

URBAN MORPHOLOGICAL ZONES

DEFINITION, METHODOLOGICAL APPROACH AND RESULTS

1 DEFINITION OF URBAN MORPHOLOGICAL ZONE (UMZ)

"A set of urban areas laying less than 200 m apart". Those urban areas are defined by the land cover classes considered to contribute to the urban tissue and function.

2 WHICH CLC CLASSES?

Our proposal is to consider the following classes:

1.1.1 (Continuous urban fabric)

1.1.2 (Discontinuous urban fabric)

1.2.1 (Industrial or commercial units)

1.4.1 (Green urban areas)

1.4.2 (Sport and leisure facilities) and 1.2.2 (Road and rail networks and associated land): to be considered only if they are adjacent to at least one of the classes above.

Classes 1.4.1 and 1.4.2 are kept within the UMZ because we think they are part of the urban system and play an important role in the functioning of a city. If needed, green areas can be extracted by image processing (e.g. NDVI) from IMAGE2000 data.

3 METHODOLOGY

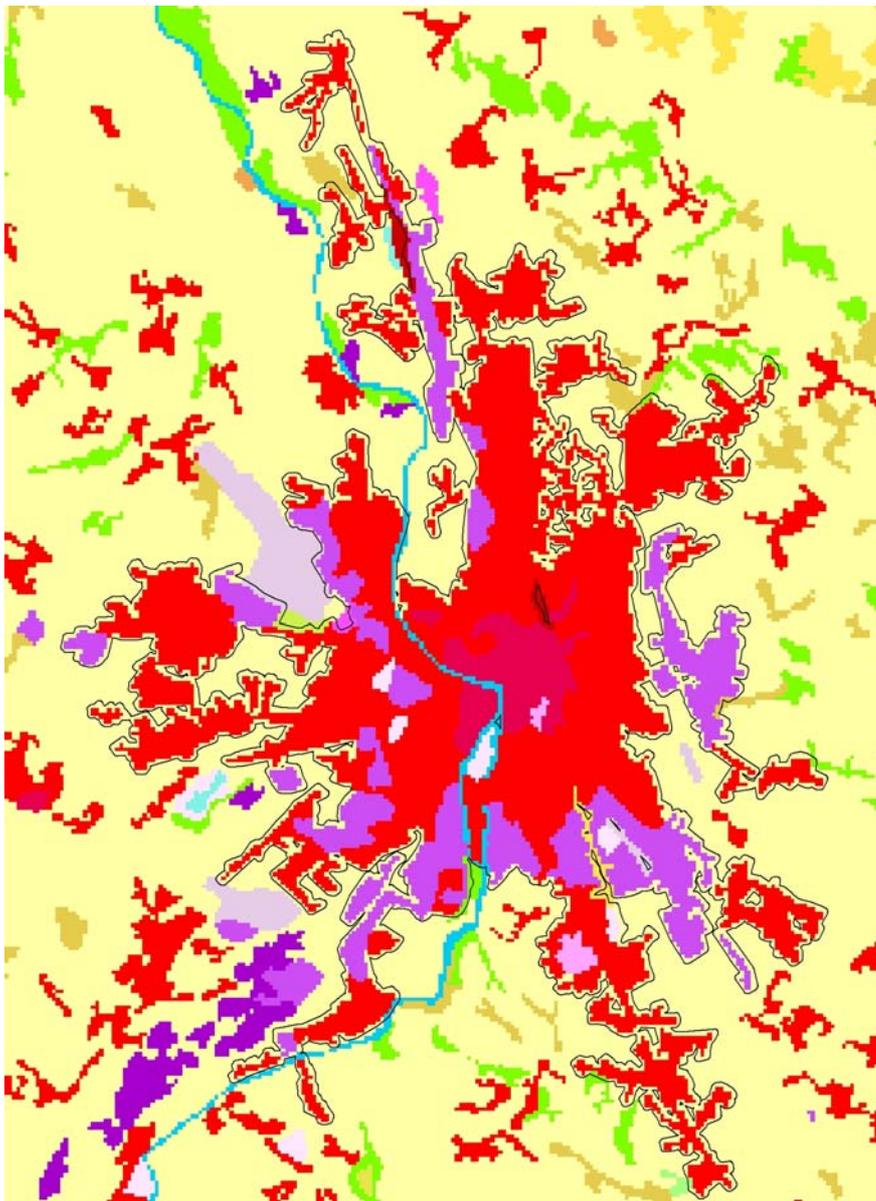
Two possible methodologies have been considered and attempted.

3.1 Buffering methodology (using vector data)

In this case, the first step is a selection of all the polygons of the urban classes described above. All these polygons are buffered by 100 metres and then polygons and buffers are merged and dissolved in order to build the urban morphological zones.

Problems: the buffering process enlarges urban morphological zones by 100 metres out of their boundaries (see image). Polygons inside UMZs may be very small and even much narrower than 100 metres (see image). Slow processing.

Advantages: buffering distance allows us to select urban polygons laying exactly 200 metres or less apart.



TOULOUSE UMZ. Methodology: vectorial buffering.

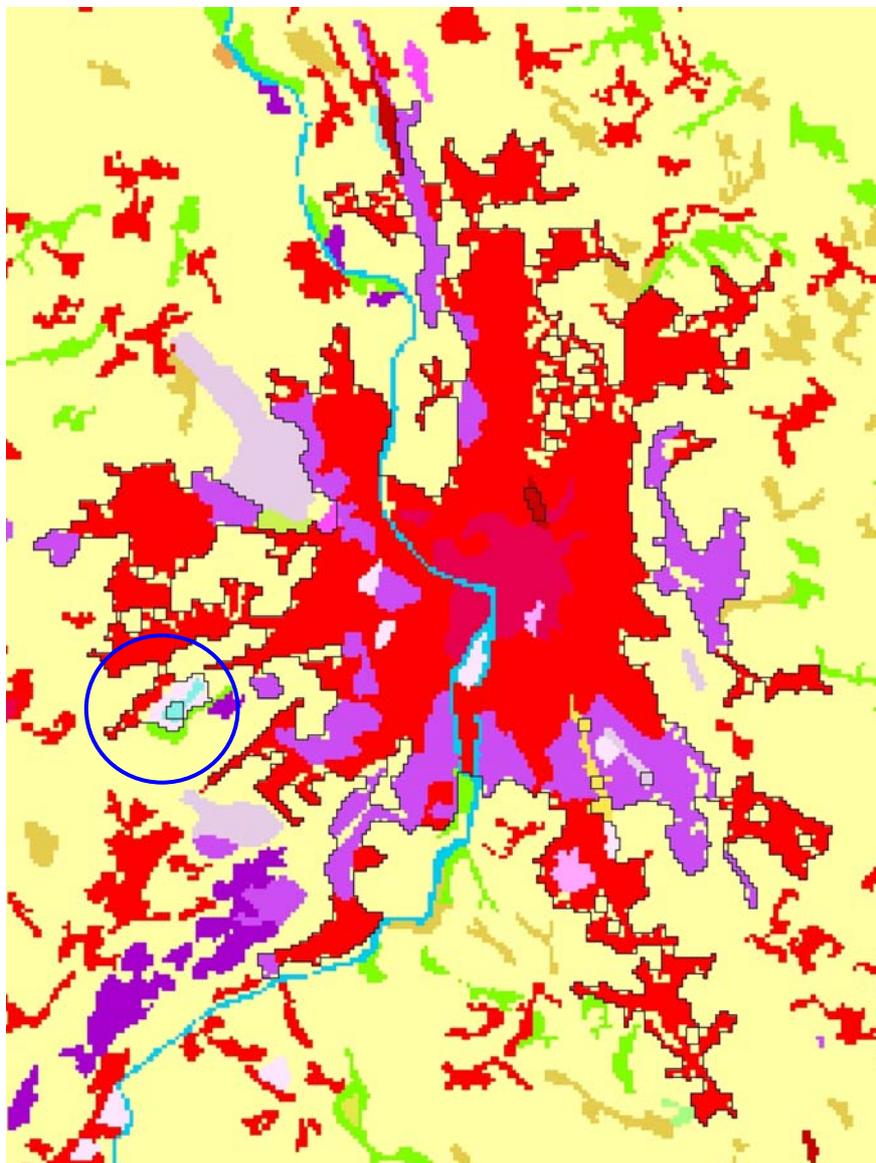
3.2 Expand and shrink methodology (using raster data)

The first step consists of a reclassification of the land cover raster in order to leave urban classes considered above with a single value (e.g. 1) and the rest of classes with another value (e.g. 0). Afterwards, a two-step process of expansion and shrinking (see scheme) of the urban areas cells by one pixel (resolution: 100 m) is undertaken. Finally, the result can be vectorised in order to obtain UMZ polygons.



Problems: the selection of areas to be part of the UMZ is done by pixel, not by an exact distance of 100 m. Therefore, areas laying up to 288 m apart can become part of the same UMZ (see the area within the circle in the image, and compare with the vectorial case).

Advantages: The boundary of the UMZ is more real as the shrinking process makes it coincide with actual urban cells. Quick processing.



TOULOUSE UMZ. Methodology: raster expansion and shrinking.

Taking into account advantages and drawbacks of both methodologies and the results achieved in some attempts, we think that the best approach is given by the raster method of expansion and shrinking cells.

4 URBAN MORPHOLOGICAL ZONES SELECTION

Which UMZs will be left in the database? There are two different possibilities. On the one hand, UMZs may be selected by **area** (e.g. UMZs of more than 1 000 hectares), a quite relevant criteria in terms of territorial analysis. On the other hand, **population** of the settlements may be used, although UMZs are not necessarily linked to one city unit and, in addition, information on population is not complete or updated for all the settlements in the GISCO database. A three-level population selection has been essayed, using thresholds of 50 000, 100 000 and 500 000 inhabitants.

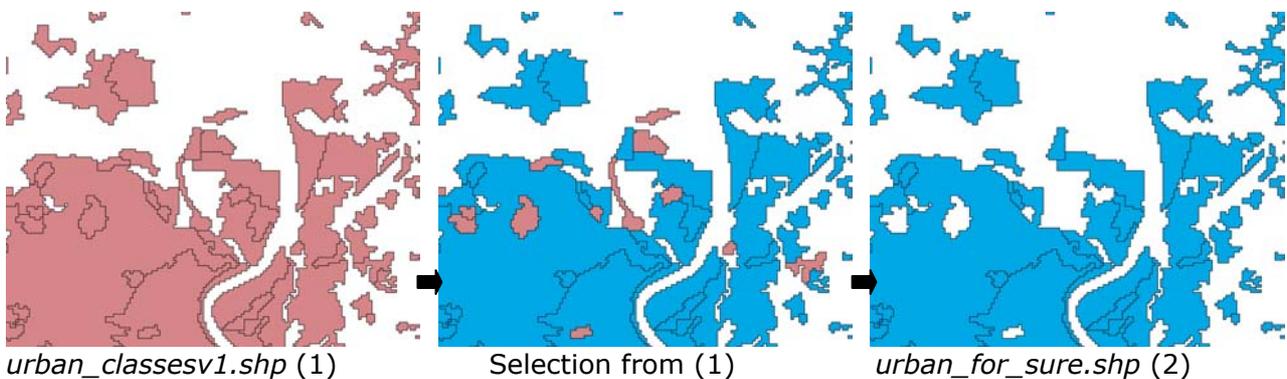
5 ADDITIONAL NOTES

As non-urban internal islands don't accomplish the criteria for UMZ definition, they will be kept as inner polygons or areas not belonging to the UMZ.

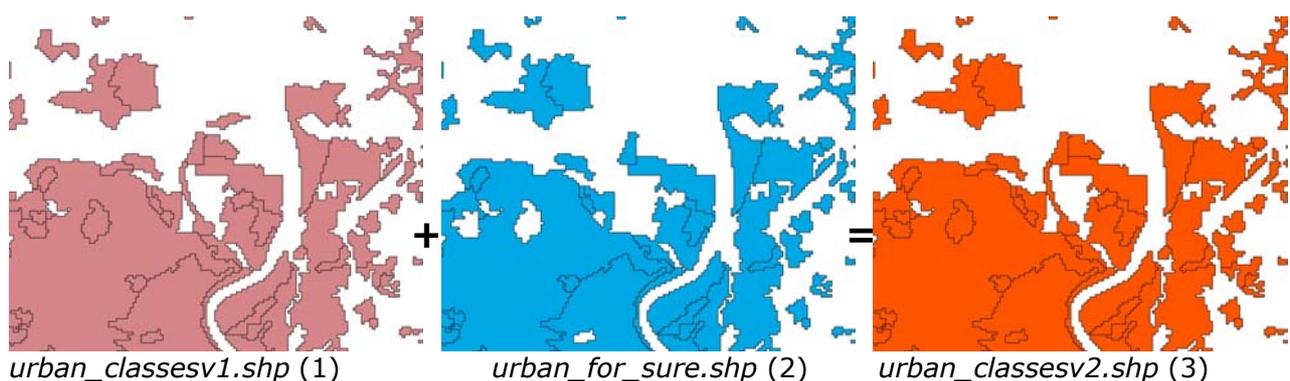
A single UMZ may include more than one administrative city in it, that's why we won't give the name of a city to any UMZ. The population is therefore orientative, e.g. a UMZ with more than 50 000 inhabitants could have more than 100 000 when two or more settlement points are falling into it.

6 TECHNICAL PROCEDURE FOR THE CREATION OF UMZs

- 1- Reclassification from CLC90 100m grid to create a grid containing only the urban classes considered: 1.1.1, 1.1.2, 1.2.1, 1.2.2, 1.4.1 & 1.4.2.
- 2- Vectorisation of the reclassified raster to create *urban_classesv1.shp*
- 3- Selection of the urban classes that need no condition to become UMZ (1.1.1, 1.1.2, 1.2.1 & 1.4.1.) and creation of *Urban_for_sure.shp* from the selection.



- 4- Spatial selection of all urban classes polygons from *urban_classesv1.shp* that intersect (i.e. the same or adjacent polygons) the polygons in *Urban_for_sure.shp*. Result: *urban_classesv2.shp*.



- 5- Rasterisation of *urban_classesv2.shp* to create the grid *urbclassesv2*.
- 6- Reclassification of *urbclassesv2* to give all the urban classes the code 1. Result: *urbclassesv3*.

7- Expansion of urbclassesv3 in one cell (100 m): URBEXPAND = expand (urbclassesv3,1,list,1).



urbclassesv3



urbexpand

8- Shrinking of urbexpand in one cell (100 m): URBSHRINK = shrink (urbexpand,1,list,1).



urbexpand

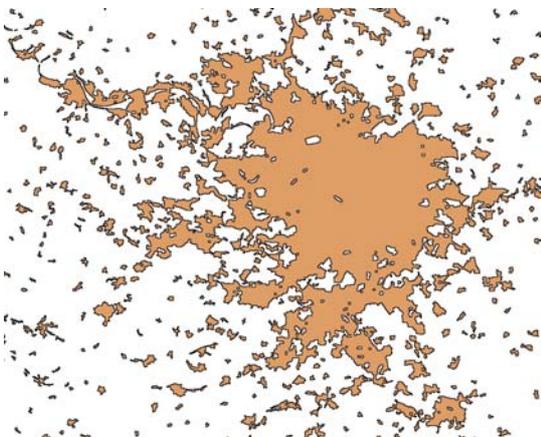


urbshrink

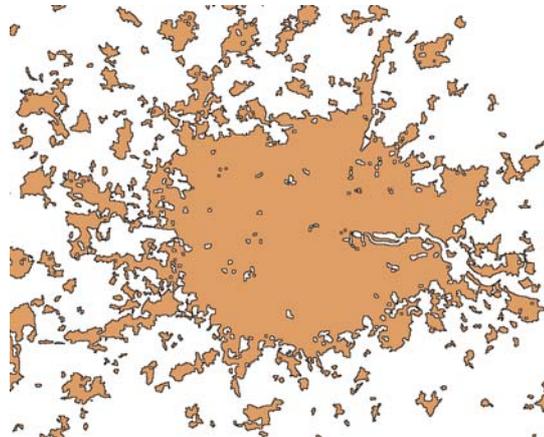
9- Vectorisation of urbshrink. Result: urbshrinkvec.shp.

10-Conversion of urbshrinkvec into a polygon coverage to have areas. Result: **umzcomplete.**

Examples for Paris and London:



PARIS

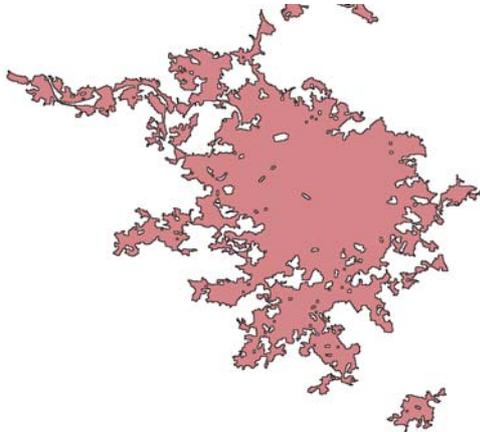


LONDON

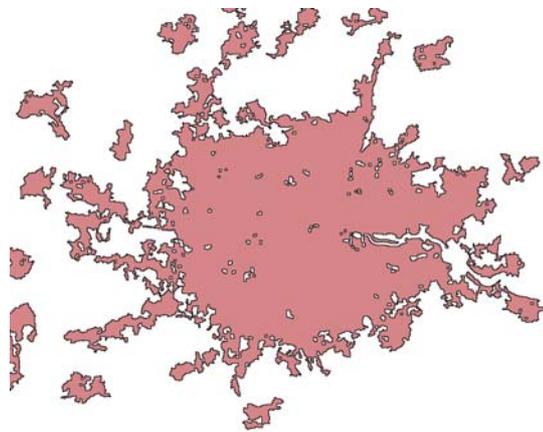
7 UMZ SELECTION USING A SIZE CRITERIA

11-Selection from umzcomplete of polygons at least 1 000 ha big. Result: **umzsz**. A total of **1464** UMZ selected.

Examples for Paris and London:



PARIS



LONDON

8 UMZ SELECTION USING A POPULATION CRITERIA

12-Selection from the GISCO settlements of those with more than 50 000, more than 100 000 and more than 500 000 inhabitants.

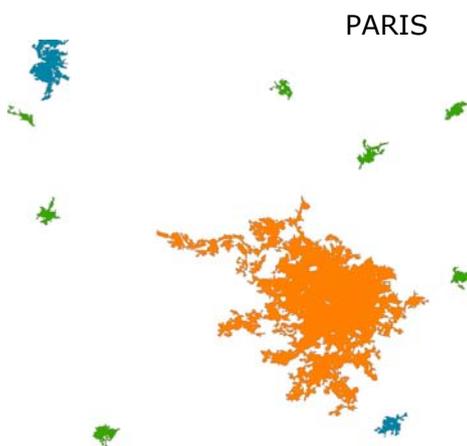
13-Manual correction of settlement points falling out of a umz area, or into a non-umz island, for settlements between 50 000 and 100 000 inhabitants.

14-Spatial selection of polygons from umzcomplete using the three sets of settlements selected above (those polygons having a settlement point inside).

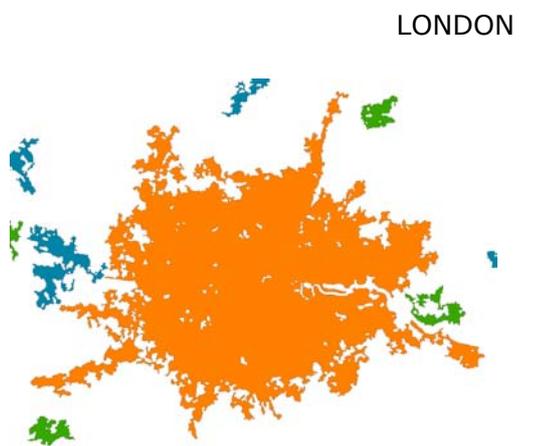
15-Creation of an attribute to store the level of population of each settlement (more than 500 000 inhab., between 100 000 and 500 000 and between 50 000 and 100 000).

16-Creation of a single UMZ layer by updating the one selected by 50 000 inhabitants with th one selected by 100 000 inhabitants, and then updating the result with the one selected by 500 000 inhabitants. Result: **umzpn3I**. A total of **897** UMZ selected.

Examples for Paris and London:



PARIS



LONDON