Implementation of a forecasting system for urban heat island effect for the development of urban adaptation strategies - LIFE ASTI

Bilbao, May 8 2019

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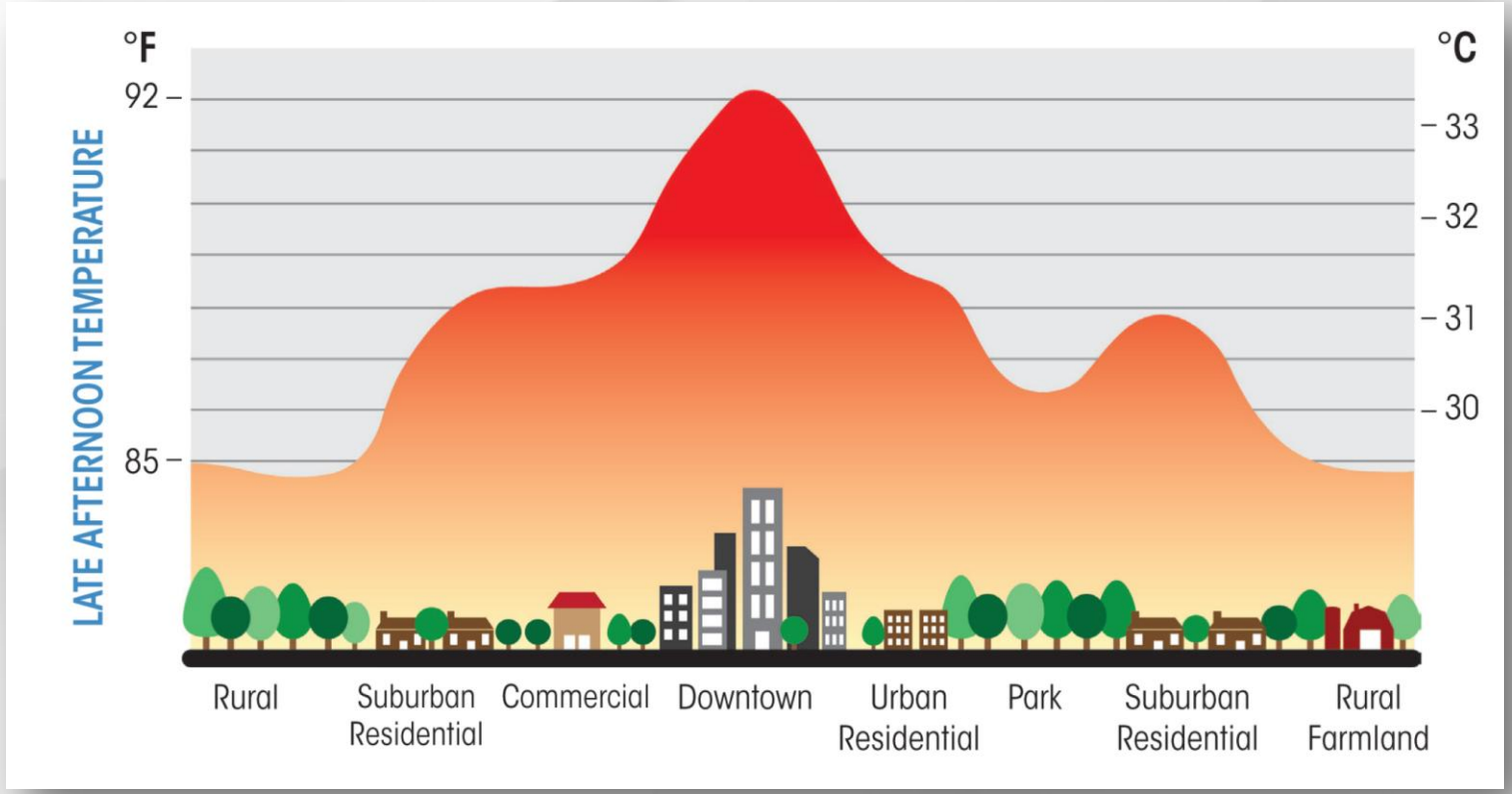
LIFE Good Local Adapt European Workshop

The project *Implementation of a forecAsting System for urban heaT Island effect for the development of urban adaptation strategies - LIFE ASTI* has received funding from the LIFE Programme of the European Union.

The Urban Heat Island Effect

Urban Heat Island (**UHI**):
Temperature contrast between a city and its rural surroundings

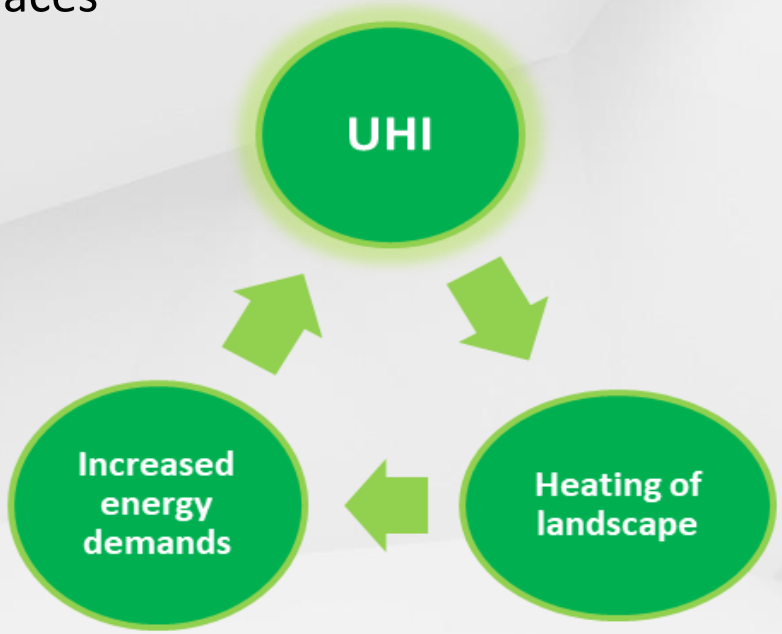


The Urban Heat Island Effect

UHI can be **attributed to** …

- Anthropogenic heat release
- Geometric impact of buildings
- Thermal properties of urban surfaces
- Absence of vegetation

Interaction of **controllable** (i.e. anthropogenic heat) and **uncontrollable** (i.e. solar radiation) factors



THE CASE STUDY OF THESSALONIKI

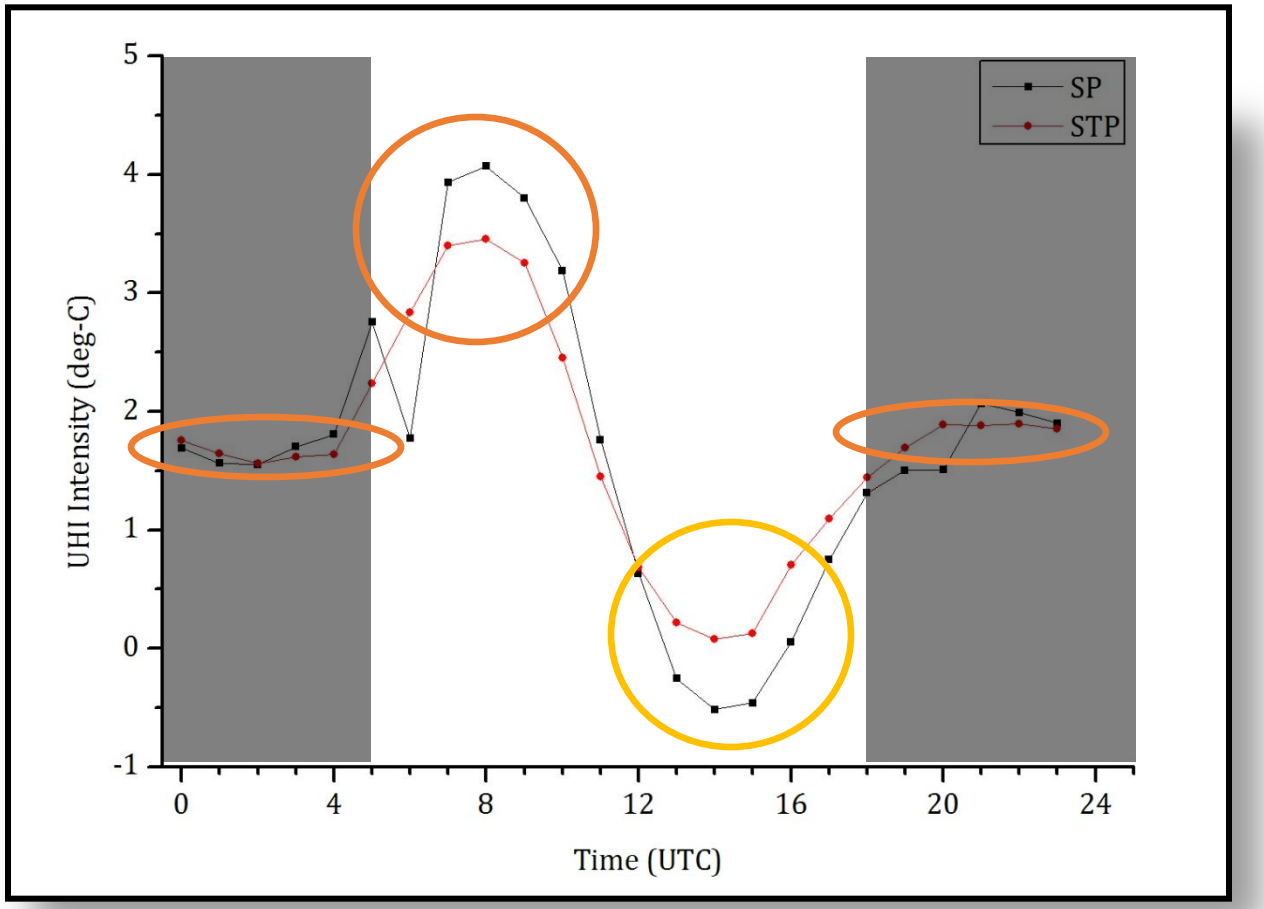
Results – UHI Intensity

$$UHII = T_{urban} - T_{suburban}$$

❖"Background ΔT" ~ **2 deg-C**

❖Heat island is more consistently observed during the nighttime hours

❖Heat island is **stronger** in early **morning** hours, **weakening** and almost vanishing in early **evening**



UHI and LIFE ASTI

➢ A living environment that is significantly degraded.

i. Increased thermal stress on residents and the public. **A significantly increased level and risk of morbidity and mortality due to heat.**

ii. The formation of large amounts of smog and air pollutants, and a resulting degradation in the quality of air.

iii. Increased cooling energy usage and associated costs.

iv. Significant increases in peak energy demand.

v. Strong impact on urban ecosystems.

AGGRAVATED CONCEQUENCES DUE TO CLIMATE CHANGE!

➢ **Stakeholders**

➢ **General population**

Development and implementation of:

- **Short term adaptation tools**
- **Long term mitigation tools**

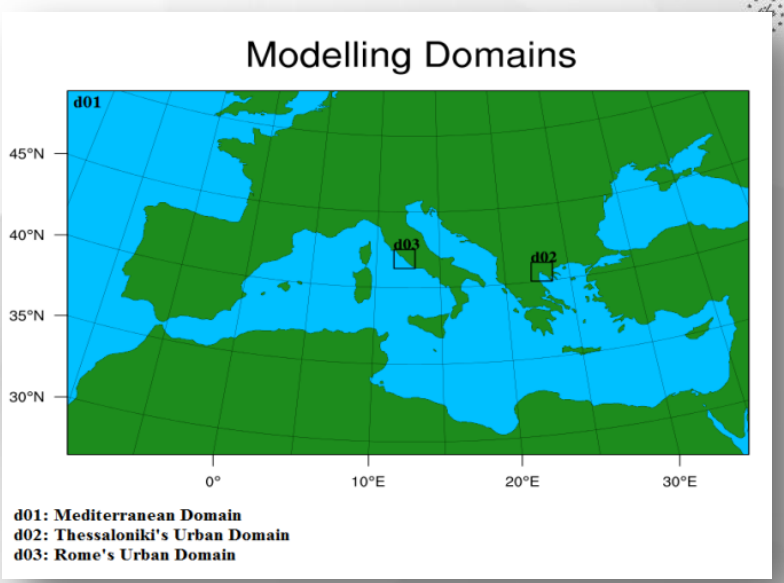
to counteract the UHI effect and its heat-health impacts in Thessaloniki and Rome

LIFE ASTI: General information

Location: Thessaloniki, Greece + Rome, Italy

Replication: Heraklion, Greece

Duration: 01/09/2018 - 31/08/2021



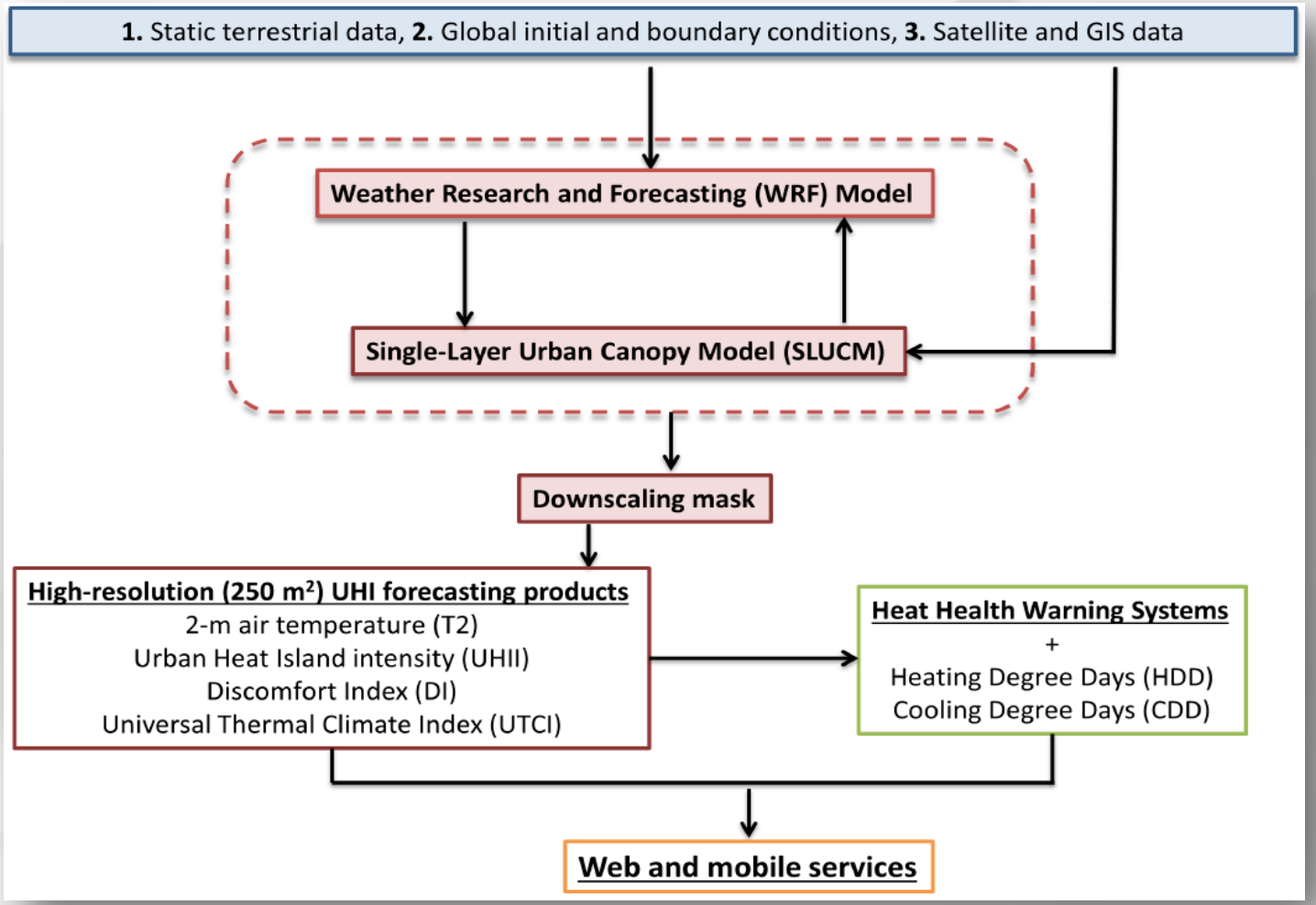
Project implementors:

- **Aristotle University of Thessaloniki (coordinator)**
- Institute of Atmospheric Sciences and Climate, National Research Council of Italy
- Municipality of Thessaloniki
- Azienda Sanitaria Locale Roma 1
- Geospatial Enabling Technologies Ltd
- Sympraxis Team P.C.

Short-term adaptation tools for Rome and Thessaloniki

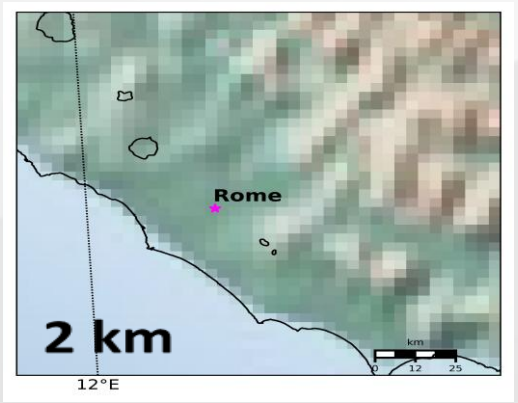
- Pilot UHI forecasting systems and monitoring stations in the two cities
  - ✓ High-resolution (250 m) numerical model forecasts of UHI-related products (meteorological variables and related indices).
  - ✓ Dense network of meteorological stations.
  - ✓ Heat Health Warning systems providing differential alerts within each involved city and the potential effects on health at high spatiotemporal resolution.
- A web-based open access portal and a mobile application to disseminate the above-mentioned forecasting products to authorities, stakeholders and the general public.
- A concrete replicability and transferability plan that will increase the potential of LIFE ASTI results to be utilized by authorities and stakeholders of other regions in Europe

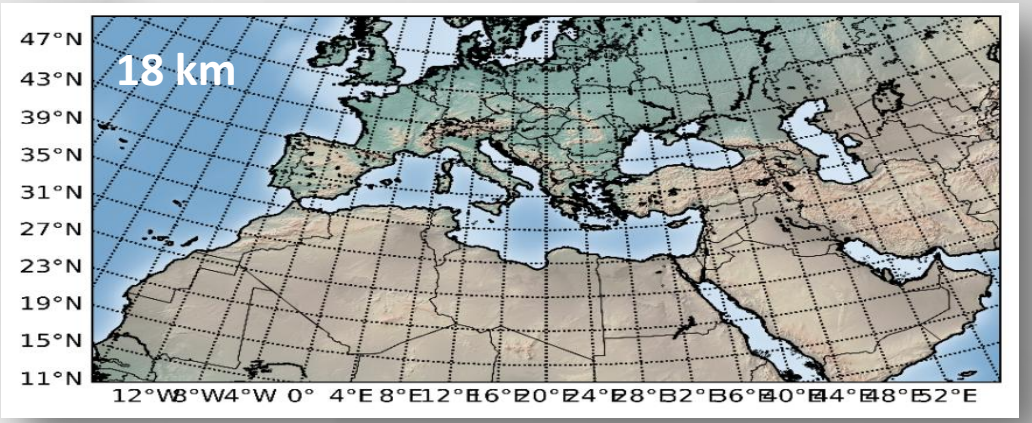
LIFE ASTI forecasting systems, products and services

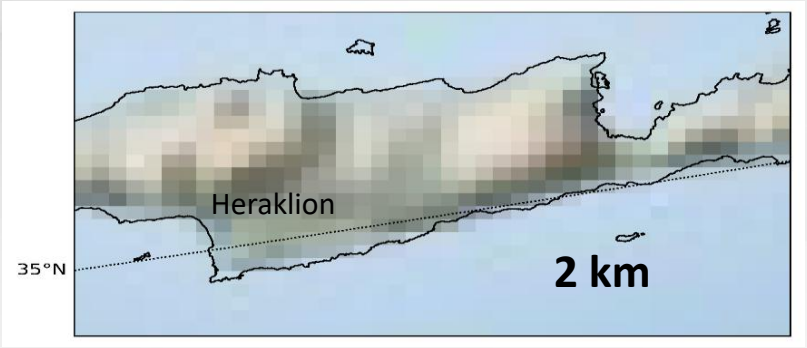


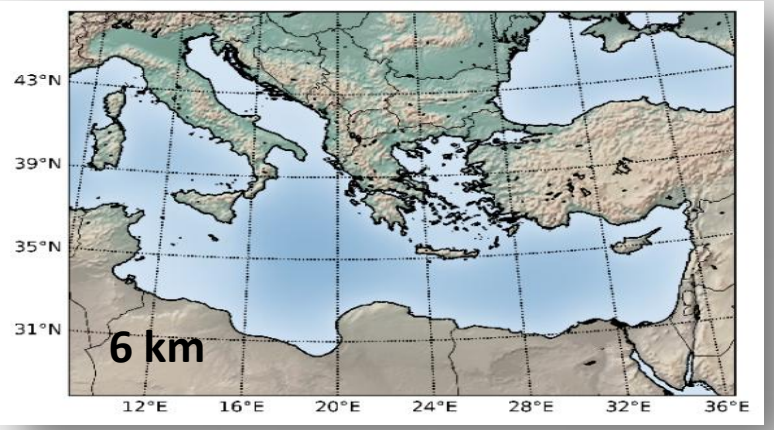
Study areas

High resolution WRF simulations (6 km over Mediterranean area and 2 km over Thessaloniki, Heraklion and Rome)



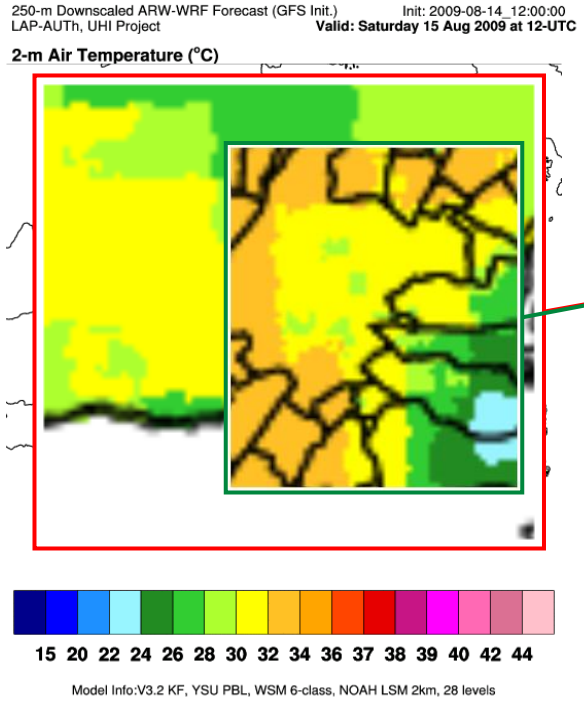


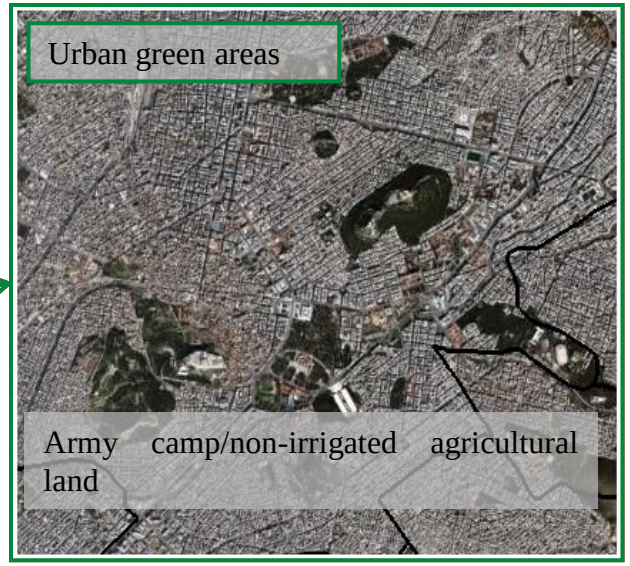




An example from Athens

Athens





Long-term mitigation tools for Rome and Thessaloniki

- Assessment of the impact of future climate change scenarios on UHI.
- Sensitivity studies for assessing the impact of adaptation and mitigation strategies (e.g., green infrastructure).
  - ✓ UHI Adaptation Actions Plans Portfolios for each city.
- Good Practice Guidebook for combating UHI and increasing resilience to heat.

Pilot actions in Thessaloniki and Rome

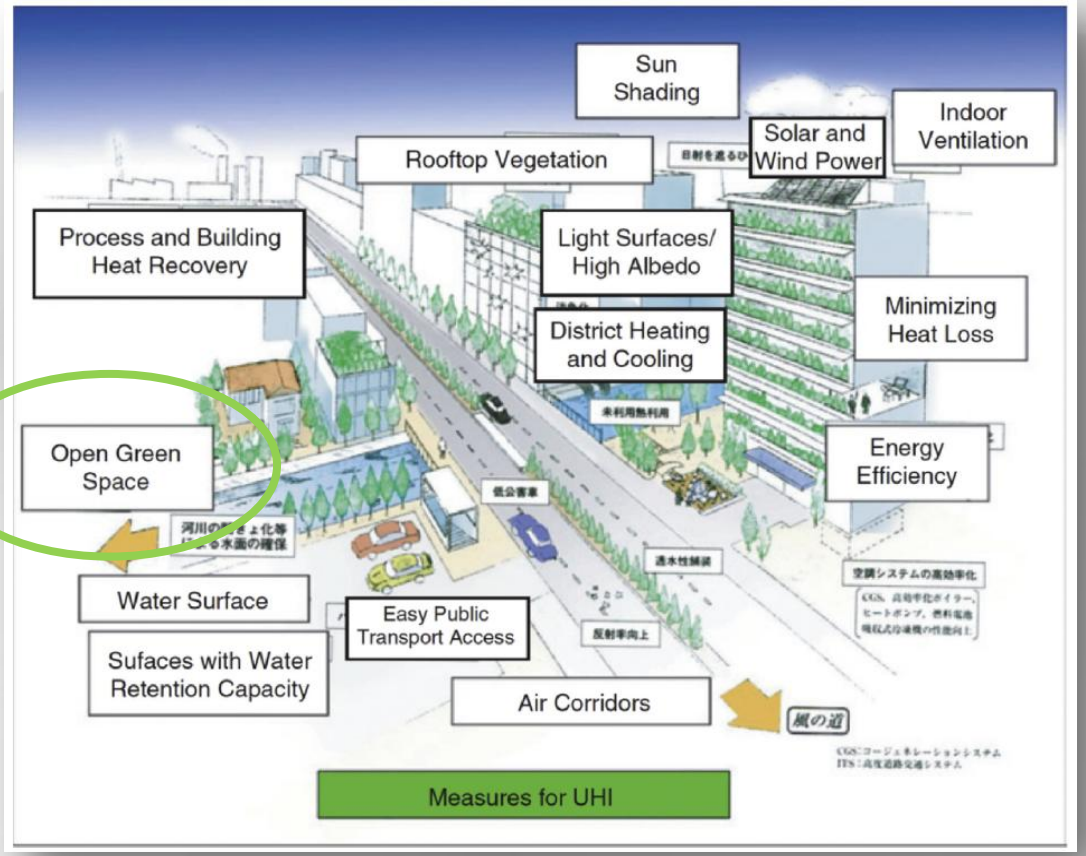
- Developing pilot actions on local level will serve as case studies for future reference.

- Pilot actions will assist in future adaptation action plans and they will provide a more complete perspective, to further develop and operate the Heat Health Warning Systems.

Municipality of Thessaloniki

- Higher-level green interventions will take place in parks and nodal areas in the city.

✓ Similar green activities will be identified in Rome.



Ichinose, T., Matsumoto, F., Kataoka, K., 2008. Chapter 15-Counteracting Urban Heat Islands in Japan. In: Droege, P. (Ed.), Urban Energy Transition. Elsevier, Amsterdam, pp. 365-380.

Policy issues

Expected contribution

✓**Sustainable Energy and Climate Action Plan (SECAP)** in the framework of the Covenant of Mayors climate policy.

The Municipality of Thessaloniki has been a member of the Covenant of Mayors since 2011. in the framework of the Covenant of Mayors, the Municipality of Thessaloniki is committed to submit a Sustainable Energy and Climate Action Plan. The results of the future climate studies, implemented during the LIFE ASTI, will be utilized in the assessment reports of risk and vulnerability to climate change that is part of the SECAP.

Policy issues – cont.

Expected contribution

✓**Mayors Adapt initiative.**

The LIFE ASTI modeling systems will be used to a) assess the impact of future climate change scenarios on UHI, and, b) assess the impact of mitigation strategies. These studies facilitate the development of inventories of good practice guides and comprehensive adaptation and mitigation strategies, in line with “Covenant of Mayors” initiative. The project partnership will encourage local/regional authorities to adopt those integrated approaches and plans on climate change adaptation and mitigation, promoting action and, consequently, compliance with EU legislation.

Particular emphasis is placed on stimulating resilient infrastructures, such as ventilation corridors and green infrastructure, as a mitigation and adaptation tool in primary vulnerable sectors.

✓**100 Resilient Cities Initiative.**

The Municipality of Thessaloniki participates in the 100 resilient cities initiative with extreme heat being one of the biggest challenges to be combated. The project ties with the city values of environmental management, health and well-being, contributing to the heat related health impacts prevention and provision of good quality of life.

LIFE ASTI Replicability and Transferability plan

A plan that will support the potential of LIFE ASTI results to be utilized by authorities and stakeholders of other regions in Europe.

- ✓ The UHI forecasting and the Heat Health Warning Systems demonstrate a design that is modular and the implementation approach allows their straightforward replication and transfer to any urban area facing the adverse impacts of UHI effect.

- ✓ The provided forecasts at the Mediterranean forecasting domain provide the capability to identify potential cities that are vulnerable to heat wave events and UHI effect.

- ✓ Good Practice Guidebook will indicate the means, policies, examples of excellence, and financial tools for increasing resilience to heat at regional/local scale, beyond the targeted cities of Thessaloniki and Rome.

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