

GEO COMMUNITY & PARTNERS
CAPACITY BUILDING ACTIVITIES
EARTH OBSERVATIONS DATA
TO SUPPORT THE SUSTAINABLE
DEVELOPMENT GOALS
WGGI DECEMBER 2017



Earth Observations in support of the 2030 Agenda for Sustainable Development



| Target <small>Contribute to progress on the Target yet not the indicator per se</small> | | | | | | | | | | Goal | Indicator <small>Direct measure or indirect support</small> | | | | |
|--|------|------|------|------|------|-------|-------|-------|--|------|--|---------|--------|--------|--------|
| | | | | | | | 1.4 | 1.5 | | 1 | 1.4.2 | | | | |
| | | | | | | 2.3 | 2.4 | 2.c | | 2 | 2.4.1 | | | | |
| | | | | 3.3 | 3.4 | 3.9 | 3.c | | | 3 | 3.9.1 | | | | |
| | | | | | | | | | | 4 | | | | | |
| | | | | | | | | 5.a | | 5 | 5.a.1 | | | | |
| | 6.1 | 6.3 | 6.4 | 6.5 | 6.6 | 6.a | 6.b | | | 6 | 6.3.1 | 6.3.2 | 6.4.2 | 6.5.1 | 6.6.1 |
| | | | | 7.2 | 7.3 | 7.a | 7.b | | | 7 | 7.1.1 | | | | |
| | | | | | | | | 8.4 | | 8 | | | | | |
| | | | | 9.1 | 9.4 | 9.5 | 9.a | | | 9 | 9.1.1 | 9.4.1 | | | |
| | | | | | 10.6 | 10.7 | 10.a | | | 10 | | | | | |
| 11.1 | 11.3 | 11.4 | 11.5 | 11.6 | 11.7 | 11.b | 11.c | | | 11 | 11.1.1 | 11.2.1 | 11.3.1 | 11.6.2 | 11.7.1 |
| | | | 12.2 | 12.4 | 12.6 | 12.a | 12.b | | | 12 | 12.a.1 | | | | |
| | | | | 13.1 | 13.2 | 13.3 | 13.b | | | 13 | 13.1.1 | | | | |
| | 14.1 | 14.2 | 14.3 | 14.4 | 14.6 | 14.7 | 14.a | | | 14 | 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 | 15.1.1 | 15.2.1 | 15.3.1 | 15.4.1 | 15.4.2 |
| | | | | | | | 16.8 | | | 16 | | | | | |
| 17.2 | 17.3 | 17.6 | 17.7 | 17.8 | 17.9 | 17.16 | 17.17 | 17.18 | | 17 | 17.6.1 | 17.18.1 | | | |

Fig. 2 SDG Targets and Indicators that can be supported by Earth observations.
Credit: EO4SDGs / CEOS



Integration of Earth Observations and National Statistics for the Sustainable Development Goals (SDGs) in Colombia

Figure 1. Evolution of the indicator and rates for the Barranquilla Metropolitan Area

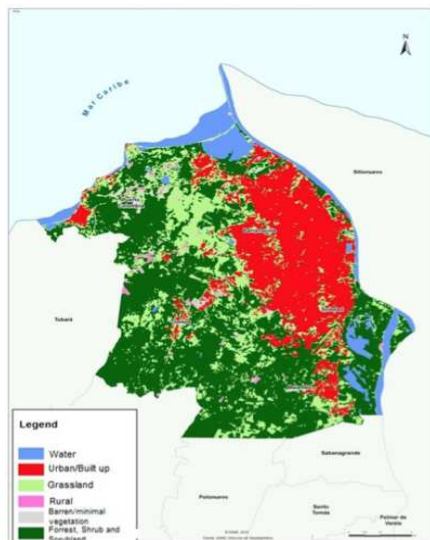
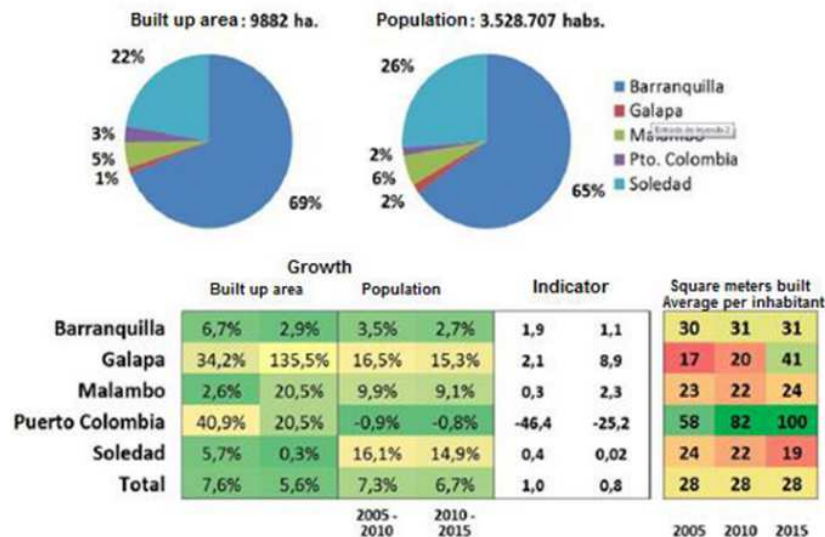


Figure 2. Land cover areas for the Barranquilla Metropolitan Area: year 2015. (Credit: DANE Report “Use of Satellite Images to calculate statistics on land cover and land use”)

- **Colombia’s National Statistics Office (DANE) used Landsat images with population data for 2005, 2010, and 2015, to investigate the relationship between land consumption and population growth (SDG indicator 11.3.1).**
- **DANE is now calculating this indicator for 138 cities in Colombia using Google Earth Engine for image classification and processing.**
- **Together with GEO, CEOS, GPSDD and partners, NASA is working with DANE to:** build capacity in the use and processing of satellite images via webinars and in-country workshops; extend successful method to other countries; identify additional priority areas for collaboration (i.e. air pollution, agriculture, forest management, land cover change, water ecosystems).

WEBINAR TRAINING



Remote Sensing of Land Indicators for SDG 15: 15.1.1 & 15.3.1

June 20-22, 2017

Course Material in English & Spanish

Three-session training:
Satellite observations of land cover;
image classification, change
detection, and techniques for
developing accuracy assessments.

Satellites & sensors: Landsat, MODIS,
Sentinel 3, Suomi NPP/VIIRS

IN PERSON TRAINING



Satellite Observations of Water Quality for SDG 6: 6.3.2

October 24, 2017;

Washington, DC GEOWeek 2017

Three-hour training:
Satellite observations for monitoring
of harmful algal blooms, sediments,
and other water pollutants.

Hands-on Exercises: Acquiring
Satellite-Based Water Quality Data
for SDG Indicator 6.3.2

<https://arset.gsfc.nasa.gov/>



Ghana



April 5-6, 2017: National Forum on Data Roadmaps for Sustainable Development organized with Ghana by GPSDD. Addressed data gaps, data use, data ecosystem, and multi-stakeholder approaches

September 19-20, 2017: Meeting during UNGA events

October 23-27, 2017: NSO participation in EO4SDG Side Mtg. GEO Week Events



GLOBAL PARTNERSHIP
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SERVIR



Senegal



GEO EO4SDG engaging with Senegal National Statistical Office, African Development Bank, GPSDD, ipar, and Knoema.

Key topics include: forest cover, sustainable forest management, food security / agriculture



GLOBAL PARTNERSHIP
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knoema



Kenya



Ministry of Agriculture, GPSDD, SERVIR, and EO4SDG addressing Earth obs. and geospatial info. for SDG monitoring and reporting and to meet Agenda 2063

Topics: Food security, Capacity building in agricultural sector, Cross-regional collaboration, Health

CEOS exploring country-wide data cube



RCMRD

SERVIR



GLOBAL PARTNERSHIP
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African Regional Data Cube

- CEOS, GPSDD, GEO Partnership
- Today much of the archived EO satellite data is underutilized despite availability of computing and analysis infrastructures
- It often not technically feasible or financially affordable for countries to consider traditional local processing and data distribution methods
- The Data Cube allows satellite data to be spatially and temporally aligned in "cubes" of pixels. These data cubes allow efficient time series analyses (e.g. water extent or land change)
- The new African Regional Data Cube (ARDC) will support 5 countries in central Africa: Kenya, Senegal, Sierra Leone, Ghana and Tanzania

Analysis Algorithms In Open Data Cube

- Custom Mosaic Cloud-free mosaic based on median, recent pixel; Tutorial:
<https://www.youtube.com/watch?v=aw3de5098lg> CEOS https://github.com/ceos-seo/data_cube_ui/tree/master/apps/custom_mosaic_tool
- Fractional Cover Land cover (bare soil, PV, NPV) fraction based on Juan Gerschman algorithm CSIRO, CEOS
https://github.com/ceos-seo/data_cube_notebooks OR https://github.com/ceos-seo/data_cube_ui/tree/master/apps/fractional_cover
- pyCCD Land change detection based on Boston Univ. and USGS PyCCD algorithm USGS, CEOS
https://github.com/ceos-seo/data_cube_notebooks
- NDVI Anomaly Change in NDVI CEOS https://github.com/ceos-seo/data_cube_notebooks OR
https://github.com/ceos-seo/data_cube_ui/tree/master/apps/ndvi_anomaly
- SLIP Landslide risk detection based on Dalia Kirschbaum algorithm CEOS, NASA GSFC https://github.com/ceos-seo/data_cube_notebooks OR https://github.com/ceos-seo/data_cube_ui/tree/master/apps/slip
- Coastal Change Change in coastline position based on Australian WOFSC EOS, GA https://github.com/ceos-seo/data_cube_notebooks OR https://github.com/ceos-seo/data_cube_ui/tree/master/apps/coastal_change
- TSM Total Suspended Matter (water quality) CSIRO, CEOS https://github.com/ceos-seo/data_cube_ui/tree/master/apps/tsm
- SWAMPy Water Quality CSIRO, GA
- K-Means Clustering Pixel clustering function to support classification CEOS https://github.com/ceos-seo/data_cube_utilities/blob/master/dc_clustering.python

New GEO Land Degradation Neutrality Initiative

- Created to assist UN Member Countries develop Earth observations, monitoring and reporting necessary to support SDG 15, specifically Indicator 15.3.1 (selected for action by WGGI last year)
- Will also help convene the global community interested in landscape changes and classification to help develop related standards and methodologies;
- Working with UNCCD, the Custodian Agency for this Indicator, the Initiative includes and series of 6 to 8 regional workshops organized for Member Countries by UNCCD starting in 2018
- Initiative will include two workgroups and primary action areas – capacity building, standards development
- Initiative governance will be organized early next year.



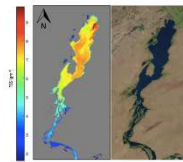
EARTH OBSERVATIONS FOR THE SUSTAINABLE DEVELOPMENT GOALS



EO Case Studies for the 2030 Agenda



UN Environment-GEO-NASA -UMD Collaboration on SDG 6



Land-based concentrations of Total Suspended Solids (TSS) in Lake Calico, Senegal. The warmer colors indicate more turbid waters. The highest TSS concentrations are associated with areas where water flows from the lake toward the Senegal River. The blue color range (0-1000 mg/L) is shown to the right.

The UN Environment-NASA collaboration

Global monitoring of Sustainable Development Goal (SDG) 6 – ensure availability and sustainable management of water and sanitation for all – was initiated in early 2017 following development, testing, and evaluation of methodologies for monitoring the associated indicators. Target 6.6 of SDG 6 calls for the protection and restoration of water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes. The first indicator of this target, Indicator 6.6.1, tracks changes over time in the extent of water-related ecosystems. UN Environment is the custodian agency for this indicator and has developed a step-by-step methodology that explains how to monitor change in the extent of water-related ecosystems over time. A pilot initiative by UN Environment and NASA has been developed to explore the applicability of Earth observation datasets and tools that can be used with country-level generated data to support national reporting on this indicator.

Summary of the components measured and datasets used for the pilot study

| Water Ecosystems Measured | Sub-Indicators Measured | Datasets | Spatial Resolution (m) |
|----------------------------------|-------------------------|--------------------------------------|------------------------|
| Open water | Spatial extent | MODIS/4W CG1.1 | 250 |
| Open water | Spatial extent | Landuse 5, 7, and 8* | 30 |
| Lakes & reservoirs | TSS and Chlorophyll | Landuse 8* and Sentinel-2A1 | 20-30 |
| Wetlands (terrestrial, mangrove) | Spatial extent | Landuse 10, 11*, Sentinel-1A1, SRTM3 | 30 |

*National Assessment and Open Administration (NASA) / US Geological Survey (USGS) / European Space Agency (ESA)

The UN Environment-NASA pilot effort does not intend to replace the country-owned process of SDG data collection and submission; rather, this initiative intends to explore the applicability of Earth observation data to complement country-generated data. The goal of the initiative is to extract information relevant to meeting the reporting requirements of SDG Indicator 6.6.1 from Earth observation data for a select group of pilot countries, utilizing openly available, free-of-charge datasets and tools. In its custodian agency role, UN Environment will subsequently aim to efficiently distribute the successful methods and datasets to countries to support their data-driven decision-making regarding this indicator.



TECHNICAL BRIEF

Reporting on SDG Indicator 6.6.1 Using Satellite Earth Observations

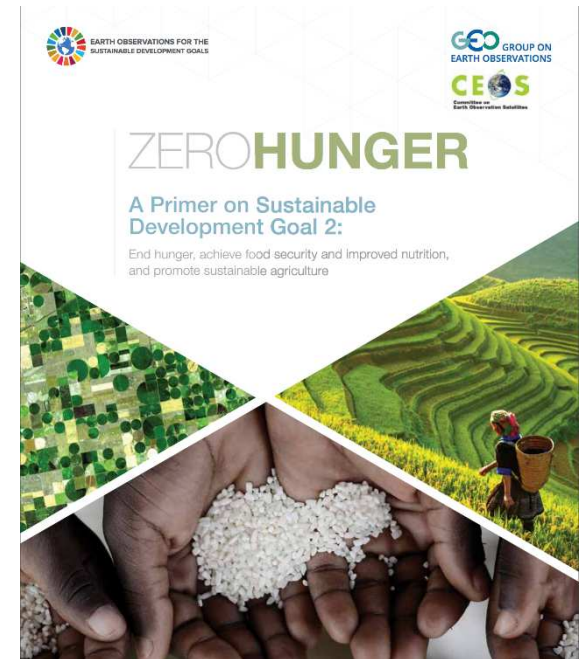
Indicator 6.6.1 tracks changes over time in the extent of water-related ecosystems. While analysis of ground-based, survey data and in-situ measurements is an important part of SDG monitoring and reporting, there is potential for countries to utilize satellite-based Earth observations to meet some of the reporting requirements of Indicator 6.6.1, pertaining to both spatial water extent and quality of waterbodies and wetlands. In collaboration with the Group on Earth Observations (GEO) and space agencies such as NASA, ESA, and JAXA, UN Environment has identified a series of activities that focus on the use of Earth observations to support the monitoring and data collection process for this indicator.

Proof of concept for select pilot countries

A NASA-University of Maryland research team carried out a proof of concept for the initiative, focusing on the ecosystem categories of irrigated wetlands (small mangroves only) and open water (rivers and estuaries, lakes and reservoirs). Two of the three principle water ecosystem sub-indicators, as defined by the UN Water publication "Integrated Monitoring Guide for SDG 6", were mapped and measured: the spatial extent of water-related ecosystems, and the quality of water within these ecosystems. The following aspects of the indicators were analyzed by the team:

1. Spatial extent for open waterbodies.
2. TSS and Chlorophyll for inland waterbodies.
3. Spatial extent for coastal mangroves.

For the extent of open waterbodies the pilot countries included Cambodia, Jamaica, Philippines, Senegal, Uganda and



A Primer on SDG 2, Zero Hunger



EO4SDG-GPSDD-DANE Workshop at DANE HQ, Colombia

In person trainings & webinars



Pilot Activities

Outreach & Engagement

Capacity Building

Information Products



EO4SDG Initiative Website: <http://eo4sdg.org>

Aims to serve as:

- GEO community resource
- UN SDG community resource
- NSOs / Line Ministries resource
- General public resource
- Platform to demonstrate success stories, lessons learned, challenges, opportunities for engagement

Twitter: @EO4SDG
www.facebook.com/eo4sdg/



GEO EO4SDG
Earth Observations in Service of the 2030 Agenda for Sustainable Development

EO4SDG Initiative website:
<http://eo4sdg.org>

WHAT WE DO
Share the latest pilot projects, data and information products, capacity building and outreach activities.

UPCOMING EVENTS
Keep up with the latest events that are relevant to EO4SDG's mission and purpose.

NEWS
See the latest on Earth observations as they relate to Sustainable Development Goals.

USERS & GEO COMMUNITY
Share successes, challenges, lessons learned, and opportunities for engagement.

EO4SDG organizes and realizes the potential of Earth observations and geospatial information to advance the United Nations 2030 Agenda and enable societal benefits through achievement of the Sustainable Development Goals.

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