Session x: Sustainable Development Goals, SDG indicators

The Combination of Geospatial Data with Statistical Data for SDG Indicators

UN-GGIM: EUROPE
UNITED NATIONS INITIATIVE ON
GLOBAL GEOSPATIAL
INFORMATION MANAGEMENT

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5-8 December2018, Nairobi
IAEG SDG WG GI

UN-GGIM: Europe – Work Plan 2017 - 2020

Task 1 (Subgroup 1):
Policy Outreach Paper

- ✓ Promote the benefits of the integration of statistical and geospatial data
- ✓ Make use of recommendations from deliverables on priority user needs, interoperability frameworks, cooperation and methods for data integration and side effects

Task 2 (Subgroup 2):
Analyse new global, regional or national indicators

- ✓ Meet the Sustainable Development Goals 2030
- ✓ Reflect the European perspective (INSPIRE, Copernicus)
- ✓ Reflect data integration aspects

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Analyse new global, regional or national indicators

- ✓ Meet the Sustainable Development Goals 2030
- ✓ Reflect the European perspective (INSPIRE, Copernicus)
- ✓ Reflect data integration aspects

Analyze contribution of geospatial data and its combination with statistical data, for the purpose of addressing specific SDG indicators and targets by taking into account:

- the specificities of the European context regarding data availability, policy orientation and governance arrangements on geospatial and statistical information
- the background and experiences of European and national initiatives addressing the SDGs from a geospatial perspective.

Task 2 (Subgroup 2):
Analyse new global, regional or national indicators

- ✓ Meet the Sustainable Development Goals 2030
- ✓ Reflect the European perspective (INSPIRE, Copernicus)
- ✓ Reflect data integration aspects

Task 2: Analyse global, regional or national indicators

The Sustainable Development Goals Report 2016

Sustainable development in the European Union
MONITORING REPORT ON PROGRESS TOWARDS THE SDGS IN AN EU CONTEXT — 2017 edition

STATISTICAL BOOKS | eurostat

✓ Systematization of global "metadata" for indicators and national practices

✓ Indicate EU-SDG indicators potentially benefiting from geospatial information

✓ Identify additional national specific indicators benefiting from geospatial information and its combination with statistical   data, defined within the context of national SDG monitoring

Deutsche Nachhaltigkeitsstrategie
Neuauflage 2016
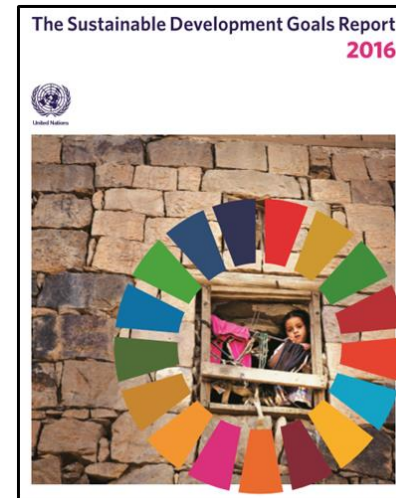
Task 2: Selected SDG indicators

11 SUSTAINABLE CITIES AND COMMUNITIES — 11.2.1
tier II indicator

Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities

Indicator coordinator: Austria (NSI)

11 SUSTAINABLE CITIES AND COMMUNITIES — 11.3.1
tier II indicator

Ratio of land consumption rate to population growth rate

Indicator coordinator: Portugal (NSI)

11 SUSTAINABLE CITIES AND COMMUNITIES — 11.7.1
tier III indicator

Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities

Indicator coordinator: Sweden (NSI)

15 LIFE ON LAND — 15.1.1
tier I indicator

Forest area as a proportion of total land area
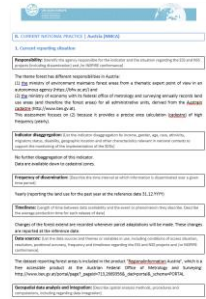
Indicator coordinator: Italy (e-GEOS)

Task 2 – Analyse global, regional or national indicators

A – Global Metadata

- Current reporting situation
- Methodology
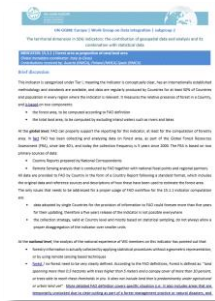- Gap Analysis
- Suggested integration

B – Current National Practices

- Reporting situation
- Data sources
- Data quality
- Gap analysis

C – Brief Discussion papers

- Summary of the gap analysis
- Recommendations on how to deal with common issues

D – Final Report

- Including the discussion papers
- Findings of the gap analysis
- national monitoring examples
- unsolved issues

Contribution to the GEOSTAT-3 project

Objective: Project funded by Eurostat to develop a European version of the GSGF and to test SDG indicators

- GEOSTAT-3 Work Package 1: Contribute to the improvement of the Global Statistical and Geospatial Framework (GSGF) and – particularly – the development of a European version of it
  - ★ 3rd consolidation phase mid-end September 2018
    - ★ Involvement of UN-GGIM: Europe WG Core Data and WG Data Integration
- GEOSTAT-3 Work Package 2: Test SDGs selected by WG on Data Integration
  - ★ National test reports using the gap analysis of UN-GGIM WG Data Integration
  - ★ Evaluation of the tests

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National report assessment

Include an overall national report assessment for the several countries based on the "Swedish classification model"

SCB Preparing for the National Reporting

🟢 Possible to report or already being reported

🟠 Possible to develop: data integration needed or changes to current surveys

🔴 Very difficult to report, no current survey, no available method
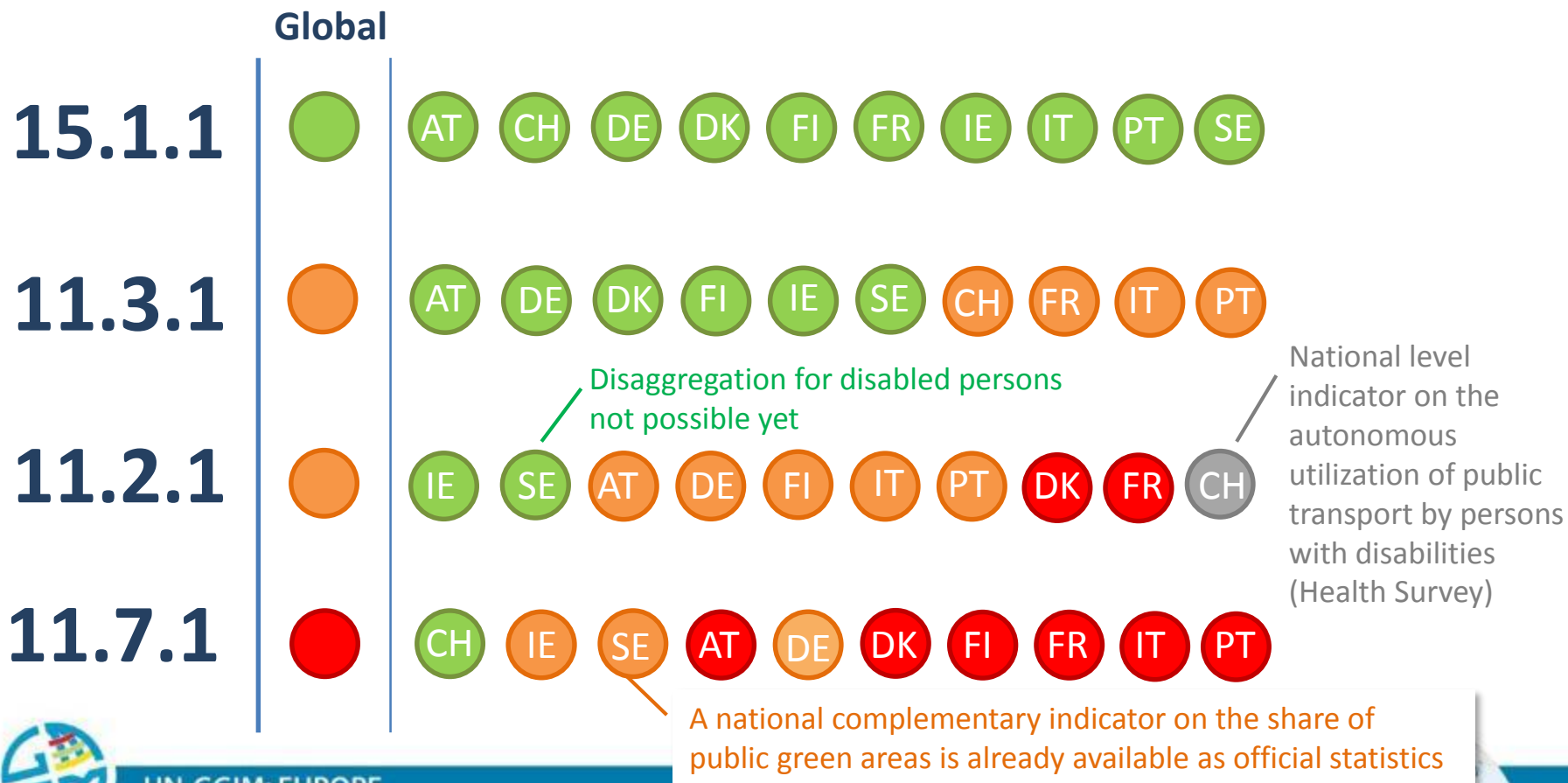
⚪ Not relevant for Sweden / Global data enough

Assessed the global indicators, added national indicators for targets of national policy relevance

Source: Haldorson, M. (2017). *Engaging Custodian Agencies: A National Perspective*. Presentation at the IAEG-SDG WG GI, New York, Dec 2017.

National report assessment

Include an overall national report assessment for the several countries based on the "Swedish classification model"

Global

15.1.1 ● | AT CH DE DK FI FR IE IT PT SE

11.3.1 ● | AT DE DK FI IE SE CH FR IT PT

Disaggregation for disabled persons not possible yet

National level indicator on the autonomous utilization of public transport by persons with disabilities (Health Survey)

11.2.1 ● | IE SE AT DE FI IT PT DK FR CH

11.7.1 ● | CH IE SE AT DE DK FI FR IT PT

A national complementary indicator on the share of public green areas is already available as official statistics

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INFORMATION MANAGEMENT

11.2.1 | Proportion of population that has convenient access to public transport, by sex, age and persons with disabilities

✓ **National practices**: Austria (NSI) France (NMCA) Ireland (NSI), Sweden (NSI) Switzerland (NSI)

✓ EU SDG indicator: 11.21 Distribution of population by level of difficulty in accessing public transport (Eurostat)

11.3.1 | Ratio of land consumption rate to population growth rate

✓ **National practices**: Finland (NMCA) Ireland (NSI) Italy (e-GEOS) Portugal (NSI and NMCA)

✓ EU SDG indicators: 15.21 Artificial land cover per capita; 15.24 Change in artificial land cover per year (Eurostat)

11.7.1 | Average share of the built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities

✓ **National practices**: Ireland (NSI), Sweden (NSI and NMCA) Switzerland (NSI)

✓ EU SDG indicators: No corresponding EU SDG indicator available

15.1.1 | Forest area as a proportion of total land area

✓ **National practices**: Austria (NMCA), Finland (NMCA), France (NMCA), Germany (NMCA), Italy (e-GEOS) Spain (NMCA)

✓ EU SDG indicator: 15.11 Forest area as a proportion of total land area (Eurostat)

Examples showing the use of EO data
The 15.1.1 indicator

- Indicator 15.1.1 is the **ratio between**
  - ★ **the Forest area** (defined according to FAO: *land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use*) and
  - ★ **the Total land area** (*total surface area of a country less the area covered by inland waters, like major rivers and lakes*)

- FAO provides the forest area in the framework of the FAO's Forest Resources Assessment every 5 years

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Actual computation

- **The analysis of the national experience of WG members** on this indicator has pointed out that:

  - ★ **forestry information is actually collected by applying statistical procedures without a geometric representation, or by using remote sensing based techniques**

  - ★ forest / no-forest need to be very clearly defined

  - ★ **definition at national level of forest area may be different**

  - ★ remote sensing images, when not used for the delimitation of forest area, are used for the collection of additional information over sampled area

  - ★ disaggregation over regions of limited size (such as NUTS3 regions) could introduce less reliable information due to smaller number of sample plots

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Support from Geospatial layers

- Geospatial layer allows a fast computation of the indicator, and its disaggregation on smaller territorial units, also allowing an improvement in the computation frequency

- Geospatial layers that can be used for this purpose are different at Global and European level.

- In general **European geospatial data layers are much more detailed and reliable**

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Global level geospatial layers

- **Geospatial layers that can be used for this purpose are different at Global and European level**

- At global layer, there are several initiatives that map on a regular basis the world land cover, i.e. the Land cover generated by ESA (European Space Agency) in support to the Climate Change Initiative (*https://www.esa-landcover-cci.org/*)

- It is based on automatic workflows for the generation of Land Cover with a resolution of 250 meters (down to 30 meters and less in the very next future)

- **Each year, is generated a land cover map on a worldwide basis, from which can be extracted geospatial layers related to forestry areas**

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Global level geospatial layers

• When adopting land cover maps to extract forest areas it must be considered that legend could not perfectly fit with desired forestry definition

ESA Land Cover legend

VALUE	LABEL	COLOR
0	No Data	
10	Cropland, rainfed	
11	Herbaceous cover	
12	Tree or shrub cover	
20	Cropland, irrigated or post-flooding	
30	Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (<50%)	
40	Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (<50%)	
50	Tree cover, broadleaved, evergreen, closed to open (>15%)	
60	Tree cover, broadleaved, deciduous, closed to open (>15%)	
61	Tree cover, broadleaved, deciduous, closed (>40%)	
62	Tree cover, broadleaved, deciduous, open (15-40%)	
70	Tree cover, needleleaved, evergreen, closed to open (>15%)	
71	Tree cover, needleleaved, evergreen, closed (>40%)	
72	Tree cover, needleleaved, evergreen, open (15-40%)	
80	Tree cover, needleleaved, deciduous, closed to open (>15%)	
81	Tree cover, needleleaved, deciduous, closed (>40%)	
82	Tree cover, needleleaved, deciduous, open (15-40%)	
90	Tree cover, mixed leaf type (broadleaved and needleleaved)	
100	Mosaic tree and shrub (>50%) / herbaceous cover (<50%)	
110	Mosaic herbaceous cover (>50%) / tree and shrub (<50%)	
120	Shrubland	
121	Evergreen shrubland	
122	Deciduous shrubland	
130	Grassland	
140	Lichens and mosses	
150	Sparse vegetation (tree, shrub, herbaceous cover) (<15%)	
152	Sparse shrub (<15%)	
153	Sparse herbaceous cover (<15%)	
160	Tree cover, flooded, fresh or brakish water	
170	Tree cover, flooded, saline water	
180	Shrub or herbaceous cover, flooded, fresh/saline/brakish water	
190	Urban areas	
200	Bare areas	
201	Consolidated bare areas	
202	Unconsolidated bare areas	
210	Water bodies	
220	Permanent snow and ice	

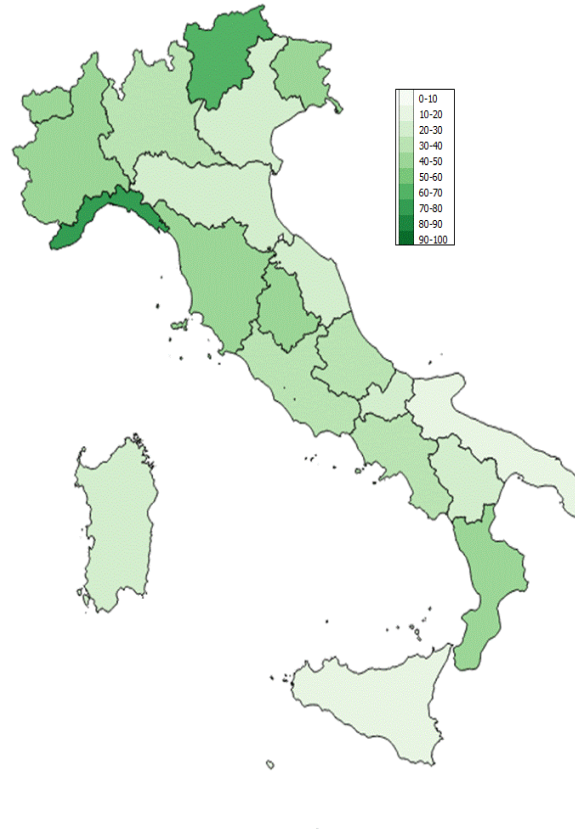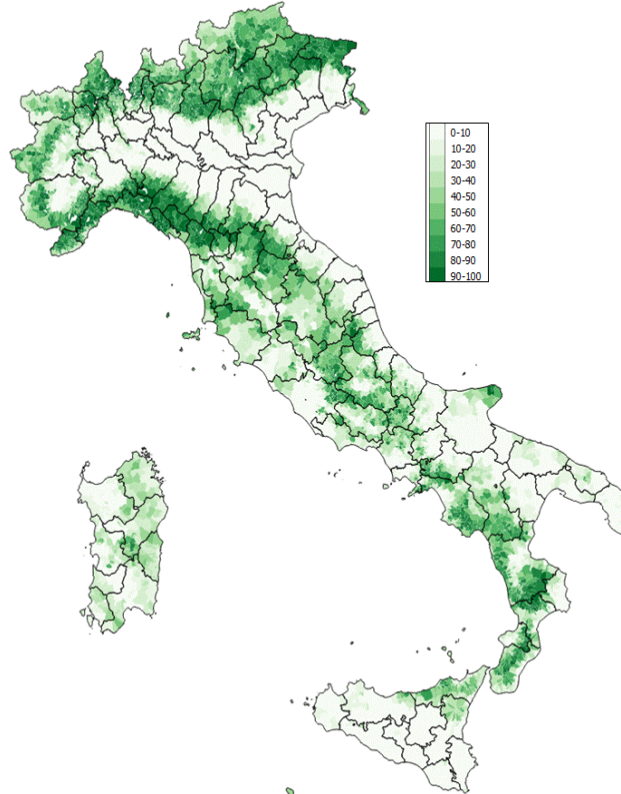Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Global level geospatial layers

INDICATOR 15.1.1 computed from ESA LAND Cover
NUTS1 level
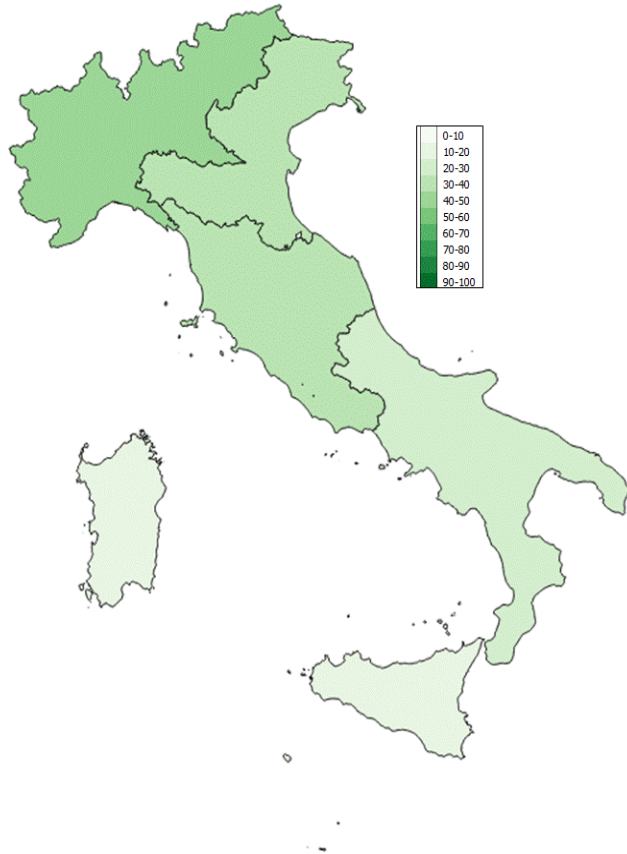
INDICATOR 15.1.1 computed from ESA LAND Cover
NUTS2 level

Legend:
- 0-10
- 10-20
- 20-30
- 30-40
- 40-50
- 50-60
- 60-70
- 70-80
- 80-90
- 90-100

- **Usage of ESA Land Cover for indicator computation**
- Example of disaggregation at NUTS1 and NUTS2 level

FAO based indicator: 2010: **36.7%** - 2015: **37.7%**

ESA Land cover based indicator: 2012: **33.4%**

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Global level geospatial layers

INDICATOR 15.1.1 computed from ESA LAND Cover
NUTS3 Level
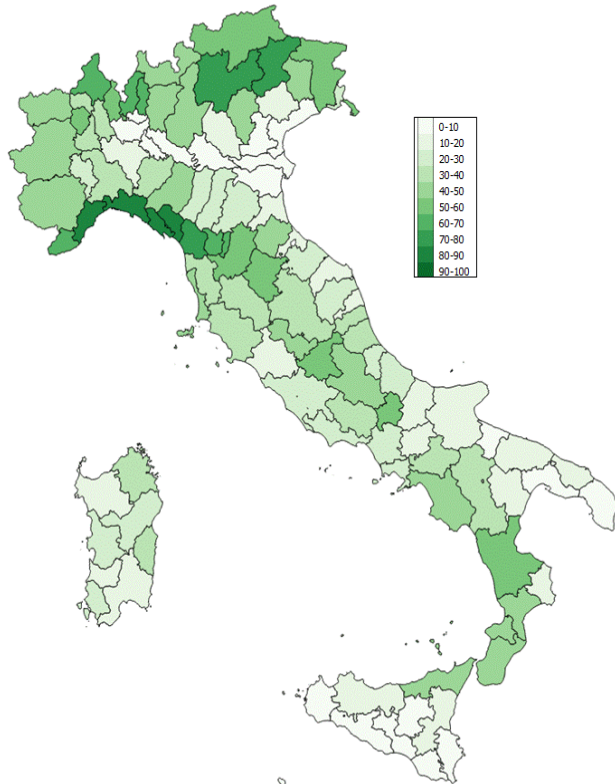
INDICATOR 15.1.1 computed from ESA LAND Cover
Comune level

- **Usage of ESA Land Cover for indicator computation**
- Example of disaggregation at NUTS3 and NUTS4 level

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
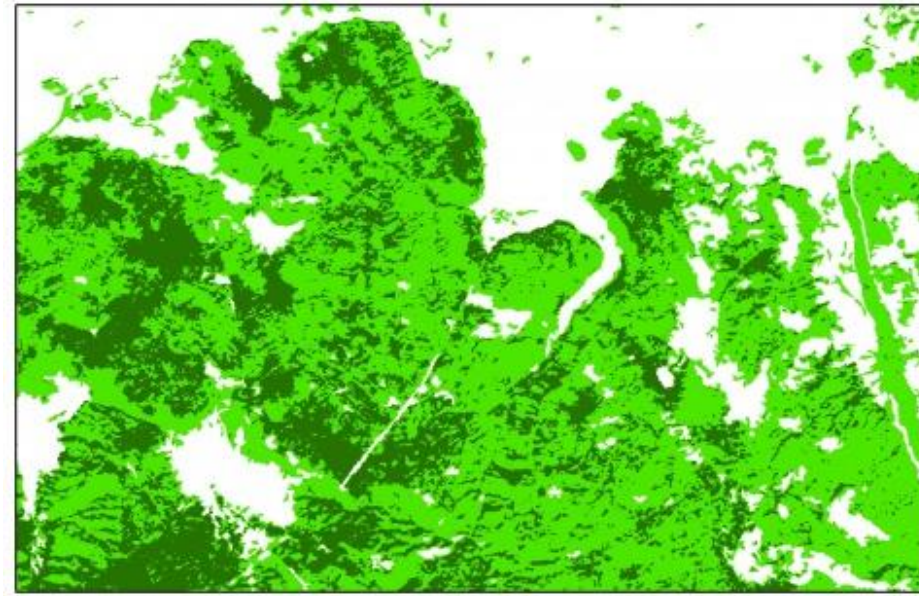# The 15.1.1 indicator – Regional level geospatial layers

- Even if FAO workflow allows to obtain quite comparable data in all Countries at global level, it must be considered that at EU level, in the framework of **Copernicus Pan-European High Resolution Layers**, are available geospatial data layer allowing the whole computation of the indicator:
    - ★ **the geospatial data layer Copernicus Forest HRL (High Resolution Layer)**
    - ★ **The geospatial data layer Copernicus Water Bodies HRL**
- By using these datasets, available over all EU MS, can be computed very detailed statistics on forest cover, allowing a very detailed disaggregation even exceeding NUTS3 level
- Forest HRL are updated with a 3 years frequency (2012-2015-2018)

Indicator 15.1.1: Forest area as a proportion of total area
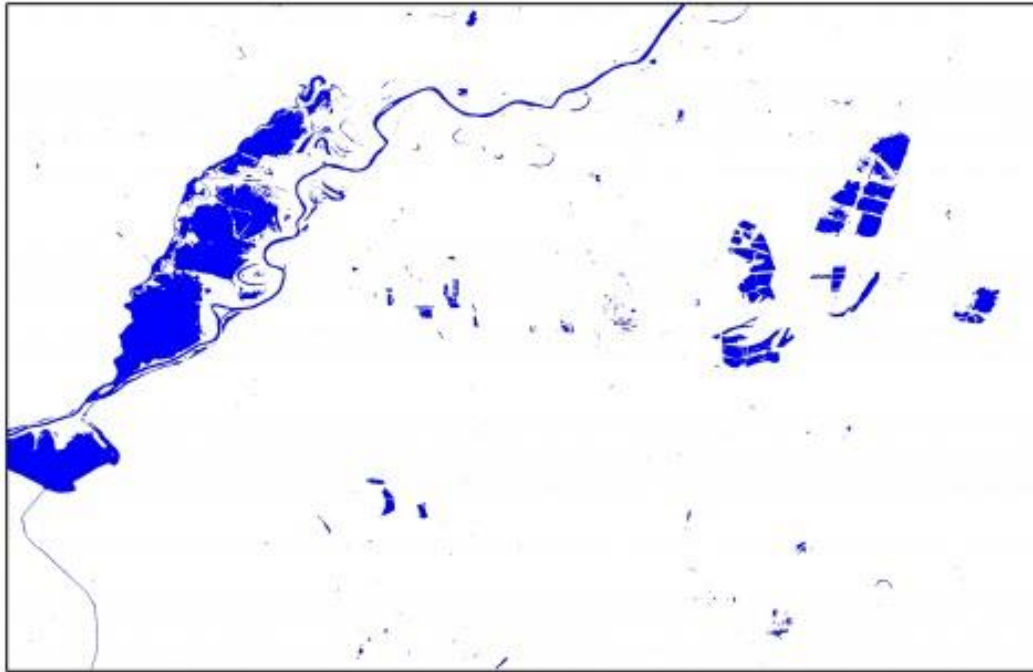
Examples showing the use of EO data
The 15.1.1 indicator – Regional level geospatial layers

- Copernicus High resolution layers:

  ★ The **tree cover density geospatial layer** maps the level of tree cover density in a range from 0-100%, has no MMU (minimum number of pixels to form a patch) and a minimum mapping width of 20 m.

  ★ This geospatial layer is used in conjunction with the Forest type layer
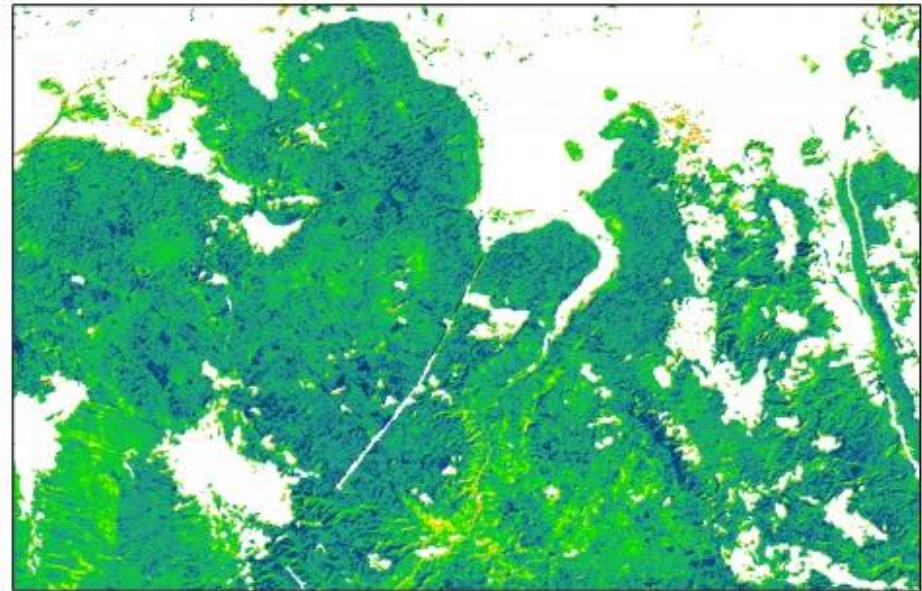
Indicator 15.1.1: Forest area as a proportion of total area

- Copernicus High resolution layers:

  ★ The **forest type geospatial layer** allows to get as close as possible to the FAO forest definition. Has a MMU of 0.5 ha, as well as a 10% tree cover density threshold applied

  ★ For the final 100m product trees under agricultural use and urban context from the support layer are removed, in line with FAO forest definition

Copernicus
Europe's eyes on Earth

Land Monitoring Service

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Regional level geospatial layers

- Copernicus High resolution layers:
  - ⭐ The **permanent water bodies geospatial layer** provides the detailed measure of **inland waters** (to be subtracted to total land area for indicator computation)

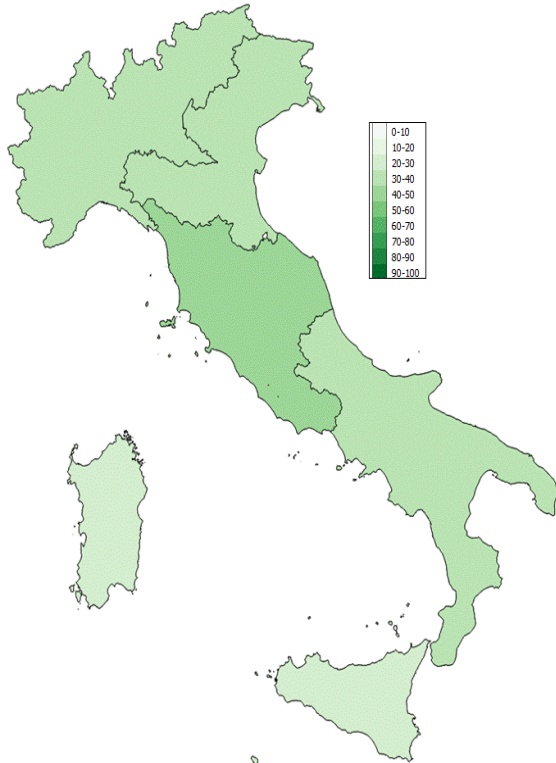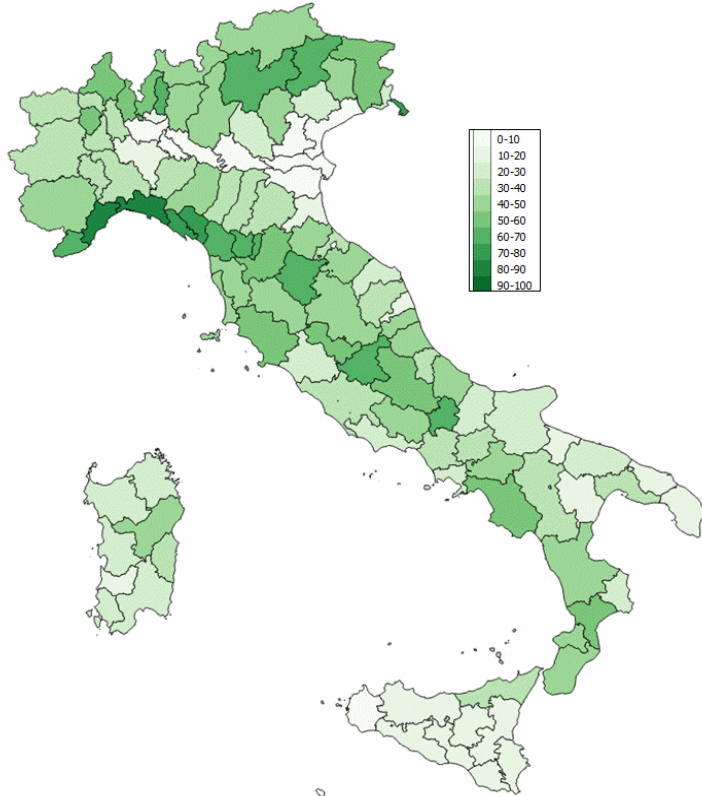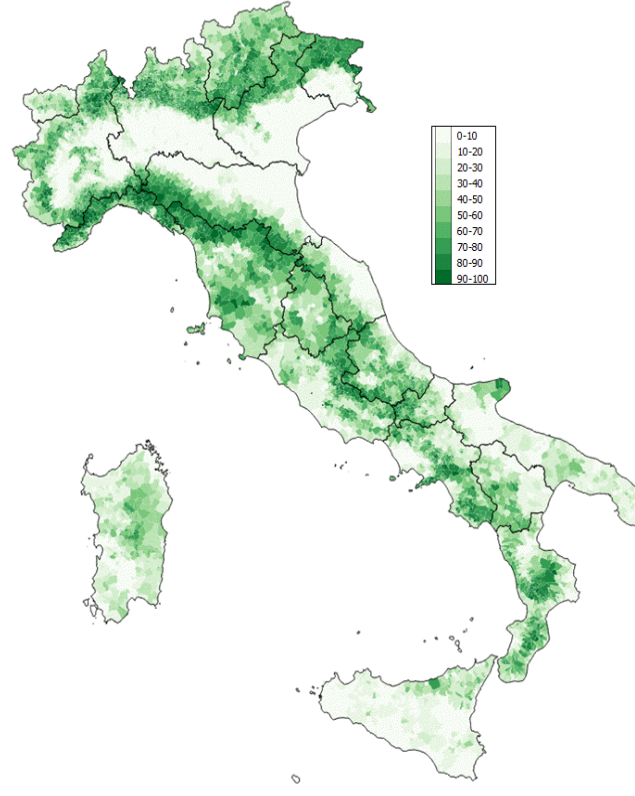Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Regional level geospatial layers

INDICATOR 15.1.1 computed from Copernicus HRL
NUTS1 level

0-10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90-100

INDICATOR 15.1.1 computed from Copernicus HRL
NUTS2 level
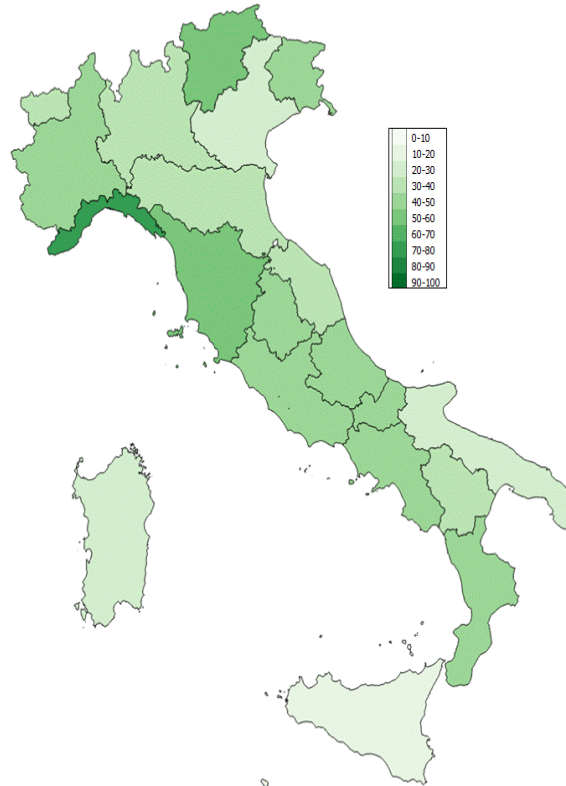
0-10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90-100

- Example of computation of the 15.1.1 indicator **by using only** Copernicus **geospatial layers**, with disaggregation at NUTS1 and NUT2 level

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Regional level geospatial layers

INDICATOR 15.1.1 computed from Copernicus HRL
NUTS3 level

INDICATOR 15.1.1 computed from Copernicus HRL
Comune level

- Example of computation of the 15.1.1 indicator **by using only** Copernicus **geospatial layers**, with disaggregation down to Comune level

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Regional level geospatial layers

15.1.1 indicator - YEAR 2012 - NUTS2 level		
NUTS2 UNIT	**Copernicus HRL**	**ESA Land Cover**
Piemonte	40,5%	42,6%
Val d'Aosta	30,2%	40,6%
Lombardia	30,3%	31,9%
Trentino Alto Adige	54,5%	61,9%
Veneto	29,1%	28,7%
Friuli	46,9%	49,1%
Liguria	79,8%	80,0%
Emilia Romagna	32,2%	28,1%
Toscan	55,6%	49,5%
Umbria	50,1%	40,7%
Marche	32,4%	22,2%
Lazio	40,2%	31,5%
Abruzzo	47,1%	34,5%
Molise	41,5%	29,0%
Campania	44,4%	34,9%
Puglia	21,4%	11,4%
Basilicata	31,7%	28,8%
Calabria	44,5%	46,5%
Sicilia	14,8%	11,5%
Sardegna	28,3%	22,9%
ITALY	**36,9%**	**33,4%**

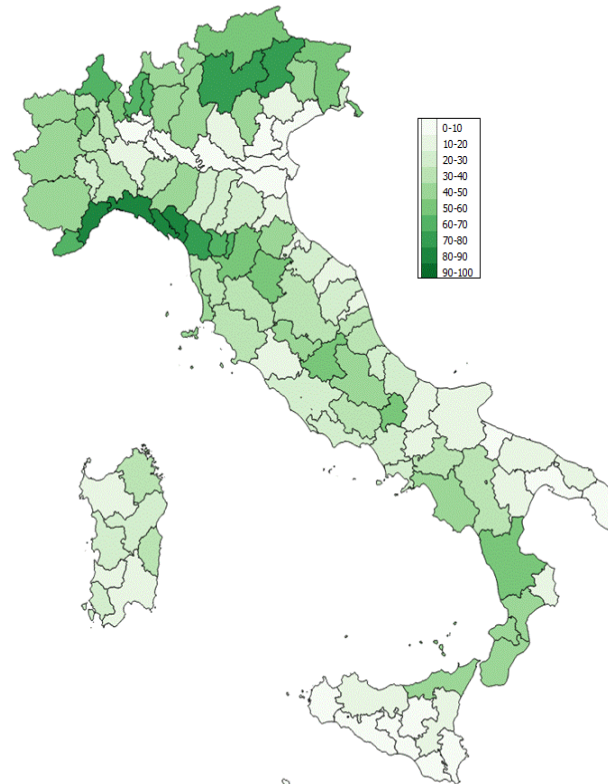FAO based indicator: 2010: **36.7%** - 2015: **37.7%**

Examples showing the use of EO data
The 15.1.1 indicator – Usage of different geospatial layers

INDICATOR 15.1.1 computed from Copernicus HRL
NUTS3 level
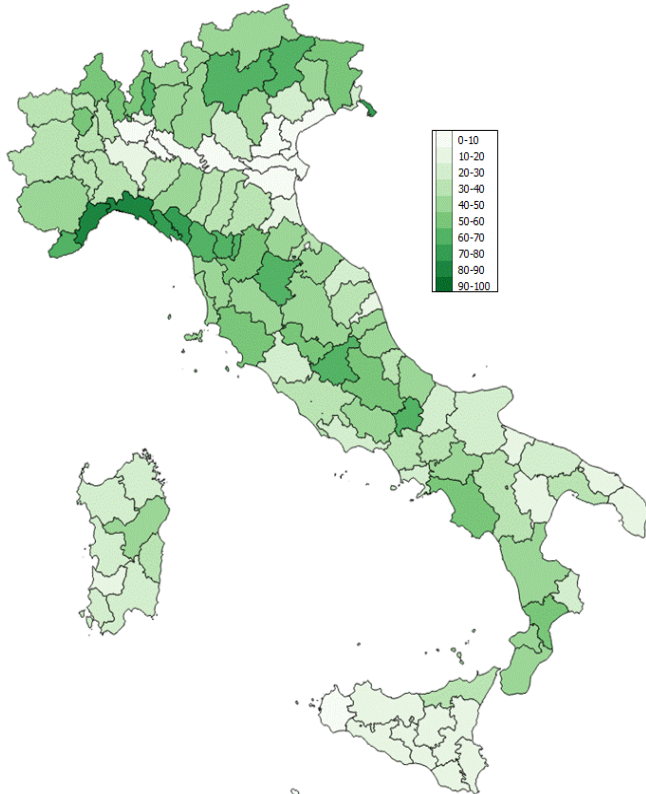
INDICATOR 15.1.1 computed from ESA LAND Cover
NUTS3 Level

- Even if limited, there are differences in the indicator value by adopting different datasets

Indicator 15.1.1: Forest area as a proportion of total area

Examples showing the use of EO data
The 15.1.1 indicator – Benefits of transnational datasets

- **EU perspective**:
  - ★ EU produces geospatial datasets with high detail, that are subject to validation procedure, allowing a proper computation of the indicator on a frequency of 3 years over all EU MS
  - ★ By using EU geospatial datasets, the indicator can also be disaggregated at a very detailed spatial level

- **Global perspective**:
  - ★ There are global land cover datasets that can be used for the computation of the indicator at worldwide basis with an homogeneous procedure for all the Countries
  - ★ By using Global Land Cover datasets (such ESA Global Cover) the results are different in terms of accuracy, also due to the different definition of the forest area

Indicator 15.1.1: Forest area as a proportion of total area

Calculation of SDG Indicator
15.4.2 „Mountain Green Cover Index"
with remote sensing and geospatial data

Using the example of BKG Germany

Examples showing the use of EO data
The 15.4.2 indicator – National level geospatial layers

- Tier I Indicator, Custodian Agency: FAO
- Defined as proportion of *green covered mountain area* and *total mountain area*
- *Green cover* comprises forests, grasslands and agricultural areas
- Disaggregated by *mountain classes* according to Kapos et al. 2000:
  - ★ Class 1:elevation > 4,500 meters
  - ★ Class 2:elevation 3,500 – 4,500 meters
  - ★ Class 3:elevation2,500 – 3,500 meters
  - ★ Class 4:elevation1,500 – 2,500 meters and slope >2
  - ★ Class 5:elevation1,000 – 1,500 meters and slope >5 or local elevation range (7 km radius) > 300 meters
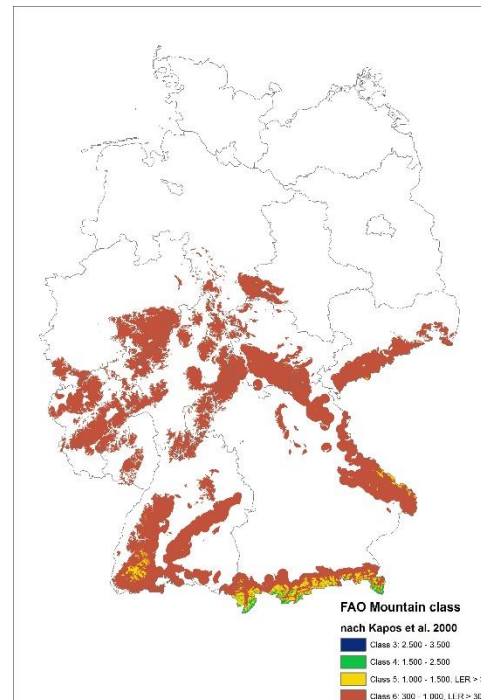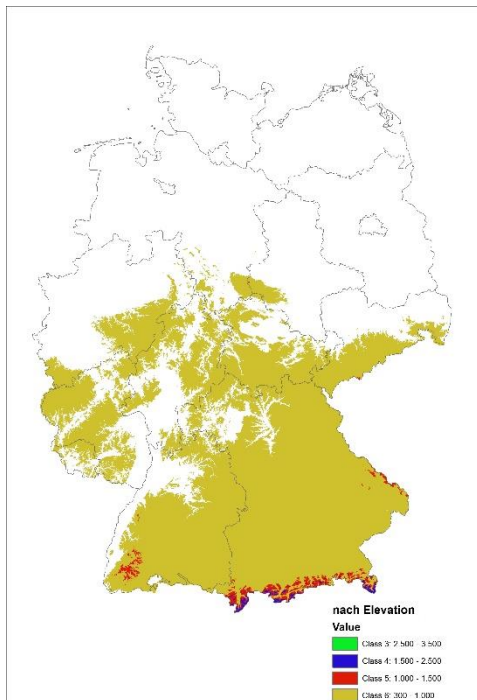 - ★ Class 6:elevation300 – 1,000 meters and local elevation range (7 km radius) >300 meters

Kapos V., Rhind J., Edwards M., Price M.F., Ravilious C. (2000): In M.F. Price and N. Butt (eds.) (2000) *Forests in sustainable mountain development*: A state-of knowledge report for 2000. CAB International, Wallingford: 4-9.
https://www.researchgate.net/publication/306151877_Developing_a_map_of_the_world's_mountain_forests_Forests_in_sustainable_mountain_development_a_state_of_knowledge_report_for_2000
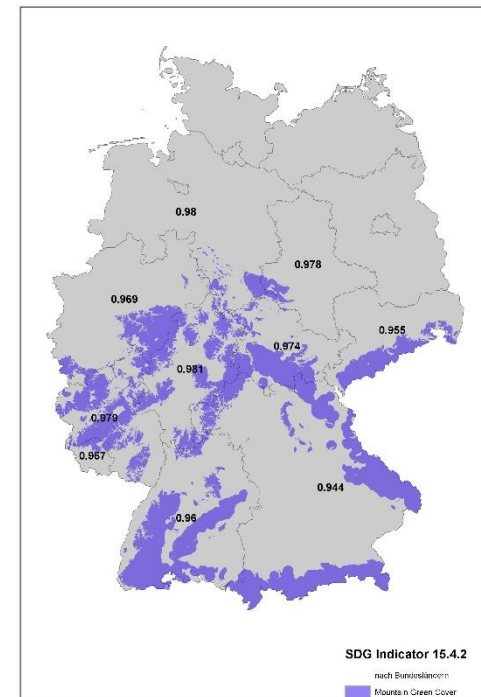
Examples showing the use of EO data
The 15.4.2 indicator – National level geospatial layers

Data sources:
- The digital **terrain model** (DGM10) and
- The digital **land cover model** (LBM-DE) of BKG Germany

nach Elevation Value
- Class 3: 2.500 - 3.500
- Class 4: 1.500 - 2.500
- Class 5: 1.000 - 1.500
- Class 6: 300 - 1.000

FAO Mountain class nach Kapos et al. 2000
- Class 3: 2.500 - 3.500
- Class 4: 1.500 - 2.500
- Class 5: 1.000 - 1.500, LER > 300
- Class 6: 300 - 1.000, LER > 300

Mountain Area in Germany: 0,186 %

SDG Indicator 15.4.2
nach Bundesländern
Mountain Green Cover

MGCI for Germany: **0,962 %**

Examples showing the use of EO data
Benefits of national cooperation

- The **German National Geospatial Agency** (BKG) and the **German National Statistical Office** (Destatis) started to cooperate and discuss several indicators (11.2.1, 11.3.1, 11.7.1, 15.1.1, 15.4.2) in 2017

- In June 2018 it was decided that the **calculation of indicator 15.4.2** shall be in the **responsibility of BKG** in the future

- On the basis of a **calculation result comparison** it will be discussed and decided soon whether or not BKG could take over the calculation of **indicator 11.7.1** as well

- **Further indicators under a „geospatial lens"** might be identified in January 2019 and be **analyzed in 2019**

Next actions to conclude the work…

October	November	December	January

Consolidate final report

Submit report to UN-GGIM: Europe ExCom

> National report assessement
>
> Brief discussions papers
>
> Indicator testing (GEOSTAT 3)

Finish Final Report

↓

DIRECT INPUT FOR THE REPORT

PUBLICATION

> Gap analysis with global, European and national practices

↓

ANNEX TO THE REPORT

Provide feedback to UN on current status
(e.g., IAEG-SDG WG GI)

# UN-GGIM: Europe questions to be dealt in the report

- Are there **"metadata" recommendations** regarding indicators that should be highlighted at the **global level** for the United Nations (e.g., concepts, sources, algorithms…)?

- What are the relevant **geospatial and statistical datasets** to calculate indicators and what are their status of availability at global, European and national levels?

- What are the **main issues / challenges** of using geospatial data and its combination regarding indicators and what possible recommendations do we suggest?

The main communication platforms for the WG...
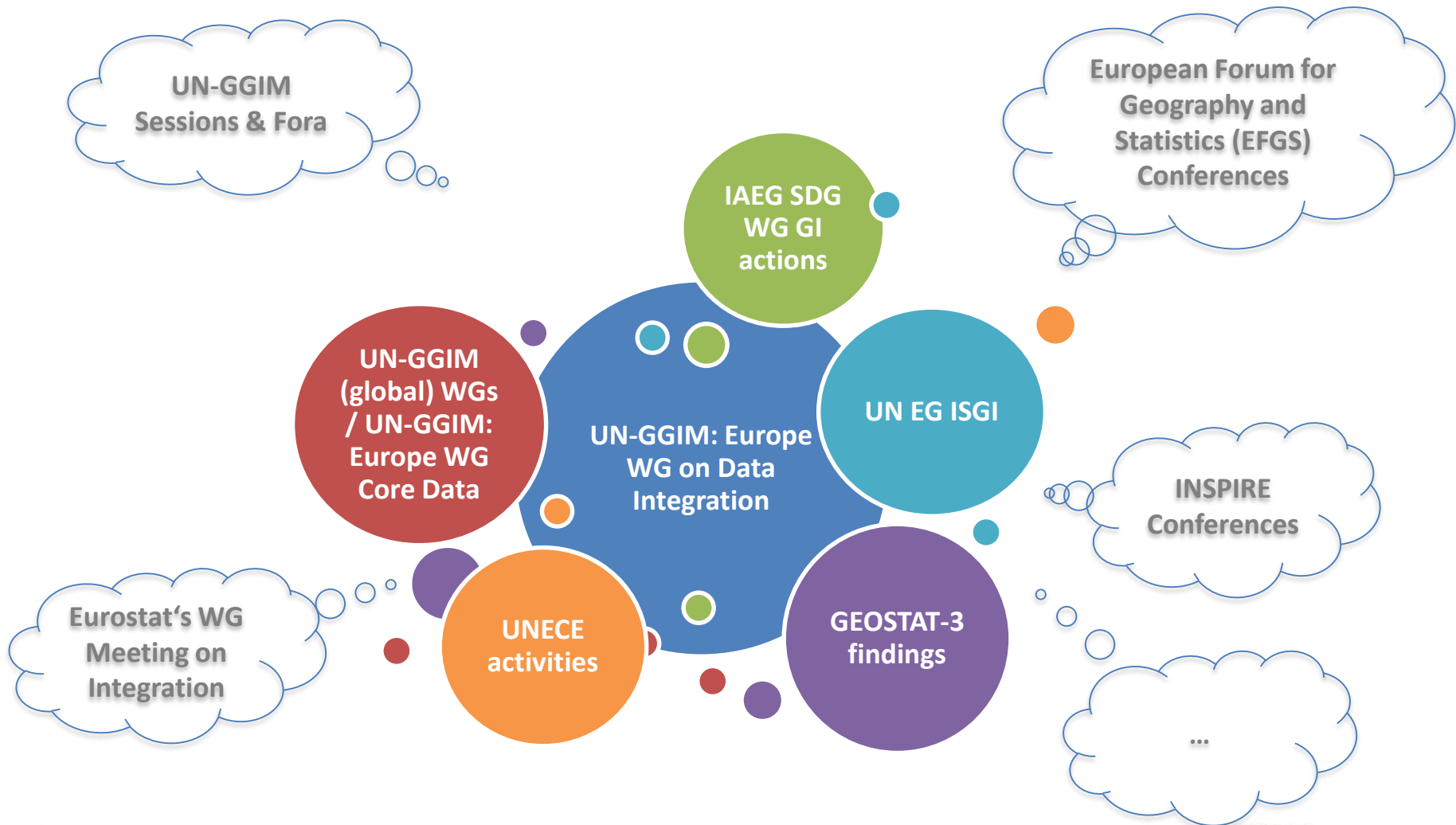
Still some way to go… but it remains exciting…

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