UN-GGIM: EUROPE
GLOBAL GEOSPATIAL

UN-GGIM: Europe | Work Group on Data Integration | subgroup 2

The territorial dimension in SDG indicators: the contribution of geospatial data and analysis and its combination with statistical data

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 [tier III indicator]

Brief discussion

At the ***global level,*** UN-Habitat and other partners including private and regional commissions are leading the efforts of building national capacities to monitor and report on this indicator. Conceptually, the indicator requires estimation of the area of public space based on three steps:

a) Spatial analysis to delimit the built-up area of the city;
b) Estimation of the total open public space and;
c) Estimation of the total area allocated to streets.

The final computation of the indicator should be calculated using the following formula:

$$Share\ of\ the\ built-up\ area\ of\ the\ city\ that\ is\ open\ space\ in\ public\ use(\%) = \frac{Total\ surface\ of\ open\ public\ space + Total\ surface\ of\ land\ allocated\ to\ sreets}{Total\ surface\ of\ built\ up\ area\ of\ the\ urban\ agglomeration}$$

This indicator is categorised under Tier III, meaning that internationally established methodology or standards are yet available for the indicator, but methodology/standards are being (or will be) developed or tested. A request to upgrade the indicator to Tier II has been made by UN-Habitat but decision from the SDG-IAEG is still pending.

At the global level, the harmonization of the following data sources is proposed to ensure more consistent reporting on this indicator:

- For estimating the total surface of built-up area, it is proposed the use of existing layers of satellite imagery ranging from open sources, such as Google Earth and US Geological Survey/NASA imagery Landsat, to more sophisticated and higher resolution land cover datasets. Images are to be analysed for the latest year.
- For the Inventory of open public space, information can be obtained from legal documents outlining publicly owned land and well-defined land use plans. In some cases, where this information is lacking, incomplete or outdated, open sources, informants in the city and community-based maps, which are increasingly recognised as a valid source of information, can be a viable alternative.
- The share of land in public open spaces cannot be obtained directly from the use of high-resolution satellite imagery, because it is not possible to determine the ownership or use of open spaces by remote sensing. However, fieldwork to validate and verify the open spaces derived from satellite imagery helps to map out land that is for public and non-public use.

The analysis of the WG members regarding the metadata on this indicator has pointed out two main dimensions that need further development:

- At the conceptual level

There is a need for clear definition regarding the underlying concepts of this indicator, namely:

- Built-up area: it is not clear what categories should be included in the definition of a built-up area. The concept of built-up areas should be in line with indicator 11.3.1 *Ratio of land consumption rate to population growth rate* as it aims to capture the same entity. In this vein, built-up areas should be measured as artificial land.
- Urban areas/cities: the territorial classifications and / or methodology to identify cities delimitation is also not clearly stated. At the European level there is a classification for European cities (Urban Audit) and the DEGURBA – Degree of urbanization and countries may also have national classifications. Therefore, common and harmonised territorial typologies should be used to capture the urban dimension and, in the case of EU, the TERCET regulation defines territorial typologies to be used and published by the Commission (Eurostat).
- Public open space: this concept is very complex and difficult to measure, especially at the global level. It can be difficult and in some cases impossible to classify the types of public open space without conducting field inventories. In this context, other proxies might be considered that still grasp the idea of quality of life in cities and that are easier to measure, such as open green space.
- Global metadata included the estimation of area allocated to streets, in order to better capture the use of public spaces for leisure activities, the indicator would benefit from excluding the area allocated to streets. In this vein, a calculation with or without this dimension could be carried out in order to evaluate differences in terms of results.
- Accessibility: typically, accessibility is measured using rules for spatial proximity between objects, such as between peoples permanent place of residence and public parks. In the metadata description, accessibility is measured at each identified individual public open space, such as a square. If no restrictions for the public to access the square is found, it is considered accessible open space. Regarding this approach, the scope of the indicator is ambiguous. There are two different types of objects to measure (according to the title of the indicator), the open space, on the one hand, and the people that have access to the open space, on the other hand. The current methodology does not address people as an object; hence, it does not permit disaggregation of accessibility by sex, age and persons with disabilities. Another point of view could be to measure accessibility to this type of space based on a similar methodology as proposed for indicator 11.2.1 *Proportion of population that has convenient access to public transport*, which would entail changing the perspective on the indicator.

- At the data source level and geospatial processing level:

The data sources listed in the metadata are relevant, however further clarifications may be needed:

- For estimating the total surface of built-up area, use of satellite imagery is recommended. However, it can be discussed whether use of raw EO data should be the first hand choice or if global EO data derivate products could provide a more efficient option. Such data could be the Global Human Settlement Layer (GHSL), which is freely available and has global coverage. Another option could be the grid cluster approach jointly developed by EU and OECD to define urban areas. This approach also builds on the GHSL, but with additional modelling of population density. Currently, additional work is being conducted by DG REGIO to investigate the prospect of applying the approach globally.

- For the Inventory of open public space, the metadata description relies heavily on use of semi-structured, non-geospatial data such as information obtained from legal documents outlining publicly owned land or well-defined land use plans and fieldwork to validate and verify the open spaces derived from satellite imagery to map out land that is for public and non-public use. In a European context, it can be assumed the willingness from governments to spend resources on additional field data collection will be low, considering the large investments that have been done in geospatial information during the recent years. Investments in geospatial information are expected to pay-off in terms of reduction of the need to use of semi-structured, non-geospatial data and expensive fieldwork.

- The metadata description should benefit from better recognising the use of alternative geospatial data sources to describe the accessibility of open space. Such data sources can be cadastral information (where ownership is defined). In contrast to fieldwork, the use of such data will result in less precise classification of types of public open space, but on the other hand it will have a better coverage and possibly also a more consistent and objective classification. A cross-reference benchmark on the substitutability of field data/non-geospatial data to geospatial information could be valuable as to open up for regional adaptations of approaches that can return a comparable result.

- Comparability is best guaranteed with the use available global / EU data sources, as well as territorial typologies, but at the national level data sources might have more detailed information and be able to better address the conceptual definitions of the indicator, including the proposed segmentations. The indicator might be calculated based on different sources at different levels of analysis, but to guarantee comparability across countries it is relevant to use harmonized definitions, typologies and data sources.

In the case of Spain, the cadastre includes in its database the urban qualification of each real estate, including for green areas. The Spanish cadastre provides information on the status, area (m^2) and coordinates [see Figure 1], and information can be analysed at different territorial levels (e.g., by municipality, building blocks).

Figure 1 - Example of a green area as included in the Spanish Cadastre

Source: Dirección General del Catastro (http://www.catastro.meh.es)

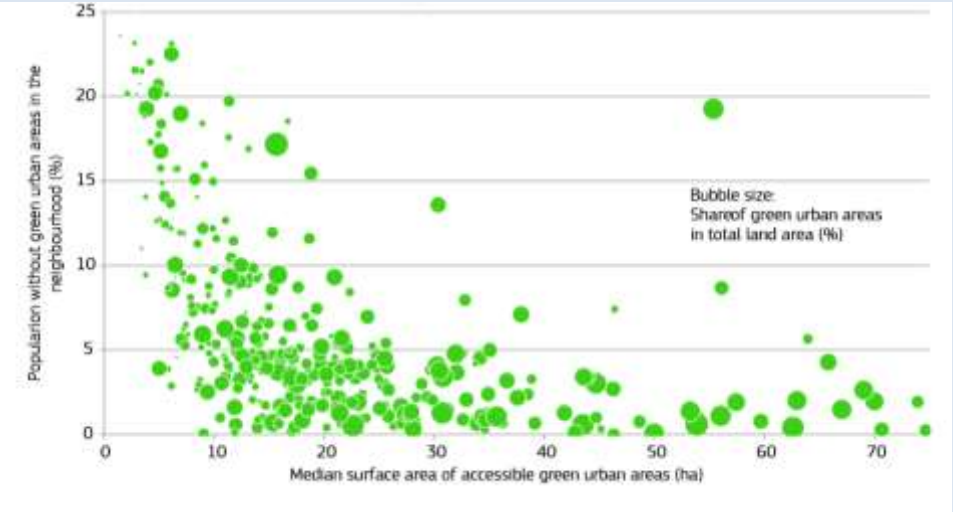
At the ***EU level,*** the EU-SDG indicator set defined by Eurostat has not included an indicator that has a direct correspondence with the one defined at the global level. Worth to mention, however, is that the EU collects data possibly useful for calculation of this indicator. Urban atlas is one of the relevant data sources compiled by the European Environment Agency (EEA) in a harmonised way across Member-States. The European Settlement Map is another new data source, produced by the Joint Research Centre (JRC) that provides an opportunity for calculations based on very detailed and harmonized urban data. However, presently none of these data sources has a complete coverage of all urban areas. Additionally, a further European approach based on geospatial data has been developed by DG REGIO in the working paper *A walk to the park? Assessing access to green areas in Europe's cities* (Poelman, 2018). The study relies on the concept Urban Audit grid-based concept of *urban centre*, but also produces results for the *city* and *greater city* level as defined according to administrative boundaries. The *green area* definition relies on the one provided by the Copernicus Urban Atlas and population is also derived from the Copernicus Urban Atlas [see Box 1].

Box 1 - Assessing access to green areas in Europe's cities (DG REGIO)

DG REGIO study on access to green areas is based on Copernicus Urban Atlas data. The definition used in Copernicus Urban Atlas refers to "public green areas for predominantly recreational use such as gardens, zoos, parks, castle parks; suburban natural areas that have become and are managed as urban parks". Nevertheless, because at the fringe of cities, the distinction between "green urban areas" and forests is not easily made, DG REGIO study also included the Urban Atlas class "forests" in the analysis with a minimum mapping unit of 0.25 ha.

To measure proximity to urban areas, the study determined an area of easy walking distance (defined as 10 minutes along the street network) around each Urban Atlas polygon. For each polygon an estimation of the total resident population was available, making it possible to calculate the population-weighted median surface of green areas by urban centre or by city/greater city that can be reached within 10 minutes walking (the median rather than the average is used as the study argues that the latter tends to be influenced by outliers in the distribution of green areas). The study also calculates the distribution of the urban population compared to the level of access to green areas and the share of green areas in total land area [see Figure 2].

Figure 2 - Proximity of green areas, population without green areas nearby and share of green areas in the total land area



Source: Poelman, H. (2018). *A walk to the park? Assessing access to green areas in Europe's cities*. Regional Working Paper, DG REGIO.

At the ***national level***, from the national practices collected (from Ireland, Sweden and Switzerland), it was possible to identify this indicator has not been calculated, disseminated or reported by countries, which is explained by the fact that the indicator is still in Tier III mode. Countries have identified national data sources to address this indicator. In the case of Ireland, data related to built-up areas and public space can be sourced from the PRIME2 database maintained by Ordnance Survey Ireland (Irish NMCA), which corresponds to a central database of spatial information [see Box 2].

Box 2 – Measuring built-up areas that are open space for public use based on the Irish PRIME2 database

For the national context of Ireland, the identification of built-up areas that area open space for public use can be derived from the PRIME2 geospatial database maintained by the Irish NMCA - Ordnance Survey Ireland (OSi). The central premise behind PRIME2 is to have topologically consistent polygons that cover the surface of Ireland. These polygons are grouped into five broad categories: way, water, vegetation, artificial and exposed (non-vegetative ground such as sand and mud). For the built-up areas, artificial and way objects can be considered to be in scope. Artificial objects represent man-made ground cover such as concrete, tarmacadam, gravel, sloping masonry, rail bed, among others including gardens. Way objects in the PRIME2 database also represent all drivable and walkable roads and paths from motorways down to sidewalks and lane ways. Figure 3 shows the objects classified as artificial and way in the centre of Dublin.

PRIME2 contains over 50 million attributed objects in point (building), line (road) and polygon (parcel) format, and includes form and function object classification which describes the physical form (e.g., building) and its use (e.g., residential, hospital, church etc.). There are over 1 000 different function types recorded in PRIME2. The following categories can be selected for open public space: green space, public park, beach, and cemetery: Figure 4 shows the objects classified as open public space in the centre of Dublin.

Figure 3 – Built-up areas in Dublin city centre

Figure 4 – Objects classified as open space in Dublin city centre

The following categories of objects can be selected in the PRIME2 that resemble land allocated to streets that are considered as public space: car park, roundabout, sidewalk, traffic island, pier and street. Figure 5 shows the objects classified as open public space in the centre of Dublin.

Figure 5 – Objects classified as land allocated to streets in Dublin city centre

Source: PRIME2 database (OSi – Ordnance Survey Ireland).

For the context of Switzerland and Sweden complementary indicators within their national monitoring framework have been proposed. In the case of Switzerland, the national complementary indicator is defined as *Urban recreational areas* and the Swiss Federal Office for Spatial Development holds thematic responsibility and the Swiss Federal Statistical Office is responsible for the data sources used. The indicator relies on national land use statistics which are established by visual interpretation of high-resolution aerial photography and distinguishes 46 categories of land use and 27 categories of land cover. The percentage of the surface occupied by the land use classes referring to "Recreational areas and cemeteries" and to "Surroundings of residential buildings" is used to calculate the indicator for the urban municipalities. Urban municipalities are defined according to the Swiss Federal Statistical Office urban-rural typology. In the case of Sweden, the national complementary indicator is based on access to urban green areas. Access is defined as spatial proximity to public green areas and calculation of this indicator is conducted as part of the existing official land use statistics [see Box 3].

Box 3 - Sweden national complementary indicator on Access to urban public green areas

For the context of the national SDG indicator framework and monitoring, Statistics Sweden proposed a complementary national indicator measuring people's access to public green areas in urban areas. This indicator is based on existing official statistics. To calculate this statistics, a method has been developed, based on a combined use of Earth Observation (EO) data and geocoded register data and other geospatial information (geocoded population data, cadastral parcels, buildings, road networks etc). The data compiled for the green area statistics can also be used as a foundation to estimate the global indicator on the totality of urban public space. Some of the categories of public open space are already calculated [see Figure 6] and some can be retrieved on the basis of the data compiled. Some methodological issues still remain to be solved, but tests within GEOSTAT 3 show promising results.

In brief, green spaces are mapped using EO data. Public access is determined using cadastral parcels in combination with ownership data. Large enough adjacent green spaces (>= 0.5 hectares) accessible for the public are qualified for "green areas". Proximity to population is calculated using Euclidian distance between population data linked to physical address location and green areas. The share of urban population with access to green areas within 200 meters from the place of permanent residence is calculated.

Figure 6 - Public green areas in Malmö by size