GEO WEEK & MINISTERIAL SUMMIT 2023

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

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GEO WEEK & Ministerial Summit 2023

Open Data Open Knowledge 2023

ODOK 2023 Impact Report

Paola de Salvo

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Available on the GEO Knowledge Hub

(doi.org/10.60566/tmdyw-qqk49)

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Data Management Plan

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

MINES PARIS | PSL | O.I.E.

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Data Management Plan Self-Assessment Tool

Data and metadata

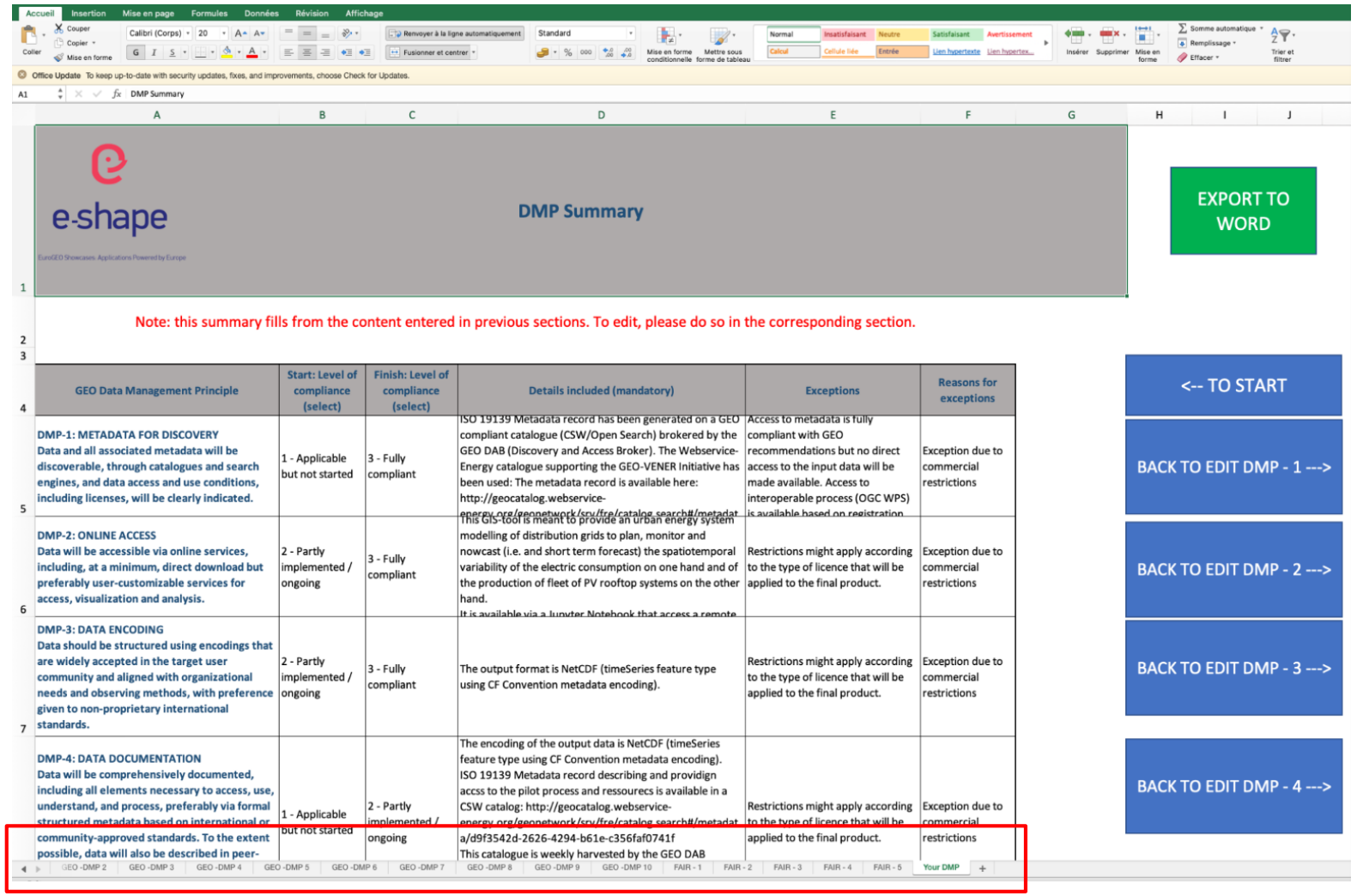
Definition:

- 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 i**mplicit 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**



e-shape

DMP Summary

EXPORT TO WORD

Note: this summary fills from the content entered in previous sections. To edit, please do so in the corresponding section.

GEO Data Management Principle	Start: Level of compliance (select)	Finish: Level of compliance (select)	Details included (mandatory)	Exceptions	Reasons for exceptions
DMP-1: METADATA FOR DISCOVERY 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.	1 - Applicable but not started	3 - Fully compliant	ISO 19139 Metadata record has been generated on a GEO compliant catalogue (CSW/Open Search) brokered by the GEO DAB (Discovery and Access Broker). The Webservice-Energy catalogue supporting the GEO-VENER Initiative has been used: The metadata record is available here: http://geocatalog.webservice-energy.org/geonetwork/srv/fre/catalog.search#/metadat	Access to metadata is fully compliant with GEO recommendations but no direct access to the input data will be made available. Access to interoperable process (OGC WPS) is available based on registration	Exception due to commercial restrictions
DMP-2: ONLINE ACCESS Data will be accessible via online services, including, at a minimum, direct download but preferably user-customizable services for access, visualization and analysis.	2 - Partly implemented / ongoing	3 - Fully compliant	This GIS-tool is meant to provide an urban energy system modelling of distribution grids to plan, monitor and nowcast (i.e. and short term forecast) the spatiotemporal variability of the electric consumption on one hand and of the production of fleet of PV rooftop systems on the other hand. It is available via a Jupyter Notebook that access a remote	Restrictions might apply according to the type of licence that will be applied to the final product.	Exception due to commercial restrictions
DMP-3: DATA ENCODING Data should 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.	2 - Partly implemented / ongoing	3 - Fully compliant	The output format is NetCDF (timeSeries feature type using CF Convention metadata encoding).	Restrictions might apply according to the type of licence that will be applied to the final product.	Exception due to commercial restrictions
DMP-4: DATA DOCUMENTATION 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-	1 - Applicable but not started	2 - Partly implemented / ongoing	The encoding of the output data is NetCDF (timeSeries feature type using CF Convention metadata encoding). ISO 19139 Metadata record describing and providign accss to the pilot process and ressourecs is available in a CSW catalog: http://geocatalog.webservice-energy.org/geonetwork/srv/fre/catalog.search#/metadat a/d9f3542d-2626-4294-b61e-c356faf0741f This catalogue is weekly harvested by the GEO DAB	Restrictions might apply according to the type of licence that will be applied to the final product.	Exception due to commercial restrictions

<-- TO START
BACK TO EDIT DMP - 1 --->
BACK TO EDIT DMP - 2 --->
BACK TO EDIT DMP - 3 --->
BACK TO EDIT DMP - 4 --->

2024 - **Optimize data sharing and interoperability** of GEO sharing principles

- **DMP OPIDoR platform**: 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 !

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Dialogue Series and Data Management Principles Implementation Guidelines

Bente Lilja Bye, Marie-Francoise Voidrot

BLB, OGC

Bente Lilja Bye

OUTLINE

History & Timeline

The GEO data sharing and data management principles

Advocate - Engage - Deliver : The GEO dialogue series

Guides and capacity development material

GEO Timeline- Strategies

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Aug 2003

2005

2015

2025

- Ad hoc GEO
- Global Earth Observing System of Systems - 10-Year Implementation Plan
- GEO Strategy 2016-2025
- Post 2025

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.

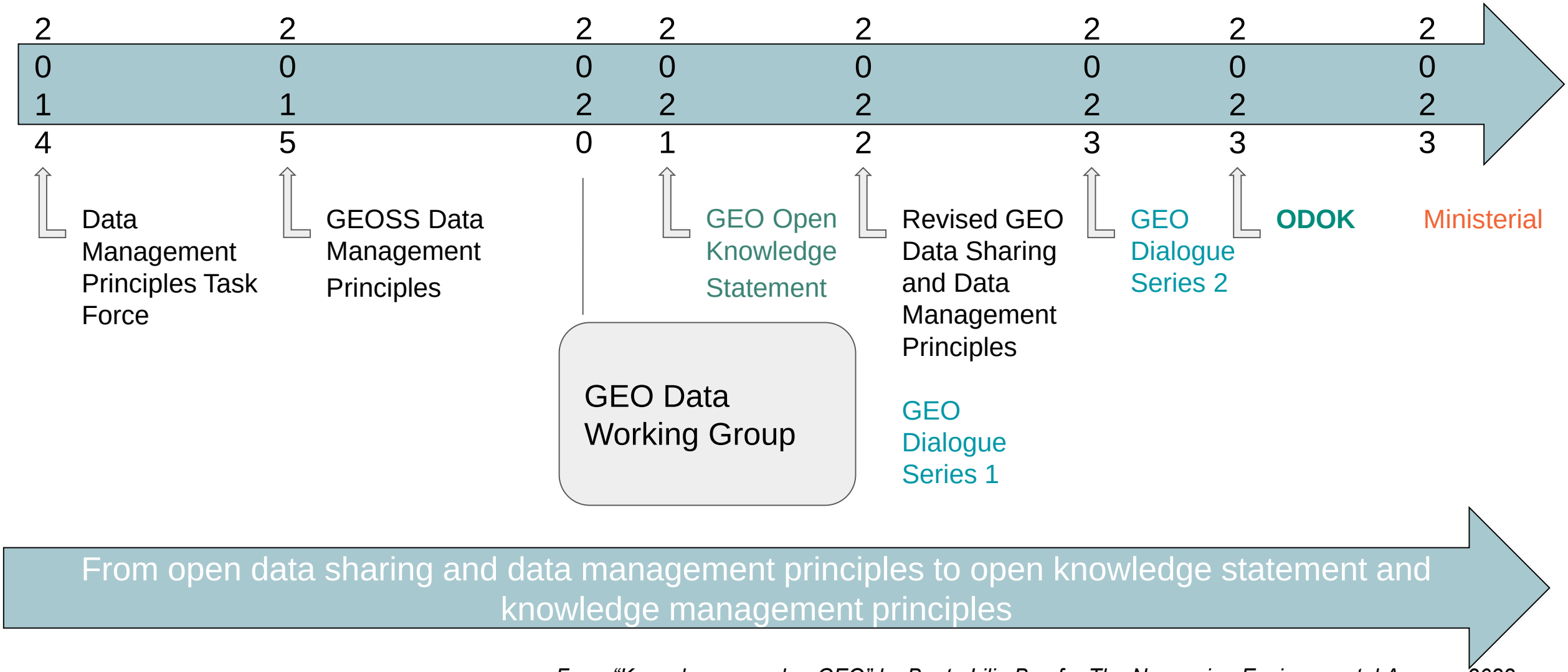
Use of data or products does not necessarily imply agreement with or endorsement of the purpose behind the gathering of such data.

GEO 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**

From "Kunnskapsgrunnlag GEO" by Bente Lilja Bye for The Norwegian Environmental Agency, 2022

GEO Timeline- Data management & Dialogues



From "Kunnskapsgrunnlag GEO" by Bente Lilja Bye for The Norwegian Environmental Agency, 2022

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3. All shared data, products and metadata will be made available with **minimum time delay**

The GEO Data Management Principles

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Discoverability

Accessibility

USABILITY

- Encoding
- Documentation
- Provenance
- Quality control

PRESERVATION

- Preservation
- Verification

CURATION

- Review and processing
- Identifiers

Reference: Revised GEO Data Management Principles Implementation Guidelines 2022

Data management principles

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.

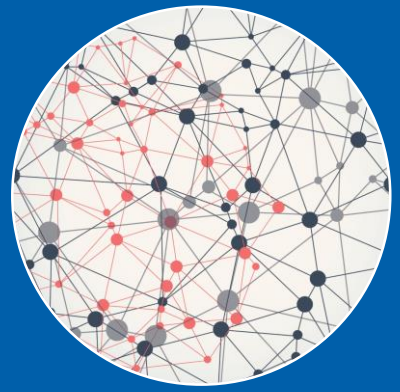
DMP-8. Data and associated metadata held in data management systems will be periodically verified to ensure integrity, authenticity and readability.

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

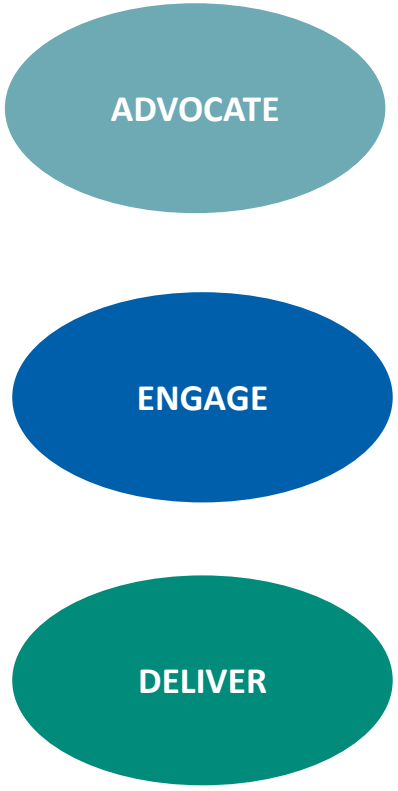
Data Sharing & Data Management Principles

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**



Open Knowledge

Open Science	Open Access	Citizen and Participatory Science	Open Data
Open Reproducible Research	Open Software	Open Infrastructure	Open Hardware
Open Education	Open Evaluation	Diversity of knowledge	

NOVEMBER 2023

2022 Dialogue series: GEO Data Sharing and Data Management Principles

Data life cycle
Data sharing principles
Discoverability(DMP1)
Accessibility (DMP 2)
Usability (DPM3-6)
Preservation (DMP7-DMP8)
Curation (DMP9-DMP10)
Data Management **Self-Assessment Tool**

2023 Dialogue series: GEO Open Knowledge Statement

DELIVER

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

GEO Knowledge Hub

Visit the **GEO Knowledge Hub**

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

Visit the GEO Knowledge Hub!

Contact Us

FOR QUESTIONS AND CLARIFICATIONS

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IMAGE CREDIT: NASA IMAGE BY NORMAN KURING, NASA'S OCEAN COLOR WEB

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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

Lea Shanley, PhD (ICSI) and
Derek Hanson, JD (US NOAA)

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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

Recommended implementation actions from ODOK 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: lshanley@icsi.Berkeley.edu

- **Open Data Licensing Guidance**:
- https://www.earthobservations.org/geo_blog_obs.php?id=590

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In situ data activities

GEO Open Knowledge and Data WG

Jose Miguel Rubio

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 in 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*

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Value Chains

From Ocean Observations to Users

7 November 2023, 16:00-18:00

Tamaryn Morris

Juliet Hermes

Emma Heslop

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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.

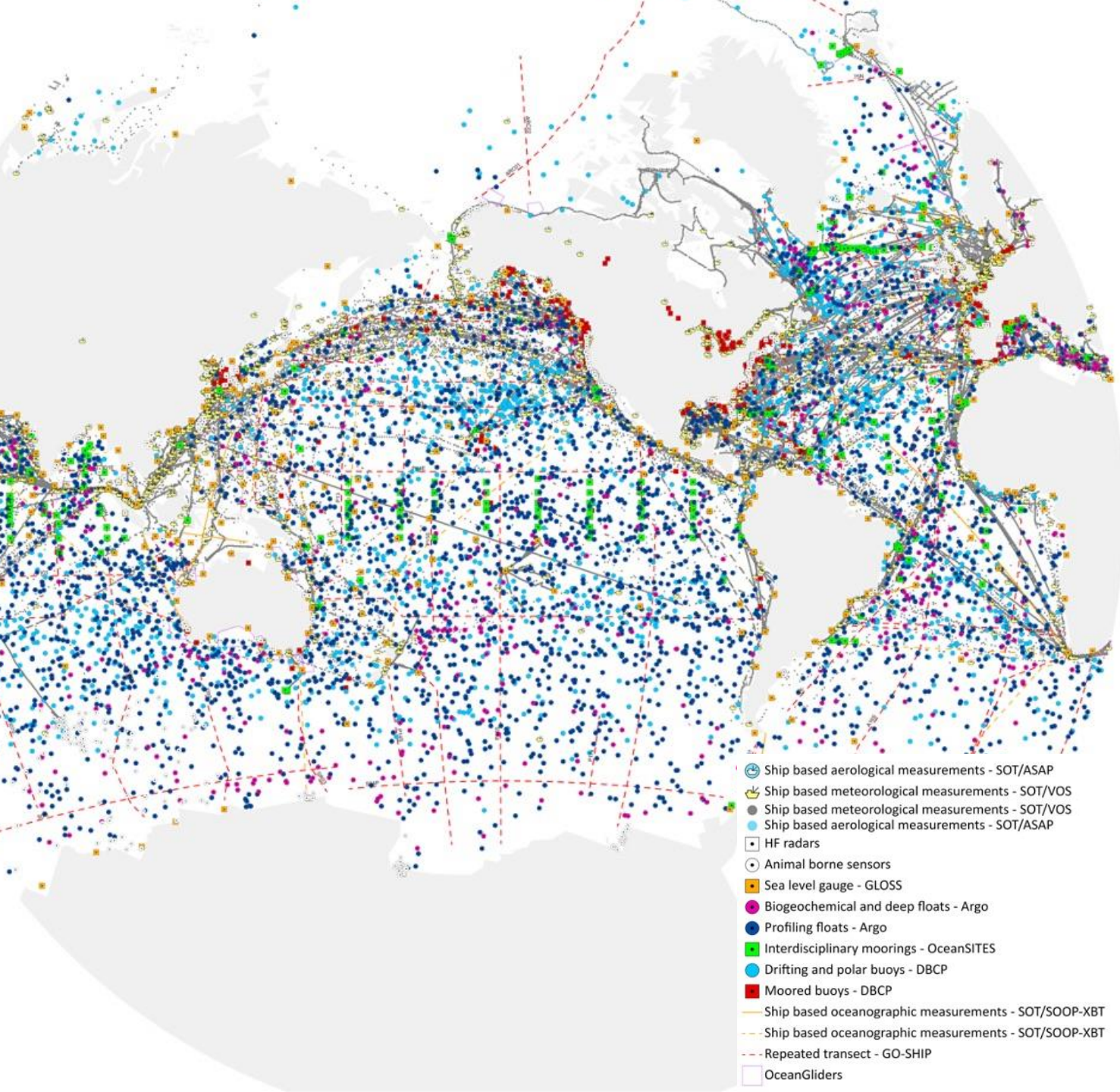
Ocean health

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



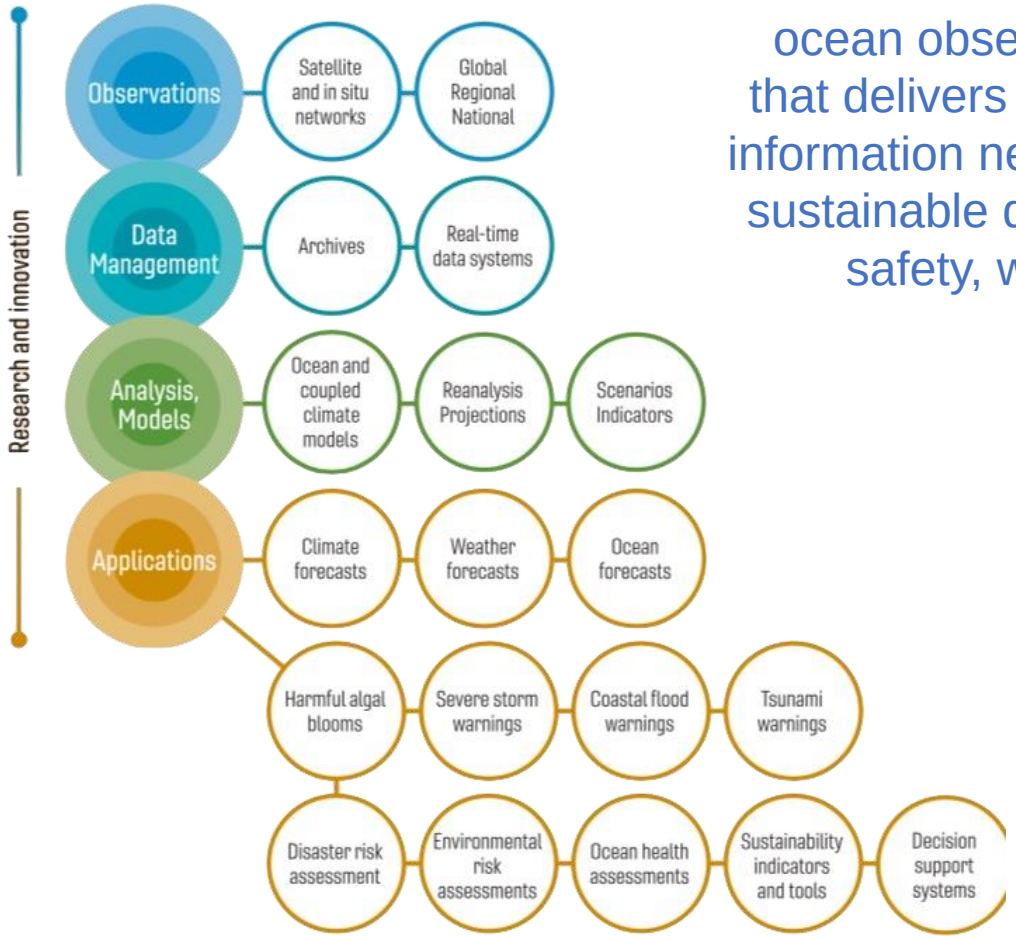
GOOS Today

- 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

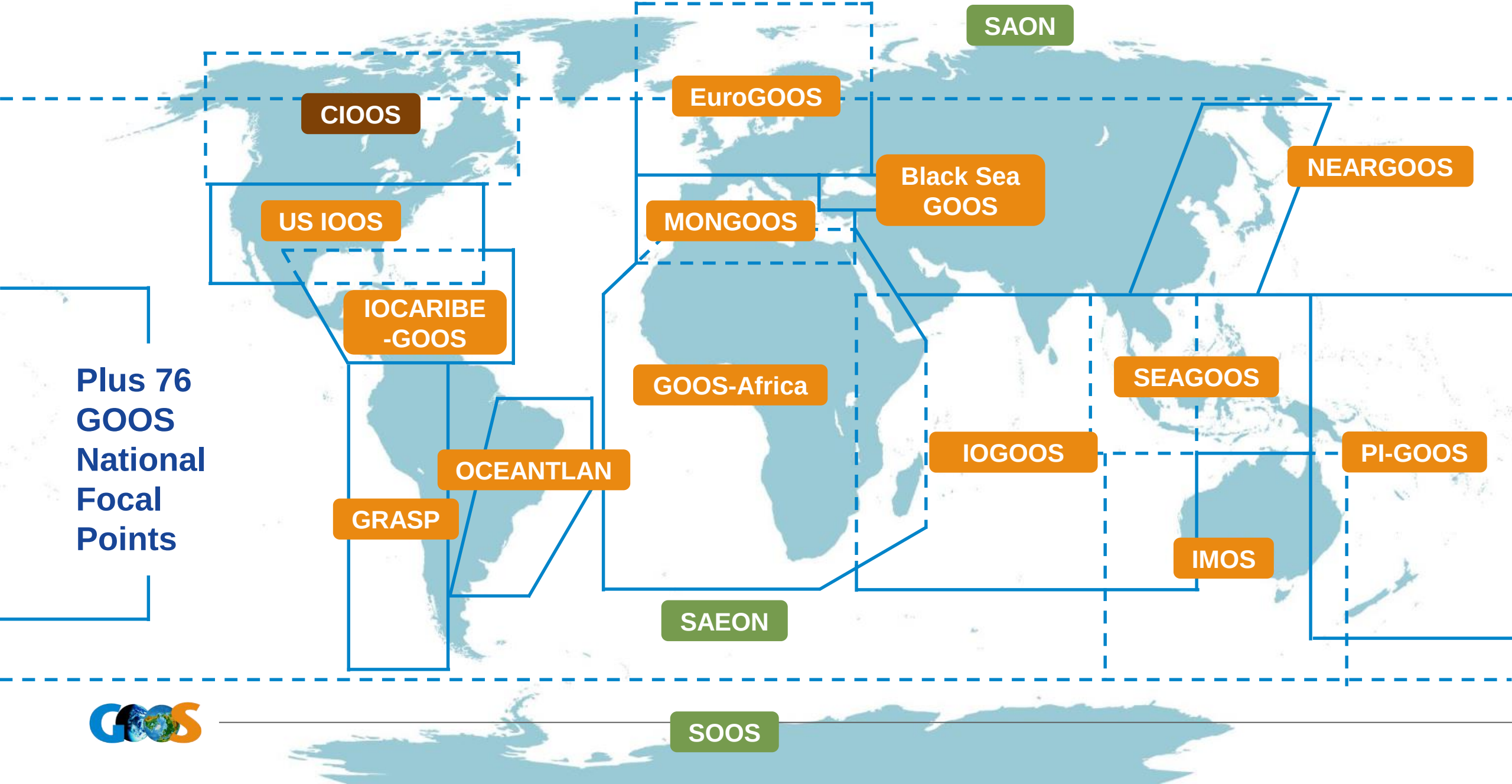
www.ocean-ops.org/reportcard2022

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



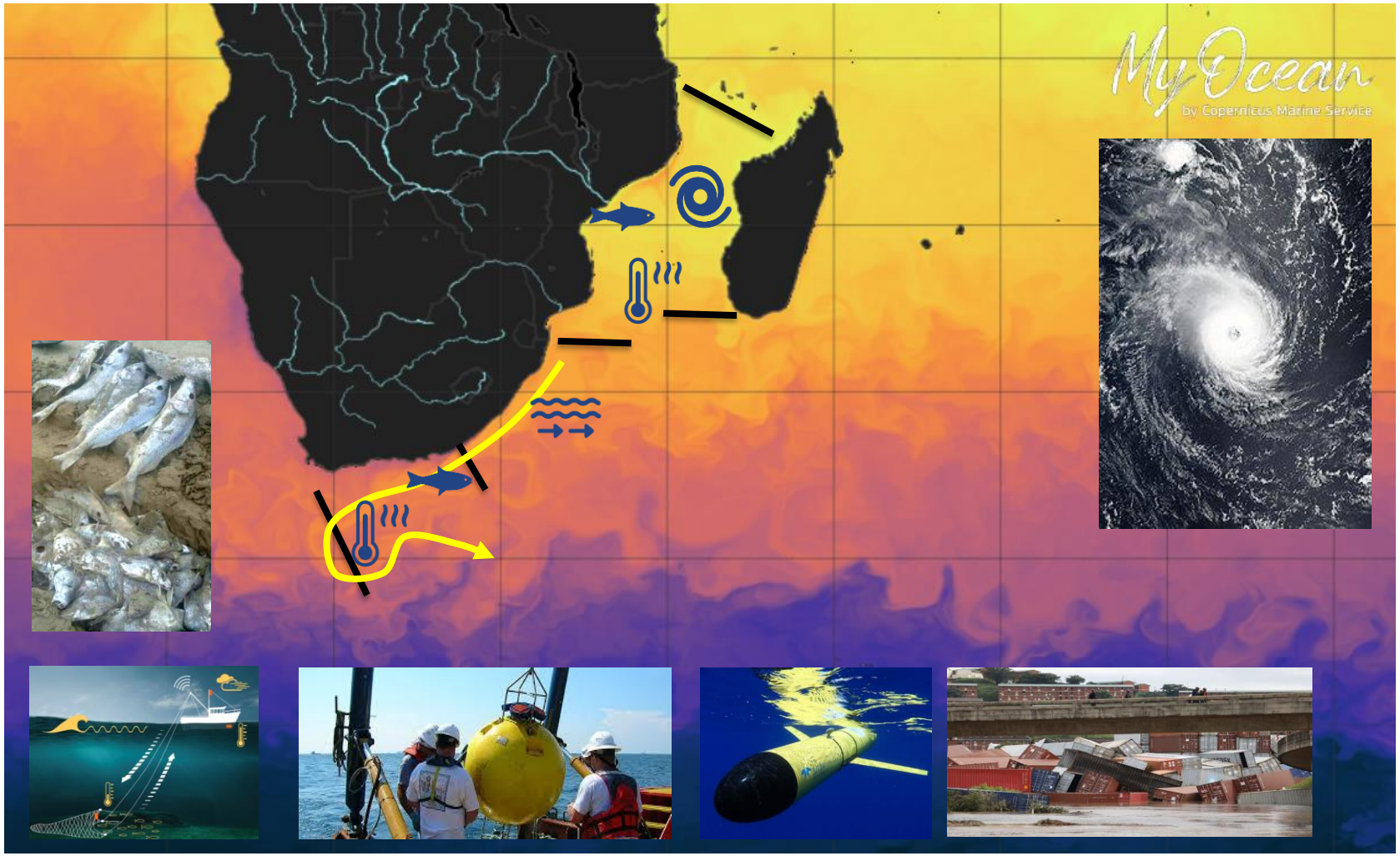
Plus 76 GOOS National Focal Points

The Global Ocean Observing System

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

The Greater Agulhas Current Pilot Region



Boundary Currents

Marine Heatwaves

Tropical Storms

Marine Life

BOUNDARY CURRENTS

Core coordination

User Engagement

Value assessment

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

Pilot Region: **Agulhas Current**

END USERS:

Weather services

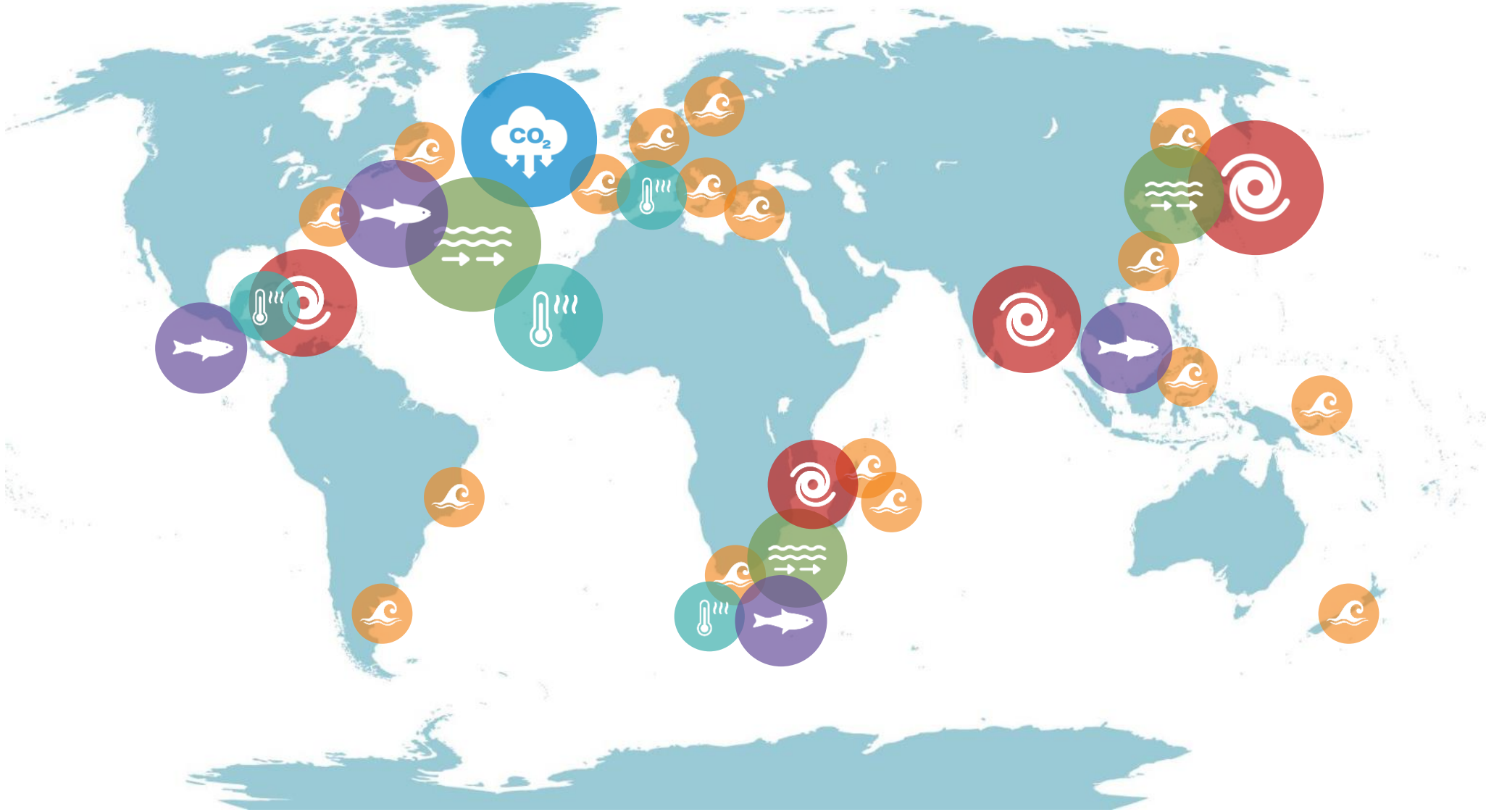
Regional fisheries

Ocean Industries, e.g. shipping

Marine resource management

Co-Design Exemplars

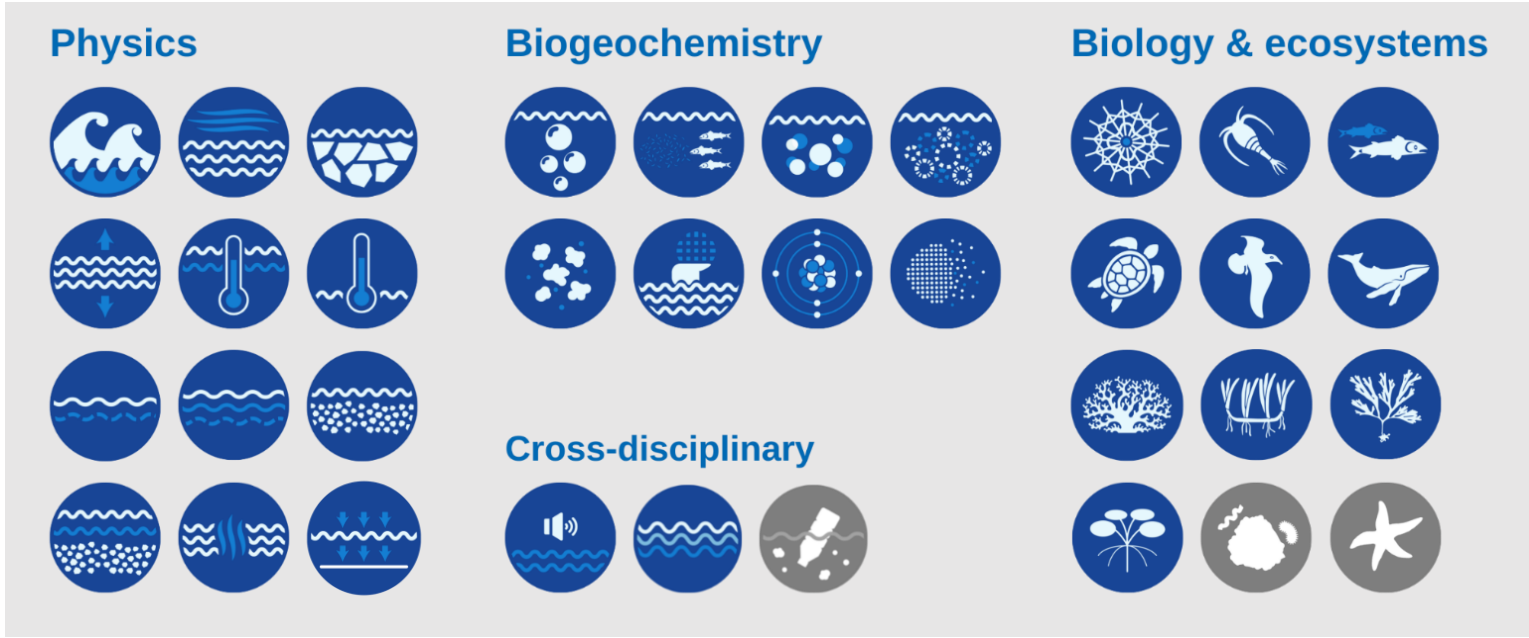
*Each exemplar is at different levels of maturity



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?

35 Essential Ocean Variables (EOVs)



SENDAI FRAMEWORK
FOR DISASTER RISK REDUCTION 2015-2030

Convention on Biological Diversity

Post-2020 Biodiversity Framework

14 LIFE BELOW WATER

United Nations Climate Change

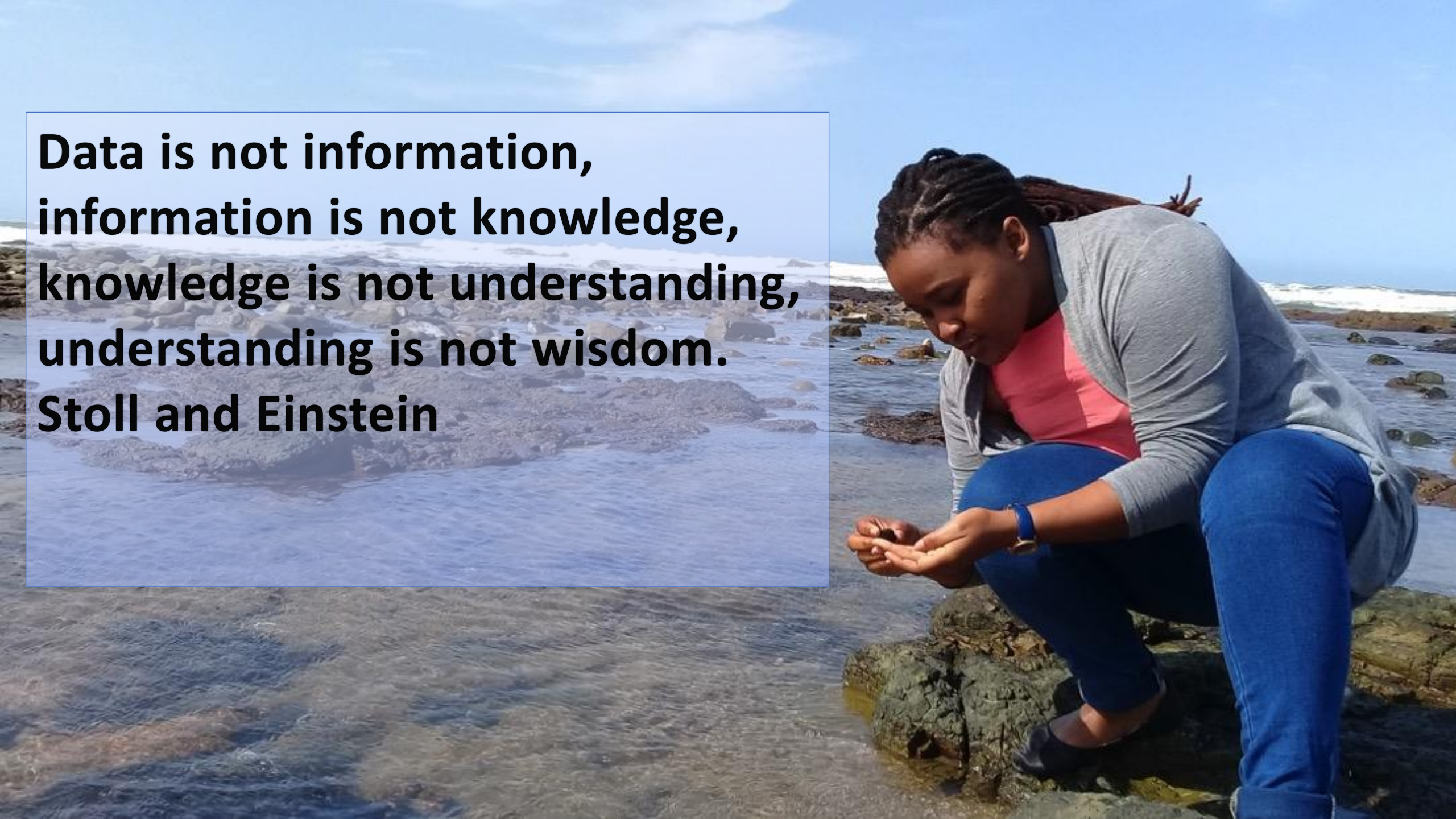
UNEP

International Legally Binding Instrument on Plastic Pollution 2024

THE LAW OF THE SEA

+ Biodiversity Beyond National Jurisdiction

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

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GEO WEEK & Ministerial Summit 2023

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?

DATA SPACES SUPPORT CENTRE

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

European Commission

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

Data Spaces:

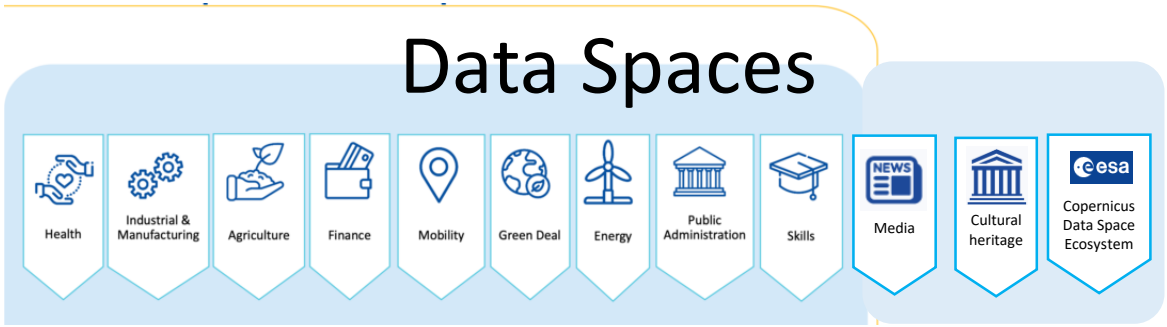
(i) **deploy** data-sharing tools and **services for** the pooling, processing and **sharing** of data by an open number of organisations, as well as federate energy-efficient and **trustworthy cloud capacities** and related services;

(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.

[1] Starter Kit for Data Space Designers. Version 1.0 | March 2023. Data Spaces Support Center https://dssc.eu/wp-content/uploads/2023/03/DSSC-Starterkit-Version-1.0.pdf

[2] Staff working document on data spaces https://digital-strategy.ec.europa.eu/en/library/staff-working-document-data-spaces



European Green Deal issues:

Climate change

Circular economy

Pollution

Biodiversity

Deforestation

Difficulties we face:

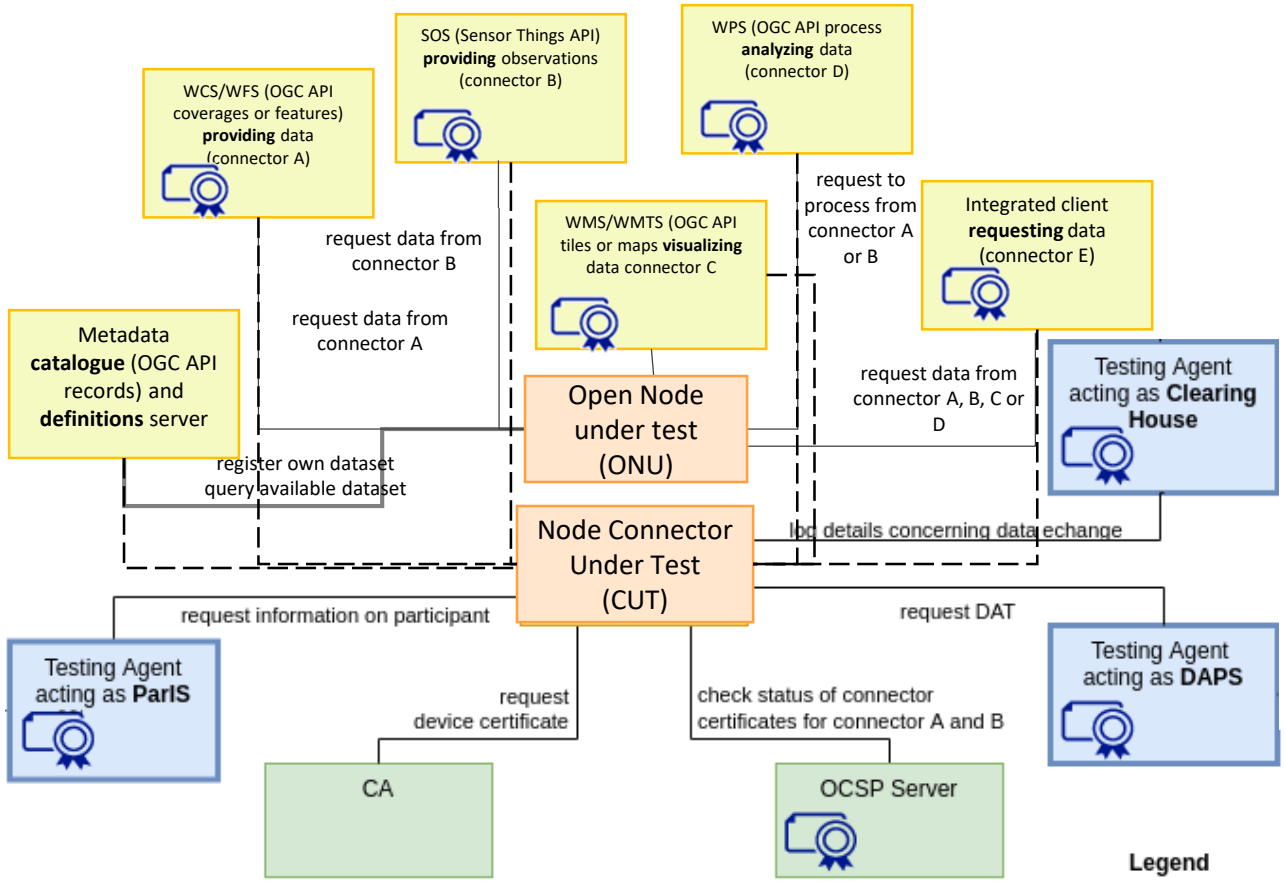
- Is *data space* the *only* or the *right* solution for ensuring Open Data and at the same time Trust, Governance and Data Sovereignty?

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*?

Who a open data + dataspace could work

Adding:
Geospatial Services, APIs
Open Nodes



Log files

Information about participants

Generates tokens

Certificate Authority

Online Certificate Status Protocol

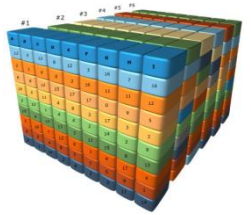
Legend

- Validated open source component behaving according to specification
- ONU represents an instance of any yellow node type without connector
  CUT represents an instance of any yellow node types tested through a connector.
- Geospatial Web Service or modern OGC API
- Identity certificate issued by the CA
- Component for testing a CUT

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 collaborat with **USAGE**
  - Gridded data in **datacubes**, in collaboration with **B3** and **FAIRiCUBE**.



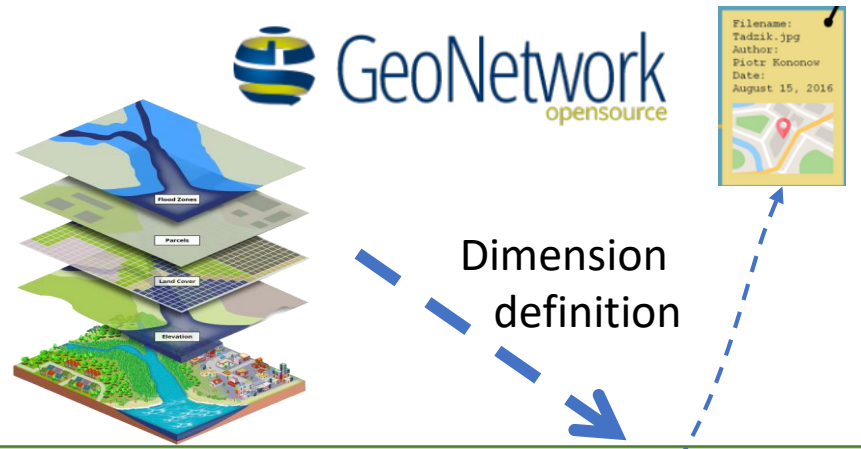
- Using semantics. Two approaches
  - The Green Deal Information Model (**GDIM**)
    - Data can be converted in to a general RDF model respecting the original data attributes.
  - Focus on **variables**/observedProperties
    - Tag them with variable **name**, EV, **UoM**
    - Report **provenance**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

- Test OGC web services and OGC web APIs **with** IDSA connectors.

AD4GD

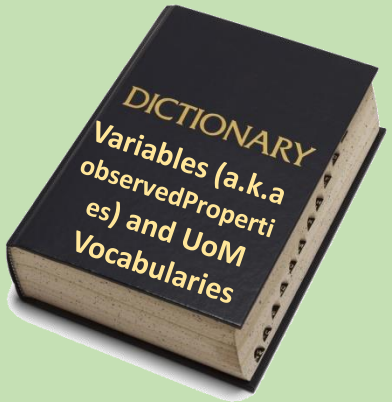
Co-funded by the European Union, Switzerland and the United Kingdom

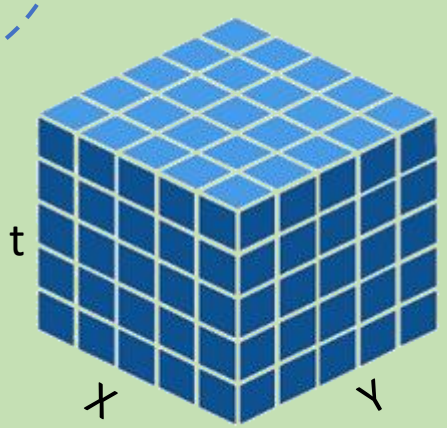
Layer destruction and reconstruction for the GDDS



GDDS

Original layers are no longer visible





RDF representation of mainly vector data

DC representation of mainly raster data

GeoSPARQL queries

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

WCS Xarray queries

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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

Definition	Source
"Dataspaces are not a data integration approach; rather, they are more of a data co-existence approach. The goal of dataspace support is to provide base functionality over all data sources, regardless of how integrated they are."	Halevy et al. [6]
"A data space is defined as a decentralised infrastructure for trustworthy data sharing and exchange in data ecosystems based in commonly agreed principles."	Nagel [7]
"A dataspace system manages the large-scale heterogeneous collection of data distributed over various data sources in different formats. It addresses the structured, semi-structured, and unstructured data in coordinated manner without presuming the semantic integration among them."	Singh [8]
"to provide various of the benefits of classical data integration, but with reduced up-front costs, combined with opportunities for incremental refinement, enabling a "pay-as-you-go" approach."	Hedeler et al. [9]
"enable agile data integration with much lower upfront and maintenance costs."	Hedeler et al. [10]
"A dataspace system processes data, with various formats, accessible through many systems with different interfaces, such as relational, sequential, XML, RDF, etc. Unlike data integration over DBMS, a dataspace system does not have full control on its data, and gradually integrates data as necessary."	Wang et al. [11]
"Dataspace Support Platforms envision data integration systems where the amount of upfront effort is much smaller. The system should be able to bootstrap itself and provide some useful services with no human intervention. Over time, through user feedback or as sources are added and the data management needs become clearer, the system evolves in a pay-as-you-go fashion."	Das Sarma et al. [12]
"Dataspace is defined as a set of participants and a set of relationships among them."	Singh and Jain [13]
"Real-time Linked Dataspace combines the pay-as-you-go paradigm of dataspaces with Linked Data, Knowledge Graphs, and real-time stream and event processing capabilities to support the large-scale distributed heterogeneous collection of streams, events, and data sources."	Curry [14], Curry et al. [15]
"any ecosystem of data models, datasets, ontologies, data sharing contracts and specialised management services (i.e., as often provided by data centres, stores, repositories, individually or within 'data lakes'), together with soft competencies around it (i.e., governance, social interactions, business processes)."	Scerri et al. [16]

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 dataspace 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.

M. Franklin, A. Halevy, and D. Maier, "From databases to dataspaces: a new abstraction for information management," *SIGMOD Rec.*, vol. 34, no. 4, pp. 27–33, Dec. 2005, doi: 10.1145/1107499.1107502.

Data spaces as Digital Ecosystems

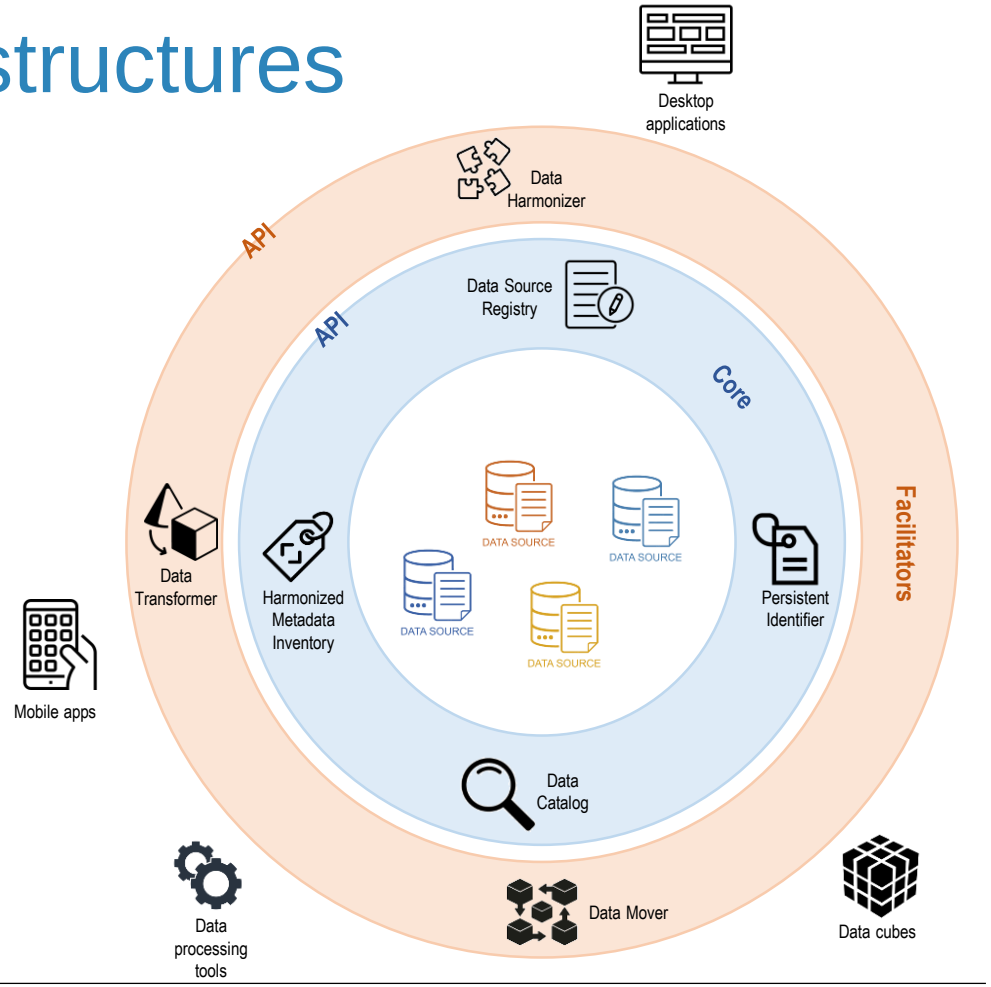
- A Digital Ecosystem emulates Natural Ecosystems
  - Multiple ‘species’ (autonomous entities) collaborating and competing
  - In a (digital) ‘environment’
  - Carrying out different functions
  - Contributing to a ‘service’ for the human society
  - To be protected (governance)
- No fixed set of participants (‘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
  - …

GEOSS PLATFORM PLUS

GREAT Green Deal Data Space

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



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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

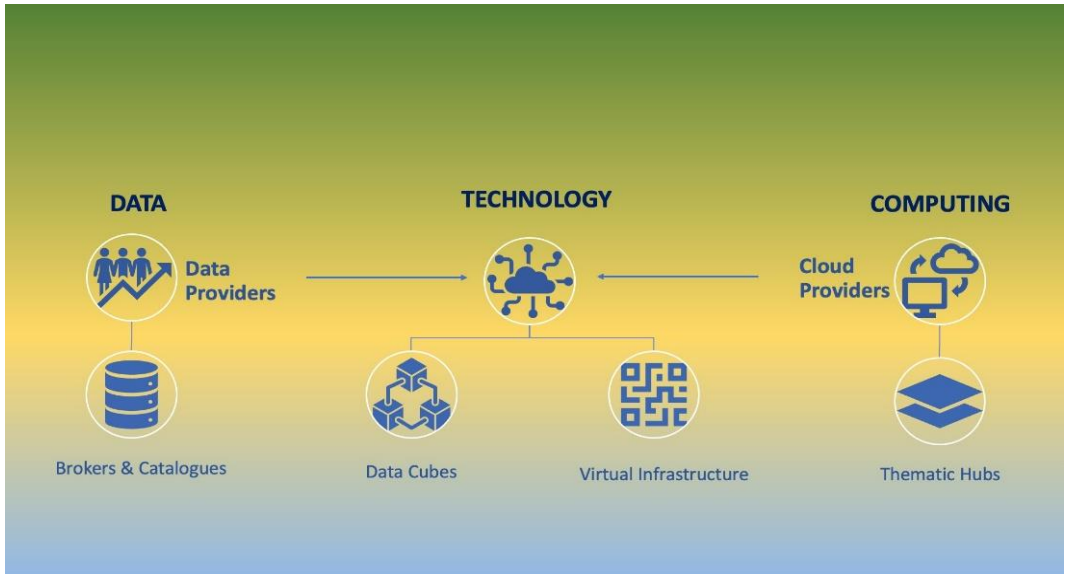
- The landscape of EO digital platforms is fragmented
- Limitations currently faced by the users
- Discoverability: no single place where all the information on available services and costs can be found
- Developers often struggle to find the services that match their needs
- No information about users' 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 neaded 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

Dimensions for evaluation of digital platforms – Insights II

Customization

- Customization of environment – preferred in-house solutions
- Need for tailored services for near-real time kind of users;
- several levels of functionalities for data provision;
- demand for decision is getting faster; capacity problems in areas with conflicts; need

Data & model sharing

- Facilitate data and model sharing and reuse

Sustainability

- Sustainability of platforms after public funding period not always clear

Costs

- Pricing of services not fully transparent.
- 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 Kona[1], Margherita Di Leo[2], Brooke Tapsall[3], Marco Minghini[1], Alexander Kotsev[1]

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

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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**.

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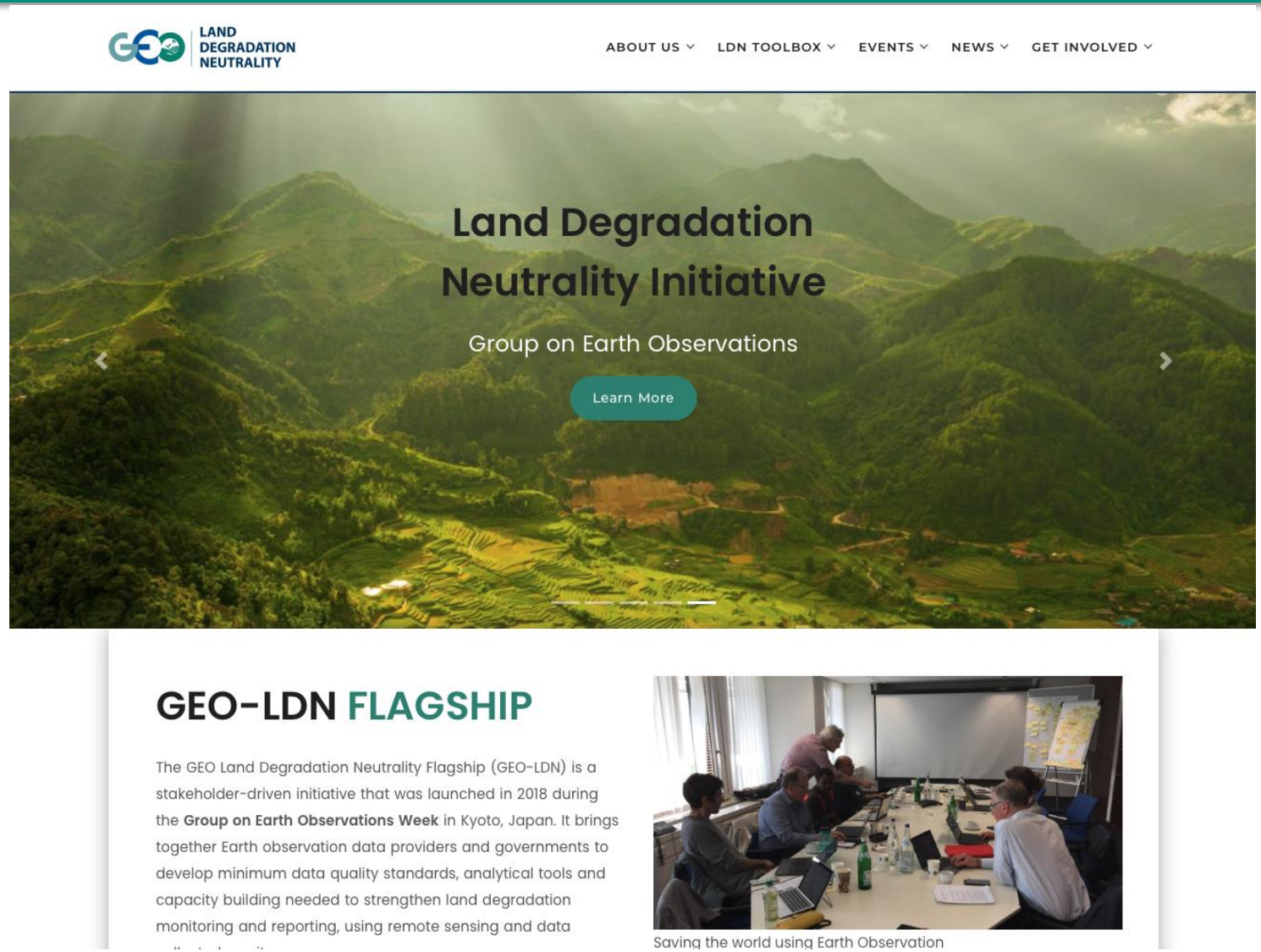
GEO-LDN



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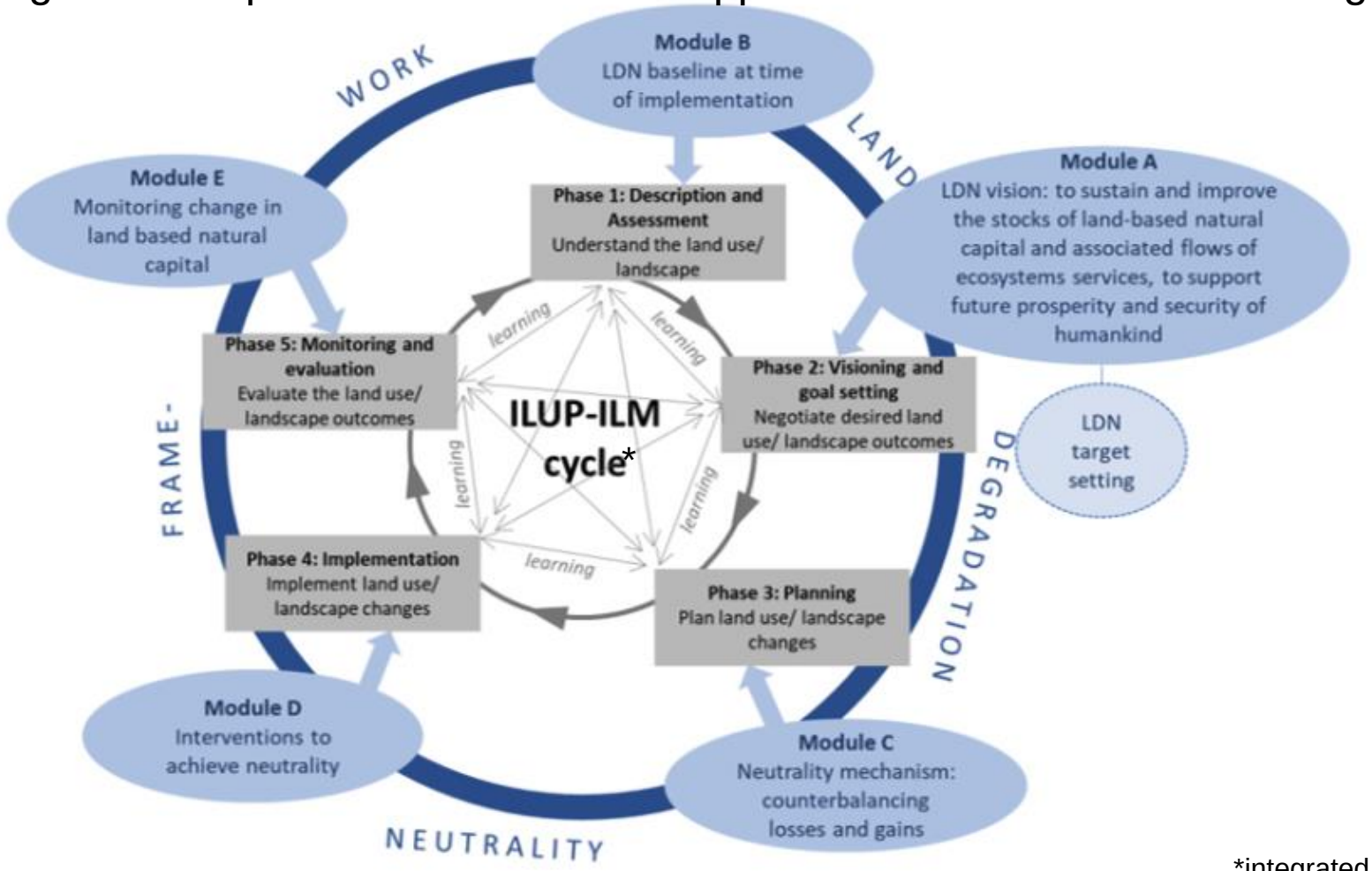
Objective of the GPP use-case

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



Source: 2022 UNCCD Science Policy Interface Review of LDN entry points (see link above)

*integrated land use planning-integrated land management (ILUP-ILM)

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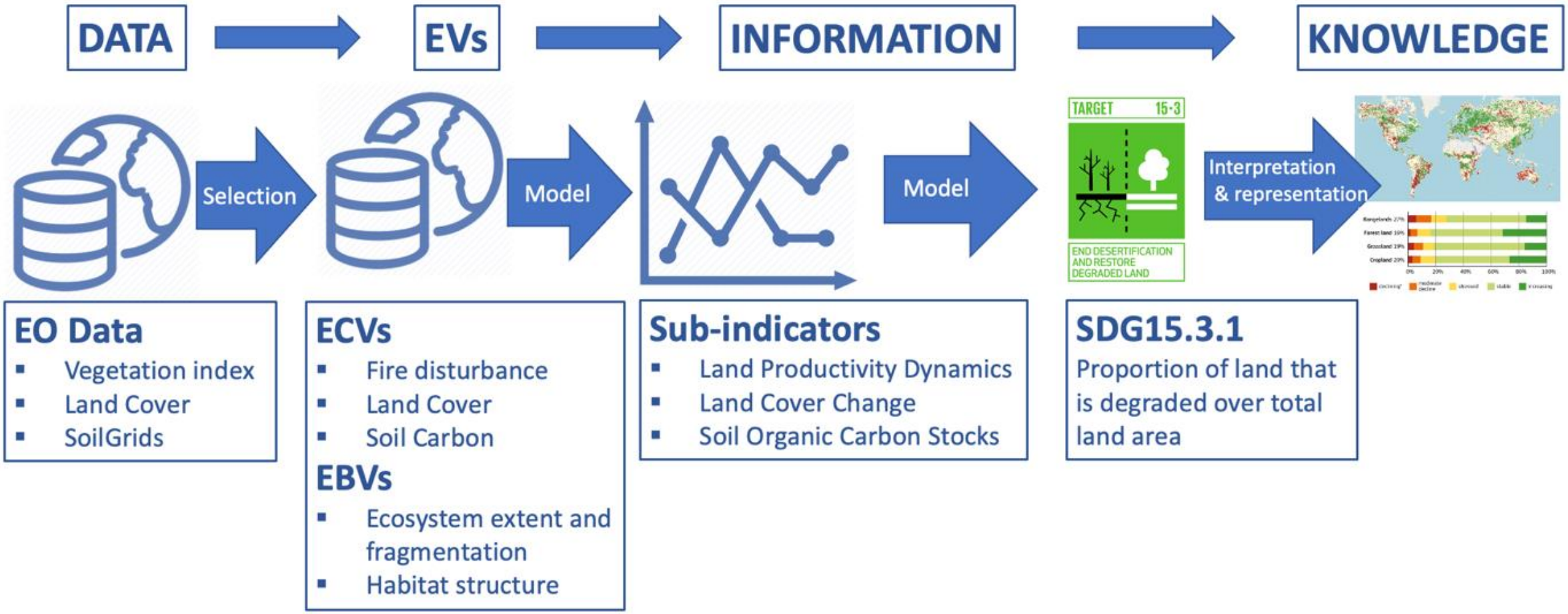
SDG15.3.1 – Data to Knowledge



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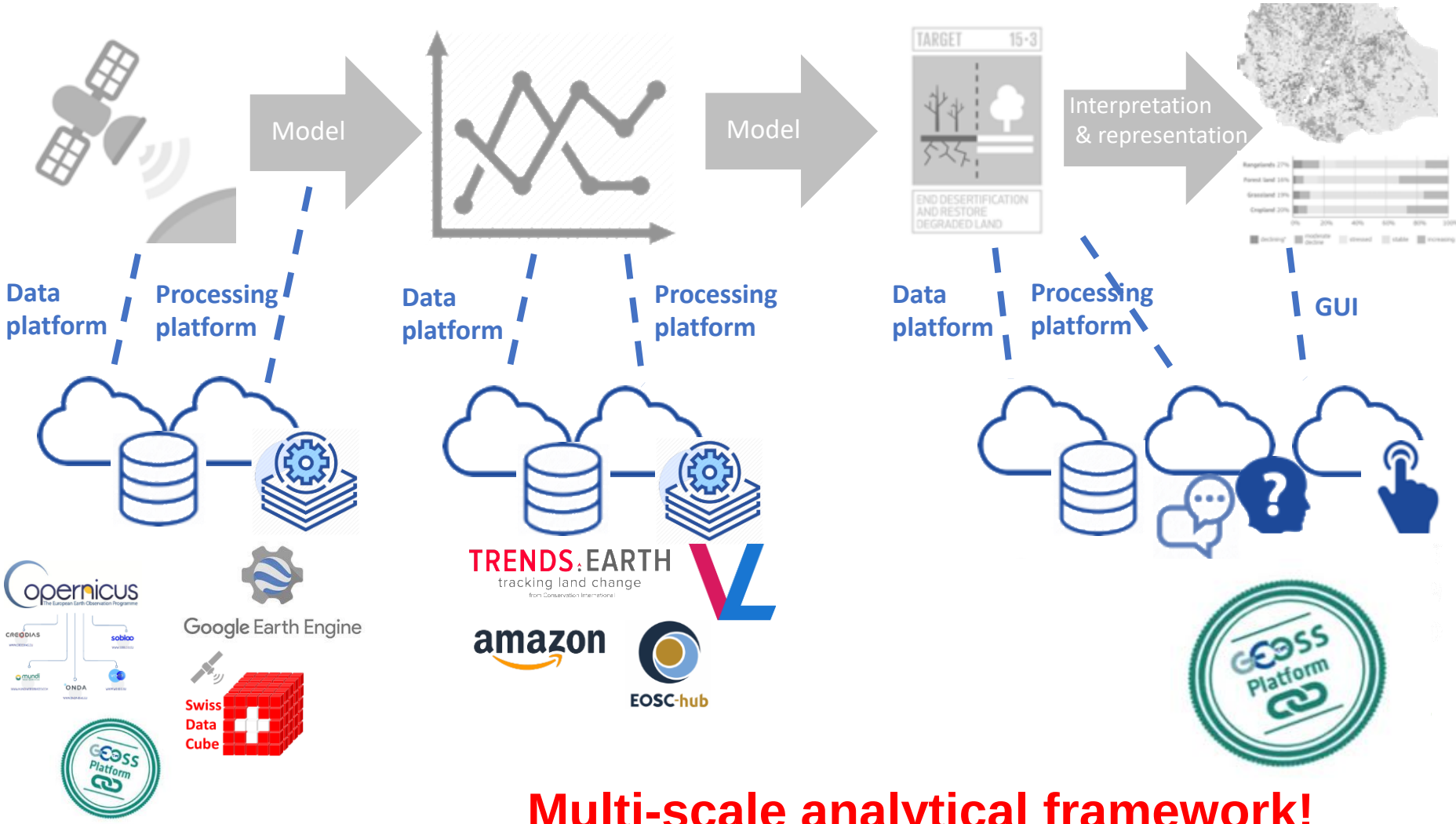
SDG15.3.1 – Implementation in the GEOSS platform



Multi-scale analytical framework!

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DEMO
Shift

New FAO report highlights urgent need to restore Africa's degraded landscape

© **FAO/Luis Tato** | Up to 65 per cent of productive land is degraded, while desertification affects 45 per cent of Africa's land area.

29 September 2021 | **Climate and Environment**

Pre-Production service…

https://geoss.uat.esaportal.eu/

Please provide your feedbacks:
https://forms.gle/DozNjS4Vq4JHtqVL6

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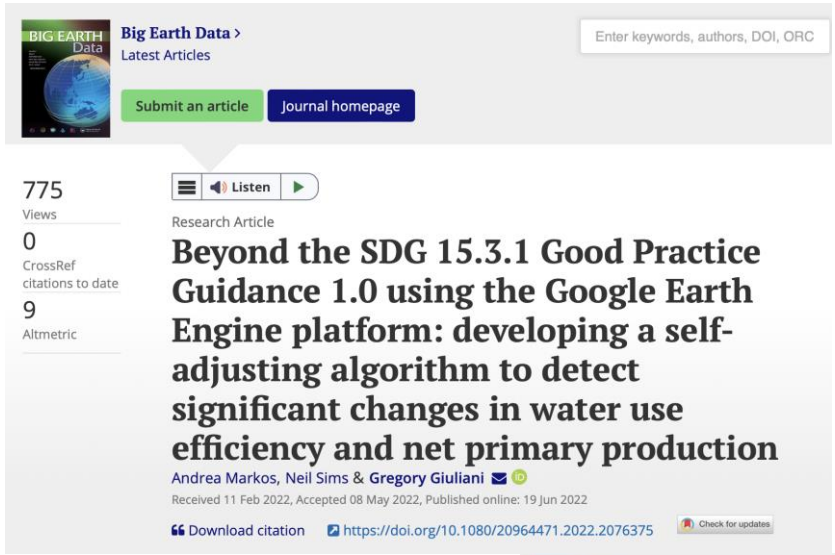
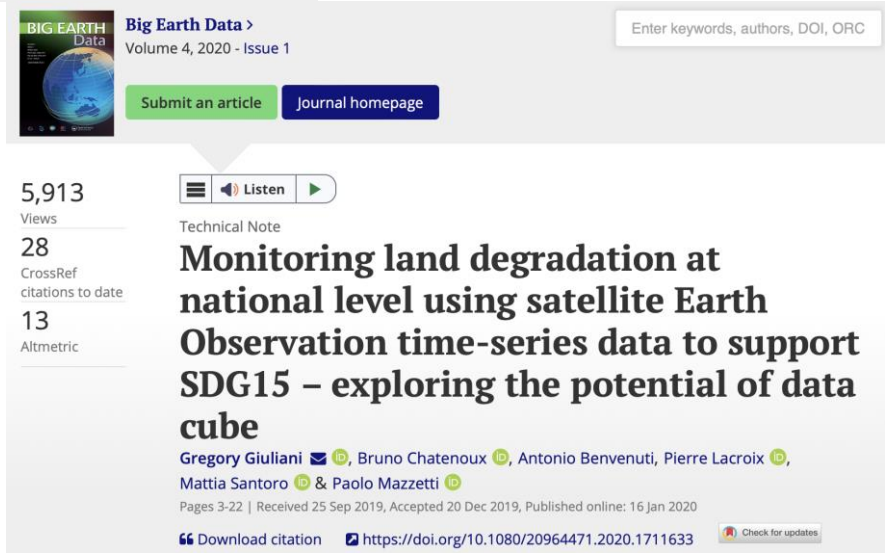
Scientific background





ELSEVIER

International Journal of Applied Earth Observation and Geoinformation

Volume 88, June 2020, 102068

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

Gregory Giuliani [a, b], Paolo Mazzetti [c], Mattia Santoro [c], Stefano Nativi [d], Joost Van Bemmelen [e], Guido Colangeli [e], Anthony Lehmann [a, f]

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https://doi.org/10.1016/j.jag.2020.102068

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Conclusions

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".

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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

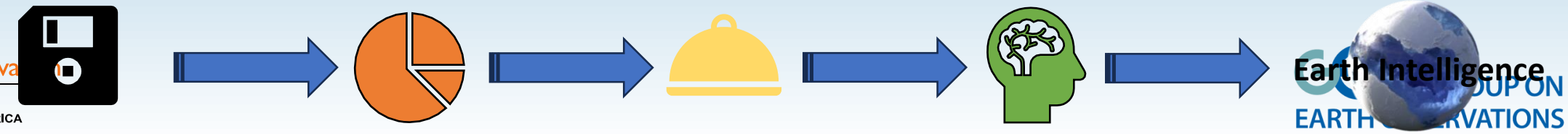
1.Data refers to a collection of facts, statistics, or information that can be in the form of numbers, text, images, or other formats. It consists of raw, unprocessed elements and observations. The significance and interpretation of data are determined by the context and how the data is analyzed or processed.

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:

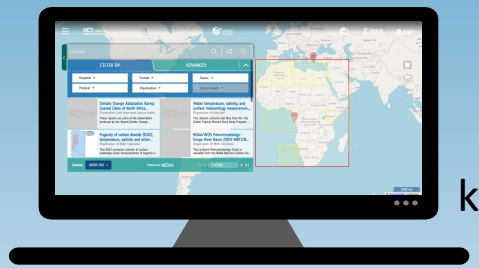
Accuracy: Information should be correct and free from errors or inaccuracies. Accuracy ensures that the information can be trusted to represent reality as closely as possible.
Reliability: Reliable information comes from trustworthy sources and is consistent over time. It can be counted on to provide 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

GEOSS Portal



data

knowledge

services

In situ data
Remote sensing
Catalogues from communities

GKH
External KH
Scientific repositories
Relationships

Algorithms
Models
Applications

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, reportingm and sharing mechanisms enabling collaboration and promotion of data, results, experiments

knowledge generation: Tools/Enablers/Applications

GEO DAB

Continuously harvest New data sources
Routinely Update data sources
Continuously fine tune metadata
customized filters based on data sources

GEOSS Portal

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

Search Widget

Provides search capabilities of the GEOSS Portal

Open APIs

Provides APIs to use GEO DAB functionalities

Community portal

self creation tool to set up a fully customizable Community portal

Geoss Views

Provides customization of Views functionalities

GEO Services

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

Status Checker

Provides resources health status

Dashboard tool

Provides functionalities to Create and share knowledge and reports

Yellow Pages

Provides functionalities to register as resource provider

Third Party Enablers

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knowledge generation: Tools/Enablers/Applications

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.

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

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

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

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

Exploring the possibility to use existing **water lifecycle models** to estimate the impact of environmental changes on water resources using the GEOSS Platform.

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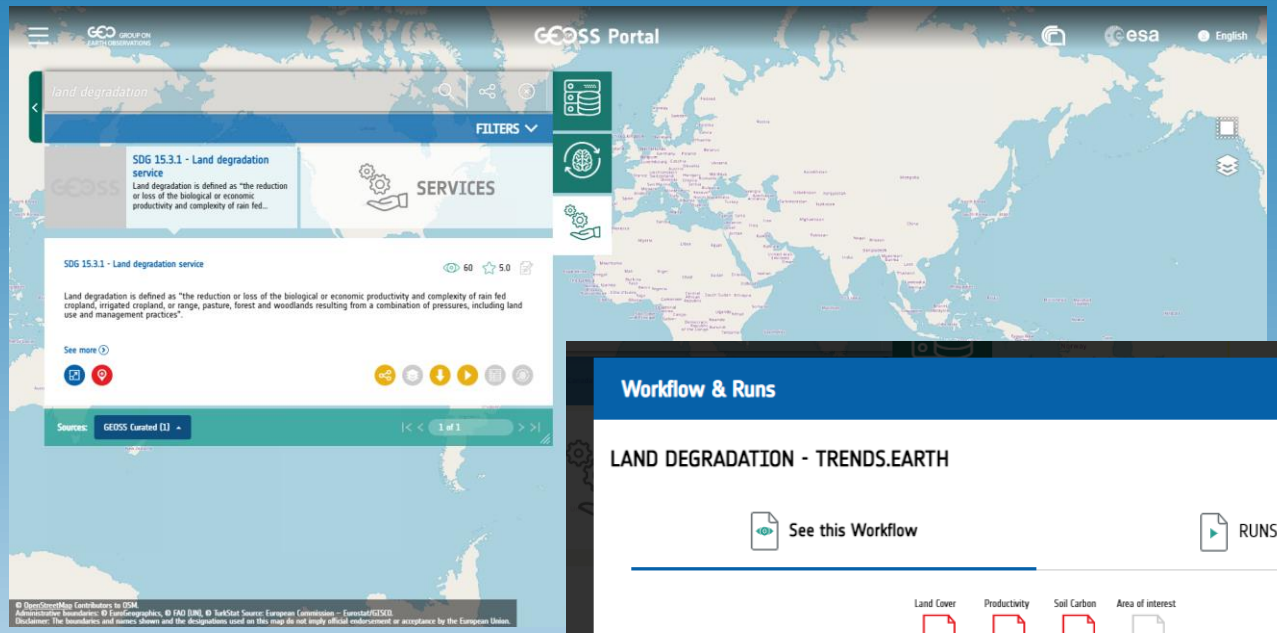
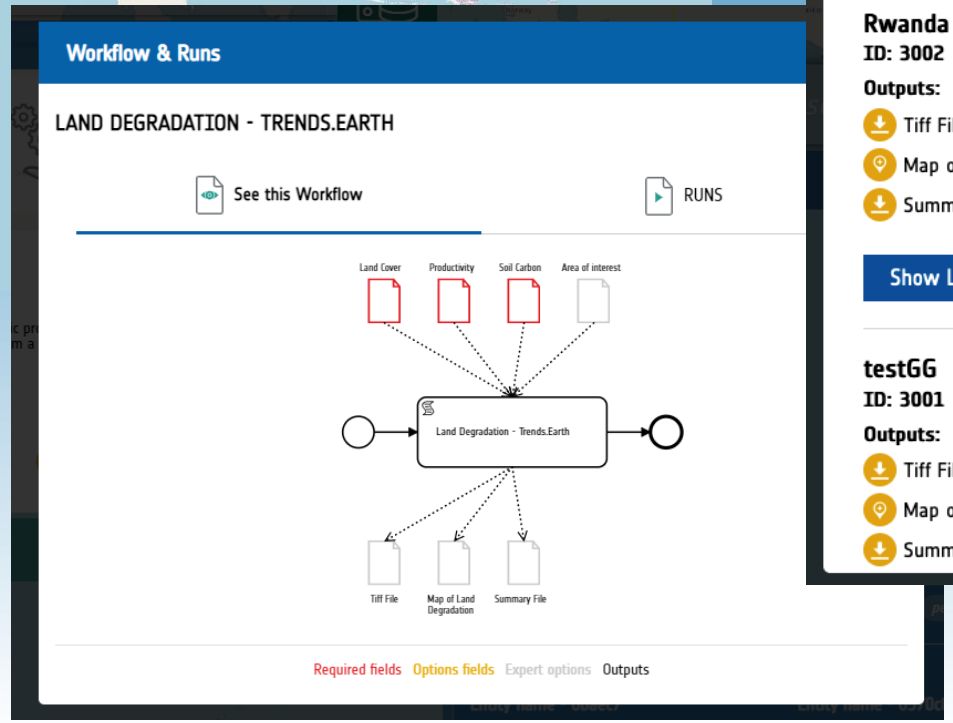
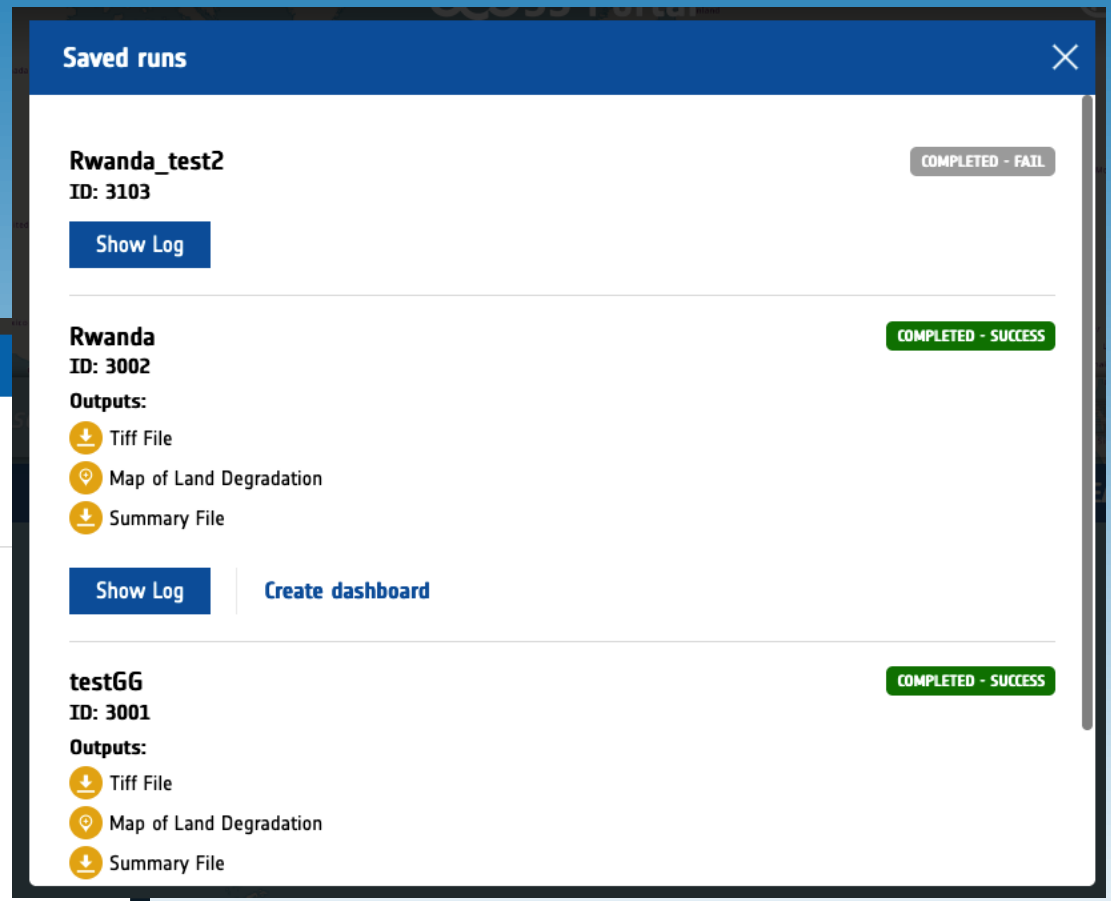
Contribution Examples: GEO Service SDG 15.3.1







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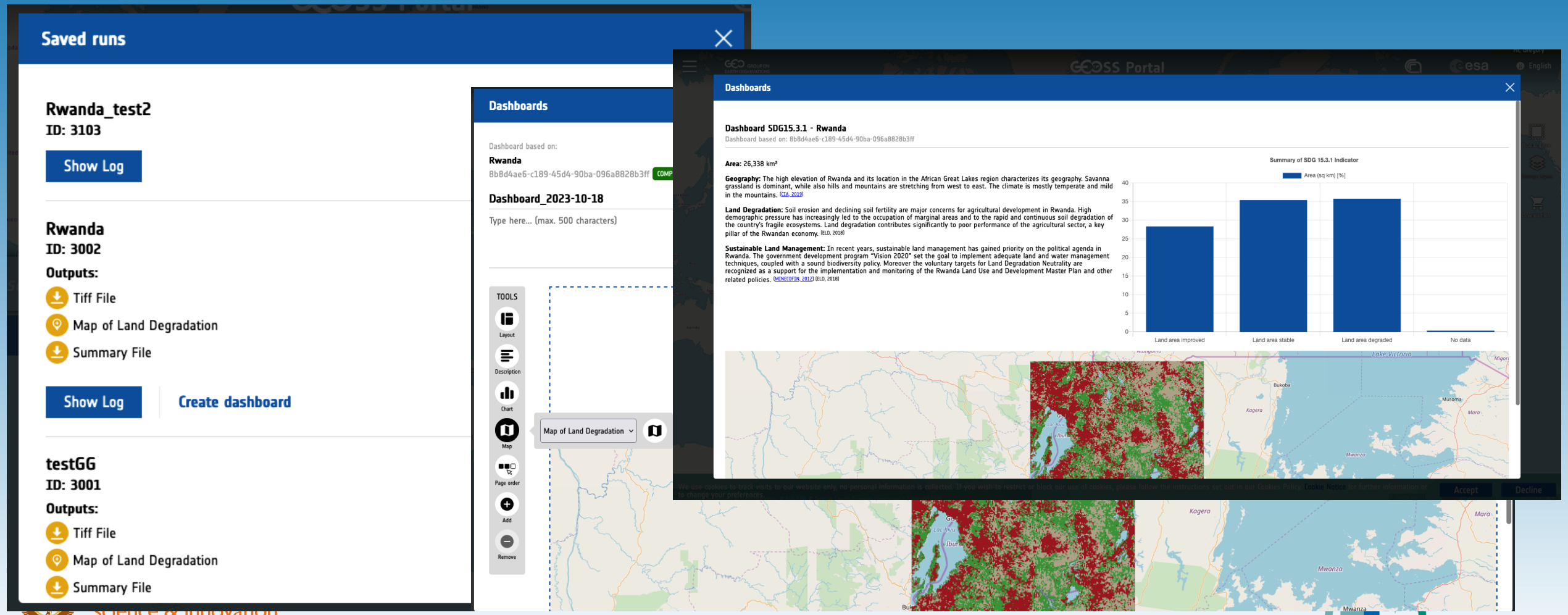
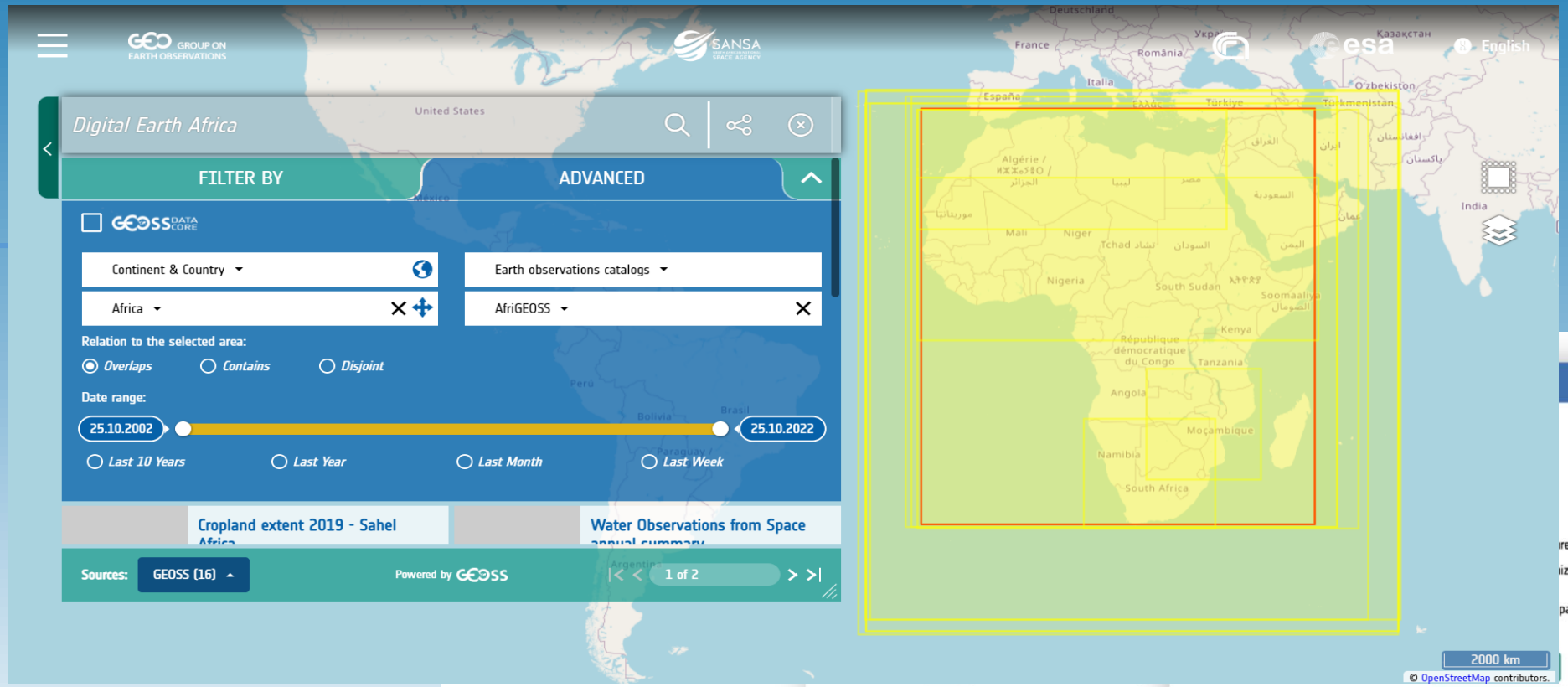
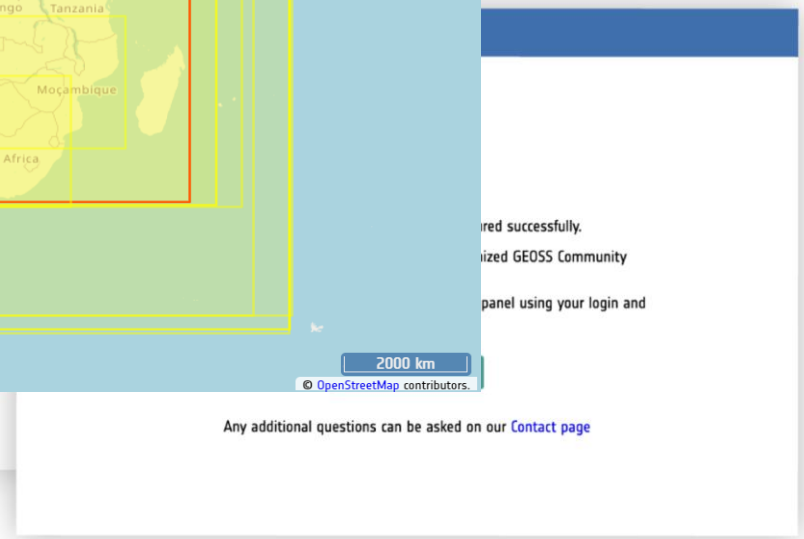
Contribution Examples: Dashboard tool for report generation



Contribution Examples: Community Portal Self Creation process. AFRIGEOSS

1. User opens a manual with download links





GPP Web site

https://geossplatformplus.com/

Geo Portal website

https://www.geoportal.org/

Contact us

geoss_platform_support@esa.int

Testing Geo Portal website

it is a testing environment, some functionalities may face some issues

https://geoss.uat.esaportal.eu/

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

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6-10 NOVEMBER

CAPE TOWN, SOUTH AFRICA

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

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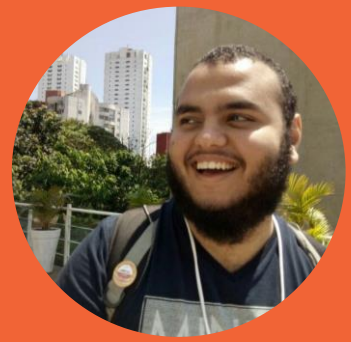
Sharing and preserving knowledge using the GEO Knowledge Hub

Paola de Salvo

Kalamkas Yessimkhanova



Felipe Carlos

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Environmental and societal issues

GEO Work Programme Activities

Digital Earth

LAND DEGRADATION NEUTRALITY

GEOGLOWS

GEOGLAM
GLOBAL AGRICULTURAL MONITORING

Environmental and societal issues

GEO Work Programme Activities

Digital Earth
LAND DEGRADATION NEUTRALITY
GEOGLOWS
GEOGLAM
GLOBAL AGRICULTURAL MONITORING

EO-based Applications

Data
Software
Workflow
Documents

Environmental and societal issues

GEO Work Programme Activities

Digital Earth
LAND DEGRADATION NEUTRALITY
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GLOBAL AGRICULTURAL MONITORING

EO-based Applications

Data
Software
Workflow
Documents

Environmental and societal issues

Open Knowledge

Open Knowledge

Open Knowledge

Understand

Open Knowledge

Understand

Reuse

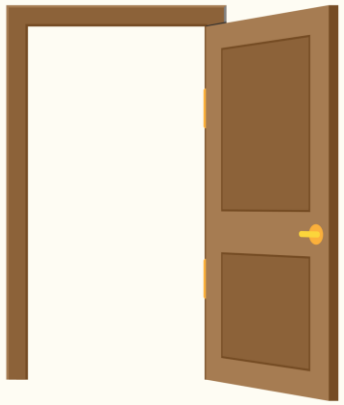
Open Knowledge

Understand

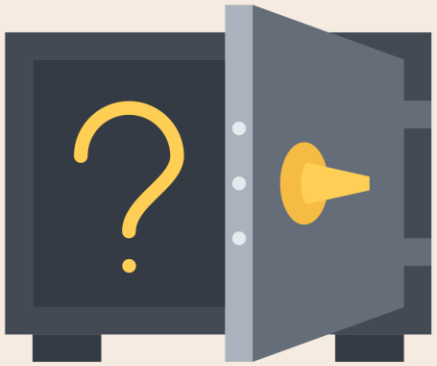
Reuse

Create

Open



Preserve



Use

GEO Knowledge Hub

The **GEO Knowledge Hub** is a **digital library** for the **GEO Community**

Share

Share

Preserve

Share

Search

Preserve

Share

Search

Preserve

Interact

Crop Monitor

Crop Monitor

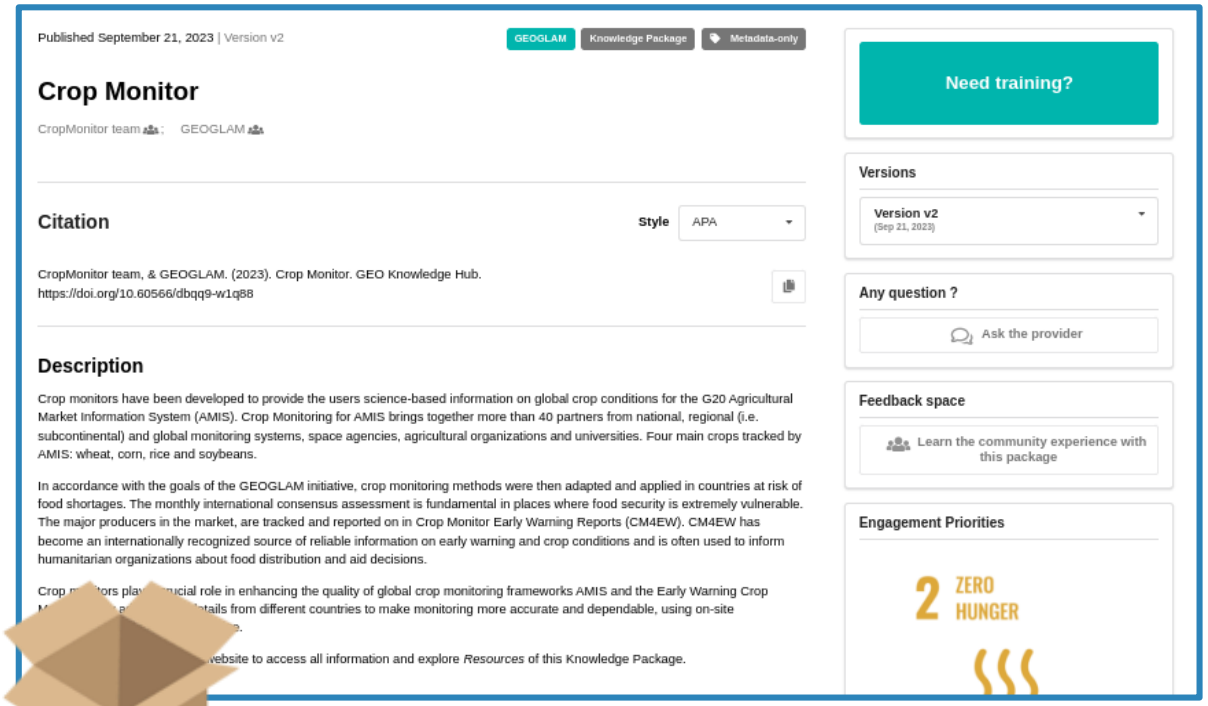
Datasets

Software

User stories

Publications

Knowledge Package



Published September 21, 2023 | Version v2

GEOGLAM | Knowledge Package | Metadata-only

Crop Monitor

CropMonitor team ; GEOGLAM

Citation

Style APA

CropMonitor team, & GEOGLAM. (2023). Crop Monitor. GEO Knowledge Hub. https://doi.org/10.60566/dbqq9-w1q88

Description

Crop monitors have been developed to provide the users science-based information on global crop conditions for the G20 Agricultural Market Information System (AMIS). Crop Monitoring for AMIS brings together more than 40 partners from national, regional (i.e. subcontinental) and global monitoring systems, space agencies, agricultural organizations and universities. Four main crops tracked by AMIS: wheat, corn, rice and soybeans.

In accordance with the goals of the GEOGLAM initiative, crop monitoring methods were then adapted and applied in countries at risk of food shortages. The monthly international consensus assessment is fundamental in places where food security is extremely vulnerable. The major producers in the market, are tracked and reported on in Crop Monitor Early Warning Reports (CM4EW). CM4EW has become an internationally recognized source of reliable information on early warning and crop conditions and is often used to inform humanitarian organizations about food distribution and aid decisions.

Crop ...tors play ...ucial role in enhancing the quality of global crop monitoring frameworks AMIS and the Early Warning Crop M... a... ...tails from different countries to make monitoring more accurate and dependable, using on-site ...e.

...website to access all information and explore *Resources* of this Knowledge Package.

Need training?

Versions

Version v2 (Sep 21, 2023)

Any question ?

Ask the provider

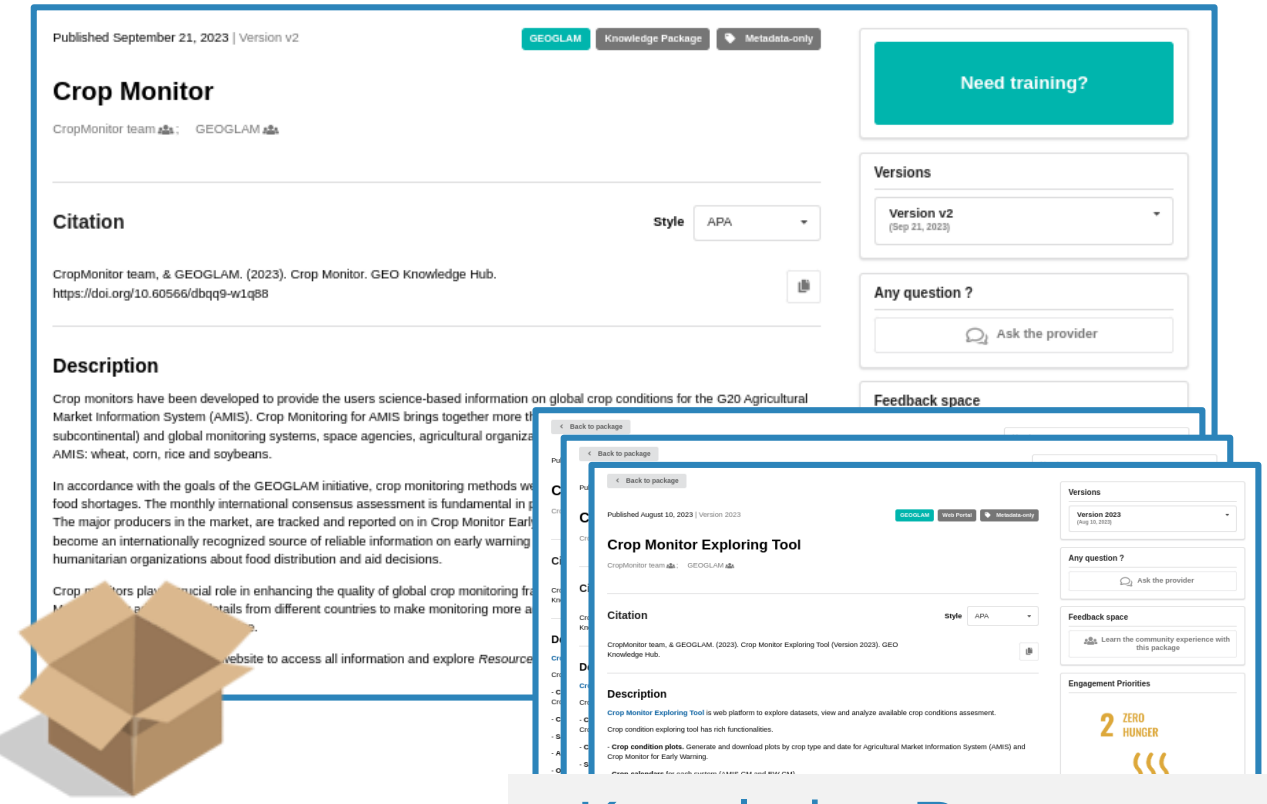
Feedback space

Learn the community experience with this package

Engagement Priorities

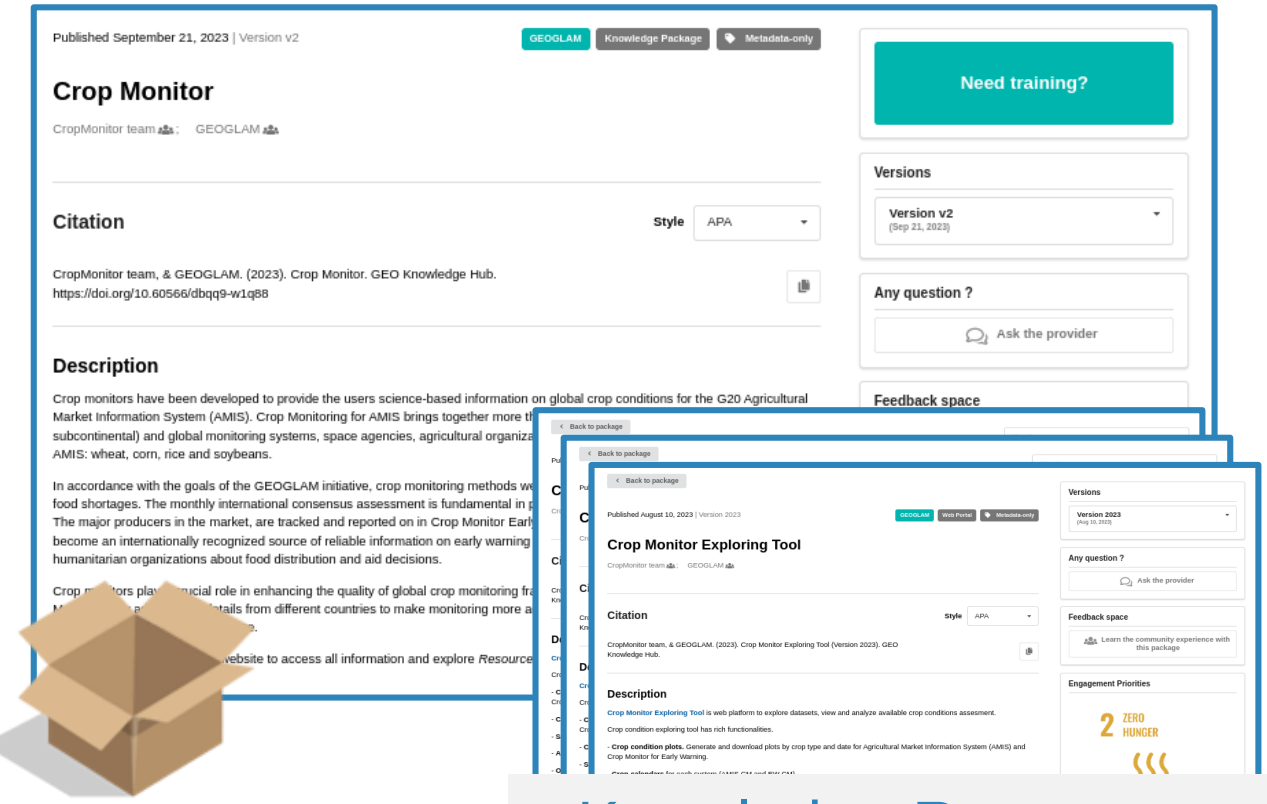
2 ZERO HUNGER

Knowledge Package



Knowledge Resources

Knowledge Package



Knowledge Resources

Metadata

Files

Digital Object Identifier (DOI)

We build **together** with the **community**, **for** the **community**

Digital Earth AFRICA

GEO GOS4M GLOBAL OBSERVATION SYSTEM FOR MERCURY

EO4SENDAI Monitoring

GWIS

GEO ECO

EO4SDG

GEO GLOWS GLOBAL WATER SUSTAINABILITY

OPEN EARTH ALLIANCE

GEO Human Planet Initiative

GEO VENER VISION FOR ENERGY

GEOMIN

GEO Value

GEO MOUNTAINS Observing Mountain Environments

Data Working Group

GEO GLAM GLOBAL AGRICULTURAL MONITORING

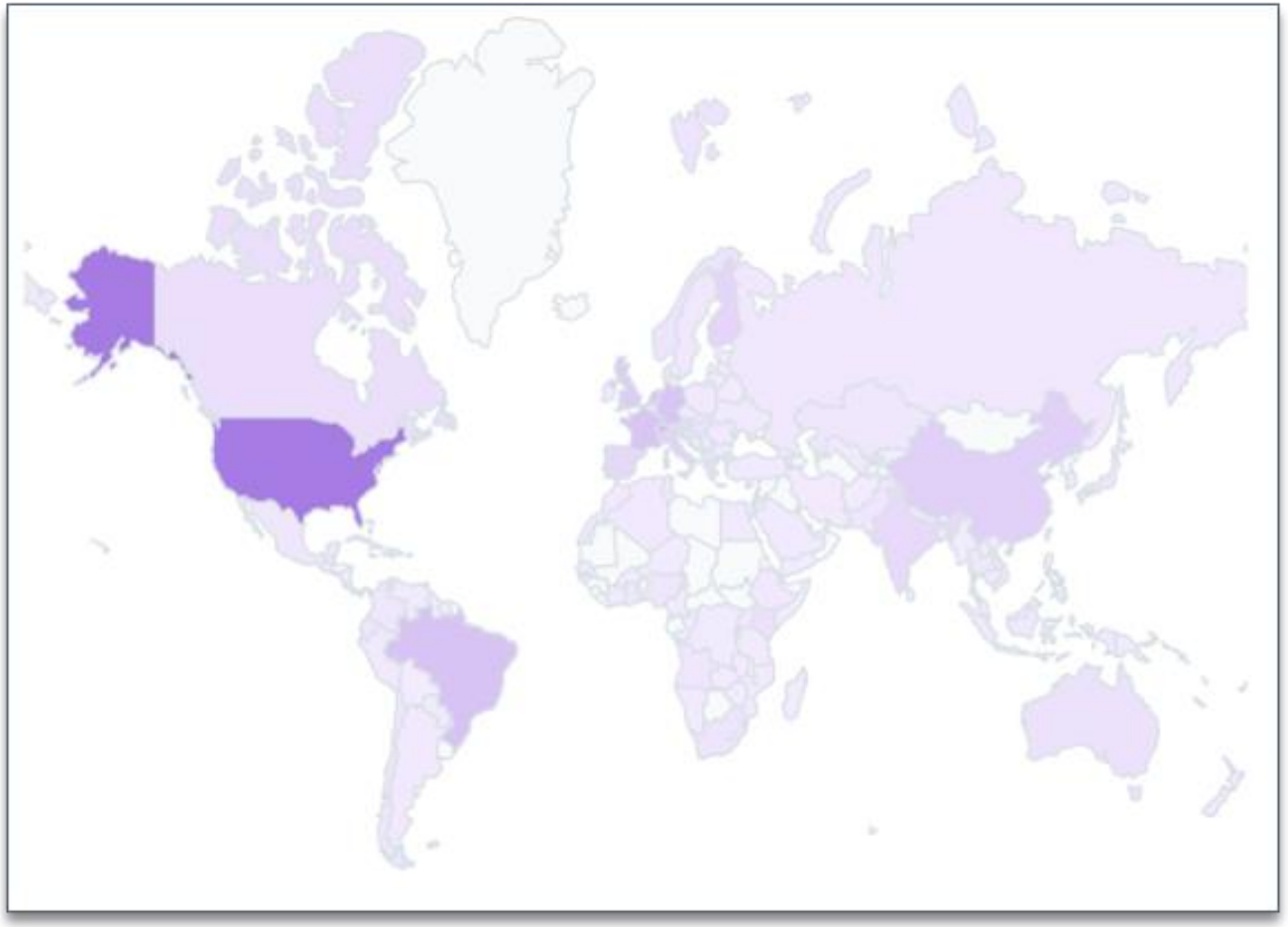
110

Knowledge Packages

539

Knowledge Resources

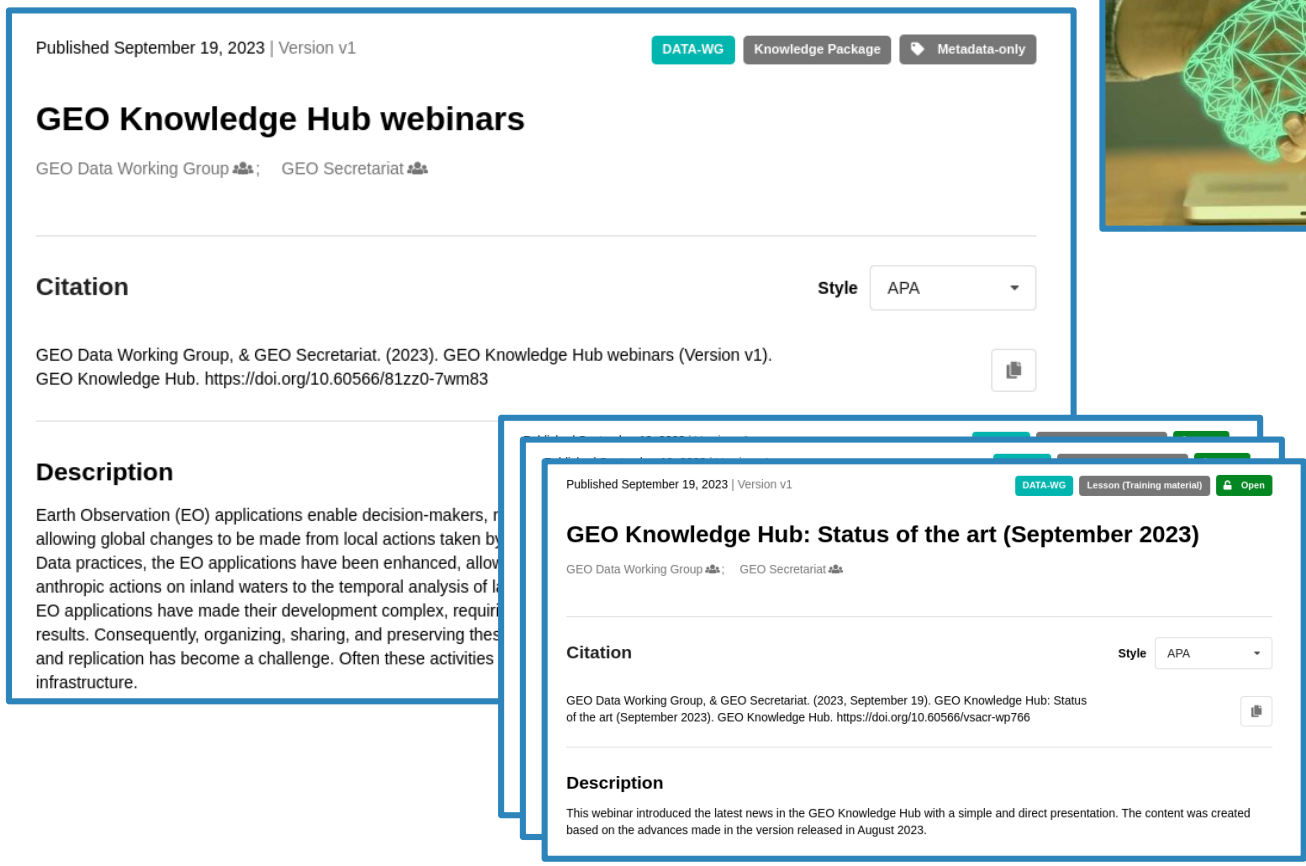
~23.000 views
(in the last 11 months)



Visitors by country
(Stronger color means more visitors)

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


Knowledge Provider
Application Users



doi.org/10.60566/81zz0-7wm83

127th OGC Member Meeting

Open Geospatial Consortium

September 25 - 29

Open Earth Monitor Workshop

October 4 – 6

Jupyter Notebooks workshop

CEOS

The Committee on Earth Observation Satellites

October 26

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

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

07/11/2023 – 16:00 – 18:00

Ms. Dominique Tilmans

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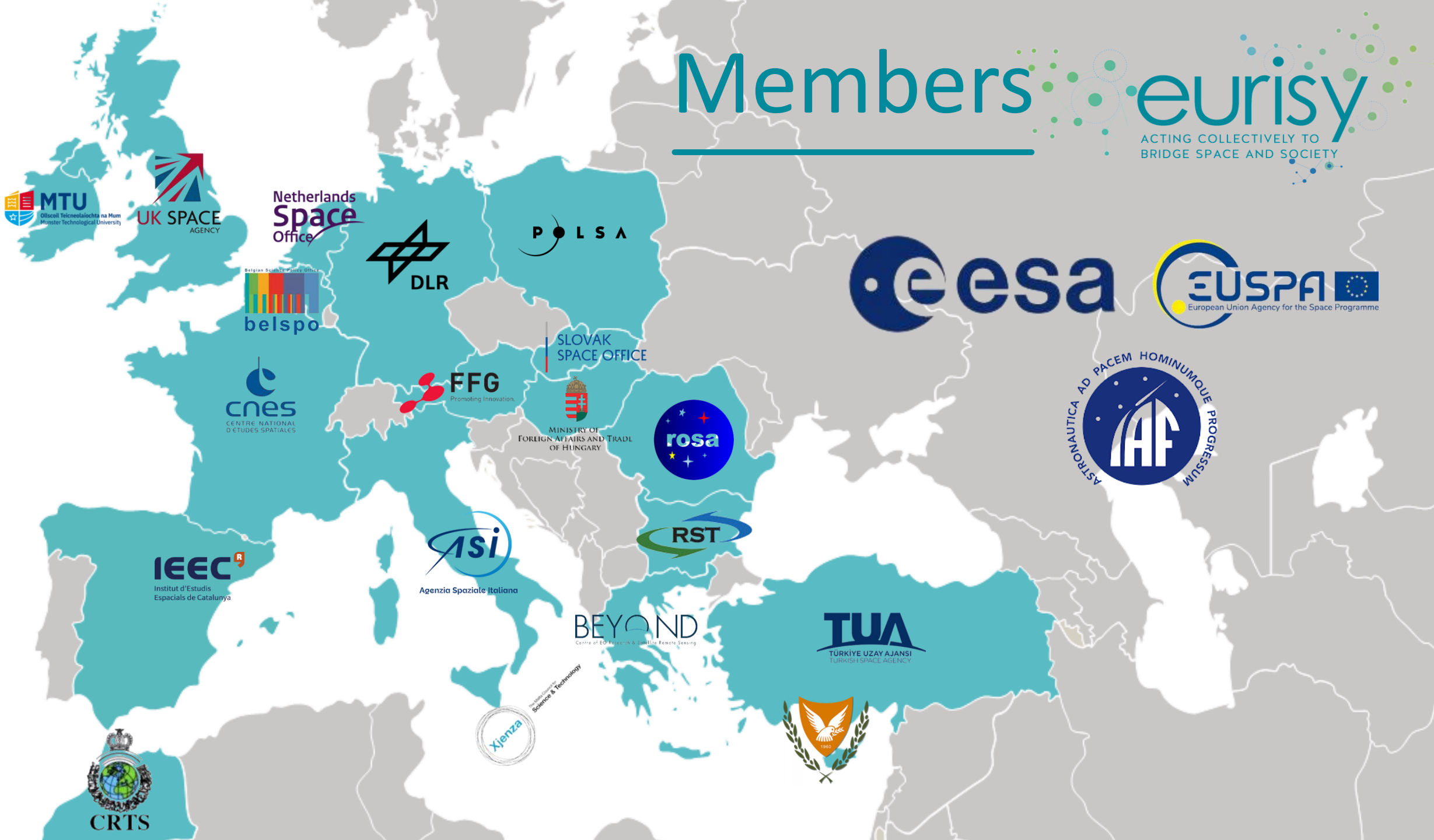
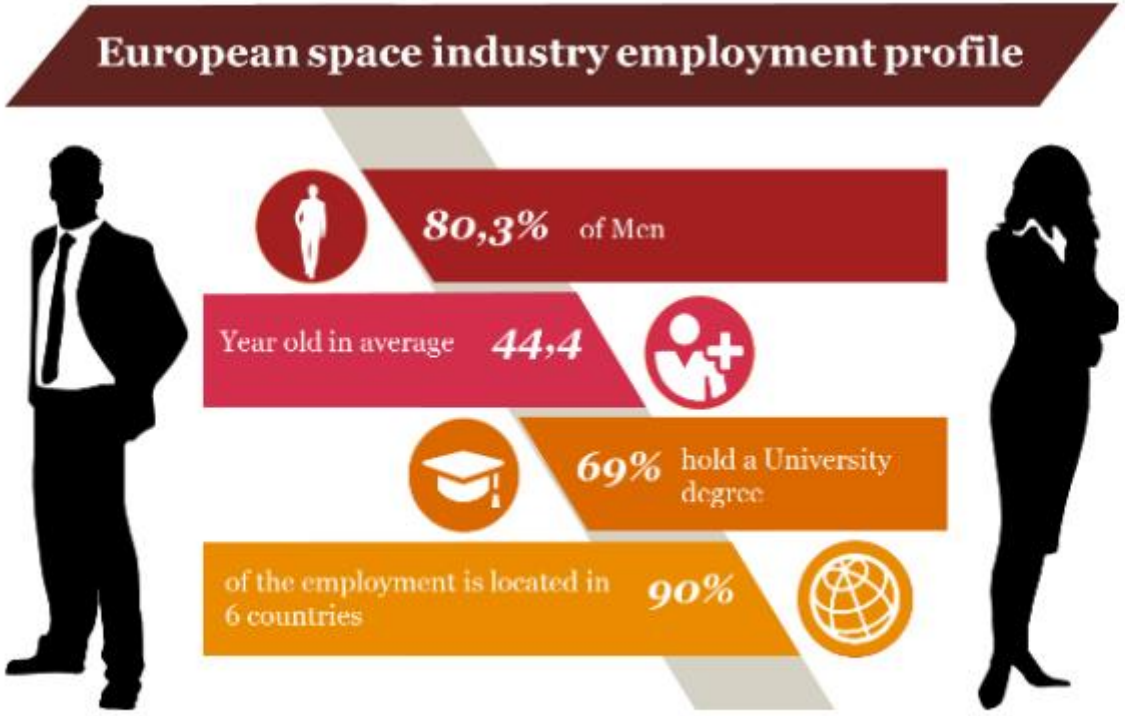
Members

eurisy
ACTING COLLECTIVELY TO BRIDGE SPACE AND SOCIETY



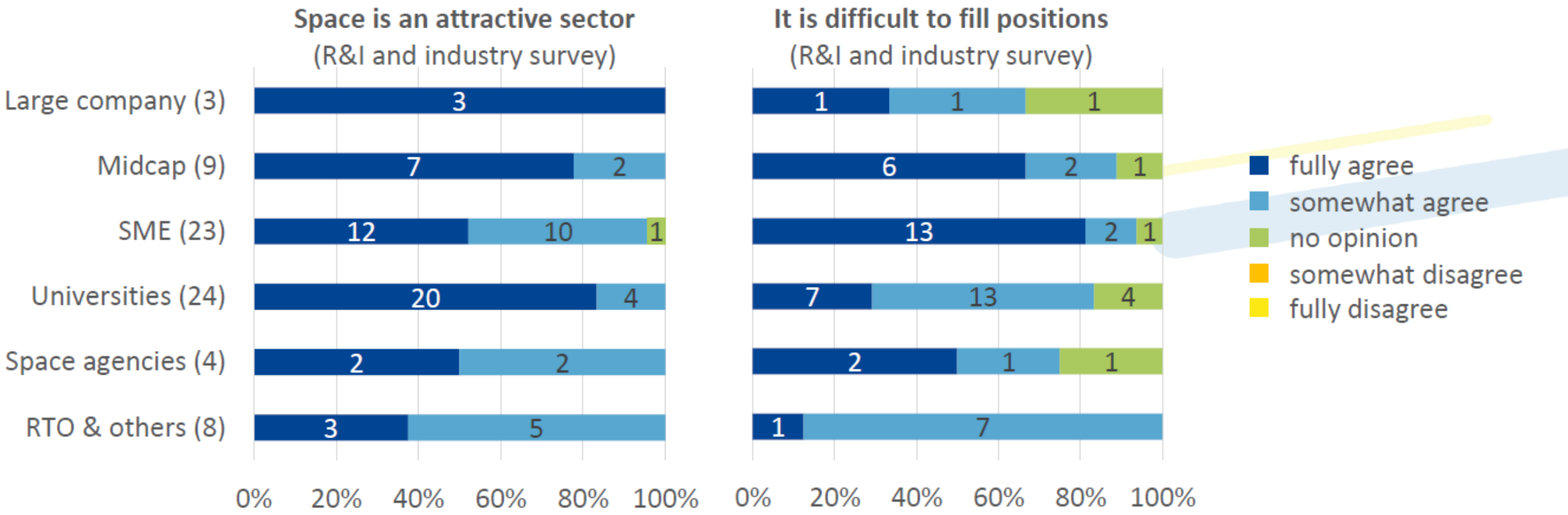
AN OVERVIEW OF THE SPACE ECONOMY IN 2022

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



Source Stars*EU project

space4geo

- 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

GEO-ACADEMY

GEO-Hub for teachers in Europe

- 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)

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Thank you!