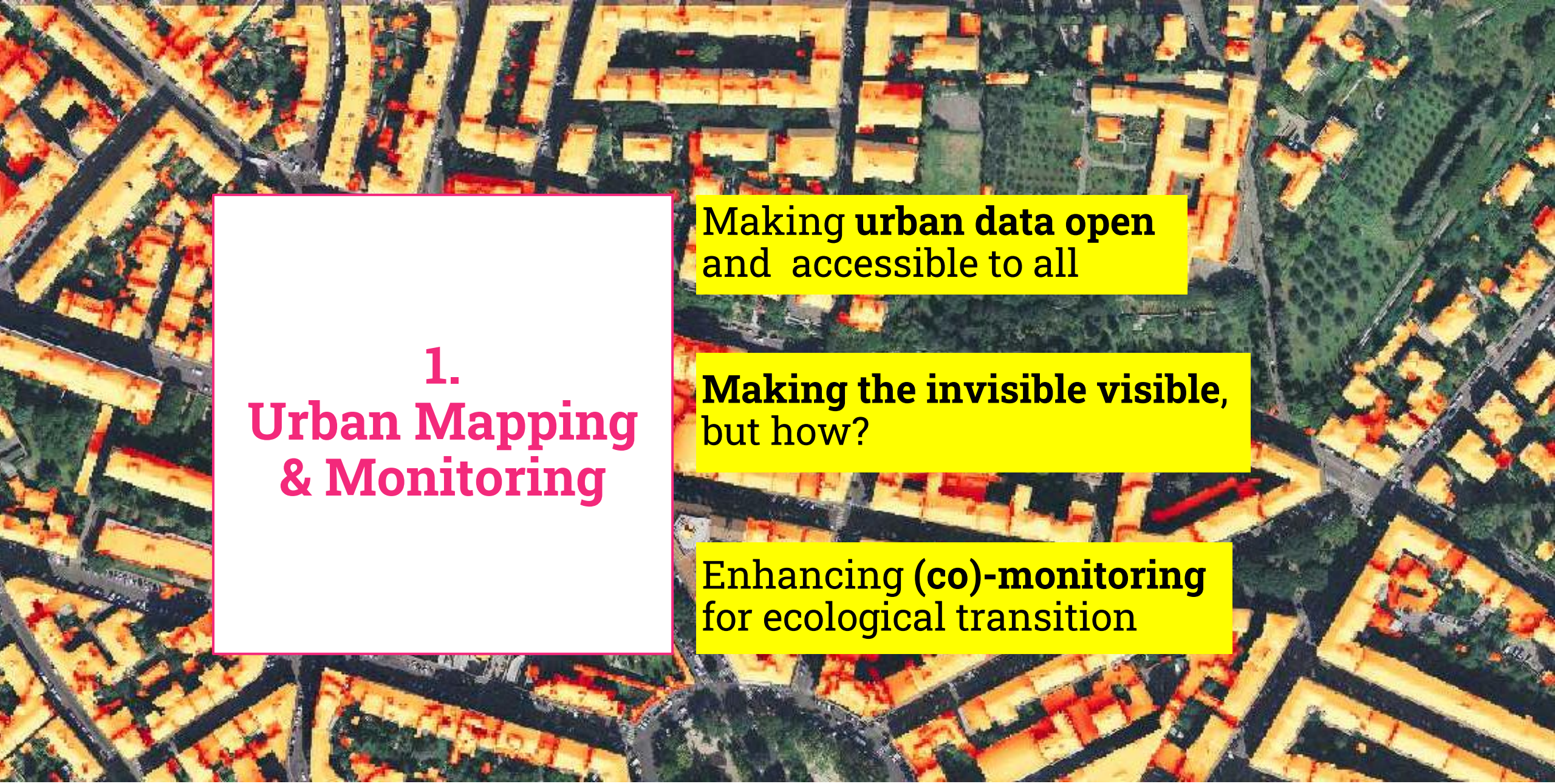
Diffusing adaptation measures (green, blue, gray and blue solutions)

Investing in adapation is critical, difficult to demonstrate investments return

Investigation lenses

1.
Urban Mapping & Monitoring

2.
Transition as a Community Challenge



1.
Urban Mapping & Monitoring

Making **urban data open** and accessible to all

Making the invisible visible, but how?

Enhancing **(co)-monitoring** for ecological transition

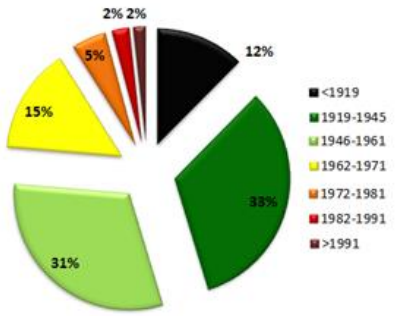
Deep retrofitting Europe: Milan case study

The average requirement of primary thermal energy for heating is **258 kWh/m²/year**

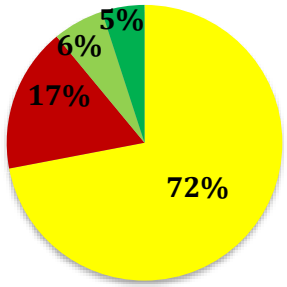
Very high consumption: **92% of the buildings is estimated to be in the worst class of CENED classification** ('G' class) – as of 2015

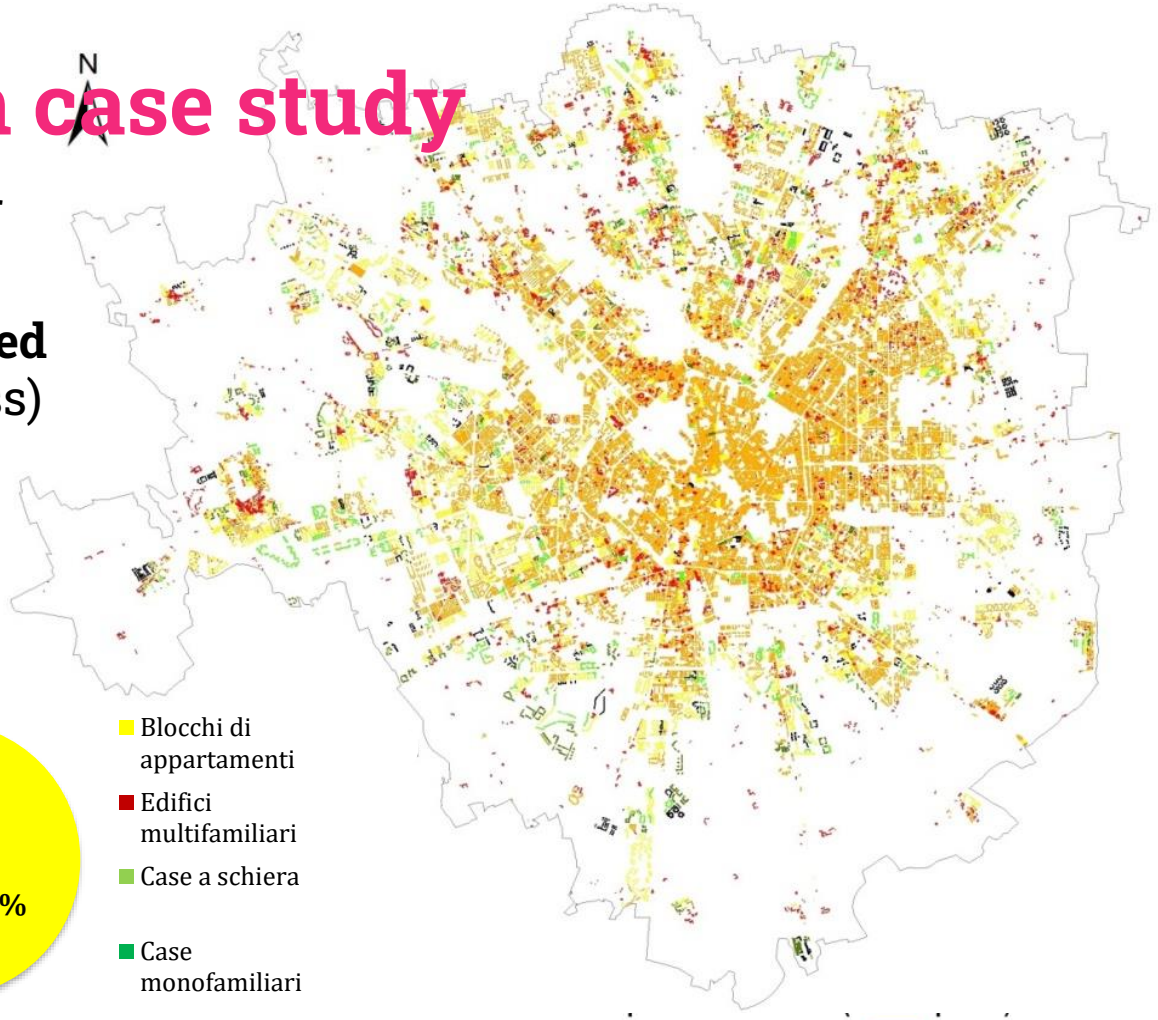
Why ?

Obsolescence of Milan buildings (about 90% of buildings <1971, only 4% >1981)



While from the **building typology** side, Milan is mainly characterized by the **most efficient one** (72% apartment blocks)





Census sections classified by mean primary energy demand (kWh/m2/yr)

57,5 - 87 (Classe C)
87 - 116 (Classe D)
116 - 145 (Classe E)
145 - 175 (Classe F)
175 - 230 (Classe G)
230 - 280 (Classe G-)
280 - 496 (Classe G--)
No Census Data
No Res Buildings

A COLLABORATIVE EFFORT IS REQUIRED, AND A STRONG PUBLIC COMMITMENT IS ESSENTIAL

Deep Energy Retrofit as an «urban metabolism» challenge

- Urban deep energy retrofitting (DER) in the next decades will generate **large amounts of construction materials / waste**
- To reduce the entropy of DER, a **new infrastructure for the management of construction materials** (organizing the logistics of stocks - **urban mining**) is needed.
- New business opportunities
- Strong coordination by local authorities

Picture by E. Labrozzi & S. Puleio

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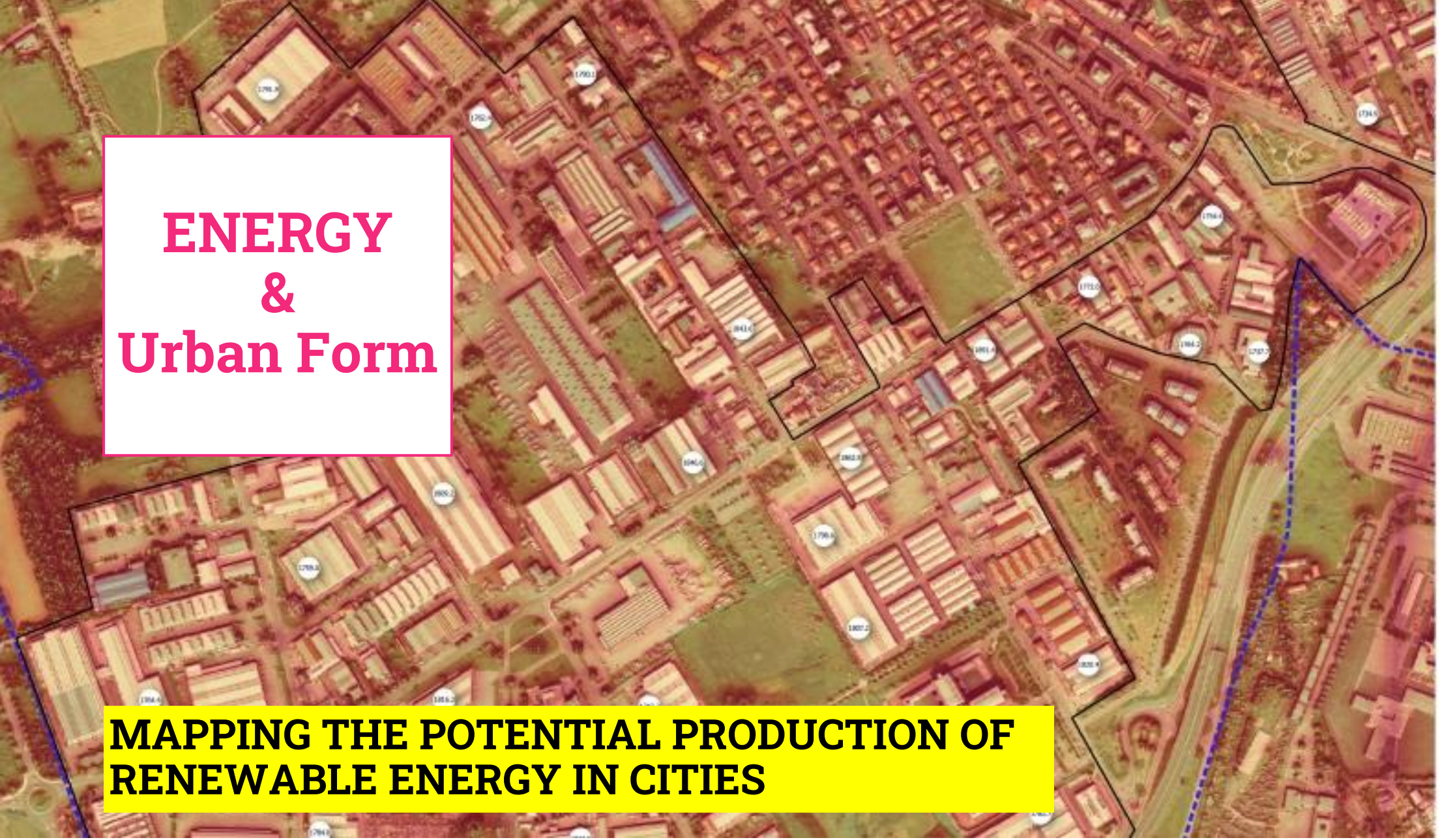
ENERGY & Urban Form



MAPPING THE POTENTIAL PRODUCTION OF RENEWABLE ENERGY IN CITIES

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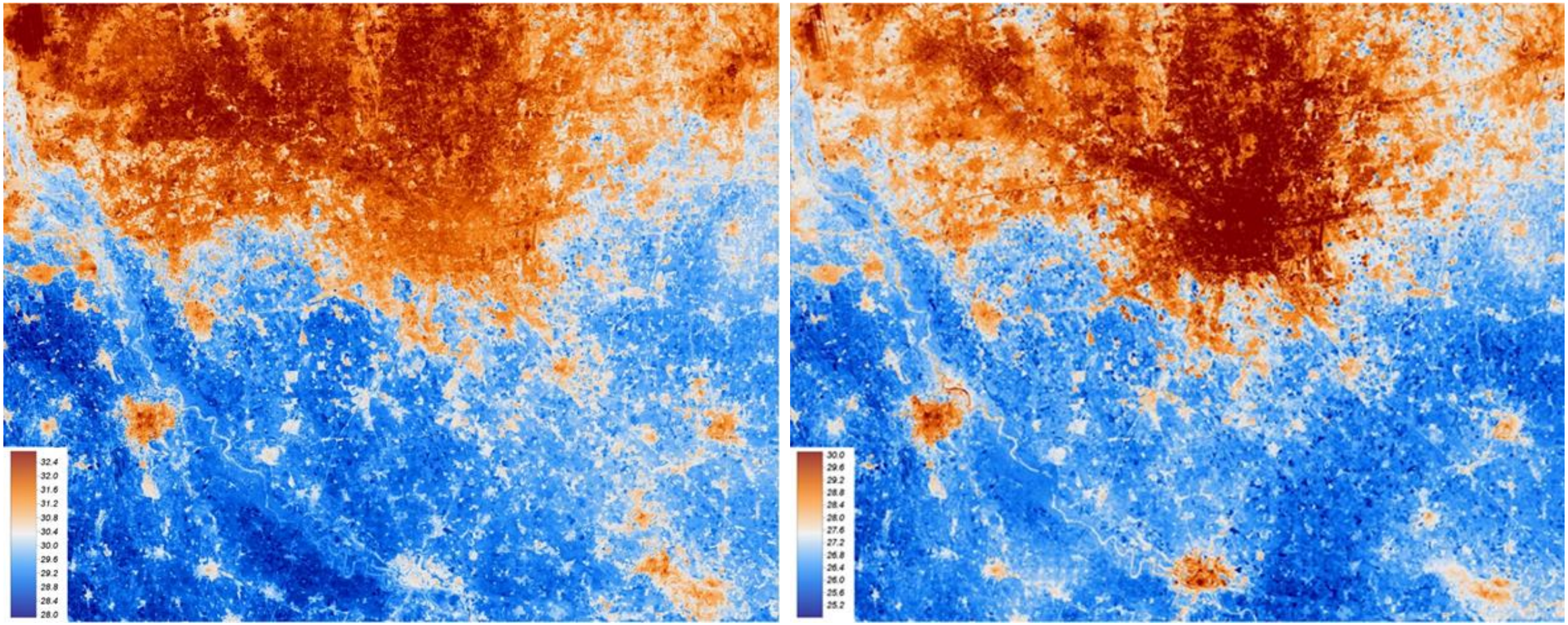
Making the invisible visible: mapping the heat island



Near-Surface Air Temperature, Metropolitan City of Milan, Italy - Resolution 30 m - 04/08/2017, 10:10 (left) 22:10 (right)

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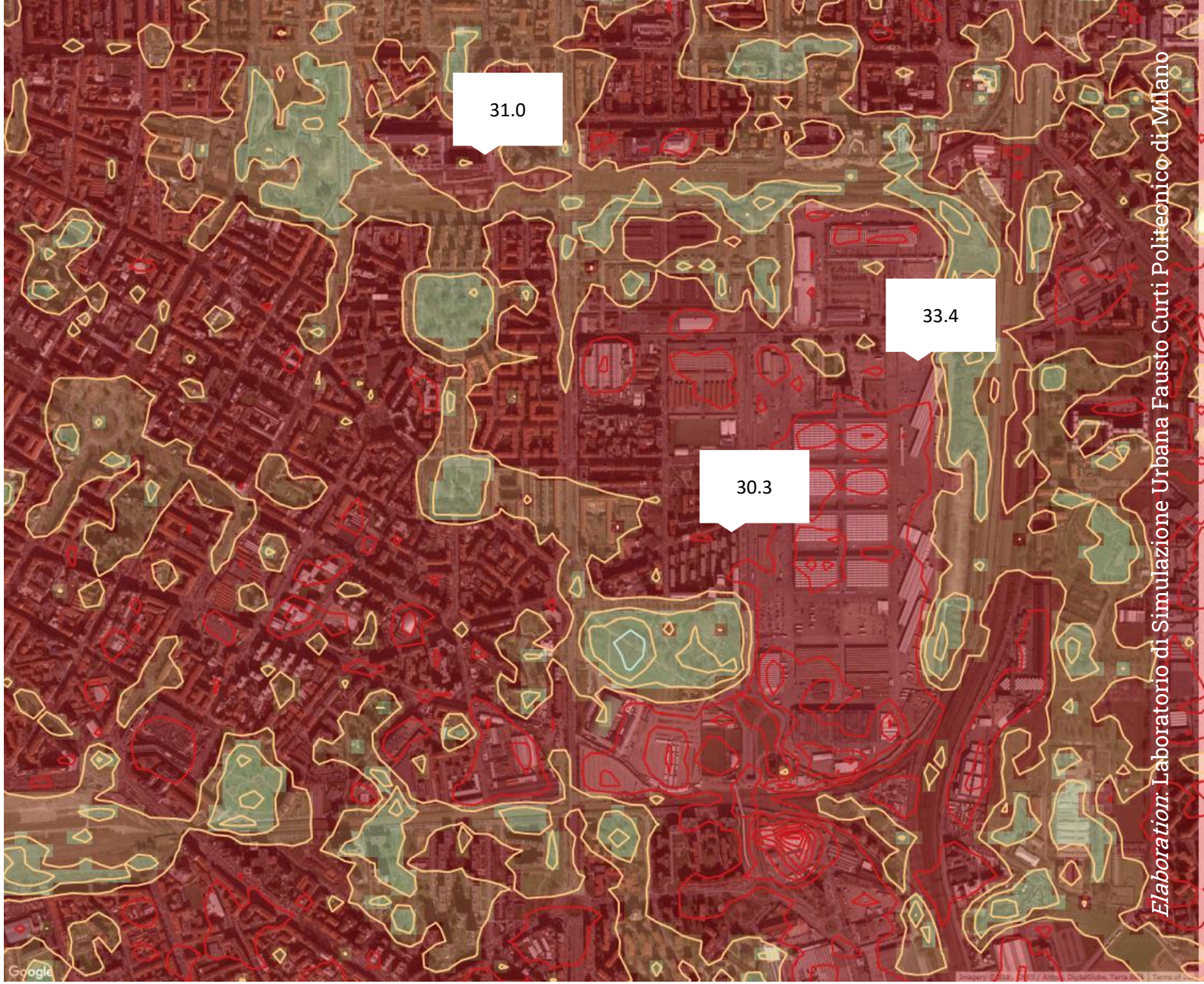
CLIMATE & Urban Form

Near-Surface Air Temperature, Metropolitan City of Milan, Italy - Resolution 30 m - 04/08/2017, 10:10 (left) 22:10 (right)



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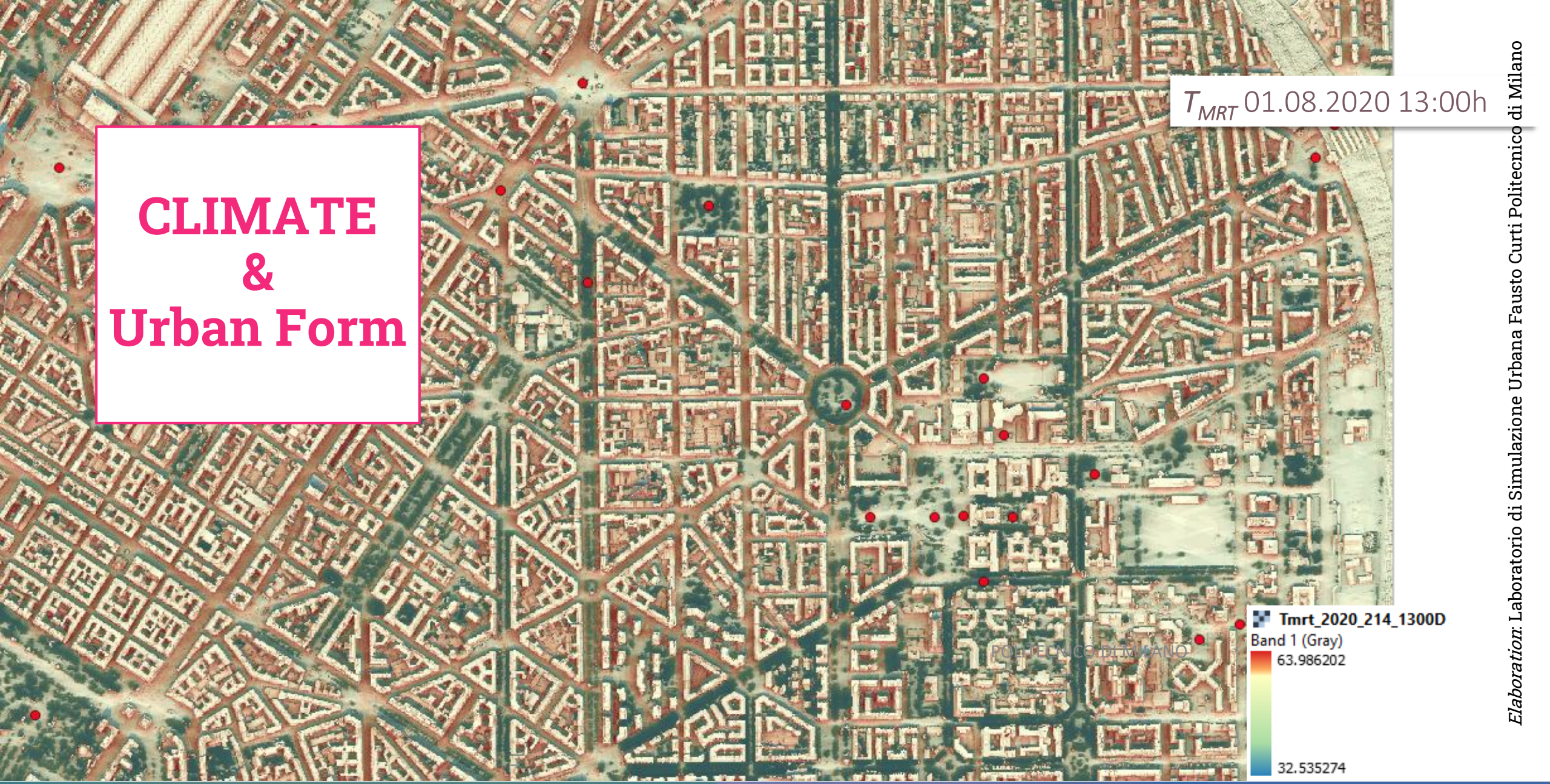
CLIMATE & Urban Form



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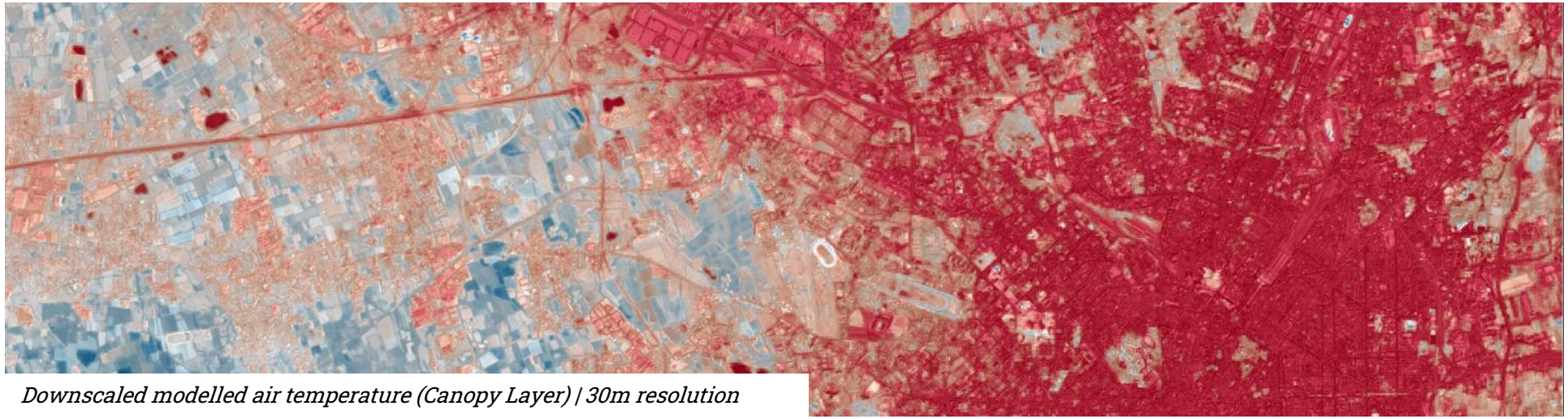
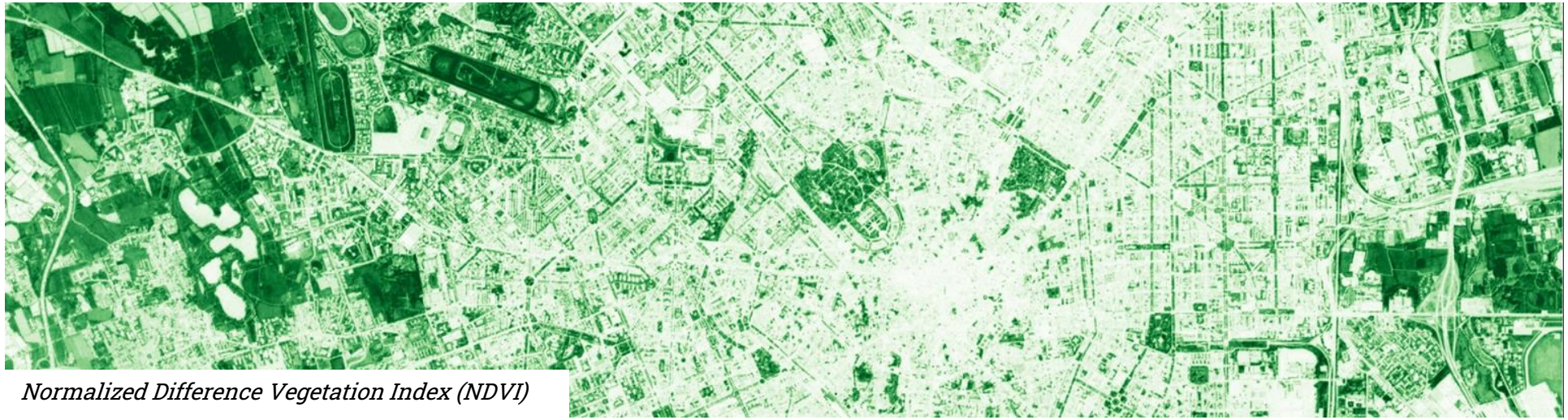
The crucial role of urban materials and vegetation



Downscaled modelled air temperature (Canopy Layer) | 30m resolution



Normalized Difference Vegetation Index (NDVI)

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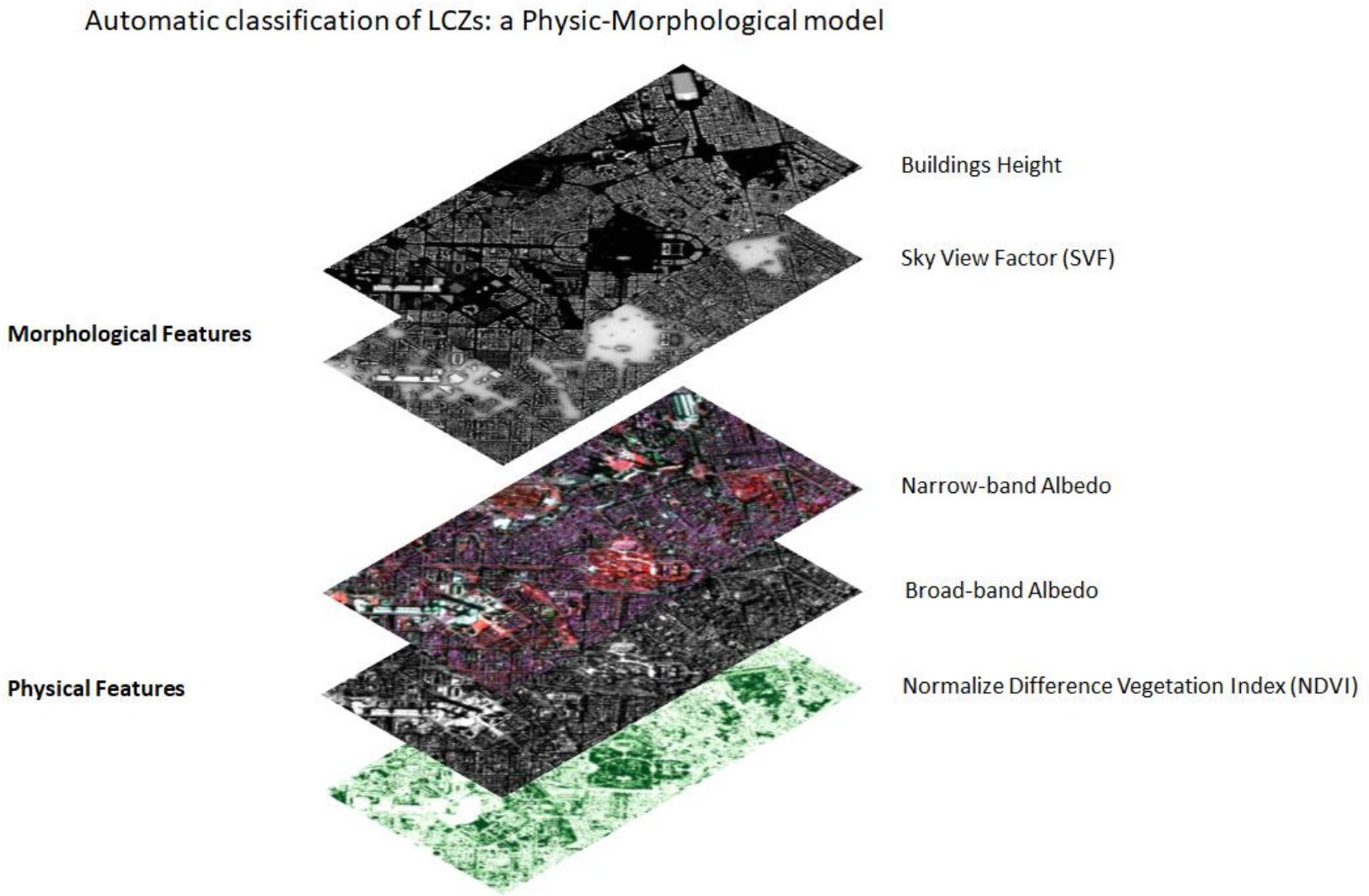
From gray to green, still a long way to go…

- Adaptation, mitigation measures
- Urban Greening and Nature-based Solutions (NBS)

Local Climate Zones (LCZ)

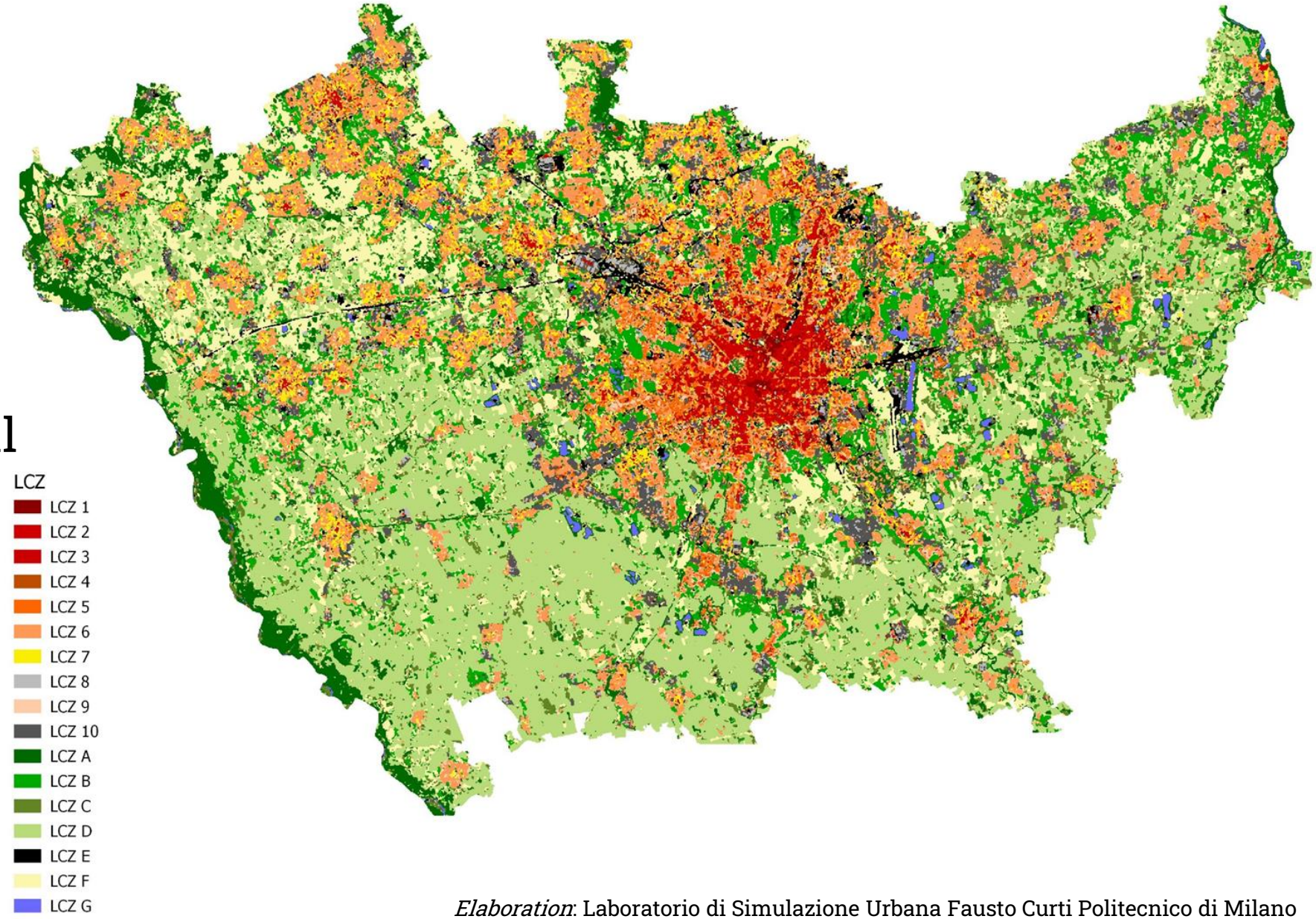
In order to assess the performance of cities against climate, the morphological (geometry) and physical (materials) aspects of the built environment need to be taken into consideration



Local Climate Zones (LCZ)

Physic-Morphological Classification:

- Narrow-band ALBEDO
- Broad-band ALBEDO
- NDVI
- Buildings Height
- Sky view Factor



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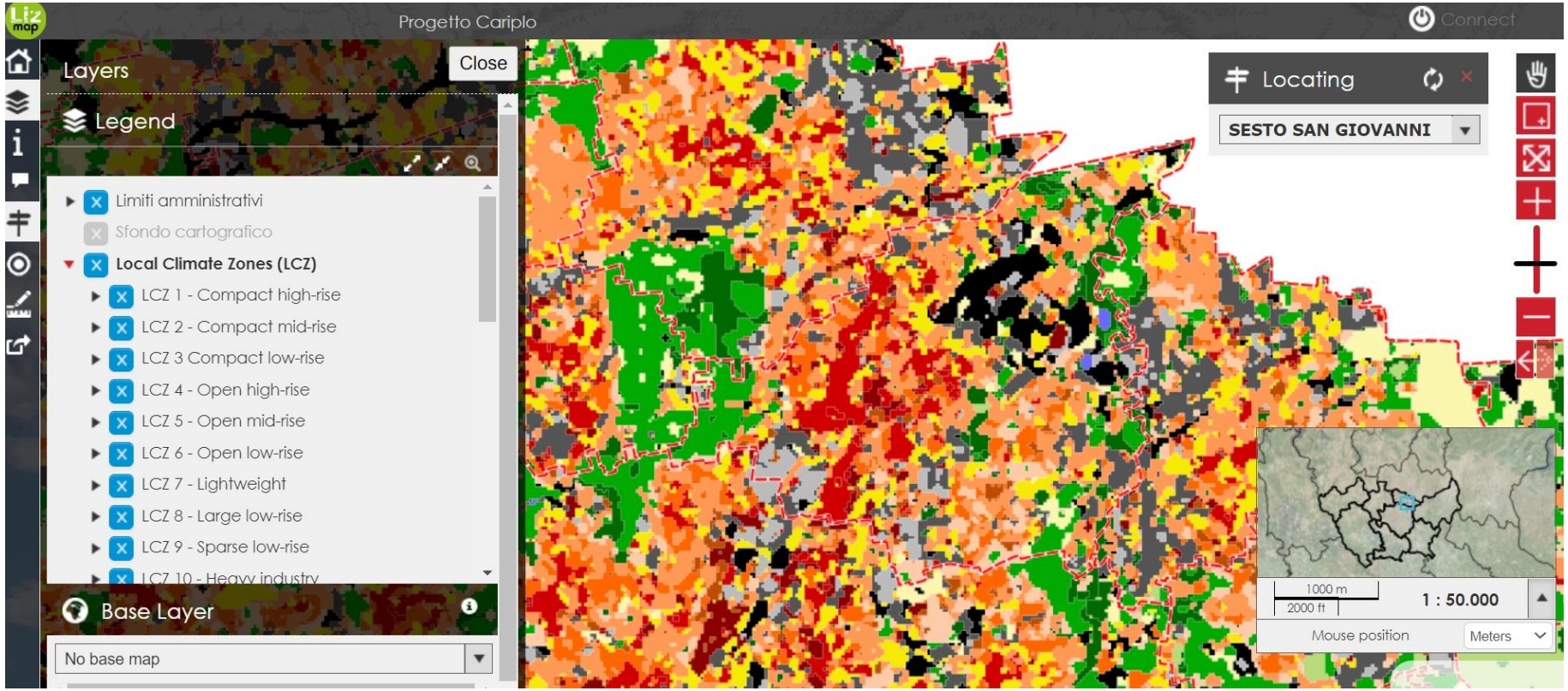
Climate planning with open platforms

LCZs in open platforms to support decision making and planning



https://www.cittametropolitana.mi.it/Territori_resilienti/TERRITORI/index.html

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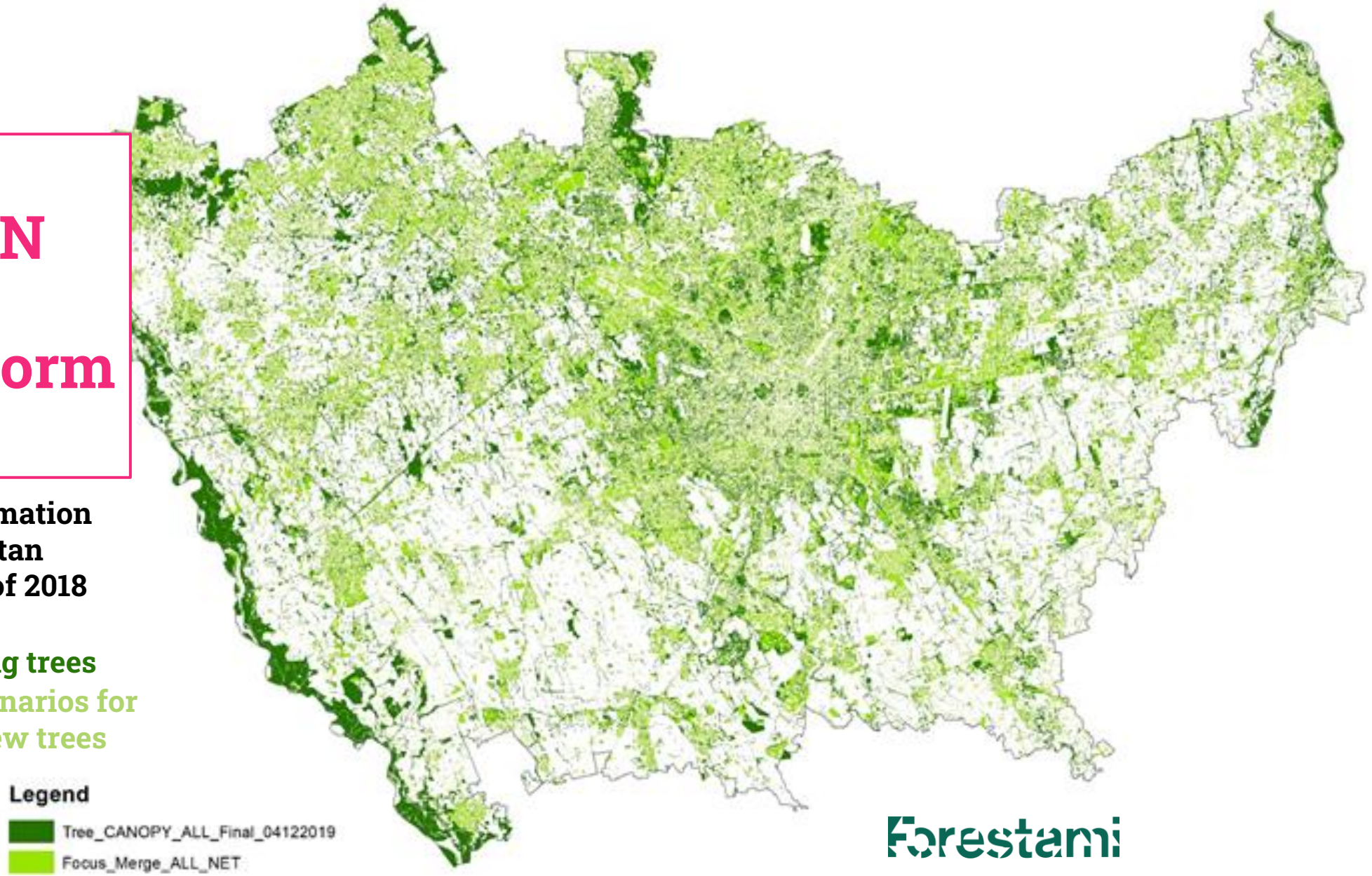
GREEN & Urban Form

Tree canopy estimation for the Metropolitan City of Milan as of 2018

ca. 10.041.000 estimated existing trees

Afforestation scenarios for ca. + 6.000.000 new trees



Forestami

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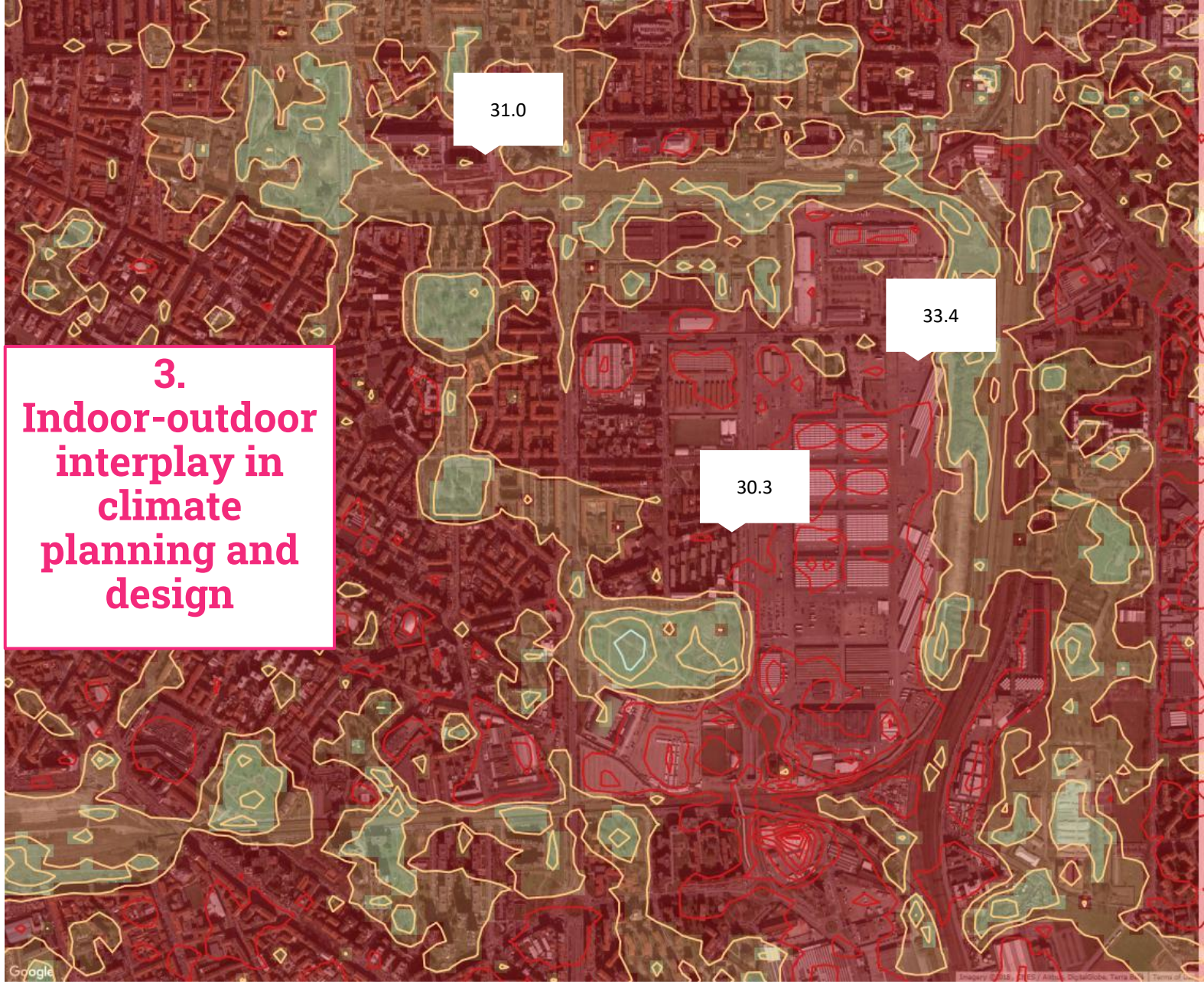
Challenges and open questions for research

1. Integrating Vegetation in Urban Design and Planning

2. The spatial dimension of ecological transition (space matters)

3. Indoor-outdoor interplay in climate planning and design



The relevance of Urban Form

Launching **Local Green Deals** to involve stakeholders according to the **quadruple helix** approach

EU Missions ask for **citizen engagement, co-creation processes**, and the establishment of **living labs** as local **innovation ecosystems.**

Promoting **shared governance** for a successful ecological transition

2. Transition as a Community Challenge

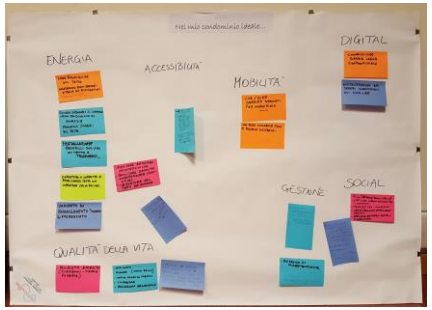
Collaborative decision-making, co-creation of solutions

Big responsibility when it comes to producing information for decision-making, especially if it involves a larger audience.

Decision support systems (DSS) are produced, often without much attention to the messages transferred to people.

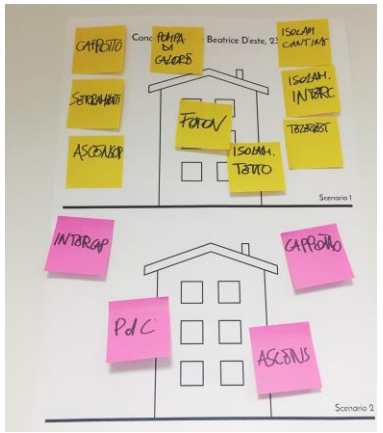
ENERGY & Co-creation

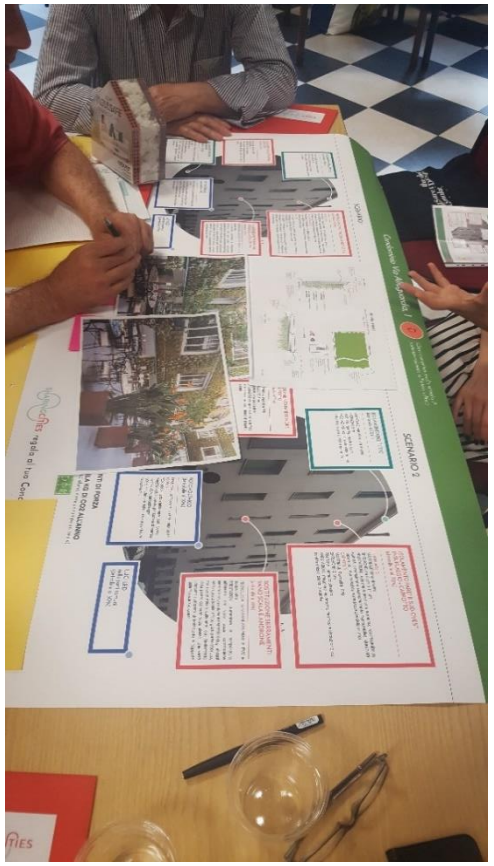
Workshop 1



Workshop 2

Workshop 3



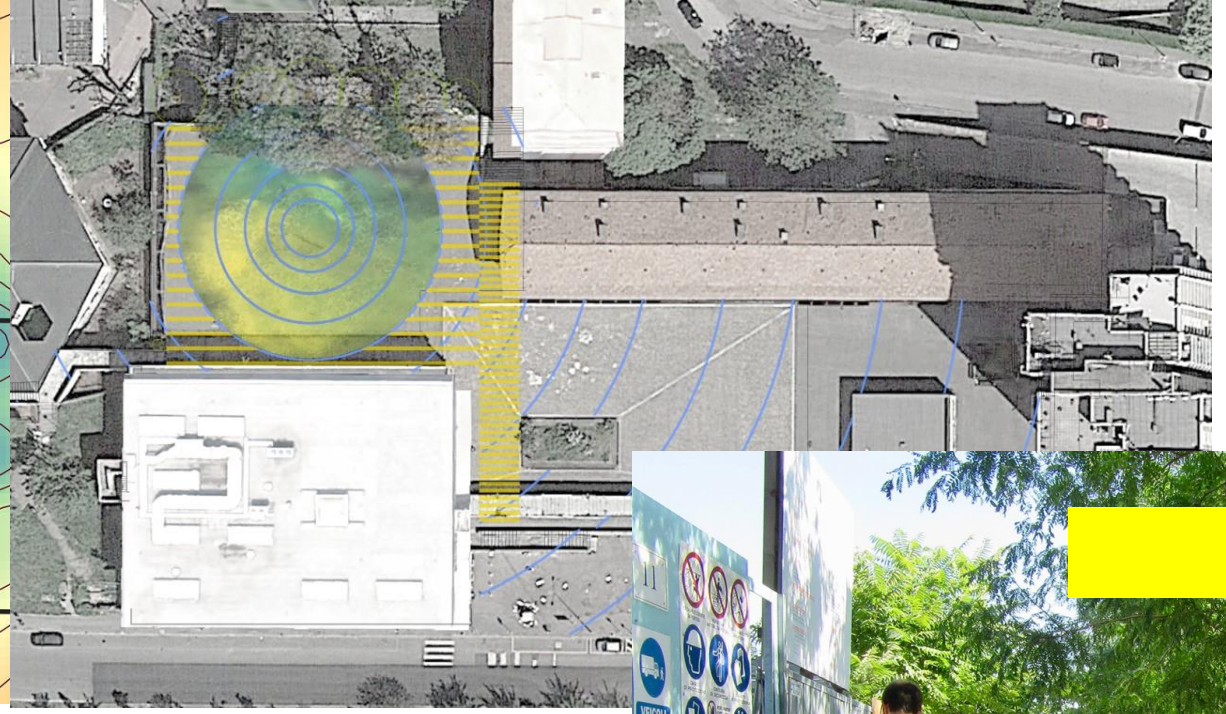


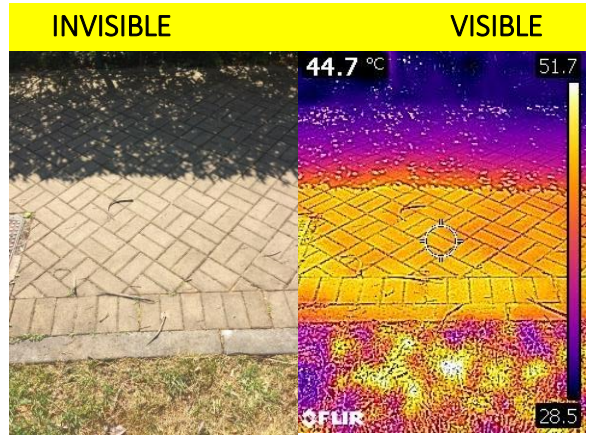
DEEP ENERGY RETROFITTING AS A COMMUNITY CHALLENGE

SHARINGCITIES

Sharing Cities
Building smart cities together

CLIMATE & Co-creation





CLIMATE WALK

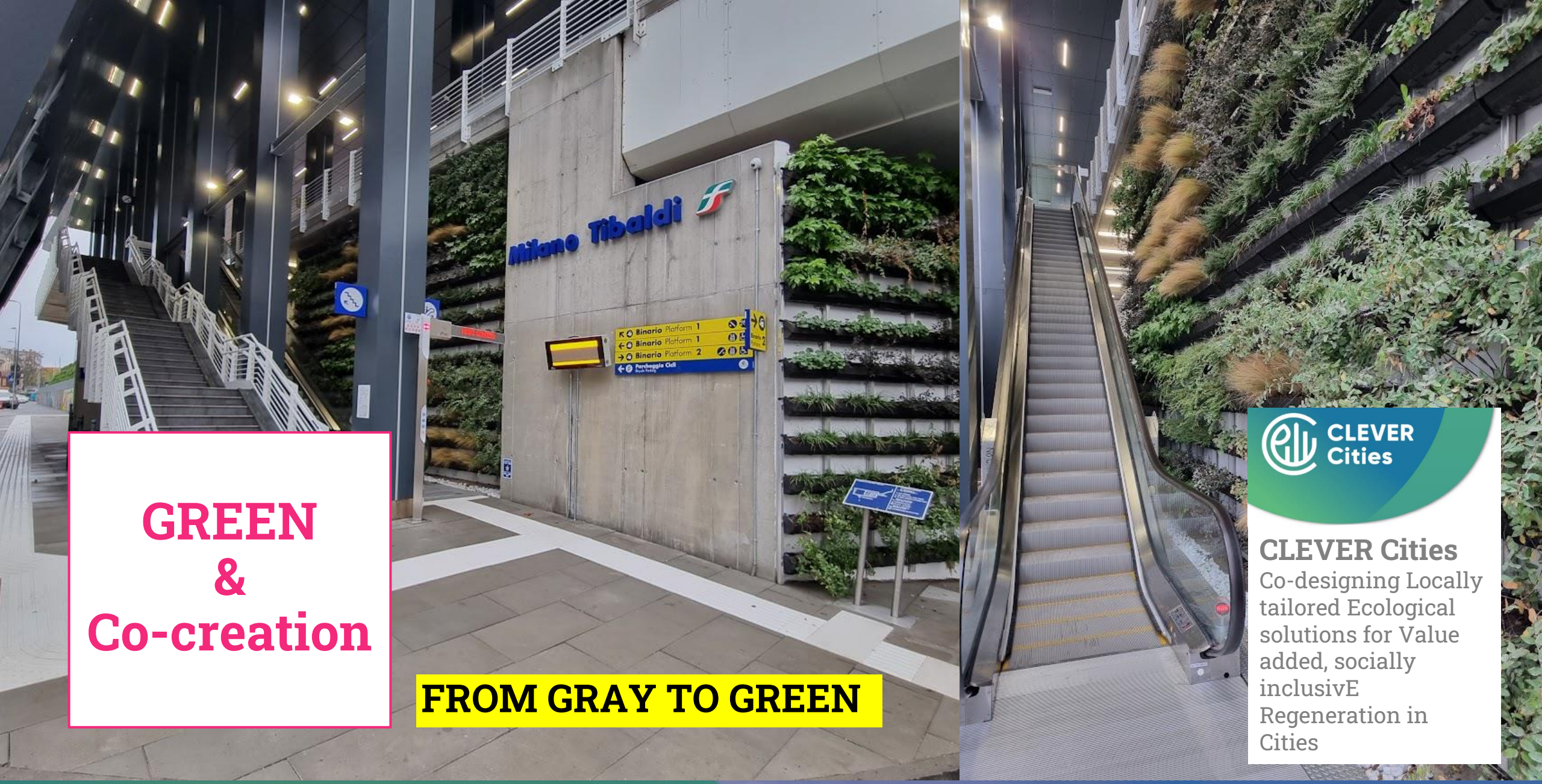
CLIMATE DESIGN

CLIMATE-AWARE TACTICAL URBANISM

EXPERIENCING CLIMATE CHANGE

ENERGY, CLIMATE & Co-creation

TOWARDS SUSTAINABLE AND PRO-ADAPTIVE INDUSTRIAL PRODUCTION AREAS



GREEN & Co-creation

FROM GRAY TO GREEN

CLEVER Cities

Co-designing Locally tailored Ecological solutions for Value added, socially inclusivE Regeneration in Cities

BUILDING CO-MONITORING COMMUNITIES

AIR & Co-creation

Air-Break

AIR-BREAK

Co-producing healthy clean commuting air spots in town

Thanks for your attention!

Eugenio Morello
eugenio.morello@polimi.it

Laboratorio di Simulazione Urbana Fausto Curti
Dipartimento di Architettura e Studi Urbani
www.labsimurb.polimi.it

Co-creation projects for addressing environmental challenges at Laboratorio di Simulazione Urbana Fausto Curti, Polimi

ENERGY & co-creation

Sharing Cities
Building smart cities together

GREEN & co-creation

CLEVER Cities
Co-designing Locally tailored Ecological solutions for Value added, socially inclusivE Regeneration in Cities

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AIR-BREAK
Co-producing healthy clean commuting air spots in town

CLIMATE & co-creation

AP+A
Aree Produttive, Aree Pro-Adattive

MultiCAST
Multiscale Thermal-related Urban Climate Analysis & Simulation Tool

WATER & co-creation

ASAP!
Acqua Sostenibile al Politecnico!

SOIL & co-creation

NATI0ONS
National engagement activities to support the launch of the Mission 'A Soil Deal for Europe' 100 Living Labs & Lighthouses