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 towards GEOSS

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GEO-CRADLE

Addressing regional needs through DataHub

Dr. Panagiotis Kosmopoulos / National Observatory of Athens

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

GEO GROUP ON EARTH OBSERVATIONS

Copernicus

The GEO-CRADLE project

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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

Project coordinator: Haris Kontoes (NOA)

Total Budget: 2,910,800.00 €

The GEO-CRADLE project

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… is the only EU GEO funded CSA that runs over the diversified territories of North Africa, Middle East and Balkans;

✓ **Identifying common needs and regional priorities**;

✓ **Fostering the regional cooperation and integration of monitoring capabilities and skills, and facilitating the networking of stakeholders**;

✓ **Defining coordination and support actions that are beneficial from societal and market wise point of view, and also realistic and in line with the domestic priorities and user needs;**

✓ **Proposing/setting up large scale regional initiatives in Earth Observation (space based and in-situ) relating to capacity building and delivery of services and innovative information in the thematic areas of the project such as:**

Adaptation to Climate Change
Improved Food Security – Water Extremes Management
Access to Raw Materials
Access to Solar Energy

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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**.

GEO-CRALDE pilots

Adaptation to Climate Change (ACC)

Improved Food Security – Water Extremes Management (IFS-WEM)

Access to Raw Materials (ARM)

Access to Solar Energy (SENSE)

GEO-CRALDE pilots

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The Solar Energy Nowcasting SystEm (SENSE) pilot

Coordination of regional EO capacities & research activities (incl. Copernicus Space & Service Segment initiatives) for an operational, satellite-driven, real-time system for solar energy now-cast.

Purpose:

- **Demonstrate ways to maximize value and benefits at the Region of Interest.**
- **Contribute to energy related capacity building.**
- **Create synergies with public and private sector (solar plants, energy distributors, solar energy related end-users).**

Provision of (tailored to end-user):

- **Now-casting and forecasting 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.**

Access to Solar Energy (SENSE)

Showcase

The SENSE pilot

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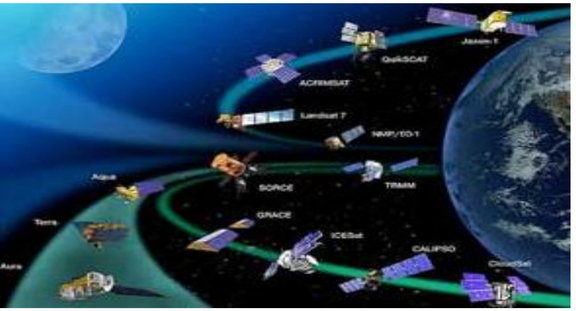
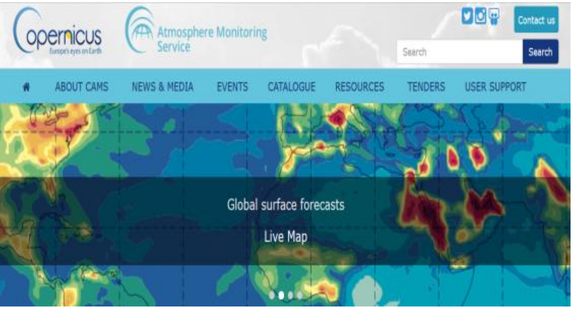


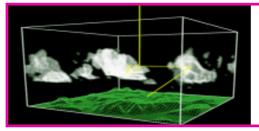
Satellite Data



Copernicus Atmospheric Monitoring Service

Actinometric platform

- Solar power production **now-casting and forecasts**, from t+0 min to t+2 hours ahead, with a time resolution from 5 minutes
- Nowcasts and forecasts on different spatial horizons: from the **local plant production to the country scale**
- integration in any already existing Information System. Possibility to add meteorological sensors on-site to **optimize forecasts**



Radiative Transfer models

Neural networks

End-users

- Use of solar irradiance spectra for: **Agricultural, health, biological** and scientific application and studies

Users: **Municipalities, private and government based Energy transmission operators, solar farms, renewable energy planning, smart phone apps, health and agricultural sectors, scientific community**

MINISTRY OF ELECTRICITY AND RENEWABLE ENERGY

The PRE-TECT campaign
Revealing the secrets of desert dust
1st – 30th April, 2017

MAGDI YACOUB HEART FOUNDATION
ASWAN HEART CENTRE

TREASURE

ΑΔΜΗΕ
ΑΝΕΞΑΡΤΗΤΟΣ ΔΙΑΧΕΙΡΙΣΤΗΣ ΜΕΤΑΦΟΡΑΣ ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ

Attica Group
SUPERFAST FERRIES
Blue Star Ferries

NREA

HELLENIC REPUBLIC
National and Kapodistrian University of Athens

SENSE's data provision

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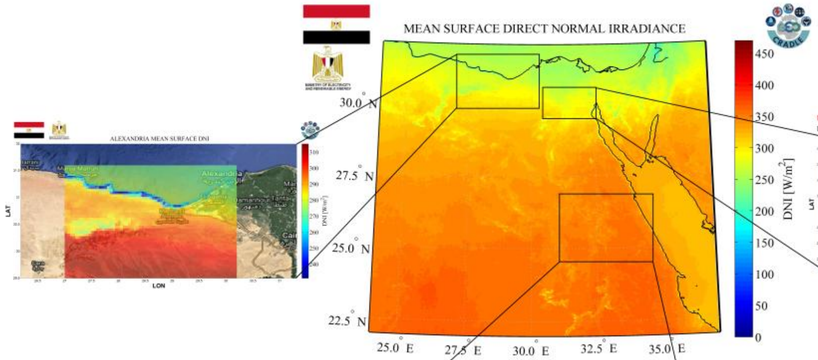
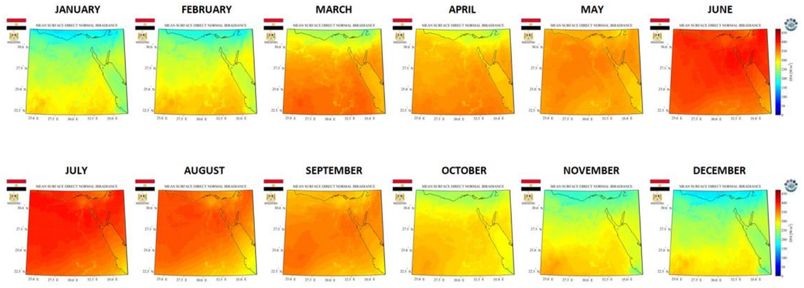
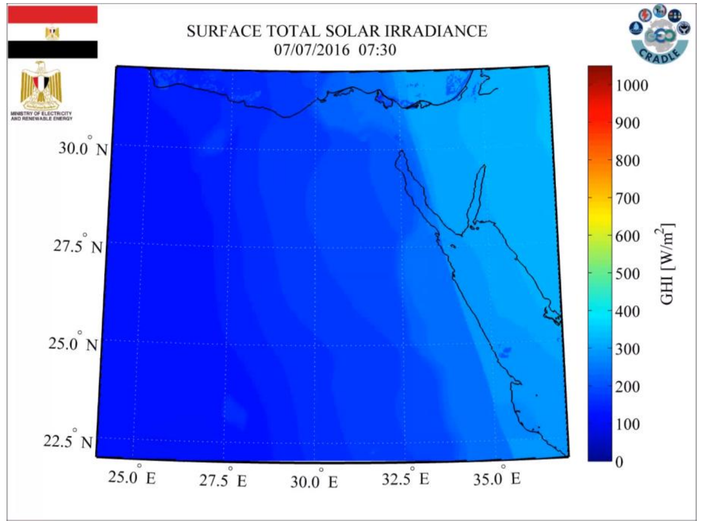
Real-time & solar atlas services



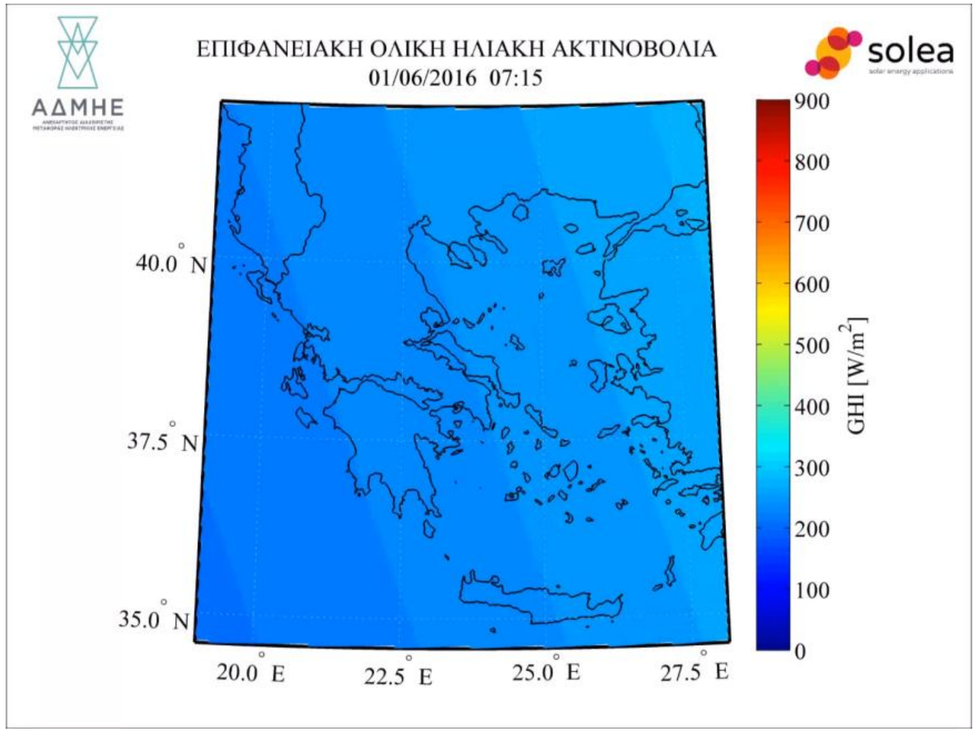


MINISTRY OF ELECTRICITY AND RENEWABLE ENERGY



SENSE's data provision

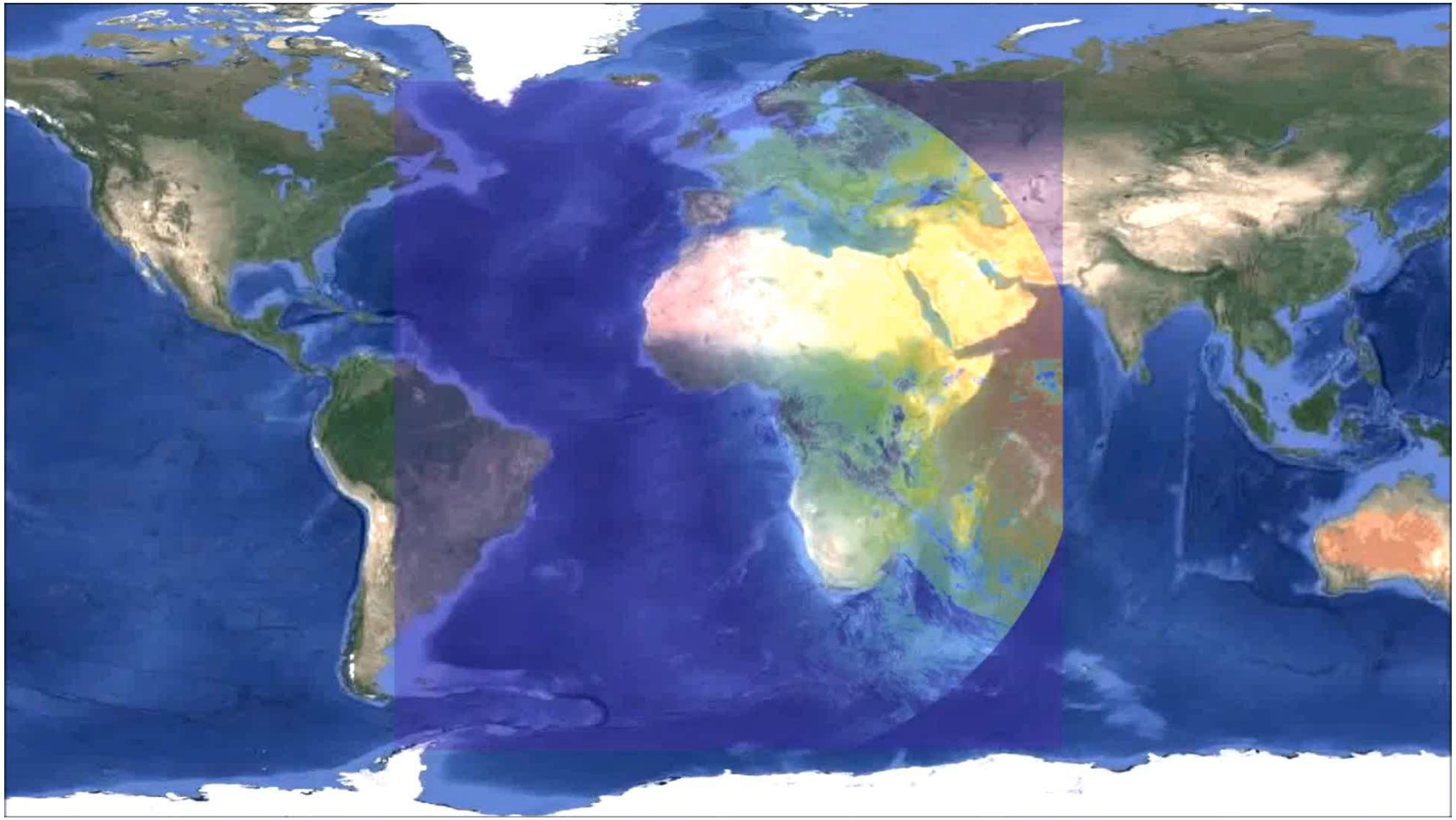
Solar Energy now-casting



ΑΔΜΗΕ
ΑΝΕΞΑΡΤΗΤΟΣ ΔΙΑΧΕΙΡΙΣΤΗΣ
ΜΕΤΑΦΟΡΑΣ ΗΛΕΚΤΡΙΚΗΣ ΕΝΕΡΓΕΙΑΣ

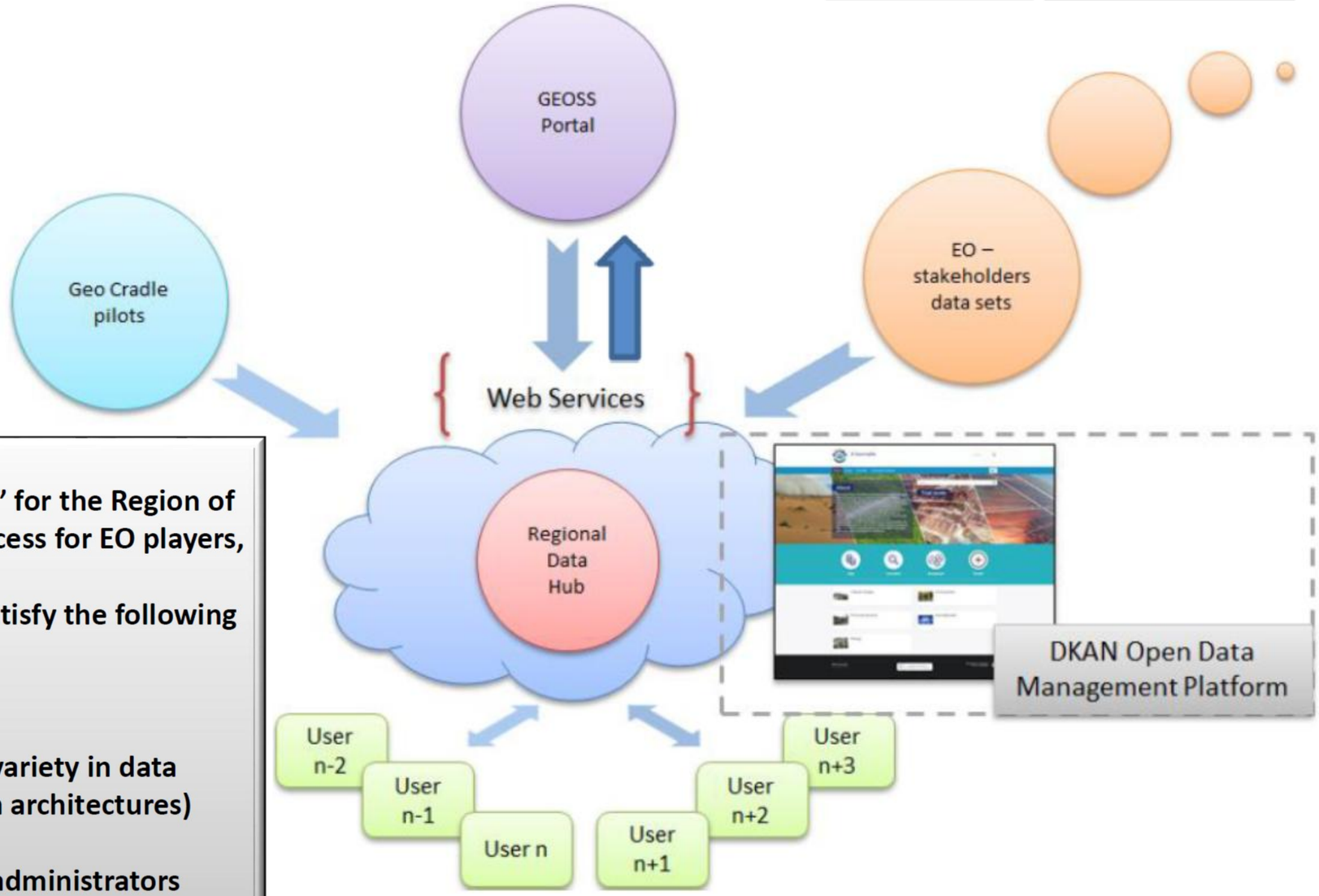
- IPTO is the Independent Power Transmission Operator for Greece
- Control the energy demands

SENSE's operational capabilities



Regional DataHub

Regional DataHub – The Concept



- The concept is simple, but not easy to implement.
- The RDH aspires to become a de facto "one-stop-shop" for the Region of Interest (RoI) specific data/information/knowledge access for EO players, service providers, and end users.
- In order for this to be accomplished, the RDH has to satisfy the following conditions:
  i. Be online
  ii. Connect with GEOSS
  iii. Connect with multiple remote data sources (big variety in data formats, data types, and data distribution system architectures)
  iv. Act as a gateway to the users
  v. Be efficient, and user friendly to both users and administrators
  vi. Act as an integrated open data management platform

Regional DataHub – The Solution

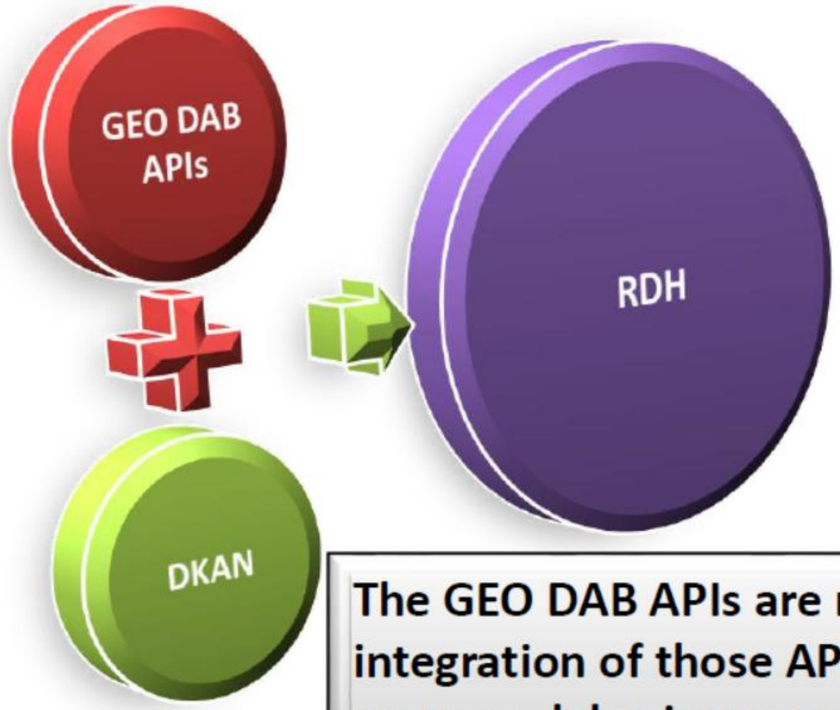
THE SOLUTION:

- RDH supports two types of users: (a) unauthorized users and (b) authorized users (i.e. administrators, content authors, group owners, etc.)
- The 1st category is interested more to the search, view/preview and download
- The 2nd category is related with an admin panel (i.e. crud functions, content organization, user management, publishing options, etc.)
- DKAN to the rescue!
- Why DKAN ?
    i. Ultimately, DKAN is a complimentary offering to CKAN in the effort to make data more open and accessible (source)
    ii. Integrates open data catalog features into Drupal CMS, which is build upon PHP. PHP powers a significant percentage of Web, while Drupal powers ~2% of the Internet as a whole
    iii. Has a wide community of active users/developers.

Regional DataHub – The Connection with GEOSS

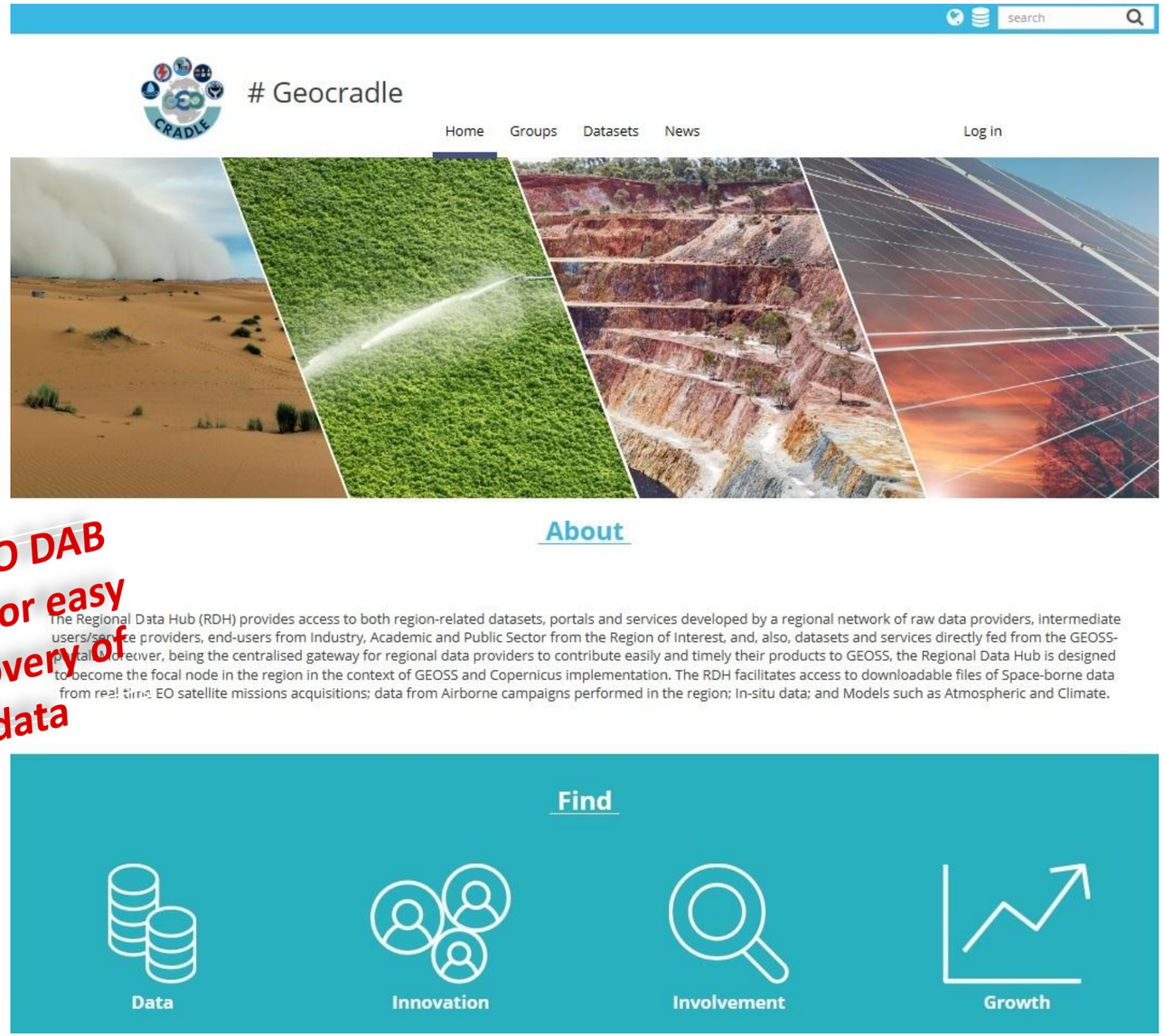
The connection of GEOSS to RDH was a challenging objective of the GEO CRADLE project

For this to be achieved the GEO DAB APIs were used, and in particular the OpenSearch API



The GEO DAB APIs are really plug and play. However the integration of those APIs in DKAN in an efficient way, has proven a laborious work that demanded novel software architectural design from the development team

Regional DataHub – The Connection with GEOSS



Utilizing the GEO DAB APIs and DKAN for easy access and discovery of regional EO data

http://datahub.geocradle.eu/

Stable service and full interoperability with GCI and GEO DAB APIs, as well as connection with data available through the project pilots.

Regional DataHub – The Connection with GEOSS

✓Regional DataHub is designed to become the focal node in the region in the context of GEOSS and Copernicus implementation.

- It is an open data web management tool / portal (developed using web technologies such as PHP, HTML5, JavaScript, CSS, etc.) that provides access to region-related datasets and services, directly fed from GCI, and at the same time being the central gateway for regional data providers to contribute easily and timely their products to GEOSS.

- It advances the current state of the art by integrating DKAN, which is a complementary implementation of CKAN (Comprehensive Knowledge Archive Network) over Drupal/PHP, with the GEO DAB APIs. DKAN CMS (Content Management System) is an open-source data management platform that treats data as content, facilitating the subsequent publication, management, and maintenance of these, no matter the administration team, its size and level of technical expertise.

Regional DataHub – The Connection with GEOSS

✓Several **achievements** were accomplished for the Regional DataHub for the provision of up-to-date functionalities:

- Search in multiple sources (although by default DKAN looks up for datasets and resources in a single local database).
- Search for datasets in remote resources (integration of the GEO DAB APIs in the DKAN environment).
- Display the remote datasets and resources on-the-fly and with high performance (using a rendering cache mechanism which also implements an Adaptive Time-to-Live consistency mechanism to periodically check the consistency of the cached rendering structures with the original data to assure that users do not receive stale data).
- Cleaning data mechanism (cleans identical or duplicate data, discovers missing information for data, discovers URL that have changed or that are not working anymore, discards data with invalid URL schemes, etc.)
- Preview mechanism (to preview data of various formats and services, such as CSV files, Web Map Services, Zip files, etc.)

An integrated Search and Display mechanism that offers the users unified, centralized and user-friendly interface.

Regional DataHub - Examples

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Home / Datasets / Regional Soil Spectral Library

View | Revisions

PILOT 2: Improved Food Security – Water Extremes Management (IFS)

Food security depends on many aspects such as water abundance and extremes (flooding and drought), vegetation stresses, yield monitoring, soil quality monitoring and sustainability. Plants need...

Data Extent

License

Open Data Commons Open Database License (ODbL)

Other Access

The information on this page (the dataset metadata) is also available in these formats.

Regional Soil Spectral Library

Regional Soil Spectral Library

Part of pilot 2 - Improved Food Security and Water Extremes Management

The importance of soils is ubiquitously recognized; they provide essential services such as food production, prevention of land degradation, water quality, and they act as carbon sinks. It has been thus recognized that a spatio-temporal monitoring of soil quality and soil properties is necessary. One of the most important technologies used to monitor soils is soil spectroscopy which utilizes the spectral information of soil samples to derive their properties. For the successful upscaling (i.e. use of Earth Observation tools) of soil spectroscopy it is important to create detailed soil spectral libraries on the ground, which assist in the validation of the sensors as well as development of soil models.

The Regional Soil Spectral Library

The current dataset contains a regional vis-NIR (350-2500 nm) soil spectral library of the region. It contains metadata regarding the soils sampled, their key properties, and their spectral signature. The spectral signatures were obtained using a standardization protocol. The dataset encompasses the following countries and soil properties:

Country	Samples	SOM	Texture	CaCO3	pH	NO3	EC	CEC
Albania	107	107	107	X	X	X	X	X
Bulgaria	105	105	105	X	105	X	X	105
Cyprus	96	96	94	96	96	X	93	X
Egypt	10	6	X	4	6	X	6	X
FYROM	124	124	124	X	124	X	X	X
Greece	928	928	928	928	X	928	X	X
Israel	221	106	193	150	137	X	141	X
Serbia	63	63	63	63	63	63	X	X
Turkey	100	94	98	100	100	X	100	X
All	1754	1629	1712	1341	631	991	334	105

Form of the datasets

To assist future researchers using this soil spectral library, the datasets are provided in the following formats:

- Per country SSLs in .csv format
- Complete GEO-CRADLE SSL in .csv format

The documentation describing what each column represents may be found in D4.6.

Data and Resources

SSL Albania
This SSL was established by the Institute for Nature Conservation in Albania... — Download

SSL Bulgaria
This SSL was established by the Space Research and Technology Institute (... — Download

SSL Cyprus
This SSL was established by the Cyprus University of Technology (CUT). — Download

SSL Egypt
This SSL was established by the Centre for Environment and Development for... — Download

SSL FYROM
This SSL was established by the Ss. Cyril and Methodius University (USCM).... — Download

SSL Greece
This SSL was established by the inter-Balkan Environment Center (i-BEC). — Download

SSL Israel
This SSL was established by the Tel-Aviv University (TAU). — Download

SSL Serbia
This SSL was established by the Institute of Physics Belgrade (IPB). — Download

SSL Turkey
This SSL was established by the Space Technologies Research Institute (... — Download

SSL GEO-CRADLE
This dataset contains the complete GEO-CRADLE SSL (i.e. all of the countries... — Download

Download All

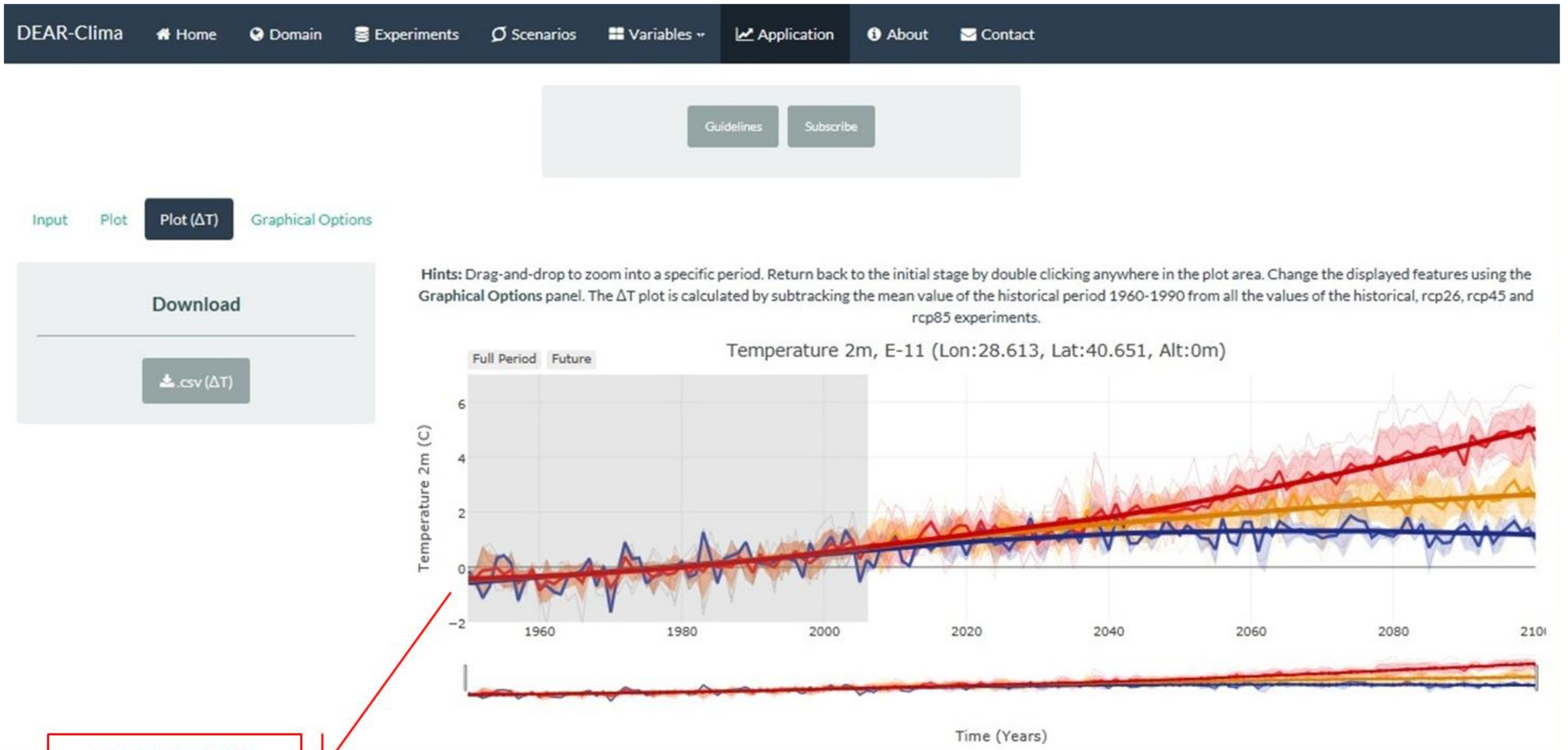
Agriculture · Soils · soil spectral library · soil spectroscopy · vis-NIR

Dataset Info

These fields are compatible with DCAT, an RDF vocabulary designed to facilitate interoperability between data catalogs published on the Web.

Field	Value
Publisher	PILOT 2: Improved Food Security – Water Extremes Management (IFS)
Modified Date	2018-02-13
Release Date	2017-12-19

Regional DataHub - Examples



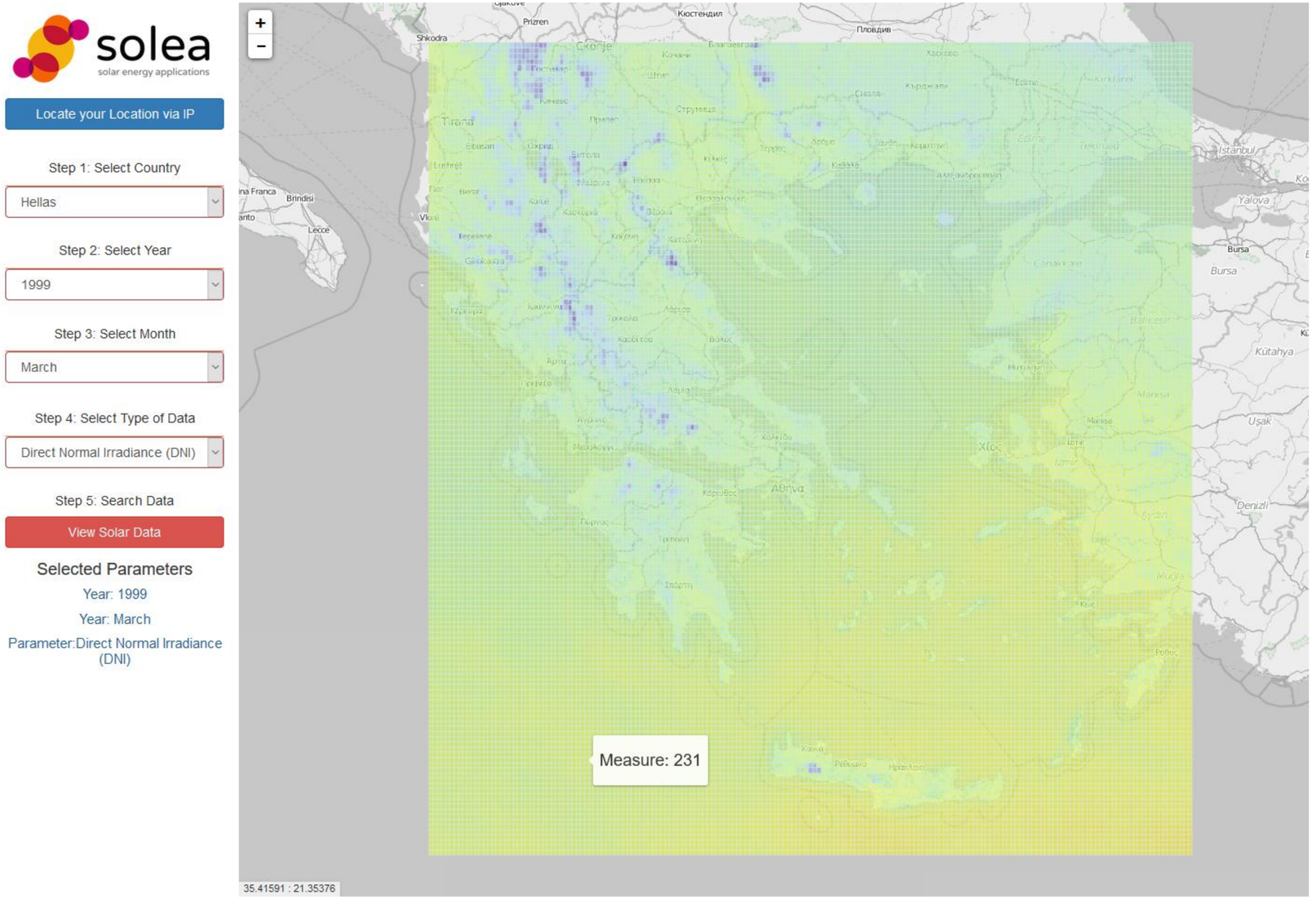
TIMESERIES (ΔT): Temperature 2m (°C)

Regional DataHub - Examples

SOLar Energy Applications (SOLEA) through GEOSS portal

EO-based SOLEA into a wider GEOSS driven system through the GEO-CRADLE project in the international scale.

http://solea.gr/



Contribution to EO market uptake

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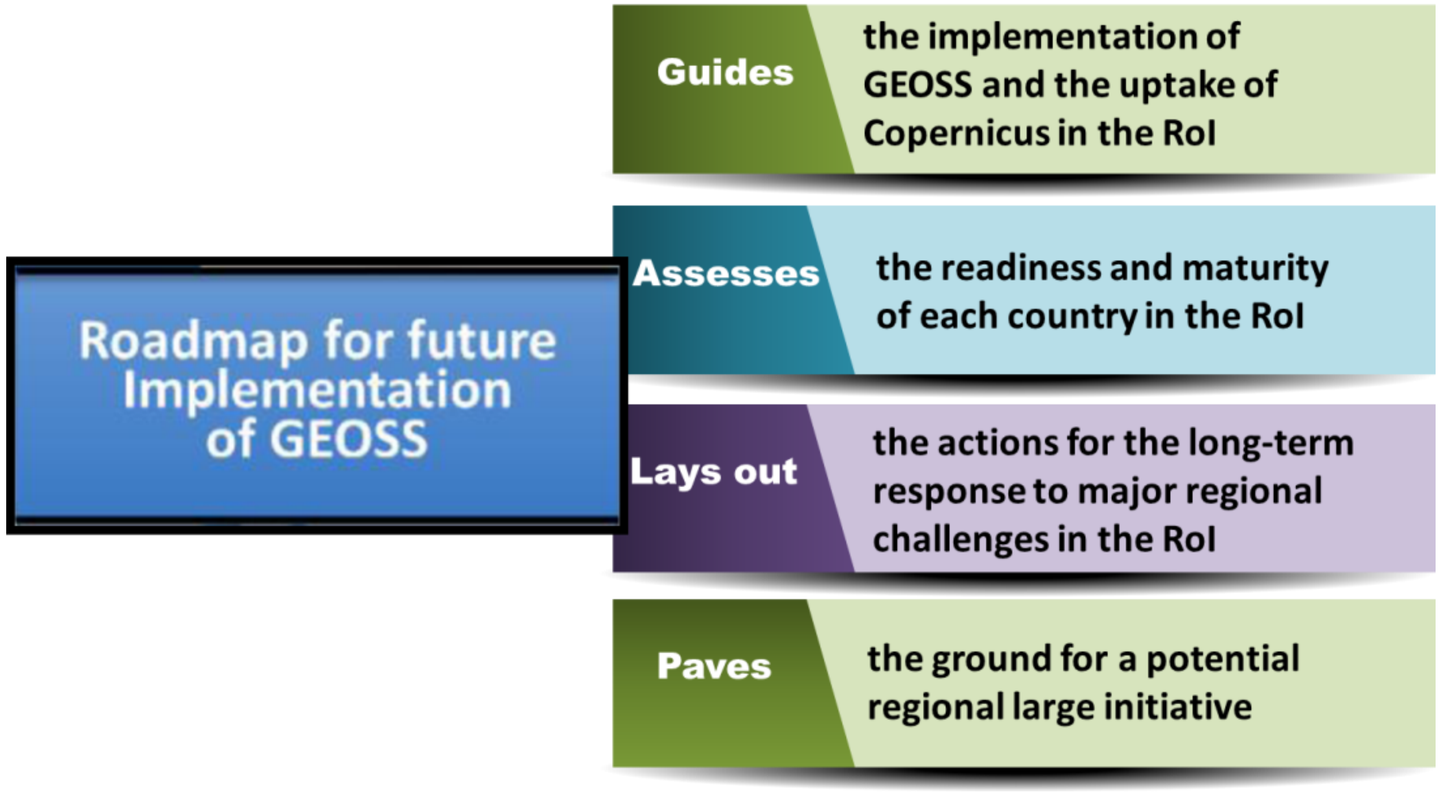
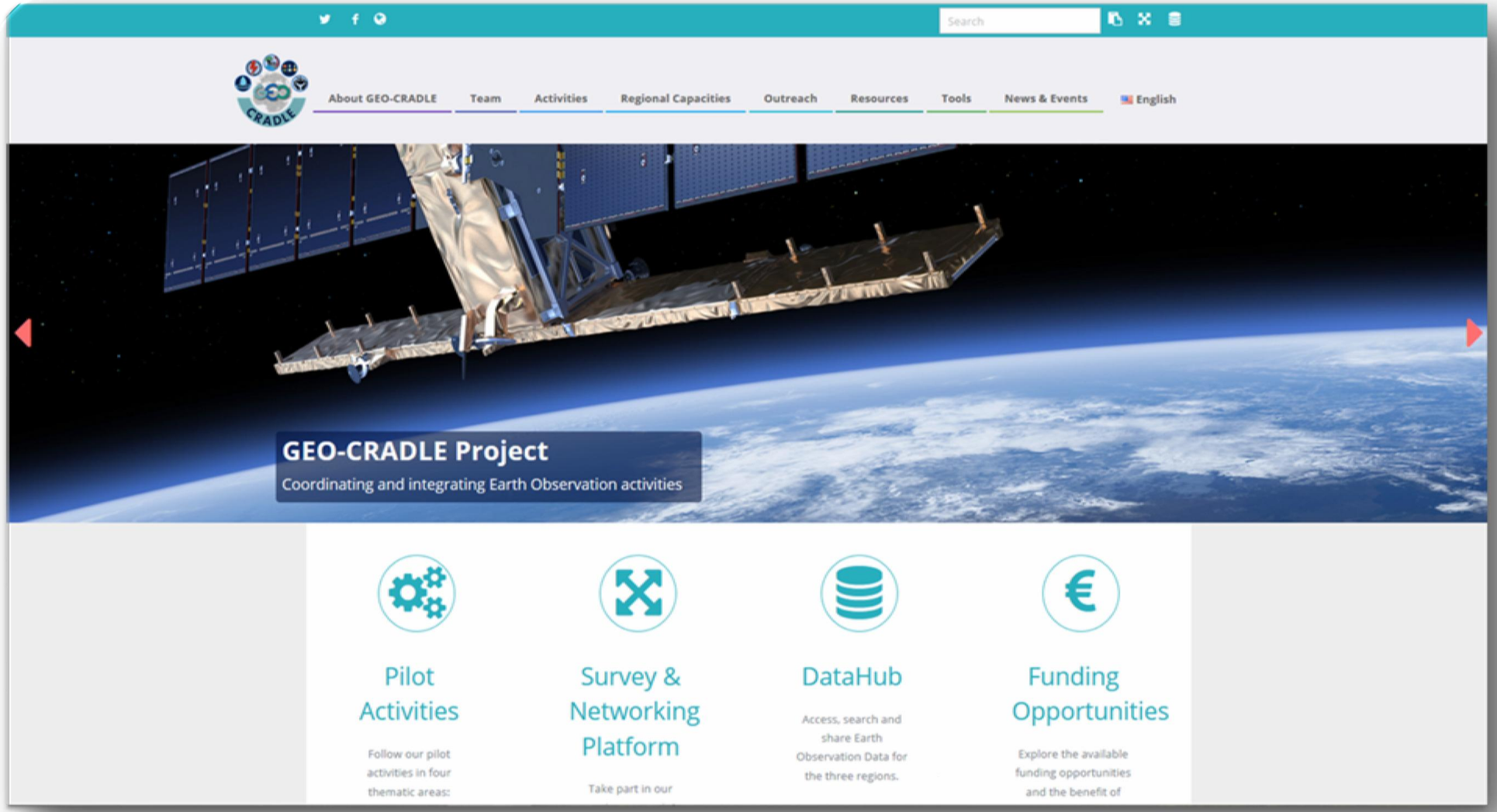
Submit a roadmap together with funding priorities in relation to capacity building, service delivery, filling in gaps (networks, infrastructures, data sharing, skills), training, education, service provision, and business uptake at regional level.

GEO-CRADLE will be a starting point for short future investments towards and beyond the implementation of GEO, GEOSS and Copernicus products and activities and visioning innovative high-end applications and technologies.



Long term funding: Science towards applications

http://geocradle.eu/



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thank you!

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