Providing Earth Observation Support to the Monitoring and Implementation of the Sustainable Development Goals: Gaps and Priorities

The ConnectinGEO project
Ivette Serral
Introduction

• 2 year H2020 funded project (641538). Now in the last months (ending by January 2017).
• Coordinate and Support Action (CSA)
• 15 partners
• A contribution of the EC to GEOSS
• Main objectives
  • Perform a gap analysis in EO data, mainly in-situ
  • Propose priorities for addressing this gaps
  • Manage an European Network of Earth Observation (ENEON)
  • Link gaps to EV and SDG
Main results - EV review and analysis

*EVs are variables that have a high impact and should have priority in designing, deploying and maintaining observation systems and making data and products available*

- Coming from a Workshop in Bari, June 2015 and reported in the public *D2.3: Proposal of EVs for selected themes*
- 147 EVs reviewed
- Some of the EVs are not a single variable, but a cluster of several ones
- The community that has defined the highest number of EVs is currently the Climate one, lead by the Global Climate Observing System (GCOS)
- Most of the ECVs are relevant to the other GEO SBAs or themes
- Other communities already working on a mature set of EVs are Weather (lead by WMO/GAW) and Ocean, lead by the Global Ocean Observing System (GOOS)
- EV discussion and related work is growing fast in Biodiversity and Water. Energy community follows.
- Agriculture, Disasters, Ecosystems, Health, and Urban Development, are still in the initial stage
**Conclusions**

- Many SBA can rely on a number of EVs already available in other areas.
- Better to concentrate efforts on those variables that are cross-cutting different domains and check if the requirements are the same.

### Fragment of the summary table available in the deliverable

<table>
<thead>
<tr>
<th>GEO New SBA (+ Climate)</th>
<th>Themes (according to the Bari’s Workshop)</th>
<th>EV name</th>
<th>Domain and/or system component</th>
<th>Status of EV discussion (initial, medium, advanced)</th>
<th>Relevant communities, conventions, others initiatives</th>
<th>Other relevant GEO SBAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodiversity and Ecosystem Sustainability</td>
<td>Biodiversity</td>
<td>Genetic composition (Co-ancestry, Allelic diversity, Population genetic differentiation, Breed and variety div.)</td>
<td>Advanced</td>
<td>GEOBON, CBD, Ramsar Convention</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Species populations (Species distribution, Population abundance, Population structure by age/size class)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Main results - SDG review and analysis

- UN approved 17 SDGs articulated in 169 targets and 240 indicators to measure progress towards these targets
- How many indicators can be measured using Geospatial information and which subset can be measured with EO using EV?
  - 231 of the 240 indicators can be calculated with socio-economic data,
  - only 30 can be extracted with the combination of socio-economic data and Earth observation (in-situ, airborne or remote sensing),
  - only 9 indicators by Earth observation alone,
  - ..., but Earth observation can be used to understand global processes that can help to retrieve other indicators.
- In ConnectinGEO, an effort has been done to link SDG with EV → available in the D2.3 Proposal of EVs for selected themes
Example

- **Goal 14:** Conserve and sustainably use the oceans, seas and marine resources for sustainable development
  - **Target 14.1:** By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
    - *Indicator 14.1.1 Index of Coastal Eutrophication (ICEP) and Floating Plastic debris Density*
      - **Related proposed EV:** Ocean colour | Ocean acidity | Species populations (Species distribution, Population abundance, Population structure by age/size class) | Community composition (Taxonomic diversity, Species interactions) | Ecosystem structure (Habitat structure, Ecosys. extent and fragmentation, Ecosys. composition by functional type)
  - **Target 14.3:** Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
    - *Indicator 14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations*
      - **Related proposed EV:** Ocean acidity
  - **Target 14.4:** By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least
    - *Indicator 14.4.1 Proportion of fish stocks within biologically sustainable levels*
      - **Related proposed EV:** Species populations (Species distribution, Population abundance, Population structure by age/size class)
Organizing the European Contribution to GEOSS

• Instruments:
  • European data hub - NextGEOSS
  • ERA-Planet
  • European Network of Earth Observation Networks

• Via:
  • Participation in GD-06
    • Report provided on the status of in-situ observations
  • ENEON workshops
  • ENEON website
  • ENEON activities
    • E.g. Mapping the Networks
    • SOS Web service for the networks linking data to GEOSS
Main results – Map of the EO networks

- A dynamic graph of the existent EO networks in Europe in JSON-LD format - http://www.eneon.net/graph
- Anyone can contribute! User feedback system integrated to enhance this first draft version
Main results – EO gaps analysis

- 176 gaps identified coming from the ConnectinGEO methodology
- Collected in a collaborative table were anyone can contribute: [http://twiki.connectingeo.net/foswiki/bin/view/ConnectinGEOIntranet/GapAnalysisTable](http://twiki.connectingeo.net/foswiki/bin/view/ConnectinGEOIntranet/GapAnalysisTable)

<table>
<thead>
<tr>
<th>Add</th>
<th>View</th>
<th>Gap ID</th>
<th>Gap type</th>
<th>Theme</th>
<th>EV</th>
<th>Gap description</th>
<th>Thread RS/In-Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add</td>
<td>FeedBk</td>
<td>061</td>
<td>1.1</td>
<td>Climate</td>
<td>ECV: Temperature (Atmosphere upper-air)</td>
<td>The scarce of microclimatic data (air temperature) from the beneath of trees.</td>
<td>3</td>
</tr>
<tr>
<td>Add</td>
<td>FeedBk</td>
<td>062</td>
<td>2.3</td>
<td>Climate</td>
<td>ECV: Aerosols (aerosol mass, size distribution (or at least mass at 3 fraction sizes: 1, 2.5 and 10 micron), speciation and chemical composition, Aerosol Optical Depth (AOD) at multiple wavelengths, AAOD, water content, ratio of mass to AOD, vertical distribution of extinction)</td>
<td>Daily monitoring of inorganic compounds in precipitation</td>
<td>2</td>
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<td>Daily/weekly monitoring of heavy metals in precipitation</td>
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<td>Daily/hourly monitoring of NO2 in air</td>
<td>2</td>
</tr>
</tbody>
</table>

- User feedback system integrated for a given gap
• Some preliminary statistics extracted from the gaps.
Other results – gaps inventory

- Linked to the GEO DAB and the GEOSS KB
- Metadata enrichers and data filters
- Formulating the right questions to assess the gaps
Other results – A WebGIS Client providing access to in-situ measurements:

- Based on the 52N SWE (Sensor Web Enablement) solution following OGC SOS (Sensor Observation Service) standard and GEOSS recommendation on interoperability
- [http://insitu.webservice-energy.org/jsClient-0.2.0/#map](http://insitu.webservice-energy.org/jsClient-0.2.0/#map)

- visualization of sensor locations
- visualization of measurements as time series
- display of sensor metadata
- computation and statistical representation of time series
- download data
Challenges

• Sustainability and engagement in the ENEON
  • Analyzing alternatives including social network or merging with other initiatives (ERA-Planet, NextGEOSS, ENVRI+…)
• Keep the network mapping updated
• Activate Bottom-Up Thread 2 and 3 to collect their gaps
• Apply the gap analysis methodology regularly
• Setting the right priorities for the current gaps

• Scientific Special Issue on Environmental and socio-economic methodologies and solutions towards integrated Essential Variable definition and generation