PROCEEDINGS OF THE FINAL CONFERENCE

"Urban Heat Island and Heat Resilience: Networking for Future Strategy"

Thessaloniki, 19 May 2022

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.

Introduction

LIFE ASTI Final Conference “Implementation of a forecasting System for urban heaT Island effect for the development of urban adaptation strategies” took place as a hybrid event on 19th of May 2022, at the City Hall of the Municipality of Thessaloniki.

During the Conference were presented the research data of the Urban Heat Island (UHI) identified in 3 European cities (Thessaloniki, Rome and Heraklion), the short-term forecast system warning residents and citizens of cities on the heat load during hot days, as well as proposals for the protection of the health of vulnerable groups in urban areas.

The Conference, organized by the Municipality of Thessaloniki, was attended by a total of more than 80 people (either live or streaming), including project partners from Greece and Italy, representatives of the State, Local and Regional Authorities, the Academic Community and organizations working on the crucial issue of Climate Change.

After brief addresses from local, regional and national authorities, followed the session “Life is 30! Celebrating 30 years of LIFE Programme” with brief presentations by the connected LIFE projects, that gave the opportunity to celebrate 30 years of LIFE Program, which counts 5,500 projects and 5 billion across Europe, exclusively for the environment and climate change.

The next session of Invited talks was devoted to dedicated presentations about climate change and its impacts from invited speakers. The session “Life Asti results” followed and LIFE ASTI partners presented an overview of the project and the main results on the UHI forecasting systems and the heat health warning systems for climate change adaptation. The final conference ended with the stakeholder’s session and the conclusions of the meeting.

The Final Workshop brought together stakeholders, LIFE projects, LIFE ASTI partners and the necessity of such collaboration was highlighted in order to provide services that improve difficulties that caused by UHI phenomenon in modern cities.

Final Conference Posters

Final Conference Agenda

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

Implementation of a forecAsting System for urban heaT Island effect for the development of urban adaptation strategies

LIFE ASTI

FINAL CONFERENCE

Celebrating 30 years of LIFE Programme

May 19, 2022

Municipality of Thessaloniki, Vas. Georgiou A 1, Municipal Council Hall

*The conference will take place in **hybrid format**:*

- *Those who wish to attend the conference online can do so from the following link: https://lever.webex.com/lever/j.php?MTID=m6ff27883add594eaeebe3bbea6de04ef (Meeting number: 2550 544 2110, Password: MDhj5p2cDX5)*
- *Those that wish to attend the events in person must know that all the protocols regarding the covid-19 pandemic that are in effect at the day of the events, will be followed.*

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AGENDA

09:00 – 09:15	Registrations – Welcome coffee * *Registrations can also be made electronically, before the date of the events, at the following link:* registration form
09:15 – 09:30	Press Conference – Welcome addresses - Mr. Konstantinos Zervas, Mayor of Thessaloniki - Mr. Mihail Koupkas, Deputy Mayor in Finance, Chief Resilience Officer of the Municipality of Thessaloniki - Prof. Dimitrios Melas, Aristotle University of Thessaloniki
09:30-10:30	LIFE is 30! Celebrating 30 years of LIFE Programme o *Mr. Bernd Deckar*, Senior Project Adviser LIFE Climate Action - LIFE ASTI animation video #LIFEis30 - Brief presentations by the connected LIFE projects o Project "HEATLAND", *Mr. V. Gumilar* (http://heatlandlife.eu) o Project "VEG-GAP", *Mrs. G. Righini* (https://www.lifeveggap.eu/) o Project "LIFE Urbanproof", *Mr. G. Lemesion* (https://urbanproof.eu) o Project "LIFE-IP AdaptInGR", *Mr. A. Sotiropoulos* (https://www.adaptivegreece.gr/) o Project "Life + A_GreeNet", *TBD* (N/A yet)
10:30-11:15	Invited talks - "CLIMPACT: The Greek initiative for studying the Climate change and its impacts", *Prof. N. Mihalopoulos*, Institute for Environmental Research and Sustainable Development of National Observatory of Athens - "The European Green Deal: reaching climate neutrality by 2050", *Dr. G. Amanatidis*, Parliamentary Research Administrator, European Parliament, Policy Department for Economic, Scientific and Quality of Life Policies - "Climate change and health: adaptation and mitigation actions in Italy", *Dr. P. Michelozzi*, Environmental and Occupational Epidemiology and Cancer Registry Unit, Department of Epidemiology Lazio regional Health Service
11:15-11:45	Coffee break
11:45-13:00	LIFE ASTI results (science session) - "Overview of the LIFE ASTI project", *Prof. D. Melas*, Aristotle University of Thessaloniki - "Meteorological Modeling of Urban Heat Island (UHI)", *Dr. S. Kontos*, Aristotle University of Thessaloniki - "UHI Future Climate Assessment", *Dr. S. Kappos*, Aristotle University of Thessaloniki, - "Atmospheric Monitoring of the urban heat island in Rome", *Dr. S. Argentini*, Institute of Atmospheric Sciences and Climate (ISAC), National Research Council - "Heat health warning systems for climate change adaptation", *Dr. F. de'Donato*, Department of Epidemiology ASL ROMA 1 Lazio regional health service
13:00-13:45	Stakeholders' session - "LIFE ASTI tools: How platform and mobile applications contribute to better-informed decision making", *Mrs. M. Pahoula*, Geospatial Enabling Technologies - "The contribution of the LIFE ASTI project to the Municipality's future planning", *Dr G. Papastergios*, Municipality of Thessaloniki - "Building Heat Resilience in the Climate Era: The example of Athens", *Eleni (Lenio) Myrivili*, Senior Consultant for Heat Resilience | Arsht Rock Resilience Center and City of Athens
13:45-14:00	Discussion – Questions – Conclusions
14:00 – 14:45	End of Conference – Light lunch

forecAsting System for urban heaT Island effect

Welcome Addresses

LIFE ASTI FINAL CONFERENCE

Thessaloniki, 19 May 2022

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

www.lifeasti.eu

Session 1: Welcome Addresses

- **Mr. Mihail Koupkas**, Deputy Mayor in Finance, Chief Resilience Officer of the Municipality of Thessaloniki
- **Mr. Erotokritos Theotokatos**, Deputy Mayor of Environment. Municipality of Thessaloniki

forecAsting System for urban heaT Island effect

LIFE IS 30!
CELEBRATING 30 YEARS OF LIFE PROGRAMME
LIFE ASTI FINAL CONFERENCE

Thessaloniki, 19 May 2022

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

www.lifeasti.eu

Session 2: LIFE is 30!
Celebrating 30 Years of LIFE Programme

Brief presentations by the connected LIFE projects

- Project **“LIFE-IP AdaptInGR”**, *Mr. A. Sotiropoulos* (https://www.adaptivegreece.gr/)
- Project **“VEG-GAP”**, *Mrs. G. Righini* (https://www.lifeveggap.eu/)
- Project **“Life + A_GreeNet”**, *Mrs. L. Antosa (https://www.agreenet.org/)*
- **LIFE ASTI animation video #LIFEis30**

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LIFE-IP AdaptInGR – Boosting the impl ementation of adaptation pol icy across Greece
LIFE17 IPC/GR/000006

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

LIFE-IP AdaptInGR – Boosting the implementation of adaptation policy across Greece-LIFE17 IPC/GR/000006

LIFE ASTI, FINAL CONFERENCE, 19/05/2022

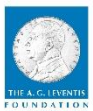
Angelos Sotiropoulos
LIFE-IP AdaptInGR Project Manager

With the contribution of the LIFE Programme of the European Union

With the contribution of the Green Fund




Με την υποστήριξη:



The LIFE-IP AdaptInGR Consortium

Acronym
LIFE-IP AdaptInGR

Title
Boosting the implementation of adaptation policy across Greece

Ref.
LIFE17 IPC/GR/000006

Duration
2019-2026 (8 years)

Budget
€14.189.548,00

Funding
€8,3 EU/LIFE Programme
€2,5 Green Fund
€3,1 Own contribution
€0,3 Co-financers

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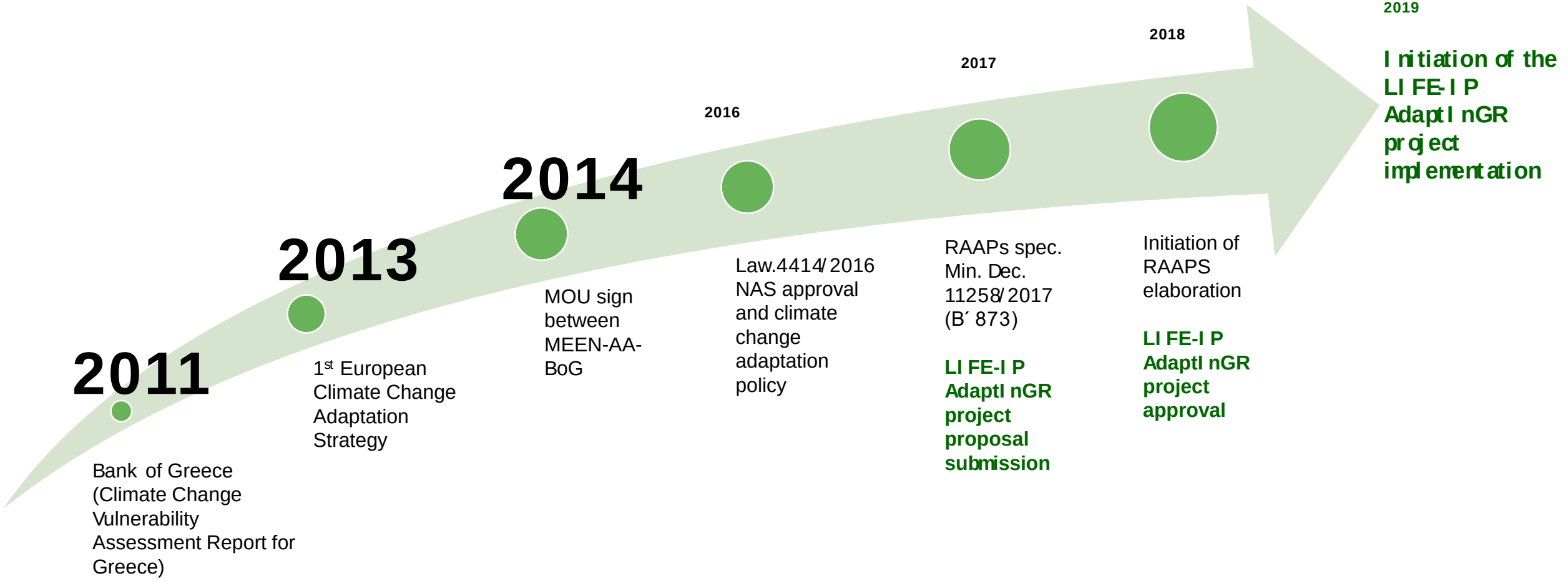
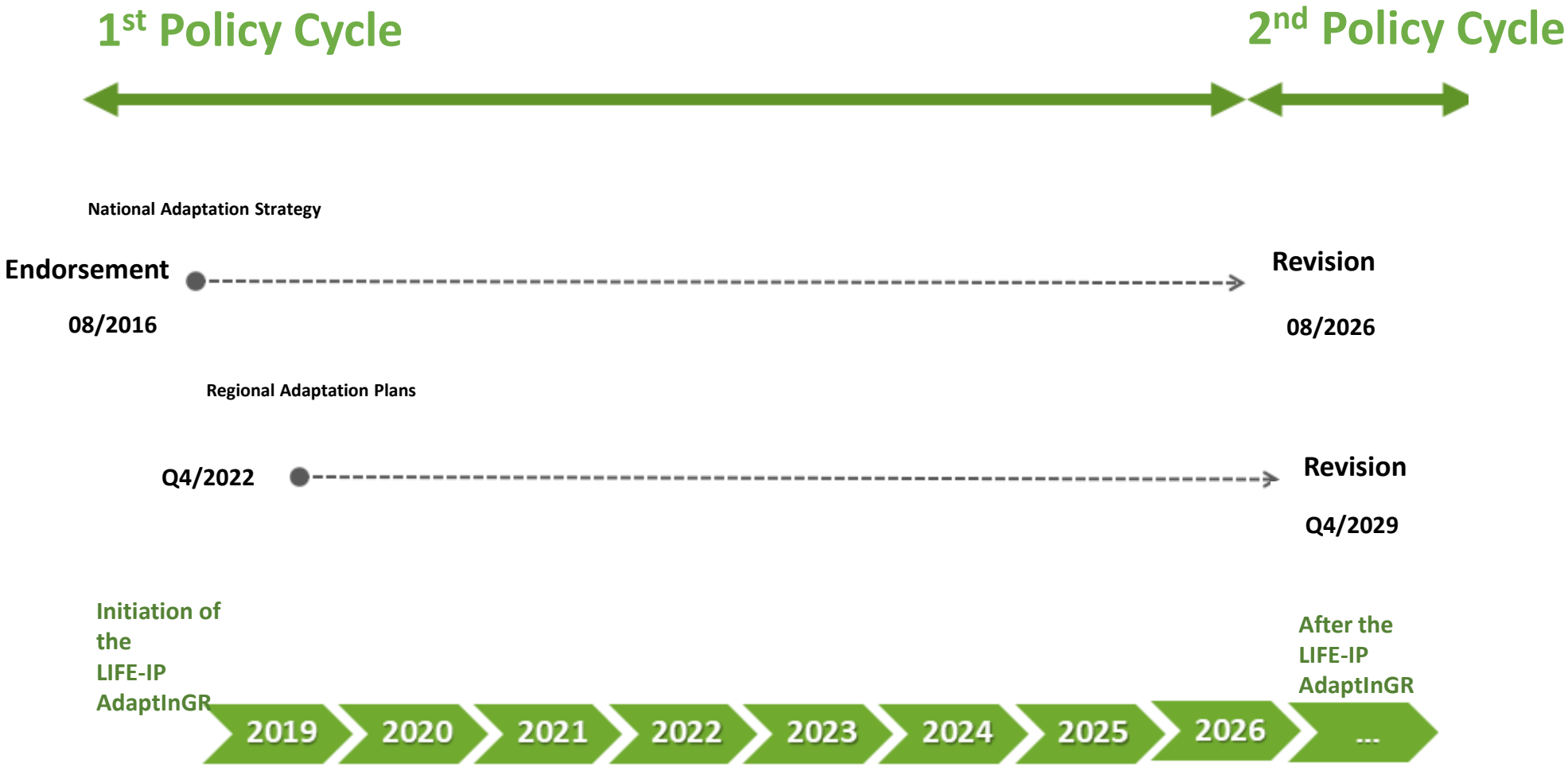
LIFE-IP AdaptInGR Milestones




1st Policy Cycle
2nd Policy Cycle
National Adaptation Strategy
Endorsement
08/2016
Revision
08/2026
Regional Adaptation Plans
Q4/2022
Revision
Q4/2029
Initiation of the LIFE-IP AdaptInGR
After the LIFE-IP AdaptInGR
2019
2020
2021
2022
2023
2024
2025
2026
...

Project contribution to NAS implementation

Catalyse the implementation of the 1st adaptation policy cycle (2016-2026)

- Improve the availability of climate projections and data
- Build capacity to prioritise and implement adaptation measures
- Develop local plans for CCA
- Provide replicable “good practice” examples of concrete adaptation projects to promote action in major vulnerable sectors
- Monitor and evaluate NAS and RAAPs implementation
- Strengthen adapting capacity of stakeholders and the general public through dedicated awareness raising
- Pool and coordinate funding for adaptation implementation (2014-2020, 2021-2027)

Prepare the passage to the 2nd adaptation policy cycle (2026+)

- Update of the CCIV BoG report
- Review and revise the NAS
- Make recommendations for the RAAPs review and revision
- Identify adaptation priorities for post-2028+ programming period

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LIFE-IP AdaptInGR

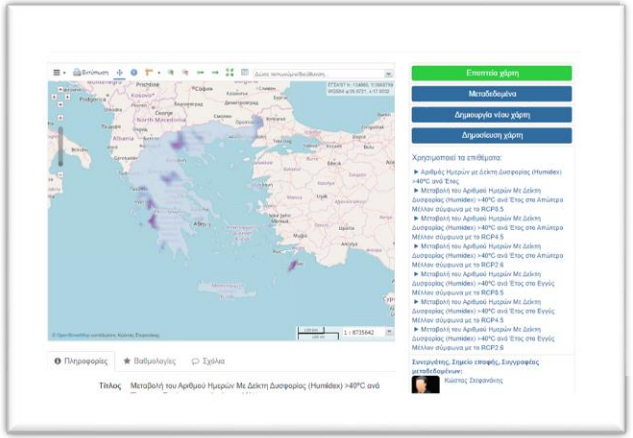
Main actions for boosting the implementation of the 1st CCA policy cycle

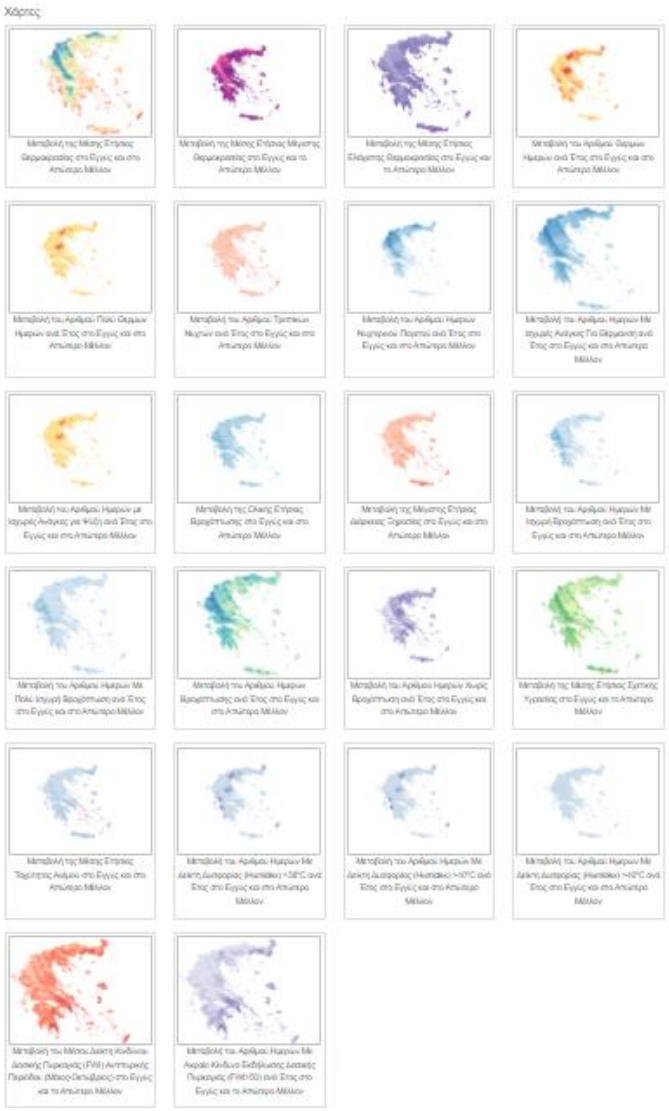
OBJECTIVE 1

The systematization and improvement of short- and long-term decision making for Climate Change Adaptation

More and better information and data

- **Action C.7:** A publicly accessible **national adaptation hub** to provide information & resources for assisting decision makers.
- **Action A.4:** Open access to **geospatial climate projection data and maps** through the Geoportal of the (MEEN) Ministry of Environment and Energy http://mapsportal.ypen.gr/thema_climatechange





OBJECTIVE 1

The systematization and improvement of short- and long-term decision making for Climate Change Adaptation

Build capacity for adaptation

- **Action C.6:** 13 regional and 2 national **capacity building workshops** involving decision makers and officers from national, regional and local authorities.
- **Sub-Action C1.4: Webinars** to introduce the geospatial climate projection data and maps in MEEN geoportal and provide good example of using climate projections in planning.
- **Sub-Action C1.4:** Thematic **peer-to-peer visits** for the national authorities' staff to benefit from the experience of their peers more advanced in the adaptation process **in other EU Member States.**

EU and international cooperation

- **Workshops** to enhance transnational and EU cooperation.

OBJECTIVE 2

The linking of Climate Change Adaptation with a sustainable development model through Regional and Local Action Plans

Action at regional level

- **Action A.1: Analysis of the 13 RAAPs** to identify knowledge gaps, funding needs and need for action at national level.
- **Sub-Action C1.5:** Recommendations and **guidelines for RAAPs** evaluation and review in 2026

Covenant of Mayors for Climate & Energy EUROPE

www.covenantofmayors.eu

Action at local level

- **Action A.3: Good practice examples**: 3 Sustainable Energy and Climate Action Plans (SECAP) developed by the LIFE-IP AdaptInGR project using climate projections.
- **Action A.4: Open access climate data** to facilitate the development of SECAPs.

Provide and replicate good practice examples (Actions: A.3, C.2, C.3, C.4, E.2)

- 12 pilot CCA projects & 14 CCA case studies across 7 priority sectors
- Enabling replication and transfer of good practices in Greece and EU

Flood risk management (3)

Coastal zone management (3)

Forest fires in drought-prone (1)

Sustainable water management (3)

Urban planning & regeneration (2)

Landscape & land uses (9)

Archeological historical sites (5)

Action C.4: Pilot assessments & guidelines for landscapes, land uses, Cultural Heritage

Nestos

Vistonida

Avdira

Zagoria

Leuka Ori

Samaria

Ioannina

Messini

Taygetos

Monemvasia

Kriti

Dikti

TTinos

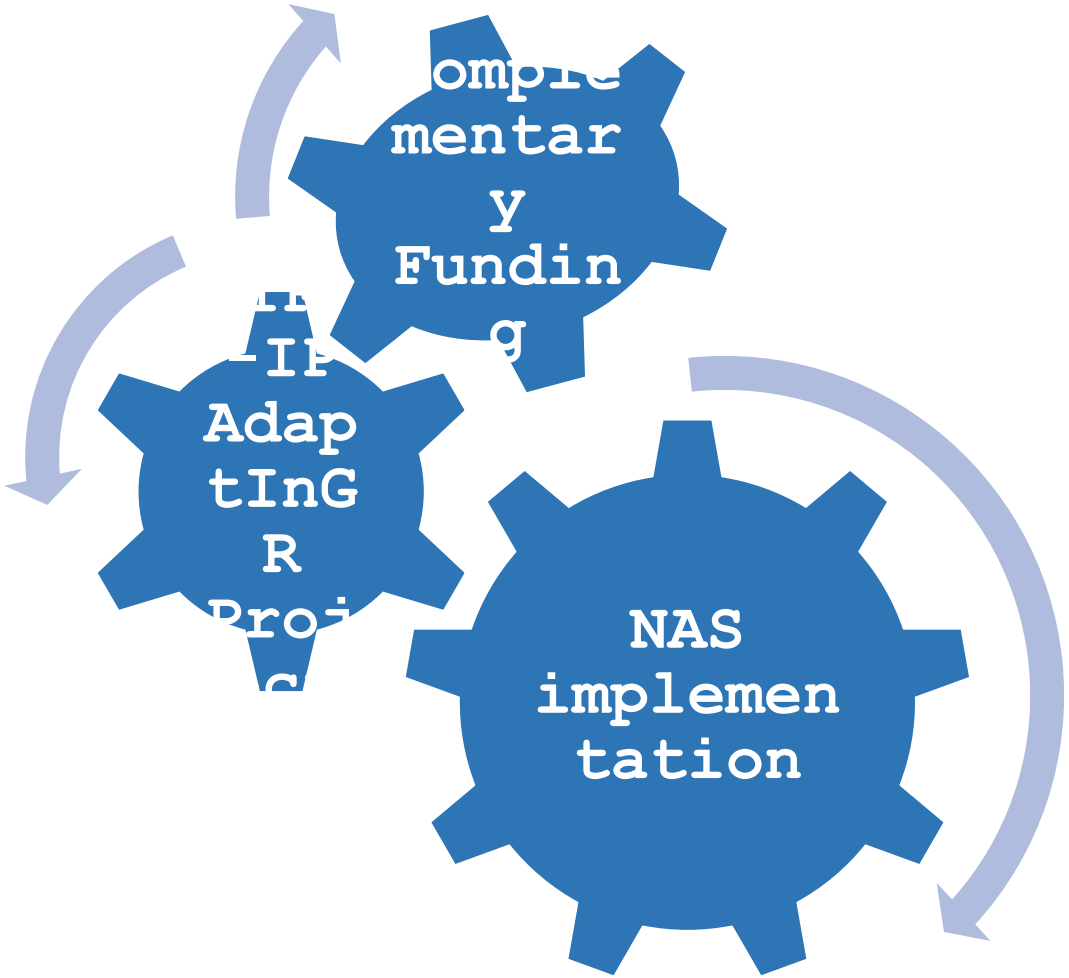
Itea

Parnassos

Kalloni

Area Natura 2000

Area ή Natura 2000



Monitor Complementary Funding

- Recognize complementary funds
- Contact the respective managing authorities
- Collect, synthesise and update data and information through the elaboration of brief and phase reports.
- Recognize possible funding gaps and opportunities.

Mobilise Complementary Funding

- Inform managing authorities on CCA priorities and needs.
- Inform the respective services and bodies implementing adaptation actions for the available funds.
- Inform the financial sector on the need for CCA funding and financial products development.

OBJECTIVE 5

The strengthening of the adaptive capacity of the Greek society through awareness and dissemination actions

Students (Action E.1)

- Teachers' kit + 13 regional seminars for teachers
- "Youth adapts" material + campaign (>100 schools)
- Other educational activities: e.g. school competitions

General public (Action E.1)

- 2 waves of public opinion research to determine the level of awareness
- 13 regional info-days (launched 2021)
- 3 conferences
- National adaptation hub
- Other awareness raising activities: e.g. tv spots, social media

Professional groups (Actions E.1, A.4, C.6, C.7)

- 4 waves of surveys & interviews with stakeholders to determine the level of awareness
- Provide info and data: Climate Projections Geoportal + National Adaptation Hub
- Build capacity: 13 regional capacity building workshops

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Thank you for your attention!

Angel os Sotiropoul os
LI FE-I P AdaptI nGR Project Manager
Tel . 6971899507
E-mail : a.sotiropoul os@prv.ypeka.gr
Web-Site: www.adaptivegreece.gr

LIFE-18 PRE IT 003 - The VEG-GAP project has received funding from the LIFE Programme of the European Union

Italian National Agency for New Technologies, Energy and Sustainable Economic Developmen

Veg Gap

Vegetation for Urban Green Air Quality Plans

https://www.lifeveggap.eu

3 December 2018 – 3 May 2022

Gaia Righini, Mihaela Mircea
ENEA

Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

CITTÀ METROPOLITANA DI BOLOGNA

Comune di Milano

MADRID

ARIANET

crea Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria

POLITÉCNICA | UNIVERSIDAD POLITÉCNICA DE MADRID

MEEO Meteorological Environmental Earth Observation

Why VEG-GAP?

Italian National Agency for New Technologies, Energy and Sustainable Economic Development

a holistic approach for quantifying vegetation effects on atmosphere

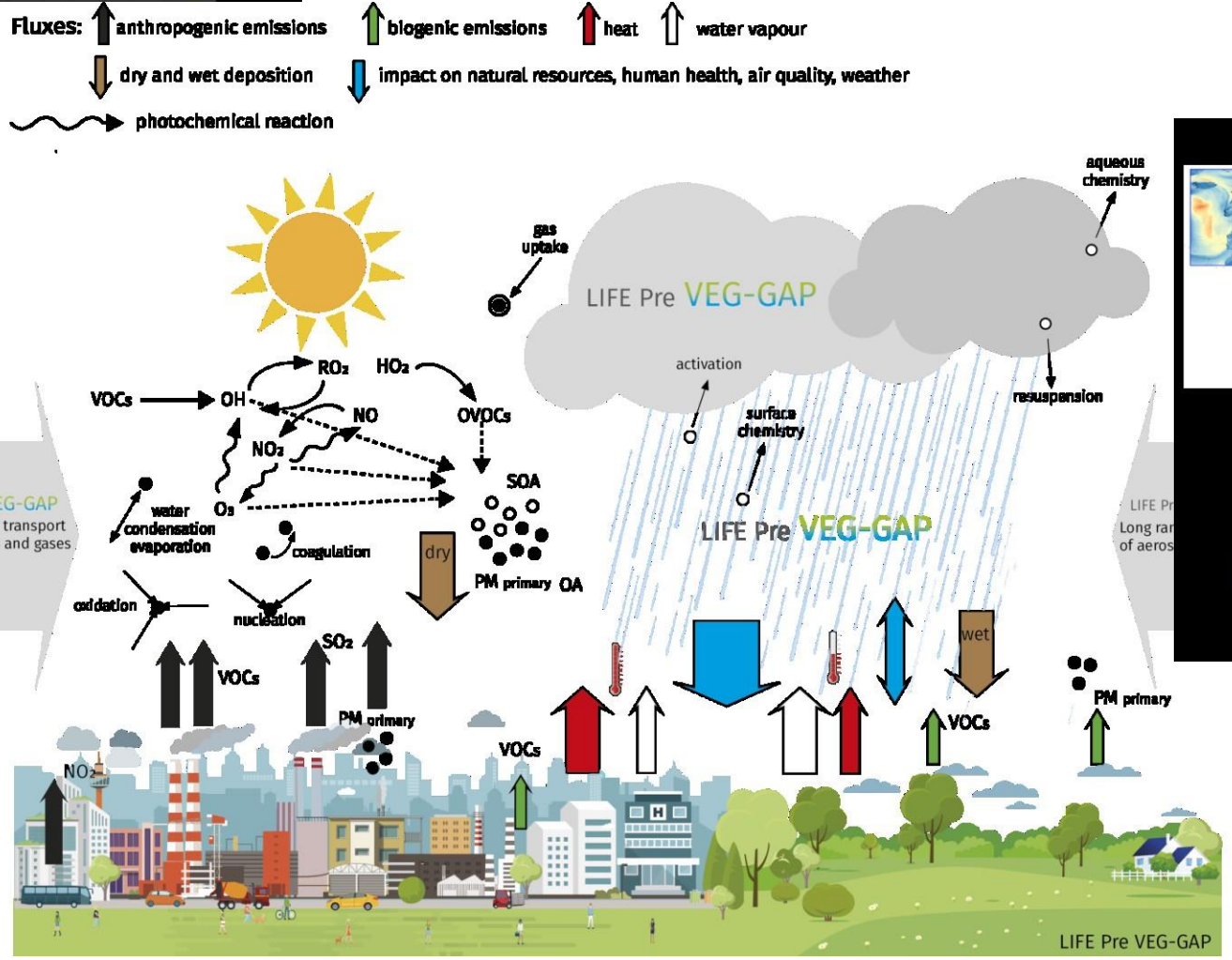
- **quantify the effect of urban vegetation ecosystems on air temperature (urban heating and cooling patterns) and its impact on air quality**
- **quantify the contribution of vegetation ecosystems both as source and sink of air pollution in urban areas**

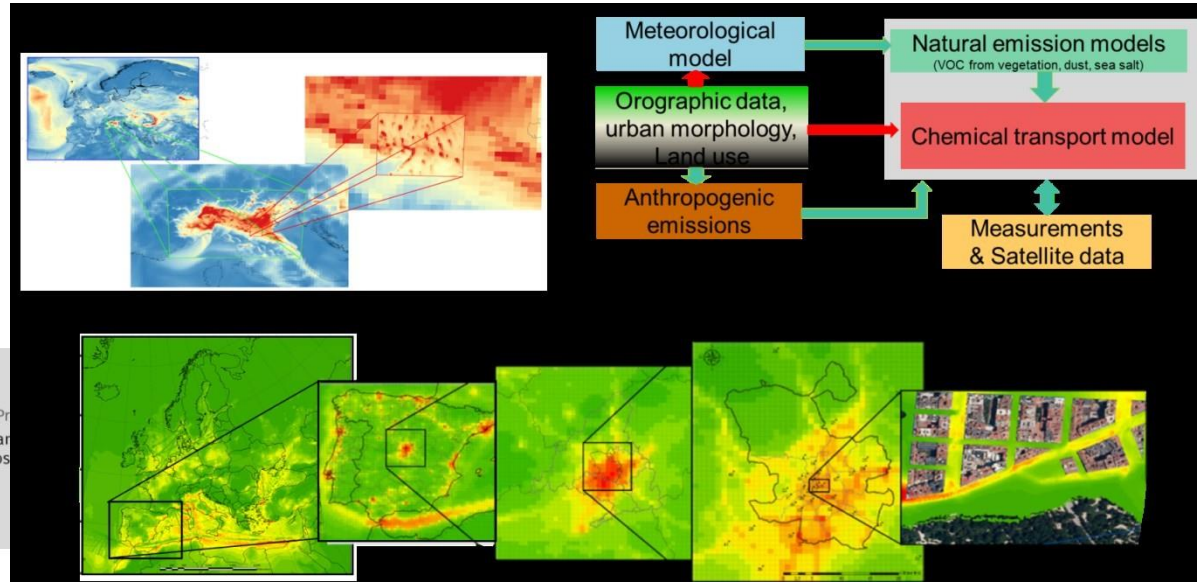
Life

Veg Gap
Vegetation for Urban Green Air Quality Plans

VEG-GAP instruments and data

Italian National Agency for New Technologies, Energy and Sustainable Economic Development





Vegetation for Urban Green Air Quality Plans

VEG-GAP approach = Air Quality Plans approach

VEG-GAP and Air Quality Plans

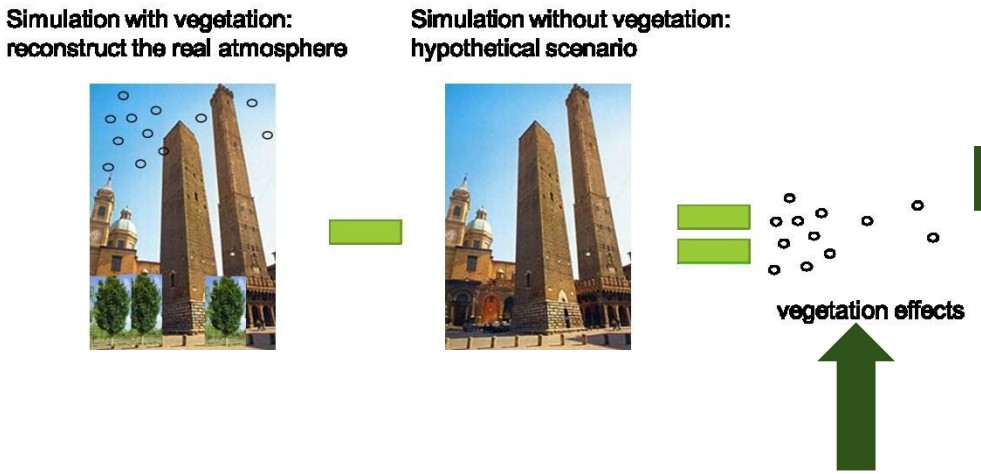
Air Quality Plans (AQPs) are instruments introduced by the Ambient Air Quality Directive 2008/50/EC (AQD50) in order to achieve EU standards.

AQPs is to set measures to reduce air pollution. The assessment of the effectiveness of possible measures in achieving compliance with AQD50 Limit or Target values is performed with AMS. The difference between an AMS simulation without measures and a simulation with measures shows the effectiveness of a measure.

VEG-GAP reveals the effectiveness of vegetation for air quality and temperature by showing the difference between an AMS simulation with actual vegetation and a simulation without vegetation. Thus, it is providing support to both City Air Quality and Climate Change Plans.

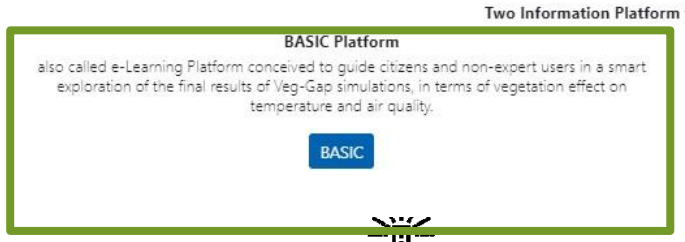
The effect of vegetation on air quality and temperature should be assessed by considering the multiple interactions between vegetation and atmosphere at city scale, for different years, in order to ensure a major positive effect of new interventions.

https://veggaplatform.enea.it



NO_2 O_3 PM10 T(ºC)

VEG-GAP results available through Information Platform (EN, IT, ES)



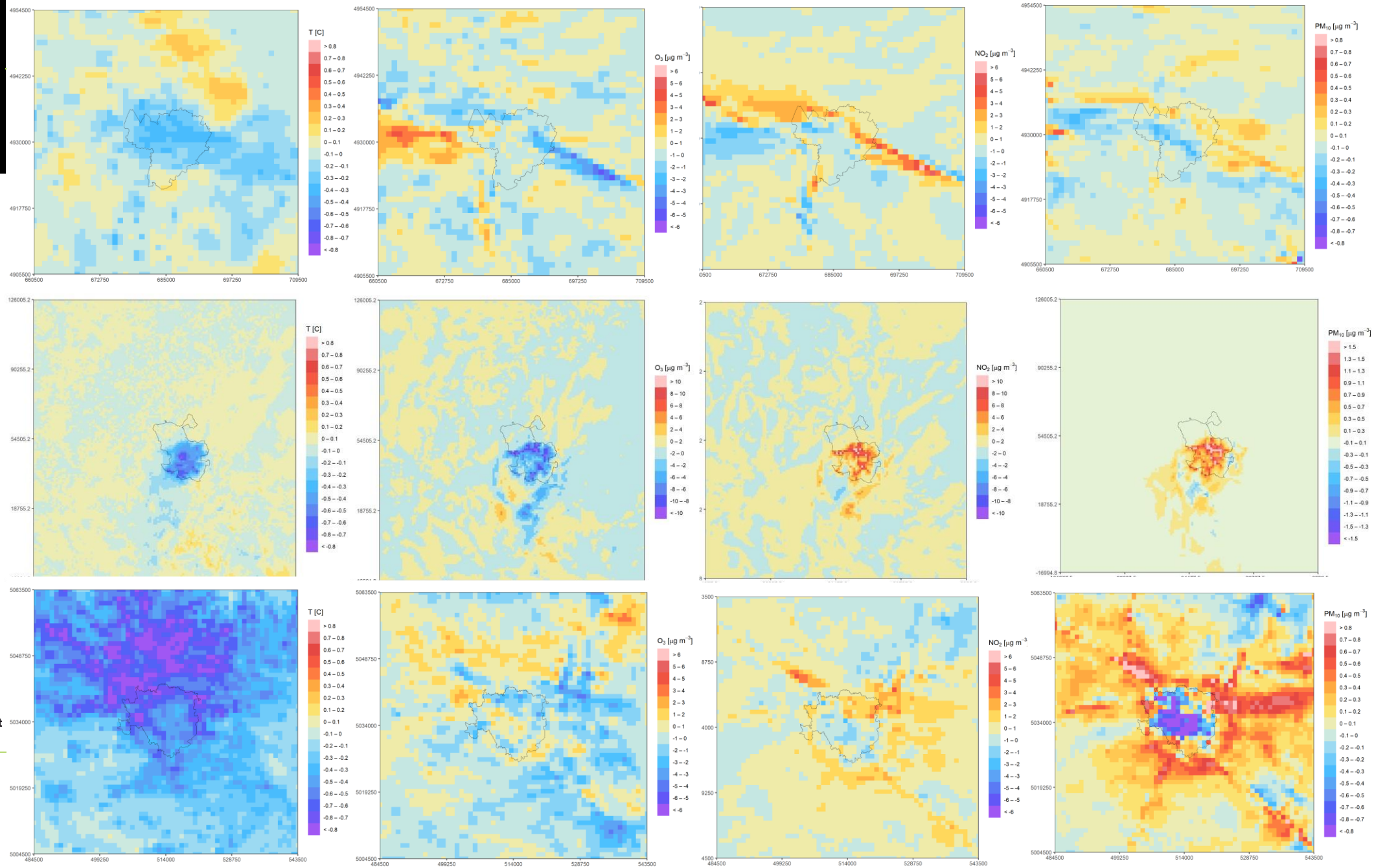
- **Present vegetation**
- **Future vegetation:** urban forests, green infrastructures, green roofs and walls, etc.

Life

Veg Gap
Vegetation for Urban Green Air Quality Plans

egetation effects on temperature and air concentrations – daily average

13 July 2015
Veg-NoVeg

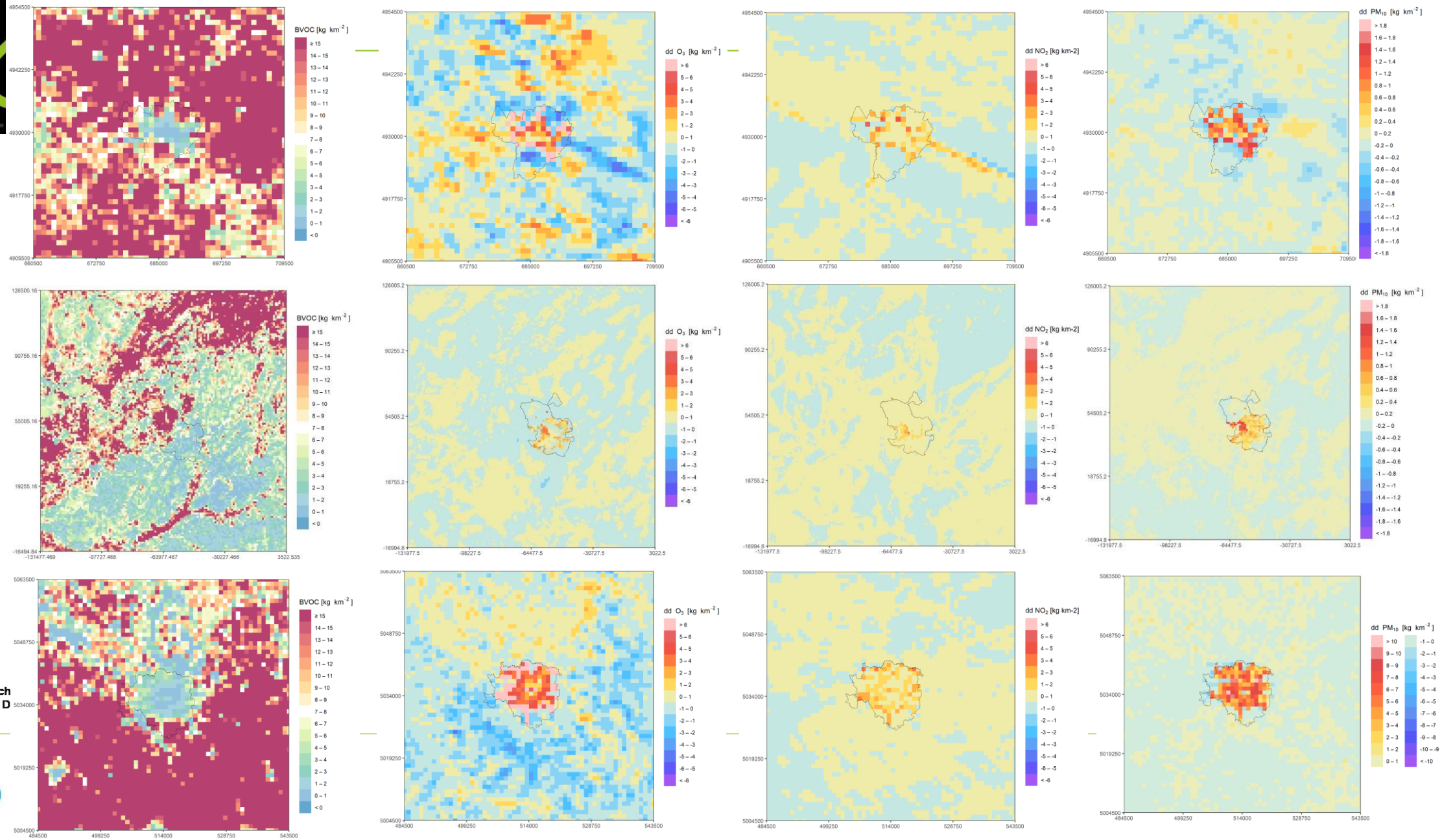


Italian National Agency for New Technologies, Energy and Sustainable Economic Development

Life Veg Gap – Vegetation for Urban Green Air Quality Plans

Current Vegetation effects on air depositions and BVOC emissions – daily sum

13 July 2015
Veg-NoVeg



Italian National Agency for New Tech
Energy and Sustainable Economic D

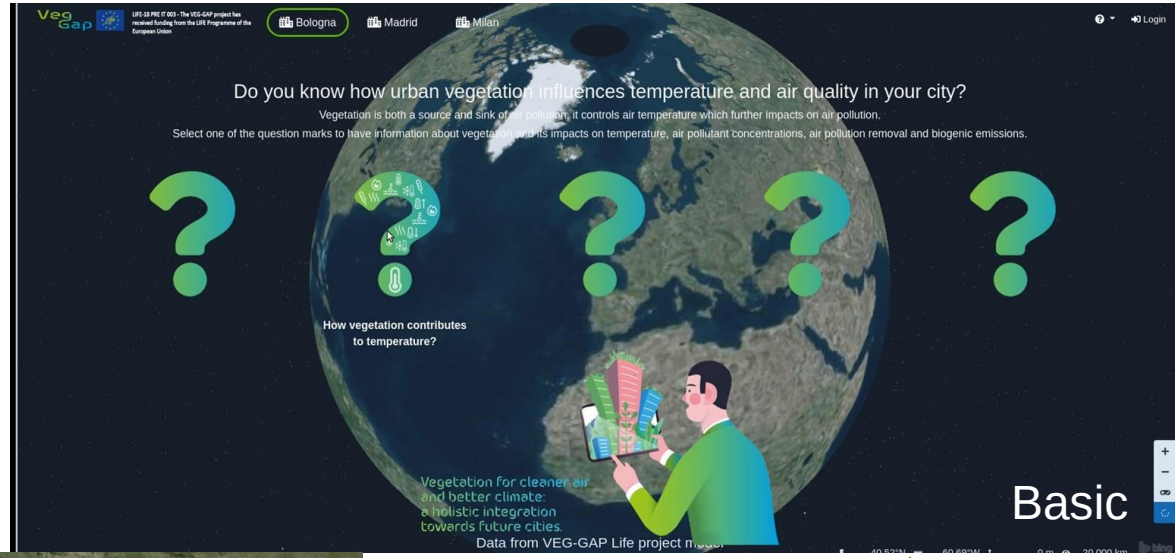
Vegetation for Urban Green Air Quality Plans

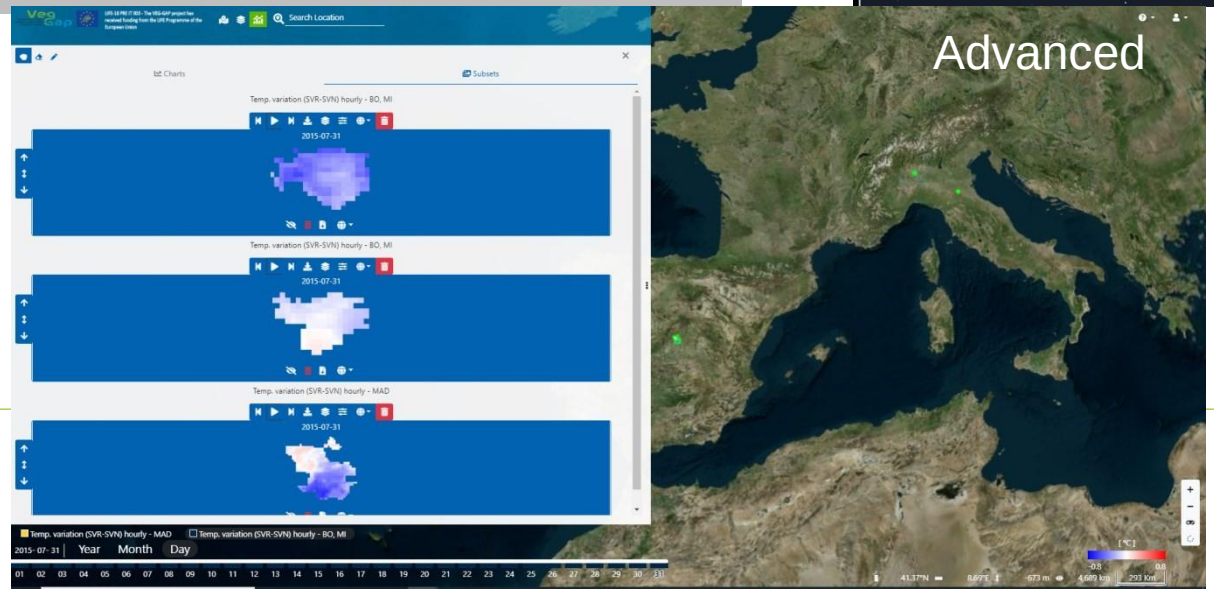
Data for BASIC and Advanced Information Platform

Italian National Agency for New Technologies, Energy and Sustainable Economic Development

Information Platform: BASIC for general public and ANCED for other stakeholders equipped with an user guide for visualization, download, etc.

- Simulation results for the current (real) and vegetation removal scenarios for the desired category:
  - Vegetation
  - Temperature
  - Pollutant concentration (NO2, O3, PM10)
  - Dry deposition (NO2, O3, PM10)
  - Biogenic emissions (Isoprene, Terpene, BVOC total)
  - Other parameters ADVANCED (humidity, wind, precipitation etc)

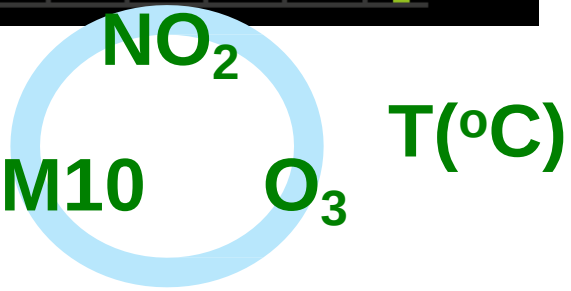




https://veggaplatform.enea.it/

Operational framework to evaluate multiple interactions between vegetation and atmosphere in cities

Italian National Agency for New Technologies, Energy and Sustainable Economic Development



Guidelines:

- **Guidelines on mapping vegetation characteristics in urban areas**
- **Guidelines on estimating BVOC emissions**
- **Guidelines on relating vegetation ecosystem urban heat island and air pollution for supporting AQPs of municipalities.**
- **Guidelines and support tool for estimating impact of urban ecosystems/vegetation on health and ecosystem risks due to their effect on air pollution in partner municipalities in support to AQPs**

- **Bologna**

Population: 390,849 inhabitants (January 2019, MCBO)

Area: 140,8 km^2

- **Madrid**

Population: 3,141, 991 inhabitants

Area: 604,3 km^2

- **Milano**

Population: 1,378,689 inhabitants (2018-ISTAT)

Area: 181,7 km^2

Life

VegGap Vegetation for Urban Green Air Quality Plans

Summary of VEG-GAP results

Italian National Agency for New Technologies, Energy and Sustainable Economic Development

time and space variability

- science-based evidence of vegetation effects on meteorology and air quality in three European cities at present
- a framework to assess and visualize the effects of present and future urban vegetation and NBS on the air of a city
- assessments and framework to evaluate vegetation effects on human and ecosystems health through its effects on meteorology and air quality
- facilitate knowledge and participation through the information platform

Project staff

Arianet: S. Finardi, N. Pepe, C. Silibello
CREA: *A. Alivernini*, S. Fares, I. Zappitelli
ENEA: M. Adani, G. Briganti, A. Cappelletti, *L. Cianciarella*, G. Cremona, I. D'Elia, A. De Marco, M. D'Isidoro, G. Ferro, M. Gualtieri, M. Mircea, E. Petralia, A. Piersanti, G. Righini, F. Russo, *B. Sorrentino*, *P. Stocchi*, M. Stracquadanio, M. G. Villani, *D. Visparelli*, L. Vitali, G. Zanini
MEEO srl: D. Barboni, M. Cavicchi, S. Mantovani, S. Pasetti
Metropolitan City of Bologna: M. Cavallo., *D. Cencioni, S. Ferraro, F. Ferrero*, A. Merighi, E. Pighi, V. Stacchini, M. Trabalzini
Municipality of Madrid: J. Azcárate Luxan, A. Cristobal Lopez, R. R. López de la Cova, L. Tejero Encinas, *D.Garcia Falin*, María Jesús Sanchez-Redondo
Municipality of Milan: *M. A. Mauri*, E. Ferrara, *P. Pelizzaro, E. Torricelli, F. Putignano*, M. Trentin
UPM: R. Borge, J.M. de Andrés, A. Narros y J. *Lumbreras, D.* de la Paz

Simularia srl: G. Carlino, R. Prandi

Italian National Agency for New Technologies, Energy and Sustainable Economic Development

Discover our Information Platform on:

https://www.lifeveggap.eu/

Join us!

Veg Gap
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Thank you!

LIFE+ A_GreeNet
ADRIATIC CLIMATE URBAN NETWORK

LIFE20 CCA/IT/001752
Realizzato con il contributo dello strumento finanziario LIFE dell'UE

LIFE is 30! Celebrating 30 years of LIFE Programme: Life+ A_GreeNet – LIFE20 CCA/IT/001752

LIFE ASTI – Final Conference - May 19, 2022

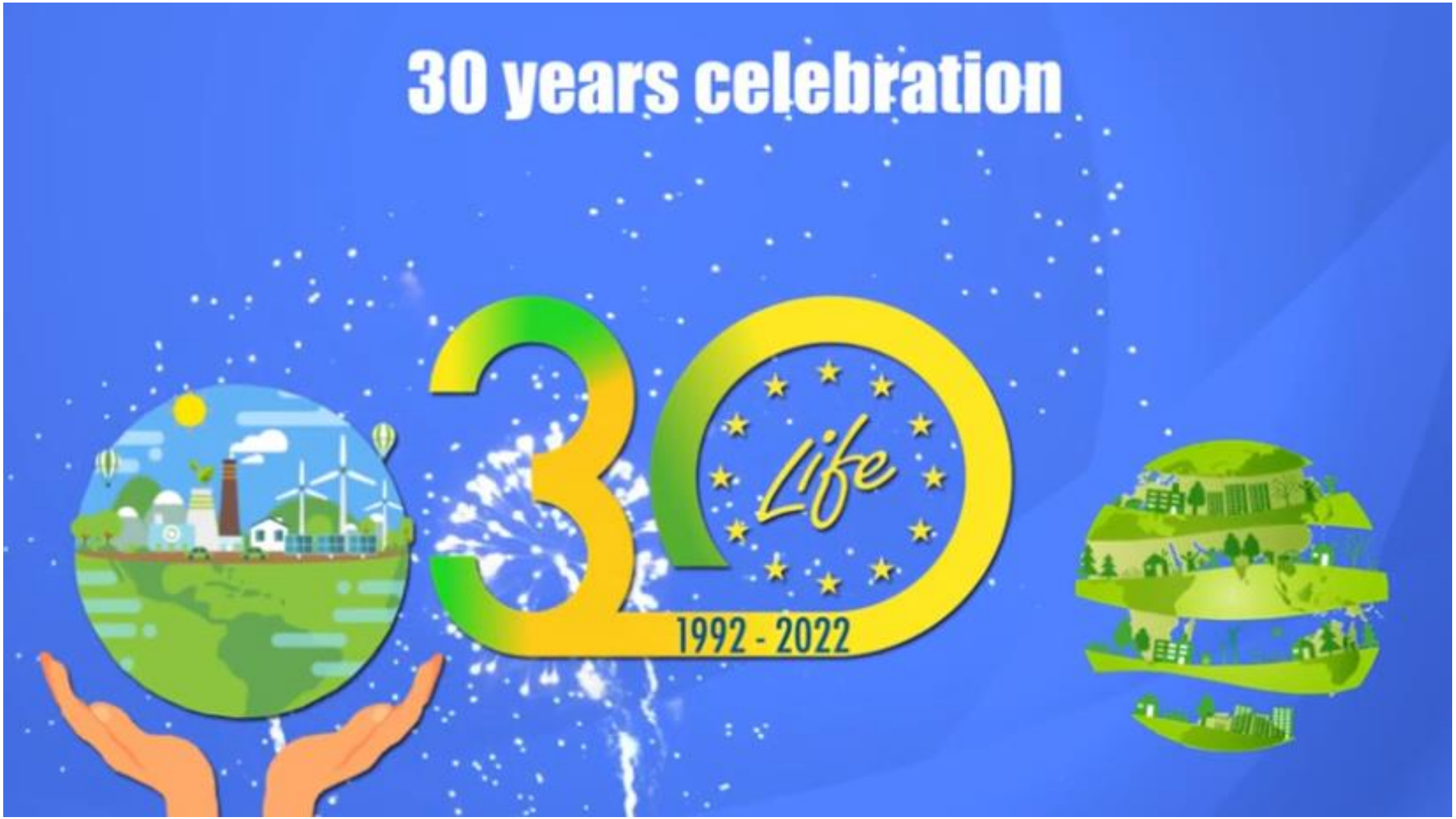
Capofila di Progetto

REGIONE ABRUZZO

Partner beneficiari

Comune di Silvi | Comune di Ancona | Comune di Pescara | Città di San Benedetto del Tronto | LEGAMBIENTE | RES AGRARIA | Università di Camerino

[LIFE Programme - 30th Anniversary 1992-2022 – animation video #LIFEis30]



forecAsting System for urban heaT Island effect

Invited Talks

LIFE ASTI FINAL CONFERENCE

Thessaloniki, 19 May 2022

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

www.lifeasti.eu

Session 3: Invited Talks

- “CLIMPACT: The Greek Initiative for studying the Climate change and its impacts”, *Prof. N.Mihalopoulos*, Institute for Environmental Research and Sustainable Development of National Observatory of Athens
- “The European Green Deal: reaching climate neutrality by 2050”, *Dr. G. Amanatidis*, Parliamentary Research Administrator, European Parliament, Policy Department for Economic, Scientific and Qualityof Life Policies
- “Climate change and health: adaptation and mitigation actions in Italy”, *Dr. P. Michelozzi*, Environmental and Occupational Epidemiology and Cancer Registry Unit, Department of Epidemiology Lazio regional Health Service

CLIMPACT

ΕΘΝΙΚΟ ΔΙΚΤΥΟ ΓΙΑ ΤΗΝ ΚΛΙΜΑΤΙΚΗ ΑΛΛΑΓΗ

"CLIMPACT: The Greek Initiative for studying the Climate change and its impacts"

N. Mihalopoulos

National Observatory of Athens

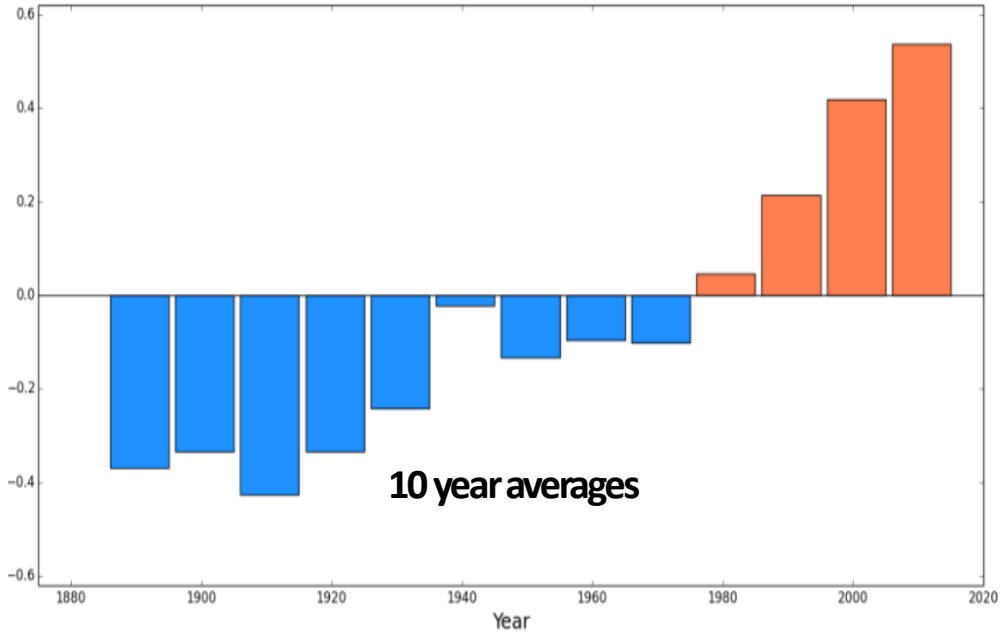
University of Crete

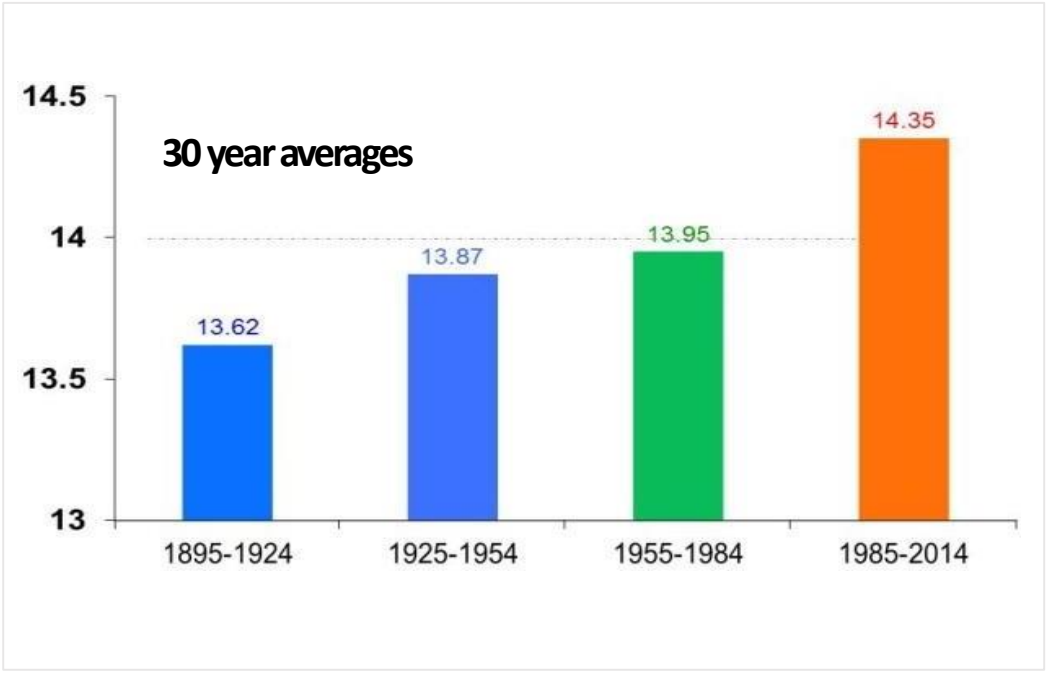
Το έργο χρηματοδοτείται από το ΠΔΕ του Υπουργείου Ανάπτυξης και Επενδύσεων και τη ΓΓΕΤ

IERSD - NOA

- **IPCC: “warming of climate system is unequivocal”.**
- **“Human influence on the climate system is clear”**

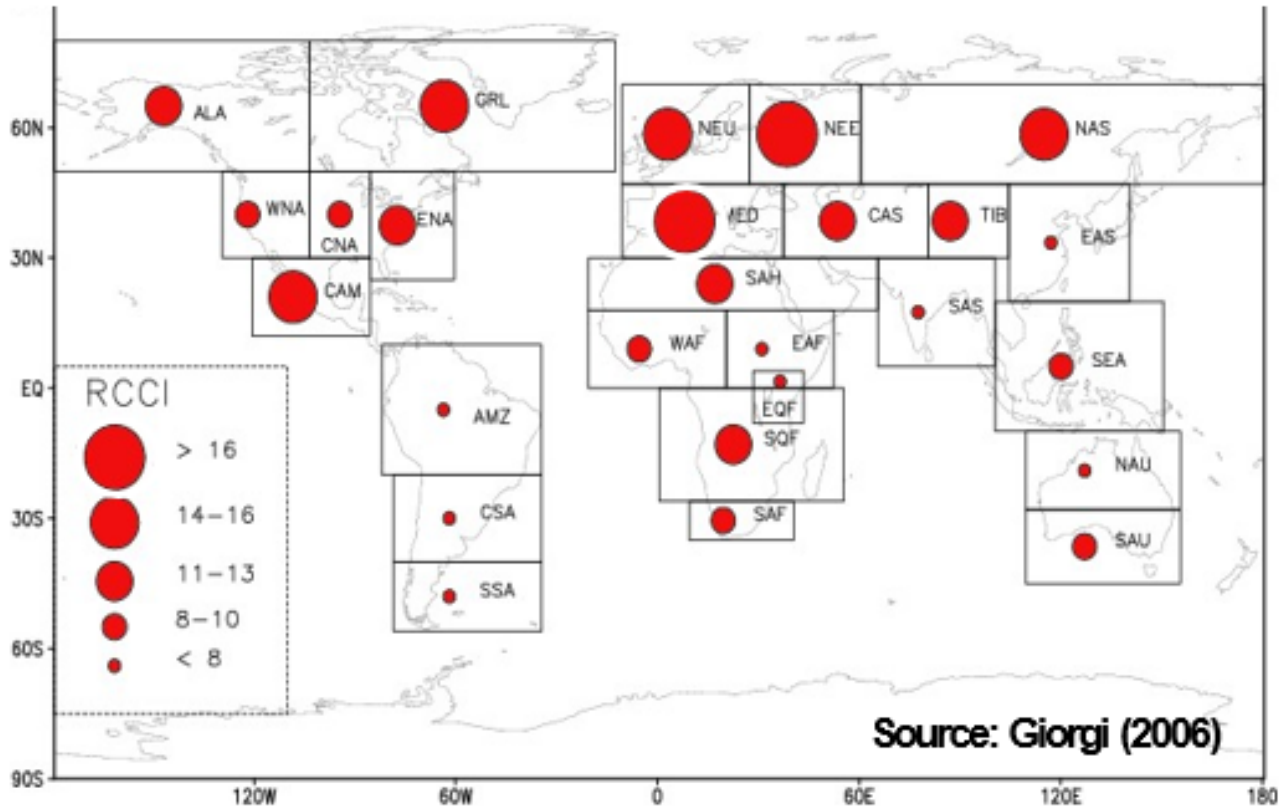
Global surface temperature anomalies 1880-2015





"Address **impacts** and possible **mitigation** and **adaptation** strategies of **Climate Change** in the **EMME*** through **Fundamental Science**, **Applied Research**, and **Innovation**"

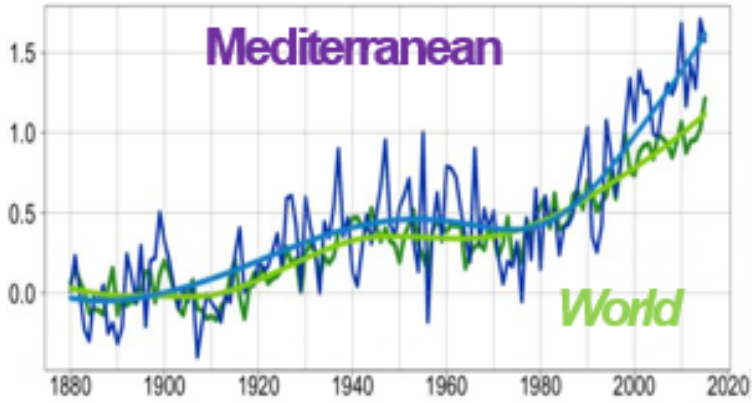
Regional Climate Change Index, 20 models, 3 scenarios



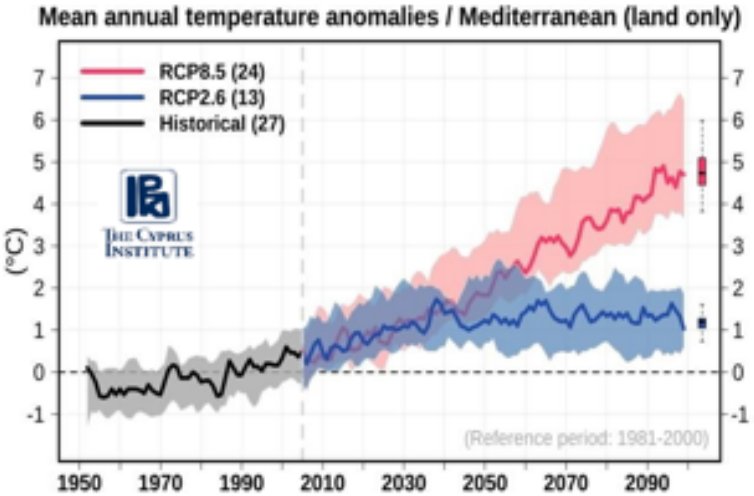
PRESENT

FUTURE

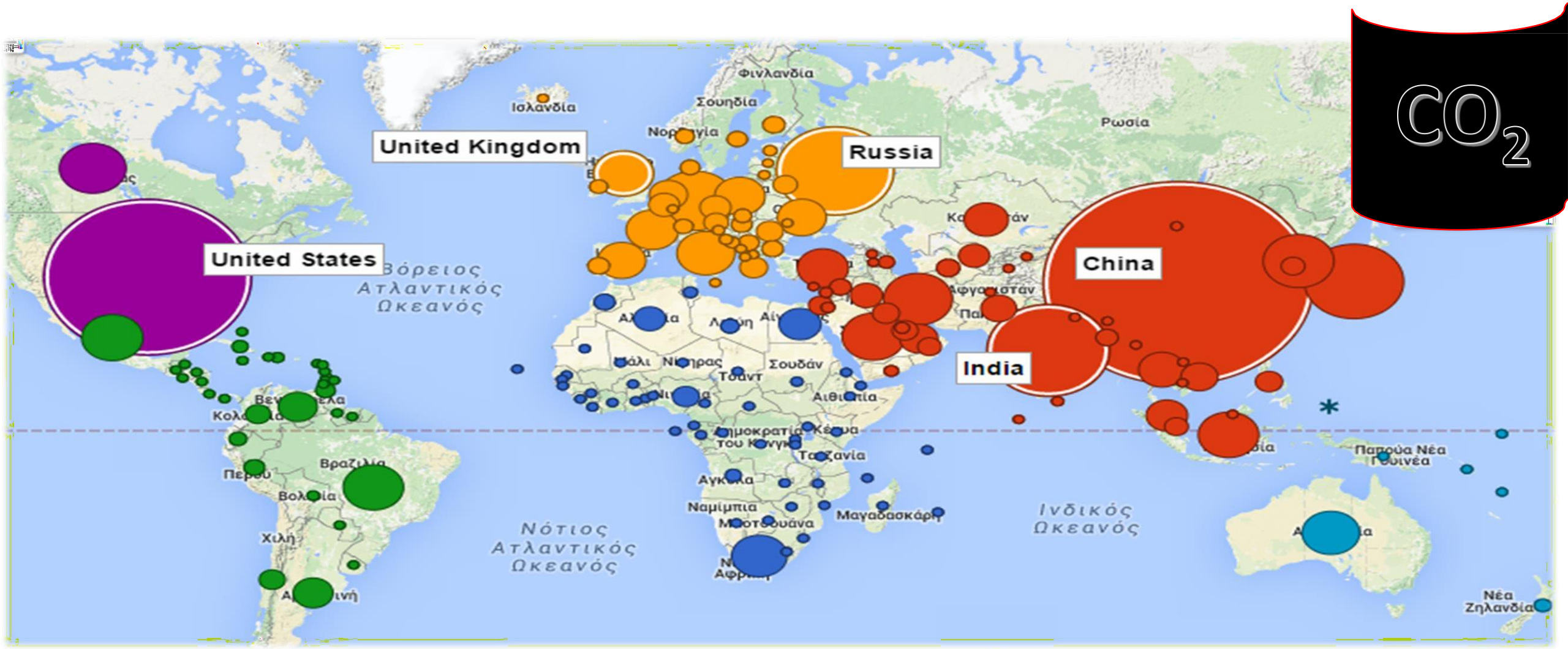
Mean Temperature Anomalies



http://berkeleyearth.org/

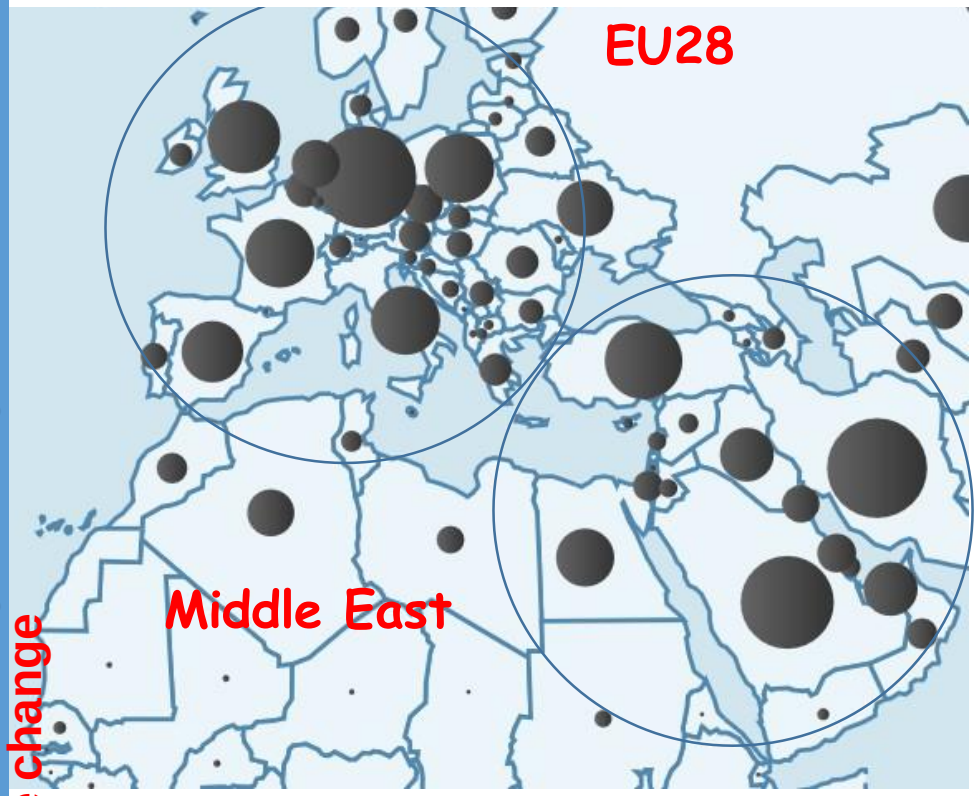


* EMME: Eastern Mediterranean and Middle East


CO_2
United Kingdom
Russia
United States
China
India
Ισλανδία
Φινλανδία
Σουηδία
Νορβηγία
Ρωσία
Βόρειος Ατλαντικός Ωκεανός
Νότιος Ατλαντικός Ωκεανός
Ινδικός Ωκεανός
Σουδάν
Αιθιοπία
Τανζανία
Μαγαδασκάρη
Περού
Βραζιλία
Χιλή
Παπούα Νέα Γουινέα
Νέα Ζηλανδία

REGIONAL CO_2 emissions will get higher

Yearly emissions of CO_2 (2018)

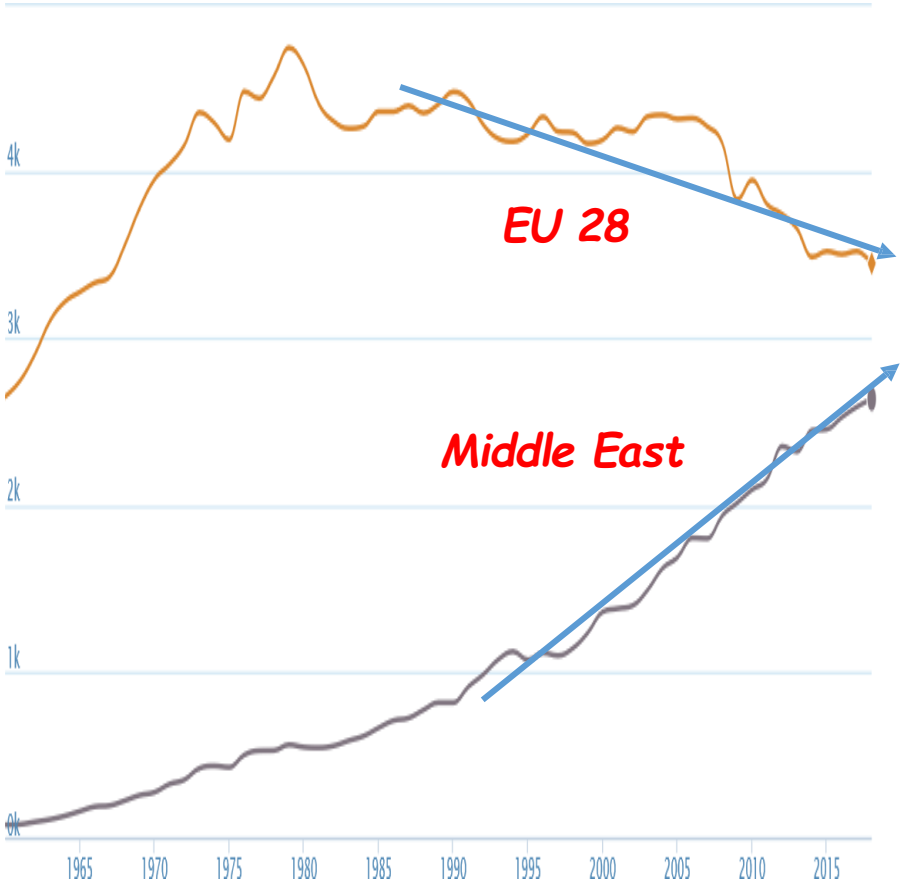


http://www.globalcarbonatlas.org/en/CO2-emissions

Opposite trends
(decreasing for EU ;
increasing for Middle East)

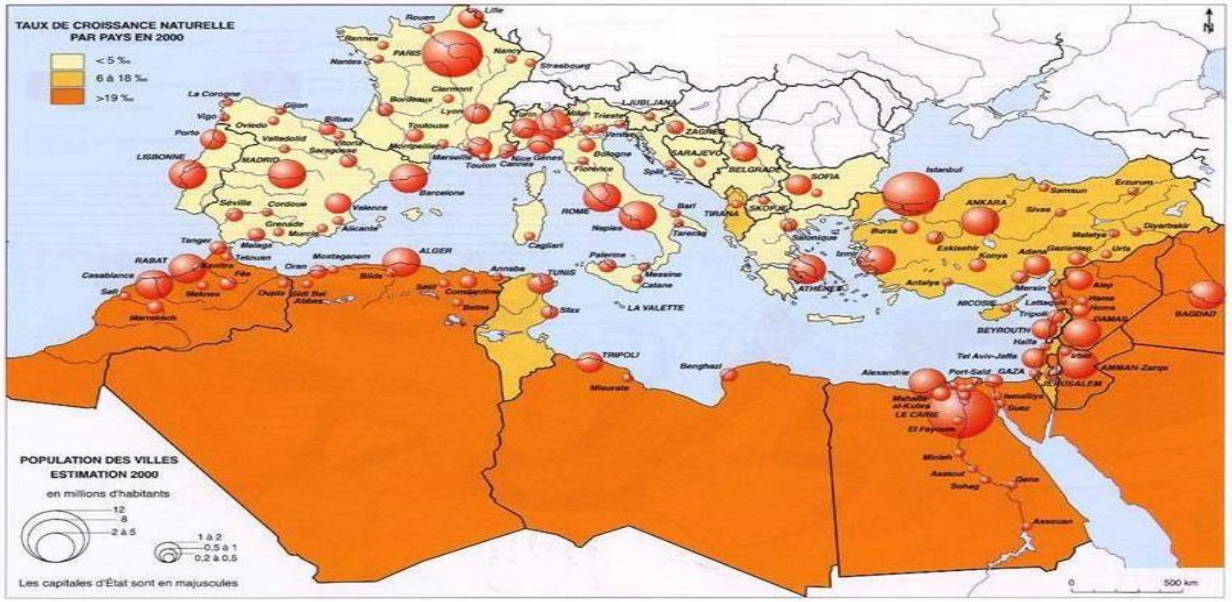
Two regions with high CO_2 emissions
(EU & Middle East countries)

Emission trends of CO_2 (1960-2018)

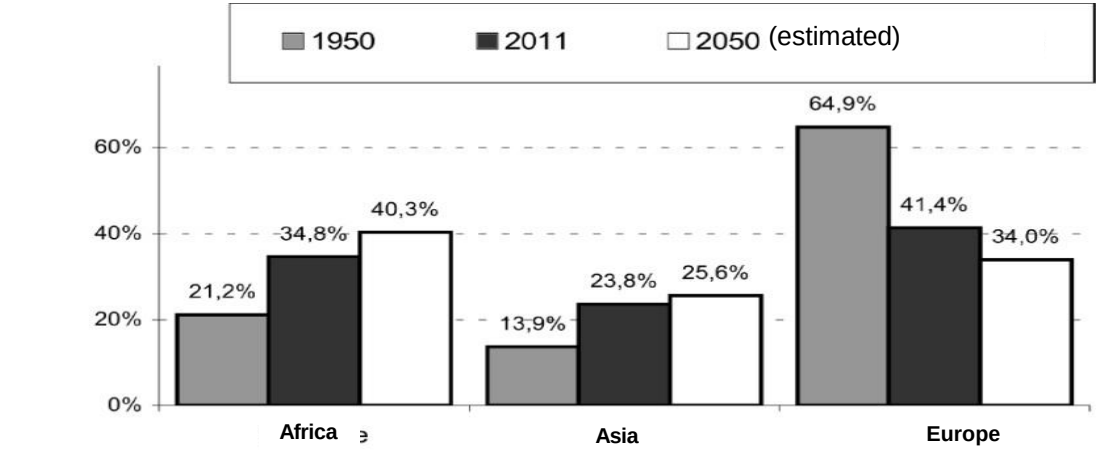


Human exposure to air pollution in the Mediterranean

Population around the Mediterranean (2000)

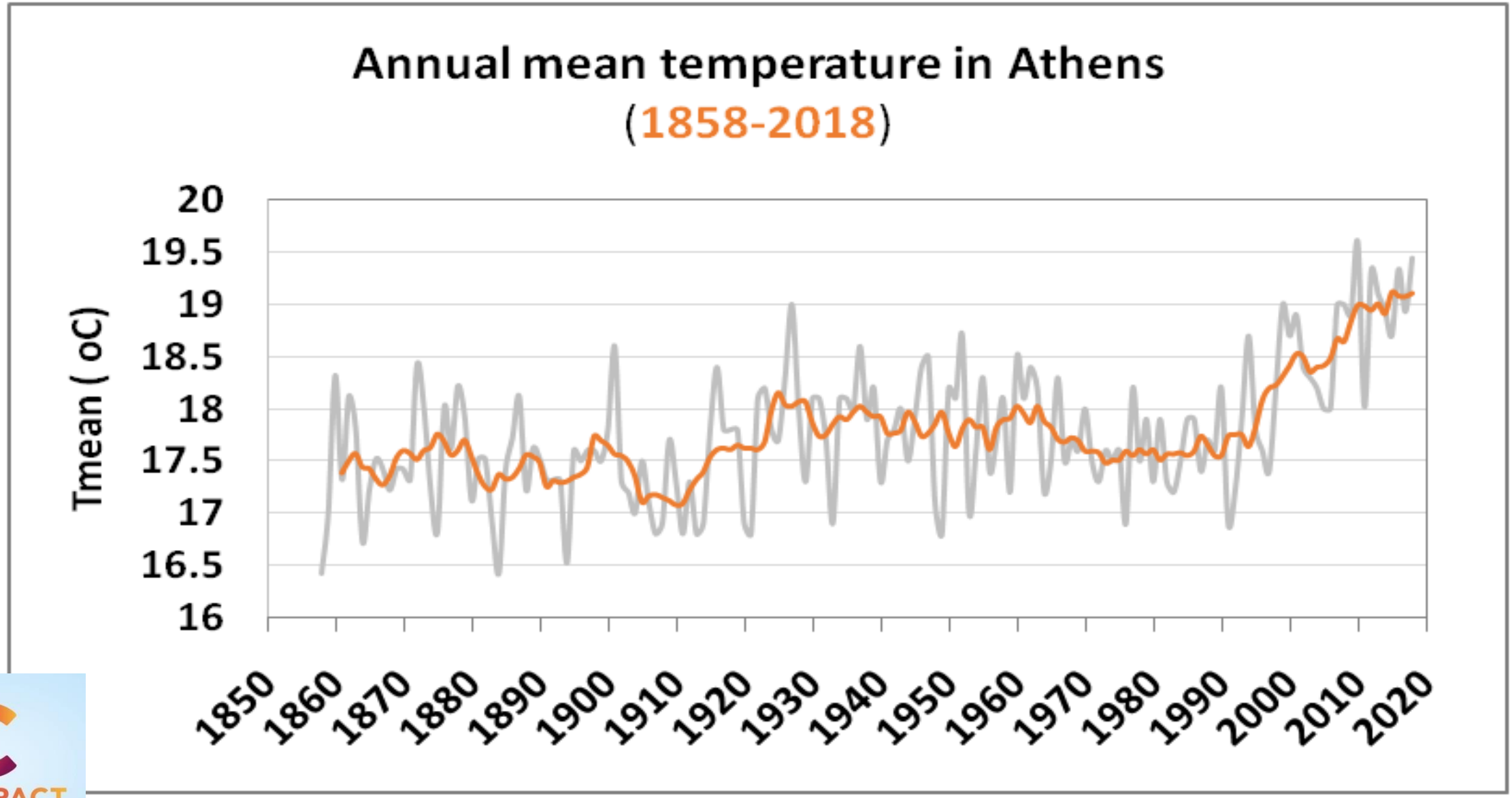


(Source: Géopolis)



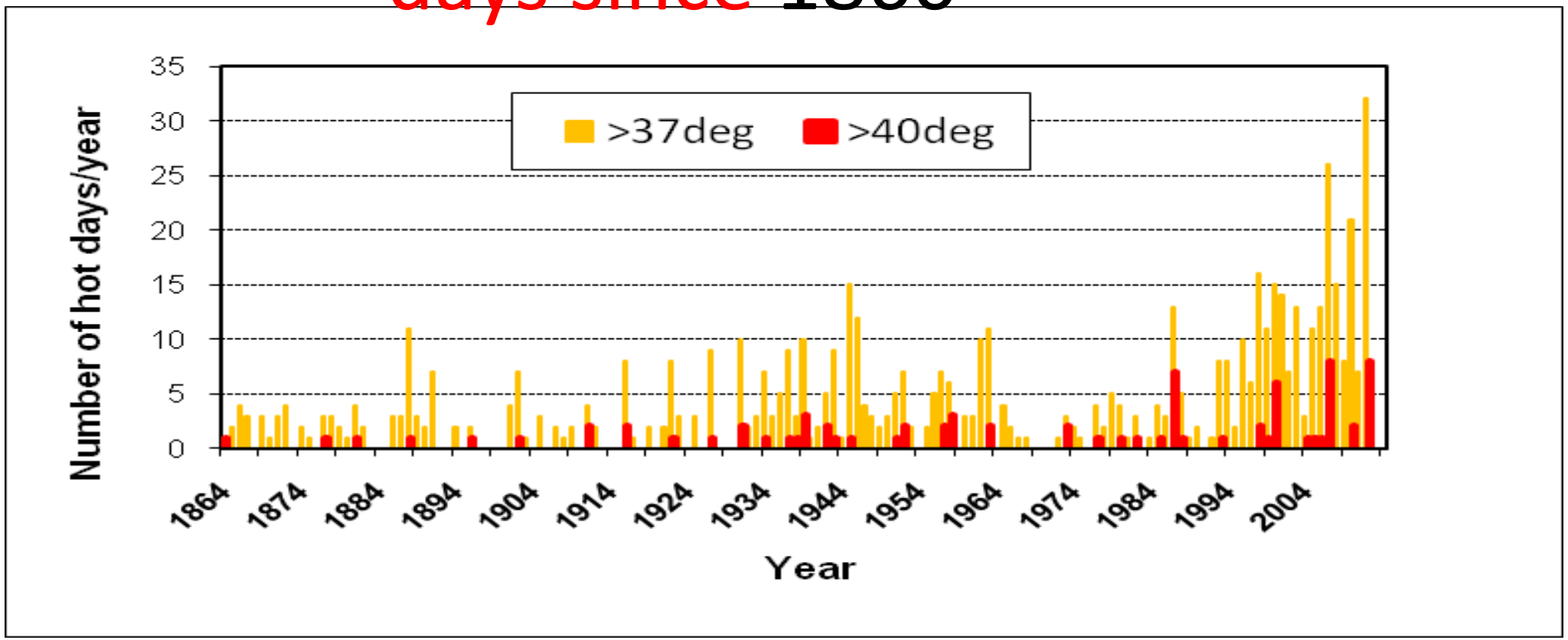
© Gérard-François Dumont - Chiffres PRB 2012.

- ✓ **A high anthropogenic pressure around the Mediterranean with almost half a billion of inhabitants**
- ✓ **A strong increase of the population in the Southern and Eastern Basin with more than half of the Mediterranean population leaving out of Europe (N. Africa and Middle-East)**



CLIMPACT
ΕΘΝΙΚΟ ΔΙΚΤΥΟ ΓΙΑ ΤΗΝ ΚΛΙΜΑΤΙΚΗ ΑΛΛΑΓΗ

Frequency of hot days since 1860



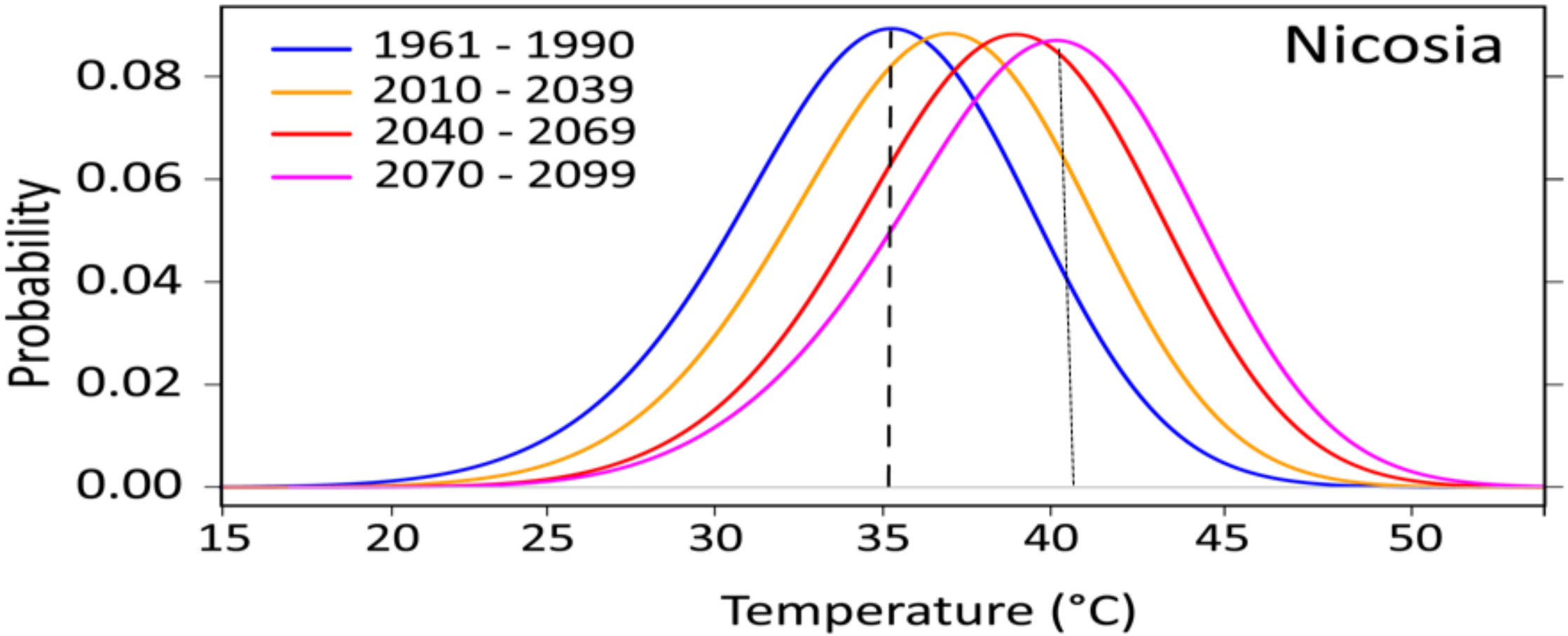
Source: Founda & Giannakopoulos 2009 (Global&Planetary Change)

This increase was accompanied by a striking increase in the hot days frequency

CLIMPACT
ΕΘΝΙΚΟ ΔΙΚΤΥΟ ΓΙΑ ΤΗΝ ΚΛΙΜΑΤΙΚΗ ΑΛΛΑΓΗ

ΕΘΝΙΚΟΝ ΑΣΤΕΡΟΣΚΟΠΕΙΟΝ ΑΘΗΝΩΝ
NATIONAL OBSERVATORY ATHENS

Probability distribution (PDF) of daytime temperatures in summer (June – August)



CLIMPACT: The Greek Initiative for studying the Climate change and its impacts”

- The proposed initiative aims to create a scientific core of excellence in research, to produce new knowledge on climate change, as there is currently a core of Greek scientists actively involved on climate change issues.

  Our country can utilize the significant number of terrestrial measurements (EMY, METEO), the current infrastructure of the road map (PANACEA, HIMIOFoTS) as well as the satellite data, producing innovative information necessary for the more accurate quantification of climate change and its effects.

Aims of CLIMPACT

- The optimization of the existing climate services and early warning systems for natural disasters in Greece, including the supporting observations from terrestrial networks, aerial platforms and satellite Earth observation systems collected in the relevant national infrastructures

- Utilization of new research results and methodologies in the production of original climate services and innovative early warning systems for natural disasters related to climate change.

Aims of CLIMPACT

- The creation of a national database through the systematic collection, control and archiving climatic and environmental parameters, data from satellite earth observation systems, models and products, and their free and open use by the Greek and international scientific community.

- Valid and timely dissemination of information to decision-making bodies, cross-sectoral policy design (with emphasis on tourism, agriculture, forests / ecosystems, and civil protection), shielding of citizens, society and economy in general from the effects of Climate Change.

Pillars of CLIMPACT

<u>Pillar 1:</u> Science and High quality data related to Climate Change

<u>Pillar 2</u>: Climate Change: Impacts on agriculture, tourism and energy consumption – adaptation – mitigation – financial impact

<u>Pillar 3</u>: Hazard and risk estimation from Climate Change (production of early warning systems for fire and floods)

Participants

- National Observatory of Athens (NOA, Co-ordiantion)
- Academy of Athens
- Aristotle University
- University of Athens
- National Technical University of Athens
- Hellenic center of Marine Research (HCMR)
- Demokritos Research center
- University of Crete
- National technical University of Crete
- Research Center Athena
- National Center for Social Studies
- The initiative is open to other Greek Institutes and Universities

Dialogue FORUM (CLIMPACT)

- *Forum on the adaptation and impacts of climate change on agriculture (October 2020; Thessaloniki)*
- *Forum on the adaptation and impacts of climate change on tourism (June 2021: Crete)*
- Forum on the adaptation and impacts of climate change on **floods**, Athens , November 2021).
- Forum on the adaptation and impacts of climate change on **marine environment** , March 2022).
- Forum on the adaptation and impacts of climate change on **air quality and health**, Kythera, June 2022).

Impact of tourism on National Economy

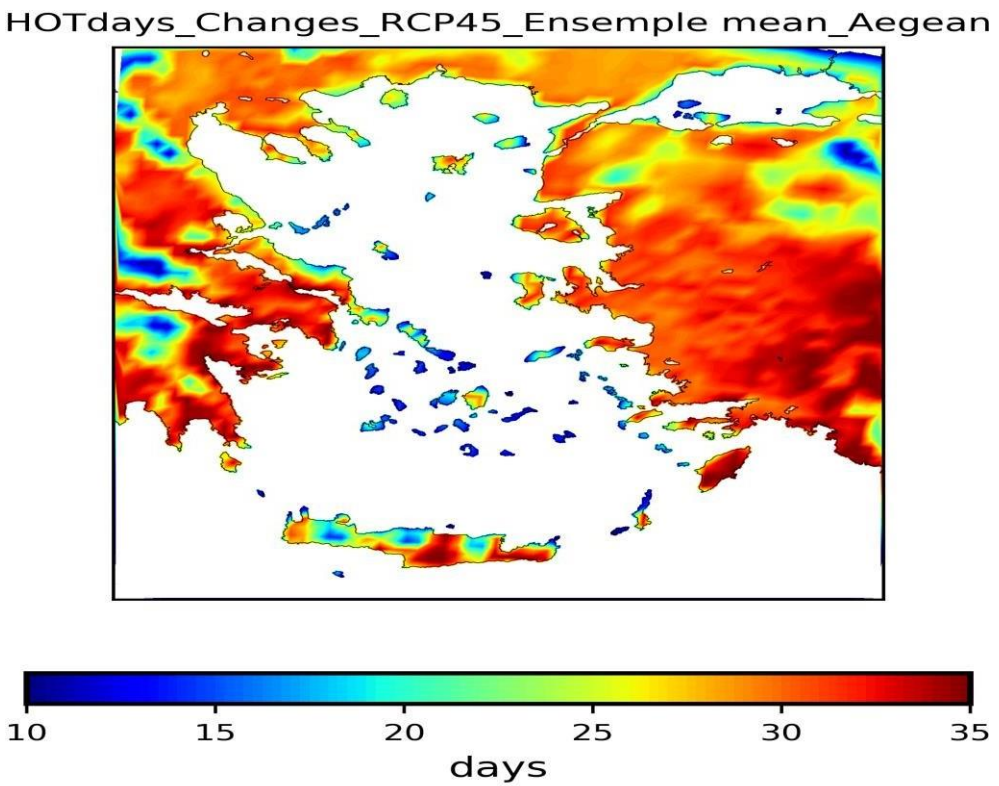
- The participation of tourism activity is estimated at around EUR 22 billion. euro (2018 data).
- Based on the latest available data, at least one percentage point of 2018 growth, of 1.9%, comes from tourism.
- Also, tourism contributed directly to the creation of 12% of the country's GDP, while its direct and indirect contribution is estimated from 26% to 31%.
- At the same time, tourism contributes directly at 17% of employment and overall (directly and indirectly) between about 40%, while it is a key lever for reducing unemployment.
- In the Regions of Crete, the Ionian Islands and the South Aegean, tourism contributes directly to the creation of 47%, 71% and 97% respectively of the GDP of these destinations.

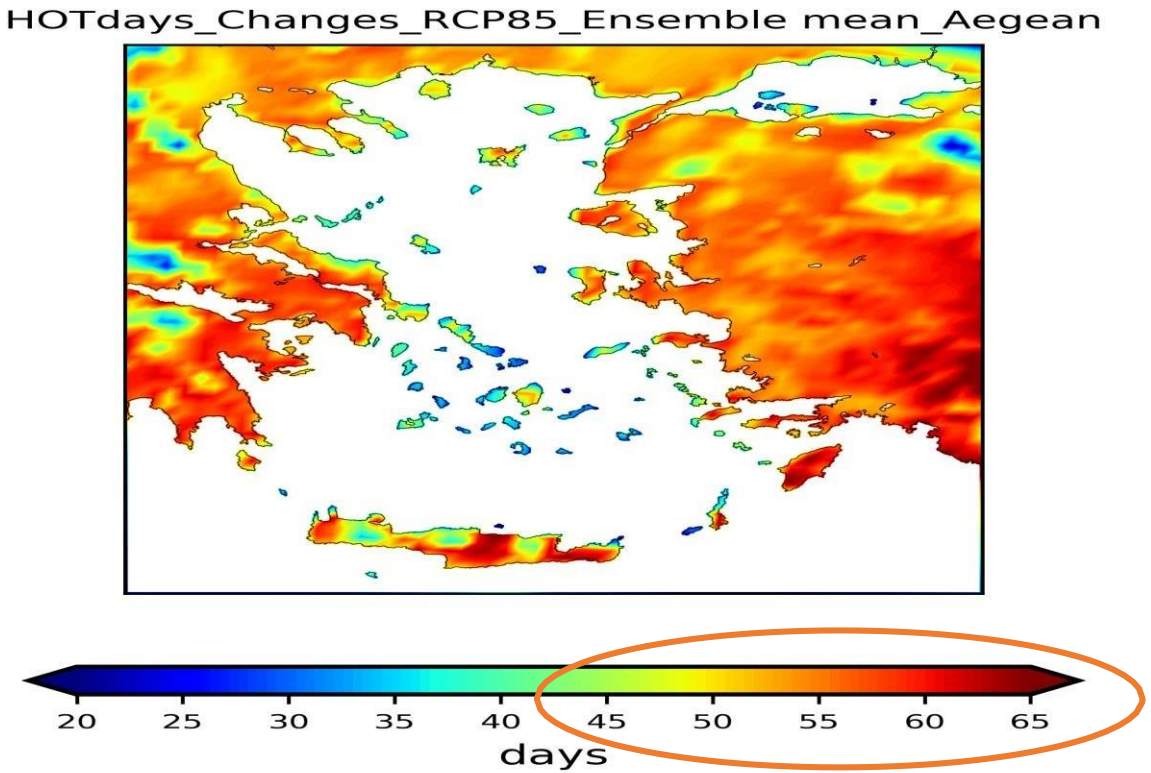
Σηοιχεία : Ινζηηούηο ηου Συνδέζμου Ελληνικών Τουριζηικών Επιχειρήζεων (ΙΝΣΕΤΕ).

RCP4.5

Hot days: Tmax>30^{0}C

RCP8.5

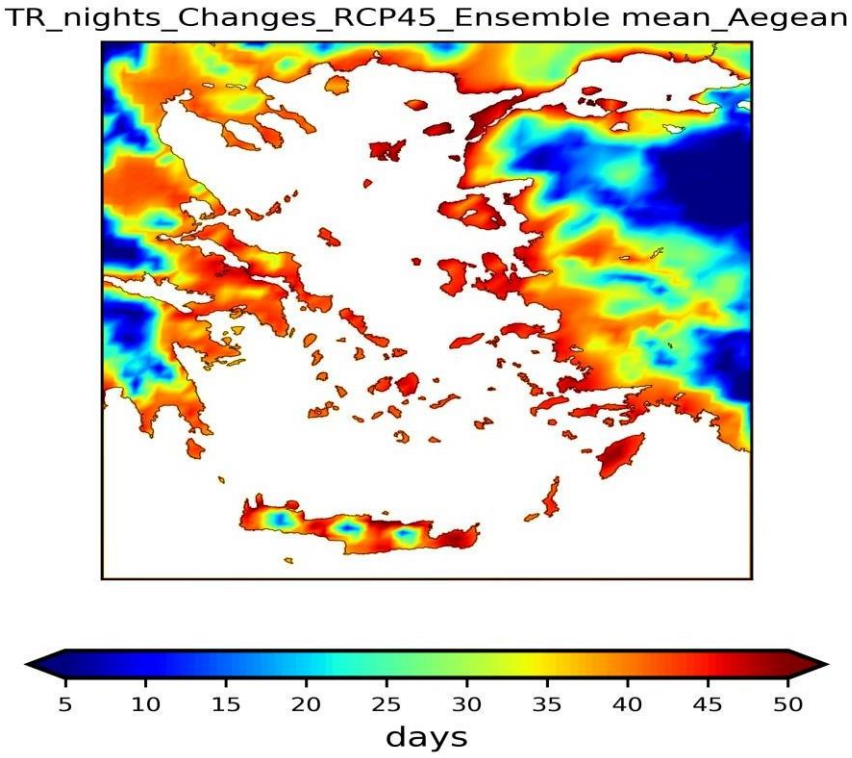




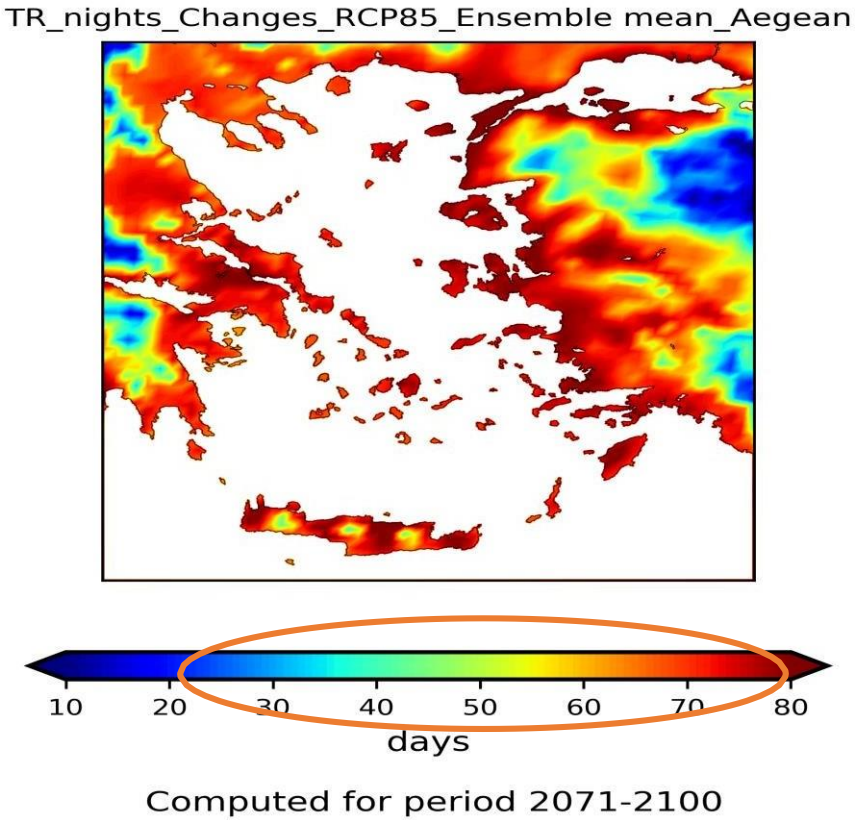
Thermal stress has significant effects on human health and can affect the tourism sector. Thermal discomfort is associated with tropical nights.

Tropical nights: Tmin>20^{0}C

RCP4.5



RCP8.5



As a consequence:

- Uncertainty about the type of services appropriate to the new climatic conditions

- Inability to develop a highly demanding strategy
- Possible differentiation from place to place

Urgent need for adaptation

Ευχαριστώ για τη προσοχή σας

Thank you very much for your attention

The European Green Deal: reaching climate neutrality by 2050

Georgios Amanatidis, PhD

Parliamentary research administrator

Policy Department for Economic, Scientific and Quality of Life Policies,

European Parliament

LIFE ASTI FINAL CONFERENCE, Thessaloniki, 19 May 2022

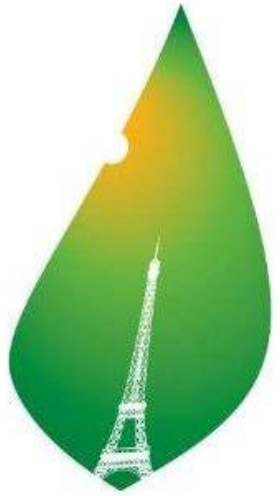
EU's role on climate change

- The EU is competent to act by the principle of subsidiarity in all areas of environment policy, including climate change
- The EU has been a pioneer and a role model for countries across the world
- The EU's Environment Council already agreed in 1996 to limit global average surface temperature rise to below 2°C above pre-industrial levels
- The EU share of global CO2 emissions fell from 19.7% in 1990 to 8.7% in 2019
- Europe's early determination to take action on climate change was necessary to allow 195 countries to commit to the Paris Agreement

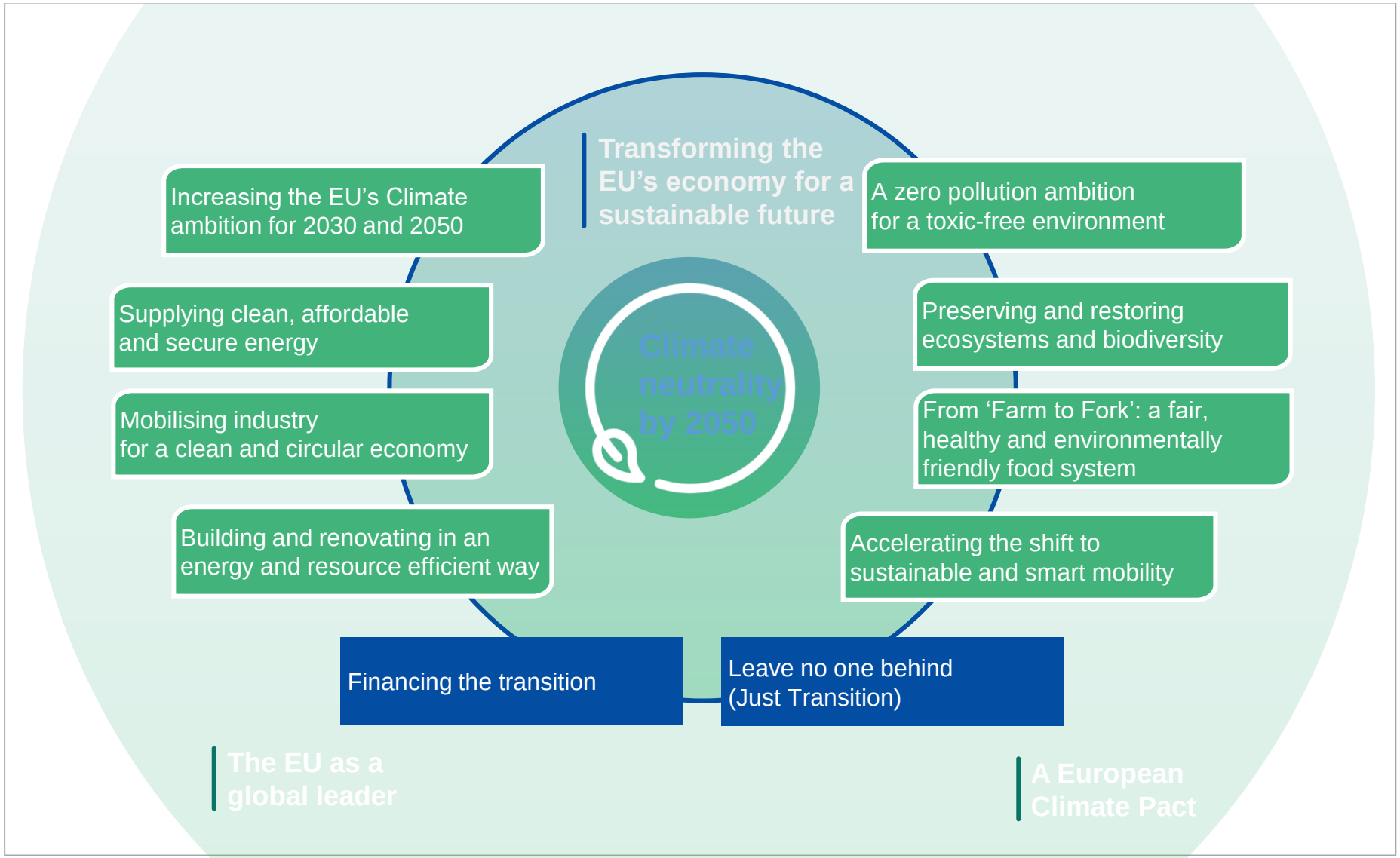
The EU vision on climate change

A sustainable, fair and **prosperous** future for **people** and **planet** based on European values.

- Tackling **climate change,** an existential threat to Europe and the world
- Implement the 2015 **Paris Agreement** and achieve **carbon neutrality by 2050**
- Helping to achieve the 17 **Sustainable Development Goals**
- Boosting the Union's **competitiveness and growth**



The **European Green Deal**



The European Green Deal

Without action on climate change, the EU will see, in the lifetime of our children:

Water and flooding

40%
less available water in southern regions of the European Union

Half a million
people exposed to river flooding each year

2.2 million
people exposed to coastal inundation each year

Heat and drought

90,000
annual deaths as a result of heatwaves[1]

660,000
additional asylum applications per year in the EU at 5°C temperature increase[2]

16%
of species at risk of extinction at 4.3°C temperature increase[3]

Economics

€190 billion
annual losses projected for a 3°C increase in global average temperature

Source: Ciscar et al., 2014: Climate impacts in Europe, the European Commission's Joint Research Centre PESETA II project

Globally, the number of **people at risk** of being forced from their homes by river flooding could increase to **50 million** a year

Source: Internal Displacement Monitoring Centre, Assessing the impacts of climate change on flood displacement risk, 2019

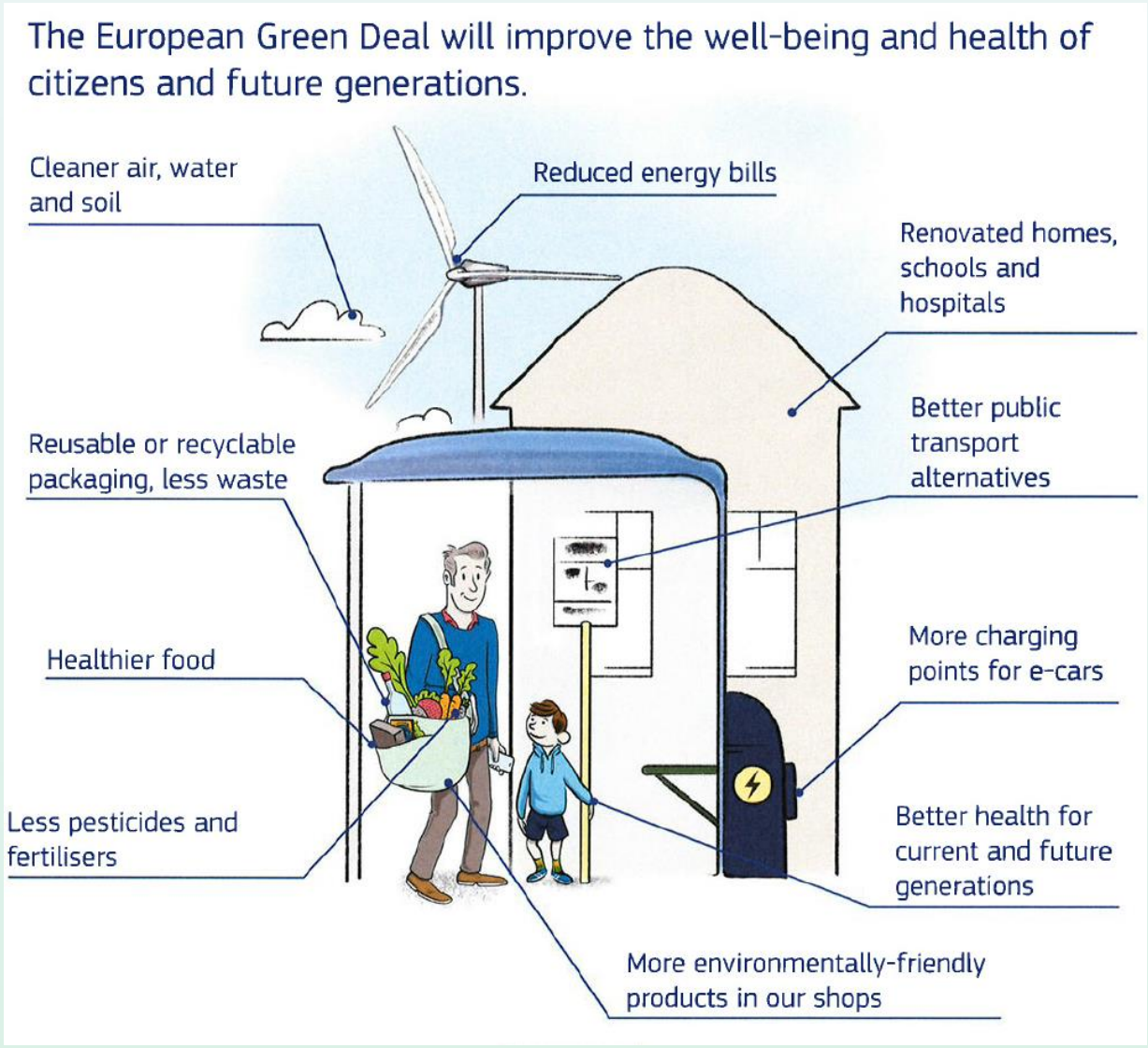
Climate change could lead to a **20% food price rise** in 2050

Economic costs of heat-related mortality could amount to more than **€40 billion** per year

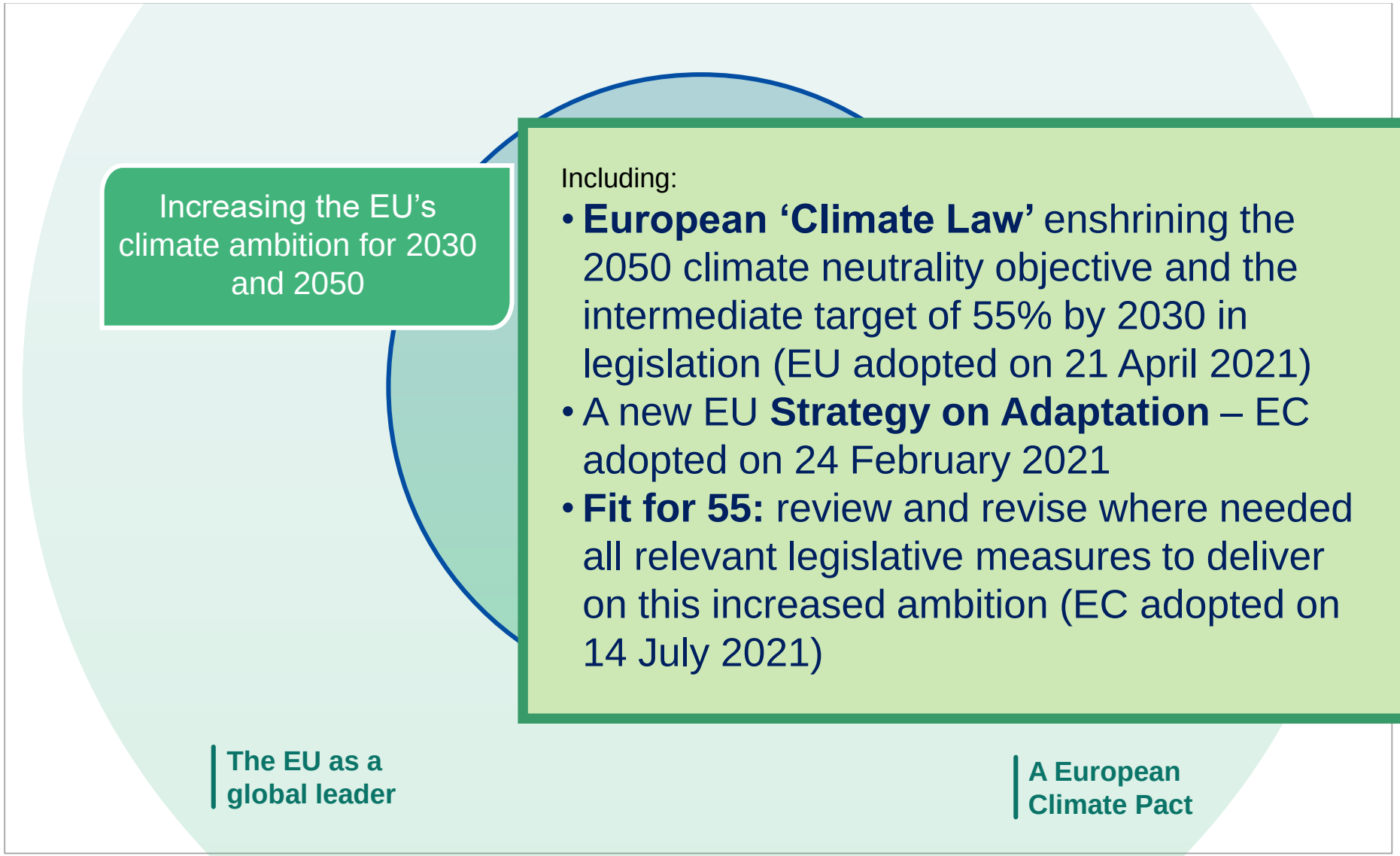
Pollution

400,000
premature deaths per year today due to air pollution. This figure is expected to soar

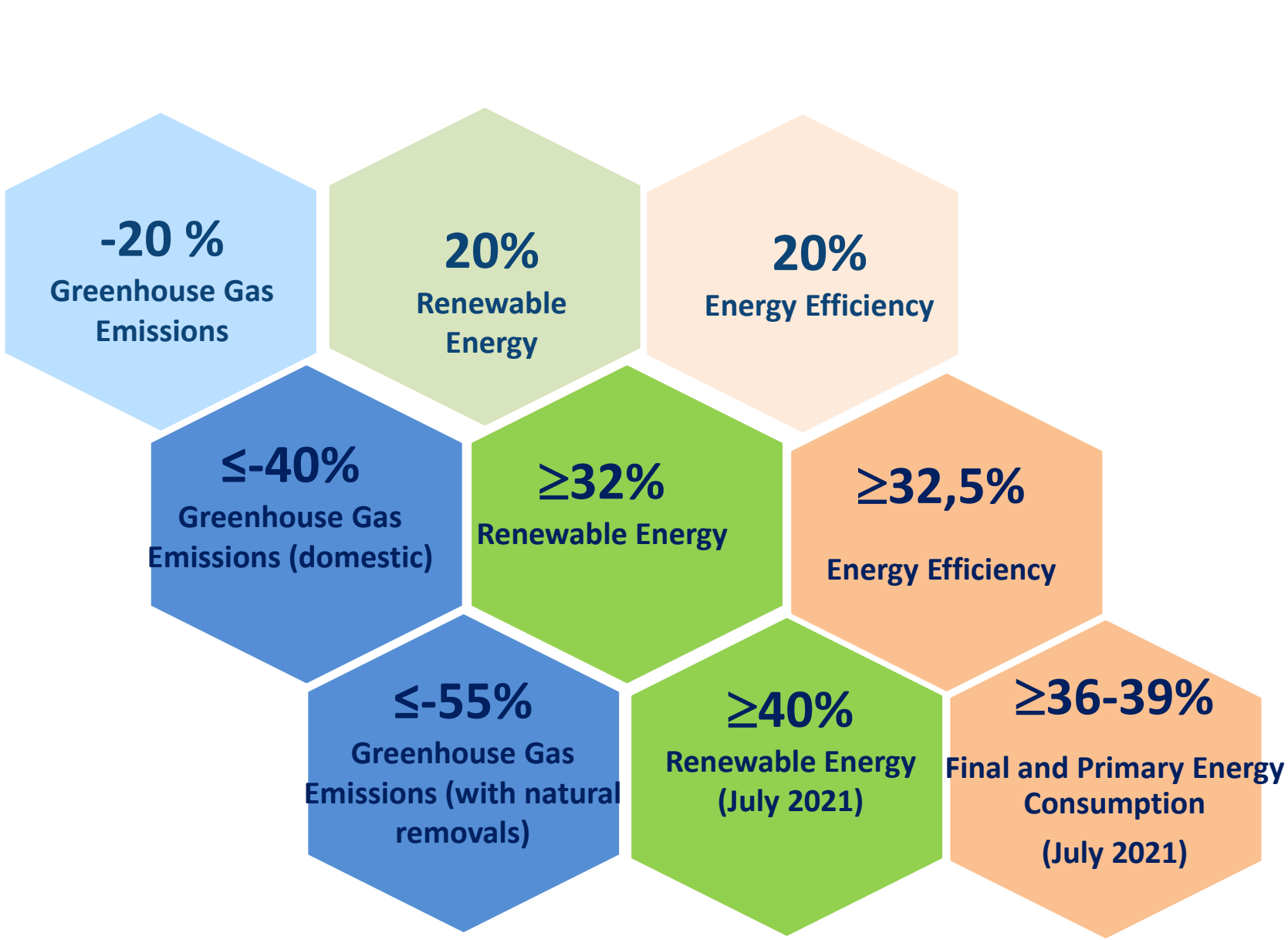
The European Green Deal



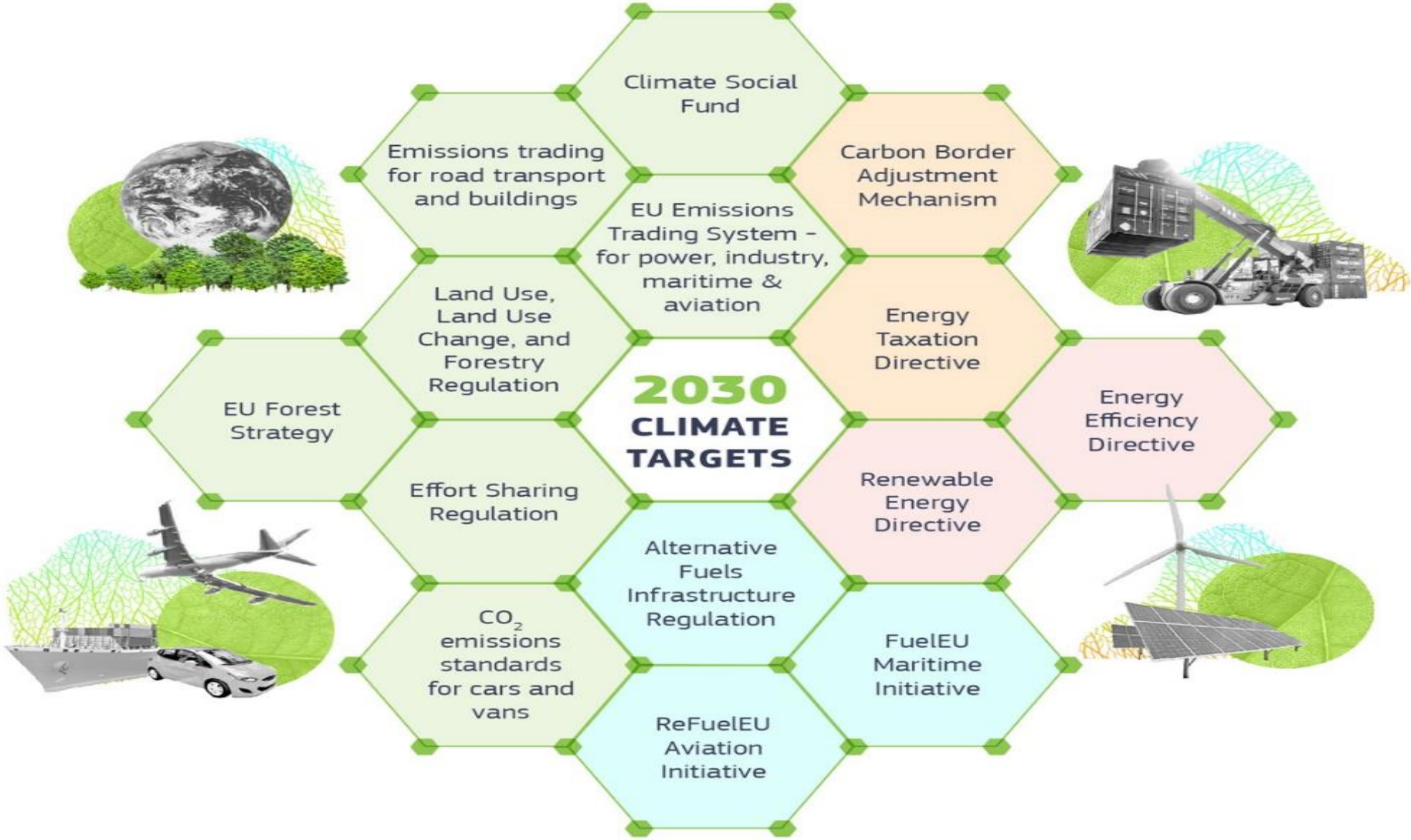
The European Green Deal



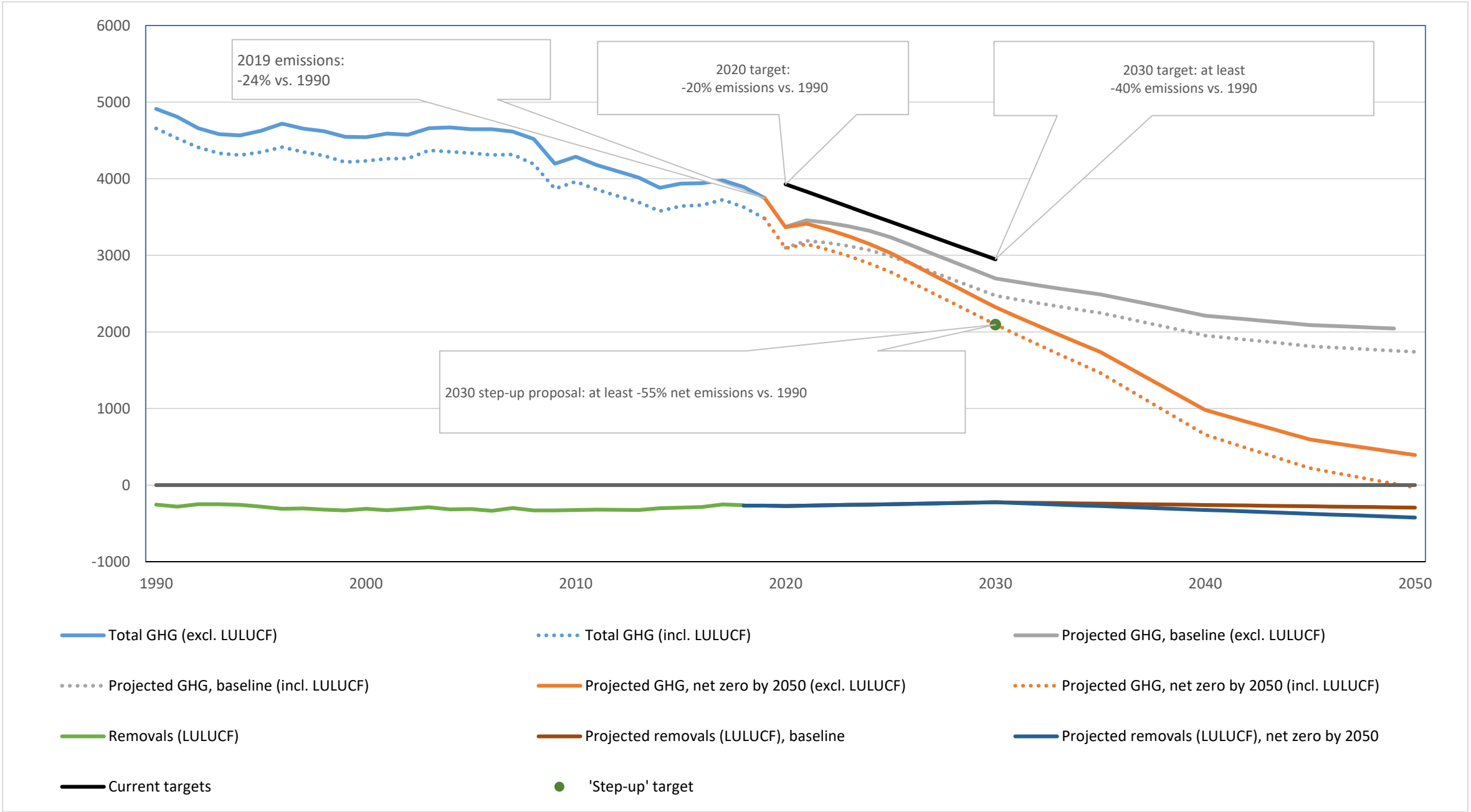
EU climate and energy targets



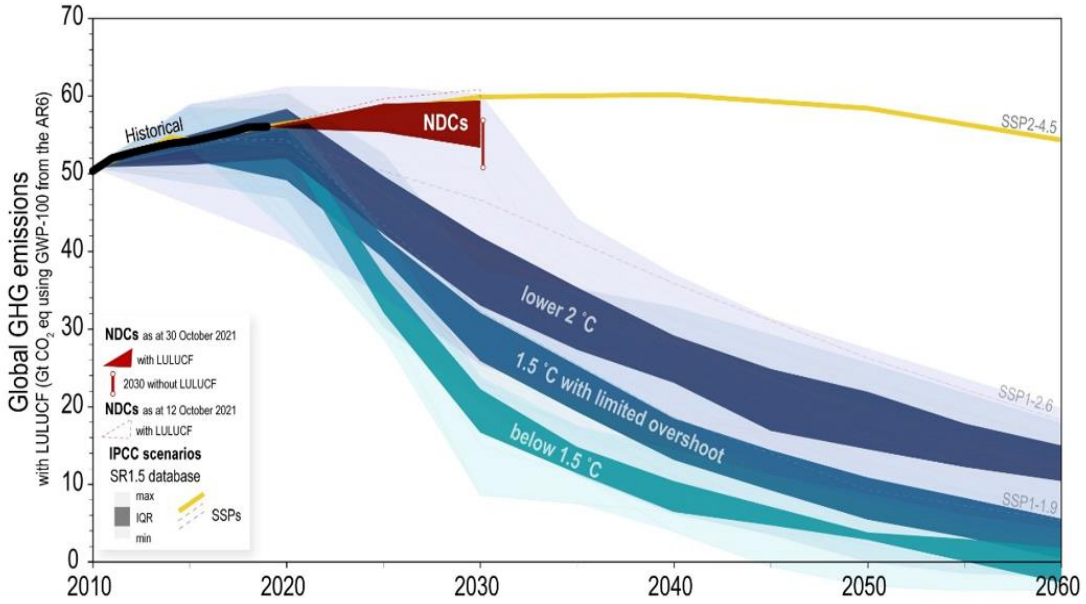
The Fit for 55 Package – Overview



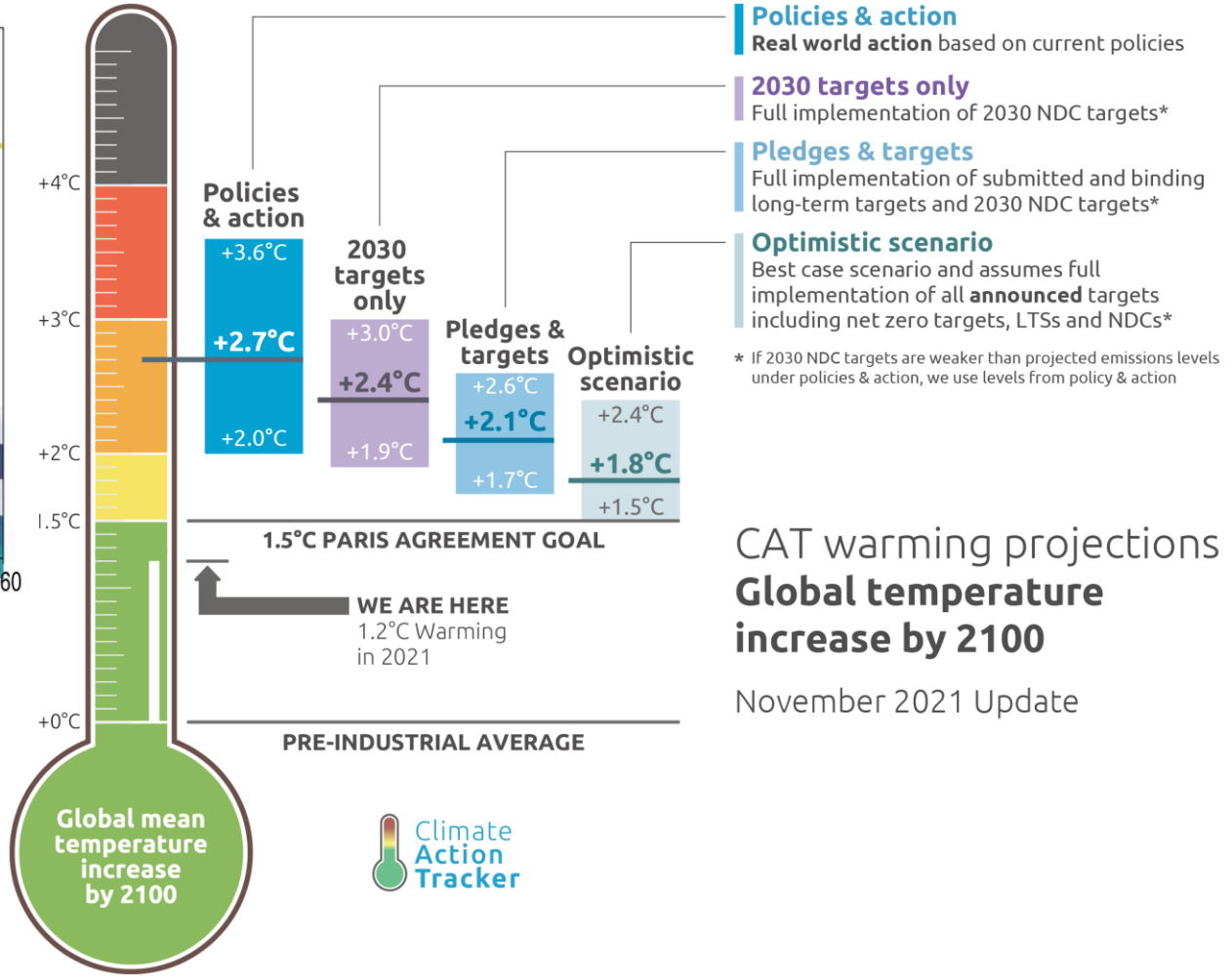
EU GHG emission trends, projections and targets



Going global: The ambition gap



Latest updated comparison of global emissions under IPCC SR1.5 scenarios with total global emissions according to NDCs (UNFCCC SR)



The European Green Deal

Financing the transition

- **30% of the EU budget** under the 2021-2027 multiannual financial framework (€1.074 trillion) and the NextGenerationEU (€750 billion) will have to be spent to fight climate change
- **Recovery and Resilience Facility (€672.5 billion)** - each national plan will have to include a minimum of 37% of expenditure related to climate
- **Just Transition Mechanism** worth €150 billion of public/private funds
- Initiatives to screen EU/MS **green budgeting practices** from 2020
- Review of **state aid guidelines for environment and energy**
- Review of the **Non-Financial Reporting Directive** in 2020
- **€84.9 billion for the Horizon Europe R&D program** and 35% of it will be set aside for climate-friendly technologies
- Stakeholders to identify and **remedy incoherent legislation** that reduces the effectiveness in delivering the European Green Deal from 2020
- Integration of the **Sustainable Development Goals in the European Semester** from 2020

Leave no one behind (Just Transition)

The EU as a global leader

A European Climate Pact

Key messages: Climate change and its impacts

- Climate change is happening on a global scale and is attributable to human activity; it is adversely affecting humans and the planet while risks will increase over time.
- Rapid and decisive action, to cut GHG emissions sufficiently to keep temperature increase below 2°C above pre-industrial level, could greatly reduce these risks.
- Major near term benefits are arising from decarbonising the economy as a result of reduced air pollution and other co-benefits of climate change mitigation.
- Achieving the climate-neutrality goal requires massive investment and an unprecedented transformation of all sectors of the economy.
- Since the EU is responsible for only a fraction of global emissions, global leadership and engagement with international partners through trade and diplomacy are vital.
- The scientific community has important roles in generating new knowledge and countering misinformation on the climate change impacts, on factors increasing vulnerability, and on the effectiveness of adaptation and mitigation strategies, in close collaboration with decision makers.

Thank you for your attention!

More information:

Legislative Train Schedule:
https://www.europarl.europa.eu/legislative-train/theme-a-european-green-deal
Information on the European Green Deal

EC Climate Action: https://ec.europa.eu/clima/index_en
Delivering the European Green Deal

What Europe does for me:
https://what-europe-does-for-me.eu/el/home

DEPI Lazio
Department of Epidemiology
Lazio Regional Health Service, Italy

SISTEMA SANITARIO REGIONALE
ASL ROMA 1

REGIONE LAZIO

Climate change and health: adaptation and mitigation actions in Italy

Paola Michelozzi

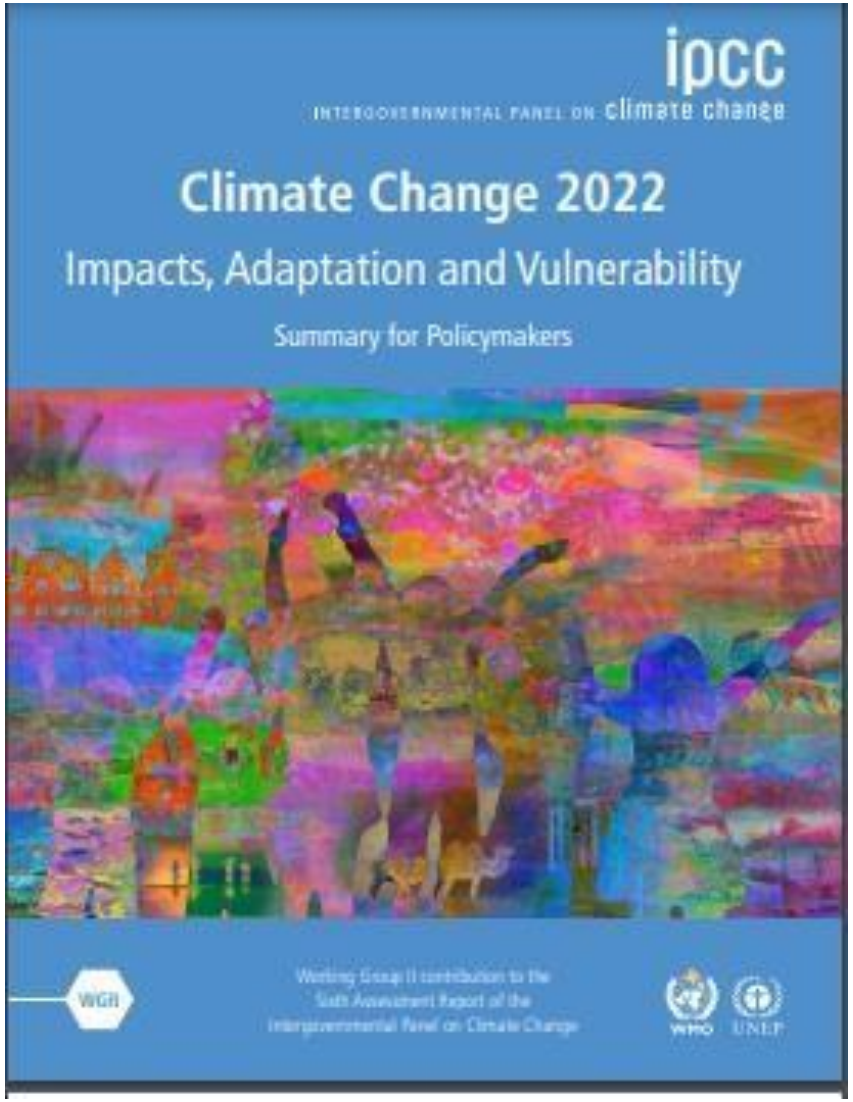
LIFE ASTI Final Conference May, 19 2022

Climate Change 2022 Intergovernmental Panel on Climate Change

The 6th Assessment Report of the IPCC strenghtens the evidence about the human responsibility in the warming of the atmosphere due to emissions of greenhouse gases

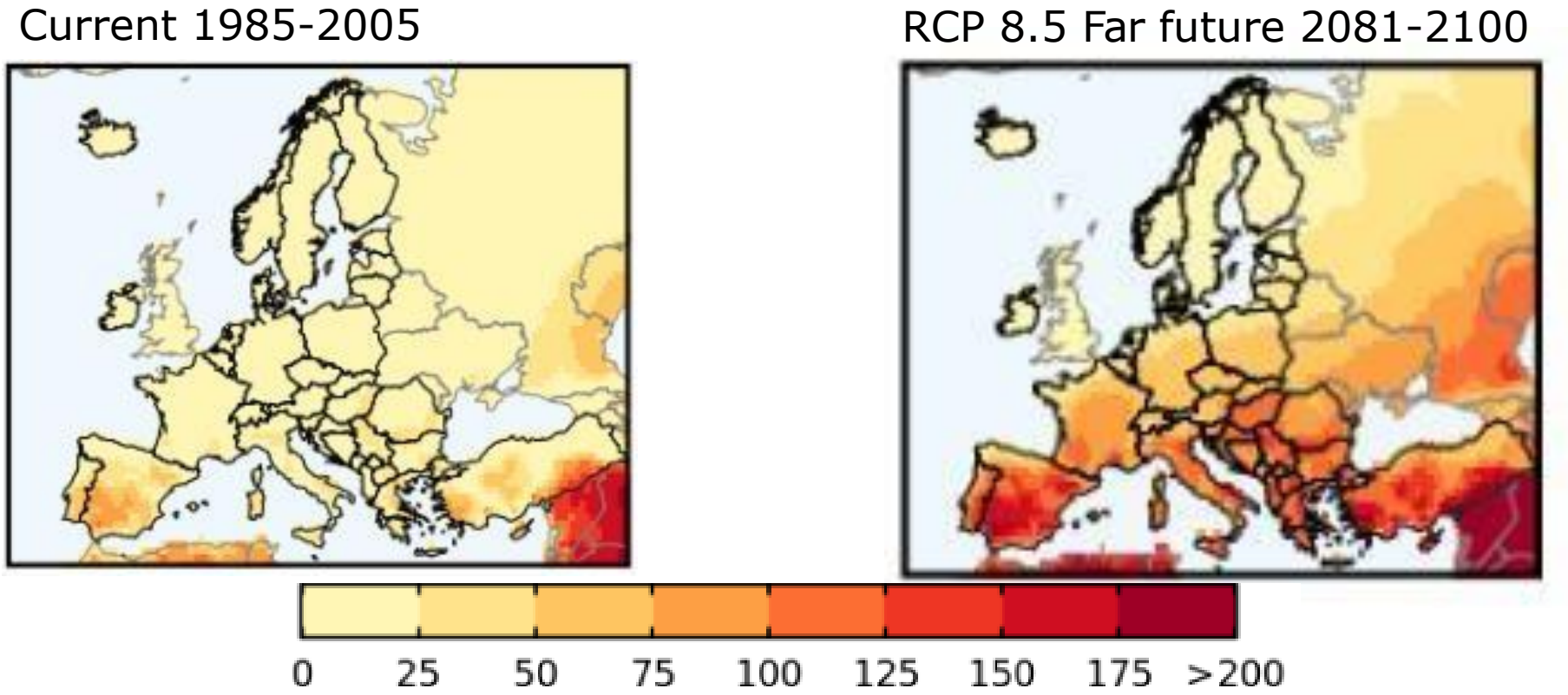
There is *high confidence* that extreme events (e.g. heat waves) have become more frequent and more intense and this trend will continue in the future

Southern Europe is one of the most vulnerable areas to climate change related stressors (droughts, heat waves, forest fires…)



Extreme heat in Europe

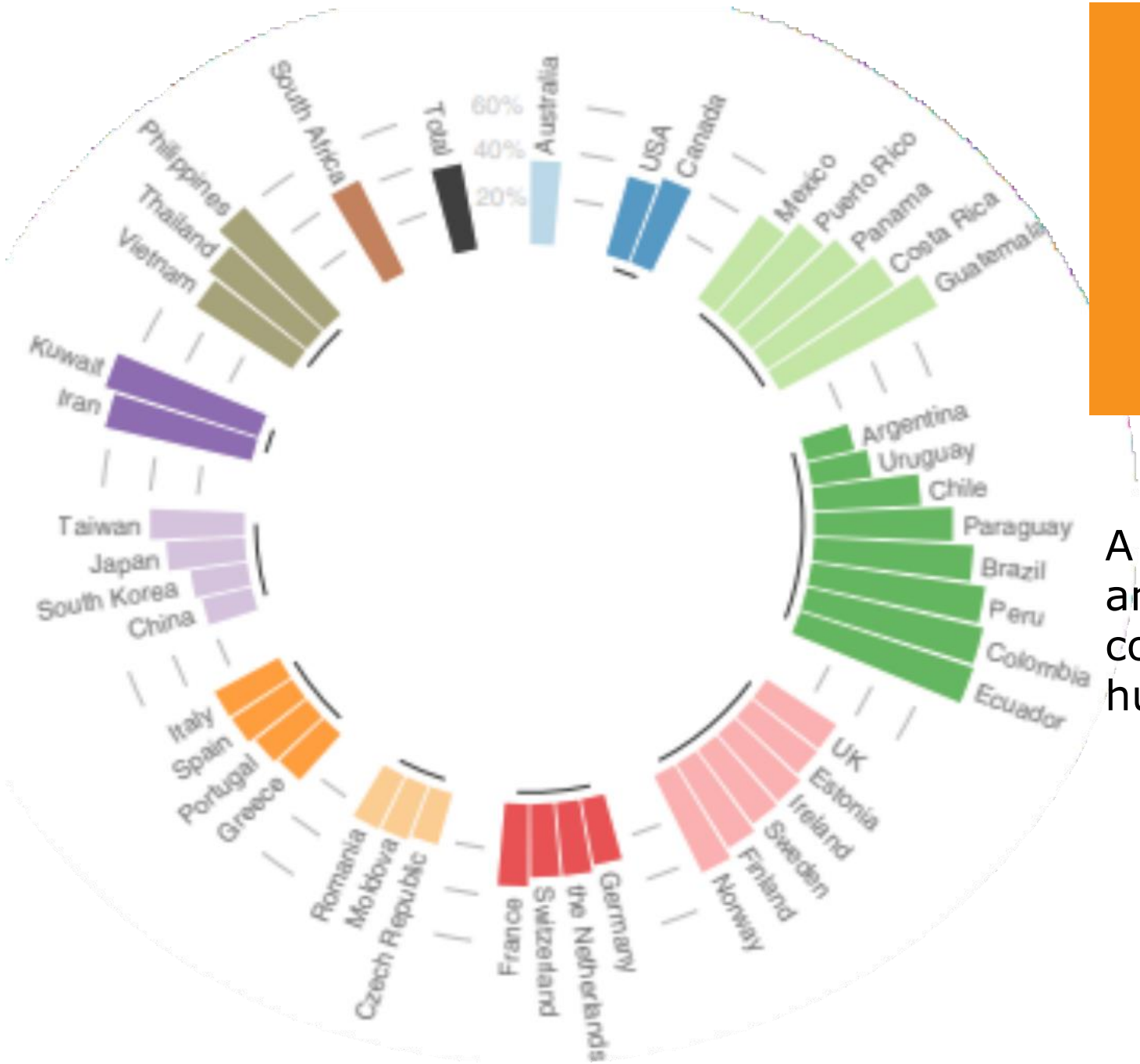
Number of hot days (maximum temperature > 30°C) per year



In Europe, the number of hot days is expected to almost quadruple during the 21st century under the high-emissions scenarios (RCP8.5) with largest absolute increases in Southern Europe

Source: EEA 2022

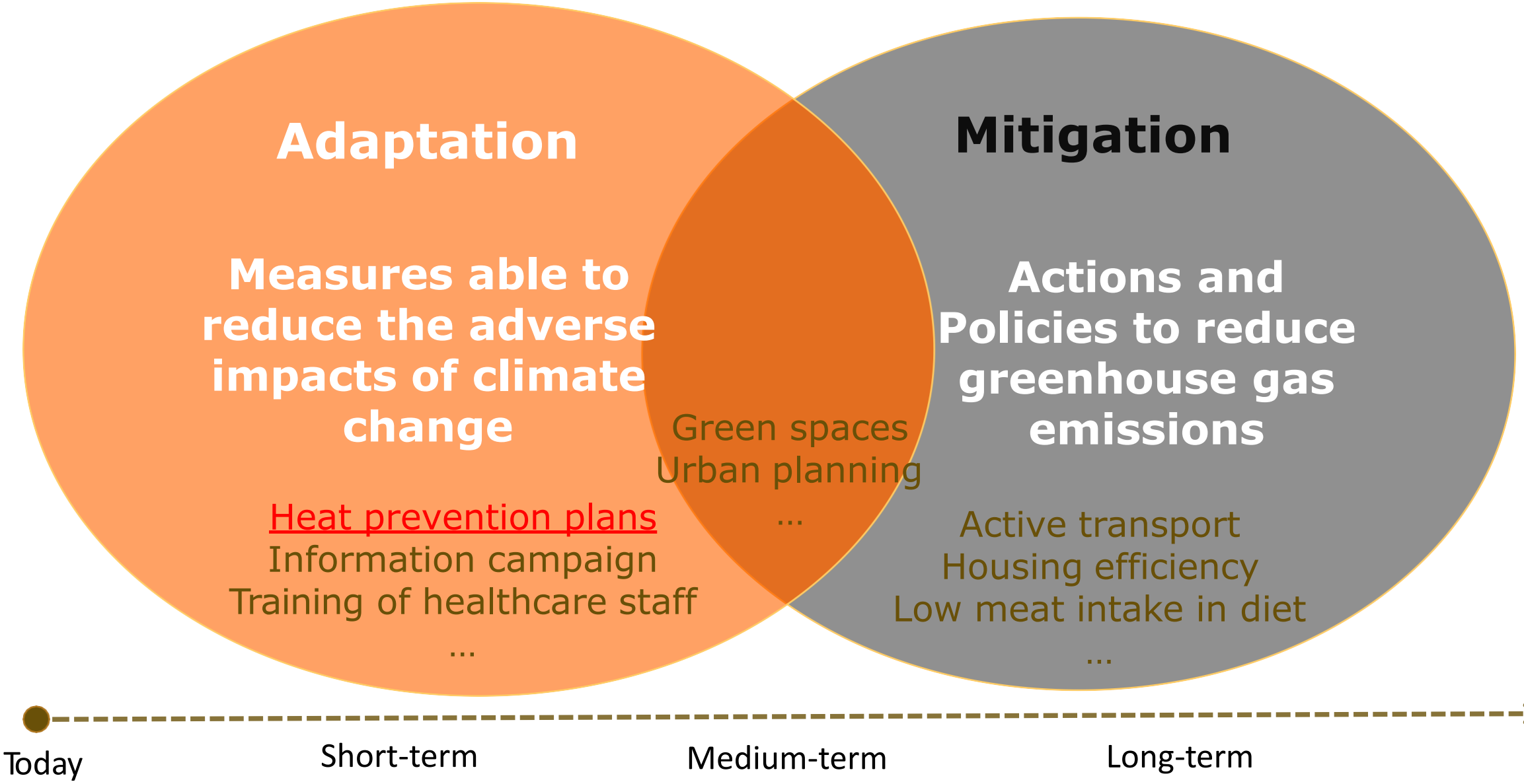
- Extreme heat have been linked to an increased risk of heat-related mortality and morbidity, of occupational injuries and changes in work productivity
- Vulnerable population includes: elderly, children, (pregnant) women, socially isolated people and those suffering from pre-existing medical conditions, including cardiovascular disease, kidney disorders, diabetes and respiratory disease
- Implementing adaptation measures is important to reduce the risks of future heat waves.



Proportion of heat-related mortality attributed to human- induced climate change (%)

A substantial proportion of total and heat-related deaths in all countries can be attributed to human-induced climate change

Source: Vicedo-Cabrera 2021


Adaptation
Measures able to reduce the adverse impacts of climate change
Heat prevention plans
Information campaign
Training of healthcare staff
...
Green spaces
Urban planning
...
Mitigation
Actions and Policies to reduce greenhouse gas emissions
Active transport
Housing efficiency
Low meat intake in diet
...
Today
Short-term
Medium-term
Long-term

WHO Core elements of heat-health action plans

- Identification of lead body, interdepartmental co-operation
- Accurate and timely site-specific warning systems
- Information campaign (general pop, at risk groups, care givers etc.)
- Preparedness of the health/social care system
- Identification of vulnerable subgroups
- Real-time surveillance (mortality, ER visits, ambulance calls, Help lines)
- Reduction in indoor heat exposure
- Long-term urban planning

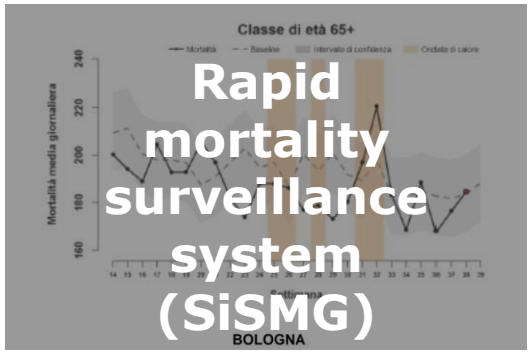
Italian Heat Prevention Plan (HHAP) of the Italian MoH

Heat warning system

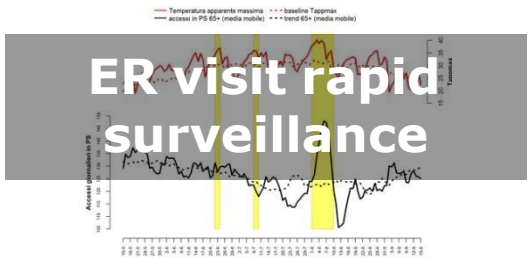
Local dissemination network

Prevention is graded based on level of warnings

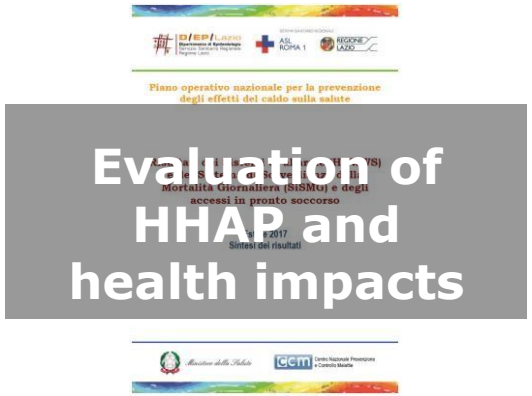
Monitoring and evaluation



Rapid mortality surveillance system (SiSMG)



ER visit rapid surveillance



Evaluation of HHAP and health impacts

Preparedness, Prevention & Response

Public Health Guidance

Identification of susceptible subgroups

Advice\measures for susceptible ubgroups and health care professionals

Survey of local prevention plans and adaptation measures

Italian Heat Prevention Plan (HHAP) of the Italian MoH

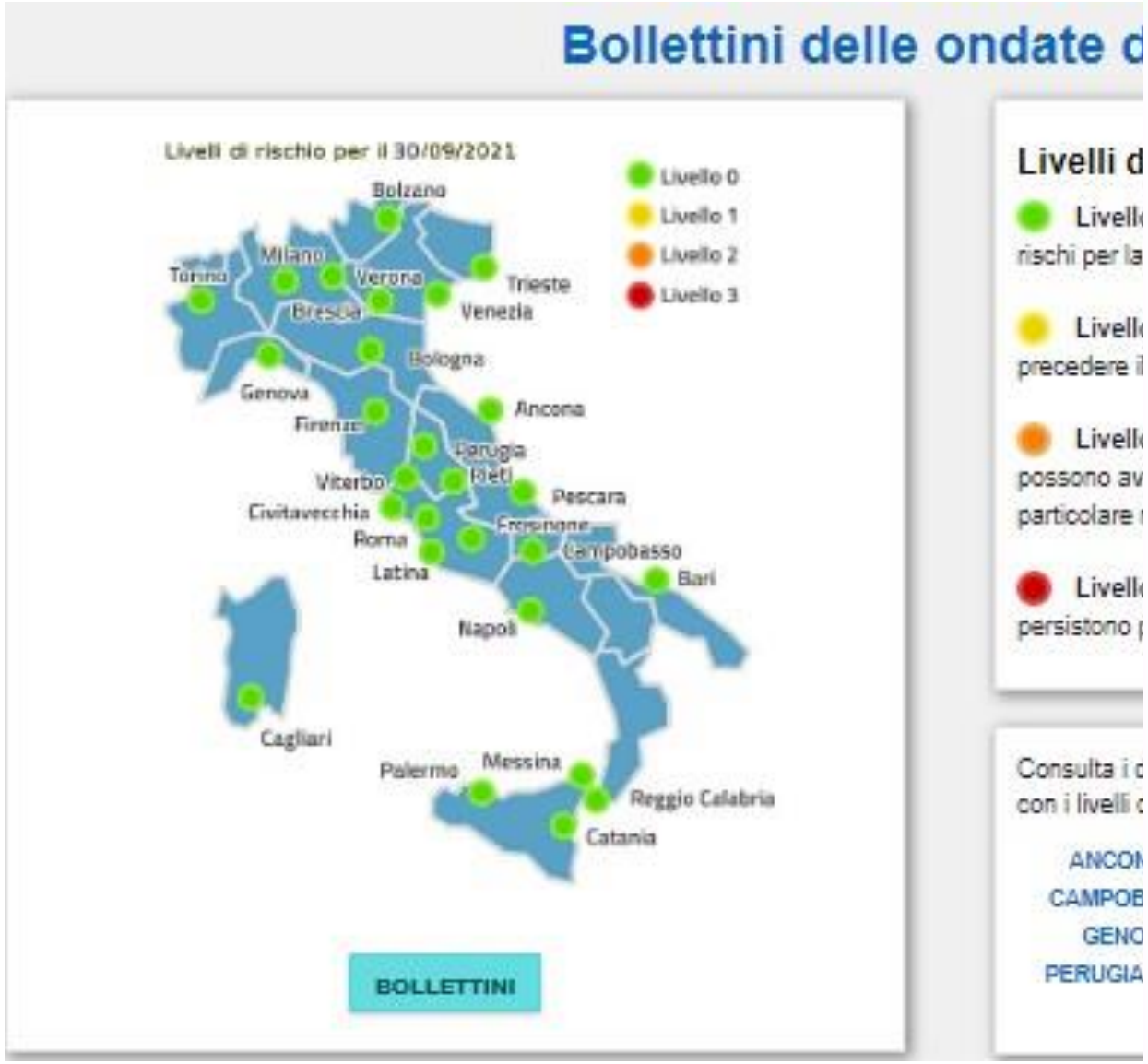
The Italian Heat Prevention Plan encloses the key components of the WHO guidance, with interventions modulated based on warning systems and targeted to the most vulnerable individuals

It represents one of the few examples of adaptation measures involving the Health Sector

For the first time, Italy encloses «Climate and Health» and the Italian Heat Prevention Plan among its national health prevention goals (National Prevention Plan 2020-2025)

MoH 2022

WARNING SYSTEMS AND DAILY BULLETIN



Sistema di allarme per la prevenzione degli effetti delle ondate di calore sulla salute

MILANO

	Previsione per il giorno:		
	15/05/2022	16/05/2022	17/05/2022
	LIVELLO 0	LIVELLO 1	LIVELLO 1
Temperatura ore 8:00	22	20	21
Temperatura ore 14:00	27	31	31
Temperatura massima percepita *	28	30	31

Livello 0	Condizioni meteorologiche non a rischio per la salute della popolazione
Livello 1	Condizioni meteorologiche che possono precedere un livello 2. **Pre-Allerta dei servizi sanitari e sociali.**
Livello 2	Temperature elevate e condizioni meteorologiche che possono avere effetti negativi sulla salute della popolazione, in particolare nei sottogruppi di popolazione suscettibili **Allerta dei servizi sanitari e sociali.**
Livello 3	**Ondata di calore.** Condizioni ad elevato rischio che persistono per 3 o più giorni consecutivi. **Allerta dei servizi sanitari e sociali.**

* Indicatore di disagio bioclimatico che tiene conto della temperatura dell'aria e dell'umidità relativa.

Per approfondimenti: **http://www.salute.gov.it/caldo/**

A cura del
Centro di Competenza Nazionale

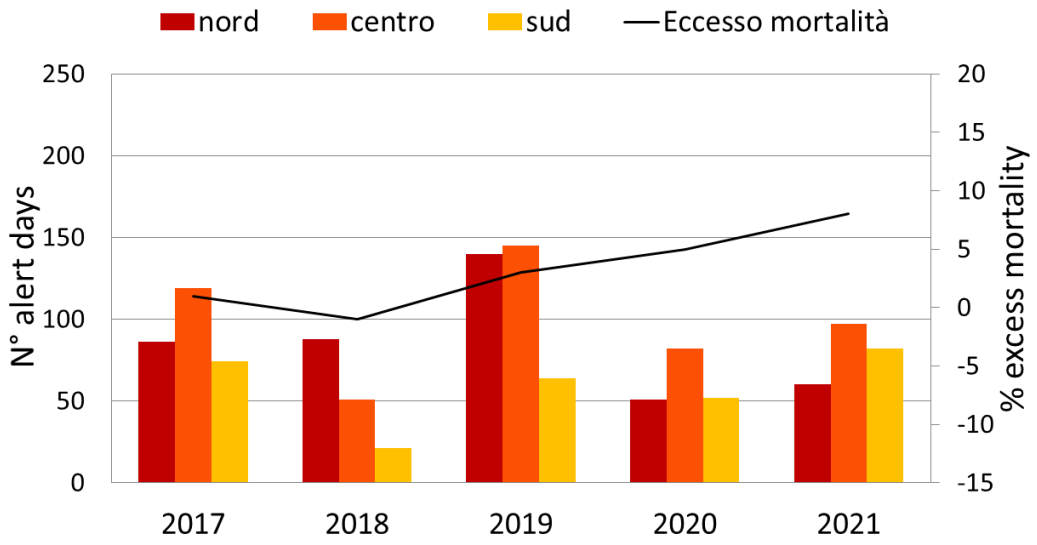
Ministero della Salute

DEP Lazio
Dipartimento di Epidemiologia del Servizio Sanitario Regionale Regione Lazio

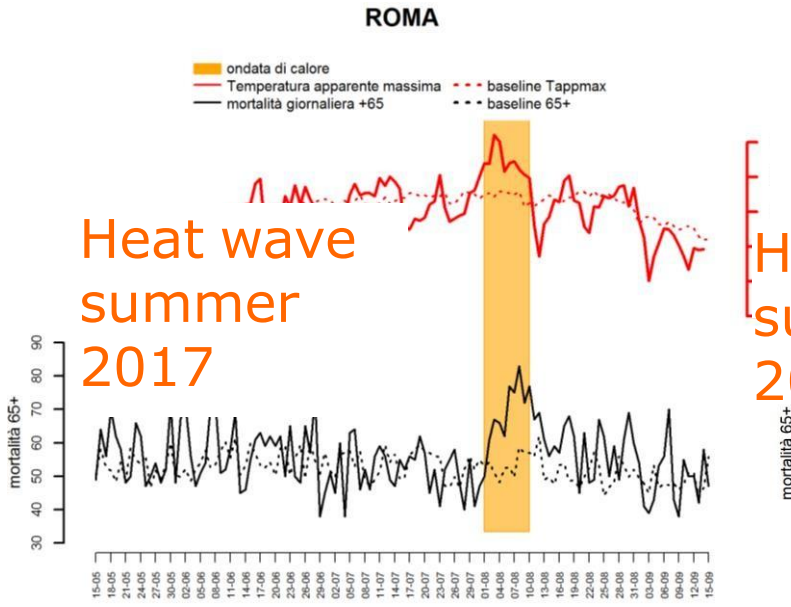
PROTEZIONE CIVILE

Heat waves and mortality in Italian cities in past 5 years

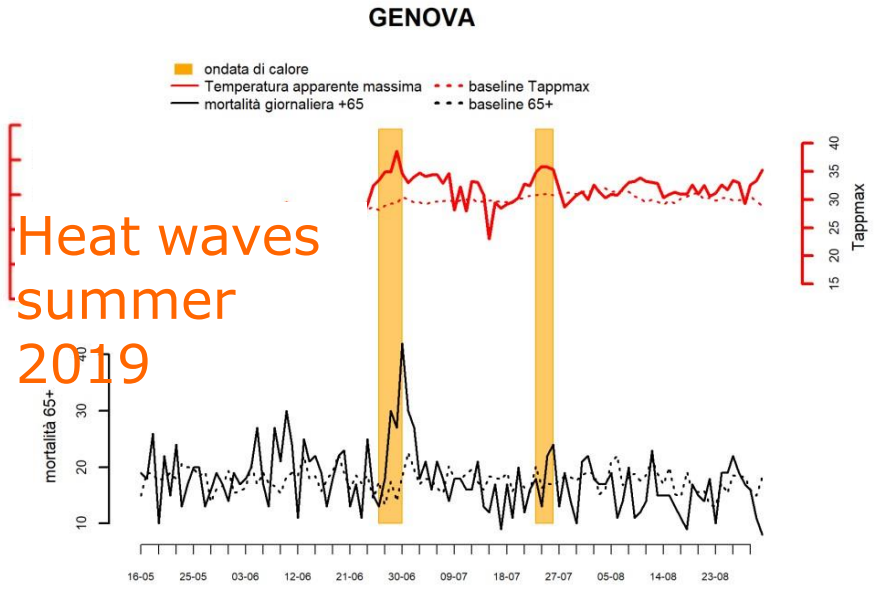
Number of alert days (level 2 and 3) in cities in North, Centre and South of Italy and percent excess mortality in summer



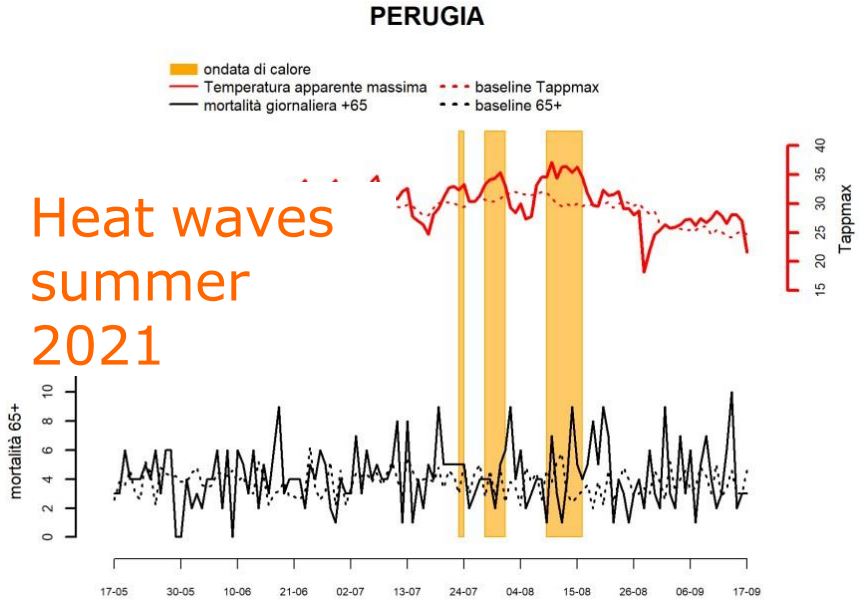
Daily tappmax (maximum apparent temperature) and daily observed and expected mortality (heat waves: orange boxes)



Heat wave summer 2017



Heat waves summer 2019



Heat waves summer 2021

LOCAL PREVENTION PLANS and MEASURES

Survey of local prevention plans and adaptation measures

www.salute.gov.it/caldo

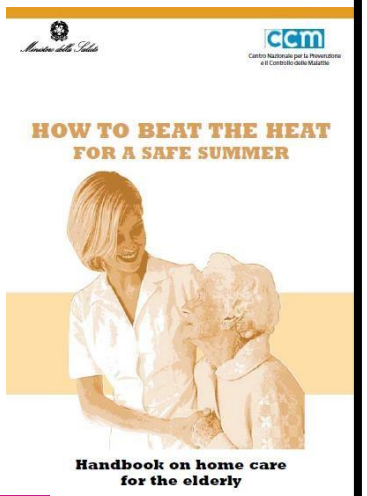
Prevention activity	n° cities		Description
	total	Changes related to COVID-19	
Information campaign	23	5	Leaflets and advice issued during heat waves, Written heat plans and health guidance
Education and training for health and social services	6	3	Online webinars and training, seminars/workshop, dissemination of information and guidelines
Formal identification and Surveillance of susceptible subgroups	14	1	Identification using HIS or by GP and social service notifications teleassitance/home visits by GPS/health care workers
Social service health care	9	1	Social service assistance and home care and telephone help line, e-health
Emergency protocols	20 (16 modulated on warnings	9	Measures to improve operatiional efficiency in hospitals (extra beds, staffing), care homes , etc
Telephone help lines	21	1	Local health call centres, linked to social services and primary care and volunteer assistance
Social services support	16	4	Home visits, home care, pharmacy services and delivery by volunteers and care givers

PREVENTION national guidance and advice for susceptible subgroups

- Elderly
- Subjects with chronic conditions
- Children
- Pregnant women
- Workers
- COVID-19 and heat

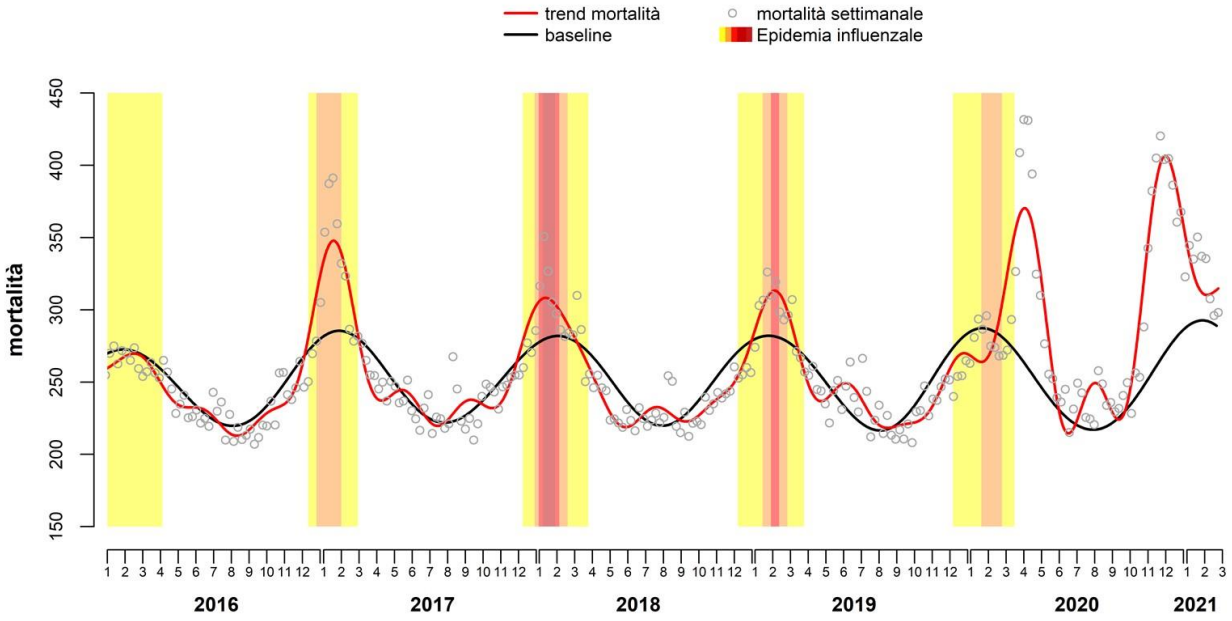
Need to be updated t changes in vulnerable

Link tailored each group



MORTALITY SURVEILLANCE SYSTEM - SISMG

- Near-real time mortality surveillance
- monitoring impacts during HW events to adjust response actions
- Evaluation of HHAP
- Regular estimation of heat wave impacts (temporal changes)
- In 2021 will be **extended to 50 cities in Italy**



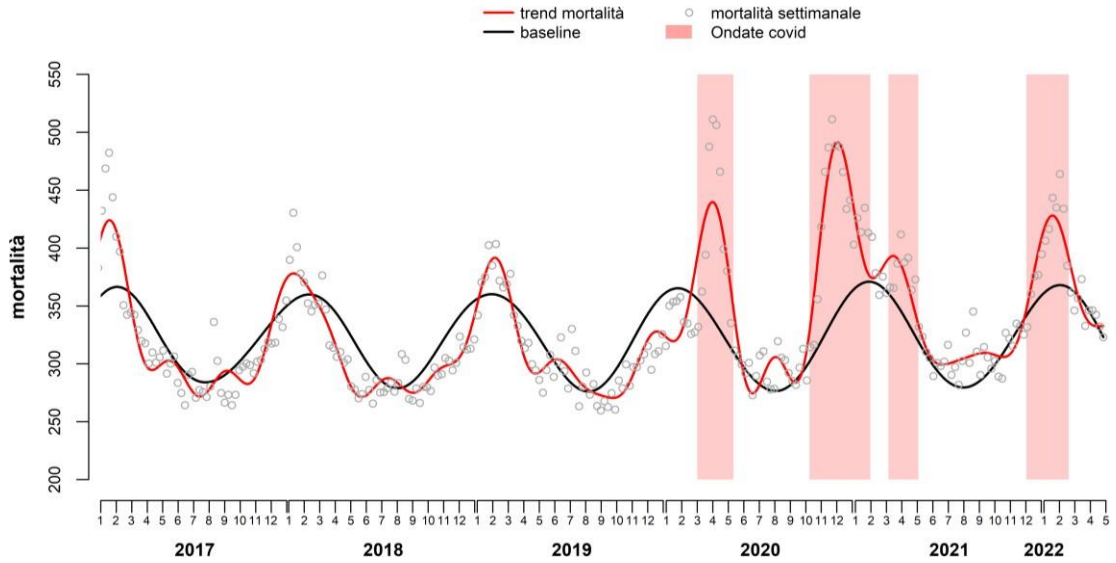
Ministero della Salute

Centro Nazionale Prevenzione e Controllo Malattie

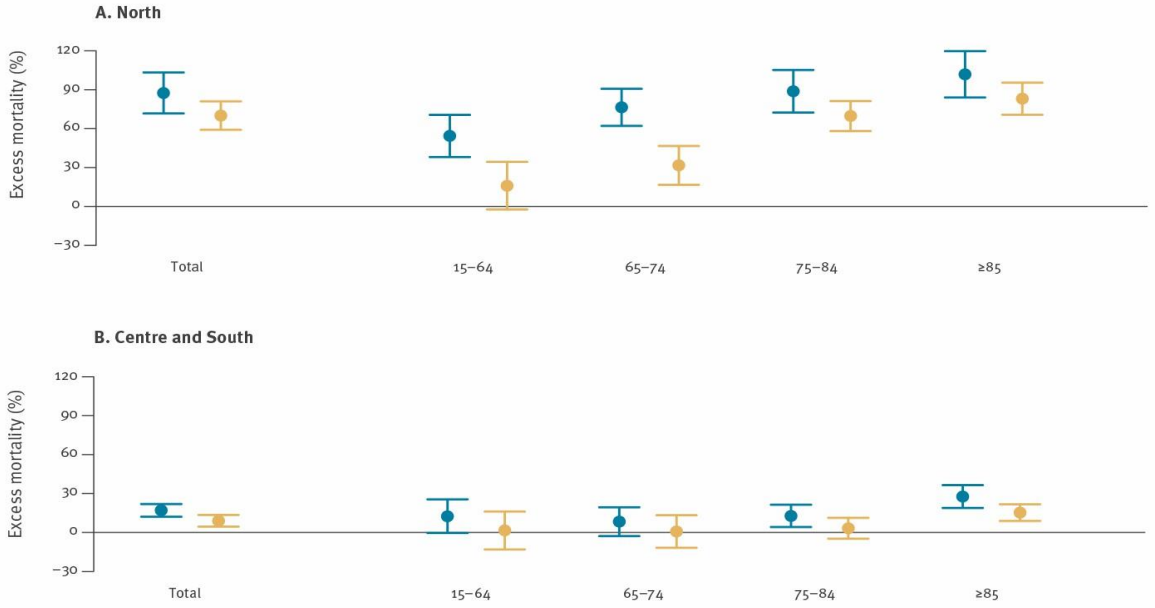
Mortality Surveillance System during Covid-19 epidemic

- Since the start of the epidemic, the mortality surveillance system allowed estimation of peaks in total mortality in weekly reports
- It allowed to characterize the geographical heteogeneity and differences by age and gender

Excess mortality (%) in the epidemic waves



Excess mortality (%) by age and gender



Project Climactions (funded by MoH)

- Case studies of urban heat island mitigation in italian cities
- Rising awareness intervention on climate change related risks in urban areas (Distance Learning modules on eduiss platform)
- Home to work mobility survey at national level

Project website

Rome case study

Mitigation of climate change and health prevention in Italy: the co- benefits policy

22,745 and 50,856 deaths attributable to PM10 and PM2.5 every year would be avoided if the levels of concentrations of these pollutants did not exceed the values set by 2021 WHO AQG to protect health

Health impact of temperature and air pollution in Italy

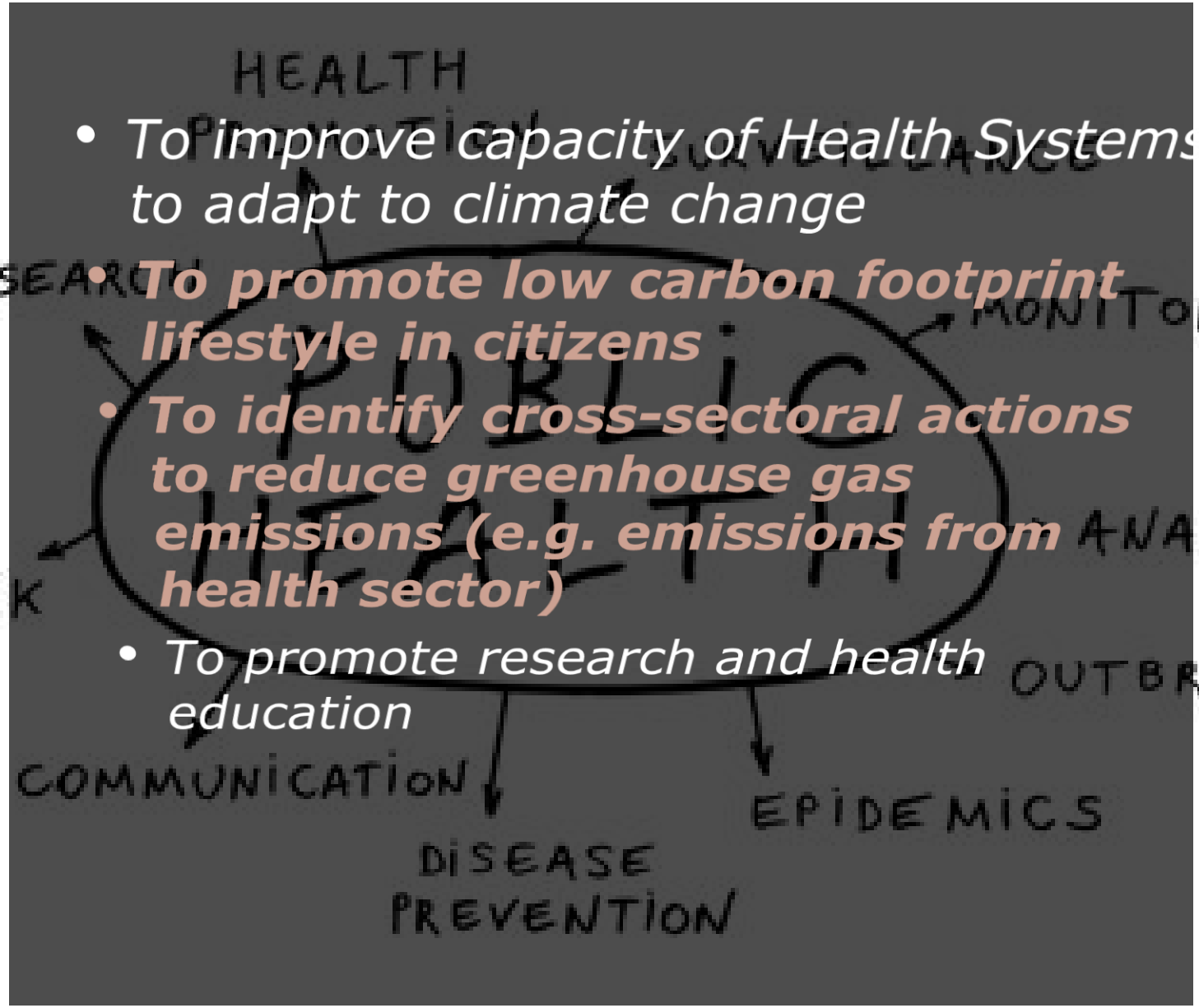
Deaths attributable (AD) to heat, Italy summer 2015

	AD to heat	95%CI
Natural causes	14,521	9,870 - 18,975

Deaths attributable to long-term exposure to air pollution using new WHO Air Quality Guidelines (WHO AQG) limits, Italy 2016-2019

	AD to PM2.5 < 5 µg/m³	AD to PM10 < 5 µg/m³
Natural causes	50,856	22,745
CVD	24,125	8,034
RESP	4,638	4,658

Adaptation and mitigation: the role of public health



- *To improve capacity of Health Systems to adapt to climate change*
- ***To promote low carbon footprint lifestyle in citizens***
- ***To identify cross-sectoral actions to reduce greenhouse gas emissions (e.g. emissions from health sector)***
- *To promote research and health education*

Thank you

p.michelozzi@deplazio.it

www.deplazio.net

www.salute.gov.it/caldo

forecAsting System for urban heaT Island effect

LIFE ASTI RESULTS

LIFE ASTI FINAL CONFERENCE

Thessaloniki, 19 May 2022

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

www.lifeasti.eu

Session 4: Results (science session)

- “Overview of the LIFE ASTI project”, *Prof. D. Melas*, Aristotle University of Thessaloniki
- “Meteorological Modeling of Urban Heat Island (UHI)”, *Dr. S. Kontos*, Aristotle University of Thessaloniki
- “UHI Future Climate Assessment”, *Dr. S. Keppas*, Aristotle University of Thessaloniki,
- “Atmospheric Monitoring of the urban heat island in Rome”, *Dr. S. Argentini*, Institute of Atmospheric Sciences and Climate (ISAC), National Research Council
- “Heat health warning systems for climate change adaptation”, *Dr. F. de'Donato,* Department of Epidemiology ASL ROMA 1 Lazio regional health service
- “Urban Heat Island” LIFE ASTI Project – Educational Video

Implementation of a forecAsting System for urban heaT Island effect for the development of urban adaptation strategies

Final Conference - 19 May 2022

Professor Dimitris Melas
Aristotle University of Thessaloniki
Laboratory of Atmospheric Physics

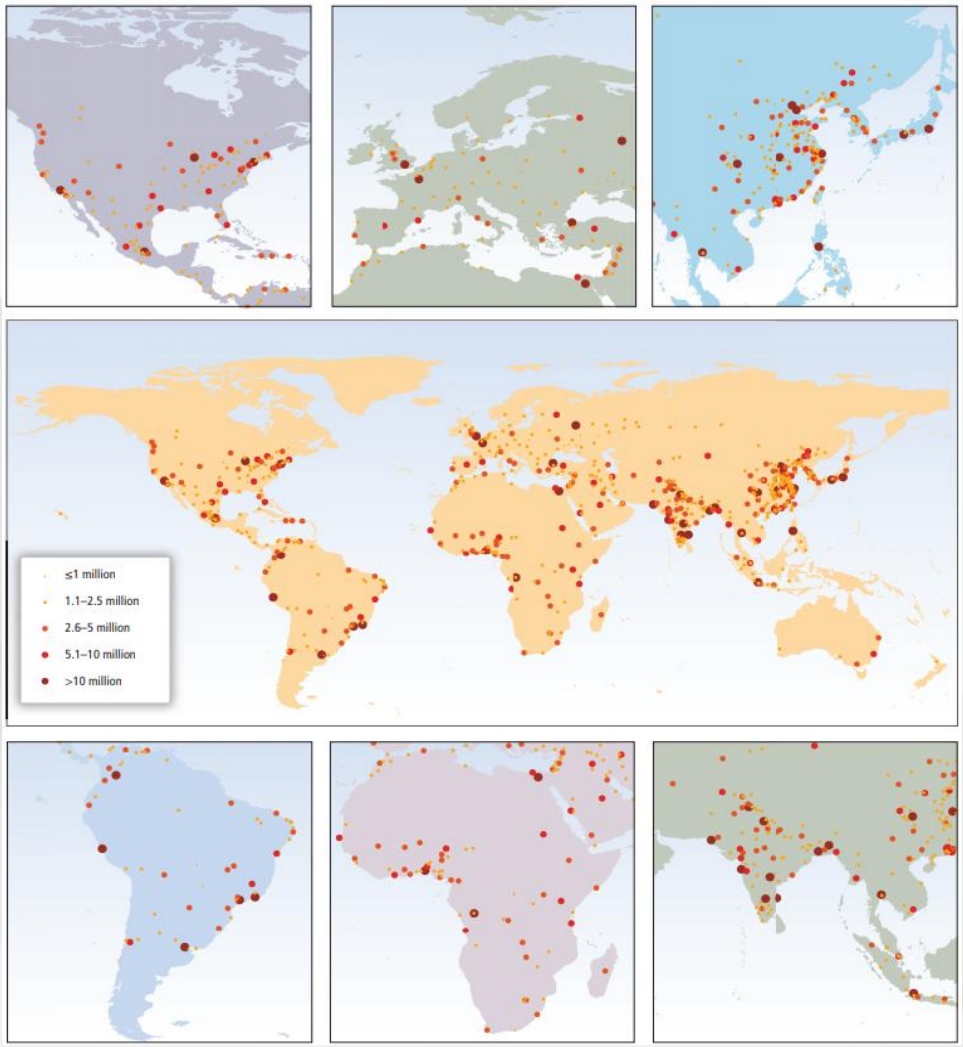
The project *Implementation of a forecAsting System for urban heaT Island effect for the development of urban adaptation strategies - LIFE ASTI* has received funding from the LIFE Programme of the European Union.

An urbanizing world

1950: 30% of the population was urban

2018: 55%

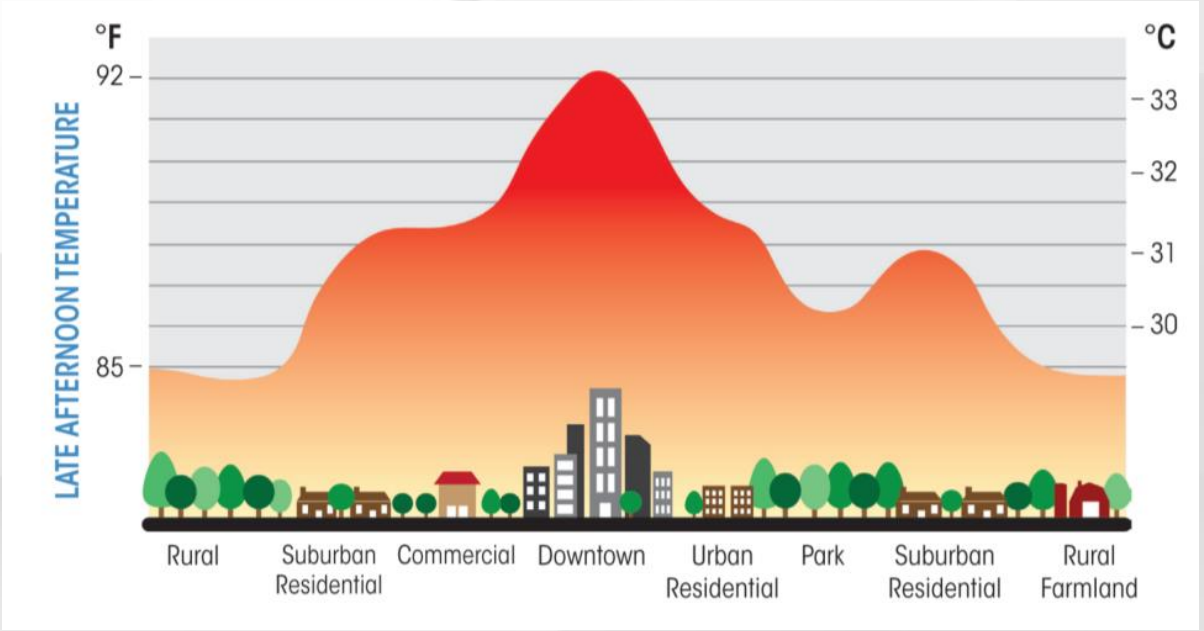
2050: 68%



Urban agglomerations with 750,000-plus inhabitants in 1950/2025 (derived from statistics in UN DESA Population Division, 2012)

Urban Heat Island

What is it? Temperature contrast between a city and its rural surroundings

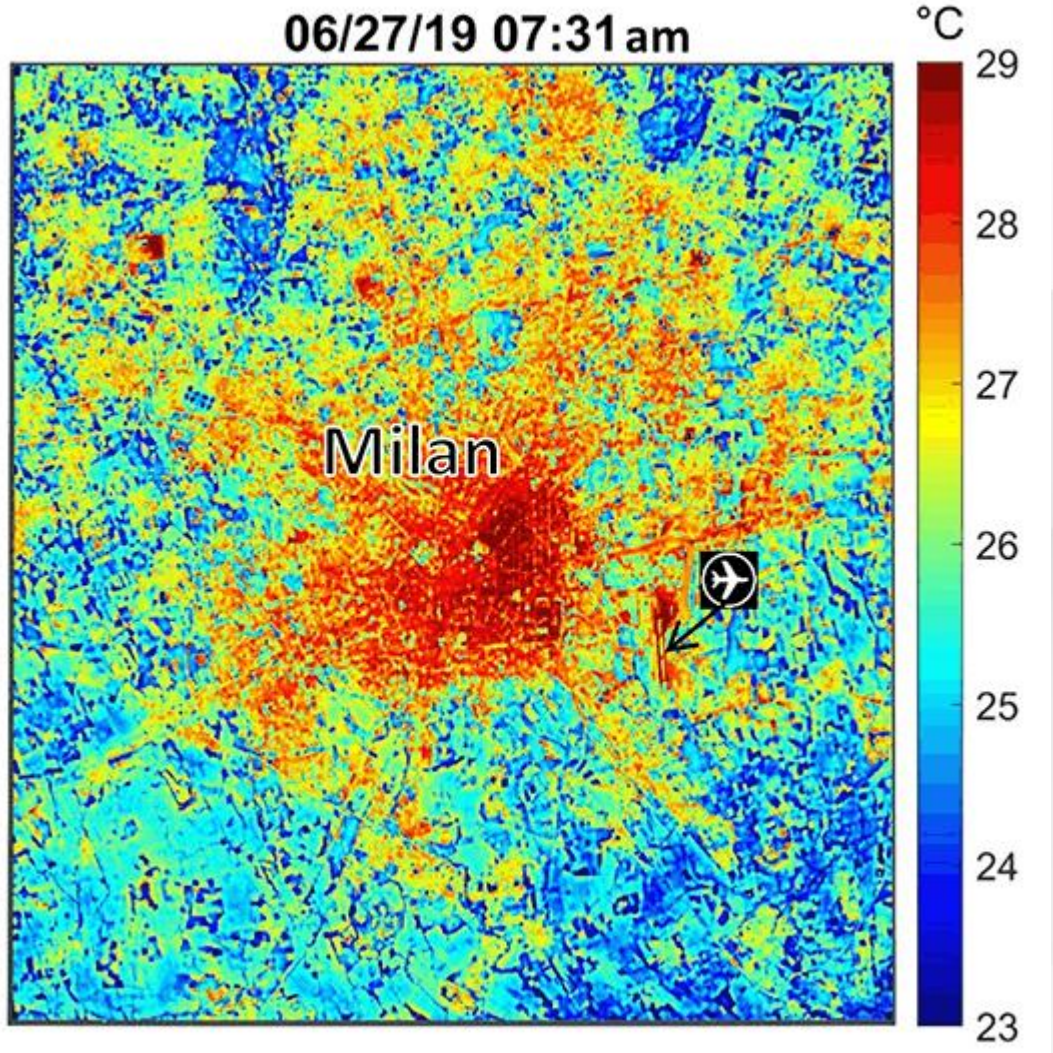


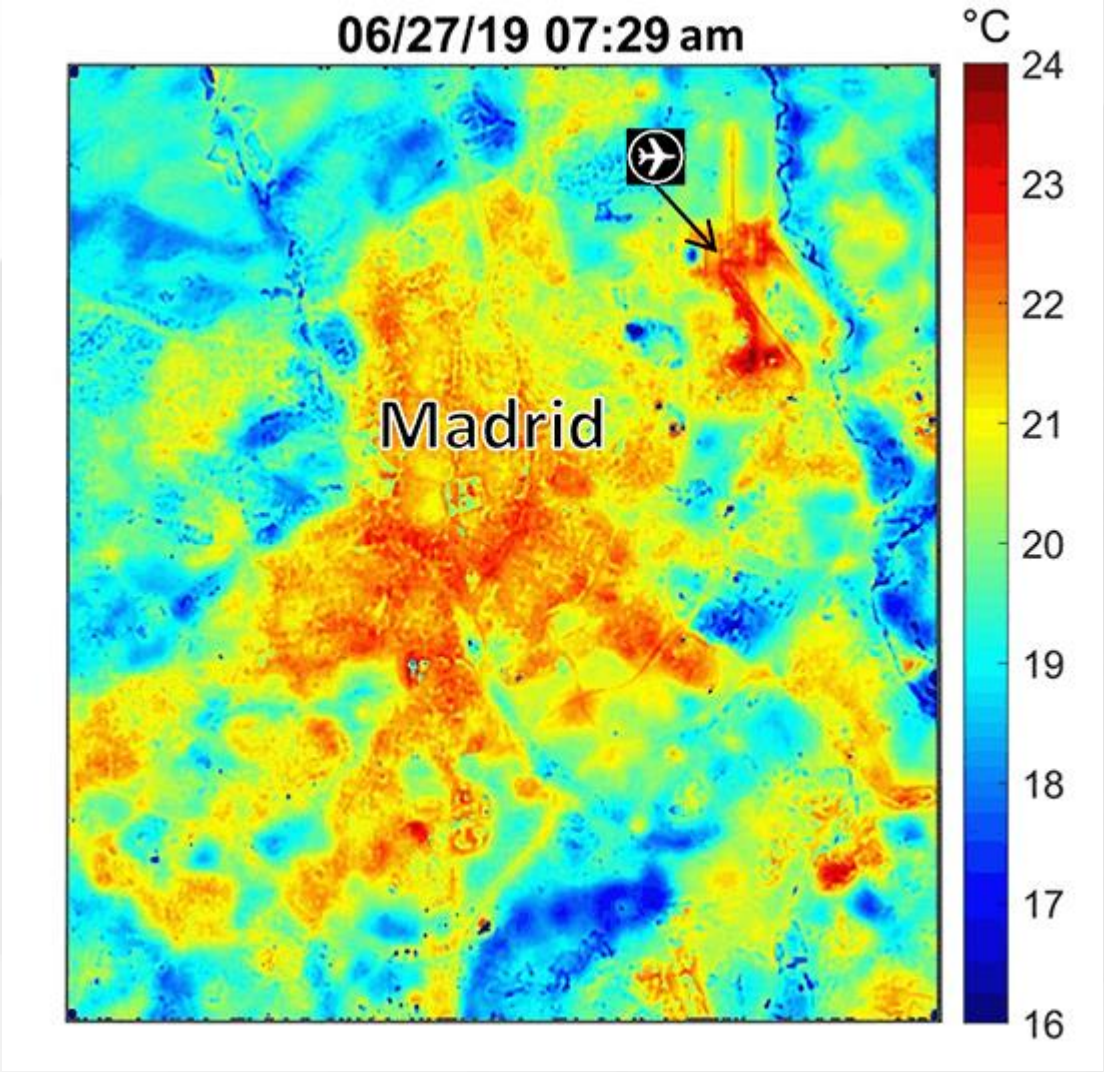
UHI can be **attributed to:**

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

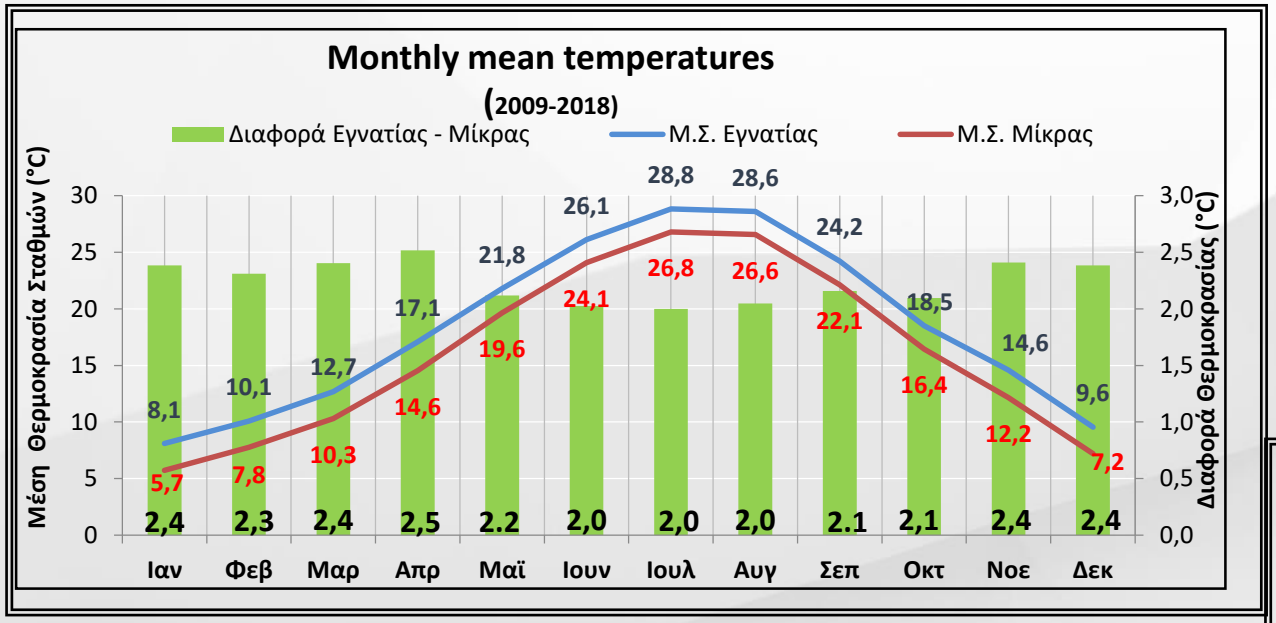
When does it occur? UHI intensity is more intense during night hours, maximizes early morning and almost disappears around noon.

The NASA Ecostress map for European cities during the June 2019 heatwave

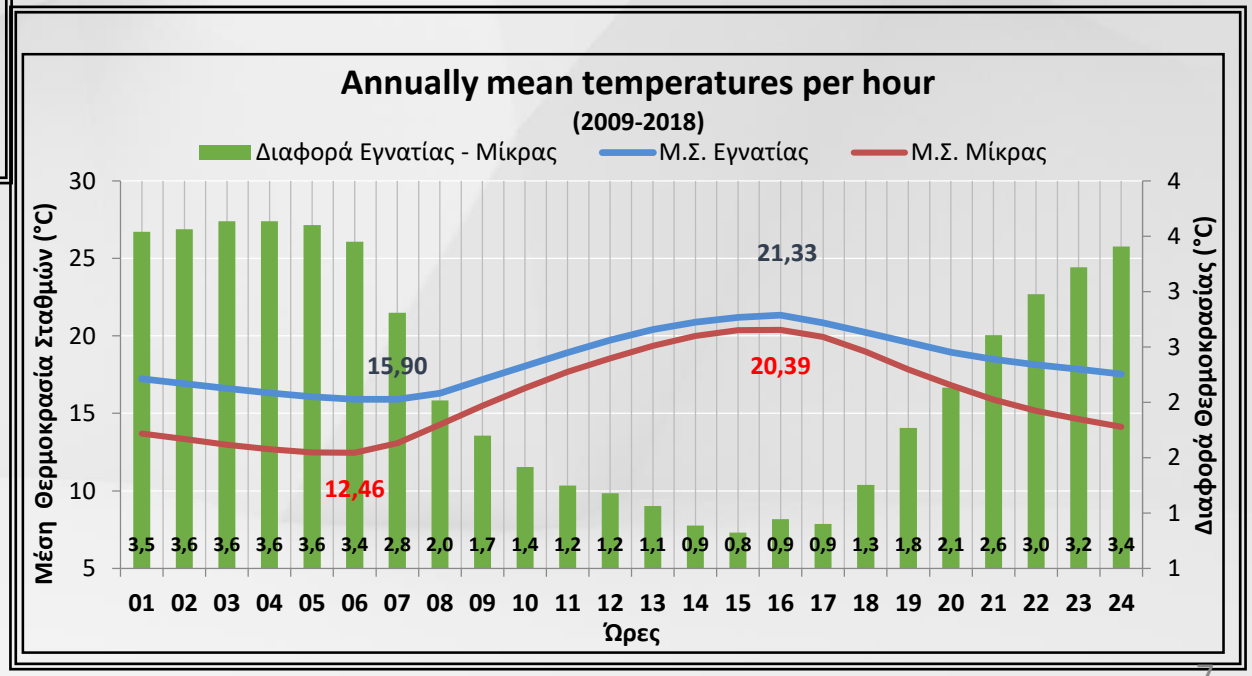




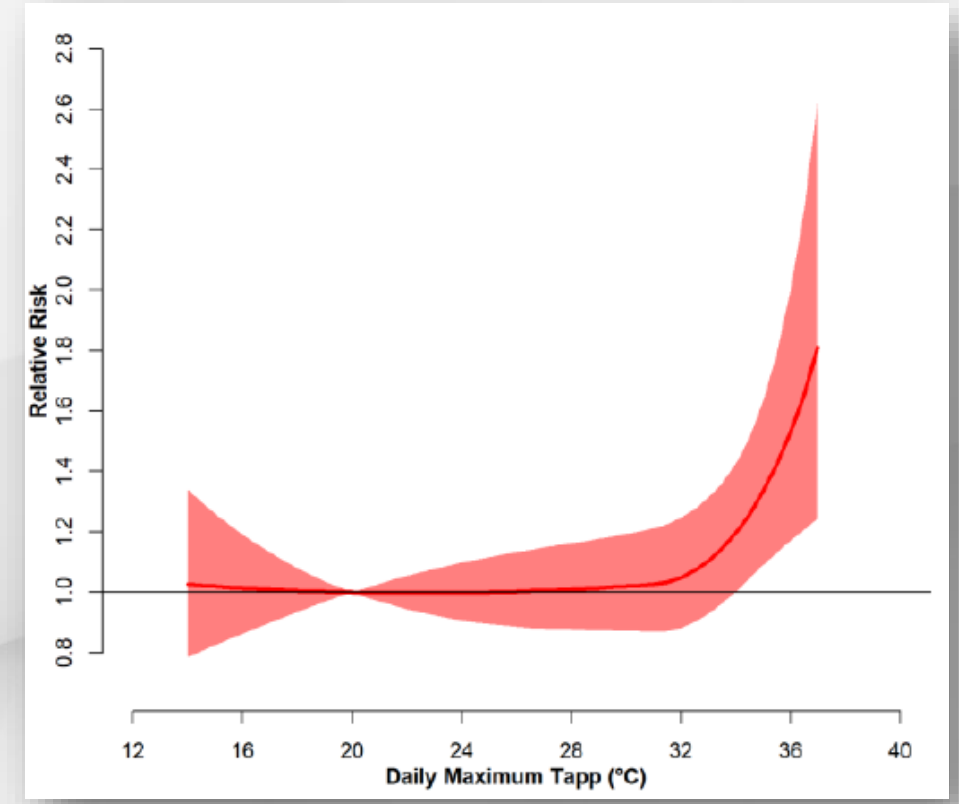
Time variation – The case of Thessaloniki



Sarras, 2019



UHI impacts - Health



Francesca de'Donato, Matteo Scortichini, 2019

- Urban settlements are areas with degraded environmental quality and increased thermal discomfort.

- Significantly increased risk of morbidity and mortality due to high temperatures.

UHI impacts - Health

1998-2017: More than **166,000** people died due to extreme temperatures.

2003: **70,000** people in Europe died as a result of the June-August event.

2010: **56,000** excess deaths occurred during a 44-day heatwave in the Russian Federation.

2015: **175 million** additional people were exposed to heat waves compared to average years.

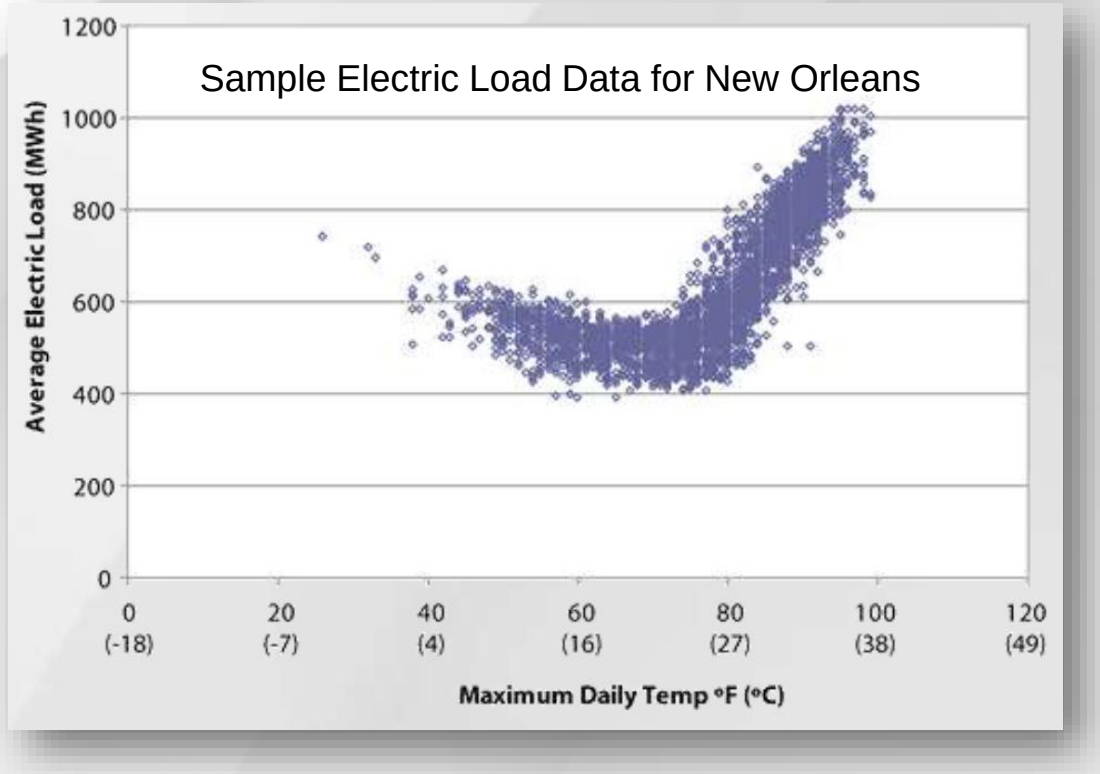
2000 – 2016: the number of people exposed to heat waves increased globally by around **125 million.**

Source: World Health Organization
https://www.who.int/health-topics/heatwaves#tab=tab_1

UHI impacts - Energy

- In the example of New Orleans, the electric load is steadily increasing at temperatures above 25 –27°C.

- Significant increase in energy consumption.



Sailor, D. J. 2002

LIFE ASTI: General information

Location: Thessaloniki, Greece + Rome, Italy

Replication: Heraklion, Pavlos Melas, Greece

Duration: 01/09/2018 - 31/08/2022

forecAsting System for urban heaT Island effect

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.

Project results

1. Satellite data
2. Observations
3. Boundary conditions
4. Mortality data

Forecasting model with 2 km spatial resolution

Downscaling method to enhance spatial resolution to 250 m

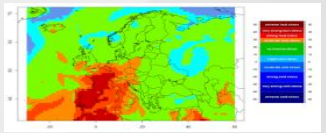
Heat Health Warning System

LIFE ASTI Dissemination platform

Web/smartphones app

Needs of interested stakeholders

High resolution forecasting products



Bioclimatic indices

End users and wide public

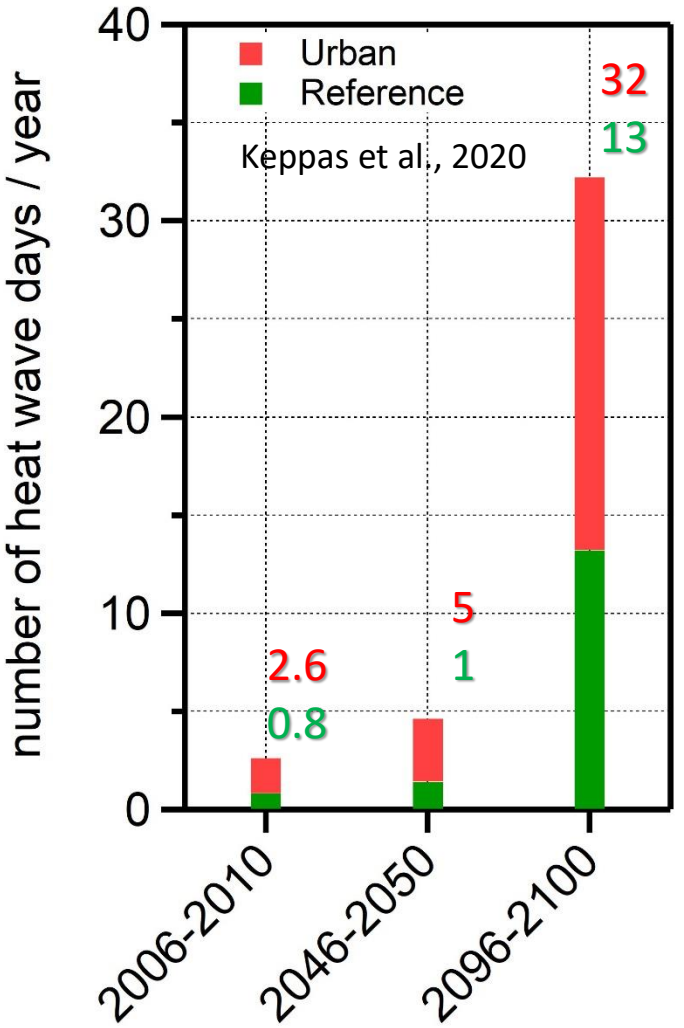
The impact of future climate change scenarios on UHI - Thessaloniki

HEAT WAVE DAYS (HWD)

The criteria:

- $T_{max} \geq 37°C$
- $T_{avg} \geq 31°C$

Metaxas, D. A., and METAXAS DA. "Heat waves from a synoptic point of view." (1980)



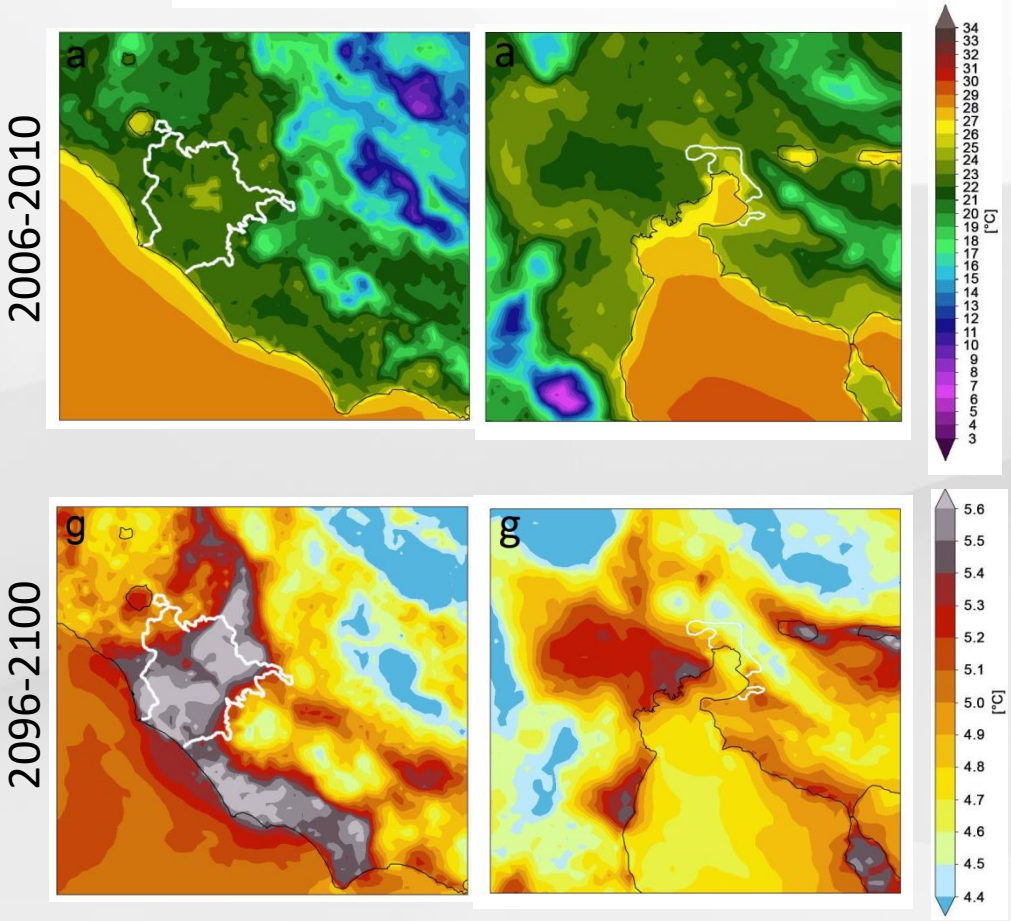
Thessaloniki hardly gets 40s or higher temperatures under the present climate

Only 2.6 (0.8) days per year are considered as heat wave days for urban (non-urban) area

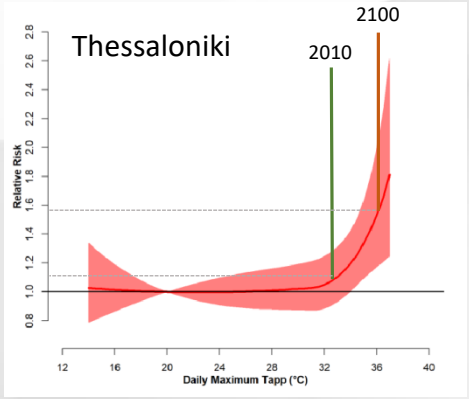
By 2100, we should expect a month of heat wave conditions for the urban area of Thessaloniki

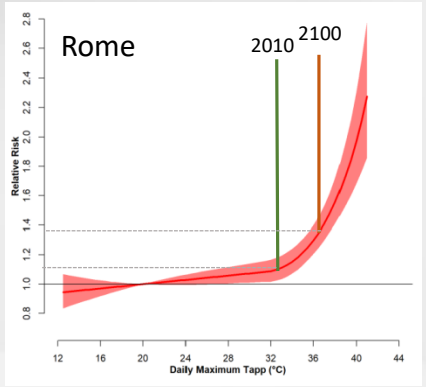
Difference between urban and non-urban areas

Average Tapp at 03UTC in July



$Tapp_{max}$ vs Relative Risk
(*exposed mortality/non-exposed mortality*)





Francesca de'Donato, Matteo Scortichini, 2019

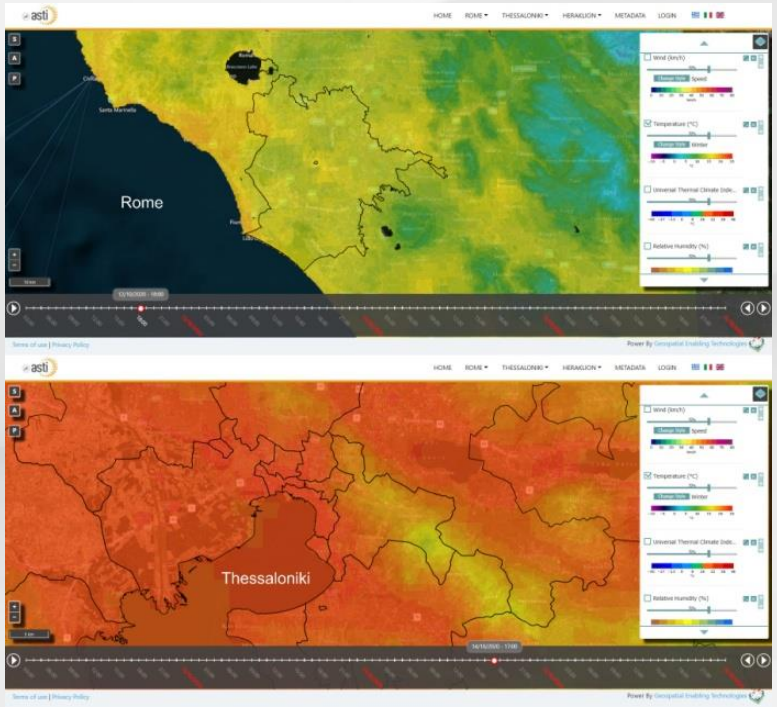
Considering **no changes in the urban structure and size**:

- **Tapp will increase less in the urban fabric** (by 0.5-1°C) comparing to the surrounding areas by **2100**, but will be still higher. Increased $Tapp_{max}$ associates with increased RR (1.4-1.6) by 2100.
- **Tapp** is **increased early in the morning during summertime** in the **urban area** by **+3-4°C** compared to the surrounding areas.

$$TAPP = -2.653 + 0.994\ \mathbf{T} + 0.0153 * \mathbf{T_{dew}}^2$$

Dissemination of results

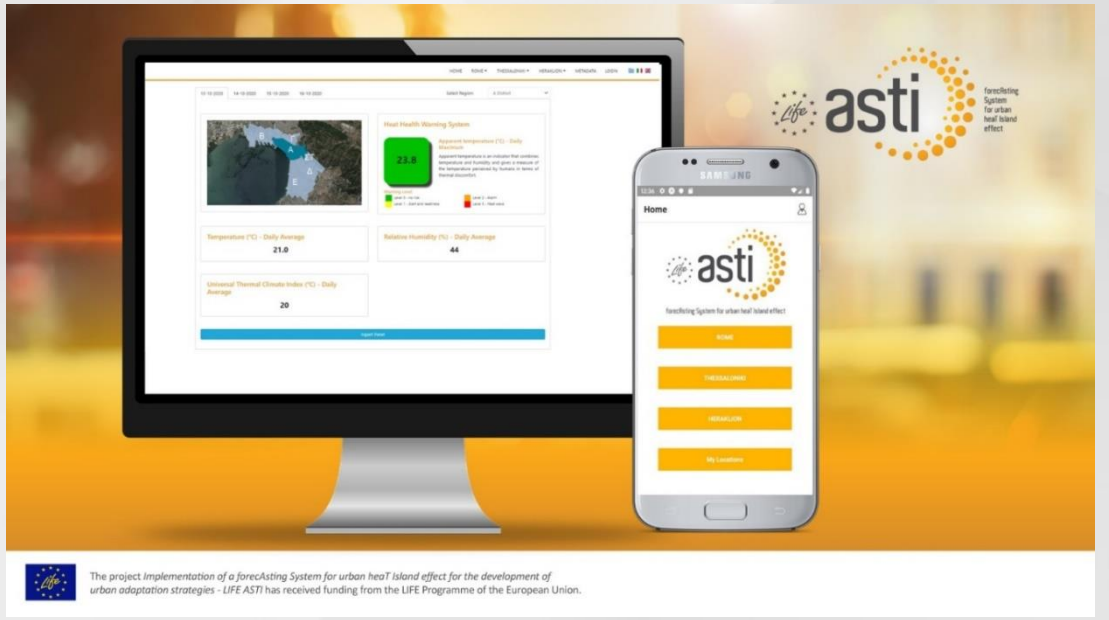
Open access web portal (https://app.lifeasti.eu/)



Smartphone app

Available on the App Store

GET IT ON Google Play



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researchgate.net/project/LIFE-ASTI

Meteorological modeling of the Urban Heat Island effect

Thessaloniki, May 19 2022

Dr. Serafim Kontos
Aristotle University of Thessaloniki

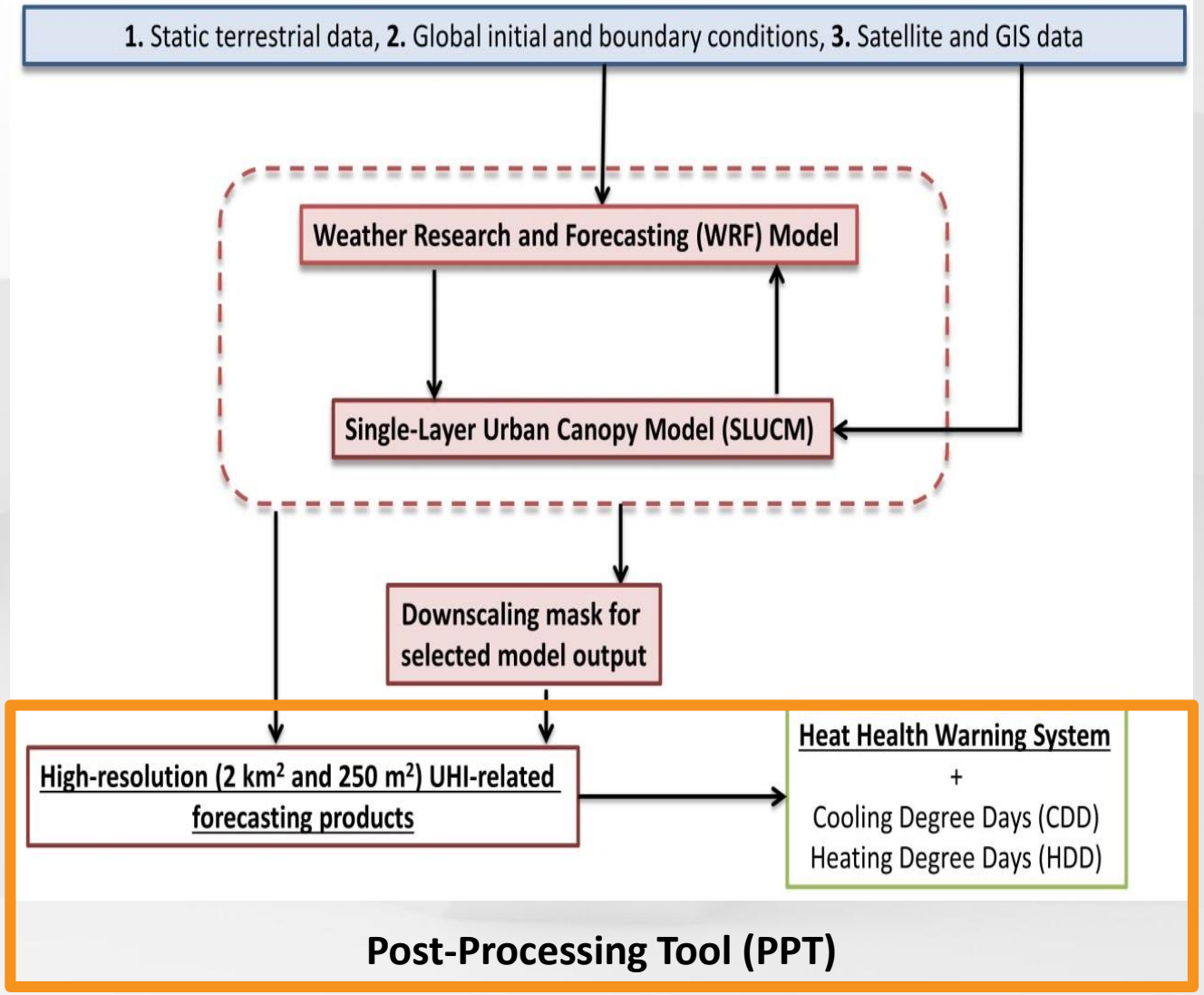
The project *Implementation of a forecAsting System for urban heaT Island effect for the development of urban adaptation strategies - LIFE ASTI* has received funding from the LIFE Programme of the European Union.

Outline

- Brief Description of the operational Urban Heat Island forecast system
- Recent example of application of the system
- Summary

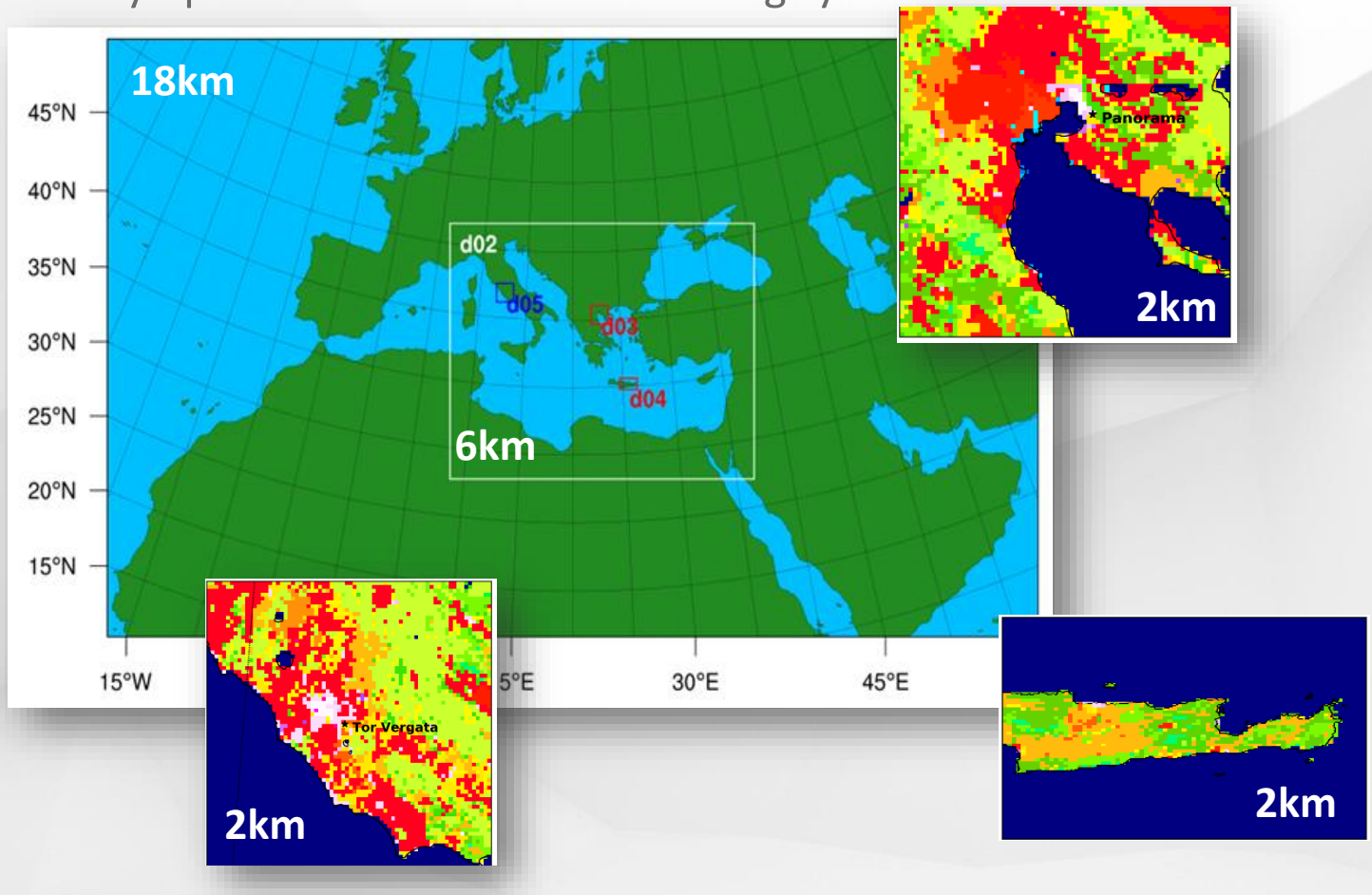
General structure

- Weather Research and Forecast system coupled with the Single Layer Urban Canopy Model SLUCM (WRF+SLUCM)



Implementation of the UHI-FS modeling system

- Daily operation of the UHI forecasting system



UHI-FS Products

- Meteorological
- Urban Heat Island
- Bioclimatic indices
- Energy-consumption related information

Evaluation of UHI-FS

Table 2: Validation statistics for the chosen SVM models, with 2015 observational data.

City	Variable	RMSE	Bias	MAE	IOA	Pearson Cor.
Rome	Rel. Humidity	13.87	-4.65	11.30	0.77	0.65
Rome	Temperature	2.12	-0.37	1.64	0.98	0.96
Thessaloniki	Rel. Humidity	17.76	-9.81	14.11	0.71	0.59
Thessaloniki	Temperature	3.10	0.57	1.87	0.96	0.93

Table 3: Validation statistics for WRF and 2015 observational data.

City	Variable	RMSE	Bias	MAE	IOA	Pearson Cor.
Rome	Rel. Humidity	14.66	-5.74	11.24	0.83	0.73
Rome	Temperature	2.10	-0.57	1.57	0.98	0.97
Thessaloniki	Rel. Humidity	17.67	-10.64	13.73	0.76	0.66
Thessaloniki	Temperature	3.06	0.61	1.81	0.97	0.94

- Evaluation of Temperature and Relative Humidity for Rome/Thessaloniki
- Reference year 2015

IOA > 0.7

Emery C., Tai E., Yarwood G. (2001). Enhanced meteorological modeling and performance evaluation for two Texas ozone episodes. Final Report prepared for the Texas Natural Resource Conservation Commission

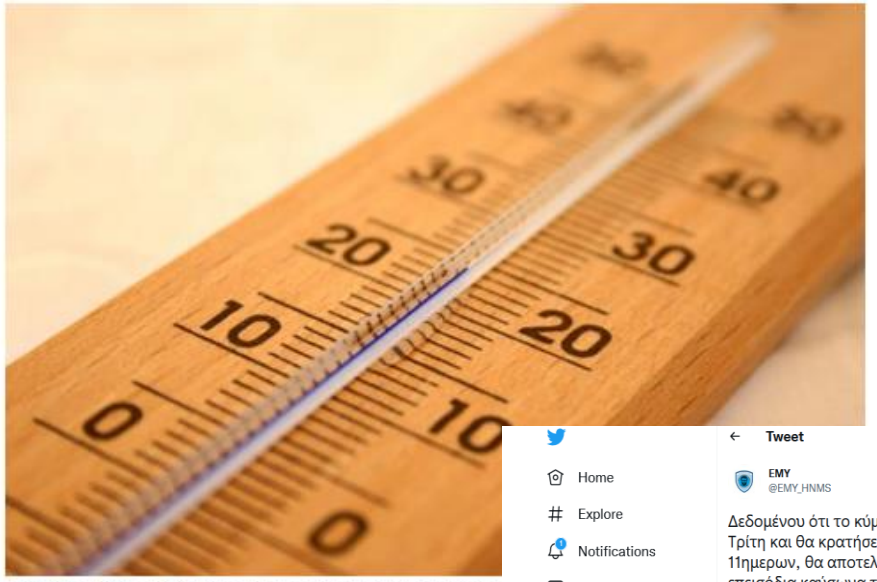
Application of UHI-FS – August 2021

GreekReporter.com › Greek News › Greece Records Highest Temperature in Its History in Unprecedented Heatwave

Greece Records Highest Temperature in Its History in Unprecedented Heatwave

By **Nick Kampouris** August 3, 2021

FACEBOOK TWITTER WHATSAPP LINKEDIN EMAIL



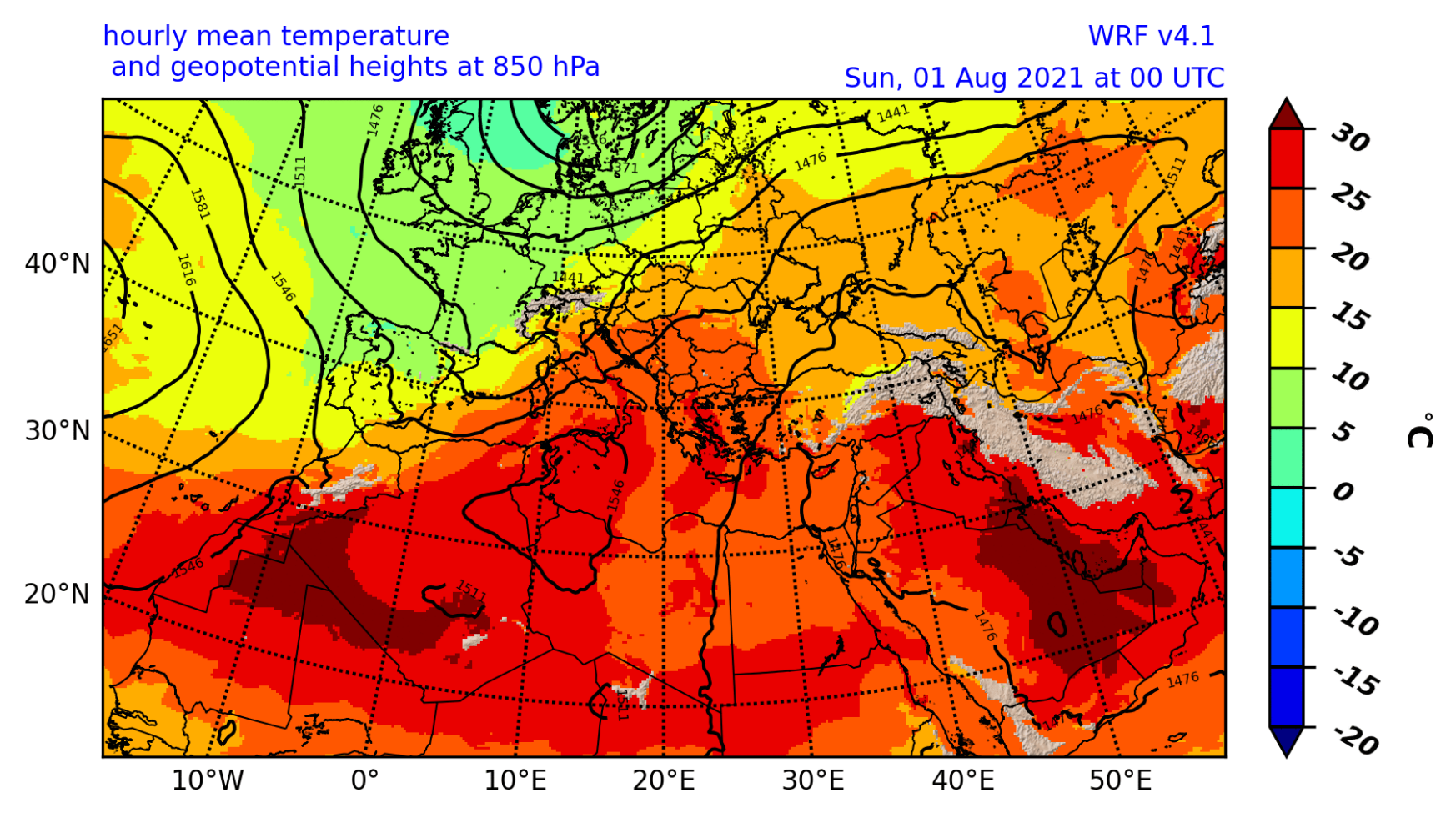
46.3 degrees Celsius (115 degrees F) was the highest temperature e
Petr Kratochvil / Public Domain Pictures / Public Domain

The heatwave that has been gripping Gree

New heat record in Italy as anticyclone 'Lucifer' sweeps in

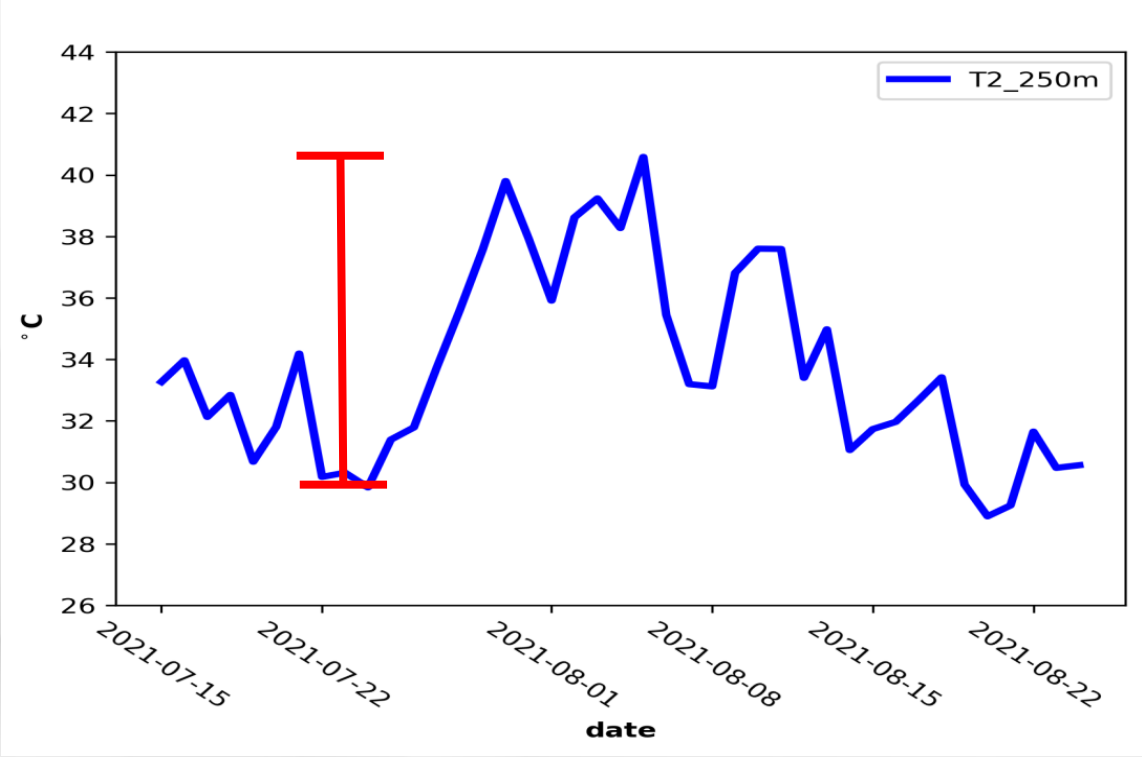
Updated / Wednesday, 11 Aug 2021 16:53

Synoptic conditions of August 2021

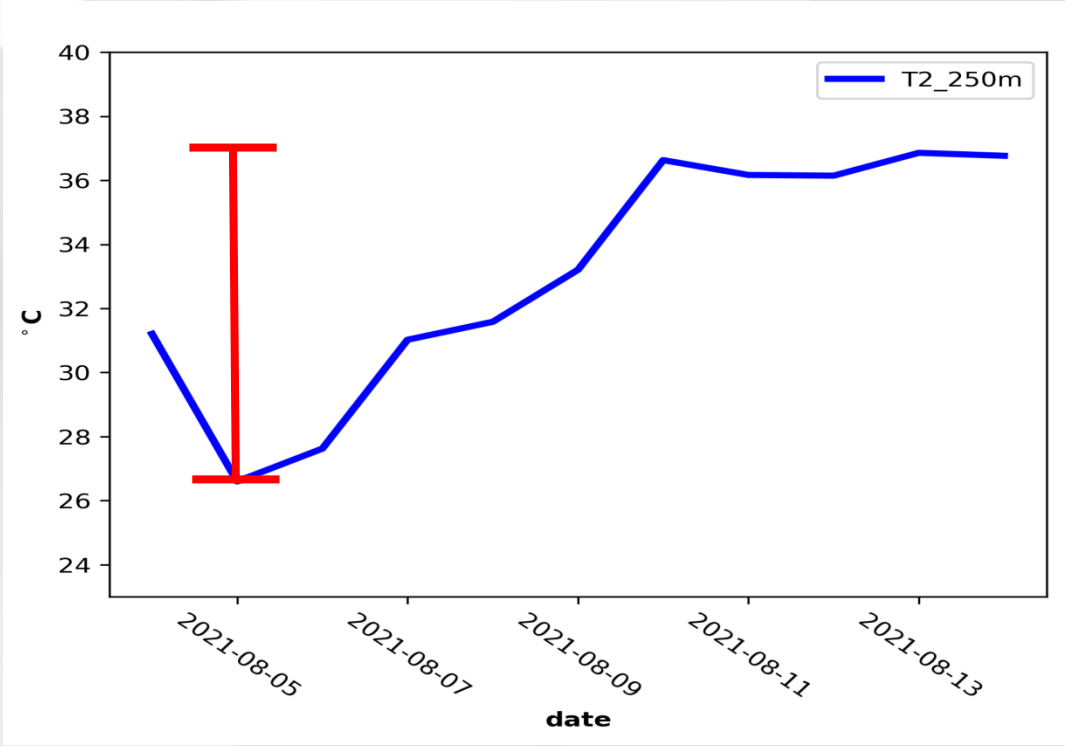


Max. temperature's evolution

Thessaloniki (Eptapyrgio)



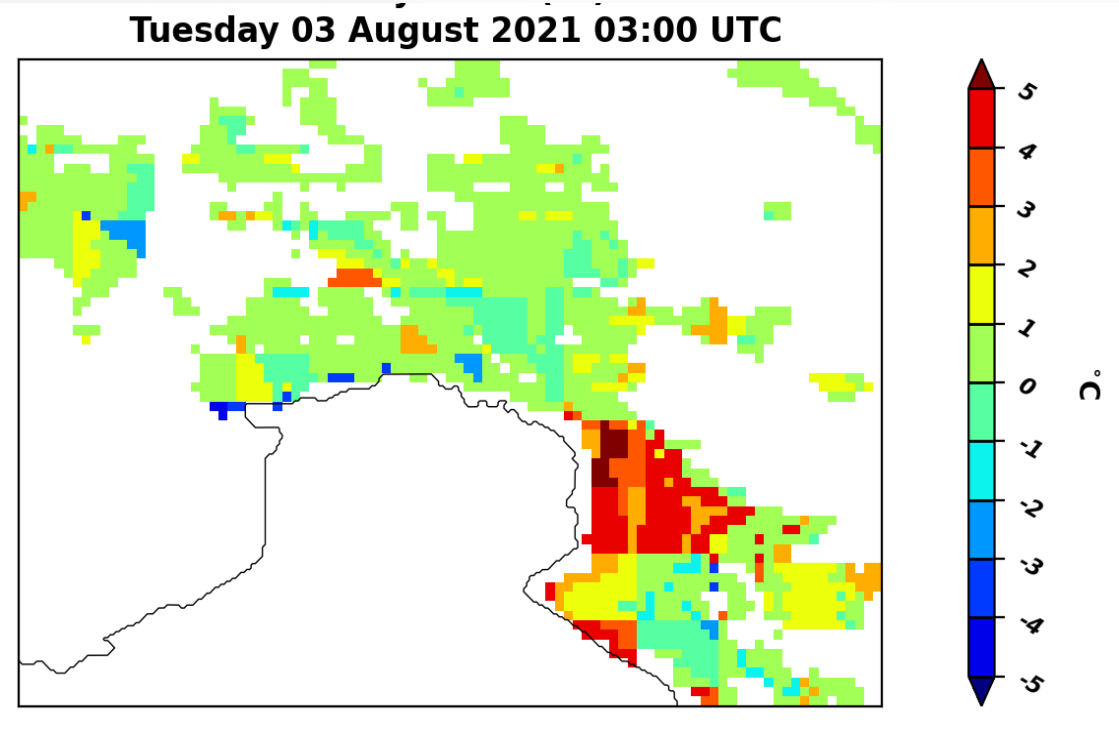
Rome (Ciampino)



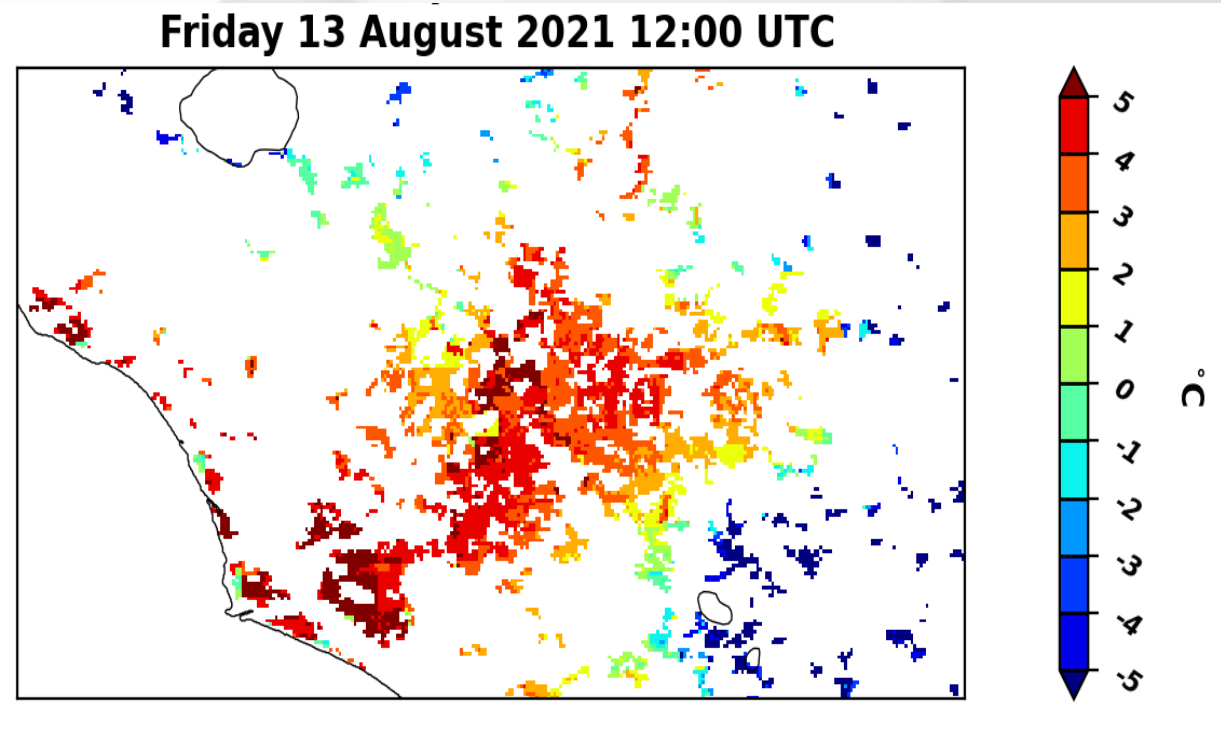
~10 °C

Urban Heat Island Effect

Thessaloniki



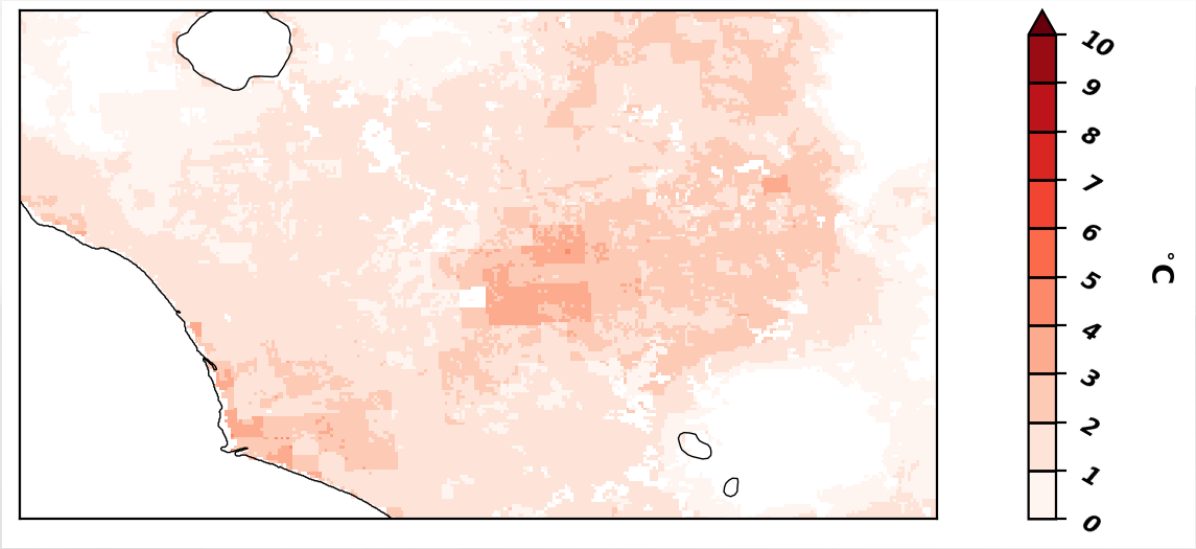
Rome



UHII=T2_urban-T2_rural

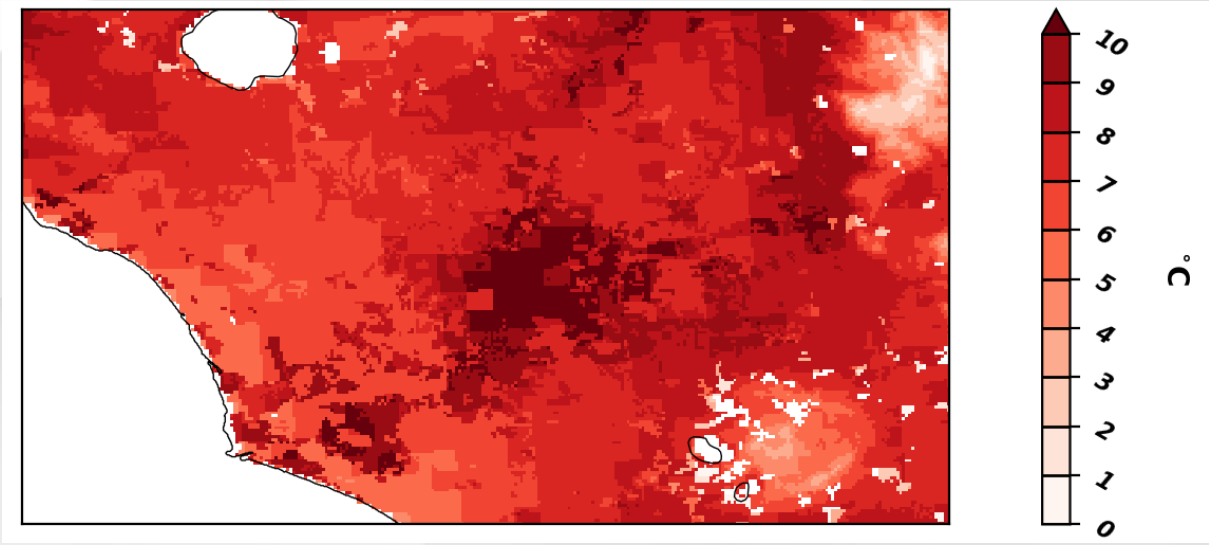
Cooling Degree Days under Heat Wave

5th of August (Before the Heat Wave)



Urban max. CDD ~ 3-4 °C

13th of August (During the Heat Wave)

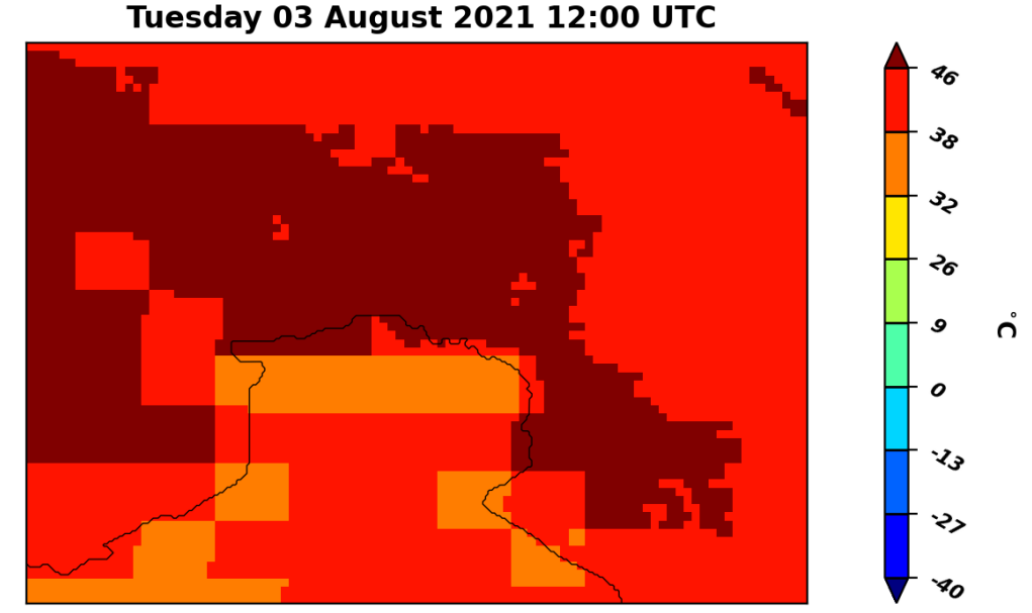


Urban max. CDD ~ 11-12 °C

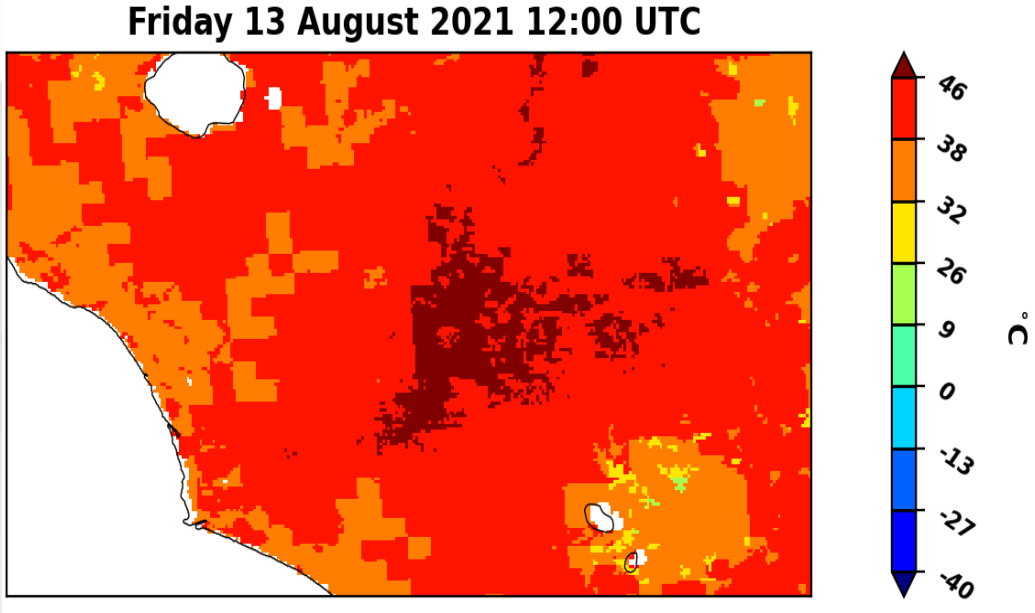
+175% increase during Heat Waves

Bioclimatic Indices under Heat Wave
Universal Thermal Climate Index

Thessaloniki



Rome

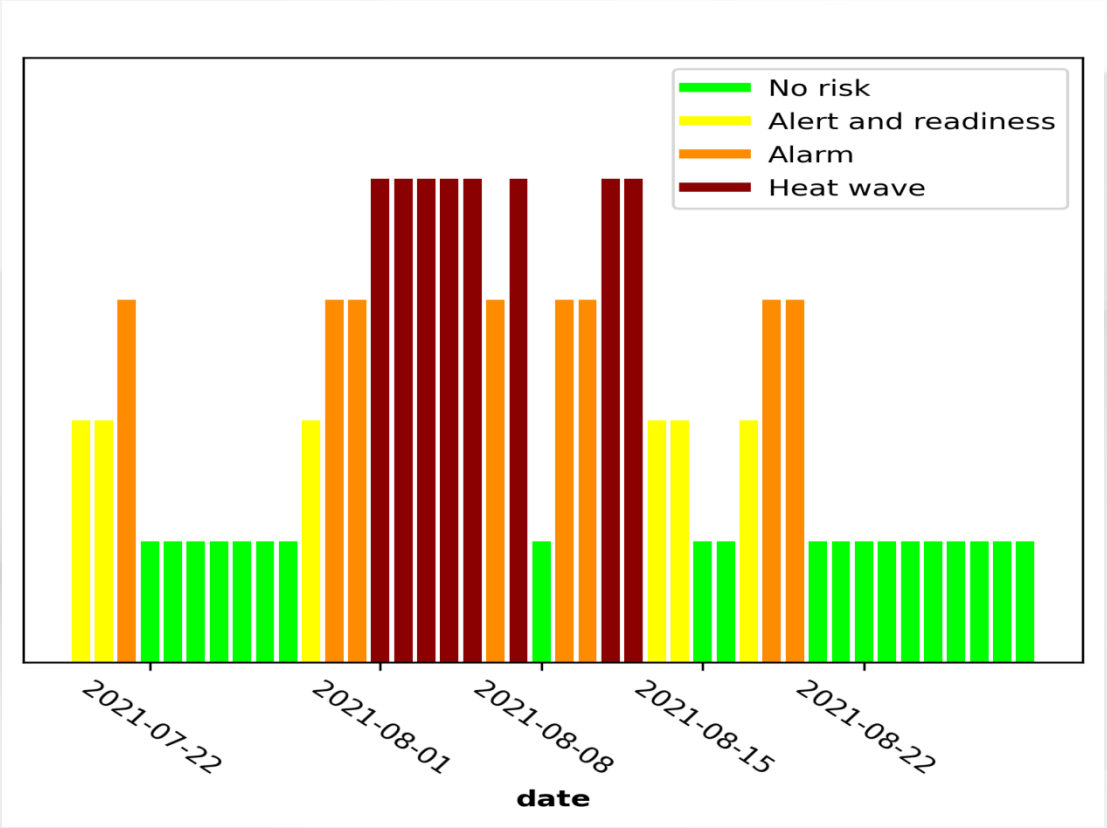


Extreme heat stress over Urban areas:

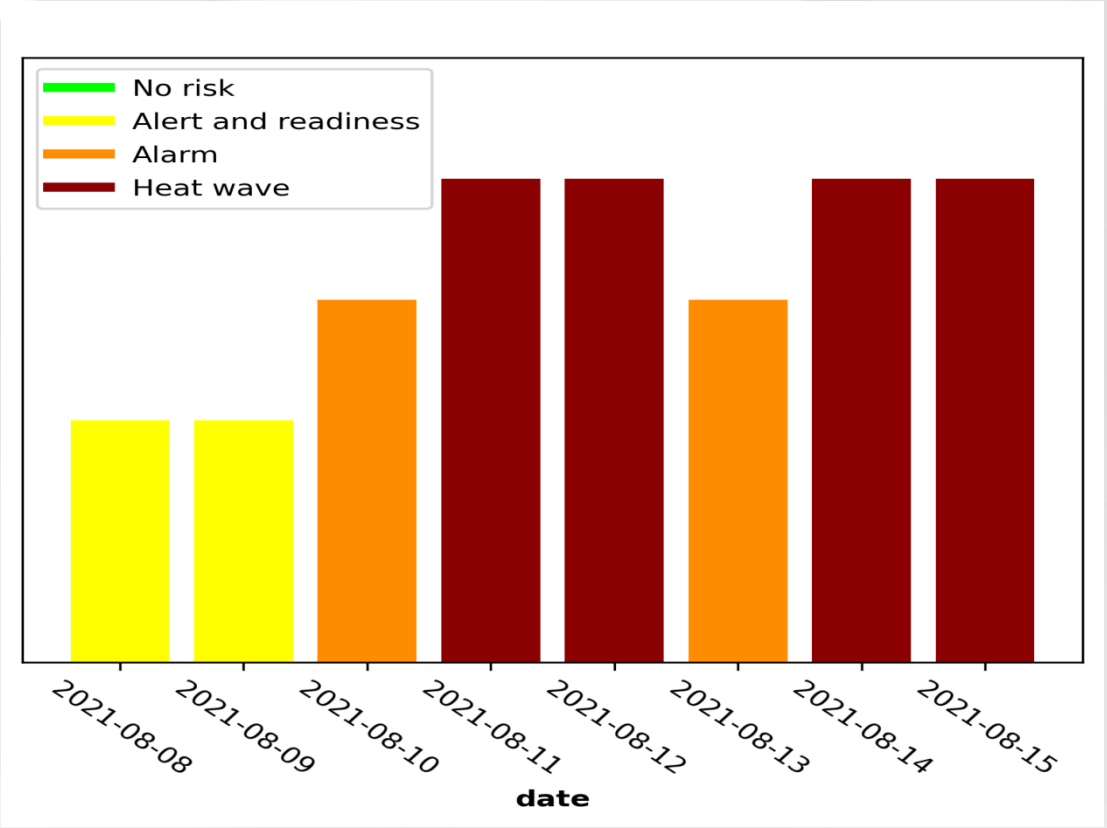
- The use of air conditioning, frequent short cold showers, consumption of water> 0.5 liters per hour and physical activity should be avoided.

Heat Health Warning System – 4th forecasted day of Heat Wave

Thessaloniki



Rome



Summary

- Development of high resolution, accurate operational UHI forecasting system.
- Transferability and replicability to other cities of Europe
- Easy access to simplified and effective information for civilians, stakeholders and policy-makers

Thank you for your attention

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.

Future projections of climate and urban heat island

May 19th, 2022

Dr. Stavros Keppas
Aristotle University of Thessaloniki
School of Physics
Laboratory of Atmospheric Physics

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.

Increased Heat Stress in the cities - Reasons

C4 Future climate impact assessment of UHI effect and assessment of adaptation plans

> UHI Future Climate Assessment Report (UHI-FCAR)

- Study on the present and future climate of Thessaloniki and Rome
- Study on Urban Heat Island effect

> UHI Adaptation Strategies Assessment Report (UHI-ASAR)

- Study on the impact of green interventions on the urban microclimate in the future

Increased Heat Stress in the cities - Reasons

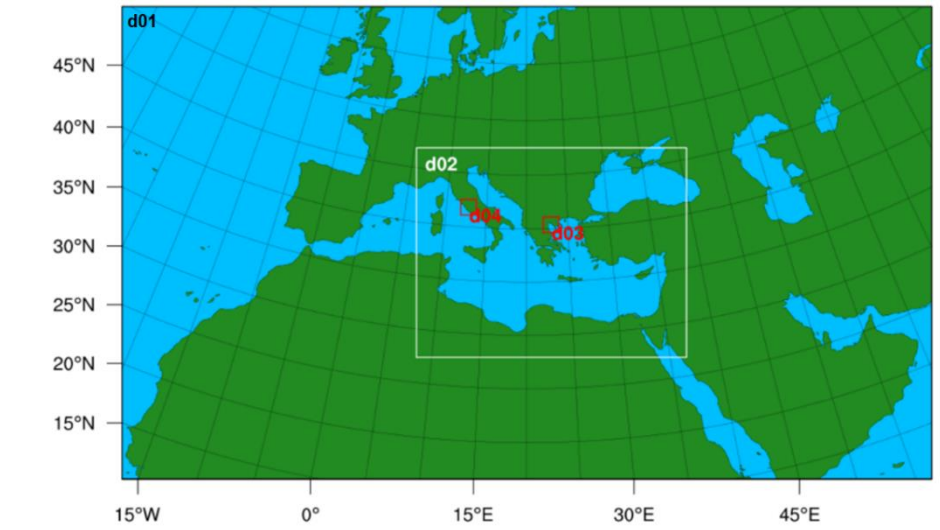
Increasing temperature in a global scale due to **green house gases emissions**

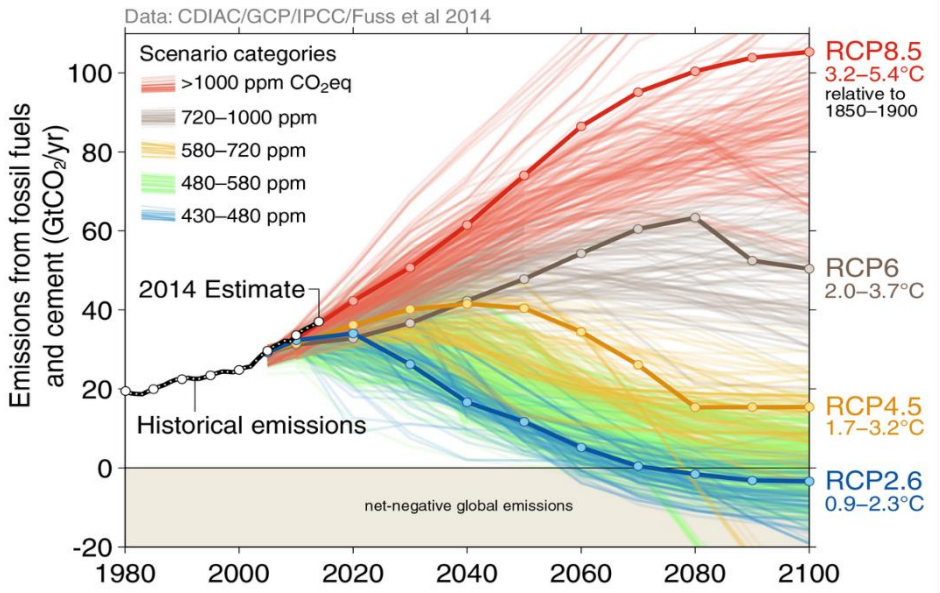
Urban Heat Island (UHI) effect occurs due to different land use and it describes the temperature difference between urban and surrounding non-urban areas:

$$UHII = T_{urban} - T_{non\_urban}$$

The impact of UHI is added to the impact of global warming.

Model and Data



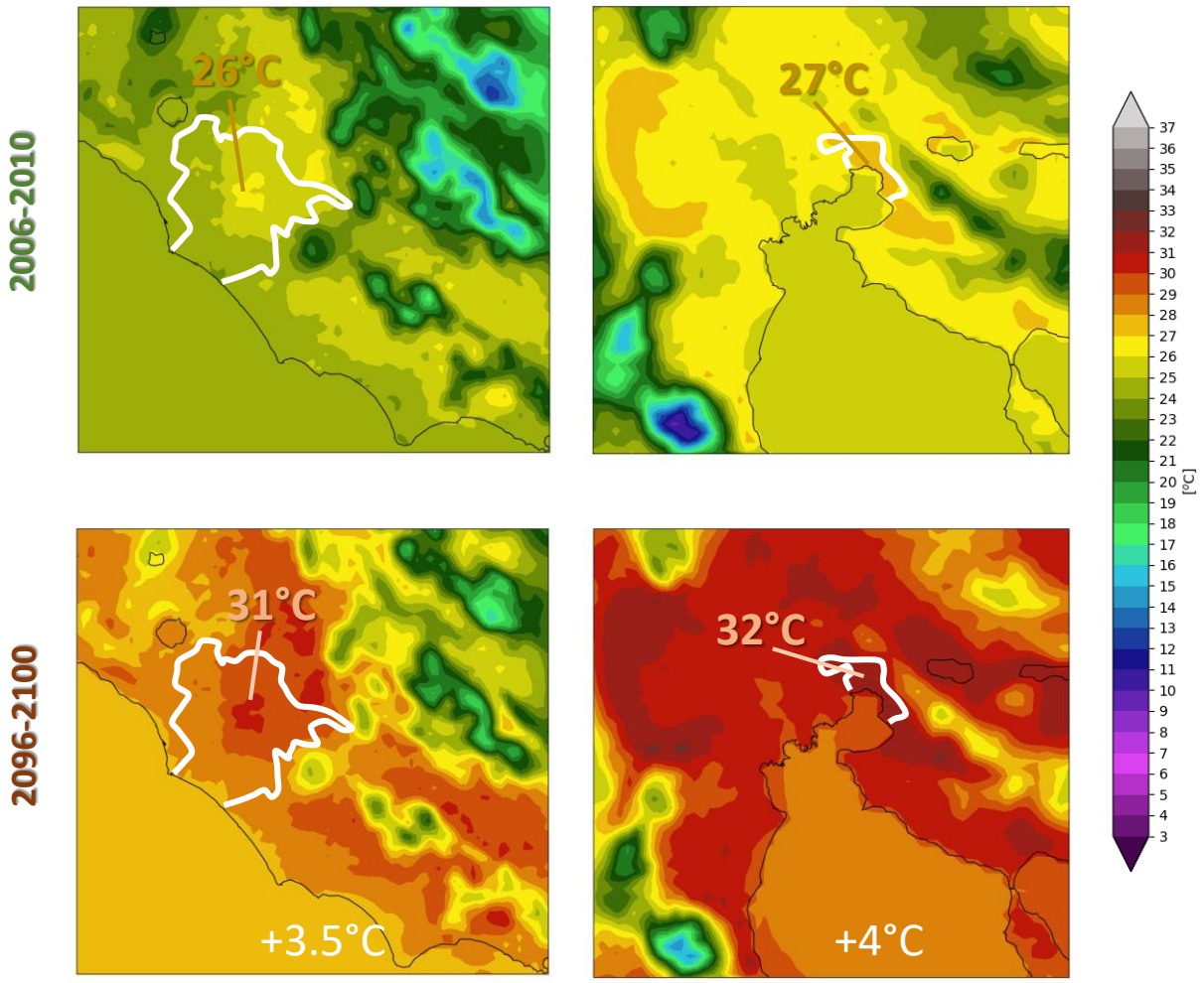


Climate projections

- WRF as regional climate model
- CMIP-5 RCP8.5 (spatial resolution ~1°)
- High resolution dataset for Land Use (250m)
- Simulation periods:2006-2010, 2046-2050, 2096-2100
- Spatial resolution: 50-10-**2km**
- Time resolution: 3 hours

Temperature trends in the greater area of Thessaloniki

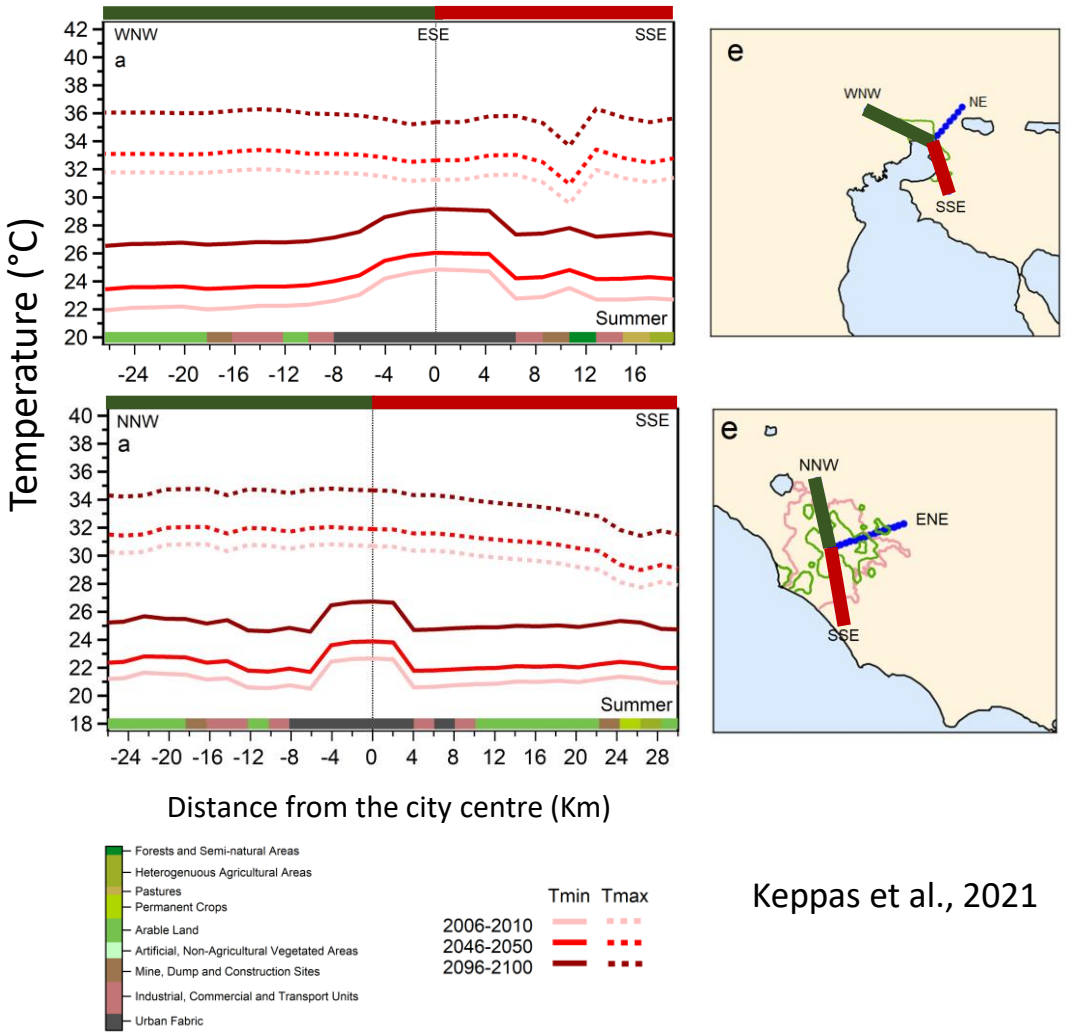
Average Summer Temperature (°C)



- Clear footprint of the urban areas of both cities on summer average temperature
- At the end of the century, we expect the highest temperature increase in summer by 3.5-4°C (and the lowest in winter)

Difference between urban and non-urban areas

Average T_{min} and T_{max} along the intersections



Keppas et al., 2021

Present Climate

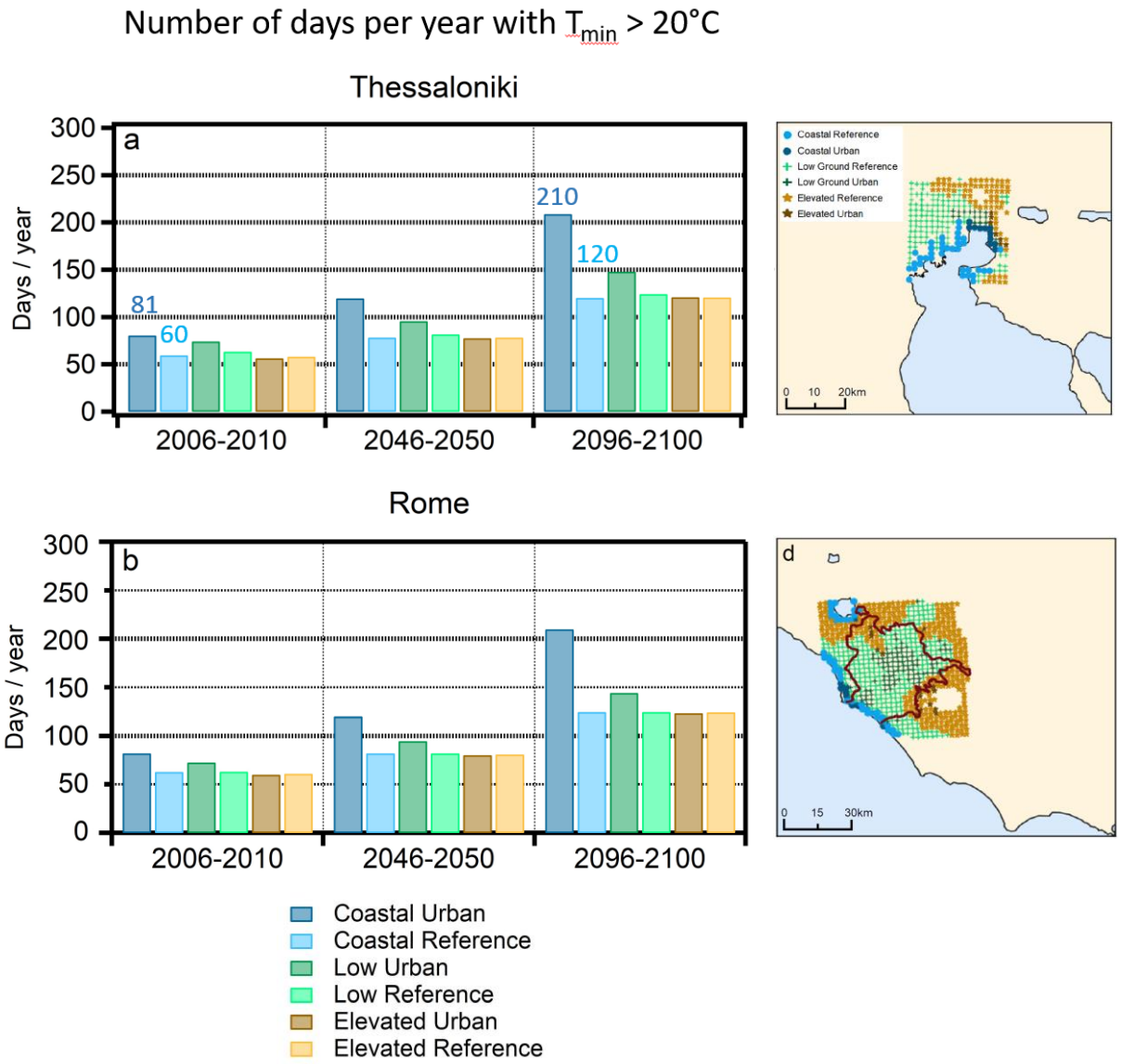
- UHI is obvious and intense on T_{min}
- T_{min} is higher by 2-3°C in the urban area
- UHI does not affect T_{max}, which may be in cases lower over urban areas (-1 to 0.4°C)

Future Climate

- UHI **remains constant** by 2100, but within a new temperature range causing increased discomfort in the urban area.

	Now	2100
Thessaloniki average summer temperature daily range:	25-31 |	29-35°C
Rome average summer temperature daily range:	23-31 |	27-34°C

Difference between urban and non-urban areas



Discrimination between coastal, non-coastal low ground and elevated areas.

Results are similar for both cities

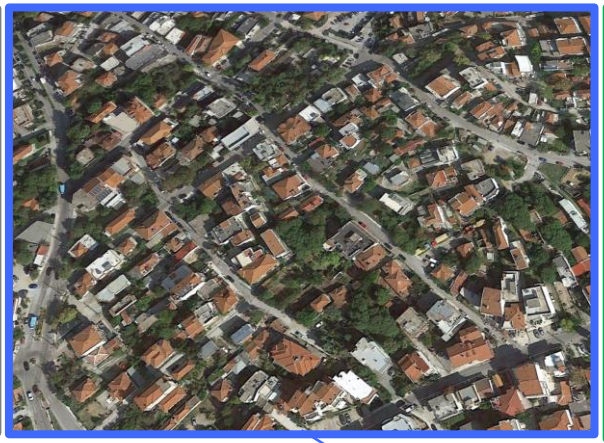
- Coastal urban areas are characterized by the largest number of days/year with T_{min}>20°C
- Coastal urban areas present the largest increase in the number of such days in the future.
- No significant differences are expected between non-coastal low ground and elevated areas.

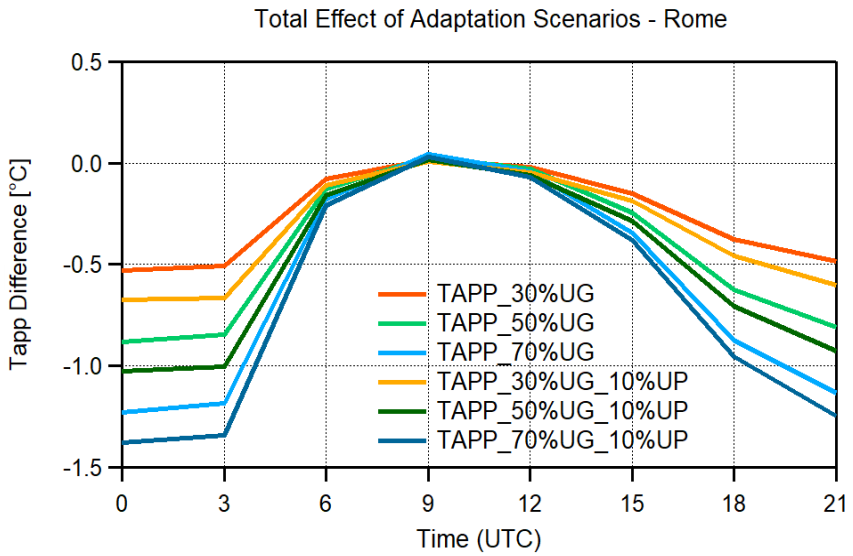
Impact of green interventions on the urban microclimate

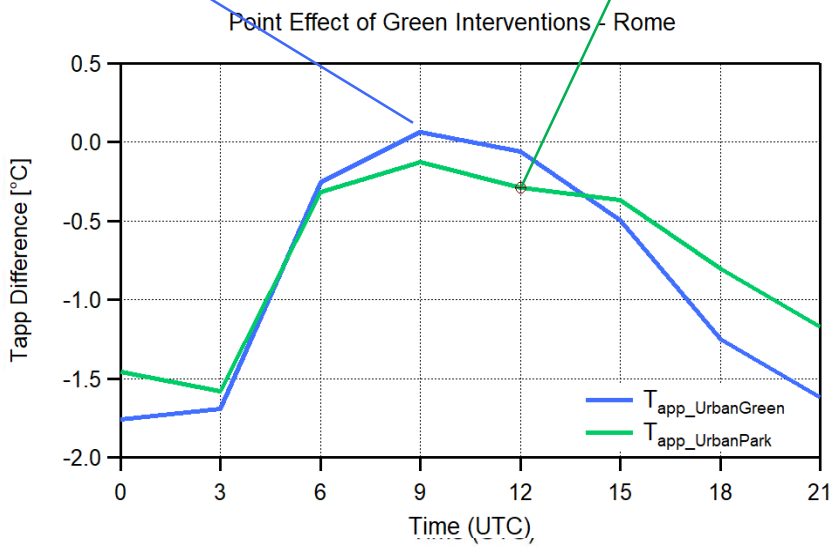
Dense Urban Fabric

Urban green

Urban park







Project co-financed by the European Regional Development Fund

WECAREMED

ToWards thE CARbon offsEtting in MED

- **WECAREMED** tries to identify the carbon footprint of all the processes that take place under the **INTERREG MED project activities.**

- **WECAREMED** develops an **integrated tool**, suitable for INTERREG MED projects, that combines:

  ✓ the estimation of **Greenhouse Gas emissions** generated by project activities,
  ✓ guidelines to **reduce carbon emissions**,
  ✓ the identification of **offset** measures to compensate carbon emissions,
  ✓ the evaluation of **costs of mitigation measures**.

PROJECT PARTNERS

Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto

Universidad de Sevilla

Aristotle University of Thessaloniki

800 anni 1222-2022

Università degli Studi di Padova

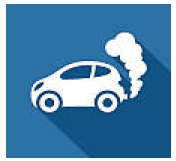
cri EP

Project co-financed by the European Regional Development Fund

CARBON FOOTPRINT EMISSION SOURCES

Footprint can be in various ways:

1. **Heating - Fuels**
2. **Electricity**
3. **Transportation**
4. **Water**
5. **Materials**
6. **Printable deliverables**
7. **Equipment**
8. **Events**



MITIGATION SCENARIOS BUILDING

*The WECAREMED tool **can be implemented** for several mitigation scenarios*

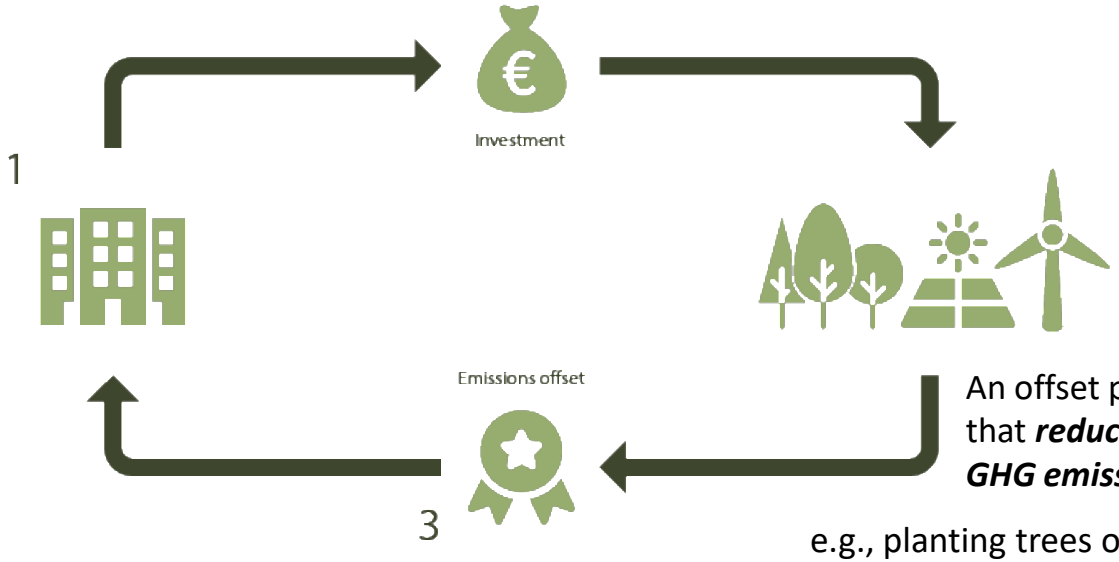
Examples:

- **Use of eco - friendly means of transportation**
- **Promotion of the usage of recycled or reused materials**
- **Reduction in the number of printable deliverables**
- **Promotion of on-line meetings**

Project co-financed by the European Regional Development Fund

Carbon offsetting

Estimation of cost of the emissions to be offsetting



Carbon Offsetting Projects/Programmes

Trees for All

SOLITE

Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto
Aristotle University of Thessaloniki

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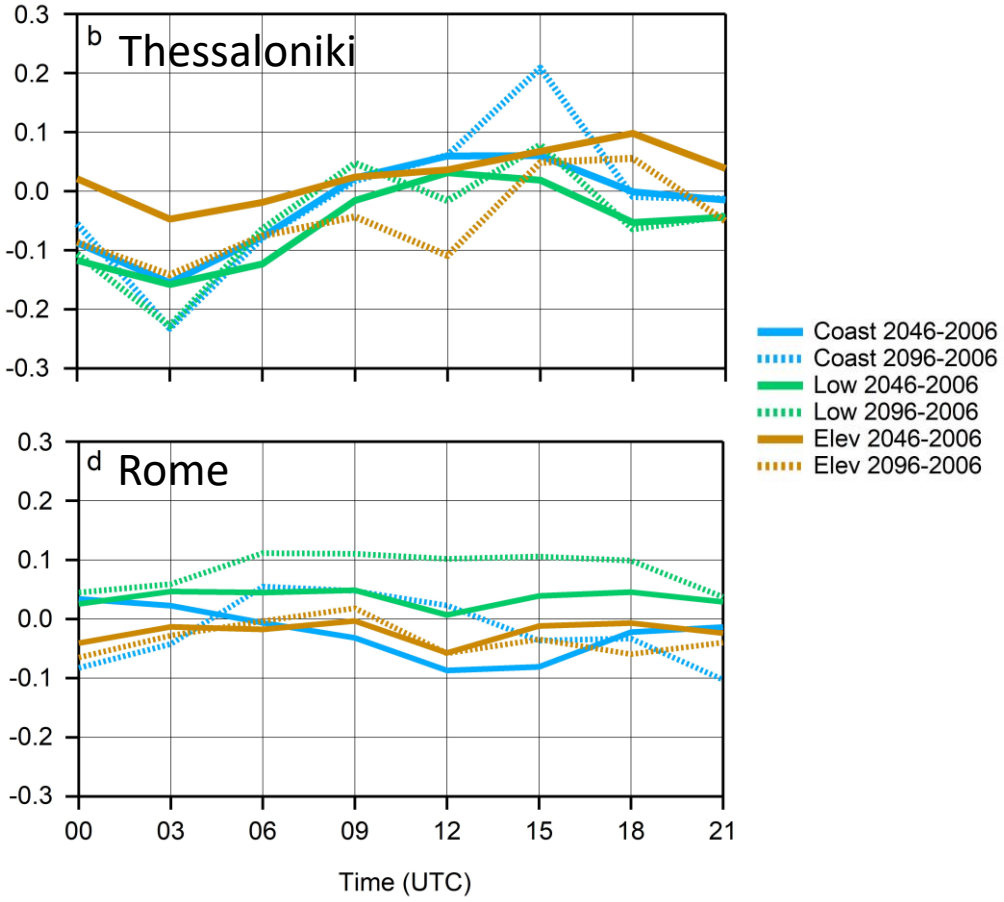
Difference between urban and non-urban areas

Summer UHI intensity change
by 2050 and 2100

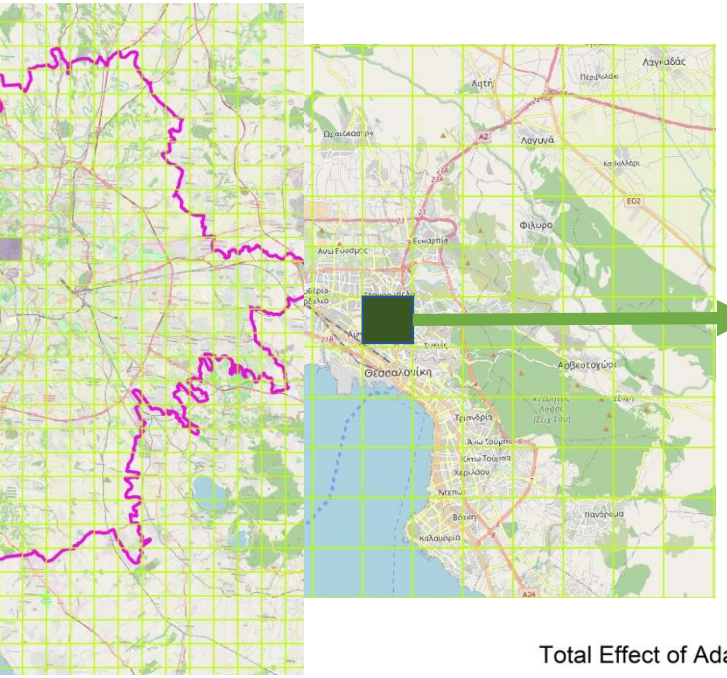


- UHI intensity changes in an insignificant way (by ±0.2°C)

The largest but still insignificant changes are expected in coastal and non-coastal low ground areas of Thessaloniki.

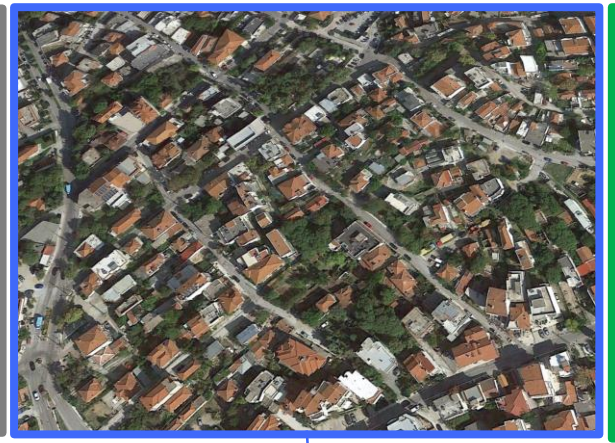
- There is a decreasing trend of UHI intensity early in the morning and an increasing trend in the afternoon only in Thessaloniki.

Impact of green interventions on the urban microclimate

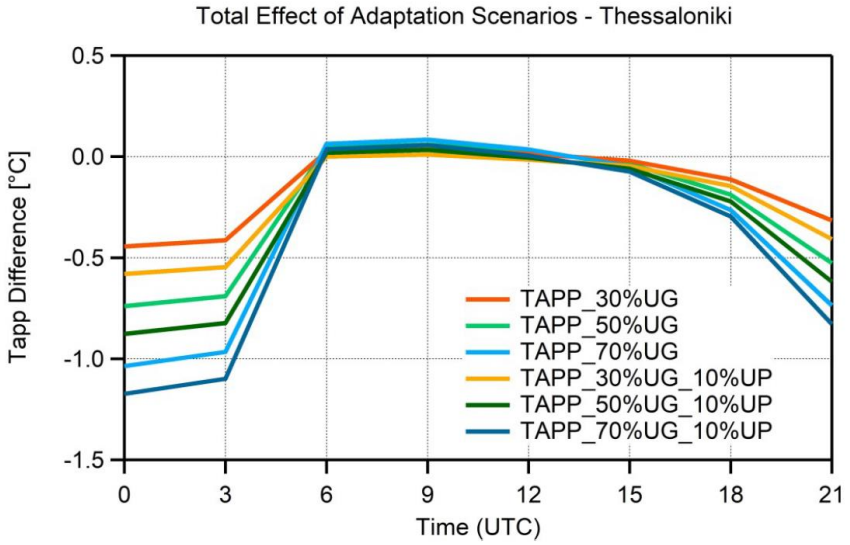


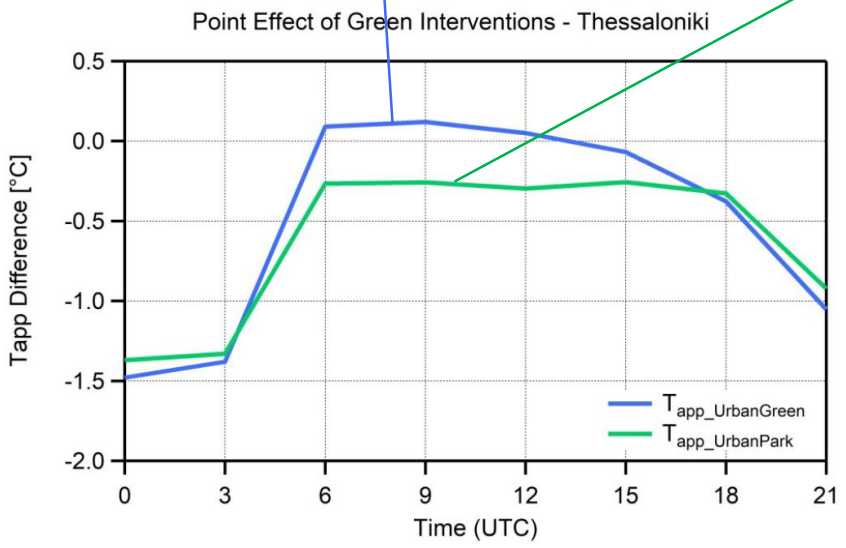
Dense Urban Fabric

Urban green



Urban park





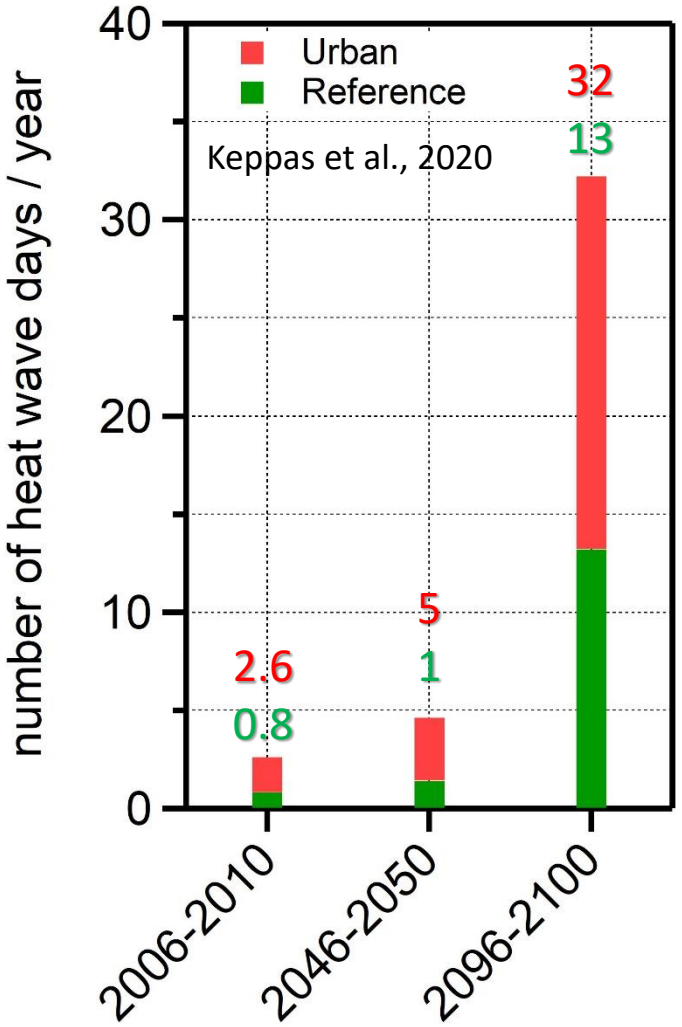
Difference between urban and non-urban areas - Thessaloniki

HEAT WAVE DAYS (HWD)

The criteria:

- $T_{max} \geq 37°C$
- $T_{avg} \geq 31°C$

Metaxas, D. A., and METAXAS DA. "Heat waves from a synoptic point of view." (1980)



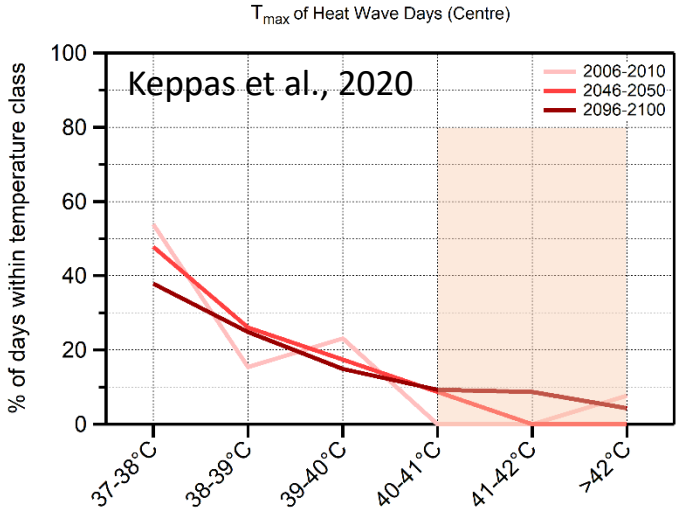
Difference between urban and non-urban areas - Thessaloniki

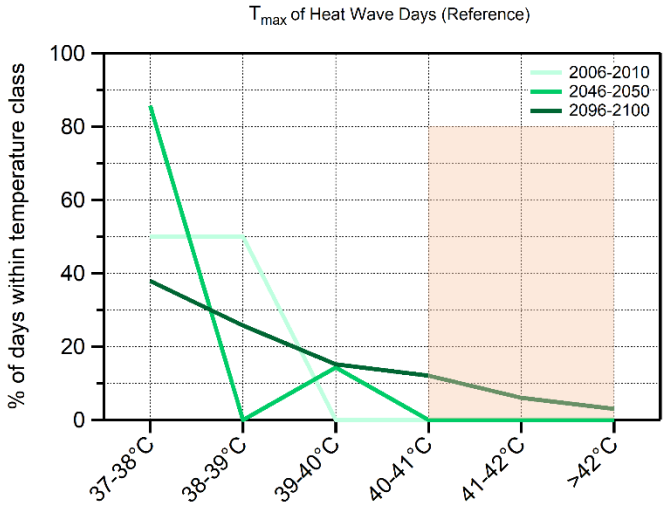
URBAN

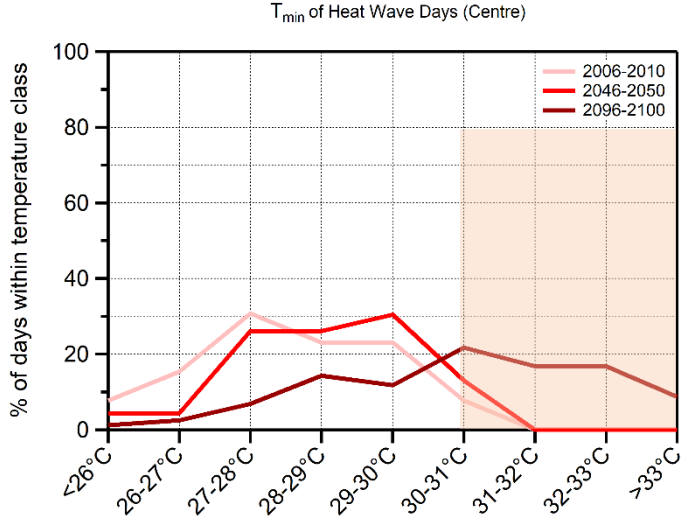
NON-URBAN

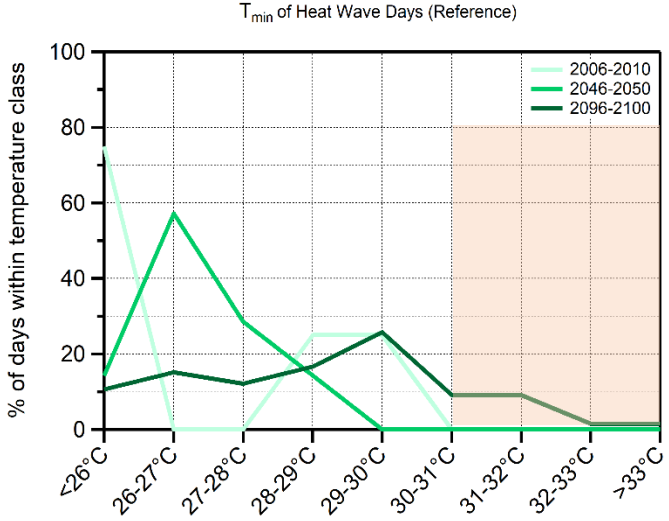
T_{max}

T_{min}







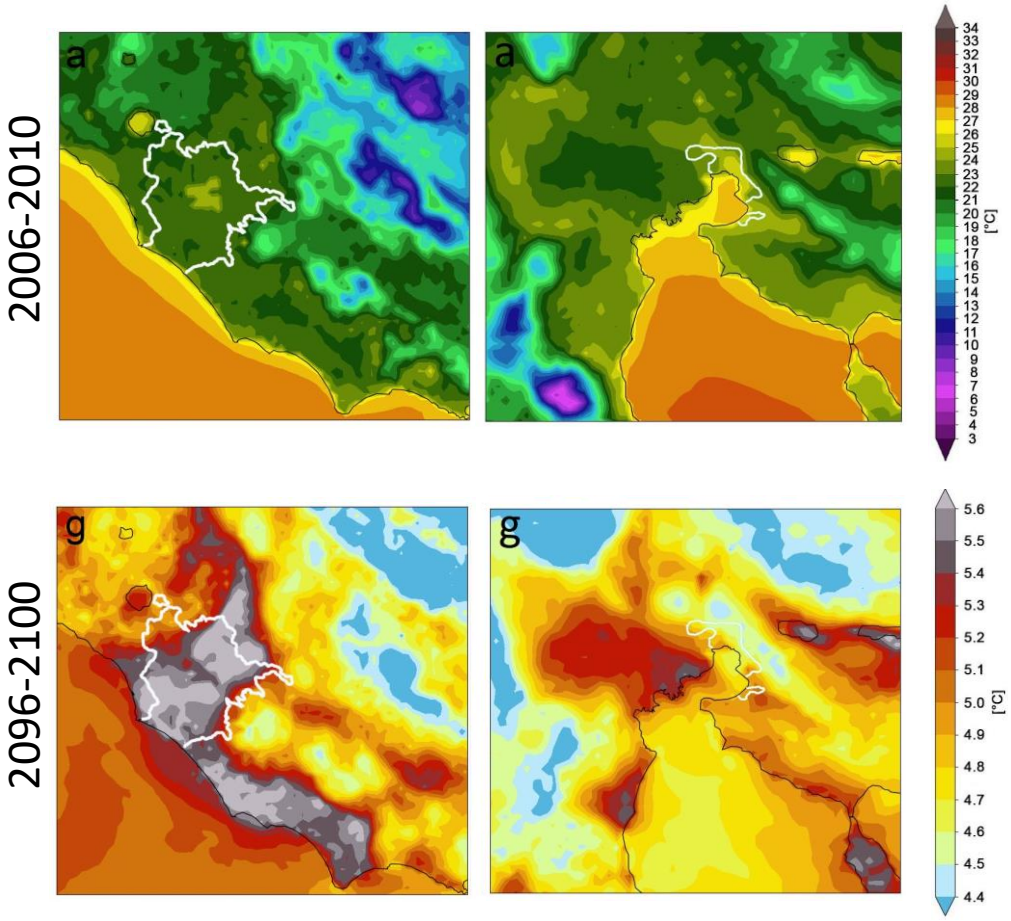


Analyzing T_{max} and T_{min} of heat wave days:

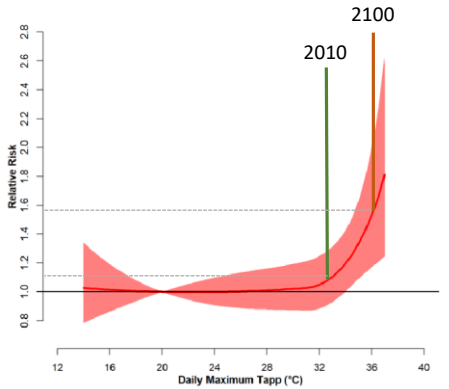
- T_{max} in the urban area will exceed 40°C in 24% of the heat wave days by 2100. The results are similar in the non-urban area.
- T_{min} in the urban area will exceed 30°C in 63% of the heat wave days by 2100, over-exceeding the respective number of such days in the present (8%).
- T_{min} in the non-urban area will exceed 30°C only in 20% of the heat waves by 2100.

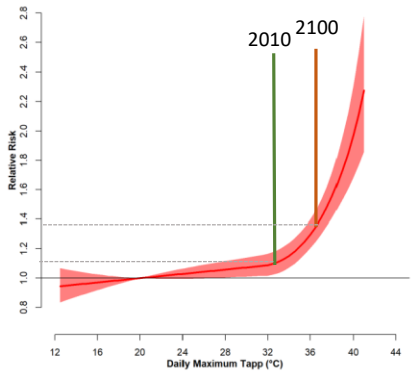
Difference between urban and non-urban areas

Average Tapp at 03UTC in July



$Tapp_{max}$ vs Relative Risk
(*exposed mortality/non-exposed mortality*)





Francesca de'Donato, Matteo Scortichini, 2019

Considering **no changes in the urban structure and size**:

- **Tapp will increase less in the urban fabric** (by 0.5-1°C) comparing to the surrounding areas by **2100**, but will be still higher. RR increases to 1.4-1.6 by 2100.
- **Tapp** is **increased early in the morning during summertime** in the **urban area** by **+3-4°C** comparing to the surrounding areas.

$TAPP = -2.653 + 0.994\ T + 0.0153 * T_{dew}^2$

Atmospheric monitoring of the Urban Heat Island in Rome

S. ARGENTINI[2], G. CASASANTA[2], A. CECILIA[1], I. PETENKO[2],

[2]CNR-ISAC Tor Vergata[1],University of Rome Tor Vergata

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.

Motivations and goals for installing new atmospheric monitoring stations

Motivations

- UHI is strongly related to health, economic and environmental issues and can affect everyday activities
- Satellite measurements do not provide UHI measurements – they provide SUHI measurements
- Deploy and maintain observational networks is still a challenge

Goals

- Provide high quality measurements
- Cover a city with a high spatial and temporal resolution
- Merge local existing citizen's meteorological stations in a single, synergistic network

Potential of the network - METEOROLOGY

- Urban - Suburban meteo-micrometeorological characterization
- Validation of the urban module of WRF model
- Mitigating effect of mesoscale circulation
- Mechanisms generating the urban heat island
- Effect of heat waves on the city
- Accuracy of satellite remote sensing techniques

Observation System Overview

8 new Davis Vantage Pro 2™ Wireless Weather Stations

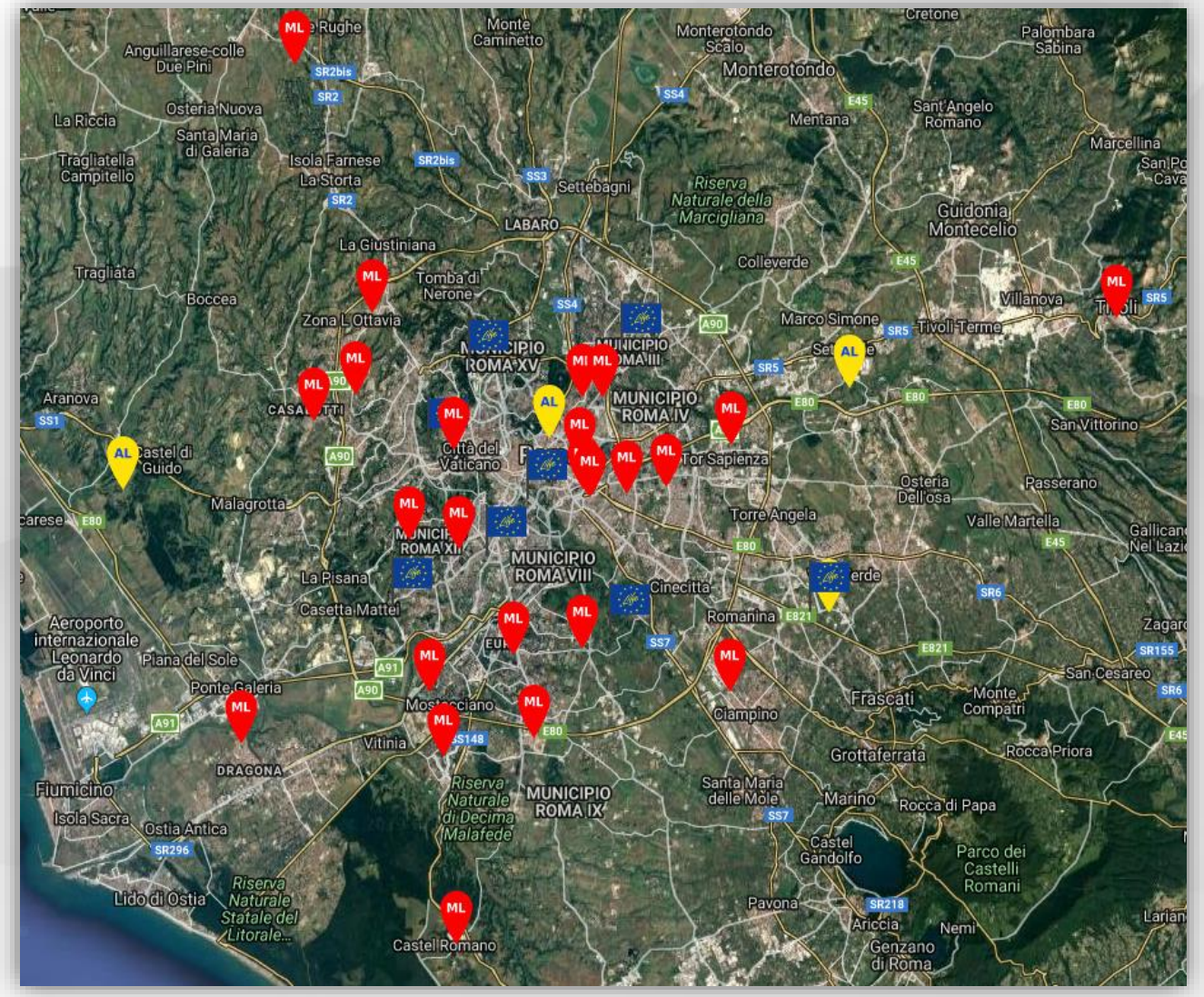
+

Meteo Lazio (25)

Arpa Lazio (4)

=

37 weather stations



Weather stations

Davis weather stations, installed at schools, public institutions, and private people's buildings.

Davis

Acquisition system

- Temperature
- Relative humidity
- Wind speed & dir
- Rainfall

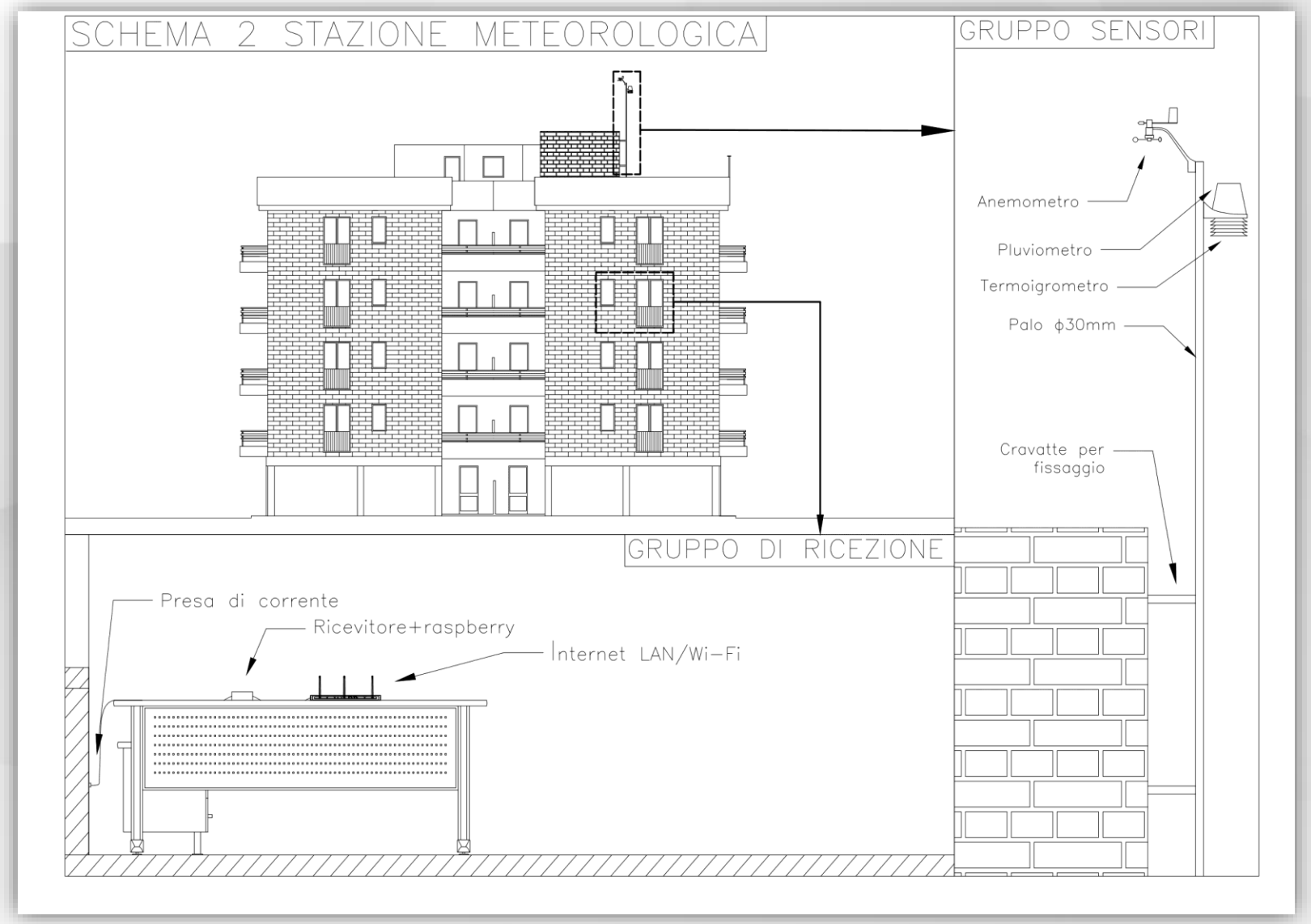
- Data receiver
- Datalogger

Online submission to a central database

Parameter	Resolution	Accuracy	Sampling time
Temperature	0.1°C	± 0.3 °C	10 s
Relative Humidity	1%	± 2%	50 s
Rainfall	0.2 mm	± (4% + 0.2) mm	10 s
Wind direction	1°	± 3°	2.5 s
Wind speed	1 km/h	3.2 km/h	2.5 s

Stations position

- 2 m from the pavement on a rooftop
- Over the urban canopy layer



Monte Ciocci LIFE ASTI weather station

Webcams

- Directly monitoring the sky
- Wide angle of view
- 1 snapshot every 1 minute to FTP server
- Real-time images available for the web user

ARPA Lazio micrometeo stations

Regional Agency for the Environmental Protection

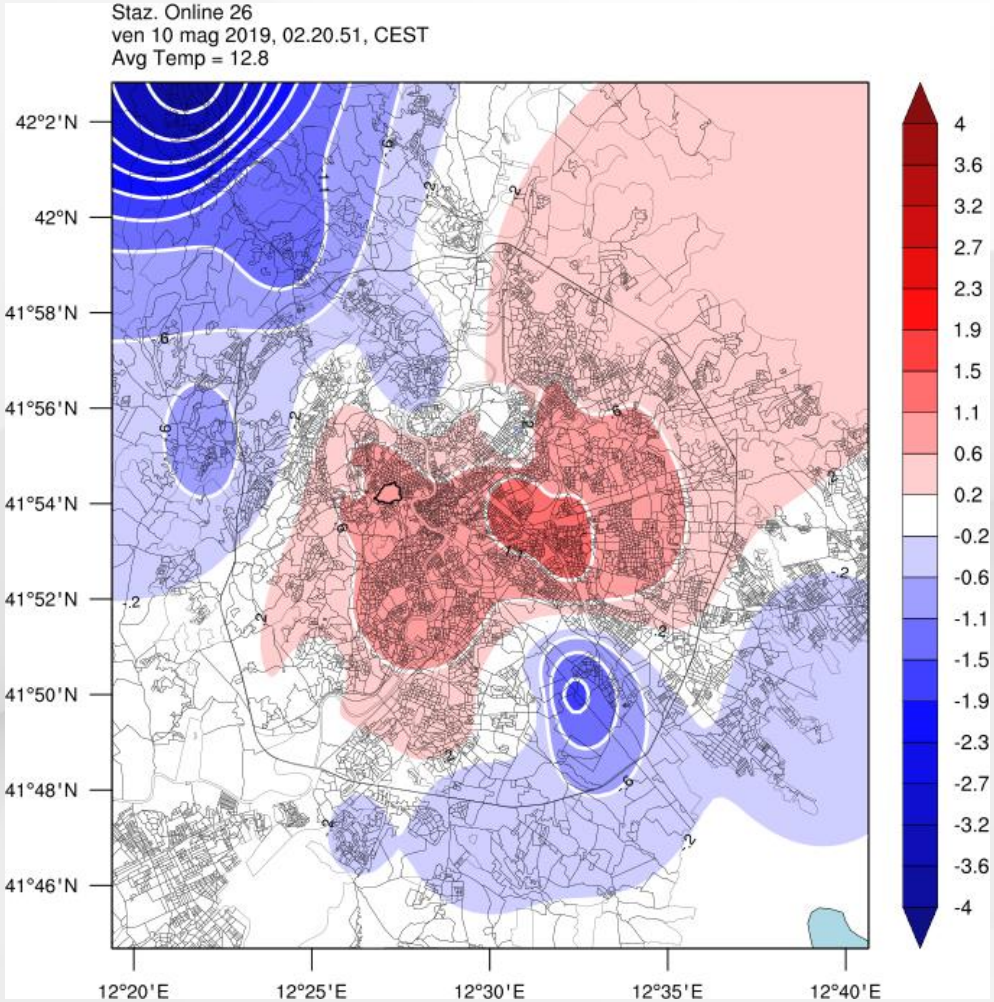
micrometeorological regional network

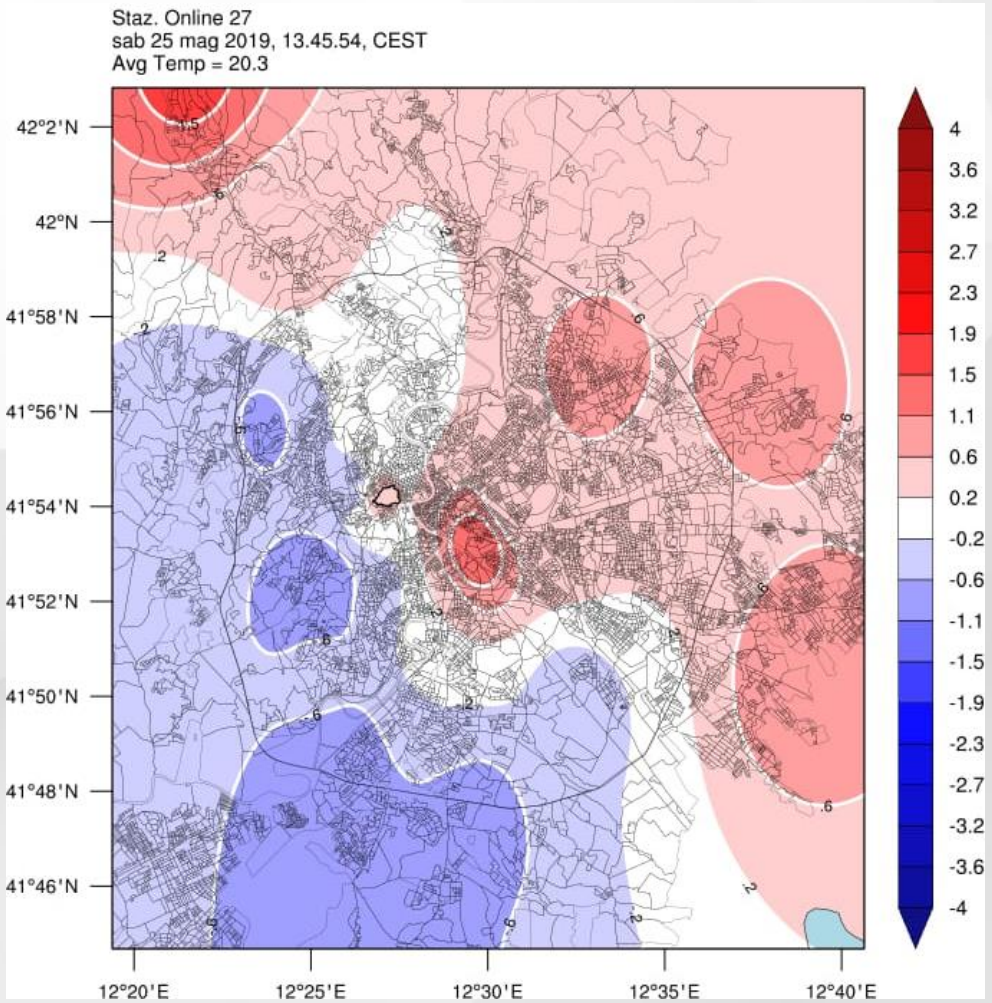
4 measuring points in Rome and its suburbs

reference for observations and in situ when applicable

no real-time data, later integrated into the central database

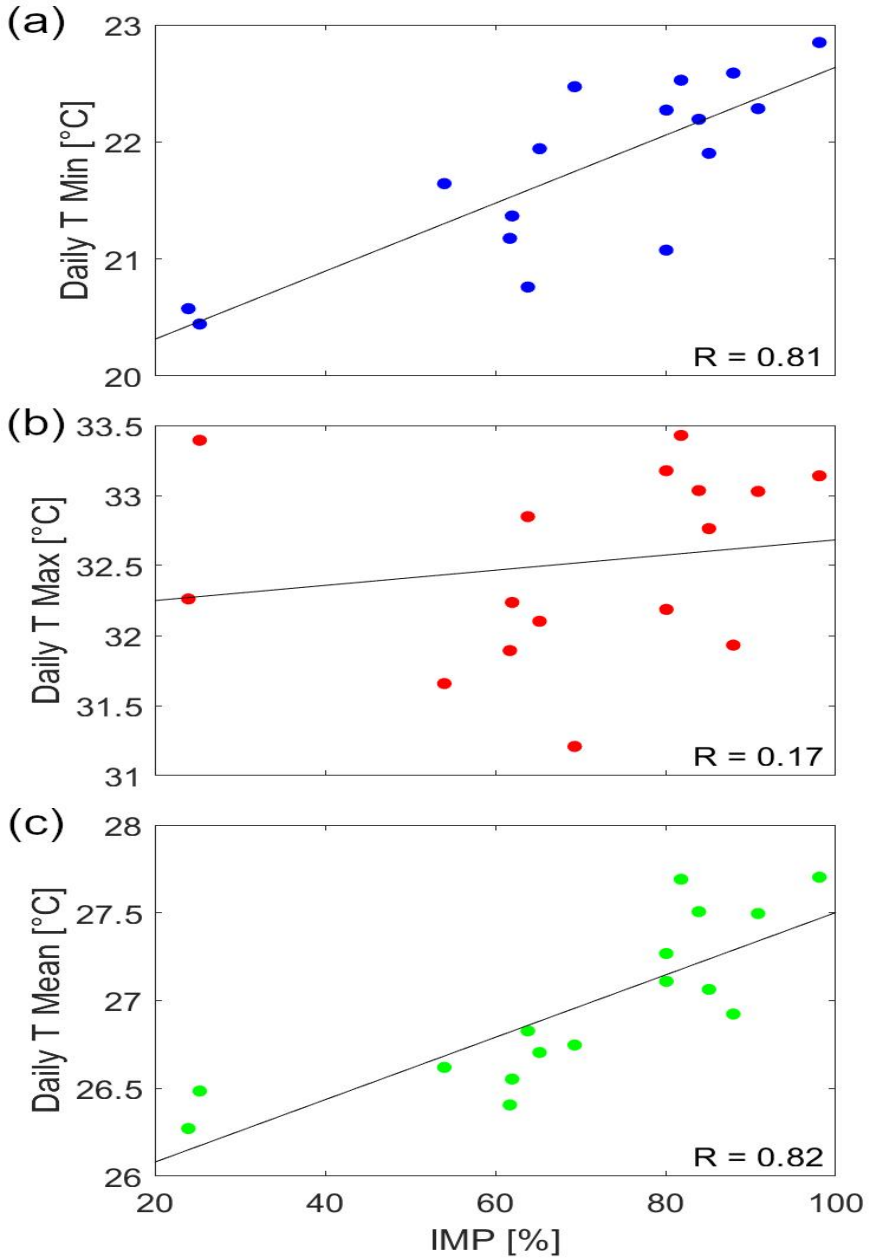
Urban heat island

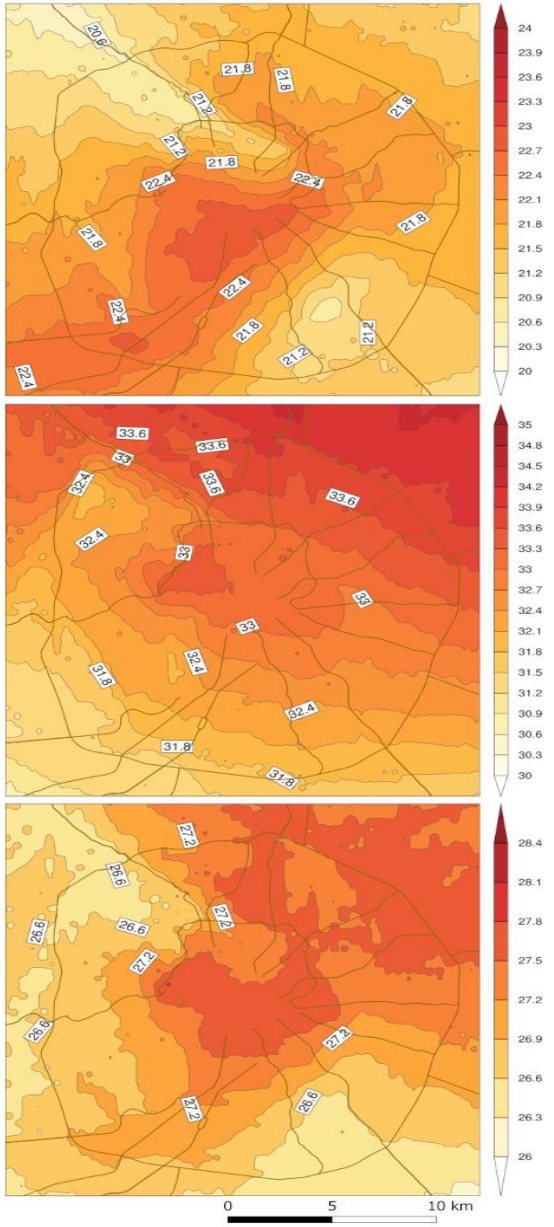




Penetration of the sea breeze

INTERPOLATED MAPS AND SCATTER PLOTS VERSUS IMP OF DAILY MINIMUM, MAXIMUM AND MEAN TEMPERATURES





Summers 2019-2020

Correlation coefficient R = 0.17 between maximum temperatures and IMP (figure b) indicate no correlation

In agreement with the expected behavior of the UHI, that is supposed to reach its minimum intensity during the day

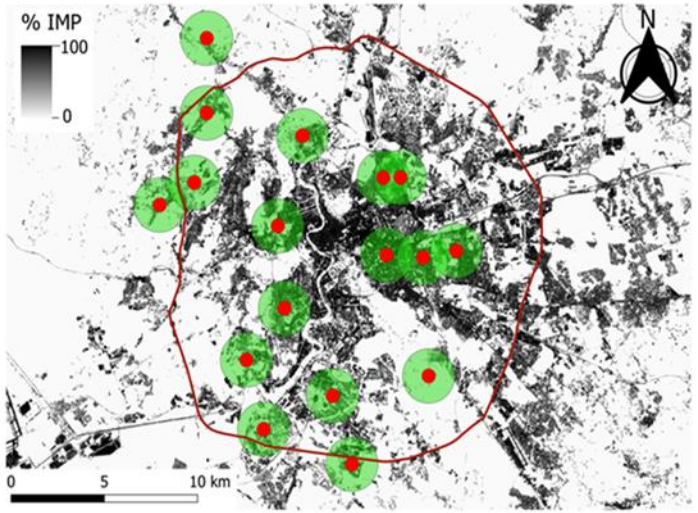
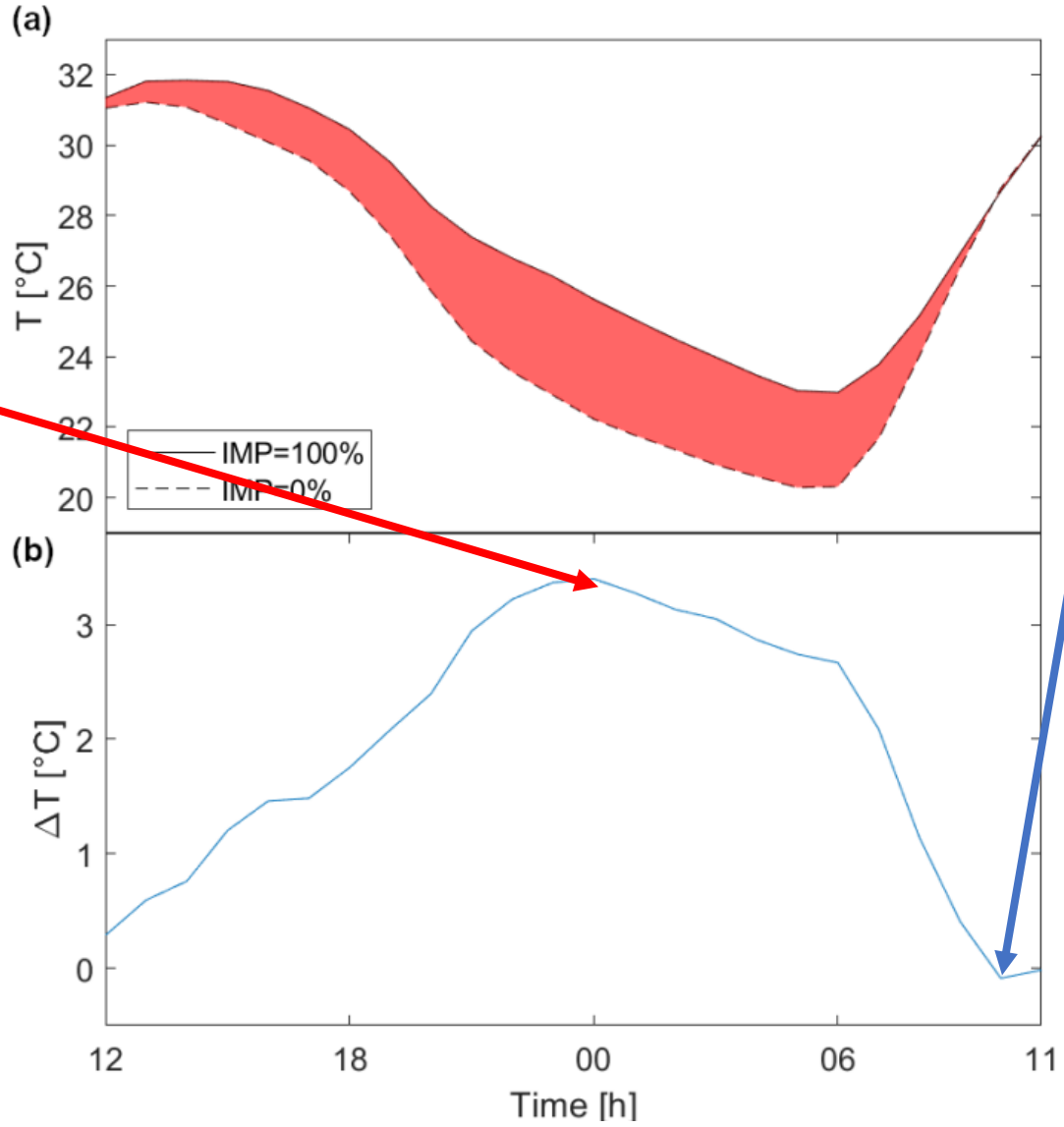


Figure 4: Circumferences of radius $r = 1400$ m (green) drawn around the stations (red dots), superimposed on *imperviousness density* satellite data.

THE RED AREA REPRESENTS THE UHI INTENSITY

THE UHI INTENSITY ΔT IS HIGHER AT **NIGHT, BETWEEN 21:00 CET AND 06:00 CET**



MINIMUM VALUE OF -0.1°C IS OBSERVED AT 10:00

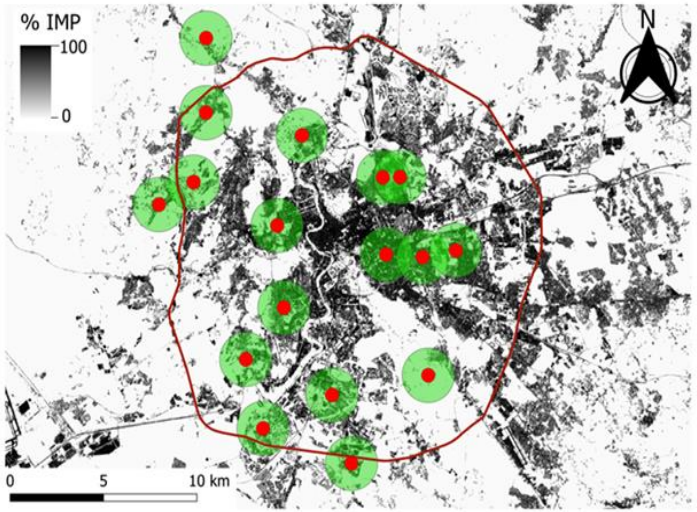
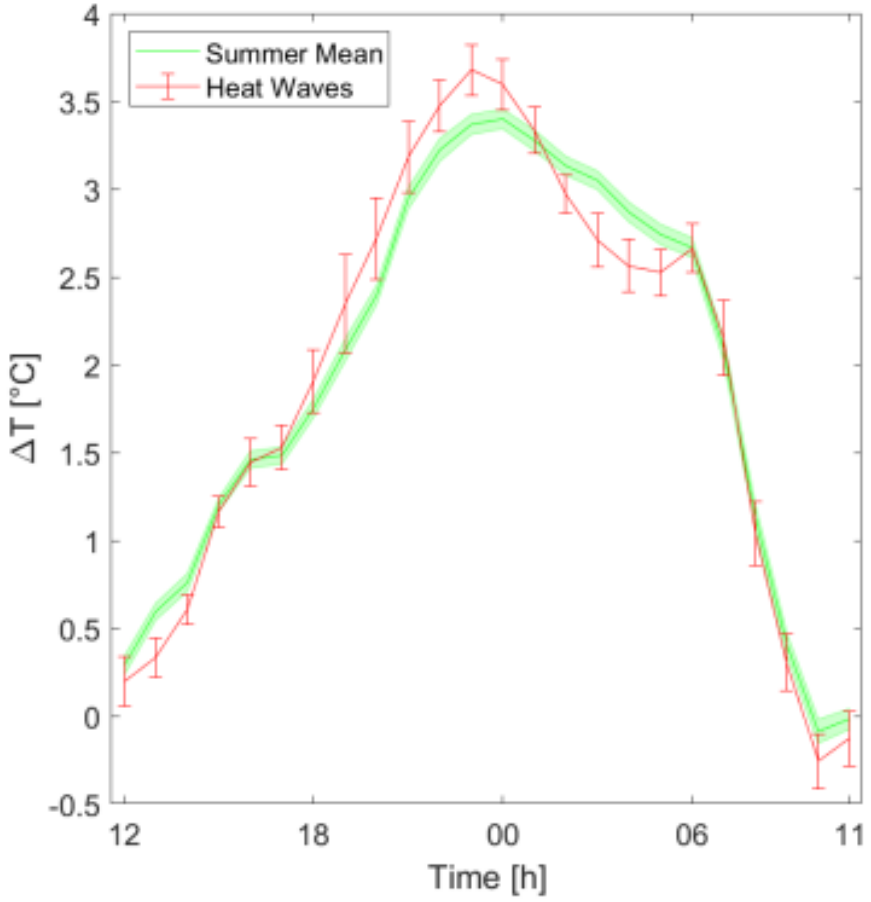


Figure 4: Circumferences of radius $r = 1400$ m (green) drawn around the stations (red dots), superimposed on *imperviousness density* satellite data.

Cecilia A., Casasanta G., Petenko I., Conidi I., Argentini S.. Study of the Canopy Layer Urban Heat Island with a dense rooftop weather station network.Under Revision, in press on Urban Climate, 2022.

UHI INTENSITY AND HEAT WAVES



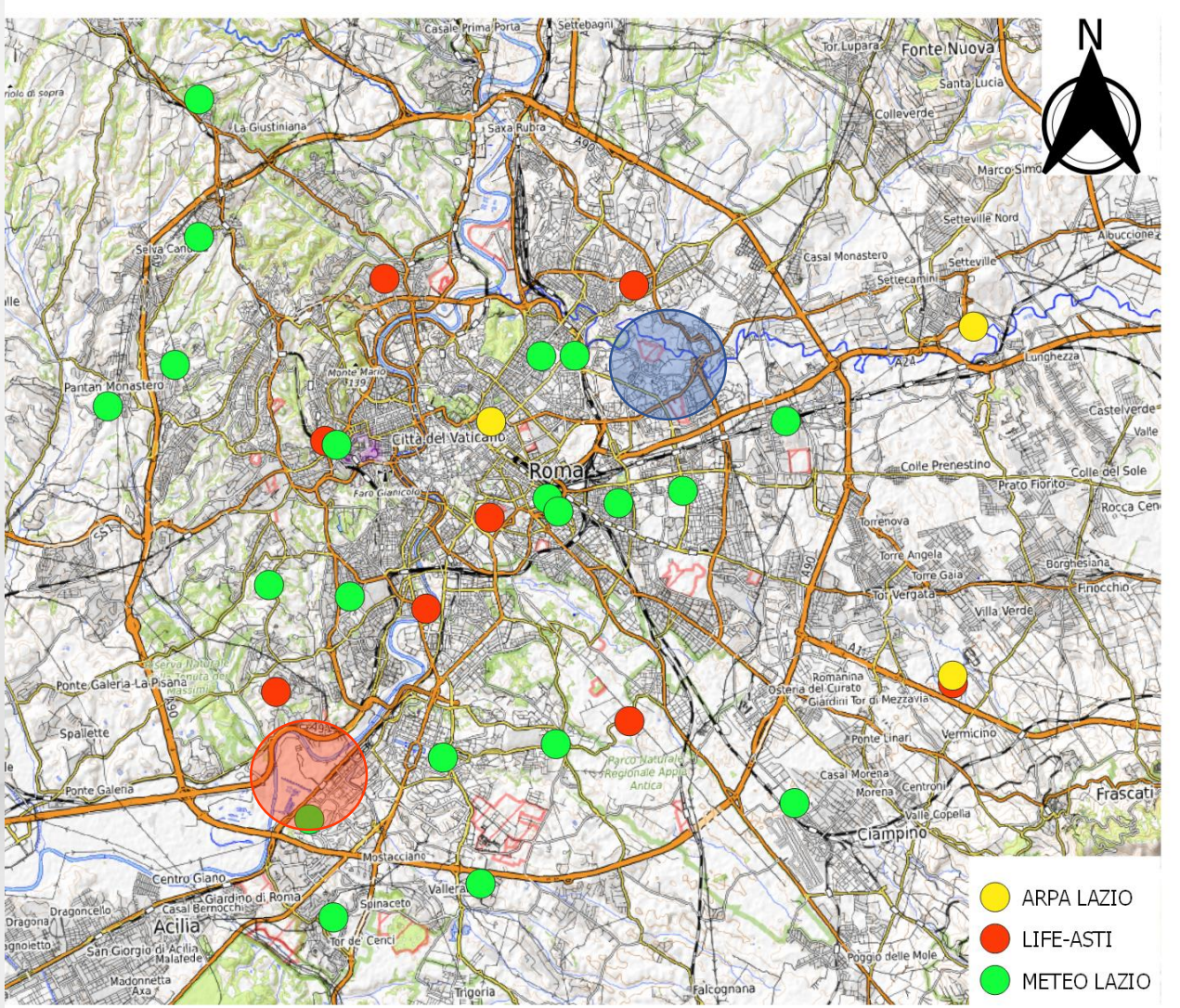
Comparison of UHI diurnal cycle

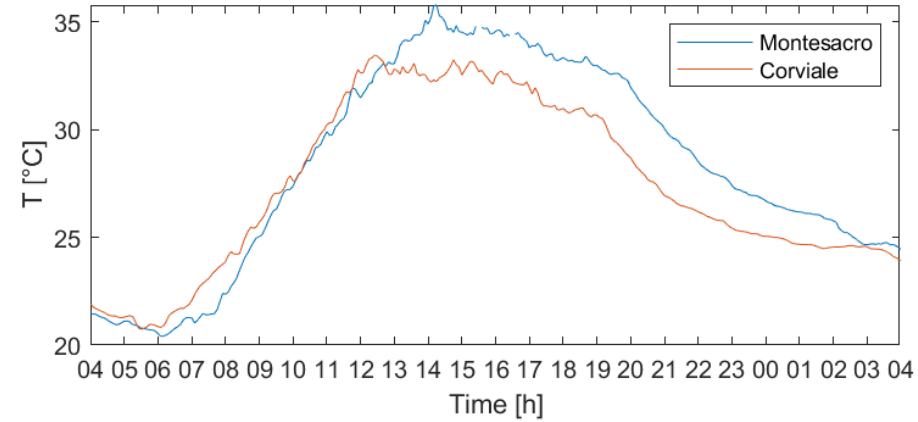
HWs (red line)

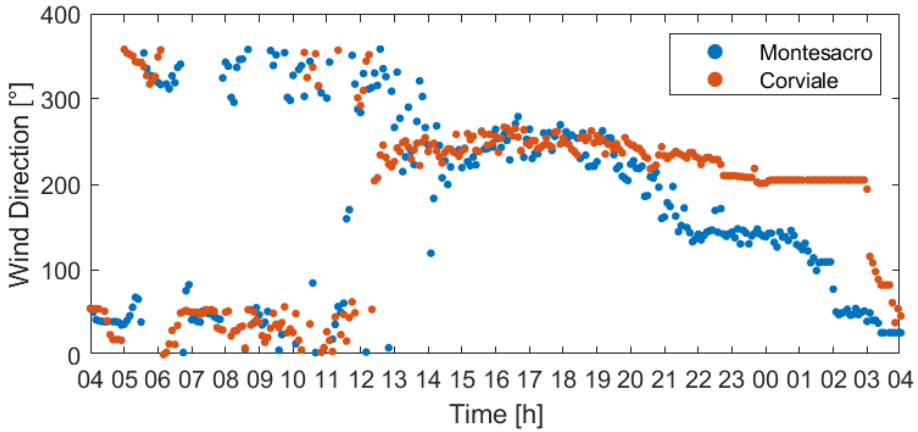
non-HW (green line)

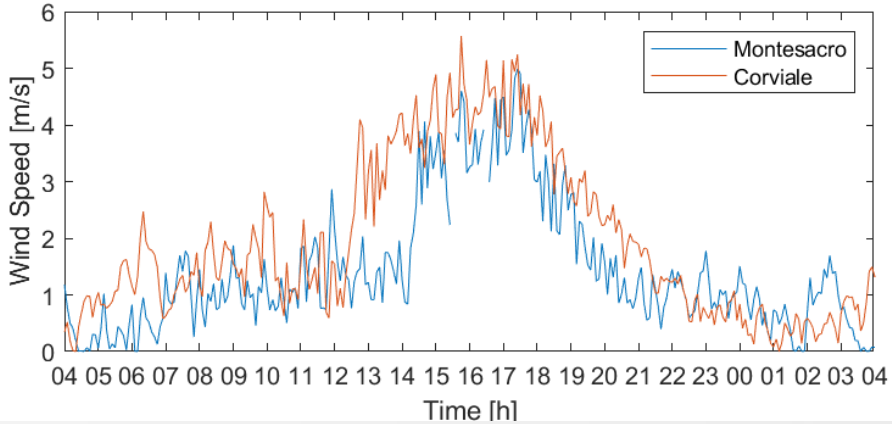
Cecilia A., Casasanta G., Petenko I., Conidi I., Argentini S.. Study of the Canopy Layer Urban Heat Island with a dense rooftop weather station network.Under Revision, in press on Urban Climate, 2022.

Sea Breeze



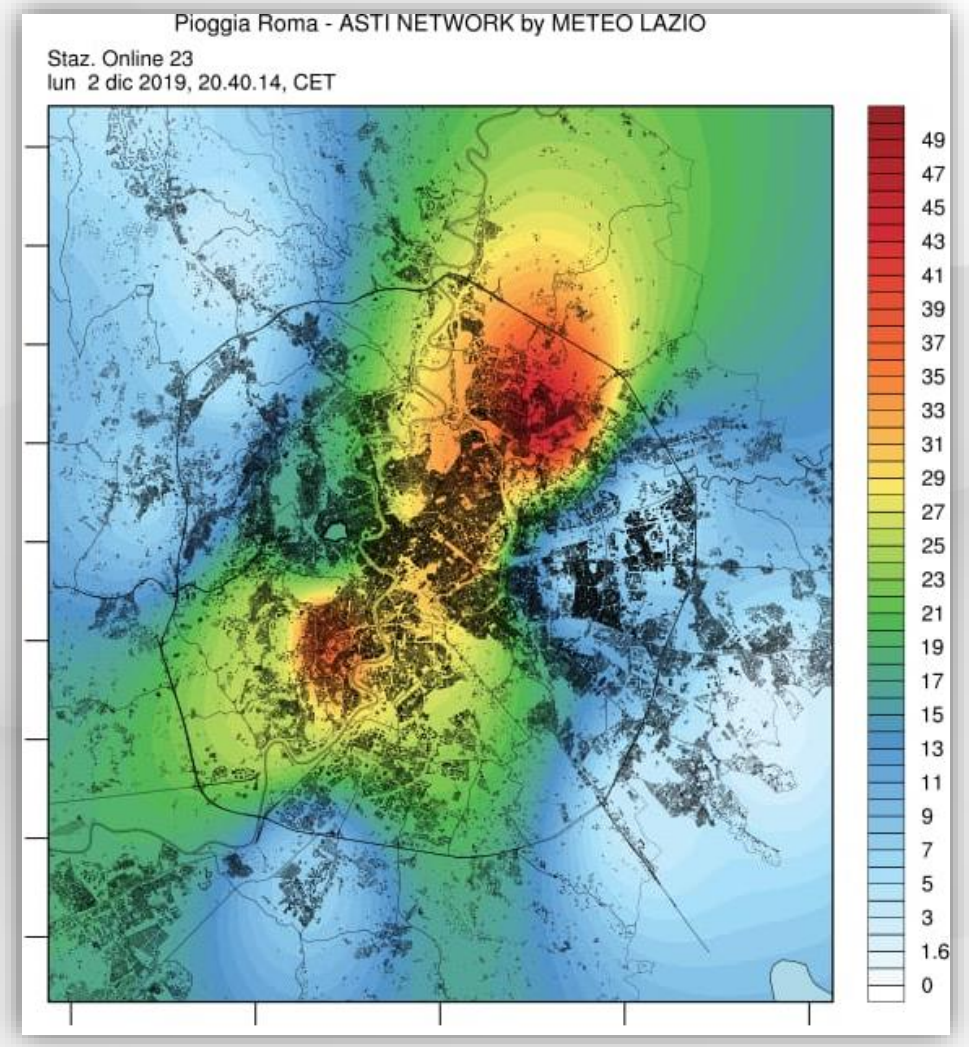






During summer the sea breeze from WSW in the daytime reduces the urban temperature, with more significant effect in the west districts of the city, closer to the sea.

Daily total rainfall



Daily total rainfall (mm)

Rome, 2019 December 2

Papers

- Ciardini V., Caporaso L., Sozzi R., Petenko I., Bolignano A, Morelli M., Melas D., Argentini S.. Interconnections of the urban heat island with the spatial and temporal micrometeorological variability in Rome. *Urban Climate Volume* 29, September 2019, 100493, *https://doi.org/10.1016/j.uclim.2019.100493*.
- Sozzi R., G. Casasanta, V. Ciardini, S. Finardi, I. Petenko, A. Cecilia and S. Argentini. Surface and Aerodynamic Parameters Estimation for Urban and Rural Areas. *Atmosphere* 2020, 11, 147; doi:10.3390/atmos11020147.
- Keppas, S.C..; Papadogiannaki, S.; Parliari, D.; Kontos, S.; Poupkou, A.; Tzoumaka, P.; Kelessis, A.; Zanis, P.; Casasanta, G.; de'Donato, F.; et al. Future Climate Change Impact on Urban Heat Island in Two Mediterranean Cities Based on High-Resolution Regional Climate Simulations. *Atmosphere* 2021, 12, 884. https:// doi.org/10.3390/atmos12070884.
- Cecilia A., Casasanta G., Petenko I., Conidi I., Argentini S.. Study of the Canopy Layer Urban Heat Island with a dense rooftop weather station network.Under Revision, in press on *Urban Climate*, 2022.

Thank you for your attention

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.

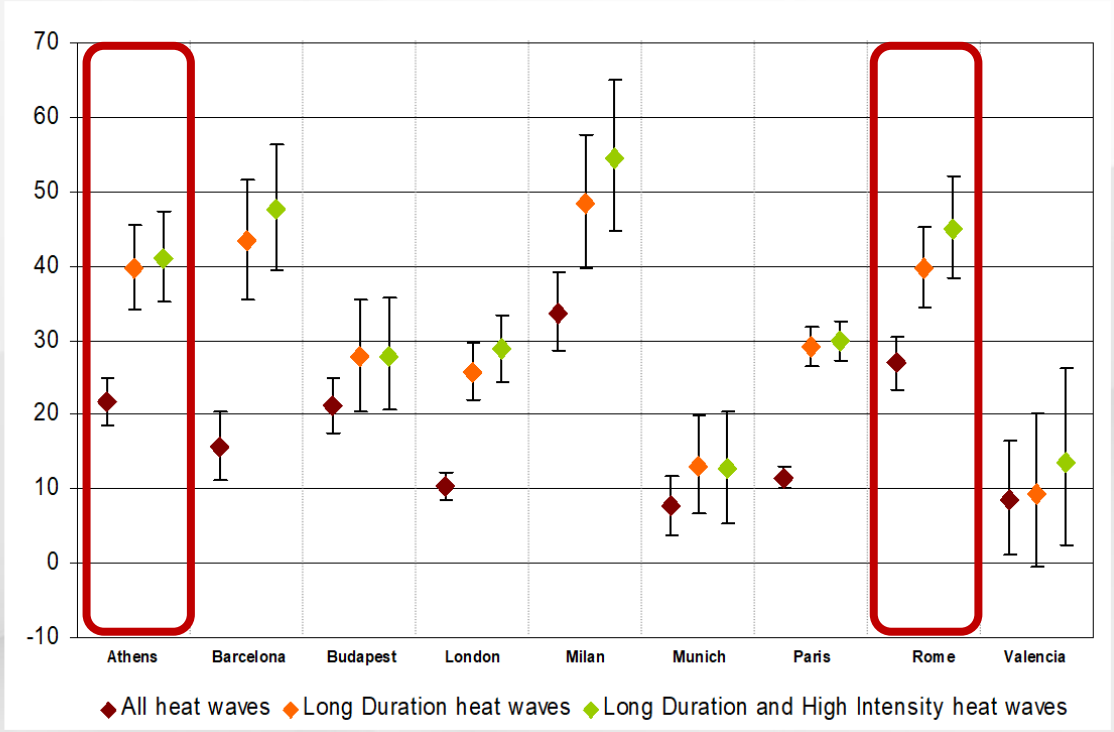
Heat health warning systems for climate change adaptation

Francesca de'Donato

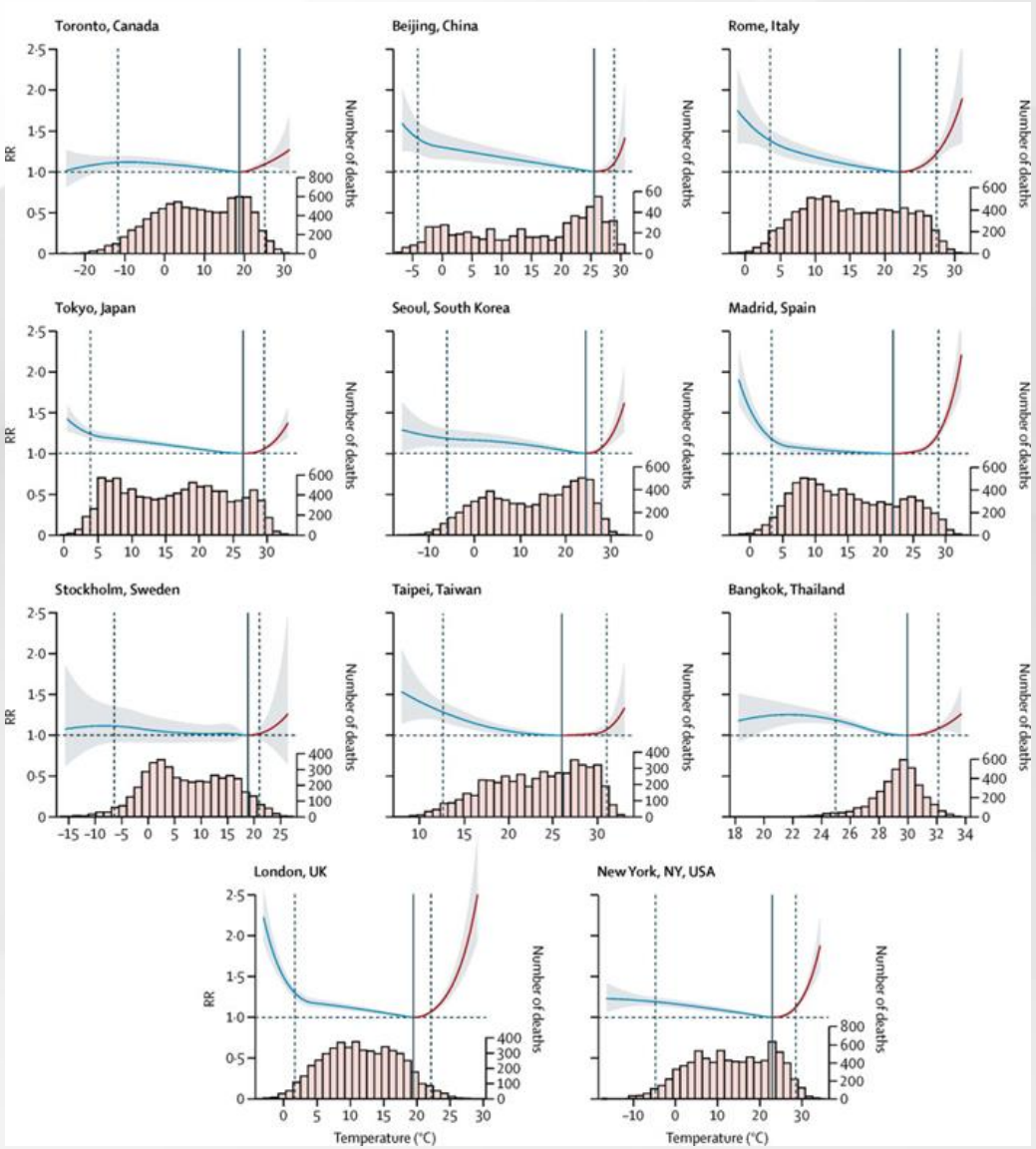
Final Conference, Thessaloniki , 19 may 2022

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.

Health risks related to heat in urban areas

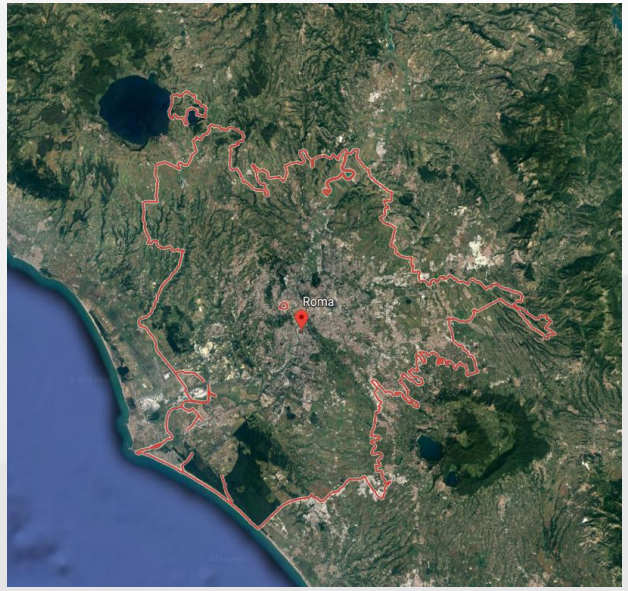


D'Ippoliti et al. 2010 Env Res



Gasparrini et al. 2015 Lancet

Case study cities: Rome, Thessaloniki and Heraklion

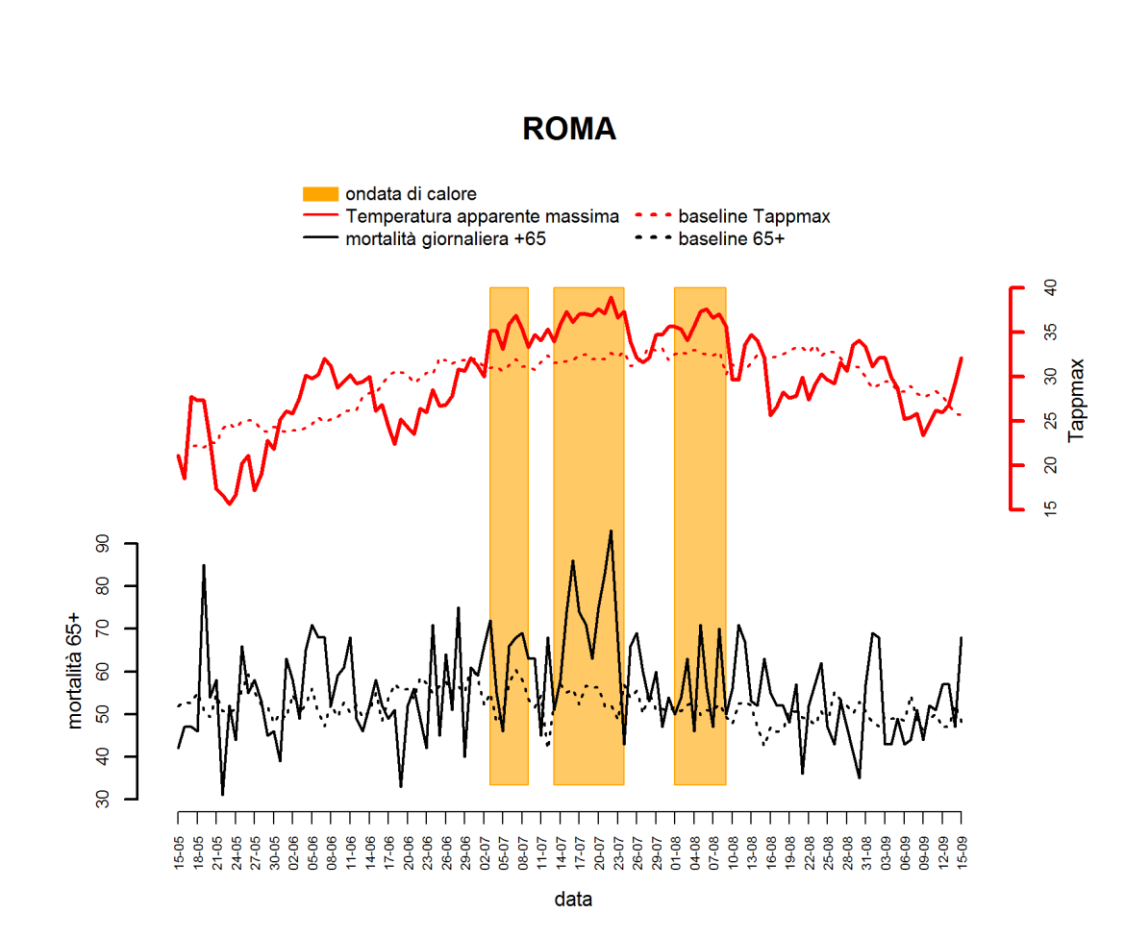


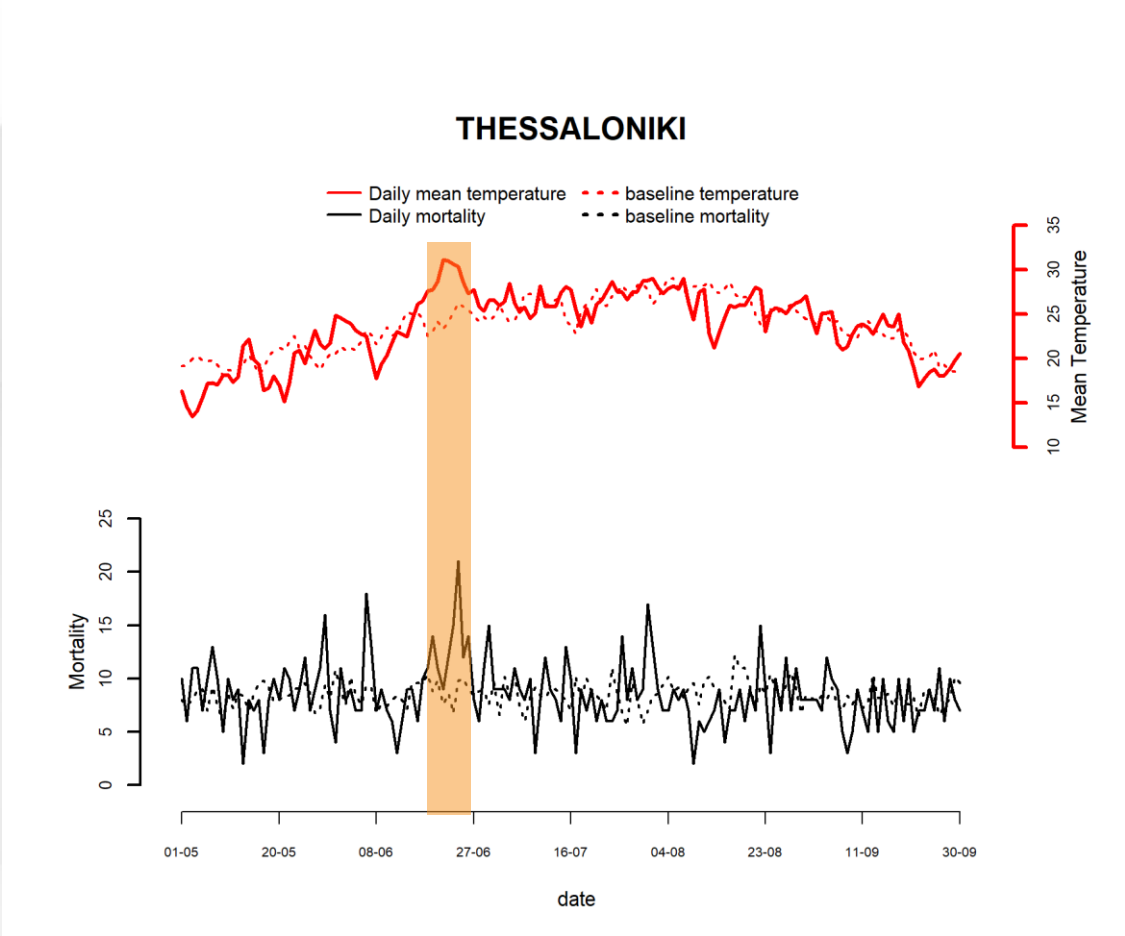
Rome, Italy
Population: 2.8 million, 4.5 million metropolitan area

Thessaloniki, Greece
Population: 1 million

Heraklion, Crete - Greece
Population: 150 thousand

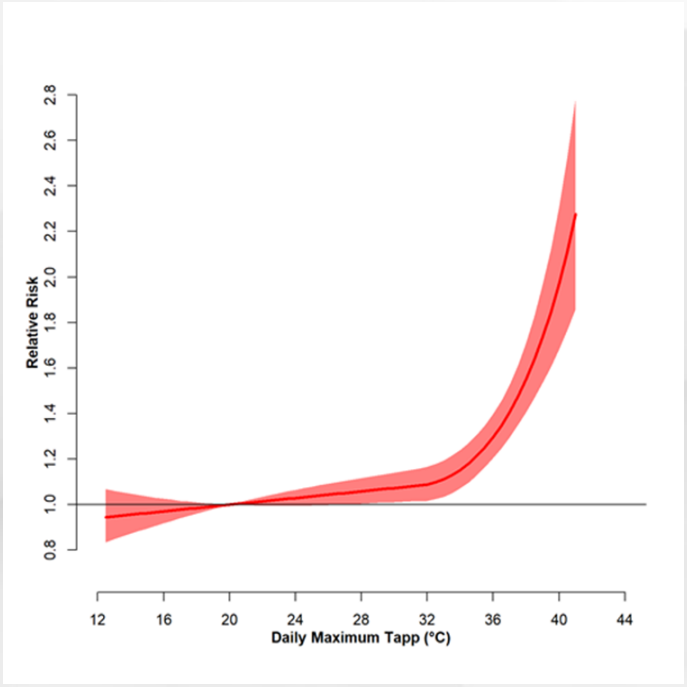
Daily temperatures and mortality trends during summer Rome and Thessaloniki



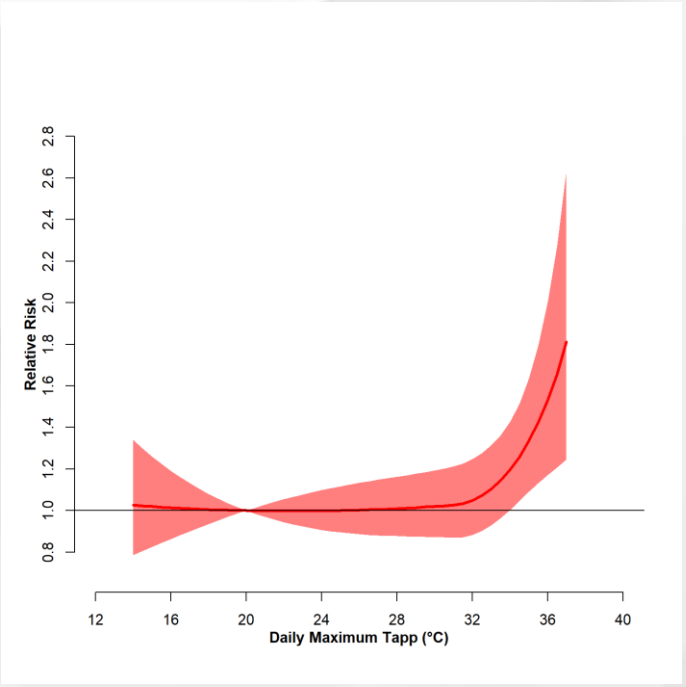


The association between temperature and mortality in Thessaloniki (left) and Rome (right)

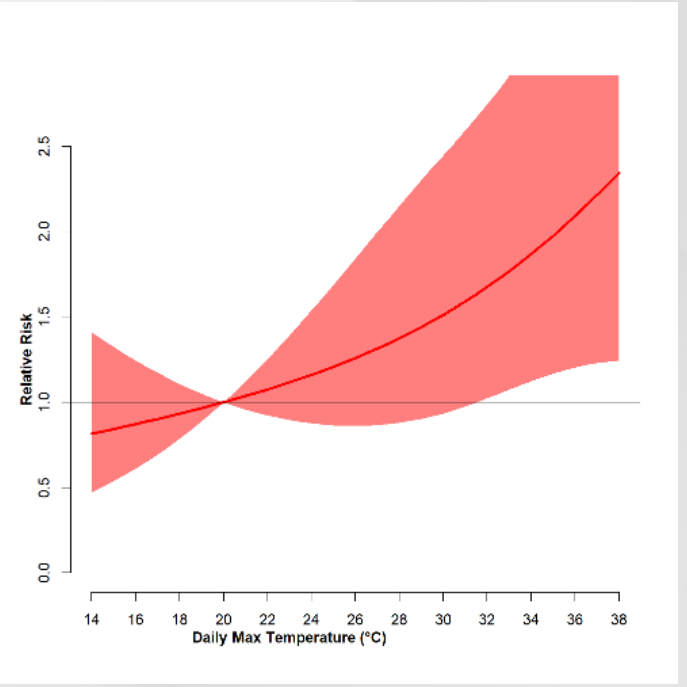
ROME



THESSALONIKI



HERAKLION



WHO Core elements of heat-health action plans

- Identification of lead body, interdepartmental co-operation
- Accurate and timely site-specific warning systems
- Information campaign (general pop, at risk groups, care givers etc.)
- Preparedness of the health/social care system
- Identification of vulnerable subgroups
- Real-time surveillance (mortality, ER visits, ambulance calls, Help lines)
- Reduction in indoor heat exposure
- Long-term urban planning

Heat Health Watch Warning systems

City-specific models based on the temperature-mortality relationship.

On the basis of this relationship, defined using time series data**, HHWW** use weather forecast data to predict at-risk conditions for local populations associated to an increase in mortality.

High spatio-temporal resolution forecasts enable accurate and differential warnings within urban areas.

Dataset Rome. Thessaloniki, Heraklion

Temperature, dew point and humidity: weather monitoring stations Thessaloniki area (ΕΠΤΑΠΥΡΓΙΟ station, 2013-2017), Rome Ciampino airport (2000-2018), Heraklion airport (2010-2016): hourly, 3 hourly SYNOP data or daily data

Exposure indictors developed: maximum temperature (HERAKLION), Tappmax (Rome, Thessaloniki)

Mortality: daily counts of deaths (Thessaloniki 2013 –2018; Rome 2000-2018, Heraklion 2010-2016)

	Daily deaths		Maximum apparent Temperature °C			
	mean	St.dev	mean	St.dev	90th percentile	90p summer range
Heraklion*	**2.7**	1.7	**27.7**	3.2	**31.0**	29.0-32.0
Thessaloniki	**8.5**	2.9	**27.4**	3.2	**31.3**	26.4-33.8
Rome	**53.7**	8.7	**27.7**	3.5	**32.1**	26.1-35.9

HHWW predictive model definition

The tappmax threshold model is defined on the basis of the relationship between mortality and Tappmax investigated through a city-specific Poisson regression model

$$log[E(Y_i)] = \alpha + tappmax_i * month_i + consecutive\_days_i$$

The explicative variables included in the model are:

- holidays, month (May–August),
- interaction between Tappmax and month
- number of consecutive hot days with Tappmax above the threshold (defined as the mean temperature value corresponding to all days for which excess mortality was greater than 10%)

ROME HHWW model Definition of Risk Levels

For each month, a health-risk table were drawn up and a daily level of risk attributed:

No risk: increase in mortality <10%
low risk: increase in mortality between 10-20
high Risk: increase in mortality between >20%

The increase in mortality is defined as the difference between observed and baseline mortality.

Rome

month	tappmax	1	2	3	4	5	6	7	8
5	29								
5	30								
6	31								
6	32								
6	33								
6	34								
6	35								
7	33								
7	34								
7	35								
7	36								
8	34								
8	35								
8	36								

THESSALONIKI HHWW model

For each month, a health-risk table were drawn up and a daily level of risk attributed:

No risk: increase in mortality <10%
low risk: increase in mortality between 10-20
high Risk: increase in mortality between >20%

The increase in mortality is defined as the difference between observed and baseline mortality.

			CONSECUTIVE DAYS							
threshold	**month**	**tappmax**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
22.3	5	27								
	5	28								
28.3	6	31								
	6	32								
	6	33								
31.0	7	32								
	7	33								
	7	34								
31.0	8	32								
	8	33								
	8	34								
25.9	9	28								
	9	29								
	9	30								

HERAKLION HHWW model

For each month, a health-risk table were drawn up and a daily level of risk attributed:

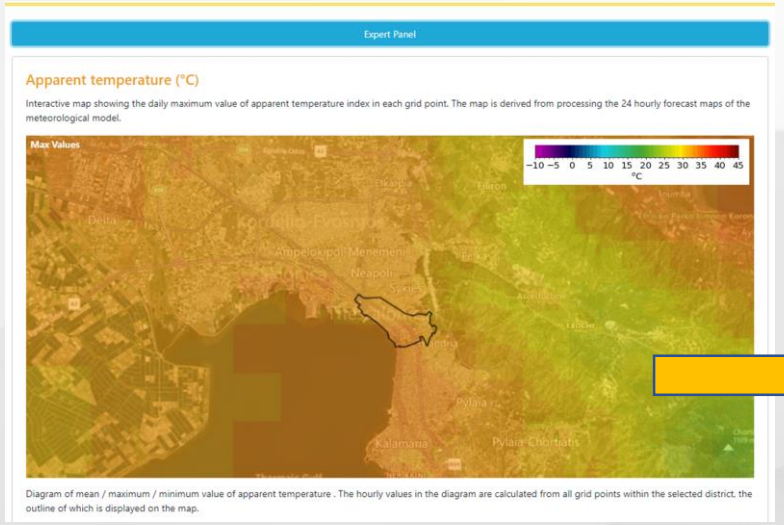
No risk: increase in mortality <10%
low risk: increase in mortality between 10-20
high Risk: increase in mortality between >20%

The increase in mortality is defined as the difference between observed and baseline mortality.

			CONSECUTIVE DAYS							
threshold	Month	Tempmax	1	2	3	4	5	6	7	8
25.2	5	27								
	5	28								
	5	29								
	5	30								
27.3	6	27								
	6	28								
	6	29								
	6	30								
	6	31								
29.8	7	30								
	7	31								
	7	32								
29.8	8	30								
	8	31								
	8	32								
28.2	9	28								
	9	29								
	9	30								
	9	31								
	9	32								

Daily HHWW LIFE ASTI Forecast for each city

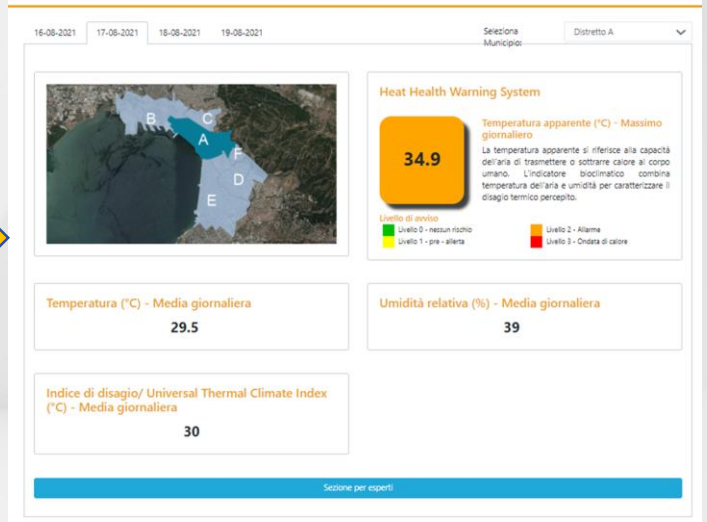
LIFE ASTI FORECAST



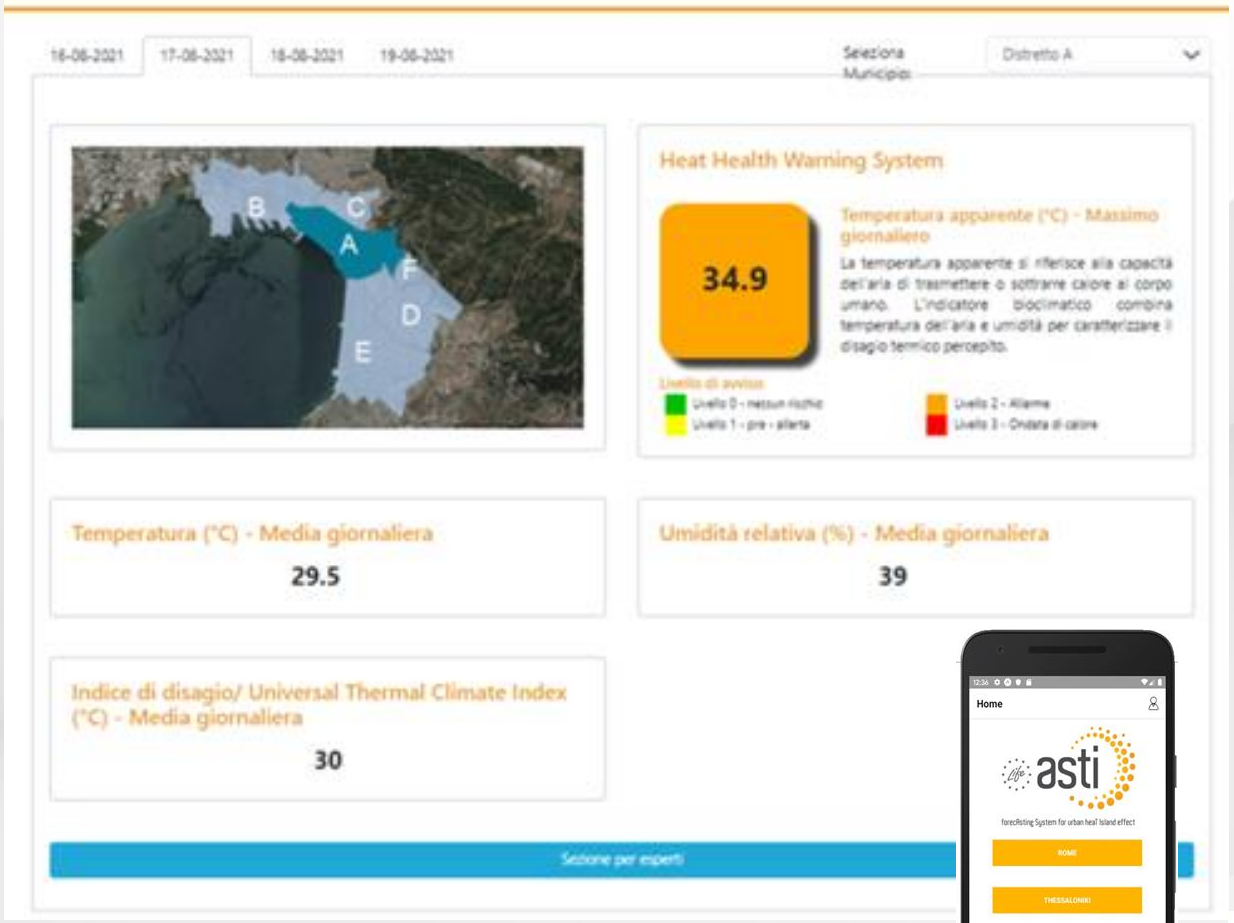
HHWW thresholds

			CONSECUTIVE DAYS							
threshold	month	tappmax	1	2	3	4	5	6	7	8
22.3	5	27								
	5	28								
28.3	6	31								
	6	32								
	6	33								
31.0	7	32								
	7	33								
	7	34								
31.0	8	32								
	8	33								
	8	34								
25.9	9	28								
	9	29								
	9	30								

HHWW 4 day warning for each district



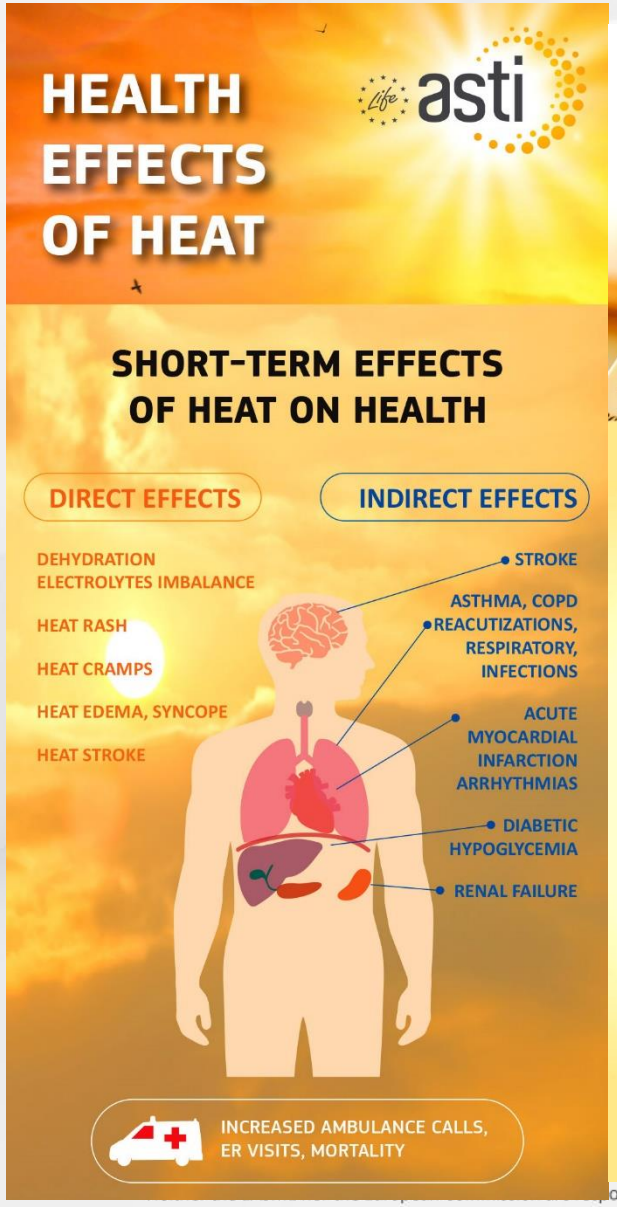
Local Heat plan and Information Network: dissemination of warning to stakeholders.

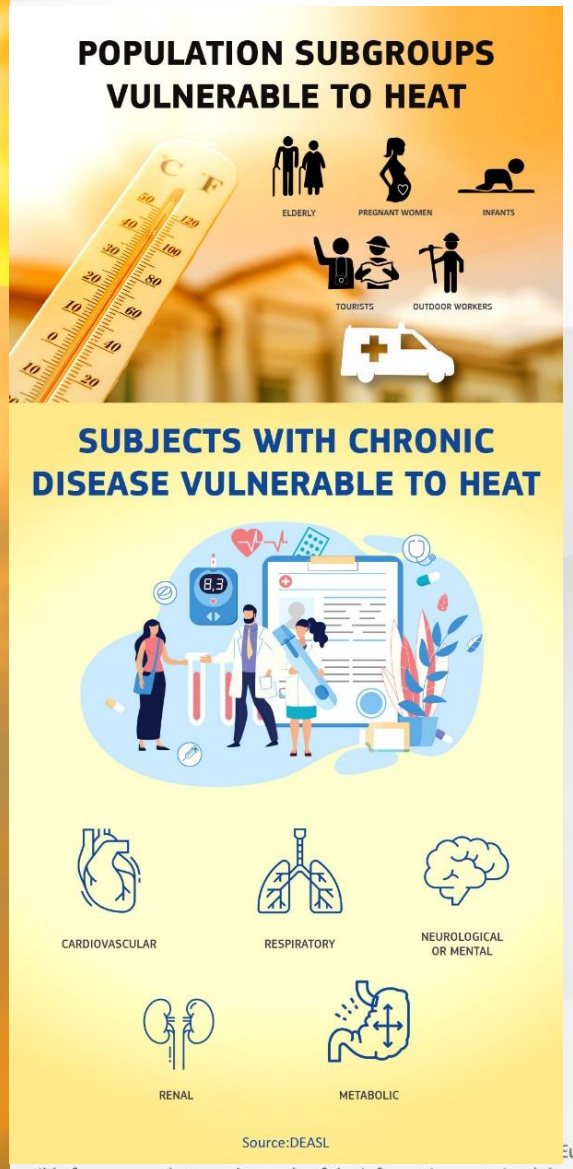


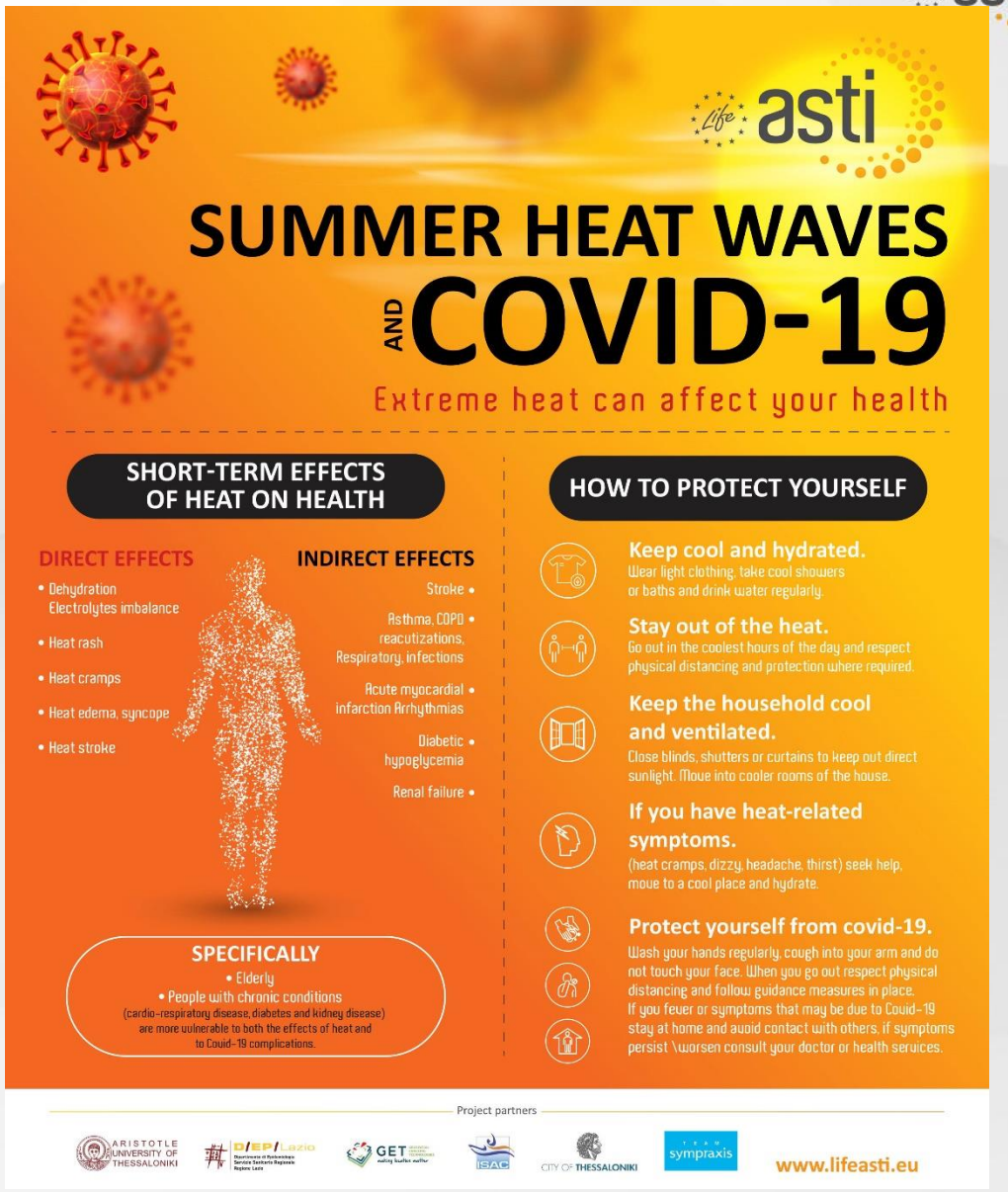
Local prevention plan

- **Emergency services** (civil protection, Health services, etc)
- **Action and prevention graded on HHWW**: Local stakeholders (health, environmental, social services, etc)
- Raise awareness, adaptation and response: General public and registered users

Information and health recommendations







Urban Heat Island Forecasting System

The LIFE ASTI project focuses on the Urban Heat Island effect and human health by using a system of numerical models that lead to the short-term forecast and future projection of the UHI phenomenon in three Mediterranean cities: Thessaloniki, Rome and Heraklion. The LIFE ASTI model system produces high-quality forecasting products, such as bioclimatic indicators and heating and cooling degree days to assess the energy needs of buildings.

life asti

forecAsting
System
for urban
heaT Island
effect

https://app.lifeasti.eu/

Thank you for your attention

f.dedonato@deplazio.it
www.deplazio.net

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.

DEP Lazio
Department of Epidemiology
Lazio Regional Health Service, Italy
SISTEMA SANITARIO REGIONALE
ASL ROMA 1
REGIONE LAZIO

LIFE ASTI Educational Video

Educational Video – YouTube - English

Educational Video – YouTube - Italian

Educational Video – YouTube - Greek

forecAsting System for urban heaT Island effect

STAKEHOLDERS' SESSION

LIFE ASTI FINAL CONFERENCE

Thessaloniki, 19 May 2022

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

www.lifeasti.eu

Session 5: Stakeholders Session

- “LIFE ASTI tools: How platform and mobile applications contribute to better-informed decision making”, *Mrs. M. Pahoula,* Geospatial Enabling Technologies
- “The contribution of the LIFE ASTI project to the Municipality’s future planning”, *Dr G. Papastergios*, Municipality of Thessaloniki
- “Building Heat Resilience in the Climate Era: The example of Athens”, *Eleni (Lenio) Myrivili*, Senior Consultant for Heat Resilience | Arsht Rock Resilience Center and City of Athens

LIFE ASTI tools: How platform and mobile applications contribute to better-informed decision making

Be informed about thermal stress and extreme heat events

Maria Pahoula
Geospatial Enabling Technologies

Thessaloniki, 19 May 2022

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.

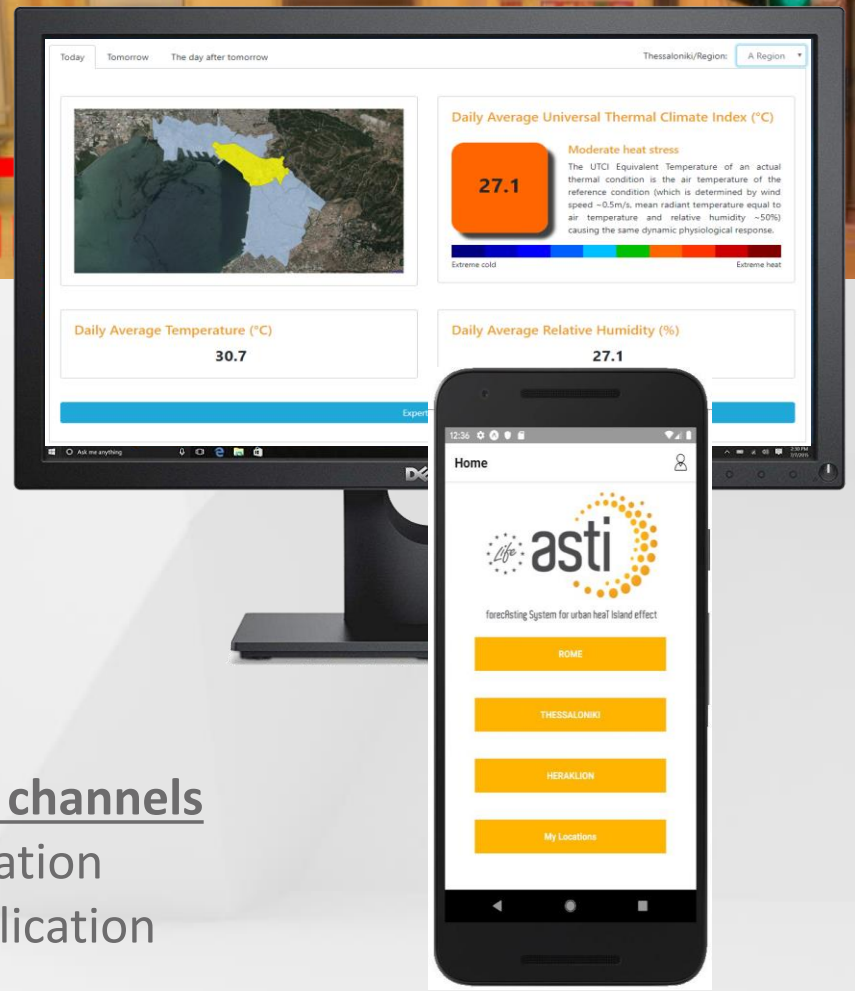
Geospatial Enabling Technologies (GET)

Making Location Matter

GeoInformatics
Open Data
Business Intelligence
Environment
Earth Observation
Digital Twins

Geo ICT	Open DATA	Data for Digital Twins	GeoBI Business Inteligence	Environment	EARTH OBSERVATION
Γεωπληροφορική	Ανοιχτά Δεδομένα	Δεδομένα για DIGITAL TWINS	Επιχειρηματική Ευφυΐα	Περιβάλλον	Παρατήρηση Γης

The LIFE ASTI platform



Objectives

- To inform **citizens** and **Authorities** for **extreme heat events** as well as for the impacts of **Urban Heat Island**
- To disseminate complex scientific information like the outputs of mathematical weather forecasting models in a simple, user-friendly way

Technologies

Web technologies based on **open standards** and **free / open-source** software

Dissemination channels

- Web application
- Mobile application

The LIFE ASTI web application

Presents the data from the forecasting models and the meteorological stations for 4 cities. The three pilot areas:

- **Rome (IT)**
- **Thessaloniki (GR)**
- **Heraklion (GR)**

- **Pavlos Melas (GR) – added recently**

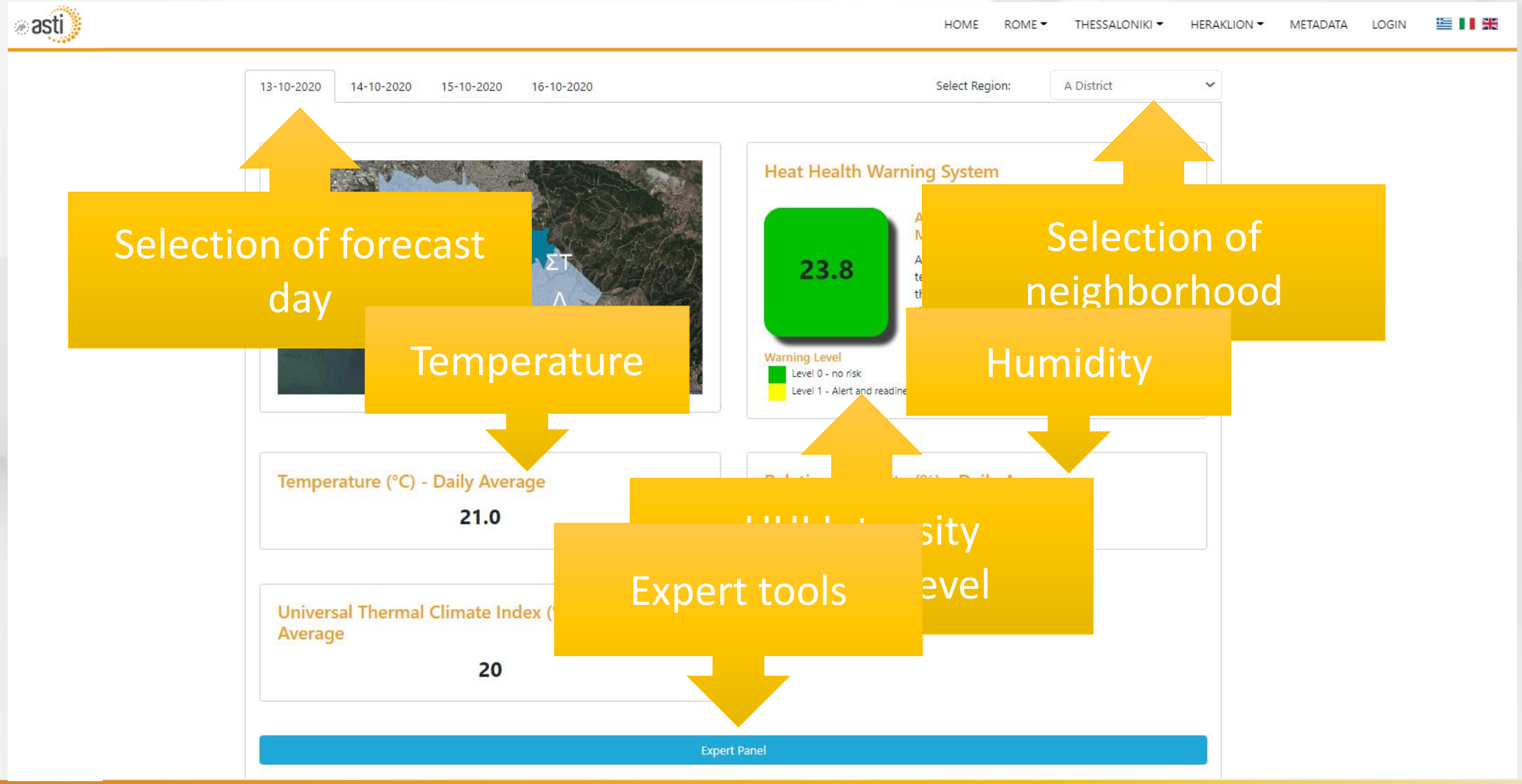
Functionalities

- Overall presentation of UHI status in neighborhood level (**UHI dashboard**)
- Detailed presentation of UHI characteristics using graphs and maps (**expert panel**)
- Dynamic map for data visualization in city block level (**map view**)

https://app.lifeasti.eu/

UHI Dashboard

Overall presentation of UHI status in city neighborhood level



Expert Tools

Present the spatiotemporal variation of the UHI phenomenon using graphs and maps

Apparent temperature (°C)

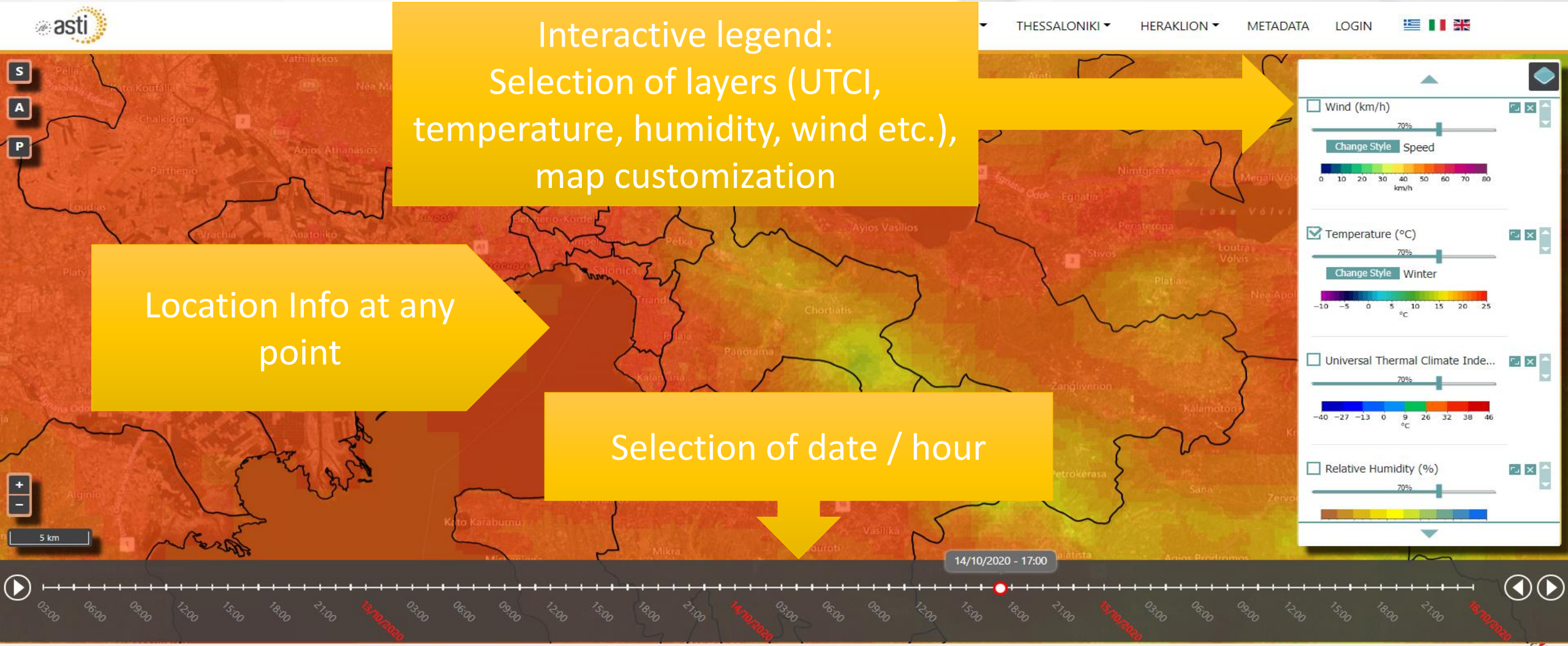
Interactive map showing the maximum value of apparent temperature index regardless of the time of occurrence of the maximum in each location. The map has been derived from the processing of the 24 hourly forecast maps derived from the meteorological model.

Diurnal variation graphs

Diagram of mean / maximum / minimum value of apparent temperature . The values in the diagram derived and refer to the selected area of the city. The values for each hour are calculated from all grid points within the selected district, the outline of which is displayed on the map.

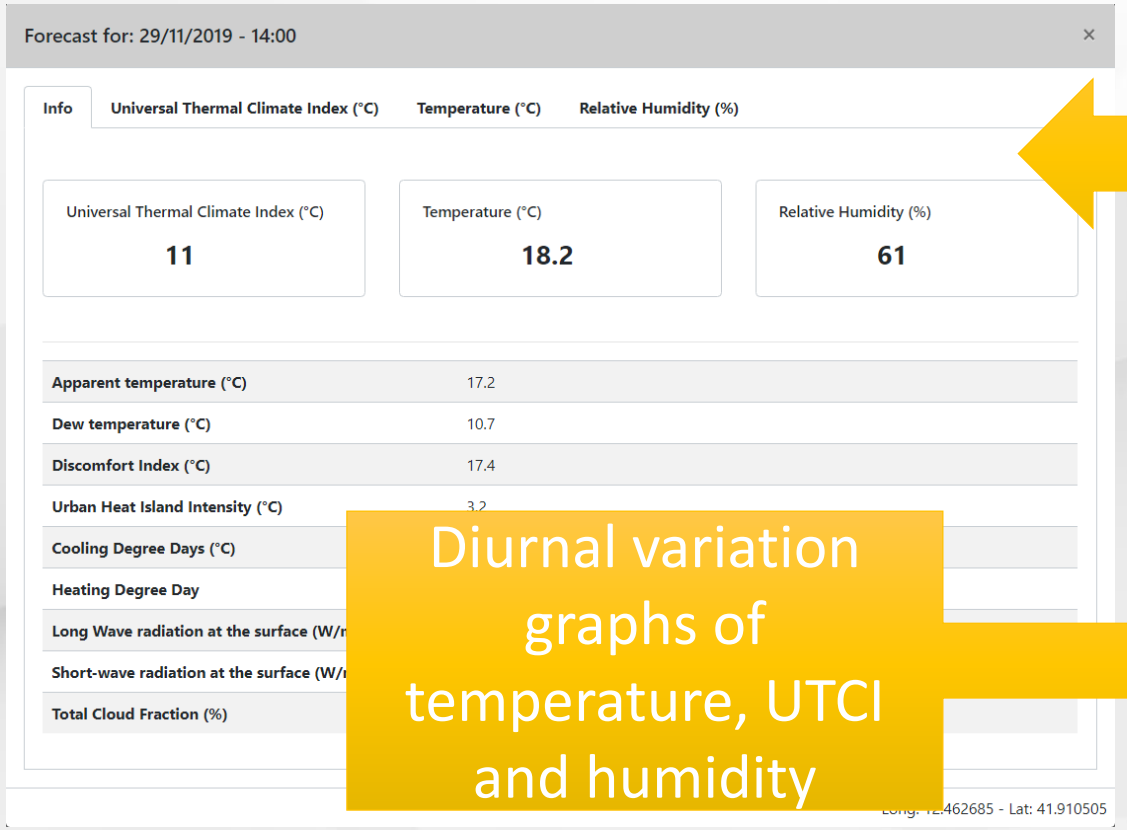
Dynamic map

Dynamic map for data visualization in city block level



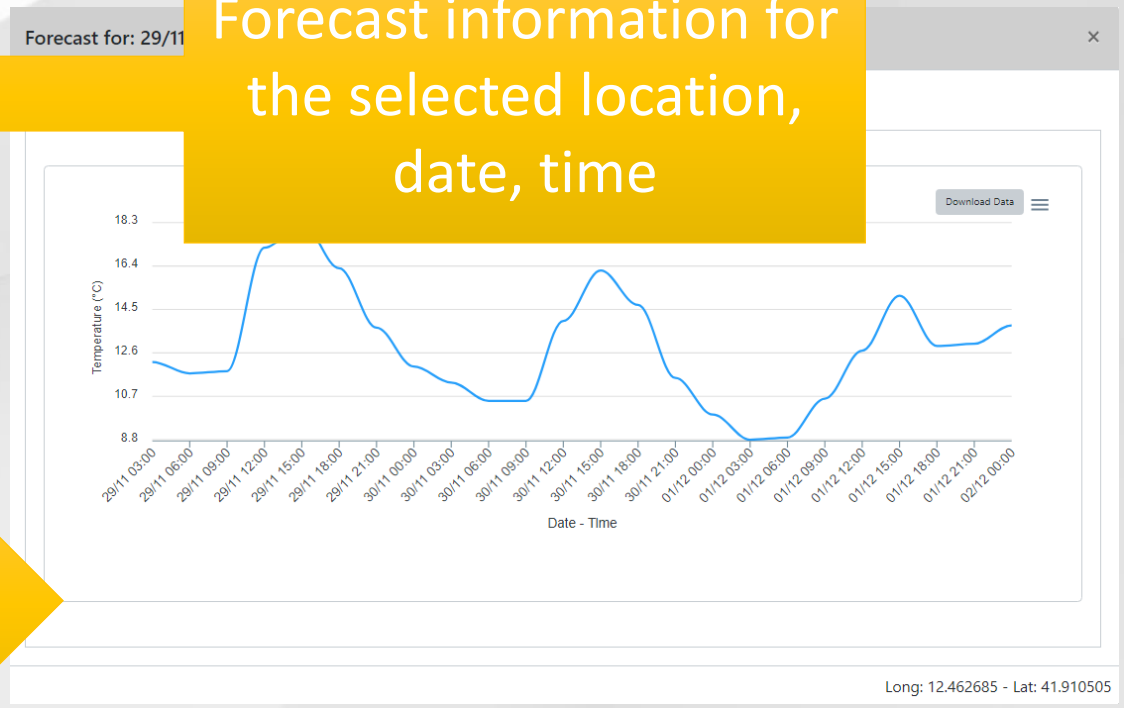
Dynamic map

One click UHI information at city block level



Forecast information for the selected location, date, time

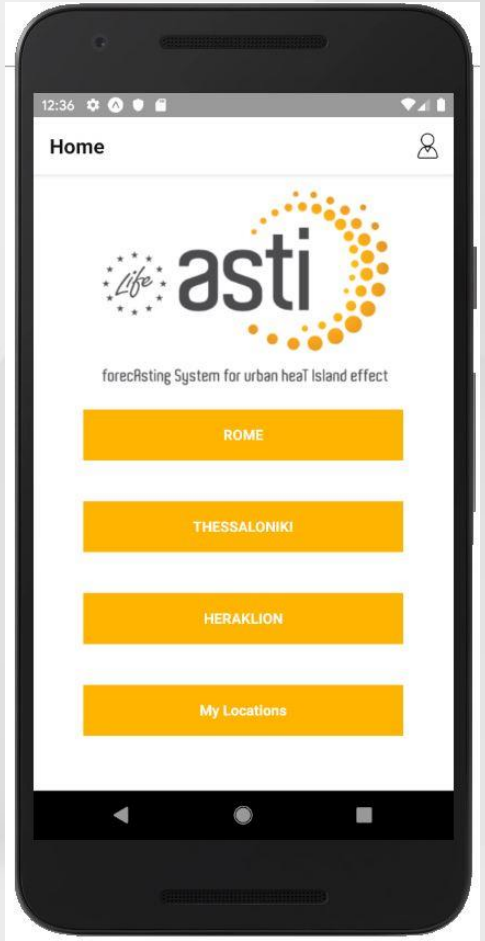
Diurnal variation graphs of temperature, UTCI and humidity



LIFE ASTI mobile app

Easy access to UHI information at city block level in your mobile

- Access to forecast data for all pilot areas
- UHI dashboard with simple to understand information
- Diurnal variation of the basic thermal related parameters
- Dynamic map of UHI products
- One click UHI information at city block scale
- Personalized information / alerts *for registered users*
- Custom locations *for registers users*

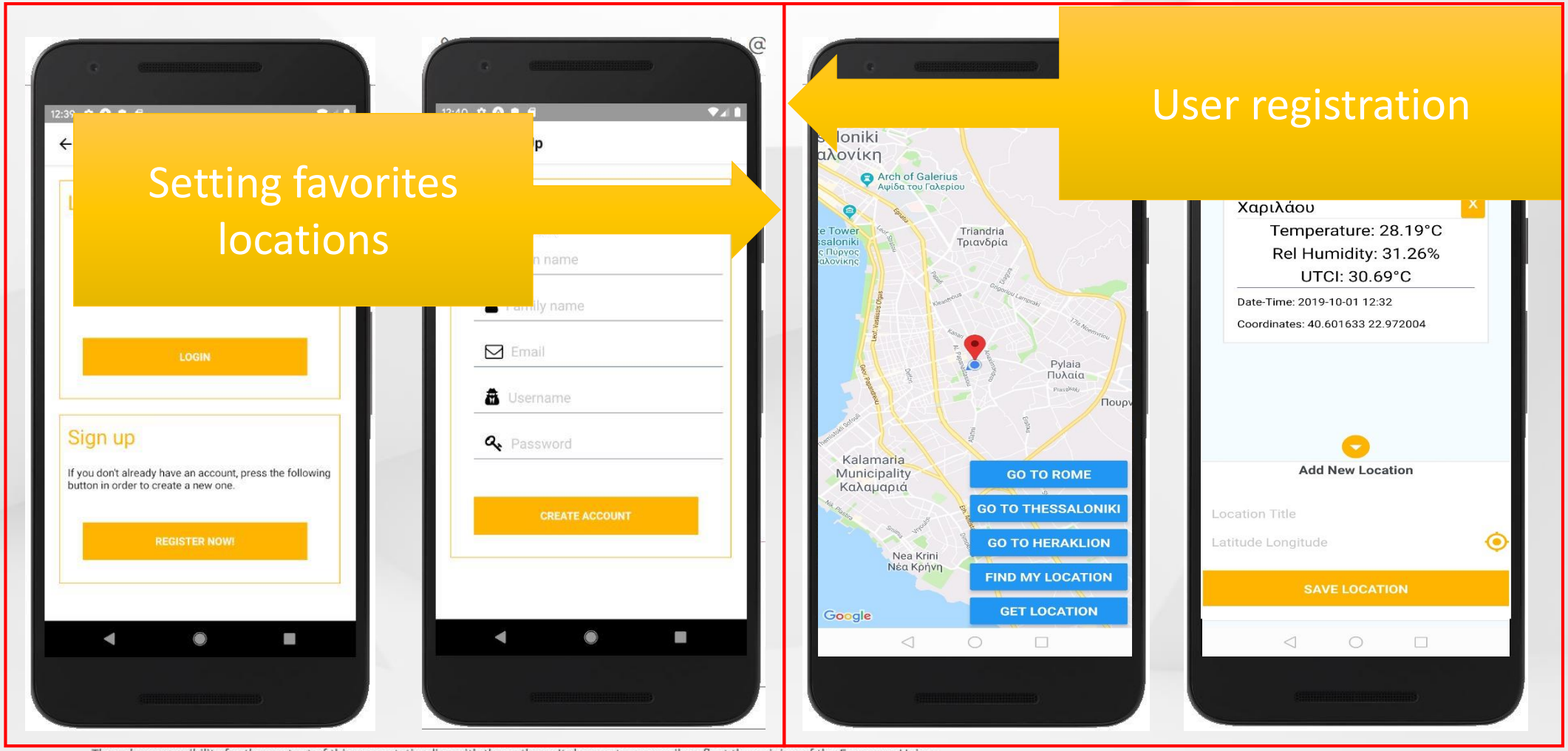


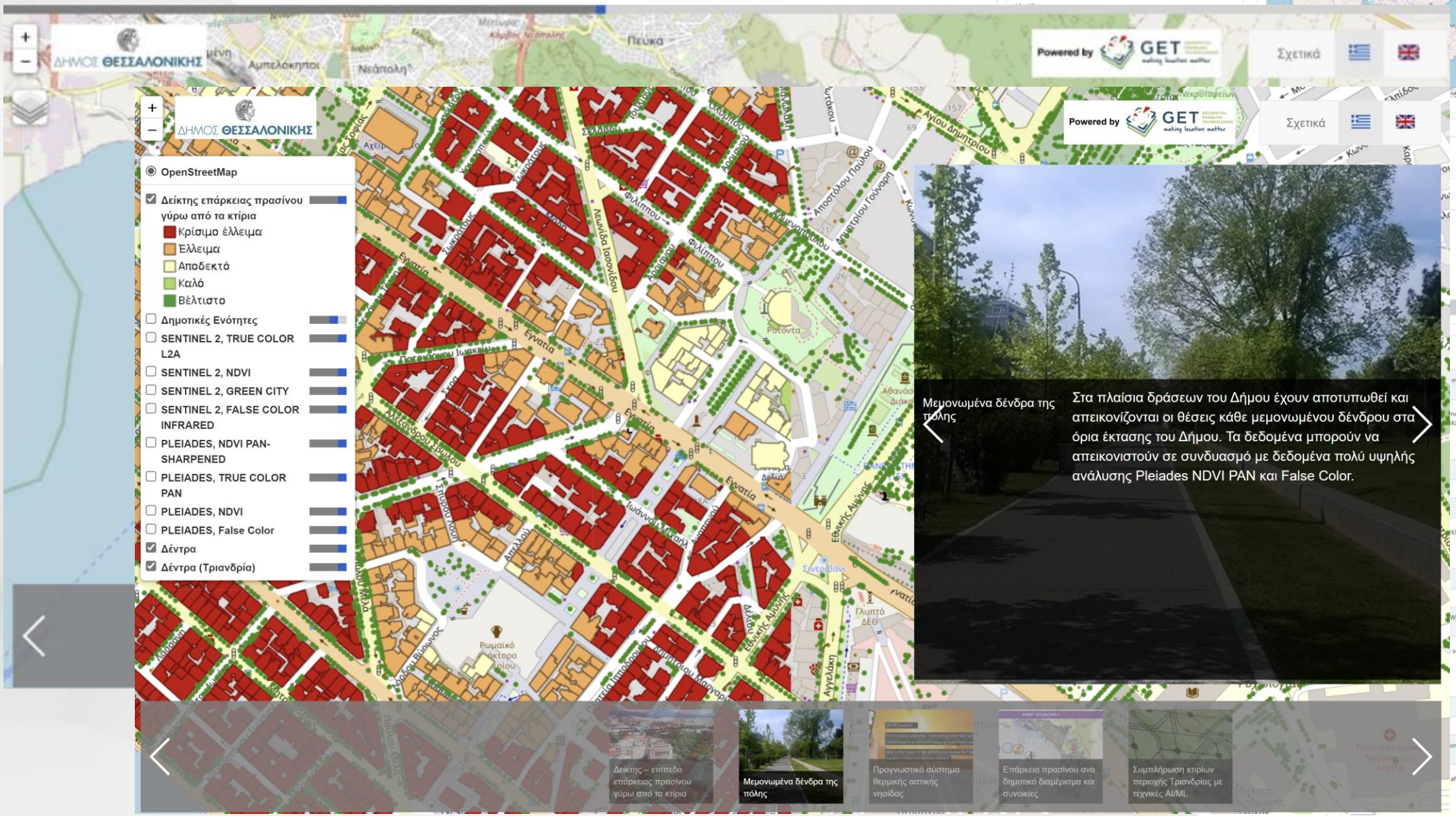
Download our Android App

Download on the App Store

LIFE ASTI mobile app

Easy access to UHI information at city block level in your mobile





LIFE ASTI Applications: Contribution to better-informed decision making

The LIFE ASTI forecasting platform serves as **short term adaptation tool** by providing the before mentioned information (for each involved city) in **high spatial resolution - city block level.**

- **UHI-related forecasting products** combined with **Heat Health Warning Systems** contribute to better-informed decision-making for the **prevention and the protection of the general public**
- the prediction of **Heating/Cooling Degree Days HDD/CDD** assists in energy demand monitoring and control of power consumption in line with the “Covenant Of Mayors” initiative.
- the combination with the climate change impact assessment of the UHI effect it helps in the assessment of the impact of mitigation strategies such as promoting green infrastructure.

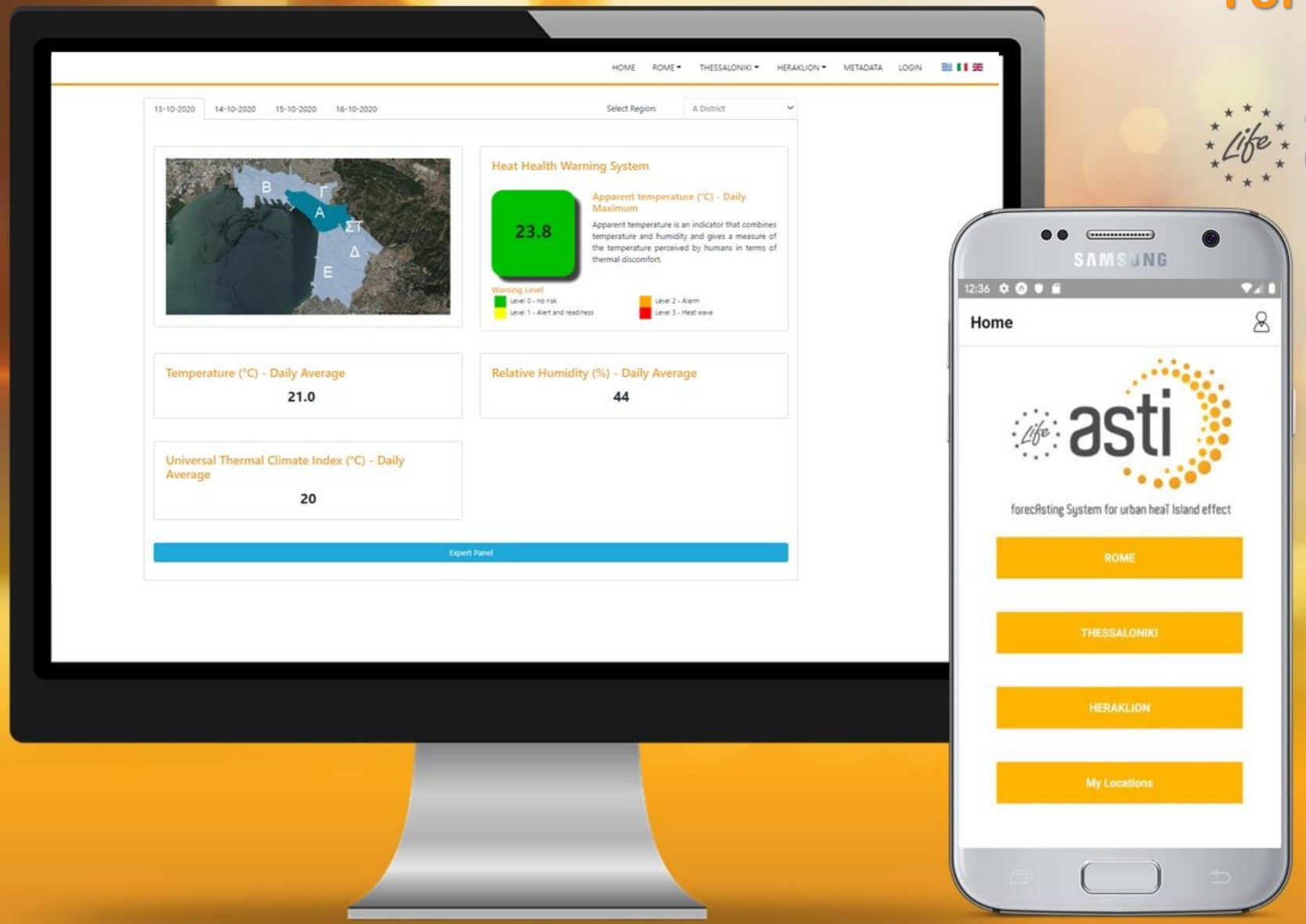
LIFE ASTI Applications: Contribution to better-informed decision making

The information provided by the LIFE ASTI forecasting platform (or each involved city) is in **high spatial resolution (city block level),** which helps decision makers to better understand their own city and therefore design new instruction services and better urban climate adaptation plans for the protection of human health and local environment.

LIFE ASTI's forecasting web platform is a powerful tool supporting local authorities to better-informed decision making in their effort to achieve and exceed the eu climate and energy targets, supporting the signatories' commitment to initiatives such as "Mayors Adapt" and "Covenant Of Mayors"

For more information...

asti
forecAsting System for urban heaT Island effect

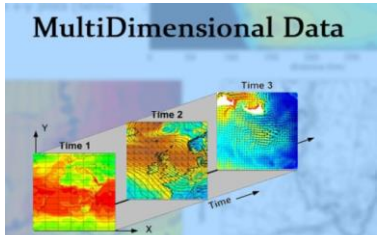


The project *Implementation of a forecAsting System for urban heaT Island effect for the development of urban adaptation strategies - LIFE ASTI* has received funding from the LIFE Programme of the European Union.

https://app.lifeasti.eu/

Data Flow and system architecture

Meteorological Stations



Meteorological Forecast models

PostgreSQL

OGC® Making location count.

WebServices

GeoServer

GET SDIPORTAL

php

Users

netCDF

D3

GDAL

NumPy

React JS

OpenLayers™

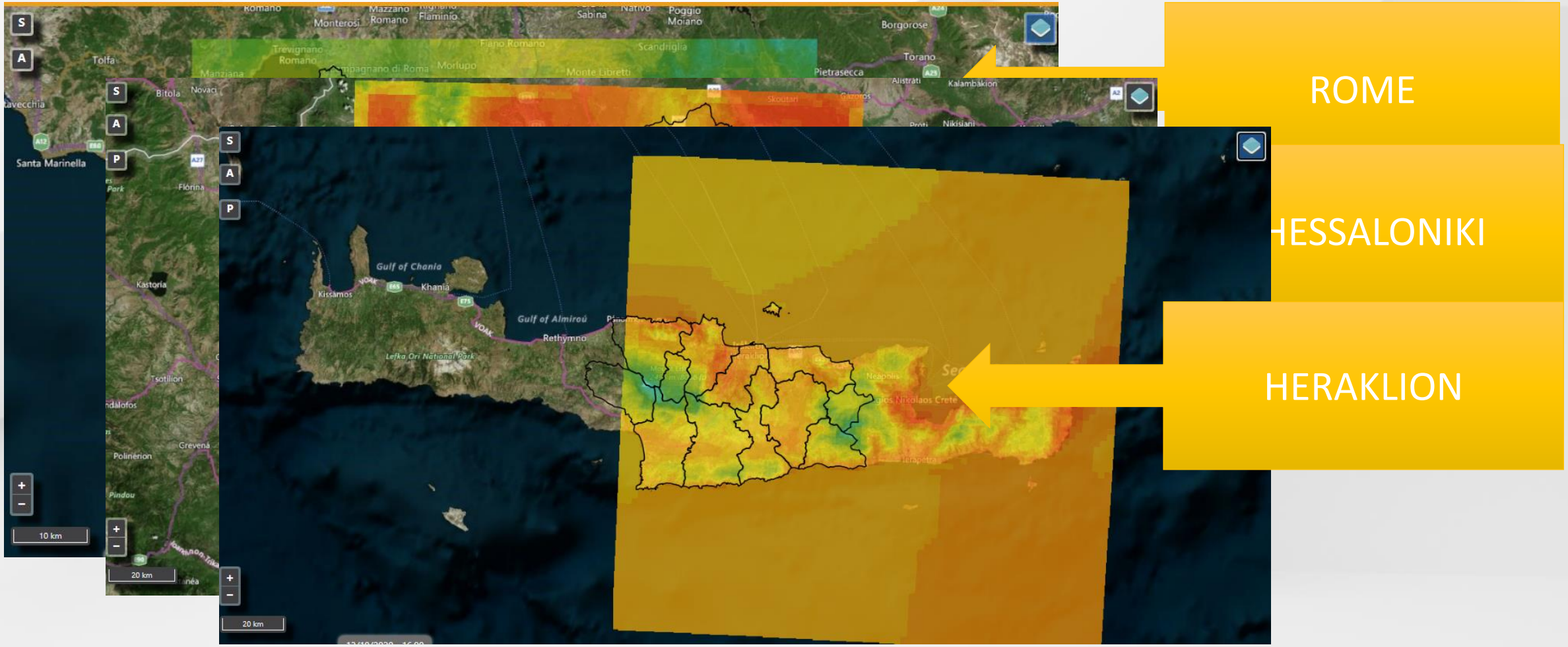
React Native

iOS

Android

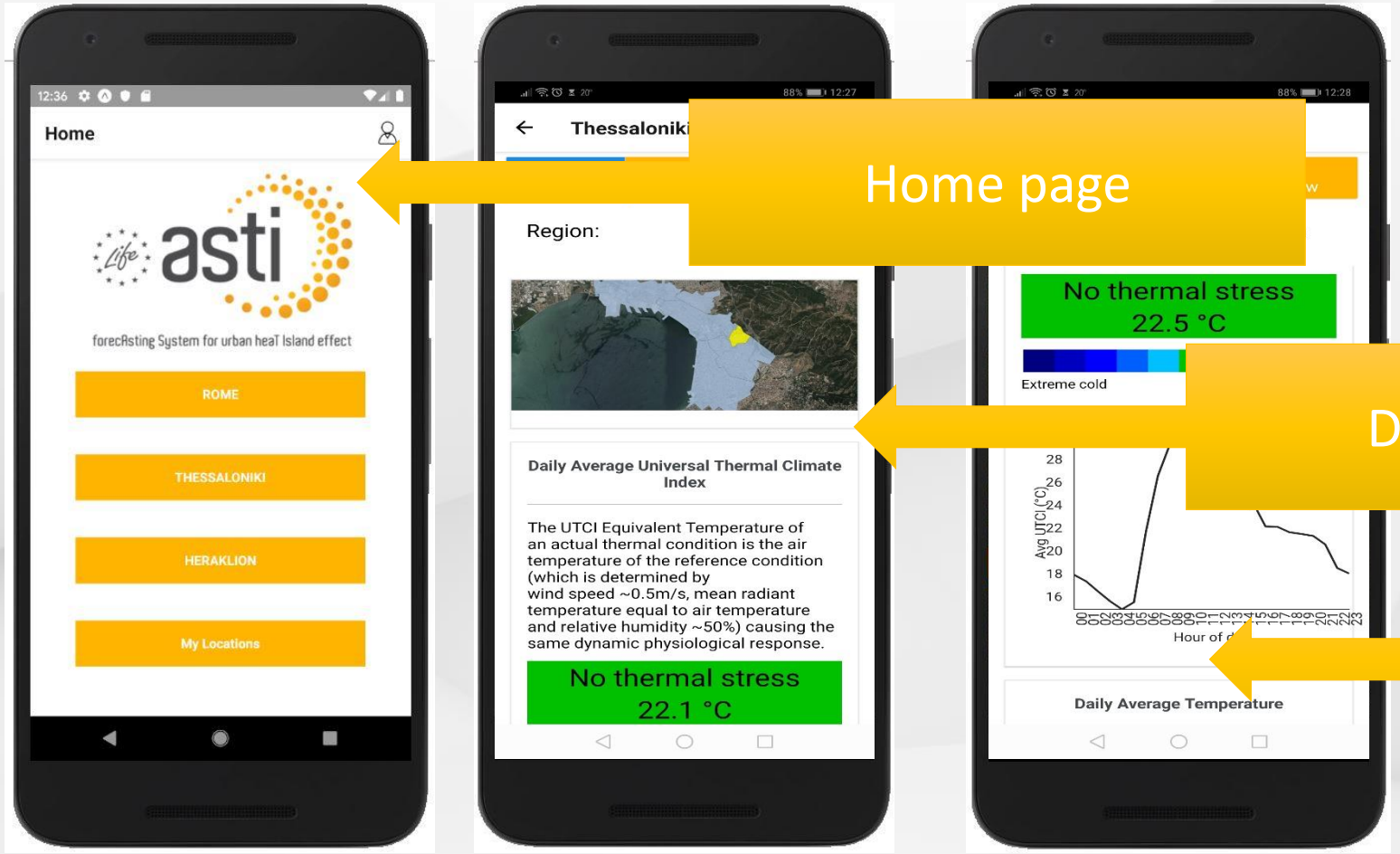
Pilot areas

1 Pilot area in Italy (Rome) and 2 Pilot areas in Greece (Thessaloniki, Heraklion)



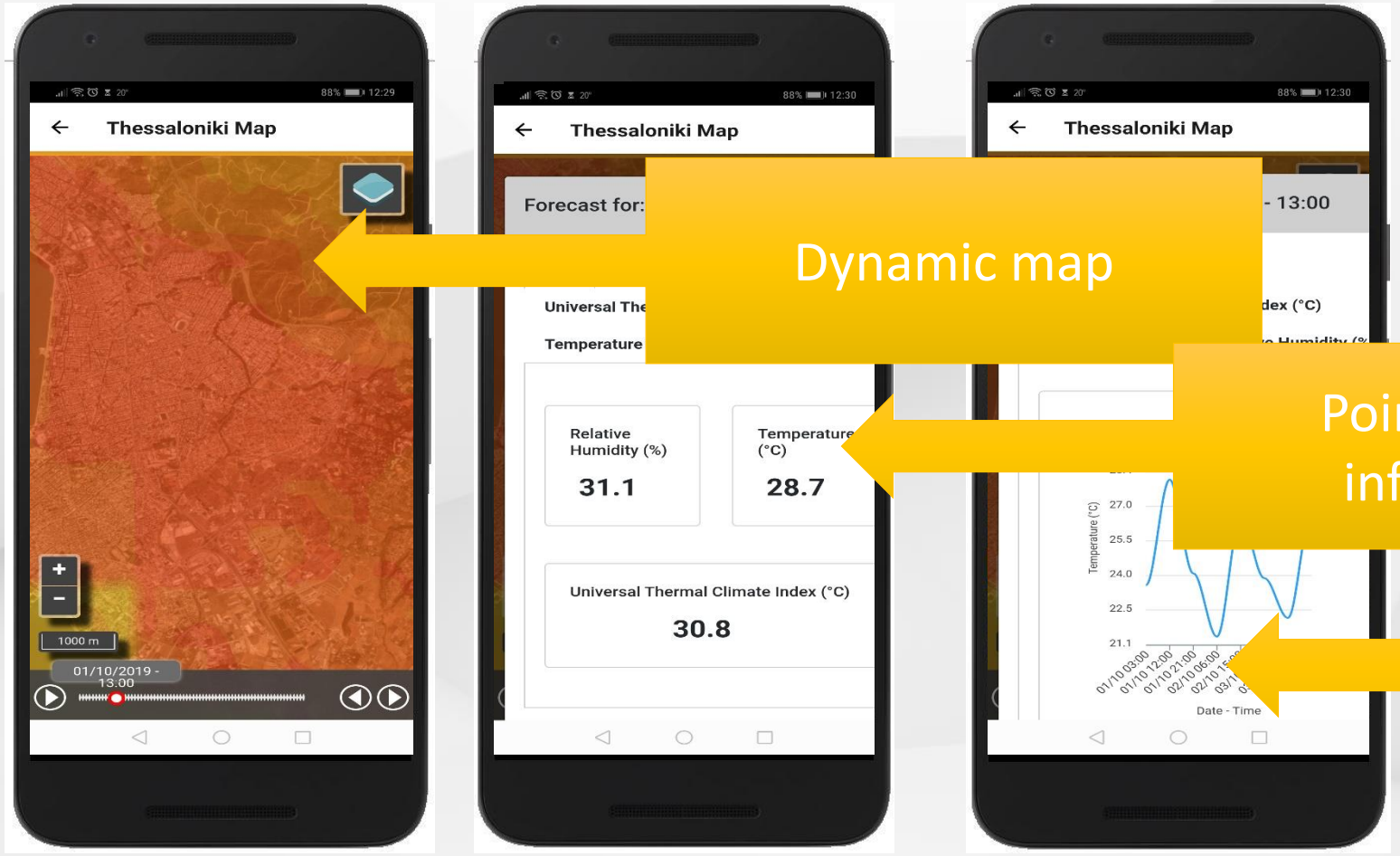
LIFE ASTI mobile app

Easy access to UHI information at city block level in your mobile



LIFE ASTI mobile app

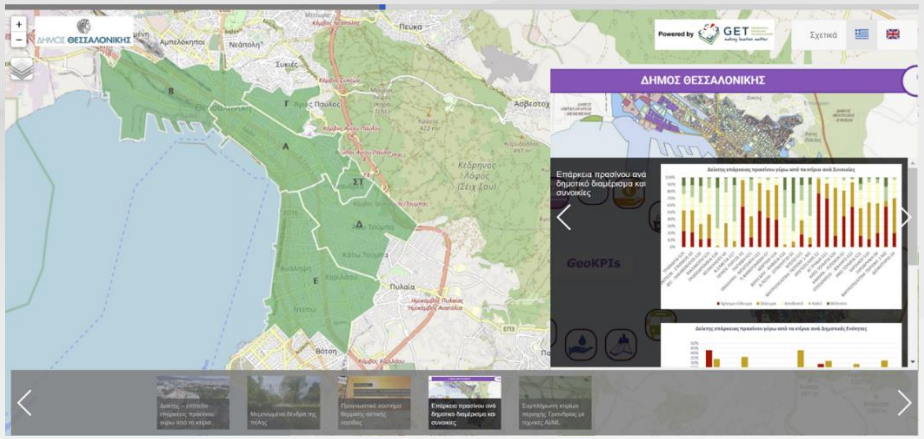
Easy access to UHI information at city block level in your mobile



LIFE ASTI applications: Contribution to better-informed decision making

LIFE ASTI a powerful asset for local authorities in their effort to achieve and exceed the eu climate and energy targets, supporting the signatories' commitment to "Mayors Adapt" and "Covenant Of Mayors"

1. **Link LIFE ASTI's derivatives to other services providing added value to local ecosystem, stakeholders, and civil society to plan and implement strategic goals for the sustainability and resilience of a city. Example of the [Observatory of Urban Green Siting for the Municipality of Thessaloniki](#).**



Thank you for your attention

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.

LIFE ASTI – Implementation of a forecAsting System for urban heaT Island effect for the development of urban adaptation strategies

FINAL CONFERENCE

Thessaloniki, 19th of May 2022

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 contribution of the LIFE ASTI project to the Municipality’s future planning”

Dr. G. Papastergios,
Municipality of Thessaloniki

Thessaloniki, 19th of May 2022

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.

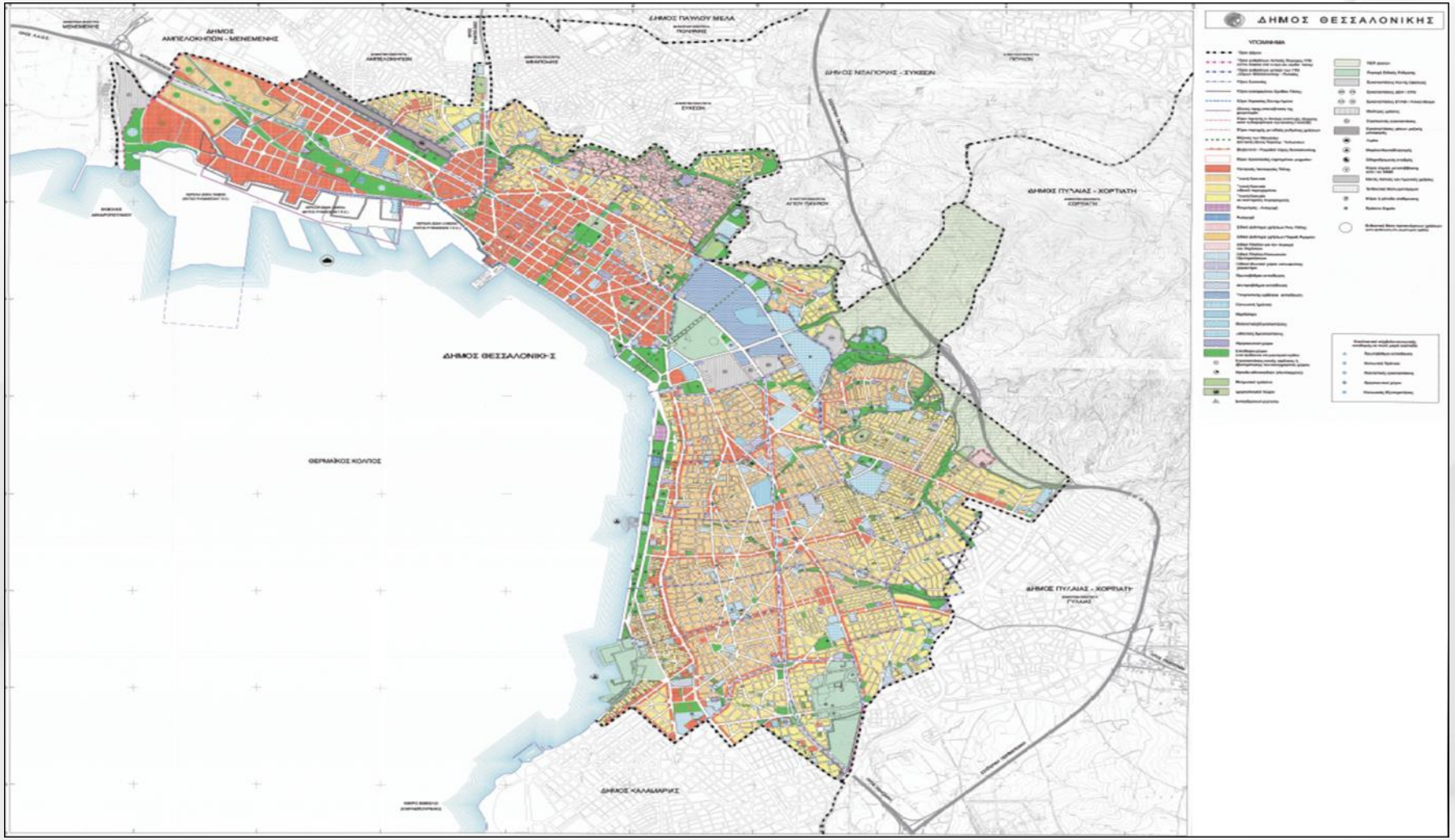
Contents

- Current situation analysis
- LIFE ASTI Action Plan's measures
- The contribution of the LIFE ASTI project to the Municipality's future planning
  - To the Operational Plan of the Municipality
  - To the Resilience Strategy of Thessaloniki
  - To the Covenant of Mayors for Climate and Energy and the SECAP's eventual implementation (plus…**EU Mission: 100 Climate-Neutral and Smart Cities**)

The Municipality of Thessaloniki

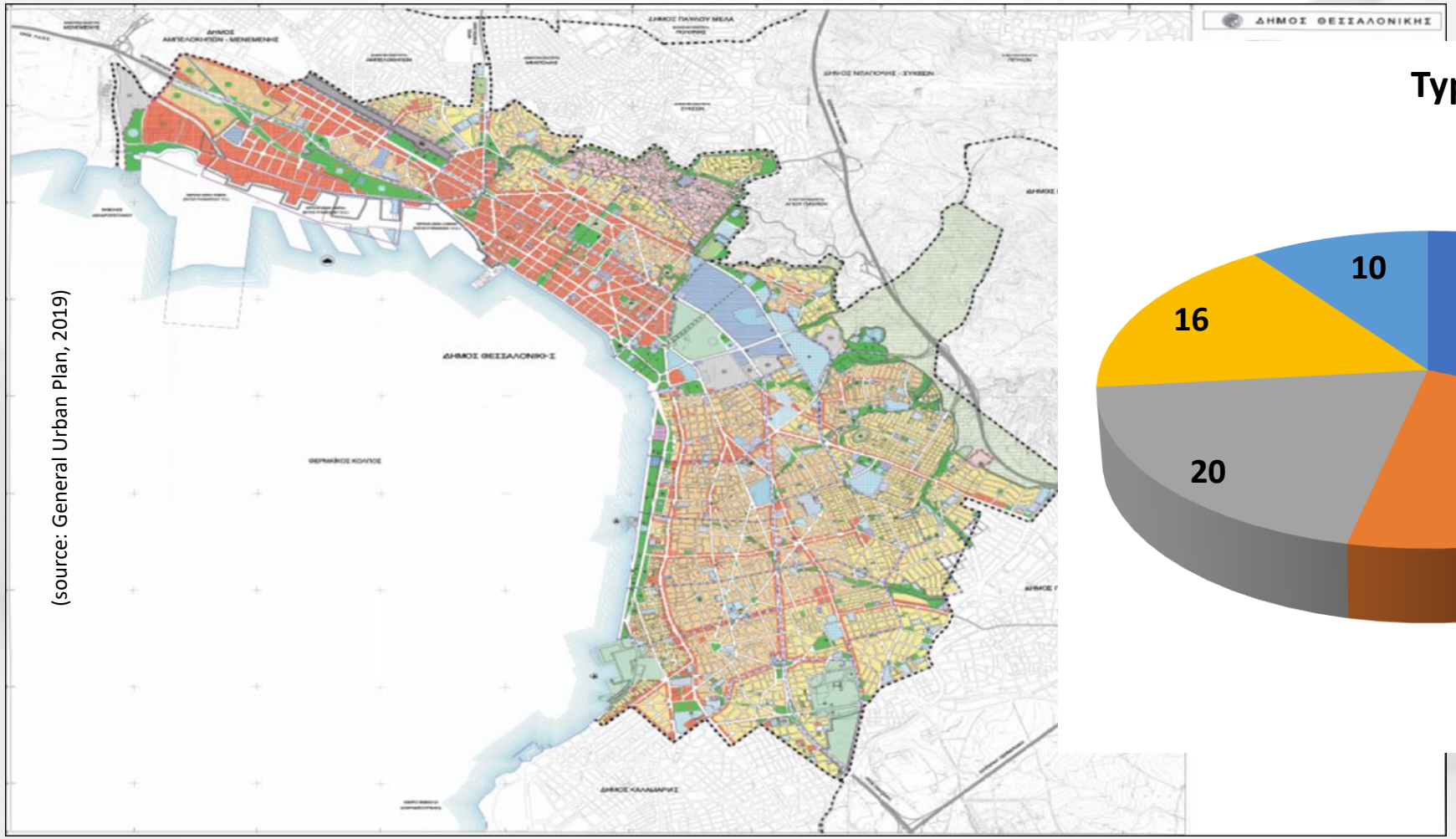
Current situation

- MoT: 325.182 inhabitants in 2011
- R.U. of Thessaloniki: 1.110.551 inhabitants

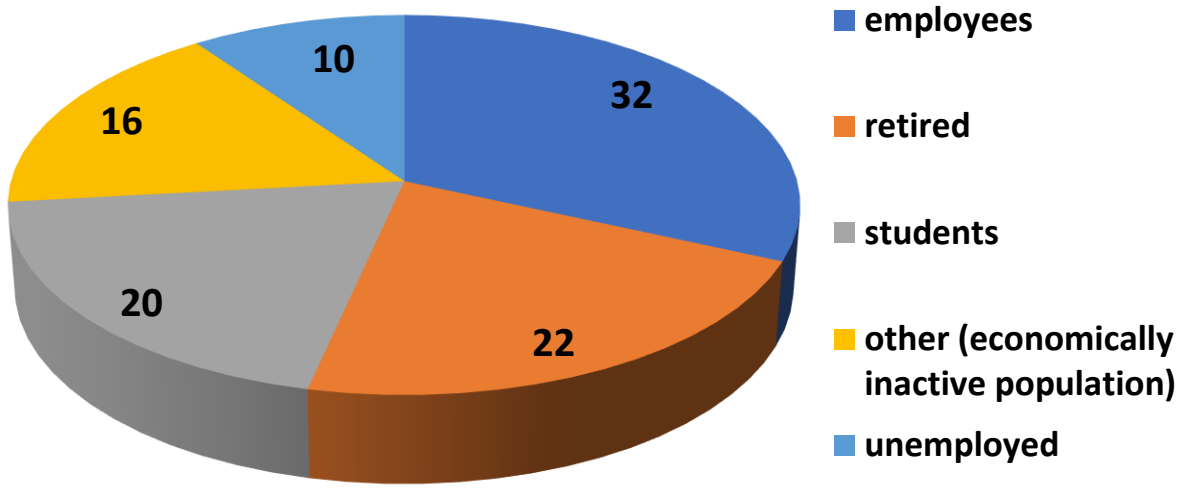


(source: General Urban Plan, 2019)

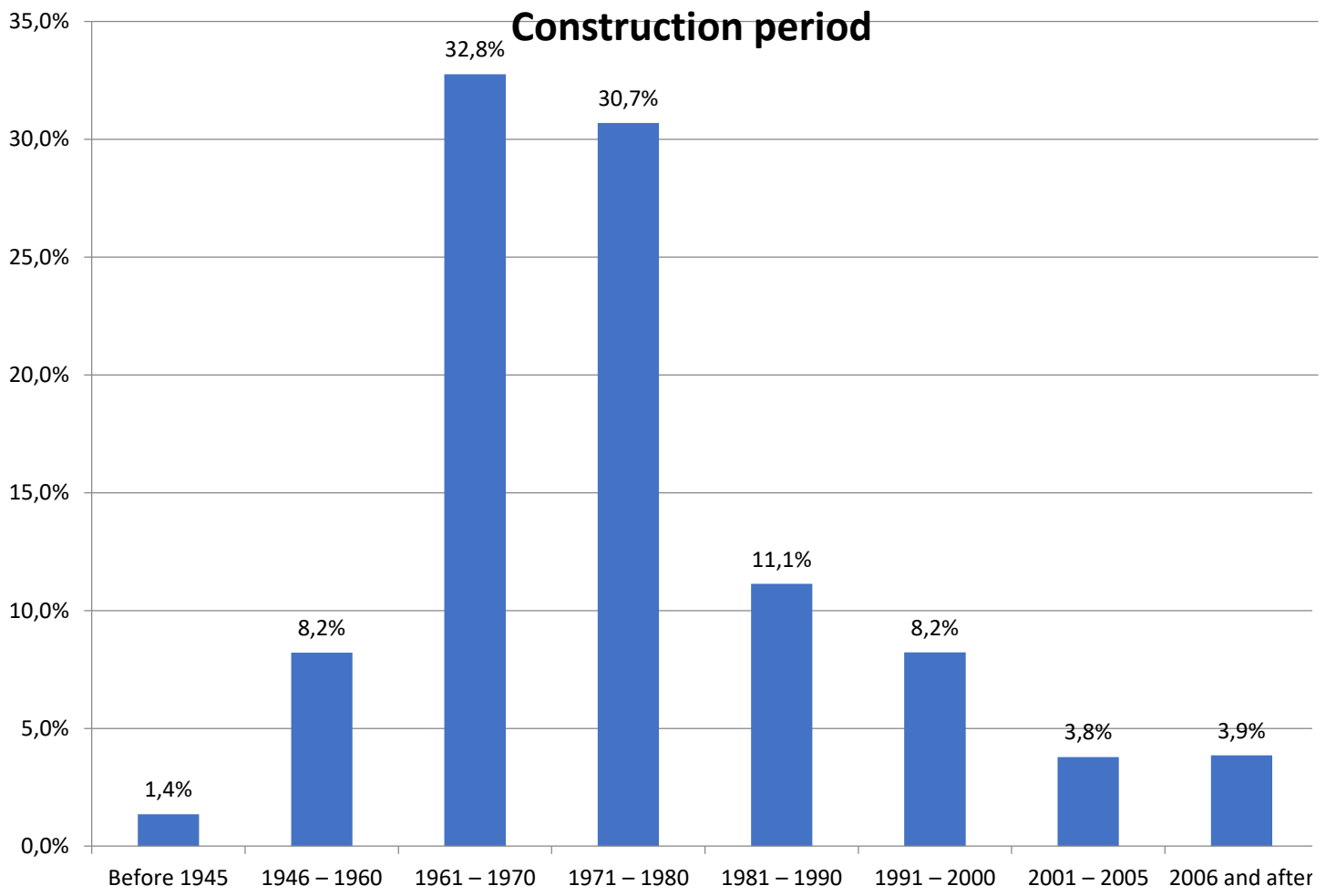
The Municipality of Thessaloniki



(source: General Urban Plan, 2019)

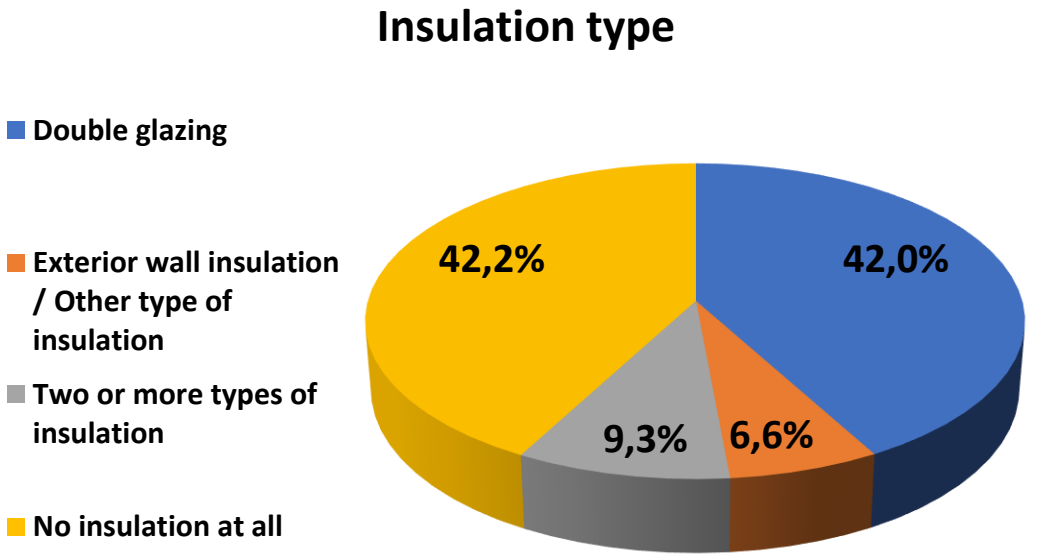


The Municipality of Thessaloniki - Buildings



- Only 17% is 30 years old or younger (after 1990)
- 83% is at least 30 years old
- 40% was build before 1970

- Double glazing: 42.0%
- Exterior wall insulation: 6.6%
- Two or more types of insulation: 9.3%
- **No insulation at all: 42.2%**



Action Plan for the adaptation of the city of Thessaloniki to the UHI effect - advantages

Social strengths

- Reduction of related diseases and deaths
- Creation and development of a new local identity
- Mental well-being
- Reconnection with nature
- Reduction of sun exposure
- Heat-resistant housing even for the financially weakest

Economic strengths

- Region's upgrading due to the green spaces and the adaptation to the UHI phenomenon
- Possible avoidance of maintenance costs
- Reduction of public health costs
- Enhancement of the city's positive image
- Increase of employees' productivity

Environmental strengths

- Reduction of atmospheric pollution
- More resilient urban ecosystem
- Better absorption of water - drainage

(source: own elaboration based on the "Moreland City Council. (2016). Moreland Urban Heat Island Effect Action Plan 2016/2017 – 2025/2026. https://www.moreland.vic.gov.au/globalassets/areas/esd/esd-uhie-urban-heat-island-effect---action-plan---final-draft-for-council-june-2016.pdf")

The Action Plan is developed around 4 main axes

Adaptation measures – 4 scenarios with regard to the level of preparedness and considering the relevant needs

- **Axis 1**: **Prevent the UHI effect's influence on human health** through the deterrence of the effects of a heat wave (it should be constantly implemented from alert level 1 and intensified and monitored towards level 4).
- **Axis 2**: **Protect the population by implementing appropriate management measures** per meteorological vigilance level as provided to the municipality by LIFE ASTI's **Heat Health Warning System** (HHWS) or the national relevant service and, of course, considering the data of the municipality's meteorological stations (it should be constantly implemented from alert level 1 to 4).
- **Axis 3**: **Inform and communicate** (the preparation of the informative material should be carried out in alert levels 1-2, while their dissemination should start from level 2 and intensified onwards to level 4).
- **Axis 4**: **Capitalize** on the Region's **experience** (after taking action at level 4).

Heat Health Warning System (HHWS)

Δελτίο θερμοκρασιών και προειδοποίησης κινδύνου για την ανθρώπινη υγεία

(https://app.lifeasti.eu/)

2021-09-17: Επίπεδο 2 - Προειδοποίηση κινδύνου

Η θερμοκρασία στο κέντρο της Θεσσαλονίκης θα κυμανθεί από 20.3 έως 32.2°C, ενώ στα ενδότερα τμήματα του αστικού ιστού θα φτάσει και τους 32.6°C. Το επίπεδο προειδοποίησης κινδύνου για την ανθρώπινη υγεία είναι στο επίπεδο 2*.

Αναλυτικά σε κάθε δημοτικό διαμέρισμα η θερμοκρασία θα κυμανθεί:

Περιοχή	Ελάχιστη	Μέση	Μέγιστη
Α' Διαμέρισμα	20.3°C	25.9°C	32.2°C

2021-09-18: Επίπεδο 3 - Καύσωνας

Η θερμοκρασία στο κέντρο της Θεσσαλονίκης θα κυμανθεί από 21.5 έως 32.4°C, ενώ στα ενδότερα τμήματα του αστικού ιστού θα φτάσει και τους 32.7°C. Το επίπεδο προειδοποίησης κινδύνου για την ανθρώπινη υγεία είναι στο επίπεδο 3*.

Αναλυτικά σε κάθε δημοτικό διαμέρισμα η θερμοκρασία θα κυμανθεί:

Περιοχή	Ελάχιστη	Μέση	Μέγιστη
Α' Διαμέρισμα	21.5°C	27.4°C	32.4°C
Β' Διαμέρισμα	21.9°C	27.1°C	32.7°C
Γ' Διαμέρισμα	23.4°C	27.3°C	32.3°C
Δ' Διαμέρισμα	23.3°C	27.5°C	32.7°C
Ε' Διαμέρισμα	22.1°C	27.5°C	32.7°C
ΣΤ' Διαμέρισμα	23.4°C	27.4°C	32.5°C

Θέλω να ενημερωθώ | Ανακοινώσεις | Χρηματοδοτούμενα | Δελτία τύπου Χρηματοδοτούμενων προγραμμάτων

Δελτίο θερμοκρασιών και προειδοποίησης κινδύνου για την ανθρώπινη υγεία για την περίοδο 17 έως 20/9/2021- LIFE ASTI

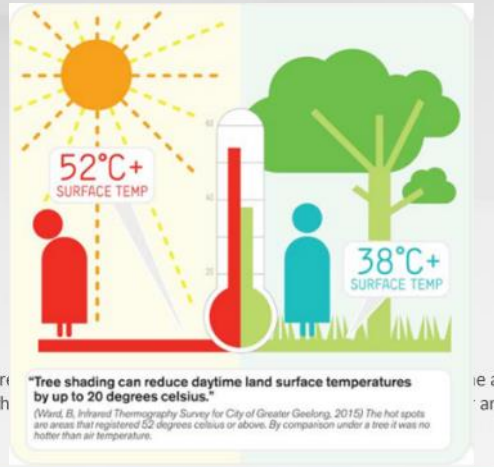
17/09/2021 10:15

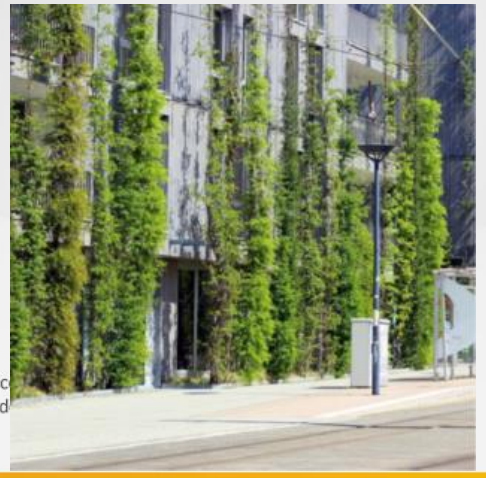
Στο πλαίσιο ενημέρωσης των δημοτών και επισκεπτών της πόλης, αλλά και της υλοποίησης του ευρωπαϊκού έργου **LIFE ASTI**, μπορείτε να βρείτε **εδώ** το **Δελτίο Θερμοκρασιών και Προειδοποίησης Κινδύνου για την Ανθρώπινη Υγεία**, για τον Δήμο Θεσσαλονίκης, που εκδόθηκε από το **Προγνωστικό Σύστημα Αστικής Θερμικής Νησίδας** του έργου, για τη χρονική περίοδο **17/09/2021** έως **20/09/2021**.

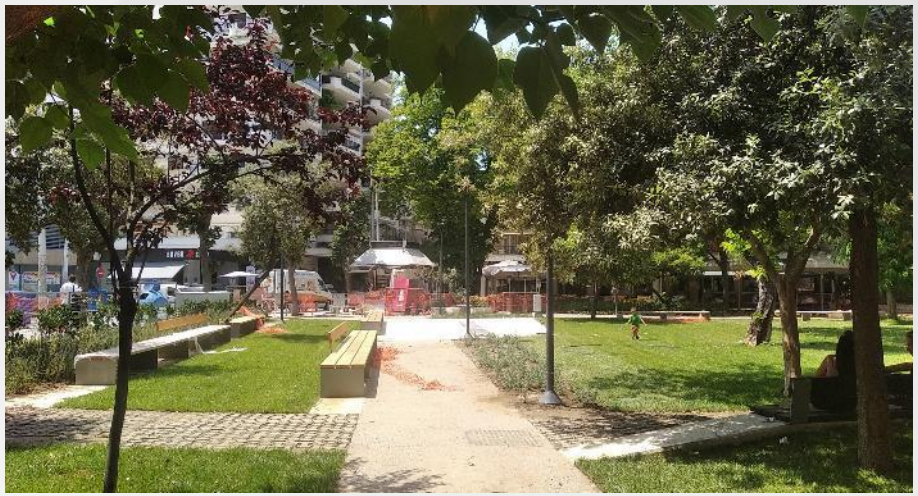
Περισσότερες πληροφορίες για το έργο LIFE ASTI μπορείτε να βρείτε στην επίσημη ιστοσελίδα του https://lifeasti.eu/ και στα μέσα κοινωνικής δικτύωσης (Facebook, Twitter, Instagram, LinkedIn, Youtube).

Action Plan's recommendations: more green

- ✓ **Development of the urban green** at least by 30% in combination with the reinforcement of the sub-urban green parks and forests.
  - ✓ **identification of the vacant spaces, public spaces and buildings** that can be potentially turned into green areas, the studies for their regeneration and efforts carried out under the aim of their inclusion to identified funded programmes.
  - ✓ **Organisation of seminars**, eventually carried out by the municipality may also help both public and private initiatives.
  - ✓ Several initiatives to **mobilize the private sector** should also be foreseen either informative seminars or economic initiatives



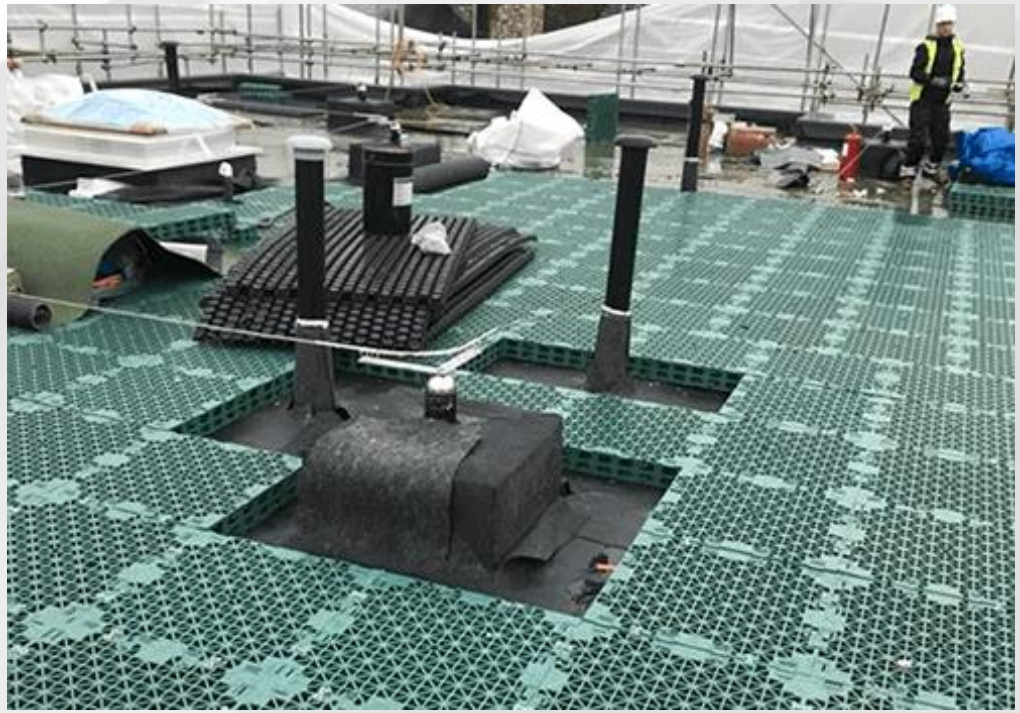




World bank, 2020, Chicago's City Hall Green Roof.
Moreland City Council. (2016). Moreland Urban Heat Island Effect Action Plan 2016/2017 – 2025/2026. https://www.moreland.vic.gov.au/globalassets/areas/esd/esd-uhie-urban-heat-island-effect---action-plan---final-draft-for-council-june-2016.pdf;
https://www.in.gr/2020/07/17/life/design/ti-einai-ta-parklets-kai-giati-exoun-ginei-anarpasta-logo-koronaiou/

Action Plan's recommendations: more blue

- ✓ Development and maintenance of the "blue" element.

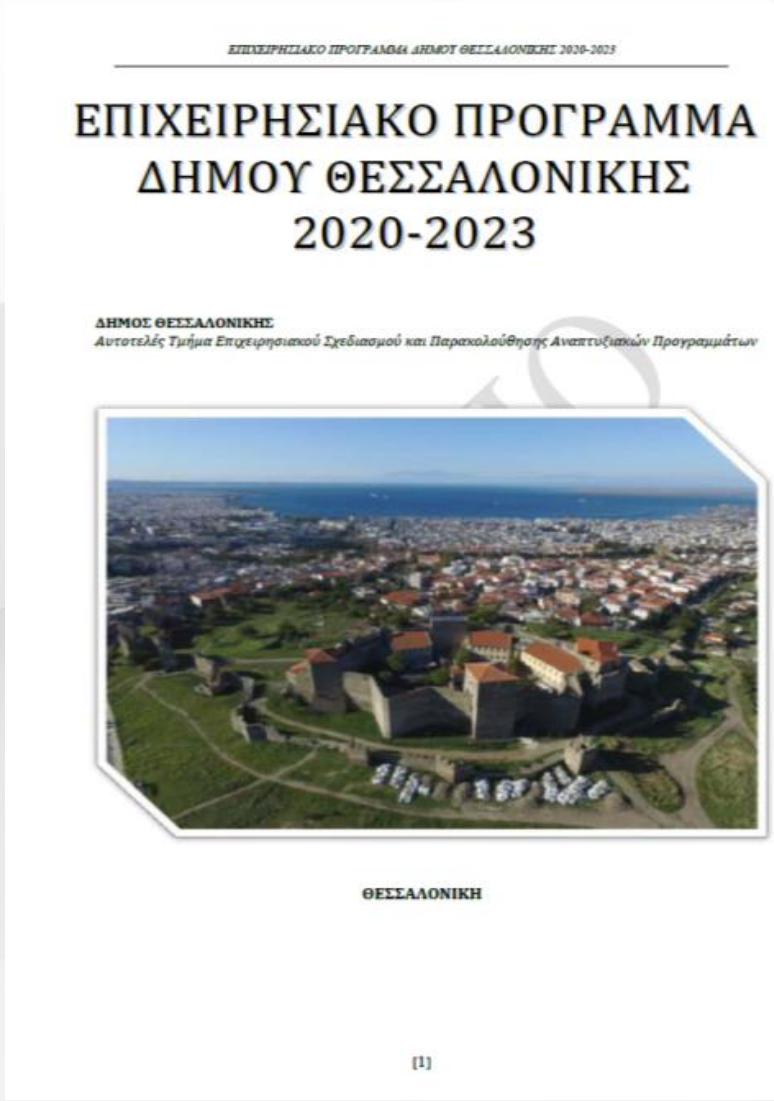


The image shows the blue roofing water-retention matting laid over the waterproofing membrane. Also in view are the inspection chambers to the drainage system

Action Plan's recommendations: wise use of construction materials per case

Video available: https://www.youtube.com/watch?v=BjqCmOTklD4

LIFE ASTI Project's contribution – MoT Operational Plan


ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ ΔΗΜΟΥ ΘΕΣΣΑΛΟΝΙΚΗΣ 2020-2023

ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ ΔΗΜΟΥ ΘΕΣΣΑΛΟΝΙΚΗΣ 2020-2023

ΔΗΜΟΣ ΘΕΣΣΑΛΟΝΙΚΗΣ

Αυτοτελές Τμήμα Επιχειρησιακού Σχεδιασμού και Παρακολούθησης Αναπτυξιακών Προγραμμάτων

ΘΕΣΣΑΛΟΝΙΚΗ

[1]

The Pillars of the OP of MoT – LIFE ASTI contribution

Pillar 1: Environment and Quality of life	• Measure 1.7 **Increasing the resilience of MoT** against climate change • Target 1.7.1 Mitigation actions against climate change
Pillar 2: Society – Health – Education – Culture - Sports	• Measure 2.1 Health and social care • Target 2.1.1 **Improving public health services**
Pillar 3: Local Economy and Employment	• Measure 3.1 Mapping and rebooting of local financial activities • Target 3.1.3 **Boosting local financial activities**
Pillar 4: Administrative Capacity and Internal Development of the Municipality of Thessaloniki	• Measure 4.2 e-governance & improving citizen services • Target 4.2.2 **Thessaloniki "Smart City"**

LIFE ASTI Project's contribution – Resilience Strategy

the resilience strategy of Thessaloniki, in the framework of 100 resilient cities initiative

The Resilient Thessaloniki program and the strategy for urban resilience "Thessaloniki 2030", has 4 pillars:

- the goal of shaping a sustainable city,
- the joint design of an open city,
- the creation of a dynamic local economy and an effective system of urban governance and
- the redefinition of the city's relation / bonding with the sea

The Strategy includes 30 Programs and over 100 Actions with multiple benefits for the resilience of the city and its population.

LIFE ASTI Project's contribution – Covenant of Mayors

Covenant of Mayors for Climate and Energy - Goals

"We, Mayors from all over Europe, hereby step up our climate ambitions and commit to delivering action at the pace that science dictates, in a joint effort to keep global temperature rise below 1.5℃ - the highest ambition of the Paris Agreement.

Our vision is that, by 2050, we will all be living in decarbonised and resilient cities with access to affordable, secure and sustainable energy. As part of the Covenant of Mayors - Europe movement, we will continue to (1) reduce greenhouse gas emissions on our territory, (2) increase resilience and prepare for the adverse impacts of climate change, and (3) tackle energy poverty as one key action to ensure a just transition."

Signatory cities pledge action to support implementation of the EU 55% greenhouse gas-reduction target by 2030 and the adoption of a joint approach to tackling mitigation and adaptation to climate change.

LIFE ASTI Project's contribution – 100 CNC

SELECTED CITIES

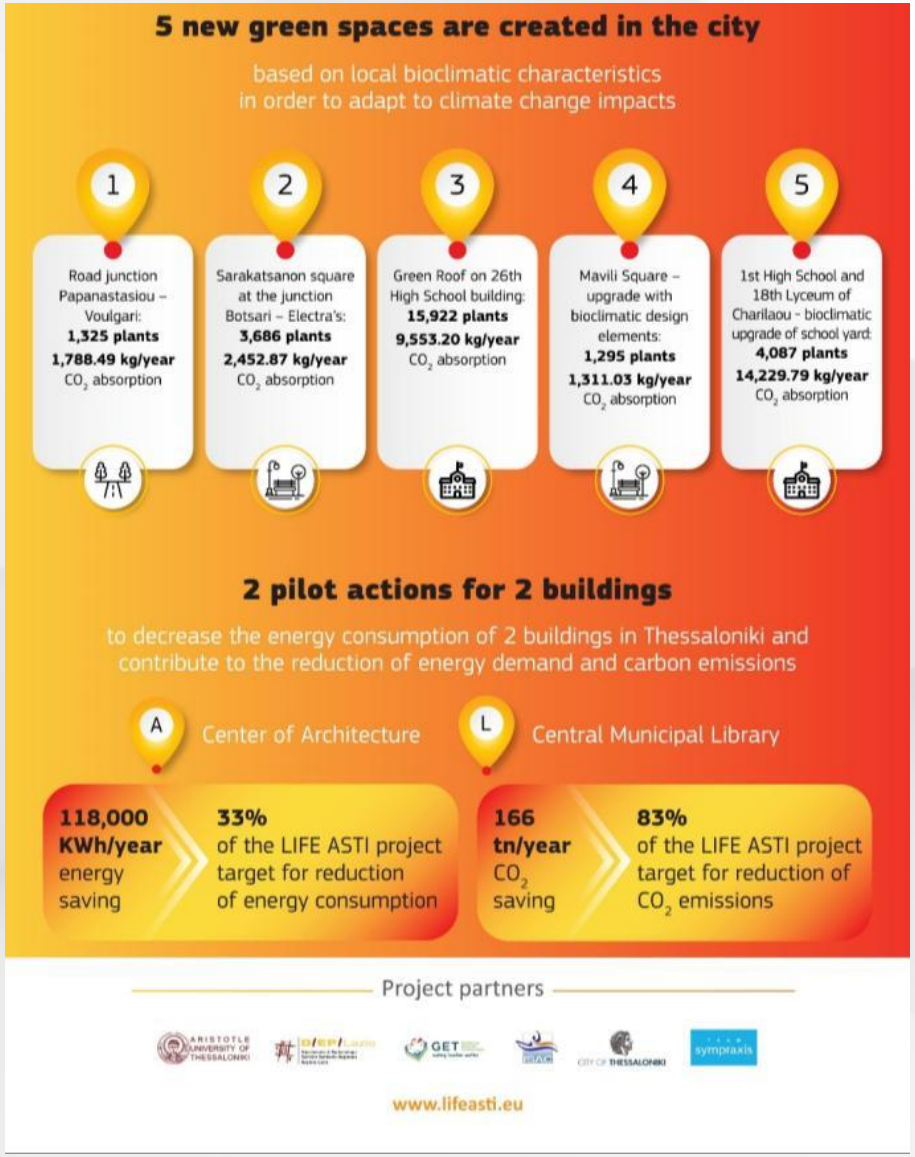
- 100 EU cities
- 12 cities from countries associated to Horizon Europe, the EU's research and innovation programme (2021-2027).

Cities from every Member State | Capital cities | Small, medium, large cities | Frontrunners and less prepared cities

BENEFITS FOR CITIES

- **Tailor-made advice and assistance** from the Mission Platform (managed by the NetZeroCities consortium)
- Unlocking additional **funding and financing opportunities** through a Mission label
- **Research & innovation funding opportunities** for cities to join large innovation actions, pilot projects and demonstrations (total budget from Horizon Europe for 2021-2023 is €360 million)
- Support through a national **coordination network**
- Networking opportunities, **learning and exchange of experiences** among cities
- Support with **involving citizens in decision-making**
- **High visibility** – raised political profile and attractiveness for investment and skilled workers

LIFE ASTI Project's contribution – Current & Future projects



Current & future projects:

- Energy upgrade of municipal buildings (i.e., Kleanthous, Mazaraki, Iktinou, Siggrou, Mitsaki, Olimpiados et. al.)
- Public space renovations (i.e. Aristotelous, Deck, et. al.)
- Vertical gardens
- Green roofs
- Energy communities

THANK YOU FOR YOUR ATTENTION

Questions?

Thank you for your attention!
Dr. Georgios Papastergios
Municipality of Thessaloniki
g.papastergios@thessaloniki.gr

MoT team:
Dr. Georgios Papastergios
Dr. Vassilis-Ioannis Akylas
Mrs. Athina Chontolidou
Mrs. Chrysoula Zournatzidou
Dr. Paraskevi Tzoumaka
Dr. Apostolos Kelesis
Mrs. Foteini Vagena
Mrs. Efi Androutsou
Mrs. Ioanna Tsikoti
Mrs. Konstantinia Andreopoulou
Mrs. Spyridoula Lefa
Mr. Christos Triantaris

Dr. Simos Misirloglou
Mr. Kostas Evdoridis

LEVER team:
Mrs. Elissavet Pavlidou
Mrs. Ioanna-Vasiliki Pothitaki
Mrs. Ismini – Anastasia Savvaidou
Mr. Polikarpos Karkavitsas
Mrs. Aikaterini Chagiou

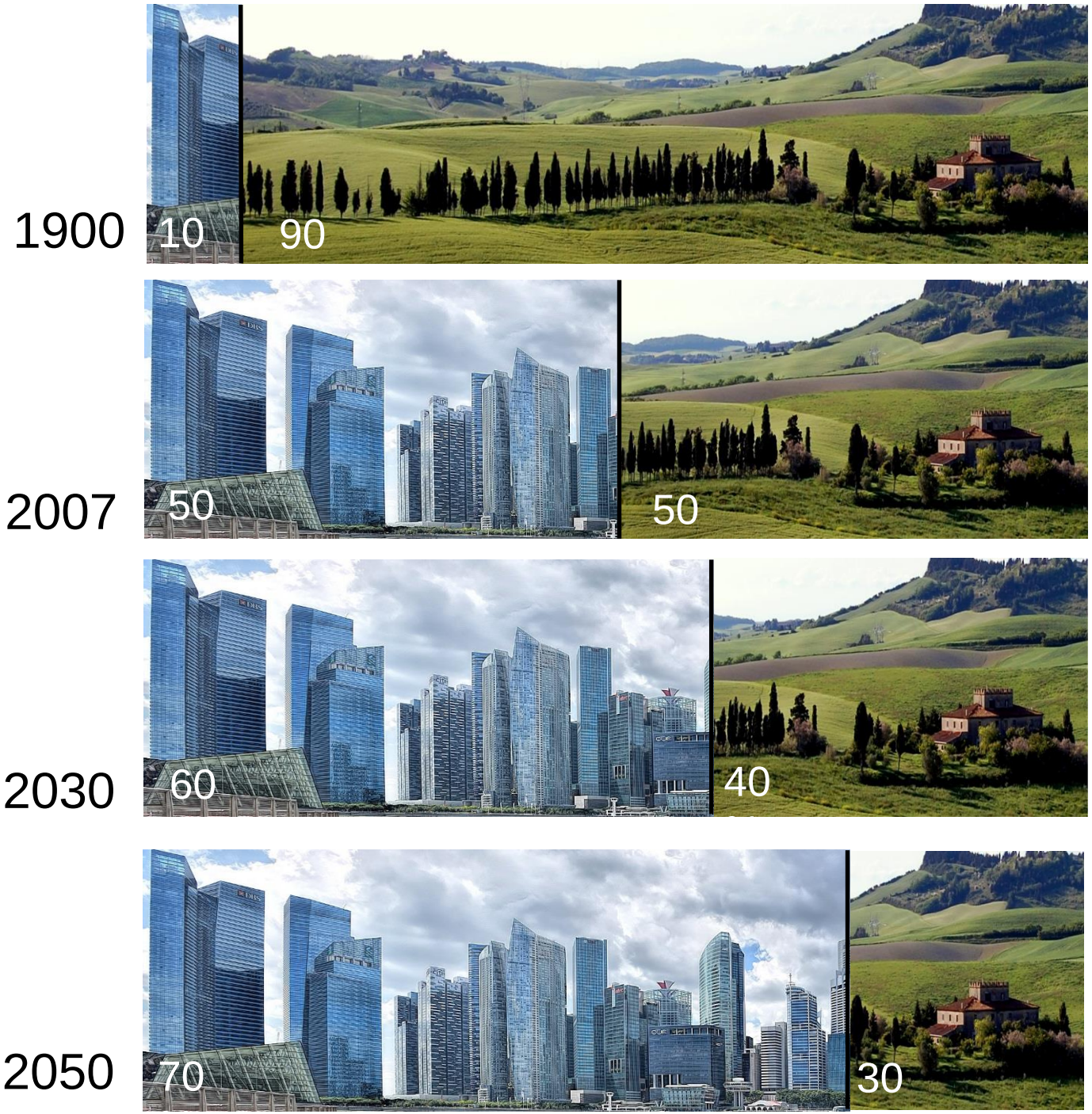
Building Heat Resilience in the Climate Era: The example of Athens

Eleni Myrivili
Senior Consultant on Heat Resilience
City of Athens

CITY OF ATHENS

Atlantic Council

Adrienne Arsht-Rockefeller Foundation Resilience Center



1.4 million new people are moving into cities every week.

People are drawn to cities as centres of economic activity, social connection, opportunity, and innovation.

GLOBAL TEMPERATURE IS STEADILY RISING.

TWENTY OF THE WARMEST YEARS HAVE OCCURRED SINCE 2000.

NASA's Goddard Institute for Space Studies (GISS)

#HEATSEASON

Atlantic Council

Adrienne Arsht-Rockefeller Foundation Resilience Center

Cities & heat extremes

By the 2050s

Today 200 million city-dwellers in 350 cities face temperatures over 35°C (95°F).

By 2050 these cities will be 970 = Heatwaves will become far more intense

This means that 1.6 billion people living in close to 1,000 cities will face regular, extreme heatwaves in under 30 years' time.

This is more than 40 percent of today's total urban population.

EXTREME HEAT IS DANGEROUS, AND IT'S ON THE RISE GLOBALLY.

IN RECENT YEARS, TEMPERATURES HAVE HIT RECORD HIGHS AND HAVE CAUSED THOUSANDS OF DEATHS.

70,000 DIED FROM THE 2003 EUROPEAN HEATWAVE

CITIES IN COUNTRIES THAT ARE LESS USED TO DEALING WITH EXTREME HEAT ARE ESPECIALLY VULNERABLE.

POLITICAL GEOGRAPHY

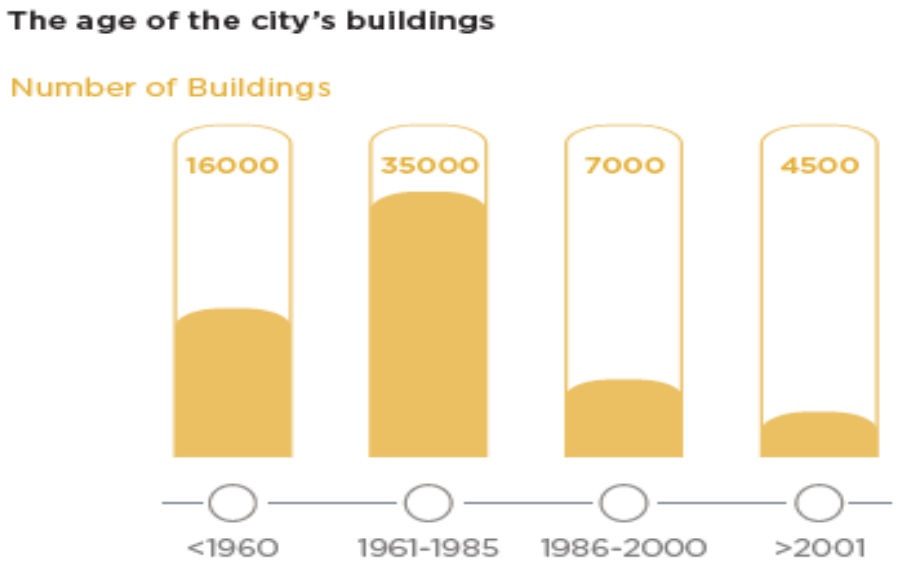
Attica Region: 64 Municipalities: 3.828.434 residents

Metropolitan Athens: 38 Municipalities

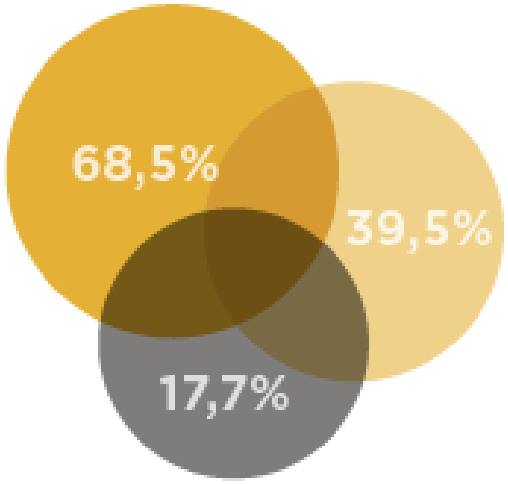
City of Athens: 7 districts: 664.046 residents - around 2 mil daily users


Chiesa greco-ortodossa
Ekklisia Kimisi
Theotokou...
Libreria
Αιόλου Σγούρδα 1870
Ταβάκι bar
Miltiadou
Nikiou
Aiolou
Ristorante
specializzato in falàfel
Haimantas,
Dimitrios, & Co. OE
ΧΑΙΜΑΝΤΑΣ,

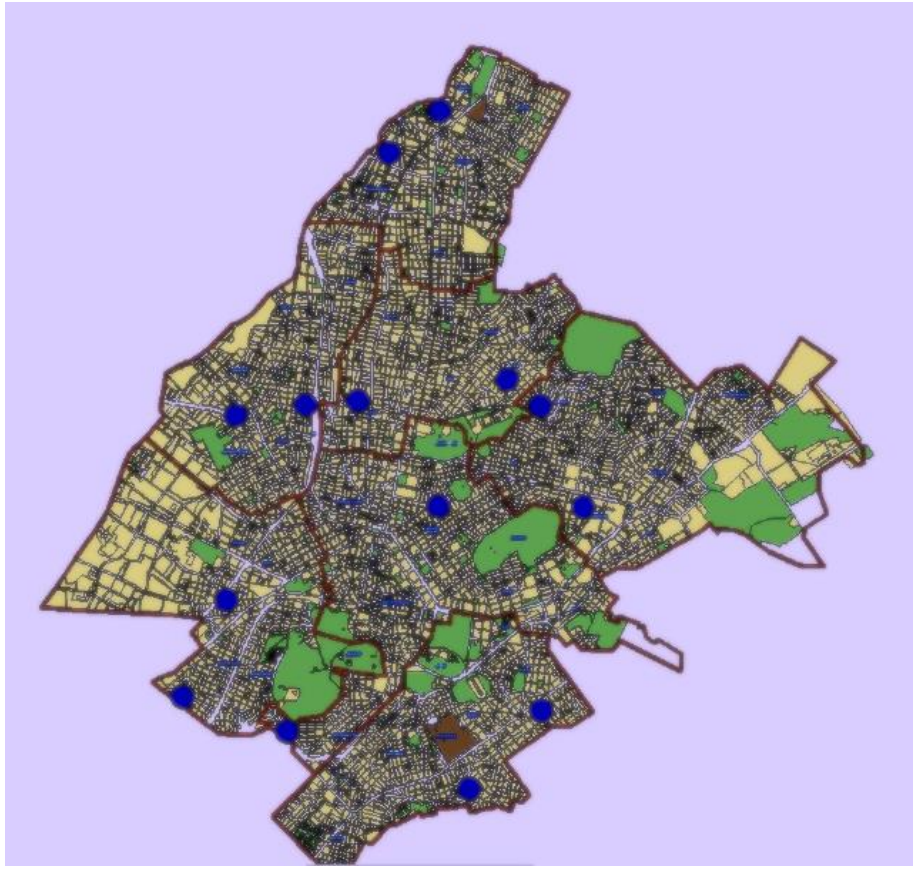
GRAY INFRASTRUCTURE



Uncontrollable Cementification (Great urban density) Percentage of Land coverage Over total land Area.



GREEN INFRASTRUCTURE



Out of 38 km² only 4,6 km² are Green Areas.

Hills - Parks - Cemeteries (72%)

Squares - Pedestrian Streets - Tree Avenues (22%)

Apart from number of trees of Tree Avenues, no other data available re trees in Athens

In the total number of 93.891 Avenue trees, the most populated species are Mulberries (21%), Acacias (8%) and Seville Orange trees (19%).

Athens Shocks and Stresses

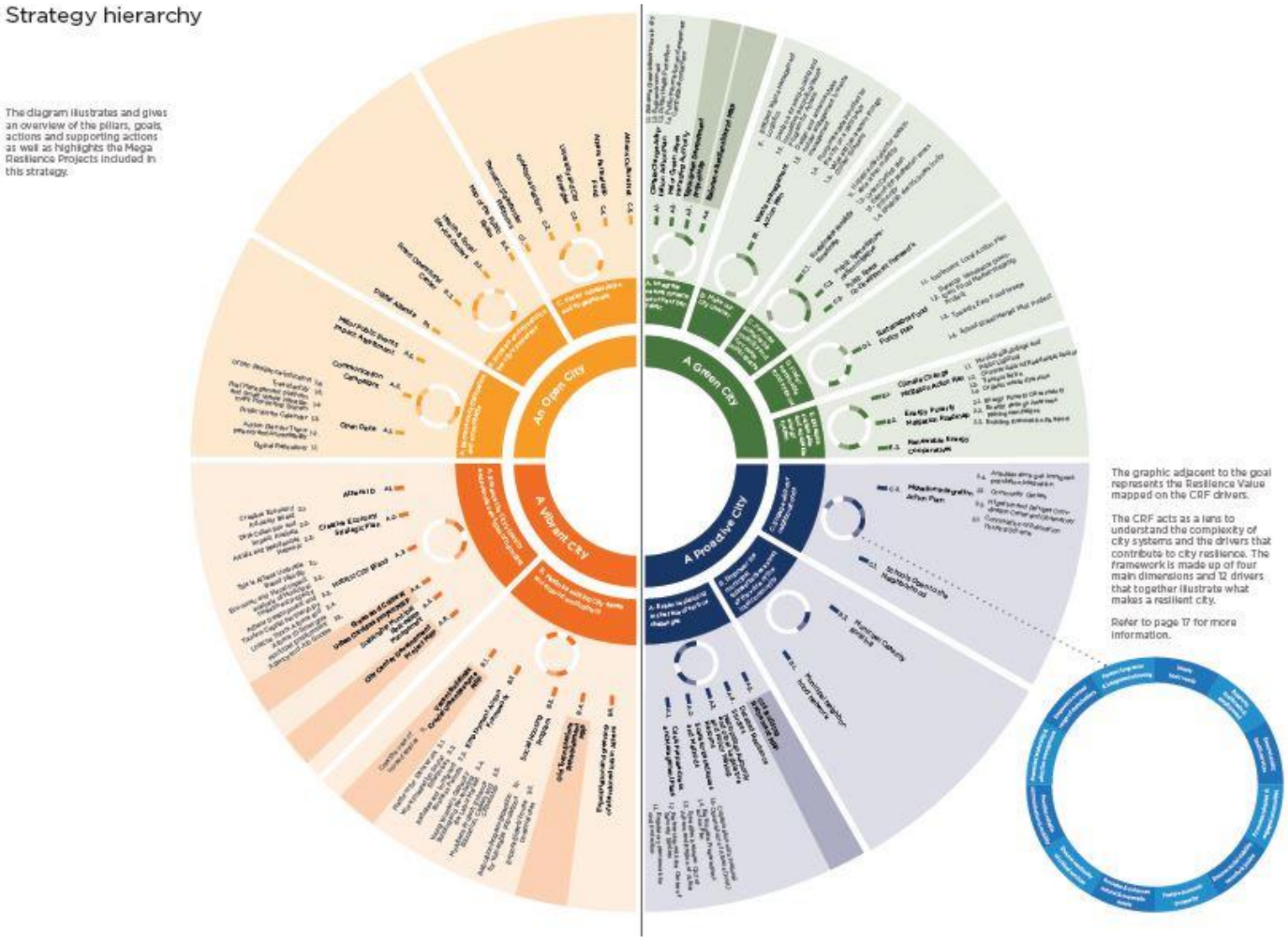
stresses

- **Depressed Macroeconomic Conditions**: Unemployment - Poverty
- **Mistrust**: Lack of Effective and Transparent Governance – Lack of Data-Driven Policymaking
- **Large Scale Refugee & Migration Flows**
- **Ageing Infrastructure**: Vacant Buildings – Lack of Maintenance and Long Term Planning

shocks

- **Climate Change**: Heat Waves/UHI, Flash Floods, Peri-Urban Fires, Drought, Air Quality
- **Earthquakes**
- **Civil Unrest**: Violence
- **Cyber-Attack**

Athens Resilience Strategy for 2030



A.1 Climate change adaptation action plan

Description:

The City of Athens, recognizes that impacts of climate change will continue to affect the quality of life for its citizens. The city plans to implement measures that aim at increasing the city's resilience and protecting the citizens from the repercussions of increasing urban temperatures. Raising temperatures will also lead to a dramatic increase in energy consumption, and will intensify flash floods and poor air quality. city mayors have an important leadership role to play in climate change adaptation policy making. The City of Athens, in collaboration with C40 and the office of Resilience and Sustainability, has just finished drafting its Climate Change Adaptation Action plan (CAAP). This is a summary of all the related actions within this plan.

Goal A

Integrate natural systems into the urban fabric

Resilience Value:

- Support data-driven policy making
- Enhance and promote communication channels with the citizens
- Support transparency and accountability
- Promote digital adaptation
- Develop synergies with city stakeholders and enhance participation
- Support integrated planning and strengthen municipal leadership
- Raise awareness and appreciation for the City and its services
- Maximize the dynamic of the Athenian neighborhood
- Combine essential services with dynamic urban development
- Invest in local capacity building
- Promote equitable, cohesive and supportive communities
- Protect and maintain critical infrastructure
- Enhance city's identity
- Promote local culture
- Provide incentives for economic development
- Promote sustainable management and development
- Support and enhance natural environment
- Promote residents' well-being and ameliorate their quality of life
- Maximize urban assets

Action Owners: City of Athens

Partners: Neighborhood Cities, Ministry of Environment and Energy, C40

Legislative authority:

Funding Sources: Municipal funds, structural funds

Timeframe: Short-term (Ongoing)

SDGs goals

A.1 Climate change adaptation action plan

A.1.1 Enhance green infrastructure in the city

The City of Athens targets investment into green infrastructure and nature-based solutions that could improve the city's microclimate. These solutions could also limit the urban heat island effect and improve air quality, and reduce the impacts of flooding.. To achieve these goals, the actions to be taken are the following:

a. Provide proper maintenance of the existing green areas so as to increase their environmental impact, and implement new planting in existing green areas that belong to the municipality of Athens. (Actions 5.1.1-5.1.2, CAAP)
b. Enhance green infrastructure in the regeneration of public spaces. (Action 5.1.3, CAAP)
c. Design and create "Green Corridors" both within the municipality of Athens and on a metropolitan scale, in order to improve air circulation and walkability. (Actions 5.1.4-5.1.5, CAAP)
d. Undertake the necessary regulatory procedures for establishing new green public spaces in the city. (Actions 5.1.6, CAAP)
e. Design and develop pocket parks, parklets, green roofs and vertical gardens in public, private and abandoned properties. (Actions 5.1.7-5.1.10, CAAP)
f. Enhance small urban framing boxes in school playground and develop urban farming in parks, public and private lots, roof gardens etc., and promote community farming in a municipal green area. (Actions 5.1.11, CAAP)
g. Establish sustainable water management and organic (green byproducts) waste management in all urban green areas. (Actions 5.1.12-5.1.13, CAAP)
h. Design and create "Blue Corridors" and enhance other water elements in the city, such as maintaining as well as creating new water fountains. (Actions 5.1.14-5.1.15, CAAP)

Action Owner: City of Athens (Department of Green and Parks with ORS)

Partners: C40, platform partners, synAthina, city of Vienna (MoU), universities, NGOs, CSOs, private sector

Funding sources: Municipal funds, NSRF, private investments and Donations

Time frame: Short/Medium-term

A.1.2. Built environment

Athens is a very densely and anarchically built city with an aging building stock, high energy demands and low albedo surfaces. The use of sustainable materials and bioclimatic design (cool materials, shading structures, increase of vegetation) can have positive effects on climate change and help protect the city's population. The adaptation measures that are suggested cover a wide range of actions.

The actions to be taken are the following:
a. Regulate new pedestrian streets. (Actions 5.2.1, CAAP)
b. Establish a regulatory framework for the use of cool and sustainable materials in all municipal public works. (Actions 5.2.2, CAAP)
c. Design and develop shading and natural cooling solutions in urban planning and street furniture. (Actions 5.2.3-5.2.4, CAAP)
d. Record and monitor existing underground tunnels and develop routes and shelters for the case of future extreme heat waves or other crises. (Actions 5.2.5, CAAP)

Action Owner: City of Athens (Relevant departments and ORS)

Partners: C40, platform partners, universities, private sector

Funding sources: Municipal funds, NSRF, private investments and Donations

Timeframe: Short/Medium-term

A.1 Climate change adaptation action plan

A.1.3 Public health protection

The municipality is responsible for making available data and services, to all residents, that contribute to the protection and the reduction of the health risks related to high temperatures. The Municipality, through strategic partnerships and the use of new technologies, can ensure the comprehensive dissemination of relevant information. The city also actively pursues better coordination with the relevant government authorities for implementing prevention and protection measures for the general population.

The actions to be taken are the following:
a. Expand the "cool centers" network so that citizens can protect themselves during high temperatures. (Actions 5.3.1, CAAP)
b. Establish public water fountains so that the public can have access to drinkable water. (Actions 5.3.2, CAAP)
c. Protect air quality through establishing regulatory measures for traffic management. (Actions 5.1.3, CAAP)

Improve crisis preparedness of municipal administration services. (Actions 5.3.4, CAAP)

Action Owner: City of Athens (Relevant departments and ORS)

Partners: universities, NOA, General Secretariat of Civil Protection

Funding sources: Own funds

Time frame: Short/Medium-term

A.1.4 Public information and awareness campaign #coolathens

The involvement and participation of citizens and professionals in the actions outlined in this strategy are crucial to the success of the endeavor. Tackling climate change can only be achieved by joining forces with the people.

The actions to be taken are the following:
a. Promote publicly available personalized information linking high temperatures to health risks through the Treasure Phone and Web Application (NOA) as well as NFC tags and guide high risk populations to an enhanced network of municipal "Cool Centers". (Actions 5.4.1, CAAP)
b. Link all heat related data sources (EU projects, Central Government institutional info, NOA and other research centers data) to the Municipal Portal. (Actions 5.4.2, CAAP)
c. Establish a series of information and awareness raising campaigns and activities of the general public. (Actions 5.4.3, CAAP)
d. Engage the private sector in all the above activities the private. (Actions 5.4.4, CAAP)

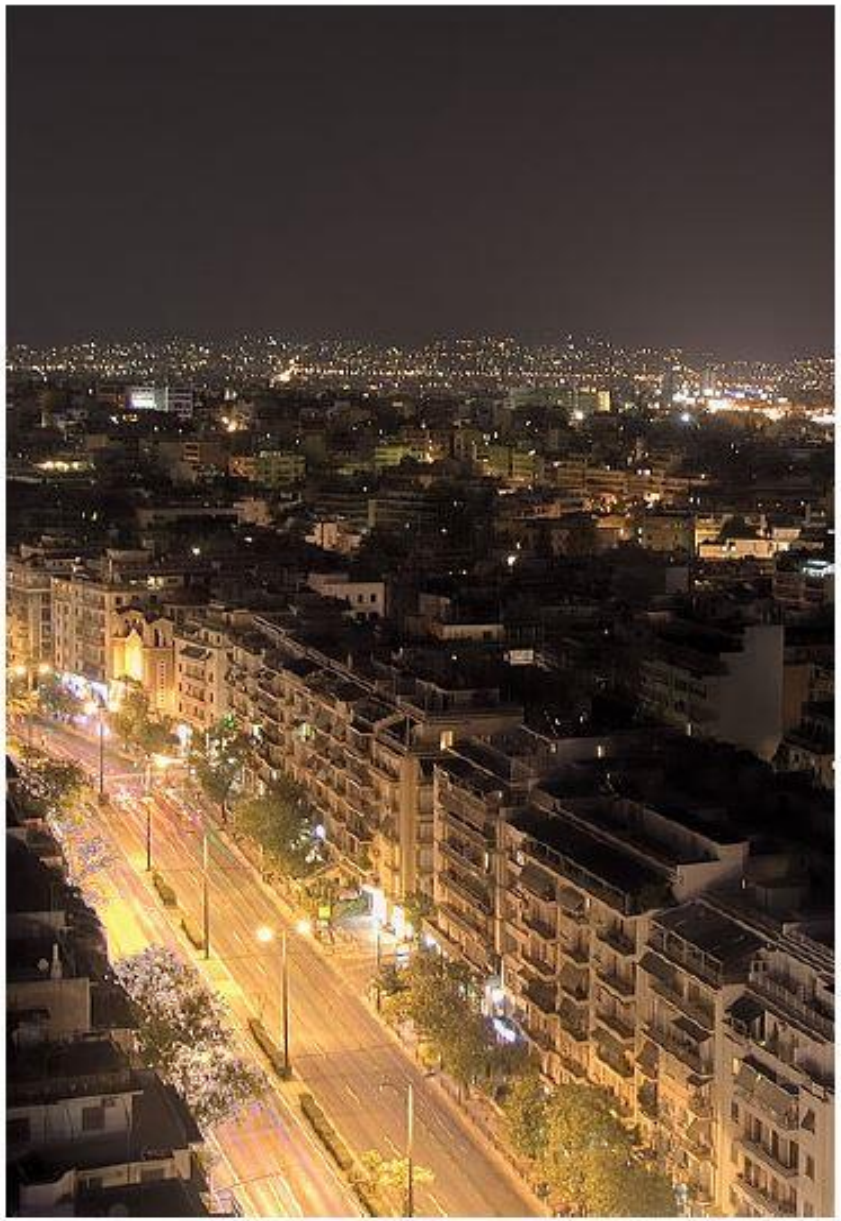
Action Owner: City of Athens (Mayor's Office, relevant departments and ORS)

Partners: universities, research centers, Central Government, private sector, NGOs and CSOs

Funding sources: Municipal funds, private Donations

Time frame: Short-term

The Athens Climate Change Adaptation Plan consists of 29 actions aiming to improve Athens' capacity to respond to rising urban temperatures, which are organized under these 4 pillars



E.2 Energy poverty mitigation roadmap

Description:

Energy poverty tends to become one of the biggest social problems in Europe. Greece is no exception. According to a recent study almost 25% of Athenian households suffer from energy poverty due to the economic crisis and are unable to cover their basic domestic needs. These households are unable to afford any heating during the winter and live in indoor temperatures that do not exceed 6 to 7 degrees Celsius in the cold winter months.

The City of Athens will implement measures for energy poverty elimination at city level and will develop programs to alleviate the most vulnerable populations suffering from energy poverty.

Goal E

Establish sustainable and equitable energy system

Resilience Value:

- Support data-driven policy making
- Enhance and promote communication channels with the citizens
- Support transparency and accountability
- Develop synergies with city stakeholders and enhance participation
- Support integrated planning and strengthen municipal leadership
- Raise awareness and appreciation for the City and its services
- Invest in local capacity building
- Promote equitable, cohesive and supportive communities
- Protect and maintain critical infrastructure
- Provide incentives for economic development
- Promote sustainable management and development
- Support and enhance natural environment
- Promote residents' well-being and ameliorate their quality of life

Action Owners: City of Athens (ORS)

Partners: CRES and relevant municipal departments

Legislative authority:

Funding Sources: CRES, European Funds, and Municipal funds

Timeframe: Medium-term

SDGs goals:

E.2 Energy poverty mitigation roadmap

E.2.1 Energy poverty observatory

The City of Athens will establish in cooperation with the Center for Renewable Energy Sources and Saving (CRES) an energy poverty Observatory that would be responsible for monitoring households that suffers from energy poverty and will deliver solutions for energy efficiency. It would also try to link energy demands to renewable energy production.

Action Owner: City of Athens (ORS) and CRES

Partners: Athenian Gas: Metropolitan Agency for Natural Gas, CRES, Heinrich Boll Foundation, Social Cooperative "Wind of Renewal," NGOs and Department of Social Services

Funding sources: CRES, European Funding and Municipal funds

Timeframe: Short-term

E.2.2 Energy saving awareness raising campaign and capacity building

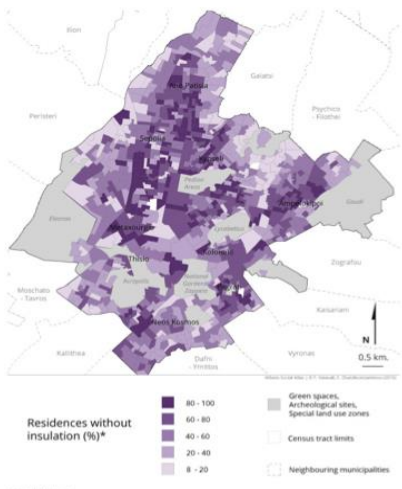
The City of Athens will consider a joint venture of public and private sector for planning and implementing a long-term campaign to provide information and build capacity among citizens regarding energy savings (energy inspectors, website, phone center, financial instruments consultation, etc.).

Action Owner: City of Athens (ORS, Mayor's Office)

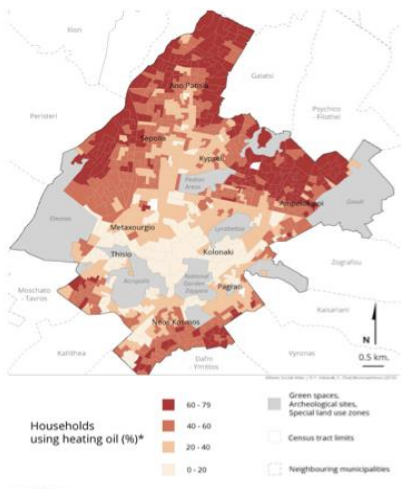
Partners: ADDMA, Athenian Gas: Metropolitan Agency for Natural Gas, Heinrich Boll Foundation, Social Cooperative "Wind of Renewal, "NGOs and private sector.

Funding sources: Municipal funds and private donors

Timeframe: Medium-term



Source: VatavaliF ., Chatzikonstantinou E.,(eds) (2015) Athens Social Atlas. Mapping energy poverty in Athens during the crisis,(http://www.athenssocialatlas.gr/en/article/energy-poverty/)



Source: VatavaliF .,Chatzikonstantinou E.,(eds) (2015) Athens Social Atlas. Mapping energy poverty in Athens during the crisis,(http://www.athenssocialatlas.gr/en/article/energy-poverty/)

E.2 Supporting Actions

E.2 Energy poverty mitigation roadmap

E.2.3 Building renovation passport

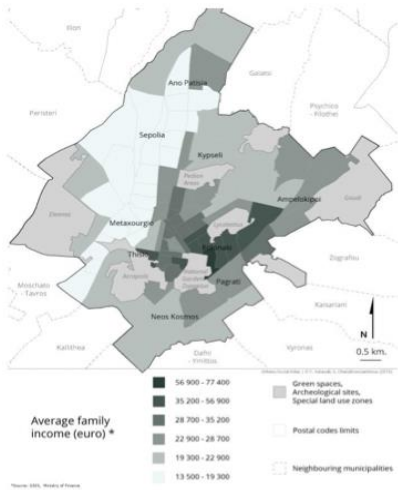
A Building Renovation Passport (BRP) is –a document outlining a long-term (up to 15 or 20 years) step-by-step renovation roadmap for a specific building, resulting from an on-site energy audit guided by specific quality criteria and indicators, in dialogue with the renters and building owners. The City of Athens in collaboration with CRES will develop a library with BRPs from its buildings in order to record the energy demands and the measures applied in long-term for energy savings so that in future an energy roadmap could be developed.

Action Owner: City of Athens (ORS) and CRES

Partners: CRES, Athenian Gas: Metropolitan Agency for Natural Gas, Heinrich Boll Foundation, Social Cooperative "Wind of Renewal," and Department of Public Works

Funding sources: CRES, European Funding and Municipal funds

Timeframe: Medium-term



Source: VatavaliF .,Chatzikonstantinou E.,(eds) (2015) Athens Social Atlas. Mapping energy poverty in Athens during the crisis,(http://www.athenssocialatlas.gr/en/article/energy-poverty/)

2 BILLION PEOPLE WORLDWIDE EXPERIENCE ENERGY POVERTY.*

*INTERNATIONAL ENERGY AGENCY (IEA)

DATA FROM THE EUROPEAN UNION ENERGY POVERTY OBSERVATORY INDICATES THAT THE ESTIMATED NUMBER OF ENERGY-POOR CITIZENS IN THE EUROPEAN UNION VARIES BETWEEN 50 AND 125 MILLION PEOPLE.

#HEATSEASON

Atlantic Council

Arsht-Rockefeller Foundation Resilience Center

Climate Risk Information

Heat

A 2019 analysis of **571** European citi**es** by the Newcastle University Polytechnic School ranked **Athens as the European city facing the single greatest impact from heat waves.**

In December 2018, **Moody's** released a report evaluating the credit risks to 30 European cities posed by climate change. **Athens ranked highest in terms of exposure to heat and drought and among the top three cities at risk from peri-urban forest fires.**

Moody's stated that the increased intensity and frequency of extreme heat waves means "**Athens' credit strength will be sensitive to climate change… [particularly] if heat waves were to depress tourism activity [and] negatively impact the city's overall economic strength.**"

Climate Risk Information

Heat

Currently the number of days with temperatures **above 36°C** are **between 15 and 25 per year.**

During the next decades, around the middle of the century, the **number of heatwave days is expected double, we expect 15 to 20 days extra** each year while **rainfall is expected to decrease by 12%.**

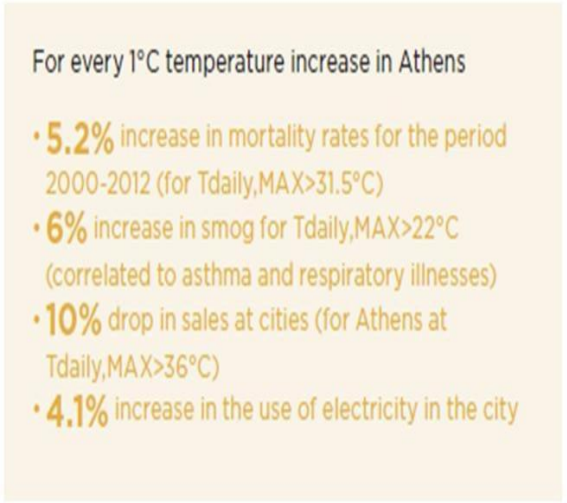
Average summer temperatures in Athens are expected to increase:

- **by 2°C between 2021 - 2050**
- **up to 4°C between 2071 and 2100**

As **heat rises** together with the **frequency and duration of heat waves,** the **Athenian Urban Heat Island effects**, already exhibiting severe temperature differences between the city center and its suburbs, **will also intensify**.

Climate Risk Information

Heat



- Central Athens can be **5°C hotter during the night** and up to **10°C hotter during the day**, than outlying suburban areas due to the Urban Heat Island Effect.
- **~200 deaths per year** are related to high temperatures
- **Electricity use increases by 4.1% per degree of temperature increase**, in a city with 24% energy poverty
- **Commercial activity declines** as temperatures climb over 34 Celsius
- **Insects, fungi** and related illnesses are becoming more prominent infecting humans, flora and fauna
- Prolonged heat waves aggravates the **risk of peri-urban fires** which destroy ecosystems and their cooling services

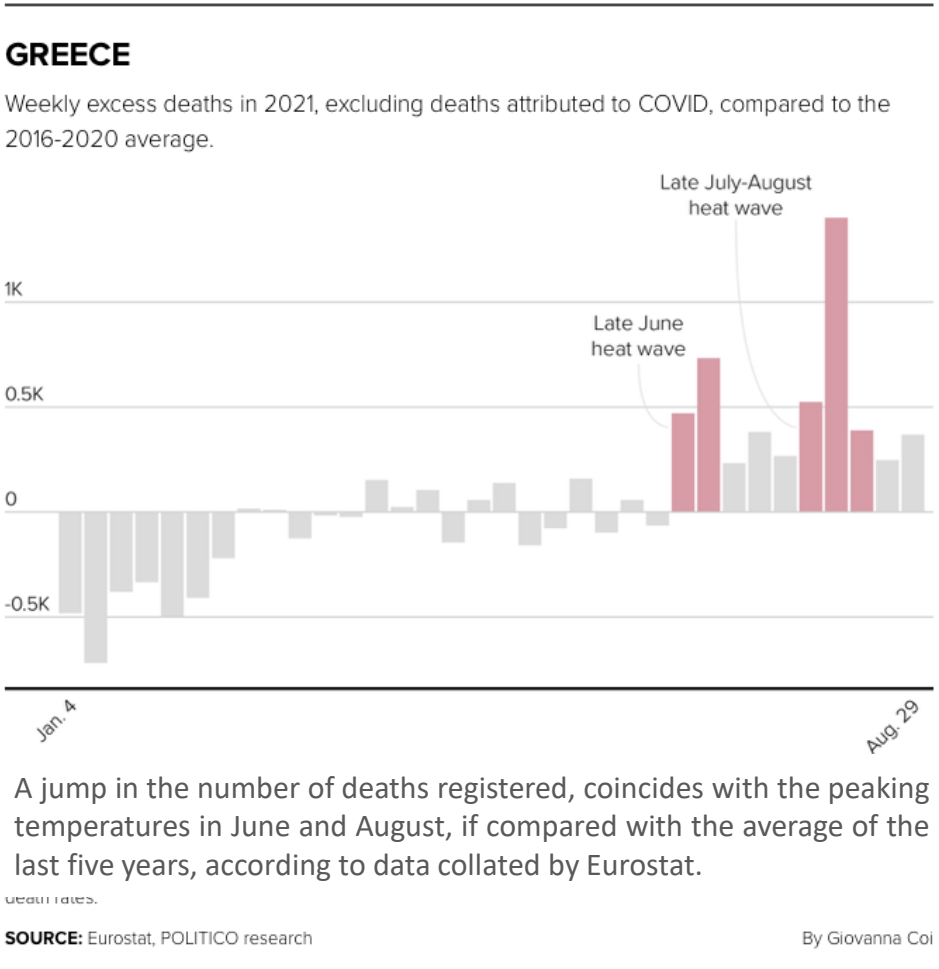
Climate Risk Information

The summer of 2021, Greece experienced the worst heatwave in three decades. The first heatwave occurred in June, and then temperatures peaked from the last week of July until the middle of August.

47C in early August in Northern Greece and **45C in Athens**
Between August 3rd and Sept 3rd **140+ wildfires burned 125.000 hectares burned.**

Greece recorded over 2,300 excess deaths
— excluding registered deaths from coronavirus —
between late July and mid-August
compared with the last five years.

Around 1,400 excess deaths were in the first week of August alone.



EXPOSURE TO EXTREME HEAT CAN CAUSE

LOSS OF CONSCIOUSNESS
DEHYDRATION
HEAT EXHAUSTION
HEAT STROKE
DEATH

FROM 1998-2017

166,000+ PEOPLE DIED DUE TO HEATWAVES GLOBALLY

AND EVEN THESE NUMBERS ARE LIKELY UNDERESTIMATED AS DEATHS FROM HEATWAVES ARE OFTEN ATTRIBUTED TO OTHER ILLNESSES MADE WORSE BY HEAT (LIKE CARDIOVASCULAR DISEASE).

Heatwaves and Health, World Health Organization (WHO)

Atlantic Council | Rockefeller Resilience Center

#HEATSEASON

OUTSIDE WORKERS MAY BE AT INCREASED RISK OF HEAT-RELATED ILLNESS AND DEATH.

AS THE NUMBER OF HOURS EXPOSED TO HEAT INCREASES, SO DOES THE LIKELIHOOD OF HEAT-HEALTH IMPACTS.

https://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/extreme-weather/heat/osha-fact-sheet.pdf

#HEATSEASON

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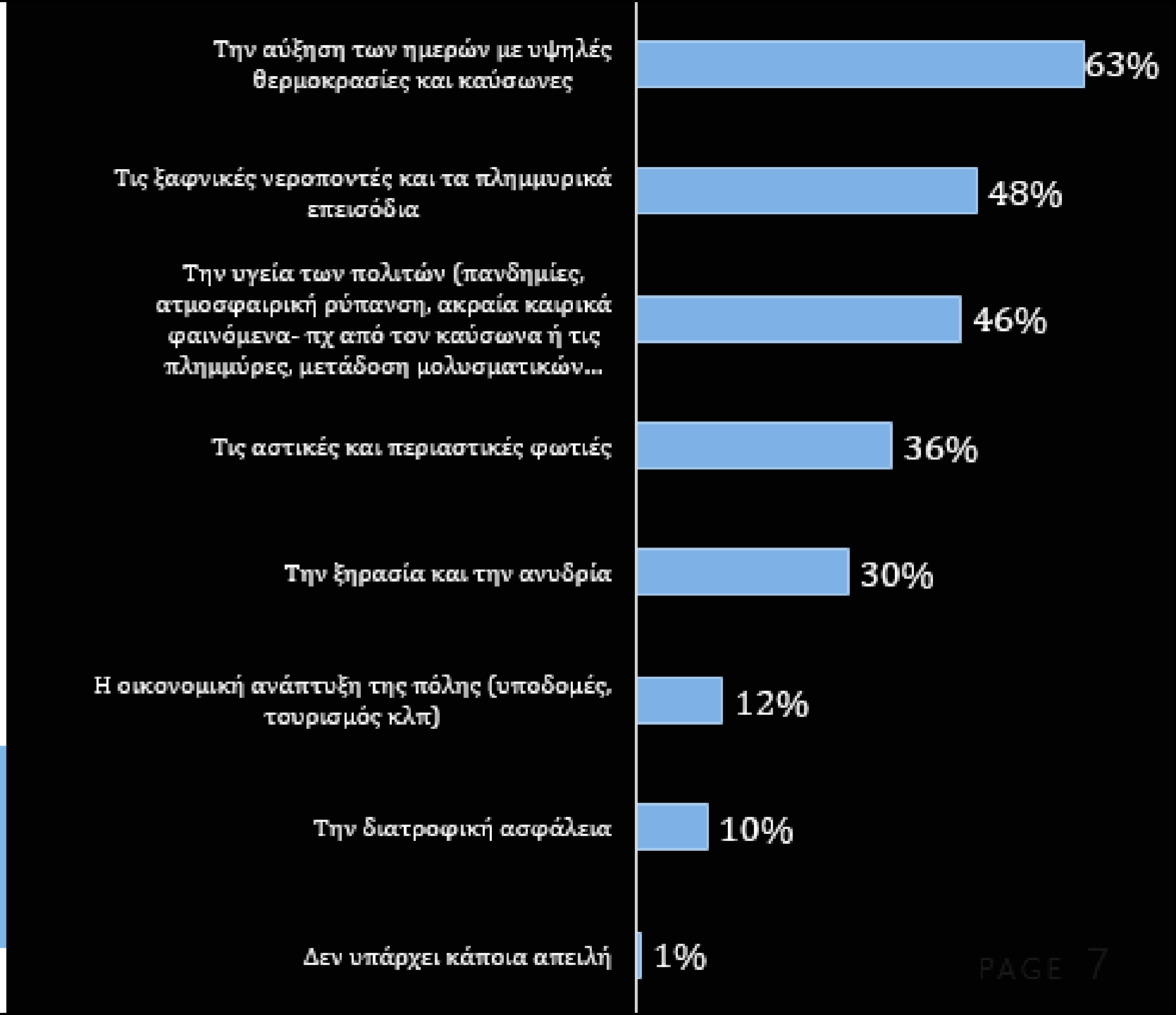
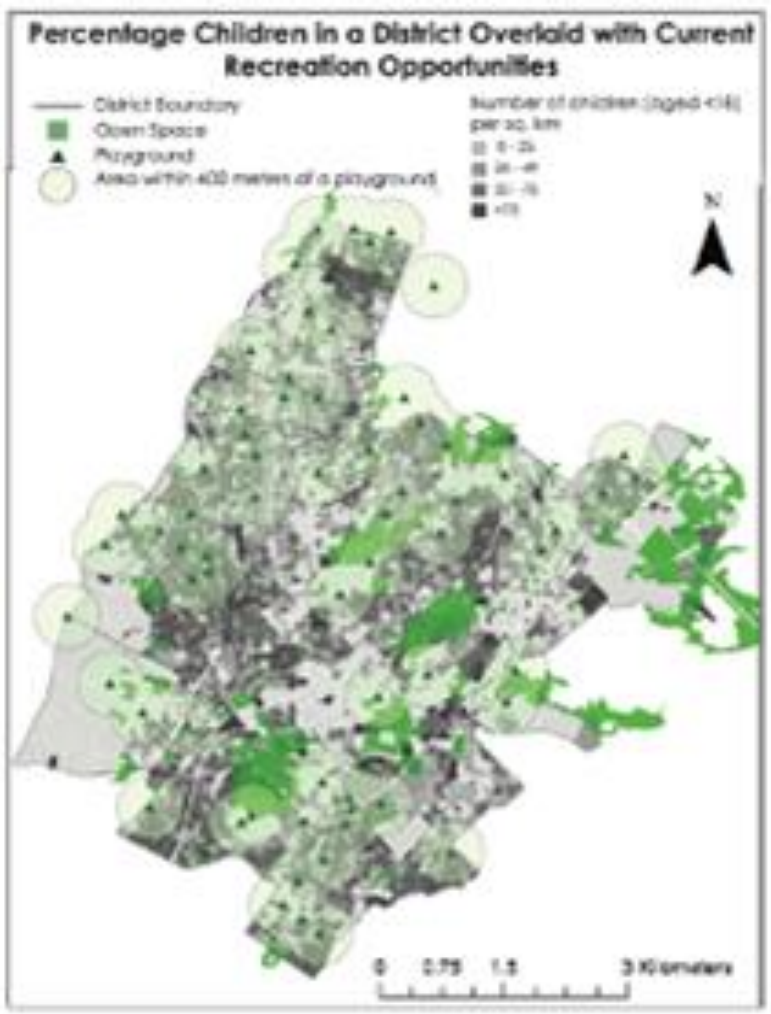
Ποια θεωρείτε ως την πιο σημαντική απειλή για την πόλη μας σε σχέση με την Κλιματική Κρίση;

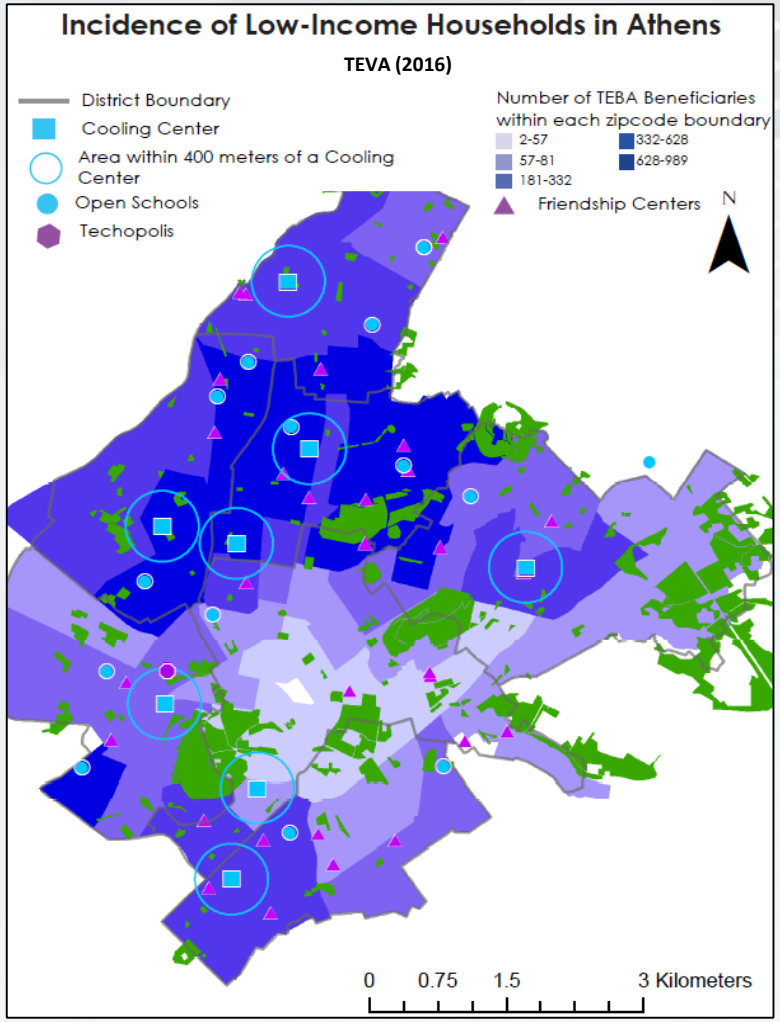


Η Αθήνα αλλάζει το κλίμα!

1 έως και 3 επιλογές

Geospatial Correlations:
Children, Green, Temperature & Income Distribution





Geospatial Correlations:

- Temperatures
- Green areas

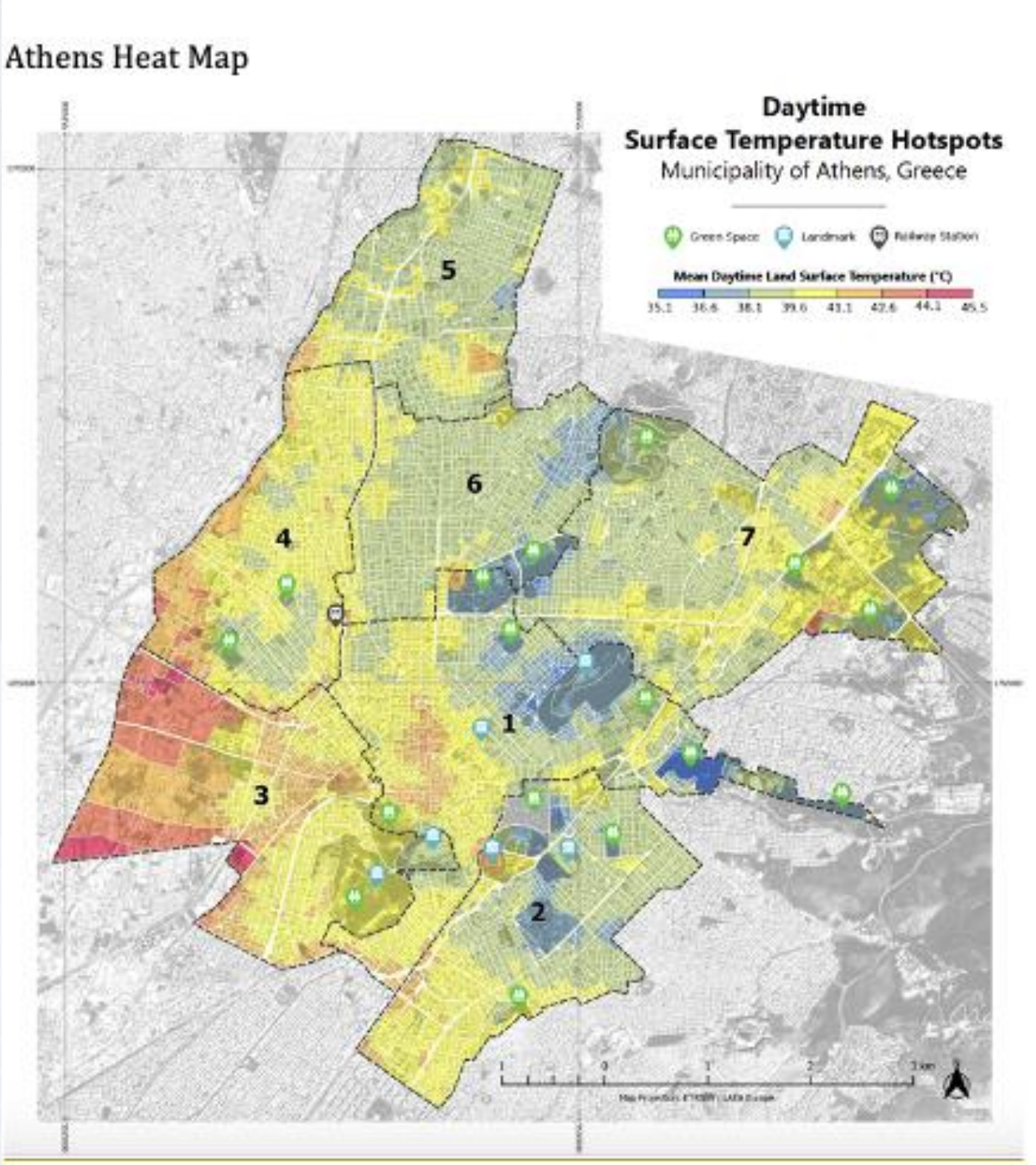
but also

- Canopy Coverage
- Species Conditions and Health

Demographic data

- Seniors
- Children

Income Distribution
Job Distribution
Airconditioning penetration



PLANNING FOR EXTREME HEAT

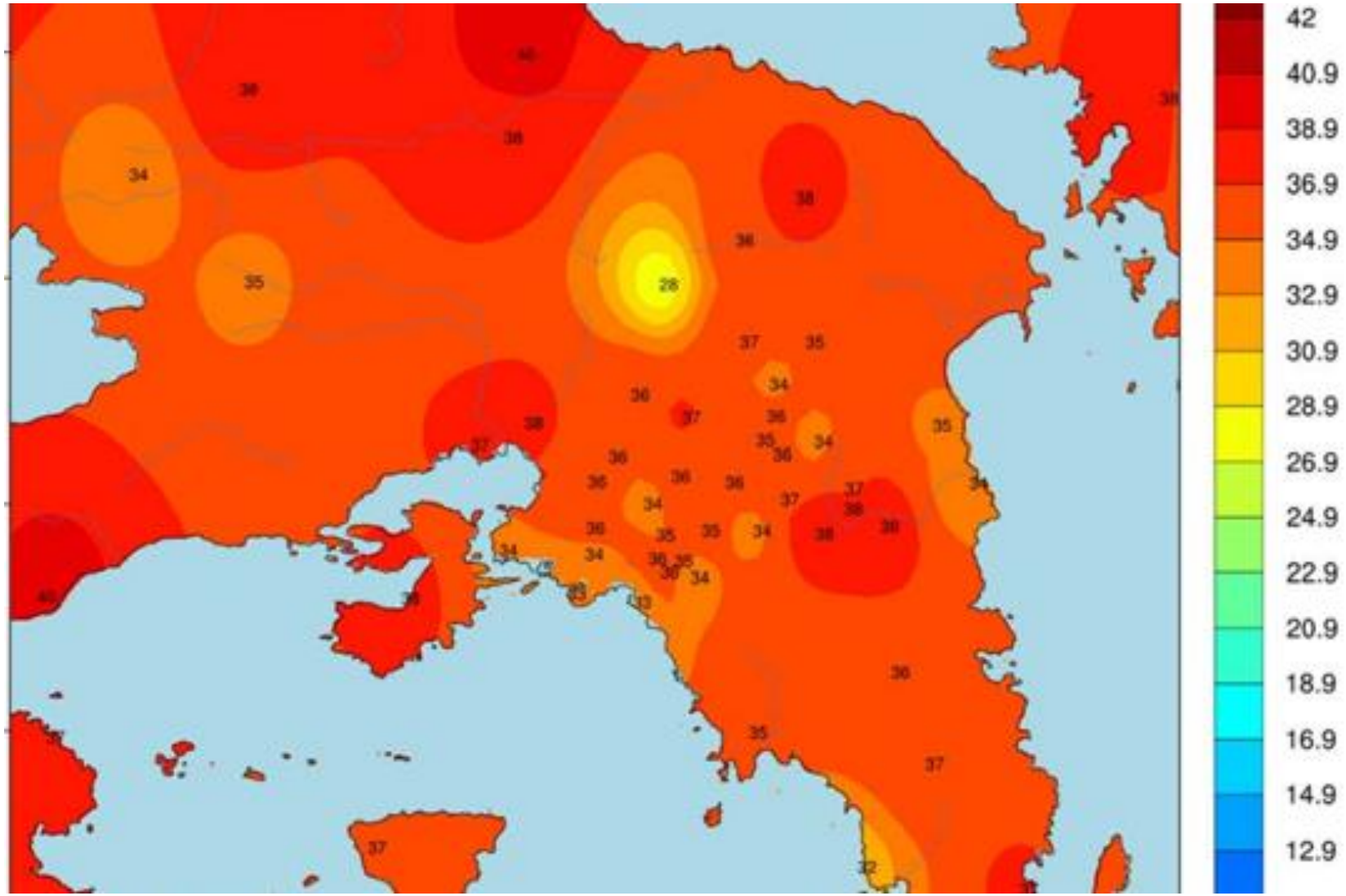
Peter Kuper / CartoonCollections.com

- ❑ **Awareness**
- ❑ **Preparedness**
- ❑ **Redesign**

AWARENESS

- **Categorizing HEATWAVES**

- **#CoolAthens Campaign**
  #HeatSeason Campaign



USING DATA TO DETERMINE YOUR HEAT RISK.

EXTREMA GLOBAL IS A MOBILE APP WHICH USES WEATHER AND CLIMATE DATA TO PROVIDE REAL-TIME PERSONALISED HEAT RISK INFORMATION AND RECOMMENDATIONS FOR THE NEAREST COOLING SPACES, DRINKING WATER FOUNTAINS AND COOL WALKING ROUTES.

www.extrema-global.com

#HEATSEASON

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PREPAREDNESS

City networks | community workshops | vulnerable communities

EXTREMA Global app

The Heat-line – a special helpline number

Public Cooling Centers

“Help at Home” and “Buddy Systems” – municipal and community networks

Non- working hours during HEATWAVES

Supporting Energy poor Households

Diverting Energy from Industrial to Residential Areas

WHAT DOES IT LOOK LIKE WHEN CITIES CREATE SPACES FOR RESIDENTS TO STAY COOL AND SAFE?

#HEATSEASON

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REDESIGN

Nature Positive Cities | Nature Based Solutions | Green/Blue Infrastracture

- **Hadrian' Aqueduct and Cool District**
- **Green Corridors**
- **Lycabettus Hill Program**
- **New Large Green Areas and Pocket Parks**
- **Maintenance and support of existing Urban Nature**

Cooling the City

CITY EXAMPLES

Medellín, Colombia: 36 green corridors with surrounding areas seeing temperature reductions of up to 4°C.

Paris, France: Paris is using the Seine River water to provide “free district cooling,” is issuing permits for people to green public spaces, and is co-designing its “school-yards oases”

Melbourne, Australia: has an Urban Forest and a Nature in the City Strategy supporting and creating healthy diverse ecosystems

Seoul, South Korea: Cheonggyecheon stream 5.8 km of water corridor has decreased temperature 3.3°C to 5.9°C compared to a parallel road a few blocks away.

New York City, USA: The city established the ”buddy system” and installed 74,000 air-conditioners to provide lifesaving in-home cooling for low-income seniors

IF WE WORK TOGETHER AS A GLOBAL COMMUNITY, WE CAN HELP PROTECT PEOPLE FROM EXTREME HEAT.

EXTREME HEAT
RESILIENCE ALLIANCE

THIS IS EHRA'S APPROACH:

#HEATSEASON

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Rockefeller Foundation Resilience Center

Thank you!

CITY OF ATHENS

Atlantic Council

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Final Conference: Photos

Find more photos of the Final Conference HERE

Final Conference: Video

Watch the video of the Final Conference HERE