THE JRC-GEOSTAT 2018 POPULATION

Metadata / Technical fiche

Brief description of the dataset

The JRC-GEOSTAT 2018 is a regular grid map of 1 x 1 km cells reporting the number of residents for the year 2018 for Europe. It was developed in the second half of 2020 by the European Commission Joint Research Centre, at the request of DG REGIO, and with the collaboration of Eurostat, as a follow up of the earlier GEOSTAT editions 2006 and 2011 from Eurostat.

A key motivation to produce the JRC-GEOSTAT 2018 was the need to have an update of the population distribution information at high spatial resolution and to obtain insight in recent population changes at local level, in view of various European Commission policy documents foreseen for the period 2020-2022. The release of the GEOSTAT 2021 grid, fully based on the 2021 census, is not expected before 2023.

The GEOSTAT 2011 was based on the 2011 census and, for the majority of countries, it was generated by aggregating address-based population counts to the 1 km^2 grid cells ('bottom-up' grid), making it a very reliable dataset for what concerns the geographical distribution of the resident population. Conversely, the JRC-GEOSTAT 2018 was constructed by combining data on the number of residents in 2018 at local level provided by the National Statistical Institutes, the number of residents per 1 km^2 cells in 2011 (as per the GEOSTAT 2011), and information on the density of built-up areas in 2012 and 2018 derived from Copernicus Earth Observation products. The exact method to derive population per 1 km^2 grid cells depended on the quality of the population data available for each country. As such, the final product can be considered a 'hybrid' grid, ranging from 'bottom-up' (i.e. aggregated) to 'top-down' (i.e. downscaled) depending on the country. The JRC-GEOSTAT 2018 is a best possible approximation to the population distribution in 2018 and is as compatible as possible with the GEOSTAT 2011 grid. However, because 2018 was not a census year, full comparability could not be attained due the input data limitations in terms of spatial resolution as well as possible differences in the definition of 'resident population'.

Table 1. Main product's specifications

Product's name	JRC-GEOSTAT 2018
Latest version	2021.02.10
Variable	Number of residents / Total resident population
Coordinate Reference System	ETRS-89 LAEA (EPSG: 3035)
Spatial resolution	1 x 1 km
Geographical coverage	EU-27 + EFTA countries + Western Balkans + UK (38 countries)
Temporal coverage	2018 (2016-2019)
Data structure / format	Attribute table, raster (TIFF)
Authorship	European Commission, Joint Research Centre (B.3) and DG REGIO (B.1)
Ownership	European Commission
Dissemination	Public

Geographical coverage

The JRC-GEOSTAT 2018 covers a total of 38 European countries, including all the European Union Member States and the following additional countries: Albania, Bosnia and Herzegovina, Iceland, Kosovo[1], Liechtenstein, Montenegro, North Macedonia, Norway, Serbia, Switzerland, and United Kingdom.

Temporal coverage

In most countries, population refers to 31/12/2017 or 01/01/2018. Exceptions are listed below:

- 31/12/2018 or 01/01/2019: AT, BG, LV, SE, XK
- 30/06/2018: BA, ME, MK, UK
- 24/06/2016: IE

Methods

The JRC-GEOSTAT 2018 was constructed by employing 4 different methods, depending on the quality of the input population data available in each country. In essence, the objective of each method is to transfer known population figures from a given 'source' geometry (usually provided by the National Statistical Institute via Eurostat or DG REGIO) to the 'target' geometry (i.e. the 1 km x 1 km cells of the European reference grid).

The methods are summarized in the table below. Methods 3 and 4 are the most reliable, as population figures were already available at 1 km^2 resolution or finer. Methods 1 and 2 are less reliable, as they involve a downscaling procedure, generally from relatively coarse Local Administrative Units (LAU) to the 1 km^2 reference grid cells, thus encompassing higher uncertainty. Method 1 is superior to method 2, as it considers known population in 2011 as per the GEOSTAT 2011 and focuses on the allocation of population changes between 2011 and 2018 based on observed changes in built-up density in the same period. This method, however, could only be applied to countries where GEOSTAT 2011 was constructed using a 'bottom-up' approach.

Table 2. Short description of the methods implemented to produce the JRC-GEOSTAT 2018

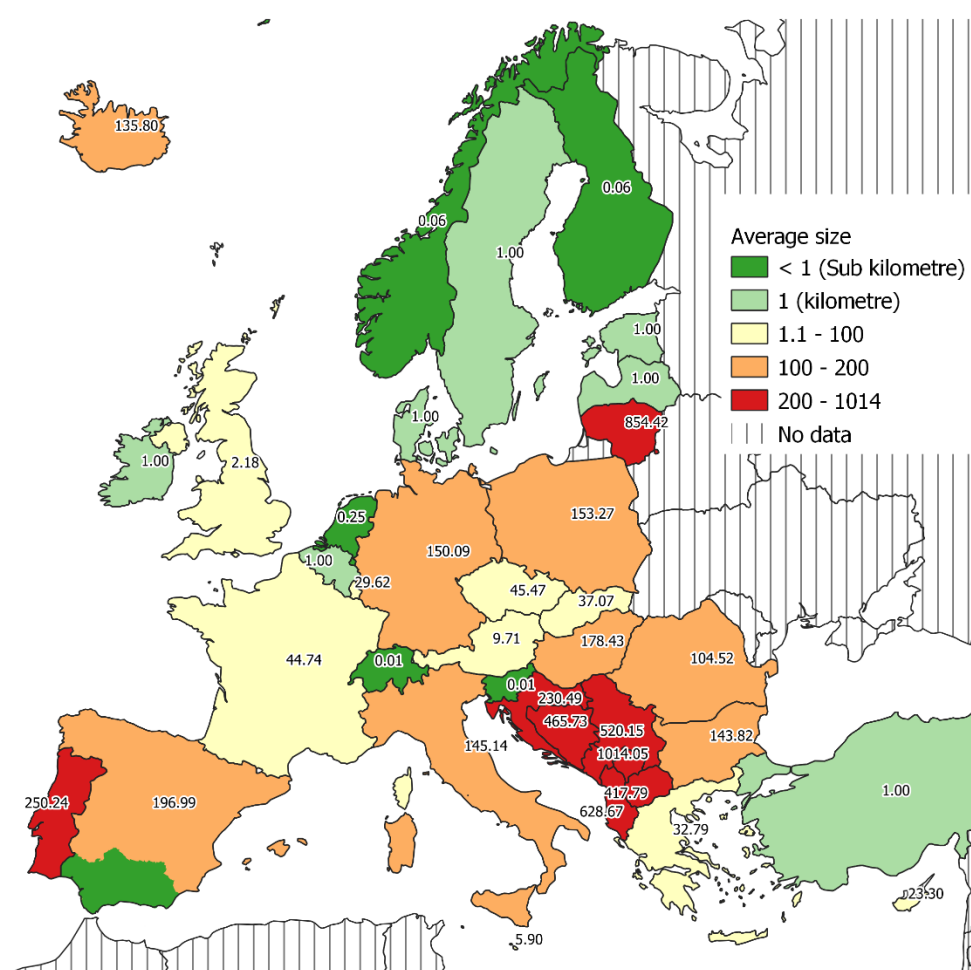| Method	Countries/regions covered	Short description	Reliability
1	AL, AT, CZ, DE, ES (except ES61, ES70), FR, HR, HU, IT, LT, MT, PL, PT, RO, SK, XK, UK	Downscaling of differences in population between 2011 and 2018 recorded at the level of LAUs or sub-LAUs. Ancillary data: change in built-up density between 2012 and 2018; population in 2011 from GEOSTAT 2011.	Medium
2	BA, BG, CY, EL, IS, LU, ME, MK, RS	Downscaling of total population in 2018 recorded at the level of LAUs or sub-LAUs. Ancillary data: built-up density in 2018.	Low
3	BE, CH, ES61, ES70, FI, LI, NO, SI	Aggregation or correspondence between original sub-km or 1-km grid cells and the 1-km reference grid, respectively (centroid assignment method).	Very high
4	IE, DK, SE, EE, LV, NL	Areal interpolation of total population in 2018 recorded at the level of 1-km grid cells (non-snapping with reference grid). Ancillary data: built-up density in 2018.	High

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[1] This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

Countries for which methods 3 and 4 could be employed are deemed of high or very high reliability, as the population estimates correspond to those provided originally by the respective National Statistical Institutes at high spatial resolution (1 km^2 or smaller).

For countries where population was derived using a top-down / downscaling method, higher uncertainties were involved. It was possible to assess the performance of methods 1 and 2 by using them to downscale population in countries where ground-truth data were available at 1 km^2 or finer resolution. As such, methods 1 and 2 were tested in the following countries/regions: BE, CH, ES61 (Andalusia), FI, LV, NL, SI. From this sample of countries/regions, it was possible to determine an average map accuracy of 84% for method 1 and 62% for method 2, assessed at the final products' resolution of 1 km x 1 km. 'Map accuracy' corresponds to the share of the total country's population allocated to the correct 1 x 1 km cells. It must be emphasized that the downscaled product is consistent with the original coarser population distribution data at LAU or sub-LAU level, and therefore never less accurate.

It should also be noted that there is a strong relationship between the average size of the source zones within a country and the obtained map accuracies: the larger the average size of the source zones of a country, the lower the resulting map accuracy. Figure 1 shows the population weighted average size of source zones per country. Countries with source zones above 200 km^2 and/or for which method 2 was used portray the least accurate population estimates at the 1 km^2 level.

Figure 1. Average size (population weighted) of input source zones in each country or region.

Download URL

The JRC-GEOSTAT 2018 gridded population estimates are available from the Eurostat, GISCO webpage, as an additional attribute ('TOT_P_2018') to the downloadable reference grids, here:

- https://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/grids

The JRC-GEOSTAT 2018 will also be available soon for download at 1 km and 100 m resolutions in TIFF format from the European Commission Joint Research Centre servers:

- https://jeodpp.jrc.ec.europa.eu/ftp/jrc-opendata/LUISA/EUROPE/Basemaps/2018/

Acknowledgements and disclaimer

- EC Joint Research Centre: methodological development; implementation.
- EC DG REGIO: client; data provider (population at sub-LAU level).
- EC Eurostat: data provider (population at LAU level); data hosting.

The European Commission Joint Research Centre (JRC) developed and maintains this dataset using the best available data and scientifically rigorous methods. Any eventual errors or issues brought to JRC's attention will be addressed as soon as possible. The European Commission accepts no responsibility or liability whatsoever for the use which may be made of this dataset.

Citation

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