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 intiatives toward GEOSS

GEO-CRADLE:

Fostering regional cooperation and roadmap for GEO and Copernicus implementation in North Africa, Middle East and Balkans

http://geocradle.eu/

Funded under H2020 - Climate action, environment, resource efficiency and raw materials
ACTIVITY: Developing Comprehensive and Sustained Global Environmental Observation and Information Systems
CALL IDENTIFIER: H2020 SC5-18b-2015
Integrating North African, Middle East and Balkan Earth Observation capacities in GEOSS
Project GA number: 690133
Total Budget: 2,910,800.00 €

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Research Director NOA

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GEO-CRADLE

… is a unique EU funded Coordination Action running at regional level;
… is looking at the territories of North Africa, Middle East and Balkans;

It seeks to identify common needs, create synergies, and integrate capacities;

Fosters the regional cooperation and integration of monitoring capabilities and networks, as well as scientific skills;

Define and communicate goals that are clear and beneficial from societal and market wise point of view, and also realistic and in line with the domestic priorities and user needs;

Proposes/sets up large scale regional initiatives based on the Earth Observation (space based and in-situ) for capacity building and also addressing societal priorities in the thematic areas of the project such as Adaptation to Climate Change, Access to Raw Materials, better exploitation of the renewable Energy resources, and Food Security.

Objectives

- ✓ **Promote** the uptake of EO services and data in response to regional needs.
- ✓ **Support** the effective integration of existing Earth Observation 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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Thematic 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

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What is Copernicus? An overview

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

Copernicus will be served by a set of **dedicated satellites (the Sentinels)** and contributing missions

The EU will place a constellation of almost **20 more satellites in orbit before 2030**

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User Requirements: Strategic, Technical, Ope

Copernicus space and *in situ* data

Copernicus Services

esa EUMETSAT EEA

Data sources

Service Information

Service Portals

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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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25 Partners, 3 Continents, 1 Team

25 Partners, 3 Continents, 1 Team

- **GEO-CRADLE** brings together a highly-complementary team combining a strong background in GEO-related coordination activities with proven excellence in the field of Earth Observation:
  - Leading research institutes and universities
  - Highly-esteemed international associations
  - Service Providers with strong regional presence

NATIONAL OBSERVATORY OF ATHENS
Coordinator

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The Project Pillars

Visit: http://195.251.203.238/surveygeocradle/index.php/inventories/capacities/gc-survey1

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Regional Data Hub – Connection with GEOSS & Regional Portals

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The Regional Priorities

Priority Definition Workflow

Identify recommendations → Define the priority framework → Develop the regional action plan → Validate the action plan

- Identify national EO recommendations as perceived from GEO-CRADLE partners.

- Propose a priority framework
- What are the criteria to consider in the definition of priority goals?

- Builds upon the national priorities the regional priorities by looking at the commonalities of national actions with the RoI as well as the specificity of the region.

- Validate the action plan with decision makers.
- How to ensure that the action plan is in adequacy with real needs in the RoI?

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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

Landuse 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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Copernicus Europe's eyes on Earth

Atmosphere Monitoring Service

ACC – Regional air quality services

EUFAR

Observational platforms

Athens - ACTRIS

Finokalia - ACTRIS

ACTRIS

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Impacts of Climate Change

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

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

Sentinel-2 Satelllite

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

Flood Forecast Model (Task 4.2 – WEM)

dewetra

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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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SOLar Energy Applications The Solar Energy Nowcasting SystEm (SENSE) pilot

Purpose:

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

Provision of (tailored to end-user):

- 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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Solar Atlases Energy Maps

- Operational energy planning
- Areas with optimum solar energy potential
- Optimum locations for CSP & PV installations using solar Atlas energy maps

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Solar radiation related products

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The GEO-CRADLE Contribution: Conclusions

1. **Submit to the EC a roadmap** with funding priorities in relation to capacity building, filling in gaps (networks, infrastructures, data sharing, skills), training, education, service provision, and business uptake at regional level

2. **Engage the countries and regional stakeholders** in the data sharing process, the use of open standards, and facilitate the access of the local actors to existing portals, web servers, data repositories, and satellite image archives through big infrastructures such as GEOSS, the European Data Portal, Copernicus data/service portals, and any existing regional Data Hubs (e.g. GEO-CRADLE RDH)

The GEO-CRADLE Contribution: Conclusions

3. **Generate and sustain a network stakeholders** to ensure visibility, and sharing of knowhow, excellence, and skills between the local actors and their counterparts worldwide
4. **Deliver a prototype methodology and a detailed assessment** on the nations' (market and science) maturity in relation to EO. Compare the regional capacity/state-of-the-art with the ones of developed countries in space, and find the complementary roles where they exist
5. **Support the EO market** uptake and internationalisation by,
   - Understanding the local market, and capacities
   - Mapping existing policies in sectors that may need support from EO
   - Facilitating access to open data
   - Mapping the local competitive landscape
   - Engaging the end-user community
   - Facilitating partnering with international interlocutors (companies, researchers, industries)
   - Building trust / Overcoming cultural and linguistic issues
6. **Advance the role of the countries in GEO, and Copernicus** by,
   - Setting up local GEO offices, Copernicus Relay Offices, and/or nominating official GEO representations at various levels
   - Strengthening the EO industrial/research dimension by using Copernicus & GEO as key drivers
   - Helping the stakeholders understand how they can benefit from and contribute to GEOSS & Copernicus

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thank you!