Territorial typologies manual - degree of urbanisation

Statistics Explained

This article forms part of Eurostat 's *methodology manual on territorial typologies* .

The degree of urbanisation classifies local administrative units (LAUs) as cities , towns and suburbs or rural areas based on a combination of geographical contiguity and population density , measured by minimum population thresholds applied to 1 km^2 population grid cells ; each LAU belongs exclusively to 1 of these 3 classes.

Classes for the typology and their conditions

Details of the typology

The degree of urbanisation is a classification based on the following 3 categories

- **cities** , otherwise referred to as densely populated areas – code 1
- **towns and suburbs** , otherwise referred to as intermediate density areas – code 2
- **rural areas** , otherwise referred to as thinly populated areas – code 3.

Urban areas refers to an aggregate composed of information covering cities as well as towns and suburbs (in other words, densely populated areas and intermediate density areas).

Methodology for the typology

The basis for the degree of urbanisation classification is data for 1 km^2 population grid cells. Each cell has the same shape and surface area, thereby avoiding distortions caused by using units varying in size. This is a considerable advantage when compared with alternative approaches such as those based on the use of population data for local administrative units (such as municipalities).

The use of relatively small (1 km^2) and uniform grid cells means that the basic concept for the degree of urbanisation looks inside larger local administrative units to detect the presence of individual rural areas, towns and suburbs, or cities, providing more accurate data for the 3 categories when aggregated to produce national data. Note that to have a population grid covering all of the EU countries, it was necessary to employ a 'top-down' approach (or a disaggregation grid) for those countries which didn't dispose of a 1 km^2 grid; such an approach is based on disaggregating population data for local administrative units according to land use or land cover information. In some other cases, countries use a hybrid approach to manage situations where the coverage of the population grid is incomplete. More information pertaining to population grids as a basis for developing territorial typologies is provided in the introductory chapter .

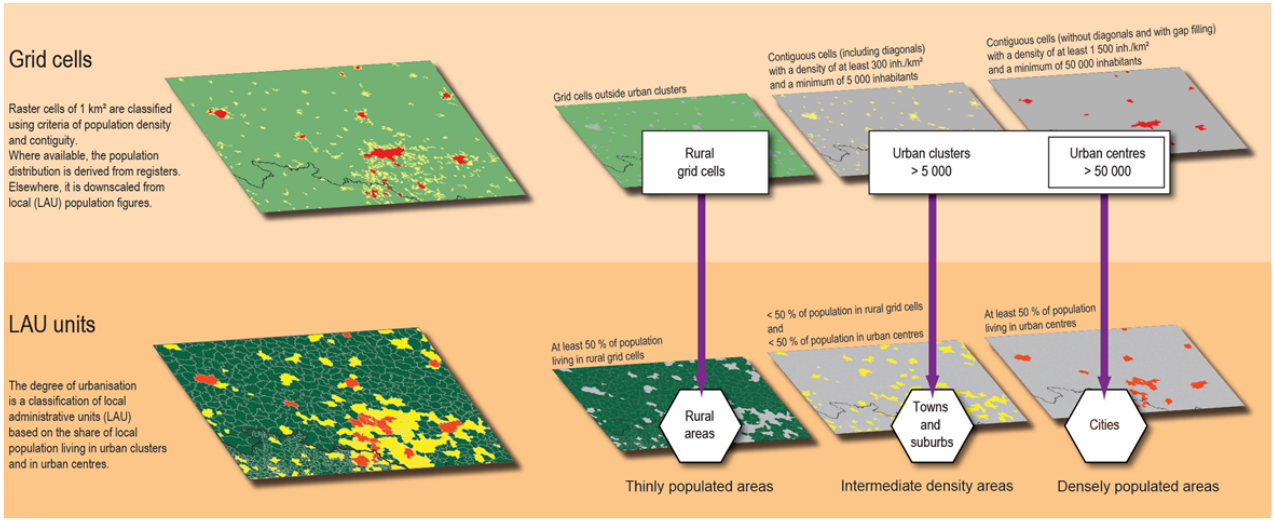
Step 1: classifying grid cells

Groups of 1 km^2 population grid cells are plotted in relation to their neighbouring cells to identify

- rural grid cells : all grid cells outside of urban clusters/centres

- urban clusters (or moderate-density clusters): a cluster of contiguous grid cells of 1 km^2 (in other words, grid cells that share a common border including grid cells that only touch diagonally at corners) with a population density of at least 300 inhabitants per km^2 and a minimum population of at least 5 000 inhabitants
- urban centres (or high-density clusters): a cluster of non-diagonal contiguous grid cells (in other words, excluding those cells with only touching corners) with a population density of at least 1 500 inhabitants per km^2 and collectively at least 50 000 inhabitants after gap-filling.

For a more detailed explanation of how grid cells are classified to the various cluster types (including the gap-filling process), see Chapter 1 .



Note: for more information, see https://ec.europa.eu/regional_policy/sources/work/2014_01_new_urban.pdf.
Source: Directorate-General Regional and Urban Policy, based on data from Eurostat, JRC, national statistical authorities

Figure 1: Schematic overview of the degree of urbanisation classification Source: Directorate-General Regional and Urban Policy, based on data from Eurostat, JRC, national statistical authorities

Step 2: classifying local administrative units according to the degree of urbanisation

Once all grid cells have been classified and urban centres, urban clusters and rural grid cells identified, the next step concerns overlaying these results onto local administrative units (LAUs), as follows

- **cities** (densely populated areas) – where at least 50% of the population lives in 1 or more urban centres (code 1)
- **towns and suburbs** (intermediate density areas) – where less than 50% of the population lives in an urban centre, but at least 50% of the population lives in an urban cluster (code 2)
- **rural areas** (thinly populated areas) – where more than 50% of the population lives in rural grid cells (code 3).

Note that once this 2nd step has been completed, then each LAU should be classified to a unique class/category. However, in order to classify LAUs based on the population grid, the LAUs have to be transformed into a raster as well, which can lead to some situations which require an ad-hoc solution (see further adjustments below). For more information on LAUs, see the section on Building blocks for typologies in the introductory chapter .

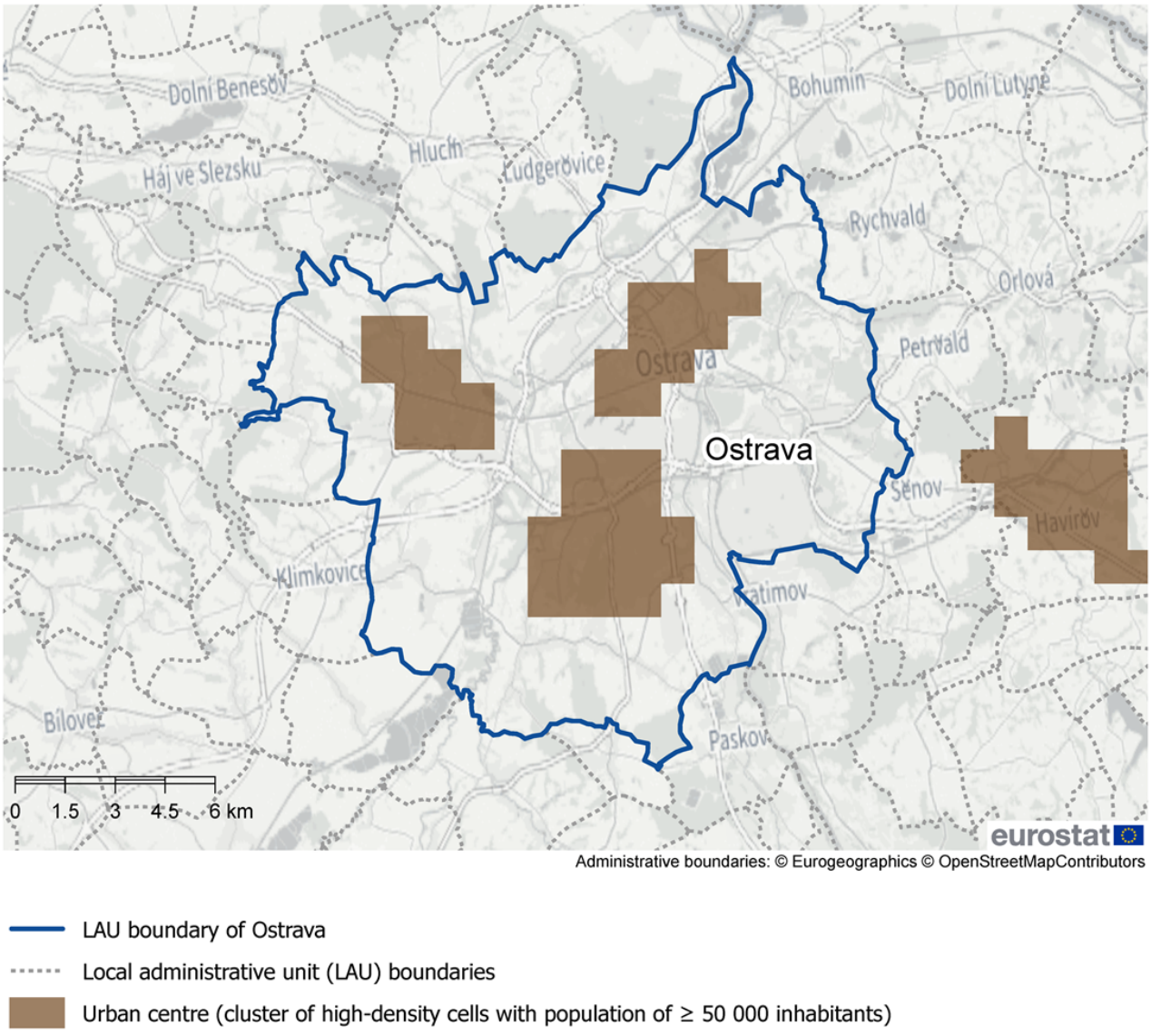


Figure 2: More than 1 urban centre needed to define a city – an example for Ostrava Source: Eurostat (GISCO) based on census population grid from 2021 and local administrative units 2021

Figure 2 shows that when classifying LAUs as cities, it may be necessary to consider more than 1 urban centre. In this example, there were 54 301 people living in the urban centre of Ostrava in Czechia, which equated to just 19% of the total population of the LAU for Ostrava (below the threshold of 50% that is required to identify a city). Nevertheless, as shown in the example, there were 2 adjacent urban centres. Aggregating the total population of these 3 urban centres that are located within the boundaries of Ostrava results in the share of those living in urban centres rising to 79% of the total population; as such, Ostrava is classified as a city within the degree of urbanisation.

Further adjustments

Adjusting the results for cities

As the typologies for the degree or urbanisation and for functional urban areas (cities and their commuting zones) share a common definition of cities, any changes that may be made to the classification of cities should be adopted for both typologies (using the same rules). More information on adjustments that might be made when classifying cities is provided in Chapter 3 (under the heading Further adjustments), while the relationships between these typologies (and the related typology of metropolitan regions – NUTS level 3 regions where at least half of the population lives in a func-
tional urban area composed of at least 250 000 inhabitants; see Chapter 6 for more information) is shown in Figure 3.

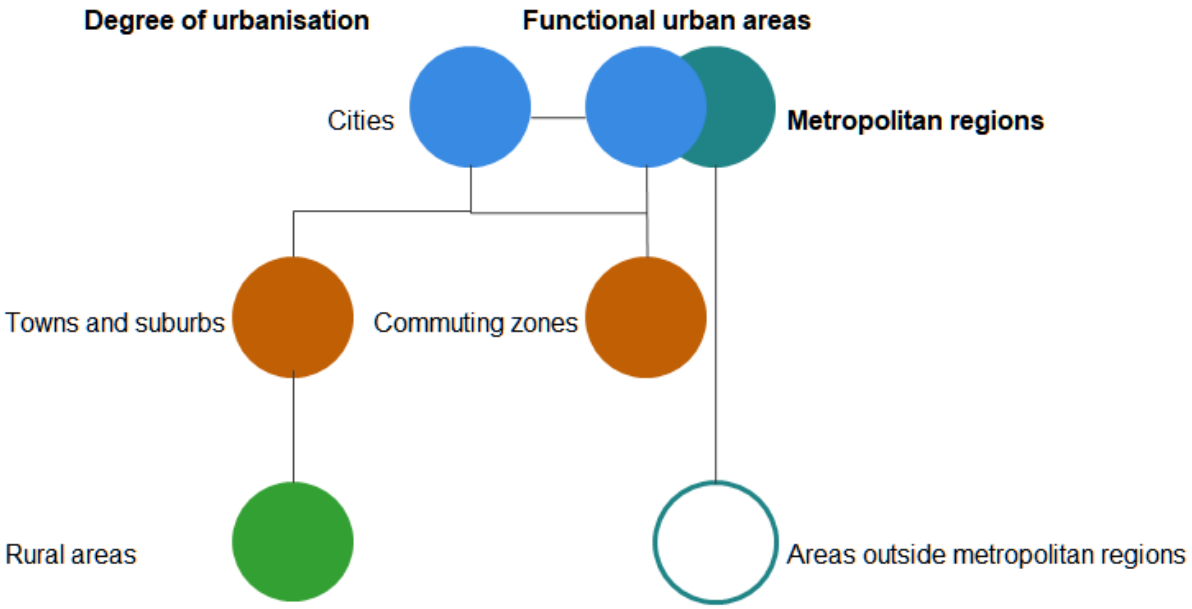


Figure 3: Three typologies which are joined together by a common definition for cities

Local administrative units with no population in the raster equivalent

A number of LAUs don't have any population for their raster equivalent. When calculating their degree of urbanisation, these LAUs aren't assigned any population as they are too small (smaller than 1 grid cell); as such, they are given no initial classification. These LAUs with no population in the raster equivalent are classified according to their surrounding cluster; they were found
to be exclusively in high-density clusters (urban centres). An example is provided for Athens in Greece (see Figure 4).

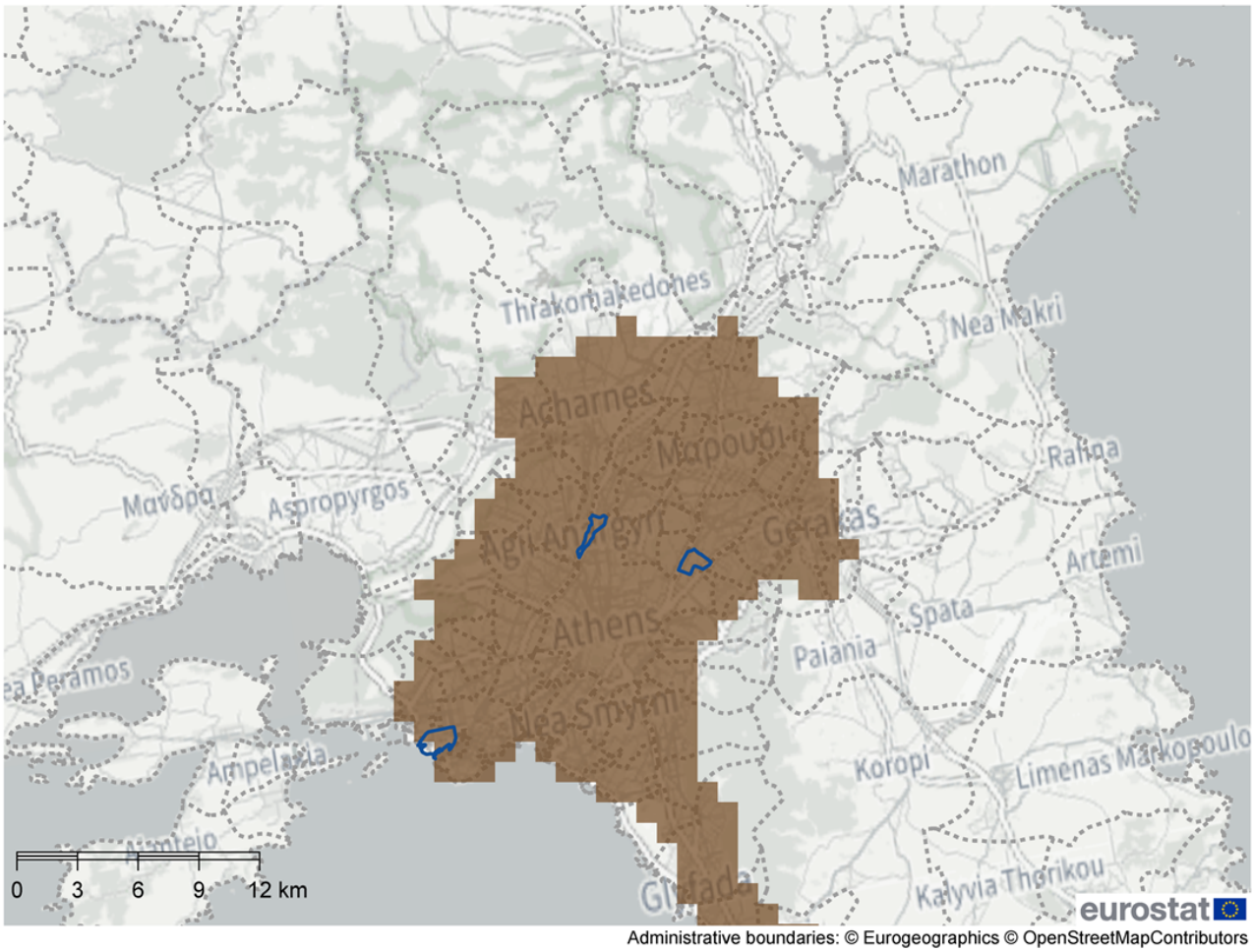


Figure 4: Local administrative units with no population in the raster equivalent – an example for Athens
Source: Eurostat (GISCO) based on census population grid from 2021 and local administrative units 2021

LAUs reclassified due to border effects

Thinly populated LAUs that are classified as intermediate density areas or densely populated areas may be classified incorrectly if rural grid cells cover most of their territory. Those LAUs with a total population of less than 5 000 inhabitants and with 90% or more of their area composed of rural grid cells could be reclassified as thinly populated areas; this adjustment is optional. An example is provided for Ezcabarte in northern Spain (LAU code ES_31101) which has a grid based population of 1 714, of which 957 (55.8%) live in an urban cluster, so it's initially classified as an intermediate density area. However, as its population is below 5 000 and only 4.3% of its area is covered by the urban cluster, it could be reclassified as a rural area.

In a similar vein, small LAUs classified as rural areas may be classified incorrectly due to the coarse resolution of the population grid compared with the small size of some LAUs. Those LAUs with an area of less than 5 km^2 and with more than 30% of their surface area covered by non-rural grid cells could be reclassified as intermediate density areas or densely populated areas according to the respective shares of these clusters; this adjustment is also optional.

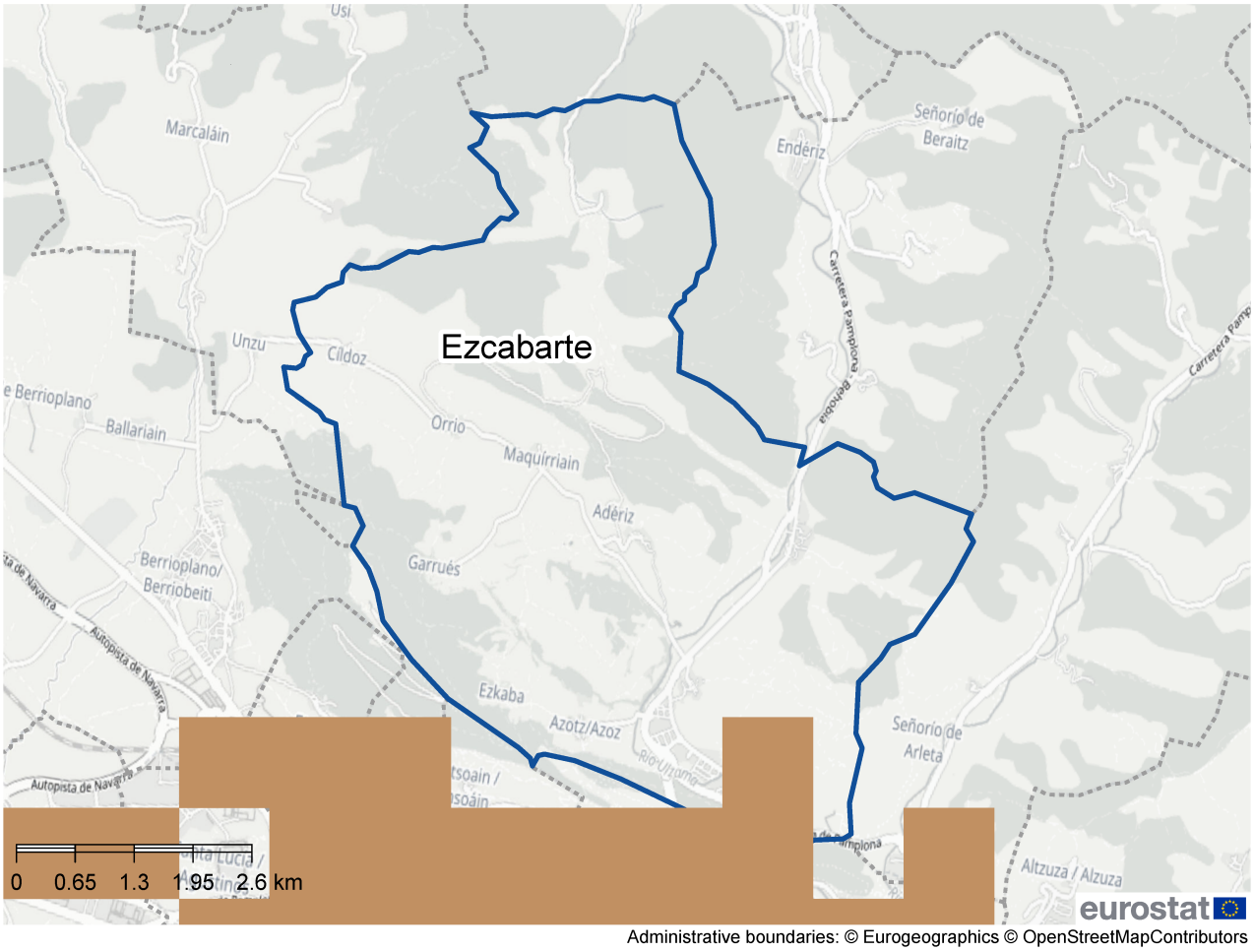


Figure 5: Local administrative units reclassified due to border effects – an example for Ezcabarte Source: Eurostat (GISCO) based on census population grid from 2021 and local administrative units 2021

Links to other spatial concepts/typologies

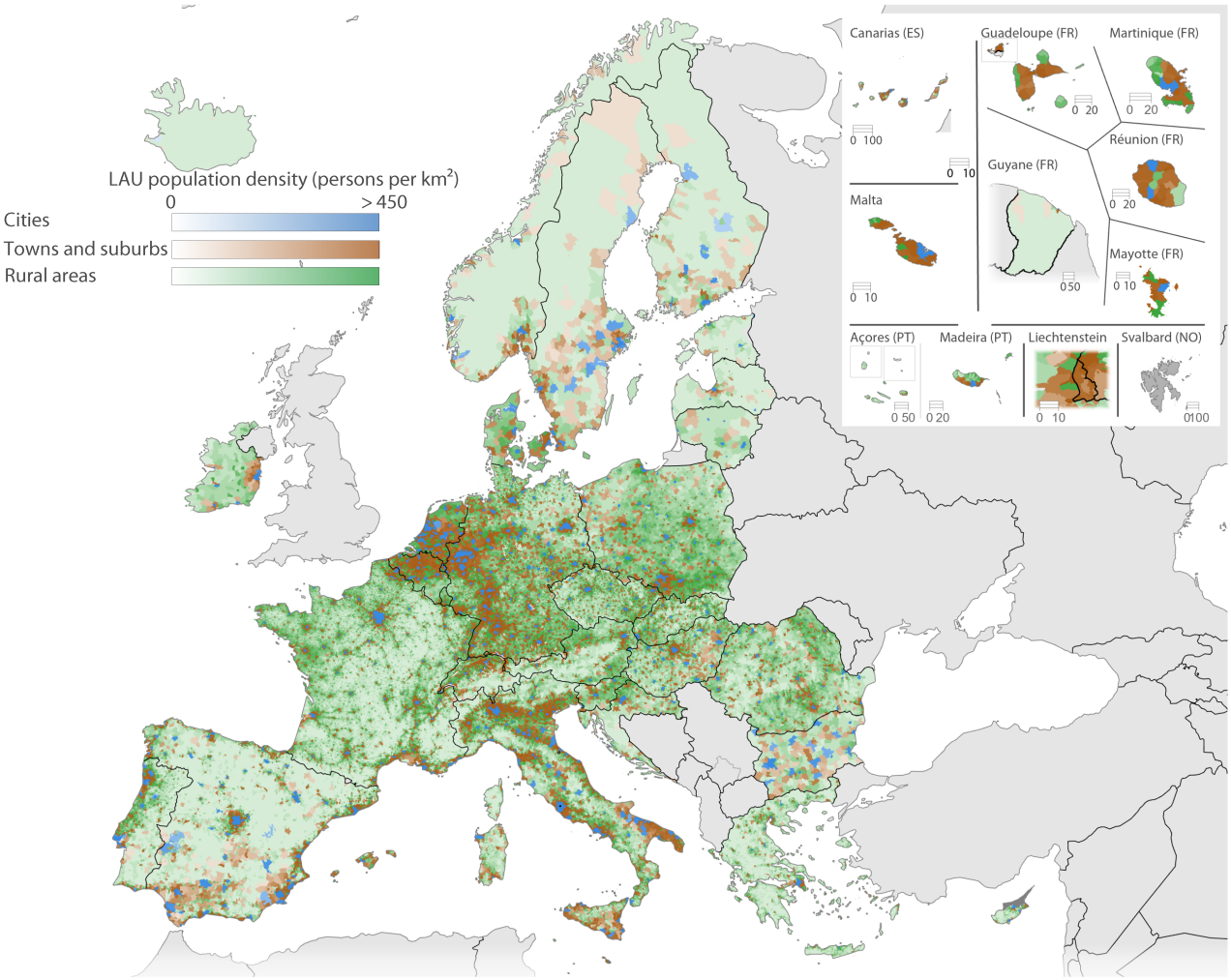
The degree of urbanisation classification provides streamlined and harmonised definitions for a number of similar but not identical spatial concepts, for example, all urban centres with at least 50 000 inhabitants – cities – are included in the city statistics data collection exercise (see Chapter 3 for more information), while rural areas identified by the degree of urbanisation and predominantly rural regions (from the urban-rural typology ; see Chapter 5 for more information) are both based on the share of population living in rural grid cells.

Results

Map 1 provides an overview of the final classification for the degree of urbanisation by LAU.

For all EU countries, EFTA countries and some candidate countries a list of their LAUs with their degree of urbanisation category is available on Eurostat's dedicated section for NUTS .

Degree of urbanisation, 2021



Map 1: Degree of urbanisation for local administrative units Source: Eurostat (GISCO) based on census population grid 2021 and local administrative units 2021

Changes to the typology over time

Historical developments

Urban and rural developments are central concepts used by a wide range of policymakers, researchers, national administrations and international organisations. While these terms may be readily understood by the general public, a clear statistical definition at an international level has proved elusive.

The degree of urbanisation classification was originally introduced in 1991, distinguishing between densely, intermediate and thinly populated areas. It was based on information for numbers of inhabitants, population density and the contiguity of local administrative units at level 2 (LAU2), otherwise referred to as municipalities. As LAU2s varied considerably in terms of their size/area, the results were compromised in terms of comparability; this was especially the case for EU countries characterised by relatively large or relatively small LAUs. Note also that the original classification for the degree of urbanisation was based on different population density thresholds to those currently employed: for example, densely populated areas had a lower threshold of 500 inhabitants per km^2, which led to many smaller towns and some suburbs being classified within this category.

In 2011, the OECD together with the European Commission's Directorates-General for Regional and Urban Policy ,

Eurostat , Agriculture and Rural Development and the Joint Research Centre (JRC) started working on revising the degree of urbanisation classification. As a result the methodology has been improved see: *A harmonised definition of cities and rural areas: the new degree of urbanisation; WP 01/2014* . The refinement of the methodology also provided an opportunity to harmonise several similar but not identical spatial concepts. 1 of the major improvements was the introduction of a population grid approach.

Advantages of the population grid approach – introduced with the 2011 revision

The 2 main advantages of the new methodology based on population grid cells are

- greater comparability and
- a harmonisation of spatial concepts.

Greater comparability and less distortion

The problem with the original degree of urbanisation was that it relied on the population size of LAU2s as 1 of its main criteria. If an LAU2 was large enough in area, even the presence of a large city could lead to it being classified as thinly populated.

For example, the original degree of urbanisation classified the LAU2 of Uppsala (Sweden), Aalborg (Denmark) and Badajoz (Spain) as thinly populated despite the presence of cities with more than 100 000 inhabitants. As a result, the degree of urbanisation of countries with typically large LAU2s was underestimated compared with countries that had typically smaller LAU2s.

The approach adopted with the 2011 revision also uses the criterion of population density but applied to units of analysis of the same size: 1 km^2 grid cells. As a result, it may be used to look inside large LAU2s and detect the presence of towns or cities. Therefore, the results of the 2011 exercise were less distorted and more comparable across countries.

In 2016, the 2 levels of LAUs expired: only 1 level of LAUs has been maintained since 2017. As the administrative and governmental system, and the size of LAUs are different across EU Member States, an analysis of population grid and degree of urbanisation classes doesn't necessarily 'fit' into the existing administrative units. For example, in countries like Slovakia or Portugal, cities usually consist of multiple LAUs. In the administrative boundaries of a city – like Braga or Guimarães in Portugal, or Bratislava in Slovakia – there could be less densely populated areas, that shouldn't be classified as a city (with code 1) in the degree of urbanisation, for example in Bratislava almost half of the LAUs are classified as rural when based on an analysis of the census population grid. These differences might cause some discrepancies between official governmental systems and the calculation methodology, and in such cases the existing administrative rules are generally used to overwrite the computed results. In other words, in the examples of Braga, Guimarães or Bratislava, all of their administrative units continue to be classified as 'cities', despite the share of their population living in urban centres being below the threshold of 50%.

"'Harmonising 4 spatial concepts"'

Prior to the 2011 revision, 4 similar but not identical urban-rural spatial concepts were used (see Figure 6)

- rural areas (according to the OECD)
- thinly populated areas
- densely populated areas, and
- Urban Audit City .

Urban–rural typology	Degree of urbanisation	Urban audit
Rural LAU2 ≠	Thinly populated	
	Intermediate density	
	Densely populated ≠	Cities

Figure 6: Four conflicting spatial concepts Source: Eurostat

The OECD methodology classified all LAU2s with a population density below 150 inhabitants per km^2 as rural. This is different from the original degree of urbanisation method which also took account of population size and contiguity. The OECD method also classified large LAU2s within a city as rural if they had a low population density.

The degree of urbanisation approach introduced with the 2011 revision ensured that rural areas equalled thinly populated areas. This also meant that rural regions could be identified using the same approach (namely, the share of their population in rural grids).

The Urban Audit covered a large sample of cities but wasn't compatible with the degree of urbanisation prior to 2011. Since the 2011 revision, the Urban Audit covers all cities and densely populated areas in the degree of urbanisation are identical to Urban Audit cities (see Figure 7).

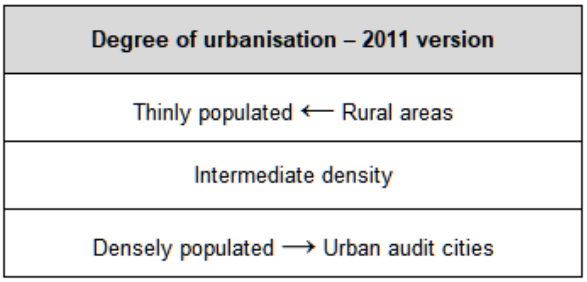


Figure 7: Harmonised spatial concepts Source: Eurostat

Changes over time that impact on the classification

The degree of urbanisation classification should be updated to reflect any changes to the underlying sources of information that are used in the compilation of the classification. As such, the classification may be updated to reflect: changes to LAU boundaries or changes to population distributions for 1 km^2 grid cells. The frequency of such updates varies according to the source of information.

Changes to the degree of urbanisation classification resulting from a revision of population distributions for 1 km^2 grid cells are less common and these may be expected every 10 years, when new census data becomes available. The latest major update of the population grid is based on the population and housing census for reference year 2021.

Annual updates of the degree of urbanisation classification should be made to reflect changes to LAU boundaries. These modifications can be implemented in 2 ways: applying the degree of urbanisation methodology as described above for the new layer of LAUs; or estimating the degree of urbanisation based on changes to LAU boundaries. The 1st approach is more labour intensive, while the 2nd is particularly suitable if boundary changes for LAUs are relatively small or consist principally of merging LAUs, especially if these have the same degree of urbanisation.

Updating the degree of urbanisation to reflect changes in LAU boundaries

LAU boundaries may change over time in 3 different ways: LAUs can merge, they may undergo a boundary shift, or they may be split. The most common change for LAUs within the EU in recent years has been for 2 or more units to be merged; boundary shifts have been less common, while splitting units apart has been rare.

Case 1: LAU mergers

Merging 2 LAUs with different degrees of urbanisation may be resolved by giving precedence to the more densely populated unit: when merging LAUs composed of a city and a town or suburb, reclassify the new LAU as a city; when merging LAUs composed of a town or suburb and a rural area, reclassify the new LAU as a town or suburb. Such a process may be further refined by taking into account the relative population sizes of the 2 LAUs.

Case 1a: LAU mergers involving the same degree of urbanisation

The degree of urbanisation is additive, meaning that if 2 LAUs classified as thinly populated areas are subsequently merged into a single LAU then they will remain a thinly populated area; this is also true for the other degrees of urbanisation.

Case 1b: LAU mergers involving a densely populated area

The degree or urbanisation methodology specifies that each high-density cluster should have at least 75% of its population covered by densely populated LAUs. It also envisages a method to match densely populated areas with the geographic areas of administrative or political functions and links the degree of urbanisation to the city data collection exercise. This means that any merger involving an LAU that has been previously classified as a densely populated area should result in the newly merged LAU also being classified as a densely populated area.

Case 1c: LAU mergers involving thinly populated and intermediate density areas

These mergers can be addressed in 2 simple ways: using the population of the urban cluster or using the population of the LAUs.

In the 1st case, if the population of the relevant urban cluster(s) is available then add the population inhabiting the urban cluster for each of the LAUs and divide this by the total population of the new LAU to determine the new degree of urbanisation. If more than 50% of the population of the new LAU lives in an urban cluster, the new LAU should be classified as an intermediate density area. If the population share is less than 50%, then the new LAU should be classified as a thinly populated area.

In the 2nd case, if the population living in the urban cluster can't be identified, then the degree of urbanisation may be determined based on the population distribution between the LAUs. If more than 50% of the population of the new LAU comes from thinly populated LAUs, the new LAU should be classified as thinly populated. If more than 50% of the population of the new LAU comes from intermediate density LAUs, the new LAU should be classified as intermediate density.

Case 2: LAU boundary shifts

Whereas mergers can be dealt with using simple methods, boundary shifts can't always be as reliably addressed. Indeed, in some rare cases, boundary shifts between LAUs that have the same degree of urbanisation can lead to a change in classification. Such complexity means that a simple rule of thumb is often the preferred and most efficient approach.

A simple rule may be established whereby if an LAU loses less than 25% of its previous population or gains less than 50% of its population due to boundary shifts, then the degree of urbanisation doesn't change. This rule of thumb is likely to cover 90% of all boundary shifts and ensures continuity. If this isn't the case, then further investigation is required, as described below:

Case 2a: changes in the degree of urbanisation from boundary shifts are excluded

For each LAU, the share of population in the 3 different types of population grids cells is known. For example, if as the result of a boundary shift the population of an LAU that has 100% of its population in rural grid cells shrinks, then it will remain a thinly populated area. Equally, if a boundary shift for an LAU that has 100% of its population in rural grid cells rises, then the new LAU would need to more than double its population before it could (potentially) become an intermediate density area. As a result, if the boundary shift leads to a change in population that is too small to tip the population share of the revised LAU below 50% of the relevant grid cells, it keeps the same degree of urbanisation.

Case 2b: changes in the degree of urbanisation from boundary shifts are unlikely (but can't be excluded)

If the boundary shift leads to a change in population that is theoretically sufficient to the tip the population share of the revised LAU below or above 50%, but the shift is between LAUs with the same degree of urbanisation, then the same degree of urbanisation should be kept.

Case 2c: changes in the degree of urbanisation from boundary shifts are likely

In some cases, changes in the degree of urbanisation are likely. Take for example, if a city were to gain part of a suburb as a result of a boundary shift. The city (a densely populated area) gains a small number of additional

inhabitants (which doesn't have an impact on its degree of urbanisation). The suburb loses some of its population (that is reclassified to the city). As a result, the population in the revised LAU covered by the suburb may have less than 50% of its population living in an urban cluster in which case it should subsequently be reclassified as a thinly populated area.

Case 3: splitting LAUs

This type of change is relatively rare. Therefore, the main recommendation is for continuity; in other words, maintain the same degree of urbanisation. If an LAU is split, the new LAUs should have the same degree of urbanisation as the old LAU. If there are concerns, that the new LAUs may have different urban structures, the same approaches as described for boundary shifts can be used.

Recent and future developments

A regulation to implement the population and housing census for 2021 concerned a statistical action for 1 km^2 population grid statistics. As well as information for annual counts of populations, it also envisaged more detailed analyses, including population by sex, population by age, number of employed people, population by place of birth, population by usual place of residence a year prior to the census.

Eurostat has had discussions with national statistical authorities concerning developments after the 2021 census. These concern the production of annual counts of populations (based on usual place of residence) for a 1 km^2 grid, with data to be made available within 12 months of the end of the reference period.

Further information

Glossary entry

Degree of urbanisation

Detailed methodology

A harmonised definition of cities and rural areas: the new degree of urbanisation (WP 01/2014) , European Commission, Directorate-General for Regional and Urban Policy

Dedicated section

Information on data for the degree of urbanisation

Correspondence for local administrative units

Correspondence table for LAUs and the degree of urbanisation

Published indicators

A variety of different statistical surveys collect data for LAUs and this information may be used to calculate data for the 3 different degrees or urbanisation. This process involves aggregating the data for all cities within a territory (for example an EU country, or the EU as a whole) into 1 value, and doing the same for all towns and suburbs and for all rural areas. Indeed, the classification provides a means for accessing a much broader range of data from a number of different surveys, including the EU's labour force survey (LFS) and EU statistics on income and living conditions (EU-SILC) and tourism statistics; see below for more details relating to the available data.

Visualisation tools

Eurostat publishes data on the degree of urbanisation through **Regions and cities illustrated** .

Database

Eurostat's website provides information for over 100 indicators by degree of urbanisation. These statistics are available for the following statistical domains: health, education, living conditions and welfare, the labour market, tourism, and the digital economy and society. They are available here .

Examples

Statistics by degree of urbanisation – Rural Europe and Urban Europe – Education and training

Statistics by degree of urbanisation – Rural Europe and Urban Europe – Labour market

Statistics by degree of urbanisation – Rural Europe and Urban Europe – Income and living conditions

Statistics by degree of urbanisation – Rural Europe and Urban Europe – Digital society

Explore further

Database

- Degree of urbanisation (degurb)

Thematic section

- Information on data for the degree of urbanisation

Methodology

- Correspondence table for LAUs and the degree of urbanisation

External links

- A harmonised definition of cities and rural areas: the new degree of urbanisation (WP 01/2014) : European Commission, Directorate-General for Regional and Urban Policy

Visualisation

- Regions and cities illustrated