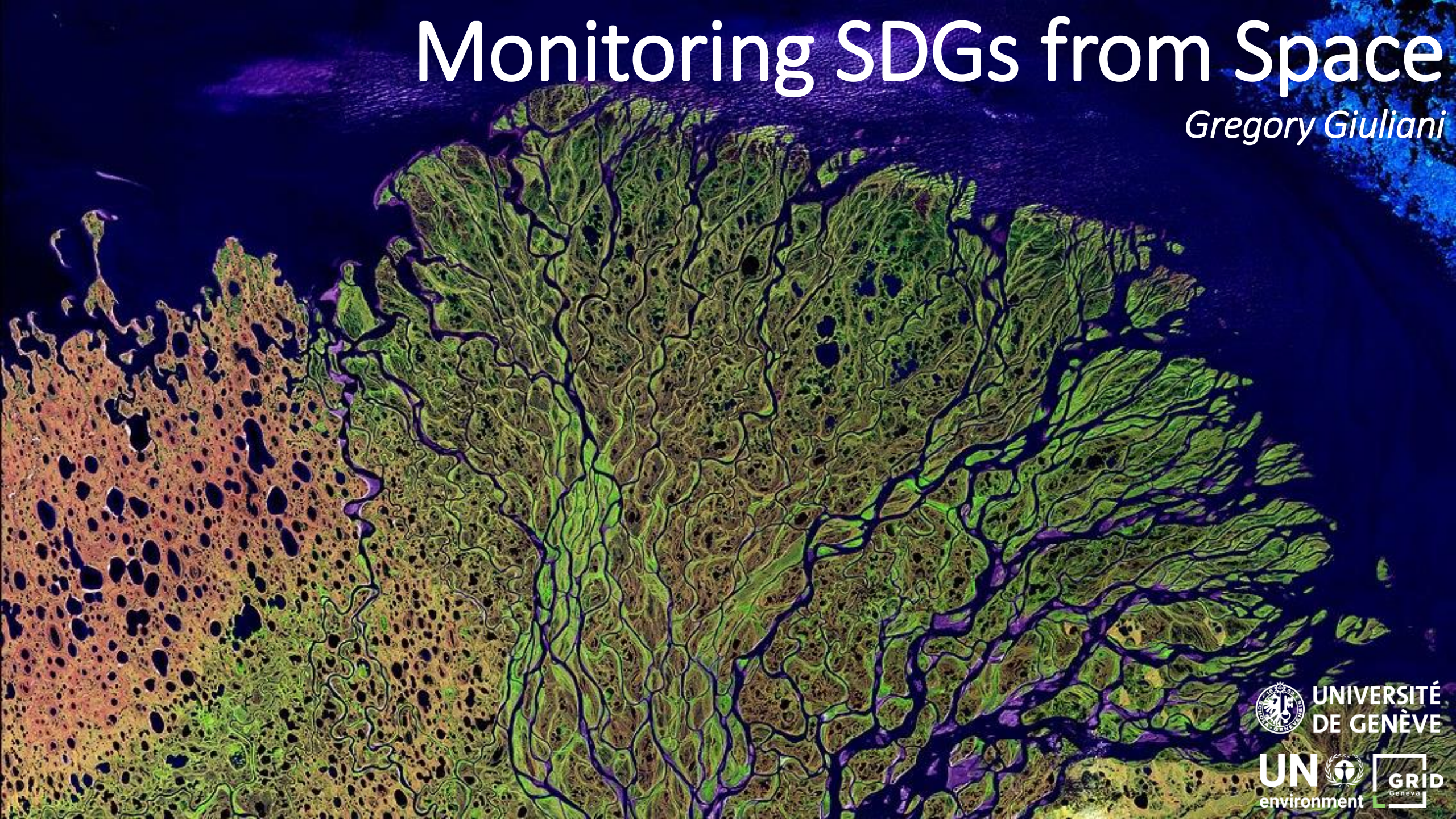


Monitoring SDGs from Space

Gregory Giuliani

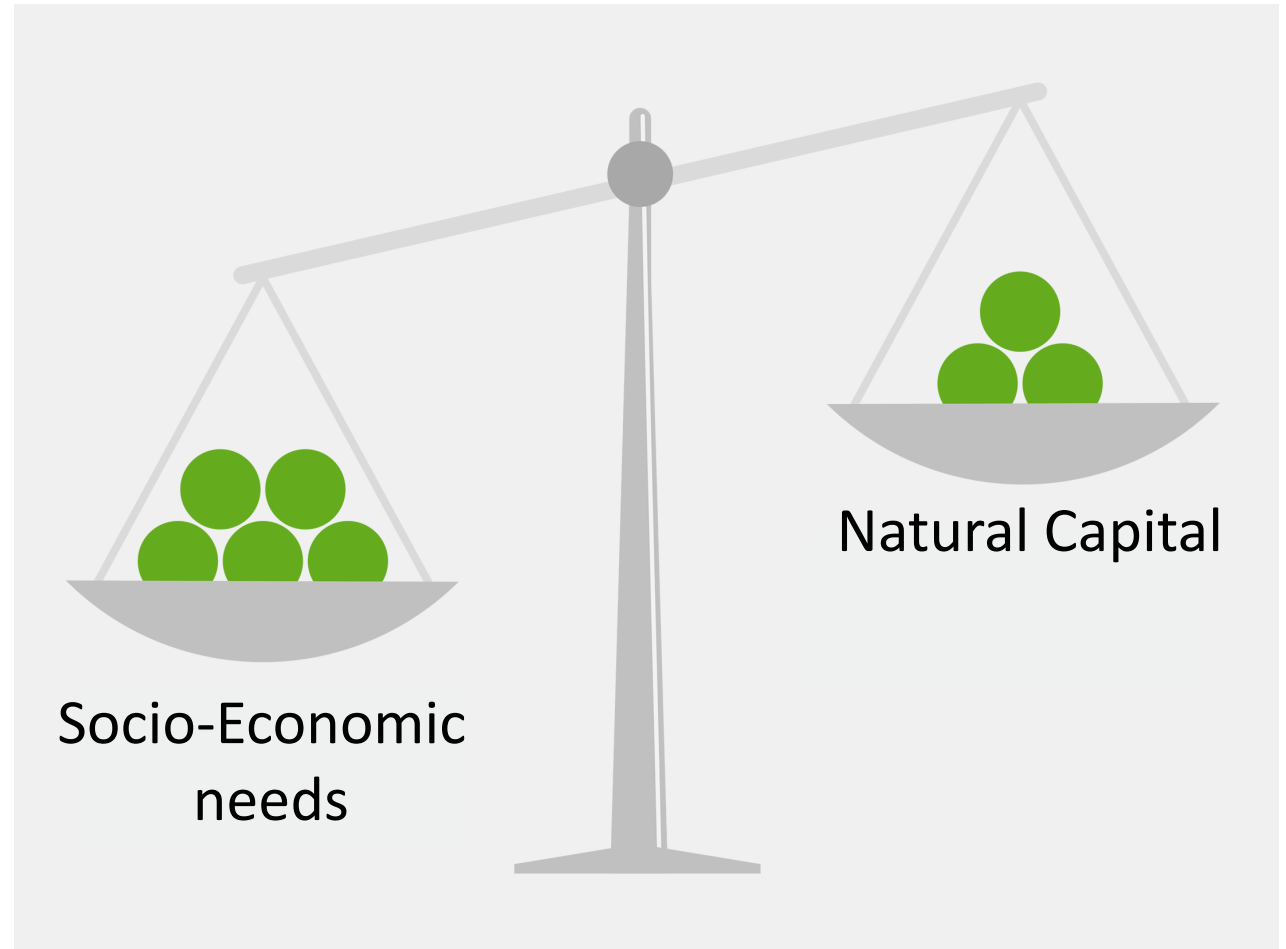


 UNIVERSITÉ
DE GENÈVE

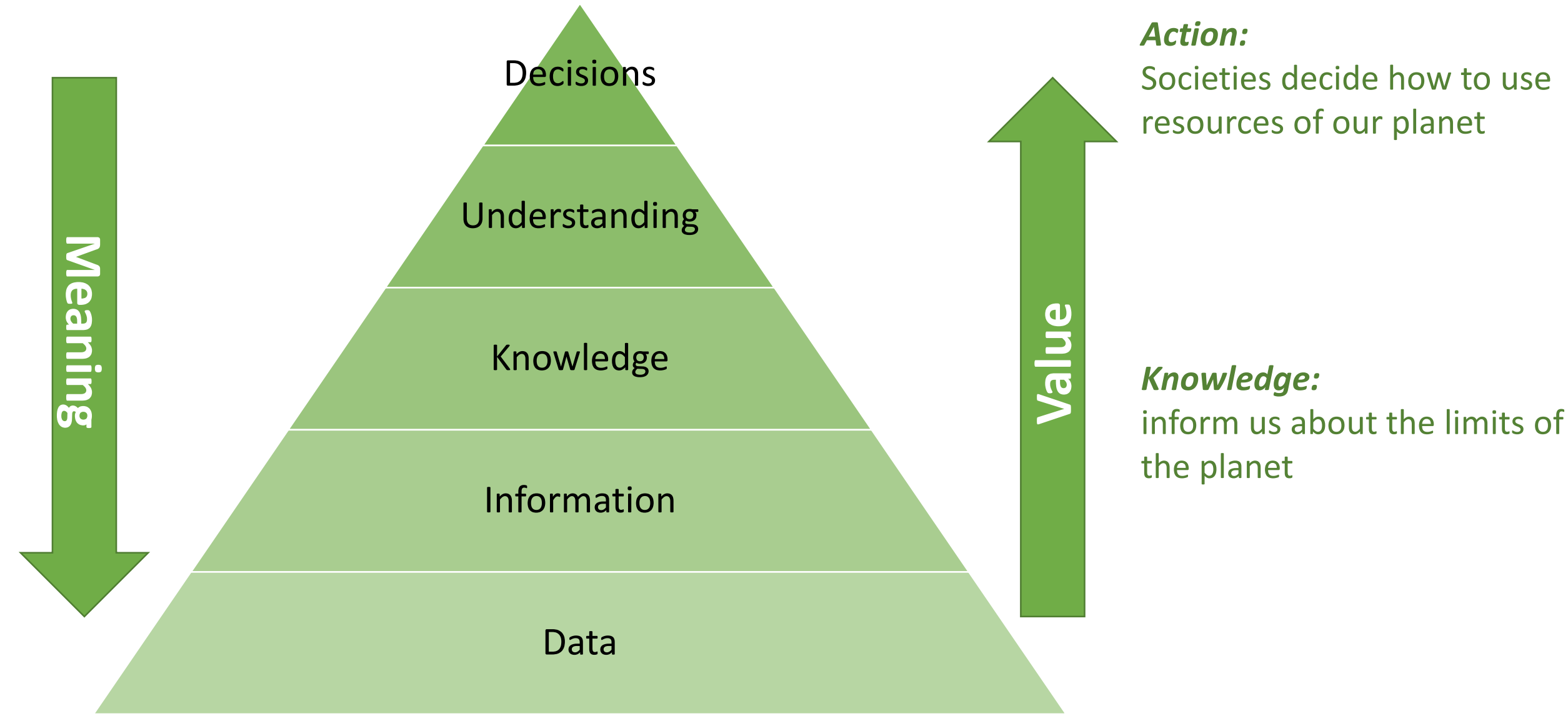
 UN
environment  GRID
Geneva

The key to sustainable development...

...is achieving a balance between the exploitation of natural resources for socio-economic development, and conserving ecosystem services that are critical to everyone's wellbeing and livelihoods.

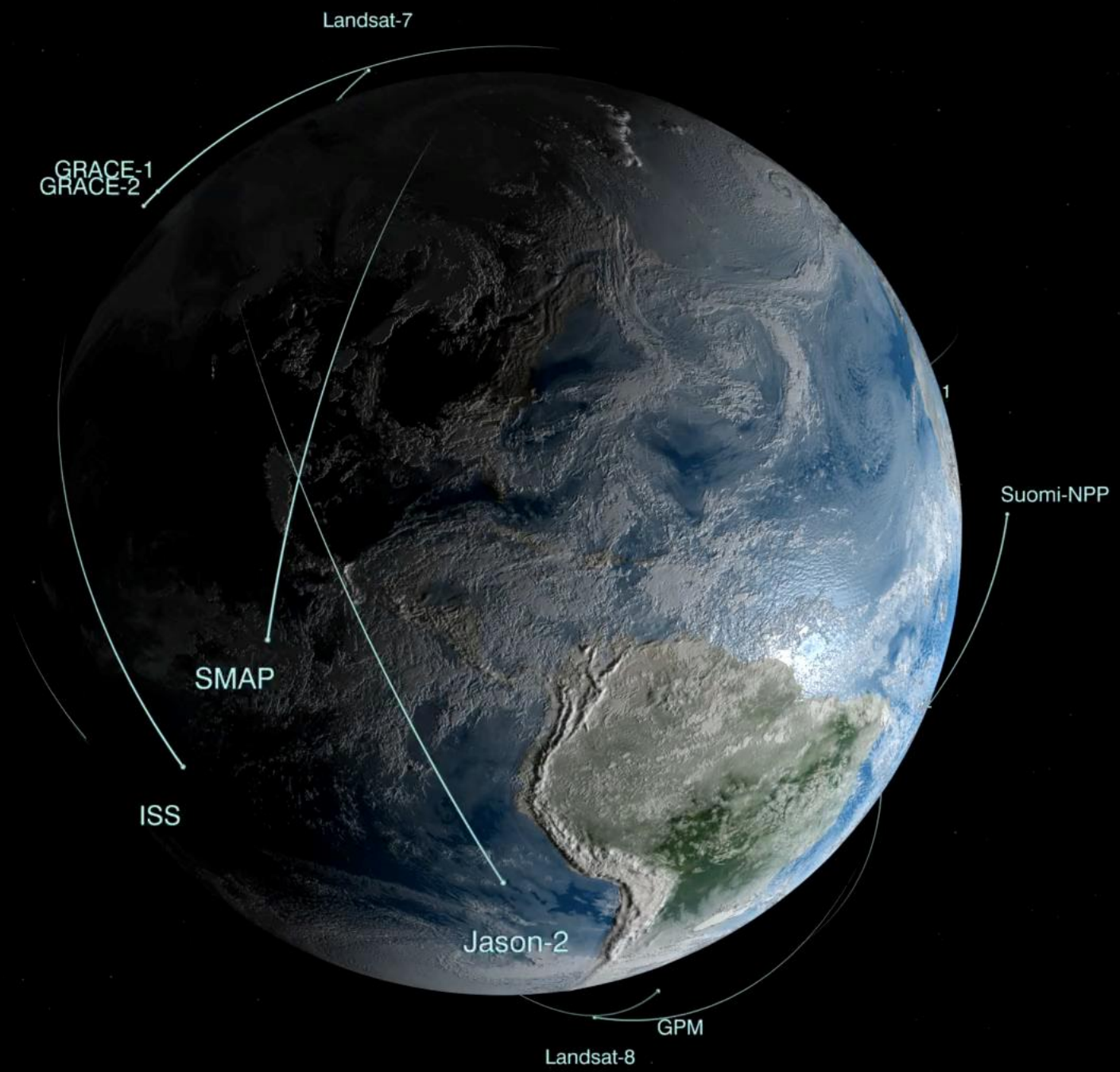


The Challenge: Evidence-based policy-making



To better
understand
these
changes...

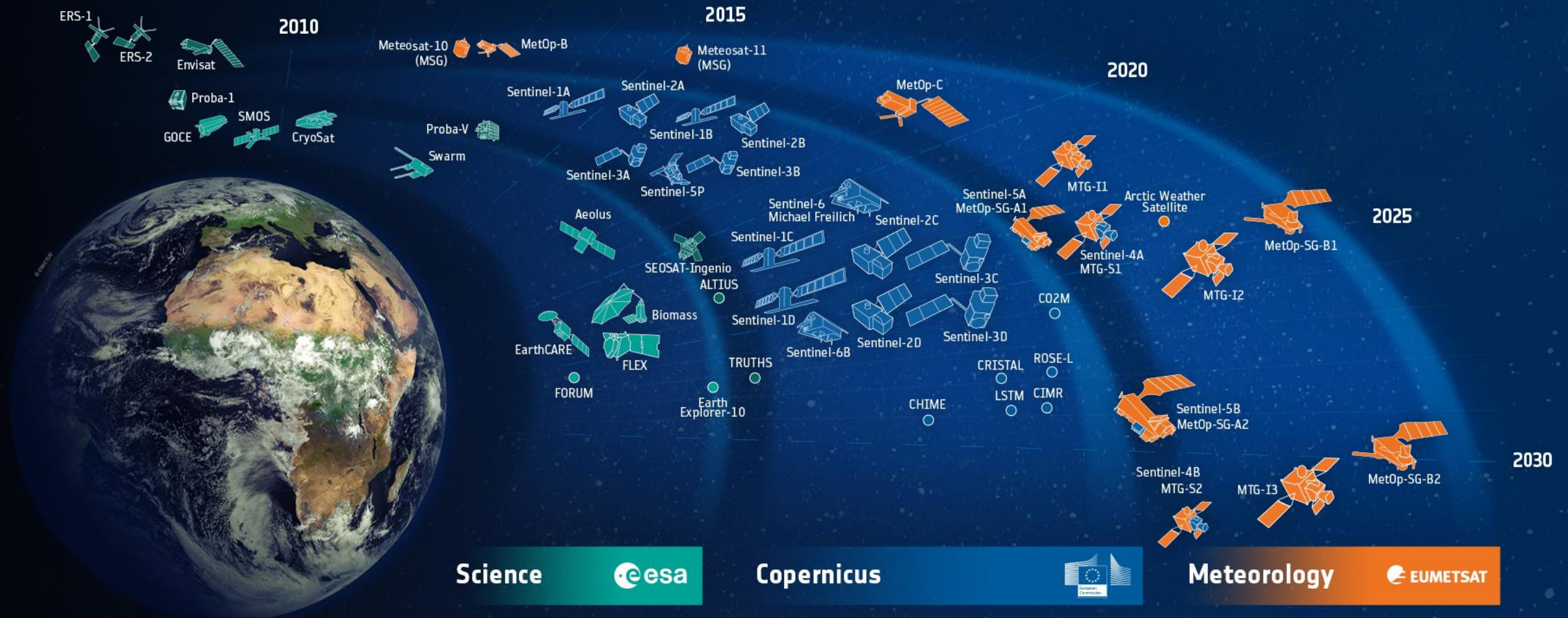
Our planet is
under
continuous
observation
from satellites



Copernicus – Europe's Eye on Earth

Largest EO data provider in the World: 250TB/day data

Archive: 250PB of data stored, daily growth rate: 220TB



Monitoring the Earth in (near) real-time is now a reality!





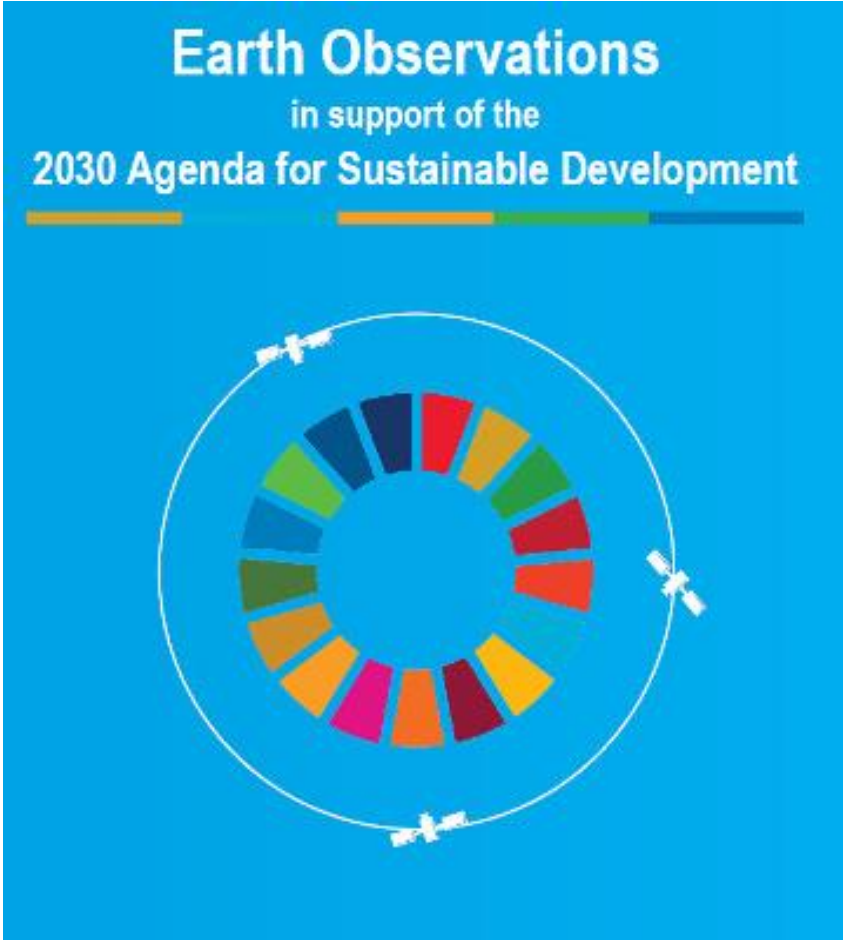
Big Data Challenges in EO Science...

- Data Volume
- Data Variety/Heterogeneity (e.g., sensors, spatial-temporal-spectral resolution)
- It requires scientific knowledge to understand what data is needed... optical (which resolution?), radar (which type?)
- It is hard to access or download
- It is hard to prepare... atmospheric correction, grid formats, pixel alignment, speckle filtering
- It requires capacity building and training



**How to transform
this large amount
of data in useful
information and
support evidence-
based decisions?**

Earth Observations is useful for monitoring SDG's



http://earthobservations.org/geo_sdgs.php

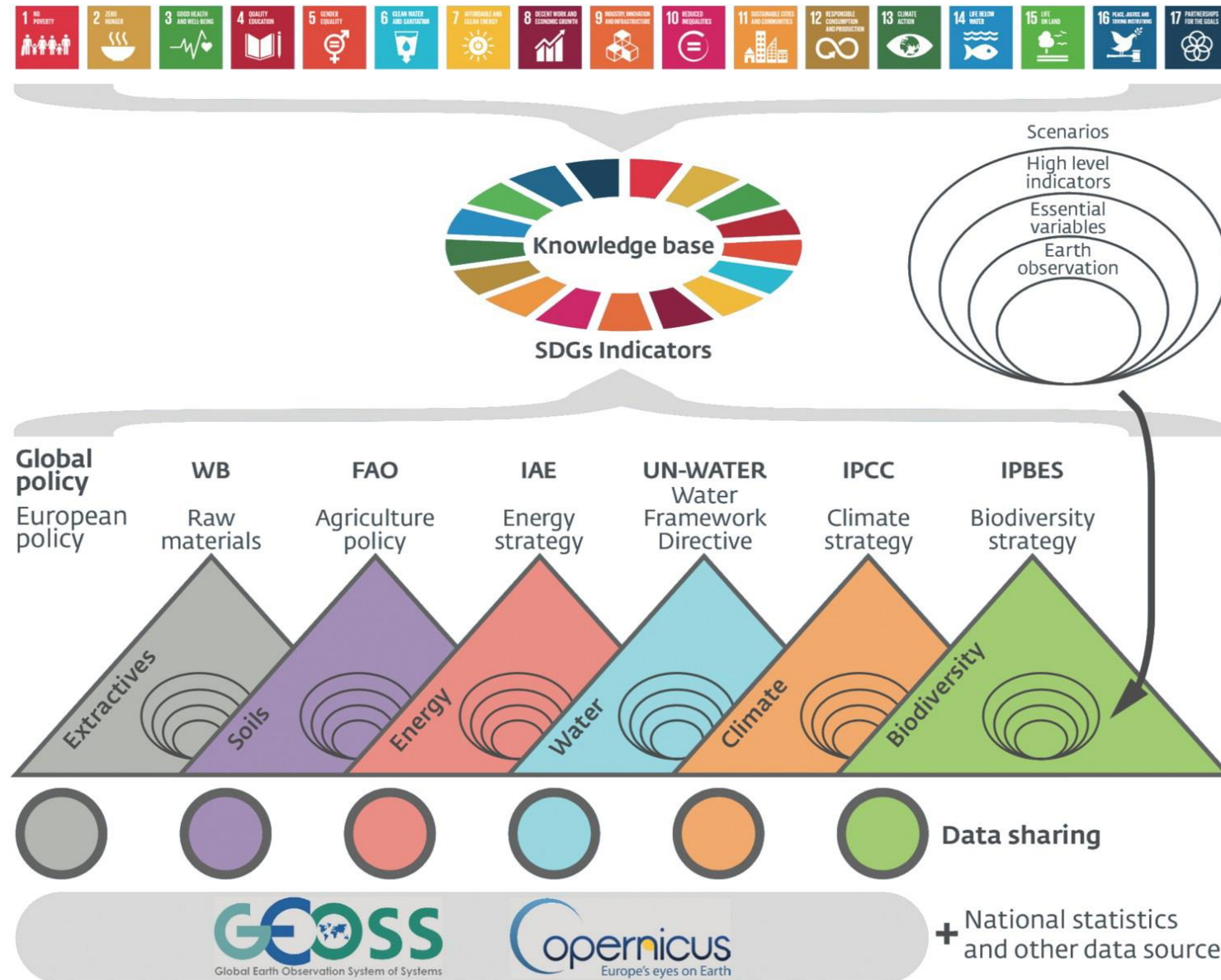
EARTH OBSERVATION AND GEOSPATIAL INFORMATION LINKAGES TO SDG GOALS, TARGETS AND INDICATORS



Target Contribute to progress on the Target, not necessarily the Indicator										Goal	Indicator Direct measure or indirect support to the Indicator				
							1.4	1.5		1 No poverty	1.4.2				
						2.3	2.4	2.c		2 Zero hunger	2.4.1				
				3.3	3.4	3.9	3.d			3 Good health and well-being	3.9.1				
										4 Quality education					
								5.a		5 Gender equality	5.a.1				
		6.1	6.3	6.4	6.5	6.6	6.a	6.b		6 Clean water and sanitation	6.3.1	6.3.2	6.4.2	6.5.1	6.6.1
					7.2	7.3	7.a	7.b		7 Affordable and clean energy	7.1.1				
								8.4		8 Decent work and economic growth					
					9.1	9.4	9.5	9.a		9 Industry, innovation and infrastructure	9.1.1	9.4.1			
						10.6	10.7	10.a		10 Reduced inequalities					
	11.1	11.3	11.4	11.5	11.6	11.7	11.b	11.c		11 Sustainable cities and communities	11.1.1	11.2.1	11.3.1	11.6.2	11.7.1
				12.2	12.4	12.8	12.a	12.b		12 Responsible consumption and production	12.a.1				
					13.1	13.2	13.3	13.b		13 Climate action	13.1.1				
		14.1	14.2	14.3	14.4	14.6	14.7	14.a		14 Life below water	14.3.1	14.4.1	14.5.1		
	15.1	15.2	15.3	15.4	15.5	15.7	15.8	15.9		15 Life on land	15.1.1	15.2.1	15.3.1	15.4.1	15.4.2
								16.8		16 Peace, justice and strong institutions					
17.2	17.3	17.6	17.7	17.8	17.9	17.16	17.17	17.18		17 Partnerships for the goals	17.6.1	17.18.1			

GEOEssential – <http://www.geoessential.eu>

Generalization of the EV concept across SBAs & connection with SDGs



Lehmann A. et al. (2020) **GEOEssential - Mainstreaming workflows from Essential Variables to Environment Policy Indicators.** DOI: 10.1080/17538947.2019.1585977
Nativi S. et al. (2020) **Towards a knowledge base to support global change policy goals.** DOI: 10.1080/17538947.2019.1585977

SDG15.3.1...

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



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

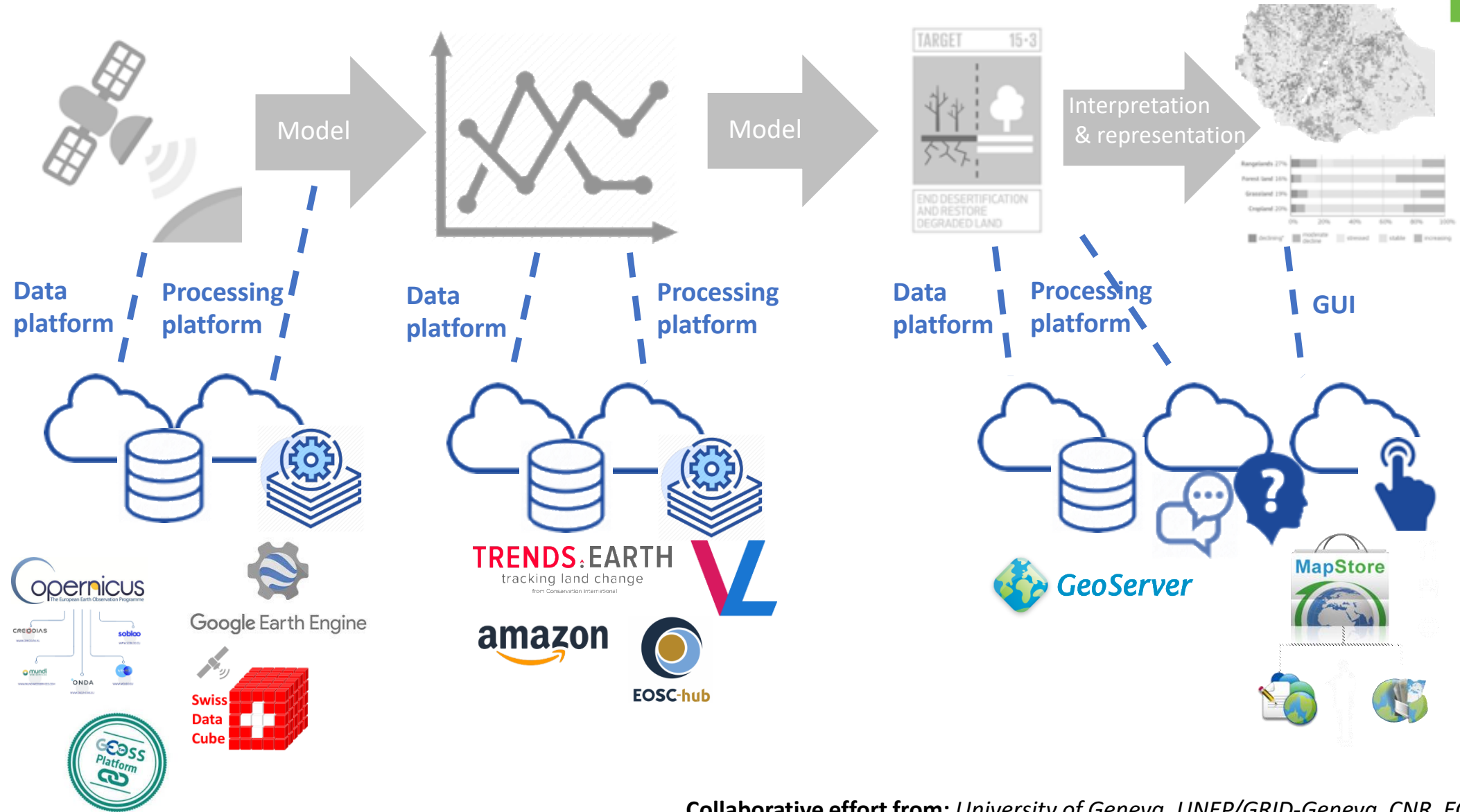
- ECVs**
- Fire disturbance
 - Land Cover
 - Soil Carbon
- EBVs**
- Ecosystem extent and fragmentation
 - Habitat structure

- 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

SDG15.3.1...

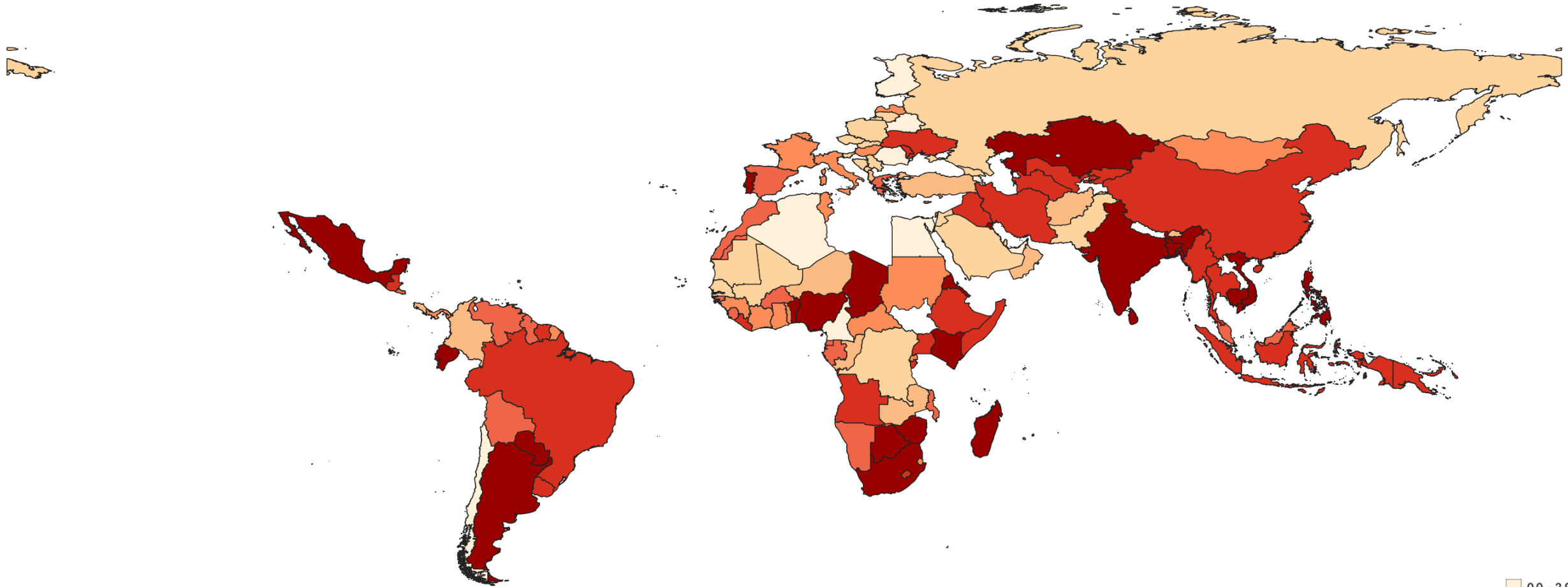
...Implementation using the GEOSS platform & more



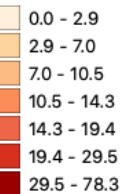
Collaborative effort from: University of Geneva, UNEP/GRID-Geneva, CNR, EC-JRC, ESA, GEO

SDG15.3.1...

...UNSD SDG Indicators Global Database

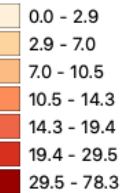
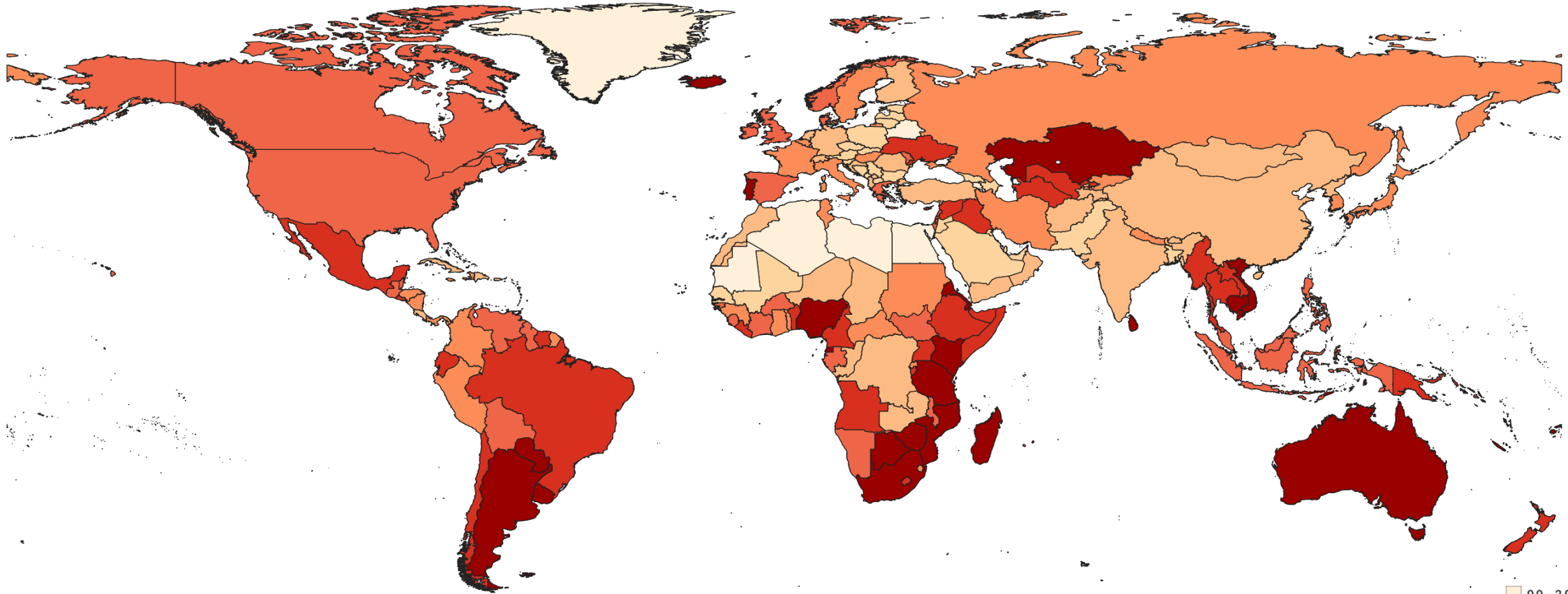


Only 50% of the countries have reported a value



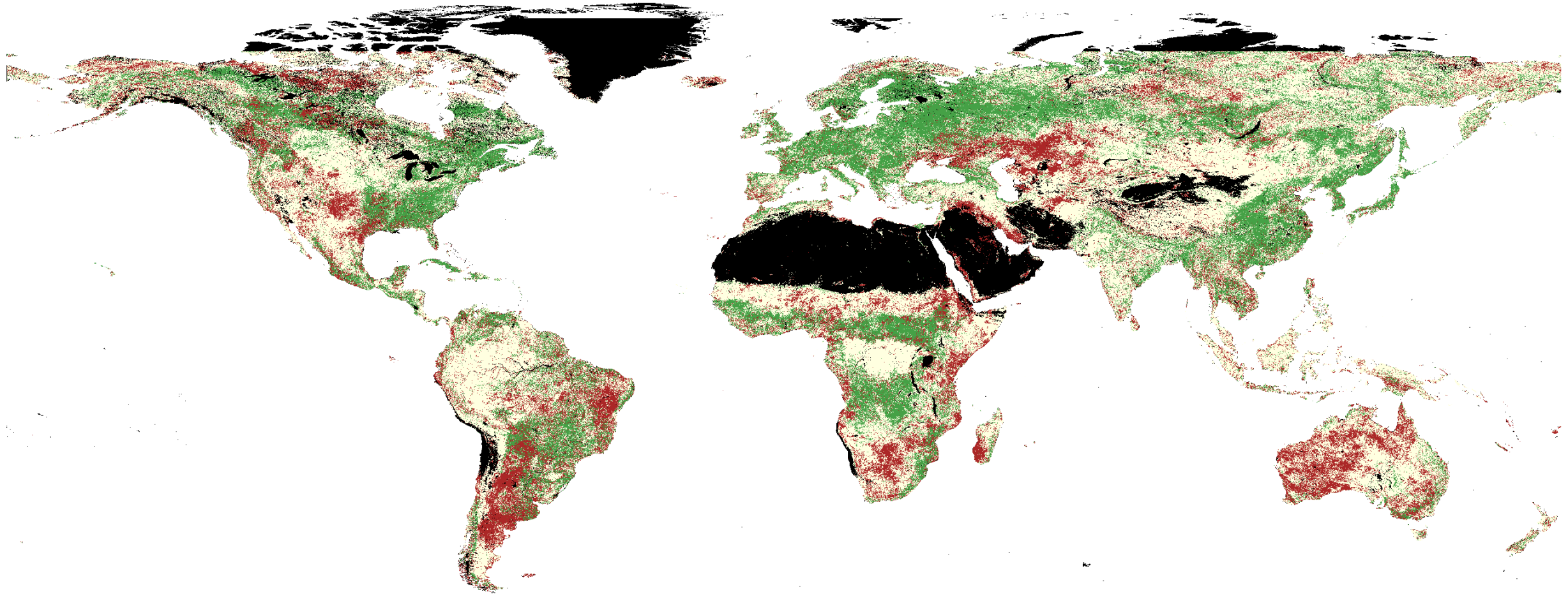
SDG15.3.1...

...Modelled using EO data



SDG15.3.1...

...Disaggregation



SDG15.3.1...

...GEOEssential Dashboard



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SDG15.3.1 indicator Land Degradation

[Home](#) / [EO Workflows](#) / [SDG15.3.1](#)

Monitoring Land Degradation - The need for action



The Summary for Policymakers of the landmark Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Assessment Report detailed the dangers of land degradation, which cost the equivalent of about 10 % of the world's annual gross product in 2010 through the loss of biodiversity and ecosystem services, together with a catalogue of corrective options.

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.

Land degradation through human activities is undermining the well-being of at least 3.2 billion people, and is

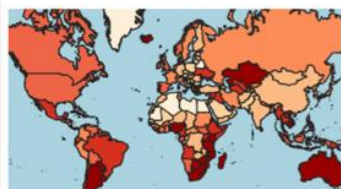
SDG15.3.1 - Proportion of land that is degraded over

The indicator is generated using the Trends Earth model published in the GEOEssential Virtual Laboratory (VLab). In order to assess the area degraded, SDG indicator 15.3.1 uses information from sub-indicators:

1. Land cover
2. Land productivity
3. Carbon stocks

Trends Earth allows the user to compute each of these subindicators in a spatially explicit way generating raster maps which are then integrated into a final SDG 15.3.1 indicator map and produces a table result reporting areas potentially improved and degraded for the area of analysis. More information on the indicator 15.3.1: [United Nations SDG Indicators - Metadata Repository](#)

SDG15.3.1 - National value [model]



SDG15.3.1 - National le.



SDG15.3.1 - Disaggregation



SDG15.3.1 - Pixel



Spatial extent: Switzerland, Europe, World

Dashboard link: <https://geoessential.unepgrid.ch/mapstore/#/dashboard/36>

Temporal extent: 2001-2015

EVs used: Land cover, NDVI, Precipitation, Temperature, Soil Moisture

Inputs: Land cover, NDVI, Precipitation, Temperature, Soil Moisture,

Data Story

Global Land Degradation
(GlobLD) - A global map of land
degradation for the SDGs
[https://geoessential.unepgrid.ch/
mapstore/#/geostory/74](https://geoessential.unepgrid.ch/mapstore/#/geostory/74)

Videos

Video Show Case presented at
the GEO plenary in Canberra on
the European Commission & ESA
booth: GEOSS Platform: a Land
Degradation use case
[https://www.youtube.com/watch?
v=TN1VC0rOjvE](https://www.youtube.com/watch?v=TN1VC0rOjvE)

Poster

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



Thank you!

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<http://www.unige.ch/enviropace/people/giuliani/>