Development and Integration of a Local Solar Atlas into a GEOSS compliant Global Spatial Data Infrastructure (GSDI)

European Commission FP7 project ENDORSE (Energy DOwnstReam Services for GMES; 2011-2013)

Architecture Implementation Pilot - Phase 5 (AIP-5) of GEO (Group on Earth Observation)
Rationales

- Provides a local solar atlas suitable for local level analysis, namely 1/250 000
- Deploy an Open Source and access-free Spatial Data Infrastructure (SDI)
- Leverage the use of GMES (Global Monitoring for Environment and Security) Core Services from FP7 ENDORSE project:
  - HelioClim3 irradiance database, SRTM elevation, Geoland 2 land cover
- Framework of the Architecture Implementation Pilot - Phase 5 (AIP-5) of GEO (Group on Earth Observation)
Area of Interest

- PACA (Provence Alpes Côte d’Azur) is the sunniest region of France
- Bounding box: c. 300 km x 250 km
- Mountainous zones (in particular the East part of PACA)

Each year, the sun shines on the PACA region for about 2,881 hours on average, which is approximately 27% more than the country’s average. This makes it one of the most promising regions for solar power generation in France.
Innovations

- The major challenge is to develop a high resolution atlas suitable for local level studies, i.e. at 1/250 000 scale.
  - Deal with the refinement in scale which will be suitable for local decisions
  - Combine irradiance and other meteorological data with data of various nature
  - Developed replicable and scientifically-validated methods for creation of atlases
  - Provide users an easy access to solar resources to support decision making
Definition of the product

Set of geo-referenced digital maps relevant for the assessment of solar energy potential in the region Provence-Alpes-Côte d'Azur (PACA).

- 200 m irradiation maps
- BNI
- DHI
- GHI
- Territorial units
- District units
- Natural reserves
- Flood risks
- DEM Slopes
- DEM Aspects
- Land-use
- Distance to electric source points
- Air temperature

Validation of irradiation data
- 21 Météo-France ground stations used for calibration (cross-validation)
- 3 dedicated ground stations used as test stations

- GHI: bias < 1 %, RMSE ~5 % (~7 kWh/m²)
- BNI: bias < 1 %, RMSE ~8 % (~12.5 kWh/m²)
GEO / GEOSS / AIP-5

- **GEO** (Group on Earth Observation)
  - Launched at 2002 World Summit on Sustainable Development and by the G8
  - 88 Countries and the European Commission.
  - 67 intergovernmental, international, and regional organizations
  - 9 SBA’s
  - Coordinating efforts to build a Global Earth Observation System of Systems, or GEOSS

- **GEOSS**
  - Provides decision-support tools
  - Link existing and planned observing systems
  - Support the development of new systems
  - Promote the use of common standards

- **AIP-5**
  - Develops and deploys new process and infrastructure components for the GCI
  - Broader GEOSS architecture
The SDI includes the following interoperable components:

- A Community Portal
- A GeoServer hosting OGC (Open Geospatial Consortium) compliant Web Services
- A Catalog providing standard ISO Metadata for Search & Discovery
- Web-based Geodata Visualization client aka WebGIS client
Community Portal (Energy & Environment)

- Registered in the GEOSS Component & Service Registry (CSR)
● Community driven Open Source server

● Publishes data from any major spatial data source using open standards.

● Hosts hundreds of standard and interoperable resources (OGC WMS, WFS)
OGC Catalog (Geonetwork)

- Free Open Source Catalog application to manage spatially referenced resources
- Host over 400 energy related resources, 84 granules layers for Atlas PACA
- Bridge resources and applications
- Action list:
  - Browse Metadata
  - Interactive Map
  - Google Earth
  - Helper Application
WebGIS client (Heron Framework)

- Accessible via the “Helper Application” link in the Catalog
- Allows the creation of browser-based web mapping applications
- Based on GeoExt JavaScript toolkit and the Web mapping library OpenLayers
GEOSS Data CORE

- GEOSS Data Collection of Open Resources for Everyone (Data-CORE) is a distributed pool of documented datasets, contributed by the GEO community under the following principles:
  - The data are free of restrictions on re-use
  - Marginal cost recovery charges (i.e., not greater than the cost of reproduction and distribution)

- Data-CORE information are added in ISO Metadata as keywords:
  - GEOSS Data CORE, geossDataCore, geossNoMonetaryCharge.
GEOSS Data CORE: geossDataCore
GEOSS No Monetary Charge: geossNoMonetaryCharge
Harvest from the DAB (Discovery and Access Broker)

GEOSS Data CORE: geossDataCore
GEOSS No Monetary Charge: geossNoMonetaryCharge
Result propagated on the GWP (Geo Web Portal)

GEOSS Data CORE: geossDataCore
Integration & Dissemination in GEOSS framework

- Registry and Clearinghouse
- EuroGEOSS Discovery and Access Broker (DAB)
- Geo-Portal
- Metadata consistency (GEOSS Data CORE)
- Helper Application
Benefits and on-going works

- Promotion of solar energy usage towards people at large

- Accurate, easy access and well-presented solar maps are concrete and instructive for everybody (e.g. Decision makers, education, research).

- GEO/GEOSS maximize data provider effort for dissemination (Interoperability & standard)

- Work on fixing and enhancing Metadata and data workflow between SDI