The project receives funding from the European Union's Horizon 2020 Research and innovation programme under grant agreement No 101039118

Knowledge generation using satellite Earth Observations & the GEOSS platform to support Sustainable Development Goals (SDG): a use case on Land Degradation

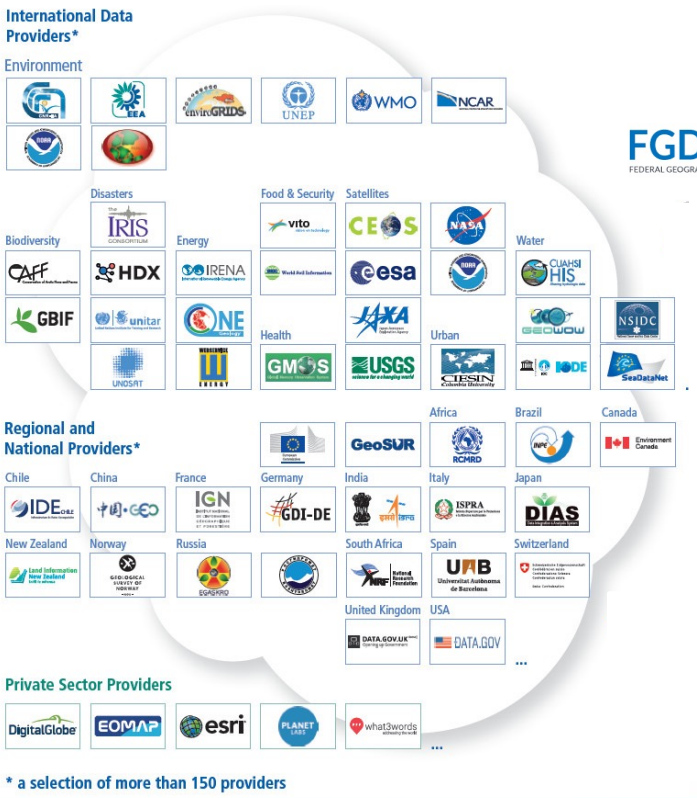
UNGGIM-Europe Webinar – May 14, 2025

Gregory Giuliani (UNIGE) in collaboration with ESA, CNR, EVERSIS, JRC & GEO

European Commission
Institute of Atmospheric Pollution Research
National Research Council of Italy
UNIVERSITÉ DE GENÈVE
With support from EVERSIS
esa

The GEOSS Platform: a bridge from data to Knowledge

Data, technologies,resources, Services providers



GEOSS
Global Earth Observation System of Systems

FGDC.GOV
FEDERAL GEOGRAPHIC DATA COMMITTEE

UNIVERSITÉ DE GENÈVE

Status Checker

GEOSS Platform

YP
Yellow Pages

End-users (e.g. Decision Makers)

GEO DAB ⟷ GEOSS Portal ⟷

Intermediate users (e.g. Developers scientists)

esa

UPSTREAM

MIDSTREAM

DOWNSTREAM

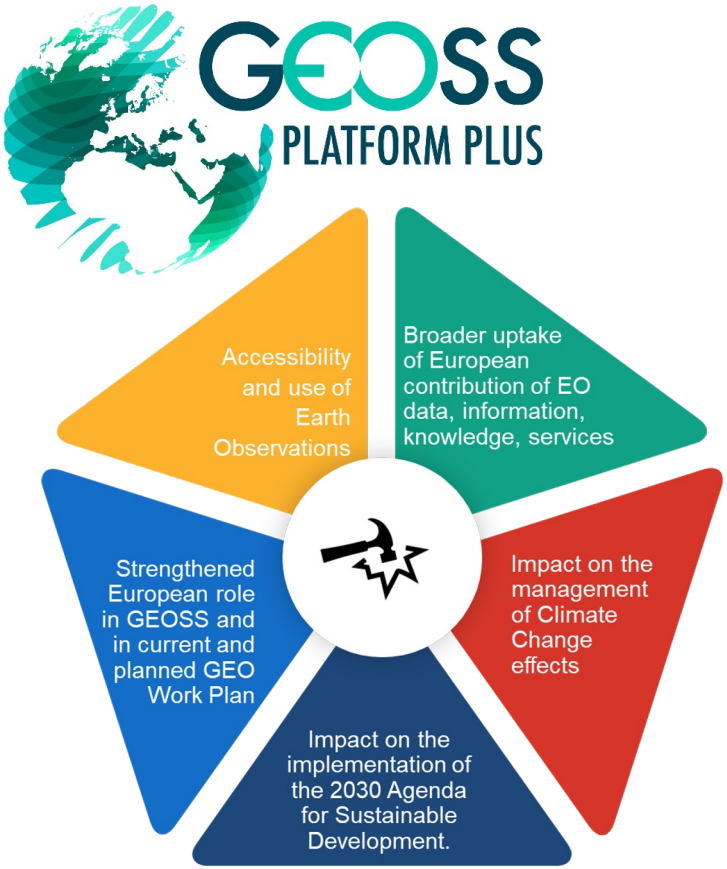
European Commission

UNIVERSITÉ DE GENÈVE

With support from EVERSIS

esa

Expected Impacts



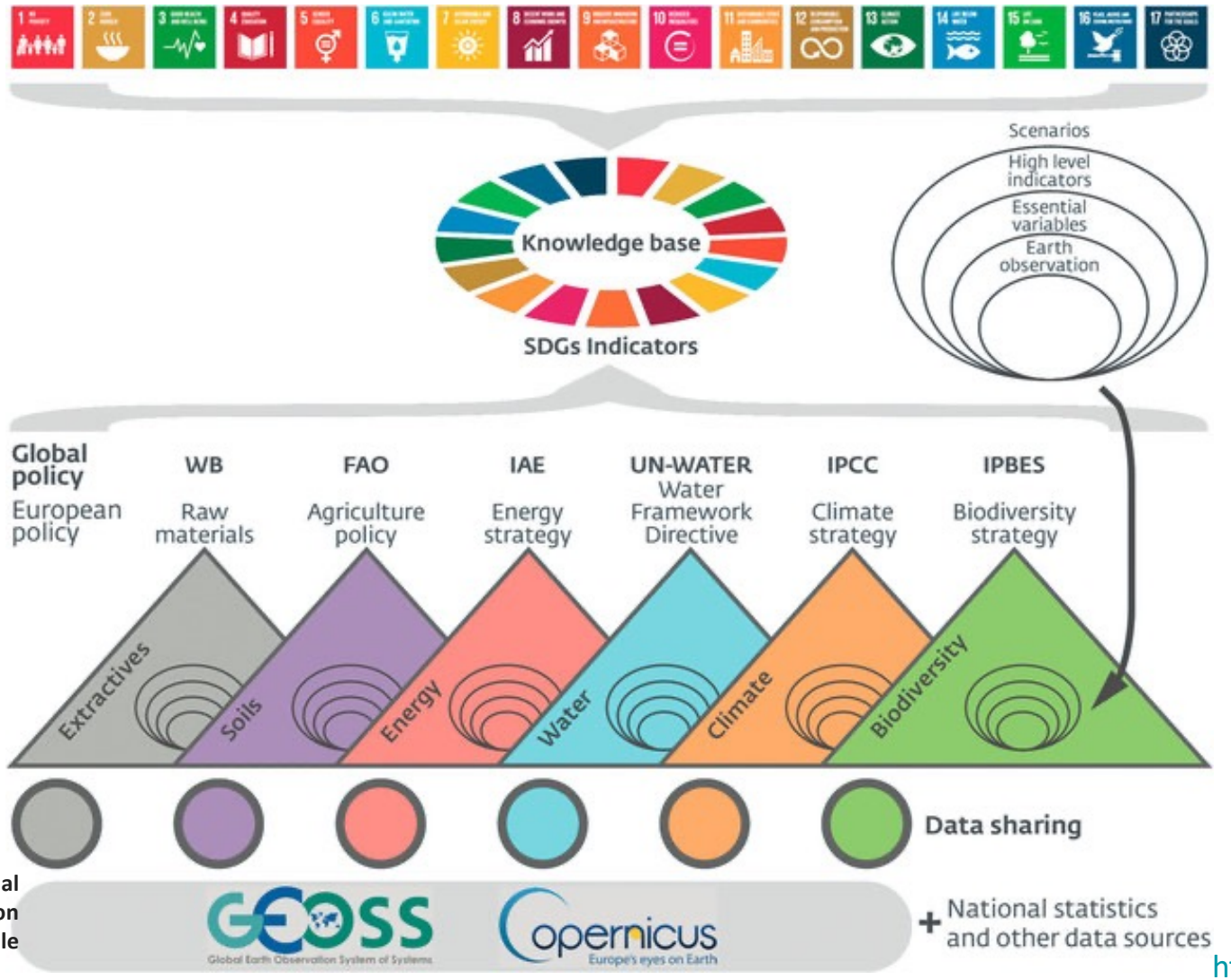
GPP will further evolve the GEOSS infrastructure with users' required functionalities to ***access and generate tailor-made information*** & ***actionable knowledge***.

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

It will implement different scenarios benefiting from GEOSS Platform developments. It will as well consider *linking with the GKH to set up the foundations of more interoperability among knowledge platforms*.

European Commission
UNIVERSITÉ DE GENÈVE
With support from EVERSIS
esa

GEOEssential – Generalize the EV concept across GEO SBAs



Lehmann A. et al., **Essential Variables from Earth Observation for environmental multi-scale indicators and policies**. *Submitted*

https://www.geoessential.eu

SDG15.3.1 – Data to Knowledge

EO Data
- Vegetation index
- Land Cover
- SoilGrids

ECVs
- Fire disturbance
- Land Cover
- Soil Carbon

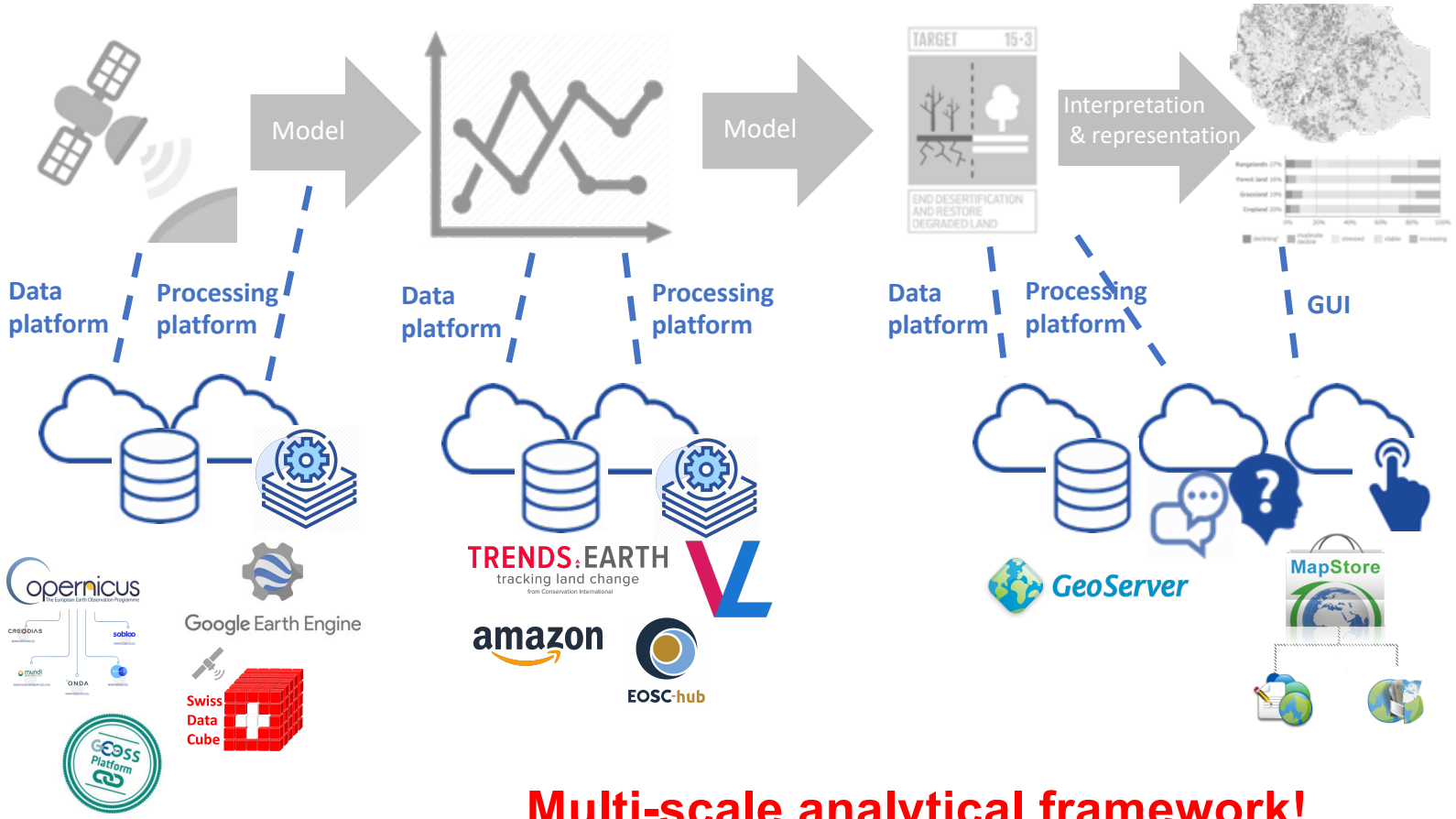
EBVs
- Ecosystem extent and fragmentation
- Habitat structure

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

SDG15.3.1
Proportion of land that is degraded over total land area

European Commission
UNIVERSITÉ DE GENÈVE
With support from EVERSIS
esa

SDG15.3.1 – Implementation in the GEOSS platform



Multi-scale analytical framework!

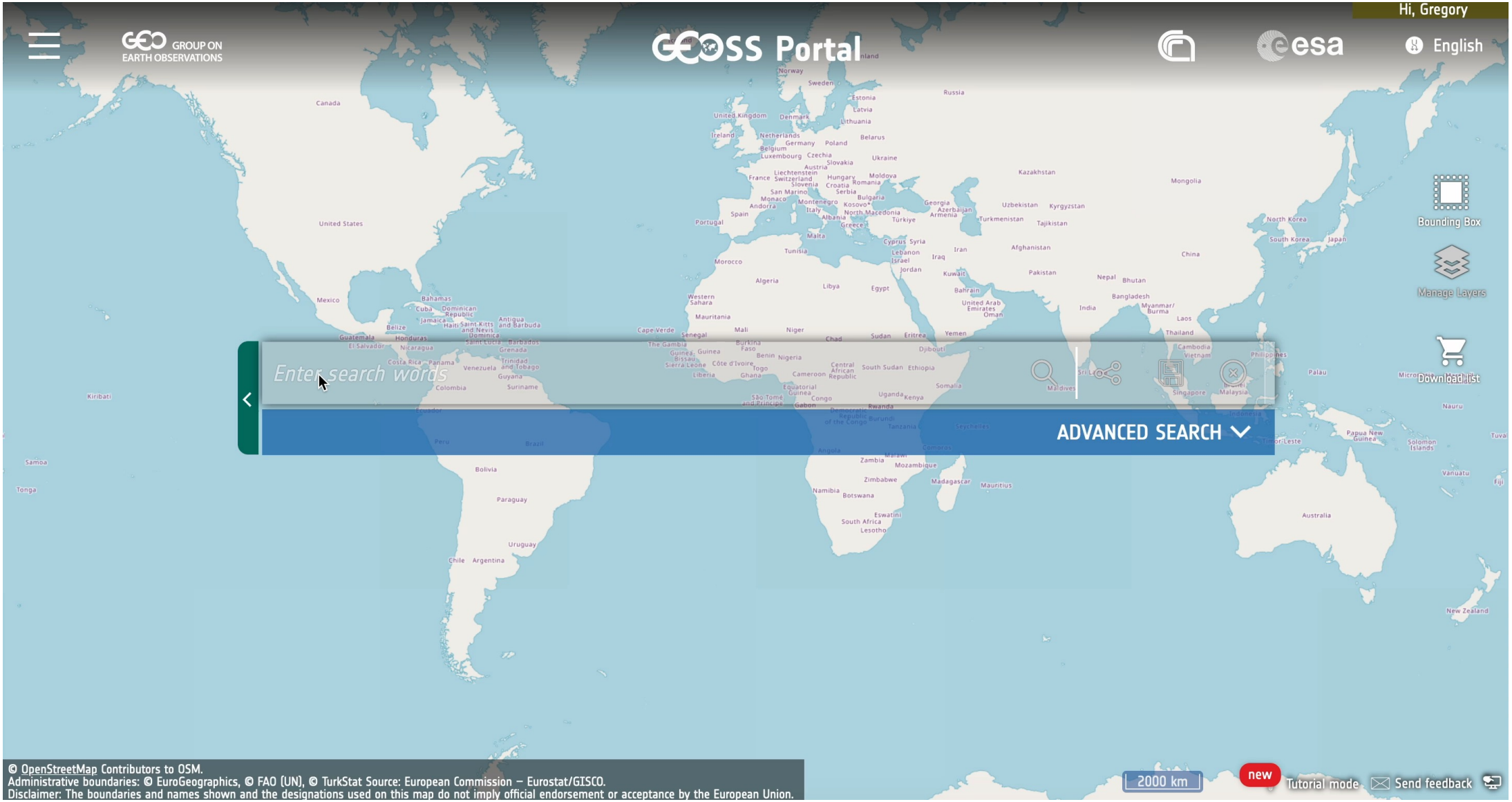
European Commission

UNIVERSITÉ DE GENÈVE

With support from EVERSIS

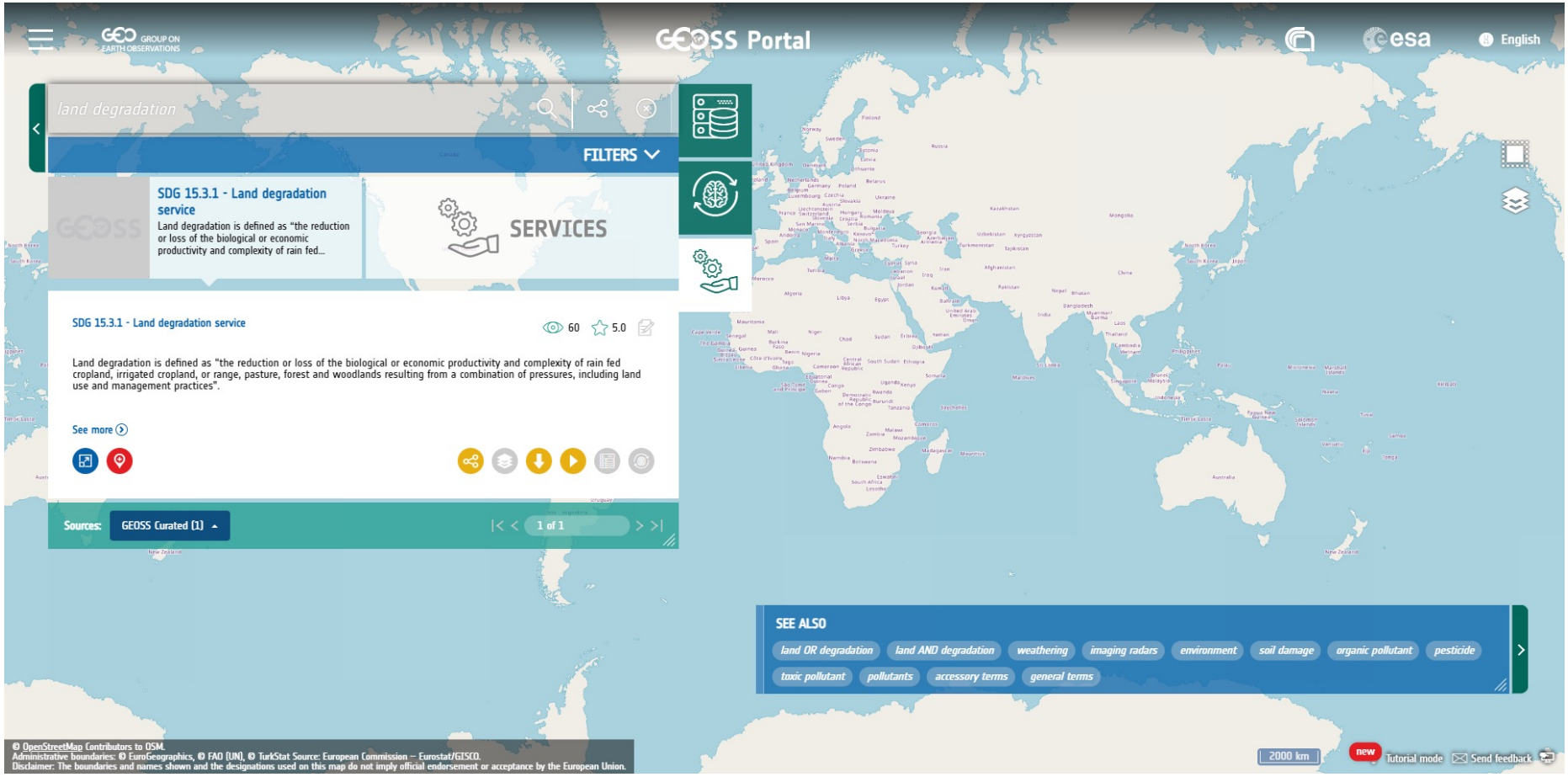
esa

Search for a service to compute the SDG15.3.1 indicator


Hi, Gregory
GROUP ON EARTH OBSERVATIONS
GEOSS Portal
esa
English
Bounding Box
Manage Layers
Download list
Enter search words
ADVANCED SEARCH
© OpenStreetMap Contributors to OSM.
Administrative boundaries: © EuroGeographics, © FAO (UN), © TurkStat Source: European Commission – Eurostat/GISCO.
Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the European Union.
2000 km
new
Tutorial mode
Send feedback

SDG15.3.1 – Service search

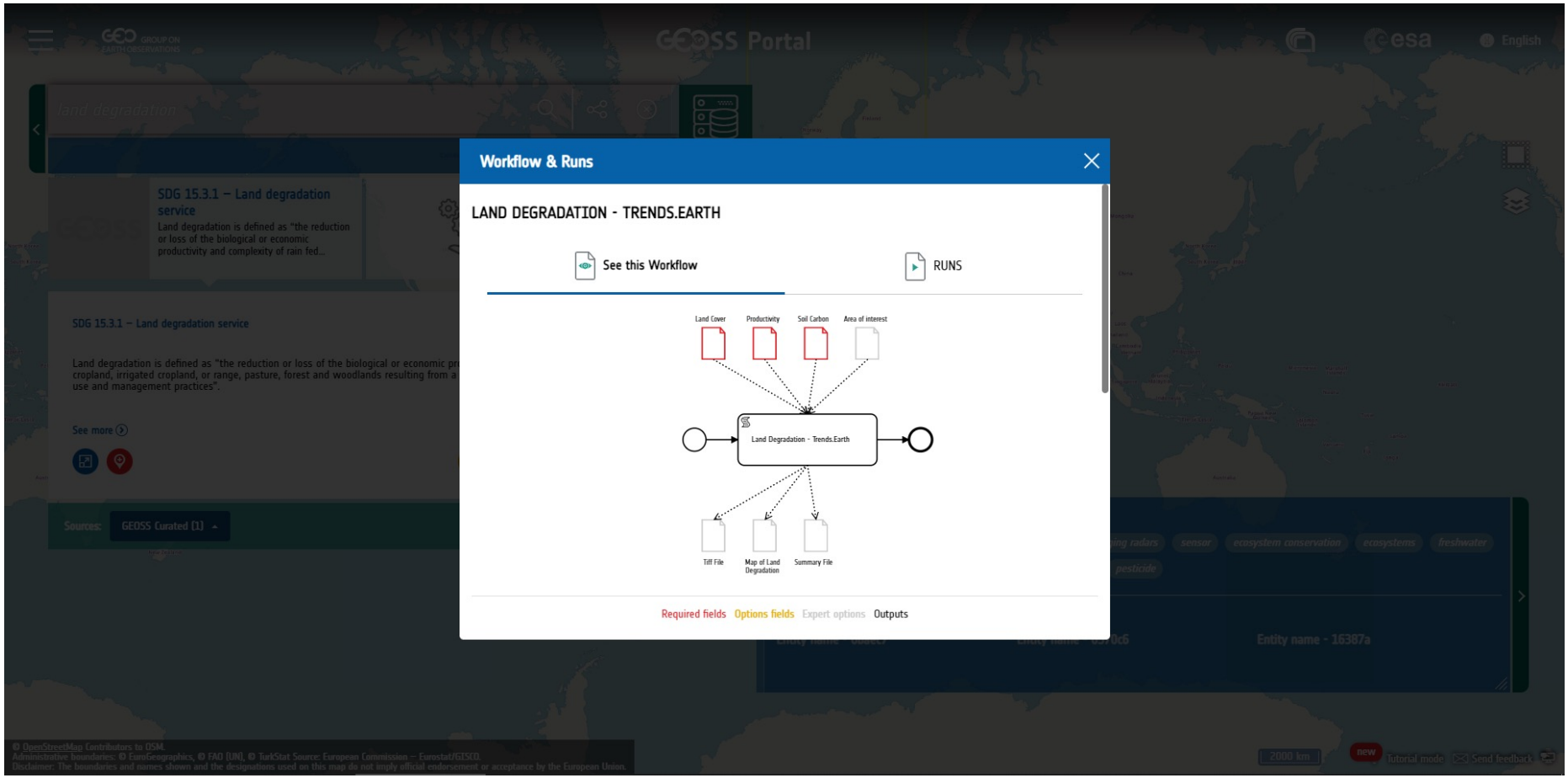
SDG15.3.1 – Model details



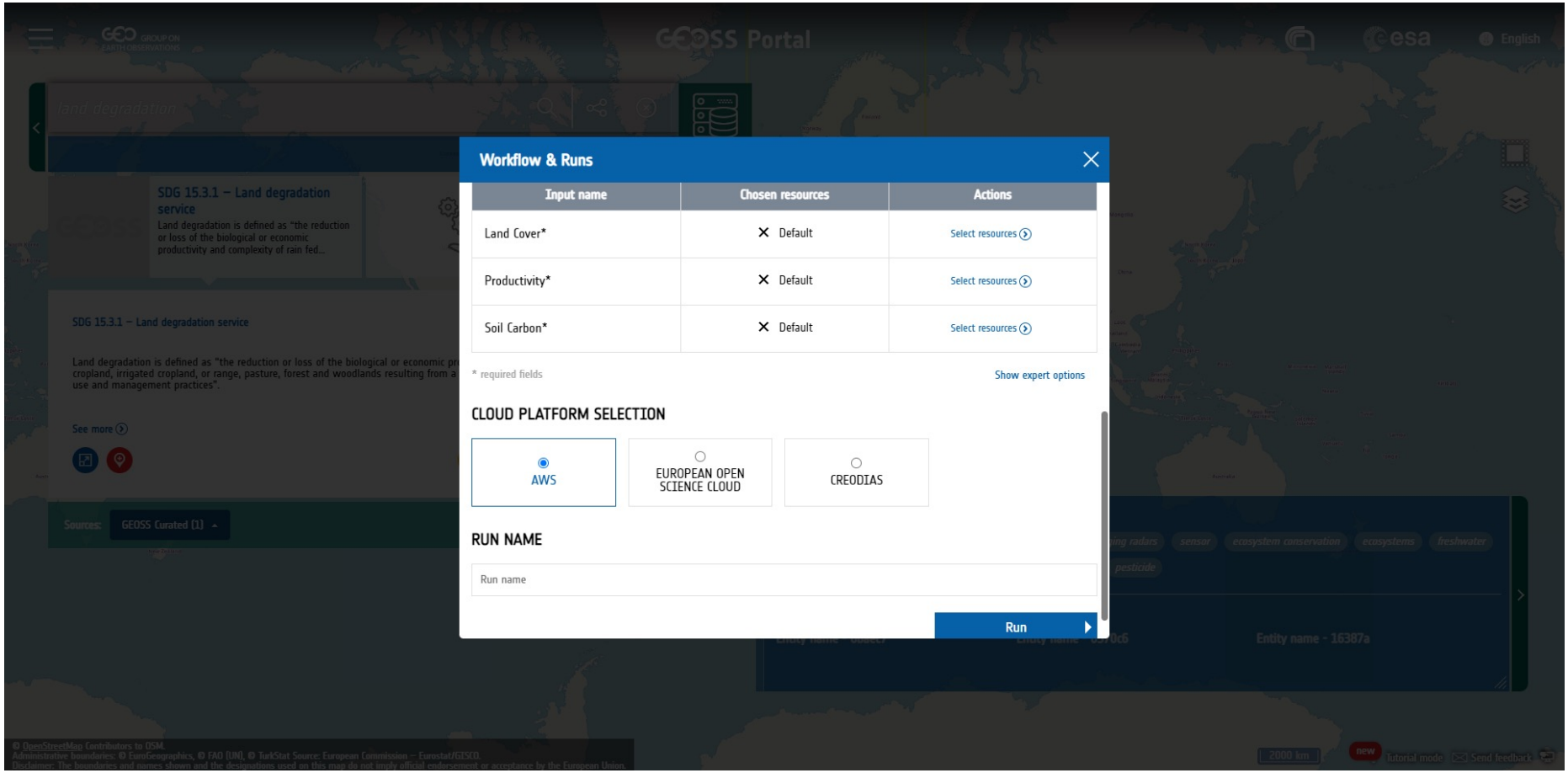
European Commission
UNIVERSITÉ DE GENÈVE
With support from EVERSIS
esa

Execute the model

SDG15.3.1 – Workflow



SDG15.3.1 – Data input



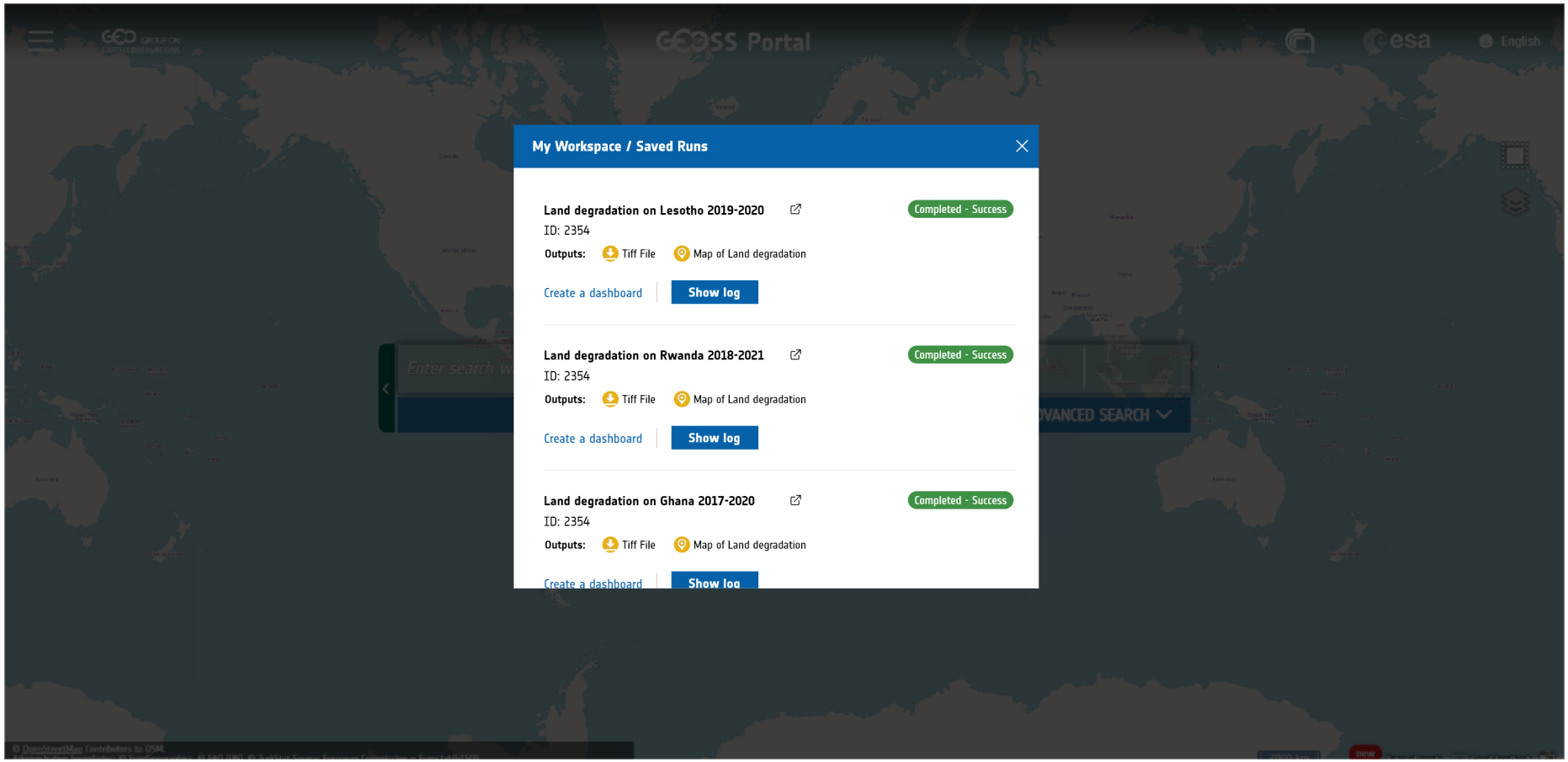
European Commission

UNIVERSITÉ DE GENÈVE

With support from EVERSIS

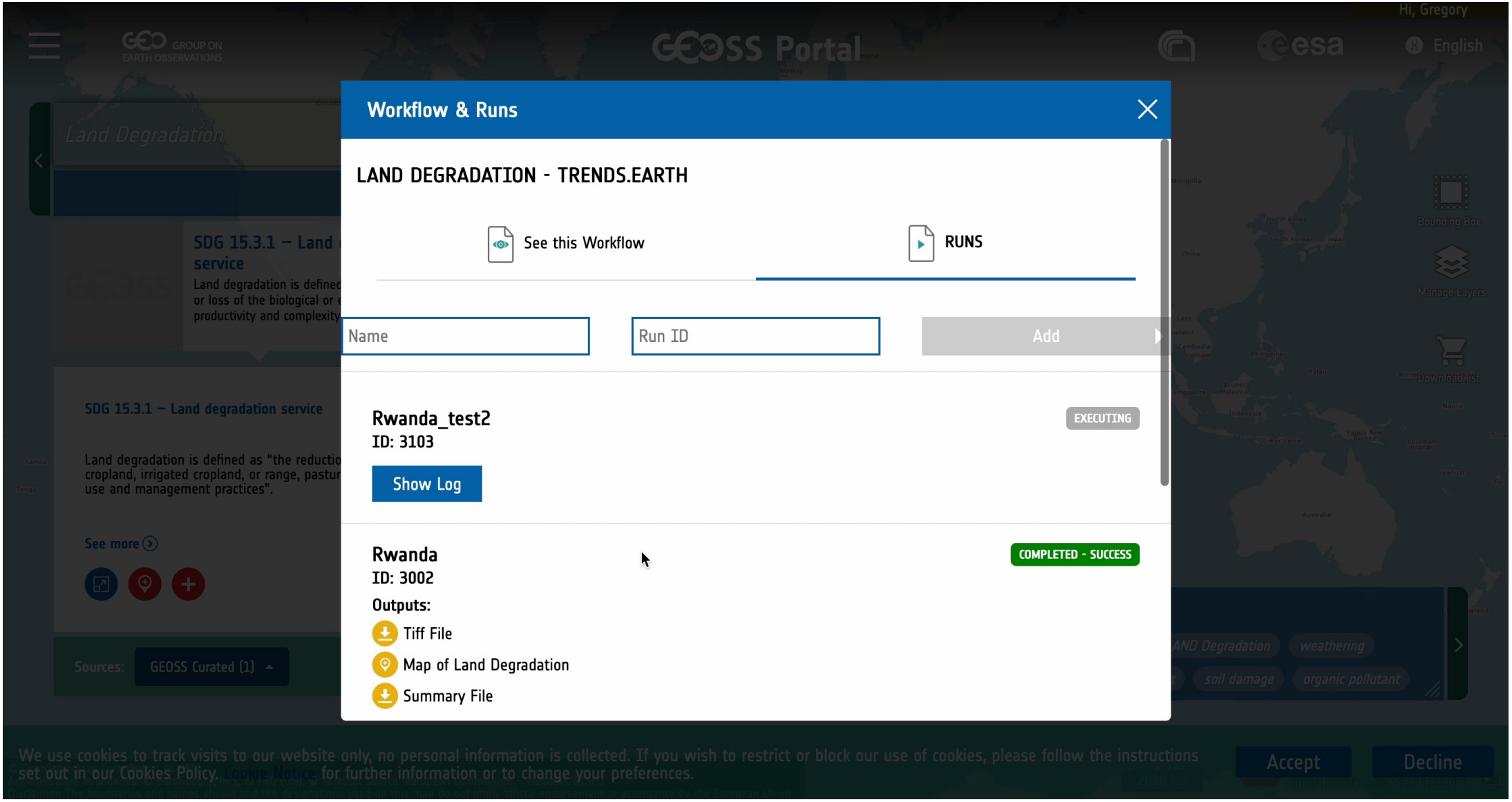
esa

SDG15.3.1 – Runs

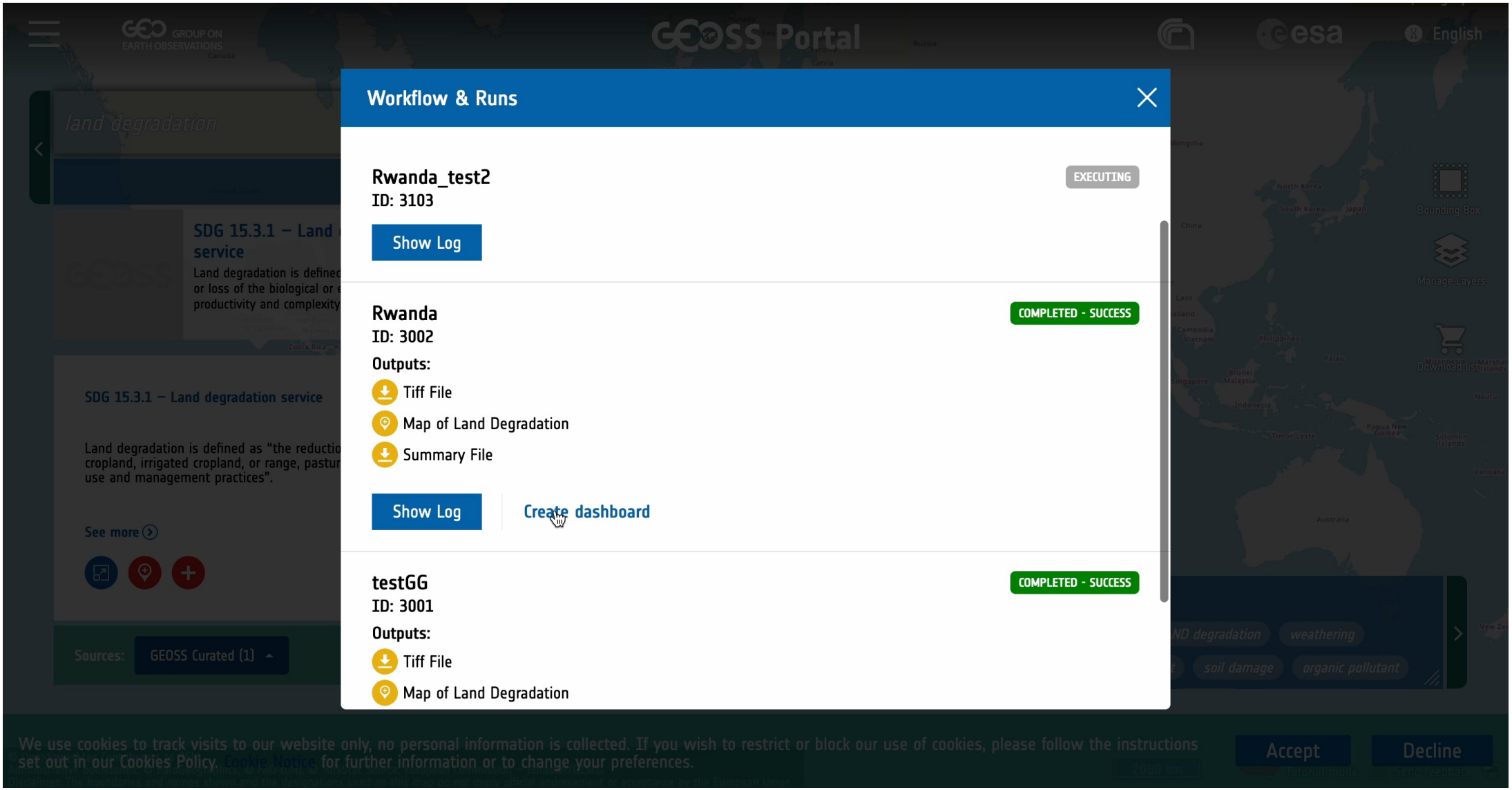


European Commission
UNIVERSITÉ DE GENÈVE
With support from EVERSIS
esa

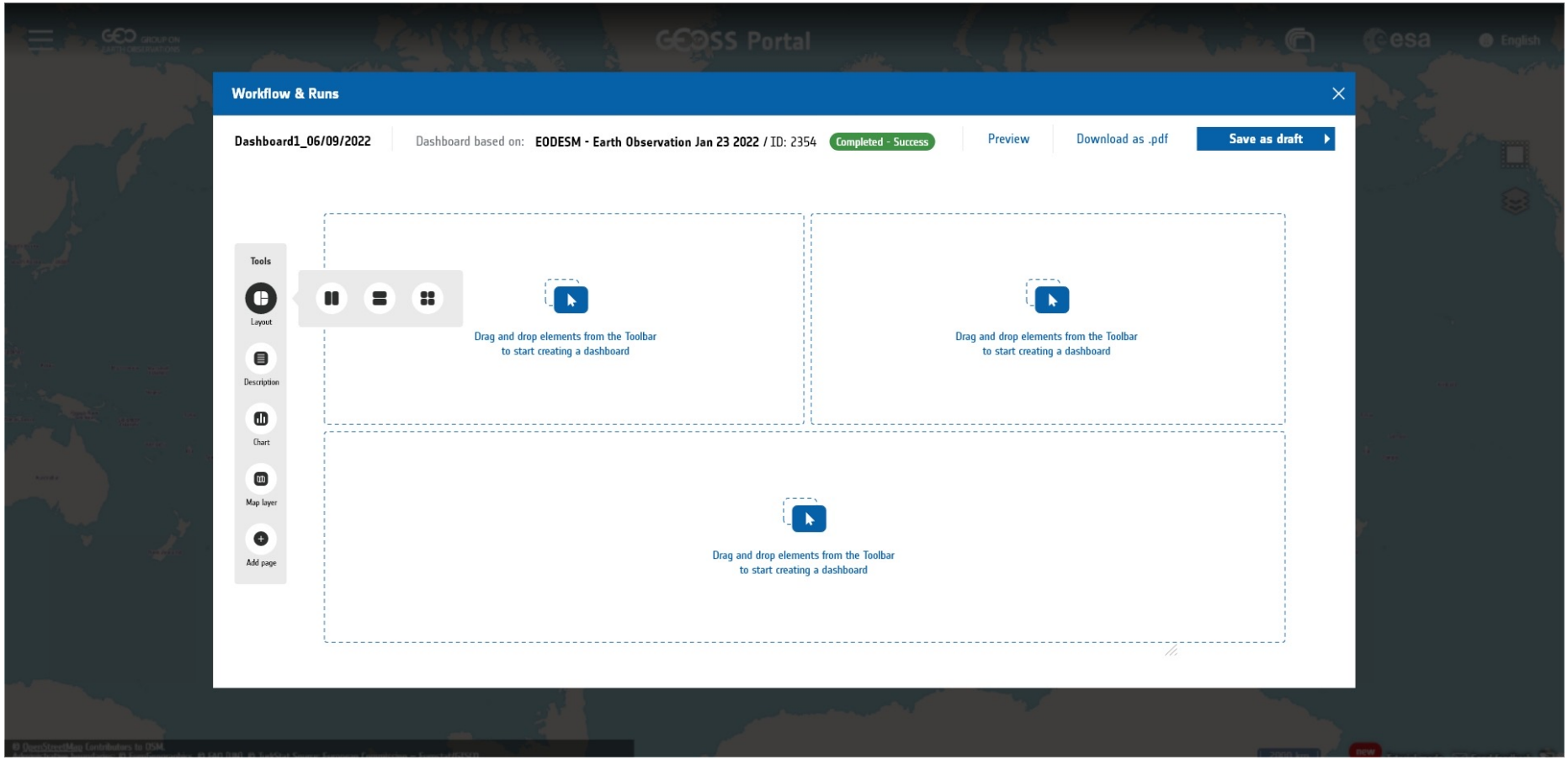
Download & Visualize the outputs


Hi, Gregory
English
GEOSS Portal
Land Degradation
SDG 15.3.1 – Land
service
Land degradation is defined
or loss of the biological or
productivity and complexity
SDG 15.3.1 – Land degradation service
Land degradation is defined as "the reductio
cropland, irrigated cropland, or range, pastur
use and management practices".
See more
Sources:
GEOSS Curated (1)
Bounding Box
Manage Layers
Download list
Workflow & Runs
LAND DEGRADATION - TRENDS.EARTH
See this Workflow
RUNS
Name
Run ID
Add
Rwanda_test2
ID: 3103
EXECUTING
Show Log
Rwanda
ID: 3002
COMPLETED - SUCCESS
Outputs:
Tiff File
Map of Land Degradation
Summary File
AND Degradation
weathering
soil damage
organic pollutant
We use cookies to track visits to our website only, no personal information is collected. If you wish to restrict or block our use of cookies, please follow the instructions set out in our Cookies Policy. Cookie Notice for further information or to change your preferences.
Accept
Decline

Create a dashboard & share knowledge


GEO GROUP ON EARTH OBSERVATIONS
GEOSS Portal
esa
English
land degradation
SDG 15.3.1 – Land
service
Land degradation is defined
or loss of the biological or
productivity and complexity
SDG 15.3.1 – Land degradation service
Land degradation is defined as "the reductio
cropland, irrigated cropland, or range, pastur
use and management practices".
See more
Sources:
GEOSS Curated (1)
Bounding Box
Manage Layers
Download list
ND degradation
weathering
soil damage
organic pollutant
Workflow & Runs
Rwanda_test2
ID: 3103
EXECUTING
Show Log
Rwanda
ID: 3002
COMPLETED - SUCCESS
Outputs:
Tiff File
Map of Land Degradation
Summary File
Show Log
Create dashboard
testGG
ID: 3001
COMPLETED - SUCCESS
Outputs:
Tiff File
Map of Land Degradation
We use cookies to track visits to our website only, no personal information is collected. If you wish to restrict or block our use of cookies, please follow the instructions set out in our Cookies Policy. Cookie Notice for further information or to change your preferences.
Accept
Decline

SDG15.3.1 – Dashboard creation



European Commission

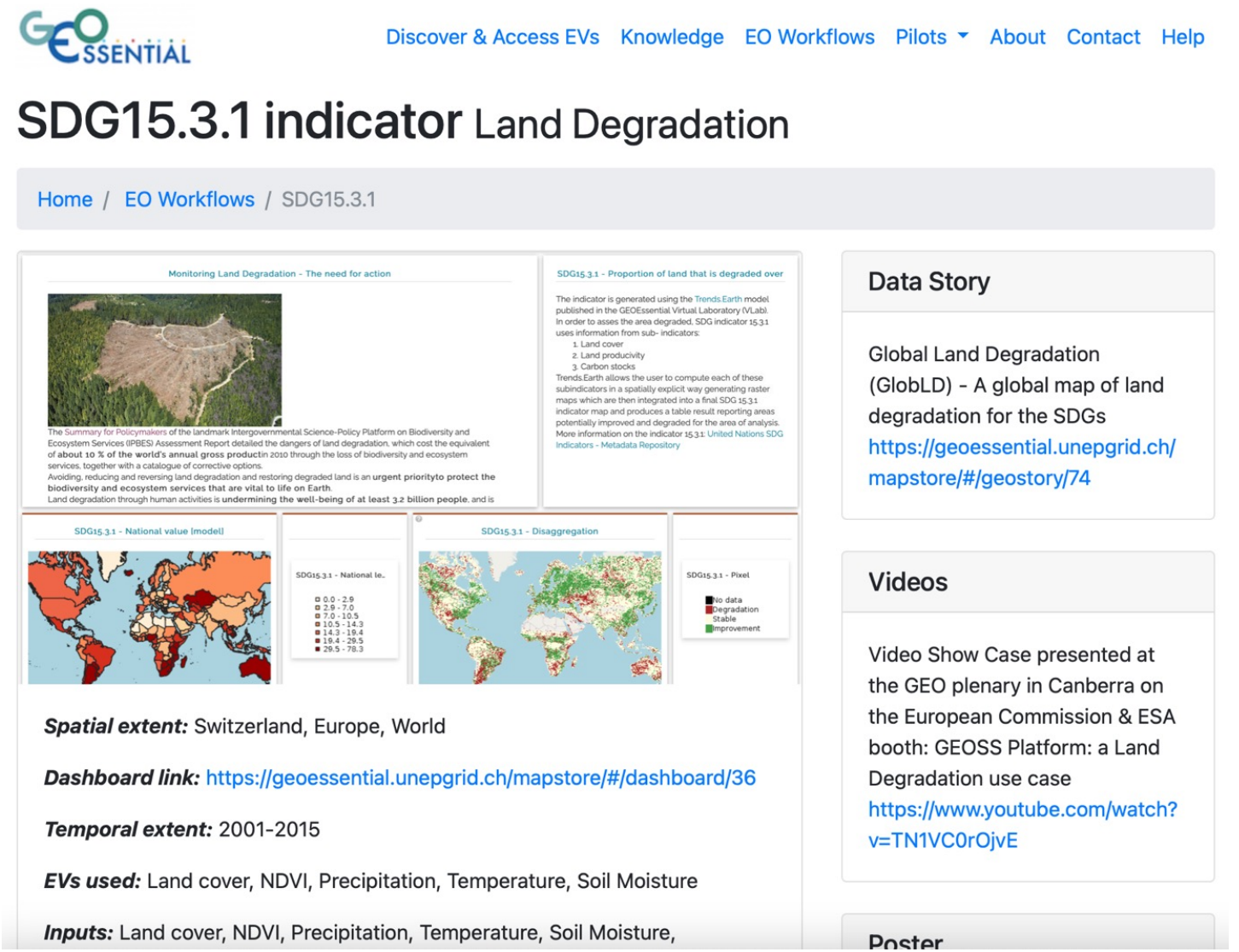
UNIVERSITÉ DE GENÈVE

With support from EVERSIS

esa

SDG15.3.1…

…GEOEssential Dashboard

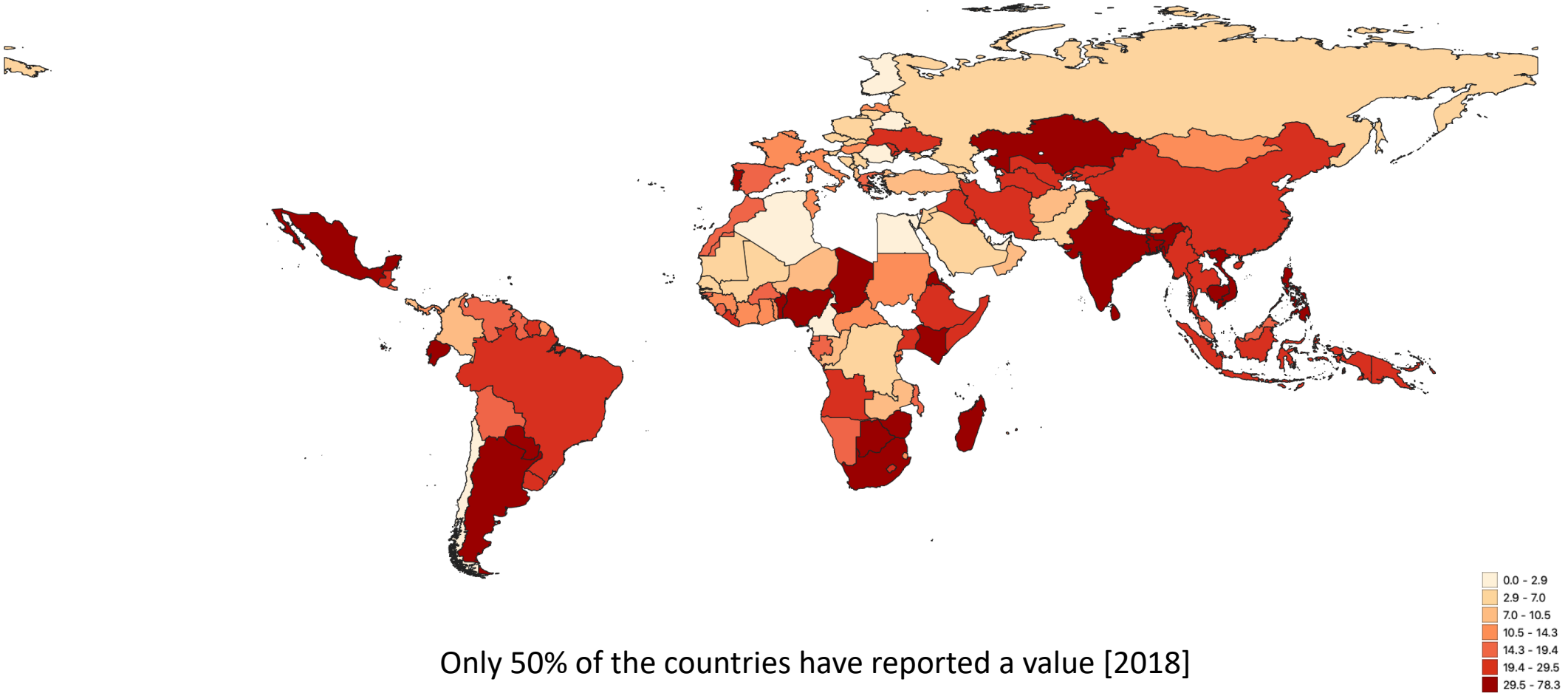


Giuliani G. et al. (2020) **Knowledge generation using satellite Earth Observations to support Sustainable Development Goals (SDG): a use case on Land Degradation**.
DOI: 10.1016/j.jag.2020.102068

How this approach has been used?

SDG15.3.1…

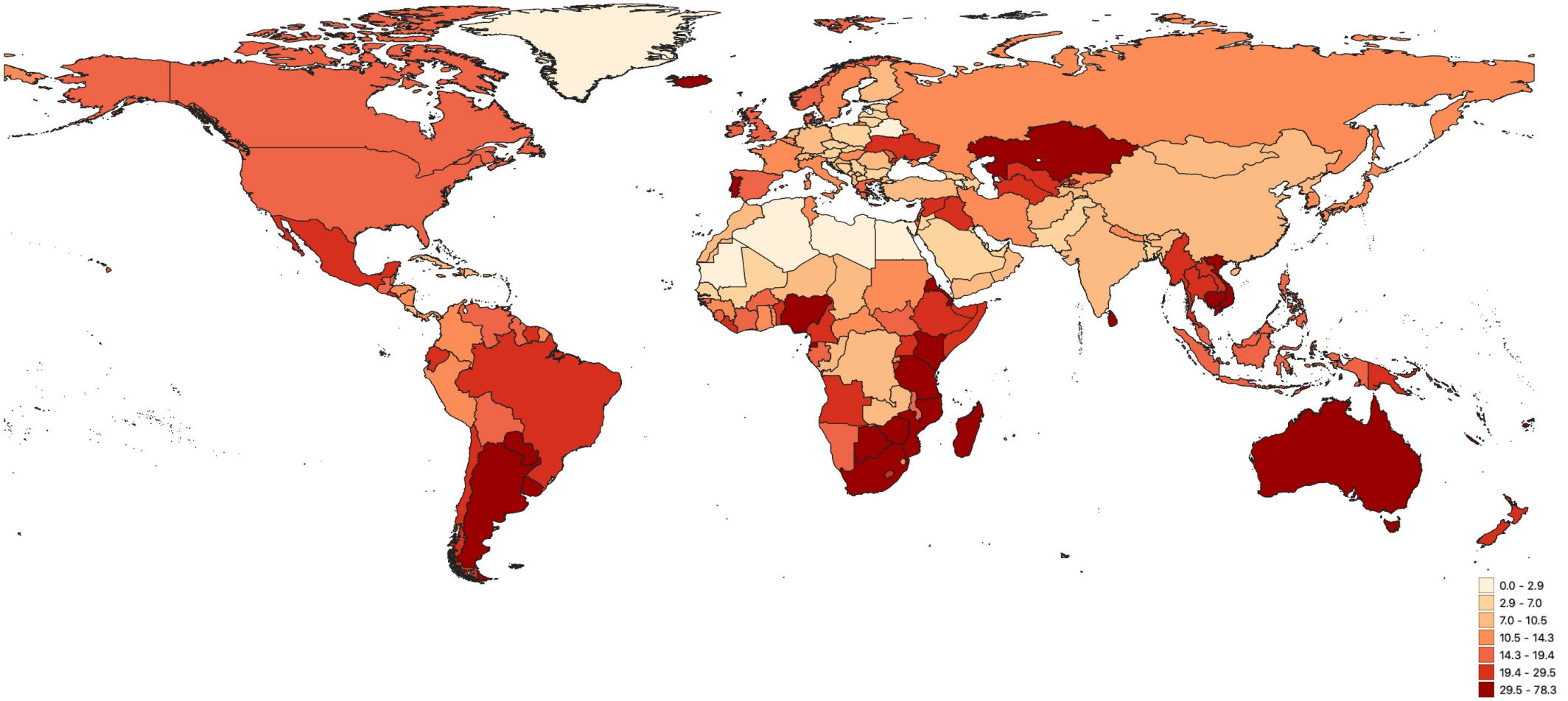
…UNSD SDG Indicators Global Database



Only 50% of the countries have reported a value [2018]

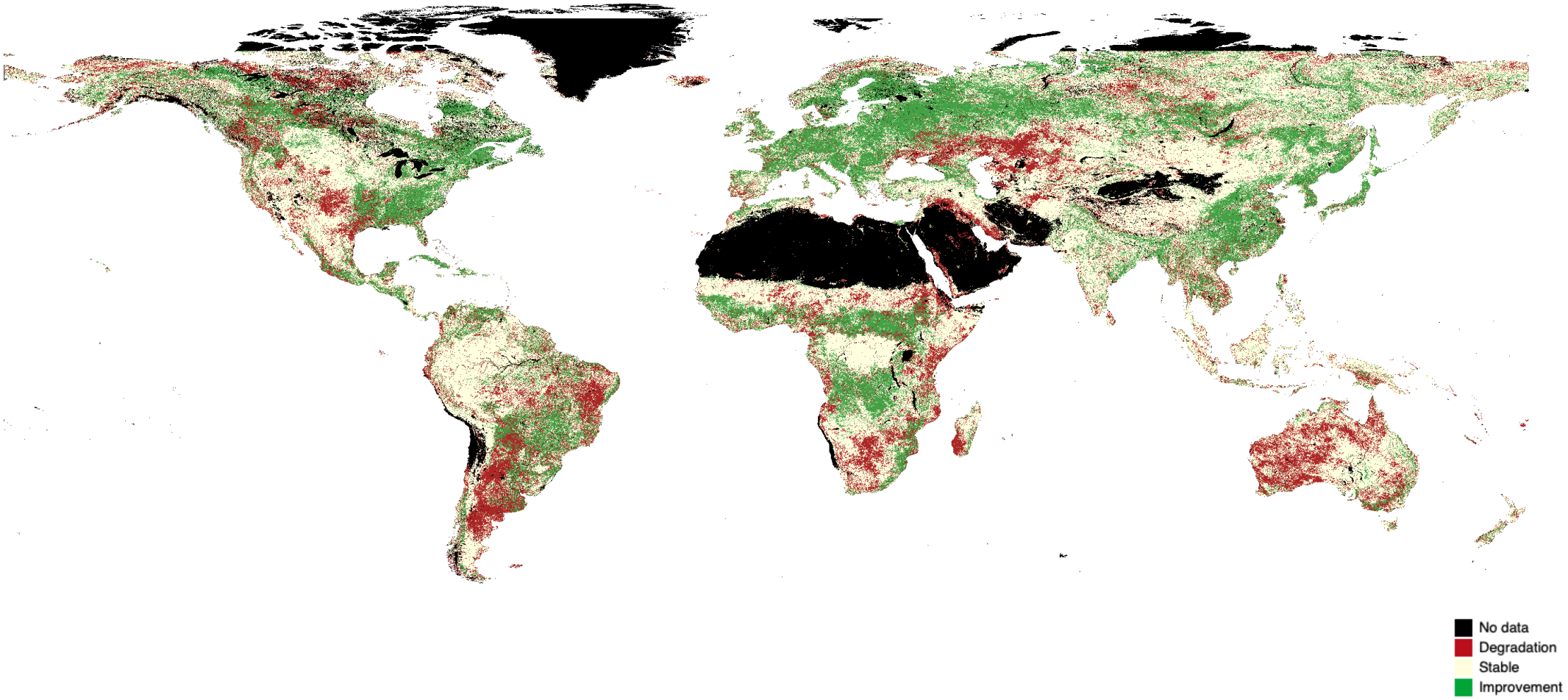
SDG15.3.1…

…Modelled using EO data



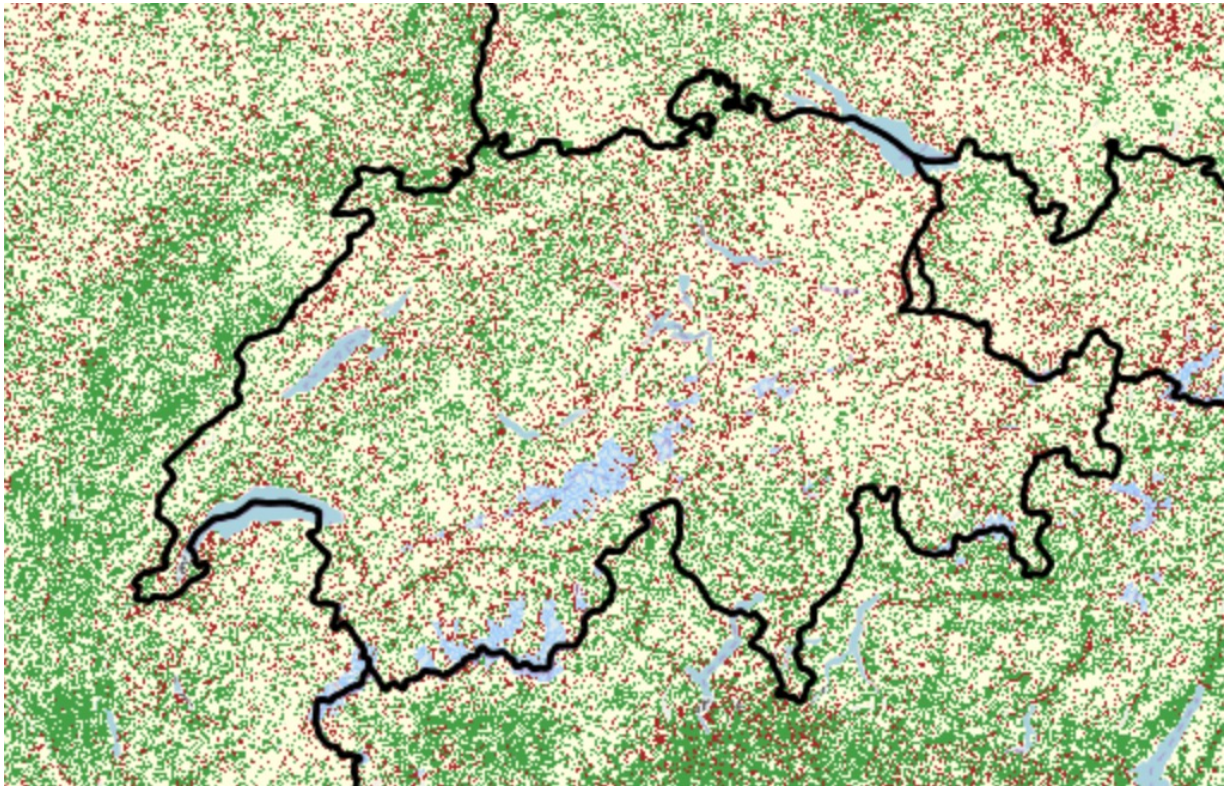
SDG15.3.1…

…Disaggregation



SDG15.3.1…

…at the national scale



No data
Degradation
Stable
Improvement

Using the Swiss Data Cube & Landsat data

Official value: 4.7%

SDC value: 9.7%

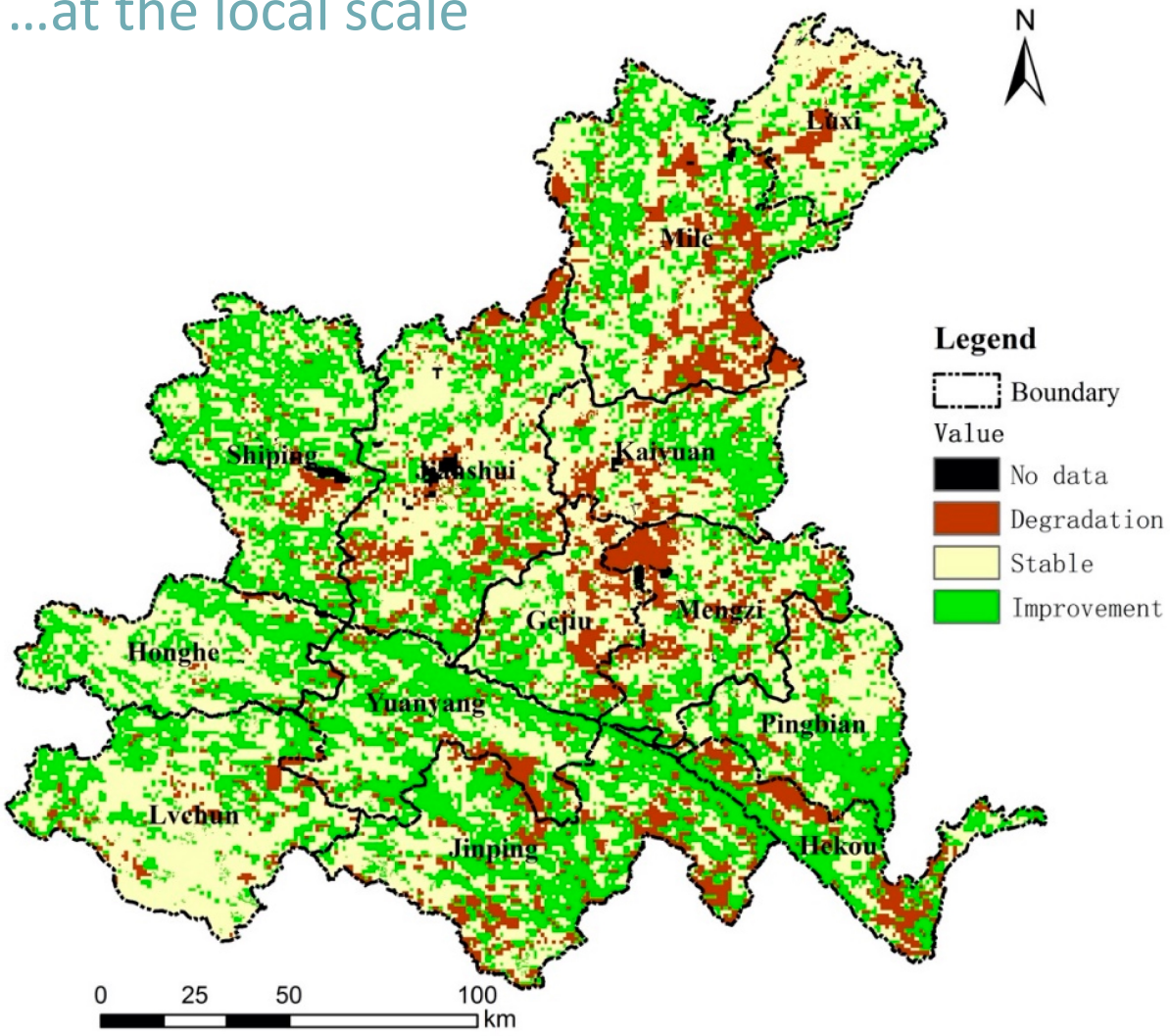
Official definition in Switzerland is based only on soil sealing and do not consider land productivity!

Do not comply with the official UN definition!

Giuliani G. et al. (2020) **Monitoring land degradation at national level using satellite Earth Observation time-series data to support SDG15 – exploring the potential of data cube**.
DOI: 10.1080/20964471.2020.1711633

SDG15.3.1…

…at the local scale

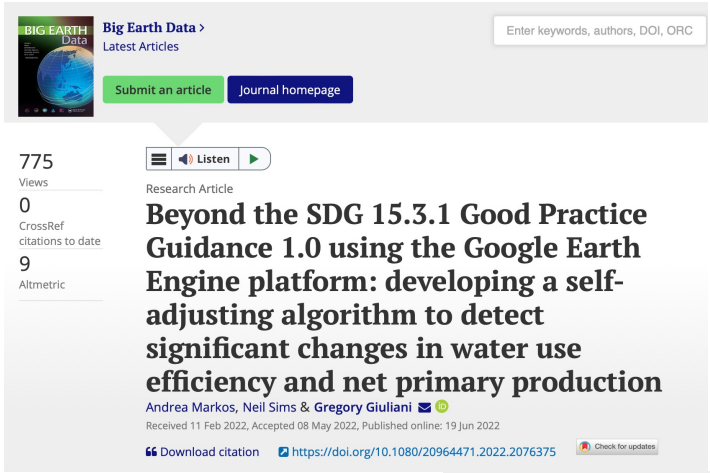


Honge prefecture; Yunnan Province of China

Land degradation is mostly caused **by urban expansion**

Main drivers: loss of land productivity & land cover change.

Wang T. et al. (2020) **Supporting SDG15: Identifying Main Drivers of Land Degradation in Honghe Prefecture between 2005 and 2015**.
DOI: 10.3390/ijgi9120710



Big Earth Data ›
Latest Articles

Enter keywords, authors, DOI, ORC

Submit an article | Journal homepage

775
Views
0
CrossRef citations to date
9
Altmetric

Listen

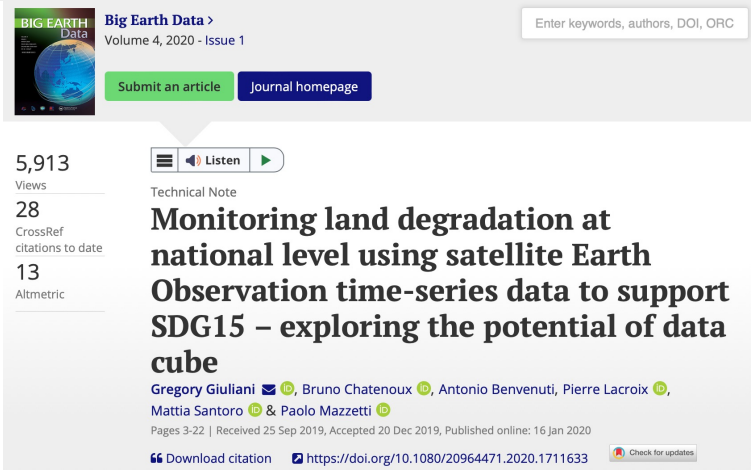
Research Article

Beyond the SDG 15.3.1 Good Practice Guidance 1.0 using the Google Earth Engine platform: developing a self-adjusting algorithm to detect significant changes in water use efficiency and net primary production

Andrea Markos, Neil Sims & Gregory Giuliani

Received 11 Feb 2022, Accepted 08 May 2022, Published online: 19 Jun 2022

Download citation | https://doi.org/10.1080/20964471.2022.2076375



Big Earth Data ›
Volume 4, 2020 - Issue 1

Enter keywords, authors, DOI, ORC

Submit an article | Journal homepage

5,913
Views
28
CrossRef citations to date
13
Altmetric

Listen

Technical Note

Monitoring land degradation at national level using satellite Earth Observation time-series data to support SDG15 – exploring the potential of data cube

Gregory Giuliani, Bruno Chatenoux, Antonio Benvenuti, Pierre Lacroix, Mattia Santoro & Paolo Mazzetti

Pages 3-22 | Received 25 Sep 2019, Accepted 20 Dec 2019, Published online: 16 Jan 2020

Download citation | https://doi.org/10.1080/20964471.2020.1711633

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]

Show more

Share | Cite

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

European Commission

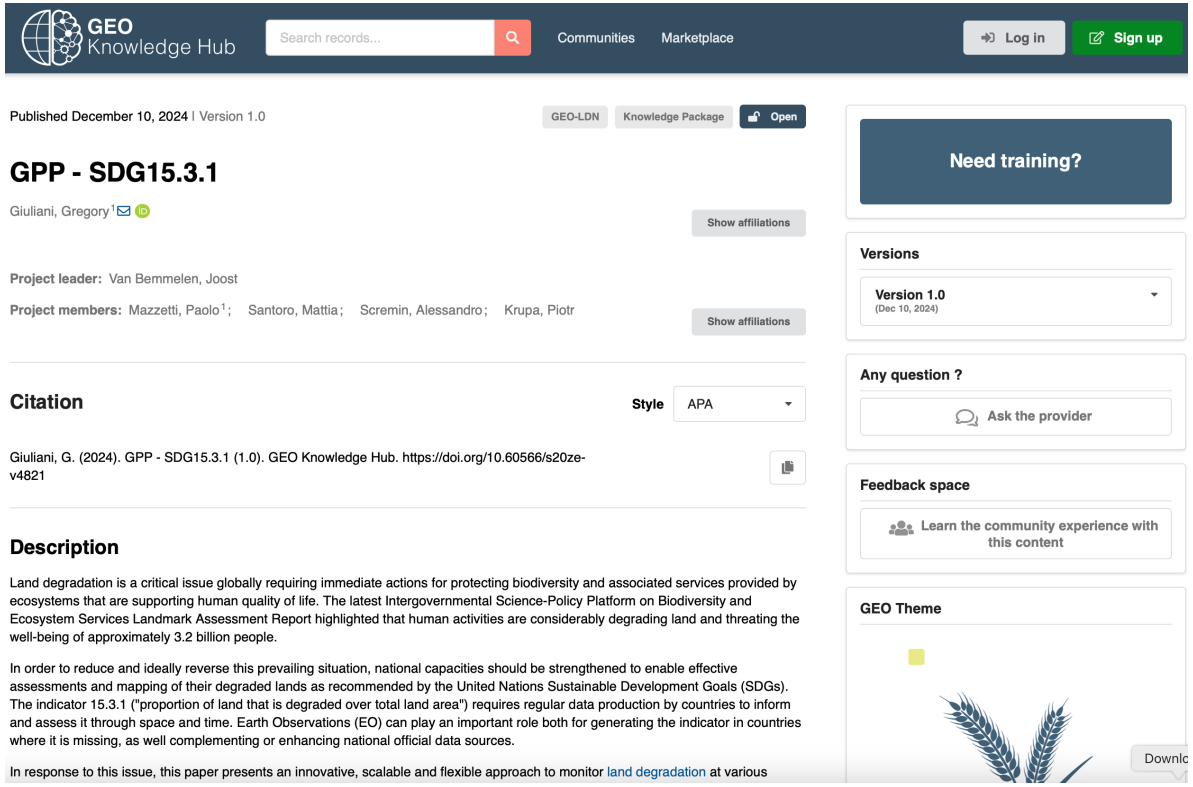
UNIVERSITÉ DE GENÈVE

With support from EVERSIS

esa

Stakeholders and impact

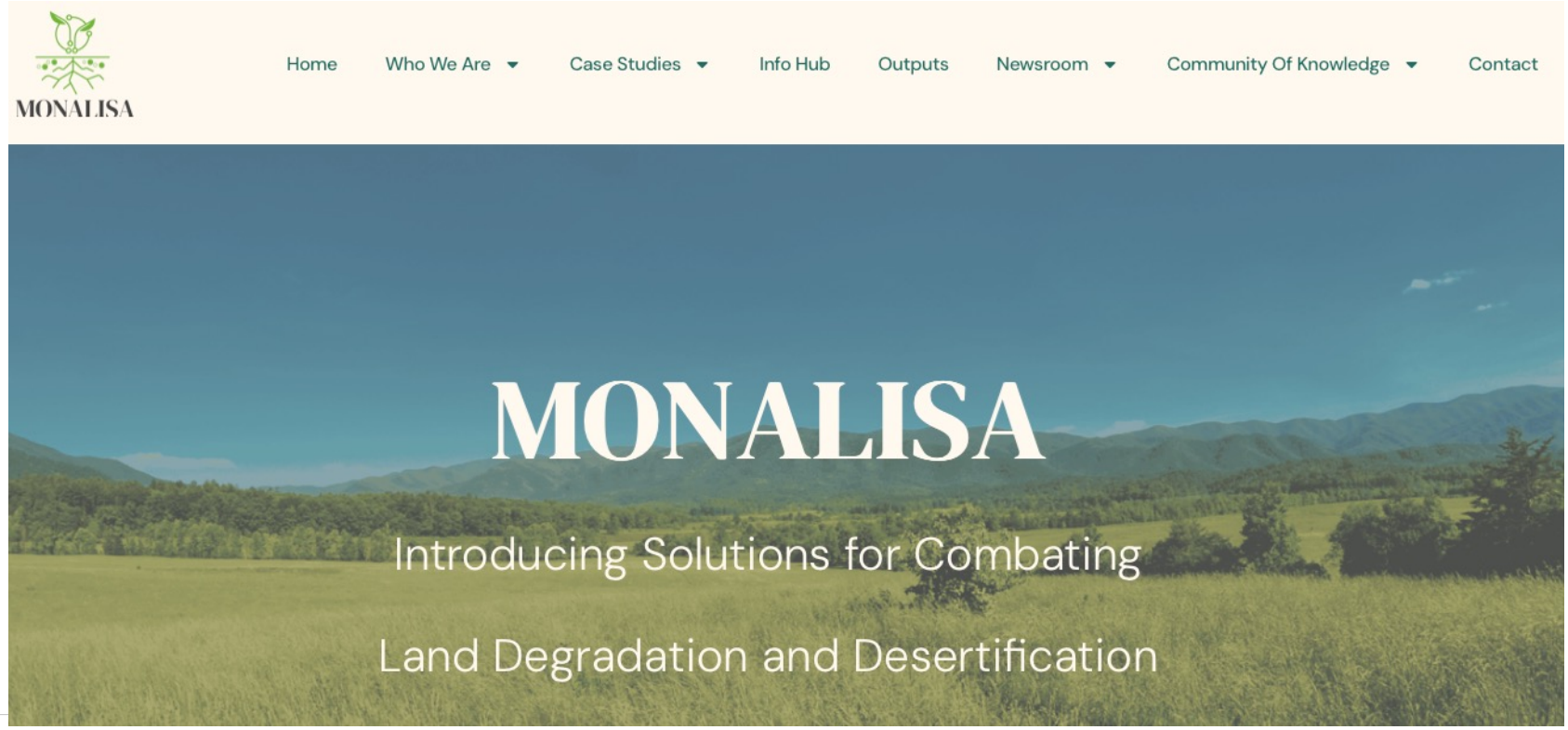
- Registered in the GEO Knowledge Hub: https://doi.org/10.60566/s20ze-v4821



With support from

Exploitation

- Further developments are expected in MONALISA > link with Living Earth
- Strengthen the link with GEO LDN



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".

European Commission
UNIVERSITÉ DE GENÈVE
With support from EVERSIS
esa

GEOSS PLATFORM PLUS

“In my lifetime, I’ve witnessed a terrible decline.
In yours, you could witness a wonderful recovery!”

Sir David Attenborough, COP26 Summit, November 1, 2021

European Commission

Institute of Atmospheric Pollution Research
National Research Council of Italy

UNIVERSITÉ DE GENÈVE

With support from
EVERSIS

esa