ASHRAE Hellenic Chapter

ΤΕΕ

ENERGY IN BUILDINGS

EMEA 2024

Europe, the Middle East & Africa

FRIDAY - SATURDAY

NOVEMBER 22-23, 2024

@ 9:00-18:00

@ ATHENS GREECE

SESSIONS:

- SUSTAINABILITY
- HEALTH & SAFETY
- DECARBONIZATION
- TECHNICAL SOLUTIONS
- DIGITAL ENVIRONMENT
- POLICIES & LEGISLATION
- ENERGY EFFICIENCY FIRST
- RESILIENCE TO CLIMATE CRISIS

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Energy interventions that contribute to the climate-proofing of buildings on multiple scales

Maria Gavrouzou,

Environmental Research Laboratory EREL, NCSR Demokritos, 15310 Agia Paraskevi, Greece

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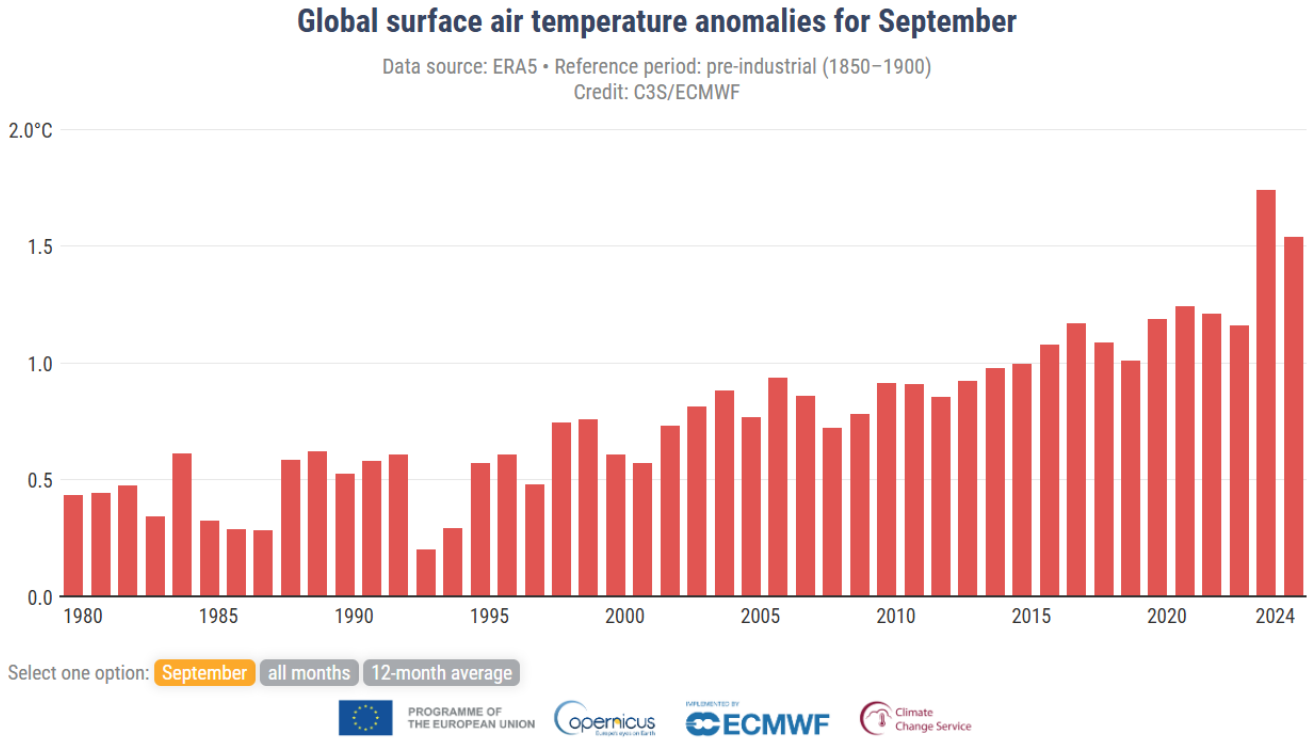
Natural Hazards related to climate change

Climate change is happening now…



- September 2024 was the **second-warmest September globally** in the ERA5 dataset, after September 2023.
- **Europe** saw also the second warmest September on record.
- Much of the continent experienced **above-average precipitation**, with Storm Boris causing heavy rainfall and **flooding in Central and Eastern Europe**.

Natural Hazards related to climate change

Climate change is happening now…

- Extreme weather and climate-related events caused economic losses of around EUR 650 billion in the EU Member States from 1980 to 2022 (European Environmental Agency).
- Around EUR 59.4 billion in 2021 and EUR 52.3 billion in 2022, are not expected to decrease by 2030.
- Weather and climate hazards resulted in between 85,000 and 145,000 fatalities over the same period in the 32 EEA member countries.

Recent floods in Spain:

- The Valencia region was worst affected, with many places receiving more than 300 l/m².
- More than 200 deaths (still counting).
- Tens of thousands of people in Valencia were without power and transport was disrupted.
- 4,500 businesses located on the ground floors of buildings submerged by mud and water were affected
- 50,000 hectares of crops were affected

Co-funded by the European Union

Natural Hazards related to climate change

IPCC predictions show that extreme heat, heavy precipitation, aridity, droughts, windstorms, and fire weather will become more frequent in most of Europe. Moreover, the concentration of CO_2 at the surface is projected to increase in all climate regions. These predictions are mainly of high and medium confidence.

CID	NORTHERN EUROPE	WESTERN & CENTRAL EUROPE	MEDITERRANEAN
Extreme heat	HC (↑)	HC (↑)	HC (↑)
Heavy precipitation and pluvial flood	HC (↑)	HC (↑)	MC (↑)
Aridity	HC (↓)		HC (↑)
Hydrological drought		MC (↑)	HC (↑)
Agricultural and ecological drought		MC (↑)	HC (↑)
Severe windstorm	MC (↑)	MC (↑)	MC (↑)
Fire weather	MC (↑)	MC (↑)	HC (↑)
Atmospheric CO_2 at surface	HC (↑)	HC (↑)	HC (↑)

Source: IPCC, Atlas

Effects on Building Stock in Europe

- The abovementioned climate impacts affect, among others, the **built environment**.
- Over 85% of the buildings in Europe were constructed before 2001 (**old buildings**).
- Most of them are **not energy-efficient** (they account for approximately 40% of the **energy consumption** in the EU, are susceptible to **heatwaves**).
- **Intense rain** has indirect and direct impacts on buildings.
- ≈30% of southern Europeans permanently struggle with **water scarcity** and that for 70% of the population, these problems only arise in the summer (European Environmental Agency).
- In 2023 thousands of **buildings were destroyed**, and tens of thousands of residents and tourists were evacuated because of wildfires in Greece.

Energy interventions for climate-proofing built environment

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MULTICLIMACT (MULTI-faceted CLIMate adaptation ACTions) project aims to:

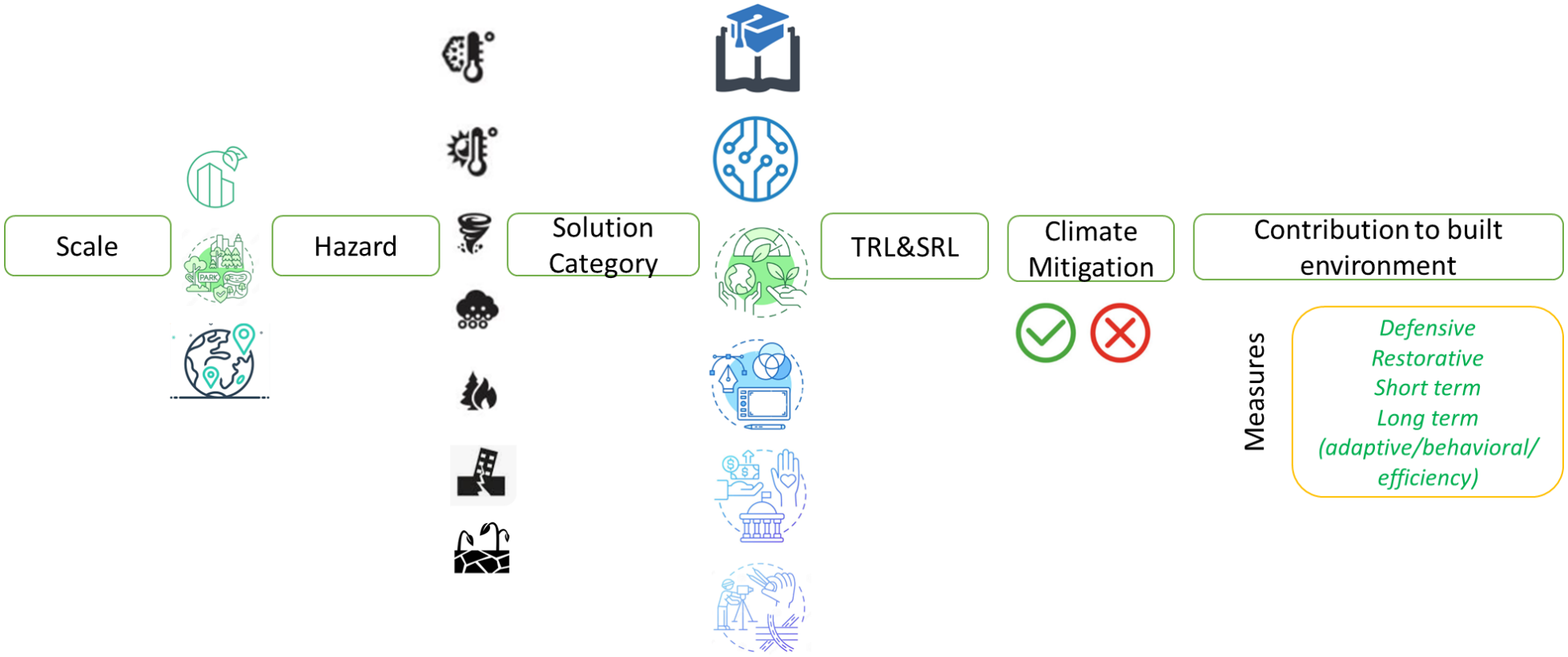
- Assist citizens and stakeholders in evaluating the built environment and its inhabitants' resilience against locally relevant natural and climatic hazards.
- Improve their preparedness and responsiveness throughout their lives.

In this context:

- An overview of the existing **energy solutions for climate-proofing** (climate change mitigation and climate adaptation) in the built environment was synthesized.
- This overview draws on a variety of sources, **including scientific papers and reports**; **guidelines** and **tools** from the European Union
- The solutions that have been found are examined concerning the Technology Readiness Level **(TRL)** and Societal Readiness Level **(SRL)**, their role **in enhancing the resilience** of the built environment and **mitigating** the effects of climate change, the **hazards** they seek to address, the **range of applications** they can be used for as well as their **effectiveness**, **affordability** and **implementation**.

Energy interventions for climate-proofing built environment

Structure of the Desk Review



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Energy interventions for climate-proofing built environment

In total, 30 energy solutions were retained and proposed.

Light-coloured and reflective materials

Shading devices

Demand and response programs

Parks

UFPUS

Street trees

Materials with high thermal mass

Adopted public spaces

OBREC

QoAir

Amenity areas

Electrical and mechanical systems and utilities above flood level

Fire-resistant building materials

Passive dampers

Natural ventilation

Adequate insulation

Reforestation

Geo-cooling and heat pumps

eEM-DAT

Natural daylighting

Energy communities

Energy storage

Cool roofs and ventilated roofs

Renewable energy

Active cooling ventilation

Myclimateservices.eu

Balcony/private garden

Sensors

Passive ventilation through thermal chimneys

Best solutions (pros and pons)

How easy is to select best solutions?

What determines the efficacy of the solutions?

What is the most common difficulties in the implementation?

How much does it cost to implement these solutions?

What is the maintenance cost?

Do all solutions fit to all buildings?

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Conclusions and Perspectives

- There are many energy solutions that can contribute to the climate-proofing of built environment (*more details in **Gavrouzou et al., 2024***).
- The selection of best practices demands detailed investigation (building typology, climate risk assessment, feasibility study).
- This work will be conducted in the next phases of MULTICLIMACT project for Camerino municipality.
- Results will be published in future work.

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THANK YOU!

Q & A

NAME: Maria Gavrouzou
EMAIL: m.gavrouzou@ipta.demokritos.gr
Website: https://mssg.ipta.demokritos.gr/climate-erel/

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