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European-wide city level air quality mapping

Evaluation of the current mapping methodology with respect to the level of cities and NUTS3 units and suggestions for future

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Contents

Summary

The report evaluates current air quality mapping methodology with respect to city- and NUTS3-levels mapping. For the cities of the City Audit and for the NUTS3 units, a comparison between the measurements and the mapping data has been carried out. Based on the results of the analysis, it can be stated that the current mapping can be used at the city and NUTS3 levels across Europe, for all examined pollutants (i.e., PM_{10}, $PM_{2.5}$, NO_2 and ozone), despite a mild smoothing effect at locations of the measurement stations. If the agreement of the predicted and observed values should be improved, a potential methodological adaption might be applied, i.e., a post-processing correction based on the kriging residuals, namely by interpolating them by some exact interpolator, which respects the measurement values.

For all cities of the City Audit, the population-weighted concentration based on the mapping results have been calculated as a potential new approach for the city ranking. The results have been compared with the average of the stations located in the relevant city as used in the current city ranking. Based on the analysis, it seems that while the averaged measurement data from the background stations provides a superior information for the whole city in general (when the measurement error is neglected), the population-weighted concentration also fairly well represents the whole city (albeit a certain smoothing effect of the interpolation) and gives a consistent information for all cities, including those without station measurements. Thus, this indicator is recommended for further evaluation for the city ranking index.

Apart from this, few potential improvements of the mapping methodology have been examined. At first, the alternative mapping variant using the joint rural-urban background map layer created based on all background stations has been compared with the current variant using the merge of the rural and the urban background map layers for three pollutants (for PM_{10}, NO_2 and ozone). It has been found that this alternative mapping variant does not improve the mapping methodology. Next to this, alternative treatments of the background and traffic stations in the urban areas have been examined for PM_{10} and NO_2. It has been found that an alternative adjustment of the urban traffic map layer slightly improves PM_{10} (not NO_2) mapping. Potential application of this slight improvement should be evaluated in relation to increased demandingness of this improved mapping procedure. During the analysis, it was confirmed that urban traffic areas are underestimated in the final 1x1 km^2 maps. For future, if the urban traffic areas should be better represented in the final maps, an increased map resolution (e.g. 100x100 m^2 instead of the current 1x1 km^2) is recommended.

Several possibilities of future development towards the European-wide city level mapping in a fine resolution have been suggested. This includes applying the existing methodology but exploiting a high-resolution model output (e.g. from the uEMEP model), downscaling of the existing spatial maps using a geostatistical downscaling technique in combination with fine-resolution proxy datasets, and the exploitation of existing low-cost sensor networks for providing additional information within a city in areas that is not adequately covered by traditional air quality stations.

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1 Introduction

The routinely used data fusion air quality mapping (Horálek et al., 2022 and references therein) was developed for estimating European-wide and country-wide exposure. Currently, a need for consistent information at NUTS3 and city levels across Europe has emerged, because the air quality monitoring and modelling background information has evolved substantially since the mapping methodology was developed. Apart from this, a city ranking index has been recently suggested, based on the measurements within the cities. Nevertheless, an improved city ranking indices based on the spatial maps might be developed, if the maps are consistent at the city level.

For these reasons, the current mapping methodology has been checked with respect to the city- and NUTS3-levels mapping. For the cities of the Urban Audit and for the NUTS3 units, a comparison between the measurements and the mapping data has been carried out. Due to the short-term aim to improve the city ranking, more detailed analysis for the cities of the Urban Audit have been executed compared to the NUTS3 units. The analysis has been performed for PM_{10} annual average, $PM_{2.5}$ annual average, NO_2 annual average and the ozone indicator 93.2 percentile of daily maximum 8-hourly means, based on 2019 data.

Potential improvements of the mapping methodology (for both the NUTS3 and the city levels) have been examined. Specifically, alternative treatments of rural and urban stations has been evaluated. The analysis has been performed for PM_{10} annual average, NO_2 annual average and the ozone indicator 93.2 percentile of daily maximum 8-hourly means, based on 2019 data.

In addition, the report suggests potential future developments concerning the European-wide city level mapping. A need of a more fine spatial resolution compared to the current 1x1 km^2 grid has emerged. Specifically, for the purposes of the integrated assessment of noise and air quality in Europe, consistent air quality maps for European cities on a 100x100 metres grid (i.e., in the same resolution as the noise maps) are required. Several possibilities of future development towards European-wide city level mapping at a fine spatial resolution have been suggested.

Chapter 2 describes the methodology and Chapter 3 shows the input data applied. Chapter 4 examines the comparison between the mapping and the measurement data for the cities and the NUTS3 units. Chapter 5 presents an alternative way of dealing with rural, urban background and urban traffic stations. Chapter 6 introduces potential approaches for city-level mapping at the European scale. Chapter 7 gives conclusions and recommendations. The Annex presents numerical results for the cities of the Urban Audit dataset.

2 Methodology and input data

2.1 Mapping methodology

The basic mapping methodology applied is the Regression – Interpolation – Merging Mapping (RIMM) as routinely used in the spatial mapping under the ETC/ATNI (Horálek et. al., 2022). It consists of a linear regression model followed by kriging of the residuals from that regression model:

$$\hat{Z}(s_0) = c + a_1 X_1(s_0) + a_2 X_2(s_0) + \cdots + a_n X_n(s_0) + \hat{\eta}(s_0) \qquad (2.1)$$

where $\hat{Z}(s_0)$ is the estimated concentration at a point s_o,
$\hat{Z}(s_0) X_1(s_0)$ is the chemical transport model (CTM) data at point s_o,
$X_2(s_0),\ldots, X_n(s_0)$ are $n-1$ other supplementary variables at point s_o,
$c, a_1, a_2,\ldots, a_n$ are the $n+1$ parameters of the linear regression model calculated based on the data at the points of measurement,
$\hat{\eta}(s_0)$ is the spatial interpolation of the residuals of the linear regression model at point s_o, based on the residuals at the points of measurement.

For different pollutants and area types (rural, urban background, and for PM and NO_2 also urban traffic), different supplementary data are used.

The spatial interpolation of the regression residuals is carried out using ordinary kriging, according to

$$\hat{\eta}(s_0) = \sum_{i=1}^{N} \lambda_i \eta(s_i) \qquad \text{with } \sum_{i=1}^{N} \lambda_i = 1, \qquad (2.2)$$

where $\hat{\eta}(s_0)$ is the interpolated value at a point s_o,
N is the number of the measurement points used in the interpolation, which is fixed based on the variogram; in any case, $20 \le N \le 50$,
$\eta(s_i)$ is the residual of the linear regression model at the measurement point s_i,
$\lambda_1,\ldots, \lambda_N$ are the estimated weights based on the variogram, see Cressie (1993).

The variogram (as a measure of a spatial correlation) is estimated using a spherical function (with parameters nugget, sill, range). For details, see Horálek et al. (2022 and references therein).

For PM_{10} and $PM_{2.5}$, prior to linear regression and interpolation, a logarithmic transformation to measurements and CTM output is executed. After interpolation, a back-transformation is applied. (For motivation, see Horálek et al., 2010.)

In the case of $PM_{2.5}$, in the mapping procedure we also use data from so-called pseudo $PM_{2.5}$ stations. These data are the estimates of $PM_{2.5}$ concentrations at the locations of PM_{10} stations with no $PM_{2.5}$ measurement, based on the linear regression model calculated based on the data at the points of stations with both $PM_{2.5}$ and PM_{10} measurements. For details, see Horálek et al. (2022).

Separate map layers are created for rural background, urban background and urban traffic areas on a grid at resolution of 1x1 km^2 (for PM and NO_2) and for rural and urban background areas on a grid at resolution of 10x10 km^2 (for ozone). The rural background map layer is based on rural background stations, the urban background map layer on urban and suburban background stations and the urban traffic map layer is based on urban and suburban traffic stations.

The separate handling of the rural and urban background map layers is based on the assumption that the estimated rural map layer value is lower (PM and NO_2) or higher (ozone) than the estimated urban background map layer value. In areas (i.e., grid cells) where this criterion does not hold, both the rural and the urban background map layers are substituted by a joint urban/rural background map layer (created using all background stations regardless their type) and such adjusted rural and urban background map layers are further applied. Specifically, these layers are adjusted according to

$$\hat{Z}_{R\_adj}(s_0) = \hat{Z}_R(s_0) \quad \text{for } \hat{Z}_R(s_0) \le \hat{Z}_{UB}(s_0) \text{ or } \hat{Z}_J(s_0) > \hat{Z}_R(s_0) > \hat{Z}_{UB}(s_0)$$
$$= \hat{Z}_J(s_0) \quad \text{for } \hat{Z}_R(s_0) > \hat{Z}_{UB}(s_0) \text{ and } \hat{Z}_J(s_0) \le \hat{Z}_R(s_0)$$
$$\hat{Z}_{UB\_adj}(s_0) = \hat{Z}_{UB}(s_0) \quad \text{for } \hat{Z}_R(s_0) \le \hat{Z}_{UB}(s_0) \text{ or } \hat{Z}_R(s_0) > \hat{Z}_{UB}(s_0) > \hat{Z}_J(s_0)$$
$$= \hat{Z}_J(s_0) \quad \text{for } \hat{Z}_R(s_0) > \hat{Z}_{UB}(s_0) \text{ and } \hat{Z}_J(s_0) \ge \hat{Z}_{UB}(s_0) \qquad (2.3)$$

where $\hat{Z}_{R\_adj}(s_0)$ is the estimated concentration in a grid cell s_o for the adjusted rural map layer,
$\hat{Z}_{UB\_adj}(s_0)$ is the estimated concentration in a grid cell s_o for the adjusted urban background map layer,
$\hat{Z}_R(s_0)$ is the estimated concentration in a grid cell s_o for the rural map layer,
$\hat{Z}_{UB}(s_0)$ is the estimated concentration in a grid cell s_o for the urban background map layer,
$\hat{Z}_J(s_0)$ is the estimated concentration in a grid cell s_o for the joint urban/rural background map layer.

The separate handling of the urban background and urban traffic map layers (for PM and NO_2) is based on the assumption that the estimated urban background map layer value is lower than the estimated urban traffic map layer value. In areas where this criterion does not hold, the urban traffic map layer is substituted by the urban background map layer and such adjusted urban traffic map layer is further applied. Thus, the urban traffic map layer is adjusted according to

$$\hat{Z}_{UT\_adj}(s_0) = \hat{Z}_{UT}(s_0) \quad \text{for } \hat{Z}_{UT}(s_0) > \hat{Z}_{UB\_adj}(s_0)$$
$$= \hat{Z}_{UB\_adj}(s_0) \quad \text{for } \hat{Z}_{UT}(s_0) \le \hat{Z}_{UB\_adj}(s_0) \qquad (2.4)$$

where $\hat{Z}_{UT\_adj}(s_0)$ is the estimated concentration in a grid cell s_o for adjusted urban traffic map layer,
$\hat{Z}_{UT}(s_0)$ is the estimated concentration in a grid cell s_o for urban traffic map layer.

Alternative adjustment of the traffic map layer is examined in this report (Section 5.2), according to

$$\hat{Z}_{UT\_adj}(s_0) = \hat{Z}_{UT}(s_0) \quad \text{for } \hat{Z}_{UB\_adj}(s_0) \le \hat{Z}_{UT}(s_0) \text{ or } \hat{Z}_{UB\_adj}(s_0) > \hat{Z}_{UT}(s_0) > \hat{Z}_{JU}(s_0)$$
$$= \hat{Z}_{JU}(s_0) \quad \text{for } \hat{Z}_{UB\_adj}(s_0) > \hat{Z}_{UT}(s_0) \text{ and } \hat{Z}_{UT}(s_0) \le \hat{Z}_{JU}(s_0) \qquad (2.5)$$

where $\hat{Z}_{JU}(s_0)$ is the estimated concentration in a grid cell s_o for the joint urban background-traffic map layer (created based on both background and traffic urban/suburban stations).

Subsequently, the separate map layers (as created at 1x1 km^2 resolution or 1x1 km^2 resolution, in dependence on a pollutant) are merged into one combined final map at 1x1 km^2 resolution (for all pollutants), according to

$$\hat{Z}_F(s_0) = \big(1 - w_U(s_0)\big) \cdot \hat{Z}_{R_{adj}}(s_0) + w_U(s_0)\big(1 - w_T(s_0)\big) \cdot \hat{Z}_{UB\_adj}(s_0) + w_T(s_0) \cdot \hat{Z}_{UT\_adj}(s_0) \quad \text{for PM and } NO_2$$
$$\hat{Z}_F(s_0) = \big(1 - w_U(s_0)\big) \cdot \hat{Z}_{R\_adj}(s_0) + w_U(s_0) \cdot \hat{Z}_{UB\_adj}(s_0) \quad \text{for ozone} \qquad (2.6)$$

where $\hat{Z}_F(s_0)$ is the resulting estimated concentration in a grid cell s_o for the final map,
$\hat{Z}_{R\_adj}(s_0)$, $\hat{Z}_{UB\_adj}(s_0)$ and $\hat{Z}_{UT\_adj}(s_0)$ are the estimated concentration in a grid cell s_o for the adjusted rural, urban background and urban traffic map layer, respectively,
$w_U(s_0)$ is the weight representing the ratio of the urban character of the grid cell s_o,
$w_T(s_0)$ is the weight representing the ratio of areas exposed to traffic in a grid cell s_o.

The weight $w_U(s_0)$ is based on the population density (in 1x1 km^2 resolution), while the weight $w_T(s_0)$ is based on the buffers around the roads. For details, see Horálek et al. (2022 and references therein).

2.2 Uncertainty estimation and comparison of different approaches

The uncertainty estimation and the comparison of different approaches of the European map is based on cross-validation and a simple comparison between the measurement data in the station points and the estimated values of the 1x1 km^2 grid cells. The comparison is performed either based on the individual stations or based on the average of the station values in a given city or NUTS3 unit.

The predicted and measurement values are compared using statistical indicators and scatter plots. The main indicators used are root mean square error (RMSE), relative root mean square error (RRMSE) and bias (mean prediction error, MPE):

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}\left(\hat{Z}(s_i) - Z(s_i)\right)^2} \qquad (2.7)$$

$$RRMSE = \frac{RMSE}{\bar{Z}}.100 \qquad (2.8)$$

$$bias(MPE) = \frac{1}{N}\sum_{i=1}^{N}\left(\hat{Z}(s_i) - Z(s_i)\right) \qquad (2.9)$$

where $Z(s_i)$ is the air quality measured indicator value at the i^{th} point, $i = 1, \ldots, N$,
$\hat{Z}(s_i)$ is the air quality estimated indicator value at the i^{th} point using other information, without the indicator value derived from the measured concentration at the i^{th} point,
$\bar{Z}$ is the mean of the indicator values $Z(s_1), \ldots, Z(s_N)$, as measured at points $i = 1, \ldots, N$,
N is the number of the measuring points.

Other indicators are R^2 and the regression equation parameters *slope* and *intercept*, following from the scatter plot between the predicted (using cross-validation) and the observed concentrations.

RMSE and RRMSE should be as small as possible, bias (MPE) should be as close to zero as possible, R^2 should be as close to 1 as possible, slope a should be as close to 1 as possible, and intercept c should be as close to zero as possible (in the regression equation $y = a.x + c$).

Additionally, indicators *FAC50%* (for PM and ozone) and *FAC30%* (for NO_2) are used, which show the fraction of the predicted gridded values in the points of measurement stations outside ±50 % or ±30 % of the measured values. This indicator is motivated by the uncertainty data quality objective for modelling which is 50 % for PM annual averages and ozone 8-hour averages and 30 % for annual NO_2 averages, see Directive 2008/50/EC (EC, 2008). FAC50% and FAC30% should be as small as possible.

2.3 Population exposure

Based on the concentration maps and the population data, the population-weighted average concentrations for individual cities and NUTS3 units have been calculated, according to

$$c_{popw\_avg} = \frac{\sum_{i=1}^{N} c(i) \cdot p(i)}{\sum_{i=1}^{N} p(i)} \qquad (2.10)$$

where c_{popw_avg} is the population-weighted average concentration in a given year,
$p(i)$ is the population in the i-th grid cell,
$c(i)$ is the mean concentration in the i-th grid cell (based on the air quality map),
N is the number of grid cells in the individual city or NUTS3 unit.

2.4 Current and proposed approaches for city ranking

Currently, the EEA´s European city air quality viewer (EEA, 2021) ranks cities of the Urban Audit based on the average of the annual aggregated measurement data from all urban and suburban background stations located in the relevant city. Only stations with annual data coverage of at least 75 percent are used. The current city ranking is based on the $PM_{2.5}$ annual average. In principle, the similar ranking might be calculated for other pollutants as well (especially for NO_2 and potentially also for ozone). The current city ranking is based on the average results of the last two years for the relevant city. For the last year, the non-validated “up-to-date” air quality data are used, while for the year before last, the validated air quality data.

The proposed approach for city ranking is based on the population-weighted concentration of the relevant city based on the mapping results (see Section 2.3). Again, it might be calculated for different pollutants. The motivation for the proposed approach is this: It might better represent the whole city (while the measurements are quite randomly located in the city area). It takes into account both background and traffic areas (in the case of PM and NO_2). And it can be calculated also for the cities with no measurement. A potential weakness of this approach is that the spatial maps smooth the measurement values. (Thus, the smoothing effect of the kriging interpolation is examined in this report, see the main analysis of Section 4.1.)

In this report, the concentration values calculated for the current and the proposed approaches for different pollutants are briefly compared, based on the 2019 data (see the additional parts of Section 4.1).

3 Input data

All input data used for mapping are the same as in Horálek et al. (2022). Apart from this, geographical data of cities and NUTS3 units have been used.

In all calculations and map presentations, the EEA standard projection ETRS89-LAEA5210 (also known as ETRS89 / LAEA Europe, see www.epsg.io) is used. The mapping domain consists of the areas of all EEA member and cooperating countries, and other microstates, as far as they fall into the EEA map extent Map_2c (EEA, 2018). The mapping area covers the whole Europe apart from Belarus, Moldova, Ukraine and the European parts of Russia and Kazakhstan.

3.1 Air quality monitoring data

In terms of air quality measurements, the validated data from the Air Quality e-Reporting database (EEA, 2021a) supplemented with several EMEP rural stations from the database EBAS (NILU, 2021) have been used. The annual aggregation for 2019 has been applied, namely *PM_{10} annual mean* [$\mu g \cdot m^{-3}$], *$PM_{2.5}$ annual mean* [$\mu g \cdot m^{-3}$], *NO_2 annual mean* [$\mu g \cdot m^{-3}$] and *ozone indicator 93.2 percentile of maximum daily 8-hour means* [$\mu g \cdot m^{-3}$]. Only data from stations classified as *background* (for all types of area, i.e. *rural*, *suburban*, *urban*) are used for ozone, while for PM_{10}, $PM_{2.5}$ and NO_2, in addition to the background stations, also stations classified as *traffic* for the types of area *suburban* and *urban* are used. The stations classified as *industrial* are not considered. We did not use the stations from areas outside the EEA map extent Map_2c (EEA, 2018), i.e., from French overseas areas (departments), Svalbard, Azores, Madeira and Canary Islands. Only stations with annual data coverage of at least 75 percent are used.

Table 3.1 presents the number of the measurement stations used for the individual pollutants, both for the entire mapping and for the analysis within the cities of the Urban Audit.

Table 3.1 Number of stations used for each pollutant indicator and area type, 2019

Station type	**PM_{10}**		**$PM_{2.5}$**		**NO_2**		**Ozone**	
	All	**Cities**	**All**	**Cities**	**All**	**Cities**	**All**	**Cities**
Rural background	381	-	220	-	480	-	550	-
Urban/suburb. background	1452	647	768	452	1381	719	1201	599
Urban/suburban traffic	775	527	379	262	1060	789	-	

For the $PM_{2.5}$ mapping, in addition to the $PM_{2.5}$ stations, 184 rural background, 722 urban/suburban background and 412 urban/suburban traffic PM_{10} stations (at locations without $PM_{2.5}$ measurement) have been also used for the purpose of calculating the pseudo $PM_{2.5}$ station data.

3.2 Modelling and other proxy data

The chemical transport model (CTM) used here is EMEP MSC-W (version rv4.35) at 0.1° x 0.1° spatial resolution, see Simpson et al. (2012) and NMI (2021). EMEP (2020) provides details on the EMEP modelling for 2019 using 2018 emission and 2019 meteorology. The same set of parameters like for the air quality observations have been used. The annual aggregated (for PM and NO_2) and hourly (for ozone) data have been downloaded from NMI (2020), the hourly data have been aggregated. The annual data have been spatially transformed into the 1x1 km^2 (for PM and NO_2) and 10x10 km^2 (for ozone) grids: the concentration value in each 1x1 km^2 (or 10x10 km^2) grid cell is calculated as a weighted average of the parts of the original 0.1°x0.1° grid cells covering the relevant 1x1 km^2 (or 10x10 km^2) grid cell.

The meteorological data used are the ECWMF data extracted from the Climate Data Store (CDS), ECMWF (2021). Hourly data for 2019 coming from the reanalysed data set ERA5-Land in 0.1° x 0.1°

resolution have been used, which was complemented by the data set ERA-5 in 0.25°x0.25° resolution in the coastal areas. The hourly data have been derived into the parameters needed, aggregated into the annual statistics and converted into the reference EEA 1x1 km^2 and 10x10 km^2 grids. Meteorological parameters used are *wind speed* (annual mean, in $m.s^{-1}$), *relative humidity* (annual mean, in percent) and *surface net solar radiation* (annual mean of daily sums, in $MWs.m^{-2}$).

The satellite data used comes from the TROPOspheric Monitoring Instrument (TROPOMI) onboard of the Sentinel-5 satellite (Veefkind et al., 2012), namely the S5P_OFFL_L2__NO2 product (van Geffen et al., 2019, 2020) in the spatial resolution of cc. 7 km by 3.5 km (until August 2019) and cc. 5.5 km by 3.5 km (after August 2019), which was re-gridded to a 1x1 km^2 resolution to match the other input datasets. The daily gridded files have been averaged to an annual mean. The parameter used is *NO_2 annual average tropospheric vertical column density (VCD)* for 2019 [number of NO_2 molecules per cm^2 of earth surface].

Altitude data (in m) of Global Multi-resolution Terrain Elevation Data 2010 (GMTED2010) have been used, see Danielson et al. (2011). The data in an original grid resolution of 15x15 arcseconds was spatially transformed into the 1x1 km^2 and 10x10 km^2 grids.

The land cover data used is the CORINE Land Cover 2018 (CLC2018) – grid 100 x 100 m^2, Version 2020_20 (EU, 2020). For regions not included in the CLC2018 dataset we have used as alternative sources MDA (2015) and ESA (2019) data. Like in Horálek et al. (2022), the 44 CLC classes have been re-grouped into 8 more general classes. In this report, we use five of these general classes, namely high density residential areas (HDR), low density residential areas (LDR), agricultural areas (AGR), natural areas (NAT), and traffic areas (TRAF). Two aggregations have been used, i.e., into 1x1 km^2 grid and into the circle with radius of 5 km. For details, see Horálek et al. (2022).

Population data (in $inhabitants.km^{-2}$, census 2011) in the 1x1 km^2 resolution are based on Geostat 2011 grid dataset (Eurostat, 2014). For regions not included in the Geostat 2011 dataset we have used as alternative sources JRC (2009) and ORNL (EEA, 2010) data. For details, see Horálek et al. (2022).

GRIP vector road type data is used (Meijer et al., 2018). Based on these data (i.e., buffers around the roads), traffic map layers (Section 2.1) are merged into the final maps (Horálek et al., 2022).

3.3 Regular air quality mapping data

Throughout the report, the regular mapping results for 2019 created based on the current version of the RIMM methodology (Section 2.1) and using the input data as described in Sections 3.1 and 3.2 are used as the basic gridded mapping data. For details of these air quality maps, see Horálek et al. (2022).

3.4 Geographical data of cities and NUTS3 units

In this report, the cities of Urban Audit 2020 (Eurostat, 2020) have been used. This geospatial dataset includes cities with a population over 50 000 inhabitants. In total, 945 cities of 31 countries (i.e., EU-27 plus Iceland, Norway, Switzerland and the United Kingdom) are included in this data set. Note that 14 of them (located in French overseas departments, Azores, Madeira and Canary Islands) fall outside the EEA map extent Map_2c (EEA, 2018) and thus have not been used in the analysis. For boundaries of the cities, polygon features of shapefiles included in the zipped file “ref-urau-2020-100k.shp” of the Urban Audit 2020 data set (Eurostat, 2021) has been used. This data set contains boundaries of cities, greater cities and functional urban areas as defined according to the EC-OECD city definition (EC, 2012). Two Urban Audit categories have been used. The Urban Audit category “C” (City), i.e. the core city (using an administrative definition) has been applied for 936 cities. Specifically, all records (936) from shapefile "CITIES" have been used. For 9 cities, namely Brussels, Charleroi, Liege, Mons, La Louviere, Verviers (all BE), Larnaca (CY), Athens, Thessaloniki (both GR) with no record in shapefile "CITIES", the category “K” (Greater City) has been used, i.e., their records from shapefile "GREATER_CITIES" have been added.

For the NUTS3 units, the EuroBoundaryMap Version 2020 geodatabase has been used (Eurogeographics, 2020), which contains the boundaries of Local Administrative Units (LAU) including the NUTS3 units (in NUTS 2016 version, see EU, 2016). In total, 1497 NUTS3 units have been used.

For the purposes of the population exposure calculation (Section 2.3), the geographical data have been merged with the 1x1 km^2 grid population data. The individual grid cells have been attached to the above-mentioned cities and NUTS3 units. In doing this, a certain level of simplification has been applied. For a grid cell to be attached to a city and a NUTS3 unit, it was enough if there was some overlap of the polygon of the city / the NUTS3 unit and the grid cell. However, each pixel could be attached to no more than one city and one NUTS3 unit. If a grid cell was overlapped by more than one polygon of the city / the NUTS3 unit, it was attached to the city / NUTS3 region that overlapped the largest part of it.

4 Comparison between measurement and mapping data for cities and NUTS3 units

4.1 Cities of the Urban Audit

For all cities of the Urban Audit, we have performed the comparison between the average of all measurements from urban and suburban stations within the limits of the city (see Section 3.4) with the average of the relevant gridded mapped values in the locations of these measurements. For PM and NO_2, the analysis has been done separately for the background and the traffic stations: the comparison of the station values has been done against the urban background and the urban traffic map layers, respectively. For ozone, no distinction of stations has been performed, as only background stations are used in the ozone mapping; the comparison has been done against the urban background map layer.

The reason of this comparison is to evaluate the impact of the smoothing effect of the mapping methodology in the individual cities. The difference between a measurement value in a point of a station and an estimated value in the underlying grid cell is caused partly by the smoothing effect of the kriging interpolation (if the value of the nugget parameter of variogram is higher than zero) and partly by the spatial averaging of the values in the 1x1 km^2 grid cells. (Note that in the interpolation smoothing effect, the measurement uncertainty also plays a role.) While the kriging interpolation is optimized across the whole European-wide mapping domain, this comparison enables us to see the smoothing effect at the city level.

Apart from this, for all cities of the Urban Audit, we have also calculated the population-weighted concentration (using the air quality maps, see Section 3.3) and have compared it with the average of the concentrations measured at the stations located in the relevant city in two variants, namely for the urban/suburban background stations and for all urban/suburban stations independently of their type. This exercise has been done in the context of the current and the proposed approaches for city ranking (see Section 2.4). The reason is to compare three approaches of the city ranking: the current (i.e., based on the average of the background measurements) and an alternative one (based on the average of all measurements) with the proposed one (i.e., based on the population-weighted concentration). Our aim is to see whether the results of the proposed approach show results that are reasonable. If so (and if the smoothing effect is not too large), the proposed approach can be further considered to be a basis for an updated city ranking.

While the overall results of the comparison are provided in this Section 4.1, the numerical results for individual cities of the Urban Audit are given in the Annex.

4.1.1 PM_{10}

For PM_{10} annual average 2019, the comparison has been done for 454 cities with at least one urban or suburban background station and for 382 cities with at least one urban or suburban traffic station (and additionally also for 585 cities with at least one urban or suburban station without regard of its type). Altogether, 646 urban/suburban background stations and 527 urban/suburban traffic stations have been used in this analysis.

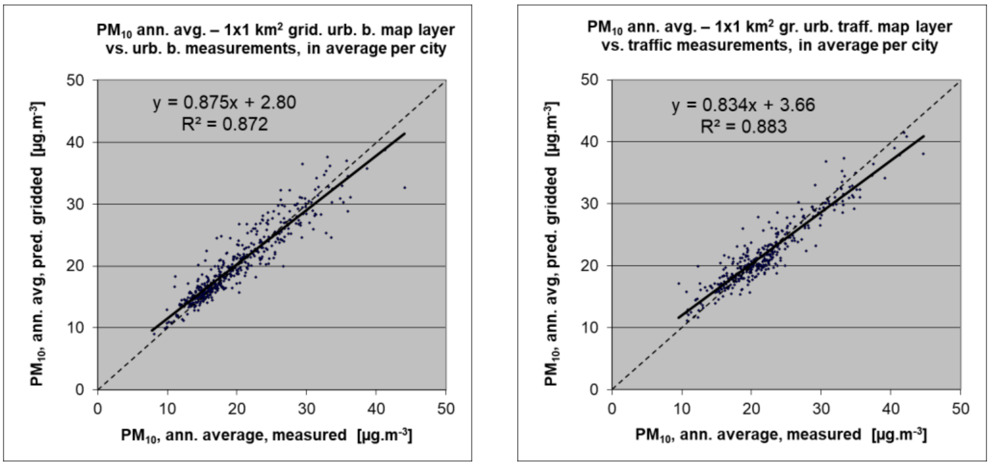
Table 4.1 shows the comparison between the city averages of the predicted gridded mapped values and the relevant averages of the measurements in locations within individual cities, separately for urban background and urban traffic locations (and the relevant map layers).

Table 4.1: Comparison of predicted grid values from separate urban background (top) and urban traffic (bottom) map layers against relevant measurements from urban/suburban background or traffic stations in average per city of the Urban Audit, using RMSE, RRMSE, bias, R^2 and regression equation from scatter plots and FAC50% for PM_{10} annual mean 2019. Units: $\mu g.m^{-3}$ except for RRMSE, R^2 and FAC50 %.

PM_{10} Annual Average	Urban background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - urban background	2.21	11.1%	0.29	0.872	y = 0.875x + 2.80	0.004
PM_{10} Annual Average	**Urban traffic areas**					
	RMSE	**RRMSE**	**Bias**	**R^2**	**Regr. eq.**	**FAC50%**
Mean predicted vs. observed values - urban traffic	2.09	9.6%	0.03	0.883	y = 0.834x + 3.66	0.005

Figure 4.1 shows the scatterplots for these comparisons.

Figure 4.1: Correlation between predicted grid values from urban background (left) and urban traffic (right) map layer (y-axis) versus measurements from urban/suburban background (left) and urban/suburban traffic stations (right) (x-axis) in average per city of the Urban Audit for PM_{10} annual average 2019



The comparison presented in Table 4.1 and Figure 4.1 shows quite good agreement of the averaged measurement and mapped values: the relative uncertainty (in terms of RRMSE) is 11 % in the urban background areas and 10 % in the urban traffic areas and R^2 from the scatter plots is at the level of about 87 % for the urban background areas and about 88 % at the urban traffic areas. In the urban background areas, a slight bias of 0.3 $\mu g.m^{-3}$ is observed, while a zero bias can be seen in the urban traffic areas. The fraction of the predicted gridded values outside ±50 % of the measured concentration levels is 0.004 (i.e., 2 of 454 cities) for the urban background areas and 0.005 (i.e., 2 of 382 cities) for the urban traffic areas. This seems to be an acceptable result.

In addition to the FAC50% indicator, a more detailed view on the differences between the predicted gridded and the measurement concentration values is presented in Table 4.2, in both absolute and relative numbers. The aim of this table is to provide data for evaluating whether the differences between the estimated and the measured values are allowable. One can see that for cc. 95 % of the cities, the differences are smaller than both one fifth (i.e., 20 %) and 5 $\mu g.m^{-3}$.

Table 4.2: Ratio of absolute differences between predicted grid values from urban background (top) and urban traffic (bottom) map layers and relevant measurements from urban/suburban background or traffic stations in average per city of the Urban Audit for PM_{10} annual mean 2019, which exceed certain absolute (left) and relative (right) difference levels

PM_{10} Annual Average	Urban background areas							
	> 2 μg.m^{-3}	> 3 μg.m^{-3}	> 5 μg.m^{-3}	> 7.5 μg.m^{-3}	>10%	>15%	>20%	>30%
Ratio of absolute differences	0.269	0.141	0.042	0.006	0.286	0.143	0.055	0.020

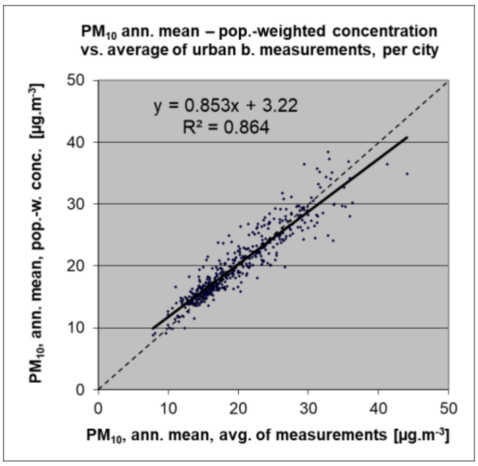
PM_{10} Annual Average	Urban traffic areas							
	> 2 μg.m^{-3}	> 3 μg.m^{-3}	> 5 μg.m^{-3}	> 7.5 μg.m^{-3}	>10%	>15%	>20%	>30%
Ratio of absolute differences	0.249	0.123	0.058	0.021	0.283	0.141	0.031	0.003

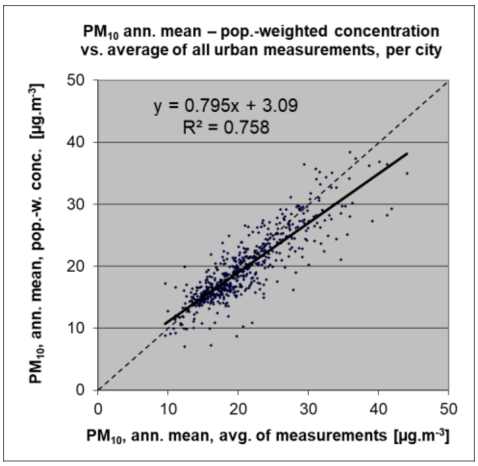
As mentioned above, the differences are caused partially by the smoothing effect of the kriging interpolation and partially by the spatial averaging of the values within the 1x1 km^2 grid cells. The effect of smoothing leads to underestimation of high values (cf. the slope of the regression equation consistently below 1) and overestimation of low values (cf. the intersect consistently above 0).

Based on the results of the city level analysis, we suppose that **the current mapping can be used at the city level across Europe**. If the agreement of the predicted and observed values should be improved in terms of the bias and the agreement of the predicted gridded and the measurement values, **a potential methodological adaptation might be a post-processing correction based on the kriging residuals**, specifically, by interpolating them by any exact interpolator (e.g. kriging with the zero nugget and a small range), which respects the measurement values, without regard to the worsening of the cross-validation uncertainty of the whole interpolation.

Next to the comparison of the measurement and underlying gridded values, we have additionally calculated the population-weighted concentration for each individual city (i.e., potential new approach for the city ranking, if applied for PM_{10}) and compared it with the average of the concentration values measured at stations located in the relevant city in two variants, i.e., for all urban/suburban stations without regard on their type and for the urban/suburban background stations only, which is a similar approach to the current city ranking for $PM_{2.5}$. See Figure 4.2.

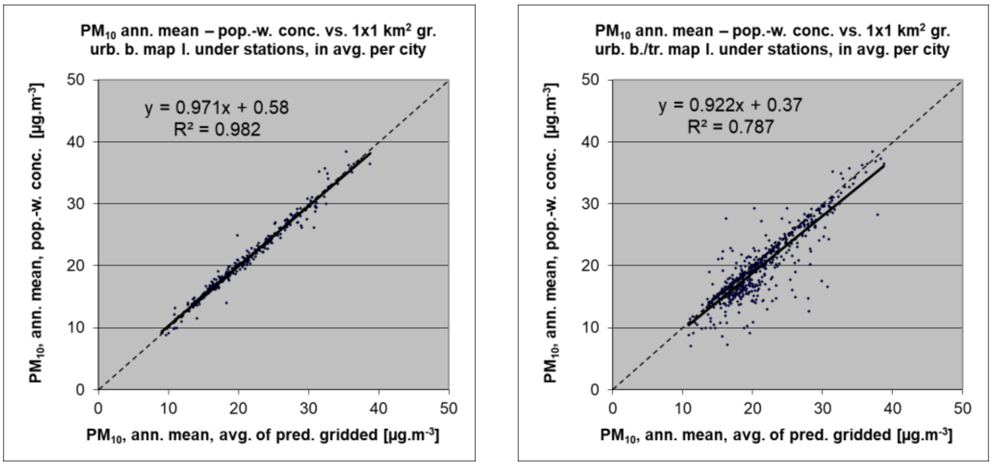
Figure 4.2: Correlation between the population-weighted concentration (y-axis) versus average of measurements from urban/suburban background (left) and all (right) stations (x-axis) located in relevant city of the Urban Audit for PM_{10} annual average 2019





The reason of this comparison is to see the differences of the three approaches. Next to the scatterplot, the bias has been calculated, being 0.3 µg.m^{-3} for the comparison based on the urban/suburban background stations and -1.2 µg.m^{-3} for the comparison based on all urban/suburban (i.e., both background and traffic) stations. As expected, the population-weighted concentrations show better agreement with the averages of the measurements from the background stations compared to the averages of the measurements from both background and traffic stations, due to higher representativeness (in terms of radius) of the background stations. Next to this, the population-weighted concentrations give in general somewhat higher results compared to the averages of the background stations and somewhat lower results compared to the averages of both background and traffic stations, as expected. In order to examine which part of the variability shown in the scatterplots of Figure 4.2 is attributable to the interpolation and the resolution smoothing effect (and the measurement uncertainty) and which part to the spatial variability within the city, we have compared for each city the population-weighted concentration with the average of the gridded mapped values in the locations of the measurement stations, again in two variants (i.e., for urban/suburban background stations and for urban/suburban stations without regard of their type). See Figure 4.3.

Figure 4.3: Correlation between the population-weighted concentration (y-axis) versus average of predicted gridded values at locations of urban/suburban background (left) and all (right) stations (x-axis) located in relevant city of the Urban Audit for PM_{10} annual average 2019



The relevant bias is 0.0 µg.m^{-3} and -1.3 µg.m^{-3} for the comparison based on the predicted gridded values at locations of urban/suburban background stations and all urban/suburban stations, respectively. One can see a good agreement between the population-weighted concentrations and the averages of the predicted gridded values at locations of urban/suburban background stations.

Comparing Figures 4.1, 4.2 and 4.3, one can state that the influence of the traffic areas in the population-weighted concentrations is marginal only. Next to this, one can state that the most of the variability between the population-weighted concentrations (i.e., the potential new approach for the city ranking) and the average of the urban/suburban background measurements (i.e., the current approach for the city ranking) is caused by the smoothing effect of the interpolation, while the variability within the city plays minor role only, in general.

Based on these results, one can state that (i) the averaged measurement data from the background stations provides a superior information for the whole city in general (when the measurement error is neglected); (ii) the population-weighted concentration also fairly well represents the whole city (albeit a certain smoothing effect of the interpolation) and gives a consistent information for all cities, including those without station measurements . Thus, when thinking about a potential update of the city ranking (if applied for PM_{10}), **the approach based on the population-weighted concentration can be further considered as a basis for an updated city ranking, preferably in a combination with the current approach** based on the averaged measurement data from the background stations in cities with at least one background measurement station.

4.1.2 $PM_{2.5}$

For $PM_{2.5}$ annual average 2019, the comparison has been performed for 357 cities with at least one urban or suburban background station and for 208 cities with at least one urban or suburban traffic station (and additionally also for 434 cities with at least one urban or suburban station without regard of its type). Altogether, 439 urban/suburban background stations and 262 urban/suburban traffic stations have been used in this analysis.

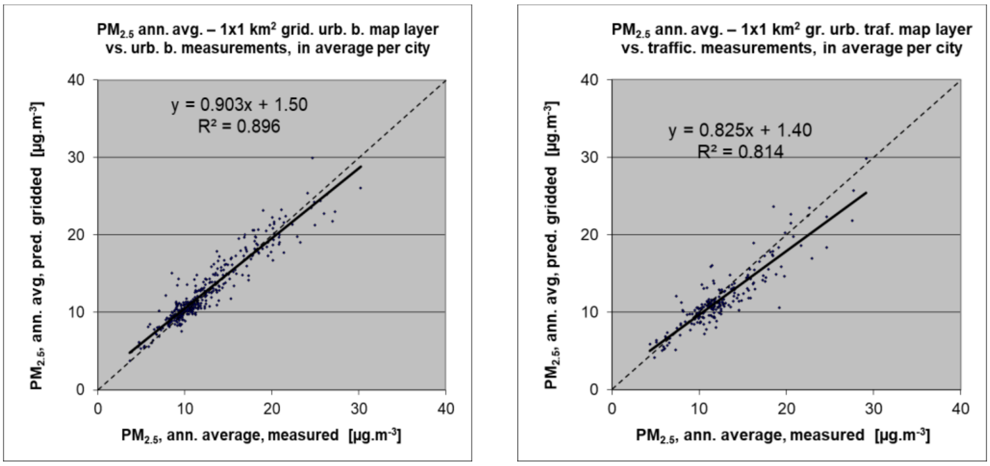
Table 4.3 shows the comparison between the city means of the predicted gridded mapped values and the relevant averages of the measurements in locations within individual cities, separately for urban background and urban traffic locations (and map layers).

Table 4.3: Comparison of predicted grid values from separate urban background (top) and urban traffic (bottom) map layers against relevant measurements from urban/suburban background or traffic stations in average per city of the Urban Audit, using RMSE, RRMSE, bias, R^2 and regression equation from scatter plots and FAC50% for $PM_{2.5}$ annual mean 2019. Units: $\mu g.m^{-3}$ except for RRMSE, R^2 and FAC50%.

$PM_{2.5}$ Annual Average	Urban background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - urban background	1.49	12.0%	0.29	0.896	y = 0.903x + 1.50	0.008
$PM_{2.5}$ Annual Average	Urban traffic areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - urban traffic	1.49	11.8%	0.08	0.814	y = 0.825x + 1.40	0.005

Figure 4.4 shows the scatterplots for these comparisons.

Figure 4.4: Correlation between predicted grid values from background (left) and urban traffic (right) map layer (y-axis) versus measurements from urban/suburban background (left) and urban/suburban traffic stations (right) (x-axis) in average per city of the Urban Audit for $PM_{2.5}$ annual average 2019



The results are quite similar to those for PM_{10}. The comparison shows a fair agreement, see the relative uncertainty (in terms of RRMSE) of 12 % in both urban background and urban traffic areas and R^2 from the scatter plots at the level of about 90 % for the urban background areas and about 81 % at the urban traffic areas. A bias of 0.3 $\mu g.m^{-3}$ is observed in the urban background areas, while a slight bias of 0.1 $\mu g.m^{-3}$ can be seen in the urban traffic areas. The fraction of the predicted gridded values outside ±50 % of the measured concentration levels is 0.008 (i.e., 3 of 355 cities) for the urban background areas and 0.005 (i.e., 1 of 208 cities) for the urban traffic areas. Again, this is quite an acceptable result. Thus, the same conclusion as for PM_{10} can be stated, i.e., that the current mapping can be used at the city level across Europe.

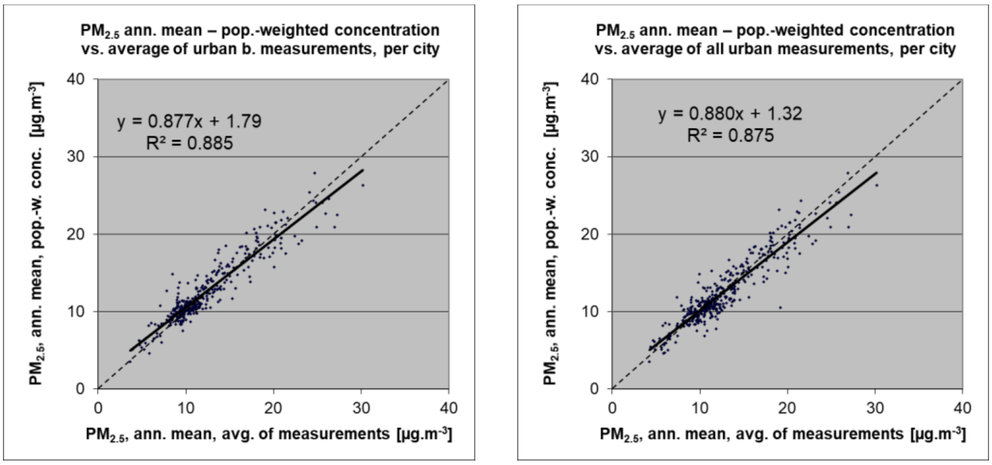
In addition to the FAC50 % indicator, a more detailed view on the differences between the predicted gridded and the measured concentrations is presented in Table 4.4, in both absolute and relative numbers. E.g., one can see that for 93 % of the cities, the differences are smaller than 3 $\mu g.m^{-3}$.

Table 4.4: Ratio of absolute differences between predicted grid values from urban background (top) and urban traffic (bottom) map layers and relevant measurements from urban/suburban background or traffic stations in average per city of the Urban Audit for $PM_{2.5}$ annual mean 2019, which exceed certain absolute (left) and relative (right) difference levels

$PM_{2.5}$ Annual Average	**Urban background areas**							
	> 1 $\mu g.m^{-3}$	**> 2 $\mu g.m^{-3}$**	**> 3 $\mu g.m^{-3}$**	**> 5 $\mu g.m^{-3}$**	**>10%**	**>15%**	**>20%**	**>30%**
Ratio of absolute differences	0.396	0.138	0.070	0.011	0.317	0.163	0.081	0.028
$PM_{2.5}$ Annual Average	**Urban traffic areas**							
	> 1 $\mu g.m^{-3}$	**> 2 $\mu g.m^{-3}$**	**> 3 $\mu g.m^{-3}$**	**> 5 $\mu g.m^{-3}$**	**>10%**	**>15%**	**>20%**	**>30%**
Ratio of absolute differences	0.370	0.135	0.067	0.014	0.279	0.178	0.101	0.034

Next to the comparison of the measurement and underlying gridded values, we have additionally calculated the population-weighted concentration for each individual city (i.e., suggested new approach for the city ranking) and compared it with the average of the concentration values measured at the stations located in the relevant city (i.e., for all urban/suburban background stations, the similar approach as the current city ranking; and for all urban/suburban stations without regard of their type). See Figure 4.5.

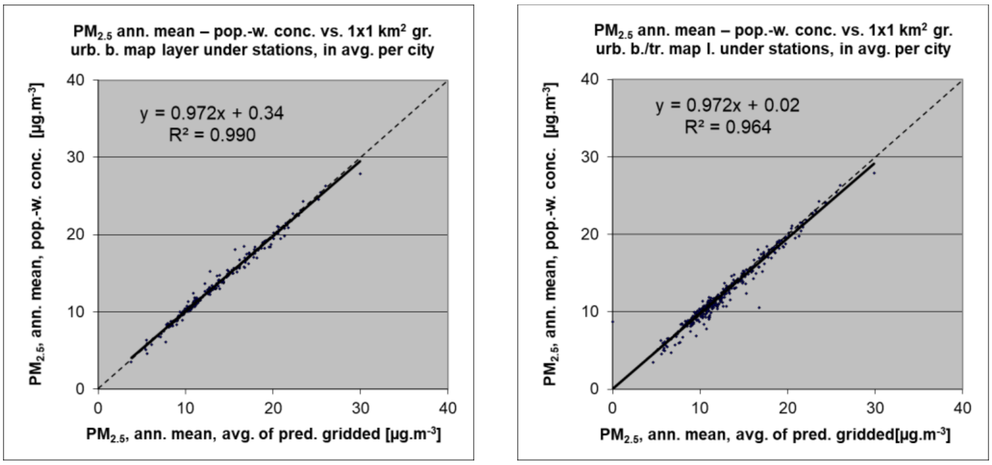
Figure 4.5: Correlation between the population-weighted concentration (y-axis) versus average of measurements from urban/suburban background (left) and all (right) stations (x-axis) located in relevant city of the Urban Audit for $PM_{2.5}$ annual average 2019



Next to the scatterplot, the bias has been calculated, being 0.3 µg.m^{-3} for the comparison based on the urban/suburban background stations and -0.2 µg.m^{-3} for the comparison based on all urban/suburban (i.e., both background and traffic) stations. The difference compared to PM_{10} (namely, the minor bias for comparison based on all stations) is caused by a smaller number of $PM_{2.5}$ traffic stations and by a smaller traffic vs. background ratio of concentration levels for $PM_{2.5}$ compared to PM_{10}. Apart from this, similar results to those for PM_{10} can be seen.

Again, we have also compared the population-weighted concentrations with the average of the gridded mapped values in the locations of the measurement stations within the relevant cities (in two variants), in order to examine which part of the variability shown in the scatterplots of Figure 4.5 is attributable to the interpolation the resolution smoothing effect and which part to the spatial variability within the city. See Figure 4.6. The relevant bias is 0.1 µg.m^{-3} and -0.3 µg.m^{-3} for the comparison based on the predicted gridded values at locations of urban/suburban background stations and all urban/suburban stations, respectively.

Figure 4.6: Correlation between the population-weighted concentration (y-axis) versus average of predicted gridded values at locations of urban/suburban background (left) and all (right) stations (x-axis) located in relevant city of the Urban Audit for $PM_{2.5}$ annual average 2019



Similarly as in the case of PM_{10}, one can state that the most of the variability between the population-weighted concentrations (i.e., the potential new approach for the city ranking) and the average of the urban/suburban background measurements (i.e., the current approach for the city ranking) is caused by the smoothing effect of the interpolation, while the variability within the city plays a minor role, in general.

Again, we can suppose that while the averaged measurement data from the background stations provides a superior information for the whole city in general (when the measurement error is neglected), the population-weighted concentrations also fairly well represents the whole city (albeit a certain smoothing effect of the interpolation) and gives a consistent information for all cities, including those without station measurements. Thus, when thinking about a potential update of the city ranking, **the approach based on the population-weighted concentration can be further considered as a basis for an updated city ranking, preferably in a combination with the current approach** based on the averaged measurement data from the background stations in cities with at least one background measurement station.

4.1.3 NO_2

For the NO_2 annual average 2019, the comparison has been performed for 495 cities with at least one urban or suburban background station and for 444 cities with at least one urban or suburban traffic station (and additionally also for 642 cities with at least one urban or suburban station without regard of its type). Altogether, 719 urban/suburban background stations and 789 urban/suburban traffic stations have been used in this analysis.

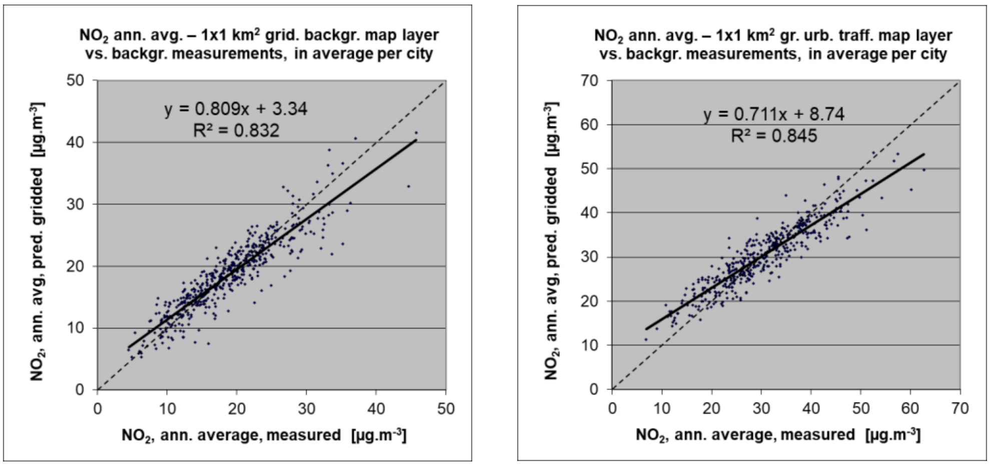
Table 4.5 shows the comparison between the city means of the predicted gridded mapped values and the relevant averages of the measurements in locations within individual cities, separately for urban background and urban traffic locations (and map layers).

Table 4.5: Comparison of predicted grid values from separate urban background (top) and urban traffic (bottom) map layers against relevant measurements from urban/suburban background or traffic stations in average per city of the Urban Audit, using RMSE, RRMSE, bias, R^2 and regression equation from scatter plots and FAC30% for NO_2 annual mean 2019. Units: μg.m^{-3} except for RRMSE, R^2 and FAC30%.

NO_2 Annual Average	Urban background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC30%
Mean predicted vs. observed values - urban background	2.55	13.4%	-0.06	0.849	y = 0.789x + 3.95	0.045
NO_2 Annual Average	Urban traffic areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC30%
Mean predicted vs. observed values - urban traffic	3.89	12.7%	-0.12	0.845	y = 0.711x + 8.74	0.061

Figure 4.7 shows the scatterplots for these comparisons.

Figure 4.7: Correlation between predicted grid values from background (left) and urban traffic (right) map layer (y-axis) versus measurements from urban/suburban background (left) and urban/suburban traffic stations (right) (x-axis) in average per city of the Urban Audit for NO_2 annual average 2019



The comparison shows a fair agreement, see the relative uncertainty (in terms of RRMSE) of 13 % in both urban background and urban traffic areas and R^2 from the scatter plots at the level of about 85 % for both the urban background areas and the urban traffic areas. A slight bias of -0.1 $\mu g.m^{-3}$ is observed in both urban background and urban traffic areas. The fraction of the predicted gridded values outside ±30 % of the measured concentration levels is 0.045 (i.e., 22 of 494 cities) for the urban background areas and 0.061 (i.e., 27 of 444 cities) for the urban traffic areas. The higher fraction compared to both PM_{10} and $PM_{2.5}$ is caused by a stricter 30 % requirement than 50 % for both PM fractions. Still, this is quite an acceptable result. Thus, the same conclusion as for PM can be stated, i.e., that the current mapping can be used at the city level across Europe.

In addition to the FAC30% indicator, a more detailed view on the differences between the predicted gridded and the measured concentrations is presented in Table 4.6, in both absolute and relative numbers. E.g., one can see that for cc. 95% of the cities, the differences are smaller than 5 $\mu g.m^{-3}$ in the urban background areas and 7.5 $\mu g.m^{-3}$ in the urban traffic areas.

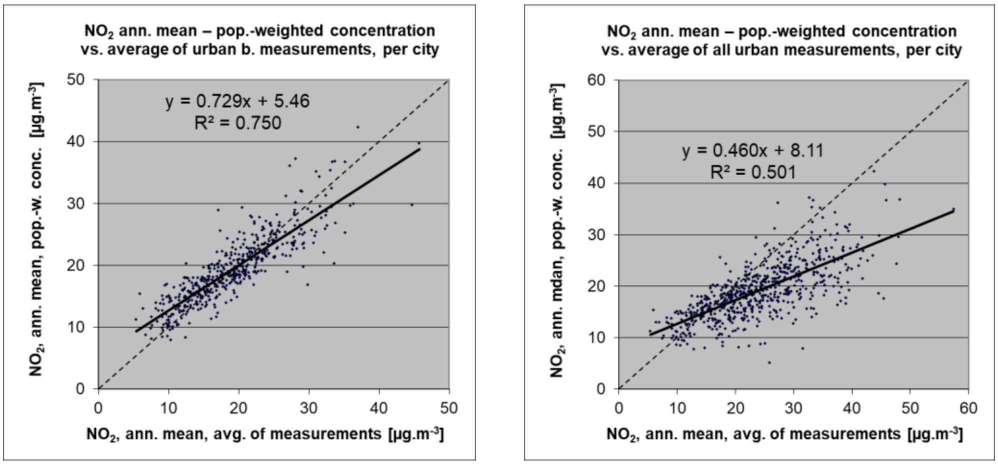
Table 4.6: Ratio of absolute differences between predicted grid values from urban background (top) and urban traffic (bottom) map layers and relevant measurements from urban/suburban background or traffic stations in average per city of the Urban Audit for NO_2 annual mean 2019, which exceed certain absolute (left) and relative (right) difference levels

NO_2 Annual Average	**Urban background areas**							
	> 2 $\mu g.m^{-3}$	**> 3 $\mu g.m^{-3}$**	**> 4 $\mu g.m^{-3}$**	**> 5 $\mu g.m^{-3}$**	**>10%**	**>15%**	**>20%**	**>25%**
Ratio of absolute differences	0.344	0.209	0.087	0.057	0.428	0.247	0.119	0.071
NO_2 Annual Average	**Urban traffic areas**							
	> 3 $\mu g.m^{-3}$	**> 4 $\mu g.m^{-3}$**	**> 5 $\mu g.m^{-3}$**	**> 7.5 $\mu g.m^{-3}$**	**>10%**	**>15%**	**>20%**	**>25%**
Ratio of absolute differences	0.414	0.297	0.189	0.052	0.426	0.264	0.142	0.090

Next to the comparison of the measurement and underling gridded values, we have additionally calculated the population-weighted concentration for each individual city (i.e., suggested new approach for the city ranking) and compared it with the average of the concentration values measured at the urban/suburban background stations located in the relevant city (i.e., the similar approach as the current city ranking) and with the average of the concentration values measured at all urban/suburban stations (both background and traffic) located in the relevant city. See Figure 4.8. As expected, the population-weighted concentrations show better agreement with the averages of the background stations compared to the averages of both background and traffic stations, due to better representativeness of the background stations.

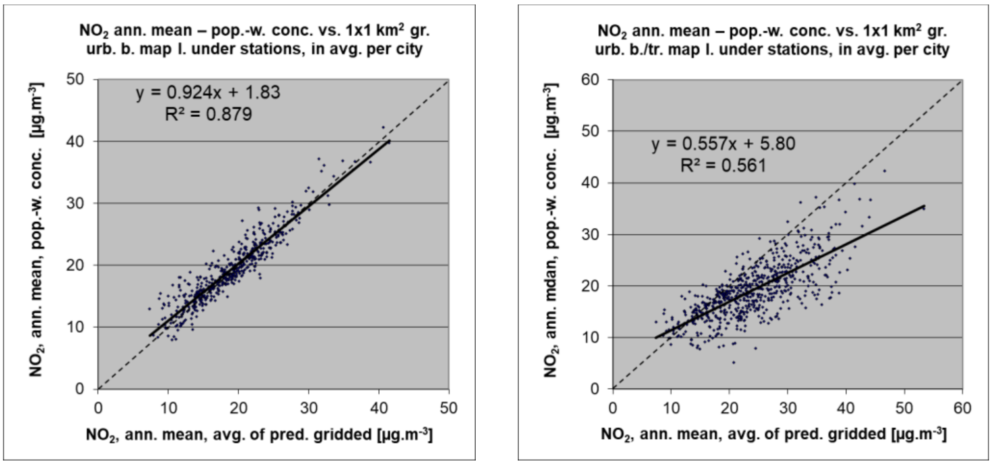
Next to the scatterplot, the bias has been calculated, being 0.3 µg.m^{-3} for the comparison based on the urban/suburban background stations and -4.8 µg.m^{-3} for the comparison based on all urban/suburban (i.e., both background and traffic) stations. As expected, the population-weighted averages give in general somewhat higher results compared to the averages of the background stations and deeply lower results compared to the averages of both background and traffic stations, as expected. This result is influenced by large number of traffic stations (see Section 3.1), as well as by a high traffic vs. background ratio of NO_2 values.

Figure 4.8: Correlation between the population-weighted concentration (y-axis) versus average of measurements from urban/suburban background (left) and all (right) stations (x-axis) located in relevant city of the Urban Audit for NO_2 annual average 2019



Quite a low correlation (i.e., R^2 of 0.75 in urban background areas and of 0.50 in urban traffic areas) is caused by a high level of spatial variability of NO_2 inside cities, namely in traffic areas. Again, we have compared the population-weighted concentrations with the average of the gridded mapped values in the locations of the stations within the relevant cities (in two variants), in order to examine which part of the variability shown in the scatterplots of Figure 4.8 is attributable to the interpolation and resolution smoothing effect and which part to the spatial variability within the city. See Figure 4.9.

Figure 4.9: Correlation between the population-weighted concentration (y-axis) versus average of predicted gridded values at locations of urban/suburban background (left) and all (right) stations (x-axis) located in relevant city of the Urban Audit for NO_2 annual average 2019



The relevant bias is 0.4 µg.m^{-3} and -4.8 µg.m^{-3} for the comparison based on the predicted gridded values at locations of urban/suburban background stations and all urban/suburban stations, respectively. Looking at Figures 4.7, 4.8 and 4.9, one can state that the smoothing effect of the interpolation and the variability within the city play a similar role in the variability between the population-weighted concentrations and the average of the urban/suburban background measurements. Thus, the variability within the city plays higher role compared to PM.

We can suppose that the population-weighted concentration and the average of measurements from quite randomly located stations provide a fairly good information for the whole city in a similar quality in general. Thus, in a potential update of the city ranking (if applied for NO_2), **the approach based on the population-weighted concentration can be further considered as a basis for an updated city ranking, preferably in a combination with the current approach** based on the averaged measurement data from the background stations in cities with at least one background measurement station.

4.1.4 Ozone

For the ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019, the comparison has been performed for 459 cities with at least one urban or suburban background station. Altogether, 599 urban/suburban background stations have been used in this analysis.

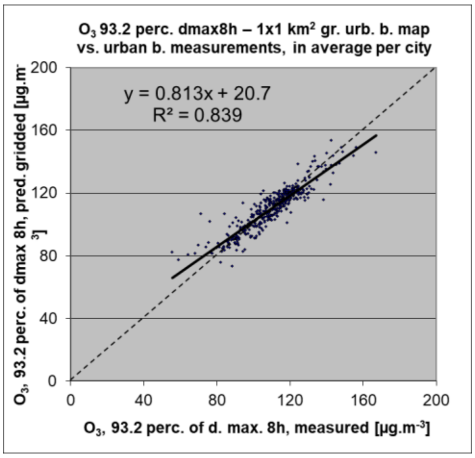
Table 4.7 shows the comparison between the city means of the predicted gridded mapped values and the relevant averages of the measurements in locations within individual cities, for urban background locations (and map layer).

Table 4.7: Comparison of predicted grid values from urban background map layer against relevant measurements from urban and suburban background stations in average per city of the Urban Audit, using RMSE, RRMSE, bias, R^2 and regression equation from scatter plot and FAC50% for ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019. Units: µg.m^{-3} except for RRMSE, R^2 and FAC50%.

Ozone, 93.2 Percentile of 8-hourly Daily Maximums	Urban background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - urban background	6.09	5.5%	0.31	0.839	y = 0.813x + 20.69	0.002

Figure 4.10 shows the scatterplot for this comparison.

Figure 4.10: Correlation between predicted grid values from background map versus measurements from urban and suburban background stations (x-axis) in average per city of the Urban Audit for ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019



The comparison shows a fair agreement, see the relative uncertainty (in terms of RRMSE) of 6% and R^2 from the scatter plots at the level of about 84 %. A slight bias of 0.3 μg.m^{-3} is observed. The fraction of deviations between the predicted gridded and the measured concentration levels bigger than 50 % is 0.002 (i.e., 1 of 459 cities), which is an acceptable result. Thus, the same conclusion as for PM and NO_2 can be stated, i.e., that the current mapping can be used at the city level across Europe.

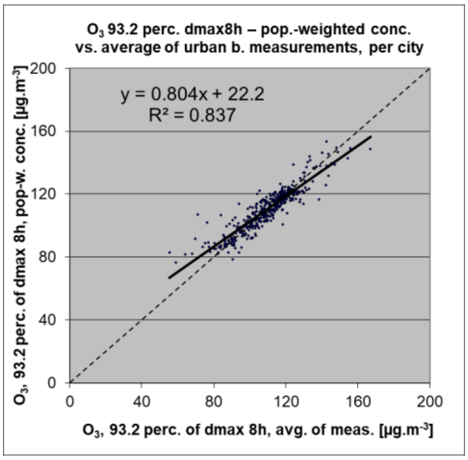
In addition to the FAC50 % indicator, a more detailed view on the differences between the predicted gridded and the measured concentrations is presented in Table 4.8, in both absolute and relative numbers. E.g., one can see that for 92 % of the cities, the differences are smaller than 10 μg.m^{-3}.

Table 4.8: Ratio of absolute differences between predicted grid values from urban background map layer and relevant measurements from urban/suburban background stations in average per city of the Urban Audit for ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019, which exceed certain absolute (left) and relative (right) difference levels.

Ozone, 93.2 Percentile of 8-hourly Daily Maximums	Urban background areas							
	> 5 μg.m^{-3}	> 7.5 μg.m^{-3}	> 10 μg.m^{-3}	> 15 μg.m^{-3}	>10%	>15%	>20%	>25%
Ratio of absolute differences	0.302	0.169	0.083	0.032	0.063	0.034	0.020	0.011

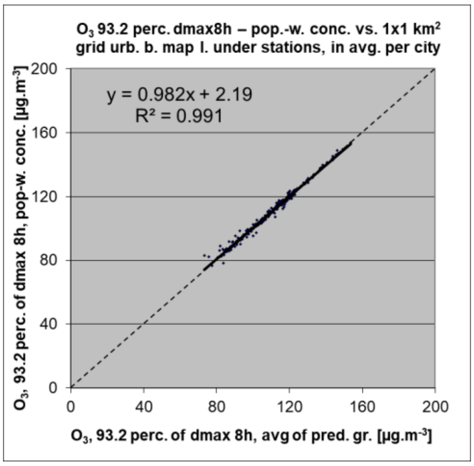
Next to the comparison of the measurement and underlying gridded values, we have additionally calculated the population-weighted concentration for each individual city (i.e., potential new approach for the city ranking, if applied for ozone) and compared it with the average of the concentration values measured at all urban/suburban background stations located in the relevant city (i.e., similar approach to the current city ranking for $PM_{2.5}$). See Figure 4.11.

Figure 4.11: Correlation between the population-weighted concentration (y-axis) versus average of measurements from urban and suburban background stations (x-axis) located in relevant city of the Urban Audit for ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019



Next to the scatterplot, the bias has been calculated, being 0.5 µg.m^{-3} for the comparison based on the urban/suburban background stations. Again, we have also compared the population-weighted concentrations with the average of the gridded mapped values in the locations of the background stations within the relevant cities, in order to examine which part of the variability shown in the scatterplots of Figure 4.11 is attributable to the smoothing effect of the interpolation and the resolution and which part is attributable to the spatial variability within the city. See Figure 4.12.

Figure 4.12: Correlation between the population-weighted concentration (y-axis) versus average of predicted gridded values at locations of urban/suburban background stations (x-axis) located in relevant city of the Urban Audit for ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019



The relevant bias is 0.2 µg.m^{-3} for the comparison based on the predicted gridded values at locations of urban/suburban background stations. Looking at Figures 4.10, 4.11 and 4.12, one can state that the most of the variability between the population-weighted concentrations and the average of the urban/suburban background measurements is caused by the smoothing effect of the interpolation, while the variability within the city plays a minor role, similarly as in the case of PM.

4.2 NUTS3 units

For the NUTS3 units, we have compared the average of all measurements within the limits of the relevant NUTS3 unit (see Section 3.4) with the average of the relevant gridded mapped values in the locations of these measurements. For PM and NO_2, the analysis has been done separately for the rural background, urban/suburban background and urban/suburban traffic stations: the comparison of the station values has been done against the rural background (in the first case), the urban background (in the second case) and the urban traffic (in the third case) map layers. For ozone, only first two cases have been applied, as only background stations are used in the ozone mapping.

4.2.1 PM_{10}

For PM_{10} annual average 2019, the comparison has been performed for 292 NUTS3 units with at least one rural background station, for 636 NUTS3 units with at least one urban or suburban background station and for 462 NUTS3 units with at least one urban or suburban traffic station. (Altogether, 363 rural background stations, 1299 urban/suburban background stations and 745 urban/suburban traffic stations have been used in this analysis.)

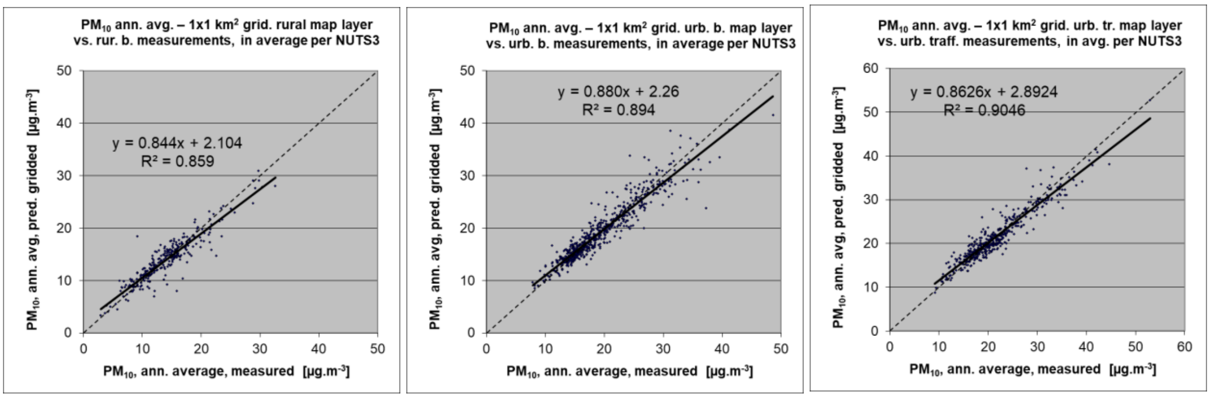
Table 4.9 shows the comparison between the NUTS3 means of the predicted gridded mapped values and the relevant averages of the measurements in locations within individual NUTS3 units, separately for rural background, urban background and urban traffic locations (and map layers).

Table 4.9: Comparison of predicted grid values from separate rural background (top), urban background (middle) and urban traffic (bottom) map layers against relevant measurements from rural background, urban/suburban background and rural/suburban traffic stations in average per NUTS3 unit, using RMSE, RRMSE, bias, R^2 and regression equation from scatter plots for PM_{10} annual mean 2019. Units: $\mu g.m^{-3}$ except for RRMSE and R^2.

PM_{10} Annual Average	Rural background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - rural background	1.83	13.0%	-0.09	0.859	y = 0.844x + 2.10	0.007
PM_{10} Annual Average	Urban background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - urban background	1.94	10.1%	-0.06	0.894	y = 0.880x + 2.26	0.002
PM_{10} Annual Average	Urban traffic areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - urban traffic	1.97	9.2%	-0.06	0.905	y = 0.863x + 2.89	0.000

Figure 4.13 shows the scatterplots for these comparisons.

Figure 4.13: Correlation between predicted grid values from rural background (left), urban background (middle) and urban traffic (right) map layer (y-axis) versus measurements from rural background (left), urban/suburban background (middle) and urban/suburban traffic stations (right) (x-axis) in average per NUTS3 for PM_{10} annual average 2019



In addition to the FAC50 % indicator, a more detailed view on the differences between the predicted gridded and the measured concentrations is presented in Table 4.10, in both absolute and relative numbers. E.g., one can see that for 97-98 % of the NUTS3 units, the differences are smaller than 5 $\mu g.m^{-3}$.

Table 4.10:Ratio of absolute differences between predicted grid values from rural (top), urban background (middle) and urban traffic (bottom) map layers and relevant measurements from rural background, urban/suburban background or urban/suburban traffic stations in average per NUTS3 unit for PM_{10} annual mean 2019, which exceed certain absolute (left) and relative (right) difference levels

PM_{10} Annual Average	Rural background areas							
	> 2 $\mu g.m^{-3}$	> 3 $\mu g.m^{-3}$	> 5 $\mu g.m^{-3}$	> 7.5 $\mu g.m^{-3}$	>10%	>15%	>20%	>30%
Ratio of absolute differences	0.185	0.068	0.024	0.010	0.346	0.182	0.120	0.041

PM_{10} Annual Average	Urban background areas							
	> 2 $\mu g.m^{-3}$	> 3 $\mu g.m^{-3}$	> 5 $\mu g.m^{-3}$	> 7.5 $\mu g.m^{-3}$	>10%	>15%	>20%	>30%
Ratio of absolute differences	0.208	0.099	0.028	0.005	0.226	0.097	0.039	0.008

PM_{10} Annual Average	Urban traffic areas							
	> 2 $\mu g.m^{-3}$	> 3 $\mu g.m^{-3}$	> 5 $\mu g.m^{-3}$	> 7.5 $\mu g.m^{-3}$	>10%	>15%	>20%	>30%
Ratio of absolute differences	0.249	0.117	0.024	0.002	0.227	0.100	0.048	0.017

In general, quite similar results as for the cities of the Urban Audit have been observed.

4.2.2 $PM_{2.5}$

For $PM_{2.5}$ annual average 2019, the comparison has been performed for 185 NUTS3 units with at least one rural background station, for 473 NUTS3 units with at least one urban or suburban background station and for 257 NUTS3 units with at least one urban or suburban traffic station. (Altogether, 213 rural background stations, 720 urban/suburban background stations and 364 urban/suburban traffic stations have been used in this analysis.)

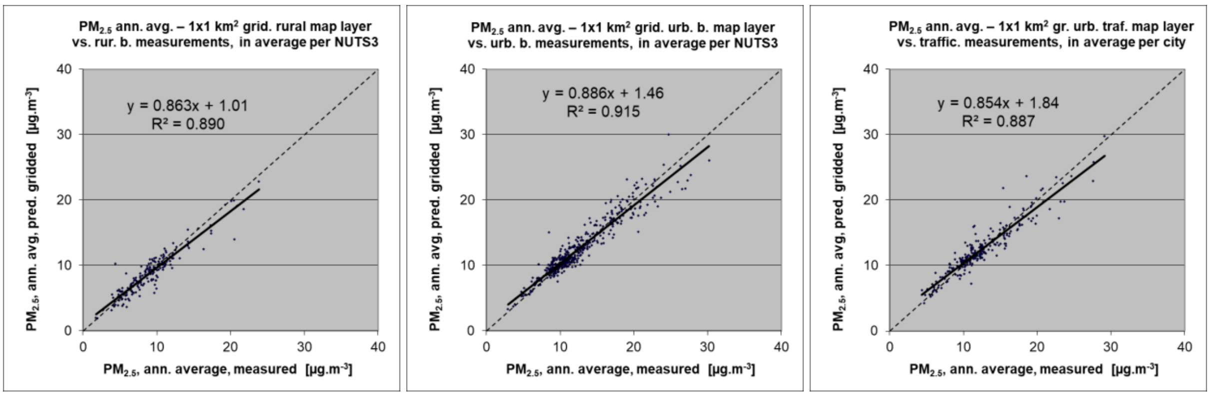
Table 4.11 shows the comparison between the NUTS3 means of the predicted gridded mapped values and the relevant averages of the measurements in locations within individual NUTS3 units, separately for rural background, urban background and urban traffic locations (and map layers).

Table 4.11:Comparison of predicted grid values from separate rural background (top), urban background (middle) and urban traffic (bottom) map layers against relevant measurements from rural background, urban/suburban background and rural/suburban traffic stations in average per NUTS3 unit, using RMSE, RRMSE, bias, R^2 and regression equation from scatter plots for $PM_{2.5}$ annual mean 2019. Units: $\mu g.m^{-3}$ except for RRMSE and R^2.

$PM_{2.5}$ Annual Average	Rural background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - rural background	1.30	14.4%	-0.23	0.890	y = 0.863x + 1.01	0.011
$PM_{2.5}$ Annual Average	Urban background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - urban background	1.33	10.8%	0.05	0.915	y = 0.886x + 1.46	0.002
$PM_{2.5}$ Annual Average	Urban traffic areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - urban traffic	1.44	11.6%	0.04	0.887	y = 0.854x + 1.84	0.000

Figure 4.14 presents the scatterplots for these comparisons.

Figure 4.14: Correlation between predicted grid values from rural background (left), urban background (middle) and urban traffic (right) map layer (y-axis) versus measurements from rural background (left), urban/suburban background (middle) and urban/suburban traffic stations (right) (x-axis) in average per NUTS3 for $PM_{2.5}$ annual average 2019



In addition to the FAC50 % indicator, a more detailed view on the differences between the predicted gridded and the measured concentrations is presented in Table 4.12, in both absolute and relative numbers. E.g., one can see that for ca. 95 % of the NUTS3 units, the differences are smaller than 3 $\mu g.m^{-3}$.

Table 4.12: Ratio of absolute differences between predicted grid values from rural (top), urban background (middle) and urban traffic (bottom) map layers and relevant measurements from rural background, urban/suburban background or urban/suburban traffic stations in average per NUTS3 unit for $PM_{2.5}$ annual mean 2019, which exceed certain absolute (left) and relative (right) difference levels

$PM_{2.5}$ Annual Average	Rural background areas							
	> 1 µg.m^{-3}	> 2 µg.m^{-3}	> 3 µg.m^{-3}	> 5 µg.m^{-3}	>10%	>15%	>20%	>30%
Ratio of absolute differences	0.357	0.081	0.038	0.011	0.405	0.254	0.130	0.049
$PM_{2.5}$ Annual Average	Urban background areas							
	> 1 µg.m^{-3}	> 2 µg.m^{-3}	> 3 µg.m^{-3}	> 5 µg.m^{-3}	>10%	>15%	>20%	>30%
Ratio of absolute differences	0.345	0.106	0.044	0.008	0.266	0.135	0.044	0.006
$PM_{2.5}$ Annual Average	Urban traffic areas							
	> 1 µg.m^{-3}	> 2 µg.m^{-3}	> 3 µg.m^{-3}	> 5 µg.m^{-3}	>10%	>15%	>20%	>30%
Ratio of absolute differences	0.370	0.117	0.062	0.012	0.307	0.152	0.082	0.031

As in the case of PM_{10}, quite similar results as for the cities of the Urban Audit have been observed.

4.2.3 NO_2

For the NO_2 annual average 2019, the comparison has been performed for 367 NUTS3 units with at least one rural background station, for 679 NUTS3 units with at least one urban or suburban background station and for 544 NUTS3 units with at least one urban or suburban traffic station. (Altogether, 456 rural background stations, 1330 urban/suburban background stations and 1075 urban/suburban traffic stations have been used in this analysis.)

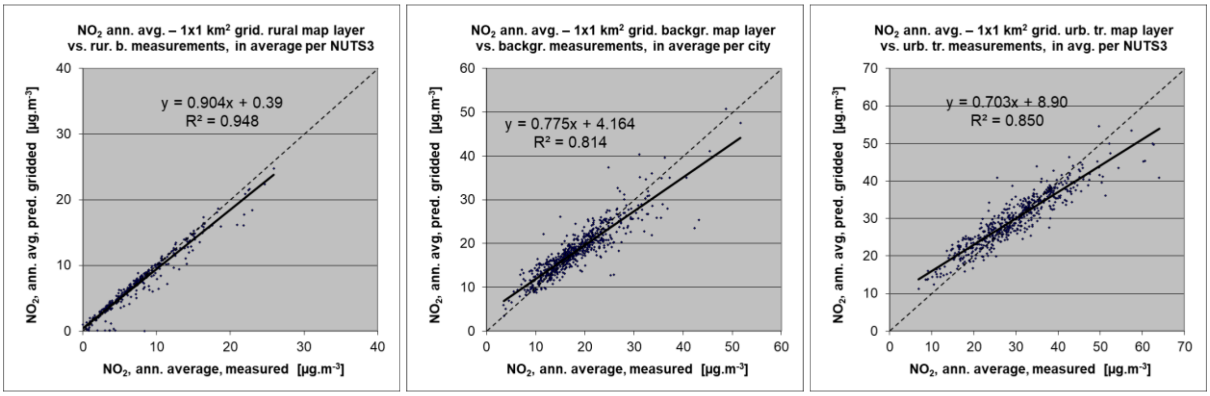
Table 4.13 shows the comparison between the NUTS3 means of the predicted gridded mapped values and the relevant averages of the measurements in locations within individual NUTS3 units, separately for rural background, urban background and urban traffic locations (and map layers).

Table 4.13:Comparison of predicted grid values from separate rural background (top), urban background (middle) and urban traffic (bottom) map layers against relevant measurements from rural background, urban/suburban background and rural/suburban traffic stations in average per NUTS3 unit, using RMSE, RRMSE, bias, R^2 and regression equation from scatter plots for NO_2 annual mean 2019. Units: µg.m^{-3} except for RRMSE and R^2.

NO_2 Annual Average	Rural background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC30%
Mean predicted vs. observed values - rural background	1.16	15.9%	-0.30	0.948	y = 0.904x + 0.39	0.093
NO_2 Annual Average	Urban background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC30%
Mean predicted vs. observed values - urban background	2.81	15.5%	0.06	0.814	y = 0.775x + 4.16	0.065
NO_2 Annual Average	Urban traffic areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	Regr. eq.
Mean predicted vs. observed values - urban traffic	3.92	13.3%	0.14	0.850	y = 0.703x + 8.90	0.077

Figure 4.15 gives the scatterplots for these comparisons.

Figure 4.15: Correlation between predicted grid values from rural background (left), urban background (middle) and urban traffic (right) map layer (y-axis) versus measurements from rural background (left), urban/suburban background (middle) and urban/suburban traffic stations (right) (x-axis) in average per NUTS3 for NO_2 annual average 2019



In addition to the FAC30% indicator, a more detailed view on the differences between the predicted gridded and the measured concentrations is presented in Table 4.14, in both absolute and relative numbers. E.g., one can see that for ca. 95 % of the NUTS3 units, the differences are smaller than 3 $\mu g.m^{-3}$ in the rural areas, 5 $\mu g.m^{-3}$ in the urban background areas and 7.5 $\mu g.m^{-3}$ in the urban traffic areas.

Table 4.14: Ratio of absolute differences between predicted grid values from rural (top), urban background (middle) and urban traffic (bottom) map layers and relevant measurements from rural background, urban/suburban background or urban/suburban traffic stations in average per NUTS3 unit for NO_2 annual mean 2019, which exceed certain absolute (left) and relative (right) difference levels

NO_2 Annual Average	**Rural background areas**							
	> 2 $\mu g.m^{-3}$	**> 3 $\mu g.m^{-3}$**	**> 4 $\mu g.m^{-3}$**	**> 5 $\mu g.m^{-3}$**	**>10%**	**>15%**	**>20%**	**>25%**
Ratio of absolute differences	0.079	0.038	0.019	0.005	0.305	0.234	0.163	0.120
NO_2 Annual Average	**Urban background areas**							
	> 2 $\mu g.m^{-3}$	**> 3 $\mu g.m^{-3}$**	**> 4 $\mu g.m^{-3}$**	**> 5 $\mu g.m^{-3}$**	**>10%**	**>15%**	**>20%**	**>25%**
Ratio of absolute differences	0.330	0.186	0.109	0.063	0.393	0.233	0.149	0.094
NO_2 Annual Average	**Urban traffic areas**							
	> 3 $\mu g.m^{-3}$	**> 4 $\mu g.m^{-3}$**	**> 5 $\mu g.m^{-3}$**	**> 7.5 $\mu g.m^{-3}$**	**>10%**	**>15%**	**>20%**	**>25%**
Ratio of absolute differences	0.384	0.279	0.169	0.046	0.421	0.257	0.153	0.110

Again, similar results as for the cities of the Urban Audit have been observed in general.

4.2.4 Ozone

For the ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019, the comparison has been performed for 405 NUTS units with at least one rural background station and for 628 NUTS3 units with at least one urban or suburban background station. (Altogether, 528 rural background stations and 1156 urban/suburban background stations have been used in this analysis.)

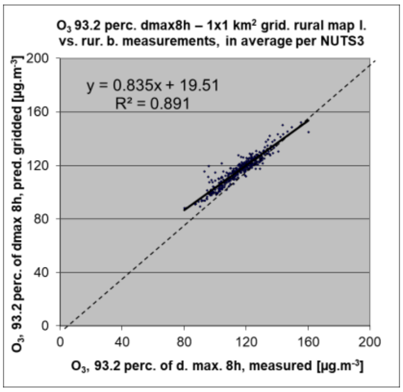
Table 4.15 shows the comparison between the NUTS3 means of the predicted gridded mapped values and the relevant averages of the measurements in locations within individual NUTS3 units, separately for rural background and urban background locations (and map layer).

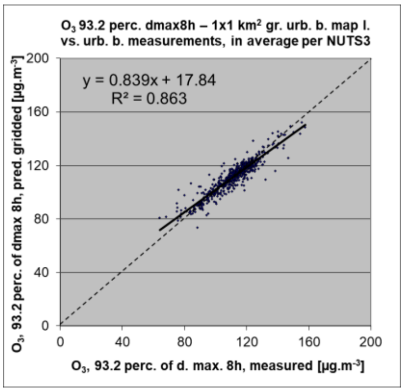
Table 4.15:Comparison of predicted grid values from separate rural background (top) and urban background (bottom) map layers against relevant measurements from rural background and urban/suburban background in average per NUTS3 unit, using RMSE, RRMSE, bias, R^2 and regression equation from scatter plots for ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019. Units: μg.m^{-3} except for RRMSE and R^2.

Ozone, 93.2 Percentile of 8-hourly Daily Maximums	Rural background areas					
	RMSE	RRMSE	Bias	R^2	Regr. eq.	FAC50%
Mean predicted vs. observed values - rural background	4.34	3.7%	0.08	0.891	y = 0.835x + 19.51	0.000
Ozone, 93.2 Percentile of 8-hourly Daily Maximums	**Urban background areas**					
	RMSE	**RRMSE**	**Bias**	**R^2**	**Regr. eq.**	**FAC50%**
Mean predicted vs. observed values - urban background	4.97	4.4%	-0.18	0.863	y = 0.839x + 17.84	0.000

Figure 4.16 gives the scatterplots for these comparisons.

Figure 4.16: Correlation between predicted grid values from rural background (left) and urban background (right) map layer (y-axis) versus measurements from rural background (left) and urban/suburban background (right) (x-axis) in average per NUTS3 for ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019





In addition to the FAC50% indicator, a more detailed view on the differences between the predicted gridded and the measured concentrations is presented in Table 4.16, in both absolute and relative numbers. E.g., one can see that for 95 % of the NUTS3 units, the differences are smaller than 10 μg.m^{-3}.

Table 4.16: Ratio of absolute differences between predicted grid values from rural (top) and urban background (bottom) map layer and relevant measurements from rural background or urban/suburban background stations in average per NUTS3 unit for ozone indicator 93.2 percentile of maximum daily 8-hour means in 2019, which exceed certain absolute (left) and relative (right) difference levels.

Ozone, 93.2 Percentile of 8-hourly Daily Maximums	Rural background areas							
	> 5 μg.m^{-3}	> 7.5 μg.m^{-3}	> 10 μg.m^{-3}	> 15 μg.m^{-3}	>10%	>15%	>20%	>25%
Ratio of absolute differences	0.188	0.074	0.027	0.015	0.020	0.012	0.005	0.000
Ozone, 93.2 Percentile of 8-hourly Daily Maximums	**Urban background areas**							
	> 5 μg.m^{-3}	> 7.5 μg.m^{-3}	> 10 μg.m^{-3}	> 15 μg.m^{-3}	>10%	>15%	>20%	>25%
Ratio of absolute differences	0.209	0.110	0.053	0.019	0.045	0.022	0.010	0.005

For ozone, as for other pollutants, the results for the NUTS3 units are quite similar as for the cities of the Urban Audit.

5 Alternative dealing with rural, urban background and urban traffic stations

During the preparation of the paper Horálek et al. (2020), it was suggested to check the separate treatment of rural, urban background and urban traffic stations. This chapter compares mapping results created based on the current merging methodology (using separate map layers) against the mapping results created based on alternative approaches of the map layers. Section 5.1 examines alternative dealing of (i) rural and (ii) urban/suburban background stations. Section 5.2 searches different dealing of urban/suburban (i) background and (ii) traffic stations.

5.1 Rural and urban/suburban background stations

In this section, the current methodology labelled (C) using the merging of the rural and the urban background map layers is compared against the alternative methodology labelled (J), i.e., the joint rural-urban background map layer created based on all background stations (both rural and urban/suburban). The analysis has been performed for PM_{10}, NO_2 and ozone.

5.1.1 PM_{10}

Table 5.1 presents the cross-validation results of the PM_{10} annual average mapping in the rural and urban background areas for two variants, i.e. the current (C) one and the alternate (J) one, in which the rural and the urban/suburban background stations are handled together. The green marking shows the better performance. For the green highlighting, the ad hoc criterion of more than ca. 5 % difference (in terms of RMSE, RRMSE, R^2 and slope) and 0.2 μg.m^{-3} (in terms of RMSE and bias) for result distinguishing has been applied, i.e., the similar criterion as in Horálek et al. (2020).

Table 5.1: Comparison of two spatial interpolation variants showing RMSE, RRMSE, bias, R^2 and regression equation from cross-validation scatterplots in rural (top) and urban (bottom) background areas for PM_{10} annual mean 2019. Units: μg.m^{-3} except for RRMSE and R^2.

PM_{10} Annual Average – Mapping variant		Rural background areas				
		RMSE	RRMSE	Bias	R^2	Regr. eq.
(C)	Current, merged separ. rural and urban backgr. map layers	3.7	25.2%	0.4	0.617	y = 0.766x + 3.9
(J)	Joint rural-urban background layer	3.7	25.1%	1.2	0.698	y = 0.920x + 2.4
PM_{10} Annual Average – Mapping variant		**Urban background areas**				
		RMSE	**RRMSE**	**Bias**	**R^2**	**Regr. eq.**
(C)	Current, merged separ. rural and urban backgr. map layers	6.6	29.3%	-0.4	0.633	y = 0.675x + 6.9
(J)	Joint rural-urban background layer	6.5	28.7%	-0.4	0.648	y = 0.671x + 7.0

Looking at the results, one can see that the current (C) mapping variant gives better results in terms of bias and worse results in terms of the R^2 and the regression equation in the rural areas, compared to the alternate (J) variant. In the urban background areas, both variants give almost the same results.

Due to the important issue of the bias in the rural areas (i.e., the overestimation of 1.2 μg.m^{-3}, in average), it can be stated that the **alternate** (J) **variant does not improve the mapping methodology**. In the rural areas, the current mapping variant gives better results. However, the (J) variant using the joint rural-urban map layer (based on both rural and urban/suburban background stations) might be considered for applying in the urban background areas, specifically for the purposes of the city level mapping. Further testing (e.g. based on the data of another year) might take place.

5.1.2 NO_2

Table 5.2 shows the cross-validation results of the NO_2 annual average mapping in the rural and urban background areas for two variants, i.e. the current (C) one and the alternate (J) one, in which the rural and the urban/suburban background stations are handled together.

Table 5.2: Comparison of two spatial interpolation variants showing RMSE, RRMSE, bias, R^2 and regression equation from cross-validation scatter plots in rural background (top) and urban background (bottom) areas for NO_2 annual mean 2019. Units: µg.m^{-3} except RRMSE and R^2.

NO_2 Annual Average – Mapping variant		Rural background areas				
		RMSE	RRMSE	Bias	R^2	Regr. eq.
(C)	Current, merged separ. rural and urban backgr. map layers	2.6	33.9%	0.5	0.781	y = 0.885x + 1.4
(J)	Joint rural-urban background layer	3.4	45.8%	0.9	0.639	y = 0.824x + 2.2
NO_3 Annual Average – Mapping variant		Urban background areas				
		RMSE	RRMSE	Bias	R^2	Regr. eq.
(C)	Current, merged separ. rural and urban backgr. map layers	5.1	27.5%	-0.4	0.618	y = 0.685x + 5.4
(J)	Joint rural-urban background layer	5.0	26.8%	-0.3	0.632	y = 0.683x + 5.6

One can see that the current (C) mapping variant gives better results compared to the alternate (J) variant in the rural areas. In the urban areas, both variants give almost the same results, with a tiny bit better results in the case of the alternate (J) variant.

The similar finding as in the case of PM_{10} can be concluded. The alternate (J) variant does not improve the mapping methodology. In the rural areas, the current method gives better results. However**,** the (J) variant using the joint rural-urban map layer (based on both rural and urban/suburban background stations) might be considered for applying in the urban background areas, specifically for the purposes of the city level mapping. Further testing might take place.

5.1.3 Ozone

Table 5.3 presents the cross-validation results of the PM_{10} annual average mapping in the rural and urban background areas for two variants, i.e. the current (C) one and the alternate (J) one, in which the rural and the urban/suburban background stations are handled together.

Table 5.3: Comparison of two spatial interpolation variants showing RMSE, RRMSE, bias, R^2 and regression equation from cross-validation scatter plots in rural background (top) and urban background (bottom) areas for ozone indicator 93.2 percentile of maximum daily 8-hour means 2019. Units: µg.m^{-3} except RRMSE and R^2.

Ozone 93.2 Percentile of 8-hour Daily Maximums – Mapping variant		Rural background areas				
		RMSE	RRMSE	Bias	R^2	Regr. eq.
(C)	Current, merged separ. rural and urban backgr. map layers	8.2	7.0%	-0.6	0.600	y = 0.644x + 41.1
(J)	Joint rural-urban background layer	8.9	7.6%	-2.5	0.566	y = 0.617x + 42.5
Ozone 93.2 Percentile of 8-hour Daily Maximums – Mapping variant		Urban background areas				
		RMSE	RRMSE	Bias	R^2	Regr. eq.
(C)	Current, merged separ. rural and urban backgr. map layers	10.1	9.0%	0.5	0.581	y = 0.624x + 43.0
(J)	Joint rural-urban background layer	10.1	8.9%	1.1	0.566	y = 0.616x + 44.5

In can be seen that the current (C) mapping variant gives better results compared to the alternate (J) variant, especially in the rural areas, but in terms of bias also in the urban background areas. The use of a joint rural-urban map layer (based both on rural and urban background stations) instead of the current use of separate rural and urban background map layers with their subsequent merge does not improve the mapping methodology. The current mapping variant gives better results.

5.2 Urban/suburban background and traffic stations

In this section, two different comparisons have been performed. At first, a similar comparison like in Section 5.1 has been done. Here, the current methodology labelled (C) using the merge of the urban background and the urban traffic map layers is compared against the alternative methodology labelled (J), i.e., the joint urban background-traffic map layer created based on all urban/suburban stations (both background and traffic).

Next to this, additional potential improvement of the mapping methodology has been examined. It examines the alternative adjustment of the urban traffic layer in areas where its estimated concentration values are lower than the urban background map layer estimated concentration values. Currently, the urban traffic layer is quite simply adjusted based on the urban background layer (i.e., not to have values smaller than this layer, see Section 2.1). We have examined the improvement of the adjustment, using the joint urban background-traffic map layer (created based on both background and traffic urban/suburban stations), as described in Section 2.1.

The analysis has been performed for PM_{10} and NO_2. No analysis for ozone has been performed, as the traffic stations are not used in the ozone mapping.

5.2.1 PM_{10}

Table 5.4 presents the cross-validation results of the PM_{10} annual average mapping in the urban background and the urban traffic areas for two mapping variants, i.e. the current (C) one and the alternate (J) one, in which the urban/suburban background and the urban/suburban traffic stations are handled together. The green marking shows the better performance.

As the urban traffic areas are underestimated in the current 1x1 km^2 final merged maps while fairly represented in the urban traffic map layer (Horálek et al., 2022), the results for separate urban traffic map layer are also presented in addition.

Table 5.4: Comparison of two mapping variants showing RMSE, RRMSE, bias, R^2 and regression equation from cross-validation scatterplots in urban background (top) and urban traffic (bottom) areas for PM_{10} annual mean 2019. Units: µg.m^{-3} except for RRMSE and R^2.

PM_{10} Annual Average – Mapping variant		Urban background areas				
		RMSE	RRMSE	Bias	R^2	Regr. eq.
(C)	Current, merged separ. urban backgr. and urban traffic m. layers	6.4	28.1%	0.1	0.659	y = 0.689x + 7.1
(J)	Joint background-traffic urban layer	6.5	28.6%	0.9	0.653	y = 0.670x + 8.3
PM_{10} Annual Average – Mapping variant		**Urban traffic areas**				
		RMSE	**RRMSE**	**Bias**	**R^2**	**Regr. eq.**
(C)	Current, merged separ. urban backgr. and urban traffic m. layers	5.1	22.7%	-2.7	0.746	y = 0.761x + 2.7
	Current, separate urban traffic map layer	4.3	19.3%	-0.1	0.776	y = 0.776x + 4.9
(J)	Joint rural-urban background layer	4.5	20.1%	-1.8	0.766	y = 0.751x + 3.8

Looking at the results, one can see that the current (C) mapping variant gives better results in terms of bias in the urban background areas, compared to the alternate (J) variant. In the urban traffic areas, the (J) variant gives somewhat better results compared to the merged urban map in the current (C) variant. However, be it noted that the results are related to the 1x1 km^2 resolution, in which the urban traffic areas (in both variants) are underestimated due to the spatial smoothing. The best results for the urban traffic areas are given by the urban traffic map layer, being an intermediate product of the current (C) variant. Note that the population exposure is currently calculated not based on the final merged 1x1 km^2 map, but based on separate map layers.

It can be summarized that the use of a joint urban background-traffic map layer (based both on urban/suburban background and urban/suburban traffic stations) instead of the current use of separate urban background and urban traffic map layers with their subsequent merge does not improve the mapping methodology. For future, if the urban traffic areas should be better represented in the final map, an increased resolution (e.g., 100x100 m^2 instead of the current 1x1 km^2) is recommended.

Additionally, we have examined an alternative adjustment of the urban traffic layer in areas where it shows lower results compared to the urban background map layer. The current (C) and the alternative (A) adjustment have been compared using the simple comparison with the measurement data. Table 5.5 shows the simple comparison between the point observation values and the prediction gridded values of the adjusted traffic map layer in two variants.

Table 5.5: Statistical indicators RMSE, RRMSE, bias, R^2 and regression equation from the scatter plots for the predicted grid values from urban traffic map layer in two variants versus the measurement point values for urban/suburban traffic stations for PM_{10} annual mean 2019. Units: μg.m^{-3} except for RRMSE and R^2.

PM_{10} Annual Average – Mapping variant		Urban/suburban traffic stations				
		RMSE	RRMSE	Bias	R^2	Regr. eq.
(C)	Urban traffic map layer, current adjustment	2.9	13.2%	0.0	0.881	y = 0.869x + 2.9
(A)	Urban traffic map layer, alternative adjustment	2.7	12.1%	-0.1	0.901	y = 0.869x + 2.8

The results show that the alternative adjustment (A) of the traffic map layer gives slightly better results compared to the current (C) adjustment in terms of RMSE. A potential inclusion of this improvement in the mapping methodology should be carefully evaluated in relation to increased computationally demandingness of the improved mapping procedure.

5.2.2 NO_2

Table 5.6 shows the cross-validation results of the NO_2 annual average mapping in the urban background and the urban traffic areas for two variants, i.e. the current (C) one and the alternate (J) one, in which the rural and the urban/suburban background stations are handled together.

Table 5.6: Comparison of two mapping variants showing RMSE, RRMSE, bias, R^2 and regression equation from cross-validation scatterplots in urban background (top) and urban traffic (bottom) areas for NO_2 annual mean 2019. Units: µg.m^{-3} except for RRMSE and R^2.

NO_2 Annual Average – Mapping variant		Urban background areas				
		RMSE	RRMSE	Bias	R^2	Regr. eq.
(C)	Current, merged separ. urban backgr. and urban traffic m. layers	5.0	26.7%	1.0	0.647	y = 0.688x + 6.8
(J)	Joint background-traffic urban layer	7.0	37.6%	4.1	0.632	y = 0.665x + 6.2
NO_2 Annual Average – Mapping variant		**Urban traffic areas**				
		RMSE	**RRMSE**	**Bias**	**R^2**	**Regr. eq.**
(C)	Current, merged separ. urban backgr. and urban traffic m. layers	7.7	24.6%	-1.3	0.519	y = 0.501x + 14.4
	Current, separate urban traffic map layer	7.6	24.2%	0.0	0.520	y = 0.530x + 14.7
(J)	Joint rural-urban background layer	9.5	30.4%	-5.2	0.473	y = 0.506x + 10.3

Looking at the results, one can see that the current (C) mapping variant gives better results in terms of bias both in the urban background and urban traffic areas, compared to the alternate (J) variant. In both mapping variants, the urban traffic areas are underestimated in the final 1x1 km^2 map. It can be stated that the (J) mapping variant does not improve the mapping methodology. For future, if the urban traffic areas should be better represented in the final map, an increased resolution (e.g., 100x100 m^2 instead of the current 1x1 km^2) is recommended.

Additionally, we have examined an alternative adjustment of the urban traffic layer in areas where it shows lower results compared to the urban background map layer. The current (C) and the alternative (A) adjustment have been compared using the simple comparison with the measurement data. Table 5.7 shows the simple comparison between the point observation values and the prediction gridded values of the adjusted traffic map layer in two variants.

Table 5.7: Statistical indicators RMSE, RRMSE, bias, R^2 and regression equation from the scatter plots for the predicted grid values from urban traffic map layer in two variants versus the measurement point values for urban/suburban traffic stations for NO_2 annual mean 2019. Units: µg.m^{-3} except for RRMSE and R^2.

NO_2 Annual Average – Mapping variant		Urban/suburban traffic stations				
		RMSE	RRMSE	Bias	R^2	Regr. eq.
(C)	Urban traffic map layer, current adjustment	5.3	17.0%	0.0	0.775	y = 0.674x + 10.2
(A)	Urban traffic map layer, alternative adjustment	5.3	17.0%	0.0	0.776	y = 0.675x + 10.2

One can see that the results of both current (C) and alternative adjustment of the urban traffic map layer are almost the same. The reason probably is that the areas where the urban traffic map layer shows lower concentration values compared to the urban background map layer are very limited in the case of NO_2. In any case, it can be stated that the alternative adjustment of the urban traffic map layer does not improve the mapping methodology in the case of NO_2.

6 Potential approaches for carrying out city-level mapping at the European scale

Under Section 5.2, an increased map resolution (e.g., 100x100 m^2 instead of the current 1x1 km^2) is recommended, if the urban traffic areas should be better represented in the final map. This Chapter 6 provides several possibilities of future development towards European-wide city level mapping at a fine spatial resolution. All these approached might be developed within the scope of the current RIMM mapping methodology.

6.1 Use of uEMEP model data

One of the overarching design principles of the RIMM methodology is that it is primarily based on observations. However, the method also makes use of model data from the EMEP model as a predictor variable in the regression. This model data is provided at a relatively coarse resolution, thus limiting the potential of the technique for high-resolution urban-scale mapping. One of the most promising approaches for city-level mapping at the European scale is therefore the use of high-resolution model output. The uEMEP (urban EMEP) model, recently developed at MET Norway (Denby et al., 2020), is currently being used to provide operational high-resolution (spatial resolution ranging from 250 m to 50 m for urban areas) hourly air quality forecasts for the area of Norway. In addition, the model can be used to calculate annual average concentrations of the main pollutants for all of Europe at a spatial resolution of ca. 250 m. See Figures 6.1 and 6.2 respectively for a map at the European scale as well an example of city-scale model output from uEMEP.

Given the recent availability of this spatially very detailed and comprehensive model information, it is recommended to explore the potential of using this data for extending the RIMM technique (Horálek et al., 2022) to the scale of individual cities and, if the initial results are promising, to eventually carry out such an analysis for all major cities in Europe. The adaption of the RIMM technique to the urban scale could potentially begin with the use of a similar residual kriging framework as currently in use for the regional scale, however it seems likely that at least for pollutants with substantial spatial gradients such as nitrogen dioxide, the method will have to be modified to include also information on the spatial representativity of each observation site. This can for example be directly accomplished with a method like Optimal Interpolation (OI), which is conceptually identical to residual kriging but which has the advantage that the background/model error covariance can be directly designed independently for each observation site. Using such an approach would for example limit the effect of traffic sites to the nearby road network, whereas urban background sites similarly would only correct urban background areas.

For completeness, it should be noted that the uEMEP model is under continuous development. It is not clear yet to what extent annual average concentration maps will be produced on a routine basis. It should further be mentioned that at this point the uEMEP model results for nitrogen dioxide are of significantly higher accuracy than those for particulate matter.

Figure 6.1: Annual average NO_2 concentration for the year 2018 from the uEMEP model

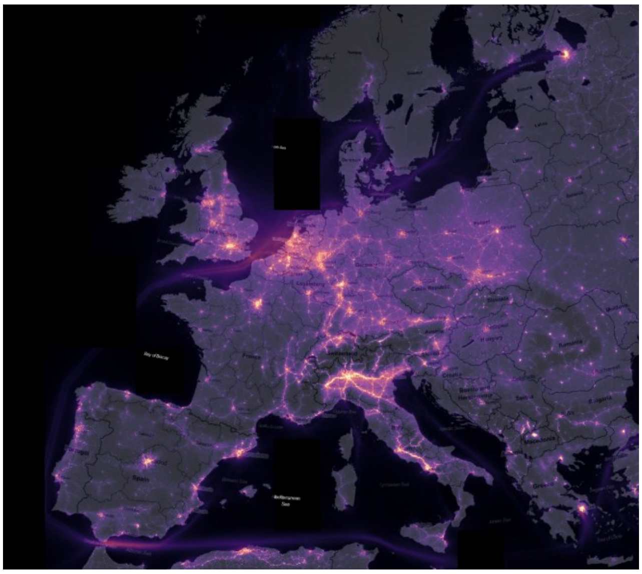


Figure 6.2: Same as Figure 1 but zoomed in to only show the output for the greater Paris area as an example of the spatial detail available in uEMEP for a large metropolitan area

6.2 Geostatistical downscaling

Another potential approach for city-level mapping would be to use the existing output from the operational RIMM mapping and to apply statistical downscaling techniques. Such techniques increase the spatial resolution of an existing dataset by exploiting the additional information from a complementary proxy dataset that is in some way correlated with the coarse resolution dataset. One such method has been recently developed at NILU within the SAMIRA project funded by the European Space Agency (Stebel et al., 2021). The method uses a combination of (multi)linear regression and geostatistical area-to-point kriging to exploit the spatial patterns of the fine-resolution proxy dataset and provides a robust way of adding spatial detail to the coarse-resolution input dataset while keeping the overall levels the same as in the coarse-resolution input dataset (i.e. the method is mass conservative, which can be demonstrated by re-aggregating the downscaled output). Figure 6.3 provides an overview of the general concept and Figure 6.4 shows an example of downscaling a satellite-derived surface NO_2 dataset over the city of Oslo, Norway. While this example shows only a relatively modest increase in spatial resolution to 1000 m, the method is capable of scaling coarse-resolution input such as the current RIMM-based maps to very high spatial resolutions of 50 m or better depending on the spatial resolution of the available proxy dataset.

Figure 6.3: Concept of the geostatistical downscaling methodology developed within the SAMIRA project (Stebel et al., 2021).

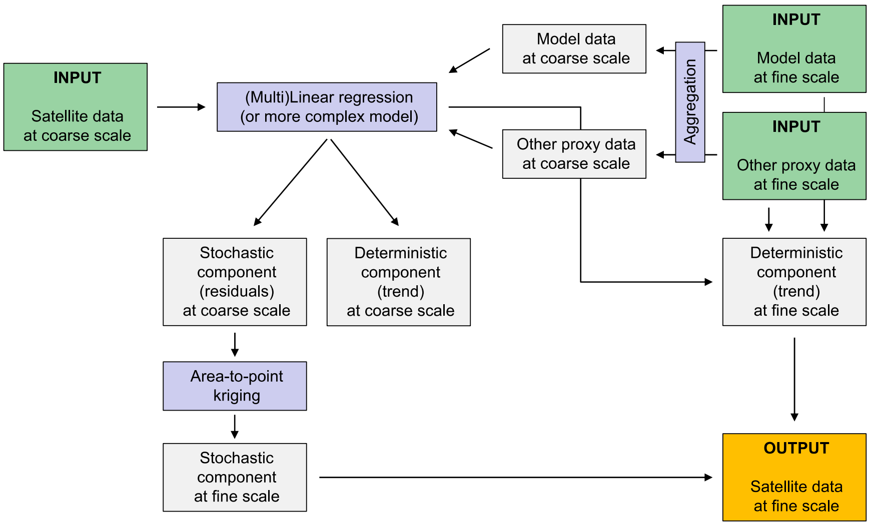
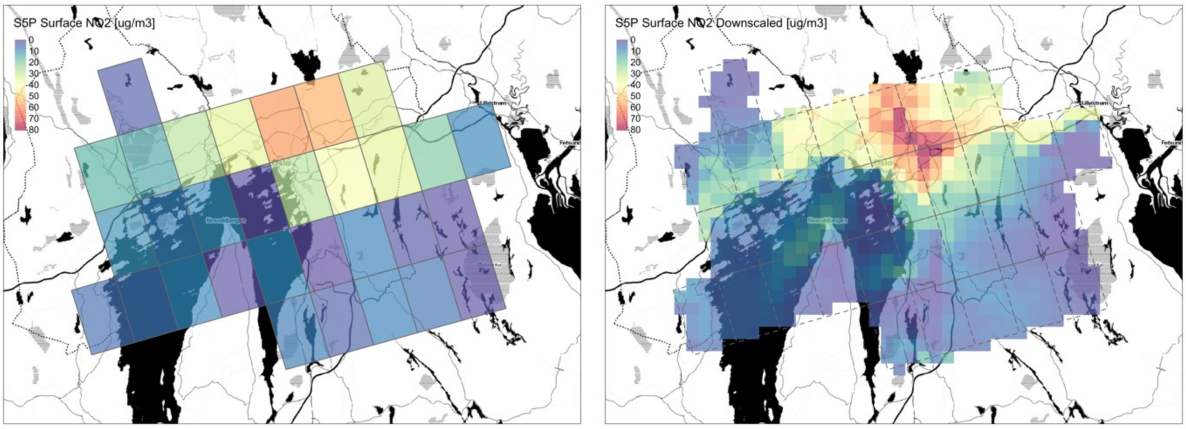
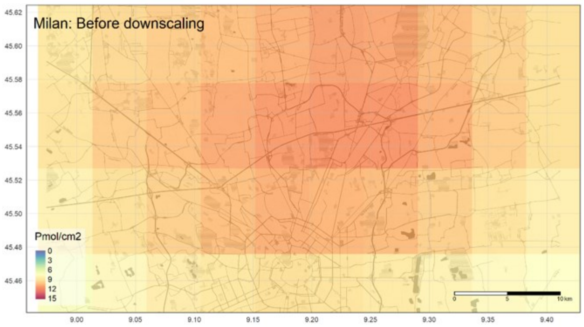


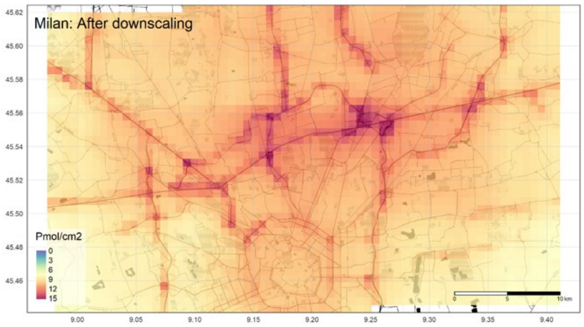
Figure 6.4: Example demonstrating the effect of geostatistically downscaling a coarse-resolution input dataset. The left panel shows a surface NO_2 map over Oslo, Norway, derived from the Sentinel-5P satellite instrument and the right panel shows the outcome of applying the geostatistical downscaling algorithm.



In addition, Figure 6.5 shows an example of geostatistical downscaling of coarse-resolution satellite-based NO_2 to scales relevant for calculating human exposure (demonstrated for the city of Milan, Italy).

Figure 6.5: Geostatistical downscaling of satellite-based NO_2 data over a city centre, here for downtown Milan, Italy.



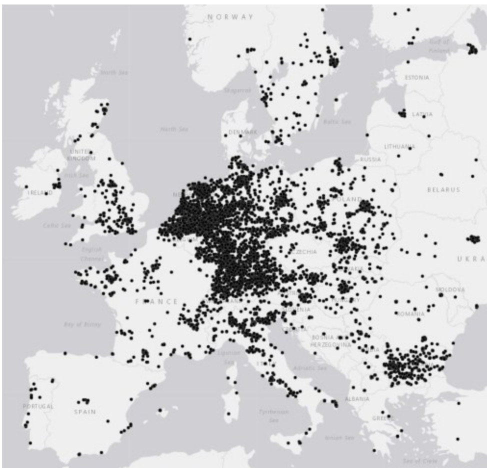


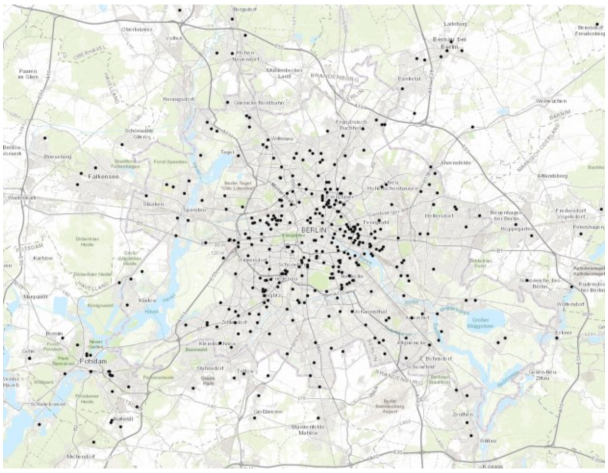
6.3 Low-cost sensor networks for urban air quality mapping

Finally, networks of low-cost air quality sensors could play a substantial role in moving towards city-level air quality mapping. While air quality models such as uEMEP are starting to provide information at the scale of individual streets, observational data sources which are the cornerstone of the RIMM methodology are spatially comparatively sparse when thinking of the perspective of individual cities. Typically, most medium-size and large cities in Europe have from a few to on the order of 10-20 monitoring stations. This is typically not enough observational information to provide data for all neighborhoods and certainly not for the majority of streets.

Networks of low-cost air quality sensors have the potential to fill in this gap as they can provide many dozens to many hundreds of data points within a city. One example of a very active low-cost sensor network in Europe is sensor.community (https://sensor.community/en/), which deploys currently about 14,000 particle sensors throughout all of Europe (see Figure 6.6). Exploiting this kind of information would be very valuable for potential city-level mapping within the ETC mapping task as long as proper QA/QC procedures (calibration and outlier removal) are applied to the sensor data. However, it should be noted that at this point such substantial low-cost sensor networks only exist for particulate matter. For gases such as nitrogen dioxide, typically electro-chemical sensors are used and they require significantly more expertise for proper calibration and operation. As a result, no Europe-wide low-cost sensor networks for gases are available, although various initiatives from individual projects exist in multiple cities (e.g. Oslo, Antwerp).

Figure 6.6: Spatial distribution of active sensors (N = 14,083) in the sensor.community particle sensor network in all of Europe (left panel) and in Berlin, Germany, as an example of a large city in Europe (right panel) (data as of December 2020).





6.4 Other potential approaches

The easiest simple way forward concerning the European-wide city level mapping probably is to construct maps for cities (e.g. for cities of the Urban audit) in 100x100 m^2 resolution, based on the current RIMM methodology. Currently, the maps are prepared in 1x1 km^2 only, although the merge of the urban background and the urban traffic map layers is performed based on buffers around the roads, which enables merge in a finer resolution. This might be done for pollutants, for which the urban map traffic layer is used in mapping, i.e., for PM_{10}, $PM_{2.5}$ and NO_2. Such a map production in a more fine resolution would be in better agreement with the population exposure, which is currently calculated in fact in a finer than 1x1 km^2 resolution, using the buffers around the roads.

Another option might be to follow some recommendation of Horálek et al. (2018), e.g. to use land cover data in 100x100 m^2 resolution as a proxy or to couple kernel method with the RIMM mapping.

7 Conclusions and recommendations

The report examines city-level mapping at the European scale, with the aim to be able to provide consistent spatial information at NUTS3 and city levels across Europe in future. Among others, this would enable to introduce an improvement of the current city ranking.

The current mapping methodology has been evaluated with respect to city- and NUTS3-levels mapping. For the cities of the City Audit and for the NUTS3 units, a comparison between the measurements and the mapping data has been carried out. Based on the results of the city level analysis, it can be stated that the current mapping can be used at the city level across Europe, for all examined pollutants (i.e., PM_{10}, $PM_{2.5}$, NO_2 and ozone), despite a slight positive bias in the urban background areas for PM and ozone and a mild smoothing effect at locations of the measurement stations. If the agreement of the predicted and observed values should be improved, a potential methodological adaption might be applied, i.e., a post-processing correction based on the kriging residuals, namely by interpolating them by some exact interpolator, which respects the measurement values. However, this would probably lead to the worsening of the cross-validation uncertainty for the whole interpolation.

Additionally, we have calculated the population-weighted concentration for individual cities as a potential new approach for the city ranking. We have compared this indicator with the average of the stations located in the relevant city in two variants (i.e., for all urban/suburban stations without regard on their type and for the urban/suburban background stations only, which is a similar approach to the current city ranking for $PM_{2.5}$). Based on the analysis, it seems that while the averaged measurement data from the background stations provides a superior information for the whole city in general (when the measurement error is neglected), the population-weighted concentration also fairly well represents the whole city (albeit a certain smoothing effect of the interpolation) and gives a consistent information for all cities, including those without station measurements. Thus, this indicator can be recommended for further evaluation for the city ranking index (preferably in a combination with the current approach based on the averaged measurement data from the background stations in cities with at least one background measurement station).

Apart from this, potential improvements of the mapping methodology have been examined. At first, the alternative mapping variant using the joint rural-urban background map layer created based on all background stations instead of the current variant using the merge of the rural and the urban background map layers has been compared with the current variant. It has been concluded that this alternative mapping variant does not improve the mapping methodology. However, in the cases of PM_{10} and NO_2 (not ozone), this variant might be considered for applying in the urban background areas, specifically for the purposes of the city level mapping. Further testing might take place. Next to this, an alternative treatment of the background and traffic stations in the urban areas have been examined. The alternative mapping variant using the joint urban background-traffic map layer created based on all urban/suburban stations has been examined, however no improvement in the mapping has been found. In addition, an alternative adjustment of the urban traffic map layer has been examined. It has been found that it slightly improves PM_{10} (not NO_2) mapping. A potential application of this slight improvement should be evaluated in relation to increased demandingness of the improved mapping procedure. In any case, urban traffic areas are underestimated in the final 1x1 km^2 maps. For future, if the urban traffic areas should be better represented in the final maps, an increased map resolution (e.g., 100x100 m^2 instead of the current 1x1 km^2) is recommended.

Several possibilities of future development towards the European-wide city level mapping in a fine resolution have been suggested. This includes a) applying the existing methodology but exploiting a high-resolution model output (e.g. from the uEMEP model), b) downscaling of the existing spatial maps using a geostatistical downscaling technique in combination with fine-resolution proxy datasets, and c) the exploitation of existing low-cost sensor networks for providing additional information within a city in areas that is not adequately covered by traditional air quality stations.

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Annex 1
Numerical results for Cities of the Urban Audit

Table A.1 gives the numerical results for Cities for PM_{10} and $PM_{2.5}$, while Table A.2 for NO_2 and O_3.

Table A.1: Total population in thousands of inhabitants (POP), estimated population-weighted concentration in µg·m^{-3} (PWC), number of urban/suburban background (NB) and traffic (NT) stations, average of annual concentrations measured at these background and traffic stations (CSB, CST), averages of annual concentrations estimated at the underlying grid cells of urban background and urban traffic map layers (CMB, CMT) in cities of the Urban Audit for PM_{10} annual average 2019 (left) and $PM_{2.5}$ annual average 2019 (right)

URAU Code	Name of City	POP	PM_{10}							$PM_{2.5}$						
			PWC	NB	CSB	CMB	NT	CST	CMT	**PWC**	NB	CSB	CMB	NT	CST	CMT
AT001C1	**Wien**	**1 741**	**18.8**	11	17.4	18.3	2	19.6	21.1	**13.1**	11	12.3	12.7	2	13.4	14.5
AT002C1	**Graz**	**275**	**23.8**	5	19.1	24.5	2	23.8	25.4	**16.2**	2	14.0	17.2	1	18.4	17.5
AT003C1	**Linz**	**208**	**19.1**	1	17.7	17.1	1	21.0	19.9	**13.7**	1	12.5	12.2	1	15.0	13.4
AT004C1	**Salzburg**	**158**	**19.4**	2	14.5	20.2	1	18.4	20.6	**13.7**	1	9.3	14.3	1	10.3	13.5
AT005C1	**Innsbruck**	**130**	**16.1**	2	14.1	15.9				**11.5**	1	9.0	11.2			
AT006C1	**Klagenfurt**	**100**	**21.5**	1	15.7	22.4	1	20.0	23.7	**14.9**	1	8.5	15.0	1	11.5	16.1
BE001K1	**Bruxelles / Brussel (gr. city)**	**1 192**	**18.8**	3	16.8	18.3	1	16.0	19.4	**11.4**	3	11.1	11.2			
BE002C1	**Antwerpen**	**544**	**22.4**	3	23.0	22.4	2	26.2	24.0	**12.9**	3	12.6	12.8	2	14.0	13.6
BE003C1	**Gent**	**277**	**21.7**	1	25.5	22.0	1	21.9	21.9	**12.9**	2	13.6	13.0	1	12.6	12.9
BE004K1	**Charleroi (greater city)**	**258**	**17.4**	4	17.4	17.3				**10.0**	4	9.9	10.0			
BE005K1	**Liege (greater city)**	**429**	**16.0**	4	16.2	15.9				**8.8**	4	8.4	8.7			
BE006C1	**Brugge**	**128**	**20.7**							**12.4**	1	12.4	12.5			
BE007C1	**Namur**	**116**	**16.5**	1	18.0	16.7				**9.3**	1	9.4	9.3			
BE008C1	**Leuven**	**114**	**18.4**							**11.0**						
BE009K1	**Mons (greater city)**	**167**	**18.3**	1	20.1	18.7				**10.9**	1	10.5	11.1			
BE010C1	**Kortrijk**	**89**	**20.2**							**12.6**						
BE011C1	**Oostende**	**80**	**20.8**							**11.8**						
BE012C1	**Mechelen**	**102**	**20.1**							**12.0**						
BE013C1	**Mouscron**	**41**	**19.8**							**12.4**						
BE014K1	**La Louvière (greater city)**	**110**	**17.6**							**10.3**						
BE015K1	**Verviers (greater city)**	**77**	**13.8**							**7.8**						
BG001C1	**Sofia**	**1 297**	**35.7**	5	27.8	29.0	2	30.7	36.8	**23.6**	1	8.9				
BG002C1	**Plovdiv**	**338**	**36.8**	1	35.8	37.0	1	44.7	38.1	**23.1**	1	19.0	23.2			
BG003C1	**Varna**	**345**	**25.9**	2	27.4	26.1				**17.4**	1	18.5	17.7			
BG004C1	**Burgas**	**213**	**25.4**	2	22.9	25.7				**16.2**						
BG005C1	**Pleven**	**132**	**30.2**	1	36.3	31.1				**21.1**						
BG006C1	**Ruse**	**168**	**28.0**	1	36.0	28.8				**18.2**	1	20.1	18.7			
BG007C1	**Vidin**	**68**	**36.4**	1	41.3	38.8				**25.0**						
BG008C1	**Stara Zagora**	**161**	**26.6**				1	20.9	27.9	**18.2**	1	20.9	19.1			
BG009C1	**Sliven**	**126**	**23.7**	1	17.8	24.8				**15.6**						
BG010C1	**Dobrich**	**91**	**24.3**	1	26.3	24.3				**16.7**						
BG011C1	**Shumen**	**94**	**27.0**	1	29.5	28.4				**18.3**						
BG012C1	**Pernik**	**97**	**28.3**	2	31.1	28.1				**18.8**						
BG013C1	**Yambol**	**75**	**25.4**							**15.8**						
BG014C1	**Haskovo**	**95**	**29.4**	1	29.0	31.2				**18.7**						
BG015C1	**Pazardzhik**	**116**	**30.0**	1	33.7	32.5				**19.8**						
BG016C1	**Blagoevgrad**	**78**	**26.2**	1	30.0	29.0				**17.2**						
BG017C1	**Veliko Tarnovo**	**89**	**26.9**	1	31.3	28.4				**18.8**	1	22.9	19.8			
BG018C1	**Vratsa**	**74**	**29.5**	1	29.3	31.0				**19.7**						
CH001C1	**Zurich**	**414**	**14.9**	1	13.6	26.0	3	15.7	29.8	**10.0**	1	9.5	9.9			
CH002C1	**Geneva**	**244**	**17.2**	1	16.1	22.9				**10.6**						
CH003C1	**Basel**	**190**	**14.7**	1	15.2	22.5				**9.9**						

URAU Code	Name of City	POP	PM$_{10}$							PM$_{2.5}$						
			PWC	NB	CSB	CMB	NT	CST	CMT	**PWC**	NB	CSB	CMB	NT	CST	CMT
CH004C1	**Bern**	**176**	**14.7**	1	12.6	25.2	1	18.7	32.3	**9.5**				1	11.3	11.2
CH005C1	**Lausanne**	**180**	**14.3**	1	11.8	24.7	1	14.3	29.0	**9.0**						
CH006C1	**Winterthur**	**116**	**13.3**	1	12.5	20.3				**9.0**						
CH007C1	**St. Gallen**	**83**	**12.7**				1	13.0	28.0	**8.6**						
CH008C1	**Lucerne**	**102**	**14.3**				1	15.3	22.8	**9.7**						
CH009C2	**Lugano**	**86**	**17.3**	2	15.4	18.6				**11.4**	1	9.8	11.3			
CH010C1	**Biel/Bienne**	**60**	**13.4**							**8.7**						
CH011C1	**Thun**	**53**	**13.4**							**8.9**						
CH012C1	**Zug**	**38**	**13.0**							**8.9**						
CY001C1	**Lefkosia**	**268**	**27.6**				1	33.3	16.2	**14.7**	1	13.5	13.9			
CY002K1	**Greater Larnaka**	**78**	**27.9**							**15.9**						
CY501C1	**Lemesos**	**191**	**29.2**	1	26.0	14.9				**15.3**	1	13.3	14.9			
CZ001C1	**Praha**	**1 291**	**19.9**	8	19.0	16.3	5	24.6	18.0	**13.9**	3	12.9	13.9	1	17.3	15.6
CZ002C1	**Brno**	**396**	**21.3**	5	20.4	14.5	3	25.3	16.5	**15.7**	4	15.8	15.5	2	18.0	16.2
CZ003C1	**Ostrava**	**310**	**27.7**	3	25.1	14.5	1	30.9	13.6	**20.9**	2	18.5	20.6	1	22.5	22.9
CZ004C1	**Plzeň**	**175**	**18.5**	2	17.0	13.9	2	19.4	16.0	**13.0**	2	11.3	12.8	2	13.9	13.9
CZ005C1	**Ústí nad Labem**	**96**	**20.8**	2	19.5	13.5	1	23.7	37.4	**14.7**	1	11.4	14.8	1	16.2	14.9
CZ006C1	**Olomouc**	**111**	**23.6**	1	25.6	10.2				**17.2**	1	17.8	17.4			
CZ007C1	**Liberec**	**108**	**19.8**	1	16.8	17.1				**14.1**	1	12.5	14.2			
CZ008C1	**České Budějovice**	**101**	**16.7**	1	16.3	28.4				**12.3**	1	12.8	12.6			
CZ009C1	**Hradec Králové**	**97**	**20.6**	1	20.1	19.6	1	20.3	24.2	**15.0**	1	14.4	15.5	1	15.5	14.6
CZ010C1	**Pardubice**	**96**	**20.4**	1	20.4	20.8				**14.9**	1	14.8	15.0			
CZ011C1	**Zlín**	**80**	**22.2**	2	22.8	27.7				**16.6**	2	17.6	16.9			
CZ012C1	**Kladno**	**75**	**18.8**	2	21.2	18.4				**12.9**	1	12.0	13.0			
CZ013C1	**Karlovy Vary**	**51**	**15.8**	1	15.6	21.2				**10.9**						
CZ014C1	**Jihlava**	**53**	**17.5**	1	17.4	23.9				**13.0**	1	13.9	13.4			
CZ015C1	**Havířov**	**80**	**26.8**	1	27.8	19.9				**19.9**	1	20.3	20.2			
CZ016C1	**Most**	**66**	**20.7**	1	23.6	16.9				**13.8**	1	15.1	14.3			
CZ017C1	**Karviná**	**61**	**29.7**	1	28.7	21.3				**21.8**	1	20.9	22.1			
CZ018C2	**Chomutov-Jirkov**	**70**	**18.7**	1	19.3	20.5				**12.7**						
DE001C1	**Berlin**	**3 374**	**18.5**	6	17.4	22.4	5	22.2	24.5	**12.4**	3	13.1	12.6	1	15.7	13.4
DE002C1	**Hamburg**	**1 779**	**18.1**	5	18.3	18.9	3	20.7	30.9	**11.4**	3	10.5	11.3	2	12.6	12.4
DE003C1	**München**	**1 399**	**15.1**	2	14.4	15.9	2	21.5	20.0	**10.1**	2	9.8	10.2	2	11.6	11.6
DE004C1	**Köln**	**1 027**	**16.7**	1	16.2	17.8	2	20.2	22.2	**10.7**				1	12.7	12.7
DE005C1	**Frankfurt am Main**	**720**	**18.0**	3	17.7	27.3	1	21.6	20.9	**11.4**	2	10.1	11.1	1	12.8	12.5
DE006C1	**Essen**	**584**	**16.6**	1	20.0	21.2	2	19.6	21.8	**11.0**	2	10.9	11.1			
DE007C1	**Stuttgart**	**618**	**16.8**	1	15.3	30.1	3	23.8	20.8	**10.6**	1	10.0	10.5	2	12.2	12.8
DE008C1	**Leipzig**	**524**	**16.1**	1	14.1	19.5	2	21.2	20.0	**10.5**	1	9.4	10.3	1	11.7	11.5
DE009C1	**Dresden**	**547**	**16.3**	1	14.9	17.2	2	18.2	20.5	**11.0**	1	10.3	11.1	2	11.3	11.9
DE010C1	**Dortmund**	**600**	**16.0**				2	19.9	20.7	**10.7**	1	11.6	10.7			
DE011C1	**Düsseldorf**	**617**	**16.8**	1	14.4	18.0	1	22.8	20.3	**11.0**	1	10.5	11.2	1	14.8	13.1
DE012C1	**Bremen**	**576**	**17.2**	4	16.9	14.9	1	22.0	23.0	**11.2**	1	10.8	10.9			
DE013C1	**Hannover**	**563**	**15.0**	1	14.0	15.3	1	18.1	19.9	**9.9**	1	9.3	9.7	1	9.7	10.6
DE014C1	**Nürnberg**	**502**	**16.5**				1	21.6	18.9	**11.0**	1	11.5	11.2	1	11.1	11.9
DE015C1	**Bochum**	**377**	**16.1**							**10.7**						
DE017C1	**Bielefeld**	**344**	**15.2**				2	19.8	20.7	**9.8**						
DE018C1	**Halle an der Saale**	**235**	**15.8**	1	16.2	17.3	1	22.5	21.5	**10.6**	1	11.0	10.6	1	12.2	11.5
DE019C1	**Magdeburg**	**231**	**16.0**	1	15.4	17.2	2	20.0	20.7	**10.6**	1	10.9	10.6	1	10.3	11.3
DE020C1	**Wiesbaden**	**285**	**16.5**	1	14.6	16.2	2	16.0	18.5	**10.8**	1	9.5	10.9	2	10.3	11.2
DE021C1	**Göttingen**	**122**	**14.7**	1	12.0	15.9	1	19.3	19.8	**9.4**	1	8.0	9.3	1	11.1	11.2
DE022C1	**Mülheim a.d.Ruhr**	**169**	**17.1**	1	16.3	16.4				**11.1**						
DE023C1	**Moers**	**112**	**16.7**							**11.1**						
DE025C1	**Darmstadt**	**163**	**15.9**	1	14.1	16.8	1	16.1	19.6	**10.2**	1	8.5	10.0	1	9.5	11.1
DE026C1	**Trier**	**119**	**14.2**				1	16.4	20.2	**8.5**						
DE027C1	**Freiburg im Breisgau**	**225**	**12.6**	1	12.9	17.1	1	15.3	20.0	**8.3**	1	8.3	8.1	1	9.0	8.6
DE028C1	**Regensburg**	**155**	**15.9**				1	19.6	18.4	**10.9**						

URAU Code	Name of City	POP	PM10							PM2.5						
			PWC	NB	CSB	CMB	NT	CST	CMT	**PWC**	NB	CSB	CMB	NT	CST	CMT
DE029C1	**Frankfurt (Oder)**	**64**	**18.3**	1	16.9	14.7	1	19.1	19.0	**12.7**	1	11.6	12.9	1	12.3	12.9
DE030C1	**Weimar**	**67**	**13.9**	1	13.4	15.6	1	15.6	18.3	**9.3**	1	9.1	9.3	1	10.3	10.1
DE031C1	**Schwerin**	**97**	**16.1**				1	18.0	17.0	**10.5**				1	11.6	11.4
DE032C1	**Erfurt**	**204**	**14.1**	2	13.2	15.8	2	17.0	14.5	**9.4**	2	8.9	9.3	2	10.1	10.2
DE033C1	**Augsburg**	**302**	**14.9**	2	14.8	16.7	2	20.0	18.2	**10.4**	2	10.5	10.3			
DE034C1	**Bonn**	**341**	**15.6**	1	15.2	14.5				**10.2**						
DE035C1	**Karlsruhe**	**315**	**16.2**	1	14.7	17.2	1	16.3	19.7	**10.7**	1	9.9	11.0	1	11.1	12.7
DE036C1	**Mönchengladbach**	**268**	**16.0**	1	16.9	15.7	1	20.9	16.4	**10.4**	1	10.7	10.2			
DE037C1	**Mainz**	**206**	**16.3**	2	17.3	12.2	1	21.9	18.8	**10.6**	1	11.5	10.5	1	11.1	11.3
DE039C1	**Kiel**	**265**	**17.1**	1	15.8	18.5	1	21.7	16.9	**10.9**				1	12.2	11.8
DE040C1	**Saarbrücken**	**197**	**15.3**	2	14.6	13.8	1	18.9	19.4	**10.1**	1	10.2	10.2			
DE041C1	**Potsdam**	**166**	**16.3**	2	16.0	13.8	2	19.4	19.7	**10.9**	2	10.3	11.0	2	11.8	11.6
DE042C1	**Koblenz**	**126**	**15.9**				1	17.6	19.9	**10.6**				1	10.9	10.9
DE043C1	**Rostock**	**208**	**16.7**	1	16.3	14.7	2	21.0	18.9	**10.9**	1	10.6	10.7	2	12.4	11.9
DE044C1	**Kaiserslautern**	**99**	**14.4**	1	14.8	15.6				**9.7**	1	10.3	9.8			
DE045C1	**Iserlohn**	**102**	**14.0**							**9.5**						
DE046C1	**Esslingen am Neckar**	**103**	**16.3**				1	23.1	20.9	**10.5**						
DE047C1	**Hanau**	**100**	**16.7**	1	16.3	16.7				**10.7**						
DE048C1	**Wilhelmshaven**	**80**	**17.0**							**10.6**						
DE049C1	**Ludwigsburg**	**97**	**16.5**	1	14.9	16.3	1	22.8	18.9	**10.5**						
DE050C1	**Tübingen**	**89**	**14.1**	1	14.7	16.9	1	22.1	19.4	**9.4**	1	9.7	9.3			
DE051C1	**Villingen-Schwenningen**	**86**	**11.8**	1	12.1	15.4				**7.8**						
DE052C1	**Flensburg**	**90**	**16.9**				1	19.0	18.3	**10.6**				1	11.0	11.1
DE053C1	**Marburg**	**77**	**15.5**	1	15.7	16.3	1	15.6	20.1	**10.5**				1	10.2	10.8
DE054C1	**Konstanz**	**79**	**13.6**	1	14.0	16.5				**9.4**	1	9.6	9.4			
DE055C1	**Neumünster**	**81**	**17.1**							**11.0**						
DE056C1	**Brandenburg an der Havel**	**75**	**15.6**	1	15.7	14.3	1	19.7	22.7	**10.5**	1	10.8	10.6	1	11.4	11.3
DE057C1	**Gießen**	**86**	**16.8**				1	17.0	23.4	**11.2**				1	10.9	11.4
DE058C1	**Lüneburg**	**82**	**15.1**	1	14.6	16.6				**9.9**						
DE059C1	**Bayreuth**	**75**	**15.2**				1	16.6	20.1	**10.5**						
DE060C1	**Celle**	**70**	**14.2**							**9.4**						
DE061C1	**Aschaffenburg**	**83**	**15.6**							**10.1**	1	10.0	10.1			
DE062C1	**Bamberg**	**79**	**15.1**	1	15.0	15.9				**10.3**	1	10.3	10.3			
DE063C1	**Plauen**	**67**	**14.4**				1	14.4	19.9	**10.0**						
DE064C1	**Neubrandenburg**	**66**	**16.0**				2	17.7	17.1	**10.6**				1	12.3	11.4
DE065C1	**Fulda**	**84**	**15.3**	1	15.2	16.1	1	18.8	19.4	**10.1**				1	11.9	11.0
DE066C1	**Kempten (Allgäu)**	**71**	**11.9**							**8.3**	1	8.8	8.5			
DE067C1	**Landshut**	**74**	**15.0**				1	15.7	18.1	**10.5**						
DE068C1	**Sindelfingen**	**70**	**14.9**							**9.6**						
DE069C1	**Rosenheim**	**64**	**13.9**							**10.0**						
DE070C1	**Frankenthal (Pfalz)**	**55**	**16.0**							**10.7**						
DE071C1	**Stralsund**	**58**	**16.3**				1	17.9	16.7	**10.3**				1	11.5	11.4
DE072C1	**Friedrichshafen**	**60**	**14.0**	1	14.2	13.9				**9.6**						
DE073C1	**Offenburg**	**64**	**14.4**							**9.5**						
DE074C1	**Görlitz**	**63**	**21.1**				1	18.4	15.6	**14.6**						
DE075C1	**Sankt Augustin**	**67**	**15.7**							**10.3**						
DE076C1	**Neu-Ulm**	**58**	**15.4**	1	16.1	11.4				**10.5**	1	10.7	10.4			
DE077C1	**Schweinfurt**	**64**	**16.1**	1	17.2	15.6				**10.6**						
DE078C1	**Greifswald**	**56**	**16.1**							**10.5**						
DE079C1	**Wetzlar**	**58**	**16.3**	1	18.1	13.6				**11.0**						
DE080C1	**Speyer**	**60**	**16.3**							**10.9**	1	11.6	10.9			
DE081C1	**Passau**	**50**	**16.2**	1	18.1	15.7				**11.4**	1	12.4	11.6			
DE082C1	**Dessau-Roßlau**	**88**	**15.7**				1	16.4	18.2	**10.5**						
DE501C1	**Duisburg**	**495**	**18.4**	1	18.6	15.1	1	19.4	18.0	**12.1**						
DE502C1	**Mannheim**	**303**	**16.7**				1	20.2	17.1	**10.9**				1	12.3	12.1
DE503C1	**Gelsenkirchen**	**281**	**17.2**				2	23.1	18.7	**11.5**	1	13.9	11.5			

URAU Code	Name of City	POP	PM10							PM2.5						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
DE504C1	**Münster**	**291**	**16.3**	1	16.4	15.0	1	20.2	21.2	**10.7**						
DE505C1	**Chemnitz**	**249**	**14.9**	1	12.5	15.4	1	17.6	18.8	**9.9**				1	10.6	10.8
DE506C1	**Braunschweig**	**250**	**14.7**	1	12.7	14.1	1	17.2	22.2	**9.6**				1	9.7	10.6
DE507C1	**Aachen**	**251**	**14.3**	1	12.0	15.4	1	20.2	19.9	**8.4**						
DE508C1	**Krefeld**	**229**	**16.4**	1	14.3	16.1				**10.9**						
DE509C1	**Oberhausen**	**211**	**17.4**				1	21.9	21.3	**11.5**						
DE510C1	**Lübeck**	**237**	**16.9**	1	15.9	16.4	1	20.2	20.3	**10.8**	1	10.0	10.9			
DE511C1	**Hagen**	**199**	**14.9**				1	23.7	17.4	**10.0**						
DE513C1	**Kassel**	**209**	**15.3**	1	15.6	16.4	1	21.5	18.2	**10.0**	1	9.7	9.9			
DE514C1	**Hamm**	**182**	**15.5**							**10.3**						
DE515C1	**Herne**	**158**	**17.0**							**11.2**						
DE516C1	**Solingen**	**177**	**15.3**	1	13.7	18.7	1	19.0	18.4	**10.0**						
DE517C1	**Osnabrück**	**176**	**15.8**	1	14.7	16.2	1	20.2	21.1	**10.2**	1	9.3	10.2	1	11.4	11.6
DE518C1	**Ludwigshafen am Rhein**	**163**	**16.6**	1	17.7	14.6	1	20.8	20.2	**11.0**				1	11.9	12.1
DE519C1	**Leverkusen**	**167**	**15.7**	1	13.3	14.4				**10.3**				1	11.6	12.0
DE520C1	**Oldenburg (Oldenburg)**	**169**	**17.0**				1	18.4	20.0	**10.8**				1	11.3	11.3
DE521C1	**Neuss**	**156**	**16.2**	1	19.3	13.8				**10.7**						
DE522C1	**Heidelberg**	**172**	**15.6**	1	14.7	16.4				**10.3**						
DE523C1	**Paderborn**	**145**	**14.8**							**9.6**						
DE524C1	**Würzburg**	**146**	**15.6**	1	15.3	16.9	1	19.9	19.6	**10.1**	1	9.4	9.8			
DE525C1	**Recklinghausen**	**127**	**16.7**							**11.1**						
DE526C1	**Wolfsburg**	**124**	**14.5**	1	13.6	15.0	1	16.7	19.8	**9.5**						
DE527C1	**Bremerhaven**	**117**	**17.1**	1	16.8	15.1	1	19.6	20.2	**11.0**	1	11.1	11.0			
DE528C1	**Bottrop**	**118**	**17.9**							**11.9**						
DE529C1	**Heilbronn**	**123**	**16.7**	1	18.4	15.6	1	22.5	19.9	**10.6**	1	10.9	10.4	1	12.4	12.6
DE530C1	**Remscheid**	**112**	**14.7**							**9.7**						
DE531C1	**Offenbach am Main**	**127**	**17.1**				1	21.8	19.8	**10.8**						
DE532C1	**Ulm**	**126**	**15.4**	1	15.2	16.9				**10.3**	1	10.2	10.3			
DE533C1	**Pforzheim**	**130**	**13.7**	1	14.5	15.8				**8.8**	1	9.2	8.3			
DE534C1	**Ingolstadt**	**133**	**15.5**				1	16.5	19.1	**10.8**				1	10.7	11.6
DE535C1	**Gera**	**100**	**14.7**	1	15.4	16.5				**10.0**						
DE536C1	**Salzgitter**	**105**	**13.9**							**9.3**						
DE537C1	**Reutlingen**	**121**	**14.0**	1	13.9	15.5	1	20.9	17.9	**9.2**				1	11.2	10.3
DE538C1	**Fürth**	**119**	**15.9**				1	17.3	19.9	**10.8**						
DE539C1	**Cottbus**	**101**	**17.3**	1	16.3	15.1	1	17.8	21.8	**11.6**	1	11.1	11.6	1	12.8	12.1
DE540C1	**Siegen**	**109**	**14.5**							**9.8**						
DE541C1	**Bergisch Gladbach**	**121**	**14.9**							**9.9**						
DE542C1	**Hildesheim**	**105**	**14.3**				1	17.2	19.9	**9.3**				1	9.8	10.4
DE543C1	**Witten**	**105**	**15.6**							**10.4**						
DE544C1	**Zwickau**	**106**	**14.9**				1	16.6	18.3	**10.1**						
DE545C1	**Erlangen**	**112**	**15.8**							**10.7**						
DE546C1	**Wuppertal**	**355**	**15.4**	1	16.0	14.5	1	19.3	18.7	**10.0**	1	9.6	9.8			
DE547C1	**Jena**	**107**	**14.3**	1	14.1	17.0				**9.6**						
DE548C1	**Düren, Stadt**	**99**	**14.1**							**8.6**						
DE549C1	**Bocholt, Stadt**	**73**	**16.9**							**11.1**						
DK001C1	**København**	**668**	**16.3**	1	16.5	16.4	2	23.4	18.5	**9.8**	1	10.9	9.8	2	12.5	11.2
DK002C1	**Århus**	**312**	**16.6**				1	19.4	18.4	**9.5**	1	9.4	9.5	1	11.7	11.1
DK003C1	**Odense**	**193**	**17.0**				1	20.3	17.9	**10.3**						
DK004C2	**Aalborg**	**200**	**16.5**							**8.9**	1	9.6	9.7			
EE001C1	**Tallinn**	**405**	**12.2**	1	9.9	15.2	1	17.5	16.5	**6.3**	1	4.6	5.5			
EE002C2	**Tartu linn**	**105**	**14.6**	1	15.1	12.8				**6.5**	1	5.4	6.3			
EE003C1	**Narva linn**	**59**	**12.7**	1	10.0	14.7				**6.1**	1	4.8	6.0			
EL001K1	**Athens**	**3 313**	**29.3**	4	25.3	12.8	3	33.4	19.8	**18.0**	3	13.8	15.6	2	18.4	18.0
EL002K1	**Thessaloniki**	**789**	**29.3**				1	41.9	20.3	**20.4**				1	20.5	21.5
EL003C1	**Patra**	**172**	**22.8**				1	29.2	20.2	**14.5**				1	15.6	15.1
EL004C1	**Iraklio**	**156**	**35.2**							**17.0**						

URAU Code	Name of City	POP	PM10							PM2.5						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
EL005C1	**Larissa**	**142**	**22.4**				1	32.3	20.3	**15.1**						
EL006C1	**Volos**	**102**	**22.9**				1	28.7	16.9	**15.3**				1	15.8	16.1
EL007C1	**Ioannina**	**76**	**27.1**							**17.5**						
EL008C1	**Kavala**	**56**	**26.5**							**17.6**						
EL009C1	**Kalamata**	**54**	**21.5**							**12.8**						
EL010C1	**Trikala**	**62**	**21.9**							**14.6**						
EL011C1	**Serres**	**60**	**24.4**							**16.6**						
EL012C1	**Katerini**	**61**	**20.6**							**14.0**						
EL013C1	**Xanthi**	**57**	**28.6**							**17.8**						
EL014C1	**Chania**	**66**	**31.1**							**15.9**						
ES001C1	**Madrid**	**3 230**	**17.8**	7	15.9	17.3	6	19.4	34.4	**8.7**	2	9.4	8.4	5	10.1	10.5
ES002C1	**Barcelona**	**1 637**	**24.7**	6	25.8	14.9	3	28.8	41.5	**15.3**	4	16.6	14.8	3	19.4	17.3
ES003C1	**Valencia**	**909**	**20.4**	2	21.6	14.2	4	23.0	28.9	**12.6**	2	13.3	12.8	3	14.5	13.6
ES004C1	**Sevilla**	**712**	**21.3**							**9.9**						
ES005C1	**Zaragoza**	**699**	**16.1**	2	15.2	16.3	4	10.7	30.4	**7.5**	1	9.6	7.6			
ES006C1	**Málaga**	**573**	**24.1**				1	30.9	29.5	**11.5**						
ES007C1	**Murcia**	**465**	**21.5**				1	29.2	19.5	**12.1**						
ES008C1	**Palmas de Gran Canaria, Las**															
ES009C1	**Valladolid**	**336**	**14.7**				3	16.3	27.9	**7.8**				3	11.9	10.8
ES010C1	**Palma de Mallorca**	**424**	**20.2**				1	22.9	23.4	**10.9**						
ES011C1	**Santiago de Compostela**	**116**	**17.8**	1	17.9	10.8	1	18.4	15.8	**8.9**	1	7.8	9.1	1	11.6	10.5
ES012C1	**Vitoria-Gasteiz**	**242**	**16.6**				3	14.1	30.7	**10.2**				2	8.1	10.3
ES013C1	**Oviedo**	**228**	**20.9**	1	15.4	14.4	2	19.3	23.2	**12.6**	1	7.8	12.2	1	13.7	13.3
ES014C1	**Pamplona/ Iruña**	**268**	**15.4**	2	13.7	12.9	1	16.7	16.4	**8.8**						
ES015C1	**Santander**	**183**	**19.0**	1	20.2	28.8	1	24.8	22.2	**11.1**						
ES016C1	**Toledo**	**90**	**20.4**	1	21.2	17.6				**10.3**	1	11.9	10.6			
ES017C1	**Badajoz**	**152**	**14.6**	1	14.1	24.5				**6.0**						
ES018C1	**Logroño**	**155**	**18.1**	1	22.7	20.4				**10.4**						
ES019C1	**Bilbao**	**358**	**18.2**	1	12.9	16.2	2	17.9	19.0	**11.8**	1	9.1	11.1			
ES020C1	**Córdoba**	**331**	**23.9**							**11.2**						
ES021C1	**Alicante/Alacant**	**342**	**18.1**				1	22.1	16.7	**10.5**	1	12.9	10.8			
ES022C1	**Vigo**	**303**	**18.7**				2	22.5	21.7	**9.3**				1	10.5	10.6
ES023C1	**Gijón**	**278**	**20.5**	2	19.3	18.5	4	22.7	16.4	**11.3**	2	9.8	11.0	1	12.1	12.1
ES024C1	**Hospitalet de Llobregat, L'**	**256**	**25.0**	1	21.5	20.9				**15.5**						
ES025C1	**Santa Cruz de Tenerife**															
ES026C1	**Coruña, A**	**261**	**24.1**	1	33.6	15.3	1	26.1	20.1	**11.7**	1	15.3	11.8	1	11.8	11.7
ES027C1	**Barakaldo**	**123**	**18.2**							**11.6**						
ES028C1	**Reus**	**112**	**17.2**				1	17.7	18.6	**10.7**						
ES029C1	**Telde**															
ES030C1	**Parla**	**123**	**19.7**							**9.9**						
ES031C1	**Lugo**	**100**	**17.0**				1	12.6	19.4	**10.0**				1	10.6	10.1
ES032C1	**San Fernando**	**97**	**24.7**							**9.9**						
ES033C1	**Girona**	**110**	**18.4**							**11.9**						
ES034C1	**Cáceres**	**96**	**14.0**	1	13.5	18.8				**5.5**						
ES035C1	**Torrevieja**	**92**	**19.9**				1	12.4	20.7	**10.7**				1	9.9	11.2
ES036C1	**Pozuelo de Alarcón**	**83**	**16.7**							**7.8**						
ES037C1	**Puerto de Santa María, El**	**95**	**21.8**							**9.8**						
ES038C1	**Coslada**	**113**	**19.5**				1	21.3	21.9	**9.9**				1	12.3	11.3
ES039C1	**Avilés**	**96**	**21.0**				2	20.8	24.5	**11.8**				1	7.4	12.3
ES040C1	**Talavera de la Reina**	**88**	**18.4**	1	21.1	20.6				**8.5**						
ES041C1	**Palencia**	**81**	**13.7**				1	14.9	18.0	**7.4**						
ES042C1	**Sant Boi de Llobregat**	**89**	**23.0**							**13.9**						
ES043C1	**Ferrol**	**96**	**22.4**				1	17.9	17.1	**10.8**				1	7.9	11.3
ES044C1	**Pontevedra**	**99**	**18.9**				1	18.1	19.9	**9.3**				1	11.4	10.9
ES045C1	**Ceuta**	**84**	**20.4**	1	18.1	13.5				**8.7**	1	10.5				
ES046C1	**Gandia**	**88**	**16.6**				1	15.8	20.1	**9.5**						

URAU Code	Name of City	POP	PM10							PM2.5						
			PWC	NB	CSB	CMB	NT	CST	CMT	**PWC**	NB	CSB	CMB	NT	CST	CMT
ES047C1	**Rozas de Madrid, Las**	**91**	**15.6**							**7.3**						
ES048C1	**Guadalajara**	**87**	**19.8**	1	26.7	18.2				**10.3**						
ES049C1	**Sant Cugat del Vallès**	**85**	**23.0**							**14.1**						
ES050C1	**Manresa**	**91**	**20.9**							**13.2**						
ES051C1	**Getxo**	**113**	**16.7**							**10.1**						
ES052C1	**Rubí**	**77**	**22.7**	1	21.0	17.1				**14.0**						
ES053C1	**Ciudad Real**	**76**	**24.3**	1	25.9	20.2				**12.1**						
ES054C1	**Benidorm**	**83**	**16.4**							**9.2**						
ES055C1	**Melilla**	**81**	**24.0**							**11.6**						
ES056C1	**Viladecans**	**98**	**22.6**							**13.7**						
ES057C1	**Ponferrada**	**71**	**13.2**							**7.9**						
ES058C1	**San Sebastián de los Reyes**	**87**	**16.8**							**8.4**						
ES059C1	**Zamora**	**65**	**13.0**				1	12.7	22.1	**6.6**						
ES060C1	**Fuengirola**	**83**	**22.9**							**11.0**						
ES061C1	**Cerdanyola del Vallès**	**83**	**23.6**							**14.7**						
ES062C1	**Sanlúcar de Barrameda**	**68**	**20.4**							**9.1**						
ES063C1	**Vilanova i la Geltrú**	**90**	**19.4**							**11.8**						
ES064C1	**Prat de Llobregat, El**	**63**	**23.8**							**14.4**						
ES065C1	**Línea de la Concepción, La**	**71**	**24.3**							**11.6**						
ES066C1	**Cornellà de Llobregat**	**99**	**23.1**							**14.0**						
ES067C1	**Majadahonda**	**76**	**16.3**	1	13.4	25.3				**7.5**						
ES068C1	**Torremolinos**	**66**	**24.2**							**11.8**						
ES069C1	**Castelldefels**	**65**	**20.2**							**11.8**						
ES070C1	**Irun**	**64**	**16.0**							**8.8**						
ES071C1	**Granollers**	**87**	**22.4**				1	28.1	15.7	**13.7**						
ES072C1	**Arrecife**															
ES073C1	**Elda**	**78**	**16.6**	1	14.6	24.6				**9.6**	1	9.8	9.7			
ES074C1	**Santa Lucía de Tirajana**															
ES075C1	**Mollet del Vallès**	**56**	**24.7**							**15.7**						
ES501C1	**Granada**	**272**	**31.3**							**16.9**						
ES503C1	**Badalona**	**234**	**23.0**							**14.2**						
ES504C1	**Móstoles**	**214**	**17.8**	1	16.6	13.7				**8.5**						
ES505C1	**Elche/Elx**	**239**	**18.8**							**10.9**						
ES506C1	**Cartagena**	**227**	**22.0**	1	24.4	18.5				**12.0**						
ES507C1	**Sabadell**	**222**	**23.3**							**14.3**						
ES508C1	**Jerez de la Frontera**	**222**	**21.6**	1	21.0	20.5				**10.1**						
ES509C1	**Fuenlabrada**	**189**	**18.6**							**9.1**						
ES510C1	**Donostia/San Sebastián**	**235**	**16.9**	1	15.0	20.0	2	20.0	23.1	**9.4**				2	8.4	9.5
ES511C1	**Alcalá de Henares**	**203**	**19.7**				1	19.9	20.4	**10.2**				1	12.5	10.3
ES512C1	**Terrassa**	**227**	**22.4**							**13.7**						
ES513C1	**Leganés**	**199**	**18.3**				1	20.8	18.3	**9.0**				1	12.0	11.0
ES514C1	**Almería**	**198**	**42.0**							**18.5**						
ES515C1	**Burgos**	**180**	**13.5**				1	18.6	13.9	**6.9**						
ES516C1	**Salamanca**	**162**	**14.5**	1	16.5	22.8	1	15.9	26.6	**6.7**						
ES517C1	**Alcorcón**	**170**	**17.4**							**8.4**	1	9.5	8.3			
ES518C1	**Getafe**	**164**	**18.7**				1	22.5	18.9	**9.3**				1	11.8	11.1
ES519C1	**Albacete**	**172**	**22.2**	1	25.5	24.3				**9.7**	1	8.6	9.5			
ES520C1	**Castellón/Castelló de la Pl.**	**187**	**16.0**							**11.3**	1	13.7	10.9			
ES521C1	**Huelva**	**156**	**21.4**				1	24.4	19.7	**9.0**						
ES522C1	**Cádiz**	**124**	**22.4**							**9.7**						
ES523C1	**León**	**158**	**13.9**	1	11.9	15.6	1	20.2	20.2	**8.8**	1	9.7	9.1			
ES524C1	**San Cristóbal de La Laguna**															
ES525C1	**Tarragona**	**141**	**18.2**							**11.5**						
ES526C1	**Santa Coloma de Gramenet**	**134**	**23.0**							**14.2**						
ES527C1	**Jaén**	**118**	**25.9**							**13.4**						
ES528C1	**Lleida**	**142**	**19.2**							**11.7**						

URAU Code	Name of City	POP	PM_{10}							$PM_{2.5}$						
			PWC	NB	CSB	CMB	NT	CST	CMT	**PWC**	NB	CSB	CMB	NT	CST	CMT
ES529C1	**Ourense**	**113**	**15.5**				1	23.6	16.2	**8.6**				1	10.2	9.3
ES530C1	**Mataró**	**129**	**21.6**							**13.4**						
ES531C1	**Dos Hermanas**	**129**	**21.3**							**9.9**						
ES532C1	**Algeciras**	**120**	**23.1**							**11.1**						
ES533C1	**Marbella**	**141**	**21.1**				1	34.7	15.1	**9.8**						
ES534C1	**Torrejón de Ardoz**	**124**	**19.9**	1	21.4	16.4				**10.2**	1	10.8	10.0			
ES535C1	**Alcobendas**	**105**	**16.7**				1	15.5	20.5	**8.3**						
ES536C1	**Alcalá de Guadaíra**	**79**	**21.8**							**10.2**						
ES537C1	**Alcoy/Alcoi**	**61**	**15.0**	1	13.4	17.6				**7.7**						
ES538C1	**Ávila**	**59**	**14.2**	1	13.5	22.6				**5.9**						
ES539C1	**Benalmádena**	**63**	**23.3**							**11.1**						
ES540C1	**Chiclana de la Frontera**	**82**	**27.1**							**10.5**						
ES541C1	**Collado Villalba**	**63**	**15.2**							**6.9**				1	10.6	9.6
ES542C1	**Cuenca**	**57**	**20.2**	1	24.6	21.6				**10.6**						
ES543C1	**Eivissa**	**55**	**19.4**							**9.0**						
ES544C1	**Linares**	**61**	**26.2**							**13.5**						
ES545C1	**Lorca**	**93**	**22.4**							**11.4**						
ES546C1	**Mérida**	**64**	**14.7**	1	14.5	17.0				**5.9**						
ES547C1	**Sagunto/Sagunt**	**76**	**16.5**	1	17.8	14.5				**9.7**						
ES548C1	**Torrelavega**	**61**	**21.4**	2	19.7	22.2	1	19.5	25.7	**13.6**						
ES549C1	**Valdemoro**	**74**	**19.3**							**9.8**	1	11.2	9.7			
ES550C1	**Puerto de la Cruz**															
ES551C1	**Paterna**	**118**	**17.4**							**10.3**						
ES552C1	**Igualada**	**54**	**18.4**							**11.1**						
ES553C1	**Torrent**	**91**	**17.7**							**10.4**						
ES554C1	**Mislata**	**66**	**18.0**							**10.7**						
ES555C1	**Rivas-Vaciamadrid**	**80**	**19.7**	1	21.5	13.6				**9.9**						
ES556C1	**Santurtzi**	**75**	**16.5**							**9.9**						
ES557C1	**Esplugues de Llobregat**	**61**	**23.5**							**14.1**						
ES558C1	**San Vicente del Raspeig**	**55**	**17.8**							**10.3**						
FI001C2	**Helsinki**	**575**	**13.2**	1	10.6	19.8	2	18.4	17.8	**5.9**	2	5.4	5.6	1	7.3	6.1
FI002C1	**Tampere**	**219**	**9.9**				2	10.8	18.7	**5.1**	1	3.9	4.9	1	5.8	5.5
FI003C1	**Turku**	**183**	**11.2**							**6.2**						
FI004C3	**Oulu**	**188**	**9.1**	1	9.7	14.8	1	10.9	29.2	**5.6**				1	5.1	6.1
FI005C1	**Espoo**	**254**	**12.5**				1	17.1	18.0	**6.0**				1	6.1	7.6
FI006C1	**Vantaa**	**207**	**14.4**				1	14.7	21.5	**6.8**				1	6.6	7.3
FI007C2	**Lahti**	**120**	**10.8**				2	14.8	15.4	**5.4**				1	4.3	6.2
FI008C3	**Kuopio**	**114**	**7.0**				2	12.4	11.2	**4.7**						
FI009C1	**Jyväskylä**	**133**	**8.8**	1	7.8	13.9	1	11.4	12.1	**5.6**						
FR001P1	**City of Paris**	**7 194**	**19.9**	7	18.9	20.4	6	30.5	17.9	**11.8**	3	11.0	11.1	2	15.9	14.7
FR003C2	**City of Lyon**	**1 038**	**17.1**	3	17.1	14.2	4	22.6	17.2	**10.4**	2	11.3	10.0	1	12.9	11.9
FR004C2	**City of Toulouse**	**597**	**15.2**	3	15.0	16.5	2	21.1	14.0	**9.0**	2	8.5	8.9	1	10.6	10.8
FR006C2	**City of Strasbourg**	**405**	**19.0**	1	19.2	21.5	2	23.0	11.7	**12.8**	1	14.0	12.9			
FR007C1	**City of Bordeaux**	**617**	**17.0**	2	16.5	19.5	3	18.8	12.5	**10.0**	1	9.8	9.8			
FR008C1	**City of Nantes**	**443**	**16.8**	2	16.2	10.9	1	19.3	29.0	**9.8**	1	9.8	9.8	1	10.4	11.0
FR009C1	**City of Lille**	**907**	**20.6**	2	20.5	10.0	1	20.5	20.9	**12.9**	1	13.3	13.1	2	12.3	12.9
FR010C1	**City of Montpellier**	**287**	**15.5**	1	15.3	9.6	1	18.4	20.2	**8.1**	1	7.2	7.9	1	9.2	10.0
FR011C1	**City of Saint-Étienne**	**207**	**15.1**	1	13.0	18.7	1	18.6	22.3	**9.2**	1	8.3	9.2			
FR012C1	**City of Le Havre**	**203**	**17.7**	2	17.7	16.4	1	24.2	19.2	**10.4**	1	10.9	10.1	1	10.0	10.8
FR013C2	**City of Rennes**	**218**	**15.6**	1	13.5	14.8	1	18.2	19.7	**9.7**	1	9.1	9.6	1	9.8	10.1
FR014C2	**City of Amiens**	**146**	**18.1**	1	18.9	18.3				**11.3**				1	11.7	11.8
FR016C1	**City of Nancy**	**232**	**17.0**	1	16.1	17.0				**10.3**	1	8.8	10.2	1	10.1	11.1
FR017C2	**City of Metz**	**179**	**16.5**	2	17.0	16.6	1	18.7	21.0	**10.1**	1	10.3	10.1			
FR018C1	**City of Reims**	**208**	**18.0**	2	17.6	21.2	1	22.7	19.6	**11.4**	1	11.4	11.4	1	11.4	11.4
FR019C1	**City of Orléans**	**221**	**14.8**	1	11.8	15.5	1	18.7	18.0	**8.9**	1	10.0	8.9			
FR020C2	**City of Dijon**	**203**	**14.8**	2	14.9	14.9				**8.2**	1	6.8	8.1	1	7.9	9.1

URAU Code	Name of City	POP	PM$_{10}$							PM$_{2.5}$						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
FR021C2	**City of Poitiers**	**105**	**15.2**	2	14.4	17.4	1	21.0	21.3	**9.2**	1	9.8	9.1			
FR022C2	**City of Clermont-Ferrand**	**203**	**13.7**	3	13.7	15.6	2	15.5	17.9	**8.2**	1	8.1	8.5	1	9.4	9.6
FR023C2	**City of Caen**	**163**	**16.4**	2	16.1	17.8	1	18.9	19.1	**9.8**	1	9.1	9.7			
FR024C2	**City of Limoges**	**161**	**14.2**	1	13.2	16.9	1	16.1	21.7	**8.7**	1	8.1	8.5			
FR025C1	**City of Besançon**	**124**	**15.0**	1	14.8	16.3				**9.2**	1	9.2	9.2			
FR026C2	**City of Grenoble**	**313**	**18.5**	2	17.6	17.8	2	22.0	19.2	**11.5**	1	10.9	11.7	1	9.7	11.3
FR028C1	**City of Saint-Denis**															
FR030C1	**City of Fort-de-France**															
FR032C2	**City of Toulon**	**335**	**21.0**	1	23.3	13.7	1	27.5	19.5	**10.4**	1	12.3	10.5			
FR034C2	**City of Valenciennes**	**128**	**19.6**	1	17.4	14.8	1	22.8	15.7	**12.4**				1	12.4	13.0
FR035C2	**City of Tours**	**248**	**15.5**	1	15.7	14.9	1	17.3	17.9	**9.6**	1	10.5	9.8			
FR036C2	**City of Angers**	**185**	**16.2**	1	15.8	13.8				**9.7**	1	9.5	9.7			
FR037C1	**City of Brest**	**149**	**17.2**	1	17.3	16.2	1	18.3	17.5	**8.5**	1	7.5	8.0			
FR038C2	**City of Le Mans**	**163**	**15.3**	1	15.1	14.0				**9.4**	1	9.3	9.2			
FR039C2	**City of Avignon**	**113**	**18.0**	1	16.7	14.9	1	27.2	21.0	**10.5**	1	11.0	10.3			
FR040C2	**City of Mulhouse**	**196**	**16.9**	2	15.8	18.6	1	19.4	28.0	**11.7**	1	12.0	11.6			
FR042C1	**City of Dunkerque**	**150**	**22.8**	2	21.4	21.0				**12.2**	1	11.4	12.1			
FR043C2	**City of Perpignan**	**134**	**15.4**	2	13.8	19.5				**8.7**	1	9.6	8.5			
FR044C2	**City of Nîmes**	**151**	**17.2**	1	15.3	15.1	1	21.4	22.4	**9.3**	1	8.2	9.2			
FR045C2	**City of Pau**	**125**	**15.9**	1	13.2	16.0	1	17.4	17.9	**8.5**	1	6.0	8.4			
FR046C2	**City of Bayonne**	**116**	**16.6**	2	18.0	17.0	1	23.2	18.4	**8.3**	1	6.5	7.8			
FR047C2	**City of Annemasse**	**62**	**16.8**	2	16.5	14.9	1	19.7	24.3	**10.8**	1	9.9	10.5			
FR048C1	**City of Annecy**	**128**	**16.5**	2	16.5	17.5	1	21.4	19.3	**10.1**	1	8.8	9.7			
FR049C2	**City of Lorient**	**83**	**15.9**	1	15.1	16.8				**9.2**	1	9.3	9.1			
FR051C2	**City of Troyes**	**112**	**16.1**	2	16.5	21.9				**9.8**	1	11.2	9.8			
FR052C2	**City of Saint-Nazaire**	**72**	**16.5**	1	17.2	15.2				**8.5**	1	8.2	8.5			
FR053C1	**City of La Rochelle**	**91**	**17.0**	1	17.0	16.9				**9.2**	1	9.1	9.2			
FR057C2	**City of Boulogne-sur-Mer**	**81**	**19.6**	1	17.5	15.7	1	22.2	22.1	**11.3**				1	11.8	11.7
FR058C2	**City of Chambéry**	**95**	**17.8**	2	14.5	16.5	1	17.4	18.3	**11.1**	1	9.0	11.4			
FR060C2	**City of Chartres**	**84**	**14.1**	1	14.6	16.4				**8.4**				1	10.5	10.5
FR062C1	**City of Calais**	**81**	**20.2**	2	22.0	15.9				**11.8**	1	10.2	11.8			
FR063C2	**City of Béziers**	**79**	**14.3**							**7.9**						
FR064C2	**City of Arras**	**77**	**18.1**	1	19.6	15.6				**11.4**						
FR065C2	**City of Bourges**	**73**	**13.5**	1	13.9	15.9	1	15.1	19.7	**8.0**						
FR066C1	**City of Saint-Brieuc**	**76**	**15.5**	1	15.5	16.5				**9.3**						
FR069C1	**C. of Cherbourg-en-Cotentin**	**85**	**17.1**	1	17.7	16.8				**9.5**						
FR076C2	**City of Belfort**	**70**	**15.4**				1	15.2	19.4	**10.3**						
FR077C1	**City of Roanne**	**57**	**14.8**	1	13.7	19.1				**9.0**						
FR079C2	**City of Saint-Quentin**	**63**	**17.7**	1	17.6	17.9				**11.1**				1	13.0	11.8
FR084C1	**City of Creil**	**77**	**18.6**	2	18.1	13.7				**11.7**	1	11.5	11.6			
FR099C1	**City of Fréjus**	**88**	**19.9**	1	18.8	20.1				**11.2**						
FR202C1	**City of Aix-en-Provence**	**152**	**19.0**	1	18.6	18.4	1	24.8	19.3	**10.4**	1	10.5	10.3			
FR203C1	**City of Marseille**	**894**	**20.9**	2	19.2	13.4	1	33.2	22.6	**10.5**	1	9.7	10.6	1	12.5	12.6
FR205C2	**City of Nice**	**710**	**22.4**	1	20.0	15.5	1	29.9	20.6	**12.9**	1	11.2	12.6	1	13.0	13.4
FR207C1	**City of Lens**	**202**	**19.2**				1	20.8	15.8	**12.3**						
FR209C2	**City of Douai**	**99**	**18.9**	1	20.0	17.0				**12.0**	1	12.4	12.0			
FR214C1	**City of Valence**	**96**	**16.5**	1	16.3	14.6	1	18.6	17.1	**9.9**	1	10.4	9.8	1	9.7	10.0
FR215C2	**City of Rouen**	**334**	**18.5**	2	18.0	17.4	2	23.7	25.1	**11.9**	1	11.9	11.9	1	14.0	13.6
FR304C1	**City of Melun**	**90**	**17.5**				1	25.6	29.8	**10.7**				1	13.6	13.0
FR305C1	**City of Meaux**	**67**	**17.2**							**10.7**						
FR306C1	**City of Mantes-la-Jolie**	**88**	**16.3**							**9.9**						
FR324C1	**City of Martigues**	**67**	**23.6**							**10.5**						
FR506C1	**City of Colmar**	**75**	**16.5**	1	16.2	18.2				**11.1**						
FR520C1	**City of Les Abymes**															
FR521C1	**City of Cayenne**															
FR522C1	**City of Mamoudzou**															

URAU Code	Name of City	POP	PM10							PM2.5						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
HR001C1	**Zagreb**	**797**	**24.5**	1	30.9	20.0	1	25.2	26.5	**17.5**	1	15.8	17.3			
HR002C1	**Rijeka**	**138**	**17.1**							**10.9**	1	10.6	11.1			
HR003C1	**Slavonski Brod**	**67**	**31.0**							**26.3**	1	30.2	26.0			
HR004C1	**Osijek**	**109**	**27.2**				1	39.2	21.2	**20.1**						
HR005C1	**Split**	**184**	**21.8**				1	16.1	18.4	**13.0**				1	10.5	13.0
HR006C1	**Pula**	**59**	**19.6**							**11.8**						
HR007C1	**Zadar**	**76**	**20.6**							**11.8**						
HU001C1	**Budapest**	**1 775**	**23.6**	3	24.2	18.6	2	31.8	23.7	**14.9**	2	14.4	14.8			
HU002C1	**Miskolc**	**173**	**25.1**				1	35.6	24.5	**17.2**						
HU003C1	**Nyíregyháza**	**122**	**23.6**				1	31.9	26.4	**16.3**						
HU004C1	**Pécs**	**162**	**22.3**	1	22.1	19.9	1	26.1	34.2	**15.0**	1	13.6	15.1			
HU005C1	**Debrecen**	**213**	**25.2**	1	26.1	21.2				**17.1**						
HU006C1	**Szeged**	**171**	**24.8**	1	26.8	18.8				**15.4**	1	15.6	15.3			
HU007C1	**Győr**	**132**	**20.2**	1	23.3	16.1				**14.0**						
HU008C1	**Kecskemét**	**114**	**22.5**							**14.1**						
HU009C1	**Székesfehérvár**	**101**	**21.3**							**13.9**						
HU010C1	**Szombathely**	**81**	**18.4**							**12.5**						
HU011C1	**Szolnok**	**74**	**23.7**							**14.8**						
HU012C1	**Tatabánya**	**70**	**19.8**				1	19.4	21.7	**13.5**						
HU013C1	**Veszprém**	**62**	**18.4**	1	19.3	16.2				**12.9**	1	14.4	13.2			
HU014C1	**Békéscsaba**	**62**	**23.3**							**14.9**						
HU015C1	**Kaposvár**	**67**	**20.2**							**13.9**						
HU016C1	**Eger**	**57**	**23.1**							**15.3**						
HU017C1	**Dunaújváros**	**49**	**24.6**							**15.1**						
HU018C1	**Zalaegerszeg**	**61**	**18.6**							**12.6**						
HU019C1	**Sopron**	**65**	**16.4**							**11.1**						
IE001C1	**Dublin**	**561**	**13.8**	4	13.1	13.3	3	16.0	16.7	**9.0**	4	9.0	8.9	2	9.5	9.7
IE002C1	**Cork**	**129**	**14.3**	2	13.4	14.0	1	17.8	17.5	**8.9**	2	8.2	8.9			
IE003C1	**Limerick**	**63**	**16.6**							**11.2**						
IE004C1	**Galway**	**73**	**14.0**	1	12.5	14.0				**8.7**						
IE005C1	**Waterford**	**51**	**15.6**	1	14.9	15.5				**10.5**	1	10.5	10.6			
IS001C1	**Reykjavík**	**202**	**9.8**	2	10.6	10.8	1	16.7	16.7	**4.6**	1	5.9	5.6			
IT001C1	**Roma**	**2 747**	**23.8**	8	24.6	24.0	4	27.7	26.4	**13.9**	6	13.1	13.9	1	14.1	15.2
IT002C1	**Milano**	**1 370**	**29.1**	1	29.4	29.5	3	32.9	32.5	**19.5**	1	20.9	20.1	1	20.8	19.8
IT003C1	**Napoli**	**1 159**	**26.8**	2	22.8	25.1	5	28.8	29.1	**12.4**	2	9.2	10.9	2	16.4	15.9
IT004C1	**Torino**	**921**	**28.5**	2	27.5	28.8	2	31.1	30.5	**20.8**	2	19.8	21.3	1	24.6	18.7
IT005C1	**Palermo**	**677**	**20.9**							**12.3**						
IT006C1	**Genova**	**610**	**18.2**	1	15.8	18.1	4	21.0	22.2	**10.8**	1	7.1	10.2	1	12.8	13.9
IT007C1	**Firenze**	**387**	**20.3**	2	18.1	20.1	2	24.2	23.7	**13.1**	1	11.8	12.9	1	15.5	14.3
IT008C1	**Bari**	**347**	**22.3**	3	22.9	22.5	2	25.2	23.1	**13.5**				2	13.8	13.6
IT009C1	**Bologna**	**408**	**24.2**	2	23.5	23.9	1	25.5	26.8	**15.4**	1	13.8	14.8	1	16.3	16.0
IT010C1	**Catania**	**346**	**21.5**							**13.0**						
IT011C1	**Venezia**	**251**	**28.8**	1	29.8	30.9	1	34.5	31.3	**19.8**	1	22.4	21.3			
IT012C1	**Verona**	**282**	**31.0**	1	30.4	30.5	1	32.8	32.6	**21.1**	1	19.4	20.5			
IT013C1	**Cremona**	**77**	**32.7**	1	35.1	32.9	1	33.0	33.5	**22.7**	1	26.0	22.8	1	20.5	22.6
IT014C1	**Trento**	**119**	**21.1**	1	18.6	22.1	1	21.7	20.1	**15.1**	1	13.0	15.9			
IT015C1	**Trieste**	**205**	**17.9**	2	18.4	18.0	1	18.4	19.8	**11.6**	1	11.3	11.6			
IT016C1	**Perugia**	**176**	**20.8**	1	23.6	21.5	2	18.8	21.9	**13.0**	1	15.7	13.4	2	12.8	14.3
IT017C1	**Ancona**	**104**	**22.9**	1	20.8	23.4				**13.3**	1	14.0	13.4			
IT019C1	**Pescara**	**128**	**20.5**	1	24.2	20.2	2	23.4	23.8	**12.8**	1	13.0	12.5	1	14.0	14.1
IT020C1	**Campobasso**	**53**	**20.2**							**11.3**	1	10.4	11.4			
IT021C1	**Caserta**	**89**	**26.8**	1	21.4	26.8	1	33.1	30.5	**14.8**	1	13.5	14.8	1	13.5	15.7
IT022C1	**Taranto**	**211**	**21.6**	2	20.6	21.2	1	22.4	22.1	**13.1**				1	10.9	13.2
IT023C1	**Potenza**	**68**	**20.4**				2	16.7	21.3	**10.0**						
IT024C1	**Catanzaro**	**93**	**19.9**	1	15.0	18.6	1	24.8	23.6	**11.4**	1	9.6	10.3			
IT025C1	**Reggio di Calabria**	**186**	**22.0**	1	23.0	22.2	1	22.4	23.1	**12.6**	1	11.4	12.7			

URAU Code	Name of City	POP	PM$_{10}$							PM$_{2.5}$						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
IT026C1	Sassari	126	20.1	1	24.6	21.2	1	18.7	21.2	8.2	1	5.8	8.1			
IT027C1	Cagliari	172	20.2				1	30.1	28.2	10.5				1	19.2	16.8
IT028C1	Padova	253	32.7	1	31.7	32.8	1	34.9	35.0	21.9						
IT029C1	Brescia	218	34.0	1	33.2	32.8	1	29.1	33.1	24.3	1	24.6	23.5	1	18.5	23.7
IT030C1	Modena	188	28.3	1	30.0	28.4	1	33.2	31.6	18.2	1	18.1	18.2			
IT031C1	Foggia	154	21.5	1	22.5	21.6				11.9	1	13.1	12.0			
IT032C1	Salerno	145	25.2	1	27.7	25.2	1	21.7	25.7	11.2	1	9.2	11.0	1	12.0	14.2
IT033C1	Piacenza	105	27.2	1	27.0	27.1	1	30.5	30.2	18.8	1	20.8	18.8			
IT034C1	Bolzano	106	19.0				1	15.5	20.5	13.3						
IT035C1	Udine	99	19.9	2	18.8	19.8	1	20.6	21.2	13.7	1	14.5	13.7			
IT036C1	La Spezia	104	18.8	1	20.6	19.3	3	19.4	19.3	10.7	1	11.1	11.1	1	12.3	11.6
IT037C1	Lecce	112	22.3				2	21.1	22.6	13.6				2	11.7	13.7
IT038C1	Barletta	94	21.4	1	22.0	21.4				11.9	1	11.2	11.9			
IT039C1	Pesaro	96	24.9	1	32.8	25.3				14.5	1	17.3	14.7			
IT040C1	Como	104	22.1				1	25.9	24.9	15.0				1	19.8	16.4
IT041C1	Pisa	95	22.4	1	21.7	23.1	1	24.9	24.3	13.9	1	12.4	14.3	1	15.9	14.9
IT042C1	Treviso	111	30.6	1	30.7	30.3	1	32.4	32.4	21.5	1	20.3	21.5			
IT043C1	Varese	106	22.5				1	23.6	25.2	15.2				1	18.8	17.2
IT044C1	Busto Arsizio	103	26.3	1	22.7	26.8				17.7						
IT045C1	Asti	80	25.8	1	29.1	26.6	1	30.4	29.4	17.8						
IT046C1	Pavia	75	27.4	1	29.1	27.0	1	35.6	31.1	19.2	1	23.3	19.0			
IT047C1	Massa	79	20.0				1	19.2	20.0	11.7				1	11.4	11.6
IT048C1	Cosenza	85	21.2	1	21.6	21.4				12.3	1	12.5	12.6			
IT052C1	Savona	67	18.1	1	15.9	17.8	1	17.4	21.2	11.3	1	9.3	11.2	1	12.7	13.5
IT054C1	Matera	58	21.1							12.3						
IT056C1	Acireale	66	21.2							12.6						
IT057C1	Avellino	68	24.4				1	27.7	26.1	11.5				1	14.6	13.5
IT058C1	Pordenone	61	23.6				1	24.5	25.6	17.3				1	17.5	17.3
IT060C1	Lecco	51	20.8	1	17.3	20.0	1	21.8	22.7	14.1	1	12.8	13.9			
IT061C1	Altamura	70	21.3				1	19.2	21.4	12.1				1	11.7	12.2
IT062C1	Bitonto	59	21.4							12.7						
IT063C1	Molfetta	61	21.7				1	23.1	21.9	12.5						
IT064C1	Battipaglia	53	23.3	1	23.9	23.8				10.7	1	9.2	10.4			
IT065C1	Bisceglie	54	21.3							12.2						
IT066C1	Carpi	72	29.6	1	29.8	30.1				19.3						
IT067C1	Cerignola	60	21.8							11.8						
IT068C1	Gallarate	77	25.3							17.1						
IT069C1	Gela	76	21.6	1	23.3	21.3	1	31.1	30.1	12.6						
IT070C1	Saronno	48	26.2	1	26.9	26.0				17.5	1	16.8	17.3			
IT071C1	Bagheria	64	19.9							11.6						
IT072C1	Anzio	69	21.7							12.2						
IT073C1	Sassuolo	48	24.3	1	25.1	24.7				15.5	1	14.2	15.8			
IT501C1	Messina	245	22.5	1	22.6	22.8	1	22.0	23.2	13.3						
IT502C1	Prato	202	23.6	1	23.4	24.2	1	25.1	25.3	15.6	1	15.5	16.1	1	15.6	15.5
IT503C1	Parma	194	27.3	1	30.4	27.0	1	29.6	28.6	17.4	1	17.2	17.0			
IT504C1	Livorno	154	18.9	2	17.7	19.1	1	23.1	22.1	10.9	1	9.1	10.9	1	12.4	12.8
IT505C1	Reggio nell'Emilia	183	27.5	1	26.7	26.9	1	32.2	29.9	17.7	1	17.8	17.3			
IT506C1	Ravenna	154	26.2	1	26.3	30.7	1	30.2	30.0	16.9	1	18.9	18.2			
IT507C1	Ferrara	146	27.3	1	26.3	27.1	1	32.0	31.0	18.0	1	17.1	17.9			
IT508C1	Rimini	155	24.3	1	29.3	24.6	1	29.9	27.7	14.7	1	15.9	15.0			
IT509C1	Siracusa	126	20.3	2	20.5	21.7	2	25.1	26.1	12.2						
IT510C1	Monza	171	28.4	2	27.6	27.5				19.2	1	20.2	19.4			
IT511C1	Bergamo	163	27.5	1	26.0	29.7	1	27.2	29.1	19.5	1	20.1	20.9			
IT512C1	Forlì	122	23.1	1	22.1	23.6	1	27.1	27.0	15.0	1	14.2	15.4			
IT513C1	Latina	126	22.0	2	22.6	22.4	1	23.5	26.0	13.4	1	11.9	13.1			
IT514C1	Vicenza	133	34.4	1	32.5	34.7				24.1	1	25.6	24.4			

URAU Code	Name of City	POP	PM_{10}							$PM_{2.5}$						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
IT515C1	**Terni**	**112**	**20.9**	1	25.3	21.3	2	26.7	23.8	**13.8**	1	17.4	14.1	2	17.3	15.4
IT516C1	**Novara**	**110**	**26.8**	1	24.3	27.0	1	26.8	30.3	**18.1**	1	17.0	18.1			
IT517C1	**Giugliano in Campania**	**201**	**27.0**							**13.0**						
IT518C1	**Alessandria**	**90**	**26.3**	1	28.9	26.7	1	34.7	31.0	**17.5**	1	19.9	17.8			
IT519C1	**Arezzo**	**102**	**19.1**	1	17.9	19.8	1	23.4	22.3	**12.2**	1	11.8	12.8			
IT520C1	**Grosseto**	**78**	**16.7**	1	16.8	16.4	1	24.1	20.8	**10.0**	1	9.3	9.3			
IT521C1	**Brindisi**	**89**	**21.4**	2	20.8	21.5	1	24.8	22.7	**13.1**	1	12.2	13.2	1	12.6	13.2
IT522C1	**Trapani**	**94**	**21.3**	1	20.6	20.6				**11.7**						
IT523C1	**Ragusa**	**72**	**22.2**							**11.9**						
IT524C1	**Andria**	**101**	**21.5**				1	21.8	21.6	**11.9**				1	12.3	12.4
IT525C1	**Trani**	**57**	**21.4**							**12.2**						
IT526C1	**L'Aquila**	**68**	**18.3**	1	15.6	18.3				**11.1**	1	10.1	11.4			
LT001C1	**Vilnius**	**552**	**21.5**	2	21.1	21.5	1	29.8	29.2	**14.1**	1	11.1	14.3	1	15.9	14.7
LT002C1	**Kaunas**	**325**	**24.3**				1	34.0	30.9	**15.2**				1	11.4	15.9
LT003C1	**Panevėžys**	**105**	**23.7**	1	26.1	23.8				**15.1**						
LT004C1	**Alytus**	**60**	**20.1**							**13.0**						
LT501C1	**Klaipėda**	**164**	**20.5**				2	22.9	22.5	**11.9**				1	15.6	12.6
LT502C1	**Šiauliai**	**113**	**23.6**				1	23.8	25.1	**13.6**						
LU001C1	**Luxembourg**	**103**	**15.9**	1	20.3	15.7	1	17.4	17.8	**8.4**	1	7.2	8.1	1	9.8	10.4
LV001C1	**Rīga**	**669**	**22.7**	1	20.2	24.1	1	34.5	32.4	**13.0**	1	12.1	13.9			
LV002C1	**Liepāja**	**77**	**19.9**				1	21.3	21.8	**11.5**				1	13.4	12.4
LV003C1	**Jelgava**	**64**	**23.2**							**13.5**						
LV501C1	**Daugavpils**	**96**	**20.4**							**13.2**						
MT001C1	**Valletta (greater)**	**228**	**28.3**				1	41.3	37.8	**12.4**				1	14.0	15.3
NL001C2	**Greater 's-Gravenhage**	**752**	**19.0**	2	18.2	18.8	1	22.4	20.8	**10.4**	1	8.6	9.9			
NL002C2	**Greater Amsterdam**	**934**	**18.8**	2	19.0	18.8	4	20.4	20.1	**11.2**	2	11.5	11.1	3	10.9	11.2
NL003C2	**Greater Rotterdam**	**1 232**	**19.2**	4	19.4	19.3	5	20.5	20.5	**10.9**	3	11.3	10.9	4	12.8	12.0
NL004C2	**Greater Utrecht**	**422**	**18.7**				2	18.5	19.5	**11.1**	1	10.5	11.0	1	11.4	11.3
NL005C2	**Greater Eindhoven**	**265**	**18.9**	1	18.5	18.4	2	19.8	20.1	**11.8**	1	11.9	11.2			
NL006C1	**Tilburg**	**216**	**19.2**							**11.2**						
NL007C1	**Groningen**	**195**	**17.6**				1	22.2	20.9	**9.6**	1	8.7	9.5	1	8.6	9.7
NL008C1	**Enschede**	**155**	**16.8**							**10.5**	1	8.9	10.4			
NL009C2	**Greater Arnhem**	**186**	**17.6**							**11.3**						
NL010C2	**Greater Heerlen**	**209**	**15.6**	1	15.8	15.3	1	18.1	18.7	**9.4**	1	8.5	9.3	1	9.9	10.8
NL011C1	**Almere**	**190**	**17.4**							**10.5**						
NL012C1	**Breda**	**180**	**19.2**	1	20.0	19.3	1	19.6	20.0	**10.7**	1	9.1	10.7	1	10.5	11.4
NL013C1	**Nijmegen**	**173**	**17.8**				1	20.8	19.9	**11.3**	1	10.5	11.3	1	11.0	11.3
NL014C1	**Apeldoorn**	**163**	**16.5**							**10.5**						
NL015C1	**Leeuwarden**	**124**	**17.1**							**9.5**						
NL016C2	**Greater Sittard-Geleen**	**129**	**16.6**							**10.2**						
NL018C1	**Hilversum**	**108**	**18.1**							**11.0**						
NL020C1	**Roosendaal**	**81**	**19.7**							**11.0**						
NL021C2	**Greater Nissewaard**	**145**	**19.7**							**11.1**						
NL023C1	**Purmerend**	**82**	**18.1**							**10.5**						
NL026C1	**Alphen aan den Rijn**	**112**	**18.8**							**10.8**						
NL028C1	**Bergen op Zoom**	**68**	**19.3**							**10.9**						
NL030C1	**Gouda**	**75**	**18.8**							**10.8**						
NL031C1	**Hoorn**	**73**	**17.3**							**10.0**						
NL032C2	**Greater Middelburg**	**93**	**19.6**							**11.1**						
NL501C2	**Greater Haarlem**	**270**	**18.6**				1	18.0	19.6	**10.4**						
NL502C1	**Zaanstad**	**152**	**18.9**	1	18.3	18.8				**10.9**	1	11.1	10.9			
NL503C1	**'s-Hertogenbosch**	**156**	**18.8**							**11.3**						
NL504C1	**Amersfoort**	**152**	**18.1**							**11.2**						
NL505C1	**Maastricht**	**125**	**16.4**							**9.8**						
NL507C2	**Greater Leiden**	**257**	**18.7**							**10.3**						
NL508C1	**Haarlemmermeer**	**167**	**18.5**							**10.5**						

URAU Code	Name of City	POP	PM10							PM2.5						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
NL509C1	**Zoetermeer**	**120**	**18.9**							**10.7**						
NL511C1	**Zwolle**	**122**	**17.1**							**10.7**						
NL512C2	**Greater Ede**	**156**	**18.2**							**11.3**						
NL513C1	**Deventer**	**103**	**17.2**							**11.0**						
NL514C2	**Greater Alkmaar**	**200**	**18.0**							**10.1**						
NL515C1	**Venlo**	**107**	**16.6**							**11.0**						
NL516C1	**Helmond**	**93**	**18.4**							**11.6**						
NL517C1	**Hengelo**	**84**	**16.9**							**10.7**						
NL519C1	**Almelo**	**79**	**17.3**							**10.8**						
NL520C1	**Lelystad**	**76**	**17.4**							**10.1**						
NL521C1	**Oss**	**99**	**18.4**							**11.4**						
NL522C1	**Assen**	**70**	**16.9**							**9.8**						
NL524C1	**Veenendaal**	**63**	**19.2**							**11.5**						
NL528C1	**Greater Heemskerk**	**92**	**18.5**							**10.2**						
NL529C1	**Greater Soest**	**71**	**17.6**							**10.8**						
NO001C1	**Oslo**	**613**	**13.9**	2	13.3	13.5	8	17.3	16.4	**8.0**	1	7.0	8.1	8	7.5	8.0
NO002C1	**Bergen**	**260**	**9.2**	2	8.2	9.0	3	13.0	13.2	**5.3**	2	5.0	5.3	3	6.1	6.3
NO003C1	**Trondheim**	**175**	**10.5**	1	10.0	10.2	3	12.4	12.8	**6.2**	1	6.2	6.0	3	5.1	6.4
NO004C1	**Stavanger**	**133**	**12.0**	1	11.4	12.1	1	10.8	12.9	**6.8**	1	7.1	6.9	1	7.8	7.5
NO005C1	**Kristiansand**	**84**	**13.6**	1	15.8	14.1	1	20.7	18.3	**7.6**						
NO006C1	**Tromsø**	**68**	**9.9**	1	12.3	11.2	1	19.5	16.9	**5.0**				1	6.3	6.0
PL001C	**M. Warszawa**	**1 759**	**28.4**	6	24.4	28.6	1	37.5	36.4	**20.7**	5	17.8	20.6	1	24.7	23.7
PL002C	**M. Łódź**	**747**	**33.2**	4	31.5	34.2	1	33.0	35.3	**22.9**	3	21.2	23.3			
PL003C	**M. Kraków**	**782**	**38.4**	4	32.8	35.3	2	42.2	40.9	**27.9**	1	24.7	30.0	1	29.2	29.8
PL004C	**M. Wrocław**	**642**	**26.6**	2	23.8	27.4				**18.4**	2	16.8	19.7	1	19.1	19.0
PL005C	**M. Poznań**	**601**	**28.0**	4	26.7	27.7				**19.0**	1	18.2	18.9			
PL006C	**M. Gdańsk**	**471**	**22.2**	4	22.4	23.5				**14.6**	1	12.4	13.6			
PL007C	**M. Szczecin**	**433**	**22.1**	2	19.5	21.5	1	23.6	24.6	**15.2**	1	13.7	12.8	1	16.9	17.3
PL008C	**M. Bydgoszcz**	**367**	**28.0**	1	28.6	28.0	1	33.1	28.6	**18.5**	1	14.6	16.7	1	21.7	18.6
PL009C	**M. Lublin**	**359**	**27.1**	2	24.5	27.3				**19.5**	2	18.2	19.7			
PL010C	**M. Katowice**	**314**	**37.3**	1	33.0	37.6	1	40.5	39.0	**25.4**	1	24.1	25.4	1	27.7	25.8
PL011C	**M. Białystok**	**306**	**23.2**	2	20.1	23.5				**15.8**	2	14.6	16.2			
PL012C	**M. Kielce**	**208**	**29.7**	2	28.5	29.8				**19.7**	2	18.1	19.8			
PL013C	**M. Toruń**	**209**	**24.9**	2	25.9	25.6	1	22.9	26.1	**16.4**	1	15.3	16.9			
PL014C	**M. Olsztyn**	**179**	**21.8**	1	20.2	21.9				**15.8**	1	15.0	16.1			
PL015C	**M. Rzeszów**	**192**	**26.9**	1	24.5	26.8	1	22.5	27.1	**20.2**	1	16.9	20.1	1	19.8	20.3
PL016C	**M. Opole**	**137**	**29.6**	2	28.3	29.9				**20.2**	1	18.0	20.6			
PL017C	**M. Gorzów Wielkopolski**	**129**	**22.7**	2	21.3	22.9				**16.0**	1	14.8	16.2			
PL018C	**M. Zielona Góra**	**140**	**22.2**	1	20.3	23.4				**15.8**	1	13.9	16.7			
PL019C	**M. Jelenia Góra**	**88**	**21.7**	2	22.3	21.9				**15.8**	1	20.1	16.8			
PL020C	**M. Nowy Sącz**	**93**	**29.6**	1	35.3	30.2				**22.5**	1	27.3	23.0			
PL021C	**M. Suwałki**	**70**	**20.2**	1	19.8	19.8				**12.9**	1	12.0	12.9			
PL022C	**M. Konin**	**84**	**26.4**	1	23.3	26.9				**18.2**						
PL023C	**M. Żory**	**65**	**34.2**	1	35.9	34.6				**24.1**	1	24.9	24.2			
PL024C	**M. Częstochowa**	**244**	**31.8**	1	26.3	32.2	1	34.5	33.0	**21.5**	1	20.3	21.7			
PL025C	**M. Radom**	**229**	**26.6**	2	27.3	26.8				**19.5**	2	20.9	19.7			
PL026C	**M. Płock**	**128**	**27.4**	2	23.6	27.5				**19.2**	2	18.0	19.2			
PL027C	**M. Kalisz**	**110**	**29.2**	1	26.9	29.6				**21.2**	1	21.4	21.6			
PL028C	**M. Koszalin**	**113**	**19.4**	1	19.1	19.1	1	21.5	21.5	**12.9**	1	13.7	12.6			
PL029C	**M. Słupsk**	**99**	**20.4**	1	18.0	20.8				**13.1**	1	11.2	13.5			
PL030C	**M. Jastrzębie-Zdrój**	**98**	**33.4**							**23.8**						
PL031C	**M. Siedlce**	**80**	**25.2**	1	25.7	25.1				**18.9**	1	19.6	19.1			
PL032C	**M. Piotrków Trybunalski**	**78**	**29.9**	1	33.6	30.3				**20.9**	1	24.9	21.3			
PL033C	**Lubin**	**78**	**23.6**							**16.4**						
PL034C	**Piła**	**75**	**24.5**	1	24.5	24.7				**16.6**						
PL035C	**Inowrocław**	**77**	**25.5**	1	22.1	25.7				**17.2**						

URAU Code	Name of City	POP	PM$_{10}$							PM$_{2.5}$						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
PL036C	**Ostrowiec Świętokrzyski**	**78**	**24.8**							**17.8**						
PL037C	**Gniezno**	**73**	**26.1**	1	27.3	26.6				**18.2**						
PL038C	**Stargard**	**71**	**21.1**							**14.4**						
PL039C	**Ostrów Wielkopolski**	**77**	**28.1**	1	31.3	28.4				**20.0**						
PL040C	**M. Przemyśl**	**70**	**23.0**	1	23.6	23.1				**18.2**	1	19.4	18.4			
PL041C	**M. Zamość**	**70**	**25.3**	1	26.4	25.5				**18.6**	1	18.4	18.7			
PL042C	**M. Chełm**	**70**	**23.7**	1	23.5	23.8				**17.8**	1	18.2	17.9			
PL043C	**Pabianice**	**75**	**29.0**	1	28.8	29.2				**20.0**						
PL044C	**Głogów**	**71**	**26.1**	1	24.3	25.8				**18.6**						
PL045C	**Stalowa Wola**	**67**	**25.2**	1	25.4	25.3				**18.5**						
PL046C	**Tomaszów Mazowiecki**	**69**	**28.9**	1	29.9	29.6				**20.1**						
PL047C	**M. Łomża**	**67**	**22.6**	1	23.9	22.4				**17.5**	1	21.4	17.7			
PL048C	**M. Leszno**	**65**	**27.0**	1	25.9	25.3				**19.2**						
PL049C	**Świdnica**	**63**	**25.3**	1	25.4	25.5				**17.3**						
PL050C	**Zgierz**	**59**	**29.7**	1	34.8	30.9				**20.9**	1	27.0	21.8			
PL051C	**Tczew**	**63**	**21.2**							**14.0**						
PL052C	**Ełk**	**60**	**20.0**	1	19.7	19.9				**14.0**						
PL501C	**M. Gdynia**	**265**	**19.4**	3	17.1	18.4				**12.7**						
PL502C	**M. Sosnowiec**	**261**	**36.5**	1	29.5	36.5				**25.1**						
PL503C	**M. Gliwice**	**211**	**35.1**	1	33.3	36.2				**24.6**	1	26.4	25.2			
PL504C	**M. Zabrze**	**173**	**36.2**	1	38.7	35.7				**25.1**						
PL505C	**M. Bytom**	**199**	**37.9**							**26.0**						
PL506C	**M. Bielsko-Biała**	**185**	**31.1**	1	27.5	32.3				**22.1**	1	21.6	22.4	1	27.6	22.9
PL507C	**M. Ruda Śląska**	**154**	**36.9**							**25.1**						
PL508C	**M. Rybnik**	**161**	**34.9**	1	44.1	32.7				**25.0**						
PL509C	**M. Tychy**	**133**	**35.2**	1	31.6	31.5				**24.6**						
PL511C	**M. Wałbrzych**	**132**	**24.4**	1	23.9	24.7				**16.8**	1	15.4	17.0			
PL512C	**M. Elbląg**	**126**	**21.4**	1	20.9	21.9				**14.6**	1	15.1	14.9			
PL513C	**M. Włocławek**	**119**	**24.1**	1	26.5	24.2	2	26.3	26.3	**16.8**	1	17.2	17.0	1	22.9	17.2
PL514C	**M. Tarnów**	**121**	**30.8**	1	26.4	29.9	1	34.1	32.7	**22.7**	1	20.1	22.3	1	22.6	23.5
PL515C	**M. Chorzów**	**160**	**38.3**							**26.0**						
PL516C	**M. Legnica**	**106**	**26.3**	1	28.5	26.9				**18.0**	1	17.0	18.3			
PL517C	**M. Grudziądź**	**102**	**24.9**	1	27.4	25.2				**17.1**	1	19.6	17.3			
PT001C1	**Lisboa**	**628**	**23.8**	1	17.1	24.5	3	21.6	22.9	**13.1**	1	9.2	13.5	1	11.7	14.8
PT002C1	**Porto**	**238**	**19.0**							**9.3**						
PT003C1	**Braga**	**191**	**19.0**							**9.8**						
PT004C1	**Funchal**															
PT005C1	**Coimbra**	**151**	**17.6**	1	17.5	18.7	1	22.2	20.0	**8.6**						
PT006C1	**Setúbal**	**134**	**19.0**	1	20.1	19.1	1	18.5	19.8	**9.0**						
PT007C1	**Ponta Delgada**															
PT008C1	**Aveiro**	**85**	**23.0**	1	23.5	22.9	1	22.4	23.4	**10.4**	1	9.0	10.5			
PT009C1	**Faro**	**68**	**20.4**	1	17.5	20.9				**8.5**						
PT010C1	**Seixal**	**162**	**20.1**							**10.0**						
PT011C1	**Amadora**	**168**	**17.4**	1	15.8	17.4				**8.4**						
PT012C1	**Almada**	**180**	**20.1**	1	21.2	20.6				**10.1**	1	10.0	10.5			
PT013C1	**Odivelas**	**157**	**20.8**				1	19.7	18.9	**10.9**						
PT014C1	**Viseu**	**103**	**12.8**							**6.3**						
PT015C1	**Valongo**	**106**	**18.5**							**9.2**						
PT016C1	**Viana do Castelo**	**93**	**18.3**							**8.3**						
PT017C1	**Paredes**	**99**	**17.2**				1	9.6	17.1	**8.7**						
PT018C1	**Barreiro**	**100**	**20.0**	1	21.7	20.1				**9.3**						
PT019C1	**Póvoa de Varzim**	**84**	**18.1**							**8.3**						
PT501C1	**Sintra**	**385**	**17.4**	1	18.1	17.5				**8.2**	1	8.1	8.3			
PT502C1	**Vila Nova de Gaia**	**326**	**19.3**							**9.4**						
PT503C1	**Matosinhos**	**205**	**19.5**	1	17.6	21.0	1	16.4	18.8	**9.5**						
PT504C1	**Gondomar**	**179**	**19.2**							**9.6**						

URAU Code	Name of City	POP	PM10							PM2.5						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
PT505C1	**Guimarães**	**190**	**17.1**				1	16.2	17.3	**8.8**						
PT508C1	**Vila Franca de Xira**	**152**	**17.7**	1	17.6	18.0				**8.3**						
RO001C1	**MUNICIPIUL BUCURESTI**	**1 940**	**28.2**	1	28.9	27.4	2	35.1	32.3	**18.4**	1	16.4	18.0	1	16.3	19.0
RO002C1	**MUNICIPIUL CLUJ-NAPOCA**	**331**	**21.2**							**14.6**						
RO003C1	**MUNICIPIUL TIMISOARA**	**326**	**24.8**	1	23.4	24.2	1	30.7	30.1	**17.0**	1	16.8	16.8			
RO004C1	**MUNICIPIUL CRAIOVA**	**272**	**34.6**							**23.5**						
RO005C1	**MUNICIPIUL BRAILA**	**181**	**18.7**							**13.3**						
RO006C1	**MUNICIPIUL ORADEA**	**199**	**26.6**							**17.7**						
RO007C1	**MUNICIPIUL BACAU**	**149**	**27.5**							**19.5**						
RO008C1	**MUNICIPIUL ARAD**	**159**	**23.1**							**15.3**						
RO009C1	**MUNICIPIUL SIBIU**	**148**	**22.0**	1	18.5	22.1				**14.8**						
RO010C1	**MUNICIPIUL TIRGU MURES**	**147**	**24.9**							**16.1**						
RO011C1	**MUNIC. PIATRA NEAMT**	**86**	**20.4**	1	20.2	19.5				**14.1**						
RO012C1	**MUNICIPIUL CALARASI**	**73**	**24.4**	1	26.7	24.0				**16.9**						
RO013C1	**MUNICIPIUL GIURGIU**	**62**	**27.8**	1	23.8	28.1	1	27.4	27.9	**18.0**						
RO014C1	**MUNICIPIUL ALBA IULIA**	**64**	**23.1**	1	23.8	23.0				**16.4**						
RO015C1	**MUNICIPIUL FOCSANI**	**81**	**19.6**							**14.2**						
RO016C1	**MUNICIPIUL TIRGU JIU**	**86**	**29.5**							**21.0**						
RO017C1	**MUNICIPIUL TULCEA**	**75**	**19.0**				1	28.2	26.1	**12.9**						
RO018C1	**MUNICIPIUL TIRGOVISTE**	**83**	**23.6**							**16.0**						
RO019C1	**MUNICIPIUL SLATINA**	**72**	**34.1**							**23.6**						
RO020C1	**MUNICIPIUL BIRLAD**	**56**	**20.3**							**14.6**						
RO021C1	**MUNICIPIUL ROMAN**	**53**	**26.8**							**18.3**						
RO022C1	**MUNICIPIUL BISTRITA**	**76**	**16.6**	1	11.1	16.7				**11.5**						
RO501C1	**MUNICIPIUL CONSTANTA**	**284**	**23.0**							**16.1**						
RO502C1	**MUNICIPIUL IASI**	**311**	**28.6**	1	32.1	28.3	1	37.3	34.6	**19.4**						
RO503C1	**MUNICIPIUL GALATI**	**253**	**18.3**	2	14.3	17.6	1	19.0	23.2	**12.9**						
RO504C1	**MUNICIPIUL BRASOV**	**256**	**23.1**	1	25.0	23.2	2	29.1	28.0	**15.8**	1	17.1	16.0			
RO505C1	**MUNICIPIUL PLOIESTI**	**216**	**25.2**	1	22.3	26.0	2	25.1	27.7	**17.3**						
RO506C1	**MUNICIPIUL PITESTI**	**161**	**29.0**							**19.4**						
RO507C1	**MUNICIPIUL BAIA MARE**	**128**	**24.9**	2	18.7	19.9	1	18.7	26.0	**17.4**						
RO508C1	**MUNICIPIUL BUZAU**	**119**	**21.0**							**14.9**						
RO509C1	**MUNICIPIUL SATU MARE**	**107**	**21.0**	1	19.5	21.0				**14.6**						
RO510C1	**MUNICIPIUL BOTOSANI**	**111**	**27.3**	1	27.4	26.6				**16.7**	1	13.4	16.2			
RO511C1	**MUNIC. RAMNICU VALCEA**	**102**	**26.4**	1	30.9	29.0				**18.7**						
RO512C1	**MUNICIPIUL SUCEAVA**	**99**	**23.3**	1	22.6	22.7				**15.3**						
RO513C1	**M. DROBETA-TURNU SEVER**	**99**	**34.2**							**23.7**						
SE001C1	**Stockholm**	**967**	**14.0**	1	11.1	18.3	6	19.0	20.8	**5.7**	1	4.8	6.1	4	6.2	7.4
SE002K1	**Greater Göteborg**	**581**	**13.8**	1	12.8	14.5	2	20.9	20.2	**6.7**	1	6.8	7.1	1	6.2	8.9
SE003C1	**Malmö**	**312**	**15.7**	1	15.3	15.8	1	16.8	17.5	**8.5**	1	9.5	8.6	1	10.1	9.8
SE004C1	**Jönköping**	**130**	**11.0**	1	11.5	11.8	1	15.7	16.3	**6.0**						
SE005C1	**Umeå**	**117**	**7.3**				1	16.1	16.4	**3.5**	1	3.7	3.8	1	4.8	5.5
SE006C1	**Uppsala**	**203**	**10.0**	1	10.3	11.0	1	17.1	15.5	**5.1**	1	5.3	5.5	1	5.9	6.2
SE007C1	**Linköping**	**149**	**10.9**				1	22.0	20.1	**5.2**						
SE008C1	**Örebro**	**139**	**10.5**				1	12.0	14.4	**4.5**						
SE009C1	**Södertälje**	**91**	**8.6**				2	19.8	15.7	**4.4**						
SE501C1	**Västerås**	**141**	**9.9**				1	12.3	14.7	**4.7**				1	6.0	6.7
SE502C1	**Norrköping**	**133**	**10.3**				2	20.7	19.2	**5.0**						
SE503C1	**Helsingborg**	**134**	**15.4**				1	17.3	17.8	**8.6**						
SE504C1	**Lund**	**117**	**15.1**				1	12.7	16.1	**8.6**						
SE505C1	**Borås**	**105**	**10.8**				1	16.6	16.3	**5.7**						
SI001C1	**Ljubljana**	**285**	**26.3**	2	20.4	26.8	1	23.7	28.6	**18.4**	1	16.2	19.5			
SI002C1	**Maribor**	**118**	**21.3**				1	22.6	23.4	**14.3**	1	12.9	14.4			
SK001C1	**Bratislava**	**413**	**19.8**	3	20.7	20.5	1	24.2	23.8	**13.3**	3	13.5	13.8			
SK002C1	**Košice**	**250**	**26.0**	1	22.6	26.1	1	28.8	29.5	**17.6**	1	13.7	17.9	1	18.4	19.3
SK003C1	**Banská Bystrica**	**85**	**19.6**	1	16.3	19.5	1	25.8	24.0	**13.7**	1	10.2	13.5	1	17.6	16.1

URAU Code	Name of City	POP	PM$_{10}$							PM$_{2.5}$						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
SK004C1	**Nitra**	**81**	**20.3**	1	20.5	19.7	1	23.5	23.9	**14.1**	1	14.7	13.8	1	15.4	15.8
SK005C1	**Prešov**	**96**	**24.8**				1	27.6	27.6	**17.7**				1	18.2	18.5
SK006C1	**Žilina**	**89**	**22.8**	1	23.3	23.8				**17.0**	1	18.4	17.8			
SK007C1	**Trnava**	**70**	**19.7**				1	23.9	23.2	**13.6**				1	16.2	15.2
SK008C1	**Trenčín**	**60**	**19.9**				1	24.9	23.6	**14.3**				1	17.7	16.1
UK002C1	**Birmingham**	**1 082**	**15.5**	1	15.2	15.2	1	15.4	17.0	**9.7**	2	9.4	9.6	1	9.8	10.8
UK003C1	**Leeds**	**753**	**15.3**	1	16.4	14.9	1	15.8	17.1	**10.9**	1	12.3	10.8	1	12.3	11.1
UK004C1	**Glasgow City**	**670**	**11.7**	1	11.3	11.9	1	10.7	12.3	**7.2**	1	6.7	7.3	1	6.3	7.6
UK005C1	**Bradford**	**533**	**14.9**							**10.5**						
UK006C1	**Liverpool**	**496**	**15.5**							**9.5**						
UK007C1	**City of Edinburgh**	**485**	**11.4**	1	10.9	11.1				**6.6**	1	6.3	6.4			
UK008C1	**Manchester**	**512**	**15.9**							**10.5**	1	11.5	10.5			
UK009C1	**Cardiff**	**357**	**16.1**				1	18.8	18.8	**10.4**						
UK010C1	**Sheffield**	**557**	**14.8**	1	14.9	15.1				**10.1**	1	10.4	10.3	1	14.5	11.5
UK011C1	**Bristol, City of**	**457**	**16.1**	1	16.0	16.0	1	20.9	19.6	**10.5**	1	10.8	10.5			
UK012C2	**Belfast**	**351**	**15.0**	1	15.3	14.7	1	18.2	17.6	**10.1**	1	10.6	10.1			
UK013C1	**Newcastle upon Tyne**	**288**	**14.2**	1	15.2	14.3	1	16.2	16.0	**8.8**	1	8.8	9.0			
UK014C1	**Leicester**	**383**	**15.8**				1	22.5	19.5	**10.6**	1	11.2	10.6			
UK016C1	**Aberdeen City**	**226**	**11.5**	1	13.7	14.0				**6.1**	1	7.3	7.7			
UK017C1	**Cambridge**	**135**	**15.7**							**11.0**						
UK018C1	**Exeter**	**121**	**15.1**							**10.2**						
UK019C1	**Lincoln**	**99**	**15.2**							**10.4**						
UK020C1	**Gravesham**	**109**	**17.2**							**11.4**						
UK021C1	**Stevenage**	**91**	**15.4**							**10.6**						
UK022C1	**Wrexham**	**138**	**13.3**				1	12.1	14.5	**8.4**				1	7.9	9.1
UK023C1	**Portsmouth**	**212**	**16.8**	1	15.0	15.9	1	19.5	19.9	**9.7**	1	8.9	9.6			
UK024C1	**Worcester**	**103**	**14.6**							**9.4**						
UK025C1	**Coventry**	**317**	**15.3**				1	19.5	17.7	**9.9**	1	9.1	9.7			
UK026C1	**Kingston upon Hull, City of**	**273**	**16.0**				1	21.0	20.3	**11.0**	1	10.8	11.0			
UK027C1	**Stoke-on-Trent**	**261**	**15.1**				1	19.7	17.5	**9.7**	1	9.5	9.5			
UK028C1	**Wolverhampton**	**255**	**15.2**							**9.6**						
UK029C1	**Nottingham**	**368**	**16.2**	1	18.1	16.2	1	19.8	19.0	**10.6**	1	10.8	10.7			
UK030C1	**Wirral**	**320**	**14.7**							**8.9**	1	8.0	8.6			
UK031C1	**Bath and N. East Somerset**	**183**	**15.4**							**10.0**						
UK032C1	**Thurrock**	**160**	**17.3**	1	20.5	17.2	1	17.3	20.4	**11.5**				1	11.5	12.3
UK033C1	**Guildford**	**153**	**14.9**							**9.9**						
UK034C1	**Thanet**	**134**	**18.5**							**11.1**						
UK035C1	**Nuneaton and Bedworth**	**129**	**15.3**							**10.0**						
UK038C1	**Waveney**	**118**	**16.5**							**10.5**						
UK040C1	**Tunbridge Wells**	**127**	**16.2**							**10.6**						
UK041C1	**Ashford**	**119**	**17.0**							**10.8**						
UK043C1	**East Staffordshire**	**121**	**15.0**							**9.8**						
UK044C1	**Darlington**	**112**	**14.3**							**9.8**						
UK045C1	**Worthing**	**113**	**16.3**							**9.9**				1	10.0	10.8
UK046C1	**Mansfield**	**112**	**15.0**							**10.0**						
UK047C1	**Chesterfield**	**110**	**14.5**	1	12.7	14.3	1	14.1	16.8	**9.8**	1	8.4	9.6	1	8.9	11.0
UK050C1	**Burnley**	**94**	**14.5**							**9.7**						
UK051C1	**Great Yarmouth**	**98**	**16.1**							**10.4**						
UK052C1	**Woking**	**104**	**15.1**							**10.1**						
UK053C1	**Hartlepool**	**93**	**16.8**							**11.2**						
UK054C1	**Cannock Chase**	**108**	**15.1**							**9.6**						
UK055C1	**Eastbourne**	**107**	**17.8**	1	15.5	16.5				**10.2**	1	10.5	10.5			
UK056C1	**Hastings**	**94**	**18.1**							**10.6**						
UK057C1	**Hyndburn**	**82**	**15.0**							**9.8**						
UK059C1	**Redditch**	**86**	**14.5**							**9.3**						
UK060C1	**Tamworth**	**82**	**15.4**							**9.9**						

URAU Code	Name of City	POP	PM$_{10}$							PM$_{2.5}$						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
UK061C1	Harlow	84	16.5							11.2						
UK062C1	Halton	126	15.1							9.4						
UK101C1	City of London	4	18.1							11.8						
UK102C1	Barking and Dagenham	188	17.1							11.4						
UK103C1	Barnet	380	16.4							11.0						
UK104C1	Bexley	258	16.7							11.1	1	11.6	11.1			
UK105C1	Brent	301	16.7							11.1						
UK106C1	Bromley	319	16.2							10.8						
UK107C1	Camden	192	17.7	1	17.6	16.8	1	19.5	22.5	11.7	1	10.8	11.4	1	11.1	13.1
UK108C1	Croydon	368	16.0							10.7						
UK109C1	Ealing	322	16.2				1	27.9	22.4	10.9						
UK110C1	Enfield	318	16.4							11.0						
UK111C1	Greenwich	237	16.6							11.0	1	10.9	10.9			
UK112C1	Hackney	265	17.7							11.7						
UK113C1	Hammersmith and Fulham	188	16.9							11.1						
UK114C1	Haringey	246	17.3							11.5						
UK115C1	Harrow	250	15.8							10.6						
UK116C1	Havering	239	16.9							11.3						
UK117C1	Hillingdon	303	15.7							10.7						
UK118C1	Hounslow	270	16.5							11.1						
UK119C1	Islington	205	17.9							11.7						
UK120C1	Kensington and Chelsea	151	17.4	1	14.5	16.2				11.4	1	9.6	11.0			
UK121C1	Kingston upon Thames	176	15.8							10.6						
UK122C1	Lambeth	324	17.3							11.4						
UK123C1	Lewisham	272	16.6	1	14.7	16.1				11.0	1	9.9	10.9			
UK124C1	Merton	191	16.5							11.0						
UK125C1	Newham	328	17.4							11.5						
UK126C1	Redbridge	292	17.1							11.4						
UK127C1	Richmond upon Thames	209	16.4							11.0	1	11.8	10.9			
UK128C1	Southwark	271	17.0				1	23.6	21.8	11.2						
UK129C1	Sutton	200	15.7							10.5						
UK130C1	Tower Hamlets	258	17.9							11.7						
UK131C1	Waltham Forest	240	17.3							11.5						
UK132C1	Wandsworth	323	16.9							11.3						
UK133C1	Westminster	228	17.8				1	24.0	22.7	11.7	1	12.5	11.1	1	14.3	13.2
UK501C1	Kirklees	425	15.1							10.5						
UK502C1	North Lanarkshire	350	11.1							6.7						
UK503C1	Wakefield	328	15.2							10.8						
UK504C1	Dudley	314	15.0							9.5						
UK505C1	Wigan	322	15.5							9.8	1	9.6	9.6			
UK506C1	Doncaster	306	15.1							10.6						
UK507C1	Stockport	292	15.1							10.0						
UK508C1	Sefton	286	15.3							9.2						
UK509C1	Sandwell	305	15.5							9.8						
UK510C1	Sunderland	274	15.1							9.5	1	9.4	9.2			
UK511C1	Bolton	283	15.6							10.1						
UK512C1	Walsall	269	15.6							9.8						
UK513C1	Medway	264	17.3				1	22.9	21.0	11.4				1	13.9	12.4
UK514C1	Rotherham	267	15.1							10.4						
UK515C1	Brighton and Hove	280	16.8							10.2						
UK516C1	Plymouth	262	16.4	1	16.9	17.1				10.2	1	11.1	10.6			
UK517C1	Swansea	245	15.5				1	18.4	18.0	9.5				1	9.9	9.8
UK518C1	Derby	261	15.9							10.3						
UK519C1	Barnsley	230	14.9							10.3						
UK520C1	Southampton	245	16.3	1	17.1	16.3	1	16.6	18.0	10.1	1	9.6	10.1			
UK521C1	Oldham	226	15.3							10.3						

URAU Code	Name of City	POP	PM10							PM2.5						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
UK522C1	Salford	231	15.8	1	15.3	15.5				10.3	1	9.5	10.2			
UK523C1	Tameside	219	15.1							10.1						
UK524C1	Trafford	228	15.5							10.1						
UK525C1	Milton Keynes	253	14.8							10.3						
UK526C1	Rochdale	216	15.1							10.1						
UK527C1	Solihull	218	15.8							9.9						
UK528C1	Northampton	218	15.1							10.5	1	11.5	10.5			
UK529C1	North Tyneside	198	14.7							8.8						
UK530C1	Gateshead	208	14.1							8.8						
UK531C1	Warrington	204	15.3							9.8						
UK532C1	Luton	217	15.4							10.6						
UK533C1	York	201	14.7	1	14.0	14.7	1	21.9	18.7	10.7	1	11.1	10.9			
UK534C1	Bury	180	15.4				1	17.7	18.0	10.2						
UK535C1	Swindon	213	15.1							9.8						
UK536C1	Stockton-on-Tees	192	15.0				1	13.6	16.0	10.2				2	8.2	10.1
UK537C1	St. Helens	193	15.4				1	20.5	18.1	9.6						
UK538C1	Basildon	185	17.3							11.4						
UK539C1	Bournemouth	192	16.0							10.1	1	10.8	10.0			
UK540C1	Wycombe	187	14.7							9.9						
UK541C1	Southend-on-Sea	182	17.4							11.3	1	10.6	11.2			
UK542C1	Telford and Wrekin	170	14.2							9.0						
UK543C1	North East Lincolnshire	163	16.0							10.7						
UK544C1	Chelmsford	173	16.8							11.2						
UK545C1	Peterborough	205	15.3							10.7						
UK546C1	Colchester	178	16.8							11.1						
UK547C1	South Tyneside	151	17.1							10.3						
UK548C1	Basingstoke and Deane	176	14.8							9.7						
UK549C1	Bedford	176	15.1							10.5						
UK550C1	Dundee City	156	10.7							6.0						
UK551C1	Falkirk	161	11.4							6.9						
UK552C1	Reading	184	15.3				1	17.2	18.7	10.2						
UK553C1	Blackpool	153	15.5							8.7	1	9.2	8.7			
UK554C1	Maidstone	162	16.9							11.1						
UK555C1	Poole	161	16.1							10.3						
UK556C1	Dacorum	153	15.1							10.3						
UK557C1	Blackburn with Darwen	150	14.9							9.7						
UK558C1	Newport	153	15.4	1	15.2	15.0				9.9	1	9.5	9.8			
UK559C1	Middlesbrough	148	14.7							9.9						
UK560C1	Oxford	160	15.1	1	14.2	14.8				9.9	1	8.9	9.7			
UK561C1	Torbay	132	15.9							9.9						
UK562C1	Preston	150	15.4							9.7	1	9.4	9.8			
UK563C1	St Albans	156	15.6							10.6						
UK564C1	Warwick	138	14.6	1	14.4	14.7	1	13.3	16.5	9.6	1	9.8	9.7	1	9.2	10.6
UK565C1	Newcastle-under-Lyme	126	15.0							9.6						
UK566C1	Norwich	162	15.6	1	14.0	15.2				10.6	1	10.3	10.6			
UK567C1	Slough	148	15.4							10.4						
UK568C2	Cheshire West and Chester	348	14.5							9.3						
UK569C1	Ipswich	144	16.6							11.1						
UK571C1	Cheltenham	118	14.8							9.6						
UK572C1	Gloucester	132	15.3							10.0						
UK573C1	Bracknell Forest	135	15.0							10.0						
UK575C1	Carlisle	110	11.9				1	18.6	16.1	7.5				1	10.8	8.9
UK576C1	Crawley	113	16.2							10.8						
UK577C1	Watford	112	15.5							10.4						
UK578C1	Gosport	84	15.9							9.5						
UK579C1	Eastleigh	131	16.2							10.1						

URAU Code	Name of City	POP	PM10							PM2.5						
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB	NT	CST	CMT
UK580C1	**Rushmoor**	**106**	**14.9**							**9.8**						
UK581C1	**Rugby**	**107**	**14.6**							**9.8**						
UK582C1	**Corby**	**60**	**14.8**							**10.4**						
UK583C1	**Kettering**	**96**	**15.0**							**10.4**						
UK584C1	**Inverclyde (Greenock)**	**81**	**10.7**				1	11.8	11.8	**6.4**				1	6.6	6.7
UK585C1	**Renfrewshire (Paisley)**	**184**	**11.4**							**6.9**						
UK586C1	**Derry & Strabane**	**148**	**11.8**	1	11.5	12.0				**8.4**	1	9.4	9.0			

Cities with no data presented are outside the mapping area (e.g. in French oversea departments).

Table A.2: Total population in thousands of inhabitants (POP), estimated population-weighted concentration in µg·m^{-3} (PWC), number of urban/suburban background (NB) and traffic (NT) stations, average of annual concentrations measured at these background and traffic stations (CSB, CST), averages of annual concentrations estimated at the underlying grid cells of urban background and urban traffic map layers (CMB, CMT) in cities of the Urban Audit for NO_2 annual average 2019 (left) and O_3 indicator 93.2 percentile of daily 8-hour maximums in 2019 (right). Urban traffic stations and areas are relevant NO_2 only.

URAU Code	Name of City	POP	NO_2							O_3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
AT001C1	**Wien**	**1 741**	**23.7**	13	19.2	20.1	3	33.2	32.4	**119.9**	5	121.3	120.5
AT002C1	**Graz**	**275**	**23.7**	4	23.7	23.3	2	31.6	31.8	**118.3**	4	115.8	117.8
AT003C1	**Linz**	**208**	**22.9**	2	25.5	24.6	2	33.6	31.3	**120.5**	2	116.9	120.1
AT004C1	**Salzburg**	**158**	**19.7**	1	20.6	20.5	2	30.0	32.6	**118.0**	2	121.9	118.2
AT005C1	**Innsbruck**	**130**	**26.4**	2	24.6	24.3	1	29.1	33.8	**120.4**	1	122.6	120.1
AT006C1	**Klagenfurt**	**100**	**19.5**	1	19.7	20.0	3	26.5	26.6	**114.5**	2	114.2	113.8
BE001K1	**Bruxelles / Brussel (gr. city)**	**1 192**	**26.8**	5	24.4	25.0	3	37.2	36.7	**103.8**	4	105.1	103.7
BE002C1	**Antwerpen**	**544**	**27.3**	3	28.4	28.3	20	36.5	36.6	**99.4**	1	86.9	98.8
BE003C1	**Gent**	**277**	**21.9**	1	23.7	23.3	21	31.2	31.3	**103.2**	1	110.1	102.7
BE004K1	**Charleroi (greater city)**	**258**	**21.0**	2	23.4	21.6				**107.9**	1	106.3	106.7
BE005K1	**Liege (greater city)**	**429**	**19.8**	2	21.2	20.4				**112.4**	2	111.5	112.4
BE006C1	**Brugge**	**128**	**16.1**							**100.1**			
BE007C1	**Namur**	**116**	**19.1**	1	23.8	20.4				**110.3**			
BE008C1	**Leuven**	**114**	**20.4**							**111.8**			
BE009K1	**Mons (greater city)**	**167**	**18.8**	1	22.5	18.3				**105.5**	1	99.8	104.8
BE010C1	**Kortrijk**	**89**	**18.4**							**103.9**			
BE011C1	**Oostende**	**80**	**14.9**							**101.9**			
BE012C1	**Mechelen**	**102**	**21.0**							**107.5**			
BE013C1	**Mouscron**	**41**	**17.7**							**105.3**			
BE014K1	**La Louvière (greater city)**	**110**	**18.9**							**107.7**			
BE015K1	**Verviers (greater city)**	**77**	**16.1**							**112.6**			
BG001C1	**Sofia**	**1 297**	**28.3**	3	27.9	27.6	2	27.2	32.5	**92.7**	3	89.0	92.0
BG002C1	**Plovdiv**	**338**	**24.3**	1	19.9	21.2	1	47.1	38.9	**101.4**	1	103.7	101.3
BG003C1	**Varna**	**345**	**23.6**	2	27.6	24.3				**102.2**	1	106.2	102.2
BG004C1	**Burgas**	**213**	**18.1**	1	12.6	14.1				**95.4**	1	90.7	90.3
BG005C1	**Pleven**	**132**	**17.0**	1	16.6	18.5				**95.1**			
BG006C1	**Ruse**	**168**	**22.8**	1	21.7	24.4				**98.4**	1	103.1	98.3
BG007C1	**Vidin**	**68**	**17.7**							**102.4**			
BG008C1	**Stara Zagora**	**161**	**18.1**				1	14.9	22.9	**102.0**			
BG009C1	**Sliven**	**126**	**18.4**							**97.6**			
BG010C1	**Dobrich**	**91**	**19.3**							**99.8**			
BG011C1	**Shumen**	**94**	**17.6**	1	19.3	19.0				**99.9**	1	101.9	99.1
BG012C1	**Pernik**	**97**	**18.1**	1	16.4	18.8				**99.3**			
BG013C1	**Yambol**	**75**	**19.2**							**97.3**			
BG014C1	**Haskovo**	**95**	**16.7**							**103.0**			
BG015C1	**Pazardzhik**	**116**	**19.2**							**101.8**			
BG016C1	**Blagoevgrad**	**78**	**19.7**	1	17.8	18.3				**99.7**	1	106.7	98.7
BG017C1	**Veliko Tarnovo**	**89**	**18.3**							**93.6**			
BG018C1	**Vratsa**	**74**	**18.1**	1	19.3	19.2				**94.0**	1	90.0	91.8
CH001C1	**Zurich**	**414**	**26.4**	1	25.8	25.6	1	29.2	38.7	**115.9**	1	122.3	116.3
CH002C1	**Geneva**	**244**	**23.9**							**112.4**			
CH003C1	**Basel**	**190**	**23.4**							**108.3**			
CH004C1	**Bern**	**176**	**21.4**	6	21.3	21.2	4	35.3	34.5	**120.4**	5	121.8	121.5
CH005C1	**Lausanne**	**180**	**18.2**	4	19.4	19.7	3	32.9	31.9	**117.9**	3	117.6	116.4
CH006C1	**Winterthur**	**116**	**18.9**	2	17.6	18.0	1	31.6	33.3	**114.8**	2	119.6	115.5
CH007C1	**St. Gallen**	**83**	**16.6**	2	14.4	14.7	2	18.7	21.9	**115.6**	2	114.0	115.4
CH008C1	**Lucerne**	**102**	**17.6**	2	17.2	17.3	1	31.0	29.1	**124.2**	2	130.6	124.1
CH009C2	**Lugano**	**86**	**18.0**	1	20.1	18.2				**115.1**			

URAU Code	Name of City	POP	NO_2							O_3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
CH010C1	**Biel/Bienne**	**60**	**13.6**	1	14.1	15.4				**117.9**	1	118.3	117.6
CH011C1	**Thun**	**53**	**14.9**	1	12.9	15.2				**114.0**	1	103.9	113.8
CH012C1	**Zug**	**38**	**14.4**				1	18.2	22.6	**118.6**	1	118.5	118.6
CY001C1	**Lefkosia**	**268**	**15.2**	1	13.6	13.9				**118.4**	1	119.2	118.3
CY002K1	**Greater Larnaka**	**78**	**14.5**	2	15.8	16.2				**115.0**	2	113.4	115.6
CY501C1	**Lemesos**	**191**	**16.5**	1	15.0	16.1				**122.1**	1	119.4	122.0
CZ001C1	**Praha**	**1 291**	**14.3**							**119.0**			
CZ002C1	**Brno**	**396**	**13.3**	1	12.7	13.5				**115.6**	1	119.4	115.4
CZ003C1	**Ostrava**	**310**	**18.7**							**112.5**			
CZ004C1	**Plzeň**	**175**	**19.7**	1	19.4	20.2				**123.8**	1	121.3	123.3
CZ005C1	**Ústí nad Labem**	**96**	**18.6**	1	18.7	19.3				**114.3**	1	115.4	114.3
CZ006C1	**Olomouc**	**111**	**18.6**							**122.9**			
CZ007C1	**Liberec**	**108**	**21.8**	6	20.6	20.7	42	39.4	39.1	**117.5**	3	117.5	116.7
CZ008C1	**České Budějovice**	**101**	**21.4**	7	21.8	22.2	4	42.8	42.0	**108.2**	4	108.9	108.2
CZ009C1	**Hradec Králové**	**97**	**26.8**	3	22.3	23.3	2	52.5	47.3	**122.4**	3	122.2	121.5
CZ010C1	**Pardubice**	**96**	**26.9**	2	24.5	23.0	11	37.7	38.3	**117.0**	2	117.9	115.4
CZ011C1	**Zlín**	**80**	**30.2**	5	28.1	27.7	6	45.3	44.9	**117.6**	3	116.4	114.4
CZ012C1	**Kladno**	**75**	**25.1**	2	25.0	22.3	8	37.0	37.0	**122.5**	1	121.7	119.7
CZ013C1	**Karlovy Vary**	**51**	**25.3**	1	24.6	26.1	4	45.8	44.3	**121.1**	1	124.7	122.0
CZ014C1	**Jihlava**	**53**	**16.9**	1	13.8	16.4	2	34.2	30.7	**117.8**	2	114.6	117.8
CZ015C1	**Havířov**	**80**	**17.3**	1	17.1	19.1	2	30.7	30.5	**120.8**	1	119.8	120.7
CZ016C1	**Most**	**66**	**22.1**	1	23.7	22.0	4	39.6	40.2	**120.8**	1	117.8	121.8
CZ017C1	**Karviná**	**61**	**27.1**	1	22.2	26.4	5	41.6	40.0	**114.3**	1	118.9	113.0
CZ018C2	**Chomutov-Jirkov**	**70**	**20.4**	4	20.0	20.3	1	34.2	36.5	**109.8**	3	114.1	110.1
DE001C1	**Berlin**	**3 374**	**18.3**	1	15.8	16.1	5	39.1	38.3	**114.3**	1	117.3	114.1
DE002C1	**Hamburg**	**1 779**	**24.4**	1	25.4	23.9	2	35.7	35.1	**119.0**	1	113.6	119.1
DE003C1	**München**	**1 399**	**22.7**				1	38.0	38.9	**123.0**			
DE004C1	**Köln**	**1 027**	**17.9**	1	20.7	18.6	4	33.8	35.0	**117.0**	1	112.4	116.0
DE005C1	**Frankfurt am Main**	**720**	**16.1**	1	16.1	16.5	1	35.6	30.2	**120.4**	1	118.1	120.4
DE006C1	**Essen**	**584**	**15.6**	1	16.2	16.9	2	26.1	28.6	**118.8**	1	119.0	119.7
DE007C1	**Stuttgart**	**618**	**25.4**	1	25.8	25.9	2	44.5	40.0	**120.9**	1	130.1	120.3
DE008C1	**Leipzig**	**524**	**15.4**	1	13.3	14.1	1	32.4	33.0	**115.6**	1	117.8	115.2
DE009C1	**Dresden**	**547**	**24.9**	1	21.9	25.3	2	32.9	35.7	**119.9**	1	121.3	120.0
DE010C1	**Dortmund**	**600**	**24.6**							**115.1**			
DE011C1	**Düsseldorf**	**617**	**18.1**	1	19.3	19.2				**94.0**	1	90.0	91.8
DE012C1	**Bremen**	**576**	**26.4**	1	25.8	25.6	1	29.2	38.7	**115.9**	1	122.3	116.3
DE013C1	**Hannover**	**563**	**23.9**							**112.4**			
DE014C1	**Nürnberg**	**502**	**23.4**							**108.3**			
DE015C1	**Bochum**	**377**	**21.4**	6	21.3	21.2	4	35.3	34.5	**120.4**	5	121.8	121.5
DE017C1	**Bielefeld**	**344**	**18.2**	4	19.4	19.7	3	32.9	31.9	**117.9**	3	117.6	116.4
DE018C1	**Halle an der Saale**	**235**	**18.9**	2	17.6	18.0	1	31.6	33.3	**114.8**	2	119.6	115.5
DE019C1	**Magdeburg**	**231**	**16.6**	2	14.4	14.7	2	18.7	21.9	**115.6**	2	114.0	115.4
DE020C1	**Wiesbaden**	**285**	**17.6**	2	17.2	17.3	1	31.0	29.1	**124.2**	2	130.6	124.1
DE021C1	**Göttingen**	**122**	**18.0**	1	20.1	18.2				**115.1**			
DE022C1	**Mülheim a.d.Ruhr**	**169**	**13.6**	1	14.1	15.4				**117.9**	1	118.3	117.6
DE023C1	**Moers**	**112**	**14.9**	1	12.9	15.2				**114.0**	1	103.9	113.8
DE025C1	**Darmstadt**	**163**	**23.7**	1	22.3	23.1	3	45.1	41.0	**124.4**	1	118.4	124.2
DE026C1	**Trier**	**119**	**18.3**				2	30.9	30.5	**116.6**			
DE027C1	**Freiburg im Breisgau**	**225**	**17.6**	1	15.7	18.6	1	36.4	34.8	**123.0**	1	123.8	123.5
DE028C1	**Regensburg**	**155**	**21.1**				1	35.3	32.1	**117.7**			
DE029C1	**Frankfurt (Oder)**	**64**	**13.4**	1	11.6	13.7	1	31.0	30.2	**119.1**	1	120.9	119.1
DE030C1	**Weimar**	**67**	**13.7**	1	15.4	15.3	2	24.6	24.6	**120.0**			
DE031C1	**Schwerin**	**97**	**12.2**				1	16.4	22.7	**111.9**			
DE032C1	**Erfurt**	**204**	**15.8**	2	15.2	15.2	3	26.1	27.0	**119.8**	2	120.8	119.4
DE033C1	**Augsburg**	**302**	**21.7**	2	20.0	21.5	2	30.9	33.3	**121.7**	2	123.9	121.9
DE034C1	**Bonn**	**341**	**22.7**	1	25.5	23.6	2	37.5	37.2	**121.9**			

URAU Code	Name of City	POP	NO_2							O_3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
DE035C1	Karlsruhe	315	22.9	1	21.2	20.9	1	34.3	34.8	122.2	1	129.0	122.7
DE036C1	Mönchengladbach	268	22.7	1	21.4	23.2	2	31.3	34.0	117.5	1	120.2	117.9
DE037C1	Mainz	206	25.1	3	25.2	26.2	22	35.1	35.8	123.4	1	117.8	120.3
DE039C1	Kiel	265	15.6	1	13.0	14.0	2	43.7	38.3	101.9	1	98.0	101.7
DE040C1	Saarbrücken	197	18.6	3	20.8	17.8	1	34.5	32.3	120.2	3	111.0	120.4
DE041C1	Potsdam	166	15.2	2	13.8	13.3	2	29.3	30.6	121.1	2	116.6	122.1
DE042C1	Koblenz	126	24.1	4	25.1	24.4	6	32.3	32.7	119.3			
DE043C1	Rostock	208	13.6	1	12.4	9.4	2	29.5	28.1	104.7	1	100.2	105.9
DE044C1	Kaiserslautern	99	17.9	1	19.5	19.2				120.3	1	119.1	120.0
DE045C1	Iserlohn	102	15.9							120.9			
DE046C1	Esslingen am Neckar	103	23.1				1	39.1	40.2	122.6			
DE047C1	Hanau	100	24.0	1	24.3	24.6				121.2	1	121.9	121.1
DE048C1	Wilhelmshaven	80	16.2							107.4			
DE049C1	Ludwigsburg	97	22.8	1	22.1	22.4	1	45.9	40.4	122.5	1	123.8	122.5
DE050C1	Tübingen	89	18.7	1	19.3	20.2	1	39.2	38.0	122.1	1	118.0	122.1
DE051C1	Villingen-Schwenningen	86	14.9	1	14.2	13.7				119.7	1	115.2	119.3
DE052C1	Flensburg	90	14.1				1	27.2	28.1	104.2			
DE053C1	Marburg	77	19.3	1	21.0	20.9	2	32.3	34.6	119.2	1	121.9	118.8
DE054C1	Konstanz	79	18.4	1	19.0	19.3				124.2	1	121.7	123.1
DE055C1	Neumünster	81	16.0							104.1			
DE056C1	Brandenburg an der Havel	75	12.8	1	12.1	12.9	1	23.5	26.3	120.2	1	118.3	119.3
DE057C1	Gießen	86	23.4	1	24.1	23.8	1	40.2	39.3	119.5			
DE058C1	Lüneburg	82	14.2	1	14.5	13.6				117.9	1	119.5	118.2
DE059C1	Bayreuth	75	17.2				1	27.2	26.8	117.5			
DE060C1	Celle	70	14.8							120.7			
DE061C1	Aschaffenburg	83	21.2	1	25.0	21.6				121.2	1	120.8	120.7
DE062C1	Bamberg	79	19.0	1	20.9	19.8				119.9			
DE063C1	Plauen	67	14.8				1	20.6	23.1	116.7	1	113.2	116.3
DE064C1	Neubrandenburg	66	11.5				2	21.4	22.0	111.4			
DE065C1	Fulda	84	18.6	1	19.7	19.2	1	37.9	36.2	117.3	1	118.7	116.8
DE066C1	Kempten (Allgäu)	71	19.0	1	19.4	20.1				117.1	1	123.3	117.1
DE067C1	Landshut	74	19.7				1	24.3	27.8	120.4			
DE068C1	Sindelfingen	70	20.7				1	37.6	38.2	121.0			
DE069C1	Rosenheim	64	20.2							117.9			
DE070C1	Frankenthal (Pfalz)	55	24.1				1	28.3	32.7	118.5			
DE071C1	Stralsund	58	10.7				1	17.4	18.1	104.8			
DE072C1	Friedrichshafen	60	18.3	1	20.9	19.2				121.5	1	116.9	121.3
DE073C1	Offenburg	64	18.6							123.1			
DE074C1	Görlitz	63	13.7				1	21.2	25.6	117.0			
DE075C1	Sankt Augustin	67	21.6							123.4			
DE076C1	Neu-Ulm	58	21.6	1	27.4	23.3				120.7	1	123.5	120.1
DE077C1	Schweinfurt	64	18.9	1	20.9	19.4				117.7	1	115.6	117.5
DE078C1	Greifswald	56	11.6							106.4			
DE079C1	Wetzlar	58	22.3	2	23.7	22.7				120.4	1	104.1	119.5
DE080C1	Speyer	60	23.6	1	27.9	22.4	1	26.0	30.8	122.9	1	121.5	122.9
DE081C1	Passau	50	19.8	1	29.2	22.3				121.9			
DE082C1	Dessau-Roßlau	88	13.3				1	16.2	22.6	122.0			
DE501C1	Duisburg	495	26.4	1	25.8	26.7	3	35.9	36.0	113.8			
DE502C1	Mannheim	303	27.3				2	39.7	38.1	118.5			
DE503C1	Gelsenkirchen	281	24.9	1	22.5	21.0	2	36.7	36.8	122.0			
DE504C1	Münster	291	17.8	1	15.7	18.3	2	33.0	33.9	123.1	1	124.2	123.2
DE505C1	Chemnitz	249	17.0	1	12.2	12.8	1	33.0	29.4	118.6	1	120.8	118.5
DE506C1	Braunschweig	250	15.9	1	12.1	11.7	2	30.0	30.5	116.1	1	115.6	115.6
DE507C1	Aachen	251	16.9	1	9.7	14.2	3	35.4	34.2	116.8	1	116.0	117.0
DE508C1	Krefeld	229	24.6				2	33.2	34.5	116.9	1	125.6	117.1
DE509C1	Oberhausen	211	26.9				2	42.0	39.4	119.7			

URAU Code	Name of City	POP	NO_2							O_3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
DE510C1	Lübeck	237	15.6	1	13.6	14.4	2	27.4	29.6	105.8	1	111.5	106.4
DE511C1	Hagen	199	18.6				2	44.6	38.9	121.6			
DE513C1	Kassel	209	19.0	1	20.0	19.5	1	38.3	38.4	117.4	1	120.3	117.4
DE514C1	Hamm	182	18.8				1	33.0	34.3	119.5			
DE515C1	Herne	158	24.3				1	38.9	37.2	122.2			
DE516C1	Solingen	177	20.0	1	17.6	20.6	1	34.3	36.5	120.9	1	117.3	120.9
DE517C1	Osnabrück	176	17.5	1	16.4	18.4	2	41.1	39.0	122.2	1	124.0	122.3
DE518C1	Ludwigshafen am Rhein	163	28.0	1	21.7	25.7	4	37.3	37.7	118.8	1	119.1	118.0
DE519C1	Leverkusen	167	22.1	1	22.4	23.6	1	38.3	37.0	119.3	1	119.1	120.0
DE520C1	Oldenburg (Oldenburg)	169	17.8				1	38.9	37.4	110.4			
DE521C1	Neuss	156	25.7	1	30.4	27.3	3	38.0	38.2	115.7			
DE522C1	Heidelberg	172	21.9	1	21.2	21.3	1	33.9	33.5	120.9	1	119.0	120.0
DE523C1	Paderborn	145	16.4				3	37.5	35.8	115.3			
DE524C1	Würzburg	146	20.9				1	30.5	33.7	117.8	1	116.2	117.7
DE525C1	Recklinghausen	127	22.1				1	34.6	36.4	122.8			
DE526C1	Wolfsburg	124	14.1	1	15.4	13.9	1	28.5	29.8	119.1	1	119.3	118.8
DE527C1	Bremerhaven	117	17.3	1	19.6	17.8	1	33.1	31.5	108.1	1	106.8	108.8
DE528C1	Bottrop	118	25.5				1	34.3	37.7	120.9			
DE529C1	Heilbronn	123	23.5	1	23.6	20.5	1	47.4	40.3	120.6	1	122.7	120.2
DE530C1	Remscheid	112	17.5				1	31.0	35.0	122.7			
DE531C1	Offenbach am Main	127	27.6				4	40.8	41.6	120.9			
DE532C1	Ulm	126	22.1	1	23.8	24.0	1	38.4	37.7	121.5	1	117.5	121.5
DE533C1	Pforzheim	130	21.0	1	23.2	20.2	1	33.0	35.4	121.6	1	114.2	121.5
DE534C1	Ingolstadt	133	20.9				1	22.9	28.4	119.2			
DE535C1	Gera	100	15.0	1	16.9	16.5	2	27.8	26.2	119.3	1	118.2	119.0
DE536C1	Salzgitter	105	13.2							115.1			
DE537C1	Reutlingen	121	20.7	1	23.3	21.2	1	46.0	40.4	122.2	1	117.8	122.7
DE538C1	Fürth	119	22.7							119.2			
DE539C1	Cottbus	101	14.1	1	11.9	13.9	1	25.8	29.0	119.6	1	121.4	119.6
DE540C1	Siegen	109	18.7				1	37.8	37.6	122.5			
DE541C1	Bergisch Gladbach	121	19.8							120.4			
DE542C1	Hildesheim	105	15.7				2	33.0	33.1	113.7			
DE543C1	Witten	105	19.8				1	38.1	37.5	122.3			
DE544C1	Zwickau	106	15.4				1	21.5	24.9	119.2			
DE545C1	Erlangen	112	19.9	1	15.7	16.0				119.6	1	126.1	119.5
DE546C1	Wuppertal	355	20.0	1	20.0	19.2	1	43.0	37.2	122.1	1	121.2	122.4
DE547C1	Jena	107	14.8	1	14.6	15.2	1	25.2	25.5	120.3	1	121.0	120.7
DE548C1	Düren, Stadt	99	19.2				1	39.5	35.4	116.8			
DE549C1	Bocholt, Stadt	73	18.7							119.1			
DK001C1	København	668	16.0	1	11.9	14.8	2	28.4	27.6	103.1	1	111.7	103.1
DK002C1	Århus	312	10.5	1	11.4	13.4	1	22.8	23.8	102.1	1	101.2	103.0
DK003C1	Odense	193	10.3	1	9.9	11.8	1	14.6	21.5	103.6	1	109.3	103.7
DK004C2	Aalborg	200	9.6	1	10.2	13.5				100.2	1	96.9	100.2
EE001C1	Tallinn	405	10.9	1	8.4	12.3	1	16.1	16.6	99.5	1	98.8	99.8
EE002C2	Tartu linn	105	10.1	1	9.9	11.1				102.7	1	107.8	102.7
EE003C1	Narva linn	59	10.4	1	7.7	11.2				99.2	1	99.8	99.2
EL001K1	Athens	3 313	29.3	4	20.5	22.9	4	45.5	47.7	113.7	4	129.7	116.9
EL002K1	Thessaloniki	789	29.5				1	23.6	34.2	94.6			
EL003C1	Patra	172	18.7				1	31.2	28.0	114.6			
EL004C1	Iraklio	156	18.3							120.5			
EL005C1	Larissa	142	22.4							110.1			
EL006C1	Volos	102	20.0							102.5			
EL007C1	Ioannina	76	18.8							115.7			
EL008C1	Kavala	56	14.9							96.1			
EL009C1	Kalamata	54	12.6							114.1			
EL010C1	Trikala	62	18.0							109.9			

URAU Code	Name of City	POP	NO$_2$							O$_3$			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
EL011C1	**Serres**	**60**	**21.8**							**102.1**			
EL012C1	**Katerini**	**61**	**18.1**							**102.9**			
EL013C1	**Xanthi**	**57**	**16.6**							**98.4**			
EL014C1	**Chania**	**66**	**12.7**							**115.7**			
ES001C1	**Madrid**	**3 230**	**35.2**	15	31.0	31.9	9	40.5	41.6	**117.7**	11	117.8	119.0
ES002C1	**Barcelona**	**1 637**	**37.2**	6	28.1	31.5	2	46.5	44.9	**102.7**	4	109.3	103.0
ES003C1	**Valencia**	**909**	**25.4**	2	20.2	22.2	5	27.0	27.1	**106.1**	2	109.6	106.0
ES004C1	**Sevilla**	**712**	**22.0**	4	18.9	20.0	2	33.1	34.1	**116.5**	3	117.0	116.2
ES005C1	**Zaragoza**	**699**	**21.9**	2	24.2	20.7	5	22.9	23.4	**108.6**	2	108.8	108.3
ES006C1	**Málaga**	**573**	**22.7**	2	22.2	20.9	1	35.8	31.6	**114.0**	2	111.2	113.2
ES007C1	**Murcia**	**465**	**17.2**				1	38.1	30.0	**110.9**			
ES008C1	**Palmas de Gran Canaria, Las**												
ES009C1	**Valladolid**	**336**	**16.9**				4	19.9	18.6	**115.3**			
ES010C1	**Palma de Mallorca**	**424**	**19.5**				1	32.1	26.4	**109.0**			
ES011C1	**Santiago de Compostela**	**116**	**14.1**	1	10.2	12.8	1	18.2	20.0	**91.9**	1	101.3	91.3
ES012C1	**Vitoria-Gasteiz**	**242**	**20.1**				3	18.6	23.0	**104.7**			
ES013C1	**Oviedo**	**228**	**20.3**	1	12.5	16.3	2	27.8	25.8	**93.7**	1	103.4	93.5
ES014C1	**Pamplona/ Iruña**	**268**	**19.0**	2	20.0	20.1	1	28.1	25.6	**101.1**	1	88.8	101.2
ES015C1	**Santander**	**183**	**17.5**	1	13.0	15.5	1	28.4	24.0	**92.4**	1	101.5	92.4
ES016C1	**Toledo**	**90**	**15.9**	1	19.3	17.2				**119.3**	1	116.9	119.3
ES017C1	**Badajoz**	**152**	**13.9**	1	8.2	10.1				**112.8**	1	114.1	110.0
ES018C1	**Logroño**	**155**	**18.2**	1	18.8	19.6				**103.5**	1	90.4	104.2
ES019C1	**Bilbao**	**358**	**22.5**	1	23.0	19.1	2	31.9	26.3	**92.7**	1	86.1	93.0
ES020C1	**Córdoba**	**331**	**17.2**	2	13.9	15.9	1	29.8	28.7	**120.1**	2	121.1	120.6
ES021C1	**Alicante/Alacant**	**342**	**18.5**	1	19.4	18.2	1	23.0	21.9	**114.8**	1	110.0	113.6
ES022C1	**Vigo**	**303**	**19.8**				2	23.5	23.2	**85.9**			
ES023C1	**Gijón**	**278**	**22.3**	2	17.7	16.5	4	24.6	25.0	**94.7**	1	96.1	93.8
ES024C1	**Hospitalet de Llobregat, L'**	**256**	**36.7**	1	33.3	38.8				**103.4**			
ES025C1	**Santa Cruz de Tenerife**												
ES026C1	**Coruña, A**	**261**	**17.2**	1	13.3	14.8	1	25.8	20.2	**91.6**	1	98.4	91.7
ES027C1	**Barakaldo**	**123**	**22.0**	1	23.4	24.1				**93.2**			
ES028C1	**Reus**	**112**	**19.3**				1	17.5	18.8	**110.8**			
ES029C1	**Telde**												
ES030C1	**Parla**	**123**	**26.2**							**119.9**			
ES031C1	**Lugo**	**100**	**13.7**				1	12.2	15.2	**93.2**			
ES032C1	**San Fernando**	**97**	**14.4**	1	11.5	14.5				**114.8**	1	111.0	114.8
ES033C1	**Girona**	**110**	**20.8**				1	26.4	27.3	**121.5**			
ES034C1	**Cáceres**	**96**	**13.0**	1	6.3	7.4				**116.2**	1	123.9	116.2
ES035C1	**Torrevieja**	**92**	**14.2**				1	11.6	17.7	**118.2**			
ES036C1	**Pozuelo de Alarcón**	**83**	**23.1**							**120.0**			
ES037C1	**Puerto de Santa María, El**	**95**	**14.7**							**112.0**			
ES038C1	**Coslada**	**113**	**30.7**				1	39.3	31.8	**119.4**			
ES039C1	**Avilés**	**96**	**16.8**				2	20.8	21.1	**89.9**			
ES040C1	**Talavera de la Reina**	**88**	**18.9**	1	15.9	13.1				**120.5**	1	124.1	120.5
ES041C1	**Palencia**	**81**	**13.1**				1	6.9	11.3	**114.6**			
ES042C1	**Sant Boi de Llobregat**	**89**	**27.1**							**104.4**			
ES043C1	**Ferrol**	**96**	**13.2**				1	12.6	16.2	**92.1**			
ES044C1	**Pontevedra**	**99**	**15.7**				1	18.1	20.0	**92.4**			
ES045C1	**Ceuta**	**84**	**16.9**	1	29.8					**112.8**	1	114.2	112.8
ES046C1	**Gandia**	**88**	**14.8**				1	10.8	19.1	**111.6**			
ES047C1	**Rozas de Madrid, Las**	**91**	**18.4**							**126.3**			
ES048C1	**Guadalajara**	**87**	**15.4**	1	14.3	17.2				**124.6**	1	119.8	124.5
ES049C1	**Sant Cugat del Vallès**	**85**	**24.1**	1	24.8	26.4				**111.6**	1	101.6	111.6
ES050C1	**Manresa**	**91**	**21.5**				1	26.4	25.9	**120.5**			
ES051C1	**Getxo**	**113**	**18.7**							**96.2**			
ES052C1	**Rubí**	**77**	**26.2**	1	23.4	22.2				**111.9**	1	116.1	111.6

URAU Code	Name of City	POP	NO2							O3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
ES053C1	**Ciudad Real**	**76**	**17.5**	1	15.5	12.4				**119.1**	1	117.1	119.1
ES054C1	**Benidorm**	**83**	**13.1**	1	8.2	9.2				**114.8**	1	109.3	114.7
ES055C1	**Melilla**	**81**	**16.4**							**103.7**			
ES056C1	**Viladecans**	**98**	**24.9**	1	25.3	26.3				**110.2**	1	106.5	108.1
ES057C1	**Ponferrada**	**71**	**14.8**							**99.9**			
ES058C1	**San Sebastián de los Reyes**	**87**	**25.1**							**125.9**			
ES059C1	**Zamora**	**65**	**13.8**				1	9.0	13.7	**114.5**			
ES060C1	**Fuengirola**	**83**	**17.7**							**116.1**			
ES061C1	**Cerdanyola del Vallès**	**83**	**28.7**							**107.7**			
ES062C1	**Sanlúcar de Barrameda**	**68**	**15.0**							**111.0**			
ES063C1	**Vilanova i la Geltrú**	**90**	**18.2**				1	17.4	21.2	**113.5**			
ES064C1	**Prat de Llobregat, El**	**63**	**28.7**	2	32.5	27.7				**107.6**	1	101.6	108.1
ES065C1	**Línea de la Concepción, La**	**71**	**21.1**							**97.2**			
ES066C1	**Cornellà de Llobregat**	**99**	**30.5**							**104.4**			
ES067C1	**Majadahonda**	**76**	**20.0**	1	22.4	19.6				**121.9**	1	118.3	121.7
ES068C1	**Torremolinos**	**66**	**18.2**							**120.4**			
ES069C1	**Castelldefels**	**65**	**20.8**							**116.3**			
ES070C1	**Irun**	**64**	**13.2**							**97.7**			
ES071C1	**Granollers**	**87**	**27.1**				1	34.6	33.4	**114.3**			
ES072C1	**Arrecife**												
ES073C1	**Elda**	**78**	**15.4**	1	5.9	8.9				**116.7**	1	120.4	116.7
ES074C1	**Santa Lucía de Tirajana**												
ES075C1	**Mollet del Vallès**	**56**	**27.6**				1	38.5	35.5	**112.2**			
ES501C1	**Granada**	**272**	**25.0**				1	42.7	37.3	**118.9**	1	111.8	120.2
ES503C1	**Badalona**	**234**	**32.5**	1	33.3	30.0				**112.5**	1	108.1	116.3
ES504C1	**Móstoles**	**214**	**27.0**	1	25.8	27.1				**120.6**	1	122.4	120.4
ES505C1	**Elche/Elx**	**239**	**18.0**	1	12.3	11.5	1	16.1	19.1	**113.9**	1	117.6	113.2
ES506C1	**Cartagena**	**227**	**13.7**	1	16.5	14.5				**109.4**	1	112.9	109.0
ES507C1	**Sabadell**	**222**	**29.1**				1	34.1	35.4	**112.6**			
ES508C1	**Jerez de la Frontera**	**222**	**15.9**	1	14.5	15.9				**110.2**	1	115.3	108.3
ES509C1	**Fuenlabrada**	**189**	**27.8**							**120.0**			
ES510C1	**Donostia/San Sebastián**	**235**	**15.1**				2	21.6	21.3	**99.4**	1	96.5	98.9
ES511C1	**Alcalá de Henares**	**203**	**23.6**				1	28.4	26.1	**126.4**			
ES512C1	**Terrassa**	**227**	**27.5**				1	36.5	34.4	**115.1**			
ES513C1	**Leganés**	**199**	**30.9**				1	35.5	34.1	**117.0**			
ES514C1	**Almería**	**198**	**16.8**	1	11.7	11.6	1	24.2	23.1	**118.8**	1	116.5	121.4
ES515C1	**Burgos**	**180**	**14.7**				1	13.2	17.2	**111.3**			
ES516C1	**Salamanca**	**162**	**15.1**	1	9.1	10.0	1	12.1	14.4	**117.0**	1	116.0	116.9
ES517C1	**Alcorcón**	**170**	**29.2**	1	29.9	25.2				**120.5**	1	127.1	120.4
ES518C1	**Getafe**	**164**	**30.4**				1	33.1	31.9	**119.6**			
ES519C1	**Albacete**	**172**	**18.0**	1	13.5	11.8				**111.2**	1	107.3	111.1
ES520C1	**Castellón/Castelló de la Pl.**	**187**	**20.2**				1	18.3	23.0	**112.2**			
ES521C1	**Huelva**	**156**	**17.1**				1	14.2	20.1	**113.9**			
ES522C1	**Cádiz**	**124**	**15.5**				1	12.0	17.6	**113.7**			
ES523C1	**León**	**158**	**16.9**	1	14.0	13.0	1	24.1	22.2	**110.6**	1	107.6	110.9
ES524C1	**San Cristóbal de La Laguna**												
ES525C1	**Tarragona**	**141**	**17.9**	1	21.6	23.1				**110.8**	1	113.0	110.6
ES526C1	**Santa Coloma de Gramenet**	**134**	**35.4**	1	33.1	36.3				**107.5**			
ES527C1	**Jaén**	**118**	**18.1**	2	14.1	14.6				**120.6**	2	123.7	120.5
ES528C1	**Lleida**	**142**	**19.6**				1	20.6	22.1	**110.2**			
ES529C1	**Ourense**	**113**	**17.2**				1	24.8	21.9	**91.3**			
ES530C1	**Mataró**	**129**	**24.5**	1	22.7	25.4				**117.0**	1	118.1	116.2
ES531C1	**Dos Hermanas**	**129**	**17.6**	1	14.7	16.7				**116.5**	1	116.8	116.6
ES532C1	**Algeciras**	**120**	**20.2**							**98.3**			
ES533C1	**Marbella**	**141**	**15.1**				1	26.9	24.4	**117.0**			
ES534C1	**Torrejón de Ardoz**	**124**	**26.6**	1	28.8	23.1				**121.8**	1	129.3	119.4

URAU Code	Name of City	POP	NO2							O3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
ES535C1	**Alcobendas**	**105**	**27.4**				1	26.6	29.0	**125.1**			
ES536C1	**Alcalá de Guadaíra**	**79**	**16.5**	1	17.0	16.4				**116.2**	1	116.8	115.9
ES537C1	**Alcoy/Alcoi**	**61**	**12.7**	1	8.5	13.8				**114.6**	1	106.6	114.6
ES538C1	**Ávila**	**59**	**11.3**	1	5.4	9.2				**120.7**	1	119.1	120.6
ES539C1	**Benalmádena**	**63**	**16.4**							**118.8**			
ES540C1	**Chiclana de la Frontera**	**82**	**11.7**							**109.2**			
ES541C1	**Collado Villalba**	**63**	**14.9**				1	27.1	22.0	**124.2**			
ES542C1	**Cuenca**	**57**	**20.3**	1	33.6	22.0				**111.1**	1	103.8	111.0
ES543C1	**Eivissa**	**55**	**12.2**							**110.2**			
ES544C1	**Linares**	**61**	**16.5**							**120.3**			
ES545C1	**Lorca**	**93**	**13.4**							**111.3**			
ES546C1	**Mérida**	**64**	**11.7**	1	9.1	11.2				**113.6**	1	114.5	113.7
ES547C1	**Sagunto/Sagunt**	**76**	**15.8**	1	13.1	15.2	1	15.5	16.8	**116.1**	1	108.5	113.1
ES548C1	**Torrelavega**	**61**	**15.9**	2	15.6	14.4	1	27.5	24.7	**87.8**	1	86.6	87.8
ES549C1	**Valdemoro**	**74**	**21.0**	1	21.8	22.3				**121.5**	1	118.6	121.4
ES550C1	**Puerto de la Cruz**												
ES551C1	**Paterna**	**118**	**20.2**	1	16.9	15.4				**107.3**	1	109.0	112.2
ES552C1	**Igualada**	**54**	**19.4**							**118.5**			
ES553C1	**Torrent**	**91**	**18.7**							**110.0**			
ES554C1	**Mislata**	**66**	**26.5**							**106.0**			
ES555C1	**Rivas-Vaciamadrid**	**80**	**23.4**	1	29.1	27.0				**121.4**	1	129.6	119.4
ES556C1	**Santurtzi**	**75**	**20.6**							**94.5**			
ES557C1	**Esplugues de Llobregat**	**61**	**31.0**							**104.4**			
ES558C1	**San Vicente del Raspeig**	**55**	**16.6**							**112.0**			
FI001C2	**Helsinki**	**575**	**14.0**	2	12.8	13.7	2	27.0	21.8	**96.6**	2	96.6	97.7
FI002C1	**Tampere**	**219**	**10.4**	1	9.9	11.9	1	13.1	17.2	**98.5**	1	101.6	98.5
FI003C1	**Turku**	**183**	**10.9**							**98.7**			
FI004C3	**Oulu**	**188**	**8.0**	1	10.3	10.5	1	19.2	18.4	**92.1**	1	90.4	91.1
FI005C1	**Espoo**	**254**	**11.2**				1	19.6	22.7	**96.8**			
FI006C1	**Vantaa**	**207**	**13.2**				1	19.2	22.6	**96.2**			
FI007C2	**Lahti**	**120**	**9.9**	1	7.4	9.6				**99.3**	1	95.3	98.9
FI008C3	**Kuopio**	**114**	**7.7**				2	12.8	14.9	**97.3**			
FI009C1	**Jyväskylä**	**133**	**8.7**	1	6.7	7.9	1	16.8	18.8	**97.2**			
FR001P1	**City of Paris**	**7 194**	**32.0**	16	28.8	29.6	9	52.6	53.6	**103.3**	7	108.1	104.4
FR003C2	**City of Lyon**	**1 038**	**25.6**	3	24.8	23.5	4	45.9	43.4	**119.7**	3	120.2	119.5
FR004C2	**City of Toulouse**	**597**	**17.9**	3	17.6	17.9	2	40.4	35.5	**117.7**	3	119.7	117.9
FR006C2	**City of Strasbourg**	**405**	**22.6**	3	19.6	20.4	2	42.2	41.1	**121.4**	1	127.6	121.3
FR007C1	**City of Bordeaux**	**617**	**16.2**	2	14.4	17.1	3	27.6	29.0	**112.6**	2	114.3	113.1
FR008C1	**City of Nantes**	**443**	**13.5**	2	13.2	13.8	1	30.8	29.9	**107.0**	1	112.8	108.2
FR009C1	**City of Lille**	**907**	**20.9**	1	22.5	22.9	2	29.3	30.6	**100.7**	2	104.2	100.7
FR010C1	**City of Montpellier**	**287**	**21.0**	2	22.6	20.1	2	33.1	33.6	**120.2**	1	112.9	119.8
FR011C1	**City of Saint-Étienne**	**207**	**17.7**	1	16.8	18.1	1	32.6	32.5	**122.2**	1	122.1	122.4
FR012C1	**City of Le Havre**	**203**	**16.2**	2	15.0	15.0	1	32.9	30.3	**98.1**	2	95.5	98.9
FR013C2	**City of Rennes**	**218**	**15.7**	1	15.2	15.1	2	24.6	27.0	**101.2**	1	100.3	101.1
FR014C2	**City of Amiens**	**146**	**16.6**	1	15.7	15.8				**105.1**	1	104.2	105.0
FR016C1	**City of Nancy**	**232**	**18.5**	1	18.0	19.3	2	23.8	26.6	**118.6**	1	118.6	118.7
FR017C2	**City of Metz**	**179**	**18.7**	2	18.1	18.1	1	28.6	30.9	**118.9**	1	119.9	119.0
FR018C1	**City of Reims**	**208**	**17.7**	2	14.6	14.3	1	40.7	35.5	**110.3**	2	111.1	110.8
FR019C1	**City of Orléans**	**221**	**13.8**	2	9.3	9.4	1	27.9	30.4	**116.7**	1	118.5	118.1
FR020C2	**City of Dijon**	**203**	**17.2**	2	17.6	16.7	1	20.6	24.3	**119.1**	1	120.7	119.0
FR021C2	**City of Poitiers**	**105**	**13.7**	2	14.8	13.7	1	33.8	27.9	**108.5**	2	106.6	108.5
FR022C2	**City of Clermont-Ferrand**	**203**	**18.1**	4	14.8	14.6	3	31.5	31.3	**118.5**	4	120.0	118.4
FR023C2	**City of Caen**	**163**	**15.7**	2	14.0	14.1	1	25.0	27.2	**96.4**	2	95.8	96.3
FR024C2	**City of Limoges**	**161**	**14.4**	1	15.8	14.8	1	27.3	26.8	**107.1**	1	107.2	107.0
FR025C1	**City of Besançon**	**124**	**16.5**	1	16.9	16.4	1	22.4	26.5	**119.9**	1	122.1	120.0
FR026C2	**City of Grenoble**	**313**	**22.9**	2	20.3	21.1	2	39.5	38.6	**120.9**	2	125.0	120.7

URAU Code	Name of City	POP	NO$_2$							O$_3$			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
FR028C1	**City of Saint-Denis**												
FR030C1	**City of Fort-de-France**												
FR032C2	**City of Toulon**	**335**	**18.5**	2	20.1	19.2	1	38.1	33.3	**119.9**	1	119.7	119.2
FR034C2	**City of Valenciennes**	**128**	**17.3**	1	17.4	17.2	1	31.5	27.9	**106.0**	1	99.0	106.6
FR035C2	**City of Tours**	**248**	**13.2**	2	11.3	11.4	1	28.5	28.1	**113.7**	1	115.2	113.6
FR036C2	**City of Angers**	**185**	**12.4**	2	11.6	12.2				**111.8**	1	115.3	111.3
FR037C1	**City of Brest**	**149**	**10.3**	1	11.2	9.5	1	26.7	25.8	**99.1**	1	96.8	99.1
FR038C2	**City of Le Mans**	**163**	**12.6**	2	11.9	12.2				**110.5**	1	115.0	110.5
FR039C2	**City of Avignon**	**113**	**17.7**	2	16.2	16.4	1	24.4	28.4	**128.0**	1	134.8	128.4
FR040C2	**City of Mulhouse**	**196**	**21.0**	2	20.1	19.6	1	34.2	33.2	**122.1**	1	123.6	121.5
FR042C1	**City of Dunkerque**	**150**	**17.8**	1	17.7	18.3				**96.4**	1	95.1	96.9
FR043C2	**City of Perpignan**	**134**	**16.1**	2	14.9	16.1				**112.8**	1	116.2	112.9
FR044C2	**City of Nîmes**	**151**	**17.1**	1	15.4	16.2	1	31.7	32.2	**123.4**	1	122.2	122.1
FR045C2	**City of Pau**	**125**	**15.3**	1	11.6	12.4	1	25.8	25.9	**106.6**	1	108.1	106.8
FR046C2	**City of Bayonne**	**116**	**13.0**	2	13.5	12.1	1	24.0	23.1	**102.7**	2	105.2	103.4
FR047C2	**City of Annemasse**	**62**	**20.1**	2	18.3	20.4	1	26.3	29.8	**119.4**	2	124.6	119.1
FR048C1	**City of Annecy**	**128**	**19.4**	2	19.0	19.7	1	32.9	32.7	**120.6**	2	126.2	120.2
FR049C2	**City of Lorient**	**83**	**10.4**	2	9.3	8.6				**99.4**	1	98.1	99.3
FR051C2	**City of Troyes**	**112**	**15.6**	2	14.2	14.3				**113.6**	1	111.3	113.6
FR052C2	**City of Saint-Nazaire**	**72**	**9.9**	2	9.1	9.9				**105.4**	1	104.1	107.1
FR053C1	**City of La Rochelle**	**91**	**11.6**	1	16.8	11.5				**105.7**	1	99.2	105.2
FR057C2	**City of Boulogne-sur-Mer**	**81**	**14.6**	1	10.2	8.7				**97.3**	1	99.5	102.0
FR058C2	**City of Chambéry**	**95**	**18.5**	2	17.5	18.3	1	28.7	32.7	**122.4**	2	124.4	122.4
FR060C2	**City of Chartres**	**84**	**12.9**				1	19.5	25.4	**116.2**	1	116.5	116.1
FR062C1	**City of Calais**	**81**	**15.3**	1	14.4	14.0				**93.5**	1	96.9	94.0
FR063C2	**City of Béziers**	**79**	**14.4**							**111.9**			
FR064C2	**City of Arras**	**77**	**15.2**	1	15.4	14.4				**105.2**	1	108.7	105.3
FR065C2	**City of Bourges**	**73**	**10.8**	1	10.1	10.8	1	14.0	19.5	**113.1**	1	110.9	113.1
FR066C1	**City of Saint-Brieuc**	**76**	**10.7**	1	11.1	10.4				**99.1**	1	95.2	99.0
FR069C1	**C. of Cherbourg-en-Cotentin**	**85**	**10.7**	1	13.0	12.1				**96.5**	1	94.2	96.0
FR076C2	**City of Belfort**	**70**	**16.2**				1	22.6	25.2	**120.3**			
FR077C1	**City of Roanne**	**57**	**16.6**	1	17.7	16.6				**118.5**	1	115.9	118.5
FR079C2	**City of Saint-Quentin**	**63**	**16.4**	1	18.0	16.3				**107.0**	1	102.6	106.8
FR084C1	**City of Creil**	**77**	**18.6**	2	20.1	19.0				**115.5**	2	115.7	115.5
FR099C1	**City of Fréjus**	**88**	**14.9**	1	9.7	13.7				**124.9**	1	124.7	124.4
FR202C1	**City of Aix-en-Provence**	**152**	**21.2**	1	22.6	21.5	1	39.2	35.1	**128.6**	1	130.6	130.2
FR203C1	**City of Marseille**	**894**	**25.3**	2	29.4	26.3	1	44.9	40.2	**120.8**	1	116.4	120.5
FR205C2	**City of Nice**	**710**	**25.5**	3	26.6	24.5	1	37.8	37.2	**120.7**	4	122.6	120.6
FR207C1	**City of Lens**	**202**	**15.8**							**104.5**			
FR209C2	**City of Douai**	**99**	**15.6**	1	15.9	16.1				**106.4**	1	110.3	105.9
FR214C1	**City of Valence**	**96**	**17.1**	1	20.2	17.0	1	30.8	31.0	**126.5**	1	117.0	126.5
FR215C2	**City of Rouen**	**334**	**18.5**	3	19.3	18.7	2	42.7	39.4	**103.8**	3	103.8	104.7
FR304C1	**City of Melun**	**90**	**19.1**	1	18.5	17.7	1	39.0	35.8	**116.7**	1	107.4	117.2
FR305C1	**City of Meaux**	**67**	**18.1**							**114.6**			
FR306C1	**City of Mantes-la-Jolie**	**88**	**17.8**	1	19.1	16.3				**112.7**	1	110.9	112.6
FR324C1	**City of Martigues**	**67**	**16.8**	1	15.8	17.2				**123.3**	1	132.9	122.4
FR506C1	**City of Colmar**	**75**	**21.4**	1	25.2	21.4				**122.2**	1	125.5	122.2
FR520C1	**City of Les Abymes**												
FR521C1	**City of Cayenne**												
FR522C1	**City of Mamoudzou**												
HR001C1	**Zagreb**	**797**	**22.6**	1	27.7	22.0	1	40.6	36.0	**116.3**	1	117.1	116.2
HR002C1	**Rijeka**	**138**	**16.8**	1	14.0	17.7				**116.2**	1	115.6	113.9
HR003C1	**Slavonski Brod**	**67**	**18.1**							**116.7**	1	114.1	117.7
HR004C1	**Osijek**	**109**	**18.0**				1	25.7	26.2	**111.2**			
HR005C1	**Split**	**184**	**16.3**				1	23.7	23.8	**121.4**			
HR006C1	**Pula**	**59**	**12.7**	1	9.1	11.2				**122.4**	1	131.5	122.5

URAU Code	Name of City	POP	NO_2							O_3			
			PWC	NB	CSB	CMB	NT	CST	CMT	**PWC**	NB	CSB	CMB
HR007C1	**Zadar**	**76**	**13.8**							**116.9**			
HU001C1	**Budapest**	**1 775**	**27.2**	3	23.9	20.6	2	40.7	39.6	**106.2**	3	103.3	106.5
HU002C1	**Miskolc**	**173**	**15.7**				1	32.2	28.8	**109.5**			
HU003C1	**Nyíregyháza**	**122**	**17.3**				1	23.5	27.2	**105.8**			
HU004C1	**Pécs**	**162**	**15.9**	1	16.9	17.1	1	43.3	34.3	**106.7**	1	84.0	106.7
HU005C1	**Debrecen**	**213**	**20.1**	1	20.2	19.5				**106.0**	1	110.4	105.4
HU006C1	**Szeged**	**171**	**17.7**	1	15.3	19.1				**105.9**			
HU007C1	**Győr**	**132**	**15.1**							**113.9**	1	104.1	113.7
HU008C1	**Kecskemét**	**114**	**16.2**							**106.1**			
HU009C1	**Székesfehérvár**	**101**	**16.6**							**110.7**			
HU010C1	**Szombathely**	**81**	**15.1**							**118.1**			
HU011C1	**Szolnok**	**74**	**16.7**							**106.5**			
HU012C1	**Tatabánya**	**70**	**14.6**				1	16.5	21.8	**110.0**			
HU013C1	**Veszprém**	**62**	**15.6**	1	19.3	16.1				**107.7**	1	120.6	107.6
HU014C1	**Békéscsaba**	**62**	**18.6**							**102.7**			
HU015C1	**Kaposvár**	**67**	**15.4**							**105.6**			
HU016C1	**Eger**	**57**	**16.3**							**106.4**			
HU017C1	**Dunaújváros**	**49**	**16.6**							**108.7**			
HU018C1	**Zalaegerszeg**	**61**	**13.8**							**115.5**			
HU019C1	**Sopron**	**65**	**13.6**							**121.2**			
IE001C1	**Dublin**	**561**	**21.7**	2	18.3	20.8	3	35.3	37.0	**121.1**	2	126.5	123.0
IE002C1	**Cork**	**129**	**25.2**	1	35.2	23.5				**118.3**	1	109.4	118.3
IE003C1	**Limerick**	**63**	**22.7**	1	23.0	22.0	1	43.9	39.5	**121.5**	1	114.0	121.1
IE004C1	**Galway**	**73**	**19.3**	1	17.9	18.1	1	33.0	33.4	**120.7**	1	121.8	120.6
IE005C1	**Waterford**	**51**	**20.3**	1	17.1	19.0	1	32.1	32.5	**121.9**	1	127.0	122.3
IS001C1	**Reykjavík**	**202**	**17.4**	1	15.1	17.2				**123.5**	1	122.7	123.7
IT001C1	**Roma**	**2 747**	**18.1**				1	33.3	33.0	**119.9**			
IT002C1	**Milano**	**1 370**	**20.2**				1	35.3	34.9	**125.3**			
IT003C1	**Napoli**	**1 159**	**21.4**	2	22.3	21.8				**142.8**	2	154.5	143.7
IT004C1	**Torino**	**921**	**17.6**							**123.3**			
IT005C1	**Palermo**	**677**	**17.7**							**124.8**			
IT006C1	**Genova**	**610**	**17.5**							**126.8**			
IT007C1	**Firenze**	**387**	**20.9**	2	20.6	19.6	3	31.7	34.2	**83.0**	2	82.5	82.9
IT008C1	**Bari**	**347**	**12.1**	1	9.6	12.0	1	21.0	24.7	**92.7**	1	91.5	92.0
IT009C1	**Bologna**	**408**	**14.5**							**91.4**			
IT010C1	**Catania**	**346**	**11.4**							**95.9**			
IT011C1	**Venezia**	**251**	**9.1**							**89.6**			
IT012C1	**Verona**	**282**	**12.9**	1	11.1	12.2	1	22.3	24.7	**90.6**			
IT013C1	**Cremona**	**77**	**31.3**	7	32.4	32.0	4	51.1	47.2	**108.6**	8	110.4	109.1
IT014C1	**Trento**	**119**	**42.3**	1	37.0	40.6	4	45.5	48.1	**141.5**	1	133.6	140.7
IT015C1	**Trieste**	**205**	**28.9**	2	17.1	23.0	5	45.2	42.7	**111.8**	2	100.4	113.1
IT016C1	**Perugia**	**176**	**36.7**	2	35.2	36.6	2	56.6	51.8	**138.1**	2	139.1	137.7
IT017C1	**Ancona**	**104**	**20.0**	1	15.8	16.9	2	47.5	41.9	**107.8**	1	111.9	107.2
IT019C1	**Pescara**	**128**	**21.9**	3	19.4	20.2	5	46.0	41.5	**119.0**	3	120.7	120.7
IT020C1	**Campobasso**	**53**	**25.1**	1	20.8	22.2	2	46.0	41.2	**118.9**			
IT021C1	**Caserta**	**89**	**18.3**	3	20.2	19.7	2	36.5	32.6	**112.6**	2	111.1	112.2
IT022C1	**Taranto**	**211**	**16.8**	2	9.4	10.6	1	24.0	24.8	**115.5**	2	113.2	116.0
IT023C1	**Potenza**	**68**	**15.1**							**122.3**			
IT024C1	**Catanzaro**	**93**	**12.1**	1	10.4	12.0	1	20.8	21.3	**112.0**	1	114.2	112.1
IT025C1	**Reggio di Calabria**	**186**	**12.8**	1	14.2	14.9	1	19.3	24.7	**101.9**	1	76.1	101.8
IT026C1	**Sassari**	**126**	**9.8**	1	10.6	9.6	1	23.0	24.6	**98.4**	1	105.0	96.4
IT027C1	**Cagliari**	**172**	**13.7**				1	26.4	28.4	**95.6**			
IT028C1	**Padova**	**253**	**29.6**	1	31.6	27.7	1	37.5	37.0	**133.6**	1	130.4	134.1
IT029C1	**Brescia**	**218**	**31.9**	1	29.0	30.7	2	45.0	43.0	**143.9**	1	133.2	143.6
IT030C1	**Modena**	**188**	**23.2**	1	24.2	25.3	1	40.7	37.6	**136.7**	1	135.6	136.9
IT031C1	**Foggia**	**154**	**19.9**	1	20.2	22.4				**120.7**			

URAU Code	Name of City	POP	NO$_2$							O$_3$			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
IT032C1	**Salerno**	**145**	**24.9**	2	29.1	25.7	1	36.7	31.6	**115.7**	2	106.4	115.3
IT033C1	**Piacenza**	**105**	**25.8**	1	23.3	24.6	1	32.9	32.3	**138.9**	1	147.0	138.9
IT034C1	**Bolzano**	**106**	**26.5**	1	28.0	26.5	2	37.6	36.6	**128.1**	1	124.4	127.9
IT035C1	**Udine**	**99**	**19.1**	1	17.0	20.0	1	23.5	27.7	**125.7**	2	123.4	126.0
IT036C1	**La Spezia**	**104**	**16.1**	2	15.6	15.5	3	30.4	27.8	**115.4**	2	112.2	114.9
IT037C1	**Lecce**	**112**	**13.6**				2	19.7	22.0	**114.7**			
IT038C1	**Barletta**	**94**	**19.4**	1	19.7	17.7				**115.5**	1	113.7	115.5
IT039C1	**Pesaro**	**96**	**18.9**	1	26.9	18.3				**114.0**	1	94.2	113.5
IT040C1	**Como**	**104**	**23.4**				1	39.9	35.4	**148.8**			
IT041C1	**Pisa**	**95**	**21.6**	1	18.1	18.0	1	32.7	32.3	**117.1**	1	111.4	117.0
IT042C1	**Treviso**	**111**	**25.8**	1	28.9	27.7	1	27.1	31.4	**128.5**	1	128.4	128.0
IT043C1	**Varese**	**106**	**22.3**	1	21.6	21.9	1	32.8	34.2	**146.8**	1	148.7	146.4
IT044C1	**Busto Arsizio**	**103**	**28.6**	1	30.4	27.0				**149.7**	1	148.0	149.2
IT045C1	**Asti**	**80**	**21.1**	1	22.8	23.2	1	34.0	33.3	**130.1**	1	128.0	129.7
IT046C1	**Pavia**	**75**	**25.1**	1	28.6	26.8	1	34.9	31.4	**138.0**	1	142.5	137.7
IT047C1	**Massa**	**79**	**17.2**				1	18.1	25.3	**117.0**			
IT048C1	**Cosenza**	**85**	**17.4**	1	20.3	20.1				**109.8**	1	112.1	109.7
IT052C1	**Savona**	**67**	**15.8**	1	12.9	14.8	1	27.9	28.2	**120.7**	1	121.3	120.3
IT054C1	**Matera**	**58**	**14.8**							**119.9**			
IT056C1	**Acireale**	**66**	**14.5**							**112.1**			
IT057C1	**Avellino**	**68**	**20.3**	1	18.9	22.5	1	21.0	25.3	**125.9**	1	142.2	125.7
IT058C1	**Pordenone**	**61**	**22.8**				1	26.6	29.6	**125.8**			
IT060C1	**Lecco**	**51**	**21.4**	1	21.5	24.0	1	35.3	31.2	**149.3**	1	155.9	149.3
IT061C1	**Altamura**	**70**	**16.7**				1	24.2	24.1	**118.7**			
IT062C1	**Bitonto**	**59**	**15.0**							**113.6**			
IT063C1	**Molfetta**	**61**	**16.5**				1	22.3	23.4	**115.5**			
IT064C1	**Battipaglia**	**53**	**19.1**	1	19.3	21.7				**116.8**	1	128.1	115.4
IT065C1	**Bisceglie**	**54**	**15.4**							**113.9**			
IT066C1	**Carpi**	**72**	**23.4**	1	27.7	22.3				**137.7**	1	137.1	136.9
IT067C1	**Cerignola**	**60**	**17.9**							**121.4**			
IT068C1	**Gallarate**	**77**	**28.2**							**147.5**			
IT069C1	**Gela**	**76**	**11.7**	1	7.5	11.1	1	24.6	25.0	**115.2**	1	127.7	117.5
IT070C1	**Saronno**	**48**	**31.3**	1	26.7	32.7				**153.7**	1	142.5	153.6
IT071C1	**Bagheria**	**64**	**11.9**							**111.5**			
IT072C1	**Anzio**	**69**	**17.7**							**107.4**			
IT073C1	**Sassuolo**	**48**	**21.2**	1	18.7	22.0				**135.0**	1	139.7	135.5
IT501C1	**Messina**	**245**	**12.7**				1	30.0	26.7	**101.7**	1	100.9	100.8
IT502C1	**Prato**	**202**	**23.6**	1	29.3	25.9	1	27.7	34.0	**119.9**			
IT503C1	**Parma**	**194**	**21.0**	1	19.8	23.8	1	33.6	32.8	**137.2**	1	131.4	137.0
IT504C1	**Livorno**	**154**	**20.8**	2	17.2	17.1	1	41.1	34.3	**122.4**			
IT505C1	**Reggio nell'Emilia**	**183**	**21.4**	1	22.8	22.3	1	34.5	34.4	**136.6**	1	135.1	136.9
IT506C1	**Ravenna**	**154**	**17.0**	1	19.8	19.3	1	28.4	30.0	**122.1**	1	121.8	119.1
IT507C1	**Ferrara**	**146**	**20.4**	1	18.8	20.4	1	36.0	33.1	**133.6**	1	129.6	133.6
IT508C1	**Rimini**	**155**	**19.4**	1	20.7	19.4	1	41.6	34.9	**119.6**	1	124.1	120.2
IT509C1	**Siracusa**	**126**	**13.2**	2	16.7	12.4	2	18.0	21.1	**106.9**	1	71.0	106.6
IT510C1	**Monza**	**171**	**39.8**	1	45.7	41.5				**146.2**	2	140.1	145.4
IT511C1	**Bergamo**	**163**	**28.9**	1	28.0	30.1	1	38.6	37.8	**148.9**	1	167.0	146.1
IT512C1	**Forlì**	**122**	**18.3**	1	21.5	20.4	1	28.3	30.7	**124.7**	1	121.5	124.8
IT513C1	**Latina**	**126**	**19.1**	2	23.2	22.3	1	27.7	26.5	**105.1**	1	91.8	102.1
IT514C1	**Vicenza**	**133**	**27.6**	1	31.8	28.8	1	31.7	34.7	**139.7**	1	145.4	138.4
IT515C1	**Terni**	**112**	**18.2**	1	16.9	18.1	2	22.7	23.9	**121.7**	1	118.4	121.4
IT516C1	**Novara**	**110**	**23.7**	1	26.9	26.1	1	34.8	32.0	**138.6**	1	124.3	138.5
IT517C1	**Giugliano in Campania**	**201**	**22.6**							**114.4**			
IT518C1	**Alessandria**	**90**	**23.7**	1	24.9	22.1	1	32.4	33.2	**131.8**	1	143.6	132.7
IT519C1	**Arezzo**	**102**	**15.0**	1	14.8	15.6	1	31.0	28.9	**116.0**	1	116.0	115.9
IT520C1	**Grosseto**	**78**	**14.8**	1	16.8	14.6	1	35.1	29.3	**112.5**			

URAU Code	Name of City	POP	NO_2							O_3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
IT521C1	Brindisi	89	13.4	2	12.3	14.9	2	21.0	21.9	115.5	1	113.9	115.7
IT522C1	Trapani	94	11.5	1	11.9	9.6				110.0	1	106.7	109.9
IT523C1	Ragusa	72	11.2	2	9.8	10.4				108.1	1	101.8	106.6
IT524C1	Andria	101	19.5				1	24.4	25.5	116.2			
IT525C1	Trani	57	15.9							115.9			
IT526C1	L'Aquila	68	15.9	2	14.3	15.9				115.3	2	114.1	113.7
LT001C1	Vilnius	552	15.2	2	14.5	15.1	1	30.4	27.0	105.8	1	108.4	105.5
LT002C1	Kaunas	325	15.1				1	19.6	22.1	105.2			
LT003C1	Panevėžys	105	15.3	1	17.3	14.8				103.0	1	101.6	103.0
LT004C1	Alytus	60	13.5							106.9			
LT501C1	Klaipėda	164	11.8				2	20.5	19.4	106.1			
LT502C1	Šiauliai	113	13.6				1	18.8	20.3	103.7			
LU001C1	Luxembourg	103	23.7	1	30.6	25.5	1	27.5	33.5	106.6	1	105.0	106.3
LV001C1	Rīga	669	16.9	1	22.2	18.1				89.1	1	76.9	82.0
LV002C1	Liepāja	77	9.2				2	17.8	15.8	107.9			
LV003C1	Jelgava	64	11.6							101.2			
LV501C1	Daugavpils	96	11.2							104.4			
MT001C1	Valletta (greater)	228	13.6				1	30.3	27.3	104.0			
NL001C2	Greater 's-Gravenhage	752	23.5	2	23.3	23.4	1	29.9	31.5	101.4	2	93.6	101.6
NL002C2	Greater Amsterdam	934	24.2	5	20.8	22.5	5	36.7	34.8	99.5	2	104.4	97.4
NL003C2	Greater Rotterdam	1 232	25.7	4	25.5	25.8	5	32.8	32.9	98.7	3	100.5	98.5
NL004C2	Greater Utrecht	422	21.7	1	18.9	21.9	2	24.9	27.3	103.8	1	109.8	105.4
NL005C2	Greater Eindhoven	265	22.2	1	16.9	19.3	2	24.1	28.7	108.2	1	102.1	108.6
NL006C1	Tilburg	216	22.5							106.1			
NL007C1	Groningen	195	16.5	1	10.7	11.6	1	24.2	27.0	106.2	1	112.8	105.4
NL008C1	Enschede	155	18.7							121.8			
NL009C2	Greater Arnhem	186	20.1							110.8			
NL010C2	Greater Heerlen	209	17.8	1	14.8	15.2	1	23.5	32.1	114.9	1	119.2	113.8
NL011C1	Almere	190	18.9							112.8			
NL012C1	Breda	180	22.0	1	21.6	23.4	1	29.5	28.7	103.6	1	96.9	102.9
NL013C1	Nijmegen	173	20.8	1	19.8	21.9	1	29.0	29.4	108.5	1	107.7	107.8
NL014C1	Apeldoorn	163	18.2							114.6			
NL015C1	Leeuwarden	124	14.0							104.3			
NL016C2	Greater Sittard-Geleen	129	19.3							112.7			
NL018C1	Hilversum	108	18.1							109.2			
NL020C1	Roosendaal	81	20.9							102.3			
NL021C2	Greater Nissewaard	145	22.6							100.2			
NL023C1	Purmerend	82	18.7							105.4			
NL026C1	Alphen aan den Rijn	112	20.1							100.3			
NL028C1	Bergen op Zoom	68	20.4							103.0			
NL030C1	Gouda	75	22.0							100.5			
NL031C1	Hoorn	73	17.8							105.8			
NL032C2	Greater Middelburg	93	16.5							105.3			
NL501C2	Greater Haarlem	270	19.2				1	23.4	26.9	104.2			
NL502C1	Zaanstad	152	20.2	1	21.3	21.7				101.0			
NL503C1	's-Hertogenbosch	156	21.6							104.6			
NL504C1	Amersfoort	152	19.1							108.0			
NL505C1	Maastricht	125	19.6							113.4			
NL507C2	Greater Leiden	257	21.3							103.8			
NL508C1	Haarlemmermeer	167	20.7							100.8			
NL509C1	Zoetermeer	120	23.0							99.5			
NL511C1	Zwolle	122	18.3							110.2			
NL512C2	Greater Ede	156	18.4							110.2			
NL513C1	Deventer	103	18.1							112.5			
NL514C2	Greater Alkmaar	200	15.7							107.0			
NL515C1	Venlo	107	21.6							115.4			

URAU Code	Name of City	POP	NO2							O3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
NL516C1	**Helmond**	**93**	**20.0**							**110.5**			
NL517C1	**Hengelo**	**84**	**18.3**							**121.9**			
NL519C1	**Almelo**	**79**	**17.8**							**117.0**			
NL520C1	**Lelystad**	**76**	**17.9**							**110.1**			
NL521C1	**Oss**	**99**	**18.8**							**106.5**			
NL522C1	**Assen**	**70**	**15.4**							**109.1**			
NL524C1	**Veenendaal**	**63**	**19.2**							**108.0**			
NL528C1	**Greater Heemskerk**	**92**	**18.1**							**103.4**			
NL529C1	**Greater Soest**	**71**	**16.5**							**110.0**			
NO001C1	**Oslo**	**613**	**19.0**				8	30.6	29.6	**95.3**	1	92.2	94.6
NO002C1	**Bergen**	**260**	**13.3**	2	12.3	12.1	3	28.8	27.8	**96.1**	1	95.3	94.7
NO003C1	**Trondheim**	**175**	**14.0**	1	18.2	14.8	3	24.6	24.5	**98.3**			
NO004C1	**Stavanger**	**133**	**10.6**	1	9.6	11.7	1	25.8	24.1	**91.9**			
NO005C1	**Kristiansand**	**84**	**8.4**	1	12.4	8.6	1	23.1	20.7	**101.6**			
NO006C1	**Tromsø**	**68**	**7.9**				1	31.6	24.5	**102.6**			
PL001C	**M. Warszawa**	**1 759**	**24.1**	3	22.7	23.4	1	49.7	43.6	**111.2**	4	108.4	108.9
PL002C	**M. Łódź**	**747**	**18.6**	2	18.2	18.8	1	28.0	32.5	**115.2**	2	117.9	115.2
PL003C	**M. Kraków**	**782**	**25.9**	1	32.3	24.6	2	49.3	45.1	**112.2**	1	111.0	112.1
PL004C	**M. Wrocław**	**642**	**19.7**	2	17.0	16.7	1	44.1	37.5	**115.3**	2	116.0	116.4
PL005C	**M. Poznań**	**601**	**21.2**	3	21.7	20.1				**110.4**	1	112.2	109.8
PL006C	**M. Gdańsk**	**471**	**16.1**	5	15.6	14.5				**99.5**	2	92.9	96.8
PL007C	**M. Szczecin**	**433**	**15.0**	1	12.4	13.0	1	19.2	24.2	**112.6**	1	114.8	113.0
PL008C	**M. Bydgoszcz**	**367**	**17.3**	1	18.9	17.1	1	26.4	27.9	**108.7**	1	103.4	108.6
PL009C	**M. Lublin**	**359**	**18.3**	1	19.5	19.1				**109.3**	1	111.2	109.5
PL010C	**M. Katowice**	**314**	**24.0**	1	28.0	24.5	1	54.3	43.4	**115.8**	1	113.7	116.4
PL011C	**M. Białystok**	**306**	**14.7**	1	12.6	14.4				**108.8**	1	108.9	108.8
PL012C	**M. Kielce**	**208**	**18.5**	1	21.0	18.6				**115.1**	1	117.1	115.6
PL013C	**M. Toruń**	**209**	**14.3**	1	10.4	13.8	1	18.1	24.9	**109.2**	1	103.6	109.3
PL014C	**M. Olsztyn**	**179**	**12.5**	1	12.7	12.7				**109.9**	1	106.8	110.7
PL015C	**M. Rzeszów**	**192**	**15.7**	1	15.8	17.8	1	33.3	32.3	**108.8**	1	105.4	108.6
PL016C	**M. Opole**	**137**	**17.0**	1	16.6	18.2				**116.0**	1	109.1	116.3
PL017C	**M. Gorzów Wielkopolski**	**129**	**16.1**	1	18.2	17.1				**112.2**	1	106.3	112.0
PL018C	**M. Zielona Góra**	**140**	**13.3**	1	15.2	13.9				**120.7**	1	113.6	120.0
PL019C	**M. Jelenia Góra**	**88**	**13.5**	1	10.8	10.1				**117.2**	1	118.9	117.1
PL020C	**M. Nowy Sącz**	**93**	**19.0**	1	22.2	17.9				**111.3**			
PL021C	**M. Suwałki**	**70**	**12.4**							**106.2**			
PL022C	**M. Konin**	**84**	**14.3**	1	12.4	16.1				**112.4**	1	103.4	111.9
PL023C	**M. Żory**	**65**	**20.3**							**114.8**			
PL024C	**M. Częstochowa**	**244**	**18.5**	1	17.7	18.7	1	39.0	35.7	**113.8**	1	108.8	113.6
PL025C	**M. Radom**	**229**	**19.0**	1	22.4	19.5				**111.8**	1	116.6	111.7
PL026C	**M. Płock**	**128**	**14.4**	2	13.3	15.3				**113.6**	2	113.9	112.4
PL027C	**M. Kalisz**	**110**	**16.4**	1	12.3	14.1				**116.0**	1	119.1	115.7
PL028C	**M. Koszalin**	**113**	**12.1**	1	12.5	13.4	1	22.2	19.7	**110.4**	1	118.1	110.2
PL029C	**M. Słupsk**	**99**	**12.0**	1	10.7	10.4				**105.8**	1	109.1	105.7
PL030C	**M. Jastrzębie-Zdrój**	**98**	**19.2**							**113.7**			
PL031C	**M. Siedlce**	**80**	**15.5**							**108.5**			
PL032C	**M. Piotrków Trybunalski**	**78**	**18.3**	1	18.5	17.8				**112.7**	1	112.3	112.5
PL033C	**Lubin**	**78**	**15.0**							**120.3**			
PL034C	**Piła**	**75**	**14.1**	1	14.0	14.6				**112.6**			
PL035C	**Inowrocław**	**77**	**15.1**	1	10.0	12.2				**107.4**			
PL036C	**Ostrowiec Świętokrzyski**	**78**	**15.7**							**113.9**			
PL037C	**Gniezno**	**73**	**15.5**							**109.8**			
PL038C	**Stargard**	**71**	**13.5**							**111.1**			
PL039C	**Ostrów Wielkopolski**	**77**	**15.2**							**117.7**			
PL040C	**M. Przemyśl**	**70**	**14.7**	1	14.8	15.4				**109.8**	1	118.0	109.7
PL041C	**M. Zamość**	**70**	**15.9**	1	15.5	13.4				**110.1**			

URAU Code	Name of City	POP	NO_2							O_3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
PL042C	**M. Chełm**	**70**	**15.4**							**110.0**			
PL043C	**Pabianice**	**75**	**17.1**							**115.7**			
PL044C	**Głogów**	**71**	**15.4**							**119.3**			
PL045C	**Stalowa Wola**	**67**	**16.7**							**113.9**			
PL046C	**Tomaszów Mazowiecki**	**69**	**16.3**							**115.5**			
PL047C	**M. Łomża**	**67**	**14.4**	1	13.0	12.5				**110.2**			
PL048C	**M. Leszno**	**65**	**14.3**							**118.2**			
PL049C	**Świdnica**	**63**	**15.3**							**114.1**			
PL050C	**Zgierz**	**59**	**15.0**	1	15.7	16.1				**115.4**			
PL051C	**Tczew**	**63**	**14.7**							**102.6**			
PL052C	**Ełk**	**60**	**11.2**	1	10.0	12.5				**108.0**	1	108.7	108.5
PL501C	**M. Gdynia**	**265**	**13.0**	3	14.6	13.7				**99.6**	2	103.0	100.2
PL502C	**M. Sosnowiec**	**261**	**23.7**	1	22.2	24.9				**114.4**			
PL503C	**M. Gliwice**	**211**	**21.5**	1	20.6	22.0				**114.7**			
PL504C	**M. Zabrze**	**173**	**22.0**	1	21.9	21.7				**114.8**	1	114.5	116.0
PL505C	**M. Bytom**	**199**	**22.7**							**116.6**			
PL506C	**M. Bielsko-Biała**	**185**	**19.0**				1	29.6	33.1	**111.8**	1	111.4	111.4
PL507C	**M. Ruda Śląska**	**154**	**21.8**							**116.0**			
PL508C	**M. Rybnik**	**161**	**18.9**	1	20.5	18.1				**115.0**	1	113.4	115.7
PL509C	**M. Tychy**	**133**	**22.2**	1	21.9	20.2				**115.6**			
PL511C	**M. Wałbrzych**	**132**	**13.2**	1	13.1	12.9				**114.4**	1	114.2	114.4
PL512C	**M. Elbląg**	**126**	**12.6**	1	12.1	14.2				**106.7**	1	112.9	107.0
PL513C	**M. Włocławek**	**119**	**15.1**	1	13.2	11.5	1	24.6	25.5	**114.1**	1	109.3	113.7
PL514C	**M. Tarnów**	**121**	**18.3**	1	19.5	20.6	1	26.8	29.7	**108.5**	1	113.7	108.6
PL515C	**M. Chorzów**	**160**	**25.0**							**116.3**			
PL516C	**M. Legnica**	**106**	**16.8**	1	18.3	15.5				**116.1**	1	117.5	114.5
PL517C	**M. Grudziądź**	**102**	**14.0**				1	19.9	22.9	**104.1**			
PT001C1	**Lisboa**	**628**	**25.9**	2	23.6	23.0	3	41.6	35.4	**95.4**	2	97.5	100.1
PT002C1	**Porto**	**238**	**28.6**							**78.4**	1	90.6	83.8
PT003C1	**Braga**	**191**	**17.8**							**81.9**	1	64.0	80.7
PT004C1	**Funchal**												
PT005C1	**Coimbra**	**151**	**15.8**							**91.4**	1	89.8	88.5
PT006C1	**Setúbal**	**134**	**13.8**	1	14.1	14.9	1	17.9	21.1	**105.1**	1	104.5	104.9
PT007C1	**Ponta Delgada**												
PT008C1	**Aveiro**	**85**	**14.4**	1	9.2	11.1	1	19.5	19.9	**91.8**	1	69.6	87.0
PT009C1	**Faro**	**68**	**8.6**	1	9.9	10.0				**113.1**	1	115.1	113.5
PT010C1	**Seixal**	**162**	**17.5**							**99.7**			
PT011C1	**Amadora**	**168**	**21.5**	2	23.9	23.0				**102.5**	2	97.7	99.9
PT012C1	**Almada**	**180**	**19.7**	1	22.3	21.4				**98.6**	1	98.5	92.6
PT013C1	**Odivelas**	**157**	**21.3**				1	25.2	31.2	**96.6**			
PT014C1	**Viseu**	**103**	**11.0**							**103.9**			
PT015C1	**Valongo**	**106**	**21.5**	1	26.8	23.2				**74.0**			
PT016C1	**Viana do Castelo**	**93**	**10.3**							**89.6**			
PT017C1	**Paredes**	**99**	**16.4**							**80.3**			
PT018C1	**Barreiro**	**100**	**17.9**	1	15.0	19.1				**102.8**	1	108.3	103.7
PT019C1	**Póvoa de Varzim**	**84**	**14.3**							**81.2**			
PT501C1	**Sintra**	**385**	**16.2**	1	12.2	15.8				**102.9**	1	106.0	101.3
PT502C1	**Vila Nova de Gaia**	**326**	**22.7**							**82.2**	1	82.1	75.9
PT503C1	**Matosinhos**	**205**	**24.3**				1	47.7	34.6	**76.6**	1	58.9	77.4
PT504C1	**Gondomar**	**179**	**22.7**							**76.3**			
PT505C1	**Guimarães**	**190**	**16.0**							**83.2**			
PT508C1	**Vila Franca de Xira**	**152**	**18.6**	1	18.1	19.7				**104.4**	1	105.5	104.0
RO001C1	**MUNICIPIUL BUCURESTI**	**1 940**	**34.9**				1	57.4	53.4	**96.6**			
RO002C1	**MUNICIPIUL CLUJ-NAPOCA**	**331**	**29.6**	1	35.9	28.9	1	60.2	45.2	**82.8**	1	55.4	82.4
RO003C1	**MUNICIPIUL TIMISOARA**	**326**	**28.1**	1	32.4	25.8	1	49.8	43.5	**99.9**			
RO004C1	**MUNICIPIUL CRAIOVA**	**272**	**24.1**				1	32.3	35.1	**98.1**			

URAU Code	Name of City	POP	NO$_2$							O$_3$			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
RO005C1	MUNICIPIUL BRAILA	181	20.8				1	23.7	28.2	100.5			
RO006C1	MUNICIPIUL ORADEA	199	24.6	1	27.8	24.6				101.2			
RO007C1	MUNICIPIUL BACAU	149	23.7							93.1			
RO008C1	MUNICIPIUL ARAD	159	20.2	1	18.1	20.9	1	25.3	28.7	104.6	1	113.0	105.1
RO009C1	MUNICIPIUL SIBIU	148	25.6							95.0	1	102.9	94.9
RO010C1	MUNICIPIUL TIRGU MURES	147	25.2	1	27.2	25.3				94.0	1	85.5	93.9
RO011C1	MUNIC. PIATRA NEAMT	86	21.4							89.5			
RO012C1	MUNICIPIUL CALARASI	73	19.5	1	16.5	17.6	1	26.5	28.0	99.9	1	103.4	99.8
RO013C1	MUNICIPIUL GIURGIU	62	22.8	1	29.3	22.7	1	32.4	31.6	98.5	1	92.9	98.3
RO014C1	MUNICIPIUL ALBA IULIA	64	23.9							94.7			
RO015C1	MUNICIPIUL FOCSANI	81	22.3							97.0			
RO016C1	MUNICIPIUL TIRGU JIU	86	25.8							98.9			
RO017C1	MUNICIPIUL TULCEA	75	21.3							99.4			
RO018C1	MUNICIPIUL TIRGOVISTE	83	23.3							94.5			
RO019C1	MUNICIPIUL SLATINA	72	22.6							100.5			
RO020C1	MUNICIPIUL BIRLAD	56	20.4							95.5			
RO021C1	MUNICIPIUL ROMAN	53	21.7							93.2			
RO022C1	MUNICIPIUL BISTRITA	76	23.4	1	26.3	23.9				92.7			
RO501C1	MUNICIPIUL CONSTANTA	284	22.6							90.8	1	92.0	90.5
RO502C1	MUNICIPIUL IASI	311	24.8	1	30.9	25.7	1	43.0	37.9	93.4			
RO503C1	MUNICIPIUL GALATI	253	22.9	2	19.1	19.3				101.8	2	100.2	102.1
RO504C1	MUNICIPIUL BRASOV	256	29.4	1	33.2	28.2	2	46.0	41.1	88.8	1	80.5	88.1
RO505C1	MUNICIPIUL PLOIESTI	216	25.0	1	24.6	23.7	2	31.9	33.7	86.6	1	73.8	85.7
RO506C1	MUNICIPIUL PITESTI	161	21.4				1	22.1	29.8	100.9	1	118.5	101.1
RO507C1	MUNICIPIUL BAIA MARE	128	19.7	2	15.0	17.2	1	25.0	28.8	94.5	2	97.8	96.6
RO508C1	MUNICIPIUL BUZAU	119	22.7							95.8	1	94.5	95.7
RO509C1	MUNICIPIUL SATU MARE	107	18.4	1	17.6	17.9				99.9	1	91.2	99.2
RO510C1	MUNICIPIUL BOTOSANI	111	25.4	1	31.0	25.3				94.1			
RO511C1	MUNIC. RAMNICU VALCEA	102	24.4	1	18.4	21.1				99.0	1	94.3	98.3
RO512C1	MUNICIPIUL SUCEAVA	99	19.6	1	15.7	21.2				93.8			
RO513C1	M. DROBETA-TURNU SEVER	99	22.5							99.6			
SE001C1	Stockholm	967	11.7	4	10.0	11.9	8	27.5	26.1	103.5	1	103.5	104.7
SE002K1	Greater Göteborg	581	12.3	1	17.0	13.5	2	27.2	25.2	99.8	1	101.2	99.1
SE003C1	Malmö	312	11.7	1	10.3	14.1	3	20.9	19.8	106.4	1	107.4	105.3
SE004C1	Jönköping	130	8.4				1	22.3	18.9	104.6			
SE005C1	Umeå	117	5.1				1	25.8	20.7	97.6			
SE006C1	Uppsala	203	8.1	1	7.5	11.1	1	33.5	25.4	100.8			
SE007C1	Linköping	149	9.0							103.6			
SE008C1	Örebro	139	8.5	1	9.1	10.9	1	11.9	16.6	103.3			
SE009C1	Södertälje	91	8.7				1	24.3	20.6	105.0			
SE501C1	Västerås	141	9.4				1	11.2	16.5	103.8			
SE502C1	Norrköping	133	9.7							102.6			
SE503C1	Helsingborg	134	11.4	1	16.0	13.3	2	21.9	19.4	103.4	1	98.8	104.6
SE504C1	Lund	117	9.5	1	9.2	11.4	1	12.5	15.6	105.2	1	106.1	104.9
SE505C1	Borås	105	8.9				1	25.0	21.0	102.5			
SI001C1	Ljubljana	285	21.3	1	25.0	24.8				114.9	1	115.3	115.2
SI002C1	Maribor	118	18.1				1	24.5	24.0	112.6	1	116.8	111.9
SK001C1	Bratislava	413	18.2	2	15.6	17.4	1	37.2	33.3	117.3	2	124.0	116.3
SK002C1	Košice	250	18.6				1	27.7	30.5	109.4	1	111.0	112.0
SK003C1	Banská Bystrica	85	13.9	1	8.9	12.5	1	29.3	29.8	103.6	1	102.7	104.5
SK004C1	Nitra	81	14.8	1	10.2	10.8	1	30.6	28.2	112.1	1	114.7	111.1
SK005C1	Prešov	96	16.7				1	39.0	32.4	112.1			
SK006C1	Žilina	89	18.8	1	21.4	20.7				105.2	1	107.7	105.0
SK007C1	Trnava	70	14.6				1	33.8	28.3	115.4			
SK008C1	Trenčín	60	15.3				1	26.6	26.4	110.8			
UK002C1	Birmingham	1 082	22.0	1	18.1	20.8	1	32.0	35.4	86.2	1	95.3	84.0

URAU Code	Name of City	POP	NO2							O3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
UK003C1	**Leeds**	**753**	**22.7**	1	28.3	24.5	1	28.4	33.7	**86.6**	1	86.5	87.8
UK004C1	**Glasgow City**	**670**	**21.9**	1	24.2	22.0	3	38.4	37.2	**86.8**	1	87.0	85.1
UK005C1	**Bradford**	**533**	**21.4**				1	41.8	33.6	**88.5**			
UK006C1	**Liverpool**	**496**	**20.8**							**84.0**			
UK007C1	**City of Edinburgh**	**485**	**19.1**	1	20.8	19.3	1	50.4	39.5	**85.6**	1	83.8	85.2
UK008C1	**Manchester**	**512**	**30.0**	1	36.3	30.2				**82.3**	1	68.0	81.6
UK009C1	**Cardiff**	**357**	**18.4**				1	29.0	35.2	**89.5**			
UK010C1	**Sheffield**	**557**	**21.8**	2	26.2	23.3	1	38.0	33.3	**87.2**	1	85.9	85.5
UK011C1	**Bristol, City of**	**457**	**21.0**	1	23.4	21.0	1	39.2	38.3	**88.6**	1	86.1	88.4
UK012C2	**Belfast**	**351**	**17.6**				1	45.4	37.2	**87.2**	1	84.1	83.4
UK013C1	**Newcastle upon Tyne**	**288**	**22.1**	1	32.1	22.8	1	38.2	32.6	**88.6**	1	89.9	87.6
UK014C1	**Leicester**	**383**	**22.5**	1	24.1	21.1	1	36.8	35.3	**89.9**	1	88.5	90.9
UK016C1	**Aberdeen City**	**226**	**14.7**	1	16.7	15.5	2	35.4	31.2	**83.0**	1	88.3	73.3
UK017C1	**Cambridge**	**135**	**17.9**				1	27.4	27.5	**94.3**			
UK018C1	**Exeter**	**121**	**13.8**				1	27.9	27.1	**91.0**			
UK019C1	**Lincoln**	**99**	**19.0**				1	29.2	28.1	**92.3**			
UK020C1	**Gravesham**	**109**	**20.6**							**91.6**			
UK021C1	**Stevenage**	**91**	**18.1**							**95.3**			
UK022C1	**Wrexham**	**138**	**15.5**				1	16.4	21.1	**90.2**			
UK023C1	**Portsmouth**	**212**	**19.1**	1	17.5	17.6	1	27.8	28.0	**85.5**	1	80.0	85.3
UK024C1	**Worcester**	**103**	**17.7**							**88.7**			
UK025C1	**Coventry**	**317**	**20.9**	1	20.4	20.4	1	30.9	30.6	**88.6**	1	87.8	90.0
UK026C1	**Kingston upon Hull, City of**	**273**	**20.4**	1	22.5	20.7	1	26.4	28.5	**88.0**	1	86.6	87.4
UK027C1	**Stoke-on-Trent**	**261**	**21.5**	1	24.0	21.2	1	51.2	36.1	**86.3**	1	82.9	85.0
UK028C1	**Wolverhampton**	**255**	**20.4**							**86.6**			
UK029C1	**Nottingham**	**368**	**23.7**	1	27.7	24.4	1	33.1	33.6	**86.3**	1	83.8	85.9
UK030C1	**Wirral**	**320**	**17.1**	1	16.4	17.9	1	23.3	28.1	**88.2**	1	91.3	88.1
UK031C1	**Bath and N. East Somerset**	**183**	**15.0**							**91.5**			
UK032C1	**Thurrock**	**160**	**21.1**	1	23.4	22.5	1	26.2	25.9	**90.4**			
UK033C1	**Guildford**	**153**	**20.4**							**91.2**			
UK034C1	**Thanet**	**134**	**12.7**							**95.4**			
UK035C1	**Nuneaton and Bedworth**	**129**	**18.8**							**87.7**			
UK038C1	**Waveney**	**118**	**10.7**							**95.3**			
UK040C1	**Tunbridge Wells**	**127**	**16.1**							**95.2**			
UK041C1	**Ashford**	**119**	**13.5**							**93.7**			
UK043C1	**East Staffordshire**	**121**	**17.6**	1	18.3	19.5				**87.9**			
UK044C1	**Darlington**	**112**	**15.9**							**91.6**			
UK045C1	**Worthing**	**113**	**14.0**				1	33.1	27.9	**89.9**			
UK046C1	**Mansfield**	**112**	**19.6**							**89.7**			
UK047C1	**Chesterfield**	**110**	**18.1**	1	12.4	17.3	1	17.4	24.8	**88.2**			
UK050C1	**Burnley**	**94**	**20.0**							**90.4**			
UK051C1	**Great Yarmouth**	**98**	**9.9**							**96.3**			
UK052C1	**Woking**	**104**	**23.2**							**89.8**			
UK053C1	**Hartlepool**	**93**	**15.1**	1	12.4	14.9				**86.7**			
UK054C1	**Cannock Chase**	**108**	**17.8**				1	21.4	27.3	**87.5**			
UK055C1	**Eastbourne**	**107**	**12.8**	1	11.5	12.3				**92.1**			
UK056C1	**Hastings**	**94**	**14.2**							**94.5**			
UK057C1	**Hyndburn**	**82**	**19.5**							**88.5**			
UK059C1	**Redditch**	**86**	**17.2**							**90.0**			
UK060C1	**Tamworth**	**82**	**19.0**							**88.2**			
UK061C1	**Harlow**	**84**	**18.9**							**93.3**			
UK062C1	**Halton**	**126**	**20.6**				1	33.9	29.8	**85.9**			
UK101C1	**City of London**	**4**	**34.0**							**84.1**			
UK102C1	**Barking and Dagenham**	**188**	**24.4**							**89.9**			
UK103C1	**Barnet**	**380**	**25.5**							**87.8**			
UK104C1	**Bexley**	**258**	**23.2**	1	22.7	22.3				**90.7**			

URAU Code	Name of City	POP	NO2							O3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
UK105C1	**Brent**	**301**	**30.4**							**85.7**			
UK106C1	**Bromley**	**319**	**21.3**							**91.0**			
UK107C1	**Camden**	**192**	**34.4**	1	31.5	33.5	1	42.7	46.4	**83.3**	1	78.0	84.1
UK108C1	**Croydon**	**368**	**23.1**							**90.9**			
UK109C1	**Ealing**	**322**	**31.3**							**85.5**			
UK110C1	**Enfield**	**318**	**24.1**							**90.5**			
UK111C1	**Greenwich**	**237**	**25.6**	1	17.3	21.3				**90.5**	1	92.1	91.2
UK112C1	**Hackney**	**265**	**32.3**							**84.8**			
UK113C1	**Hammersmith and Fulham**	**188**	**34.2**							**82.7**			
UK114C1	**Haringey**	**246**	**27.8**	1	21.9	25.2	1	37.3	40.1	**89.3**	1	91.2	89.3
UK115C1	**Harrow**	**250**	**27.3**							**89.5**			
UK116C1	**Havering**	**239**	**21.2**							**90.9**			
UK117C1	**Hillingdon**	**303**	**29.8**	1	44.7	32.9				**86.4**	1	77.4	81.6
UK118C1	**Hounslow**	**270**	**31.8**							**84.7**			
UK119C1	**Islington**	**205**	**33.6**							**85.1**			
UK120C1	**Kensington and Chelsea**	**151**	**36.1**	1	27.3	32.2				**82.7**	1	94.1	82.7
UK121C1	**Kingston upon Thames**	**176**	**26.9**							**87.0**			
UK122C1	**Lambeth**	**324**	**31.1**							**86.5**			
UK123C1	**Lewisham**	**272**	**26.4**							**89.1**			
UK124C1	**Merton**	**191**	**27.5**							**85.1**			
UK125C1	**Newham**	**328**	**28.9**							**89.3**			
UK126C1	**Redbridge**	**292**	**24.1**							**91.0**			
UK127C1	**Richmond upon Thames**	**209**	**29.8**							**85.8**			
UK128C1	**Southwark**	**271**	**31.5**				1	38.8	42.8	**86.2**			
UK129C1	**Sutton**	**200**	**23.9**							**90.3**			
UK130C1	**Tower Hamlets**	**258**	**33.4**				1	35.0	44.0	**84.1**			
UK131C1	**Waltham Forest**	**240**	**26.6**							**89.3**			
UK132C1	**Wandsworth**	**323**	**30.9**							**84.6**			
UK133C1	**Westminster**	**228**	**36.8**	1	33.7	34.9	1	62.7	49.7	**82.8**			
UK501C1	**Kirklees**	**425**	**21.0**							**87.4**			
UK502C1	**North Lanarkshire**	**350**	**18.2**							**90.7**			
UK503C1	**Wakefield**	**328**	**21.3**							**87.6**			
UK504C1	**Dudley**	**314**	**20.1**							**87.9**			
UK505C1	**Wigan**	**322**	**20.8**	1	19.3	20.6				**85.8**	1	91.8	86.8
UK506C1	**Doncaster**	**306**	**20.1**				1	30.1	30.0	**88.5**			
UK507C1	**Stockport**	**292**	**26.1**							**84.4**			
UK508C1	**Sefton**	**286**	**15.7**							**87.7**			
UK509C1	**Sandwell**	**305**	**22.3**				1	33.5	34.2	**86.6**			
UK510C1	**Sunderland**	**274**	**17.9**	1	12.8	15.4	1	17.4	24.3	**90.0**	1	90.6	93.0
UK511C1	**Bolton**	**283**	**23.4**							**84.8**			
UK512C1	**Walsall**	**269**	**20.2**	1	16.1	18.7				**87.3**	1	91.1	87.7
UK513C1	**Medway**	**264**	**19.9**				1	24.4	29.7	**91.7**			
UK514C1	**Rotherham**	**267**	**21.4**							**87.2**			
UK515C1	**Brighton and Hove**	**280**	**15.5**	1	15.2	14.3				**91.7**	1	85.7	88.8
UK516C1	**Plymouth**	**262**	**14.3**	1	18.9	16.7	1	18.8	24.9	**91.7**	1	90.0	91.0
UK517C1	**Swansea**	**245**	**13.2**				1	24.1	25.9	**89.9**			
UK518C1	**Derby**	**261**	**20.8**				1	35.0	32.8	**87.1**			
UK519C1	**Barnsley**	**230**	**20.0**	1	16.6	18.8				**87.7**	1	90.3	87.6
UK520C1	**Southampton**	**245**	**23.2**	1	27.8	22.6	1	32.5	32.1	**85.4**	1	81.3	85.7
UK521C1	**Oldham**	**226**	**25.8**				1	30.4	29.7	**86.4**			
UK522C1	**Salford**	**231**	**28.2**	1	25.4	27.9				**82.7**			
UK523C1	**Tameside**	**219**	**26.1**							**86.4**			
UK524C1	**Trafford**	**228**	**26.7**							**82.8**			
UK525C1	**Milton Keynes**	**253**	**18.4**							**94.4**			
UK526C1	**Rochdale**	**216**	**24.0**							**86.4**			
UK527C1	**Solihull**	**218**	**19.6**							**85.7**			

URAU Code	Name of City	POP	NO_2							O_3			
			PWC	NB	CSB	CMB	NT	CST	CMT	PWC	NB	CSB	CMB
UK528C1	**Northampton**	**218**	**18.3**							**92.2**	1	100.6	91.4
UK529C1	**North Tyneside**	**198**	**19.7**							**91.2**			
UK530C1	**Gateshead**	**208**	**20.3**							**88.3**			
UK531C1	**Warrington**	**204**	**21.6**							**85.2**			
UK532C1	**Luton**	**217**	**20.8**				1	39.3	34.4	**92.3**			
UK533C1	**York**	**201**	**17.7**	1	14.8	18.5	1	26.0	26.6	**90.6**			
UK534C1	**Bury**	**180**	**23.9**				1	27.2	30.7	**84.8**			
UK535C1	**Swindon**	**213**	**16.2**	1	13.5	16.1				**89.4**			
UK536C1	**Stockton-on-Tees**	**192**	**16.2**				2	15.1	19.1	**87.8**			
UK537C1	**St. Helens**	**193**	**19.6**				1	33.4	30.5	**85.3**			
UK538C1	**Basildon**	**185**	**19.0**							**89.2**			
UK539C1	**Bournemouth**	**192**	**14.9**	1	11.5	12.3				**93.7**	1	99.2	92.7
UK540C1	**Wycombe**	**187**	**21.6**							**92.6**			
UK541C1	**Southend-on-Sea**	**182**	**18.5**	1	17.9	18.8				**90.7**	1	87.9	89.9
UK542C1	**Telford and Wrekin**	**170**	**16.3**	1	14.9	16.5				**89.8**			
UK543C1	**North East Lincolnshire**	**163**	**16.7**	1	13.5	17.3				**88.2**			
UK544C1	**Chelmsford**	**173**	**17.1**							**92.8**			
UK545C1	**Peterborough**	**205**	**17.0**							**93.0**			
UK546C1	**Colchester**	**178**	**14.5**							**91.1**			
UK547C1	**South Tyneside**	**151**	**18.9**							**89.8**			
UK548C1	**Basingstoke and Deane**	**176**	**17.7**							**91.3**			
UK549C1	**Bedford**	**176**	**16.8**							**94.6**			
UK550C1	**Dundee City**	**156**	**14.8**	1	11.0	14.4				**92.3**			
UK551C1	**Falkirk**	**161**	**18.0**							**89.5**			
UK552C1	**Reading**	**184**	**23.7**				1	26.7	31.6	**88.6**			
UK553C1	**Blackpool**	**153**	**14.8**	1	12.2	14.0				**93.4**	1	95.7	93.6
UK554C1	**Maidstone**	**162**	**17.1**							**93.9**			
UK555C1	**Poole**	**161**	**14.3**							**93.3**			
UK556C1	**Dacorum**	**153**	**20.6**							**92.9**			
UK557C1	**Blackburn with Darwen**	**150**	**20.8**				1	20.2	25.1	**88.3**			
UK558C1	**Newport**	**153**	**18.4**	1	19.9	18.0				**91.1**			
UK559C1	**Middlesbrough**	**148**	**16.8**							**87.8**			
UK560C1	**Oxford**	**160**	**19.4**	1	15.9	15.9	1	42.0	34.6	**88.8**			
UK561C1	**Torbay**	**132**	**11.4**							**93.3**			
UK562C1	**Preston**	**150**	**19.1**	1	22.8	20.7				**87.9**	1	87.0	87.3
UK563C1	**St Albans**	**156**	**20.6**							**91.7**			
UK564C1	**Warwick**	**138**	**17.1**	1	17.8	18.2	1	16.3	23.8	**89.0**	1	75.4	88.3
UK565C1	**Newcastle-under-Lyme**	**126**	**20.1**							**85.5**			
UK566C1	**Norwich**	**162**	**15.9**	1	12.7	14.8				**91.4**	1	91.0	90.9
UK567C1	**Slough**	**148**	**29.5**							**85.1**			
UK568C2	**Cheshire West and Chester**	**348**	**17.9**							**86.7**			
UK569C1	**Ipswich**	**144**	**16.5**							**90.7**			
UK571C1	**Cheltenham**	**118**	**18.3**							**90.8**			
UK572C1	**Gloucester**	**132**	**18.4**							**88.8**			
UK573C1	**Bracknell Forest**	**135**	**23.6**							**88.8**			
UK575C1	**Carlisle**	**110**	**14.2**				1	26.0	25.1	**93.5**			
UK576C1	**Crawley**	**113**	**19.5**							**88.5**			
UK577C1	**Watford**	**112**	**24.7**							**92.2**			
UK578C1	**Gosport**	**84**	**18.2**							**85.1**			
UK579C1	**Eastleigh**	**131**	**20.6**							**86.3**			
UK580C1	**Rushmoor**	**106**	**22.8**							**90.6**			
UK581C1	**Rugby**	**107**	**17.1**							**90.7**			
UK582C1	**Corby**	**60**	**17.3**							**93.5**			
UK583C1	**Kettering**	**96**	**16.5**							**93.5**			
UK584C1	**Inverclyde (Greenock)**	**81**	**15.4**				1	27.7	24.9	**93.2**			
UK585C1	**Renfrewshire (Paisley)**	**184**	**18.4**							**88.9**			

URAU Code	Name of City	POP	NO_2							O_3			
			PWC	NB	CSB	CMB	NT	CST	CMT	**PWC**	NB	CSB	CMB
UK586C1	**Derry & Strabane**	**148**	**10.1**	1	10.6	11.7				**90.1**	1	86.5	90.0

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