



GEOSS Platform Plus

D3.2 - Version 1.0

Enhanced GEOSS Platform User Manual v1 with 1st set of applications

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Abstract:

This document describes the evolved GEOSS Platform, in terms of capabilities and applications offered and of instructions for using them. It regards the advanced GEOSS Portal, GEO DAB (also in terms of APIs, and of instructions for using them), Yellow Pages, new middleware enhancements and applications that use these as from the first project cycle.

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Executive Summary

In the context of the Global Earth Observation System of Systems (GEOSS), it has been implemented the GEOSS Platform with the aim of linking GEO users to resource providers and re-enforcing the GEO Communities involvement and contribution into GEOSS. To achieve this goal the GEOSS Platform shall play a role where Users can of course discover and access data, but more important where they can use these data to generate actionable information by exploiting the GEOSS Platform functionalities or contribute to the GEOSS ecosystem by providing new functionalities, applications, tools or middleware components to benefit other users and communities. For this reason, the GPP project starts from the Applications needed to the different communities to integrate, expand and exploit all the functionalities implemented and made available through and within the platform. In particular in this document, users can find step by step guidance to the functionalities implemented, interfaced and integrated within the GEOSS Platform and other GEOSS middleware components at large. In the first project cycle the following tools and applications have been enhanced:

- The Geo Portal,
- The GEOSS DAB and new data harvesting
- SDG 15.3.1 Land degradation application
- AfriGEO Custom GEOSS Portal creation
- Middleware components to support reproducibility, replicability and reusability.

The Portal is an online web map-based user interface which allows users to discover and access Earth observation data and heterogeneous collections from satellites, airplanes, drones and in-situ sensors at global, regional and local scales, from different providers from all over the world. It connects users to providers, by allowing them to discover and access to existing databases and portals, to provide reliable, up-to-date and user-friendly information – vital for the work of decision makers, and non-specialists in general managers and allow to use data by generating actionable information.

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1. Introduction

1.1 Purpose and Scope

This document (D3.2 - *Enhanced GEOSS Platform User Manual v1 with 1st set of applications*) has been generated in the context of WP3 - GEOSS Evolution design, development, integration and deployment within the GPP (short for GEOSS Platform Plus) project, Grant Agreement no. 101039118.

The objective of this document is to provide the necessary documentation for using the evolved GEOSS Platform components, instruments, and new data sources, in terms of functionalities and applications offered and of instructions for using them. It regards the enhancements at different GEOSS levels (architectural, middleware, applications) and GEOSS Platform components as the GEOSS Portal, GEO DAB (also in terms of APIs, and of instructions for using them), and new middleware enhancements driven by applications identified in the first project cycle. The new enhancements have been technically described in the [RD-2], following the specification as identified and documented in the context of WP2 in the document [RD-3], Functional and Non-functional Enhancements Specification, that underpin the user needs elicited and analysed in the context of the document [RD-4], Use Cases Description and User Requirements Document.

The target audience is the wide variety of the GEOSS Portal users but also of the GEO-DAB APIs, including specific user communities, who want to reuse functionalities of the GEOSS Platform in their own portals or wish to have or trigger actionable information all in one place.

1.2 Document Organisation

The document is organised as it follows:

- Section 1: Introduction, it describes the purpose and scope of the document and its organization.
- Section 2: Rationale and Context, it contextualizes the content of this document by providing background information and details on the operational landscape encompassing the GEOSS Platform.
- Section 3: GEOSS Platform Operational Components: describes the GEOSS Platform interfaces and how to operate them.
- Section 4: GEOSS Platform Proof of Concepts: describe the first set of applications and provide a step by step guide to use them.
- Annex A: References, List the references used in the document.
- Annex B: Figures and Tables, Provides links to figures and tables in the document.
- Annex C: Terminology, explains the meaning of the acronyms and definitions used in the document.

2. Rationale and Context

2.1 Background and operational context

A central part of GEO's Mission is to build the Global Earth Observation System of Systems (GEOSS). GEOSS is a social and software ecosystem sharing independent and open Earth observation (EO) information and processing services. It connects and coordinates a large array of observing systems, data systems and processing services to strengthen monitoring of the state of the Earth. It facilitates the sharing of environmental data and information collected by countries and organizations within GEO. GEOSS ensures that these data are accessible, of identified quality and provenance, and interoperable to support the development of tools and the delivery of information services. Thus, GEOSS increases our understanding of Earth processes and enhances predictive capabilities that underpin sound decision-making: it provides access to data, information, and knowledge to a wide variety of users.

The GEOSS Platform has been created to provide the technological tool to implement GEOSS. The story of Platform began in 2008, as Clearinghouse catalogue; in 2012 the platform evolved into a Brokering infrastructure with the inclusion of the GEO Discovery and Access Broker (GEO DAB). The first user interface, the GEOSS Portal was initially created in 2010 and in 2016 has seen great enhancements in terms of user experience and enhanced discovery, access and visualization functionalities. In 2017 the platform has evolved into the currently known GEOSS Platform (see Figure 1).

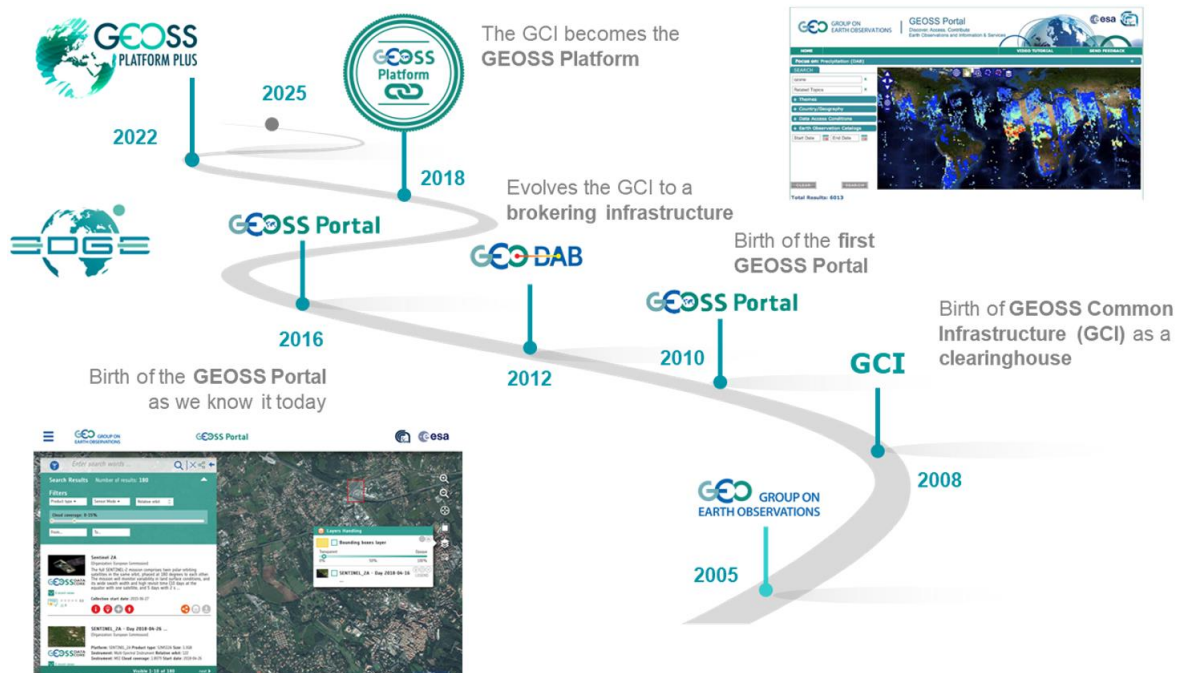


Figure 1 - The GEOSS Platform Journey

A first effort in demonstrating several proofs of concepts experimenting service execution with selection of public cloud-based analytical platforms (e.g. DIASs, AWS), navigation through linked (context) information and dedicated customisation of community portals features have been

implemented and experimented within a development platform in the framework of the EDGE (European Direction in GCI Enhancements) Project (for more details see **Error! Reference source not found.**).

Another EU effort in contributing to GEO is the GEOSS Platform Plus (GPP) Project with the aim to respond to the new challenges focused on the European Green Deal, implementation of the EU Strategy on adaptation to climate change and the outcomes of the Mid Term Review frameworks (see Figure 3) by developing new tools and functionalities to better address the user needs adopting an user centric approach by engaging User communities, GWP activities, initiatives and flagships and including European efforts in the Climate Change and green deal frameworks (see Figure 2 and Figure 3).



Figure 2 - GEOSS Platform Components



Figure 3 - The GPP Drivers and focus domains

Another objective of the GPP Project is to make the GEOSS Platform usable from a wide variety of users within the GEO communities and beyond it, that covers users coming from scientific communities to non-experts and decision makers. In Figure 4 GPP a representation of the type of users involved and the functionalities they are interested in when using the GEOSS Platform.



Figure 4 GPP User types and functionalities

2.2 Links with other project activities

GPP identifies five work packages as follows:

- WP1: Project management
- WP2: Use cases definition and user requirements specification
- WP3: GEOSS Evolution design, development, integration and deployment
- WP4: User validation and assessment
- WP5: Dissemination, training, exploitation and GEOSS Contribution

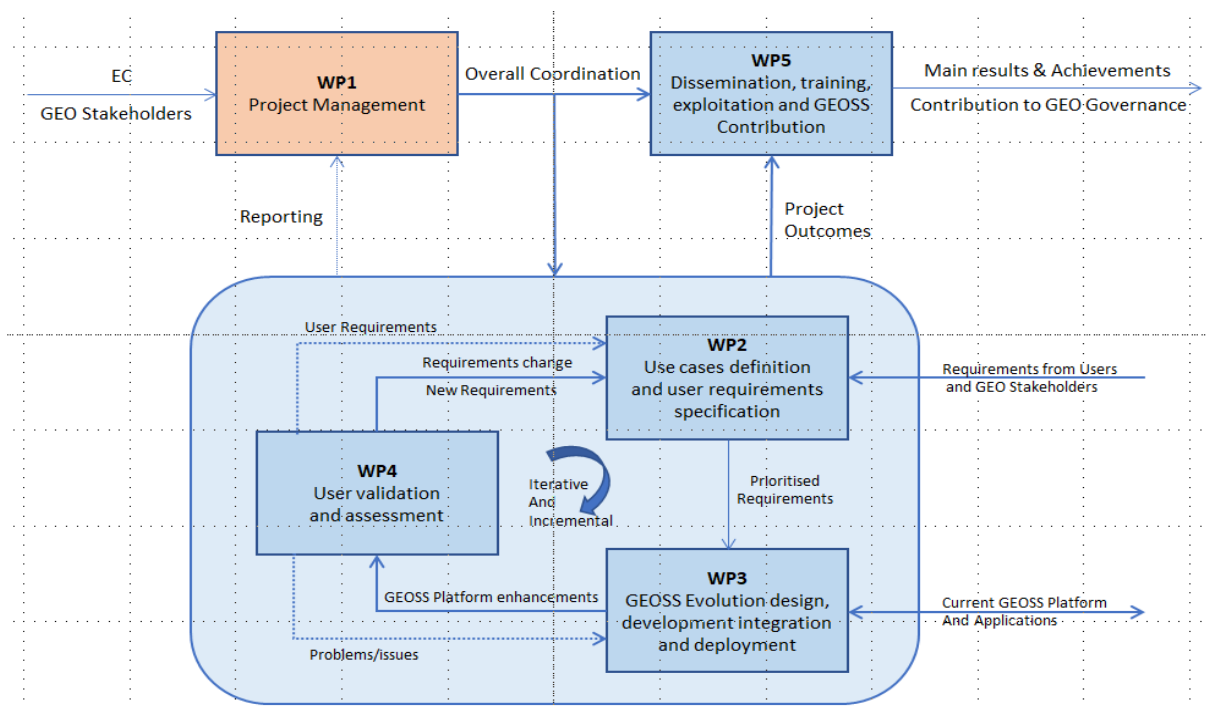


Figure 5 - GPP Workpackages and their relationships

Work-package 3 builds on prioritized GEOSS Platform requirements as input to the identification of enhancements, their implementation and definition of an integration and verification strategy. The output of WP3 is an enhanced GEOSS Platform. On top of the requirements resulting from WP2, current workpackage considers as well requirements and other inputs resulting from other (external activities).

3. GEOSS Platform Operational Components

3.1 GEOSS Portal

The GEOSS portal - available at www.geoportal.org – has the objective to provide a more intuitive and user-friendly interface to allow users and GEO communities to exploit at the maximum extent the discoverability and access to data.

3.1.1 Welcome Screen



Figure 6 - The GEOSS Portal Welcome screen

At the top opening of the portal, you will see a map of the world with a search bar in the centre, a series of icons on the right and header on the top of page.

The header on the top of page includes:

1. The option or hamburger menu icon;
2. GEOSS logo – linked to the GEO Site (<http://www.earthobservations.org/>).
3. GEOSS Portal logo – linked to geoportal home page;
4. CNR IAA logo linked to the CNR IAA (<http://www.iaa.cnr.it>).
5. ESA logo linked to the ESA site (<http://www.esa.int>).
6. The Switch language option.

The Search panel in the centre of page includes the following options:

7. Filters;
8. Search button;
9. Share search;
10. Clear search;

-
11. Hide/Show Search Bar;
 12. Targeted/Advanced search.

Icons on the right for basic GIS (Geographical Information System) functionality include:

13. area of interest.
14. layers.

In the bottom right corner there are also:

15. An envelope icon with “Send Feedback” option.
16. The map scale.
17. And the “Tutorial mode” icon that will guide the user to the different icons and provide info on their usage.
18. Tutorial YouTube Channel

3.1.2 Option Menu

Click on the “hamburger menu” icon on the header to open the option menu. You can find the following section:

- About.
- User Support.
- Community Portals.
- Yellow Pages.
- Statistics (to use this section you must have a registered account)
- My workspace (personalized workspace and retrieve information regarding popular/most used searches)
- Sign-in.

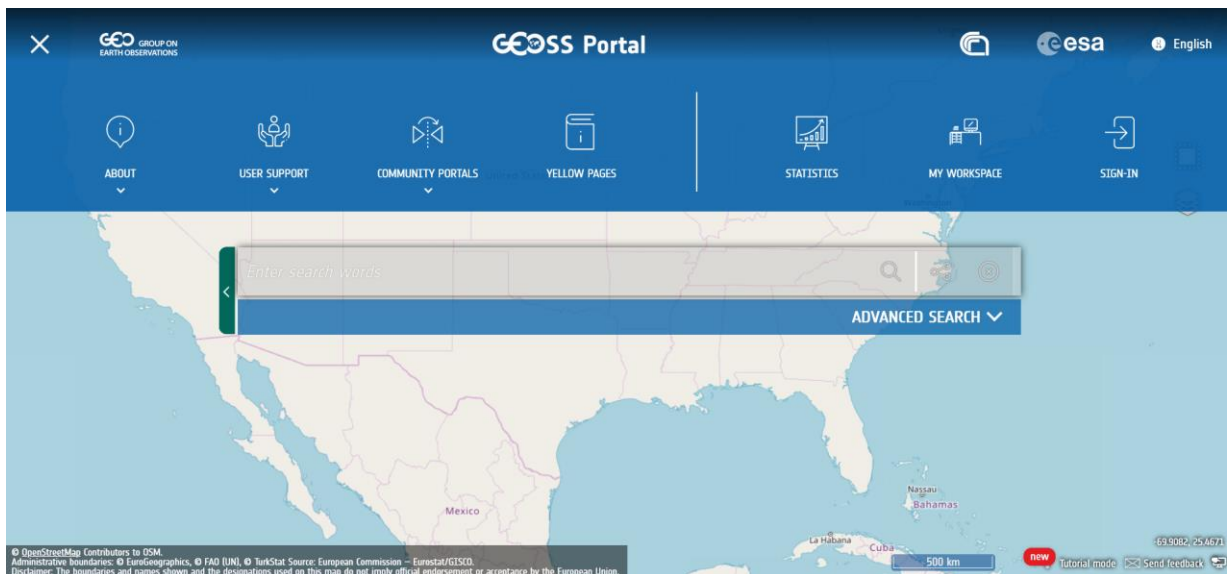


Figure 7 - The GEOSS Portal option menu

3.1.2.1 About Section

The About section contains the following 3 links:

- **General information**
- **Terms & Condition**
- **Release notes**

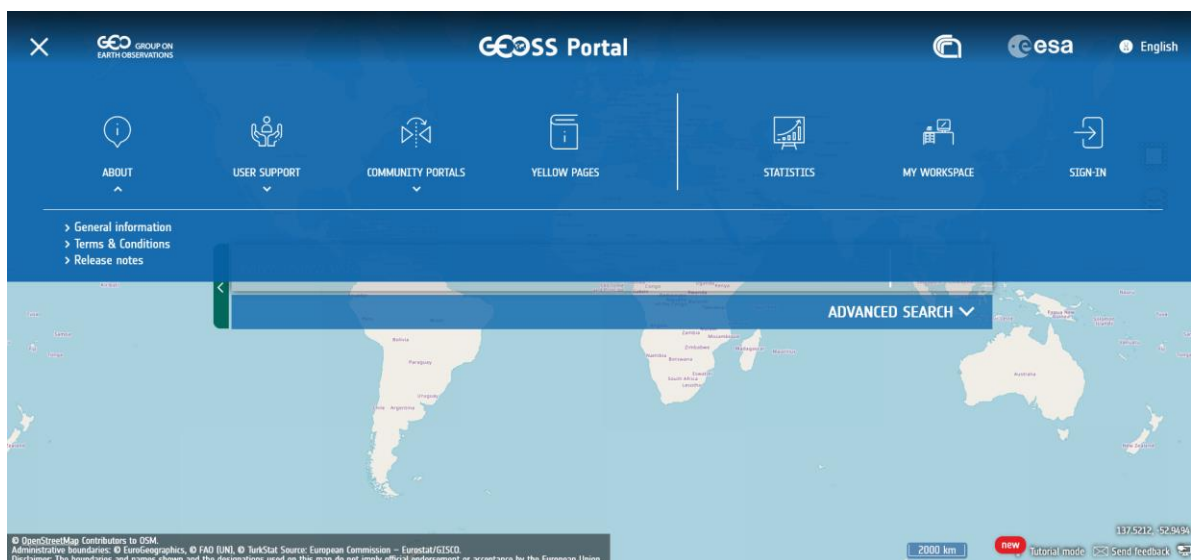


Figure 8 - About section

3.1.2.2 User support Section

The User Support section contains the following links:

- **Help Desk:** clicking on this link you can access to some services like a General information, GEOSS Portal Video tutorial, contact points, provide feedback, info for developers, FAQ.
- **Documentation:** latest updated documents.
- **Tutorials:** you can find some examples of GEOSS Platform and Video Tutorial
- **Highlighted searches:** you can find some prefilled searches

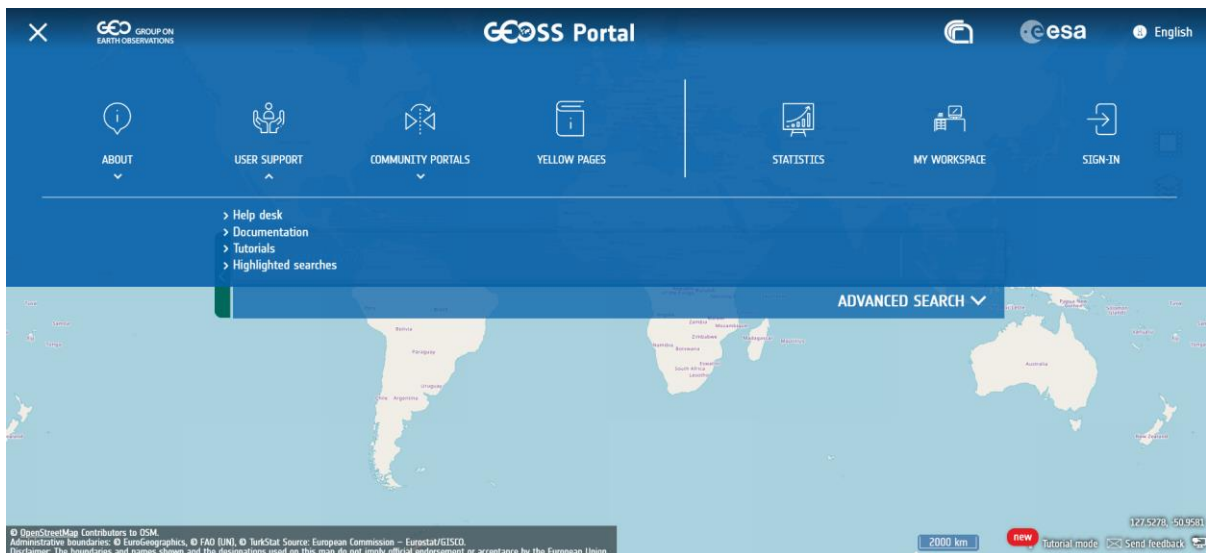


Figure 9 - User Support section

3.1.2.3 Community Portals Section

In this sub-menu you can find the existing community portals where have been implemented some customized views in order to manage specific data for the community purposes.

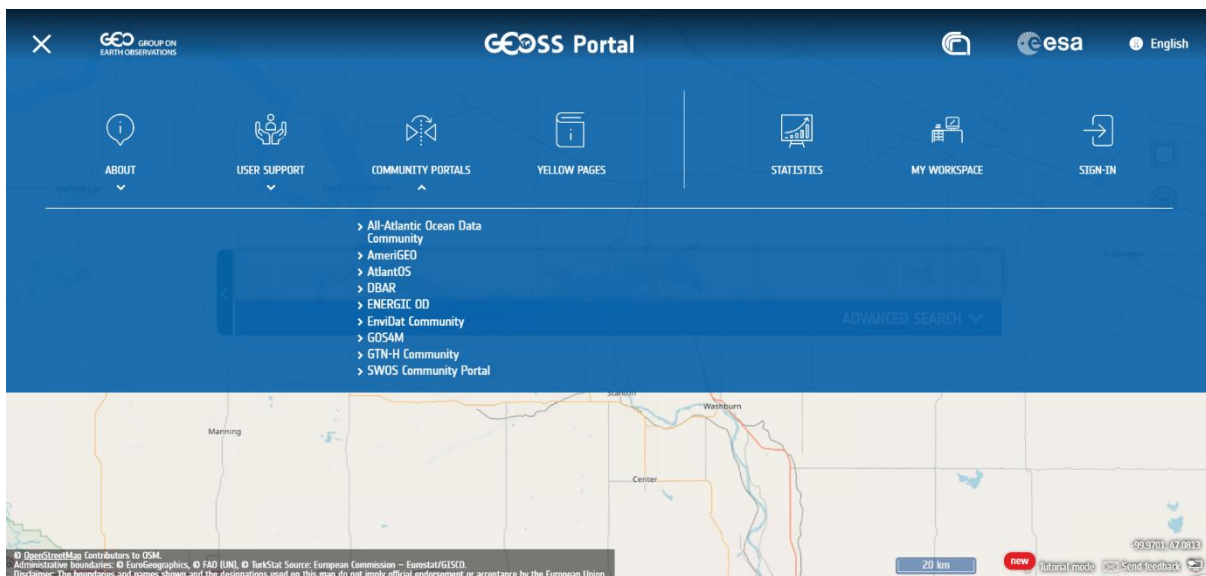


Figure 10 - Community Portals section

3.1.2.4 Yellow Pages section

The yellow pages section contains the list of registered providers

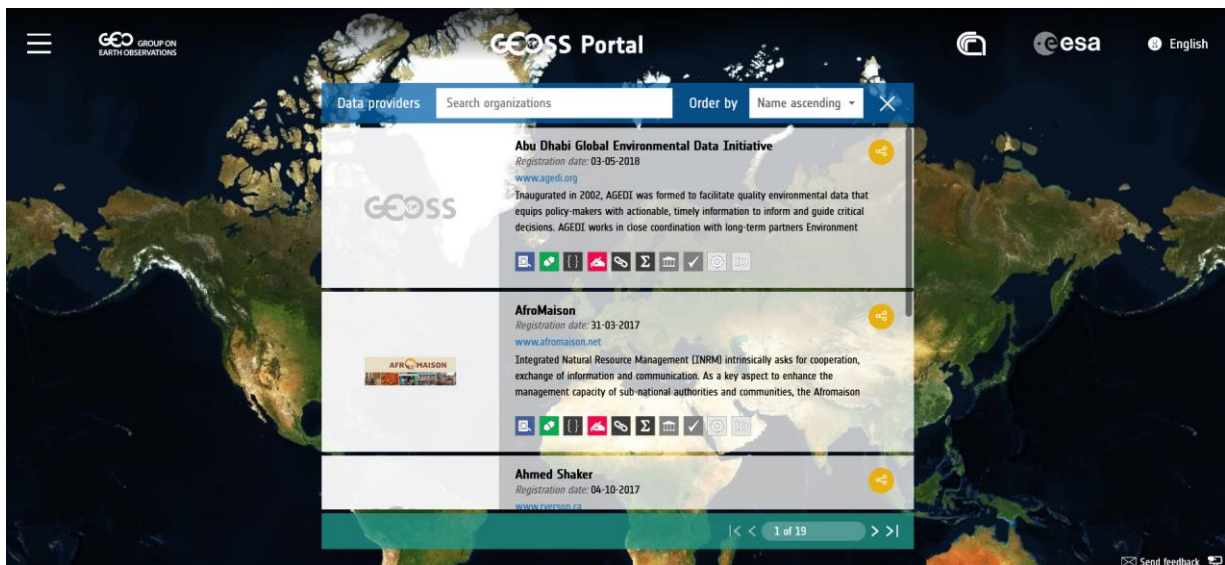


Figure 11 - Yellow pages section

3.1.2.5 Sign-in

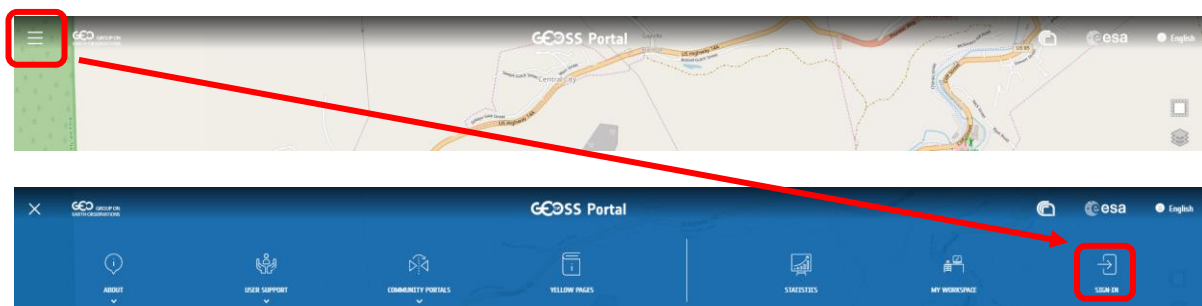


Figure 12 - The Sign-in item

In order to obtain credentials to log-in open the Hamburger menu on the top-left corner of the GEOSS Portal website and click on the item Sign-in.

3.1.2.5.1 Special features for logged users

Logged users have more options in portal e.g., can save searches, save runs, bookmark results. They can also see and save as pdf/csv statistics.

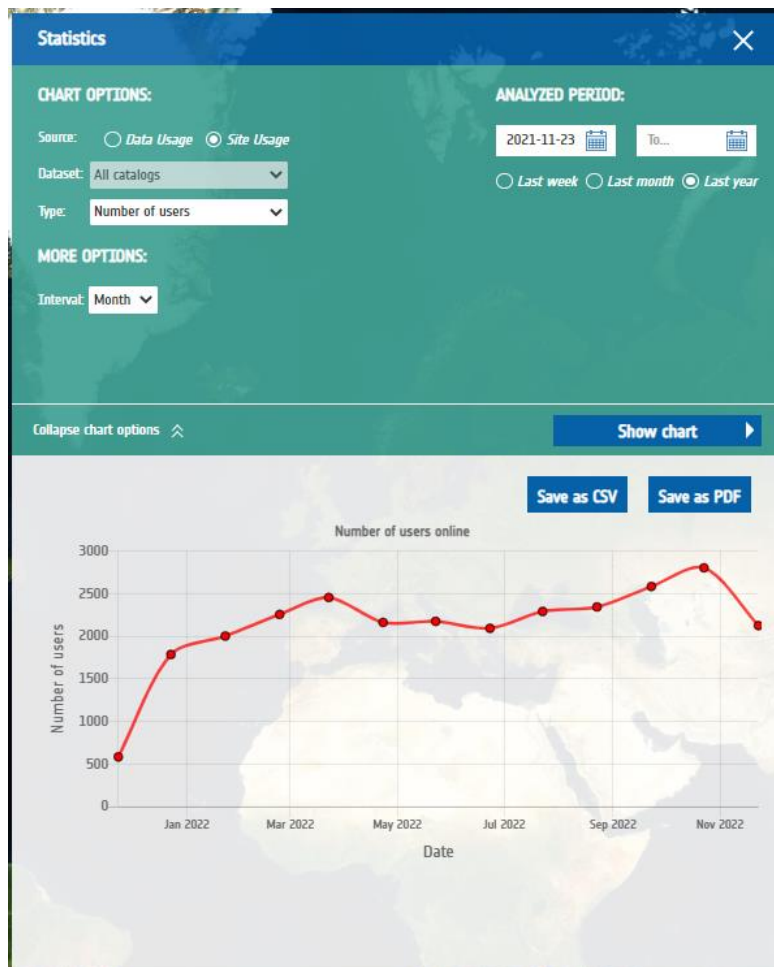


Figure 13 - GEOSS Statistics

3.1.2.5.2 Status Checker

The end user can search for Earth Observations data and filter available services using as well the Health Status filter provided by the GEOSS Status Checker.

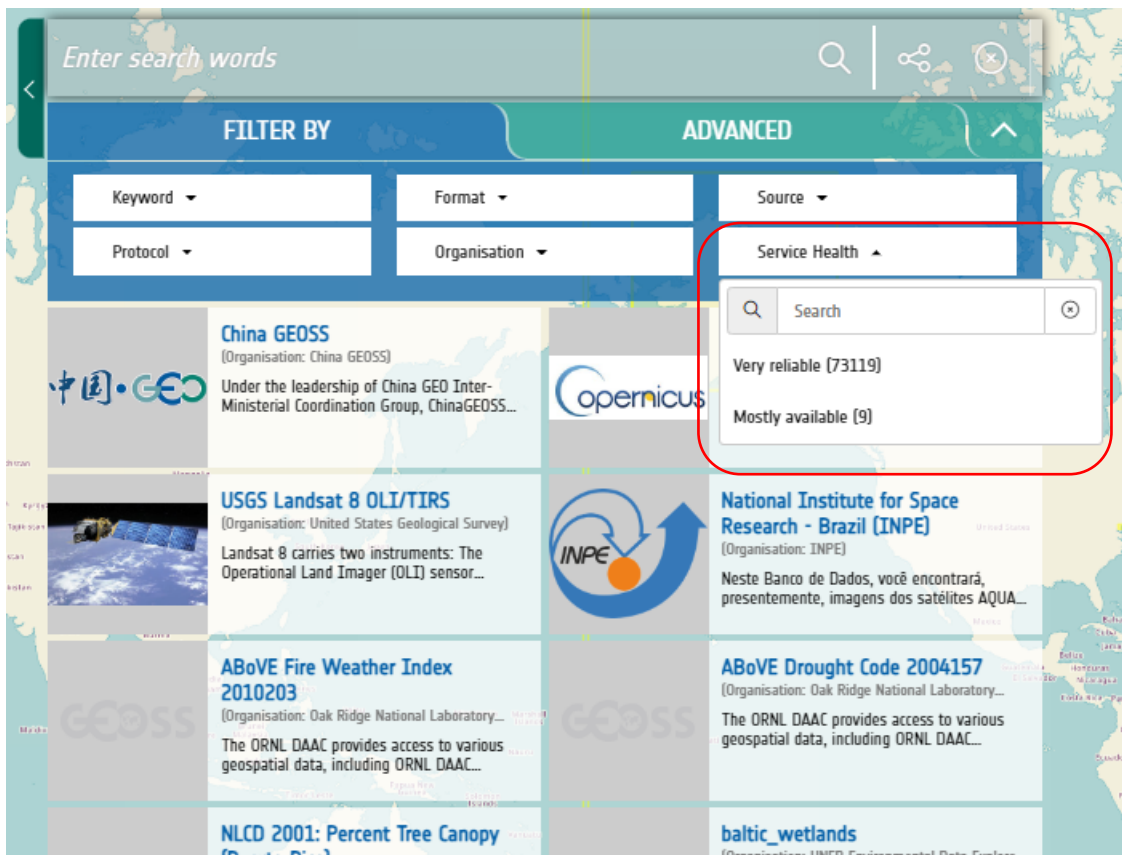


Figure 14 - the Service Health filter

3.1.3 Search for Resources - Multi-Criteria Searches

The multi-criteria search panel can be unfolded selecting the most-left icon in the keyword based search panel.

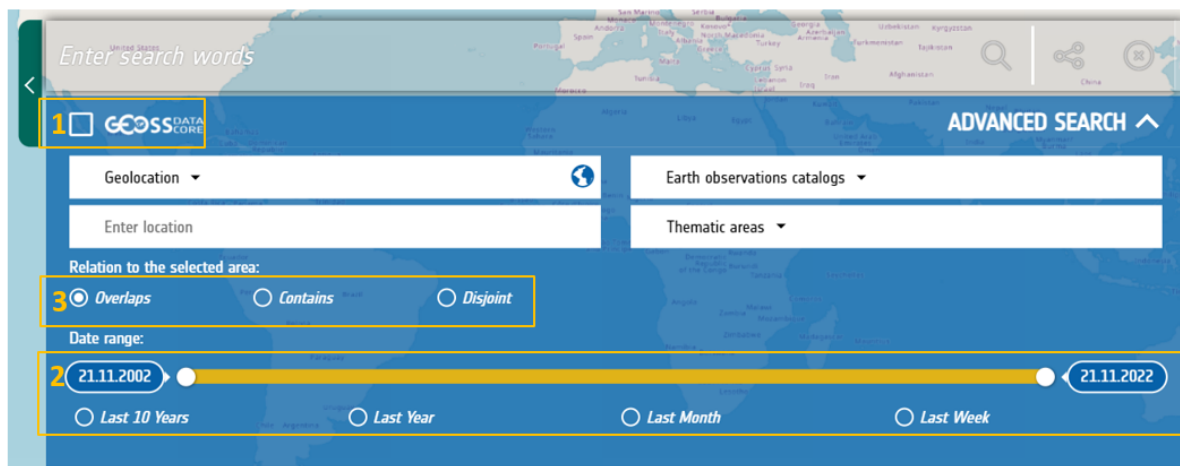


Figure 15 - The multi-criteria search panel

As part of a multi-criteria search, a user can:

1. restrict search results to the freely and openly accessible ones only, so-called GEOS Data CORE resources (see Figure 9 box 1);
2. Define a timeframe of interest (see Figure 9 box 2)
3. Relations with selected areas allow users to display on the map geographic features that Overlaps, Contains or Disjoint the Area of interest (see Figure 9 box 3)

Other main filtering options are explained below:

- restrict the search to a limited set of Earth observation catalogues of interest to the user;

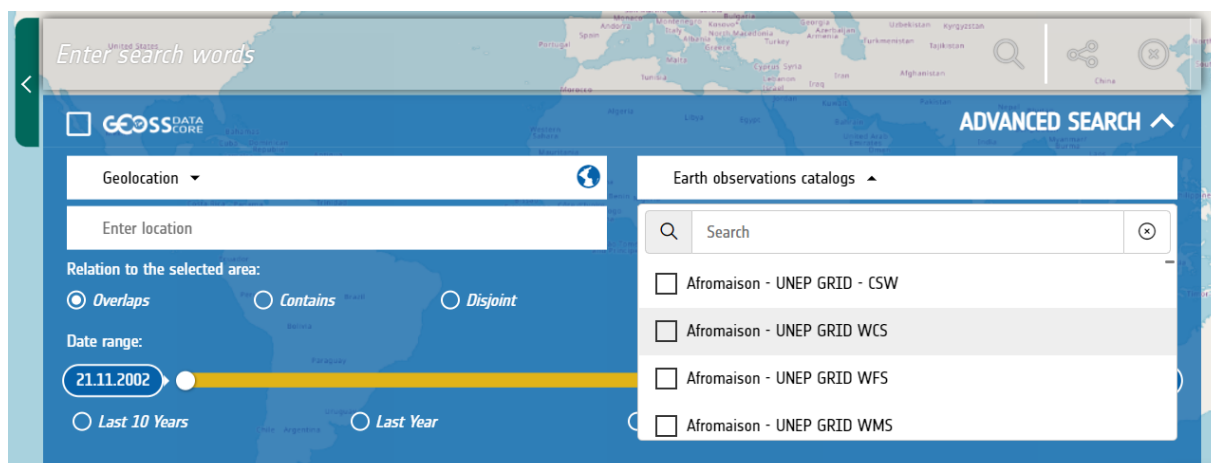
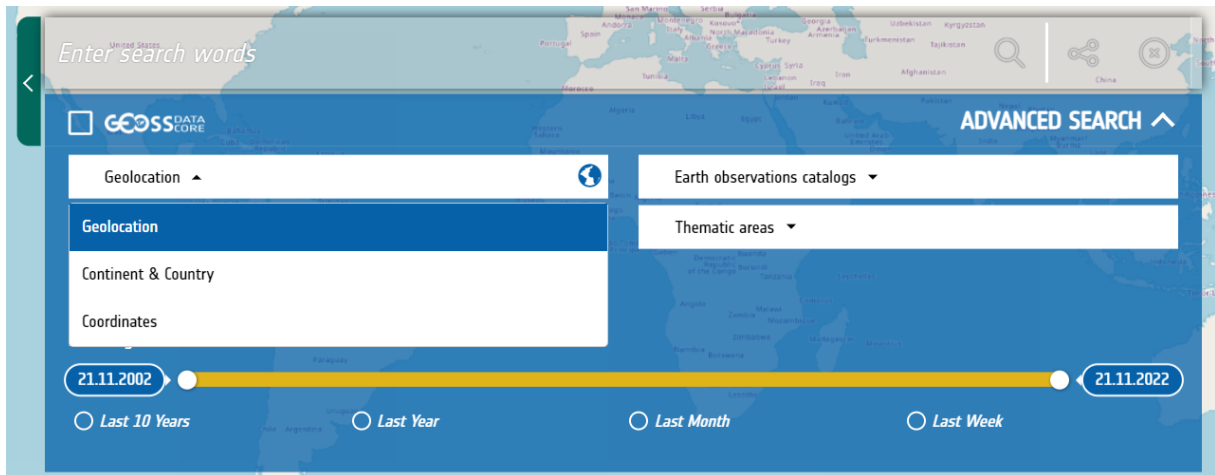


Figure 16 - the Earth Observation Catalogues filter

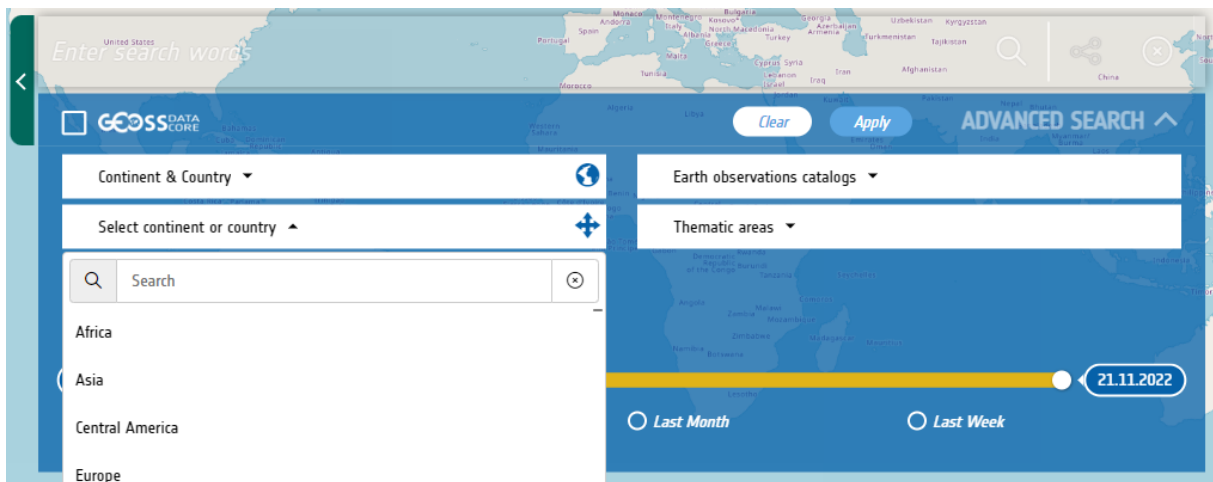
- define the **Geolocation** of interest using one of these options:
 - a. Geolocation (Figure 17 a)
 - b. Coordinates (Figure 17 b)
 - c. Continent & Country (Figure 17)



a)



b)



c)

Figure 17 - How to specify a location on Earth a), coordinates b) and countries c) filters

- Direct the search towards a specific **Thematic Area** applying predefined views on the data;

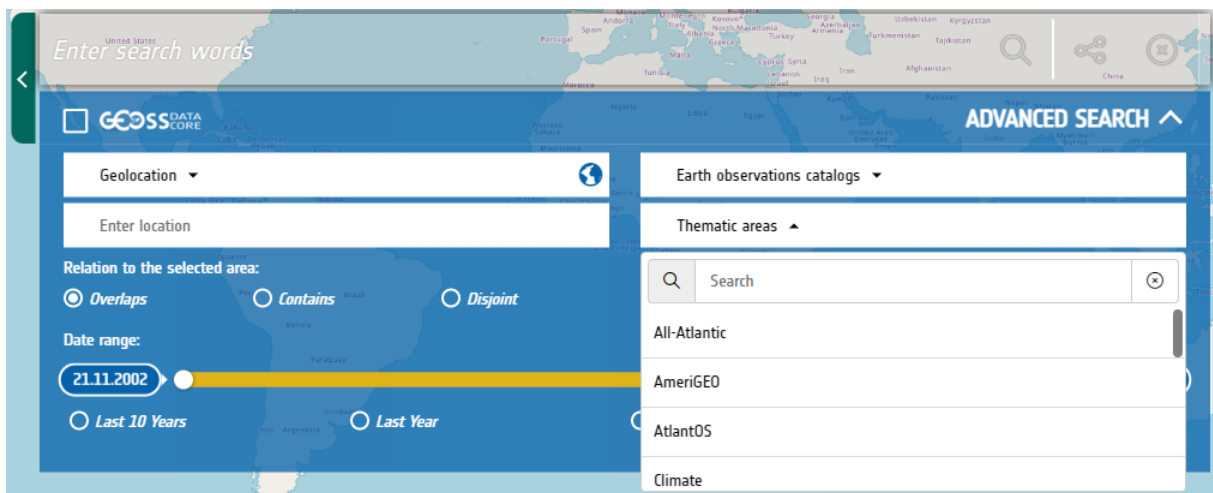


Figure 18 - The thematic areas filters

3.1.4 Results Inspection

After having specified search criteria, you can click on the search button. Results (if any) will appear in the result window.

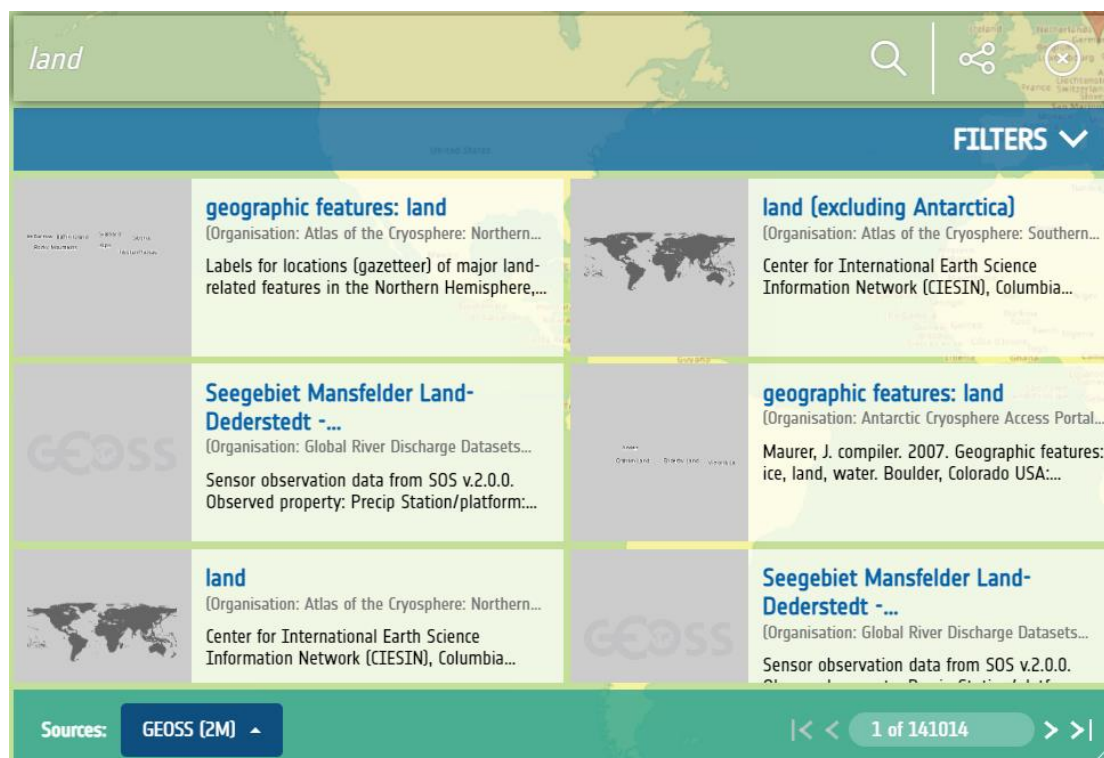


Figure 19 - The result window

The first page of results is displayed (12 results, by default); users can easily access the next (or previous) page of results by clicking the next (or prev) arrow at the bottom of the panel.

Each result item shows a title, a brief description, a browse image (if available), the GEOSS Data CORE flag (which means that the data is freely and openly accessible, according to the GEOSS Data CORE principles), and a series of icons corresponding to applicable functions.

More precisely, the following functions may be available:

Icon	Description
0 0.0	GEOSS Like (assign stars) and watch option the result.
	Allow the user to read and know more about the dataset
	Localization of the data on the map either as bounding box or as a placeholder.
	Collaboration and sharing of resources.
	Add a layer to the map in case layers are available from the Data Provider.
	Download the data in formats made available by the Data Provider.

Table 1 - Interface operational icons Description

3.1.5 Filtering

The GEOSS portal provides the possibility to narrow down the search results to a smaller set by applying filters. The type of filters depends on the actual search and results.

3.1.5.1 Default Filters

Default filters are available for most search results and include filtering on keywords, format, source, protocol and organisation. Filtering is progressive, implementing an 'AND' operation and not an 'OR'. For each filter, only one value can be selected.

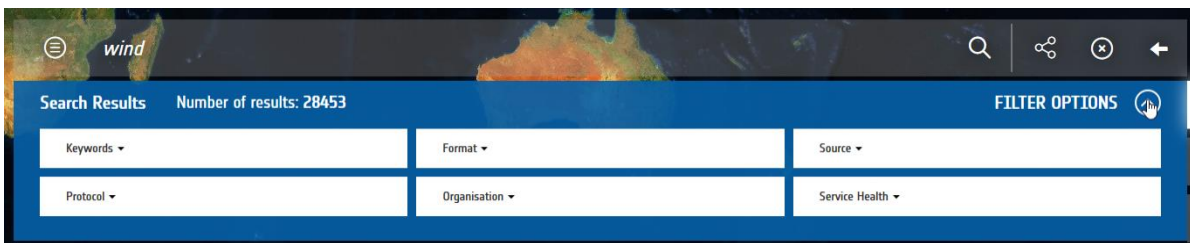


Figure 20 - Default faceted filters

3.1.5.2 Smart Filters

Smart filters and visualisation specificities are implemented for some of the result types. For example, a smart filter considering a combination of cloud coverage, product type, sensor mode and relative orbit has been implemented for data from the Sentinel 2 and the Landsat imagery, and a smart filter considering product type, sensor polarisation, sensor mode, sensor swath and relative orbit has been implemented for Sentinel 1 data.

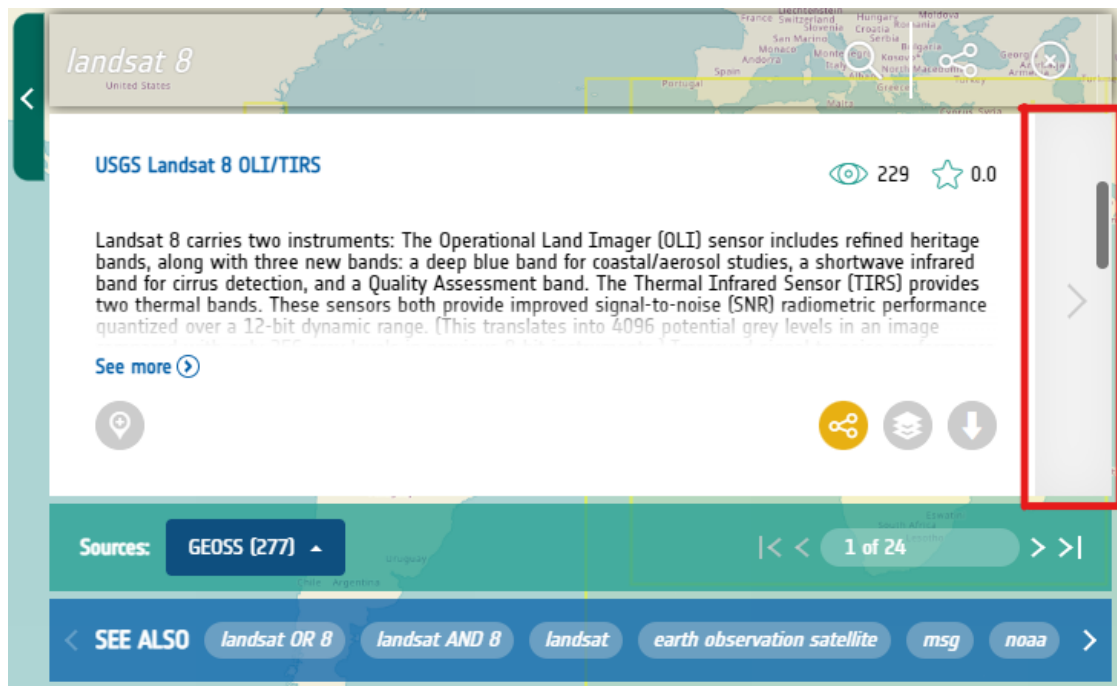


Figure 21 - How to open a collection of homogenous results

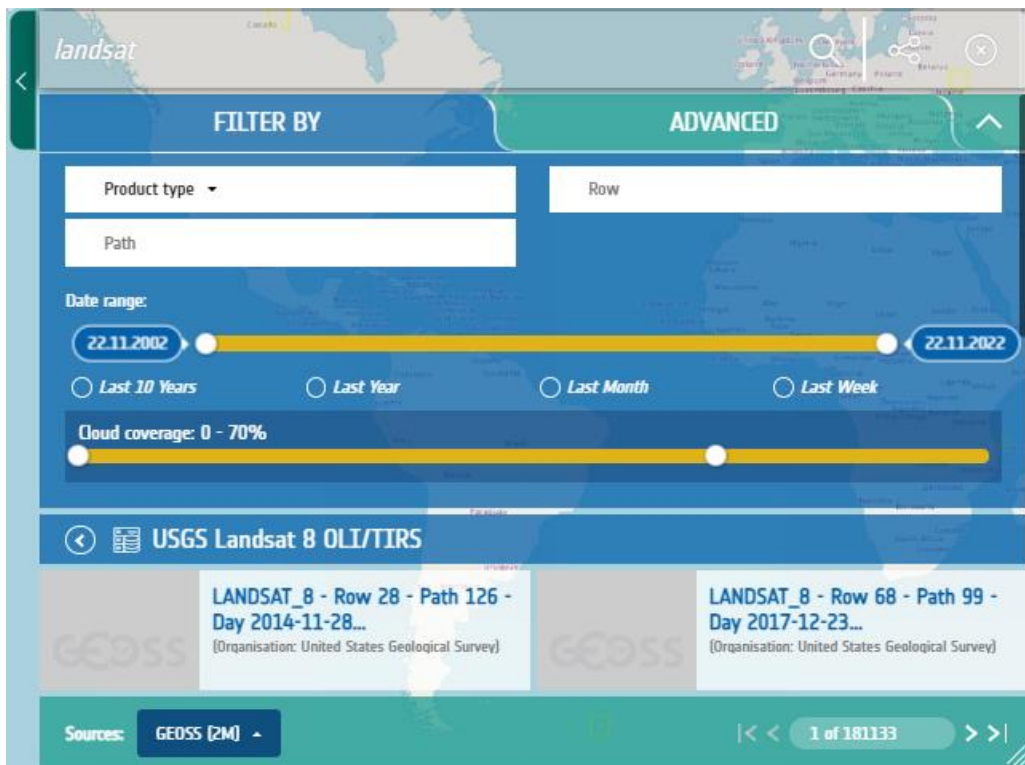


Figure 22 - Smart faceted filters

Other smart filters and specific visualisations are available for earthquake events.

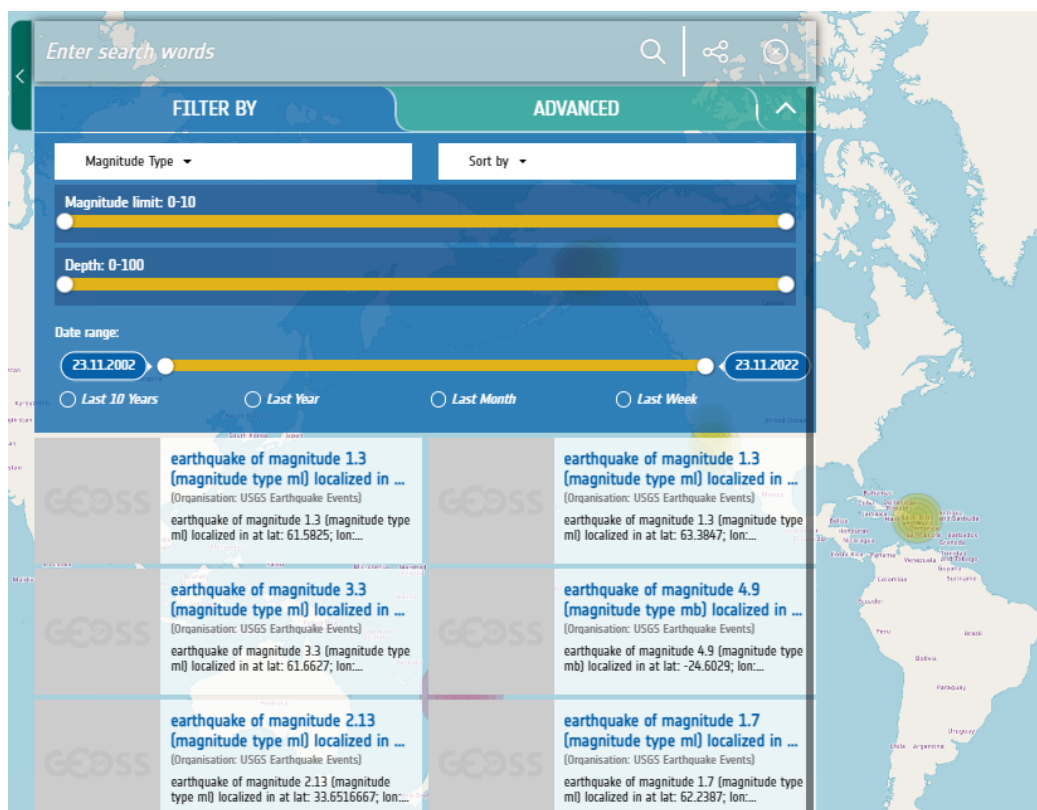


Figure 23 - Smart faceted filters for earthquake events

3.1.6 Take a tour

New users can click on the dedicated icon in the bottom right corner of the screen to enable the tutorial on how portal works. Clicking on the green lamp, it will open a pop up explaining what the button does.

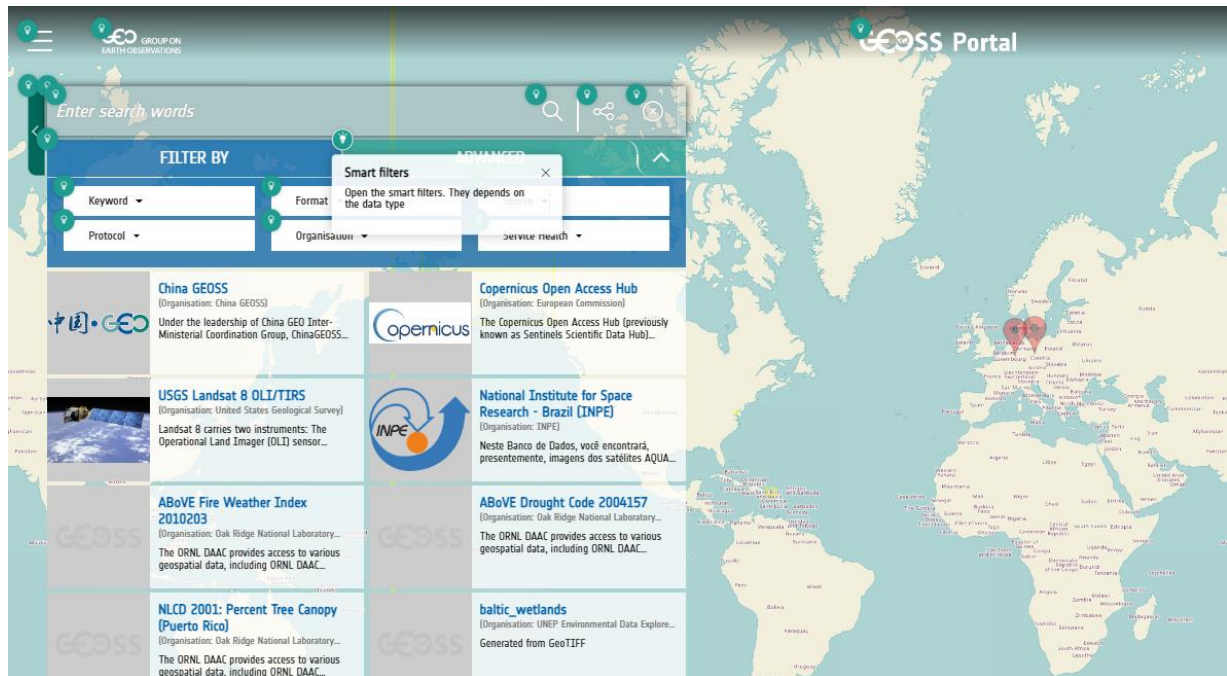


Figure 24 - "Take a Tour" help on-line

3.1.7 Languages

The Portal interface elements are available for English, Polish, Spanish and Chinese languages speakers.



Figure 25 - The language bar

3.1.8 GEOSS Instant Feedback

Users willing to participate in portal improvement can take part in quick survey to share general impression about portal.

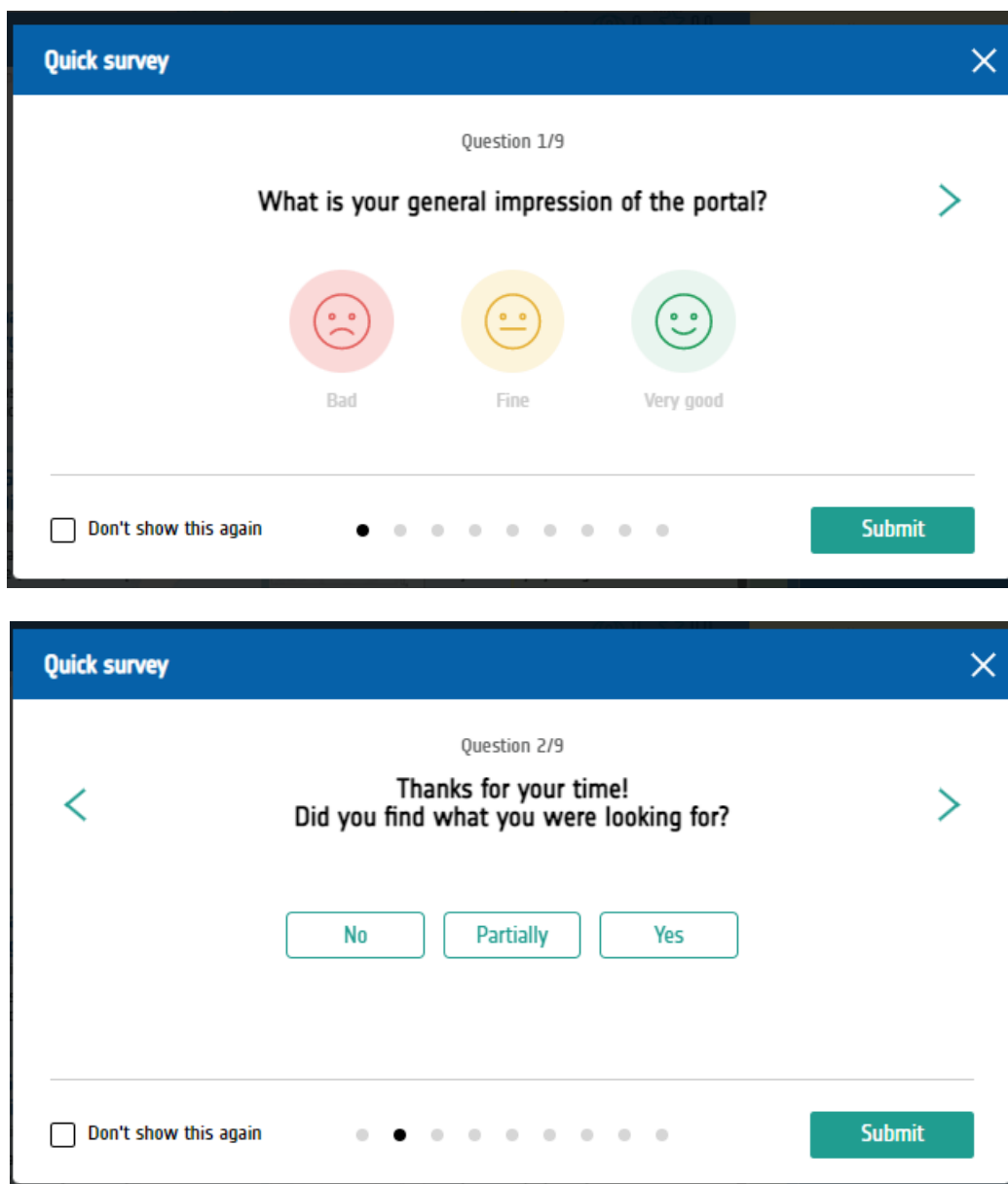


Figure 26 - The instant feedback and survey

3.2 The GEOSS Platform Re-usable Components

3.2.1 GEO DAB API

The GEO DAB is a middleware component which is in charge of interconnecting the heterogeneous and distributed capacities contributing to GEOSS; it provides three main functionalities:

1. **Data/Metadata Harmonization:** provides harmonized discovery and access to heterogeneous data systems. The heterogeneity of data sources is hidden, resources appear as a single data source.
2. **Data Access:** provides data discovery and access functionalities to heterogeneous data systems.
1. **Data Transformation:** enriches access functionalities by allowing users to customize their downloads (e.g. change format and/or CRS).

Since it is a middleware component, GEO DAB users are typically software agents, such as web-based or desktop client applications. These can exploit the GEO DAB functionalities implementing the client-side of one (or more) of the protocols published by the GEO DAB for the above functionalities. The available protocols include:

- OGC Catalog Service for the Web (CSW)
- OpenSearch with geo, time and semantic extensions
- Open Archive Initiative (OAI) PMH
- OGC Web Processing Service
- etc

In order to simplify the development of applications and clients making use of the DAB, the following APIs have been developed:

GEO DAB APIs	Geospatial Expert	Web Dev. Expert
Standard Web Services (OGC Web Services, OAI-PMH, CKAN, etc.)	X	
OpenSearch (Extended)	X	
GEO DAB API JS		X
GEO DAB API REST		X

Table 2 - GEO DAB APIs

GEO DAB API REST and JS are documented at [WR-1]

A set of APIs was developed for the VLab feature too. VLab APIs are documented at [WR-2]

3.2.2 GEOSS VIEW

A GEOSS View is a subset of the whole GEOSS resources brokered through the GEO DAB. A GEOSS View can be used to provide to the community access only to a subset of specifically defined resources using temporal, thematic and spatial criteria, to be included in their community Portal.

A GEOSS View is defined by applying a set of clauses:

- Discovery clauses (e.g., spatial envelope, keywords, sources, etc.)
- Access clauses (e.g., data format, access protocol, CRS, etc.) [implementation of this functionality is on-going]
- View clauses, i.e., nested view: allowing defining a view as a sub-view of an existing one. All the clauses from the parent view are inherited by the sub-view, which combines them with its

own clauses in an “and” relation. Multiple sub-views can be defined from the same parent view.

Presently, a GEOSS View is created by the GEO DAB operator according to the requests of the specific community. GEO DAB APIs will be enhanced to allow the automatic creation of GEOSS Views.

4. GEOSS Platform Proof of concepts

4.1 First Set of Applications

4.1.1 AFRIGEO COMMUNITY PORTAL

It has been provided the software package for the AfriGEO community portal and the Installation Guide ([RD-1]).

In the installation Guide have been reported all the information for the:

- Deployment
- Server configuration
- Features configuration
 - Map
 - Catalogues and Views
 - Menu
- Header Configuration
- Pages management
- Other settings

4.1.2 SDG15.3.1 Land Degradation

The GEOSS portal (<https://www.geoportal.org>) is the single web-based discovery and access point of EO resources from various providers all over the world through GEOSS. It is aiming not only to facilitate data and information accessibility but also help users to generate and discover knowledge. To demonstrate the facilitated access and integration of the model and outputs and the separation of concerns proposed by the Model Web approach, the different components of the workflow have been integrated into the GEOSS platform.

The following use scenarios have been defined:

1. An end-user wants to know what the situation of land degradation in Europe is.
2. In the GEOSS portal and a for “Land degradation” is performed.
3. The user obtains a number of resources that matches his search criteria.
4. Under the Knowledge tab, a description about the SDG15.3.1 indicator is provided. The user can then navigate deeper into the knowledge.
5. The user discovers that there is a model available
6. He/She finds that there are some data available for visualization and download and an external link to other resources on SDG15.3.1.
7. He/She can discover three resource layers that can be loaded on the map: indicators at national level from global sources. He selects the national data and his able to visualize it.
8. The user is « not convinced » with the global data sets because he wanted to access more local/national data sets (“trustworthiness in national data”). From here, there are two sub-scenarios:
 - a. He/She is a “traditional national user” only searching and accessing more local/national data to generate the SDG indicator 15.3.1

-
- b. He/She realizes that there is a Service associated to this model. The GEOSS Platform associates the model to the actual processing services that enable its computation, which the user can access and run in a user-friendly way. In particular, he/she can inspect the process workflow and search and select data as input to the service. In addition, he/she has the capability to choose a Cloud computing platform of preference among the available (these include all the DIAS Platforms and Amazon Web Services).
 9. Discover more national/local data sets.
 10. The user login into GEOSS portal and then starts the computation on the selected infrastructure and wait for the results
 11. He can now visualize outputs with his own data
 12. He can additionally build his own dashboard with the newly widgets implemented (maps; graphs, text, ...)
 13. He/She is a data provider from the selected country who can register his/her national datasets
 14. He/She realizes that there is a Service associated to this model. The GEOSS Platform associates the model to the actual processing services that enable its computation, which the user can access and run in a user-friendly way. In particular, he can inspect the process workflow and search and select data as input to the service. In addition, he/she has the capability to choose a Cloud computing platform of preference among the available (these include all the DIAS Platforms and Amazon Web Services).
 15. Register new as a new data provider and add the necessary data.
 - a. the discovery of the model/service
 - b. the discovery of the newly registered data to be fed to the service.
 16. The user login into GEOSS portal and then starts the computation on the selected infrastructure and wait for the results.
 17. He can now visualize outputs with his own data.
 18. He can additionally build his own dashboard with the newly widgets implemented (maps; graphs, text, ...)

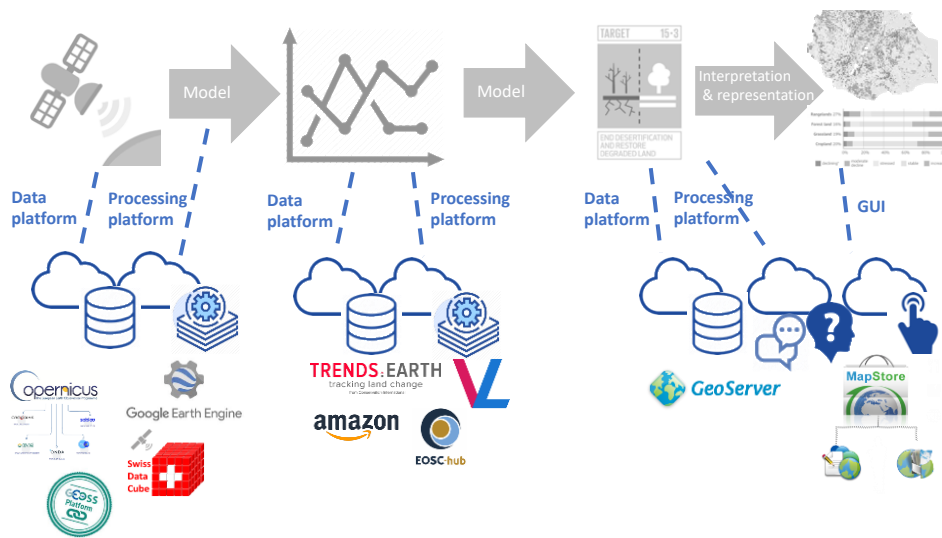


Figure 27 - SDG 15.3.1 Processing

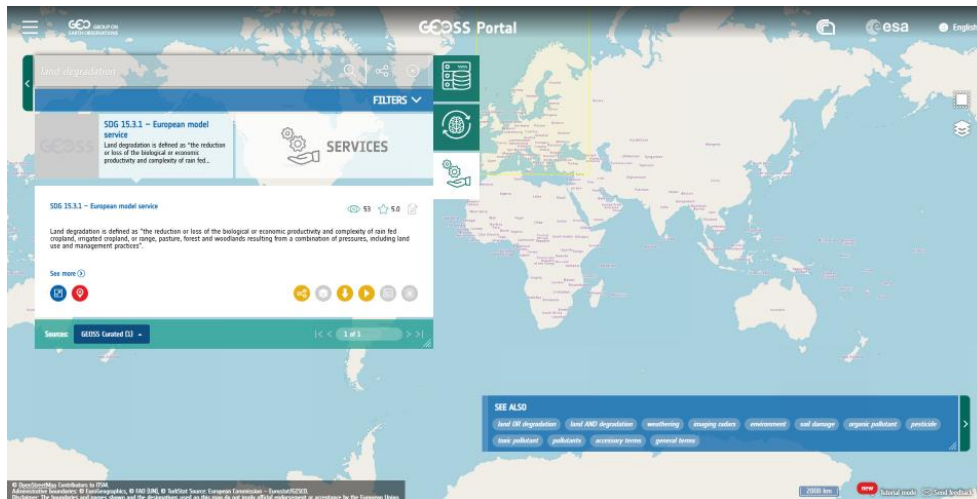


Figure 28 - SDG 15.3.1 GEOSS Portal data discovery

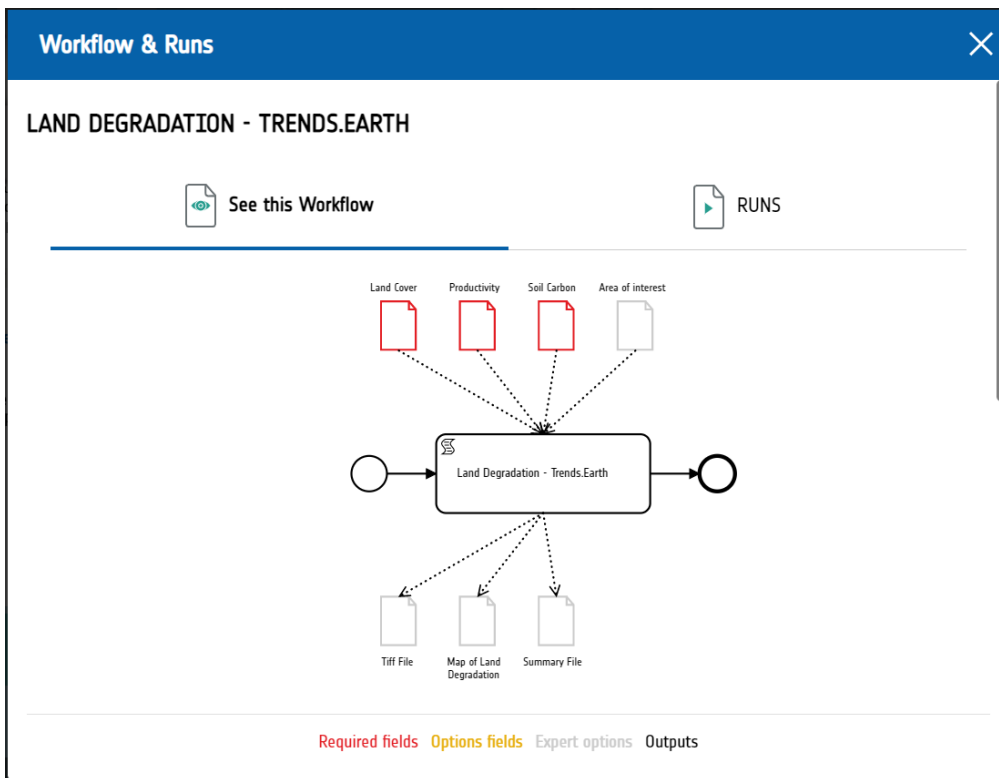


Figure 29 - Land Degradation Workflow

Workflow & Runs

WORKFLOW INPUT

Input name	Chosen resources	Actions
Land Cover*	✗ Default	Select resources >
Productivity*	✗ Default	Select resources >
Soil Carbon*	✗ Default	Select resources >

* required fields Show expert options

CLOUD PLATFORM SELECTION

AWS
 EUROPEAN OPEN SCIENCE CLOUD
 CREODIAS

RUN NAME

Run name

Figure 30 - Land Degradation Workflow Input

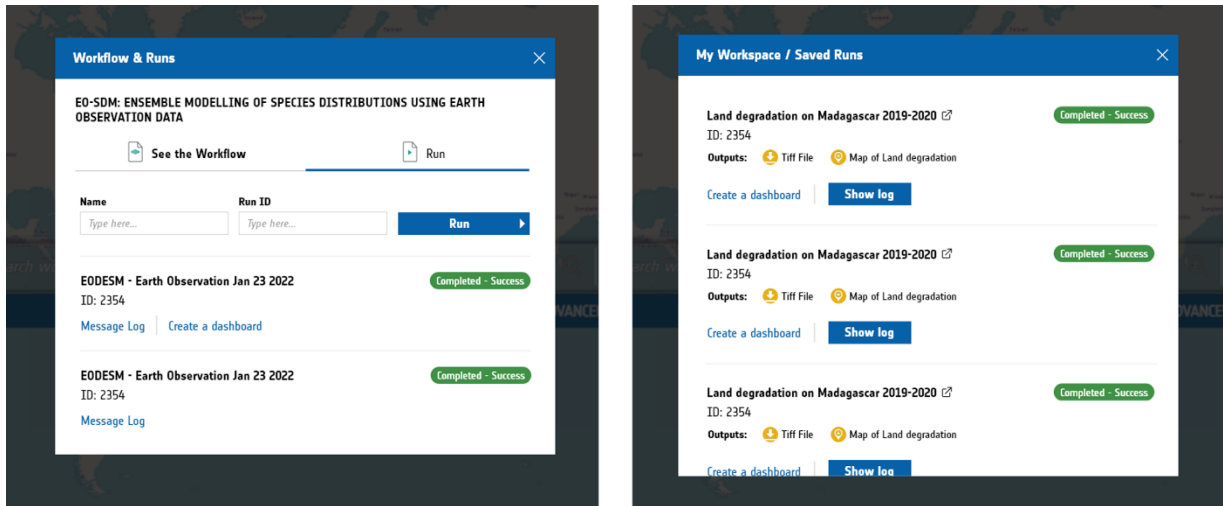


Figure 31 - Land Degradation Runs and Saved Runs

Annex A. References

Reference Documentation

- [RD-1] GPP-WP3-DEL-AfriGEOSS_installation_guide_1.0
- [RD-2] GPP-WP3-DEL-D3.1 Enhanced GEOSS Platform with 1st set of applications
- [RD-3] GPP-WP2-DEL-D2.2 Functional and non-functional enhancements specification v1.0
- [RD-4] GPP-WP3-DEL-D2.1 Use Cases Description and User Requirements Document

Web reference documentation

- [WR-1] GEO DAB API REST and JS are documented at <http://api.geodab.eu/>
- [WR-2] VLab APIs are documented at <https://vlabdev.geodab.org/vlab/docs/>
- [WR-3] EDGE GEOSS Portal enhancements at
https://www.earthobservations.org/documents/articles_ext/EDGE-WP3-DEL-D3.4-v2.0.pdf

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Annex C. Terminology

C.1 Acronyms and Abbreviations

GPP	GEOSS Platform Plus
CA	Consortium Agreement
CEOS	Committee on Earth Observation Satellites
CNR-IIA	Consiglio Nazionale delle Ricerche – Istituto per l’Inquinamento Atmosferico
CO	Confidential
DESCA	Development of a Simplified Consortium Agreement
DEL	Deliverable
DG	Directorate-General
DN	Direct Negotiation
DOA	Description of the Action
EAB	External Advisory Board
EC	European Commission
EO	Earth Observation
EOP	Earth Observation Programme
ESA	European Space Agency
ESAW	European Ground System Architecture Workshop
ESRIN	European Space Research Institute
EU	European Union
FP7	Seventh Framework Programme
GA	Grant Agreement
GCI	GEOSS Common Infrastructure
GEO	Group on Earth Observation
GEO DAB	GEO Discovery and Access Broker
GEOSS	Global Earth Observation System of Systems
GFOI	Global Forest Observation Initiative
GLAM	Global Agriculture Monitoring
GPE	GEOSS Portal Enhancements
H2020	Horizon 2020
INT	Internal Note
IPR	Intellectual Property Right
JRC	Joint Research Centre
MOM	Minutes of Meeting
OTH	Other
PD	Project Director
PP	Programme Participants
PQMP	Project Quality Management Plan

PRE	Presentation
PSB	Project Strategic Board
PU	Public Usage
QA	Quality Assurance
QAS	Quality Assurance Support
RE	Restricted
SUS	System Usability Scale
TBD	To Be Defined
TEP	Thematic Exploitation Platform
UNICEF	United Nations International Children's Emergency Fund
USGS	United States Geological Survey
PIMB	User and Technical Board
WBS	Work Breakdown Structure
WGISS	Working Group on Information Systems and Services
WP	Work Package
WPL	Work Package Leader