



Agenda item #4

Task Stream #2

Application of Satellite Earth Observation Data for the SDG indicators

IAEG-SDGs WGGI 5th expert meeting
6 and 8 December 2018, Nairobi, Kenya

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Marc Paganini, ESA, CEOS SDG Ad-hoc Team Co-lead

Task Stream II: Application of satellite EO data for the SDG indicators

Task I:

Develop expert advice and guidance to IAEG-SDGs and the larger statistical community

Deliverables

- Compendium on the EO contribution to the SDG Indicators
- Policy Brief



Compendium and Policy brief on the EO contribution to SDG indicators

Contribution from ESA project “Earth Observation for the SDGs”

- EO contribution to the SDG targets and indicators.
- **2 lists of indicators:**
 - Green List: EO identified as a major source of information
 - Amber List: EO could potentially contribute to the indicator
- **Classification following multiple criteria:** Status of EO in guidelines; Maturity of EO technologies; Technical capacity required, Availability of global data sets; Compliance with reporting calendar; Sensitivity to change; Scalability; Substitutability of gaps
- **29 factsheets** one per target, covering **33 indicators** where EO has a potential or definite contribution to the indicator methodology.
- **Stand-alone factsheets** conceived as resource material for NSOs
 - following **IAEG-SDG Metadata Template** for ease of use by NSOs.
 - with short **methodological guidelines** and **EO best practice examples**.
 - Indication of available datasets, tools & platforms and existing initiatives.
- **Expert review** of the indicator factsheets in progress
- Compendium and Policy Brief **ready for review in January 2019**
- To be **finalized in February 2019**

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Task Stream II: Application of satellite EO data for the SDG indicators

Task II:

Document national experiences and good practices (case studies)

Deliverables

- Primers and Technical guidelines, with national good practices, on the integration of EO data streams into the production of SDG indicators.
 - 6.3.1 (wastewater management)
 - 6.3.2 (ambient water quality)
 - 6.6.1 (spatial extent of water-related ecosystems)
 - 9.1.1 (rural population within 2 km distance from all-season roads)
 - 11.3.1 (land consumption per population growth)
 - 15.3.1 (proportion of degraded land per total land).



Status of indicators for Task Stream#2

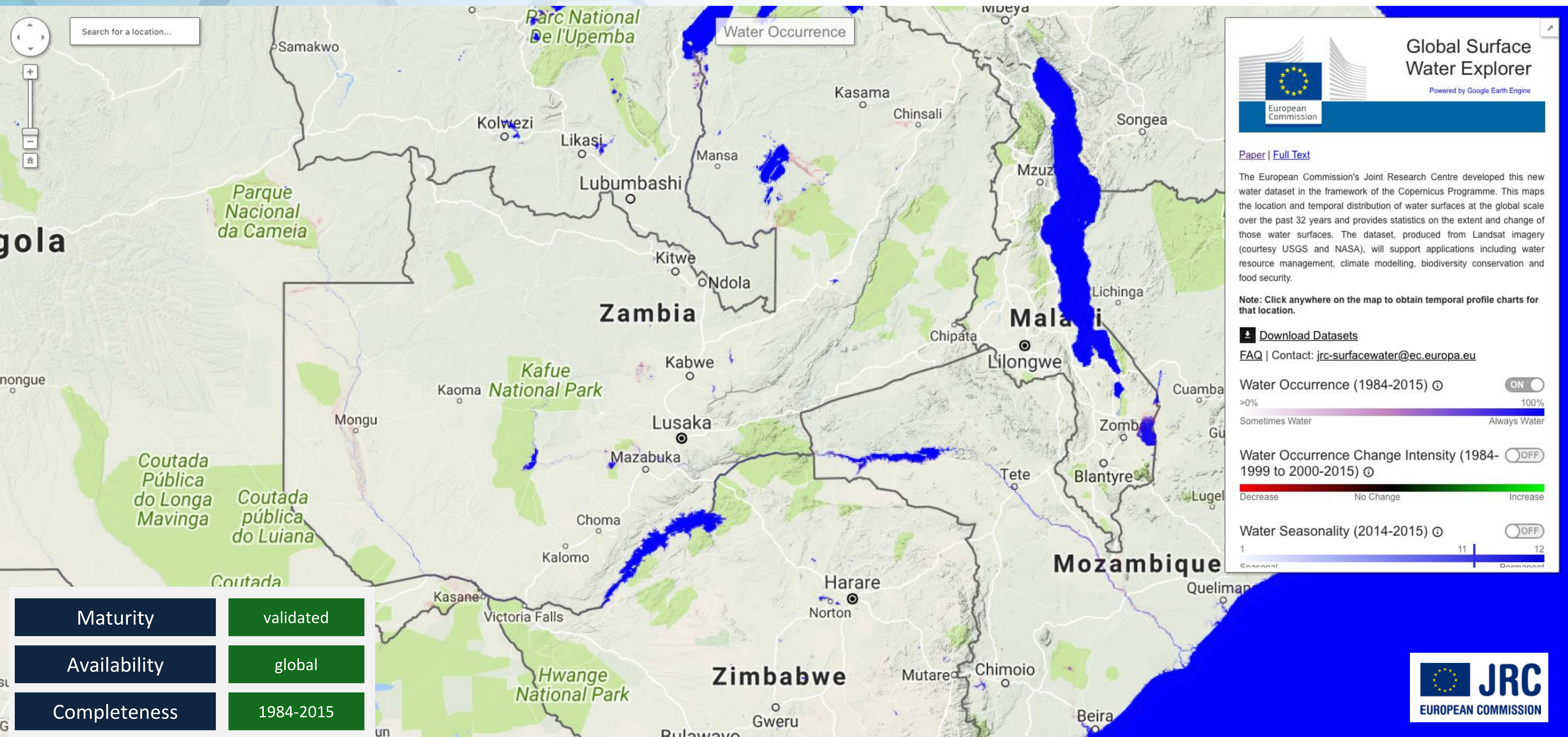
Indicator	UN custodian	Tier	Current status	Way forward
6.3.1 Wastewater management	WHO	II	Country pilots with Philippines, Fiji and Mexico were being coordinated. Satellite EO could support monitoring environments of related facilities	Coordinate with WHO on satellite data requirements
6.3.2 Ambient water quality	UNEP	II	GEM/Water collects in-situ data for the ambient water quality since 1977 Data collected in 6.3.2 will be used in sub-indicator 4 (quality of water-related ecosystem).	Coordinate satellite data requirements with UNEP; develop satellite-derived WQ products for improved monitoring of surface water; validate these satellite-derived products through partnership and engagements w/ countries
6.6.1 Spatial extent of water-related ecosystem	UNEP Ramsar	II	Country pilots in progress, EO4SDG contributors in collaboration w/ UNEP & Ramsar: Examples include (but not limited to) Peru, Uruguay, Brazil, Uganda, Benin. Recent workshop on 6.6.1 w/ representatives from water authorities & NSOs from Zambia, Senegal, Uganda, Egypt, Mongolia, and Colombia	Capacity building to allow countries to actively participate in the process & develop in-house capability for using EO products; develop good practice guidance; tool / platform development (UNEP is collaborating w/ Google on 6.6.1 portal, https://sites.google.com/view/sdg661/)

Status of indicators for Task Stream#2 (cont'd)

Indicator	UN custodian	Tier	Current status	Way forward
9.1.1 Rural population within 2km distance from all-season road	World Bank	III	Report on methodology and data are available. Mexico and Colombia already made country pilots. Satellite EO can monitor condition of roads.	Roles of satellite EO is secondary and its approach needs to be studied.
11.3.1 Land consumption per population growth	UN-Habitat	II	NASA/ CI in support of EO4SDG (in close engagement w/ UN Habitat & Colombia/ DANE): harmonization of methodological differences (i.e., global metadata to country-specific) and tool development to extend 11.3.1 (Trends.Earth: open source, QGIS)	Work on improving the delivery of methods, tools and interpretation of the indicator at the UN Habitat -planned workshops & via direct engagement w/ countries;
15.3.1 Proportion of degraded land per total land	UNCCD	II	Steering Committee established with participation of EO4SDG and three WGs are being formed. CI's Trends.Earth provides a tool for country monitoring, 155 countries already reported.	Support UNCCD through the Steering Committee and WGs

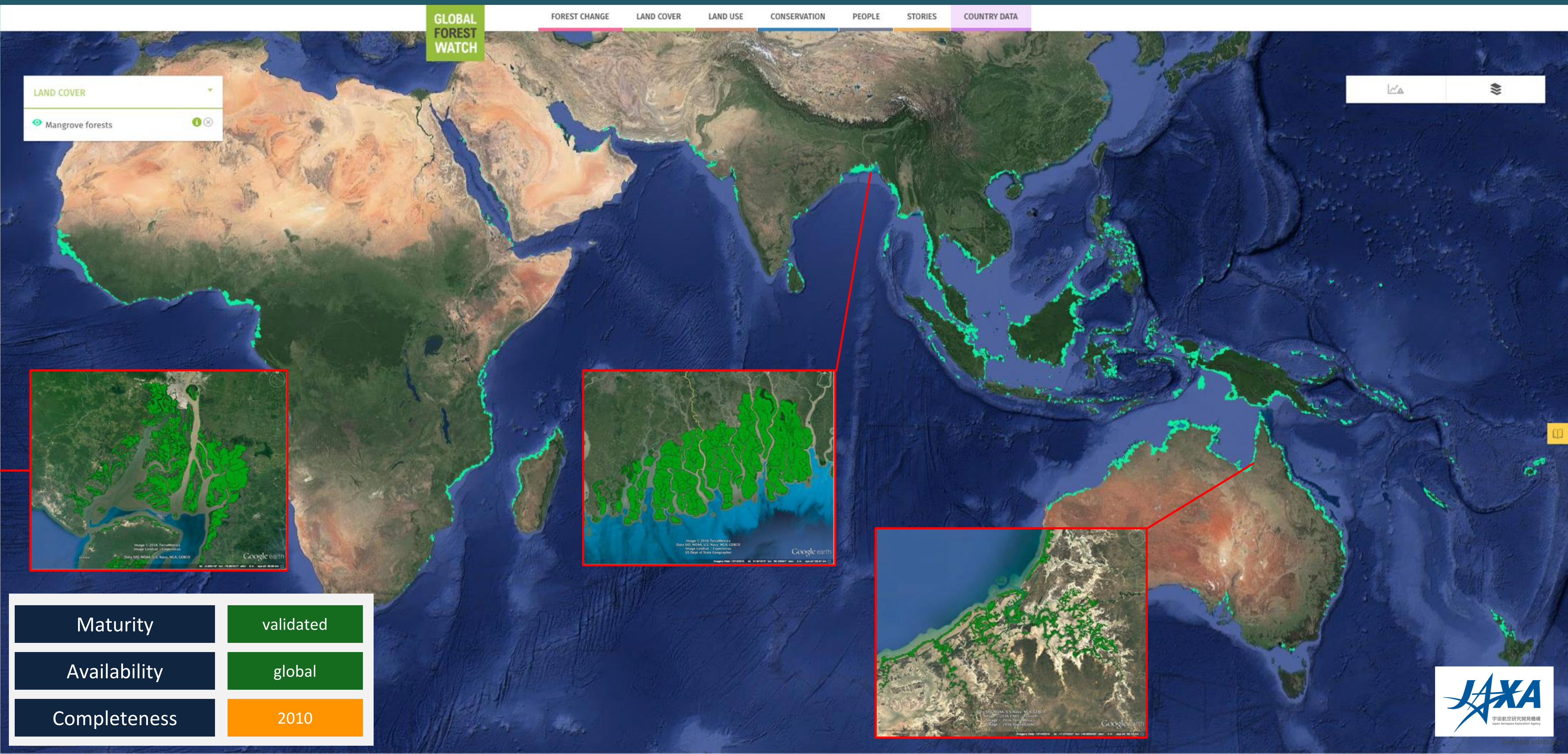
Global EO products in support of SDG indicators

Global Surface Water Extent for SDG 6.6.1 (water-related ecosystems)

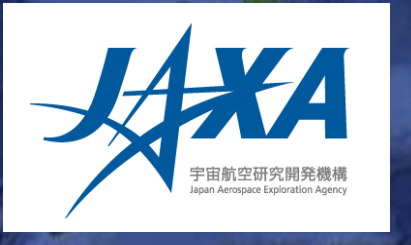


Global EO products in support of SDG indicators

Global Mangrove Watch for SDG 6.6.1 (water-related ecosystems)

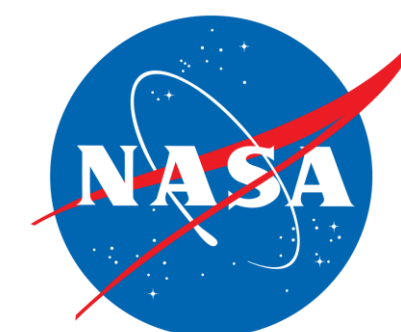
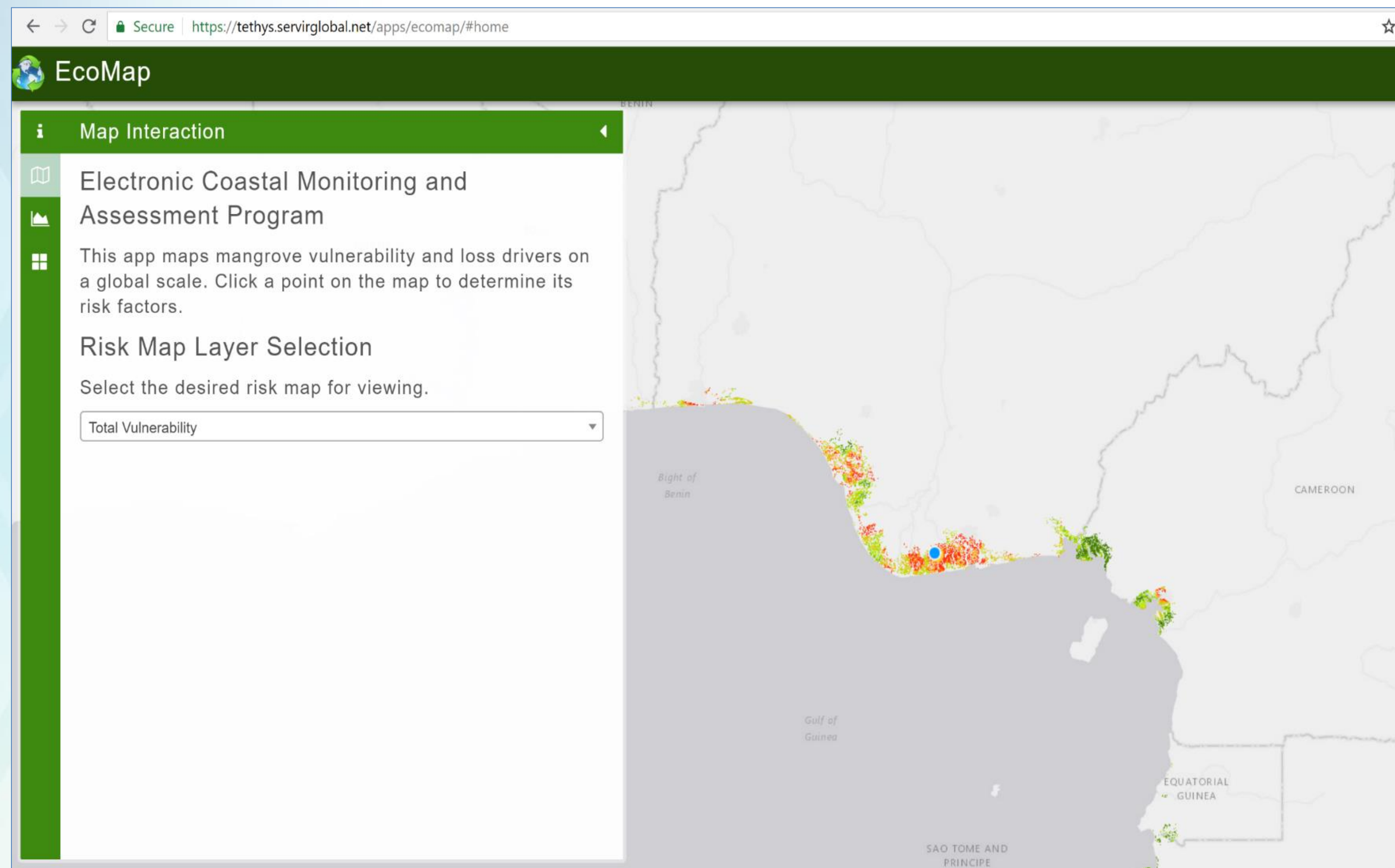


Maturity	validated
Availability	global
Completeness	2010

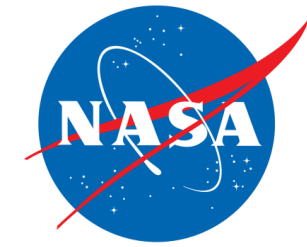


Online EcoMap Data Portal

- Through an ongoing partnership with SERVIR East Africa and the Regional Centre for Mapping of Resources for Development (RCMRD), an EcoMap portal will be made publicly available.
- EcoMap users will have the capacity to interact with global mangrove loss, loss drivers, vulnerability, and canopy height maps at 30 meter resolution.
- EcoMap will be available both online and via mobile devices.



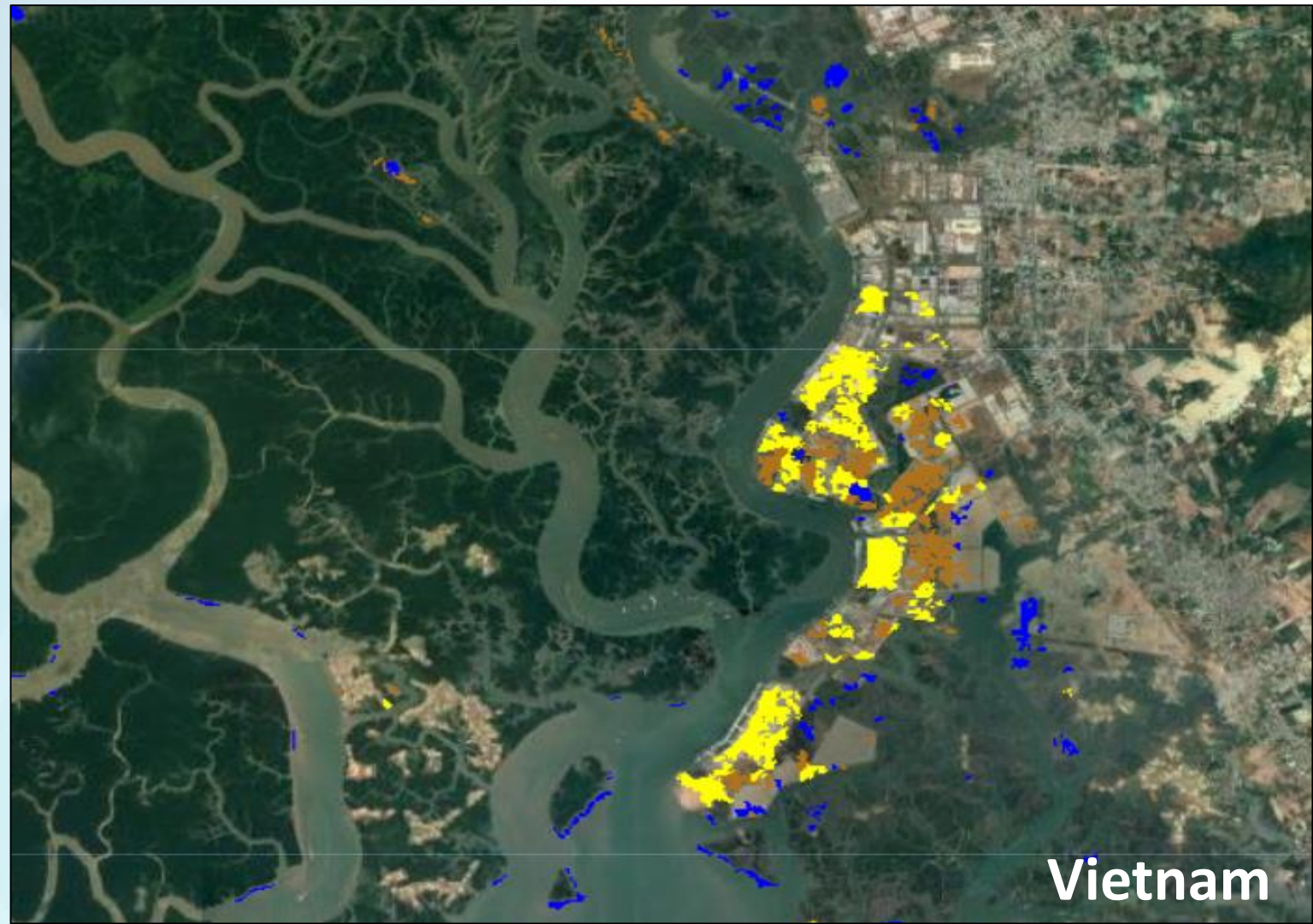
Electronic Coastal Monitoring and Assessment Program (EcoMap)



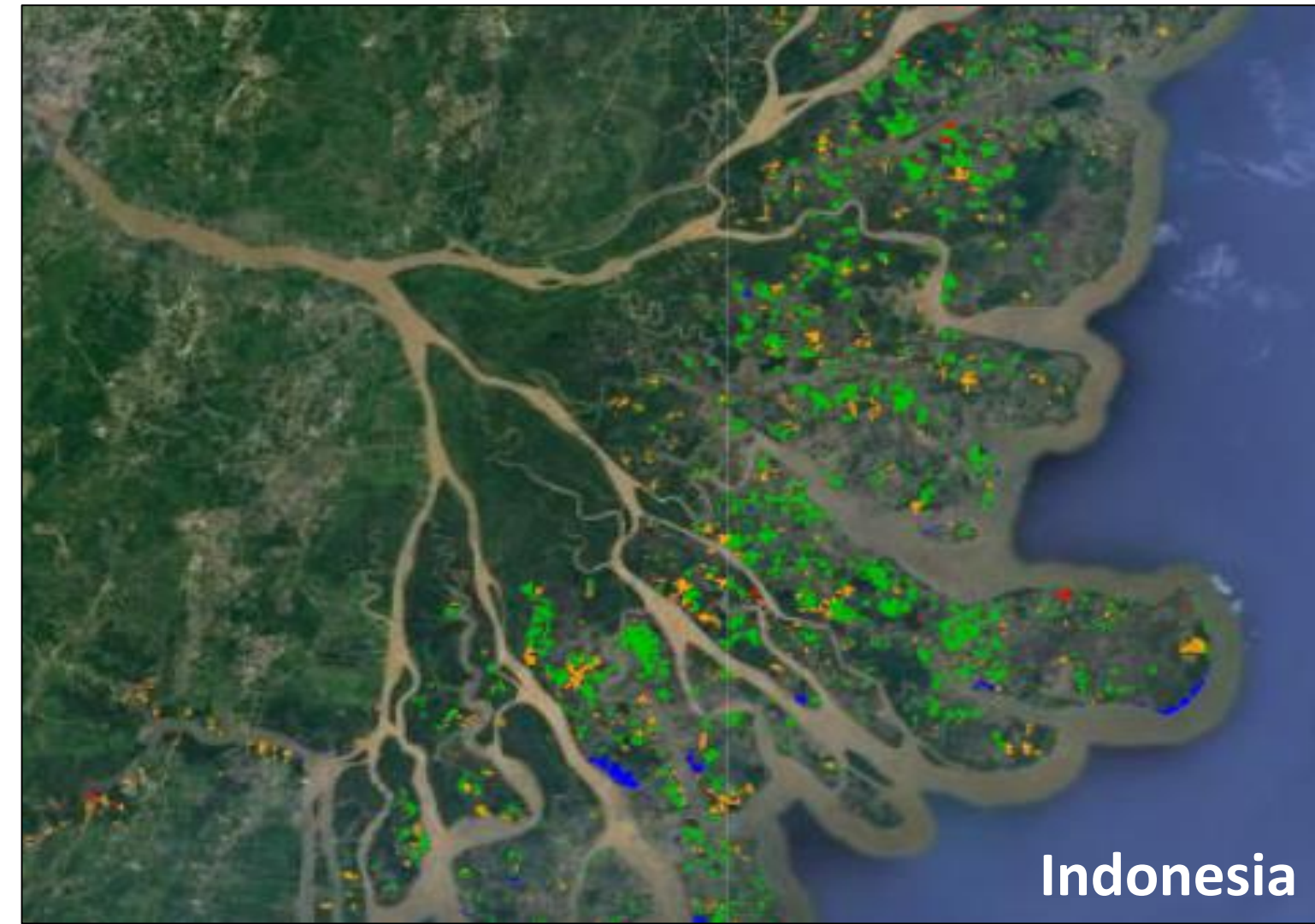
Mangrove Losses and Gains



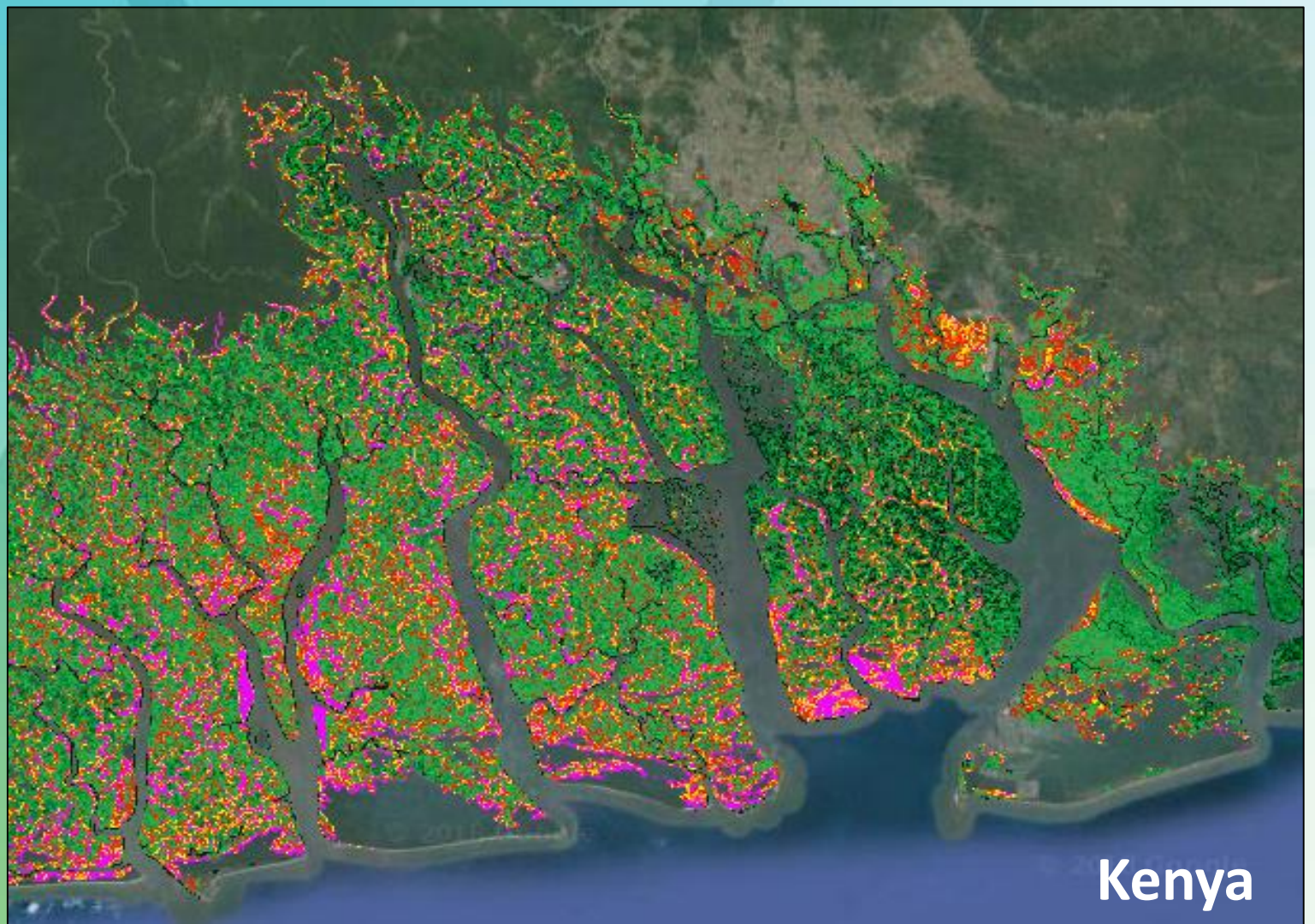
Land Cover Changes



Loss Drivers



Canopy Height



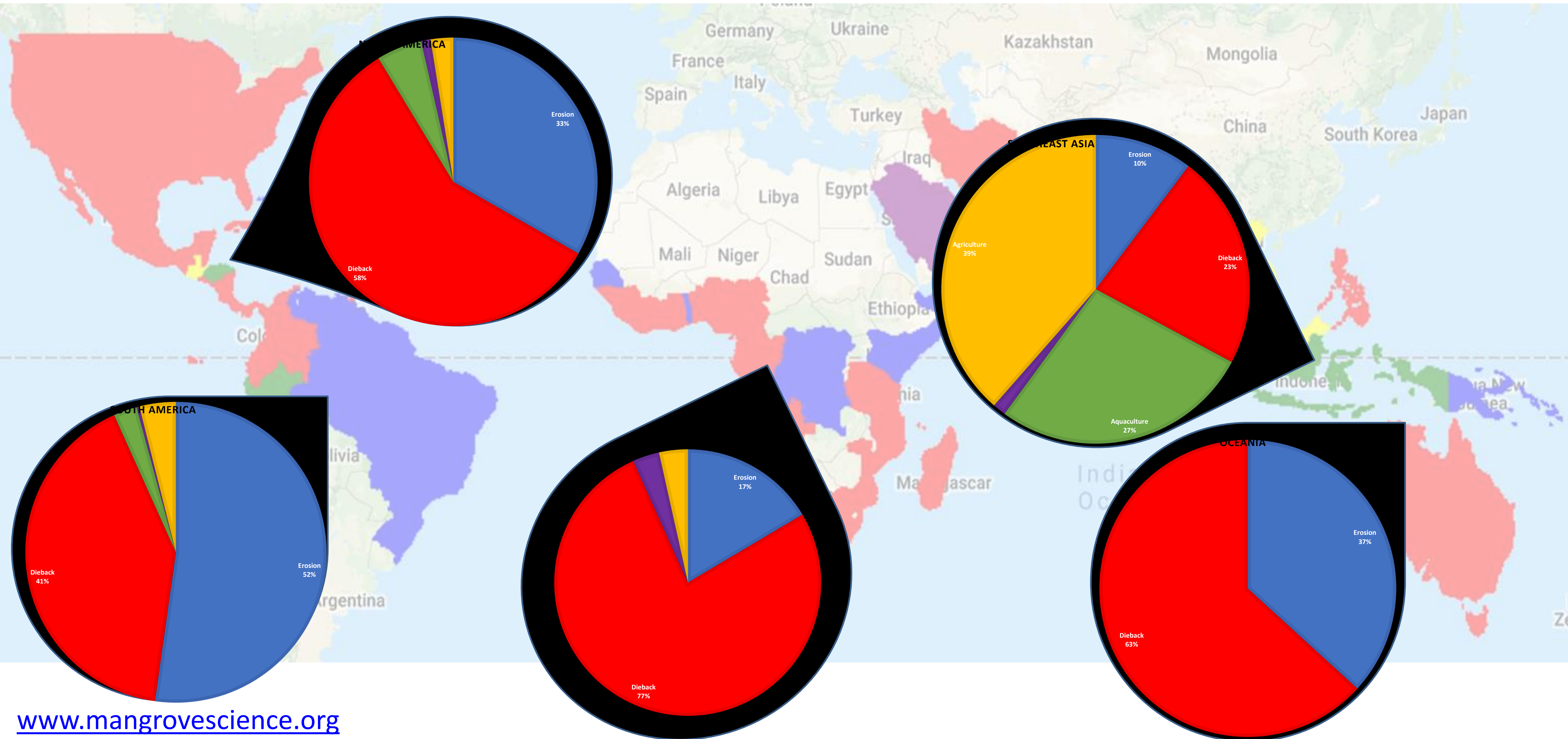
Aboveground Biomass



Total Carbon Stocks



Continental Loss Driver Trends

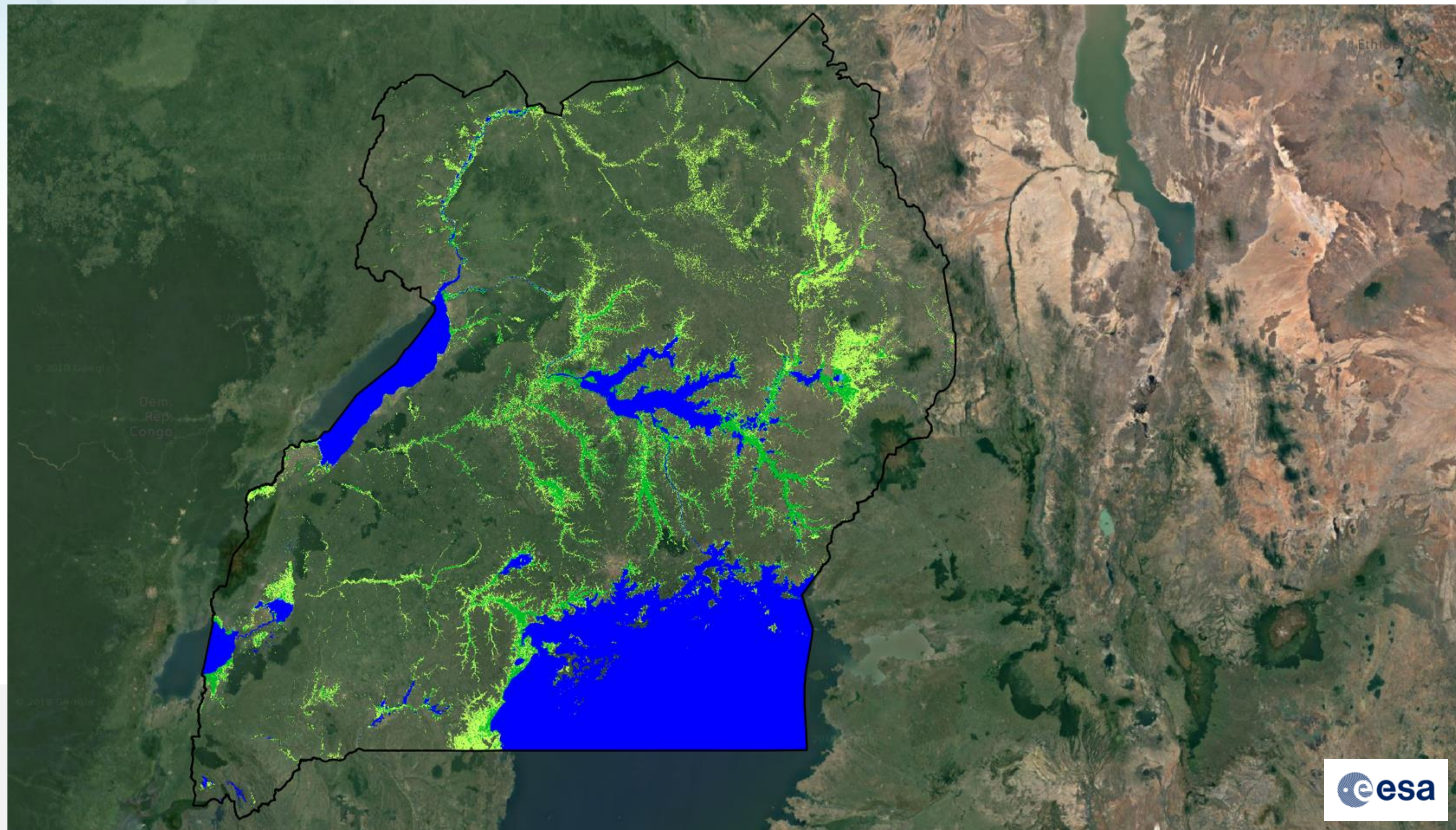


Global EO products in support of SDG indicators

Vegetated Wetlands Inventories for SDG 6.6.1 (water-related ecosystems)



- Permanent Water
- Temporary Water
- Permanent Wetland
- Seasonal Wetland



Maturity

Under validation

Availability

national cases

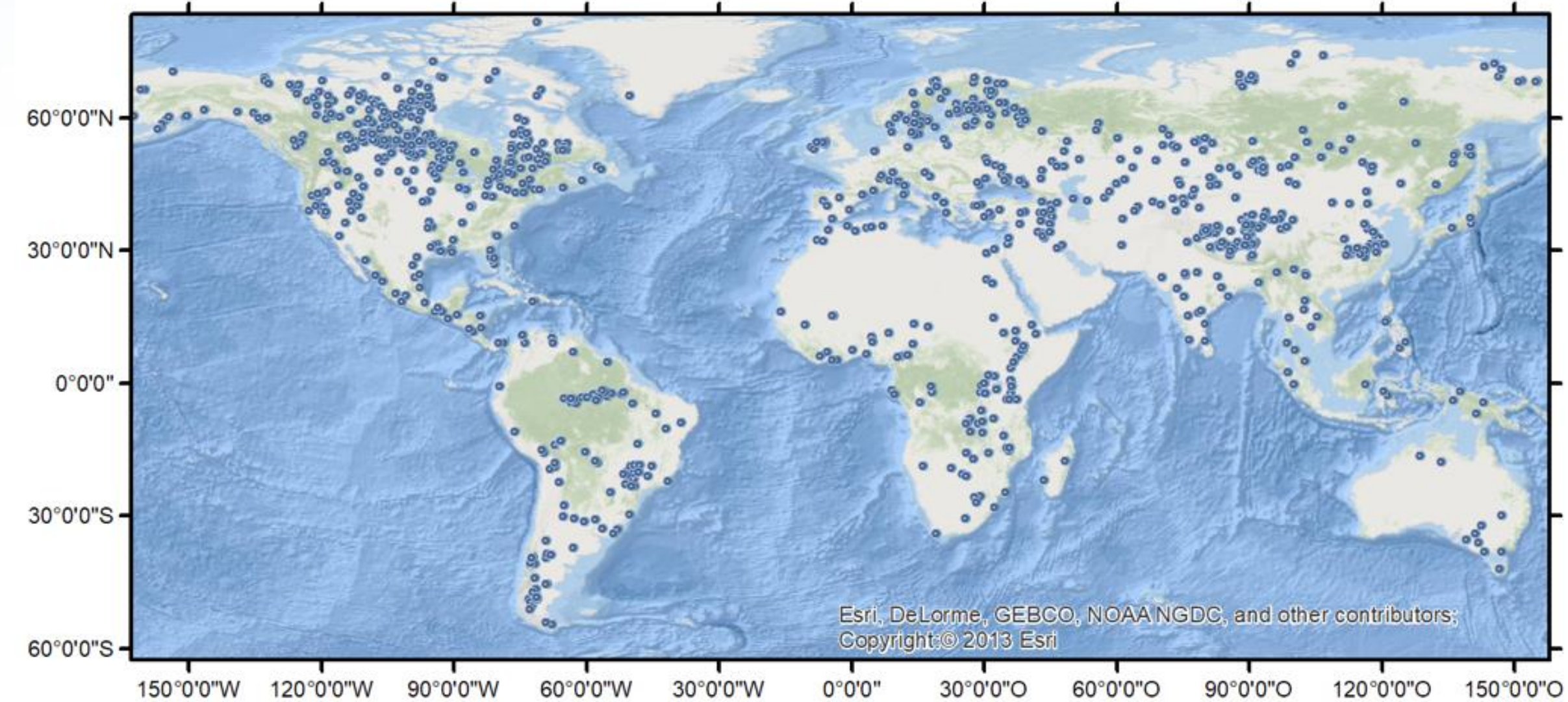
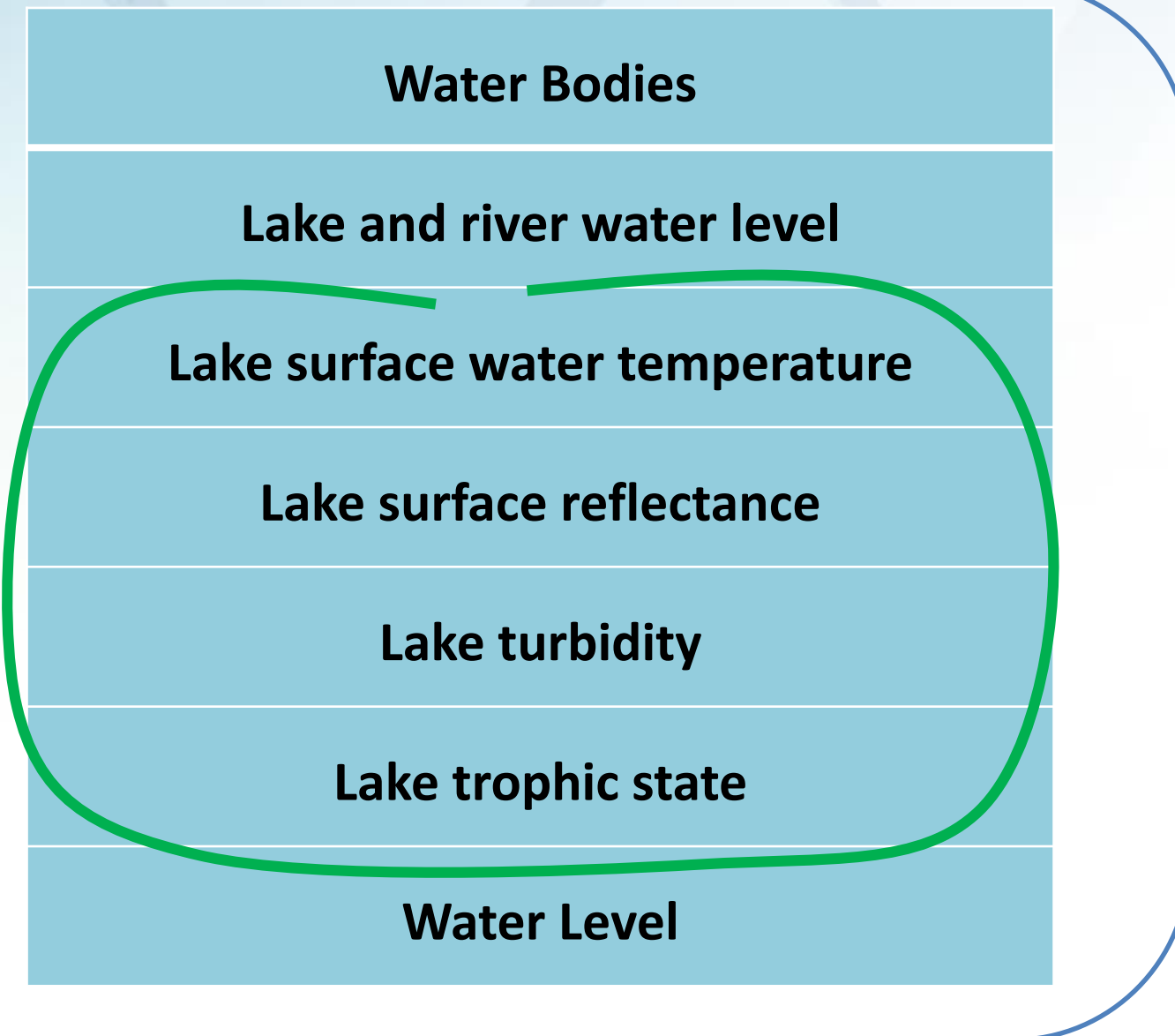
Completeness

2017/18



Global EO products in support of SDG indicators

Lake Water Quality for SDG 6.3.2 and 6.6.1



Parameters

- Lake Surface Reflectance (all bands)
 - Lake turbidity
- Trophic state (based on CHL concentration)
 - Lake Water Temperature

Coverage

- 1,000 selected lakes

Temporal

- 10days averages
- 2002 – 2012; 2016 - ongoing

Spatial resolution

- 300m, 1km
- 100m (in evolution)

Evolution

Evolution towards a seamless global product covering all water bodies at 100m resolution

Maturity

needs tailoring

Availability

1,000 lakes

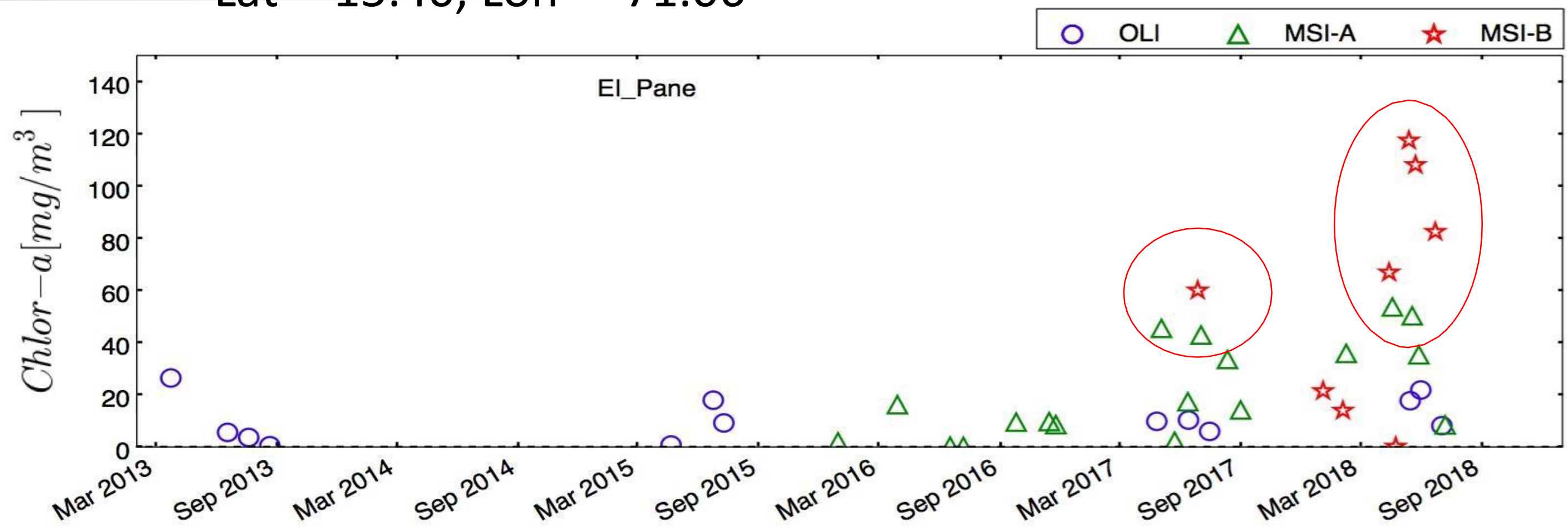
Completeness

2002-2012

Developing a Decision Support System



Lat = -15.40, Lon = -71.06



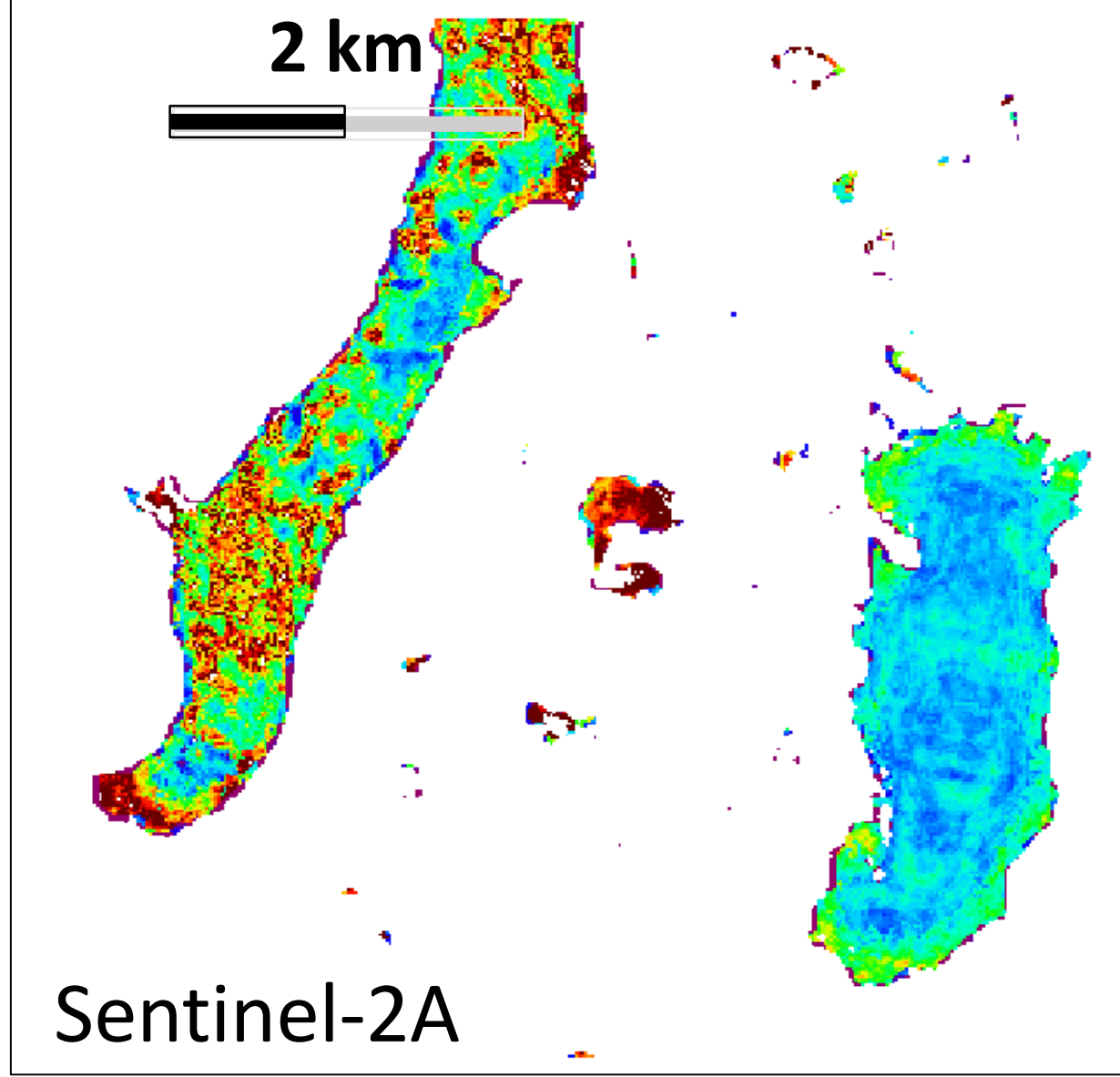
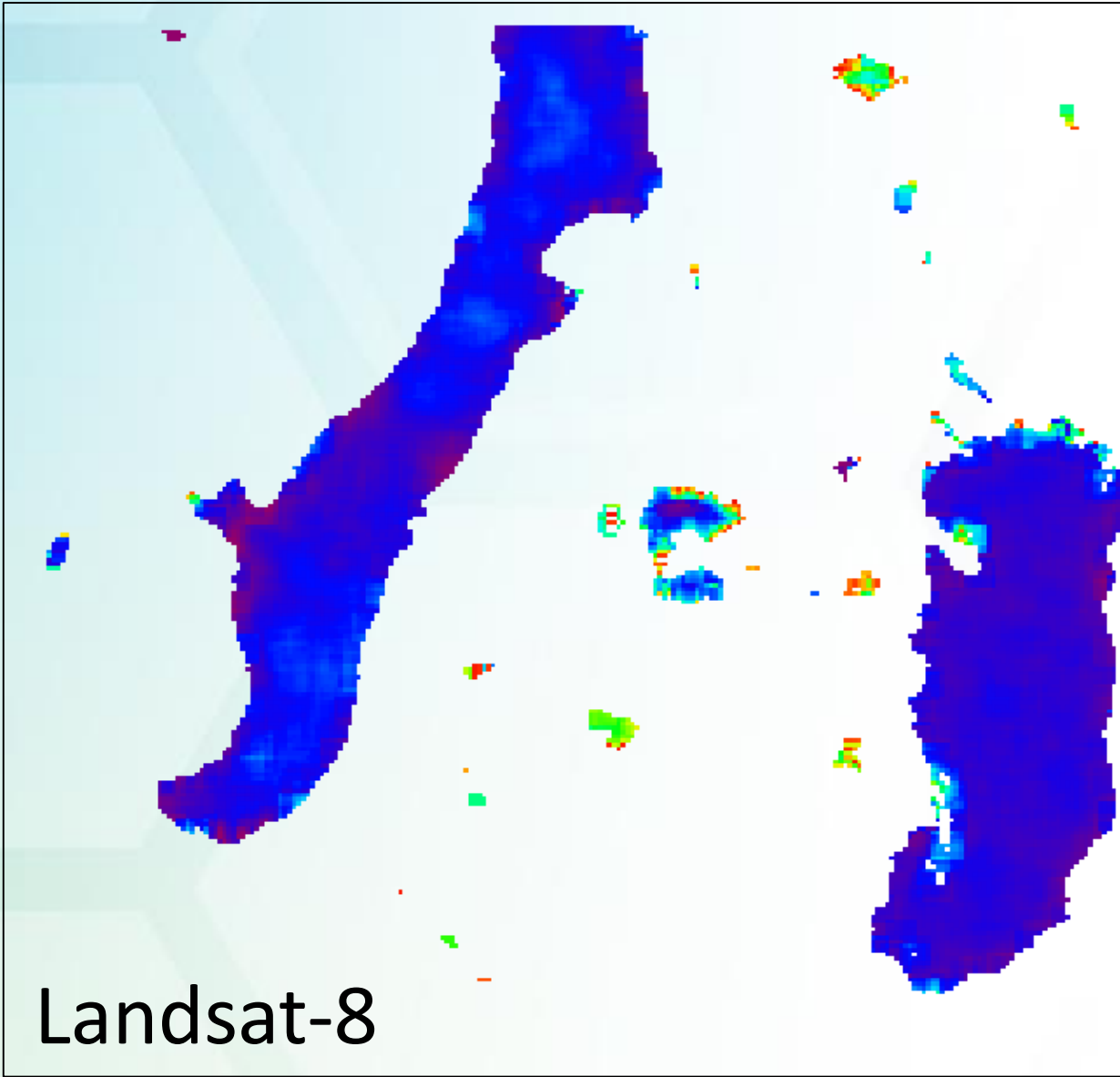
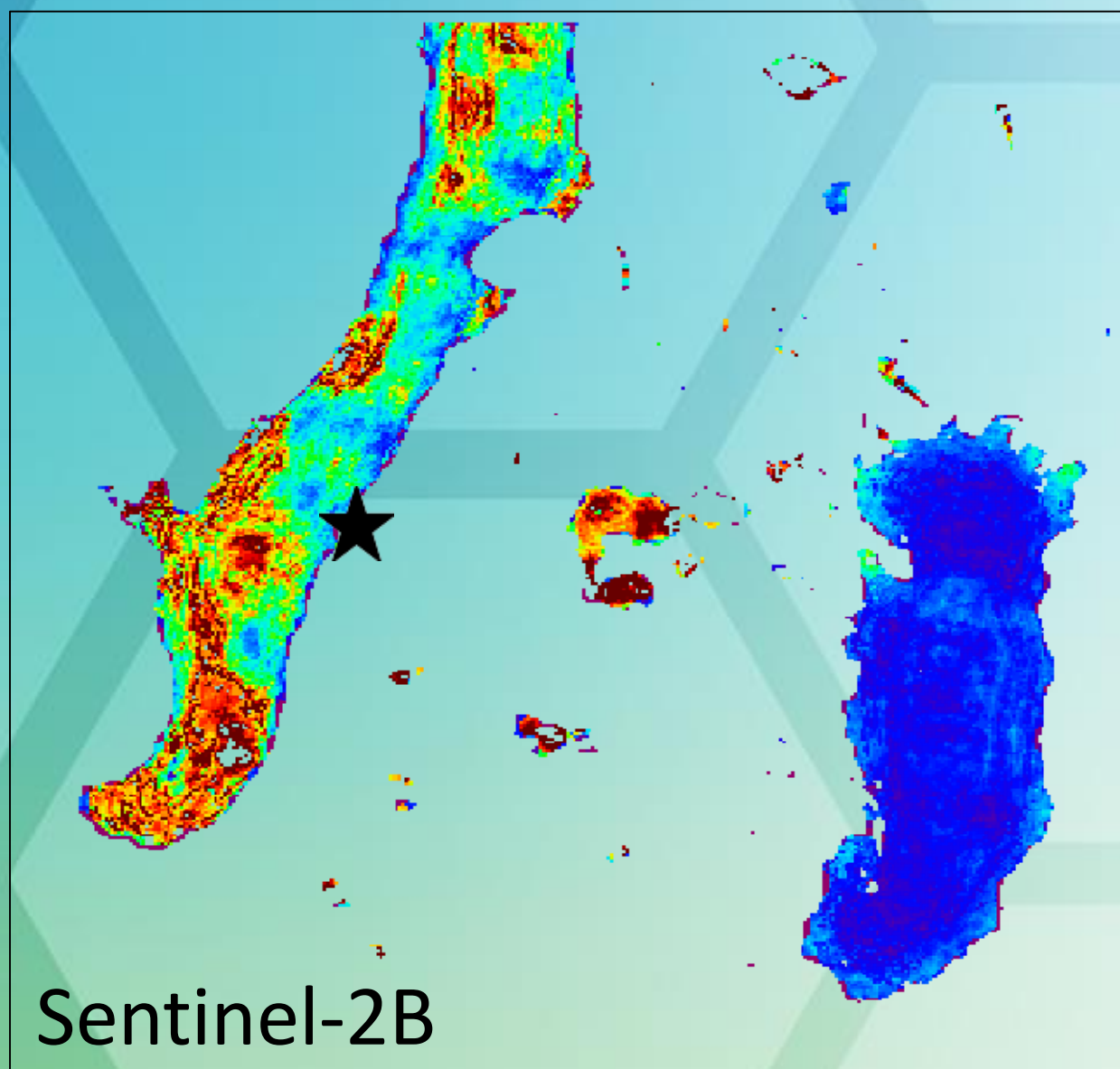
Time-series corresponds to the marked location (star)

Example: El Pañe Reservoir in Perú: water supply for Arequipa city

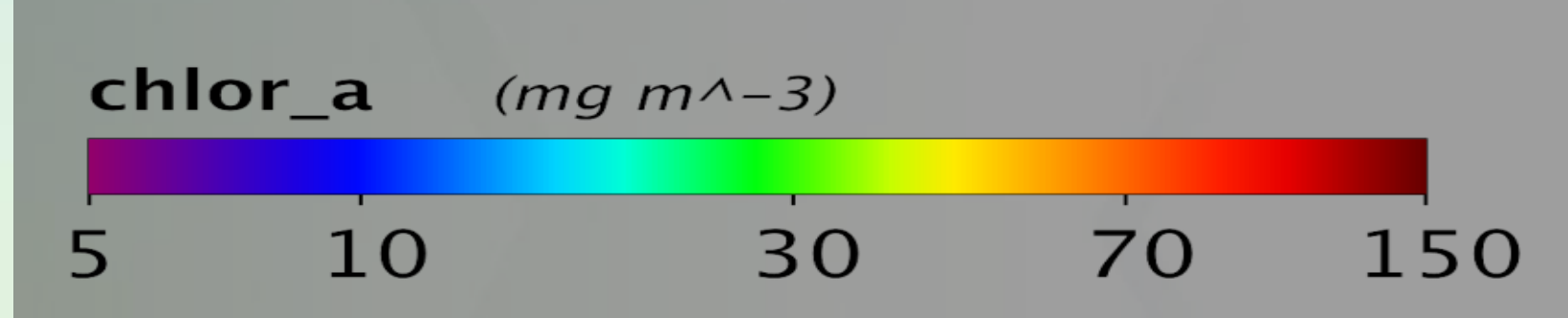
29th June 2017

17th July 2017

13th August 2017



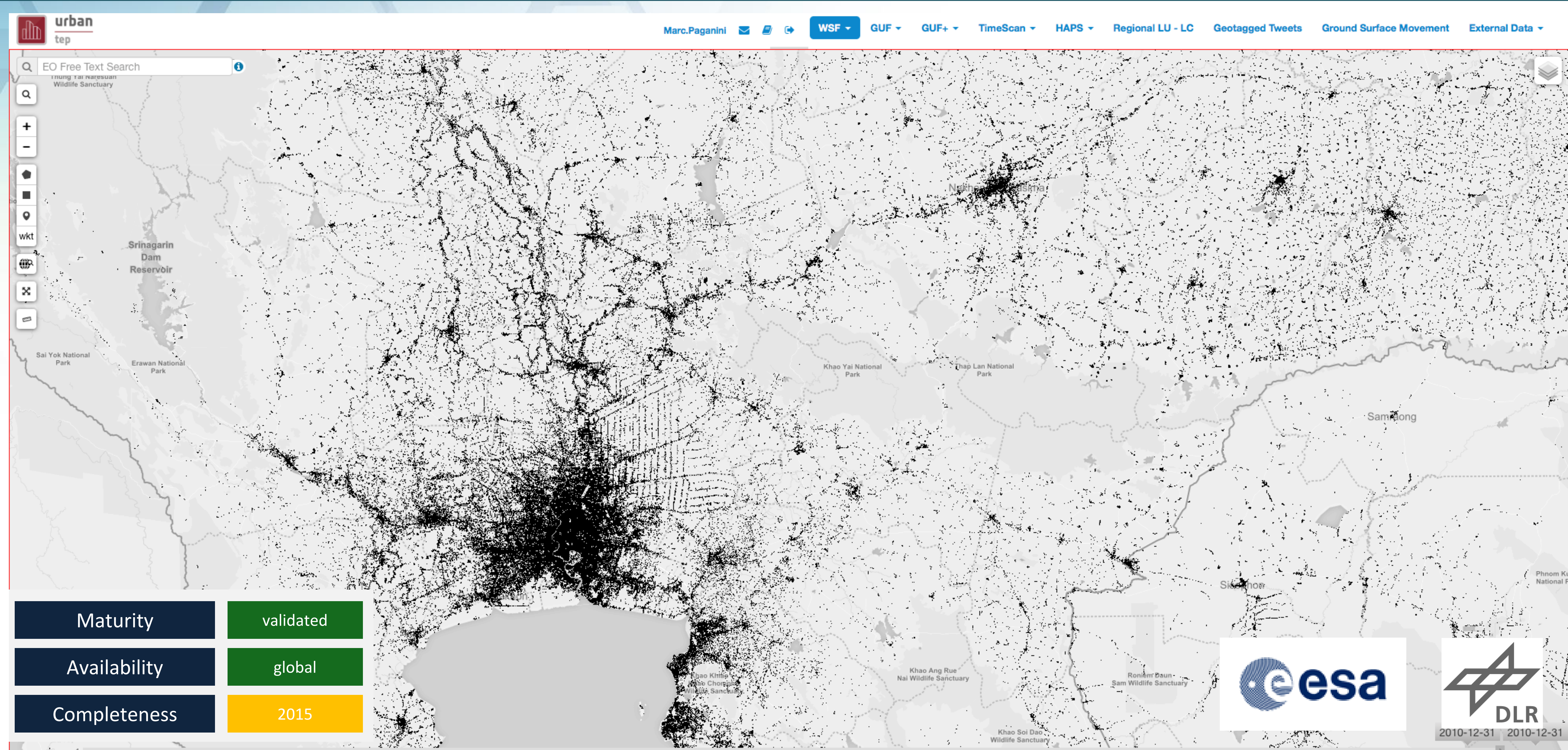
Current monitoring: Monthly at 2 locations



Chlorophyll-a

Global EO products in support of SDG indicators

World Settlement Footprint (WSF) for SDG 11.3.1 (sustainable urbanization)



Global EO products in support of SDG indicators

Global land cover and land productivity dynamics for SDG 15.3.1 (LDN)

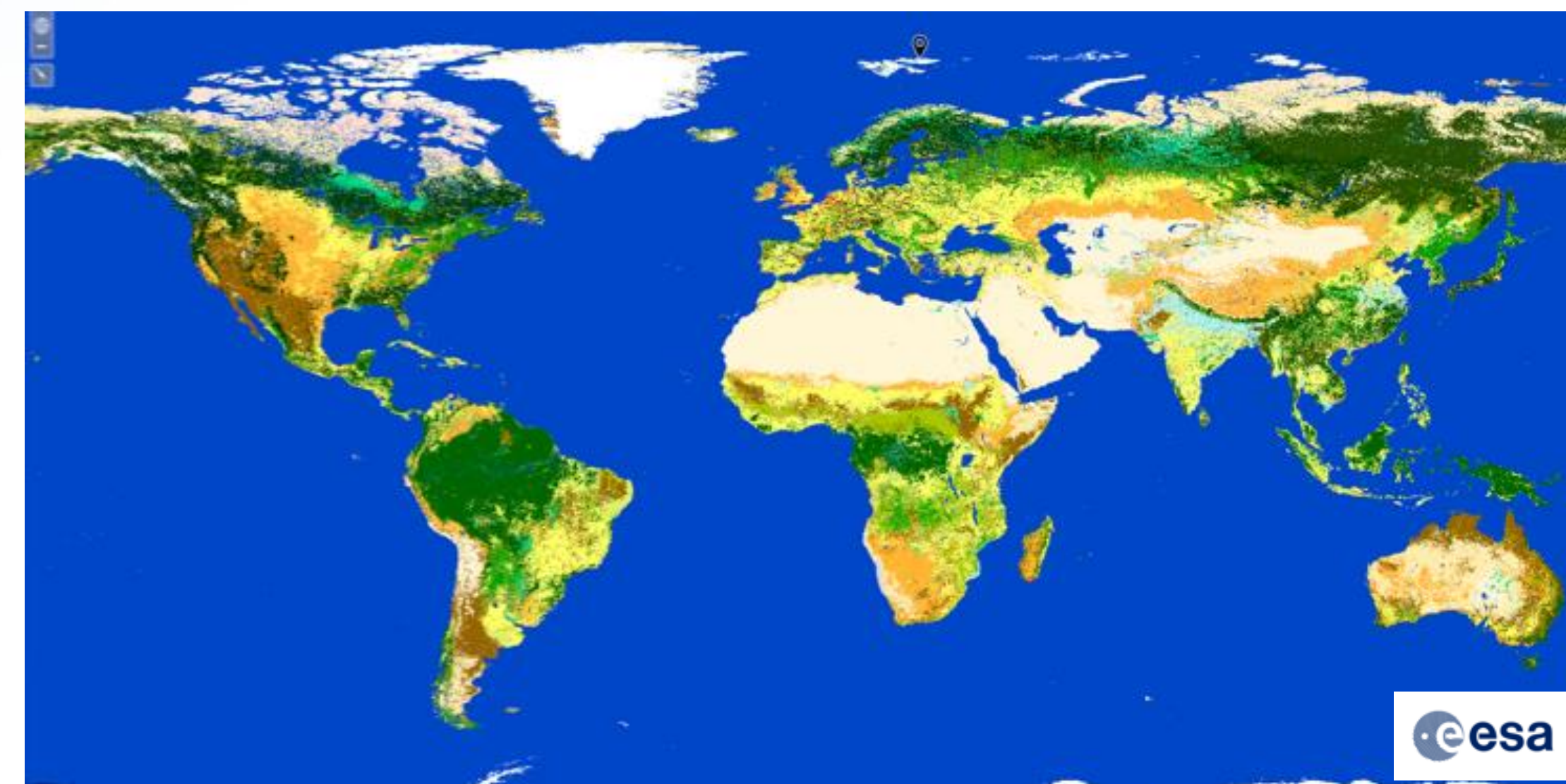


Land Cover

Global land Cover Maps, 1992-2015, Annual maps

AVHRR, SPOT VGT, ENVISAT MERIS, MODIS, PROBA-V, Sentinel 3, 300m

ESA Land Cover CCI

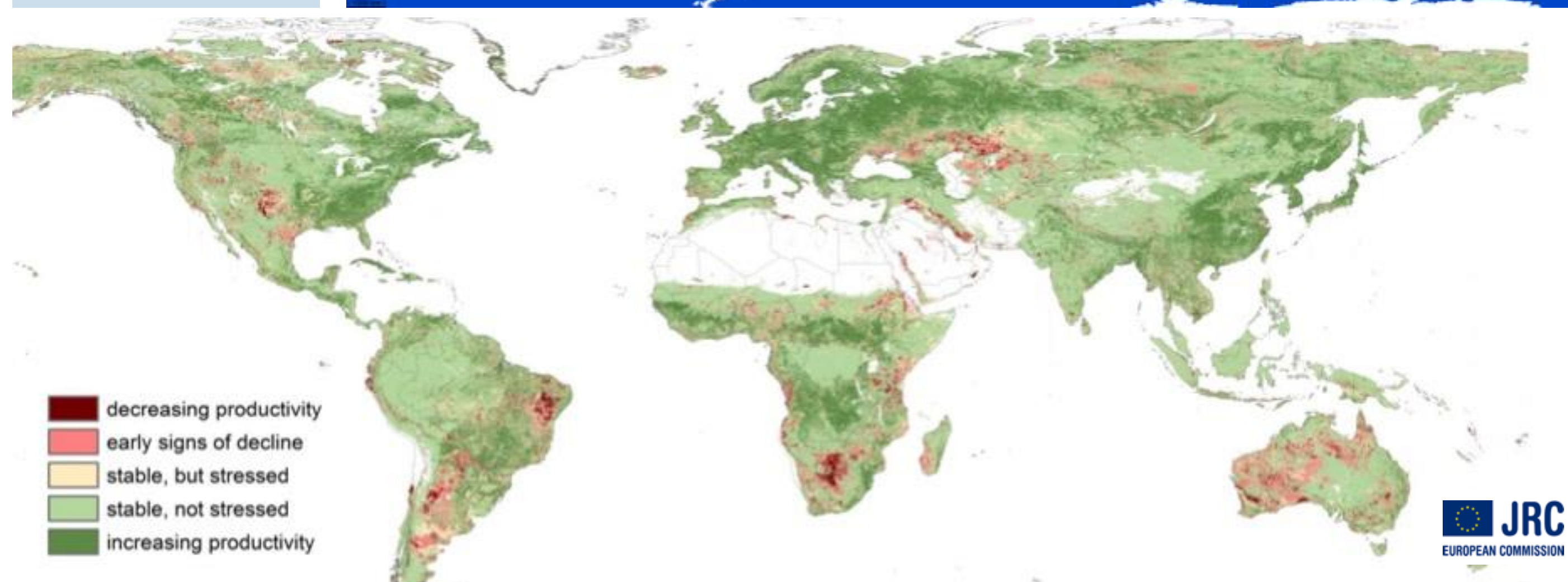


Land Productivity Dynamics

LPD derived from 1999-2013 NDVI phenological analyses

SPOT VEGETATION, 1km

EC Joint Research Center (JRC)



Maturity

coarse resolution

Availability

global

Completeness

2000-2015

Monitoring 15.3.1. on the status & trends in land degradation is based on sub-indicators:
 (1) **Land Cover and Land Cover Changes** (2) **Land Productivity** (3) **Soil Organic Carbon**

Timeline of Recent Activities with EO4SDG Engagement

March
2018

June
2018

July
2018

October
2018

November
2018

March
2019

4/9-12 7th IAEG-SDGs Mtg.

4/24-25 UNEP Regional Workshop, Bogota, Colombia

4/ 26-28 9th Global Forum on Urban Resilience and Adaptation

5/2 UN SPB Forum

5/7-12 GEOGLAM RAPP/ SDG/ ARDC Workshop

6/11-12 GEO Symposium

6/17-18 Congress on SDGs - Black Sea Region

6/18-22 UNEP Regional Workshop, Bangkok,

06/27 WGGI Virtual Mtg.

7/9-18 UN HLPF

7/30-8/3 UN-GGIM 8, SDG Training

8/12, 15-17 RCMRD Conference, SDG 11.3.1 training

8/26-31 World Water Week

9/6 IAEG-SDGs Virtual September Mtg.

9/ 17-19 UN/ Austria Symposium, Space for SDGs

9/24-25 73rd UNGA

10/16-18 32nd CEOS Plenary

10/22-24 UN World Data Forum 2018

10/29-11/2 GEO Week 2018

11/5-8 8th IAEG-SDGs Mtg.

11/7-9 UNEP SDG 6.6.1 Consultation Workshop, Lake Como, Italy

11/19-21 UN World Geospatial Congress

12/6-8 5th WGGI Mtg. & UN GGIM International Seminar

12/ 10-14 AGU Fall Meeting

2/18-22 UN Habitat N. Africa/Arab States/W. Asia Workshop

3/5-8 50th Session - UN Statistical Commission

3/11-15 UNEA 4

Task Stream II: Application of satellite EO data for the SDG indicators

Task III:

Provide recommendation on the role of NSOs on the uptake of analysis-ready satellite earth observations

Deliverables

- Toolkit of effective methods, including statistical practices and uses of geospatial information and fit-for-purpose EO datasets, and examples of use cases.

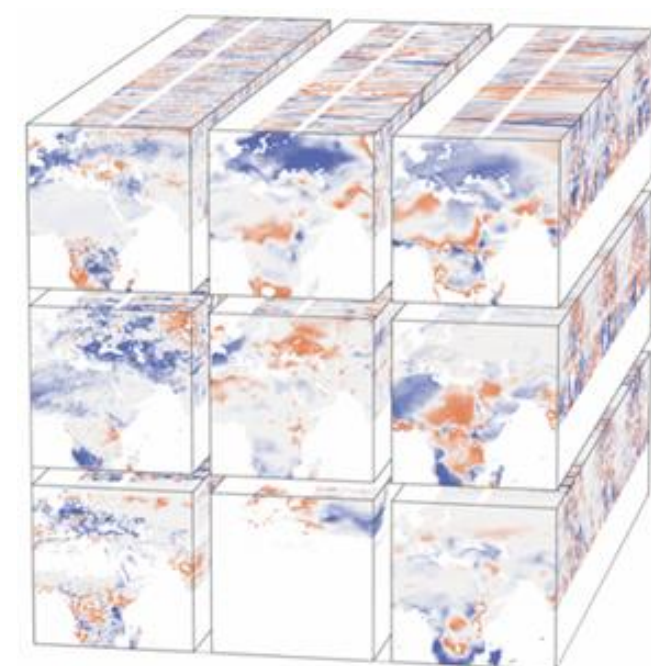
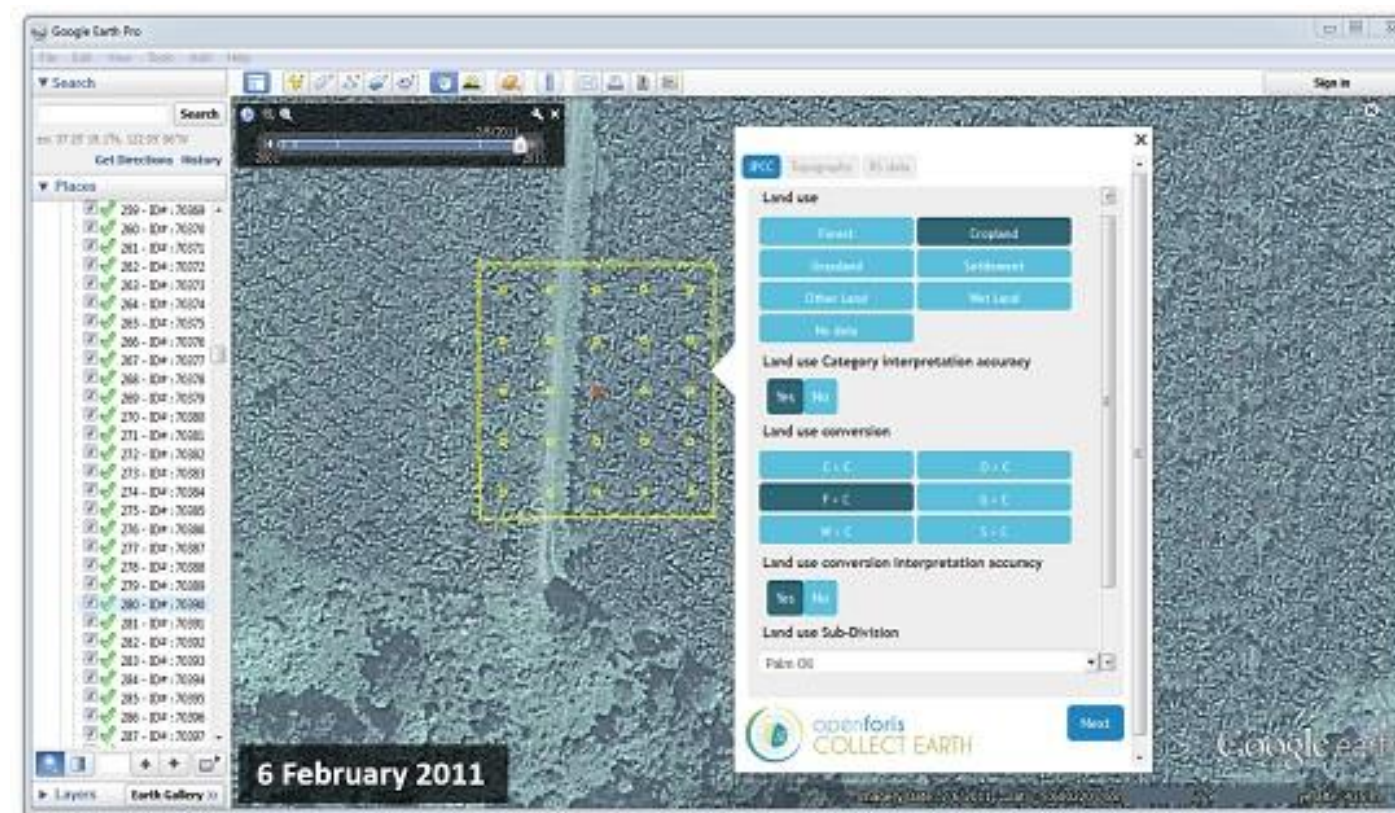


SDG 6.6.1

Custodian	UN Environment, Ramsar
Indicators	Change in extent of water-related ecosystems over time
Sub-Indicators	<ul style="list-style-type: none"> • Spatial extent of open water bodies • Spatial extent of vegetated wetlands • Lake Water Quality • <i>Other not relevant for EO</i>
Custodian's expert group	ESA, NASA, EC/JRC (GSWE), JAXA (GMW)
EO in Custodian guidelines	Level 1 includes 2 Sub-Indicators based on EO global data from which will be validated by countries against their own methodologies and datasets.
EO products	<ul style="list-style-type: none"> • Dynamics of surface waters • Vegetated Wetland inventory (with high level classification) • Surface Water quality (Chl-a /Trophic State Index, TSM / Turbidity)
Source of EO	<ul style="list-style-type: none"> • Landsat, Sentinel 1, Sentinel 2, ALOS-2 Palsar-2 (ScanSAR) • Palsar-2, Landsat-8, S1, S2 • MODIS, VIIRS, S3 OLCI & S2 + L8

Global Datasets	<ul style="list-style-type: none"> • Global Surface Water Explorer (GSWE), EC/JRC • Global Mangrove Watch (GMW), JAXA • Copernicus Global Land Service, Lake Water Quality, EC
EO good practice examples	<ul style="list-style-type: none"> • Examples from SWOS (EC), GW Africa (ESA), EO4SD Water (ESA), other projects • GPSSD project in Uganda (wetlands) • NASA pilot projects
Platforms (with data analytics)	<ul style="list-style-type: none"> • GSWE (global-surface-water.appspot.com) • ESA TEP Hydro (hydrology-tep.eo.esa.int)
S/W Toolbox	<ul style="list-style-type: none"> • Open Data Cube (free, open source) • SWOS Toolbox (free) • GlobWetland Africa Toolbox (free, open source)
GEO Initiative	<ul style="list-style-type: none"> • GEO Wetlands
Knowledge Hub	<ul style="list-style-type: none"> • GEO Wetlands Portal (in construction) http://portal.swos-service.eu/mapviewer/
National Experience	<ul style="list-style-type: none"> • Colombia • Australia • Others?

Collaborative "big data" exploitation platforms



**OPEN
DATA
CUBE**

Calculate Indicators

Step 1: Prepare sub-indicators
 Option 1: Use default UNCCD data
 Calculate all three sub-indicators in one step
 Option 2: Use customized data
 Productivity Land cover Soil organic carbon

Step 2: Calculate final SDG 15.3.1 indicator
 Option 1: Use single unit for analysis (e.g. country boundary)
 Calculate final SDG 15.3.1 spatial layer and summary table for total boundary
 Option 2: Use sub-units for analysis (e.g. province, state or district boundaries)
 Calculate area summaries of a raster on sub-units

Summary of SDG 15.3.1 Indicator		
	Area (sq km)	Percent of total land area
Total land area:	204,483.5	100.00%
Land area improved:	55,463.2	27.12%
Land area stable:	94,652.8	46.29%
Land area degraded:	53,966.4	26.39%
Land area with no data:	401.0	0.20%

CONSERVATION INTERNATIONAL | **TRENDS.EARTH** tracking land change

Copernicus
Data and Information
Access Services (DIAS)
DG GROW
Unit 13



WWW.CREODIAS.EU



WWW.MUNDIWEBSERVICES.COM



WWW.ONDA-DIAS.EU



WWW.SOBLoo.EU



WWW.WEKEO.EU

SDG 11.3.1

Custodian	UN Habitat
Indicators	Ratio of land consumption rate to population growth rate
Sub-Indicators	<ul style="list-style-type: none"> • Land consumption rate • Population growth
Custodian's expert group	EC/JRC (GHSL)
EO in Custodian guidelines	Extensive consideration of EO in methodology. The Global Human Settlement Layer (GHSL) open framework is proposed for global open spatial baseline data production (built-up and population grids).
EO products	<ul style="list-style-type: none"> • Human settlements (built up) • Population density (census population data disaggregated with EO)
Source of EO	<ul style="list-style-type: none"> • <i>Free</i>: Landsat, Sentinel 1, Sentinel 2, • <i>Commercial</i>: WorldView, Pleiades, GeoEye, SPOT 6/7, TerraSAR-X, Cosmo-Skymed

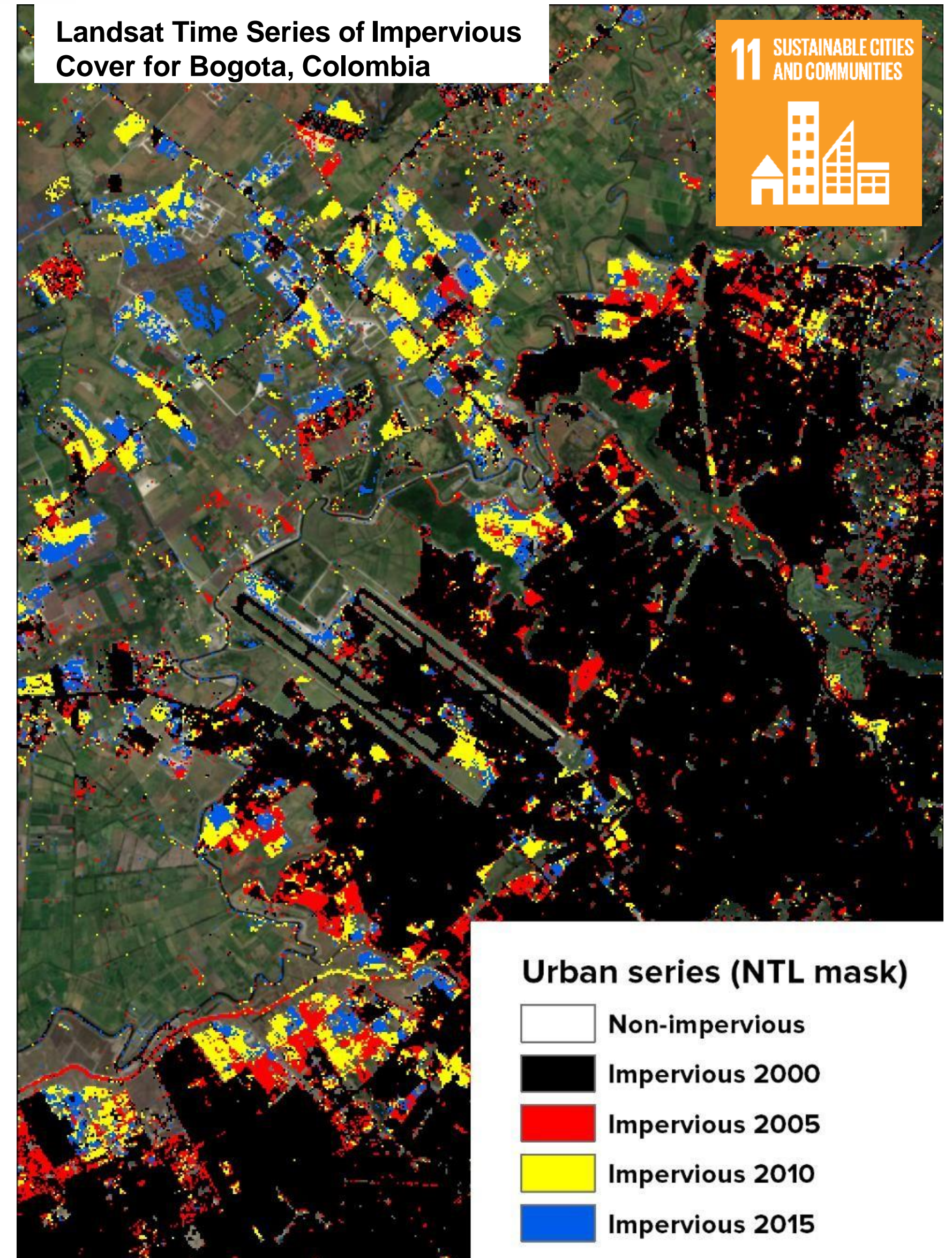
Global Datasets	<ul style="list-style-type: none"> • Global Human Settlement Layer (GHSL 2015, 2000, 1990, 1975), EC/JRC • World Settlement Footprint (WSF 2015, soon WSF Evolution), DLR/ESA
EO good practice examples	<ul style="list-style-type: none"> • Examples from EO4SD Urban (ESA), GEO Human Planet, • CIESIN
Platforms (with data analytics)	<ul style="list-style-type: none"> • GHSL Portal (GHSL.jrc.ec.europa.eu) • ESA TEP Urban (urban-tep.eo.esa.int) • CI/NASA Trends.earth (in construction)
S/W Toolbox	• N/A
GEO Initiative	• GEO Human Planet
Knowledge Hub	• GHSL Portal
National Experience	<ul style="list-style-type: none"> • Colombia • Mexico • Others?

- ✓ EO contributes to many SDG 11 targets, i.e., 11.1 (slums), 11.3. (planning), 11.6 (air quality/waste management) and 11.7 (urban green/public places) & respective indicators
- ✓ The value of global urban extent data sets or global sampling of cities (Atlas of Urban expansion from NYU/Lincoln Institute of Land Policy) are key for global & national level monitoring & reporting
- ✓ There is a need for method comparability, standardization of datasets for indicator production, capacity development at national level, tools and collaborative platforms.

Development of tool to assess the ratio of land consumption rate to population growth rate [NASA/CI Collaboration in support of EO4SDG]

Trends.Earth leverages Google's Earth Engine platform to integrate EO from multiple sources at user-defined scales and timeframes.

Close collaboration w/ UN Habitat & countries.



Urban TEP for SDG 11.3.1 (Land consumption rate)



urban
tep



Background



Use Scenarios



Data & Services



Quick Start



Activities



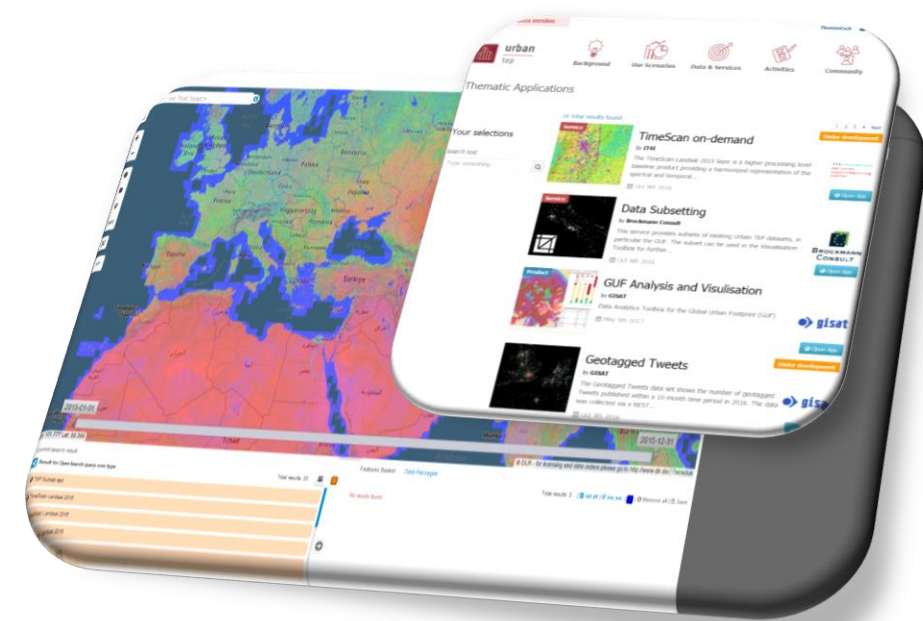
Partners

<https://urban-tep.eo.esa.int>

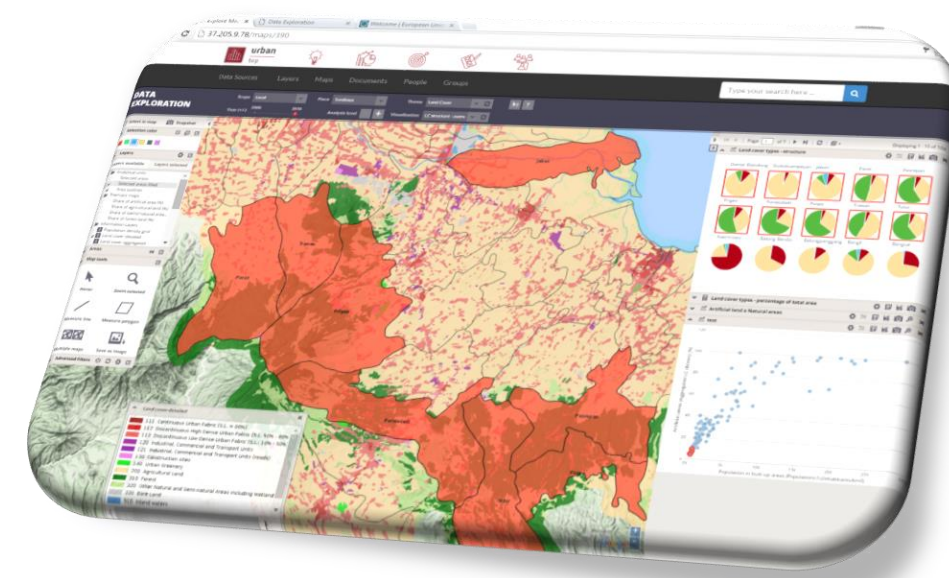
Global Urban Footprint (GUF) layer now available

Discover DLR's new Global Urban Footprint (GUF) data at the Urban TEP platform and inspect the urban and rural human settlements pattern in a so far unique precision and consistency

Browse GUF



**Geobrowser &
Catalogue**

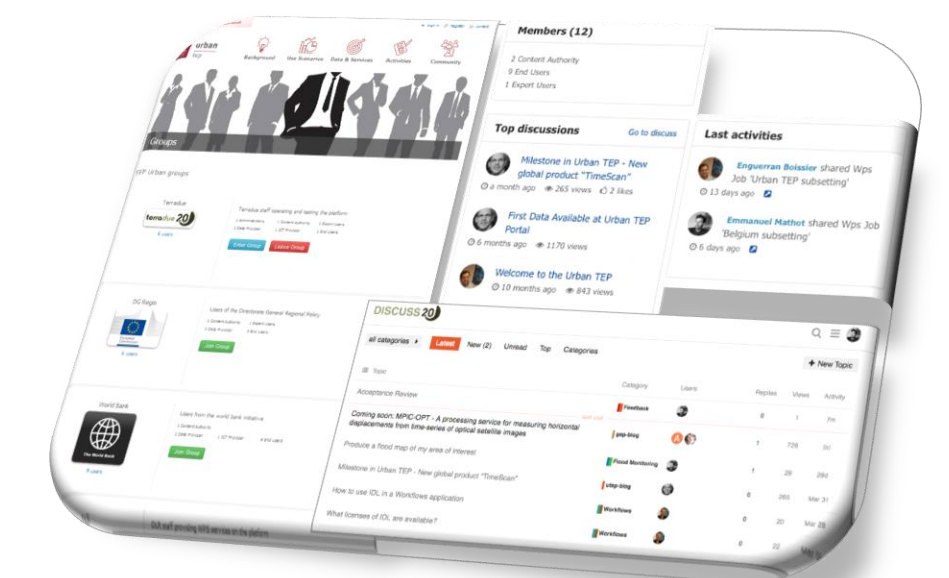


**Visualization and
Analytics**

standardised interfaces (OGC, WPS, WMS)



**Developer
Environment**



User Forum

SDG 15.3.1



Custodian	UNCCD
Indicators	Proportion of land that is degraded over total land area
Sub-Indicators	<ul style="list-style-type: none"> • Land Cover Change • Land Productivity • Carbon Stock Change (above and below ground)
Custodian's expert group	CSIRO, ESA, NASA, EC/JRC (WAD)
EO in Custodian guidelines	Good Practice Guidance (GPG) has been developed by the UNCCD and its partner CSIRO which deeply integrates EO into the methodology (for Land Cover Change and for Land Productivity).
EO products	<ul style="list-style-type: none"> • Land Cover / Land Cover change • Land Productivity (based on NDVI phenology)
Source of EO	<ul style="list-style-type: none"> • <i>Land Cover</i>: (300m) MODIS, PROBA-V, S3, soon (20m) Sentinel 2 + Sentinel 1 • <i>Land Productivity</i>: (300m) MODIS, PROBA-V, S3, Soon (30m) L8+S2

Global Datasets	<ul style="list-style-type: none"> • CCI Land Cover, ESA, 300m, 1992-2015, annual • WAD / Land Productivity Dynamics, JRC, 1km, 1999-2013 • AVHRR/GIMMS NDVI, NASA, 8km, 1992-2015 • MOD13Q1-coll16 NDVI, 250m, 2001-2016 • SoilGrids 250m
EO good practice examples	• Examples from LDN-Target Setting Program (based on CCI LC & JRC LPD)
Platforms (with data analytics)	• CI Trends.earth
S/W Toolbox	• Trends.earth (NASA algorithm for Land Productivity, ESA LandCover CCI for LCC)
GEO Initiative	• GEO Land Degradation Neutrality (with CSIRO, ESA, NASA, JRC, SANSA)
Knowledge Hub	• N/A
National Experience	• Country experience from LDN-Target Setting Program (based on CCI LC & JRC LPD)

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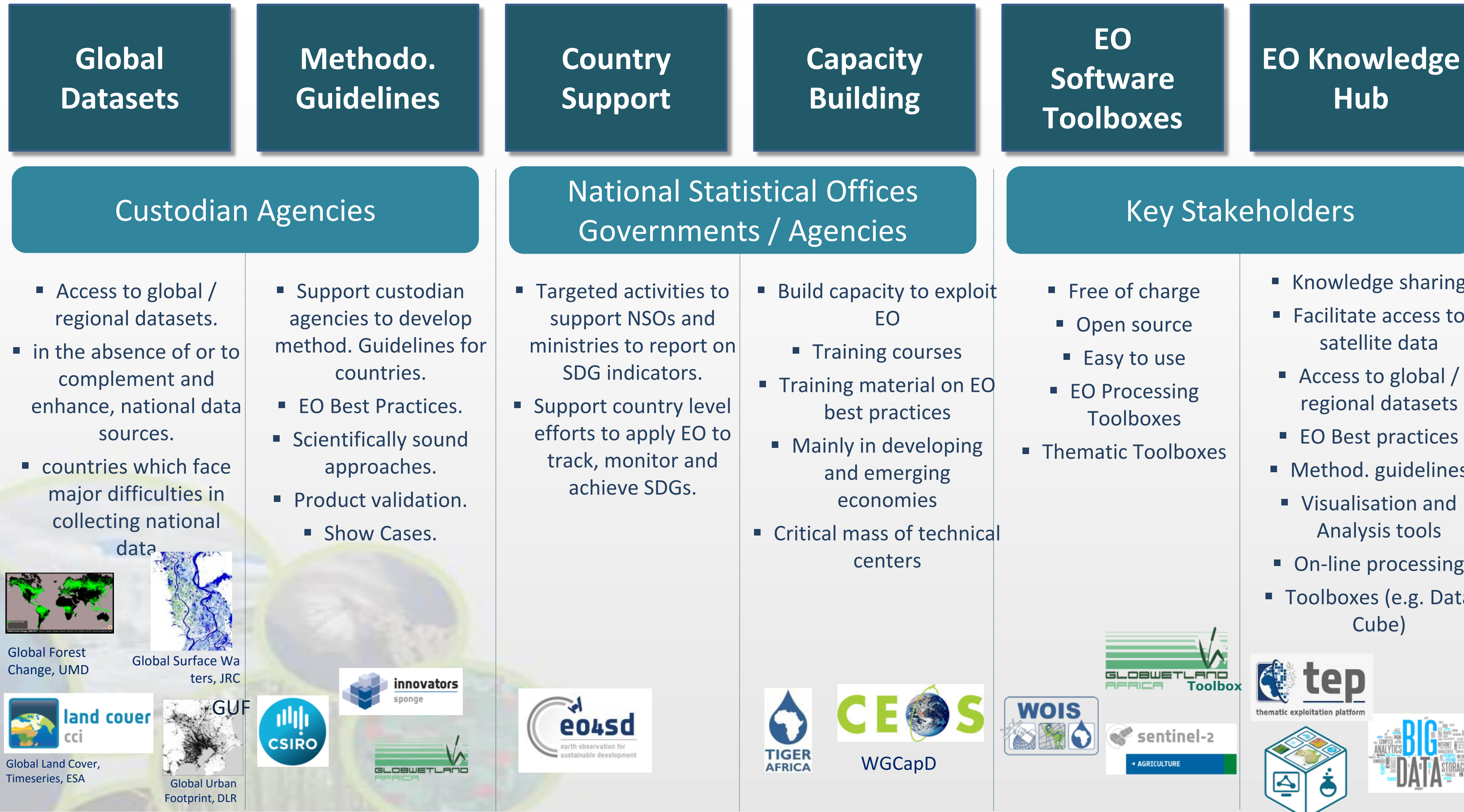
Organization:

The Task Stream II work with all the stakeholders, including UN Custodian Agencies, NSO and its line ministries, academia, civil society, and private sector.

Schedule

The Task Stream II work through 2020 to support the comprehensive review of the Global Indicator Framework by IAEG-SDGs





Schedule

	2019												2020				
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
WGGI													△WGGI#6				
IAEG-SDG					△IAEG-SDG							△IAEG-SDG					
UNSC				△UNSC(NY)												△UNSC(NY)	
Task 1	→																
Task 2	Plan →																
		Projects →															
Task 3	→																
Report														→			