KOSIS Association Urban Audit

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The German Urban Audit

Quality of Life in the City and Suburban Areas

Joint project with the German Federal Statistical Office and the Statistical Offices of the Federal States (Länder), promoted by Eurostat

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Introduction

The current KOSIS Association Urban Audit brochure bears the title “Quality of Life in the City and Suburban Areas” and is thus a continuation of the long-term focus on the utilisation of comparative urban data. While the last brochure focused on measuring the quality of life, the primary emphasis of this brochure is to compile existing data for cities and their suburban areas and to assess alternative sources of data.

The first chapter is dedicated to the newly developed spatial level of suburban areas, which is calculated from the difference between the functional urban areas (FUAs) that were already included in the data collection and the Urban Audit cities. As requested by city representatives at various events during the last year, it begins with an introduction of Eurostat’s definition of Urban Audit cities and FUAs. Next, the technical calculation and the provision of data for Germany is explained. Finally, two articles discuss the evaluation of data: First, example indicators for the quality of life in German cities and their suburban areas are analysed. Second, the housing, household, and population structure of core Swiss cities and their commuting zones are compared with one another and with the rest of Europe.

The second chapter discusses the compilation of new sources of data and provides an overview of possible uses for the data. Whether geo-data from alternative sources can be used for the variable “Length of cycle network in kilometres” is currently being tested. Until now, data for this variable was supplied by the cities themselves. The first results have encouraged additional evaluations and are most certainly relevant, including for people interested in fields other than the Urban Audit collection of city data.

Overall, the urban dimension appears to be increasingly important. This is reflected, for example, in the Eurostat annual work programme and a renewed call for funding proposals for subnational statistics. As the managing office of the KOSIS Association Urban Audit, the city of Mannheim is again closely cooperating with the statistical office of Eurostat to submit an application for funding for the coming funding period in 2018/2019. The funds were fully approved, so that we can look forward to a continued contribution to the European collection of urban data.

During the current funding period, we have been working intensively on compiling and providing data for suburban areas. In these times of a rapidly increasing production of data, the focus of the next funding period will, once again, most certainly be on establishing new sources of data – this year's brochure on the use of open data will be a preview in this respect.

I hope you will enjoy reading this Urban Audit brochure!

E. Schneider

Dr Ellen Schneider

City of Mannheim

Director, Municipal Statistics
Office

Mannheim, 10 November 2017

I A focus on spatial levels – the Urban Audit suburban areas

Chapter overview

The KOSIS Association Urban Audit collects data not only for 127 German **cities** but also for 96 **functional urban areas** (FUAs). The latter comprise a combination of cities and suburban areas that share commuting patterns. A direct comparison with suburban areas is also extremely interesting for cities. For this reason, the managing office of the KOSIS Association Urban Audit compiled data for the suburban areas, which was calculated from the difference between the FUAs that were already part of the data collection and the Urban Audit cities.

Definition
Urban Audit city/
functional urban area

In order to make it easier for cities to use this new data, the Eurostat definition of Urban Audit cities and FUAs will be presented in the first article of this chapter. This definition focuses on the degree of urbanisation, which is the basis for defining the city limits, and the commuting patterns, which define the suburban areas.

Compilation and illustration of data for suburban areas in the German Urban Audit

The second section demonstrates how city values can be subtracted from the FUA data that was previously provided for Germany in order to calculate values for the suburban areas of German cities. In addition to the technical aspect of calculating and providing data and adapting and integrating geometries, the illustration of this data for suburban areas is addressed in the Structural Data Atlas.

A comparison of cities and suburban areas in Germany

These articles, which are somewhat technical and methodical in nature, are followed by two practical texts. First, Christina Neuhaus uses objective indicators to compare the quality of life in German cities and their suburban areas.

A comparison of cities and suburban areas in Switzerland

Finally, Anna-Katharina Lautenschütz analyses the housing, household and population structures in the Swiss core cities and their commuting zones. To do so, she also makes European comparisons.

1. Definition of an Urban Audit City and its Functional Urban Area according to the degree of urbanization[1]

by Alexandra Dörzenbach and Tobias Link

The degree of urbanisation as the basis for a harmonised definition of cities

Urban and rural areas are two central concepts widely used in politics, research and in international organisations such as the United Nations or the EU. However, for a very long time there were no uniform definitions for these concepts and whenever transnational data were published, country-specific definitions were always the basis, which opposed the desire for comparability.

A first approach to the standardisation of territorial schemes based on the **degree of urbanisation** dates back to 1991. It distinguishes between densely, intermediate and thinly populated areas on the basis of the respective population size or density in local administrative units level 2 (LAU2), which in Germany correspond to the municipalities and unincorporated areas. As the size of LAU2s varies considerably between countries, this affects comparability between countries with large and such with small LAU2s. As a result, the original threshold of urbanisation had to be set at a fairly low 500 inhabitants per km^2 (and at least 50,000 inhabitants) in order for cities in large LAU2s to still receive the status of densely populated. For countries with smaller LAU2s, this meant that too many fell into the "densely populated" category.

To avoid this kind of bias, a way had to be found to look at the population distribution within the LAU2s using smaller spatial units of equal size. The use of a **population grid** with a resolution of one km^2 should solve this problem. At EU level, a population grid covering all member states was established. On the one hand, data from individual member states that had already established such a population grid on the basis of local population registers or other detailed sources could be used (bottom-up method). On the other hand, for countries without a population grid using the bottom-up method, a disaggregation grid could be created (top-down method), which assigns population data at LAU2 level to the

[1] This article is based on information from publications of the European Commission (Working Papers WP 01/2014, Lewis Dijkstra und Hugo Poelman: „A harmonised definition of cities and rural areas: the new degree of urbanisation“) and Eurostat (Methodological manual on city statistics, 2017 edition)

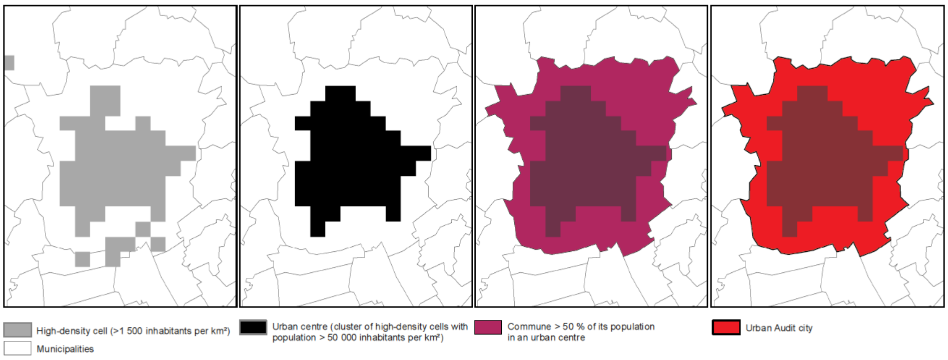
individual one km² grid cells according to land use and land cover information, e.g. from satellite images.

The degree of urbanisation newly defined in 2010/11 on the basis of the population grid retains the three previous classifications for LAU2 areas, but the criteria applied are changing: In densely populated areas (cities) at least 50% of the population must live in **urban centres** (also called high-density clusters). This is explained in more detail in the following section. In areas with an intermediate population density, less than 50% of the population live in rural grid cells (less than 300 inhabitants per km²) and less than 50% of the population in urban centres. Thinly populated areas are characterised by the fact that more than 50% of the population live in rural grid cells.

The Urban Audit City

The procedure for identifying an Urban Audit City will be discussed in more detail in the following. The foundation for this is the new degree of urbanisation on the basis of the population grid as described in the previous section.

Definition of an Urban Audit City
Example: Graz



Source: Methodological manual on city statistics, 2017 edition, eurostat

In a first step, all grid cells with a population density of at least 1,500 inhabitants per km² (high-density cells) are selected (see first figure in the graphic).

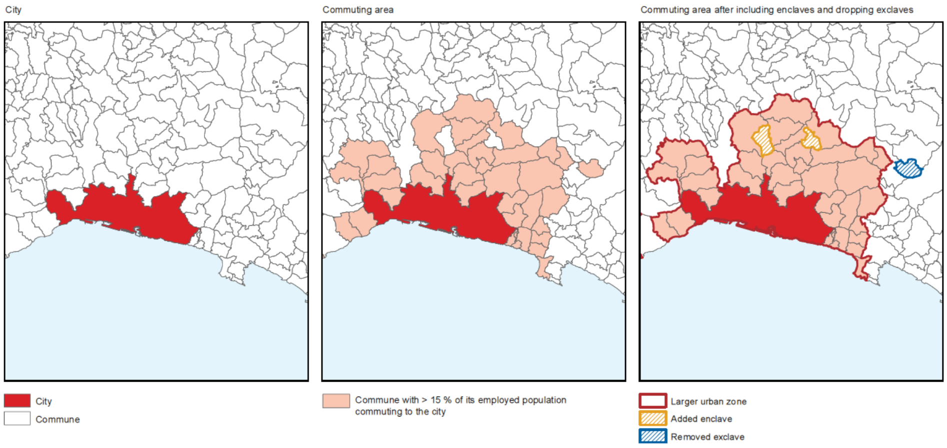
Then all adjacent high-density cells are clustered and gaps are filled. A gap is closed according to the majority rule, i.e. if at least five of the eight adjacent cells are high-density cells, the gap is added to the cluster. If the resulting cluster has at least 50,000 inhabitants, it is retained as an **urban centre** (also called high-density cluster), otherwise it is "dropped", since by definition it cannot lead to the identification of an Urban Audit City (see second figure in the graphic).

Subsequently, all municipalities (LAU2s) where at least half of the population lives in the urban centre are identified. These are candidates to become part of the city (see third figure in the graphic).

Finally, the following criteria must be met for the city area determined in this way: There is a link to a political (administrative) level, at least 50% of the total urban population live in an urban centre and at least 75% of the population of the urban centre live in the city. In most cases, this last step is not necessary, since the city usually consists of a municipality which as an administrative unit completely encloses the urban centre and the great majority of the city dwellers live in this urban centre.

The Functional Urban Area

The degree of urbanisation plays only an indirect role in determining a **Functional Urban Area (FUA).** The focus is on the economic interdependency of a city with its suburban areas in the form of commuters. A functional urban area consists of the city area and the corresponding **commuting zone**.



Source: Methodological manual on city statistics, 2017 edition, eurostat

Definition of a Functional Urban Area
Example: Genua

In order to identify a commuting zone, the first step is to investigate whether cities themselves are linked to each other via commuting patterns: If 15% of the employed population of one city works in another city, these cities are treated as connected cities. This means that the first city is considered part of the Functional Urban Area of the second city and therefore does not have its own FUA. Such linked cities are treated as a single city, i.e. commuter flows to the two cities are considered together. In Germany, for example, Mannheim and Ludwigshafen are such cases, where Ludwigshafen is part of the Mannheim FUA and a joint FUA is defined. A special case are some cities in the Ruhr area, which are closely linked via commuting networks due to their spatial concentration and form a large FUA in the Urban Audit.

In a second step, all surrounding municipalities are selected in which at least 15% of the employed residential population works in the (linked) city (see second figure in the graphic).

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Tobias Link is the contact person for the data collection of the KOSIS Association Urban Audit (tobias.link@mannheim.de).

Finally, those municipalities that were not selected in the second step but are completely surrounded by FUA affiliated municipalities will be included in the selection. Selected municipalities that are isolated and do not border other selected communities are excluded from the selection (see third figure in the graphic).

If a municipality fulfils the selection criterion for two different, not connected cities, then it should be allocated to the FUA of the city for which the percentage of commuters is higher.

2. Urban Audit data for suburban areas – from compilation to visualisation

by Alexandra Dörzenbach and Tobias Link

Data for suburban areas – calculation and provision

The Urban Audit suburban areas do not represent new areas but rather a newly developed spatial level: they are calculated from the difference between the **functional urban areas** (FUAs)[2] in the data collection and the **Urban Audit cities**[3]. While the previous data provided for the FUAs included the city values, these values are subtracted from the corresponding FUA data to calculate the values for suburban areas.

This difference cannot be calculated for Urban Audit cities whose area is per definition identical to that of their functional urban area. This is the case for 11 cities[4]. Some cities also belong to the same functional urban area. In these cases, the value for the suburban area was calculated separately for each city. As a result, the FUA Ludwigshafen/Mannheim consists of six additional districts as well as the administratively independent cities of Ludwigshafen and Mannheim. The value for the suburban area of Mannheim, for example, was calculated from these six districts plus the value for Ludwigshafen. Analogously, the value for the suburban area of Ludwigshafen was calculated from these six districts plus the value for Mannheim. The same approach was taken for the FUA Braunschweig-Salzgitter-Wolfsburg.

When calculating data for suburban areas for a comparison of cities and suburban areas, the Ruhr posed a unique problem, which was difficult to resolve: the Ruhr FUA consists of 15 districts (eleven cities and four administrative districts). Calculating values for the suburban areas of the 14 Urban Audit cities in this region using the method described above did not appear to be practical, although principally possible.

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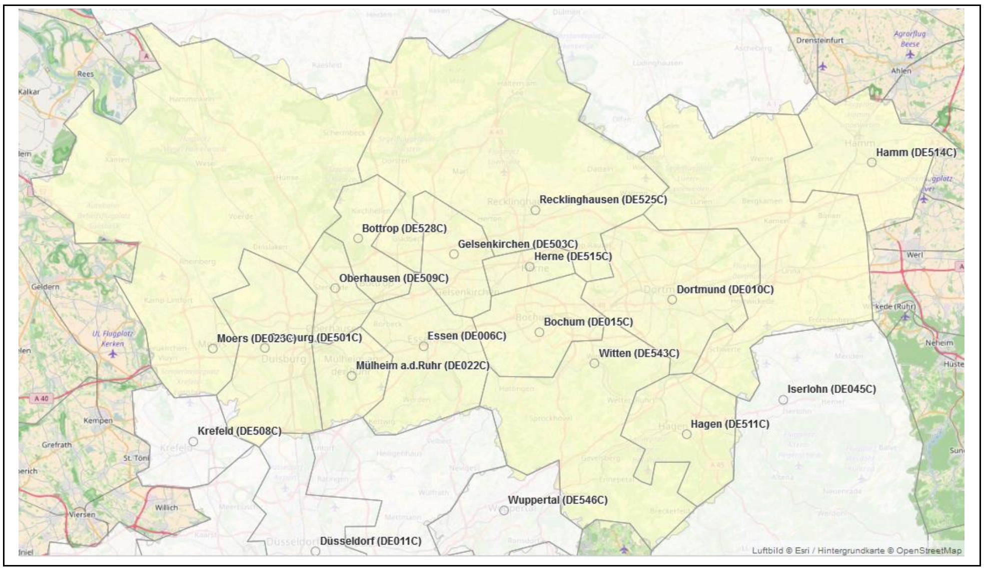
[2] For more information on the Urban Audit functional urban areas, see http://www.staedtestatistik.de/1156.html?&F=1%2520.

[3] For more information on the Urban Audit cities, see http://www.staedtestatistik.de/1157.html?&K=&F=1.

[4] For the cities of Bielefeld, Brandenburg an der Havel, Chemnitz, Dessau-Roßlau, Frankfurt (Oder), Krefeld, Mönchengladbach, Neumünster, Remscheid, Solingen, and Wuppertal, the urban area is identical with the functional urban area. As a result, there is no Urban Audit suburban area.



The Ruhr FUA

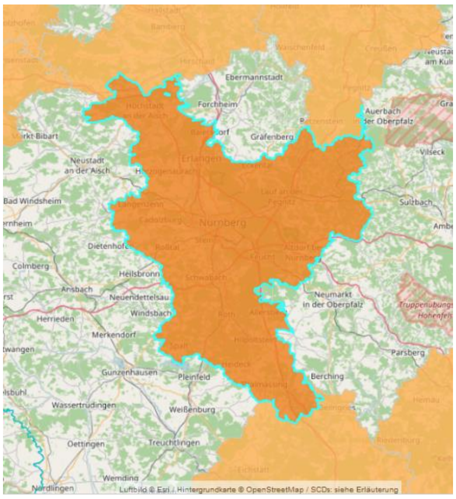
After deducting the exceptions mentioned above from the original 96 cities for which an Urban Audit functional urban area was defined, 87 cities remain for which values for the suburban areas were calculated.

There are additional limitations for different territorial units regarding the availability of data for the variables from the catalogue of characteristics. For example, no data exists on the FUA level for some variables, e.g. for the characteristics provided directly by the cities themselves. However, other data sources also do not make it possible to obtain values for all of the desired spatial sizes. Furthermore, some of the variables in the data collection are not listed as absolute figures and were instead calculated as a reference dimension. This applies in particular to characteristics that were calculated using data from the micro-census or the Federal Employment Agency. Variables calculated in this fashion cannot be used to create data for suburban areas – these areas would have had to be taken into consideration as an additional spatial size before the variables were calculated. It is therefore important to observe that it is currently not possible to calculate values for suburban areas for every characteristic in the catalogue.

Discussing these limitations with our partners and finding solutions for them will be a task that will continue on into the future. Despite these current limitations, data for suburban areas will be gradually published on the information systems of the German Urban Audit. In addition to this information portal, whose basic structure must be adapted to include data for suburban areas, initial data for suburban areas is available from other data services. This will be discussed further in this brochure.

Suburban geometries – adaptation and integration

In order to visualise comparisons between cities and suburban areas in the Structural Data Atlas, the corresponding geometries must be prepared and integrated. Data from the cities and functional urban areas served as the basis to achieve this. For both of these levels, geometries already exist, which have been in use for some time in the Structural Data Atlas. These geometries are based on the corresponding data for the municipalities and districts of the Federal Agency for Cartography and Geodesy (BKG)[5] and can be downloaded for free on their website. For the urban level, the 125 Urban Audit cities were taken from the municipality shapefile (VG250_GEM.shp). The district shapefile (VG250_KRS.shp) was used for the functional urban areas. The required districts were removed and some were spatially consolidated with the functional areas. A Eurostat code was then assigned to each area. Finally, the shapefiles were converted to the coordinate system required for use in the Structural Data Atlas. For the new city/suburban area geometry, the shapefiles were combined with one another, thereby essentially punching the urban area out of the functional urban area. For a clearer identification, the suburban areas were also assigned codes based on the naming system used for the existing areas.



Source: Urban Audit, Structural Data Atlas

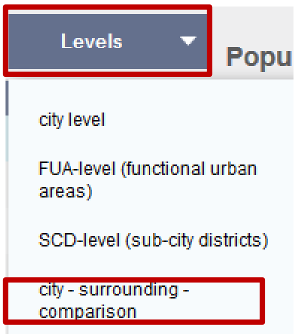
City and its suburban area

As opposed to calculating values for the suburban areas, which was only partially possible in the exceptions mentioned above, it was necessary to determine to which city the suburban areas would be spatially assigned when establishing the geometry for the FUAs Ludwigshafen-Mannheim and Braunschweig-Salzgitter-Wolfsburg. This decision was based on the number of inhabitants and a suburban area was created for Mannheim and

[5] Website of the BKG: www.bkg.bund.de/DE/Home/home.html.

Braunschweig. As was the case when calculating the data, this approach did not seem appropriate for creating a city/suburban area geometry for the FUA Ruhr. For this reason, it is not included in the geometry. The new city/suburban area shapefile[6] therefore contains 84 cities and their suburban areas. This shapefile was then used for visualisation in the Structural Data Atlas (cf. next chapter) and the current cartographic representation in this brochure (cf. chapter 3 of this section).

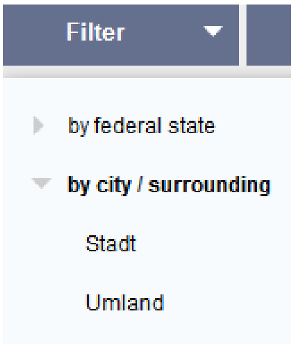
Data visualisation in the Structural Data Atlas



Users can switch between the four spatial levels using the "Levels" button.

When opened, the **Structural Data Atlas**[7] defaults to the city level. Users can switch to the level for the comparison of cities and suburban areas ("surrounding") by clicking on "Levels". This displays all of the areas, i.e. both cities and their suburban areas, on the map, in the table, and in the bar chart.

In the basic configuration, the dynamic report compares all elements with one other and colours them in the bar chart accordingly. The classification can be changed depending on how the user wishes to view the data (e.g. quantiles instead of standard deviation). Users can also customise the colour scheme and change the represented indicator by clicking on "Data".



By clicking on "Filter", users can, for example, select all territorial units for one or more states. Alternatively, they can select only the suburban areas. The filter options can also be combined with one another – for example, users can easily select all of the Bavarian suburban areas. In the default classification "standard deviation", only the selected districts are compared with one another. The selected filter is displayed in the title bar above the map. In addition to these filtering options, users can also make their own selections: to do so, they must click on the desired elements one after the other while holding down the control key and finally select "Filter". By clicking on "Filter" once more, they can delete their selection.

Data visualisation in the City Suburban Area Atlas

Since 2017, there has been a new project specifically for comparing cities and suburban areas, the Urban Audit **City**

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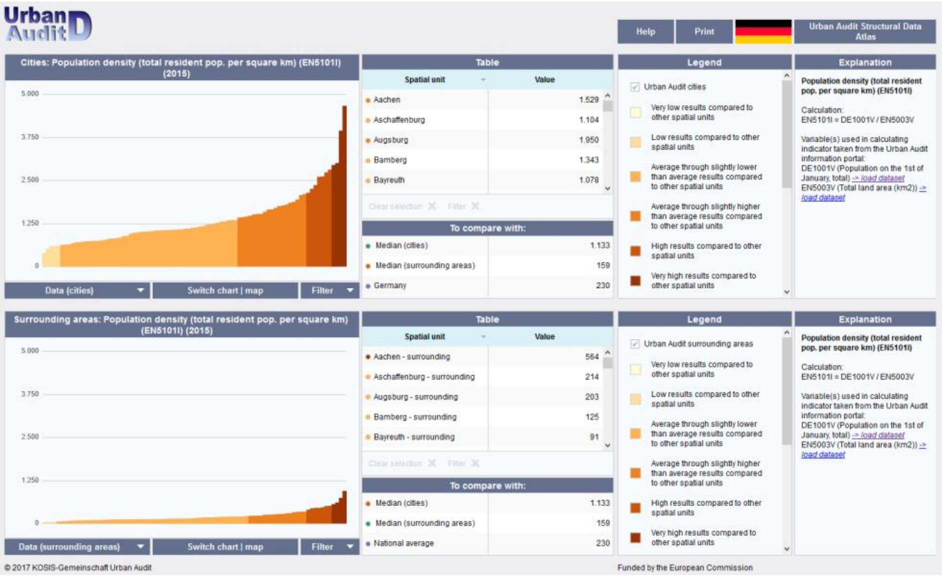
[6] These, like all of the geometries used for this project – with the exception of the Urban Audit sub-city districts (SCDs) – are available upon request (please enquire at urbanaudit@mannheim.de).

[7] Urban Audit Structural Data Atlas: http://apps.mannheim.de/urbanaudit/structuraldataatlas/

Suburban Area Atlas[8]. On its homepage, the atlas displays both levels separately. Users can choose between a bar chart and a map view.



Source: Urban Audit, City Suburban Area Atlas

City Suburban Area Atlas

Several indicators can currently be selected. For example, this illustration displays population density. At first glance, it is easy to recognise that population density is much higher in the cities (top bar chart) than in suburban areas. Using the “To compare with” table, the average for cities, the average for suburban areas, and the value for Germany, which is displayed in a horizontal line, can also be selected. The colour of the elements is based on the average and the standard deviation, similar to the default setting of the Structural Data Atlas. The cities are compared with one another in the top figure, and the suburban areas in the bottom. As in the Structural Data Atlas, the classification can be changed and thus adapted for the user's own evaluation.

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[8] Urban Audit City Suburban Area Atlas: http://apps.mannheim.de/urbanaudit/citysurroundingatlas/

3. Comparisons between cities and suburban areas using German Urban Audit data

by Christina Neuhaus

Comparisons between cities and suburban areas

The focus of this article is on comparing objective indicators for the quality of life in German cities with their suburban areas using the Urban Audit structural database. This juxtaposition allows cities to analyse their relationship and interdependency with their suburban areas as well as enabling a national comparison between cities. Using a uniform definition for suburban areas and a systematic method for calculating data for these areas provides a common basis for cities to compare their relationship to their suburban areas with that of other cities (cf. discussion in the previous chapter). The indicators “youth ratio”, “proportion of foreigners”, “unemployment rate”, “proportion of households who live in detached and semi-detached houses” and “proportion of the population with higher professional qualifications” will be used to illustrate this point.

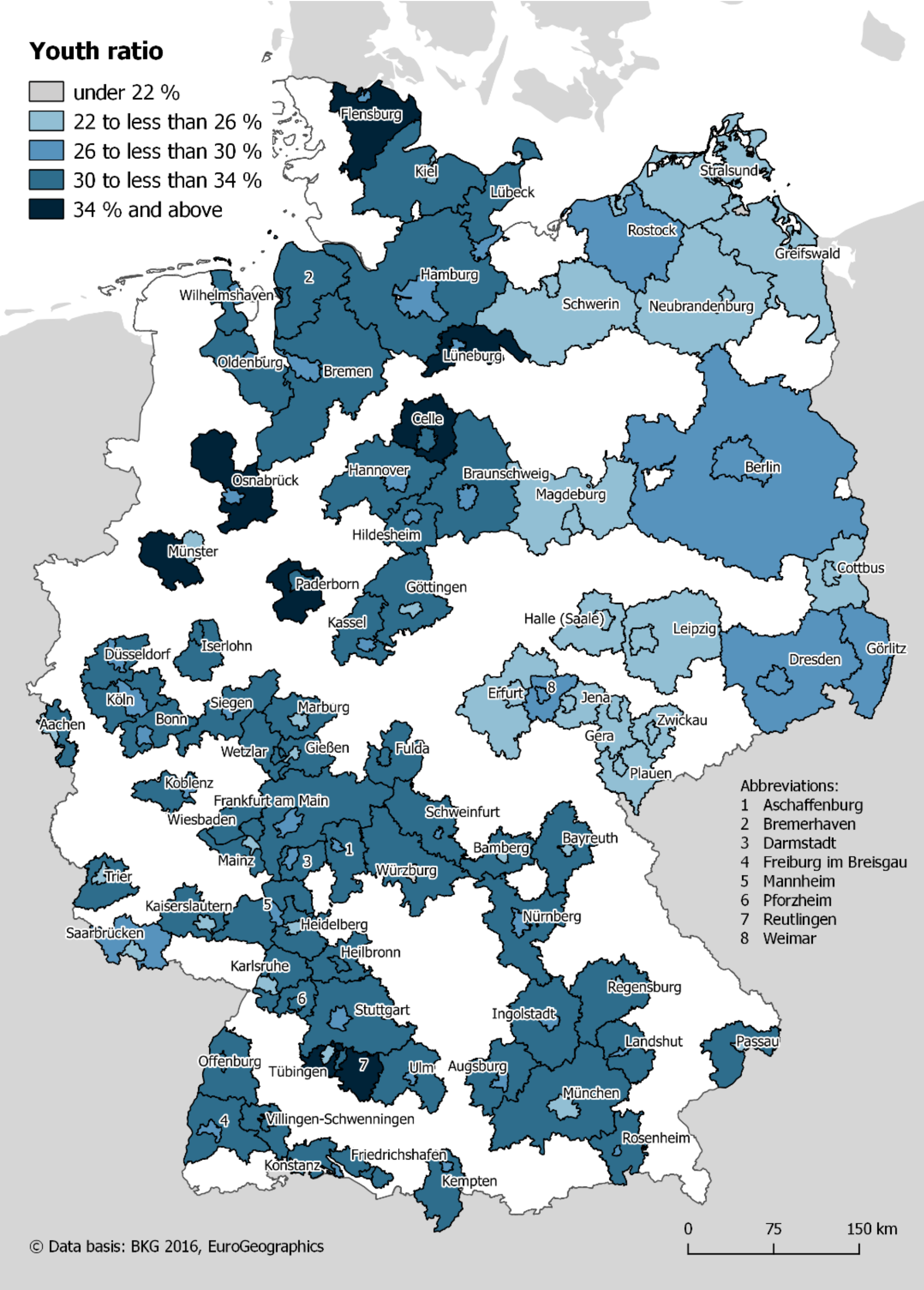
Youth ratio

The youth ratio compares the population under 20 with the population between the ages of 20 and 64. A value of 30 means that there are 30 children and adolescents for every 100 people of working age.

The average youth ratio in the Urban Audit cities for which corresponding data is available was 27.1 percent. The proportion of the population under 20 compared with the population between the ages of 20 and 64 was highest in Iserlohn (32.1%) and Solingen (32.0%), and lowest in Würzburg (21.6%) and Greifswald (21.7%). In almost nine out of ten cases, the average youth ratio in suburban areas was 30.7 and thus higher than in the corresponding cities. The suburban areas had an average of just under four more 20-year-olds for every one hundred 20- to 64-year-olds than the cities. The youth ratio was highest in the suburban areas of Paderborn, at 35.8 percent, and lowest in the suburban areas of Cottbus, at 22.7 percent.

The following map shows a significant difference between eastern and western Germany. Above-average deviations were found exclusively in the West and almost exclusively in suburban areas – e.g. the suburban areas of Flensburg, Münster, or Reutlingen –

whereas only average or below-average deviations could be found in the East.

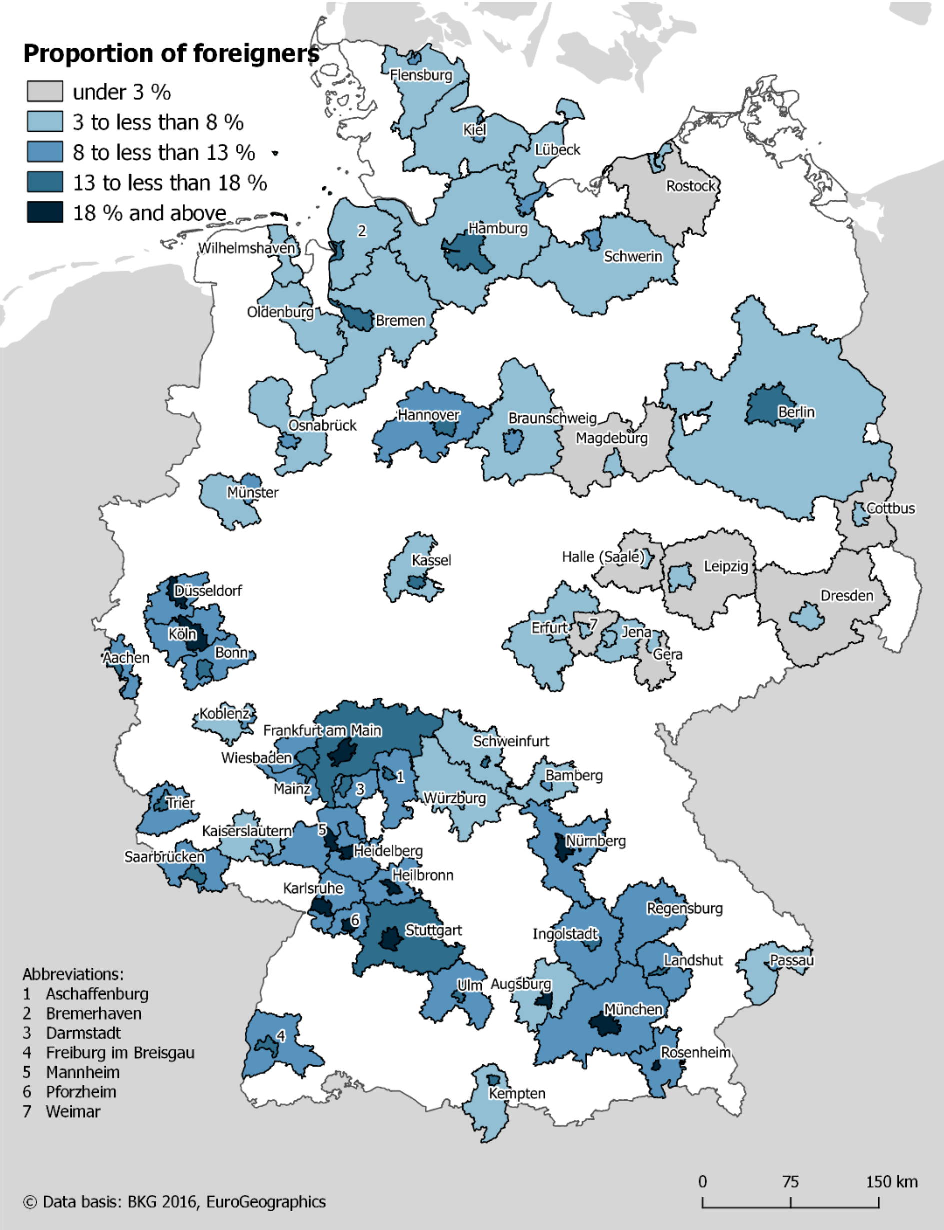


Youth ratio 2013 in the Urban Audit cities and their suburban areas

It is striking that this East-West divide also applied to the differences between cities and suburban areas. Large differences were found between the cities and suburban areas of the western cities, whereas the differences between the cities and suburban areas are smaller or not at all existent in eastern cities.

Proportion of foreigners

The average proportion of foreigners in the total population of the Urban Audit cities for which corresponding data exists was 13.5%. The average proportion of foreigners in suburban areas was 7.6%, i.e. somewhat more than half of the city average. Deviations between the cities were more significant for the indicator "proportion of foreigners" than for the "youth ratio". The average difference between the cities and their suburban areas was also higher for the proportion of foreigners. However, the variance of suburban areas barely differed between both indicators.



Proportion of foreigners 2015 in the Urban Audit cities and their suburban areas

Frankfurt am Main had the largest proportion of foreigners in the total population, at 28.0 percent, followed by two other large southern German cities, Munich (25.2%) and Stuttgart (23.8%).

The proportion of foreigners in the total population was lowest in the eastern German cities of Brandenburg an der Havel (3.5%), Dessau-Roßlau (4.1%), and Rostock (4.4%). In suburban areas, the proportion of foreigners varied between 2.0 percent in the suburban areas of Gera and 16.1 percent in the suburban areas of Frankfurt.

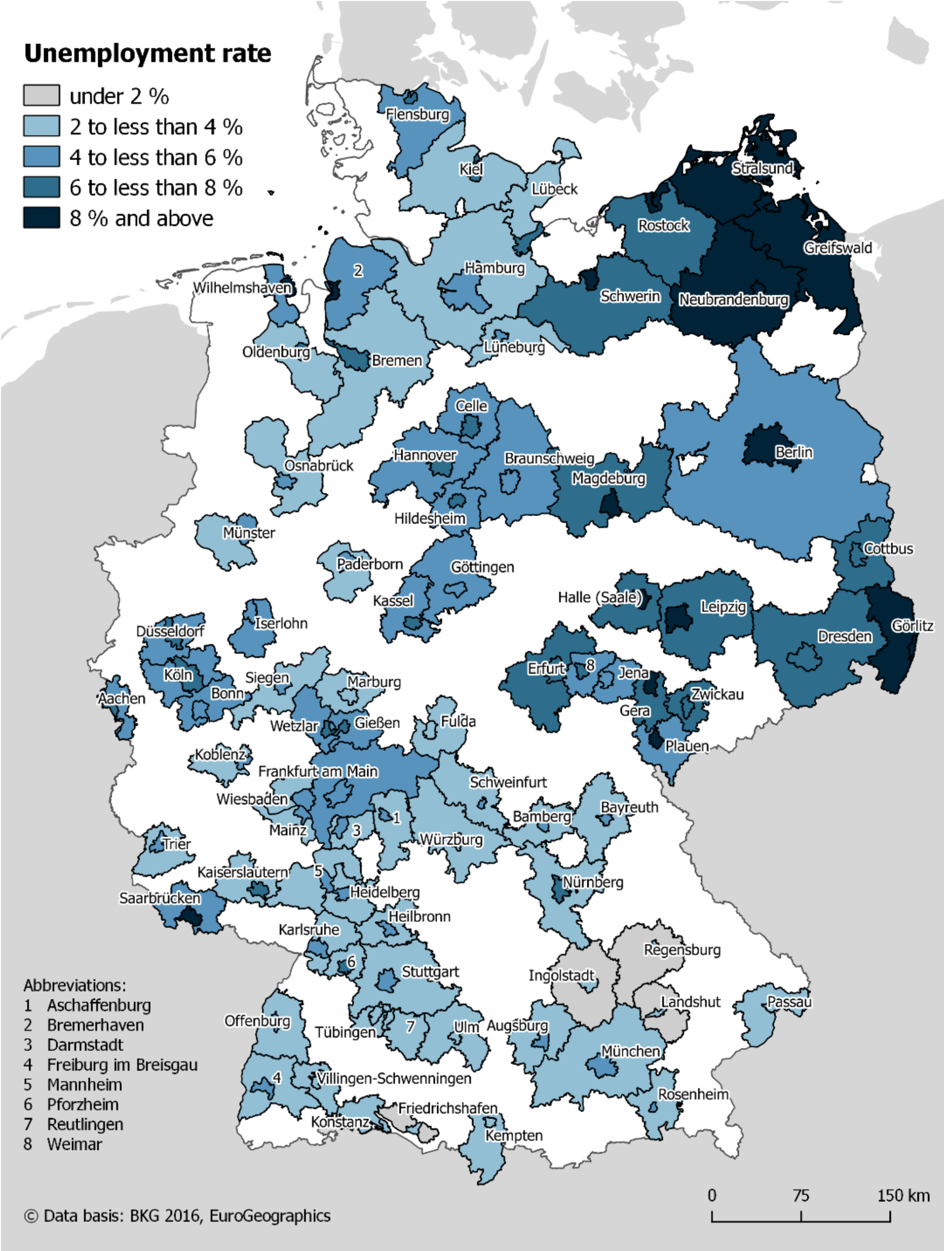
The map shows that the proportion of foreigners differed more strongly across regions than between cities and their suburban areas. In the south-western suburban areas, the proportion of foreigners was still much lower than in the corresponding cities but generally much higher than in the north-eastern suburban areas, where the differences between the cities and their suburban areas were much smaller. In the East, a significant difference between the city and its suburban areas could only be found in Berlin (+11.7 percentage points), which was only surpassed by Frankfurt am Main (+11.9 percentage points) and Munich (+12.3 percentage points) in the West.

Unemployment rates

The unemployment rate compares the total number of unemployed people with the number of people in the labour force.

In the eastern German cities of Stralsund (14.6%), Görlitz (13.7%), and Neubrandenburg (13.1%), the unemployment rate was more than double the average of the Urban Audit cities for which corresponding values exist (6.4%). The lowest unemployment rate was in the southern German cities of Friedrichshafen (2.5%), Tübingen (2.6%), and Ingolstadt (2.8%). In suburban areas, the average unemployment rate was almost always lower than that of the corresponding cities, at 4.2 percent. The only exceptions were the cities of Greifswald (-1.6 percentage points) and Wolfsburg (-1.2 percentage points), and, to a significantly lesser degree, Dresden (-0.2 percentage points) and Konstanz (-0.1 percentage points). The suburban areas of Greifswald had the highest unemployment rate, at 12.2 percent, and the suburban areas of Ingolstadt had the lowest, at 1.4 percent.

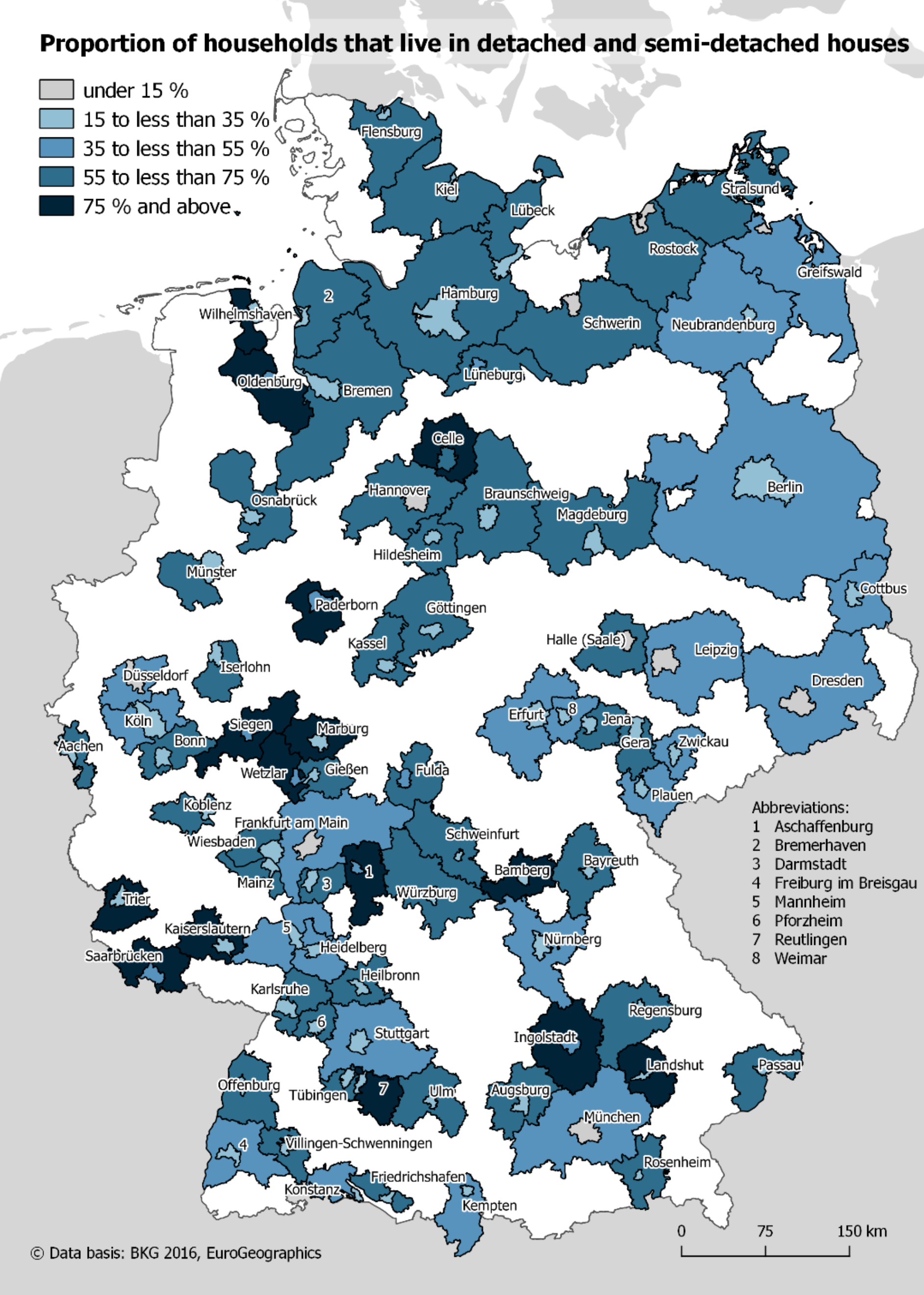
The regional differences also tended to be significantly stronger for this indicator than the differences between the cities and their suburban areas. Stralsund had the largest deviation between city and suburb at 5.5 percentage points. With the exceptions of the cities of Saarbrücken and Kaiserslautern, the unemployment rate in southern Germany was always below the total average of 5.4 percent. This was the case for both cities and suburban areas. The situation in eastern Germany was almost exactly the reverse.



Unemployment rate 2014 in the Urban Audit cities and their suburban areas

Proportion of households that live in detached and semi-detached houses

An analysis of the proportion of private households that live in detached and semi-detached houses revealed that this indicator had the largest differences between cities and suburban areas compared with the previously discussed indicators. In the cities for which the Urban Audit structural database provides values, an average of 26.1 percent of all households lived in detached or semi-detached houses. This proportion was always significantly lower than in suburban areas (average of 63.8%)



Proportion of households in detached or semi-detached homes 2012 in the Urban Audit cities and their suburban areas

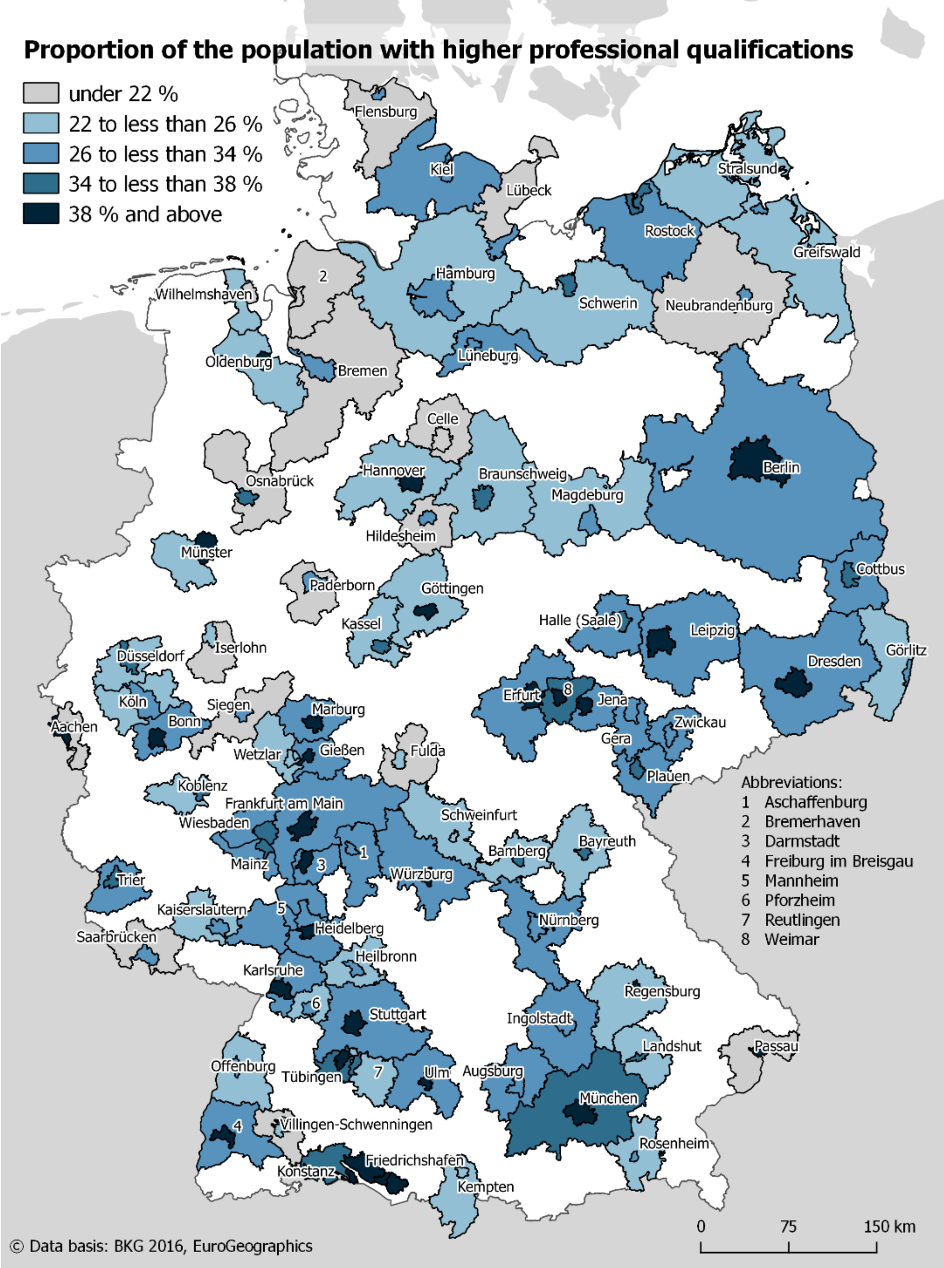
Only Salzgitter had a single-digit difference between the city (39.3%) and its suburban areas (48.3%), at exactly nine percentage points. In Reutlingen, the difference between the city (31.0%) and its suburban areas (90.5%) was almost 60 percentage points. Of all the cities for which corresponding values exist, the proportion of households that lived in detached or semi-detached houses was lowest in Greifswald (6.4%), Schwerin (7.8%), and Rostock (9.4%), all of which are located in the Baltic Sea region. In Celle (59.1%) and Wetzlar (51.2%), on the other hand, more than one in two private households lived in detached or semi-detached houses, and almost one in two in Neumünster (48.5%) and Lüneburg (47.3%). All of these cities have a population of 50,000 to just under 100,000 inhabitants. In comparison, a smaller proportion of households lived in detached or in semi-detached houses in the suburban areas of Düsseldorf (41.8%), Konstanz (43.4%), Kempten im Allgäu (44.4%), Dresden (46.0%), and Ludwigshafen am Rhein (47.0%) than in the corresponding four cities. In contrast, nine in ten households lived in detached or semi-detached houses in the suburban areas of Reutlingen and Paderborn (90.5% and 90.0% respectively).

The striking difference between the East and the West for the previous indicators does not play a role for the indicator households that live in detached or semi-detached houses. The total average for all of the territorial units included in the analysis was 43.8% for this indicator. Only cities had values (slightly) below the average in both the East and the West. In all of the larger cities with more than 500,000 inhabitants, the proportion of households that live in detached or semi-detached houses was far below the total average. Furthermore, many smaller Urban Audit cities – such as Passau and Greifswald – also had values significantly below the average.

Proportion of the population with higher professional qualifications

For this comparison, the share of the population aged 25 to 64 that has a university degree or master craftsman's diploma[9] is compared with the total population of the same age group. In almost all of the cities for which corresponding data exists, an average of 34.2 percent of the population had higher qualifications and thus a higher proportion than in suburban areas (average 26.3%). However, there were significant differences between the cities: in the university cities of Tübingen (55.1%), Heidelberg (52.8%), Bonn (52.3%), and Ulm (50.3%), more than every second inhabitant aged 25 to 64 had a university degree or master craftsman's diploma, while in the more industrial cities of Neumünster (18.0%), Wilhelmshaven (18.4%), Remscheid (18.6%), and Bremerhaven (18.7%) not even one in five did.

[9] ISCED (2011) level 5 to 8 diploma, roughly corresponds to levels 5 and 6 of the ISCED 97.



Proportion of the population with higher professional qualifications 2012 in the Urban Audit cities and their suburban areas

There also appears to be a correlation between the proximity to universities or industry in suburban areas. The differences between the suburban areas, however, were much smaller: The highest proportion of the population with higher qualifications was in the suburban areas of Friedrichshafen (41.0%), Tübingen (37.4%), and Munich (36.7%). The lowest proportion was in the suburban areas of Iserlohn (16.3%) and Siegen (17.5%), areas that are dominated by the manufacturing industry.

In the cities of Wilhelmshaven (-4.6 percentage points), Bremerhaven (-3.1 percentage points), Schweinfurt (-2.7 percentage points), Nuremberg (-1.9 percentage points), Augsburg (-1.3 percentage points), Gera (-0.6 percentage points), and

Kempten im Allgäu (-0.5 percentage points), the proportion of the population with higher qualifications was lower than in the corresponding suburban areas. In the southern German cities of Passau, Ulm, and Regensburg, the difference to the suburban areas was most pronounced, at approximately +25 percentage points respectively.

There were no clear regional differences between the East and West or the North and South for this indicator.

Conclusion

The variables and indicators for suburban areas were recalculated based on the Urban Audit structural database, enabling the discovery and analysis of a variety of new aspects in the relationships between cities and their commuting zones. Instead of an overall analysis of the functional urban areas, which always includes the entire urban area, additional aspects can be incorporated into the analysis of the relationships between urban areas using the mathematical delimitation of the suburban areas.

Comparisons between cities and suburban areas are primarily limited due to the structure of the Urban Audit database. In order to calculate values for suburban areas, two conditions must be fulfilled:

1. Data must be available for both the city level and the level of the functional urban area.
2. Data for the corresponding territorial unit must be available in the form of absolute values.

While the structural database has values for the level of the functional urban area for the majority of variables, some exceptions continue to exist for which no data sources are available on this territorial level. This also includes the variables we received directly from the cities themselves. The second condition is problematic because variables were calculated based on the micro-census and reported in reference or average values. Because they represent a reference size, these variables are not suitable for calculating values for suburban areas. The values for the suburban areas would have to be calculated directly based on the micro-census.

Despite its limitations, the Urban Audit data provides a wide range of characteristics. Comparisons between cities and suburban areas based on the Urban Audit can help to recognise potential problems or parallel developments between cities and suburban areas and compare these on a European level.

By selecting a set canon of cities, it would also be possible to deduce potential structures from the comparisons in order to illustrate trends in cross-regional developments and examine existing characteristics in different subject areas.

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4. Structures of the residential, household and population in the Swiss core cities and their communiting zones

by Anna-Katharina Lautenschütz[10]

This analysis will examine residential, household and population structures for the eight Swiss cities of the City Statistics (Urban Audit). Comparisons will also be made at European level where possible.

Core city and commuting zone according to City Statistics

The City Statistics project is a European project comparing living conditions in towns and cities with more than 50 000 inhabitants and enables cities to be analysed at different spatial levels. This publication looks at the:.

- Core city = the core of the agglomeration; this corresponds to the political administrative unit of the city concerned.
- Commuting zone = peripheral municipalities of the core city that together with the core city form a cohesive agglomeration area (in Switzerland this is pursuant to the 2012 FSO definition).

Residential structure

Single-family houses frequently imply a higher per capita living space and a private garden. In the core cities of the City Statistics, the share of single-family houses in the number of dwellings is low at 6% in comparison with the average for all Swiss core cities of 9% (reference year 2016). Switzerland's largest core cities also often have the highest population density. With 12 434 and 7 124 inhabitants per km^2, Geneva and Basel are notably far above the average of both the City Statistics cities (4 431) and the Swiss core cities in general (1 457).

In the commuting zones of the eight City Statistics cities, the share of single-family houses in all dwellings is around 25% on average and thus four times higher than in the core cities (6%). This also corresponds to the average of 26% for all 49 Swiss commuting zones. With increasing distance from the core city, the share of single-family houses increases whereas the **population density** decreases. On average, the municipalities in the Swiss commuting zones have a population density of 385 inhabitants per km^2.

The average **living space** available per person differs between cities of the City Statistics by up to 10 m^2. Furthermore, we can note a difference between the core cities with an average of 42 m^2 living space and the commuting zones with 46 m^2.

While **home ownership** can cause high initial costs and can lead to greater debt, it also allows people more freedom to shape their lives. In the core cities of the Swiss agglomerations, only around one fifth of households are home owners. In the eight core cities of the City Statistics, the home ownership rate is even lower at 14% on average. In comparison, this rate is more than two times higher

[10] This article is an abridged edition of the original report published by the Swiss Federal Statistical Office (FSO (2017): Living in cities: a comparison between the larger core cities and their commuting zones. In FSO News number 1159-1700. Available at https://www.bfs.admin.ch/bfs/en/home/statistics/cross-sectional-topics/city-statistics.gnpdetail.2017-0196.html.

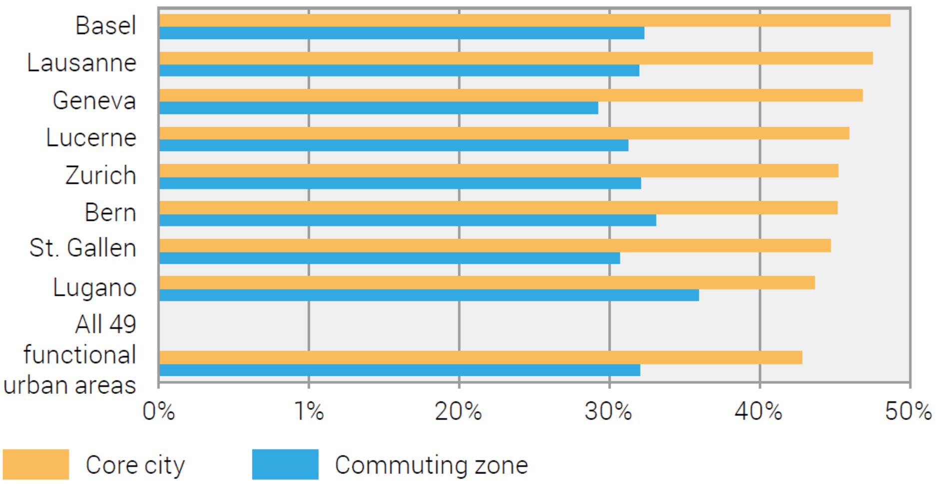
in the commuting zones of the eight City Statistics cities (41%). The share of households living in owned dwellings is on average 43% in all of Switzerland's commuting zones.

The share of **empty dwellings** is an important indicator for the ratio between supply and demand of housing. In the core cities of the City Statistics, the share of vacant dwellings is only 0.8% on average. In the eight commuting zones, the share is somewhat higher at 1.1% on average.

In contrast, in Switzerland's core cities an average of 9% of dwellings are **overcrowded dwellings**, i. e. with more than one person per room. In the commuting zones of the City Statistics cities the share of overcrowded dwellings is slightly lower, being similar to the average of all Swiss agglomerations with 7%.

Household and population structure

The household and population structure between the core city and the commuting zones has tended to become more similar in the last 25 years. However, some differences can still be observed, e. g. persons living alone are far more likely to live in the core cities. In the case of the City Statistics cities, **single-person households** account for around 45% of households, roughly corresponding to the average of the core cities of all Swiss agglomerations (43%). In the commuting zones, the corresponding value is far lower for the average of the City Statistics cities and all the Swiss commuting zones (each at 32%). In the last 25 years, the share of single-person households has on average increased by 4.4 percentage points in all Swiss commuting zones, in all core cities it was on average less than 1 percentage point.



Source: FSO – STATPOP

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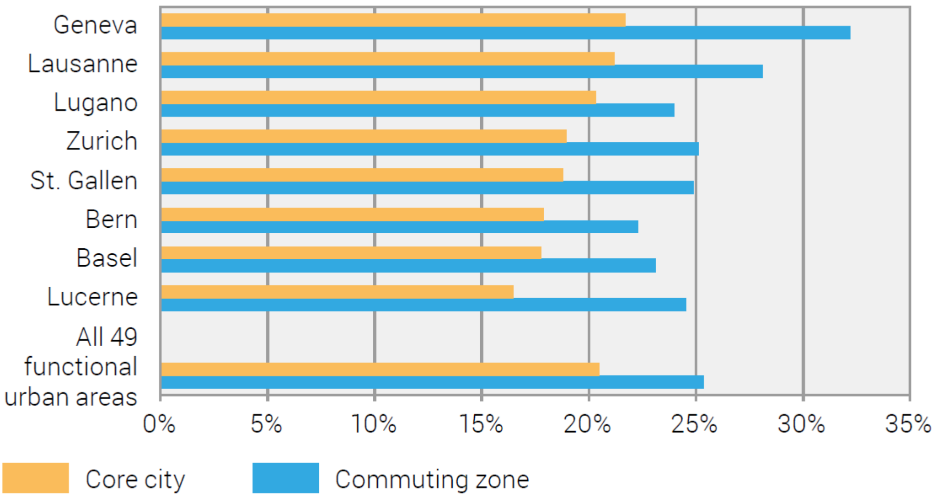
One-person households, 2016
Share of one-person households in total number of private households

Family households, 2016
Share of households with persons under 18 years of age in total number of private households



Source: FSO – STATPOP

In the core cities the share of private households with persons under 18, hereafter referred to as **family households**, is smaller than that in the commuting zones. However, this difference is lower than among single-person households. In the core cities of the City Statistics, family households account for 19% of all households, while in the commuting zones this percentage is 26%. Since 1990 the share of family households in the core cities of the City Statistics has increased slightly (+ 0.9 percentage points). Exactly the opposite trend has been seen in the commuting zones of these cities, where the share of family households has fallen by 4.7 percentage points on average since 1990. Taking into consideration Switzerland as a whole and regardless of area type, there has been a downward trend in family households over the past 25 years (–4.5 percentage points). In areas without urban influence, a decline of 10 percentage points has been observed. The general trend is thus in contrast with the aforementioned increase in family households in the core cities of the City Statistics.

These opposing developments result in a spatial assimilation of the proportions of single-person and family households in Switzerland.

There are no major differences regarding **age structure** between the core city and commuting zones if the proportions of younger persons (0–14 years) and older persons (>65 years) are considered. In all Swiss core cities, around 13% of the population is on average made up of children up to 14 years, while in the commuting zones this percentage is 15%. Among the population aged 65 years and over, the difference between the core city and the commuting zone is less than one percentage point.

On average, the share of the **foreign resident population** in the Swiss core cities is 32%. In the commuting zones, the share of the foreign resident population is generally lower than in the core cities. On average in Switzerland this share is just under 24%.

How do our European neighbours live?

In the cities of neighbouring countries, the share of private households that live in single and two-family houses varies considerably. In the German City Statistics core cities, around 26% of households live in single or two-family houses. In all core cities of Switzerland, this value is around 12%. In the French cities of Strasbourg, Grenoble and Annecy, 20% of households also live in single or two-family houses, while this is the case for as many as 30% of households in Besançon. In the commuting zones in Germany, on average more than 60% of households live in single or two-family houses.

In the German core cities of the City Statistics, on average around 30% of households own their homes while this share is almost 58% in the German commuting zones, considerably more than the 14% of the core of those of Switzerland and the 41% of their commuting zones. The population density in the German and Swiss core cities is almost identical with 1 422 or 1 457 inhabitants per km^2.

The household structure is similar in Switzerland to its European neighbours. Single-person households are also mostly found in the core cities. For example, they account for 46% of households in the German core cities, while their respective share in the commuting zones is around 35%. The difference between the core city and the commuting zones, however, is less marked when it comes to family households. In Germany, for example, these make up 18% of all households in the core cities and 22% in the commuting zones. In contrast, in France this difference is slightly greater than in Germany. In Besancon the share of family households in the core city is 24% and in its commuting zone 47%. Similar values can be found in Grenoble with a 25% share in the core city and 36% in the commuting zone. Accordingly, the age structure of the population in the core cities and commuting zones is also quite similar. In Germany, children under 18 years and people aged 65 and over are even equally represented in both of the specified areas.

Dr. Anna-Katharina Lautenschütz was a scientific collaborator at the Swiss Federal Statistical Office (FSO) and project manager for the Urban Audit Switzerland (urbanaudit@bfs.admin.ch).

II A focus on data – establishing sources for Urban Audit and data use

Chapter overview

As was demonstrated in the last chapter, the KOSIS Association Urban Audit aims to make existing data as usable as possible and – where necessary – to establish new sources of data. For the Urban Audit suburban areas, no new data was required. Instead, existing data was recompiled and analysed for the cities and functional urban areas. In this chapter, the focus will be on establishing possible new sources of data and determining the easiest method for using existing data.

OpenStreetMap as an alternative source of data for measuring the length of a cycle network

This data collection attempts to relieve the cities as much as possible from the burden of submitting their own data and to gain information from central sources. Some of the data requested from Eurostat, however, can only be submitted by the Urban Audit cities themselves. For enquires regarding the length of the designated cycle network of a city, the large number of erroneous data and difficulties in comparing data were striking. During his internship with the city of Mannheim, Sebastian Schmidt therefore used OpenStreetMap as a central source for determining the length of a city's cycle network. He demonstrated that this method is a viable alternative if the types of cycle routes are carefully selected and the chances and risks of open source data are recognised.

Data use made easy

The following article will present an overview of the availability of the data collected and analysed by Urban Audit and the various options for accessing it.

1. Measuring the total length of cycle networks in Urban Audit cities based on OpenStreetMap data

by Sebastian Schmidt

Precisely 200 years ago, Karl von Drais discovered the draisine in Mannheim, the predecessor for today's bicycle, thus changing local transport in the long term. It would be impossible to think of the world’s cities today without bicycles. They are an ecological and economic alternative to motorised traffic.

For the Urban Audit European city data collection, the length of the existing cycle networks is therefore rightfully one of the variables for urban comparisons. The KOSIS Association Urban Audit conducted city surveys of German cities in compliance with EU regulations to calculate the cycle network, i.e. the routes whose primary function is dedicated to cycling (cf. fig. 1). These include cycle lanes, i.e. lanes designated for use by cyclists that are located on roads used for other purposes.

The large proportion of erroneous data (approx. 40%) and the large differences in the compilation of cycle networks for individual cities have, until now, made it difficult to make comparisons between cities. For this reason, this article examines whether alternative sources of data could be a possible solution for this problem. Since no data is available on cycle networks in cities across Germany, the article focuses on open data. The data in question was geo-data, i.e. data with a spatial reference, that was compiled by users as part of the OpenStreetMap project. The objective of OpenStreetMap (OSM) is to create a “free world map” that can be altered and used by anyone, thus enabling users to access and analyse the underlying data free of cost.

One of the alternative views for OpenStreetMap is OpenCycleMap. It displays *cycle routes* and numerous additional cycling components. These include specialist stores, public toilets, and fountains with drinking water as well as routes designated for cycling and cycle lanes. The data basis is the same as in the standard edition of OSM, which is why I will refer directly to OSM in this article.

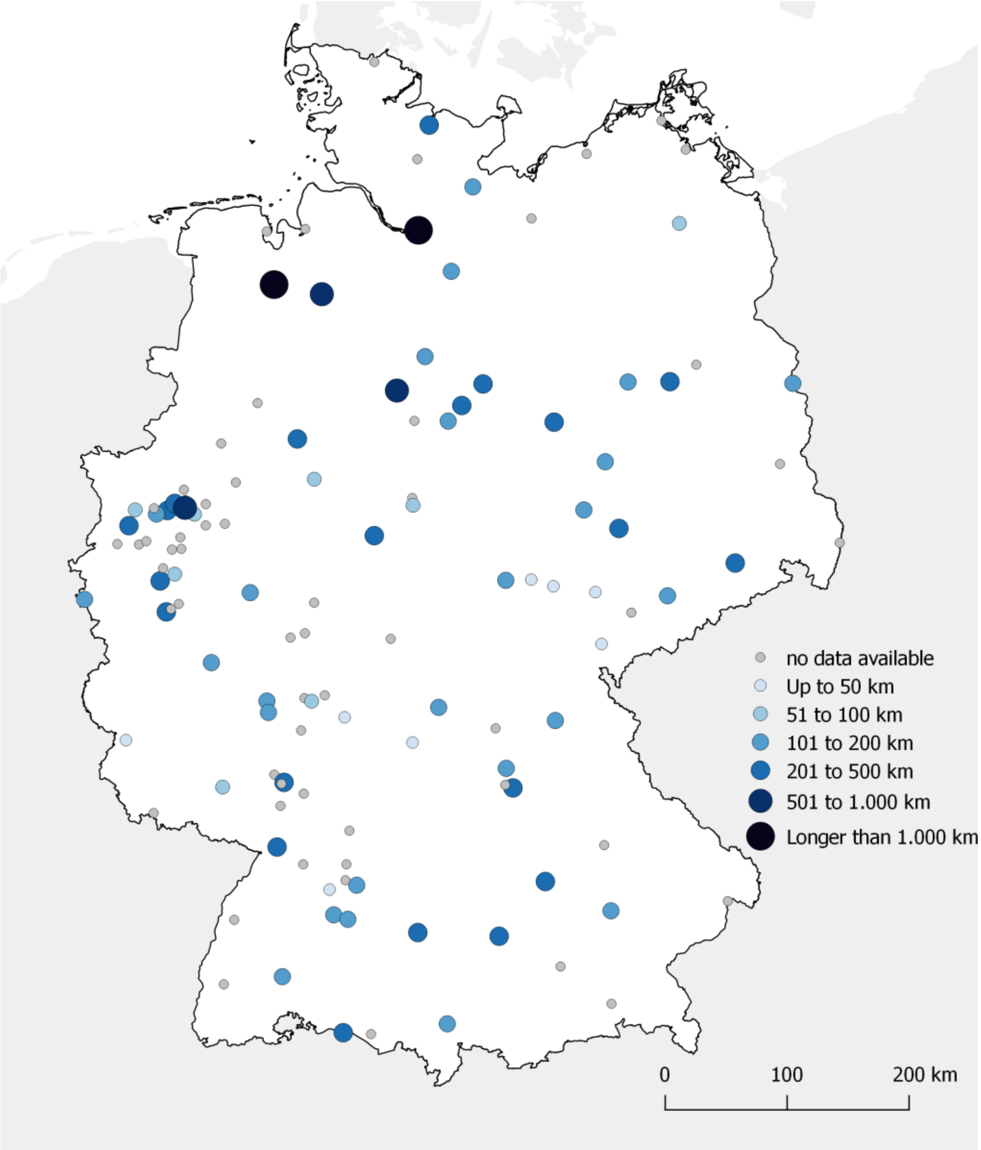


Fig. 1: Total length of cycle networks in German Urban Audit Cities (2016)

The analysis that serves as the basis for this article shows that OSM is indeed a suitable alternative for the variable cycle network. However, it is important to be aware of the different kinds of cycle routes that are included in calculations for cycle networks and how they are noted in OSM.

The article is structured as follows: First, I will discuss the types of cycle routes in the German road traffic regulations and their realisation in OSM. Since there are numerous different types of cycle routes, five classifications of OSM data are created. In a later step, I will analyse these classifications for 50 selected cities. Next, I will present the results of the classifications, focusing on the differences from the information submitted by the cities for the Urban Audit data collection. Finally, I will remark on the remaining challenges in the OSM data and draw a conclusion.

Types of cycle routes in the road traffic regulations and in OSM

Road regulations in Germany

In Germany, there are numerous different cycle routes, which are distinguished by their structural design and signs. Many of the cycle routes are marked by signs indicating a compulsory use. These include specially constructed cycle routes and cycle lanes that are designated in compliance with the road traffic regulations, shared pedestrian and cycle routes, and the portions of split cycle and pedestrian routes that are designated for cycling. The latter, for example, must have a prescribed minimum width. There are also cycle routes that are not compulsory, which are distinguished by the absence of one of the signs as shown in fig. 2. Other specific types of routes that may be used by cyclists include shared bus lanes and one-way roads and agricultural roads. However, the Urban Audit definition only includes legally designated cycle routes.

In OSM, these cycle routes can be displayed in different ways.

Source: http://velogo.cherif.de/wp-content/uploads/2014/05/Radwege.png (27/09/2017)

Fig. 2: Traffic signs 237, 240, and 241 for designating compulsory use

Data structure in OpenStreetMap

Generally, all existing and marked objects may consist of a maximum of three types of geometry: nodes, ways, and relations. For example, streets are marked as ways and assigned features that indicate their function, name, or external appearance (e.g. number of lanes, surface quality). This type of geometry represents not only streets and cycle routes but also administrative borders and rivers. Ways are drawn based on satellite images, field work (in situ observations), or other information and then categorised. In our case, we are dealing with the category *highway*. In OSM, key value pairs (*tags*), which can be freely assigned (*free tagging system*) are generated during the process of categorisation. The number of potential features is unlimited. It was possible to ascertain that the diversity and features that result from the *free tagging system* increased and thus impeded the options for making enquiries. In order to maintain a uniform classification, every mapper should comply with the instructions of the OSM Wiki, an online handbook. The free allocation of features should therefore only be used if a suggested standard feature is not suitable for a specific case. Whether users always comply with the OSM Wiki, however, is doubtful.

Within a key/value pair, the key represents the category, i.e. the kind of object. This includes main categories such as *building, highway,* or *railway* as well as sub-categories such as *maxspeed, tunnel,* or *cycleway.* The value that is added to each key provides essential details about the corresponding category. This leads to key/value pairs such as *building=church, highway=motorway* or *railway=subway.* In the sub-categories, details, such as *maxspeed=80, tunnel=yes,* are possible. The features are always listed in English in OSM.

The exclusive use of the OSM key *bicycle* is not recommended. This key includes the values *designated, official, yes,* and *n/a.* Problems can occur because the feature *bicycle=yes*, for example, is also assigned to ferries or properties set up for learner drivers and therefore produces undesired results regarding the total length of a cycle network. In order to avoid this, the key/value pair should always be linked to a specific path (e.g. *track, path*) when submitting an enquiry.

Key/value pairs for cycle routes in OSM

Theoretically, the tag *bicycle=designated* asks for the central criteria defined in the Urban Audit European data collection as this tag includes all of the cycle routes that are explicitly designated for cycling. Even if the tag *bicycle=designated* is linked to specific types of streets, a selection based exclusively on these two tags should not be made, since the variety of features in OSM would exclude numerous cycle routes.

If a cycle route is on or next to a road, it can be marked as a subcategory for this road. However, it is also possible to mark cycle routes that either run parallel to roads or are separated from them using the key/value pair *highway=cycleway.*

If a cycle route runs along a road, it can also be tagged *cycleway=track.* Specifying the position of a cycle route alongside a road can be done by changing the existing tag to *cycleway: right* or *cycleway: left* or to the key/value pair *cycleway=opposite_track.* The latter refers to a cycle route that runs in the opposite direction from the traffic lane. The same cycle routes could also be represented in two different ways, making the selection process more complicated. A double representation in OSM cannot be excluded for geometrical and visual reasons.

Fig. 3: Split pedestrian and cycle route in Mannheim
(*cycleway=track; bicycle=designated; foot=designated*)

Bicycle roads are marked with the tag *bicycle_road = yes*. Bicycle roads are defined as roads of mixed usage on which cyclists are given the right of way. This is a relatively seldom category that is mostly found in larger cities.

Cycle lanes are always sub-categories of a road in OSM and tagged as *cycleway=lane*.

Fig. 4: Cycle lanes in Mannheim
(highway=primary, cycleway=lane, bicycle=yes)

Here, too, cycle routes can be differentiated according to location and direction. A way on the map, for example, could be given the tag *highway=residential + cycleway:right=lane*. This would indicate a residential road with a cycle lane on the right.

Other types of cycle routes without any specific designation can be represented in OSM using a variety of features. These include one-way roads that may be used by cyclists driving in the opposite direction from the traffic (*cycleway=opposite*) and shared bus lanes (*cycleway: right/left=share_busway*). The majority of the paths that do not have a specific designation are multipurpose or agricultural roads where motorised traffic is forbidden (*highway=path* or *highway=track* AND *bicycle=yes*). One example are forest paths that can be easily used by cyclists on a regular basis. The key/value pair *highway=path*, in particular, can be seen as a universal tag in OSM, since it can also be used for normal footpaths. However, this results in a significant problem. Although many of these routes do exist in OSM, they do not contain specific details about their use as cycle routes (e.g. no details about the surface of the road).

Finally, there are also footpaths that may be used by cyclists (*highway=footpath* AND *bicycle=yes*). The use of these cycle routes is not compulsory. Fig. 5 shows gravel access routes to the Karlsruhe Palace. It illustrates how footpaths that are also used by cyclists can significantly increase the total length of a cycle network.

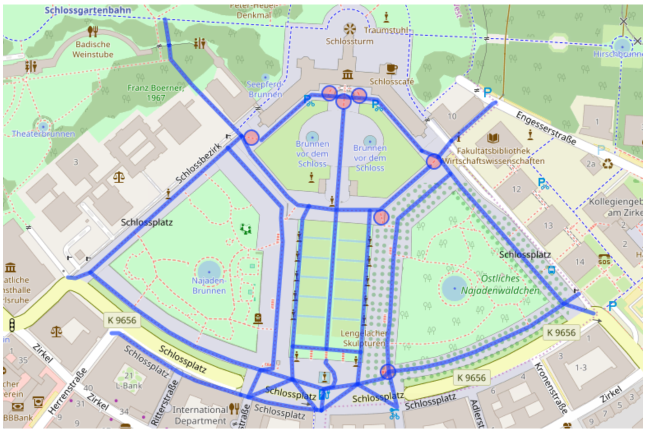


Fig. 5: Footpaths in Karlsruhe that can also be used by cyclists *(highway=footway AND bicycle=yes).*

The same problem exists in pedestrian zones in which cycling is permitted (*highway=pedestrian* AND *bicycle=yes*). In many cases, e.g. in pedestrianised areas of historic city centres (cf. fig. 6) or on university campuses, the inclusion of these types of routes results in an exponential increase in the length of the cycle network.

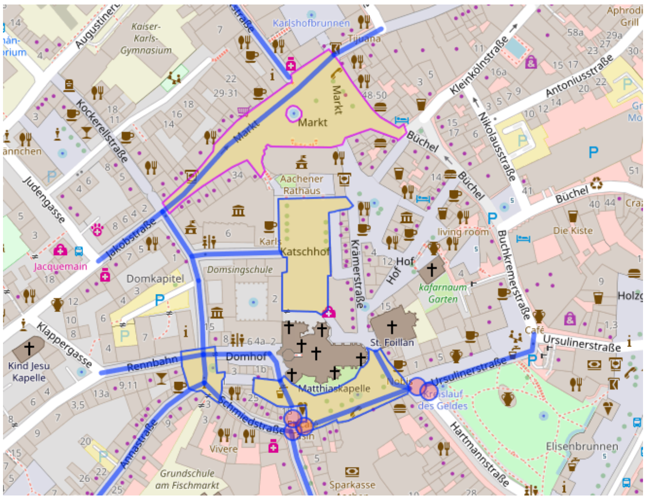


Fig. 6: Pedestrian zone in Aachen
(highway=pedestrian AND *bicycle=yes)*

One possibility for gaining continuous cycle network data from OSM is to extract routes (*networks*). These are relations, i.e. links, between geometric objects that represent, for example, long distance cycle routes or local cycle routes. They are used as the basis for the majority of the cycle networks in OpenCycleMap.

Classifications of OSM data

In order to test OSM as an alternative source of data and to compare the length of the cycle network it provides with the data that was previously supplied by the German cities, five separate classifications of types of cycle routes were created. Four of these are based solely on the cycle routes that are marked as ways, while the last category only includes the remaining cycle routes (*networks*).

Each of these classifications, which were selected during this project, consists of different types of cycle routes. Tab. 1 shows the selected features for each of the classifications. As can be seen, the second, third, and fourth classifications are successive and the fifth is also related to the third classification. This third classification corresponds to the requirements in the Urban Audit survey.

The first classification only takes the cycle routes in OSM into consideration. However, these must be used with caution. While they are usually explicitly orientated on marked routes, it is still often not clear what criteria they are based on. For example, agricultural roads and roads that are not designated as cycle routes are included in order to produce continuous networks. By contrast, some cycle lanes and other types of routes are missing, which can be downloaded through additional queries.

Furthermore, it is important to note that many of the routes overlap, i.e. in some places they cover the same paths. Simply requesting the length of a route produces erroneous results. Therefore, the database must be adapted using geometric criteria. The query should also be made using the tag *route=bicycle,* since the query of routes alone (*network=icn/ncn/rcn/lcn*[11]) could also include mountain bike routes and bridleways.

Tab. 1: Classifications of OSM data according to features

<table>
<tr><th>Classification 1</th><th>Classification 2</th><th>Classification 3</th><th>Classification 4</th><th>Classification 5</th></tr>
<tr><td>route=bicycle</td><td colspan="4">-</td></tr>
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<tr><td colspan="4">cycleway=track</td></tr>
<tr><td colspan="4">cycleway=opposite_track</td></tr>
<tr><td colspan="4">cycleway:left=track / cycleway:right=track</td></tr>
<tr><td rowspan="9">-</td><td colspan="3">cycleway=lane</td></tr>
<tr><td colspan="3">cycleway:left=lane / cycleway:right=lane / cycleway:both=lane</td></tr>
<tr><td colspan="3">cycleway=opposite_lane</td></tr>
<tr><td colspan="3">cycleway:left=opposite_lane / cycleway:right=opposite_lane</td></tr>
<tr><td rowspan="5"></td><td>cycleway=opposite</td><td>highway=path AND bicycle=official</td></tr>
<tr><td>cycleway:left=share_busway</td><td>highway=track AND bicycle=yes</td></tr>
<tr><td>cycleway:right=share_busway</td><td>highway=footway AND bicycle=yes</td></tr>
<tr><td>highway=path AND bicycle=yes</td><td rowspan="2"></td></tr>
<tr><td>highway=track AND bicycle=yes</td></tr>
</table>

Designated cycle routes without cycle lanes are included in classification 2. This classification is the basis for the next three classifications, each of which adds new types of paths to this selection. Classification 3 also contains cycle lanes. In addition, classification 4 also lists possible routes without a clear designation.

Classification 5 is the most extensive. It is a continuation of the third classification and also comprises footpaths that may be used by cyclists (*highway=footway* AND *bicycle=yes*).

Fig. 7 illustrates the differences between the classifications using the city of Heidelberg as an example. Considerably more agricultural roads are included in the cycle routes in the first classification, which is especially noticeable in the south-eastern area of the Königstuhl. Some of these are also included in the fourth classification. However, the first classification represents a smaller number of possible routes within the populated areas, which is noticeable in the western sections of the city and the

[11] The abbreviations stand for the type of cycle network (*international/national/regional/local cycle network*).

university quarter *Im Neuenheimer Feld* (in the centre of the map, north of the Neckar). This figure clearly shows the strong fragmentation of cycle routes in the classifications 2 to 5.

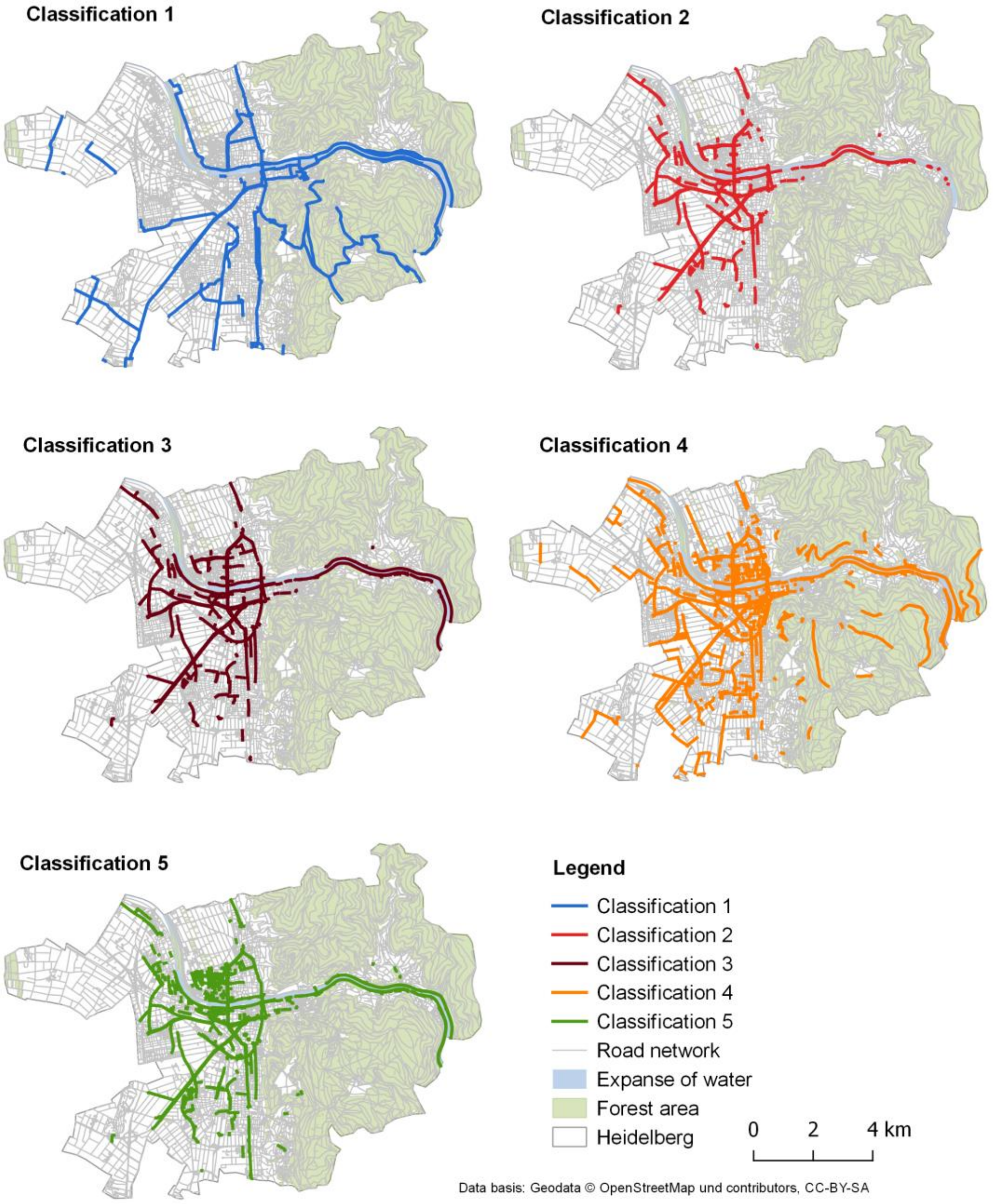

Fig. 7: Comparison of classifications using Heidelberg as an example

Selection of cities and procedure

For the project, 50 German cities, all of which are members of Urban Audit, were analysed. When selecting the cities, I attempted to achieve as large a distribution across the entire country as possible. The objective of the selection was to include a broad range of large and small cities in the analysis. Furthermore, I selected both cities in metropolitan regions and cities in more peripheral areas. In addition, spatial clusters were created in order to describe regional differences and commonalities. These primarily included northern and central Baden-Württemberg, the Rhine-Ruhr region, and Thuringia. Baden-Württemberg was chosen since I know the area well and because the project is based in Mannheim. North Rhine-Westphalia represents a very urban region whereas the cities in Thuringia are located in a less populated area. Some cities were omitted from the clusters. The

Fig. 8: General map of the analysed cities

reason for this was missing or inconsistent data in the Urban Audit data collection.

The same analyses were carried out for all of the cities. Each of the OSM databases was downloaded using Overpass Turbo[12] according to the criteria mentioned above and customised for the specific area. The area in question was always determined by the general municipal code. This was especially important for the routes, because they often cross state and national borders. In the final step, the calculated total length for each of the classifications was compared with the data submitted by the cities for the Urban Audit. The majority of the data was from 2016. Older data was only included when information was missing or was evidently flawed. The entire analysis of the data was carried out in QGIS[13]. The results of the project will be presented in detail in the next section.

Results of the project

Depending on the classification of OSM data, there were significant differences in the total length of the cycle network of the 50 selected cities (cf. fig. 9).

As anticipated, the total length of the cycle network in OSM varied dramatically between the 50 cities in the selection. The highest value was found in Berlin in the fifth classification, with 2,256.6 km of cycle routes, and the lowest value was found in Esslingen in the second category, with 17.8 km. The values in each of the classifications also varied greatly from one another. Fig. 9 shows these differences for the 50 cities.

[12] Overpass Turbo is an online data filtering tool for OpenStreetMap: http://overpass-turbo.eu.

[13] A free open source geographical information system: http://qgis.org

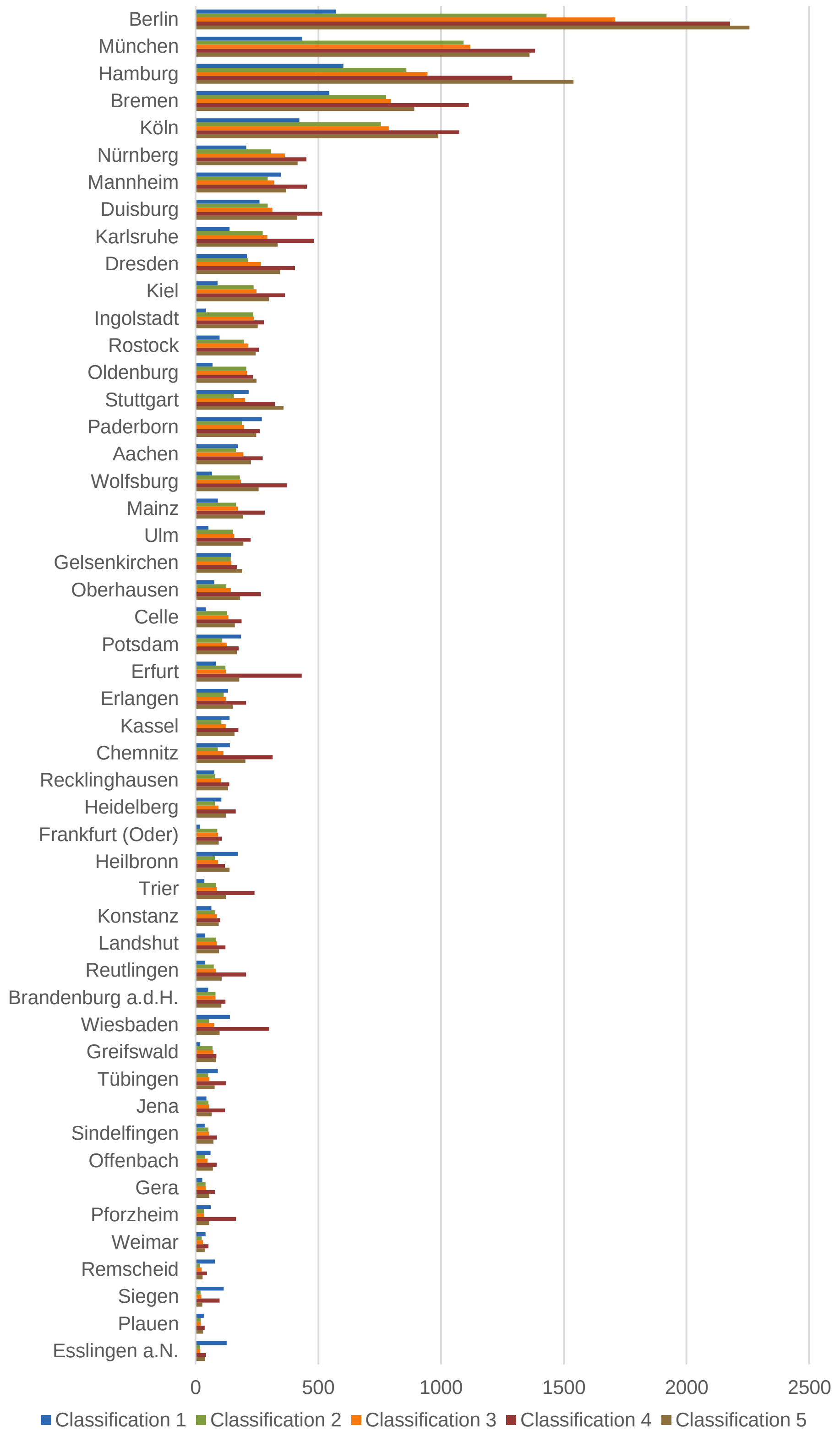

Fig. 9: Total length of cycle networks for all classifications according to OSM

Regardless of the classification of OSM data, the length of the cycle networks clearly correlated with the population and, to a lesser degree, with the area of the city.

I will now discuss the individual classifications in more detail and compare them with the data on the length of cycle networks submitted by the cities for the Urban Audit data collection.

The first classification comprises only the routes (*cycle networks*) in OSM. Thirty-nine of the fifty cities (78%) fell significantly short of the official data in some places. The enormous differences in the metropolises are particularly striking (Hamburg: -1198 km; Berlin: -875 km; Munich: -521 km). The cities whose official data was closest to the OSM data were Tübingen (+2 km), Wiesbaden (-6 km), and Chemnitz (+14 km). The largest positive deviations were found in cities with very low official data, such as Remscheid (+61 km) and Pforzheim (+59 km). Substantially negative deviations were found in Ingolstadt (-231 km) and Ulm (-234 km), among others.

The second classification was restricted to the designated cycle routes of a city, without taking cycle lanes into consideration. This classification does not correspond to the Urban Audit guidelines, but was nonetheless selected in order to test whether cycle lanes were relevant for the total length. The calculated values closely approximated the Urban Audit data, but they still showed a high dispersion. For example, there were matching results in Remscheid (-0.1 km), Berlin (-18 km), and Nuremberg (+7 km). However, some values also varied strongly, such as in Trier (+53 km), Paderborn (+92 km), and Esslingen am Neckar (-153 km). In this category, as well, negative deviations were most common (74% of the 50 cities).

The third classification only differed from the second classification in the addition of cycle lanes. This definition was the central classification criteria as it concurs with the data requested by the Urban Audit city survey. Once again, the total length of the cycle networks calculated in OSM was lower than the information submitted for the data collection for the majority of the cities (68%). However, compared with the second classification, the average deviation from the Urban Audit data is lower. As a result, it is recommended that cycle lanes be included in this classification.

The approximation to the Urban Audit data is a result of the fact that every city – with the exception of Plauen – has a certain number of cycle lanes in OpenStreetMap. However, these lanes may only measure a few hundred metres, as is the case in

Brandenburg an der Havel and Pforzheim, or they may represent significantly more relevant distances (Berlin: 279.3 km; Hamburg: 86.0 km; Nuremberg: 56.5 km). The average extension of the cycle network due to cycle lanes was +19.8 km. The values in larger cities were usually above average, which can be explained by urban design characteristics (e.g. denser traffic infrastructure).

The fourth classification created for the project is considerably more comprehensive and extends beyond the basic definition for the Urban Audit. By including agricultural roads, the total lengths are considerably increased. The result was that the data for only 24% of the cities in this classification was below that of Urban Audit. At the other end of the spectrum, the positive deviations increased, especially in large cities. For example, Berlin, Cologne, and Munich showed deviations of over 300 km compared with the Urban Audit data. For a few cities, this definition closely approximated the Urban Audit data, for example in Dresden (-4 km), Frankfurt (Oder) (+1 km), and Ingolstadt (+ 5 km).

Instead of agricultural roads, the fifth classification included the footpaths that may be used by cyclists. Once again, there were huge differences between the various cities. The biggest difference was found in the Hanseatic City of Hamburg, where an additional 595 km had to be added to the cycle network. Only Berlin had a similar magnitude (+547 km), whereas all of the other cities – with the exception of Munich, Cologne, Stuttgart, and Duisburg – had less than 100 km of designated footpaths. In some cities, such as Konstanz, Siegen, or Frankfurt (Oder), the total length according to OSM was even less than 10 km. This large variance resulted in very different final values for the total length. For some large cities, e.g. Duisburg (+5 km), Mainz (-6 km), and Heidelberg (-6 km), the results were fairly congruent. For Cologne and Stuttgart, on the other hand, the total length of the cycle network almost doubled. In other cities, e.g. Hamburg, Gelsenkirchen, and Siegen, the OSM data did not come close to approximating the official data.

On average, the smallest deviations between OSM values and Urban Audit data was found in the third classification. The largest deviations by far were found in the first classification. Fig. 10 groups the cities according to proportional deviation. The most cities with minor deviations (<15%) were in the fifth classification. The fewest cities with large deviations (>50%) were in the third classification.

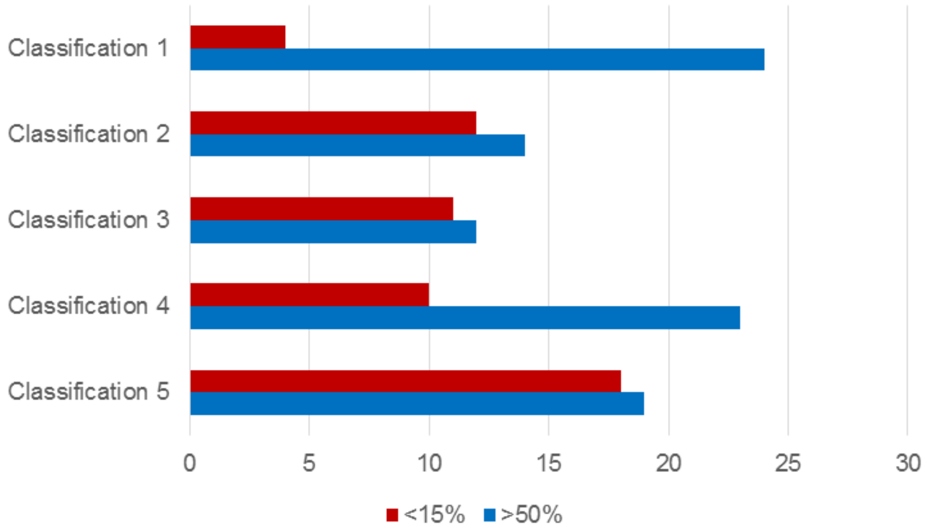

Fig. 10: Number of cities with minor and major deviations from the Urban Audit data on the length of cycle networks according to classification of OSM data

The differences, some of which were very large, of all the classifications compared with the Urban Audit data suggest that the basic definitions of the cities may have varied from one another. Of course, this variance could also be due to the quality of data in OpenStreetMap, although this would not explain the differences between the selected cities.

In order to examine this aspect more closely, an analysis was carried out on a selected regional cluster (cf. fig. 11). A large number of cities in central and northern Baden-Württemberg were examined for this project. It is quite striking that even the Urban Audit data for cities that are located close to one another greatly varied in its concurrence with OSM data. The most notable examples of this were Mannheim and Heidelberg. Mannheim's data was always below the OSM classifications and Heidelberg's data was always above the OSM classifications. In another sense, the differences in deviation from the classifications between Esslingen am Neckar and Sindelfingen, cities that are similar in terms of population, were also very striking.

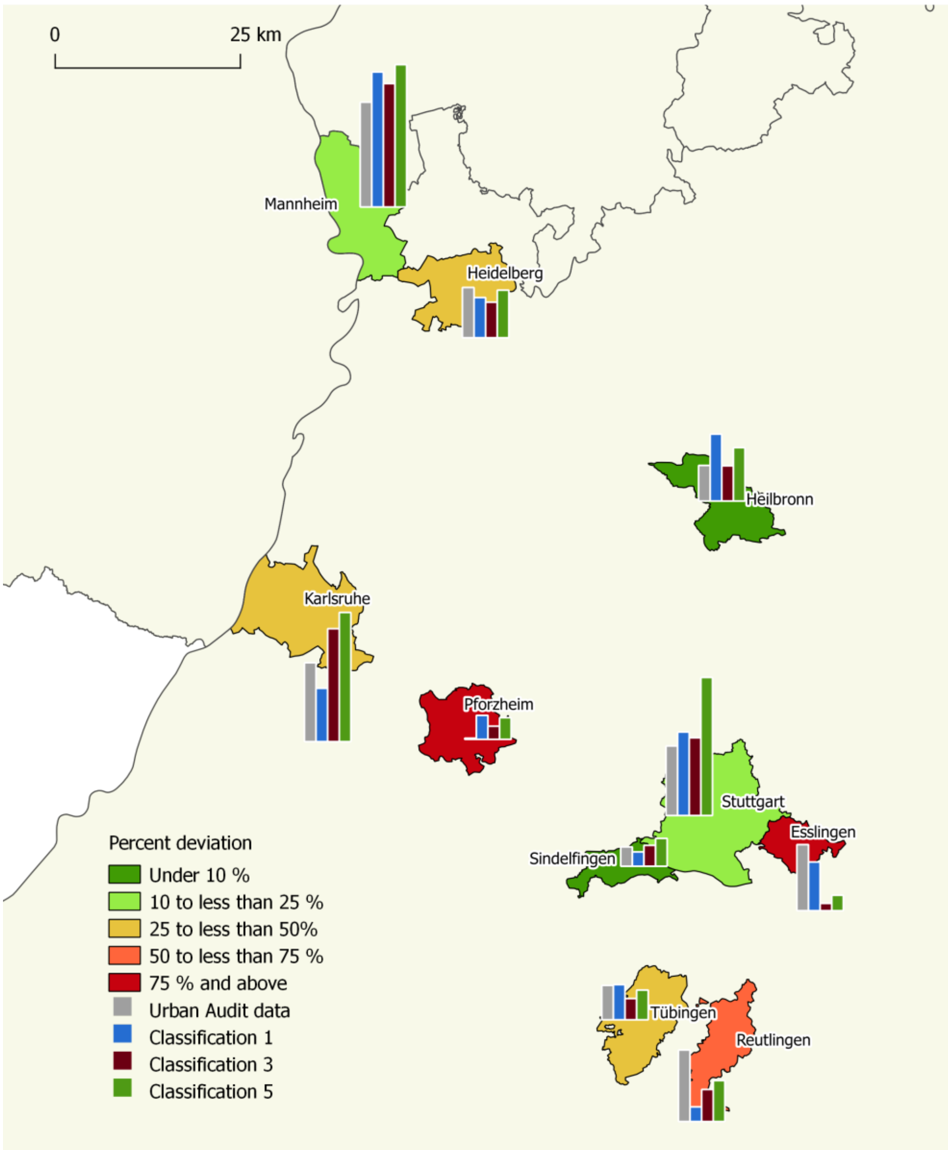

Fig. 11: Proportion of deviation from OSM classification 3 in the Urban Audit data on the length of cycle networks and a comparison of individual classifications in selected cities in Baden-Württemberg

Note: The diagrams represent the corresponding values of the classifications 1, 3, and 5 for each city and the Urban Audit data on the length of the cycle network (in km).

Since the third classification of OSM data was most similar to the Urban Audit definition and the data that was used to calculate the length of the cycle network in the data collection, I will discuss this classification in more detail.

Fig. 12 illustrates the degree of deviation between the third classification of OSM data and the Urban Audit data for the selected 50 cities. The size of the circles represents the areas of the cities. It is evident that there is no clear spatial pattern that is dependent on population or area.

While Berlin, which has a very large area, shows hardly any deviation between the third classification of OSM data and the Urban Audit data, the situation is quite different in Cologne. In smaller cities such as Greifswald and Sindelfingen, classification three data differed by only just under five kilometres from the

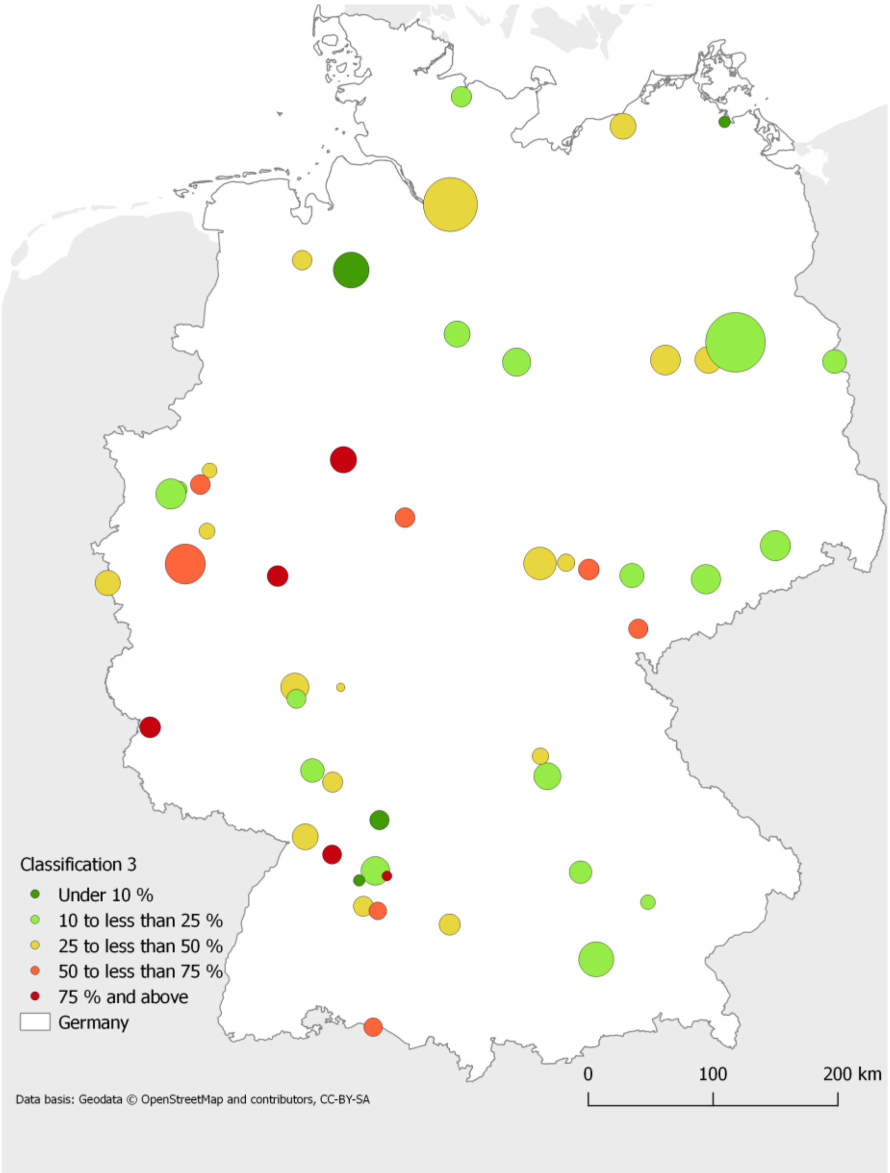

Fig. 12: Comparison of the third classification with the Urban Audit data on the length of cycle networks in relation to the area of a city (size of the circles)

length of the cycle network submitted for the Urban Audit data collection, whereas the length of the cycle network in Esslingen am Neckar according to OSM data deviated by 151 km from the Urban Audit data.

The population of a city was also a poor indicator for the accuracy of the third classification of OSM data compared with the Urban Audit data: Berlin, the German capital, showed a deviation of +18.0%, and was therefore relatively close to the value of the data collection, whereas the length of the cycle network in Hamburg according to the OSM classification was 855 km less than that of the Urban Audit data (-52.5%). Cologne also showed a large deviation (57.4%), although it was positive (+287 km). The dispersion between cities with small populations was also significant. Overall, the deviation for the majority of the smaller to mid-sized cities was in the negative range, although there were exceptions, such as Jena (+61.9%).

The assumption that cities located in peripheral regions would be of little interest for the OSM community and thus a lower data density would be available or that there would be a larger deviation from the Urban Audit data, could not be confirmed in this project. For example, there was sufficient data for Greifswald and Frankfurt (Oder), and the OSM values for Trier even surpassed those of the Urban Audit data collection.

Finally, I will compare the length of the cycle networks in kilometres per 1000 inhabitants for the third classification of OSM data and the Urban Audit data (fig. 13). The highest value in the third OSM classification was found for the city of Celle in Lower Saxony, where there were 1.95 km of cycle routes for every 1000 inhabitants. It is striking that among the ten best cities, Bremen (1.43) was the only city with more than 200,000 inhabitants. The three largest cities in the selection only placed 22nd (Munich), 25th (Cologne), and 37th (Berlin). The differences between the Urban Audit and OSM values were largely heterogeneous, although there was a slight tendency for smaller cities to show a more negative deviation from the Urban Audit value.

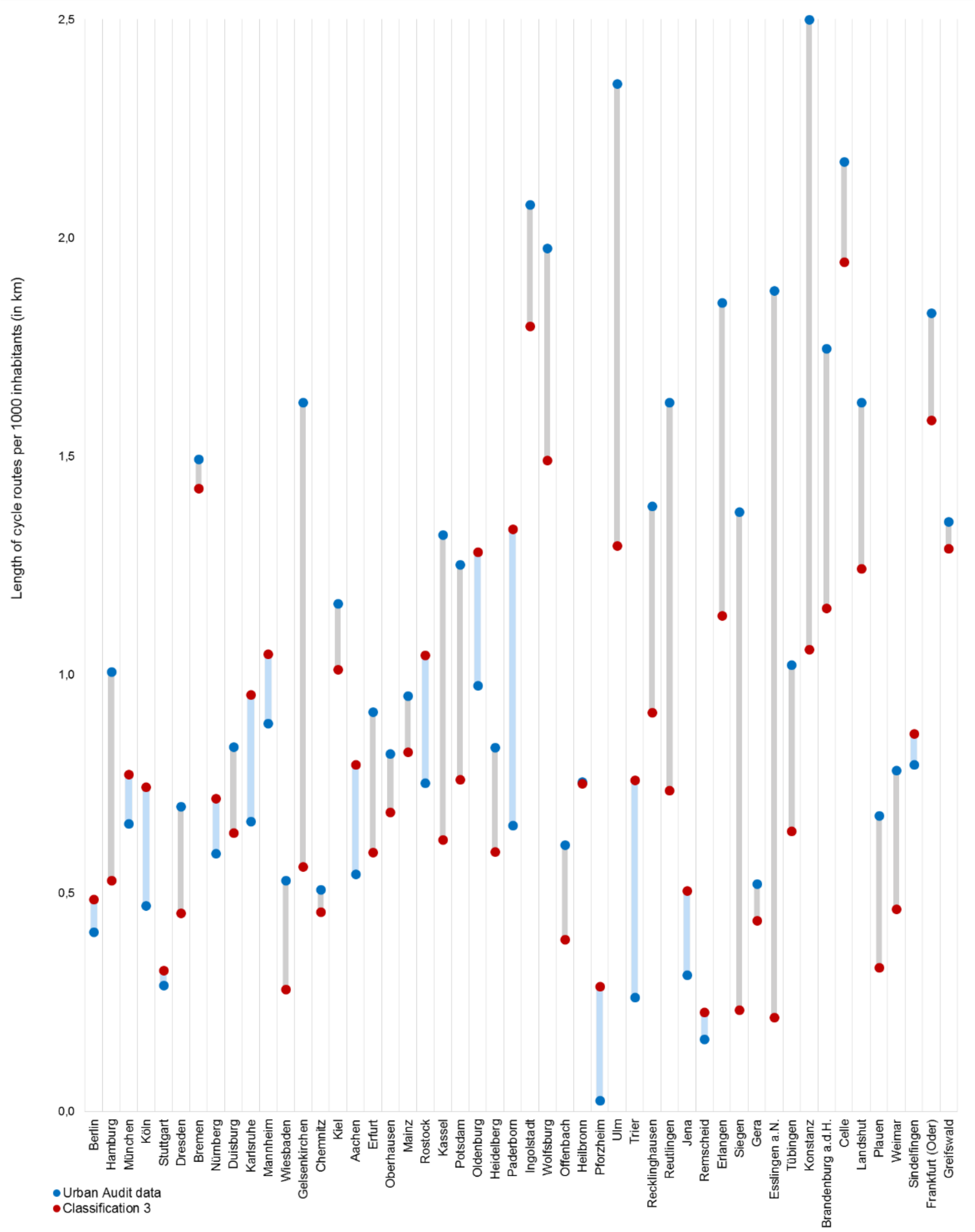

Fig. 13: Length of cycle routes per 1000 inhabitants according to the third classification of OSM data in the Urban Audit data

Challenges posed by OSM data

I will now present some of the challenges of the project, some of which have yet to be resolved satisfactorily.

For example, there is some debate about how to deal with two-lane cycle routes. These are cycle routes that often run unidirectionally, with one lane on each side of a large road. OSM chose to represent these with two separate lines as long as the two routes are separated by a physical barrier. Optionally, these could also be counted as a single cycle route. However, the technical implementation in this case would be difficult to realise. For this reason, these cycle routes were treated separately in this project.

The open tagging system in OSM is a significant problem. While an OSM Wiki[14] does exist, which describes a standardised method for compiling data for OSM, it does not cover every situation. As a result, there are numerous exceptions that have the features queried for this project, but which should not be classified as such. The majority of these problematic exceptions, however, tended to be in the fourth and fifth classifications.

The issue of data quality must, of course, also be addressed. In OSM, there are very densely and extensively "mapped" areas, whereas very little data exists for other regions. An international comparison shows that the completeness and accuracy of the data in Europe is much better than on other continents. However, large differences can be found within a continent or country, especially between rural and urban regions. Fig. 14 clearly shows

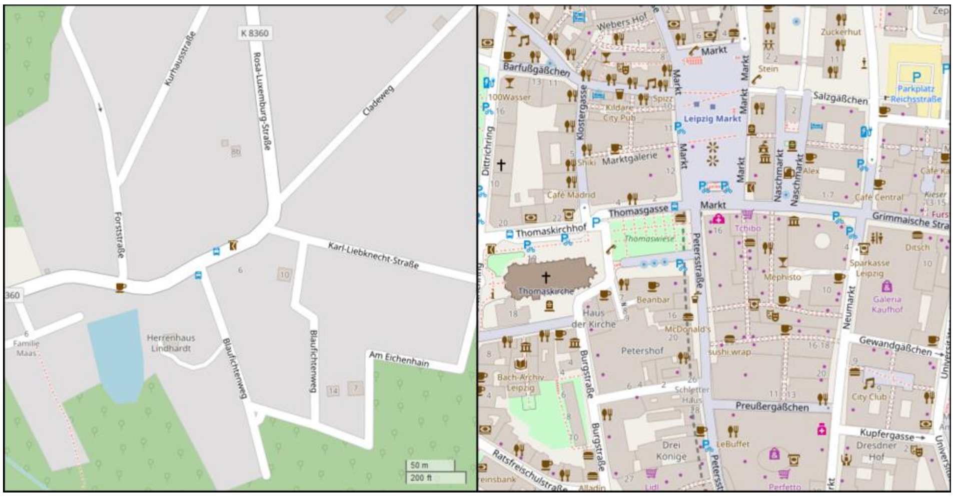

Fig. 14: Comparison of data density in OSM in Lindhardt (left) and Leipzig (right), same scale

how different even regions that are close to one another can be in OSM. There is a high data density in the centre of Leipzig, showing numerous restaurants, shops, and car parks in addition to buildings and streets. By contrast, a majority of the buildings are missing in Lindhardt, a district of Naunhof, which is situated only about 25 km away from Leipzig. The road network, however, is complete. This finding grants OSM greater validity for use in projects like this one, especially since this analysis dealt exclusively with urban areas in Germany. Nonetheless, it must be assumed that the selected features could not filter out every cycle

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14 Available online at: https://wiki.openstreetmap.org/wiki/DE:Hauptseite

route of a city, if only because of irregularities in the assignment of features or a lack of data.

Conclusion

OpenStreetMap represents both the advantages and disadvantages of user generated content. The question of data quality, in particular, must be examined considering this wealth of free geo-data. How good can data be if it was compiled by volunteers and remote mappers? One of the biggest problems with OSM, while also one of its great strengths, is certainly the free tagging system. On the one hand, it enables precision in assigning features. On the other, it makes it more difficult to compare these features. The resulting variety makes it difficult to select features, which in turn can lead to some undesired omissions and inclusions. The potential inaccuracy and a lack of data are also some of OSM's weak points. The biggest strength, aside from the fact that the data is up-to-date, is, however, the common denominator that can be used for comparing cities. Until now, it was not clear which criteria cities used to classify their cycle routes and how precise they adhered to the Urban Audit guidelines. By including OSM, it is possible to compare these criteria. Even though there were large deviations from the previous Urban Audit city data, it is likely that the findings achieved using this method are suitable for a long-term comparison. OSM has been steadily growing since its foundation in 2004 and will most likely significantly reduce the existing data gaps in the near future. Since the third classification of OSM data most closely approximated the Urban Audit definition, as well as largely concurring with the Urban Audit collection, it is the best possible solution. A selection using routes only is not recommended, since this method shows the highest average deviations. Furthermore, the selection of routes is not based on a clear definition.

Conclusion

Another project could examine whether this method could be applied outside of Germany. Since OpenStreetMap is an international initiative, it is at least theoretically possible to compare cities across Europe or even around the world. The former would certainly be of interest for the European Urban Audit

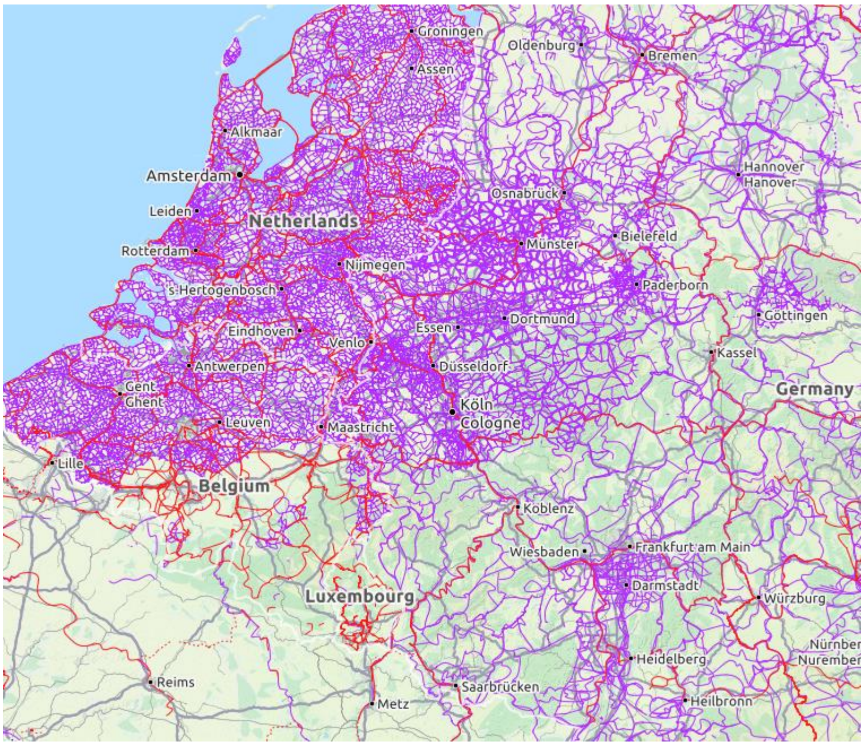

Fig. 15: Comparison of the data density of the tag *route=bicycle* in OpenCycleMap

city data collection. However, it is to be expected that there will be large variations in data density and quality across different regions. Fig. 15 shows the enormous density of cycle routes in the Netherlands and Flanders. In comparison, the French and Walloon areas, in particular, have much fewer cycle routes.

Sebastian Schmidt studies geography and romance studies at the University of Heidelberg and completed an internship at the Municipal Statistics Office of the city of Manheim (seb.schmidt2710@gmail.com).

2. Data use made easy

by Alexandra Dörzenbach and Tobias Link

The data collected and prepared in the Urban Audit is available to all interested users without restriction on the internet. There are different ways to access the data, depending on the intended use.

The services offered by the KOSIS Association Urban Audit include an **information portal** and a **dynamic report** (Urban Audit Structural Data Atlas) for all Urban Audit territorial units as well as an additional dynamic report that also contains the results from the Quality of Life Survey in European cities. **Eurostat**[15], the statistical office of the European Union, provides a database for access to this data.

The DUVA information portal

DUVA - Information portal

The data that was collected, recorded, adjusted, and tested for quality for all territorial units and reporting years of the German Urban Audit cities can be found in the DUVA-based **information portal**[16]. The information portal can be found at www.urbanaudit.de via the "Daten, Indikatoren" menu option in the "Daten, Grafiken, Karten" menu, replacing the previous web catalogue from 2015.

Data on cities, FUAs, SCDs, individual reference years, variable characteristics or characteristic groups can be individually selected and downloaded. Supplementary indicators as well as base data are available for many characteristics. This service is complemented by a cartographic display using the DUVA map tool and the option of directly accessing the evaluation and display options of the Structural Data Atlas.

Since 2017, the DUVA evaluation assistant has been successively used for providing data in tables and diagrams. The newest feature enables the creation of dynamic graphs that users can adapt to meet their needs.

[15] http://ec.europa.eu/eurostat/de/web/cities/data/database.
[16] Further information on DUVA is available at www.duva.de.

The Urban Audit Structural Data Atlas

Structural Data Atlas

The **Structural Data Atlas**[17] at www.urbanaudit.de allows users to access this data via the menu option "Graphs, maps" in the "Data, graphs, maps" menu. As a dynamic reporting supplement to the information portal, it enables the interactive generation of customised data tables, diagrams, and maps for selected base data and indicators for different German Urban Audit territorial levels (municipal level, functional urban areas – FUAs and sub-city district level – SCDs) and reporting years. In late 2016, the Structural Data Atlas was converted to HTML5 format, and, since 2017, comparisons of cities and suburban areas can be made by clicking on "Levels". For the functionality of the Structural Data Atlas, please refer to the online "Urban Audit Structural Data Atlas - User manual", which can be accessed by clicking on "Help".

The Urban Audit Perception Survey Atlas

Perception Survey Atlas

The Urban Audit **Perception Survey Atlas** provides the results of the central European survey and the German coordinated survey on the quality of life in cities over time for all of the participating cities. Predefined filters and options for users to create their own filters enable targeted comparisons with individual city groups. This atlas was also converted to HTML5 format in late 2016. A help file was attached to the programme, which provides detailed explanations of the different functions.

Urban Audit city profile

City profile

InstantAtlas's Builder Report for creating city profiles using static and dynamic features is currently being tested.

[17] Direct link: https://web2.mannheim.de/urbanaudit/strukturdatenatlas/

Appendix

Contacts and responsibilities

KOSIS Association Urban Audit

www.urbanaudit.de

In Germany, the KOSIS Association Urban Audit acts as the project partner for data collection to support the European urban comparison. In 2016, the city of Mannheim was elected as the managing office for another year. The project is supervised by the municipal statistical office of Mannheim. The managing office is responsible for business management, represents the association within its mandate, heads the steering group, carries out bookkeeping, and manages the funds of the association.

KOSIS Association Urban Audit
c/o Stadt Mannheim, Kommunale Statistikstelle
PO Box 101832
68018 Mannheim
Email: urbanaudit@mannheim.de

The director of the Municipal Statistics Office of the city of Mannheim, Dr Ellen Schneider, is responsible for the managing office.

Dr Ellen Schneider
Tel.: +49 (0) 621 / 293 7486
Fax: +49 (0) 621 / 293 7750
Email: urbanaudit@mannheim.de

Mr Tobias Link is the contact person for the KOSIS Association Urban Audit in all matters relating to the collection of structural data.

Tobias Link
Tel.: +49 (0) 621 / 293 7486
Fax: +49 (0) 621 / 293 7750
Email: urbanaudit@mannheim.de

NUAC

In the European nations participating in Urban Audit, the project is coordinated on the national level by the respective national Urban Audit coordinator (NUAC). In Germany, this coordinator is appointed by the KOSIS Association Urban Audit.

Alexandra Dörzenbach
Tel.: +49 (0) 621 / 293 7857
Fax: +49 (0) 621 / 293 7750
Email: urbanaudit@mannheim.de

Federal Statistical Office

The Federal Statistical Office is the project coordinator for the structural database and therefore the point of contact for Eurostat for all legal and financial matters. The contact person at DESTATIS is Gabriele Rutmann.

www.destatis.de

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Fachgebiet B103
Gabriele Rutmann
Gustav-Stresemann-Ring 11
65189 Wiesbaden
Tel.: +49 (0) 611 / 75 20822
Email: gabriele.rutmann@destatis.de

Eurostat

Eurostat Directorate E, Sectoral and Regional Statistics, has overall responsibility for the project. The contact person is Teodora Brandmüller in Sectoral and Regional Statistics and Geographical Information.

epp.eurostat.ec.europa.eu

Eurostat
Directorate E - Sectoral and Regional Statistics
Teodora Brandmüller
Bâtiment Bech
11, rue Alphonse Weicker
L-2721 Luxembourg
Tel.: +352 (0) 4301 / 1 (central telephone number)
Email:teodora.brandmueller@ec.europa.eu

VDSt AG Umfragen

The German survey, carried out parallel to the European survey on the quality of life from a citizen's perspective, is coordinated by the VDSt (Association of German Municipal Statisticians) Survey Working Group (VDSt AG Umfragen).

www.staedtestatistik.de

Survey officer

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Tel.: +49 (0) 69 / 212 38493
Email: ralf.gutfleisch@stadt-frankfurt.de

Publications

Free print copies of all publications of the KOSIS Association Urban Audit can be requested by sending an email to urbanaudit@mannheim.de. The PDF versions are available for download in the download section on the website www.urbanaudit.de – where you can also find many other national and international publications on the topic of Urban Audit.

Urban Audit Brochure 2013

The German Urban Audit – Comparison of Cities in the European Statistical System. (2013): The compact brochure provides interesting information on the project background, organisation, and use of data for the German Urban Audit. Also available in English.

Urban Audit Brochure 2015

Data – indicators information. (2015): The focus of this brochure is on the utilisation of comparative urban data. Let these national and international examples inspire you! Also available in English.

Regionalisation of the micro-census

Regionalisierung des Mikrozensus für den europäischen Städtevergleich (Regionalisation of the micro-census for a comparison of European cities) (2016): This brochure documents the small estimation method which enables the utilisation of results from the regular micro-census survey and the registered statistics from the Federal Employment Agency for showing small, regionalised, socio-economic reference features.

A Coruña Aachen Aalborg Aberdeen Acireale Adana Aix-en-Provence Ajaccio Alba Iulia Albacete Alcalá de Henares Alcobendas Alcorcón Algeciras Alicante Alkmaar Almada Almelo Almere Almería Alphen aan den Rijn Alytus Amadora Amersfoort Amstelveen Amsterdam Ancona Angoulême Ankara Annecy Antalya Antwerpen Apeldoorn Arad Argenteuil - Bezons Århus Arnhem Arrecife Aschaffenburg Ashford Asti Athina Aubagne Augsburg Aveiro Avellino Avilés Bacău Badajoz Badalona Baia Mare Balıkesir Bamberg Banská Bystrica Barakaldo Barcelona Bari Barking and Dagenham Bârlad Barletta Barnet Barnsley Barreiro Basel Basildon Basingstoke and Deane Bath and North East Somerset Bayreuth Bedford Belfast Benevento Benidorm Bergamo Bergen Bergen op Zoom Bergisch Gladbach Berlin Bern Besançon Bexley Białystok Biel Bielefeld Biella Bielsko-Biała Bilbao Birmingham Blackburn with Darwen Blackpool Blagoevgrad Bochum Bologna Bolton Bolzano Bonn Borås Bordeaux Botoşani Bottrop Bournemouth Bracknell Forest Bradford Braga Brăila Brandenburg an der Havel Braşov Bratislava Braunschweig Breda Bremen Bremerhaven Brent Brescia Brest Brighton and Hove Bristol Brno Bromley Brugge Bruxelles Bucureşti Budapest Burgas Burgos Burnley Bursa Bury Busto Arsizio Buzău Bydgoszcz Bytom CA Brie Francilienne CA de la Vallée de Montmorency CA de Seine Essonne CA de Sophia-Antipolis CA des deux Rives de la Seine CA des Lacs de l'Essonne CA du Plateau de Saclay CA du Val d'Orge CA du Val d'Yerres CA Europ' Essonne CA le Parisis CA les Portes de l'Essonne CA Marne et Chantereine CA Sénart - Val de Seine CA Val de France CA Val et Forêt Cáceres Cádiz Cagliari Calais Călăraşi Cambridge Camden Campobasso Cannock Chase Capelle aan den IJssel Cardiff Carlisle Carrara Cartagena Caserta Castelldefels Castellón de la Plana Catania Catanzaro CC de la Boucle de la Seine CC de l'Ouest de la Plaine de France CC des Coteaux de la Seine Celle Cerdanyola del Vallès Cergy-Pontoise České Budějovice Ceuta Charleroi Charleville-Mézières Chełm Chelmsford Cheltenham Chemnitz Cherbourg Chesterfield Chorzów City of London Ciudad Real Cluj-Napoca Coimbra Colchester Colmar Como Constanţa Córdoba Cork Cornellà de Llobregat Cosenza Coslada Cottbus Coventry Craiova Crawley Creil Cremona Croydon Częstochowa Dacorum Darlington Darmstadt Daugavpils Debrecen Delft Denizli Derby Derry Dessau-Roßlau Deventer Diyarbakır Dobrich Doncaster Dordrecht Dortmund Dos Hermanas Dresden Drobeta-Turnu Severin Dublin Dudley Duisburg Dundee City Dunkerque Düsseldorf Ealing East Staffordshire Eastbourne Ede Edinburgh Edirne Eindhoven Elbląg Elche Elda Ełk Enfield Enschede Erfurt Erlangen Erzurum Espoo Essen Esslingen am Neckar Evry Exeter Falkirk Fareham Faro Ferrara Ferrol Firenze Flensburg Focşani Foggia Forlì Fort-de-France Frankenthal (Pfalz) Frankfurt (Oder) Frankfurt am Main Freiburg im Breisgau Fréjus Friedrichshafen Fuengirola Fuenlabrada Fulda Funchal Fürth Galaţi Galway Gandia Gateshead Gaziantep Gdańsk Gdynia Gelsenkirchen Genève Genova Gent Gera Getafe Getxo Gießen Gijón Girona Giugliano in Campania Giurgiu Glasgow Gliwice Głogów Gloucester Gniezno Gondomar Görlitz Gorzów Wielkopolski Göteborg Göttingen Gouda Granada Granollers Gravesham Graz Great Yarmouth Greenwich Greifswald Groningen Grudziądz Guadalajara Guildford Guimarães Győr Haarlem Hackney Hagen Halle an der Saale Halton Hamburg Hamm Hammersmith and Fulham Hanau Hannover Haringey Harlow Harrow Hartlepool Haskovo Hastings Hatay Havering Havířov Heerlen Heidelberg Heilbronn Helmond Helsingborg Hengelo Hénin - Carvin Herne Hildesheim Hillingdon Hilversum Hoorn Hounslow Hradec Králové Huelva Hyndburn Iaşi Ingolstadt Innsbruck Inowrocław Ioannina Ipswich Irakleio Irun Iserlohn Islington İstanbul İzmir Jaén Jastrzębie-Zdrój Jelenia Góra Jelgava Jena Jerez de la Frontera Jihlava Jönköping Jyväskylä Kaiserslautern Kalamata Kalisz Karlovy Vary Karlsruhe Kars Karviná Kassel Kastamonu Katowice Katwijk Kaunas Kavala Kayseri Kecskemét Kempten (Allgäu) Kensington and Chelsea Kiel Kielce Kingston upon Thames Kingston-upon-Hull Kirklees Kladno Klagenfurt Klaipėda København Koblenz Kocaeli Köln Konin Konstanz Konya Kortrijk Košice Koszalin Kraków Krefeld Kristiansand Kuopio La Rochelle La Spezia Lahti /Lahtis Lambeth Landshut Larisa Las Palmas Latina Lausanne Le Havre Lecce Lecco Leeds Leeuwarden Lefkosia Leganés Legnica Leicester Leiden Leidschendam-Voorburg Leipzig Lelystad Lemesos Lens - Liévin León Leszno Leuven Leverkusen Lewisham L'Hospitalet de Llobregat Liberec Liège Liepāja Lille Limerick Lincoln Línea de la Concepción, La Linköping Linz Lisboa Lisburn Liverpool Livorno Ljubljana Lleida Łódź Logroño Łomża Lübeck Lubin Lublin Ludwigsburg Ludwigshafen am Rhein Lugano Lugo Lund Lüneburg Luton Luxembourg Luzern Maastricht Madrid Magdeburg Maidstone Mainz Majadahonda Málaga Malatya Malmö Manchester Manisa Mannheim Manresa Mansfield Mantes en Yvelines Marbella Marburg Maribor Marne la Vallée Marseille Martigues Massa Mataró Matera Matosinhos Meaux Medway Melilla Melun Merton Messina Middelburg Middlesbrough Milano Milton Keynes Miskolc Modena Moers Mollet del Vallès Mönchengladbach Mons Montpellier Monza Most Móstoles Mülheim a.d.Ruhr München Münster Murcia Namur Nancy Nantes Napoli Narva Neubrandenburg Neumünster Neuss Neu-Ulm Nevşehir Newcastle upon Tyne Newcastle-under-Lyme Newham Newport Nijmegen Nitra Norrköping North East Lincolnshire North Lanarkshire North Tyneside Northampton Norwich Nottingham Novara Nowy Sącz Nuneaton and Bedworth Nürnberg Nyíregyháza Oberhausen Odense Odivelas Offenbach am Main Offenburg Oldenburg Oldham Olomouc Olsztyn Oostende Opole Oradea Örebro Orléans Osijek Oslo Osnabrück Ostrava Ostrów Wielkopolski Ostrowiec Świętokrzyski Ourense Oviedo Oxford Pabianice Paderborn Padova Palencia Palermo Palma de Mallorca Pamplona/Iruña Panevėžys Pardubice Paredes Paris Parla Parma Passau Pátra Pavia Pazardzhik Pécs Pernik Perugia Pesaro Pescara Peterborough Pforzheim Piacenza Piatra Neamţ Piła Piotrków Trybunalski Pisa Piteşti Plauen Pleven Płock Ploieşti Plovdiv Plymouth Plzeň Ponferrada Ponta Delgada Pontevedra Poole Pordenone Porto Portsmouth Potenza Potsdam Póvoa de Varzim Poznań Pozuelo de Alarcón Praha Prat de Llobregat, El Prato Prešov Preston Przemyśl Puerto de Santa María, El Purmerend Radom Râmnicu Vâlcea Ravenna Reading Recklinghausen Redbridge Redditch Regensburg Reggio di Calabria Reggio nell'Emilia Reims Remscheid Reus Reutlingen Reykjavík Richmond upon Thames Rīga Rijeka Rimini Roanne Rochdale Roma Roman Roosendaal Rosenheim Rostock Rotherham Rotterdam Rozas de Madrid, Las Rubí Ruda Śląska Ruse Rybnik Rzeszów Saarbrücken Sabadell Saint Denis Saint-Brieuc Saint-Etienne Saint-Quentin en Yvelines Salamanca Salerno Salford Salzburg Salzgitter Samsun San Cristóbal de la Laguna San Fernando San Sebastián de los Reyes San Sebastián/Donostia Sandwell Sankt Augustin Sanlúcar de Barrameda Sanremo Sant Boi de Llobregat Sant Cugat del Vallès Santa Coloma de Gramenet Santa Cruz de Tenerife Santa Lucía de Tirajana Santander Santiago de Compostela Sassari Satu Mare Savona Schiedam Schweinfurt Schwerin Sefton Seixal Sénart en Essonne Setúbal Sevilla 's-Gravenhage Sheffield 's-Hertogenbosch Shumen Šiauliai Sibiu Siedlce Siegen Siirt Sindelfingen Sintra Siracusa Sittard-Geleen Slatina Slavonski Brod Sliven Slough Słupsk Sofia Solihull Solingen Sosnowiec South Tyneside Southampton Southend-on-Sea Southwark Speyer Spijkenisse Split St Albans St. Gallen St.Helens Stalowa Wola Stara Zagora Stargard Szczeciński Stavanger Stevenage Stockholm Stockport Stockton-on-Tees Stoke-on-trent Stralsund Stuttgart Suceava Sunderland Sutton Suwałki Swansea Świdnica Swindon Szczecin Szeged Székesfehérvár Szombathely Talavera de la Reina Tallinn Tameside Tampere / Tammerfors Tamworth Taranto Târgovişte Târgu Jiu Târgu Mureş Tarnów Tarragona Tartu Tczew Telde Telford and Wrekin Terni Terrassa Thanet Thessaloniki Thurrock Tilburg Timişoara Toledo Tomaszów Mazowiecki Torbay Torino Torrejón de Ardoz Torremolinos Torrevieja Toruń Tower Hamlets Trabzon Trafford Trenčín Trento Treviso Trier Trieste Trnava Tromsø Trondheim Tübingen Tulcea Tunbridge Wells Turku Tychy Udine Ulm Umeå Uppsala Ústí nad Labem Utrecht Valence Valencia Valladolid Valletta Valongo Van Vantaa Varese Varna Västerås Veliko Tarnovo Velsen Venezia Venlo Verona Versailles Viana do Castelo Viareggio Vicenza Vidin Vigevano Vigo Vila Franca de Xira Vila Nova de Gaia Viladecans Vilanova i la Geltrú Villingen-Schwenningen Vilnius Viseu Vitoria/Gasteiz Vlaardingen Volos Vratsa Wakefield Wałbrzych Walsall Waltham Forest Wandsworth Warrington Warszawa Warwick Waterford Waveney Weimar Westminster Wetzlar Wien Wiesbaden Wigan Wilhelmshaven Winterthur Wirral Witten Włocławek Woking Wolfsburg Wolverhampton Worcester Worthing Wrexham Wrocław Wuppertal Würzburg Wycombe Yambol York Zaanstad Zabrze Zagreb Zamora Zamość Zaragoza Zgierz Zielona Góra Žilina Zlín Zonguldak Żory Zürich Zwickau Zwolle