URBALYTICS

Remote Sensing tools for Urban Heat Island Assessment and Climate Change Adaptation through Nature-Based Solutions
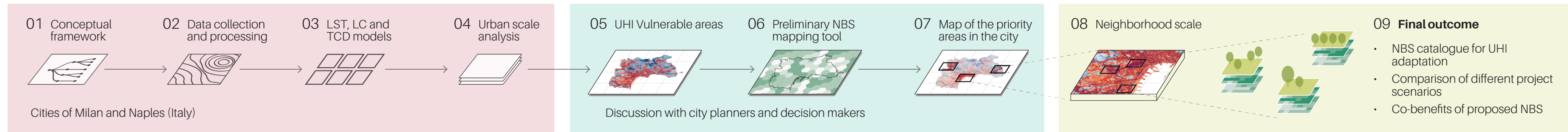
UrbAlytics is a sub-project of the H2020-funded project AI-4Copernicus that aims to bridge Artificial Intelligence with Earth Observations, producing information layers that can support city planners and decision-makers in the context of climate resilience and related challenges in urban areas. This research investigates, thanks to the joint expertise of Latitudo 40 and LAND Research Lab®, the Urban Heat Island (UHI) effect evaluating its impacts on cities, assessing Ecosystem Services provided by Blue and Green Infrastructures and proposing a set of NBS for climate adaptation and extreme heat mitigation.

01 Conceptual framework → **02** Data collection and processing → **03** LST, LC and TCD models → **04** Urban scale analysis

Cities of Milan and Naples (Italy)

05 UHI Vulnerable areas → **06** Preliminary NBS mapping tool → **07** Map of the priority areas in the city

Discussion with city planners and decision makers

08 Neighborhood scale

09 Final outcome
- NBS catalogue for UHI adaptation
- Comparison of different project scenarios
- Co-benefits of proposed NBS

01 / Heatwave Potential Risk Index

Hazard
SUHI 2018-2022 (summer average)

+

Exposure
Population density and age groups

+

Vulnerability
Sealed Surfaces
Building Density
Sky View Factor
Shadow Depth

R = H x E x V

To evaluate the potential Risk, the parameters emphasizing the UHI effect have been taken into account, divided in Hazard, Exposure and Vulnerability.

Milan case study

0 - low   Potential risk   1 - high

02 / Microclimatic Performance Index (MPI) of urban vegetation

Canopy
Tree Cover Density

+

Soil cover
Water
Grasses
Agricultural areas
Bare soil
Sealed surfaces

For each Green and Blue Infrastructure class, a microclimatic performance score was attributed based on evapotranspiration potential, shading and albedo.

0 - low   Microclimatic performance   1 - high

03 / Park Cool Islands (PCI) assessment

Major PCI
Size > 2ha
Tree canopy > 50%
300m Cooling distance

+

Minor PCI
Size > 1ha
Tree canopy < 50%
100m Cooling distance

PCI identify the most performing areas, providing public health-related information for climate adaptation and emergency preparedness during extreme heatwaves.

low   Cooling potential   high   PCI
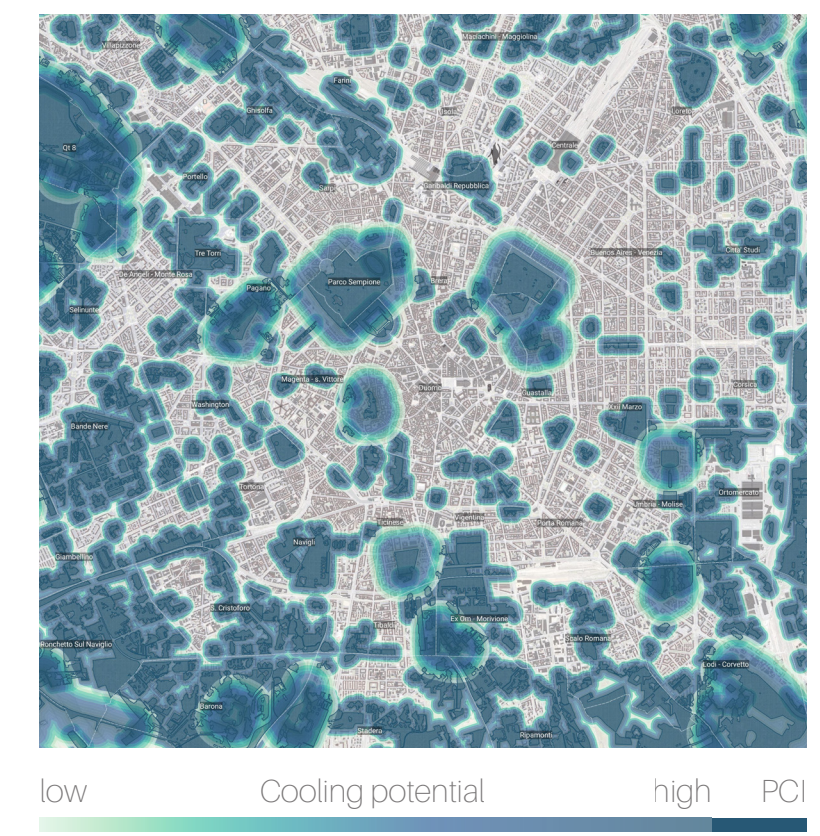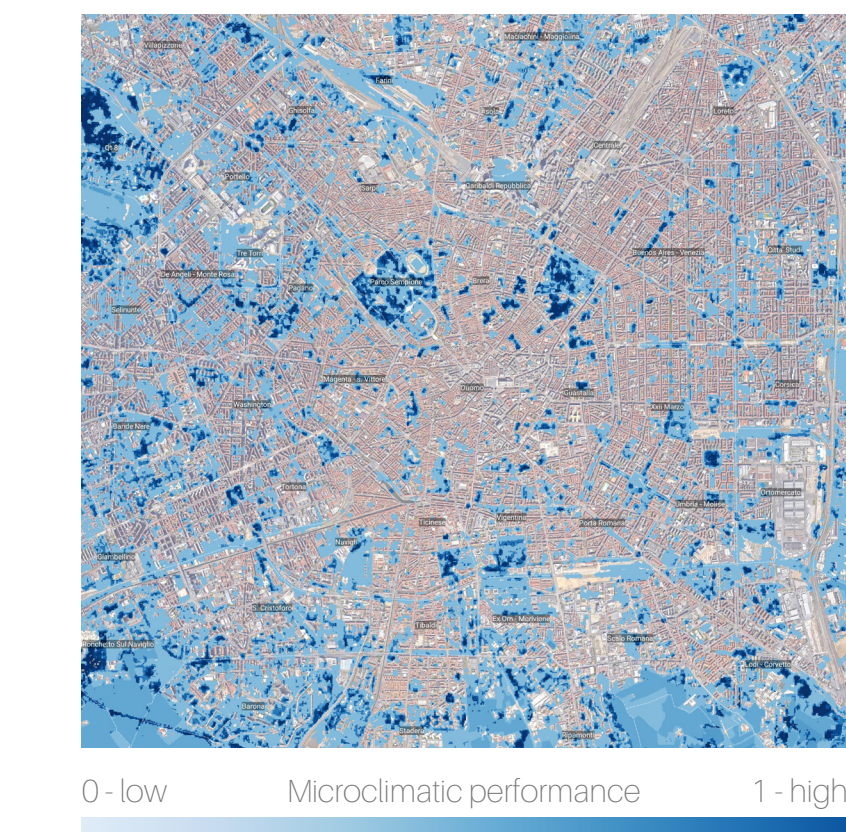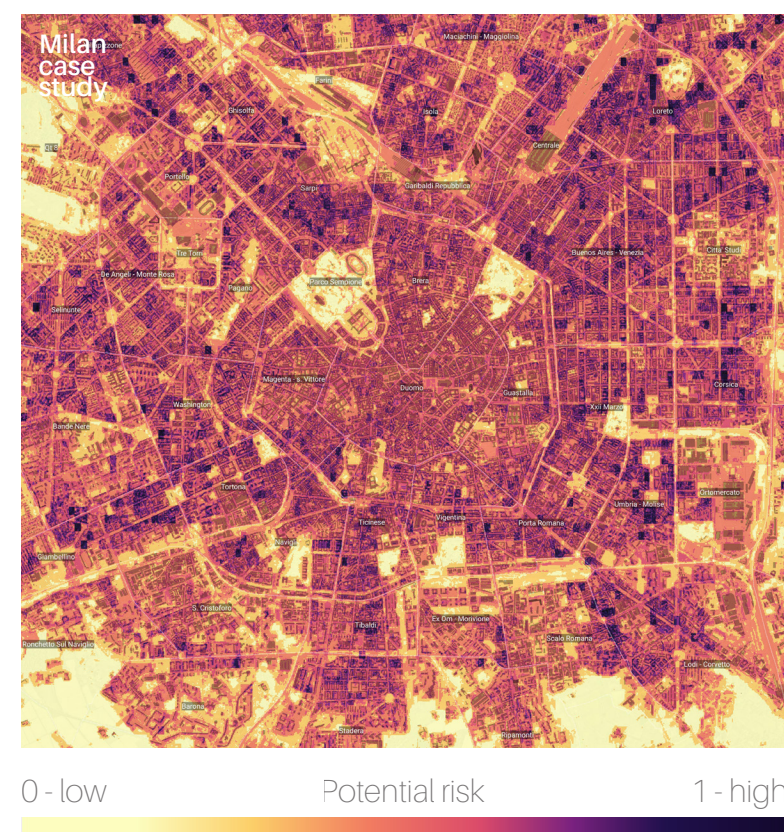
Case study: UHI Adaptation through NBS
De-paving scenarios in Neera Street, Milan

MPI at pilot case scale

In order to test the effectiveness of the adaptation measures, the MPI was then applied to the Neera street case study, constructing a series of possible design scenarios that could also represent a possible evolution of Neera street over time, through de-paving actions, removal of parking spaces and insertion of tree lines. The MPI is composed by the following coefficients:

Shading (%)

+

Evapotranspiration coefficient (kc)

+

Mean Albedo values

+

Blue-Green Factor (BGF)

2100
scenario 04
59,08 / 100
- Central green strip with big trees
- 100% pedestrian street and permeable materials

2050
scenario 03
31,99 / 100
- Remove 100% of parking lots and replace asphalt with green strips
- Permeable sidewalks

2030
scenario 02
15,79 / 100
- Remove 50% of parking lots and replace asphalt with green strips
- One way road

2025
scenario 01
12,83 / 100
- Use of cool pavement paint
- No changes in road section

2023
Current
4,08 / 100
- 98% asphalt and cars on the sidewalks
- Oversized road

0   Microclimatic Performance Index (MPI)   100

The figure shows the application of the MPI to different project scenarios, evaluating the average Microclimatic Performance of the entire project.

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