Land cover products for SDG monitoring

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Inter-Agency and Expert Group on the Sustainable Development Goal Indicators

- https://unstats.un.org/sdgs/iaeg-sdgs/
- Working Group on Geospatial Information
 - Task Stream on Application of satellite Earth Observation Data for the SDG indicators
 - <u>https://unstats.un.org/sdgs/files/Working-Group-ToR--GeoSpatial.pdf</u>
- Aims to
 - Leverage and enhance partnership with Space Agencies active in the Group on Earth Observations (GEO) Earth Observations for the Sustainable Development Goals (EO4SDG) initiative
 - Provide a critical analysis of the high-level methodological guidelines on SDG
 - Provide recommendations on how to better include Earth Observations
- Report forthcoming which will outline specific data needs for each relevant indicator, including priorities for tier 2 and 3 indicators and will highlight the current status of data availability including those expected through the Copernicus Global Land Service









SDG reporting – generic data needs

- 17 goals, 232 targets, covering social economic and environmental fields
- Each target has at least one indicator
- Reporting annually from 2015 until 2030



Why use global geospatial datasets for national reporting of SDGs? (I)

- Fill existing national data and capacity gaps for estimation and reporting:
 - Detailed assessment on what is required versus what is available (in country, by indicator)
 - Identify priorities and develop a (national) roadmap for continuous improvement
 - Evolve capacities and create ownership
- Increase the efficiency for monitoring:
 - Reduce costs for annual updating
 - Focus on tracking key changes and trends (small change in big number issue)
 - Ensure consistency and sustainability of reporting 2015-2030





Why use global geospatial datasets for national reporting of SDGs? (II)

Stimulate transparency and engagement:

- Provide information to clarify what to do where and why (for implementation)
- Use the power of open data to engage multiple stakeholders (local and global) and underpin transformational changes
- Compare and communicate "performance":
 - Global data as independent source or baseline (including data before 2015)
 - Comparisons to build confidence
 - Demonstrate and visualize successes





Sustainable Development Goals



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Land Cover Data for SDGs

	SDO	ŝs	Land Use data	La Co da	nd ver ta	Land Cove Chan data	r ge	Biomass data (AGB)	3	Fire data (Active fires, burnt areas)
	2	Zero hunger								
	6	Clean water								
	9	Industry								
	11	Cities								
	12	Consumption & production								
	13	Climate action								
	14	Life below water								
	15	Life on land								
Importance of data for										
to monitor targets/goals:			Essential		essential / complementary		Complementary		Not relevant	

GOFC-GOLD SDG assessment: http://www.gofcgold.wur.nl/documents/newsletter/Sustainable Development Goals-infobrief.pdf

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Data requirements for land sub-categories

LU / LC monitoring provides important data to monitor 8 goals, 29 targets, and 33 indicators

Land Use data



Forest land Wetlands Cropland (agriculture) Grassland Settlements

Other land

Land Cover data



Land Cover Change data

GOFC-GOLD SDG assessment: http://www.gofcgold.wur.nl/docu ments/newsletter/Sustainable_De velopment_Goals-infobrief.pdf



- Forest loss (/ deforestation)
 Forest degradation
- Afforestation / Reforestation
 Agricultural expansion
 Change in water bodies

The numbers in the pie charts refer to the number of indicators for which the spatial data 8 requirements apply. Example: Indicator 2.1.4 Proportion of agricultural area under productive and sustainable agriculture (I)

- Tier III indicator which means there are no internationally established methodology or standards available yet for the indicator
- No metadata
- Recommended reporting every 3 years
- Sub indicators will require environmental, economic and social (gathered through surveys) data





Example: Indicator 2.1.4 Proportion of agricultural area under productive and sustainable agriculture (II)

- Satellite-derived baseline datasets (e.g. GEOGLAM Crop Calendars and Crop Masks, environmental & biophysical variables);
- Satellite-based observations of land e.g. NASA & USGS (MODIS, Landsat, SMAP), ESA (Sentinel-1, Sentinel-2, Sentinel-3), CSA (Radarsat-2, RCM), JAXA (GCOM-C, ALOS-2), DLR (TerraSAR-X, TanDEM-X), CNES (Pleiades);
- In-situ & agrometeorological data sets e.g. temperature, precipitation (often in tandem with satellite sources – e.g. NASA TRMM and SMAP, ESA SMOS, JAXA GCOM-W1/W2);
- Novel crowd-sourced information e.g. land use, weather, and crop characterization, through GEO-WIKI and other platforms





Example: Indicator 2.1.4 Proportion of agricultural area under productive and sustainable agriculture (III)

Recommendations – land cover data

Generic	Temporal resolution	three years				
requirements						
	Spatial resolution	30-100 m, or higher (<30 m)				
Specific	Thematic category	Land use data / Land cover data				
requirements						
	Thematic classes	Cropland (tree crops and herbaceous				
		crops) and conversion to/from other				
		thematic classes				
	Detail in thematic	Productive cropland				
	classes	Sustainable cropland				





Example: Indicator 9.1.1: Proportion of rural population who live within 2 km of an all-season road

- Tier III indicator which means there are no internationally established methodology or standards available yet for the indicator
- No data for this indicator is currently available and its methodology is still under development
- Data required: network of all season roads and distribution of rural population:
 - Various global road network data sources including Open Street Map (open source and regularly updated)
 - Global geospatial population datasets usually spatialize national censuses
 - Land cover maps showing urban / rural areas





Example: Indicator 15.3.1: Proportion of land that is degraded over total land area (I)

- Tier III indicator which means there are no internationally established methodology or standards available yet for the indicator
- No metadata
- Recommended reporting 2018 and every four years thereafter
- Three sub-indicators (trends in Land Cover, Land Productivity and Carbon Stocks)



Example: Indicator 15.3.1: Proportion of land that is degraded over total land area (II)

Sub-indicator - Land Cover



Land cover in target year

"The "Grassland" class consists of grassland, shrub, and sparsely vegetated areas (if the default aggregation is used).





Example: Indicator 15.3.1: Proportion of land that is degraded over total land area (III)

Sub-indicator – Soil Organic Carbon

LU coefficients	Forest	Grasslands	Croplands	Wetlands	Artifical areas	Bare lands	Water bodies
Forest	1	1	f	1	0.1	0.1	1
Grasslands	1	1	f	1	0.1	0.1	1
Croplands	1/f	1/f	1	1/0.71	0.1	0.1	1
Wetlands	1	1	0.71	1	0.1	0.1	1
Artifical areas	2	2	2	2	1	1	1
Bare lands	2	2	2	2	1	1	1
Water bodies	1	1	1	1	1	1	1



Use of land cover maps to identify trade-offs between SDGs



- Climate change: IPCC (Intergovernmental panel on Climate Change):
 - Deforestation is the second largest contributor; about 12% of anthropogenic emissions



15 LIFE ON LAND

- About 80% of agriculture expansion in the tropics is into forests (Gibbs et al. 2010)
- Agriculture is expanding, and shifting towards the tropics (Foley et al. 2011)



Achieving SDG 2, 13 and 15

- Intensification through identification of areas with a high yield gap
- Expansion of agriculture into non-forested (low carbon) areas, including restoration of degraded lands
- Considerations:
 - Governance (enabling environment)
 - Risk to food insecure people





(Carter et al. 2015)

What is needed to achieve SDG 2, 13 and 15?

- Information on forests and forest change => land cover datasets
- Information on emissions
- Yield gaps, enabling environments etc.
- Transformational change (Carter et al. 2018)
 - Practical local solutions which integrate CSA and REDD+
 - Transdisciplinary research approaches and priorities
 big data, novel technologies
 - Co-ordinated policies
 - Transparency





Successful mechanisms to integrate global datasets: SEPAL

System for earth observations, data access, processing & analysis for land monitoring

SEPAL



SEARCH GEO DATA Fast and easy access to scenes and mosaics



BROWSE YOUR DATA

Preview and download your products

PROCESS YOUR DATA

Easy-to-use data processing Apps

TERMINAL Powerful command-line tools for data processing





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Successful mechanisms to integrate global datasets: Trends.Earth – QGIS plugin for Indicator 15.3.1: Proportion of land that is degraded over total land area

- <u>http://trends.earth/docs/en/</u>
- Partnership of Conservation International, Lund University, and the National Aeronautics and Space Administration (NASA), with the support of the Global Environment Facility (GEF).

Land cover

Sensor/Dataset	Temporal	Spatial	Extent	License
ESA CCI Land Cover	1992-2015	300 m	Global	CC by-SA 3.0





Closing remarks

- Aims for data
 - Fill data/capacity gaps
 - Increase efficiency (focus on change/trends)
 - Stimulate transparency and engagement
 - Compare and communicate performance
- Ensured free and open satellite time series until 2030 at least (NASA/USGS, ESA/EC-Copernicus)
 - Consistency, long-term service vision, change and trends (rather than one-off)
- Active and sustained dialog between countries and their needs, SDGs indicator developers and technical community
 - Address specific needs from varying circumstances
 - Refine requirements for global monitoring initiatives
 - Demonstrations and idea of "centers of excellence"





Thank you!

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