

Population and housing census 2021 - population grids

Statistics Explained

*Data extracted in March 2023
Planned article update: June 2024*

"Population grid data from the 2021 EU population and housing census has been released."

This article introduces harmonised [population grid](#) data that are now available for the European Union and three EFTA countries. The datasets are based on data from the 2021 population and housing census at the level of 1 km² grid cells.

Background information

The information presented in this article is based on provisional data on population grids produced as part of the 2021 population and housing censuses in the EU. The grid data consist of statistics that are geographically referenced to a system of square grid cells in a common European reference grid net with Cartesian coordinates. The use of a common European-level grid allows analyses to be undertaken for areas that cross national boundaries.

Traditionally, official statistics are reported in accordance with a hierarchical system of administrative units ranging from the local to the EU level and usually under the control of an official authority. In the EU, the Nomenclature of territorial units for statistics (NUTS) is the most important example of such an output system. While this is excellent for accounting purposes, and for reporting to the respective authorities administering services within the territory, it is not suitable for studying causes and effects of many socioeconomic and environmental phenomena, such as flooding, commuting, mobility, leisure etc.

When studying such phenomena, a system of grids with equal-size grid cells has many advantages:

- grid cells all have the same size allowing for easy comparison;
- grids are stable over time;
- grids integrate easily with other scientific data (e.g. meteorological information);
- grid systems can be constructed hierarchically in terms of cell size thus matching the study area; and
- grid cells can be assembled to form areas reflecting a specific purpose and study area (mountain regions, water catchments).

The grid data can be consulted in the interactive visualisation below.

Distribution of European population

The net of 1 km²grid covering the territory of the EU contains 4 448 981 grid cells. The total EU population measured on the grid in the census reference year 2021 was 443 234 205 residents.

Total population in Member States, 2011 and 2021

Based on data presented for the population grids

Country	Total population on grids		Change of population in %
	2021	2011	
Belgium	11 554 767	11 000 638	5.0
Bulgaria	6 519 789	7 364 570	-11.5
Czechia	10 524 167	10 436 560	0.8
Denmark	5 840 045	5 560 628	5.0
Germany	83 239 650	80 219 695	3.8
Estonia	1 319 629	1 294 455	1.9
Ireland	5 105 761	4 574 888	11.6
Greece	10 481 735	10 816 286	-3.1
Spain	47 400 798	46 815 910	1.2
France (*)	65 471 806	64 933 400	0.8
Croatia	3 871 833	4 284 889	-9.6
Italy	59 030 133	59 433 744	-0.7
Cyprus	921 033	:	:
Latvia	1 893 223	2 070 371	-8.6
Lithuania	2 810 761	3 043 429	-7.6
Luxembourg	643 941	:	:
Hungary	9 685 409	9 937 628	-2.5
Malta	519 562	417 432	24.5
Netherlands	17 475 443	16 655 799	4.9
Austria	8 964 889	8 401 940	6.7
Poland	37 019 327	38 044 565	-2.7
Portugal	10 343 066	10 562 178	-2.1
Romania	19 053 815	20 121 641	-5.3
Slovenia	2 108 912	2 050 189	2.9
Slovakia	5 449 270	5 397 036	1.0
Finland	5 533 179	5 375 276	2.9
Sweden	10 452 262	9 482 855	10.2
Liechtenstein	39 055	:	:
Norway	5 391 368	:	:
Switzerland	8 738 884	:	:

(:) not available

(*) Grid data from France does not include Régions Ultrapériphériques Françaises

Source: Eurostat, Population and housing census 2021, GISCO database

The reference grid dataset includes 1 824 619 populated cells within the EU and 75 673 populated cells in the three EFTA countries providing data (Liechtenstein, Norway, Switzerland). The population grids of the EU and the three EFTA countries contain 51 524 inhabited grid cells with exactly one inhabitant. In total, 2 624 362 cells in the EU and EFTA countries had no population. Spain and Sweden have the highest number of uninhabited cells, 426 258 and 358 269 respectively.

Compared to the population grid data from 2011, it appears that population counted on the grid cells increased the most in absolute terms in Germany (a rise of more than 3 million persons), while the largest growth rate was observed in Malta (24.5 %). Compared to 2011, total population on the grid fell most significantly in absolute terms in Romania (a drop of over one million persons) and in relative terms in Bulgaria (a decrease of 11.5 %).

Population density classes

A population can be defined as a subgroup of individuals residing within a specific location. The number of such individuals and the surface area they inhabit determine [population density](#). Population density is used to describe the location, growth and many other indicators in relation to urbanisation, immigration and population demographics, and is very useful for many areas such as ecology, epidemiology and infrastructure. It is therefore important to keep track of population density and its changes for small areas, using usually data from the population and housing censuses.

The following animation visualises population in the EU by 25 km²squares. A glimpse at the distribution of the population over such squares reveals that 38 % of them have only 1 to 500 people as residents, while the most densely populated areas (more than 10 000 people per a 25 km²square) make up only about 5 % of the total.

Population of European capitals

Population of capital cities in the EU, 2021

Based on data presented for the population grids

	Capital city	Population
France	Paris	10 276 865
Spain	Madrid	5 034 998
Germany	Berlin	3 673 539
Greece	Athina	3 249 067
Italy	Roma	2 719 091
Austria	Wien	1 915 422
Sweden	Stockholm	1 899 560
Portugal	Lisboa	1 872 764
Poland	Warszawa	1 865 602
Hungary	Budapest	1 705 425
Romania	Bucureşti	1 702 390
Ireland	Dublin	1 423 985
Denmark	København	1 336 231
Czechia	Praha	1 300 297
Bulgaria	Sofia	1 228 403
Belgium	Bruxelles/Brussel	1 206 075
Netherlands	Amsterdam	1 018 867
Croatia	Zagreb	764 181
Latvia	Rīga	611 599
Finland	Helsinki	604 676
Lithuania	Vilnius	554 113
Slovakia	Bratislava	476 286
Estonia	Tallinn	431 285
Slovenia	Ljubljana	294 016
Cyprus	Nicosia	256 098
Malta	Greater Valletta	222 024
Luxembourg	Luxembourg	129 817
Norway	Oslo	691 653
Switzerland	Bern	230 299

Notes: The European Statistical System uses the degree of urbanisation methodology to define cities, as laid down in Regulation (EU) 2017/2391 as regards territorial typologies

Source: Eurostat, Population and housing census 2021, GISCO database

The population grid is used to produce the grid cell classification to define cells that belong to an urban centre. By definition, a city is a [local administrative unit](#) or a group of local administrative units where a majority of the population lives in an urban centre of at least 50 000 inhabitants. Examples of local administrative units include a municipality or a commune. A coherent and harmonised methodology that delineates cities is the basis of the production of comparable datasets. This basis is laid down in Commission Regulation (EU) No 2019/1130 on the uniform conditions for the harmonised application of territorial typologies.

It is common that capital cities include a single urban centre located in a single local administrative unit with very high population. Some capital cities can contain more than one urban centre; or one urban centre that covers two different parts of the city, as in the case of Budapest. Moreover, some capitals have outgrown their central local administrative unit, such as Athens, Copenhagen, Paris or Valletta.

According to the population grid data from the 2021 population and housing census, the total capital city population in the EU was 47 803 637, which is close to 10 % of the total EU population enumerated in 2021. More than 20 % of the total capital city population lived in the biggest capital city, Paris. The second largest capital is Madrid with half the population of Paris. The smallest capital city, Luxembourg, has a population of only about 1.2 % of the population of the biggest capital city.

The map below allows the user to zoom in on different capital cities by selecting them from the drop-down menu at the top left.

The [degree of urbanisation](#) is a classification of the character of an area using 1 km² grid cells, according to their population density, population size and contiguity (neighbouring cells). The latest update of the classification is based on the 2021 population census grids. Based on the share of local population living in urban clusters and in [urban centres](#), local administrative units are classified into three types of area:

- [Cities](#) (densely populated areas)
- [Towns and suburbs](#) (intermediate density areas)
- [Rural areas](#) (thinly populated areas)

The map below visualises the degree of urbanisation by providing a view on urban and rural areas.

Source data for tables and figures

[Population and housing census 2021 - population grids tables and figures](#)

Data sources

The data source used to produce population grids was the 2021 population and housing census. The sources for census data differ between countries and census rounds. Four main census approaches according to the Art. 4 of Regulation (EC) No 763/2008, were applied by countries in 2021: traditional, register based, rolling and combined census.

Data for Iceland is not available.

Eurostat classifies the values on the grid cells as provisional.

The data to be provided on 1km2grid from the 2021 population and housing census is laid down in Regulation (EU) 1799/2018 and is as follows:

With a deadline of 31 December 2022

- total [population](#) ;

With a deadline of 31 March 2024

- sex (males, females);
- age (under 15, 15 to 64, 65 and over);
- employed persons, as far as possible;
- place of birth (in the reporting country, in another EU country, outside the EU);
- usual residence 12 months before the census date (unchanged, within the reporting country, outside of the reporting country).

The census grid dataset is referenced to a common 1km2reference grid, that is defined by the INSPIRE framework, more specifically by Regulation (EU) No 1089/2010 that specifies the grid to be used (the ETRS89-LAEA coordinate reference system). The geo-referenced population dataset from the 2021 population and housing censuses in the EU can be accessed at the Eurostat [GISCO website](#) .

Methodology

Currently, 30 countries in the European Statistical System have an official population grid based on the geo-referenced data from the 2021 population and housing censuses. To create population grids for the 2021 population and housing census round, the Member States applied mostly the aggregation method. As described in the Statistics Explained article on [Population grids](#) , there are usually three methodology types that are used to attribute a number of inhabitants to each square kilometre cell:

Aggregation method : Grids are produced by aggregating geo-referenced micro data (also called bottom-up approach). This method requires the availability of data that has been geocoded to a geographical location, followed by the aggregation into the square kilometre. This was the method used by 25 Member States and three EFTA countries (Belgium, Bulgaria, Czechia, Germany, Denmark, Estonia, Ireland, Spain, Italy, Croatia, Hungary, Cyprus, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, Liechtenstein, Norway and Switzerland).

Disaggregation method : In the absence of geocoded micro data this method produces grids, using statistical data for the lowest available administrative/territorial units in combination with auxiliary spatial data (also called top-down approach). Data on land use and land cover is used to estimate the population within a particular administrative region into the square kilometre cells of that region. None of the Member States used this method for the 2021 population and housing census.

Hybrid method : The hybrid method combines aggregation and disaggregation techniques and represents a compromise between accuracy and availability of data. The aim is to maximise the quality of the data over disaggregation alone, e.g. for different parts of a country. The term hybrid could also refer to the source data, meaning a combination of different data sources with the aim of establishing a geocoded framework. The hybrid method was used by two Member States (Greece and France).

Population census data at a 1 km2grid level have the same scale, the same resolution and the same delineation across countries, in order to allow easy combinations to be used in cross-cutting comparable analysis. Population grid data on totals show the estimated number of people residing in each grid cell and allows for a visualisation of the residential distribution of the European population. All grid cells have an identification according to the INSPIRE specification, according to the ETRS89-LAEA coordinate reference system mentioned above.

The first population grid data from the 2021 population and housing census contains the total population at the

place of usual residence. Although this topic is considered non-sensitive, most countries have set confidentiality thresholds defining the minimum number of persons in each cell that can be published without having to suppress the data. The countries that have not set such a threshold are: Bulgaria, Czechia, Denmark, France, Hungary, Italy and Luxembourg. Finland have applied a different method to protect information, resulting in values which are not confidential any more.

Land surface area information was calculated for ten countries (Czechia, Denmark, Germany, France, Luxembourg, the Netherlands, Slovakia, Sweden, Norway and Switzerland), where more precise geographical information than 1ha was not available at national level. The land surface parameters for these countries are based on the CORINE dataset (minimum mapping unit 25ha) and the EBM administrative boundaries (Map scale 1:100 000).

Iceland have not provided data.

For the current release of total population grids, the following set of controls, checks and improvements were applied:

- Revision of changes compared to 2011 data in the population, land surface, flags values;
- Harmonisation of coastlines and border areas;
- Revision of unpopulated units.

Context

The dissemination of Union-wide harmonised census topics on a constant area grid, in particular on a 1 km²grid, is a key European statistical output for evidence based policy-making. The collection of geocoded population data addresses a common need across the Union for reliable, accurate and comparable information on population distribution with sufficient spatial resolution, founded on harmonised output requirements and intended in particular for pan-European regional policy-making. As a result, harmonised, spatially resolved demographic information across the Union will be collected and disseminated; one dataset per Member State will be collected, containing selected topics of the 2021 population and housing census geocoded to a 1 km²grid.

In particular, in order to achieve comparable harmonised outputs across the Union, a Union-wide constant area grid consisting of 1 km²cells was determined. The specific topics and their breakdowns as well as the detailed programme to be disseminated on this 1 km²grid was established by a temporary direct statistical action. The total population in the grid cells is disseminated in 2023, further information will follow in 2024.

The EU has been going through a period of demographic and societal change. On 17 January 2023, the European Commission published the Staff Working Document on [The impact of demographic change - in a changing environment](#) which provides further analysis of the demographic consequences of the COVID-19 pandemic. More information on the work of the European Commission 2019-2024 to tackle the impact of demographic change in Europe can be found in the [European Commission dedicated pages](#) .

See also

- [Population and housing census 2021 – overview](#)
- [Population grids](#)

Database

- [Eurostat GISCO database](#)

Dedicated section

- [Population and housing censuses](#)
- [Regions and cities](#)

Publications

All the publications related to the 2021 population and housing census are available on the [Population and housing censuses](#) dedicated section.

Methodology

- [EU legislation on the 2021 population and housing censuses — explanatory notes](#)
- [Methodological manual on territorial typologies](#)
- [Applying the Degree of Urbanisation — A methodological manual to define cities, towns and rural areas for international comparisons — 2021 edition](#)

Legislation

All relevant legislation regarding the 2021 population and housing censuses in the EU can be accessed through the [Population and housing censuses](#) dedicated section.

The legislation specifically mentioned in this article is as follows:

- [Regulation \(EC\) 0763/2008 of the European Parliament and of the Council of 9 July 2008 on population and housing censuses](#)
- [Commission Implementing Regulation \(EU\) 2018/1799 of 21 November 2018 on the establishment of a temporary direct statistical action for the dissemination of selected topics of the 2021 population and housing census geocoded to a 1 km² grid](#)
- [Commission Regulation \(EU\) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services](#)
- [Commission Regulation \(EU\) No 2019/1130 of 2 July 2019 on the uniform conditions for the harmonised application of territorial typologies pursuant to Regulation \(EC\) No 1059/2003 of the European Parliament and of the Council, OJ L 179, 3.7.2019 and Regulation \(EU\) 2017/2391 of the European Parliament and of the Council of 12 December 2017 amending Regulation \(EC\) No 1059/2003 as regards the territorial typologies \(Tercet\), OJ L350, 29.12.2017 .](#)
- [Regulation \(EU\) 2017/ 2391 of the European Parliament and of the Council - of 12 December 2017 - amending Regulation \(EC\) No 1059 / 2003 as regards the territorial typologies \(Tercet\)](#)