Country Use Case of EO for SDG Indicator 15.4.2

1 Abstract

The “Mountain Green Cover Index” is designed to capture changes in vegetation growing the mountainous area. The evaluation is done by calculating the proportion of vegetation-covered mountain areas to the total area of mountains. The calculation itself is based on the official metadata description produced by the custodian agency FAO.

For Germany, the federally owned data sources Digital terrain model with 10 m resolution (DGM10) and the land cover model of Germany (LBM-DE) were used. The Method was customized according to available data set basis. Global classification can be found her: and is based on GTOPO3 Data with spatial resolution of 600 m. The Mountain Green Cover Index was 93.11% in 2018 and 93.24% in 2015.

2 Country or region

The calculations were performed for the entire area of Germany.

3 Data used

Information on land cover/use categories was derived from the land cover model for Germany (LBM-DE).

- Digital Terrain Model (DGM 10)
- Land cover model of Germany (LBM-DE)

The Digital Land Cover Model for Germany (LBM-DE) was developed in coordination with the Federal Environment Agency (UBA) for the purposes of the federal government and has been made available by the BKG since 2009 (then still under the name DLM-DE. It describes topographic objects of the landscape in vector format under the aspect of land cover and land use. In this way, the state of the environment at a certain point in time is recorded, thus enabling analyses according to different aspects. Furthermore, the LBM-DE serves as a basis for the derivation of the national CORINE Land Cover (CLC) data set, which in turn contributes to the uniform European land monitoring. The LBM-DE has been updated for the reference years 2012, 2015, and 2018 and covers the entire extension of the Federal Republic of Germany. Based on the boundaries of the spatial objects of the basic landscape model (Basis-DLM), data on land cover and land use in the sense of the European CLC nomenclature are derived from the respective reference year 2012, 2015 or 2018 by means of the evaluation of multi-spectral satellite image time series. Land cover models can be used in many different ways. The administrative sector in particular, which deals with environmental issues, has a strong interest in continuously recording landscape and environmental changes.

You can find additional information on how this is produced here (only available in German language):

- https://gdk.gdi-de.org/geonetwork/srv/api/records/7387BFCE-72CD-442E-B268-D273DE1D61F8 (LBM-DE 2015)
- https://gdk.gdi-de.org/geonetwork/srv/api/records/ED7F6DE9-6433-41DA-928A-044837C6EDAA (LBM-DE 2018)

- https://gdz.bkg.bund.de/index.php/default/digitales-gelandemodell-gitterweite-10-m-dgm10.html

4 Methodology

At first the classification of mountain areas was done using the metadata description from *United Nations Environment Programme (UNEP) and* UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) classification according to Kapos et al. 2000. Using that, the mountainous area of Germany is 18.1%.

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

Figure 1: Mountain classes according to elevation

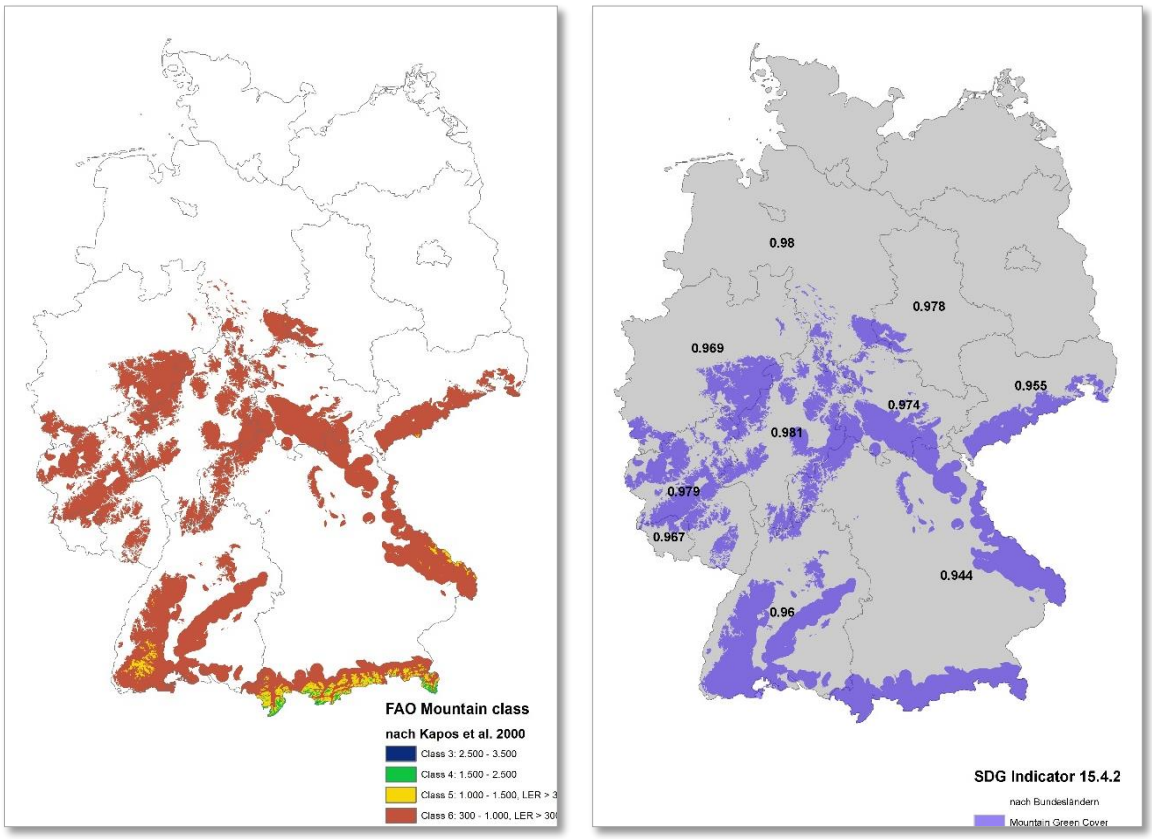

Figure 2: Mountain Areas of Germany after Kapos et al. 2000 (left) and Percentage of this areas in the different German states. (right)

In Figure 2 the mountain areas of Germany and the percentage of this area within each German states is visualized. After that, the land cover classes' forest land, grassland/shrubland and cropland areas were derived from the LBM-DE. The definition of each land cover class according to the FAO can be seen in Figure 3.

1 - Forest land - This category includes all land with woody vegetation consistent with thresholds used to define Forest Land in the national greenhouse gas inventory. It also includes systems with a vegetation structure that currently fall below, but in situ could potentially reach the threshold values used by a country to define the Forest Land category.

2 - Cropland - This category includes cropped land, including rice fields, and agro-forestry systems where the vegetation structure falls below the thresholds used for the Forest Land category.

3 - Grassland/Shrubland - This category includes rangelands and pasture land that are not considered Cropland. It also includes systems with woody vegetation and other non-grass vegetation such as herbs and brushes that fall below the threshold values used in the Forest Land category. The category also includes all grassland from wild lands to recreational areas as well as agricultural and silvi-pastural systems, consistent with national definitions.

4 - Wetlands - This category includes areas of peat extraction and land that is covered or saturated by water for all or part of the year (e.g., peatlands) and that does not fall into the Forest Land, Cropland, Grassland or Settlements categories. It includes reservoirs as a managed sub-division and natural rivers and lakes as unmanaged sub-divisions.

5 - Settlements - This category includes all developed land, including transportation infrastructure and human settlements of any size, unless they are already included under other categories. This should be consistent with national definitions.

Figure 3: Description of the land cover classes defined by FAO

Other than vegetation area, also settlement areas have to be defined in advance. The advanced description of methods done by the working group "Mountain partnership secretariat at the food and agriculture organization of the united nations" describes the maximum percentage of coverage other than vegetation land cover is under 20%. A settlement polygon is a settlement area if this area is more than 20%.

Each plot is classified according to the dominant land use, according to the following predominant land use hierarchy:

1) Settlement, if >= 20%
2) Cropland, if >= 20% and Settlement < 20%
3) Forest, if >= 20% and Settlement or Cropland < 20%
4) Grassland, if >= 20% and Settlement or Cropland or Forest < 20%
5) Wetland, if >= 20% and Settlement or Cropland or Forest or Grassland < 20%
6) Other land, if >= 80% and Settlement, Cropland, Forest, Grassland and Wetland < 20%

Figure 4: Differentiation of settlement vs. vegetation

According to the metadata description land cover of the LBM-DE was defined as vegetation if the settlement was less than 20% and then, afterwards selected by forest, grassland and cropland. Thereafter the areas were clipped to the mountain areas and green covered mountain area and total mountain area was calculated. The indicator were calculated for 2015 and 2019 for years LBM-DE is available. The results can be found in table 1. In addition, a disaggregation of the indicator was developed using the mountain classes and metadata description. The indicator is disaggregated by mountain elevation class.

Table 1: Results of the SDG calculation

Year	Total	Mountain elevation class (Kapos et al.-2000)

		6	5	4	3
in km²	96212.8	63919,5	2588,8	570,9	5,8
2015 (%)	93.24	93,35	96,63	66,88	0
2018 (%)	93.11	93.25	95,93	66,16	0

5 Lessons learned, any gaps, key issues and recommendations

The indicator or the data on which the calculation is based have common intersections with other indicators (e.g. 2.4.1, 15.1.1 etc.) which are, however, partly based on other data. Therefore a harmonisation of the data basis would be highly recommended, or at least a discussion of the different data sources would be of interest in order to interpret the analyses.

6 Supporting material

The indicator values are available via the official national platform on the agenda 2030 and the UN statistical division database.

Link: https://sustainabledevelopment-germany.github.io/

https://unstats.un.org/sdgs/indicators/database/?indicator=15.4.2

7 Collaboration with other agencies

In 2017, the BKG, in cooperation with the Federal Statistical Office of Germany, began conducting feasibility studies regarding the integration of EO and national geospatial datasets for calculating selected SDG indicators. The indicators chosen were 11.7.1, 15.1.1, and 15.4.2. Since 2018 the calculation of this indicator is only done by BKG and the result are reported to the statistical office when necessary.

European coordination: The mentioned indicator is not yet part of the current analysis of the UN-GGIM: Europe Working Group on Data Integration. But the indicator is planned to be further investigated in the near future. The selection and analysis of the SDG indicators should benefit from the different institutional background and technical expertise of members of the UN-GGIM: Europe Working Group on Data Integration. Additionally, this list should benefit from an articulation with the UNECE as well as the European Environment Agency (EEA) and Eurostat's SDG Working Group. Furthermore, the information exchange with the Inter- and Agency Expert Group on SDG Indicators – Working Group on Geospatial Information (IAEG SDG WG GI) will be continued. The same applies with the exchange and collaboration with the relevant global GEO initiatives and working groups, in particular, the EO4SDG initiative. On the European level, the exchange with the EuroGEO initiative has to be established as well.

8 Names and email addresses of individuals involved in this effort

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