

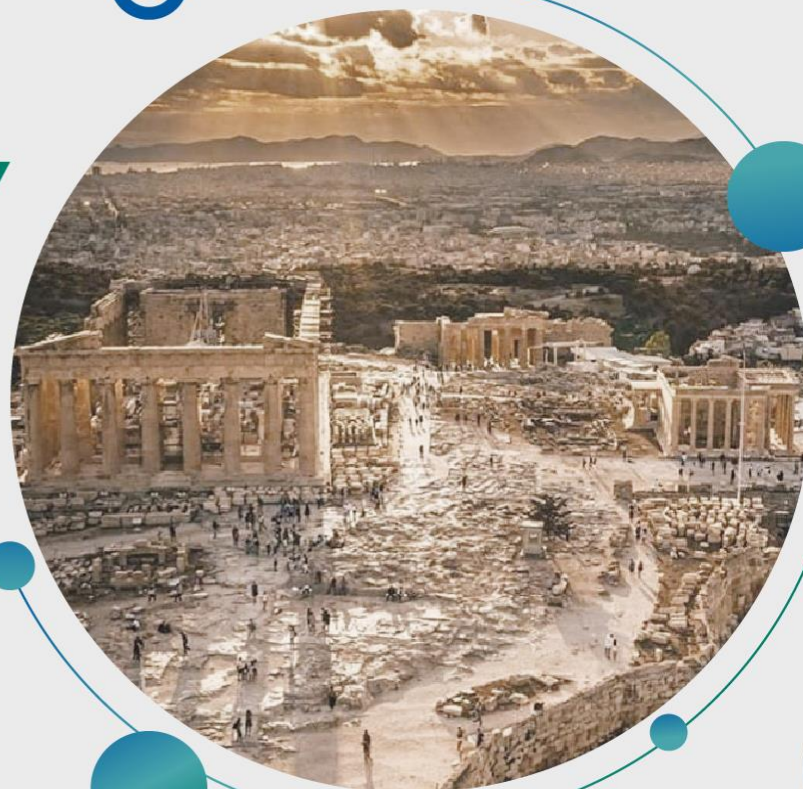
Urban Heritage Climate Observatory

A GEO Community Activity

Dr. Evangelos Gerasopoulos
National Observatory of Athens
(egera@noa.gr)

UHCO co-lead

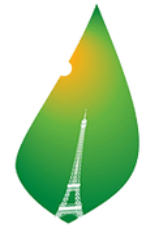
Director of the Greek GEO Office
Co-chair of GEO Programme Board



4th meeting of EU OMC group "Strengthening cultural
heritage resilience for climate change"

13-14 September 2021





PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11



GEO 2020-2022 WP

GEO
Flagships

GEO
Initiatives

GEO
Community
Activities

Regional GEOs

GEO Foundational Tasks



SENDAI FRAMEWORK
FOR DISASTER RISK REDUCTION 2015-2030

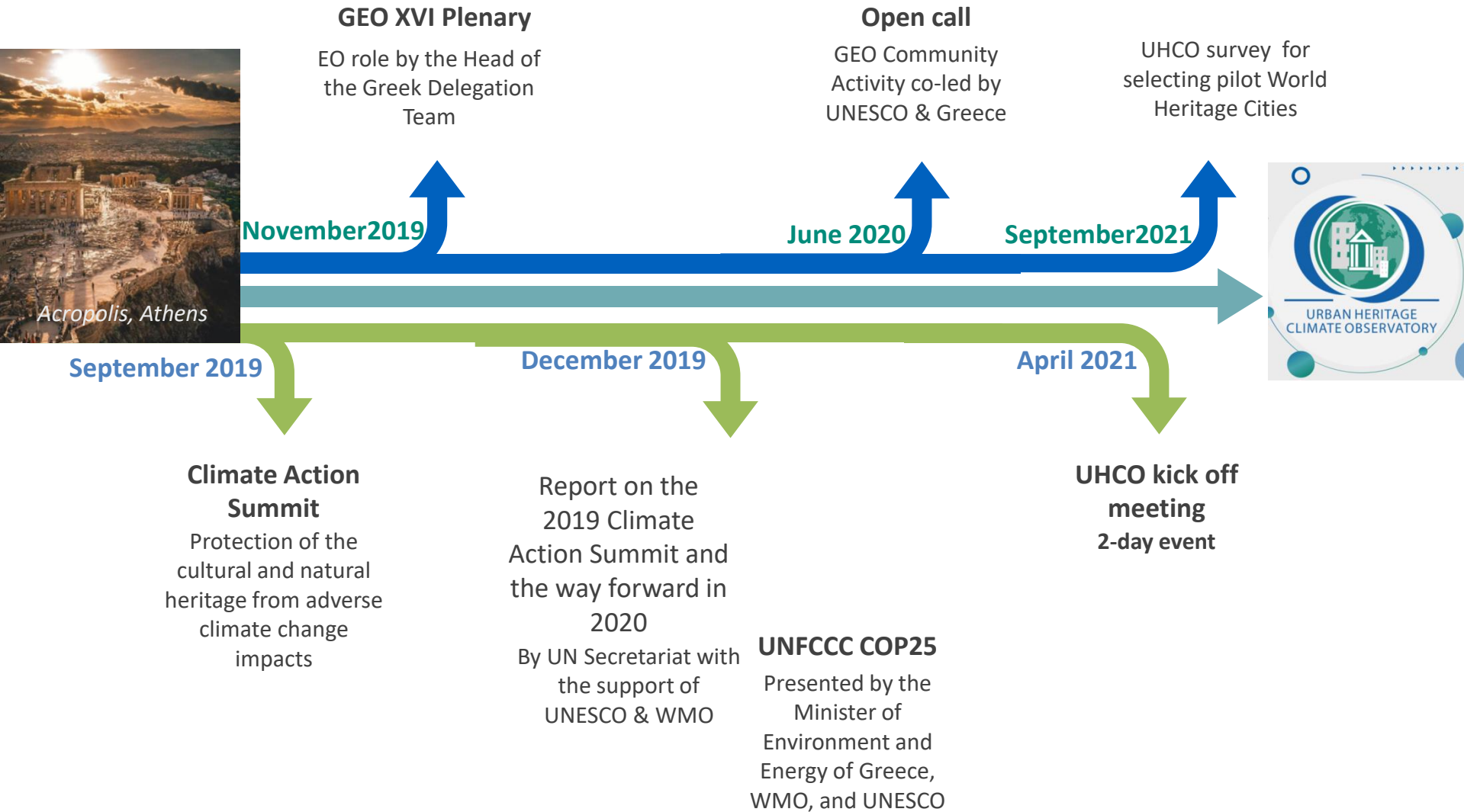


13/09/2021

4th meeting of EU OMC group:
**Strengthening cultural heritage
resilience for climate change**

Dr. Evangelos Gerasopoulos

History



13/09/2021

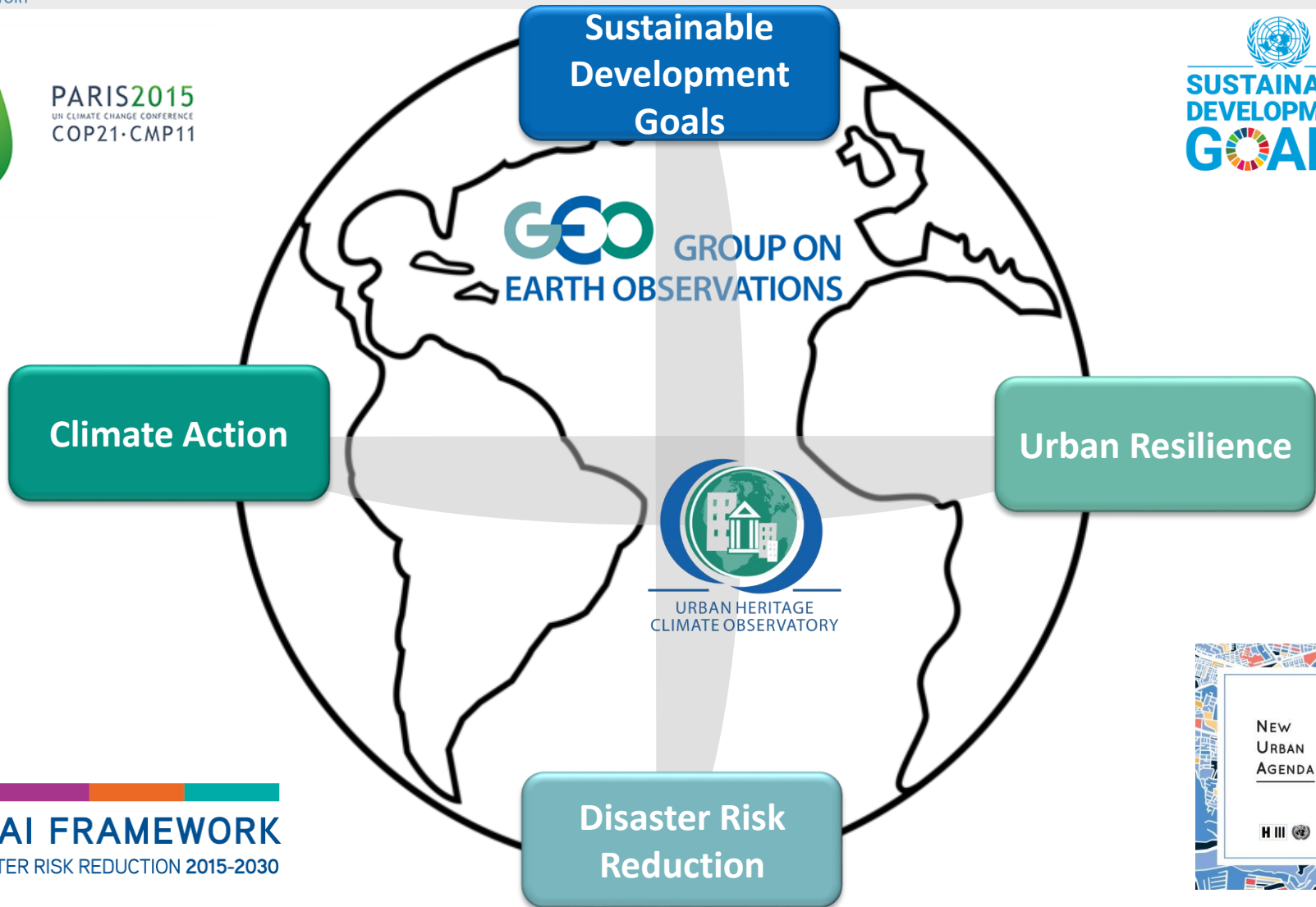
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UHCO as the vehicle



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11



SEDAI FRAMEWORK
FOR DISASTER RISK REDUCTION 2015-2030



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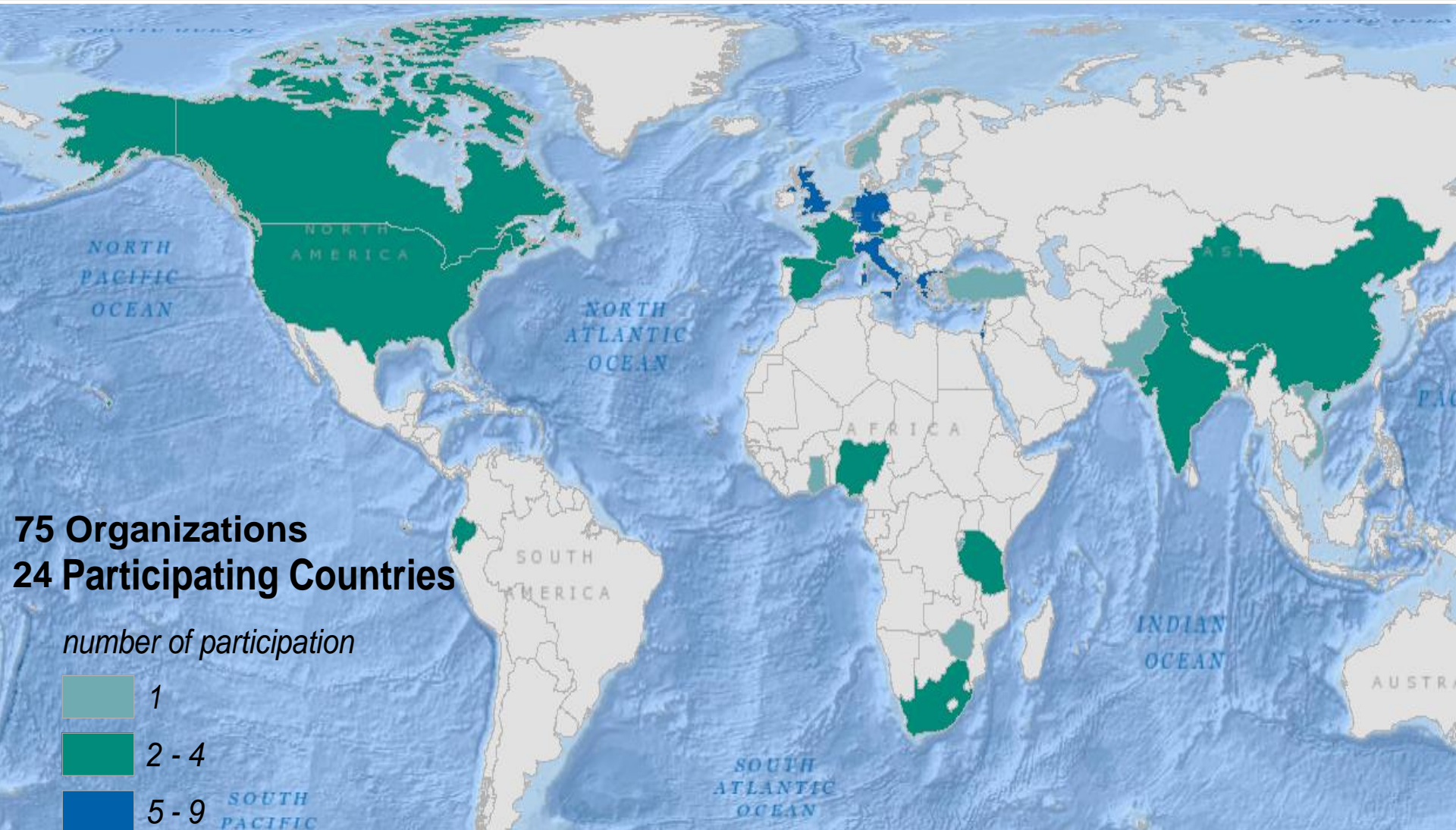
The importance
& vulnerability of
urban heritage

The urgency of
climate change



The untapped
potential of EO

Consortium



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2020-2022 GEO Work Programme

Starting in December 2018, the GEO Programme Board led an inclusive and iterative process to develop the 2020-2022 GEO Work Programme. This Work Programme was approved at the GEO-XVI Plenary, 6-7 November 2019 in Cebu, Philippines. Download the [Summary Document \(version 4\)](#), which contains short descriptions of each of the GEO Flagships, Initiatives, Regional GEOs, Community Activities, and Foundational Tasks that comprise the GEO Work Programme. Comments and questions relating to individual GEO Work Programme activities and their implementation plans should be directed to the Points of Contact of the applicable activities as listed in the Summary Document.

Those wishing to propose a new Community Activity to be included in the GEO Work Programme are invited to contact the GEO Secretariat (secretariat@geosoc.org)

Implementation Plans

GEO Flagships				UHCO			
GEO Global Operational Network		GEO Global Operational Monitoring		Global Operational Initiatives			
GEO-2024		GEO-2025		GEO-2026			
GEO Initiatives							
Geospatial		Data Science for Risk Management		Interdisciplinary and Cross-Sector			
GEO-2023		GEO-2024		GEO-2025			
Data Observability for Geo-Intelligence Development Tools		Data Quality & Validity for Geo-Data, Models, Tools, Software and Dash-Ins Integration		Data Global Operational Sustainability		Data Global Operational Sustainability	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
GEO-2023		Geospatial Operations and Global Collaboration		Global Geospatial Information System		Global Geospatial Information System	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
Global Geospatial Information System		Global Geospatial Information System		Global Geospatial Information System		Global Geospatial Information System	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
GEO Community Activities							
Monitoring & Assessment of Operations and Services		Data Science		Data Science		Data Science	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
Data Observability and Monitoring for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
Monitoring and Assessment of Operations and Services		Data Science		Data Science		Data Science	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
Data Observability and Monitoring for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
Data Observability and Monitoring for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
Data Observability and Monitoring for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
Regional GEOs							
Africa Group in GEO-2023		Africa Group in GEO-2024		Africa Group in GEO-2025		Africa Group in GEO-2026	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	
Foundational Tasks							
Data Observability and Monitoring for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development		Data Observability for Geo-Intelligence Development	
GEO-2023		GEO-2024		GEO-2025		GEO-2026	

Urban Heritage Climate Observatory

UHCO



75 Org
24 Par

num

1

2 - 4

5 - 9

https://earthobservations.org/documents/gwp20_22/UHCO.pdf

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Objectives

Floods in Venice (UNESCO)

Enrich & modernize processes for the preservation, monitoring, management of urban heritage exploiting EO

Use a bottom up approach to inform global decisions & develop a global service to assist local practitioners in tackling climate change impacts to urban heritage

Communication & advocacy around climate action

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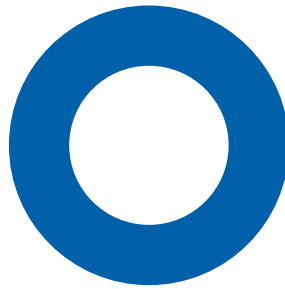
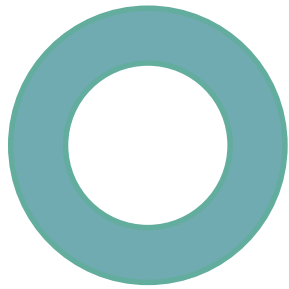
Dr. Evangelos Gerasopoulos

Planned activities

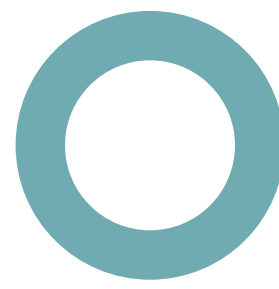
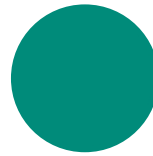
- ✓ Open invitation launched by GEO
- ✓ Exchange of letters between GEO & UNESCO
- ✓ Implementation Plan development

- Pull resources for global platform
- Pilot refinement
- Building awareness, training & education

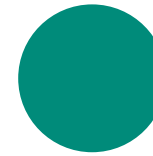
2020



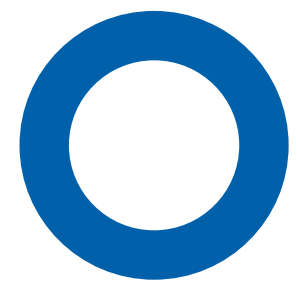
2021



2022



2023 & beyond



- Launch of UHCO
- **Define working groups & actions**
- **Collection of needs, data & global good practices**
- **Identify & select pilot sites**

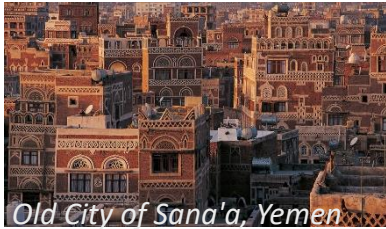
- Define frame of indicators
- Initiate pilot implementations
- Conceptualization of global platform

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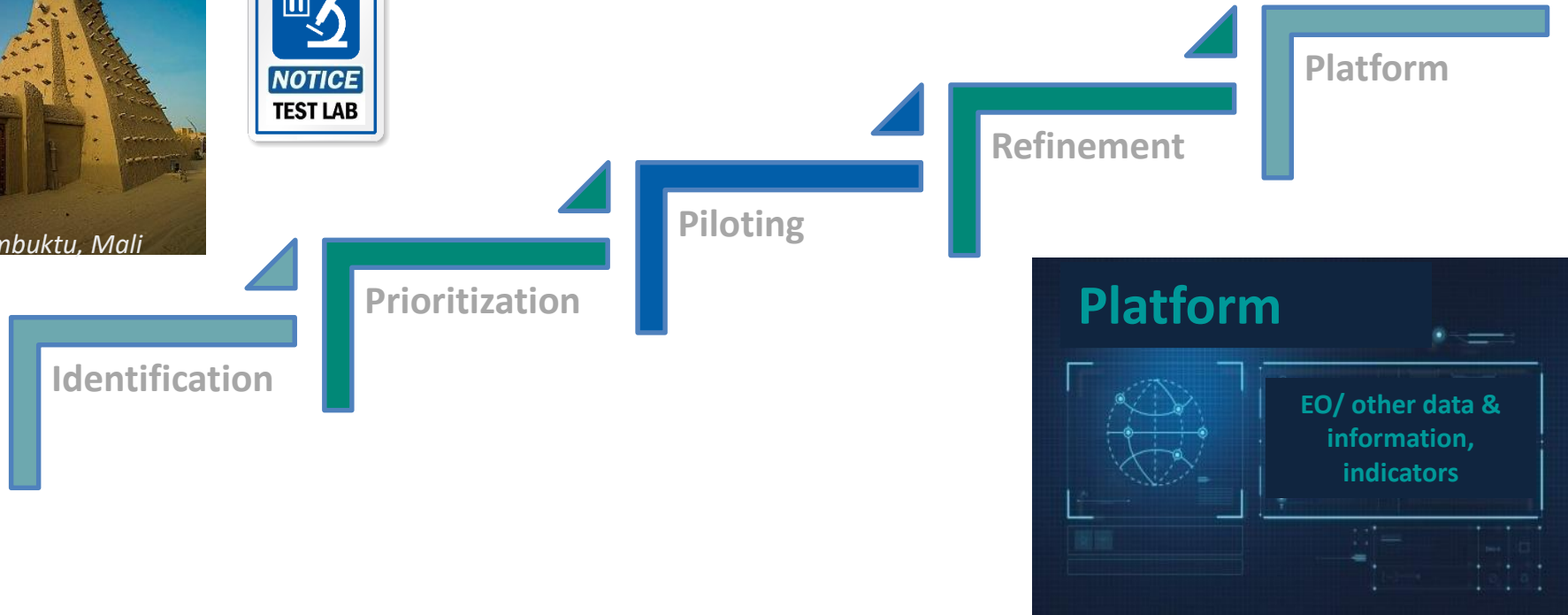
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UHCO “laboratory” sites



Bridge geographical scales, integrating a global EO-based approach into local practices and conversely informing the global platform with local experiences.



ECMWF Copernicus & UHCO

Copernicus Climate Change Service (C3S)

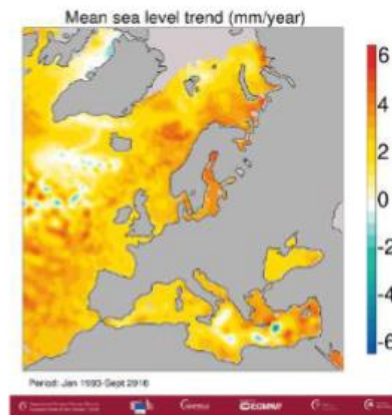
C3S can support cultural & natural heritage sector with **open & free access to climate data**, analysis **tools**, climate changes **assessments** & specific climate **indicators**.

C3S core data offering

- Observations (based on satellite and in-situ data)
- Reanalysis data “maps without gaps”
- Seasonal forecasts
- Climate projections

User Engagement

- **Online user consultation workshop 1-2 July 2021**
- **“Impacts of climate change on Cultural Heritage in Europe”**
- Understand CC challenges for CH community in Europe
- Identify data & information needs to meet these challenges
- For more information, chris.stewart@ecmwf.int



High water in Venice.

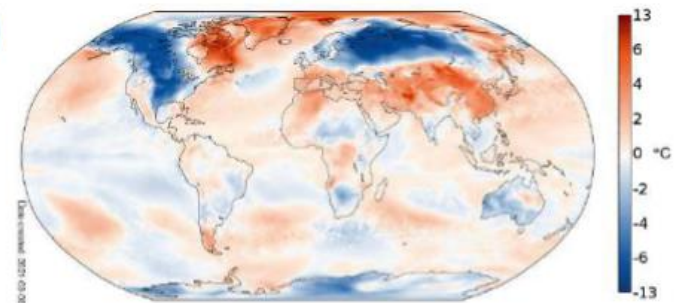


The acropolis of ancient Corinth in Greece, after a fire.

Copernicus Atmosphere Monitoring Service (CAMS)

CAMS core data offering

- Concentrations in air of particles and gas species
- Deposition fluxes
- UV radiation
- Active fires and emissions from fires
- Past (to 2003 global), forecasts to 4 (Europe) or 5 (World) days ahead





Satellite Services



DLR & UHCO

Selected DLR activities in this context

ATHENA (H2020 Project)

Remote Sensing for Cultural Heritage
(Twinning Project led by Cyprus
University of Technology –CUT-)

NAVIGATOR

(EU RESTART 2016 – 2020 Project)

Copernicus EO Big Data for CH
(Project led by CUT)

Cooperation with German
Archaeological Institute (DAI)

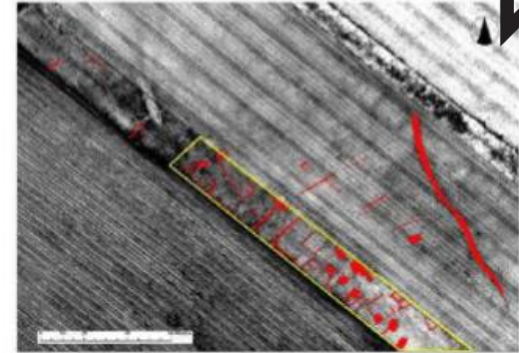
Monitoring Palmyra damage assessment

(TU Vienna & ARTE/ZDF TV-feature)

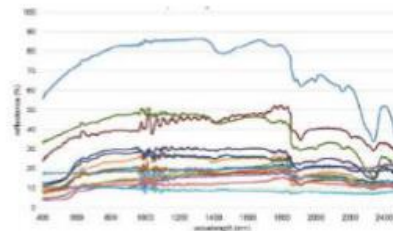
Cultural Heritage WP in EXCELSIOR
project (Creation of RS CoE in Cyprus)



Monitoring ISS
Damages in Palmyra



Evaluating Spectral
Indices for Crop Marks



Spectral Database
of Mosaics



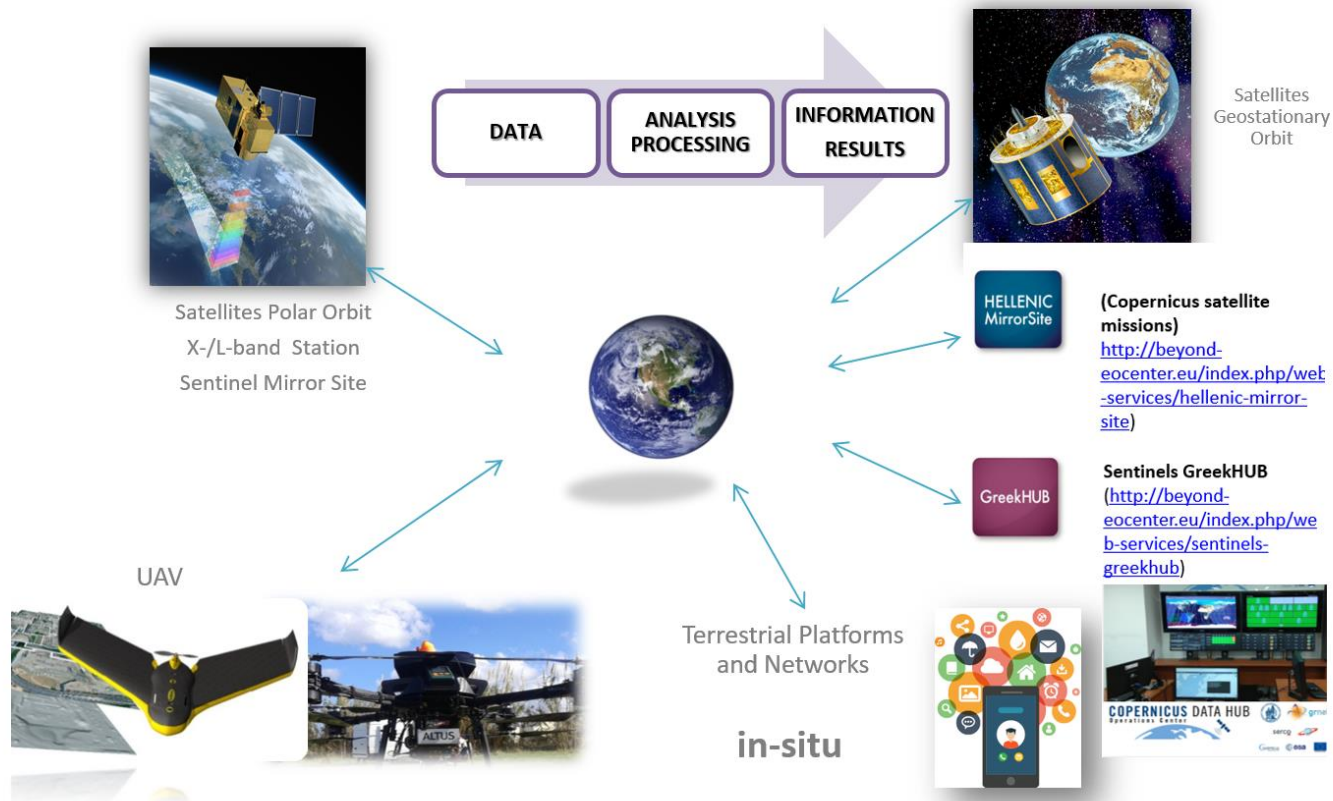
Bathymetry: the
submerged harbour of
Amathus (Cyprus)

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- **BEYOND EO Center Serves Copernicus EMS: Preparedness, Vulnerability and Risk Assessment, Recovery, and Mitigation Planning Services have been delivered to > 20 Civil Protection Authorities worldwide!** Activation of the EMS service by UNESCO for assessing the exposure, vulnerability and risk in three different regions - Arica (Chile), Tacna (Peru) and Maputo (Mozambique)- in order to protect the local communities.

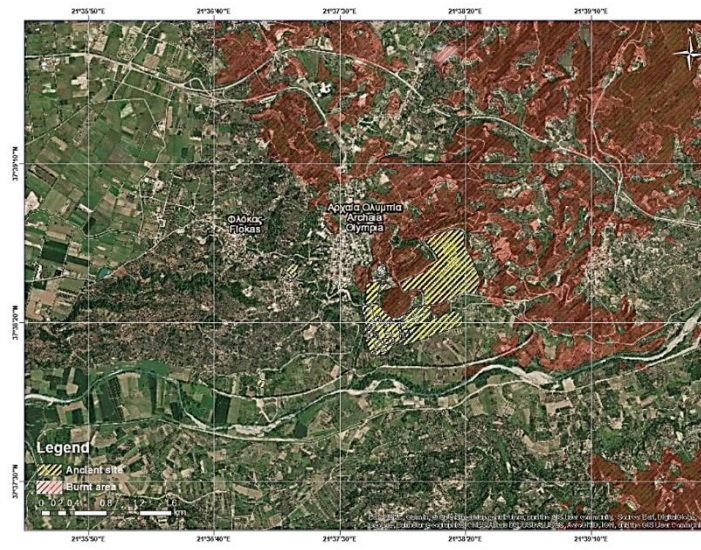


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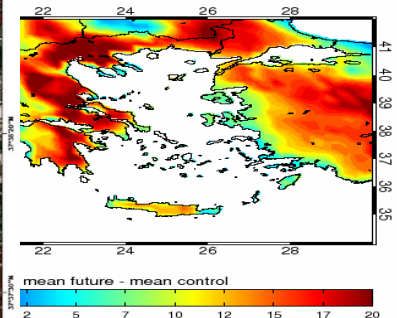
Landslide Assessment in Pelion-Greece



Post fire damage assessment of the archeological site in Ancient Olympia (summer 2007)



Number of days with extreme Fire weather Risk

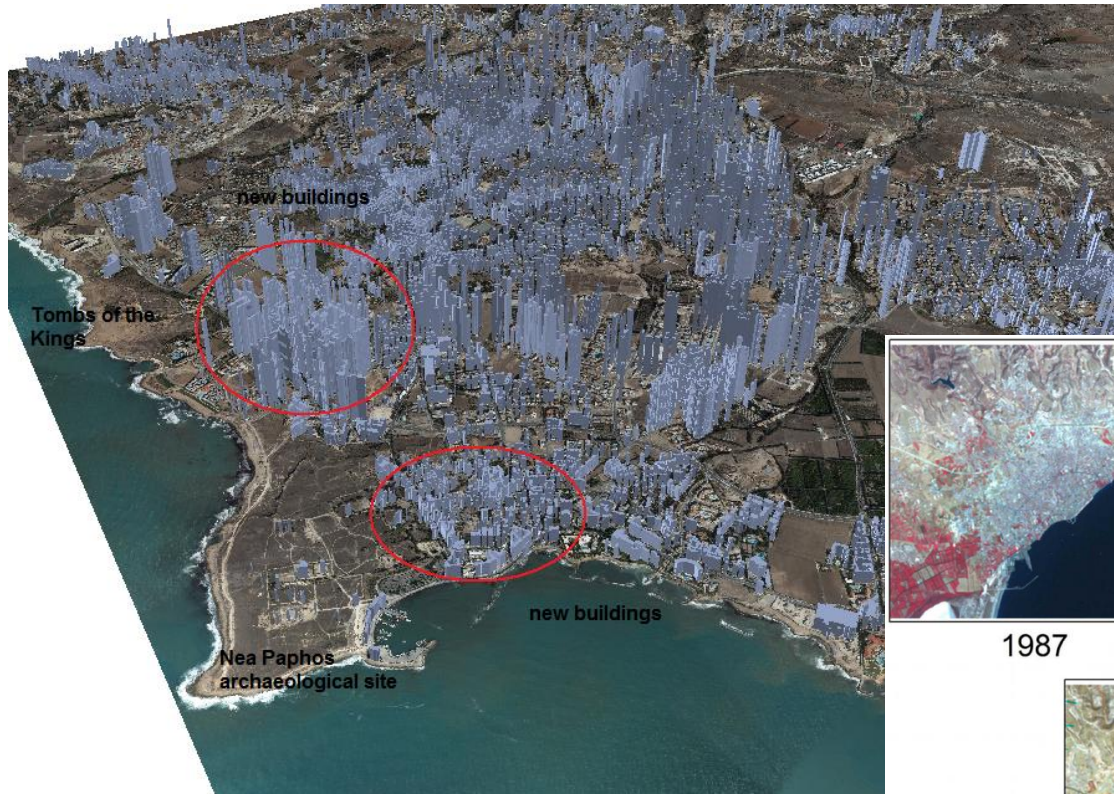


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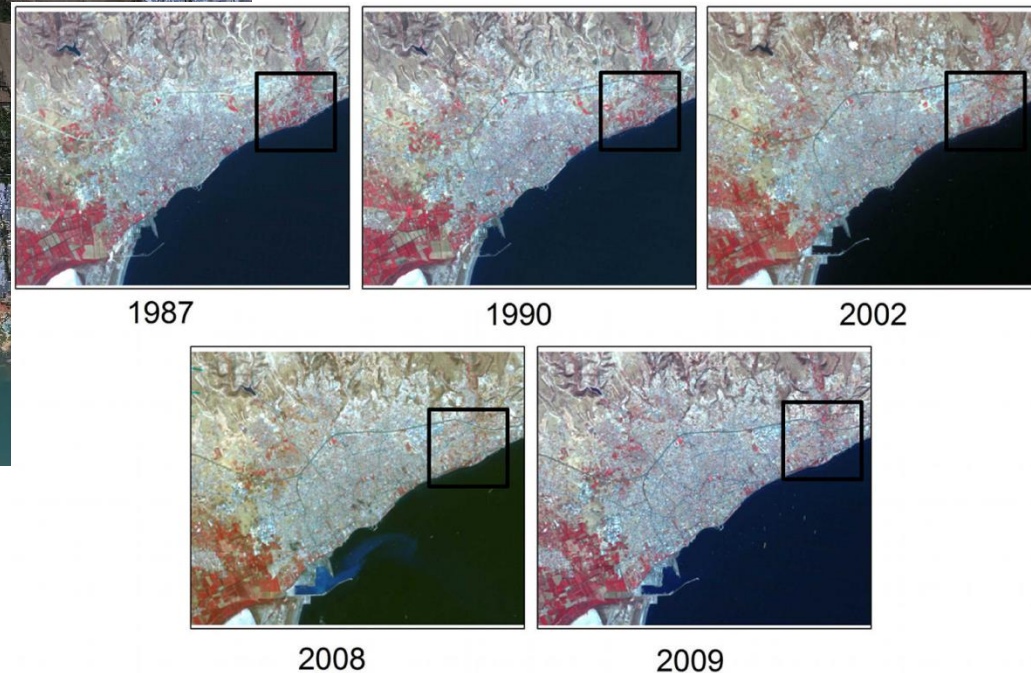
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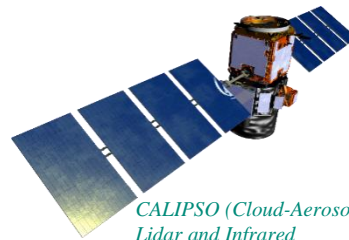
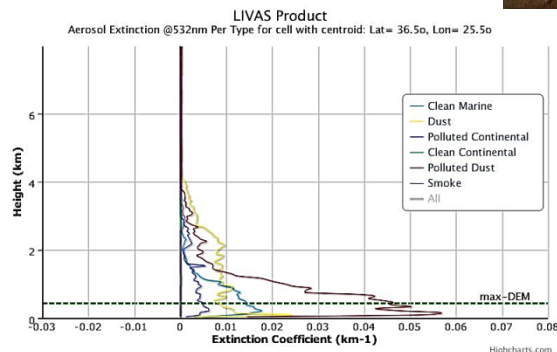
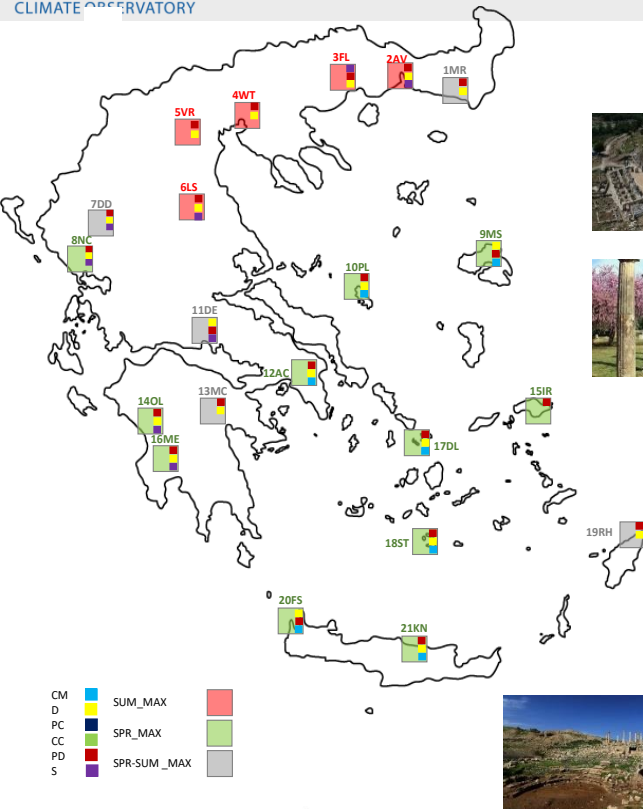
Urban expansion of Limassol town



Landsat images used for mapping the urban expansion of Limassol town during the last 30 years. *Amathus* archaeological site is indicated in a square



Hadjimitsis et al. *Remote Sensing for Archaeological Applications: Management, Documentation and Monitoring*
Cyprus University of Technology



CALIPSO (Cloud-Aerosol
Lidar and Infrared
Pathfinder Satellite
Observation)

Distribution of aerosol pollution

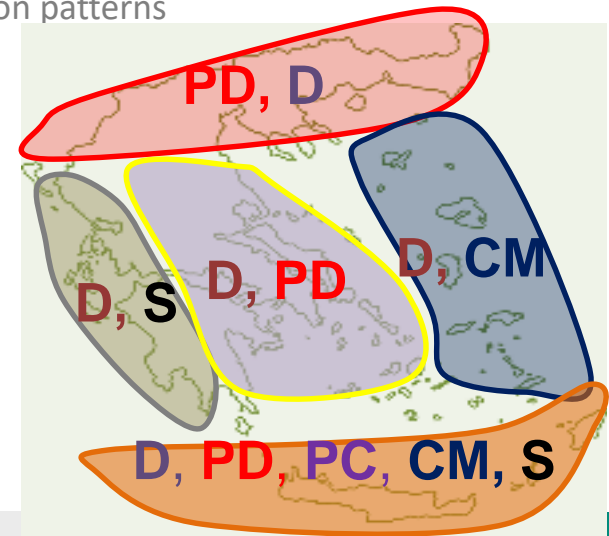
North Polluted dust + dust / more likely formation of black crusts

West: Dust + elevated levels of smoke / possibly abrasion and soiling

Central: Dust + polluted dust / more likely formation of black crusts, abrasion and soiling

East: Dust + clean marine / probably formation of salt crust

South: Most of aerosols components / various deterioration patterns



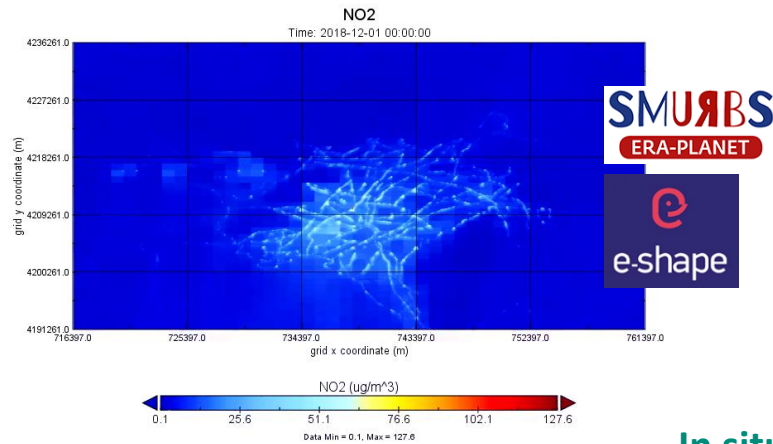
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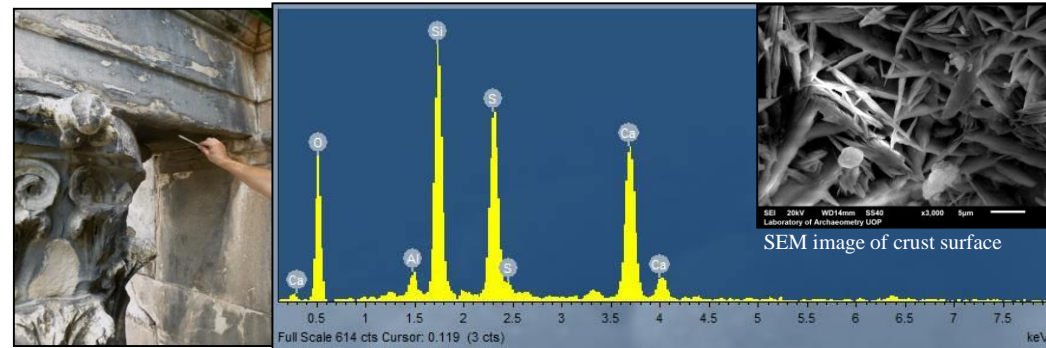
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Synergistic viewpoint that combines multiple observational, laboratory and computational platforms, incorporating new technologies such as the Internet of Things (IoT), Unmanned Aerial Vehicles (UAV), Citizen Science and more.

City-scale modeling applications (100m by 100m)



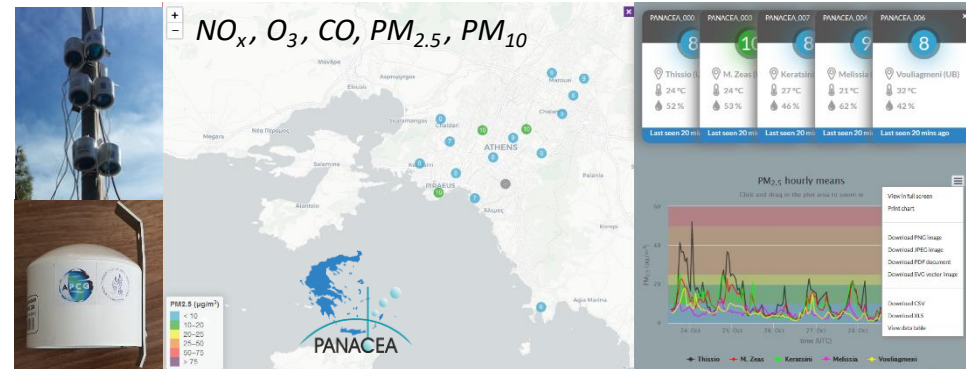
Sampling & Lab Analyses



In situ, IoT, crowdsourcing



*Aerodyne ACSM, Picarro
CRDS (aerosol sizes, GHGs)*



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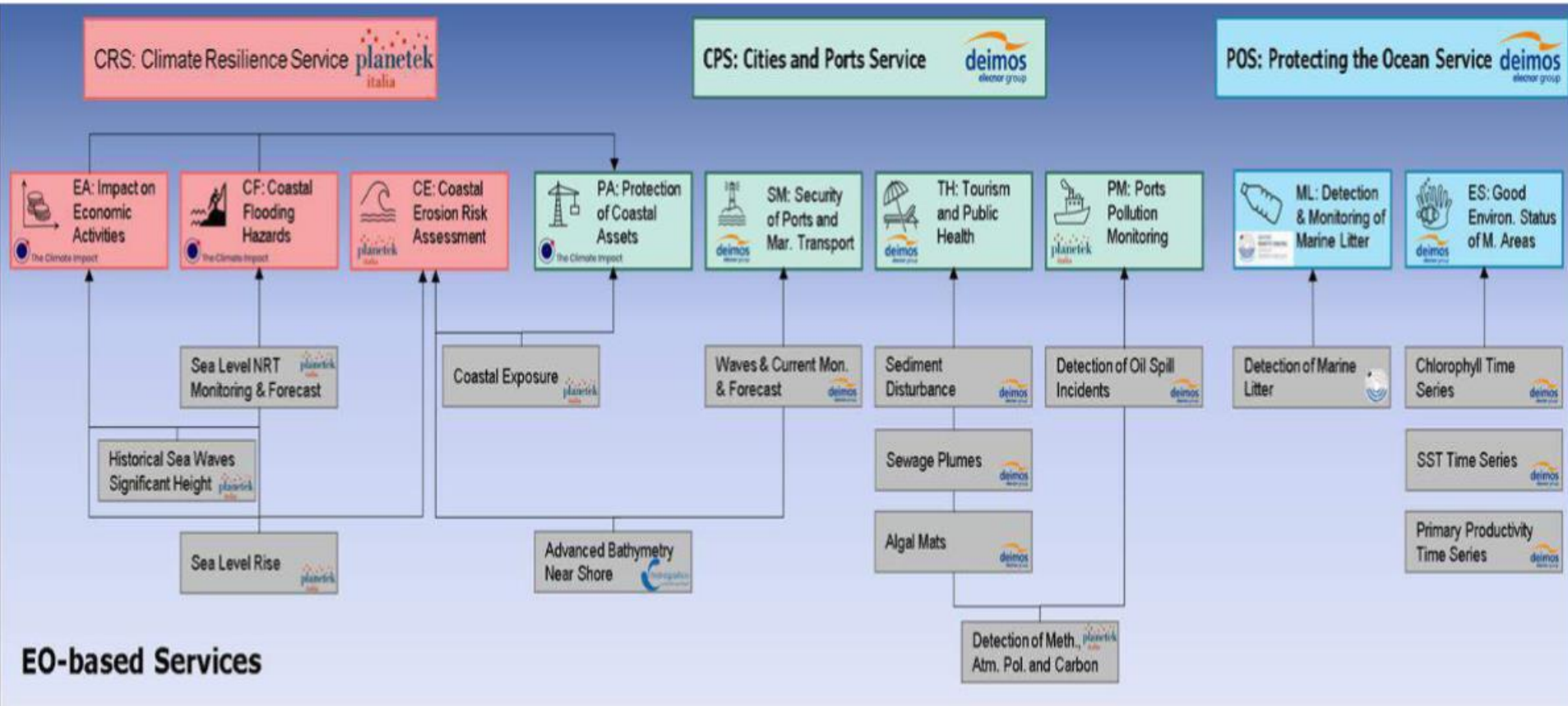
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Deimos & UHCO

Atlantic Regional Initiative: Atlantic cities

ESA project, 2 years, with 6 pilots



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Private Sector

ITACA - Innovation Technologies & Applications for Coastal Archaeological sites (past project)

Discovering and monitoring service using innovative EO techniques combined with image processing algorithms.

ECFAS - A potential new tool for Copernicus: A European Coastal Flood Awareness System (on-going project).

Will provide a much-needed solution to bolster coastal resilience to climate risk and reduce population and infrastructure exposure by monitoring and supporting disaster preparedness.

Rheticus[®] (commercial service)

An automatic cloud-based geo-information service platform, designed to provide information (at monthly up to a daily base) on territorial changes, urban dynamics and land use changes, ground displacements (landslide and subsidence), infrastructure stability, new infrastructure and construction areas, wildfire burned areas or coastal sea waters quality, aquaculture.

Early warning systems for extreme weather events

- Especially at points of cultural heritage

Earth APIs

- Satellite products provision through native DRAXIS Platform
- Climate, Digital Earth services through Web and GeoSpatial APIs
- Cloud based Infrastructure

Integrated Remote Sensing

- Farm management information systems
- Development of E-gov platforms and Decision Support Systems.



DRAXIS
ENVIRONMENTAL TECHNOLOGIES

Planning and Developing GeoDatabases

- Digitization of geospatial data
- Data modelling and transformation (Inspire)
- Spatial open source data storage technology

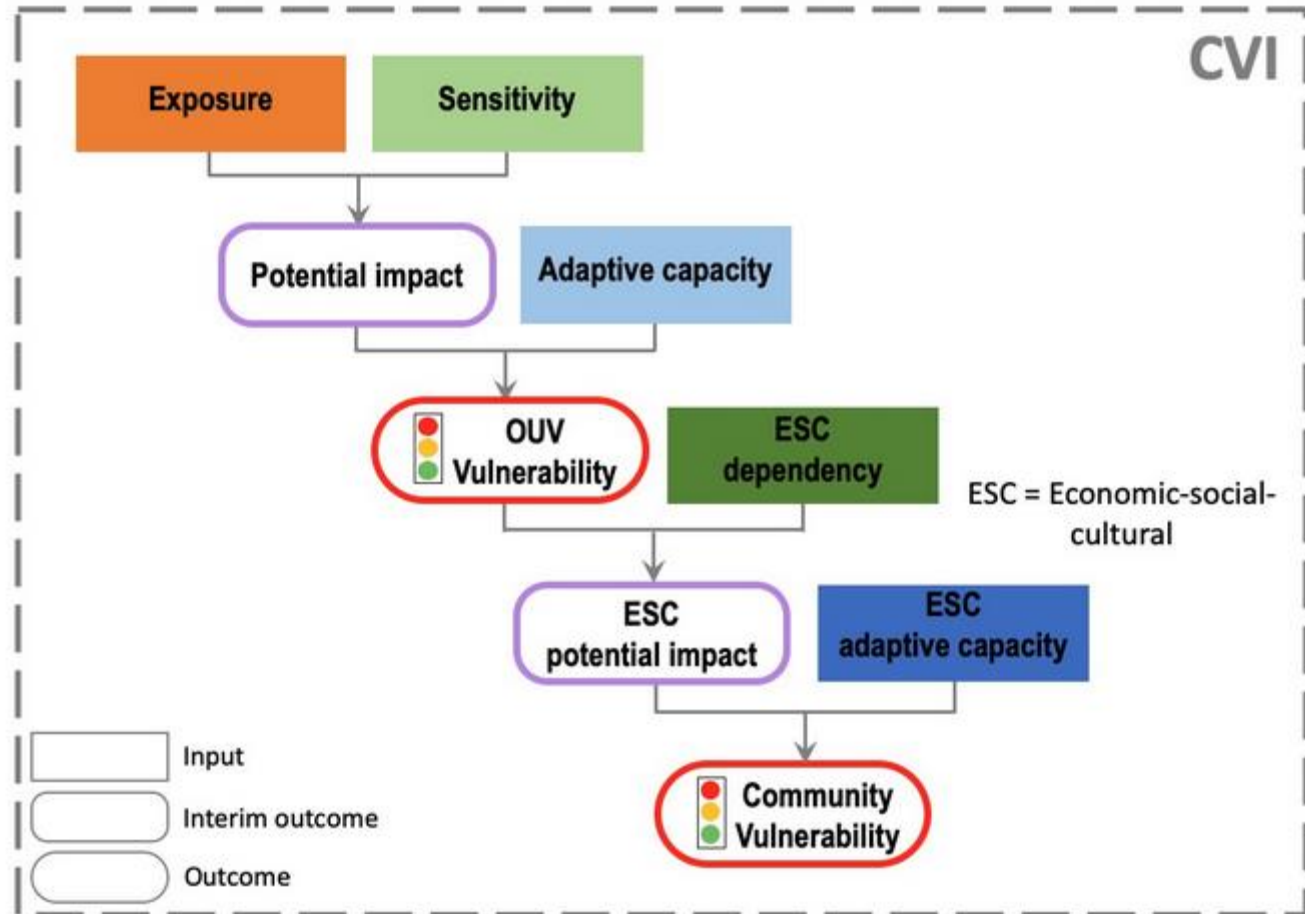
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CLIMATE VULNERABILITY INDEX

- Ongoing systematic tool to rapidly assess climate risk to cultural & natural World Heritage sites.
- Applicable across all types of WH properties, assessing the OUV Vulnerability (OUV = Outstanding Universal Value, the central concept for World Heritage) and the Community Vulnerability based on the economic, social and cultural dependencies upon the WH property, and the adaptive capacity of these to cope with climate change.



EURISY & UHCO

SPACE4CULTURE and SPACE4CITIES



Identifying uses of EO, SatNav and SatCom to:

- Manage historical cities (green areas, air quality, transport, waste collection, tourist flows, soil subsidence, etc.)
- Safeguard cultural heritage (structural integrity, conflicts and natural disasters, landscape planning, spotting of sites, etc.)
- New cultural services and creative experiences (VR tours, 5G connection, GPS drawing, data visualisation, etc.)

Identifying uses of EO, SatNav and SatCom to increase resilience and sustainability of cities

- Transport&Mobility, Urban planning, Energy, Air quality, Infrastructure maintenance, Health, etc.)



Conferences and workshops, articles, publications
brochures, feedback on opportunities and
challenges.

Geospatial Cities initiative within EU Smart Cities
Marketplace.

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Integrated and effective network



Streamlining data and workflows

- match need w/ assets
- prioritize and standardize



Funding opportunities & sharing resources



Outcomes

- support policy frames
- deliver local and practical solutions



Benefit for WHC

- build resilience
- reduce disaster risk
- conservation

VISION

Urban Heritage Climate Observatory

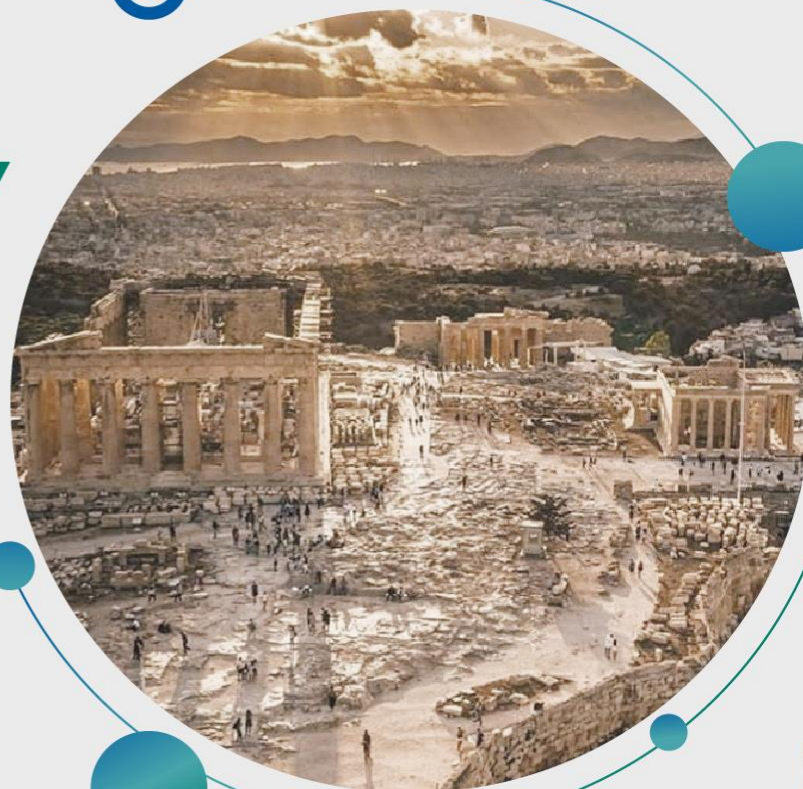
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UHCO co-leads

Dr. Jyoti Hosagrahar
WHC-UNESCO
(j.hosagrahar@unesco.org)

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Thank you!

