

Interreg



Co-funded by
the European Union

IPA South Adriatic

CLEAN

Workshop «EU Energy Policy and Recent Efficiency Directive Developments»

*Climate Information, Solutions, and
Community Engagement in Local
Adaptation Efforts*

Alfredo Reder, CMCC Foundation

November 5th, 2024





cmcc

Centro Euro-Mediterraneo
sui Cambiamenti Climatici

We are a **leading research center**
focused on **understanding the**
interaction between **climate**
change and society

www.cmcc.it



THE RESEARCH INSTITUTES





MEMBERS & INSTITUTIONAL PARTNERS



Università
Ca' Foscari
Venezia



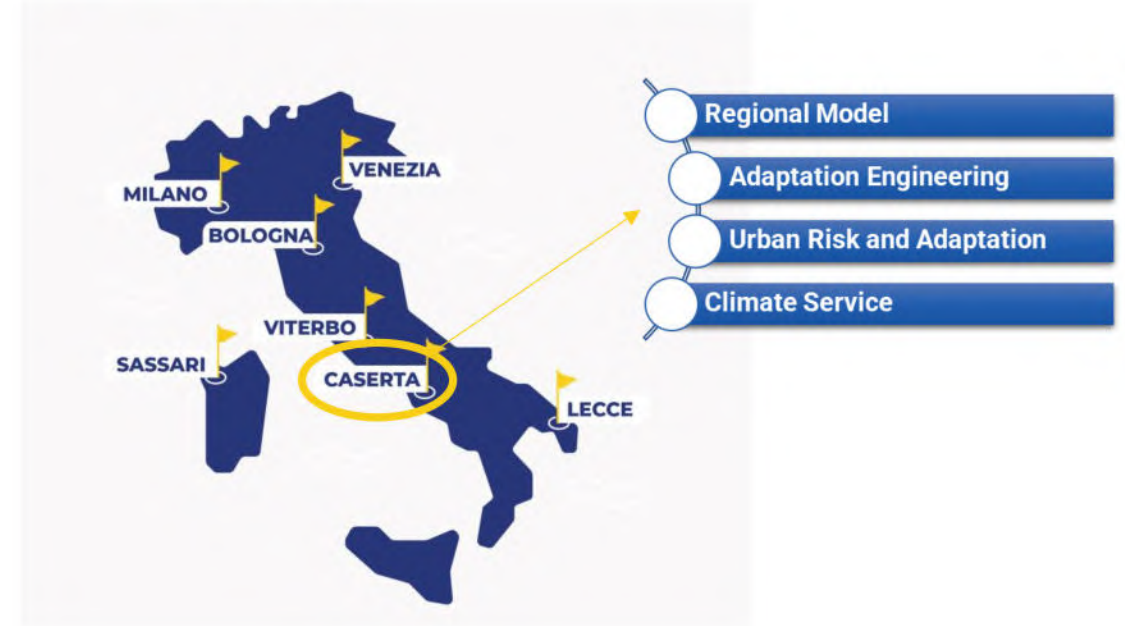
POLITECNICO
MILANO 1863



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



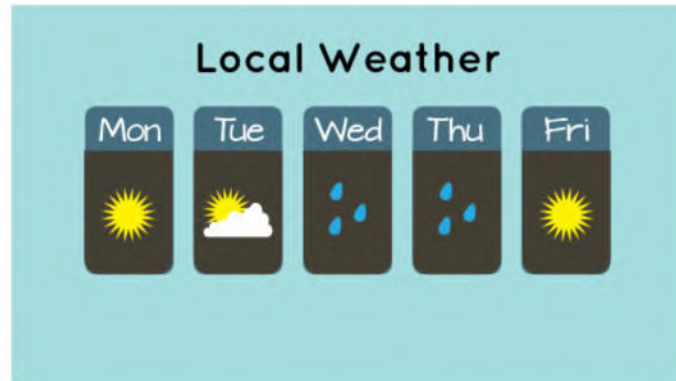
OFFICES



IPCC Focal Point for
Italy since 2006

<https://ipccitalia.cmcc.it/>

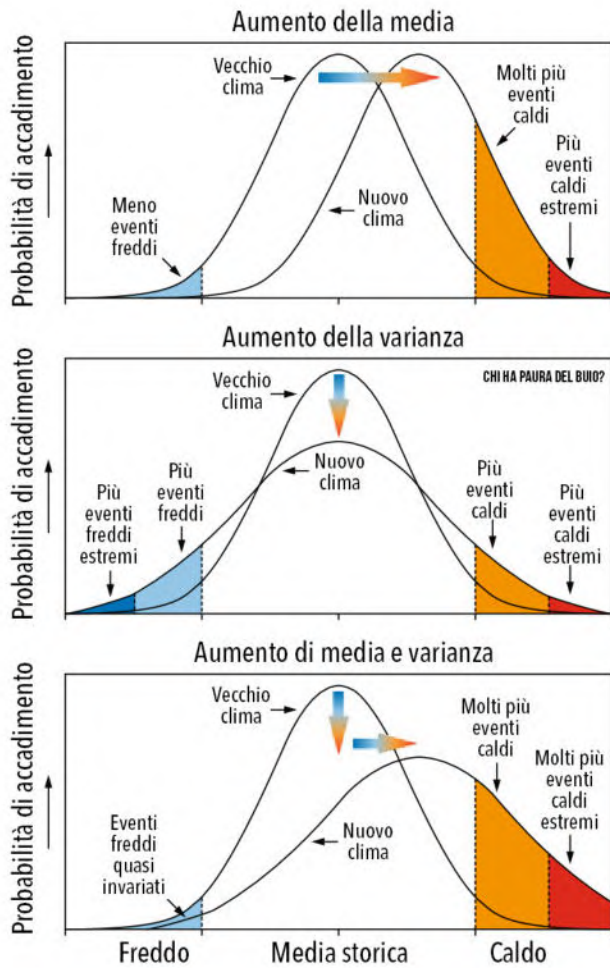
Difference between weather and climate



WEATHER is the daily state of the atmosphere and its short-term variation over minutes or weeks



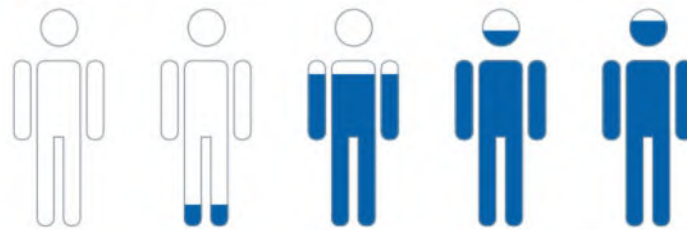
CLIMATE represents the set of weather conditions characterising a geographic region over a long period of time (at least 30 years) and is defined in terms of statistical properties



Climate variability and climate change

Q: How have the IPCC reports changed through time? (1990-2013)

■ Amount of Human-caused Warming



Year	Key Finding
1990	The report did not quantify the human contribution to global warming.
1995	"The balance of evidence suggests a discernible human influence on climate."
2001	Human-emitted greenhouse gases are likely (67-90% chance) responsible for more than half of Earth's temperature increase since 1951.
2007	Human-emitted greenhouse gases are very likely (at least 90% chance) responsible for more than half of Earth's temperature increase since 1951.
2013	Human-emitted greenhouse gases are extremely likely (at least 95% chance) responsible for more than half of Earth's temperature increase since 1951.

ipcc
 INTERGOVERNMENTAL PANEL ON
 CLIMATE CHANGE

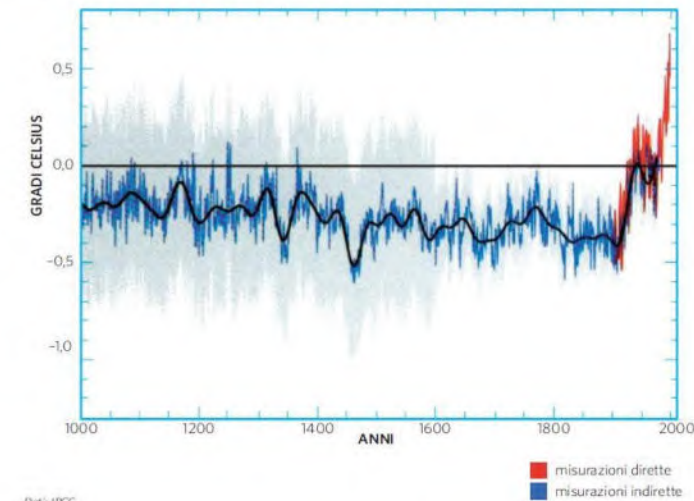


Nobel Peace Prize
 Winner, 2007

Awareness of the role of human activity



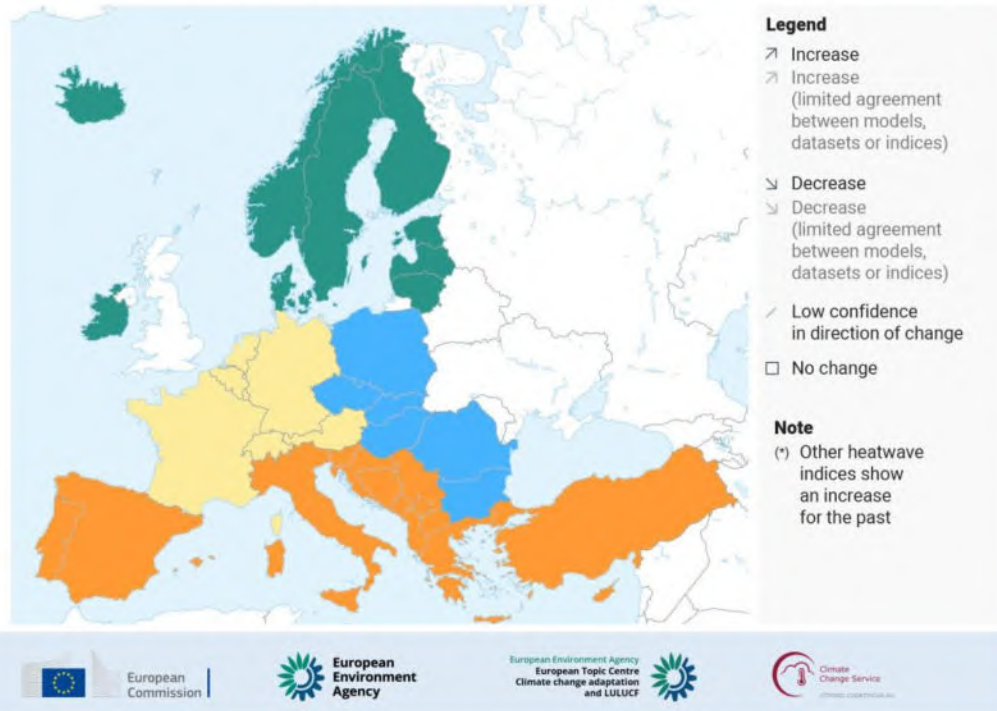
Le variazioni di temperatura nell'ultimo millennio
 Scostamenti delle temperature medie annuali dalla media 1961-1990 (1000-2000 d.C.)



The role of observations

Climate changes are now evident

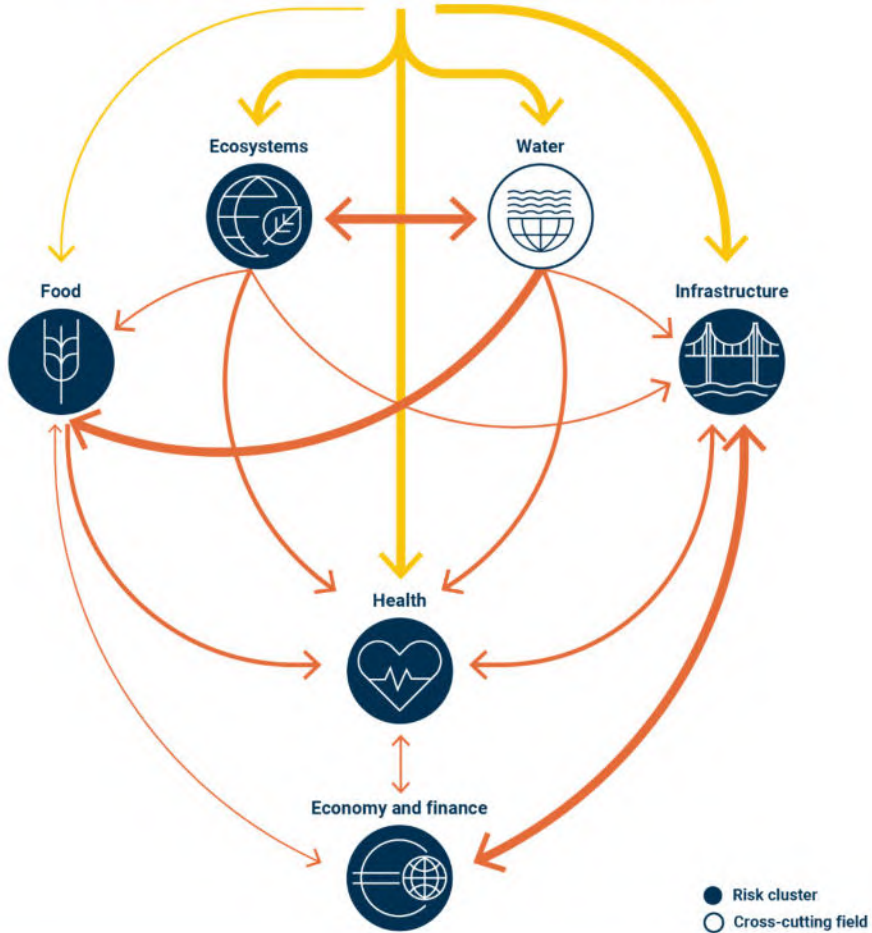
Land regions	Northern Europe			Western Europe			Central-Eastern Europe			Southern Europe			European regional seas	Past	Future
	Past	Future		Past	Future		Past	Future		Past	Future				
		Low	High		Low	High		Low	High		Low	High			
Mean temperature	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗
Heat wave days	□(*)	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗
Total precipitation	↗	↗	↗	↗	↘	↘	↗	↗	↘	↘	↘	↘	↘	↘	↘
Heavy precipitation	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗
Drought	↗	↘	↘	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗	↗



- **The temperature in the Mediterranean region has increased** and is now 1.5°C above preindustrial levels, corresponding to a rise in heatwaves and extreme temperatures
- **Droughts have become more frequent and intense** especially in the northern Mediterranean
- **Sea surface temperatures have warmed** by between 0.29 and 0.44°C per decade since the early 1980s
- **Sea levels have risen** by 1.4 mm (with an uncertainty of 0.2 mm) during the 20th century (accelerating to 2.8 mm ± 0.1 mm per year from 1993 to 2018)



Direct impacts and risks and Cascading impacts and risks



Communication on managing climate risks, 12 March 2024



Climate impacts are already here, and **risks will continue to increase in the coming decades** and beyond due to the inertia of the climate system, even if ambitious global emission cuts reduce the potential damage

Climate resilience is a matter of **maintaining societal functions**, but also of **competitiveness for economies and companies**, and thus jobs

National Adaptation Plan for Climate Change (PNACC)

- The purpose of the **PNACC** is to **reduce the vulnerability** of natural, social, and economic systems to the impacts of climate change and to **enhance their resilience**
- It serves as the implementation tool for the **National Climate Change Adaptation Strategy** of 2015 for national planning, supporting institutions that will be called upon to develop the contents of the plan at their respective levels of government, taking into account the specificities of different contexts



[PNACC DOCUMENTO DI PIANO.pdf](#)

[PNACC I Allegato Metodologie Strategie Piani Regionali.pdf](#)

[PNACC II Allegato Metodologie Strategie Piani Locali.pdf](#)

[PNACC III Allegato Impatti e vulnerabilita.pdf](#)

[PNACC IV Allegato Database Azioni.xlsx](#)

Approved on December 21, 2023, by D.M. n. 434

PNACC Platform


Piattaforma Nazionale Adattamento Cambiamenti Climatici

[HOME](#)
[LA PIATTAFORMA](#)
[LINK](#)
[NEWS](#)
[GLOSSARIO](#)
[FAQ](#)

Prima versione della Piattaforma che sarà arricchita e aggiornata periodicamente con dati e informazioni provenienti da diverse fonti
 Il Piano è attualmente sottoposto a procedimento di VAS. La documentazione è disponibile al seguente link

Conoscere i Cambiamenti Climatici	Dati e Indicatori	Piano Nazionale di Adattamento ai Cambiamenti Climatici	Quadro Normativo e Politiche di Adattamento	In primo piano
				
Per cominciare	SCIA	Contenuti del PNACC e Guida all'uso	Europa	Nella tua Regione
Mitigazione	Indicatori climatici	Fasi del PNACC	Italia	Buone pratiche
Impatti vulnerabilità e adattamento	Indicatori di impatto dei cambiamenti climatici	Dati Indicatori e mappe del PNACC	Città e Regioni	Progetto CREIAMO PA


ISPRA
 Istituto Superiore per la Protezione e la Ricerca Ambientale
ISPRA - SNPA


Istituto Nazionale per la Protezione dell'Ambiente


MINISTERO DELLA TRANSIZIONE ECOLOGICA
MITE



<https://climadat.isprambiente.it/>

PNACC Platform

Dati del PNACC

Il quadro climatico nazionale del PNACC è stato elaborato considerando 27 indicatori climatici messi in relazione con determinati pericoli climatici ([Tabella](#)). In questa sezione è possibile scaricare gli indicatori relativi al clima sul periodo di riferimento e agli scenari futuri per le aree terrestri e marine.



Home / Piano Nazionale di Adattamento ai Cambiamenti Climatici (PNACC) / Dati indicatori e mappe del PNACC / Aree Terrestri

Aree Terrestri

Il quadro climatico nazionale del PNACC per le aree terrestri è stato elaborato analizzando il clima sul periodo di riferimento 1981-2010 e le variazioni climatiche attese sul trentennio centrato sull'anno 2050 (2036-2065), rispetto allo stesso periodo 1981-2010, considerando gli scenari IPCC RCP8.5 "ad elevate emissioni", RCP4.5 "scenario intermedio", RCP2.6 "mitigazione aggressiva".

Gli indicatori relativi al clima sul periodo di riferimento sono calcolati a partire dai dati E-OBS (dati giornalieri di precipitazione, temperatura e umidità) per ciascun punto di un grigliato regolare con risoluzione orizzontale di circa 12 km.

Gli indicatori relativi alle variazioni climatiche attese sono stati ottenuti a partire da un ensemble di modelli climatici disponibili nell'ambito del programma EURO-CORDEX per ciascun punto del grigliato con risoluzione di circa 12 km (la massima disponibile). La deviazione standard rappresenta la dispersione delle proiezioni dei modelli (incertezza) attorno al valore medio (ensemble mean).

Clima sul periodo di riferimento Download degli indicatori	Clima futuro Scenario RCP2.6 Download degli indicatori	Clima futuro Scenario RCP4.5 Download degli indicatori	Clima futuro Scenario RCP8.5 Download degli indicatori
DATI PNACC		AREE MARINE	

- The platform provides users **access to scientific information and policies across various areas of Italy**, including **updated climate data to support research and national strategic decisions**
- It allows for the download of **climate hazard indicators** related to the reference period and expected changes for 2036-2065 compared to 1981-2010 (RCP 2.6, 4.5, 8.5), in both **vector and raster formats**

Other open-access Platforms

There are other **open-access platforms** from where it's possible to retrieve Climate Data:

- The **Copernicus Climate Change Service (C3S)** offers a variety of datasets, tools and visualizations through the **Climate Data Store (CDS)** and the **Copernicus Interactive Climate Atlas**
- The **Joint Research Centre Data Catalogue (JRC)** provides a diverse range of datasets and tools aimed at supporting scientific research, innovation, and policy-making
- The **European Climate Data Explorer (ECDE)** provides interactive access to a selection of climate indices reflecting the priorities of the **European Environment Agency (EEA)**



DATACLIME platform

The aim of the **DATACLIME** platform is to transform climate data into useful, tailor-made information for users with different skills and needs



Trasporti



Energia



Idrologia



Turismo



Ambiente urbano



Agricoltura

Scientists and
researchers

Engineers, architects
and urban planners

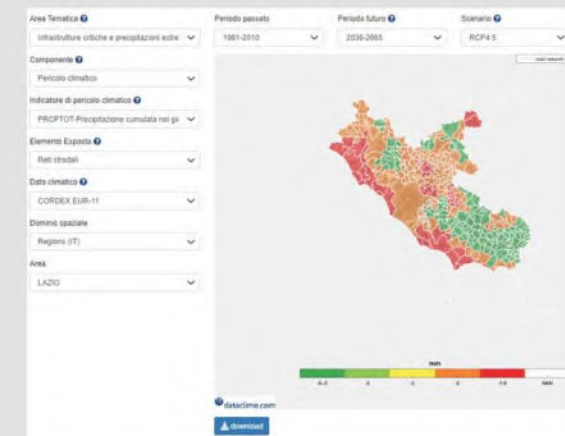
Businesses and
enterprises

Public
governments

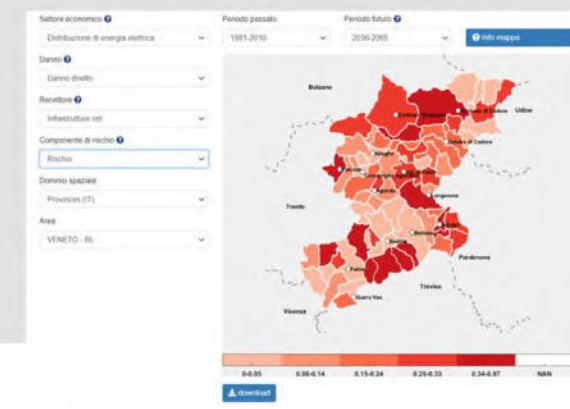
<https://www.dataclime.com/>

DATACLIME supports users by offering various climate services and managing the entire production chain 'in-house': from the collection and archiving of climate data to the processing and development of user-friendly analyses

Climate Risk Analysis for Different Spatial Units



Multisectoral Climate Risk Analysis



Cities as HOT SPOTS

Climate Change - Everyone's Business - Implications for Cities

Cities on the front line of a changing climate

Urban centres account for more than half of the world's population, most of its economic activity and the majority of energy-related emissions. The role of cities in reducing emissions and protecting their inhabitants is therefore central to effective climate policies.

Key Findings from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) For more information please visit clm.cam.ac.uk/ipcc

- Cities account for 37-49% of global GHG emissions
- Urban infrastructure accounts for over 70% of global energy use
- Over 64% of the world population to live in cities by 2050, significantly increasing energy use for infrastructure
- New infrastructure and land-use policies could reduce GHG emissions by 20-50% by 2050

IMPACTS

Climate change is expected to affect numerous aspects of urban life.

Sea-Level Rise

Two-thirds of cities with populations above 5 million are located in the Low Elevation Coastal Zone. Rising sea levels and storm surge flooding could have widespread effects on populations, property, and ecosystems, presenting threats to commerce, business and livelihoods.

ADAPTATIONS
 Resilience includes: **1** Improving early warning systems; **2** Strengthening coastal infrastructure; **3** A significant degree of zoning (including relocation of critical services); **4** and **5** Evacuation and crisis response management.

Food Insecurity

All aspects of food security are potentially affected by climate change, including access to food, food utilisation and price stability. Climate change is likely to cause food production in some regions (including the ocean due to warming and acidification) to decline.

ADAPTATIONS
 Local responses include support for urban and peri-urban agriculture; **1** Green roofs; **2** Local markets and enhanced social food safety nets; **3** Developing alternative food sources, including mixed aquaculture; **4** Reduce carbon-based revenues under threat.

Extreme Weather Events

Changes in extreme rainfall could cause the amount of sewage overflow spills and flooding to increase by 40% in some cities. Inland flooding is often made worse by uncontrolled city development.

ADAPTATIONS
 Responses include strengthening infrastructure; **1** Localised migration; **2** wastewater, stormwater and runoff infrastructure and management; and **3** better emergency measures including **4** stockpiling fuel, water and food.

Increased Temperatures

The mean temperature rise in some cities could be over 4°C by 2050, with peak seasonal temperatures even higher. More hot days will exacerbate urban heat island effects, resulting in more heat-related health problems and, possibly, air pollution.

ADAPTATIONS
 Development of urban planning heat management strategies; **1** including green zones, wind corridors, green roofs and water features; **2** Building codes will need to be improved; and **3** the infrastructure used by extensive parts of the population will need to be made more resilient.

Freshwater Availability

Risks to freshwater resources, such as drought, can cause shortages of drinking water, electricity outages, water-related diseases (through use of contaminated water), higher food prices and increased food insecurity from reduced agricultural supplies.

ADAPTATIONS
 Options include **1** encouraging water recycling and grey water use; **2** improving runoff management and developing new/alternative water sources; **3** storage facilities and autonomously powered water management and treatment infrastructure.

Mitigation efforts can have positive impacts for generations to come

Energy Supply

Reductions in greenhouse gas (GHG) emissions can be achieved by the use of low-carbon technologies including renewables, nuclear, and carbon capture and storage. Switching from coal to gas can be a bridging solution.

Transport

Emissions can be reduced by avoiding journeys, shifting to low-carbon transport systems, enhancing vehicle and engine efficiency, and reducing the carbon intensity of fuels by substituting oil-based products with natural gas, bio-methane or biofuel, or with electricity or hydrogen produced from low-GHG sources.

Buildings

Retrofitting existing buildings can reduce heating energy requirements by 50-75% in single-family housing and 50-90% in multi-family housing at costs of about US Dollar 700 to 400 per square metre. In contrast, substantial new construction in fast-growing regions presents a great mitigation opportunity as emissions can be virtually eliminated for new builds.

Energy Demand

Increasing the efficiency of buildings, appliances and distribution networks will reduce energy requirements by 50-90% in the awareness and behaviour of residents can also reduce demand. Projections suggest demand may be reduced by up to 20% in the short term and 50% by 2050.

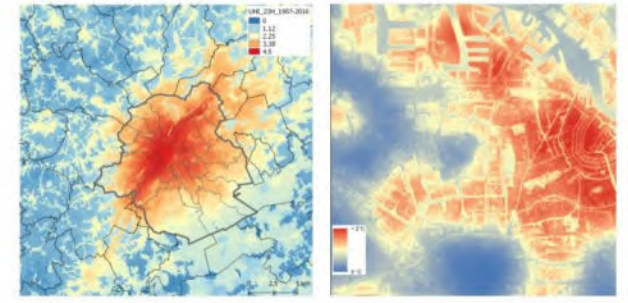
Low Carbon Cities

Options for rapidly developing cities focus on shaping their urban and infrastructure development patterns. For changes in multi-family housing or urban regeneration (compact, mixed-use development that shortens journeys, promotes transit/walking/cycling, and adaptive reuse of buildings) and rehabilitation and/or conversion to energy-efficient building designs.

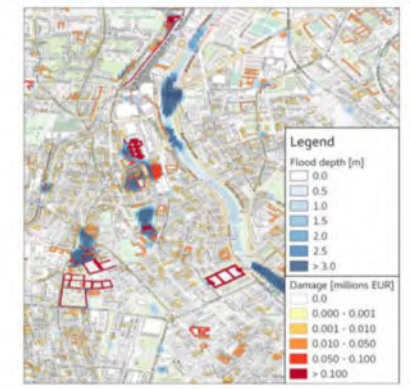
Policy Instruments

Approaches include co-locating high residential with high employment densities, achieving high land-use density, investing in public transit. The best plans for advancing sustainable urbanisation and low carbon development, especially in fast-growing parts of the world requires political will and institutional capacity.

CC IMPACTS ON URBAN AREAS: HEATWAVES

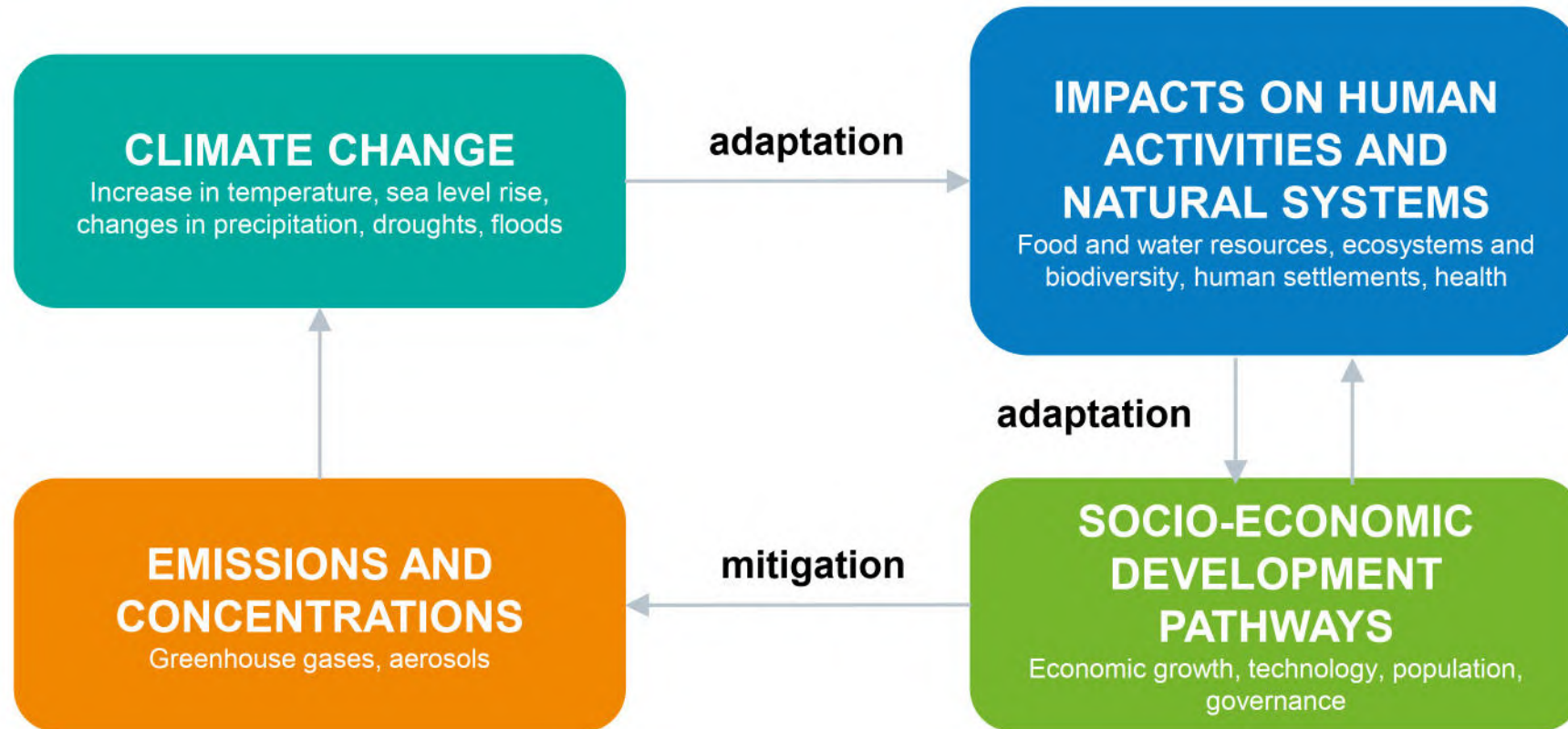


CC IMPACTS ON URBAN AREAS: FLOODINGS



 Climate Change Service
climate.copernicus.eu

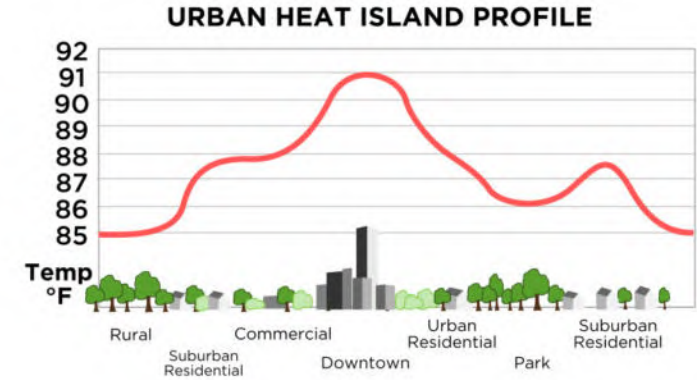
Solutions: adaptation and mitigation



Modified from IPCC

Urban Heat Island

Urban heat islands create **hotter microclimates in cities** compared to the surrounding suburban and rural areas due to **overbuilding, asphalt surfaces, traffic and industrial emissions, and reduced airflow**. The **lower horizontal-to-vertical surface ratio** also limits heat dissipation



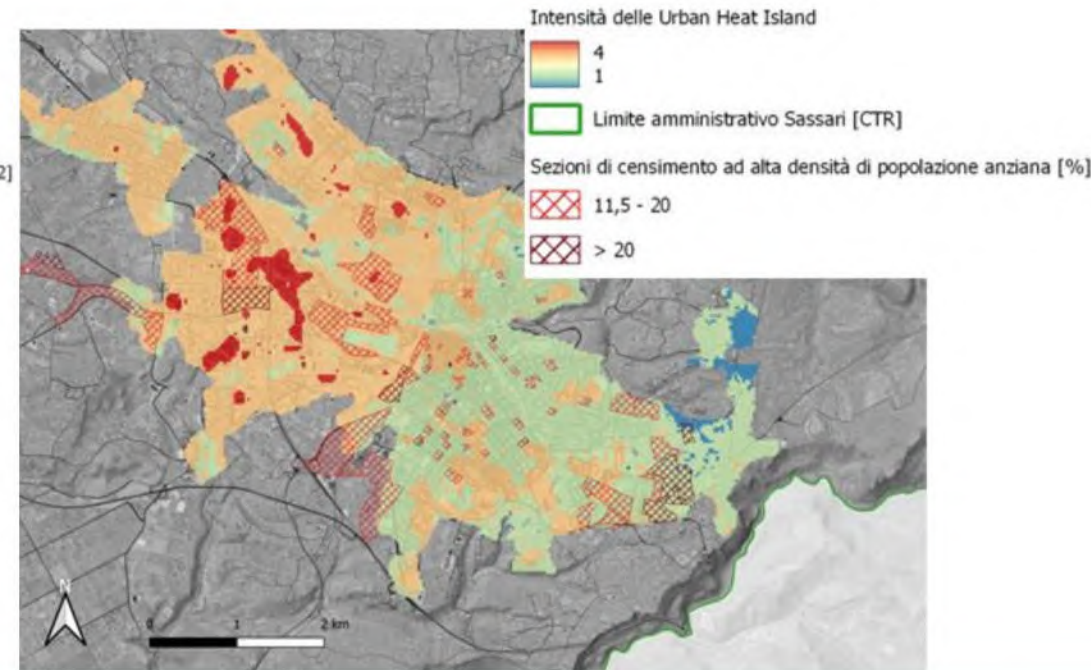
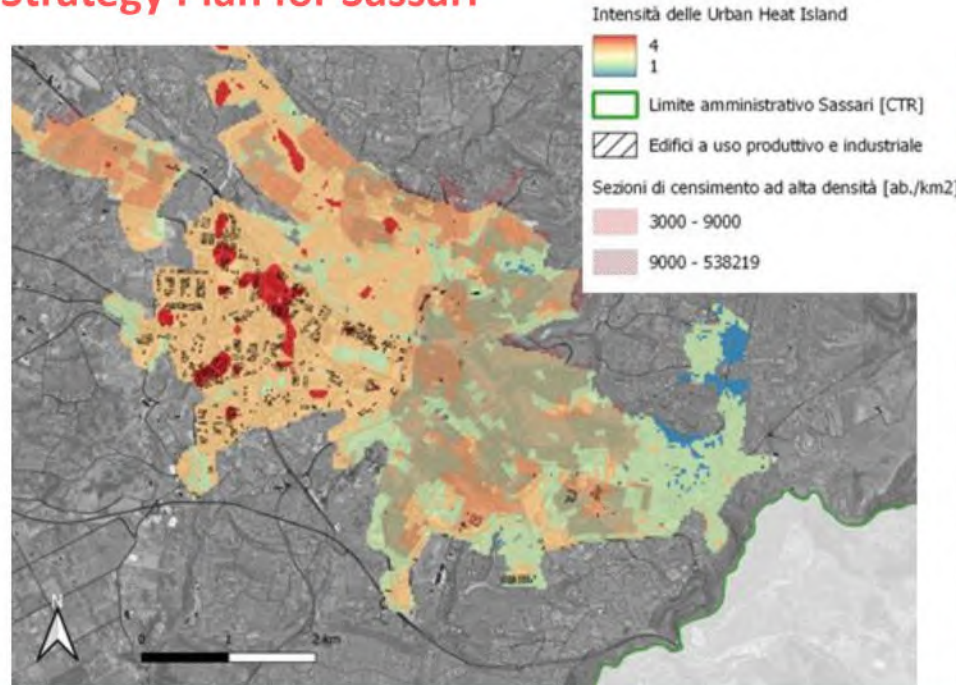
Local Adaptation Strategy Plan for Sassari

Remote sensing to obtain high-resolution land surface temperature



Landsat-8

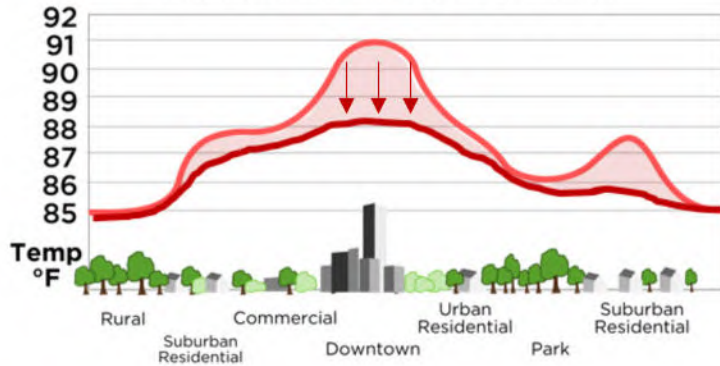
Davide Morale (PhD Candidate)



Identifying adaptation measures for a resilient built environment



URBAN HEAT ISLAND PROFILE



Urban environment features

Geometries

Materials

Traffic and domestic heat flows

Local adaptation of UHI will be essential to offset climate change impacts

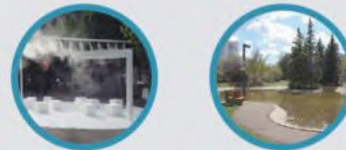
Green measures

Based on ecosystem and their services, mainly relying on existing or restored ecosystem functions. They use vegetated elements to deliver ecosystem services (e.g. microclimate regulation) and reduce climate impacts.



Blue measures

Based on ecosystem and their services, mainly relying on existing or restored ecosystem functions. They use water elements to deliver ecosystem services (e.g. water regulation and reduction of runoff) and reduce climate impacts.



Grey measures

Rely fully on infrastructure and engineering-oriented responses to reduce the climate impacts on people and assets. These include creating engineered physical structures or modifying existing infrastructure to make it more capable of withstanding extreme events.



Apreda & Ricciardi (credits)

Identifying adaptation measures for a resilient built environment

Solar Reflectance Index (SRI) of **roof surfaces** exposed to direct radiation

Cool roof



Extensive green roof



Intensive green roof



Solar Reflectance Index (SRI) of **paved surfaces** exposed to direct radiation


Cool pavers




Water elements




Wetting surfaces



Private green garden



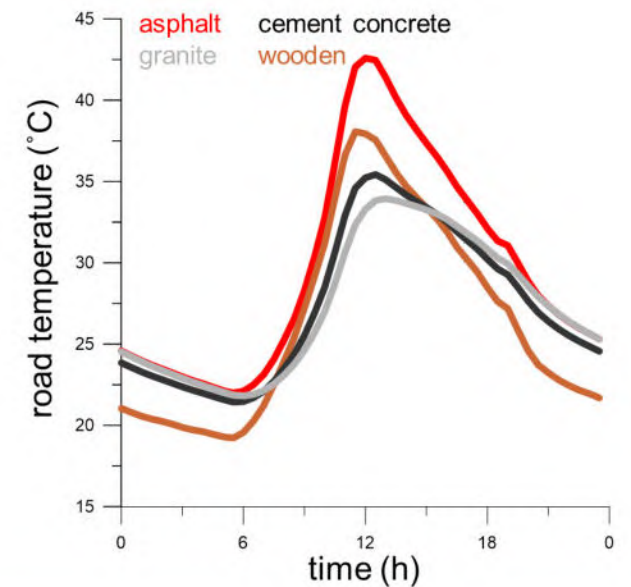
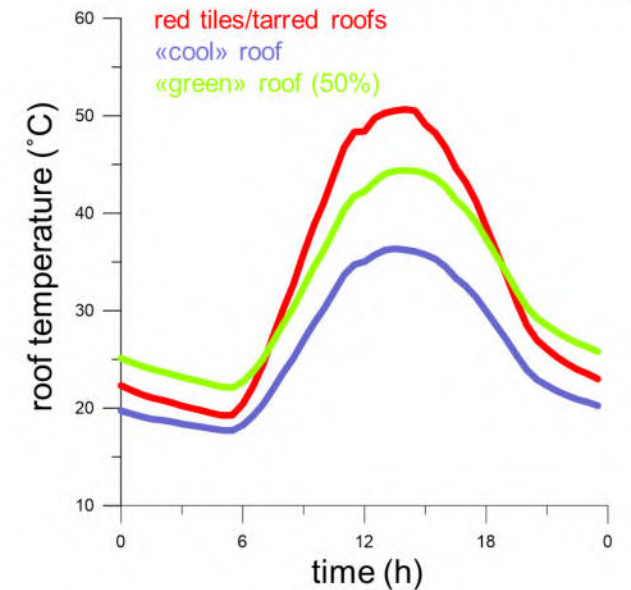
Green outdoor space



Permeable pavement



Apreda & Ricciardi (credits)



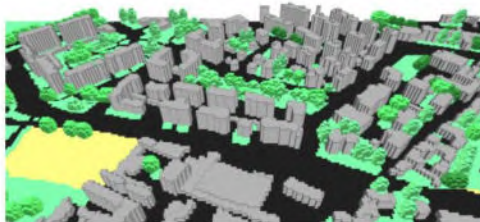
Urban microclimate modelling



Brescia – Via Metastasio

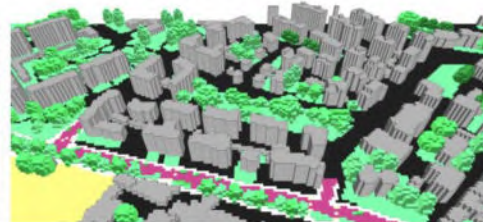
Scalas et al. (2024)

Without adaptation solutions



- Asfalto Roads - Asphalt
- Nude soil
- Vegetation - Low grass (max 25 cm)
- Trees

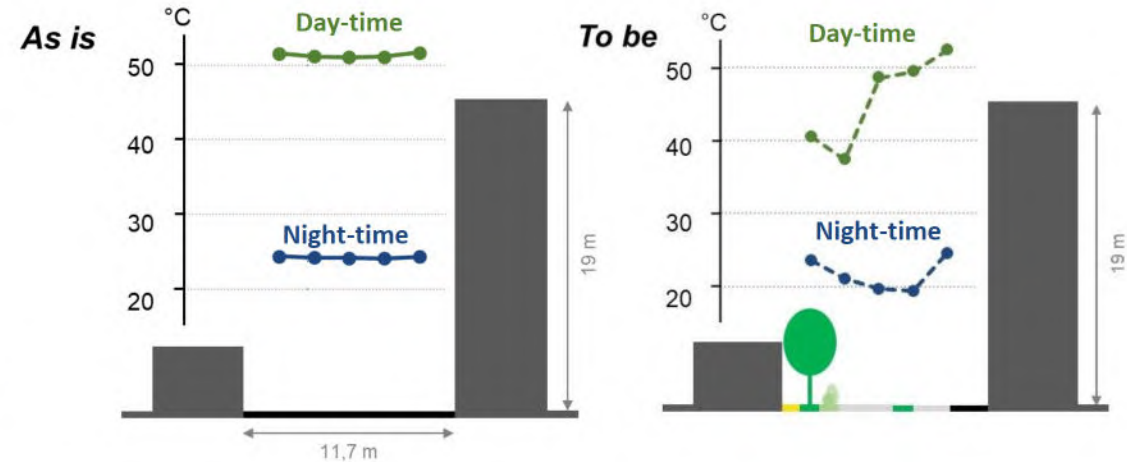
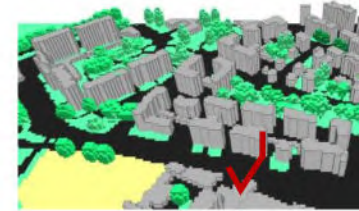
With adaptation solutions



- WALKWAYS - Colored resin with high albedo (light color type RAL9003)
- Roads - Asphalt
- Tactile paving - Yellow concrete paving slabs
- Shrubs/Bushes
- Vegetation - Low grass (max 25 cm)
- Trees (*Platano occidentalis*, *Acer platanoides*)

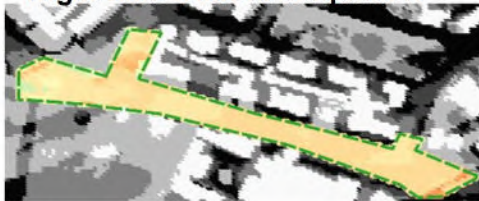
ENVI
_MET

Section B-B'

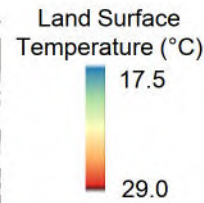
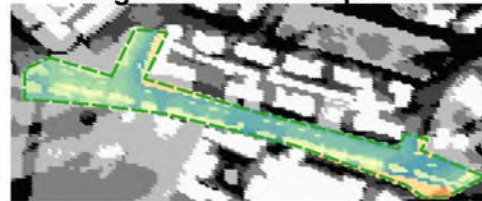


- STREET - Asphalt
- SIDEWALK - Coloured resin with high albedo (light coloured, RAL9003)
- STREET - Asphalt (new stratification)
- EXISTING VEGETATION - Grass (max. height 50 cm)
- NEW VEGETATION - Grass (max. height 50 cm)
- RAIN GARDEN
- TREES (*Platano occidentalis*, *Acer platanoides*)

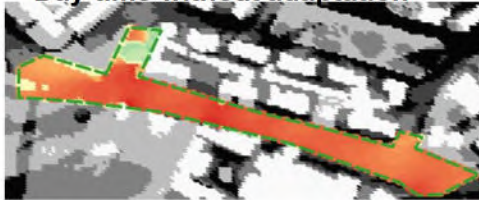
Night-time without adaptation



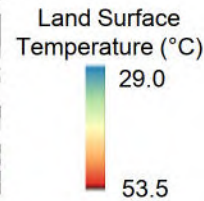
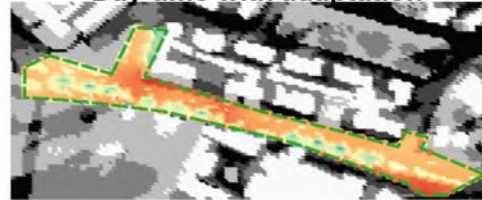
Night-time with adaptation



Day-time without adaptation



Day-time with adaptation



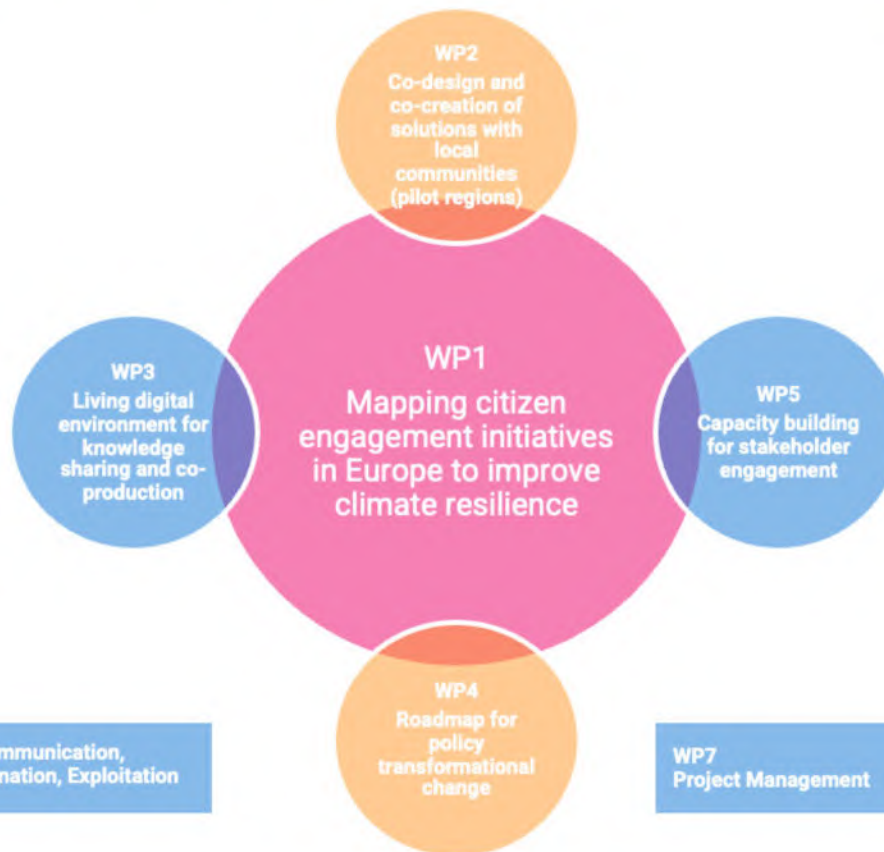
AGORA: Objectives and Main Achievements



ADAPTATION TO CLIMATE CHANGE



- **Creating digital tools** to foster engagement, learning and knowledge-acquisition
- **Testing citizen engagement methodologies**
- **Policy evaluation** and expert feedback on current strategic approaches



- **Tackling disinformation** and generating greater citizen empowerment
- **Improving collaboration** between stakeholders
- **Creating frameworks for co-design and co-creation** of climate adaptation strategies



JOIN US!

Coordinated by



AGORA Pilots

Living Labs and Pilot regions focus on citizens, but multi-stakeholder inclusion creates sustainable results that benefit all involved actors

AGORA conducts **in-person activities in specific contexts** to engage, build capacity, govern, and address disinformation in pilot regions, fostering co-design and co-creation of innovative climate adaptation solutions



Germany

Dresden, European Citizen Science Association (ECSA)

Sweden

Malmö, Stockholm Environment Institute (SEI)

Spain

Zaragoza (Ibercivis Foundation)

Italy

Rome, Euro-Mediterranean Center on Climate Change (CMCC)

Relevance

Credibility

Legitimacy

Collective
accountability

Understanding



Beyond the pilots, the AGORA followers

The AGORA team has been engaging with **multiple audiences** over the last months, ensuring a wide reach of different targets. In particular, in the Italian Pilot, meetings and capacity building events were organised with:

- **Young people** (university and school students)
- **Senior people** (civil society organisations of +65)
- **Ordinary and diverse citizens** belonging to associations (event on climate and mental health)
- **Prisoners**



AGORA Citizen Engagement Methodologies

- New database of citizen engagement initiatives
- Review and analysis of methodologies and implementation frameworks
- Protocols for conducting interviews or surveys with experts on citizen engagement in climate change adaptation
- Protocols for focus group activities with multi-ethnic groups, youth, and workers

Conversation-based

Interviews; Surveys; Focus groups; Meetings; Public hearings; Informal conversation spaces; Online forums; Webinars and live streams

Collaboration-based

Workshops; Civic hackathons; Participatory arts; Field data collection

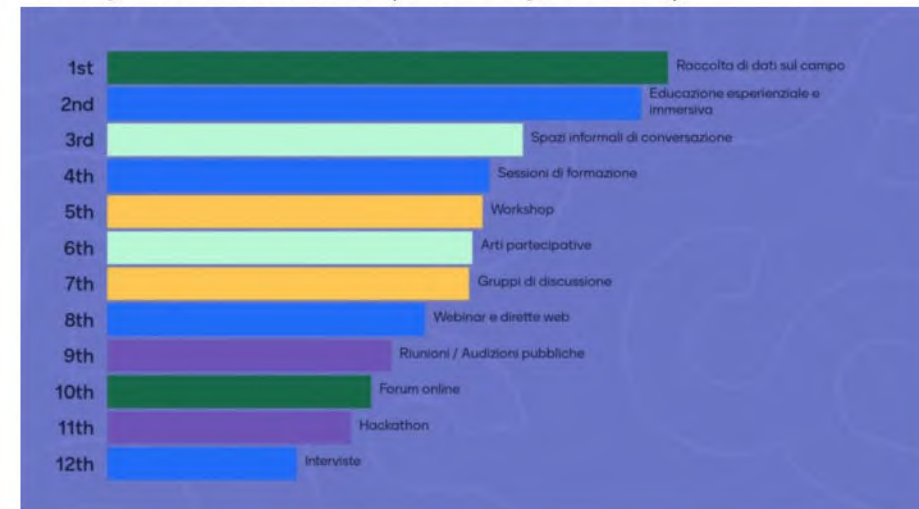
Training-based

Training sessions; Experiential and immersive education



<https://zenodo.org/communities/adaptationagora/records?q=&l=list&p=1&s=10&sort=newest>

Survey on 22 students (over 18 years old)



AGORA Digital tools



AGORA Community Hub

A meeting point to empower local communities to share needs, knowledge and experiences on climate adaptation issues and solutions.

The Agora Community Hub aims to:



Be a resource hub of information



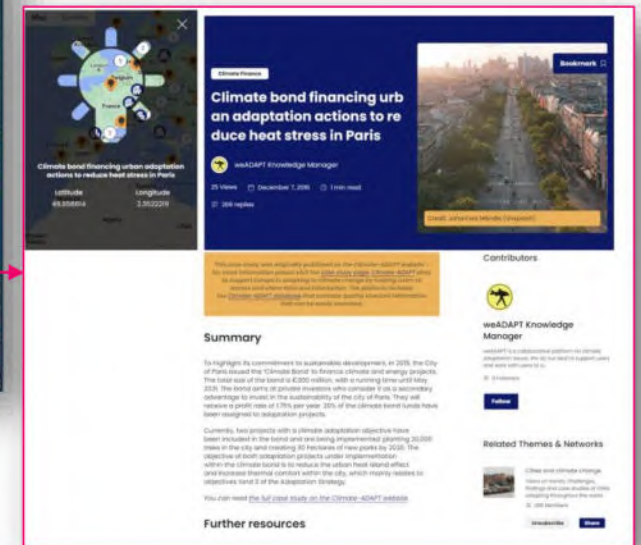
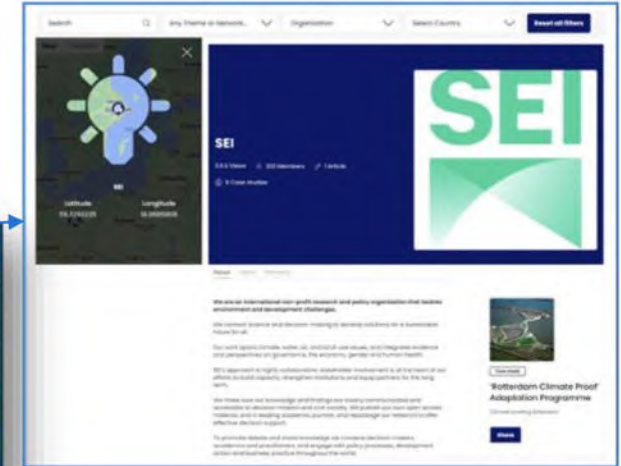
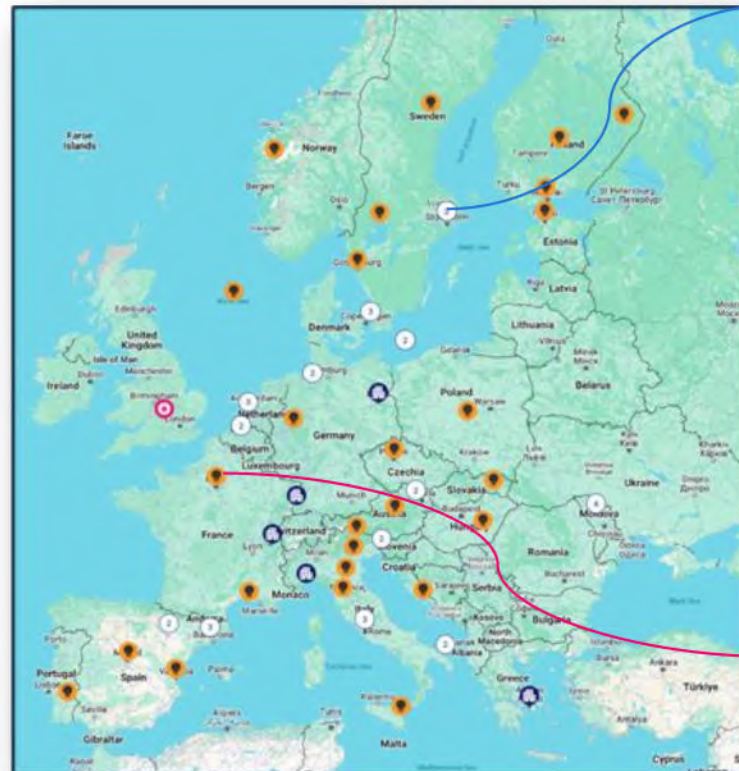
Become a co-designed platform with citizens and stakeholders



Be a place for networking, communication, and connecting with peers



Host dedicated discussion spaces and encourage/share knowledge co-production



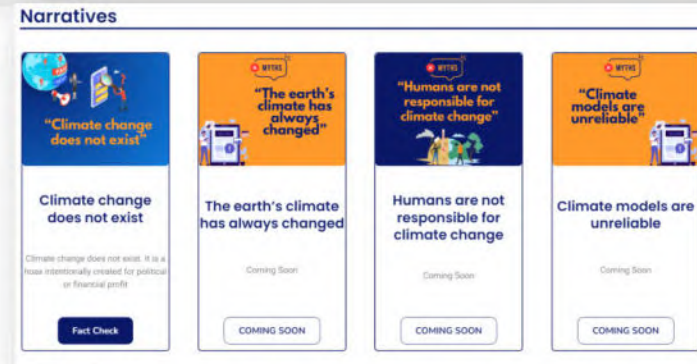
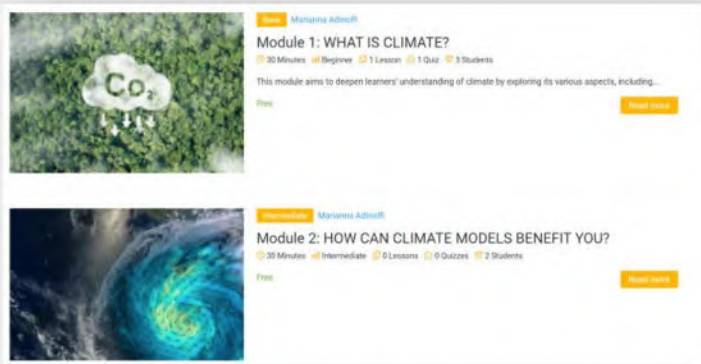
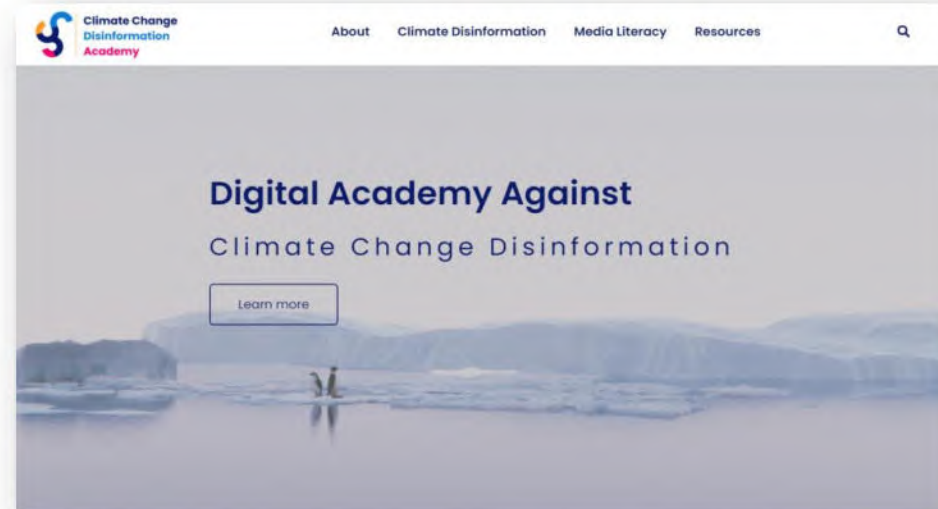
<https://agoracommunity.org/>



AGORA Digital tools



Digital academies: two capacity building and education tools to support citizens and stakeholders to **access open-source climate data** for adaptation and **tackle climate change disinformation**



<https://agoradigitalacademy.dataclime.com/>

<https://agoraclimatedisinfo.eu/>



Conclusions and take-home messages

- Addressing climate change requires coordinated, multi-level action grounded in reliable data, inclusive community engagement, and adaptable policy frameworks
- Local and national entities can support resilient communities that are better prepared for climate impacts.
- The successful implementation of climate adaptation strategies hinges on empowering citizens, integrating scientific research, and fostering collaborative environments where public and private sectors, alongside civil society, work together toward sustainable, climate-resilient futures.

Interreg



Co-funded by
the European Union

IPA South Adriatic

CLEAN

Workshop «EU Energy Policy and Recent Efficiency Directive Developments»

Thank you for your attention

Contact: alfredo.reder@cmcc.it

