Coordinating and integrating state-of-the-art Earth Observation Activities

in the regions of North Africa, Middle East and Balkans and Developing Links with GEO related initiatives toward GEOSS

GEO-CRADLE

Lefteris Mamais

GEO-CRADLE - Technical Manager

Regional Workshop in Sofia, March 24, 2017

The GEO-CRADLE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 690133.

GEO-CRADLE in a nutshell (GA: 690133)

- **Main Objective:** promote the uptake and exploitation of Earth Observation activities in North Africa, Middle East and the Balkans
- **Duration:** 30 months (started on 01/02/2016)
- **Team:** Coordinated by National Observatory of Athens – 25 partners from 3 continents

Specific Objectives

- Promote the **uptake of EO services and data** in response to regional needs
- Support the effective **integration of existing EO Capacities** in the region
- Facilitate the **engagement of the complete ecosystem of EO stakeholders** in the region
- Enhance the participation in and contribution to the **implementation of GEOSS and Copernicus in North Africa, Middle East and the Balkans**

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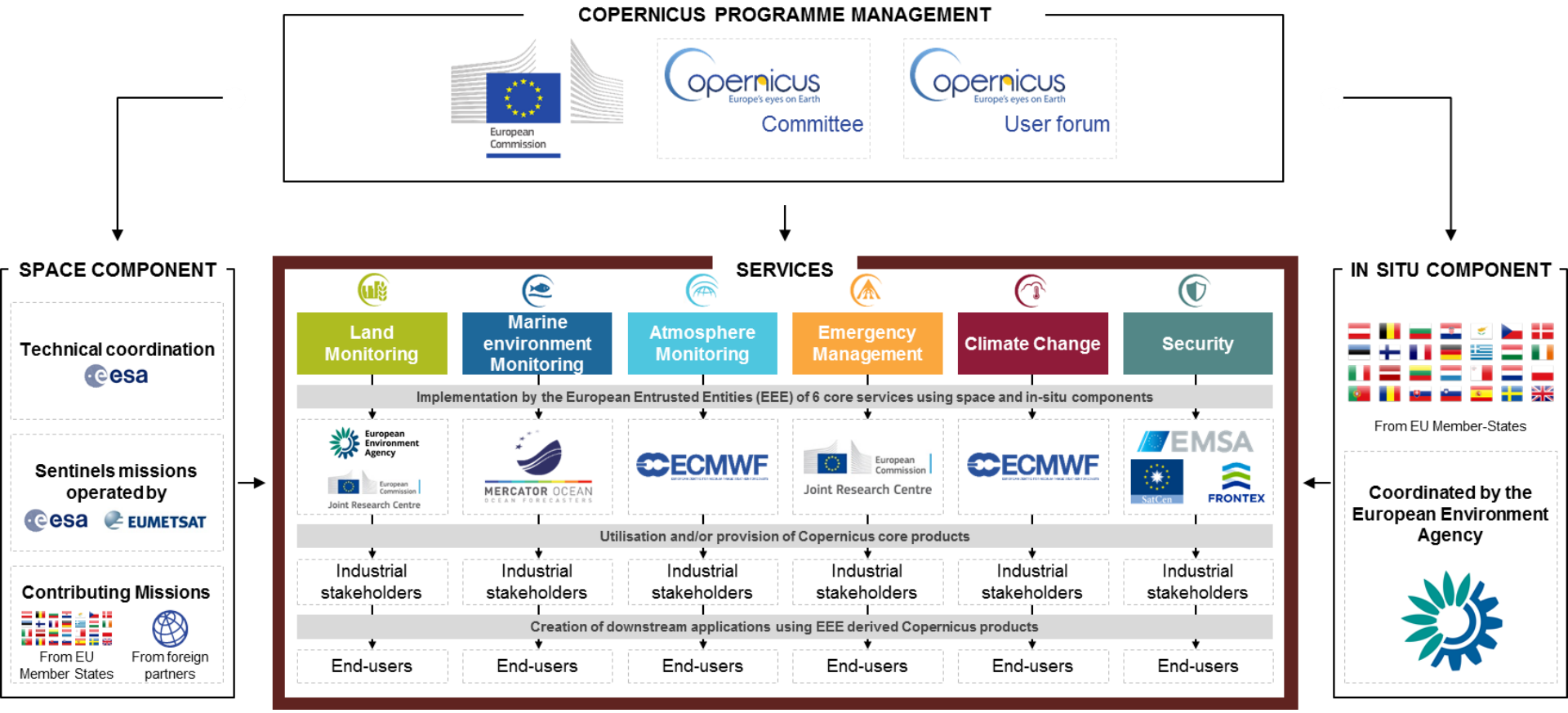
Copernicus is a flagship European Union Space Programme aimed at developing **European information services based on** satellite Earth Observation and in-situ data



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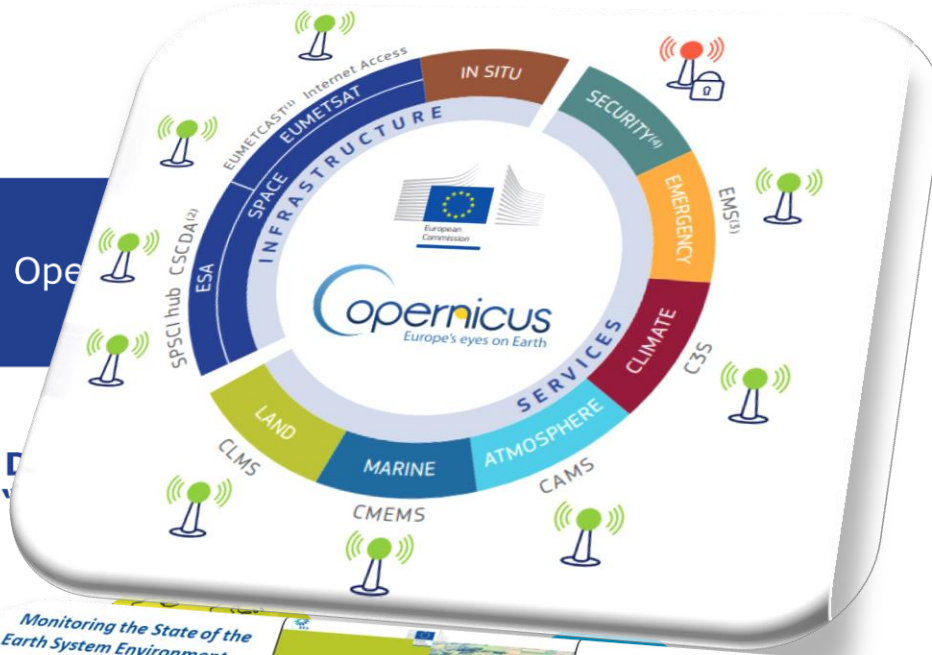
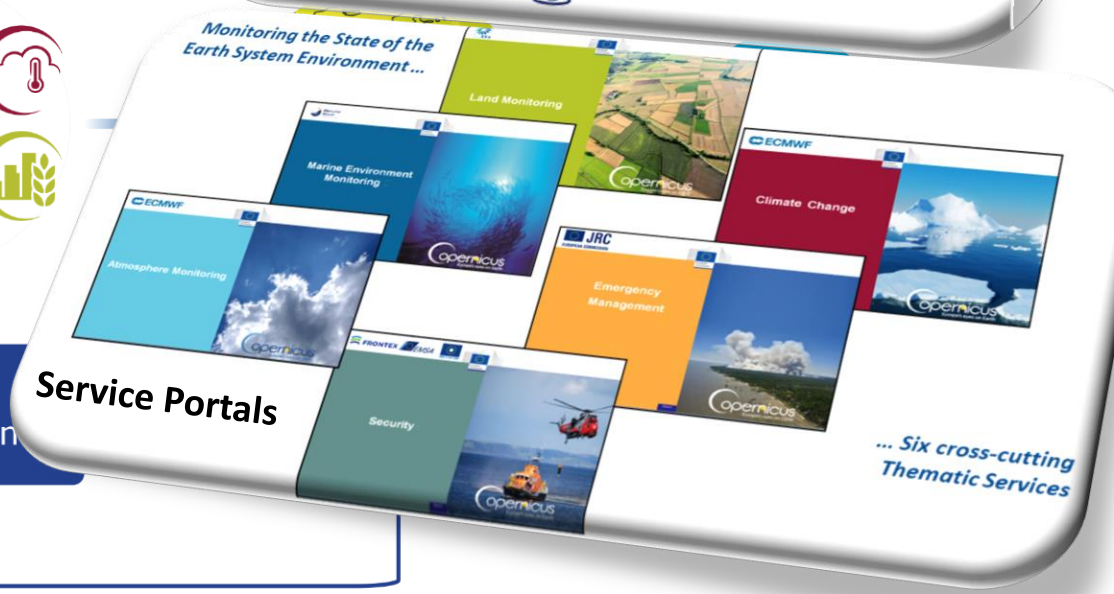
User Requirements: Strategic, Technical, Ope

Copernicus space and *in situ* data

Copernicus Services





esa EUMETSAT EEA

Data sources

Service Information

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- **GEO** community is creating the **Global Earth Observation System of Systems (GEOSS)** to better integrate observing systems and share data by connecting existing infrastructures using common standards
- More than 200 million data resources in **GEOSS** that span all **GEO's** thematic areas
- **GEO** convenes expertise from across different disciplines, coordinates activities, promotes broad and open data polices, ensures global collaboration, identifies gaps, assesses maturity in relation to EO, and reduces duplication in the areas of:
  - Biodiversity and Ecosystem Sustainability
  - Disaster Resilience
  - Energy and Mineral Resources Management
  - Food Security
  - Infrastructure & Transportation Management
  - Public Health Surveillance
  - Sustainable Urban Development
  - Water Resources Management


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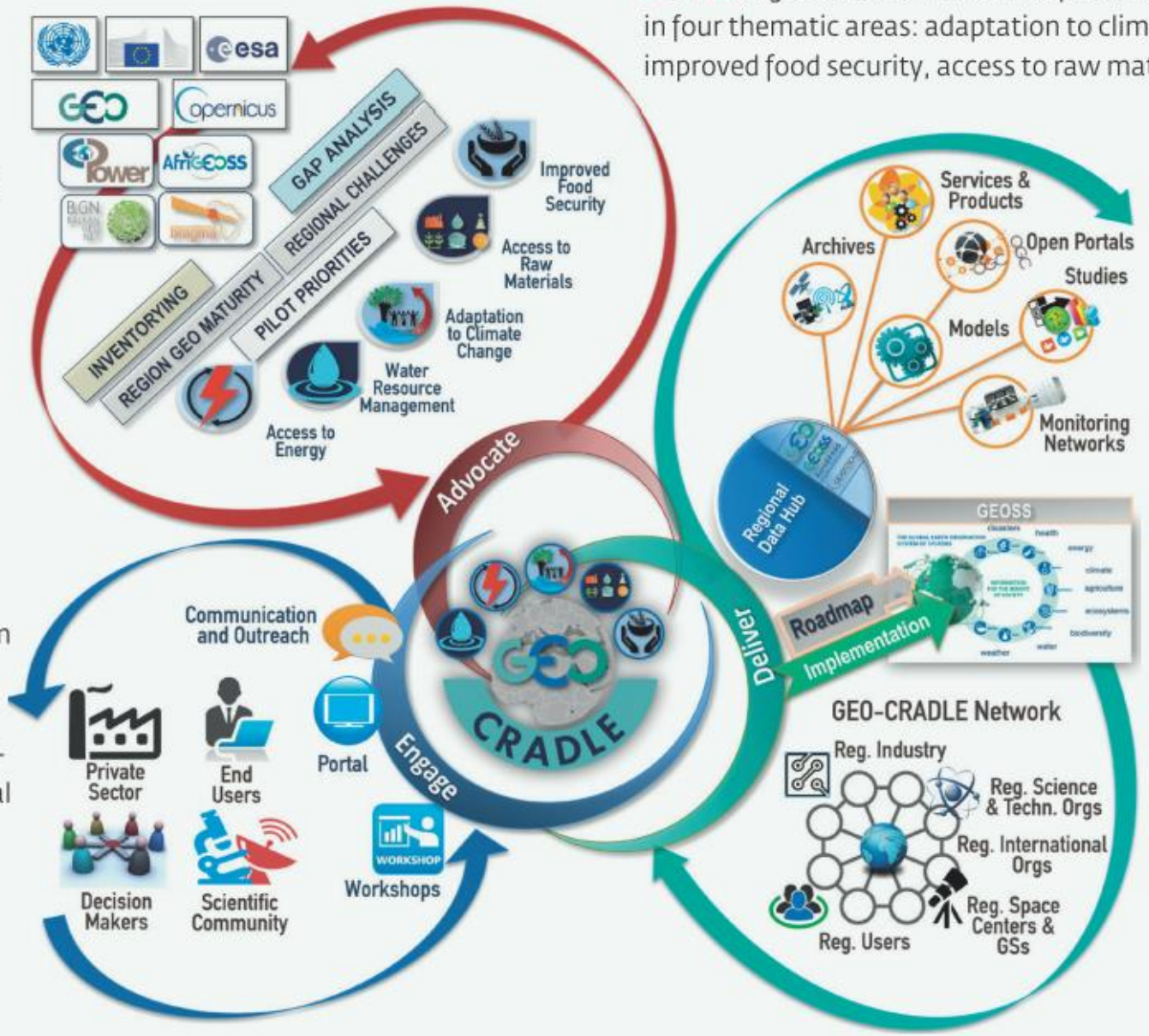
In this context, how are the GEO-CRADLE objectives translated into actions?

Advocate for the importance of coordinated Earth Observation (EO) activities towards addressing regional challenges

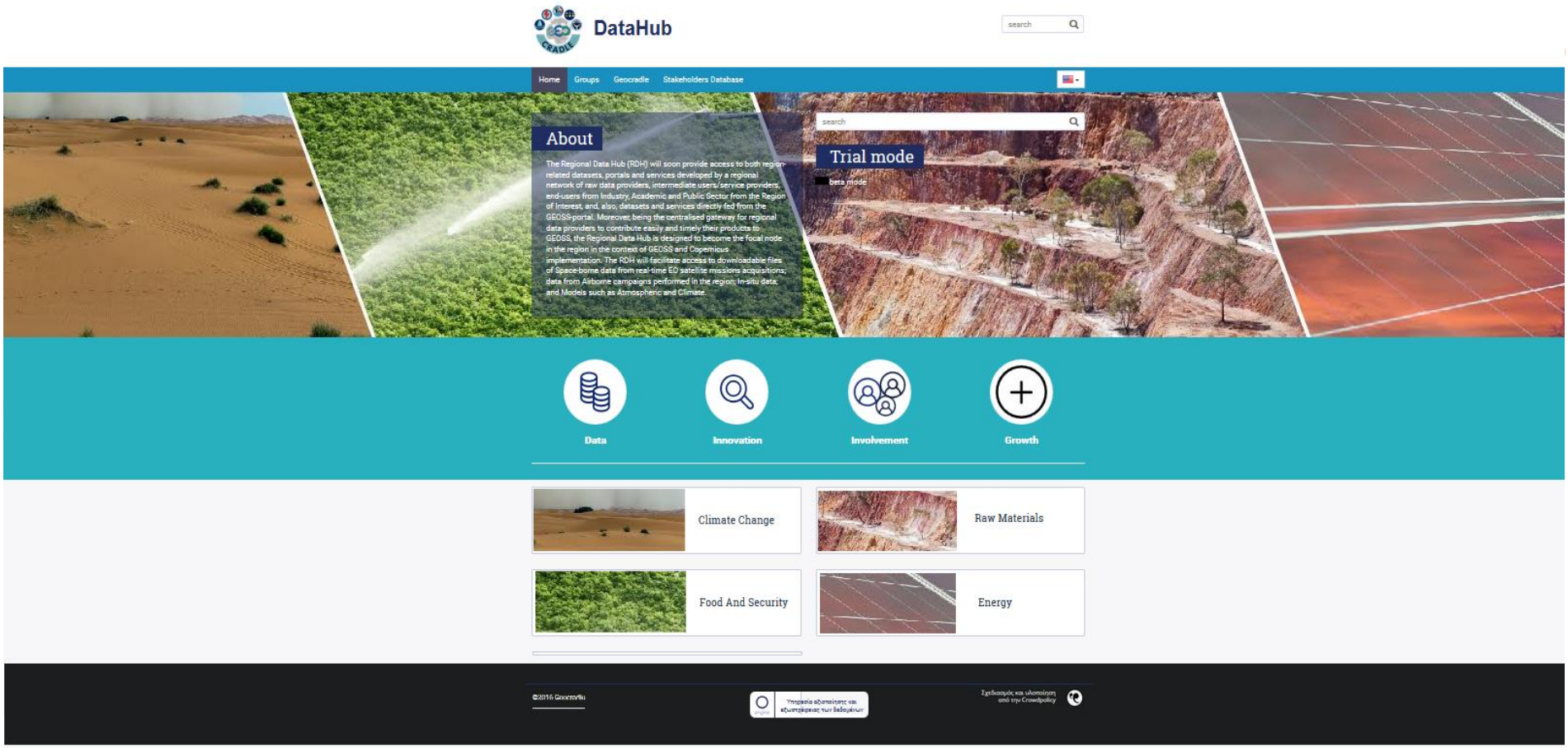
Deliver regional EO services in response to regional needs in four thematic areas: adaptation to climate change, improved food security, access to raw materials and energy

Engage with the complete ecosystem of EO stakeholders (scientists, service/ data providers, end-users, governmental organisations, and decision makers)

Deliver a concrete roadmap for the implementation of GEO, GEOSS and Copernicus in the region



Regional Data Hub – Connection with GEOSS & Regional Portals



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GEO-CRADLE feasibility studies in priority areas

Adaptation to Climate Change (ACC)

13 CLIMATE ACTION
3 GOOD HEALTH AND WELL-BEING
11 SUSTAINABLE CITIES AND COMMUNITIES
15 LIFE ON LAND

Improved Food Security – Water Extremes Management (IFS)

2 ZERO HUNGER
12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Access to Raw Materials (ARM)

1 NO POVERTY
2 ZERO HUNGER

Access to Energy (SENSE)

7 AFFORDABLE AND CLEAN ENERGY
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

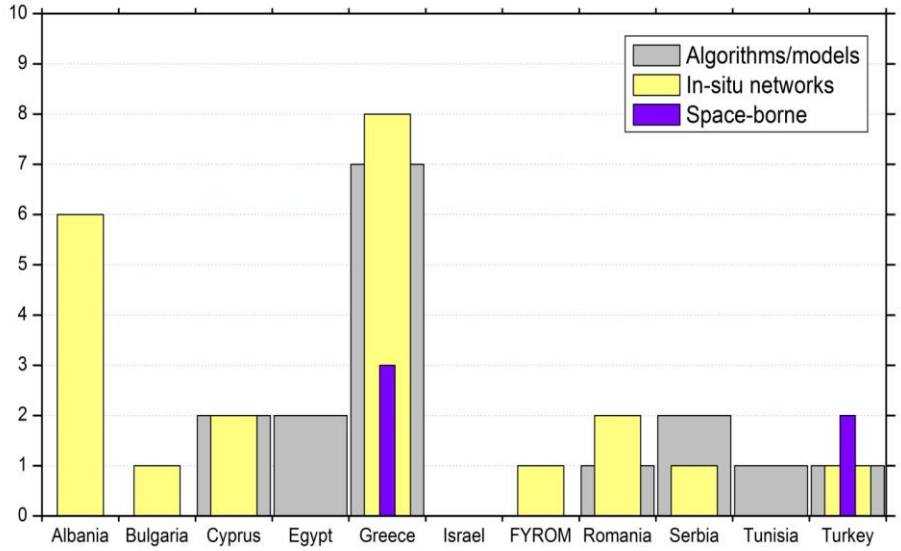
The Regional Priorities
Adaptation to Climate Change (ACC)

*The **ACC pilot will pave the ground for the holistic monitoring and forecasting of region-specific atmospheric components, ECVs and hazards**, in line with the standards and vision of GEOSS and Copernicus for information extraction and service delivery regarding the Climate SDG.*

Specifically, the GEO-CRADLE ACC will provide 3 services on respective thematic pillars :

1. ***Desert dust services***
2. ***Regional climate change services***
3. ***Air quality services***

Gap Analysis of the Regional Climate related Capacities



End-users expressing interest in the ACC pilot

(from the results of end user survey and gap analysis)

- ***Tourism sector for dust forecasting***
- ***Meteorological agencies for dust forecasting***
- ***Civil aviation for dust forecasting***
- ***Insurance companies for Climate Change services***
- ***Agriculture sector for Climate Change services***
- ***Water river basin agencies for Climate Change services***

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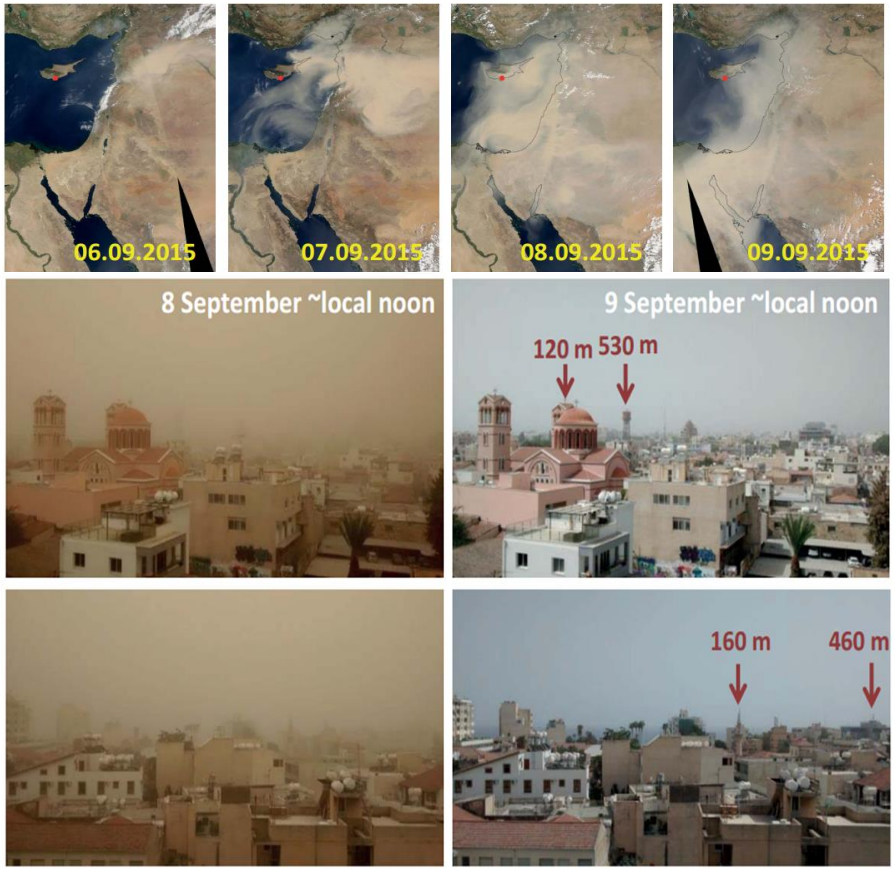
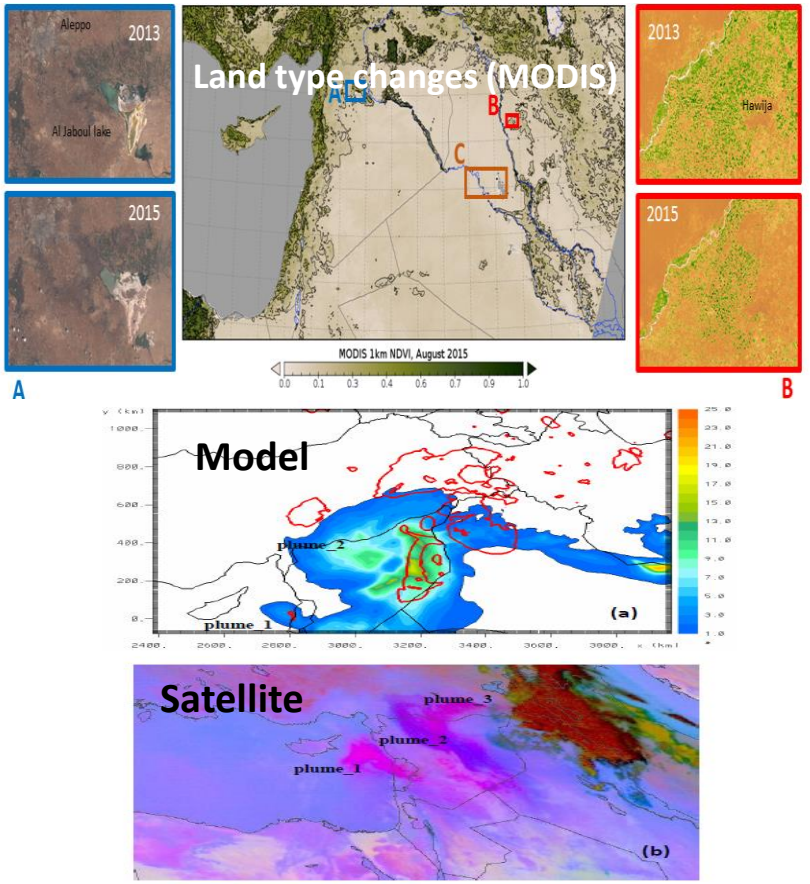
ACC – Desert dust services

The September 2015 Middle East dust-storm results in dramatic **reduction of visibility** in Limassol
Mamouri et al., 2016, ACP



Land use changes (desertification) and local meteorology increased the severity of this episode
Solomos et al., 2016, ACPD



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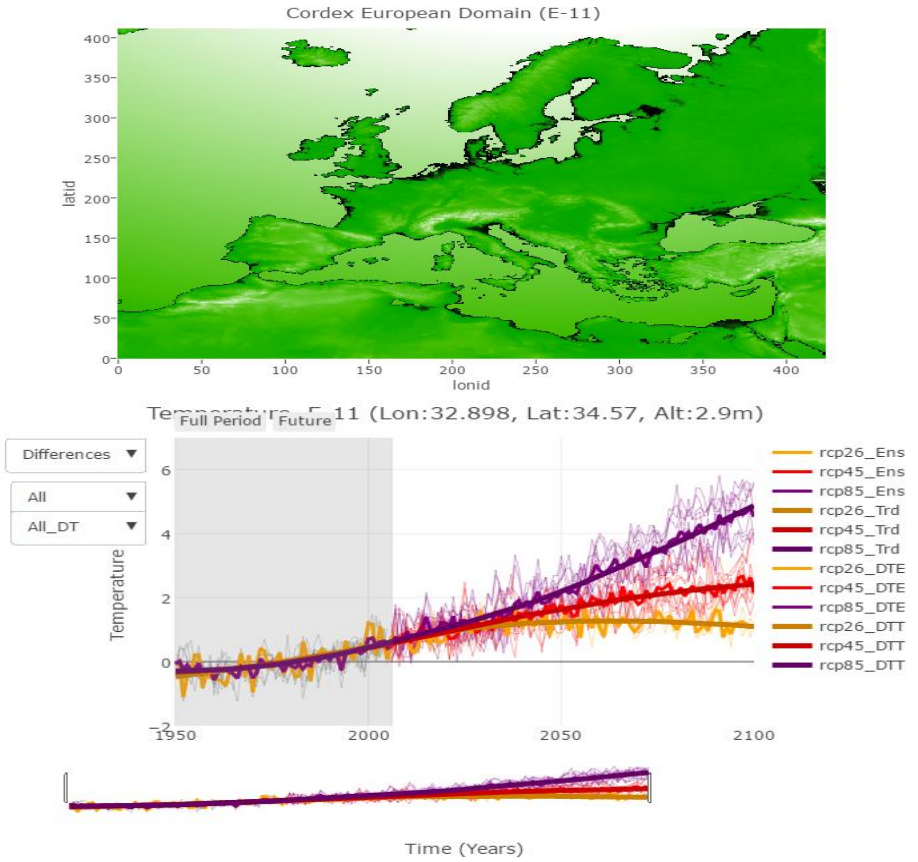
ACC – Regional climate change services

Indicative list of Climate variables and indices

Climate Indices		Relevance
CI1	Mean near surface temperature	Fundamental
CI2	Precipitation rate	Fundamental
CI3	Maximum near surface temperature	Fundamental, extremes
CI4	Minimum near surface temperature	Fundamental, extremes
CI5	Wind speed at 10m, 50m, 100m and 200m	Fundamental, Energy, natural disasters
CI6	Surface absorbed solar radiation	Fundamental, Energy, Tourism, Agriculture
CI7	95th percentile of rain day amounts	Extremes, natural disasters
CI8	95th percentile of wind speed at 10 m	Extremes, natural disasters
CI9	Annual greatest 5-day total rainfall	Extremes, natural disasters
C10	Fraction % of total rainfall from events> long-term P90	Extremes, natural disasters
C11	Number of events > long-term 90th percentile of rain days	Extremes, natural disasters
CI12	Number of frost days Tmin < 0 degC	Extremes
CI13	Heat Wave Duration Index	Agriculture,Tourism
CI14	Standardized Precipitation Index (SPI)	Agriculture,Water resources
CI15	Potential evaporation	Agriculture
CI16	Growing season duration (GSD)	Agriculture
CI17	Tourism Climate Index (TCI)	Tourism
CI18	Snow depth (SnowD)	Tourism
CI19	Heating Degree Day (HDD)	Energy
CI20	Cooling Degree Day (CDD)	Energy

Make use of high resolution RCM data (0.11°) for a number of climate variables from various RCMs and emission scenarios 1950-2100. (data source: EURO-CORDEX: http://www.euro-cordex.net/).



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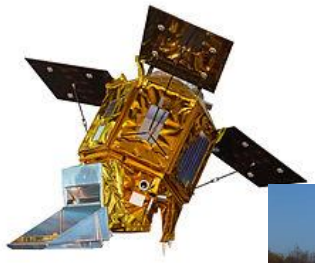
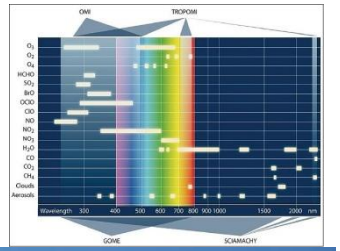
ACC – Regional air quality services





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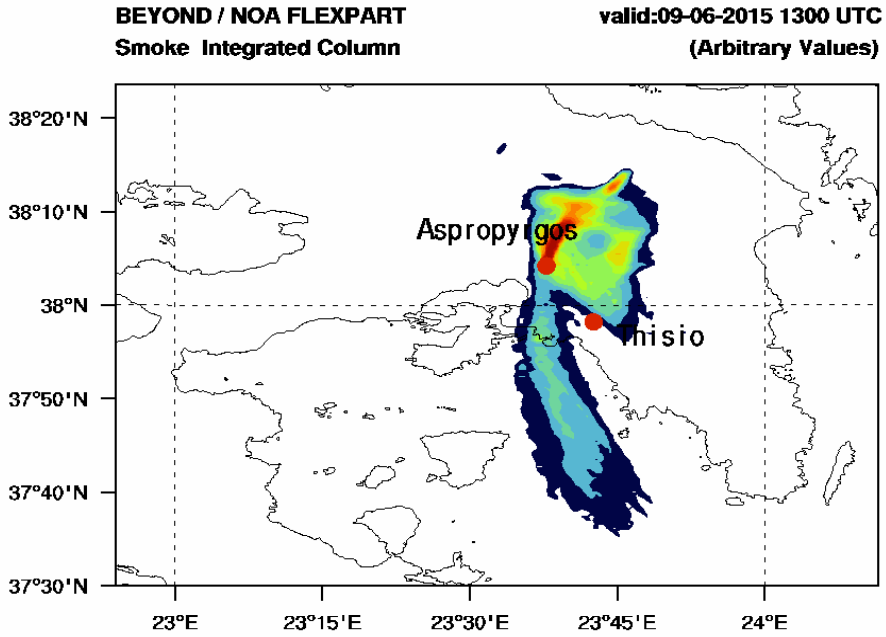
Athens - ACTRIS



Observational platforms

Finokalia - ACTRIS

· ACTRIS

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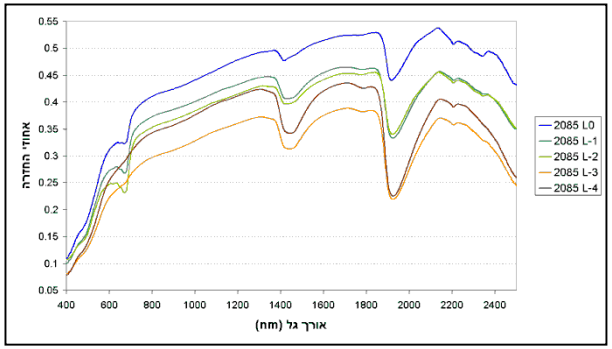
The Regional Priorities
Improved Food Security (IFS)
Water Extremes Management (WEM)

Soil Spectral Library
(Task 4.2 – IFS pilot)



Prediction (spectral based) models
of field moisture and clay content

Property	SEC, SEP, SEL	R^2_m	Prediction equation	Assignments
Soil Field Moisture (SFM)	0.045, 0.14, 0.016 0.027@	0.645 0.847@	wl_0.739*0.378179 + wl_1.65*0.389602- wl_0.689*0.184370 + 0.062336	1.65 μm-reflectance slope 0.688 μm-reflectance slope 0.739 μm-reflectance slope/chlorophyll
Organic Matter	0.003. 0.015. 0.002	0.827	wl 0.722*0.135211 + wl 2.328*0.034358-	0.722 μm-chlorophyll remaining

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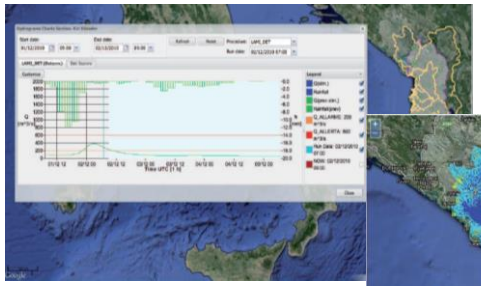
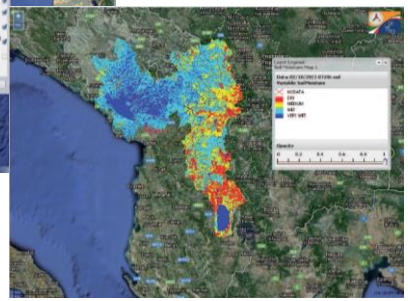
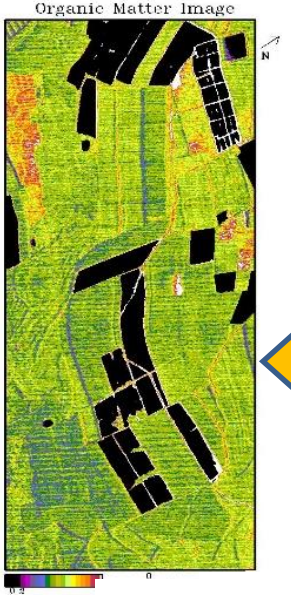




Flood Forecast Model
(Task 4.2 – WEM)

Pixel by pixel
map on
Sentinel -2
data using the
prediction
models



Sentinel-2 Satelllite

deltra

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The Regional Priorities
Access to Raw Materials (ARM)

Establishing a roadmap for long-term monitoring, mapping, and management of Quarries, Mineral Deposits in the ROI.




Use of existing regional capacities and skills

- Development of protocol for evaluating the level of impact
- Mapping of quarries and waste materials in abandoned mines
- Monitoring of ground deformation during/after mining

- Identification, collection, assessment and use of EO based and in-situ data
- Enrichment of the information content of the Regional Data Hub

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The Regional Priorities
The Solar Energy Nowcasting SystEm (SENSE) pilot

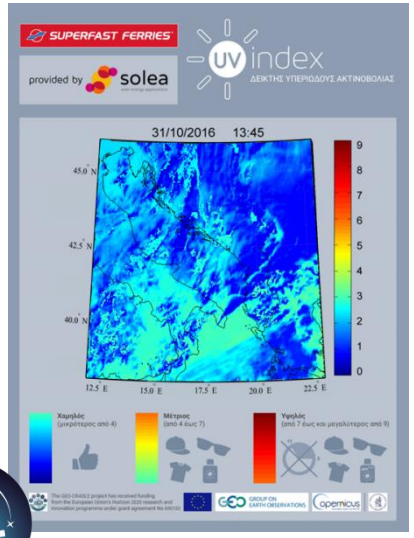
Purpose:

- demonstrate ways to maximize value and benefits in the RoI
- Create synergies with public and private sector (solar plants, energy distributors, solar energy related end-users).

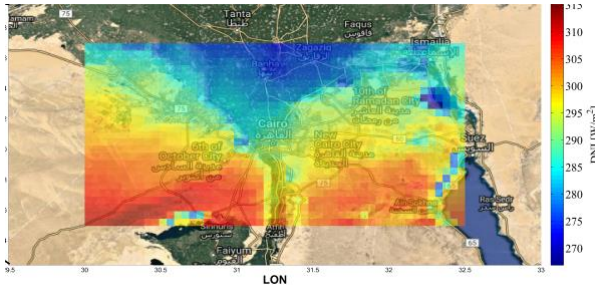
Provision of (tailored to end-user) services:

- Now-casting of solar radiation and solar energy
- Long term solar energy atlases for various areas with high temporal and spatial detail
- Solar radiation related products (real time and forecasts) related with: health (UV Index (melanoma), DNA damage, cataract, Vitamin D efficiency), agriculture (photosynthesis), scientific.

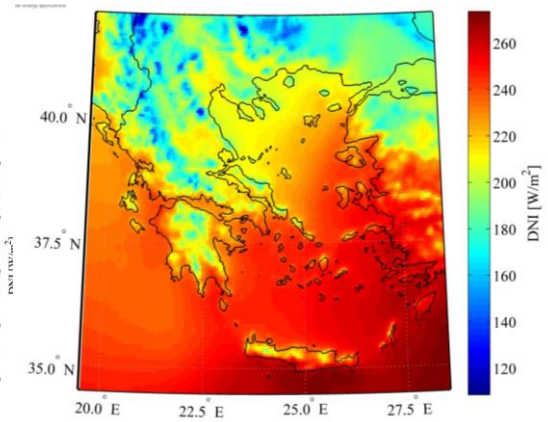
Solar radiation related products



Solar Atlases Energy Maps



Solar Energy now-casting



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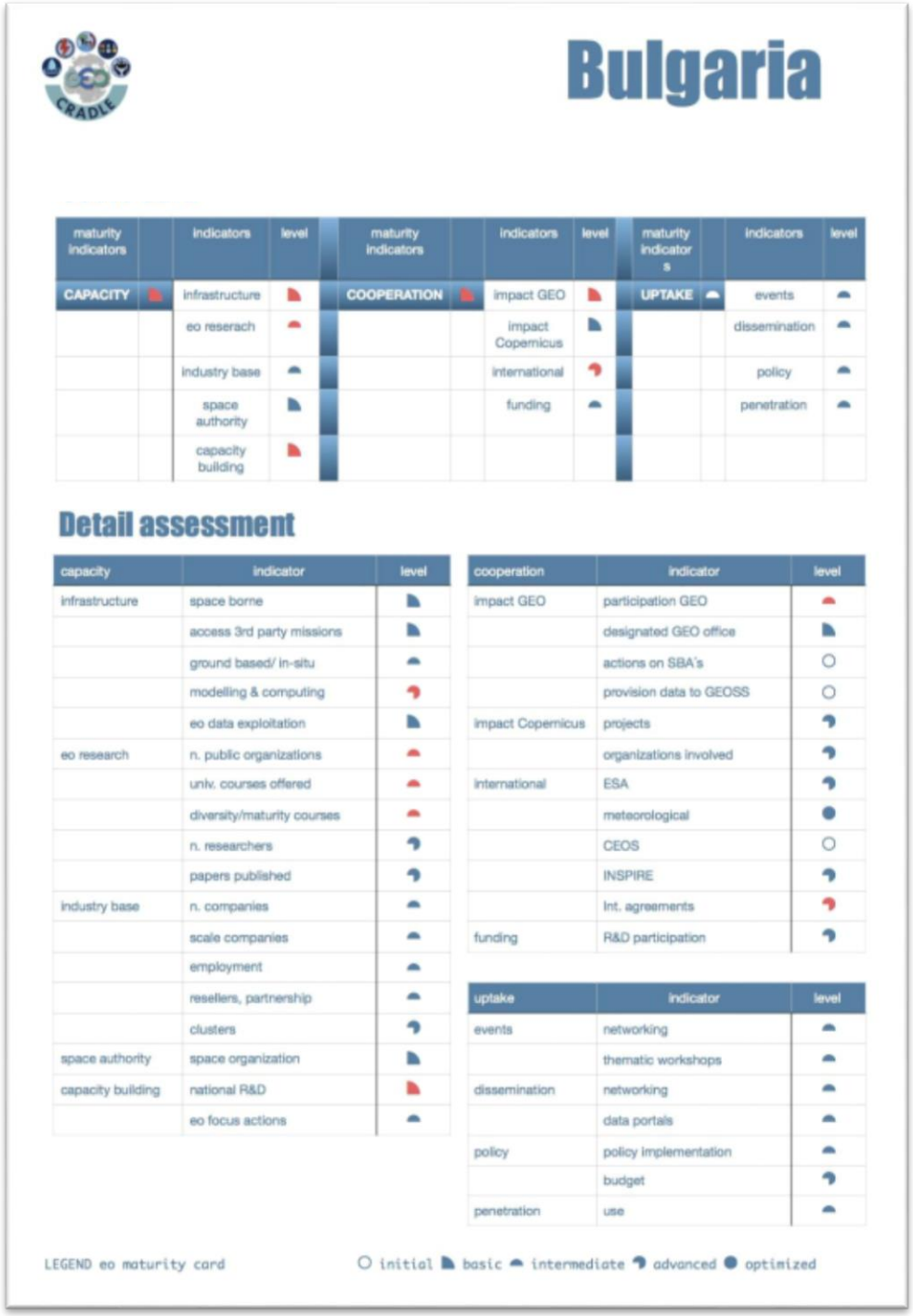
Understanding regional EO Maturity: a novel approach by GEO-CRADLE

- Providing an independent, up-to-date but also replicable methodology to assess the level of EO uptake (in particular GEOSS and Copernicus) at national level, thus allowing decision makers to make informed decisions on which activities to undertake and which gaps to fill.
- Providing information that can help regional stakeholders across the complete EO value chain to intensify their cooperation and seek collaborative actions.
- Evaluating awareness in EO and the engagement with Copernicus projects or GEO activities, thus informing both initiatives at programmatic level.



Bulgaria

maturity indicators	indicators	level	maturity indicators	indicators	level	maturity indicators	indicators	level
CAPACITY	infrastructure		COOPERATION	impact GEO		UPTAKE	events	
	eo reserach			impact Copernicus			dissemination	
	industry base			international			policy	
	space authority			funding			penetration	
	capacity building							

Detail assessment

capacity	indicator	level
infrastructure	space borne	
	access 3rd party missions	
	ground based/ in-situ	
	modelling & computing	
	eo data exploitation	
eo research	n. public organizations	
	univ. courses offered	
	diversity/maturity courses	
	n. researchers	
	papers published	
industry base	n. companies	
	scale companies	
	employment	
	resellers, partnership	
	clusters	
space authority	space organization	
capacity building	national R&D	
	eo focus actions	

cooperation	indicator	level
impact GEO	participation GEO	
	designated GEO office	
	actions on SBA's	
	provision data to GEOSS	
impact Copernicus	projects	
	organizations involved	
international	ESA	
	meteorological	
	CEOS	
	INSPIRE	
	Int. agreements	
funding	R&D participation	

uptake	indicator	level
events	networking	
	thematic workshops	
dissemination	networking	
	data portals	
policy	policy implementation	
	budget	
penetration	use	

LEGEND eo maturity card — initial · basic · intermediate · advanced · optimized

Get involved!

Regional Networking Platform

- User-friendly and comprehensive platform where regional stakeholders can be informed on existing capacities, complementary skills and collaboration opportunities

→ **Find partners and potential customers / upload your company-organisation profile**

→ **Help us understand the EO Maturity in your country in support of future actions**

→ **Join the network here.**

Regional Data Hub

- Access to region-related datasets, portals and services / centralised gateway for regional data providers to contribute easily and timely their products to GEOSS

→ **Gain access to local/regional datasets**

Regional and community oriented Workshops

- Already organised numerous regional workshop with participation of industry, academia and end-user communities

→ **Join our upcoming events** http://geocradle.eu/en/news-events/events-corner/

Regional Feasibility Studies

- Follow closely the 4 pilot studies on adaptation to climate change, access to raw materials, solar energy, improved food security

→ **Explore opportunities for joint post-project exploitation**

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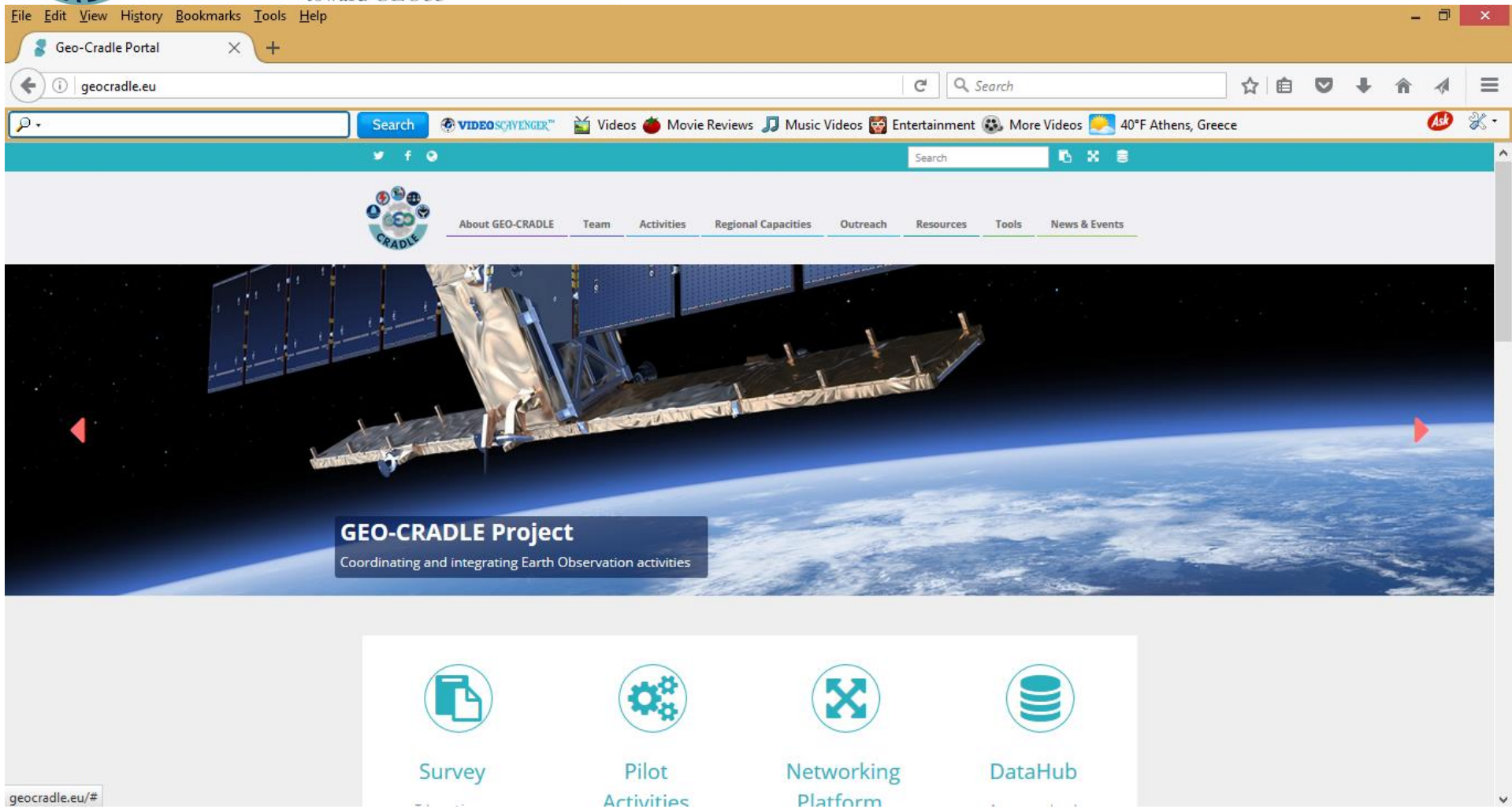

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thank you!

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