Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Target 15.4: By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development

Indicator 15.4.2: Mountain Green Cover Index

Institutional information

Organization(s):

Food and Agriculture Organization of the United Nations (FAO)

Concepts and definitions

Definition:

The Green Cover Index is meant to measure the changes of the green vegetation in mountain areas - i.e. forest, shrubs, trees, pasture land, crop land, etc. – in order to monitor progress on the mountain target.

The index, will provide information on the changes in the vegetation cover and, as such, will provide an indication of the status of the conservation of mountain environments.

Concepts:

Mountains are defined according to the UNEP-WCMC classification that identifies them according to altitude, slope and local elevation range as described by Kapos et al. 2000:

Class 1: elevation > 4,500 meters

Class 2: elevation 3,500–4,500 meters

Class 3: elevation 2,500–3,500 meters

Class 4: elevation 1,500–2,500 meters and slope > 2

Class 5: elevation 1,000–1,500 meters and slope > 5 or local elevation range (LER 7 kilometer radius) > 300 meters

Class 6: elevation 300–1,000 meters and local elevation range (7 kilometer radius) > 300 meters

Rationale:

The scientific mountain community recognizes that there is a direct correlation between the green coverage of mountain areas and their state of health, and as a consequence their capacity of fulfilling their ecosystem roles. Monitoring mountain vegetation changes over time provides an adequate measure of the status of conservation of mountain ecosystems. Monitoring the mountain “Green Cover Index” over time can provide information on the forest, woody and vegetal cover in general. For instance, its reduction will be generally linked to overgrazing, land clearing, urbanization, forest exploitation, timber extraction, fuelwood collection, fire. Its increase will be due to vegetation growth possibly linked to land restoration, reforestation or afforestation programmes.

Comments and limitations:

The indicator is based on Collect Earth, the most modern technology available. Its user friendliness and smooth learning curve make it a perfect tool for performing fast, accurate and cost-effective assessments. It is free, open source and highly customizable for the specific data collection needs and methodologies. It builds upon very high resolution multi-temporal images from Google Earth and Bing Maps and Landsat 7 and 8 datasets from Google Earth Engine. Data and images are stored and globally available for any year from 2000, making possible the monitoring of the change over time.

The indicator has a global accuracy of 99%, but at national level for small countries the degree of accuracy is lower. This will be improved over time as more countries expand the data collection within their territory.

Data on mountain coverage are provided by the 2015 FAO/MPS global map of mountains.

Methodology

Computation method:

The indicator results from the juxtaposition of land cover data extracted from FAO Collect Earth tool and the global map of mountains produced by FAO/MPS in 2015 based on the UNEP-WMCM mountain classification.

Collect Earth (http://www.openforis.org/tools/collect-earth.html) is a free and open source tool that enables data collection through Google Earth for a wide variety of purposes, including:

- Support multi-phase National Forest Inventories
- Land Use, Land Use Change and Forestry (LULUCF) assessments
- Monitoring agricultural land and urban areas
- Validation of existing maps
- Collection of spatially explicit socio-economic data
- Quantifying deforestation, reforestation and desertification

Regional aggregates:

The estimate will generated through a probabilistic sampling approach. The sampling design has been developed in order to achieve an uncertainty on the forest and vegetation cover parameters of +-2% at global level and +-4 at regional level. Remote sensing data systematically collected from 2000 will be used to generate annual series from 2000 to 2015. The satellite data will be analysed using Collect Earth.

Collect Earth is a tool that enables data collection through augmented visual interpretation of high resolution imagery using Google Earth. In conjunction with Google Earth, Bing Maps and Google Earth Engine, users can analyse high and very high resolution satellite imagery and historical trends in vegetation. It can be used to collect data at the local, regional and global level and has been successfully used by many country partners (Papua New Guinea, Tunisia, Uruguay, others).

Methods and guidance available to countries for the compilation of the data at the national level:

The indicator results from the juxtaposition of land cover data extracted from FAO Collect Earth tool (that was used to build the Global Forest Survey (GFS) Global Assessment map) and the global map of mountains produced by FAO/MPS in 2015 based on the UNEP-WMCM mountain classification.

Mountains are defined according to the UNEP-WCMC classification that identifies them according to altitude, slope and local elevation range as described by Kapos et al. 2000:

Class 1: elevation > 4,500 meters

Class 2: elevation 3,500–4,500 meters

Class 3: elevation 2,500–3,500 meters

Class 4: elevation 1,500–2,500 meters and slope > 2

Class 5: elevation 1,000–1,500 meters and slope > 5 or local elevation range (LER 7 kilometer radius) > 300 meters

Class 6: elevation 300–1,000 meters and local elevation range (7 kilometer radius) > 300 meters

http://www.fao.org/mountain-partnership/our-work/focusareas/foodsecurity/en/g

Collect Earth (http://www.openforis.org/tools/collect-earth.html) is a free and open source tool that enables data collection through Google Earth for a wide variety of purposes, including Land Use, Land Use Change and Forestry (LULUCF) assessments. The Global Forest Survey (GFS) Global Assessment built on the visual interpretation of satellite images in publicly available repositories, such as Google Earth Engine and Bing Maps, to provide a map of land cover/land use data.

Land cover data are classified according to the Intergovernmental Panel on Climate Change (IPCC) scheme, which defines six main classes: Forest land; Cropland; Grassland; Wetlands; Settlements; Other Land. Each plot is classified according to the dominant land cover. (http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_03_Ch3_Representation.pdf)

The baseline statistics for the Mountain Green Cover Index are based on the GFS Global Assessment map released in January 2017. Green cover includes forest land, grassland/shrubland and cropland. The amounts of land in square kilometers covered by each of these three IPCC land cover/land use classes are aggregated to calculate the size of the total mountain area that they cover in each country. This figure is then expressed as a ratio of the total mountain area and converted to a percentage, providing the value of the Mountain Green Cover Index of each country. This percentage is the value displayed in the SDGs global database.

Quality assurance:

The GFS Global Assessment was carried out with standard protocols applied to the entire area of interest. Documents on the system tools and survey can be accessed at:

http://openforis.org/fileadmin/user_upload/Collect_Earth_Tutorials/Collect_Earth_User_Manual_20150618_highres_full.pdf

http://www.fao.org/in-action/global-forest-survey/en/

Data for all countries have been produced by FAO/MPS and are in the process of being distributed to governments for their validation.

Data sources

Description:

The source of data is FAO Collect Earth.

Collection process:

The estimate will be generated through regional assessment carried out by circa 30 partners all around the world. The data will be collected in with the same methodology in order to guarantee data consistency. The methodology enables intensification of the sampling in order to obtain same level of uncertainties at regional and sub regional levels. The data collection will be also harmonized according to the Forest Resources Assessment definition schemes.

Data availability

All

Disaggregation:

The indicator is disaggregated by mountain elevation class.

Calendar

Data collection:

By the end of 2016

Data release:

FAO Collect Earth is constantly updated; the mountain map doesn’t need any update.

Data providers

As data are all already available, the analysis will be conducted by MPS/FAO and data will be validated by countries.

Data compilers

FAO

References

URL:

www.fao.org; www.mountainpartnership.org

References:

http://www.mountainpartnership.org/

http://www.mountainpartnership.org/our-work/focusareas/foodsecurity/en/ (GIS raster of mountains is available for download from the right-side bar)

http://www.openforis.org/tools/collect-earth.html

http://www.fao.org/3/a-i5175e.pdf

http://www.fao.org/

Related indicators as of February 2020

6.6, 15.1