LUCAS Use case - Downscaling population density

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The availability of population density data across the EU is very heterogeneous. Some countries have very detailed population density data in GIS format that can be used for advanced analysis. For other countries data are insufficiently geo-referenced for spatial analysis. For the European Institutions data are available at the commune level (LAU2) or at LAU1 from Eurostat. Such data are not detailed enough for spatial analysis for several reasons, in particular because the size of the communes is very heterogeneous across the EU. There are many European policy areas that require more detailed georeferenced population data.

CORINE Land Cover (CLC) and other land cover data sources provide very useful information that allows to disaggregate population data from LAU2 to a more detailed level. However the information provided by CLC is not sufficient, mainly because of the coarse resolution - patches smaller than 25ha are not reported by CLC - therefore in particular scattered houses or small rural nuclei are not mapped. The land use data provided by LUCAS are a precious data source needed for the disaggregation of the population density as they allow to estimate the proportion of land with residential use as a proxy of the population density in each CLC class. Table 1 reports the proportion of area with residential use for each CLC class after regrouping the 44 CLC classes into 9. Of course the problem is more complex than the simplified data reported in this table. The different behavior of CLC classes in areas with different residential pattern need to be taken into account. More details on the method used to integrate LUCAS data in the disaggregation process of population density can be found in (Gallego et al, 2011).

The coefficients used for the population density disaggregation are obtained through a logistic regression that take into account the proportion of residential area in a given CLC class (obtained from LUCAS data) and the average population density of the commune. The model necessarily simplifies the complex aspects that influence population density, but the introduction of LUCAS data has significantly improved the accuracy.

Corine Land cover class	% area with residential use
Urban dense	45.4
Urban discontinuous	41.6
Other urban	9.6
Artificial non residential	0.8
Agricultural	1.8
Heterogeneous	2.9
Forest and agroforestry	0.5
Natural vegetation	0.14
Open spaces and water	0.21

Table 1: Proportion of area with residential use for CLC grouped classes.

The gridded population density layer obtained in this way (see Fig. 1 – 3) is being used for many purposes. For example a task force of DG AGRI, DG REGIO and ESTAT has used it to review the definition of rural,

semi-rural and urban areas, the old OECD definition being considered not satisfactory and research teams are using the population grid to explore rural typologies (Van Eupen et al., 2012). The European Aviation Safety Agency is using it to assess the impact of noise around airports, and several studies exploit this population grid to assess the impact of pollution (Beelen et al., 2013, Eeftens et al., 2012), impact of population on farm characteristics (Lange et al., 2013), vulnerability to climatic events or forest fires (Aubrecht et al., 2011, Oliveira et al., 2012), environmental indicators in coastal areas (Liquete et al., 2013) or modeling urban sprawl (Siedentop and Fina, 2012).

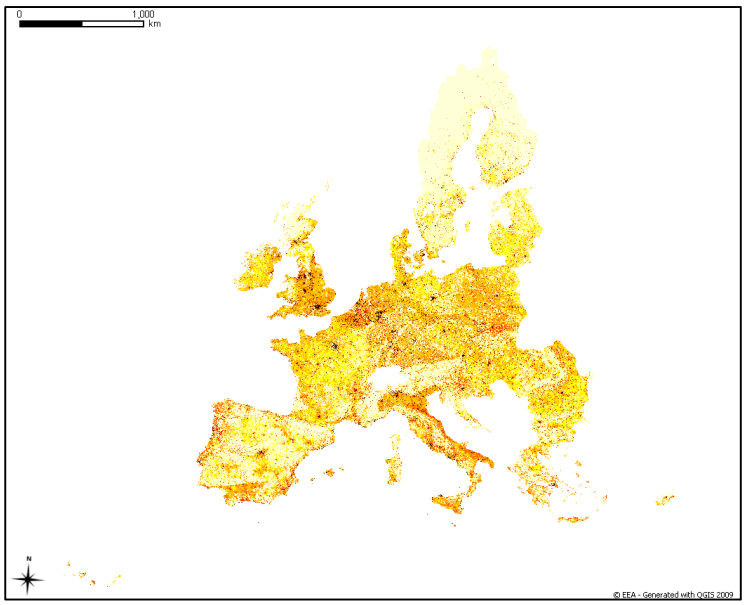
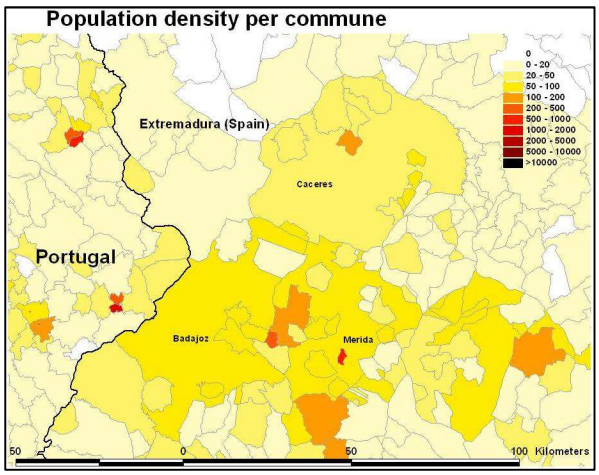


Figure 1: Population density disaggregated with CORINE land cover 2000



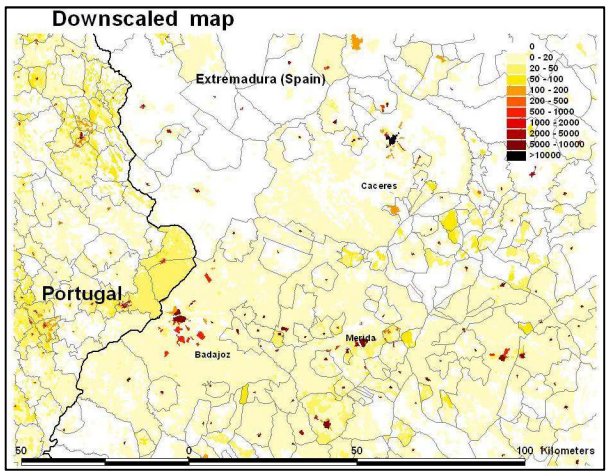


Figure 2 and 3: Extract of the population density map per commune and the disaggregated population map

The grid can be downloaded from the European Environmental Agency (EEA) data warehouse (http://dataservice.eea.europa.eu/). The number of downloads is around 1000 per year. Therefore it can be expected that the number of studies using these data soars in the next years.

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