GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
Open Data Open Knowledge 2023

ODOK 2023 Impact Report

Paola de Salvo
Available on the GEO Knowledge Hub (doi.org/10.60566/tmdyw-qqqk49)
Data Management Plan

Status and Update of the GEO – FAIR
Data Management Plan Self-Assessment Tool
Data Management Plan Self-Assessment Tool

Data and metadata

GEO Data Sharing Principles

GEO Data Management Principles

FAIR Principles

Open standards and Interoperability
Definition:

- A formal document outlining how data should be handled during and after the project is completed.
- Consider the many aspects of data management, metadata generation, data preservation before the project begins.
- Lead to data being well-managed in the present and prepared for preservation in the future.

Context:

- Regulatory - Required by national and international funding agencies (eg. European Commission)
- Educational - Familiarize young students with EO data sharing and data management principles
- Internal brainstorm - Enhance team’s implicit knowledge of sharing principles (Standard & interoperability)
- Designed for GEO and FAIR Principles
- Excel package (Macro)
- 10 GEO DMPs and 4 FAIR Principles
- Free, open, simple and easy to navigate
- Allow templating (Look & feel)
- Based on self-assessment
- Provide recommendation and guidance
- Comprehensive review
- Notion of compliance and trajectory
- Tested and validated on 37 e-shape pilots (X2)
- Free download on the GEO Knowledge Hub

---

**GEO Data Management Principles**

<table>
<thead>
<tr>
<th>DMP</th>
<th>Principle</th>
<th>Start Level of Compliance (1-3)</th>
<th>Final Level of Compliance (1-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMP 1: METADATA FOR DISCOVERY</td>
<td>Applicable but not started</td>
<td>1 - Fully compliant</td>
<td></td>
</tr>
<tr>
<td>DMP 2: ON-LINE ACCESS</td>
<td>2 - Partial implementation / ongoing</td>
<td>3 - Fully compliant</td>
<td></td>
</tr>
<tr>
<td>DMP 3: DATA ENCODING</td>
<td>2 - Partial implementation / ongoing</td>
<td>3 - Fully compliant</td>
<td></td>
</tr>
<tr>
<td>DMP 4: DATA DOCUMENTATION</td>
<td>2 - Partial implementation / ongoing</td>
<td>3 - Fully compliant</td>
<td></td>
</tr>
</tbody>
</table>

**Details included (mandatory):**

- Access to data is fully compliant with GEO recommendations but no direct access to the input data will be made available. Depending on the interoperable process (e.g. WPS), it will be made available on request.
- Restrictions might apply according to the type of loan that will be applied to the final product.

**Exceptions:**

- Exception due to commercial restrictions.

---

Note: This summary fills from the content entered in previous sections. To edit, please do so in the corresponding section.
2024 - Optimize data sharing and interoperability of GEO sharing principles

- **DMP OPIDoR platform**: [https://dmp.opidor.fr/](https://dmp.opidor.fr/)
  - Models, tools and online services in support of **machine-actionable Data Management Plan**
  - Import and export via **API**

- Adapt a **data model** compliant with GEO Data Sharing and Data Management **Principles**
- **Link** with data-related **services registries** (technical resources, PIDs, vocabularies, metadata standards, ...)
- Encourage **sharing principles’** for funder, institutional policies and the GEO community
Take Away Message

● The tool offers a powerful and flexible formal framework to assess compliance of data and services towards GEO and FAIR Principles

● Trajectory and Compliance features support the concept of a “living document”

● Automatic generation of a Data Management Plan document

● GEO-FAIR DMP Self Assessment Tool:
  ● https://gkhub.earthobservations.org/records/0ksgt-7v316

● Stay tune in 2024 for a GEO machine actionable Data Management Plan!
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain
Dialogue Series and Data Management Principles Implementation Guidelines

Bente Lilja Bye, Marie-Francoise Voidrot

BLB, OGC
OUTLINE

History & Timeline

The GEO data sharing and data management principles

Advocate - Engage - Deliver : The GEO dialogue series

Guides and capacity development material
The societal benefits of Earth Observation cannot be achieved without data sharing. The following are GEOSS data sharing principles:

- There will be full and open exchange of data, metadata, and products shared within GEOSS, while recognizing relevant international instruments and national policies and legislation.
- All shared data, metadata, and products will be made available with minimum time delay and at minimum cost.
- All shared data, metadata, and products for use in education and research will be encouraged to be made available free of charge or at no more than the cost of Reproduction.

Use of data or products does not necessarily imply agreement with or endorsement of the purpose behind the gathering of such data.

From “Kunnskapsgrunnlag GEO” by Bente Lilja Bye for The Norwegian Environmental Agency, 2022
GEO Timeline- Data management & Dialogues

From open data sharing and data management principles to open knowledge statement and knowledge management principles

From “Kunnskapsgrunnlag GEO” by Bente Lilja Bye for The Norwegian Environmental Agency, 2022
DATA SHARING PRINCIPLES

1. Data, metadata and products will be shared as **Open Data by default**, by making them available as part of the GEOSS Data Collection of Open Resources for Everyone (Data-CORE) **without charge or restrictions on re-use**, subject to the conditions of registration and attribution when the data are re-used;

2. Where international instruments, national policies or legislation preclude the sharing of data as Open Data, data should be made available with **minimal restrictions on use** and at **no more than the cost of reproduction and distribution**;

3. All shared data, products and metadata will be made available with **minimum time delay**.
The GEO Data Management Principles

Discover with us the strategies for a collaborative world

Reference: Revised GEO Data Management Principles Implementation Guidelines 2022

GEO Dialogue Series 2023 - Discover with us the strategies for a collaborative world

NOVEMBER 2023
Discoverability
DMP-1. Data and all associated metadata will be discoverable through catalogues and search engines, and data access and use conditions, including licenses, will be clearly indicated.

Accessibility
DMP-2. Data will be accessible via online services, including, at minimum, direct download but preferably user-customizable services for visualization and computation.

Usability
DMP-3. Data will be structured using encodings that are widely accepted in the target user community and aligned with organizational needs and observing methods, with preference given to non-proprietary international standards.
DMP-4. Data will be comprehensively documented, including all elements necessary to access, use, understand, and process, preferably via formal structured metadata based on international or community-approved standards. To the extent possible, data will also be described in peer-reviewed publications referenced in the metadata record.
DMP-5. Data will include provenance metadata indicating the origin and processing history of raw observations and derived products, to ensure full traceability of the product chain.
DMP-6. Data will be quality-controlled and the results of quality control shall be indicated in metadata; data made available in advance of quality control will be flagged in metadata as unchecked.

Preservation
DMP-7. Data will be protected from loss and preserved for future use; preservation planning will be for the long term and include guidelines for loss prevention, retention schedules, and disposal or transfer procedures.
DMP-8. Data and associated metadata held in data management systems will be periodically verified to ensure integrity, authenticity and readability.

Curation
DMP-9. Data will be managed to perform corrections and updates in accordance with reviews, and to enable reprocessing as appropriate; where applicable this shall follow established and agreed procedures.
DMP-10. Data will be assigned appropriate persistent, resolvable identifiers to enable documents to cite the data on which they are based and to enable data providers to receive acknowledgement of use of their data.
The GEO Data Working Group

- In-Situ data
- Data Sharing & Data Management Principles
- Law & Policy

GEO Data Working Group
The GEO Working Group – Motivation

The GEO data sharing and data management principles need to be advocated, the Earth observation community needs to be engaged, and concrete results need to be delivered and made available.
<table>
<thead>
<tr>
<th><strong>Open Knowledge</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Science</td>
</tr>
<tr>
<td>Open Access</td>
</tr>
<tr>
<td>Citizen and</td>
</tr>
<tr>
<td>Participatory</td>
</tr>
<tr>
<td>Science</td>
</tr>
<tr>
<td>Open Data</td>
</tr>
<tr>
<td>Open Reproducible</td>
</tr>
<tr>
<td>Research</td>
</tr>
<tr>
<td>Open Software</td>
</tr>
<tr>
<td>Open Infrastructure</td>
</tr>
<tr>
<td>Open Hardware</td>
</tr>
<tr>
<td>Open Education</td>
</tr>
<tr>
<td>Open Evaluation</td>
</tr>
<tr>
<td>Diversity of</td>
</tr>
<tr>
<td>knowledge</td>
</tr>
</tbody>
</table>
2022 Dialogue series:
GEO Data Sharing and Data Management Principles

Data life cycle
Data sharing principles
Discoverability (DMP 1)
Accessibility (DMP 2)
Usability (DPM 3-6)
Preservation (DMP 7-8)
Curation (DMP 9-10)
Data Management Self-Assessment Tool

2023 Dialogue series:
GEO Open Knowledge Statement

Open Knowledge, Open Science
Open Data, Open Access
Open Reproducible Research
Open Software, Open Infrastructure, Open Hardware
Open Education, Open Evaluation
Citizen and Participatory Science Overarching Goals of Open Knowledge
Diversity of Knowledge
How to go towards Open Knowledge for GEO
Self-Assessment Tool progress and G-REQs for In Situ Requirements

Recordings and packages on GEO Knowledge Hub:
https://gkhub.earthobservations.org/
Become part of the GEO community!

Listen to the 2023 Workshop on Open Data And Open Knowledge

https://gkhub.earthobservations.org/packages/pfty5-y6482

Visit the GEO Knowledge Hub

• 2022 Dialogues series recordings
• Data Management Self Assessment Tool
• 2023 Dialogue series recordings

Visit the GEO Knowledge Hub!
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
GEO DATA LICENSES GUIDELINES

GEO Data Working Group - Law & Policy Subgroup

Lea Shanley, Director/CEO, International Computer Science Institute, An Affiliated Institute of the University of California at Berkeley

DAY 2: Workshop: From Data to Open Knowledge implementation: Efforts to grow the value chain

7 OCT 2023 @ GEO WEEK in Cape Town, South Africa
OUTLINE

1. Why is data licensing important?
2. Advancing data licensing in GEO
3. Advancing data licensing in NOAA
4. Recommended Implementation Actions
Why is Data Licensing Important?

• Describing data as “Full and Open” or “Open Data by Default” provides insufficient legal certainty for many data users.

• Custom “end user license agreements” or data “terms and conditions” often include legally problematic terms and require close legal review to understand.

• The uncertainty and lack of consistency creates barriers to data use. The international community is moving towards the solution of standard open data licenses.
Advancing Data Licensing in GEO

• The GEO Programme Board directed the Data Working Group (DWG) to prepare guidelines regarding open data licensing (Action PB-24.05).

• In February 2023, the GEO Programme Board approved Data Licensing Guidance developed by the Law & Policy Subgroup of the GEO Data Working Group.

• In June 2023, the Law & Policy Subgroup hosted a session at the GEO Open Data/Open Knowledge Workshop to discuss implementation.
Advancing Data Licensing in GEO

• The following data licenses are consistent with the GEO Data Sharing Principles:
  • Creative Commons Zero 1.0 Universal Public Domain Dedication (CC0)
  • Open Data Commons Public Domain Dedication and License (PDDL) v1.0
  • Creative Commons Attribution 4.0 International (CC BY 4.0)

• GEO Members, Participating Organizations, and other entities that share open, unrestricted data should clearly license such data using only one of these licenses. Custom license agreements should not be used, and these standard licenses should not be modified or augmented with additional text.

• [https://gkhub.earthobservations.org/records/nxzjn-qx554](https://gkhub.earthobservations.org/records/nxzjn-qx554)
Recommended implementation actions from ODOM Workshop LP Session

• Work with GEO activities towards applying a recommended open license to their data and products.

• Ensure GEO platforms that host data or information (e.g., the GEO Knowledge Hub) require providers to include an open license.

• Work with the GEO Secretariat to identify metrics to track adoption of standard open data licenses.

• Seek the support of the regional GEOs in implementing data licensing guidance.
Recommended implementation actions from ODOK Workshop LP Session

• Explore opportunities to highlight the importance of open data licensing at the GEO Ministerial.

• Develop simple open data licensing implementation instructions.

• Explore options for addressing stakeholder concerns about existing open data licenses, in collaboration with groups like Creative Commons (a GEO Participating Organization).

• Effectively and repeatedly communicate the benefit of open data licensing, success stories, and the importance of licensing for users and open knowledge.
Use Case: Advancing Data Licensing at US NOAA

• Starting to use CC0 for NOAA data.

• Encouraging the use of CC0 or CC BY for external data provided to NOAA (from contractors, grantees, interagency and international partners, voluntarily from the public).

• Seeking opportunities to emphasize the importance and simplicity of using standard open data licenses with data providers and international organizations.
What can GEO Member Organizations do to advance open data licensing?

- If you are a data provider, consider using CC0 or CC BY for your own data.

- If you are a data user, consider encouraging the use of CC0 or CC BY for external data provided to you.

- Seek opportunities to emphasize the importance and simplicity of using standard open data licenses with data providers and international organizations.
GEO DATA WG – LAW & POLICY SUBGROUP MEMBERS

• Paola De Salvo (GEOSec)
• Bob Downs (Data WG co-chair)
• Derek Hanson (LP co-chair)
• Jordi Salinas (LP co-chair)
• Mariel Borowitz
• Gilberto Camara (former GEOSec)
  Bob Chen
• Estelle Chou

• Chuang Liu
• Thomas McInerney
• Albert Momo
• Ado Muhammad
• Viola Otieno
• Lea Shanley (former LP co-chair)
• Fraser Taylor
GEO DATA WG - Law & Policy Subgroup

- **Paola De Salvo**, GEO Secretariat: pdesalvo@geosec.org
- **Derek Hanson**, JD, co-Chair: derek.hanson@noaa.gov
- **Jordi Salinas**, JD, co-Chair: jordisandalinas@gmail.com
- **Lea Shanley**, PhD, former co-Chair: Ishanley@icsi.Berkeley.edu

- **Open Data Licensing Guidance**: https://www.earthobservations.org/geo_blog_obs.php?id=590
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
In situ data activities

GEO Open Knowledge and Data WG

7 November 2023

Special Thanks to Helen Glaves (BGS, Co-Chair of the In Situ SG)
Prioritising in situ data in GEO

- **Coordination of in-situ data community within GEO**: declarations from several Ministerial Summits have called for strengthening this coordination.

- **GEOSS In Situ Observation Resources Task Team report (2018)** highlighted need and potential benefits for coordination of in-situ data.

- **Canberra Declaration** (November 2019):
  - recognises the **critical role** that in-situ data collected from the atmosphere, land, and water plays in achieving GEO’s mission;
  - calls for **GEO community to develop a strategy** to address the challenges in this area and to demonstrate progress in implementation.
GEO In situ data subgroup: drivers

• Newly established Data Working Group (2020) identified key action areas:
  • In situ data → **In Situ Data Subgroup**
  • data ethics/law/policy
  • data sharing and data management principles
• GEO Mid-Term Evaluation (2021) called for improved availability and integration of in-situ data through the implementation of the GEOSS Data Sharing and Management Principles
• Identified need for a GEO in situ data strategy
In situ data subgroup: priorities

- Characterisation of the in-situ data landscape including:
  - Common barriers to data sharing and re-use
  - Identifying/mapping/gap analysis of in-situ data providers within the GEOSS platform
  - Engaging with existing networks focused on domain level coordination of in-situ data
  - Engaging with GWP activities to identify specific requirements including challenges, data gaps and priorities

- Developing a first set of strategic objectives and advancing an in-situ data strategy for GEO
In-situ data: priorities for GEO

- **Identifying current challenges** associated with making in-situ data open and accessible
- **Requirements gathering** for in-situ data within GEO, including from GWP activities and other relevant stakeholders e.g. UN agencies (use of G-reqs)
- **Definition of essential variables (EVs)** required by thematic domains such as climate, mountain environments, climate, oceans, and urban resilience.
- **Availability of high quality in-situ data** required for calibration and validation of Earth observations, and as training data for new technologies e.g. AI / ML
- **Supporting GWP activities and other related initiatives** working towards integration of heterogeneous data especially EO and in-situ measurements
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
Value Chains
From Ocean Observations to Users

7 November 2023, 16:00-18:00

Tamaryn Morris
Juliet Hermes
Emma Heslop
OUTLINE

What is GOOS?

Co-designing solutions to societal issues

Co-design pilot – local example

Links to GEO Open Knowledge and Data Hub
Why observe the ocean?

Climate and weather
The ocean plays a huge role in the Earth’s climate and weather. At the same time, it is being affected by climate change.

Ocean health
Overfishing, climate change and pollution are putting these vital natural ocean’s services at risk, and their impacts are critically under-observed.

Coastal communities
Communities in many less developed areas are particularly at risk from changing weather and ocean patterns, and increased disaster risk.

If we haven’t got data underpinning our decisions, we might as well be guessing at solutions
GOOS Today

- 84 countries, 8,700+ observing platforms, 13 global networks
- More than 100,000 observations per day - delivering an accessible, safe and productive ocean
- Global observing networks, e.g. Argo, GO-SHIP, Drifting Buoys, plus emerging networks, e.g., OceanGliders, HF Radar.

“The weather forecasting systems will run off the rails if they don’t have the surface pressure information over the ocean to constrain them” - Lars Peter Riishojgaard, Director of the Earth System Branch WMO

www.ocean-ops.org/reportcard2022
Underpinning a wide range of applications

Vision: A truly global ocean observing system that delivers the essential information needed for our sustainable development, safety, wellbeing and prosperity.
GOOS : Regional & National Alliances

- CIOOS
- US IOOS
- IOCARIBE-GOOS
- OCEANTLAN
- GRASP
- EuroGOOS
- MONGOOS
- Black Sea GOOS
- GOOS-Africa
- IOGOOS
- SEAGOOS
- PI-GOOS
- IMOS
- SAON
- NEARGOOS
- SAEON
- SOOS

Plus 76 GOOS National Focal Points
Ocean Observing Co-Design will develop a more user-focused co-design process to evolve a truly integrated, responsive ocean observing system.
Co-DESIGN to bring about a **STEP CHANGE**

<table>
<thead>
<tr>
<th>Year 1-2</th>
<th>Year 2-3</th>
<th>Year 3-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGAGEMENT &amp; DESIGN  Engaging with user communities to inform pilot activity</td>
<td>PILOT ACTIVITY  Fill observing system gaps and evaluate solutions  Refine delivery of ocean information</td>
<td>IMPLEMENTATION  Maximize Return On Investment  Embed across global observing systems</td>
</tr>
<tr>
<td><img src="CO2.png" alt="CO2" /> <img src="Wave.png" alt="Wave" /> <img src="Temperature.png" alt="Temperature" /> <img src="Salinity.png" alt="Salinity" /> <img src="Fish.png" alt="Fish" /></td>
<td><img src="Tools.png" alt="Tools" />  Tools for tracking and reporting of success</td>
<td><img src="ContinuousEngagement.png" alt="Continuous Engagement" />  Continuous engagement and feedback from user communities</td>
</tr>
</tbody>
</table>
The Greater Agulhas Current Pilot Region

- Boundary Currents
- Marine Heatwaves
- Tropical Storms
- Marine Life
**BOUNDARY CURRENTS**

**Core coordination**

**User Engagement**

**Value assessment**

<table>
<thead>
<tr>
<th>Observing System</th>
<th>Prediction System</th>
<th>Products &amp; Services</th>
<th>Pilot implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Inventory of observing capacity</td>
<td>- Engage regional ocean modeling facility</td>
<td>- Identify existing regional products</td>
<td>- Cross border cooperation</td>
</tr>
<tr>
<td>- Cross community workshop</td>
<td>- Design for OSSE’s with partner SynObs</td>
<td>- Identify delivery needs (app, web, etc.)</td>
<td>- Continuous assessment with stakeholders</td>
</tr>
<tr>
<td>- Scope design with regional partners</td>
<td>- Assess assimilation and model bias</td>
<td>- Identify data flow for products</td>
<td></td>
</tr>
<tr>
<td>- Assess gaps in data pathways</td>
<td></td>
<td>- Develop new test products</td>
<td></td>
</tr>
</tbody>
</table>

**Pilot Region: Agulhas Current**

**END USERS:**
- Weather services
- Regional fisheries
- Ocean Industries, e.g. shipping
- Marine resource management
Co-Design Exemplars
*Each exemplar is at different levels of maturity
Impacts to Open Data and Knowledge?

• Targeted data streams by co-design – how does this impact GEO?

• How do we achieve greater collaboration along the entire value chain – from ocean observations to end users?

• Focus here has been on ocean observations, but should we treat satellite observations in the same manner?
# Essential Ocean Variables (EOVs)

<table>
<thead>
<tr>
<th>Physics</th>
<th>Biogeochemistry</th>
<th>Biology &amp; ecosystems</th>
<th>Cross-disciplinary</th>
</tr>
</thead>
</table>

## International Legally Binding Instrument on Plastic Pollution 2024

+ Biodiversity Beyond National Jurisdiction

**Sendai Framework for Disaster Risk Reduction 2015-2030**

**Convention on Biological Diversity**

**Post-2020 Biodiversity Framework**

**UNEP**

**THE LAW OF THE SEA**

**United Nations Climate Change**

**14 LIFE BELOW WATER**
Data is not information, information is not knowledge, knowledge is not understanding, understanding is not wisdom. Stoll and Einstein
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
From Data to Open Knowledge implementation: efforts to grow the value chain

European dataspaces and how they can influence the future of the open data sharing

7-11-2023 18:00

Joan Maso
What is a Data Space?

An infrastructure that enables data transactions between different data ecosystem parties based on a governance framework. [1]

The act of bringing together relevant data infrastructures and governance frameworks in order to facilitate data pooling and sharing [2].

Data Spaces:

(i) deploy data-sharing tools and services for the pooling, processing and sharing of data by an open number of organisations, as well as federate energy-efficient and trustworthy cloud capacities and related services;
(ii) include data governance structures, compatible with relevant EU legislation, which determine, in a transparent and FAIR way, the rights concerning access to and processing of the data;
(iii) improve the availability, quality and interoperability of data – both in domain-specific settings and across sectors.

Difficulties we face:

- Is *data space* the only or the right solution for ensuring Open Data and at the same time Trust, Governance and Data Sovereignty?

European Green Deal issues:

- Climate change
- Circular economy
- Pollution
- Biodiversity
- Deforestation
Extending the industry data space definition

- In the industry definition of Data Space (IDSA), static assets are shared between two participants in a secured channel.
  - It requires that both (client and server) have connector software.
  - In this def. Data sharing becomes the opposite of open data!!
    - This is not the GEO Data Sharing principles definition. Confusing!
- Questions
  - How to combine open data (INSPIRE, etc) with secured data in a data space?
  - How to share queryble (dynamic) assets?
  - How to allow for data processing in the data space?
  - How to do loosely coupled and still provide enough trust?
This approach is different from the one presented in: IDS as a Foundation for Open Data Ecosystems, Chapter 14, Kirstein F. and Bohlen V. Designing Data Spaces The Ecosystem Approach to Competitive Advantage, https://link.springer.com/book/10.1007/978-3-030-93975-5
Some solutions to break silos in the GDDS

• Share and combine
  • In situ data using Sensor Things API (and STAplus), in collaboration with USAGE
  • Gridded data in datacubes, in collaboration with B3 and FAIRiCUBE.

• Using semantics. Two approaches
  • The Green Deal Information Model (GDIM)
    • Data can be converted in to a general RDF model respecting the original data attributes.
  • Focus on variables/observedProperties
    • Tag them with variable name, EV, UoM
    • Report provenance of the variables (methodology to obtain the data and applied post-processing)

• Test OGC web services and OGC web APIs with IDSA connectors.
Layer destruction and reconstruction for the GDDS

- RDF representation of mainly vector data
- GeoSPARQL queries
- Semantic tagging
- Dimension definition

Original layers are no longer visible

GDDS

DC representation of mainly raster data

WCS Xarray queries

"subLayer" extraction (a.k.a collections)

GDDS: Geospatial Data Distribution Service

Semantic tagging

Dimension definition

GeoSPARQL queries

RDF representation of mainly vector data
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
From Data to Open Knowledge implementation: efforts to grow the value chain

Digital ecosystems and soft infrastructures for building data spaces

07.11.2023 16:00 UTC+2

Paolo Mazzetti
What is a Data Space?

- No worldwide agreed definition
- General consensus on:
  - Distributed data sharing (no data centers, no data lakes)
  - Openness (no fixed number of participants, multiple roles supported)
  - Governance (no anarchy)
- Divergent views:
  - Academic literature:
    - Light system (no data integration, value added through incremental development)
  - European Union (European Strategy for Data)
    - Common European Data Space(s)
      - Added value: security, trust, data sovereignty
Data spaces and GEOSS

- **GEOSS**
  - A data space (GEOSS Platform) + enhancements for Earth Intelligence
- **Common European Data Space(s)**
  - A data space + support to data trust
  - Contributing to GEO/GEOSS through EuroGEO

Dataspaces are not a data integration approach; rather, they are more of a data co-existence approach. The goal of dataspaces support is to provide base functionality over all data sources, regardless of how integrated they are. For example, a DSSP can provide keyword search over all of its data sources, similar to that provided by existing desktop search systems. When more sophisticated operations are required, such as relational-style queries, data mining, or monitoring over certain sources, then additional effort can be applied to more closely integrate those sources in an incremental, “pay-as-you-go” fashion.

Data spaces as Digital Ecosystems

A Digital Ecosystem emulates Natural Ecosystems
- Multiple ‘species’ (autonomous entities) collaborating and competing
- In a (digital) ‘environment’
- Carrying out different functions
- Contributing to a ‘service’ for the human society
- To be protected (governance)

No fixed set of participants (‘species’) 

No fixed set of requirements, only one or more general ‘services’ (e.g., generating Earth Intelligence, secure sharing)
- Ready to changes

Participants can enrich the DE providing tools and services on top of the existing ones
- Security and trust
- Generation of knowledge for Earth Intelligence
- …
How to build a data space: soft infrastructures

• (Light) agreements and rules for participation
  • Governance rules
  • Technical specifications

• Logical ‘building blocks’ / ‘enablers’
  • Core services for data space enablement
    • Data discovery and addressing
  • ‘Facilitators’ to make life easier to intermediate users
    • Data (syntactical) harmonization
  • Open APIs
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
From Data to Open Knowledge implementation: efforts to grow the value chain

Upscaling federated infrastructures in the EU for policy support and better user experience. Digital EO Infrastructures and Initiatives: A review framework based on open principles

07.11.2023 16:00 UTC+2

Albana Kona
Digital EO Infrastructures and Initiatives: A review framework based on open principles

From a user-driven perspective, a series of requirements spanning from discoverability of available datasets, models, services, to transparency of pricing, from the problem of service sustainability to service redundancy, transparency of costs and technical specs, interoperability and accessibility, were investigated by reviewing over 150 digital platforms.

The outcome is a preliminary phase for designing a user centric framework in evaluating EO digital infrastructures. To complement the work, also a series of advisory technological enablers are provided in order to alleviate user’s challenges and enhance interconnection amongst the services, thus facilitating the interoperability between platforms and fostering the discoverability of available services.
Context background

- The landscape of EO digital platforms is fragmented
- Limitations currently faced by the users
- Discoverability: no single place where all the information on available services and costs can be found
- Developers often struggle to find the services that match their needs
- No information about users’ uptake and level of satisfaction on the current usage of the platforms
- Users’ feedback hardly taken into account. Top-down design of platforms does not always take into account the diverse needs of under-represented communities (e.g. indigenous communities)
- Overlapping services
Survey for use cases

• Gaining understanding of users’ pain points / bottlenecks, wishes and ideas; making users feel heard; gathering feedback; helping platforms implement a long-term co-design strategy

• Promoting strengths of current digital infrastructure’s offer; improving discoverability of available services; improving overall impact and visibility of EU Digital Platforms

• Identifying gaps in the current offer vs. users’ demand; informing stakeholders on how to fill existing gaps; promoting a seamless, inclusive user experience of existing infrastructures in the context of EuroGEO

• Developing a set of meaningful key performance indicators (KPIs) for the platforms’ self assessment

• Identifying “technological enablers”: successful, reusable technologies that facilitate integration, interoperability and reuse of components
Dimensions for evaluation of digital platforms

- Interoperability
- Documentation
- Accessibility
- Customization / tailored services
- Data & model sharing
- Sustainability
- Costs
- Support / community
- Datasets availability & quality
Dimensions for evaluation of digital platforms – Insights I

**Interoperability**
- Multiple platforms; not clear picture of all the offer; rather difficult to compare offers from different providers
- No single entry point; redundancy of services, need multiple logins to use services from different platforms
- No interoperability

**Documentation**
- Steep learning curve to start
- Documentation not always up-to-date. Need for updated documentation, webinars and tutorials

**Accessibility**
- Not clear what services are offered and if they fit users’ needs, often subscription is needed to try out services
- Users should be able to access a basic set of services for free for sandboxing and evaluate if the offer fits their needs
# The Earth Talks

## Dimensions for evaluation of digital platforms – Insights II

<table>
<thead>
<tr>
<th>Customization</th>
<th>Data &amp; model sharing</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Customization of environment – preferred in-house solutions</td>
<td>- Facilitate data and model sharing and reuse</td>
<td>- Pricing of services not fully transparent.</td>
</tr>
<tr>
<td>- Need for tailored services for near-real time kind of users;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- several levels of functionalities for data provision;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- demand for decision is getting faster; capacity problems in areas with conflicts; need</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sustainability**

- Sustainability of platforms after public funding period not always clear

**Costs**

- Costs difficult to estimate. Ability to assess and control costs. Ideally implement pre-paid or threshold. Pay per use. Scalability of the costs
Dimensions for evaluation of digital platforms – Insights II

**Support / community**
- Effective and quick support, both commercial and technical. Ideally provided in different languages.
- Effective communication channels: competent helpdesk, forum, bug tracker. Timely assistance.

**Datasets availability & quality**
- Need for in-situ data, data harmonisation and proper metadata.
- Data providers are usually not part of the projects and therefore no financial support can be allocated for data harmonisation and documentation.

**Datasets availability & quality**
- Quality check for data
- Licensing of data
- Need to access and integrate datasets from multiple platforms using open standards and APIs
Thank you

Albana Kona¹, Margherita Di Leo², Brooke Tapsall³, Marco Minghini¹, Alexander Kotsev¹

1: European Commission, Joint Research Centre (JRC), Ispra, Italy
2: Arcadia SIT, under contract with the European Commission, JRC, Ispra, Italy
3: AGICS OU, under contract with the European Commission, JRC, Ispra, Italy
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
From Data to Open Knowledge implementation: efforts to grow the value chain

From Data to Knowledge using the GEOSS platform

Tuesday 07.11.2023

Gregory Giuliani
Land Degradation... is undermining the well-being of 3+ billion people

Cost about 10% of the world’s annual gross product through loss of biodiversity and ecosystem services.

75% of Earth’s land areas are substantially degraded (90% by 2050).

Exacerbating biodiversity loss, climate change and leading to mass migration, conflict and major food security concerns.

Avoiding, reducing and reversing land degradation and restoring degraded land is an urgent priority to protect the biodiversity and ecosystem services that are vital to life on Earth.

There is an immediate need to enhance national capacities to undertake quantitative assessments and corresponding mapping of their degraded lands.
Land Degradation Neutrality Initiative
Group on Earth Observations

GEO-LDN FLAGSHIP

The GEO Land Degradation Neutrality Flagship (GEO-LDN) is a stakeholder-driven initiative that was launched in 2018 during the Group on Earth Observations Week in Kyoto, Japan. It brings together Earth observation data providers and governments to develop minimum data quality standards, analytical tools and capacity building needed to strengthen land degradation monitoring and reporting, using remote sensing and data from other sources.
Objective of the GPP use-case

Building an integrated & reproducible method to support Assessment and Monitoring/Evaluation

Source: 2022 UNCCD Science Policy Interface Review of LDN entry points (see link above)
SDG15.3.1 – Data to Knowledge

**DATA**
- EO Data
  - Vegetation index
  - Land Cover
  - SoilGrids

**EVs**
- ECVs
  - Fire disturbance
  - Land Cover
  - Soil Carbon

**INFORMATION**
- EBVs
  - Ecosystem extent and fragmentation
  - Habitat structure

**KNOWLEDGE**
- Sub-indicators
  - Land Productivity Dynamics
  - Land Cover Change
  - Soil Organic Carbon Stocks

**TARGET 15.3**
Proportion of land that is degraded over total land area

With support from
- European Commission
- Université de Genève
- Eversis

[Image and logos]
SDG15.3.1 – Implementation in the GEOSS platform

Multi-scale analytical framework!
New FAO report highlights urgent need to restore Africa’s degraded landscape

Up to 65 per cent of productive land is degraded, while desertification affects 45 per cent of Africa’s land area.
https://geoss.uat.esaportal.eu/

Please provide your feedbacks: https://forms.gle/DozNjS4Vq4JHtqVL6
Beyond the SDG 15.3.1 Good Practice Guidance 1.0 using the Google Earth Engine platform: developing a self-adjusting algorithm to detect significant changes in water use efficiency and net primary production

Scientific background

Knowledge generation using satellite earth observations to support sustainable development goals (SDG): A use case on Land degradation
The proposed approach enhance:

1. **Reproducibility**: users can reproduce the experiment (same data/same analysis)
2. **Replicability**: users can replicate the experiment (different data /same analysis) >> use of national/local datasets instead of global ones.
3. **Reusability**: users can reuse/apply the approach in different contexts >> change the model and/or data sources.

GPP will further evolve the GEOSS infrastructure with users’ required functionalities to **access tailor-made information** & **actionable knowledge**.

GPP will enable services to non-specialists in the domain of adaptation to extreme climatic events and to changes in climatic conditions.

Open Data, Source, Algorithms, Standards/FAIR principles > **one step towards reproducible science**.

**Facilitate connecting/utilizing** existing (European) developments and knowledge, in a collaborative way.

**Promoting collaborative approaches for Policy implementation**

**GEO role** in connecting and facilitating some existing “dots”, incubating possible “ecosystems”.
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
From Data to Open Knowledge implementation: efforts to grow the value chain

GEOSS Platform user interface developments supporting knowledge generation

Joost Van Bemmelen
OUTLINE

From data to Actionable Knowledge

The GEOSS Platform

From the GEOSS Portal to Actionable Knowledge

knowledge generation

Contribution Examples
From data to Actionable knowledge and Earth intelligence

1. Data refers to a collection of facts, statistics, or information that can be in the form of numbers, text, images, or other formats. It consists of raw, unprocessed elements and observations. The significance and interpretation of data are determined by the context and how the data is analyzed or processed.

2. Information/Knowledge: Information is data that has been processed, organized, or structured in a way that it is meaningful and can be used to make decisions or draw conclusions. Information provides context and meaning to data. It is typically factual and can be used to answer specific questions or solve problems.

3. Services: set of tools, algorithms, models, components that together support the generation of

   1. Actionable Knowledge: Actionable knowledge refers to information or knowledge that is not only meaningful but also practical and relevant for making informed decisions or taking specific actions. Actionable knowledge is designed to guide individuals or organizations in making effective choices.

4. Earth Intelligence: Earth intelligence, in the context of geospatial and environmental sciences, refers to the collection, analysis, and interpretation of data related to the Earth's physical features, climate, environment, and human activities. Earth intelligence involves the use of technologies like remote sensing, geographic information systems (GIS), and data analysis to gain a deeper understanding of the Earth's dynamics and make informed decisions regarding Earth-related matters. It can help address issues such as climate change, natural disasters, resource management, and land use planning.
From data to Actionable knowledge and Earth intelligence

To achieve the best from Actionable knowledge the piece of information should be “meaningful”: this means that it should own different qualities, among others:

**Accuracy:** Information should be correct and free from errors or inaccuracies. Accuracy ensures that the information can be trusted to represent reality as closely as possible.

**Reliability:** Reliable information comes from trustworthy sources and is consistent over time. It can be counted on to provide consistent results or insights.

**Relevance:** Information should be directly related to the topic or issue at hand. Relevant information is valuable because it is applicable to a particular context or problem.

**Completeness:** Complete information provides a full picture of a subject. It includes all the necessary details and context, leaving no critical gaps.

**Timeliness:** Timely information is current and up-to-date. It is provided or used at the right time, ensuring its relevance and usefulness.

**Precision:** Precise information is presented with a high degree of detail and exactness. It provides specific and accurate insights, which is particularly important in scientific and technical contexts.

**Accessibility:** Accessible information is readily available and easy to find. It should be organized and stored in a way that makes it accessible to those who need it.

**Verifiability:** Verifiable information can be cross-checked or confirmed through independent sources or methods. It adds credibility to the information.
The GEOSS Platform

- A data discovery and access system bridging the gap between data providers and users.
- One main HCI, the GEOSS Portal
- Enabling the creation of Community Portals via customizable GEOSS Mirrors
- Enabling the configuration of the domain of interest via customizable GEOSS Views
- Accessible via open APIs, exposed by the GEO Data and Access Broker (middleware)
- Replicability, Reproducibility, Reusability, Robustness
From the GEOSS Portal to Actionable knowledge

- **In situ data**
- **Remote sensing**
- **Catalogues from communities**

**Data**
- **GKH**
- **External KH**
- **Scientific repositories**
- **Relationships**

**Knowledge**
- **Algorithms**
- **Models**
- **Applications**

**Services**

- **Semantic links among resources** to enable reproducibility, replicability, reusability, to combine data and to verify results
- **Discovery of reliable services**, credible information and knowledge relevant tools, models, algorithms, papers, accurate and precise data
- **Developing tools that enable self-creation of community portals, views, services** to foster a broader engagement of new communities
- **Leveraging Cloud technologies supporting multi-Cloud approach** for product and actionable knowledge generation
- **Social network, reporting and sharing mechanisms** enabling collaboration and promotion of data, results, experiments
knowledge generation:
Tools/Enablers/Applications

GEOSS Portal
Provides discovery and access of data, knowledge, services, visualization functionalities and allows contribution by Communities to exploit and generate Actionable Knowledge

Open APIs
Provides APIs to use GEO DAB functionalities

Search Widget
Provides search capabilities of the GEOSS Portal

Community portal
self creation tool to set up a fully customizable Community portal

GEO Services
SDG 15.3.1, SDG 11.7, Above Groung Biomass, Water Cycle, Norovirus, 2 ITT use case

Geoss Views
Provides customization of Views functionalities

Dashboard tool
Provides functionalities to Create and share knowledge and reports

Yellow Pages
Provides functionalities to register as resource provider

Status Checker
Provides resources health status

Third Party Enablers
TPE

Continuously harvest New data sources
Routinely Update data sources
Continuously fine tune metadata customized filters based on data sources
Enabling the computation of SDG indicator 15.3.1 "Proportion of land that is degraded over total area" and its visualization in a dashboard in the GEOSS Platform.

Produce Norovirus epidemic/pandemic risk maps based on environmental changes using the GEOSS Platform.

Enabling the computation of SDG11.7 "Accessibility to urban green spaces" at the city scale using the GEOSS Platform.

Estimating the Above Ground Biomass based on the use of EO products through the GEOSS Platform.

Enhancing the All Atlantic Community Portal in terms of usability and data sources.

Exploring the possibility to use existing water lifecycle models to estimate the impact of environmental changes on water resources using the GEOSS Platform.
Contributions Examples: GEO Service SDG 15.3.1
Contribution Examples: Dashboard tool for report generation
Contribution Examples: Community Portal
Self Creation process. AFRIGEOSS
GPP Web site

https://geossplatformplus.com/

Geo Portal website
https://www.geoportal.org/

Testing Geo Portal website
it is a testing environment, some functionalities may face some issues

Contact us
geoss_platform_support@esa.int

SDG 15.3.1 Service
Provide your feedback here
https://forms.gle/DozNjS4Vq4JHtqVL6

A project receiving funding from the European Union’s Horizon 2020 Research and innovation programme under grant agreement No 101039118
From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
Sharing and preserving knowledge using the GEO Knowledge Hub

Paola de Salvo
Kalamkas Yessimkhanova
Felipe Carlos
Environmental and societal issues
GEO Work Programme Activities

Environmental and societal issues
GEO Work Programme Activities

EO-based Applications

Environmental and societal issues

Open Knowledge

Data Software Workflow Documents
Open Knowledge
Open Knowledge

Understand
Open Knowledge

Understand

Reuse
Open Knowledge

Understand

Reuse

Create
Open  Preserve  Use
GEO Knowledge Hub
The GEO Knowledge Hub is a digital library for the GEO Community
#TheEarthTalks
#TheEarthTalks

Share

Preserve
#TheEarthTalks

GEO WEEK & Ministerial Summit 2023

Share

Search

Preserve
Crop Monitor

Datasets
Software
User stories
Publications
Knowledge Package

Crop Monitor

Citation


Description

Crop monitors have been developed to provide the users scene-based information on global crop conditions for the GEO Agricultural Monitoring System (AGRO/M). Crop monitoring for needs brings together partners from national, regional (i.e., subcontinental) and global monitoring networks, space agencies, agricultural organizations and scientists. Four main crops tracked by the Crop Monitor are wheat, rice, maize and soybean.

In accordance with the goals of the GEO/AGRO initiative, crop monitoring methods were then adapted and applied in countries at risk of food shortages. The natively international continuous assessment is fundamental in places where food security is extremely vulnerable. The major providers in the initiative, all tracked and reported on in Crop Monitor, are the Warning Early Warning (CWEW) and the European Food Security Monitoring Network (CIVAT). Crop monitoring is also implemented in many countries by national and international non-governmental organizations in the area to distribute and sell food stocks.

Crop monitors play an essential role in enhancing the quality of global crop monitoring framework and the early warning crop monitoring system. They aim to improve food security and provide a viable solution for different countries to make monitoring more accurate and dependable, using on-site observations and satellite images.

Package is access all information and explore resources on this knowledge package.

Need training?

Versions

Any question?

Feedback space

Engagement Priorities

2. Zero hunger
Knowledge Package

Crop Monitor

Citation


Description

Crop monitors have been developed to provide the users science-based information on global crop conditions for the GEO-GLAM Standard (GEOGLAM). Crop monitoring for needs brings together several subcomponents, and global and regional datasets, spatial agencies, agricultural agencies, and international organizations that focus on wheat, corn, rice, and soybean.

In accordance with the goals of the GEOGLAM initiative, crop monitoring is used for operational and flood management, the monitoring of crop conditions is important to identify the major provinces in the market, which are currently modeled and reported on in Crop Monitor. The monitoring of the crops is also critical for understanding the changes in crop conditions on a large scale, which can have a significant impact on the economy.

Crop monitors play a critical role in ensuring the quality of global crop monitoring to provide timely and accurate information to different countries to enable monitoring and decision-making.

Use this tool to access all information and explore the Crop Monitor Exploring Tool.

Knowledge Resources
Knowledge Package

Crop Monitor

Citation

Description
Crop monitors have been developed to provide the users science-based information on global crop conditions for the GEO-CropMonitor Infrastructure Information System (GMIS). Crop monitoring for meets brings together research, sub-national, and global monitoring systems, space agencies, agricultural organizations, and others who work on wheat, rice, soy, and soybeans.

In accordance with the goals of the GEOGLAM initiative, crop monitoring methods are fixed strategies. The monthly international consensus assessment is fundamental to this major product. In this monitor, real-time data collected by in Crop Monitor that determines whether the monitoring network is automatically configured to ensure that the crop monitoring network is used in the direct provision of crop data that are up-to-date and robustly information on key agricultural trends and conditions. This information is made easily accessible and facilitates rapid reaction to emergency situations.

Metadata

Files

Digital Object Identifier (DOI)
We build **together** with the **community**, for the **community**
110 Knowledge Packages

539 Knowledge Resources
~23,000 views
(in the last 11 months)

Note: Metrics are collected with Plausible, a privacy-friendly tool (GDPR, CCPA, PECR compliant tool)
Knowledge Provider

#TheEarthTalks

Application Users
GEO Knowledge Hub webinars

GEO Knowledge Hub. https://doi.org/10.60566/81zz0-7wm83

Description
Earth Observation (EO) applications enable decision-makers, allowing global changes to be made from local actions taken in the environment. Data practices, the EO applications, have been enhanced, allowing anthropic actions and earth observations to support a more detailed analysis of results. Consequently, organizing, sharing, and preserving these applications has become a challenge. Often these activities are dependent on infrastructure.

Citation
https://doi.org/10.60566/81zz0-7wm83

doi.org/10.60566/81zz0-7wm83
127th OGC Member Meeting  
September 25 - 29

Open Earth Monitor Workshop  
October 4 – 6

Jupyter Notebooks workshop  
October 26

#TheEarthTalks
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
From Data to Open Knowledge implementation: efforts to grow the value chain

07/11/2023 – 16:00 – 18:00

Ms. Dominique Tilmans
Source Euroconsult: Space Economy Report 2022
Demographic profile of the European space industry employment, source Eurospace

Graphic rendering PWC Socio-economic impacts from Space activities in the EU in 2015 and beyond
#TheEarthTalks

**GEO WEEK & Ministerial Summit 2023**

- Promote the collaboration between the space industry, training centres, academia and other partners

- Attract young professionals

- Develop new and existing regional initiatives and contribute to other training programmes

**space4geo**

department of science and innovation

**GEO GROUP ON EARTH OBSERVATIONS**
GEO-Academy aims to offer a comprehensive teacher training and development program for pre- and in-service teachers.

Empowering teachers with knowledge and skills to incorporate:
- Geographic Information Systems (GIS),
- Remote Sensing (RS),
- Earth Observation (EO),
- Geospatial Storytelling technologies within Education for Sustainable Development.

Using an evidence-based, efficient, and holistic pedagogical approach.

Developing a community of practice utilising state-of-the-art educational approaches, methodologies and tools.

Tools and educational materials freely accessible, developed in 7 languages (English, German, Portuguese, Greek, Bulgarian, French, Swedish).
GEO WEEK & MINISTERIAL SUMMIT 2023

From Data to Open Knowledge implementation: efforts to grow the value chain

#TheEarthTalks
#TheEarthTalks

GEO WEEK 2023
MINISTERIAL SUMMIT

6-10 NOVEMBER
CAPE TOWN, SOUTH AFRICA

Thank you!