A diachronic analysis of the dynamic of two cities: Kisangani and Lubumbashi (Democratic Republic of Congo).

How do the extension and/or of the densification of these cities impact the urban internal and peripheral ecosystems?

André M. (m.andre@ulg.ac.be), Mahy G., Lejeune P., Bogaert J.

University of Liège, Gembloux Agro-Bio Tech, Biodiversity and Landscape Unit, 2, Passage des Déportés, B-5030 Gembloux, Belgium.

Context

The landscape dynamic of two contrasted cities from the Democratic Republic of Congo (DRC) have been studied via a diachronic analysis. The aim of the study is to identify how the extension and/or the densification of the urban and suburban zones have impacted the internal and/or peripheral ecosystems of these cities

Lubumbashi

- 2nd economic city of DRC
- humid subtropical climate
- 1 800 000 inhabitants in 2013
- industrial and mining city

Kisangani

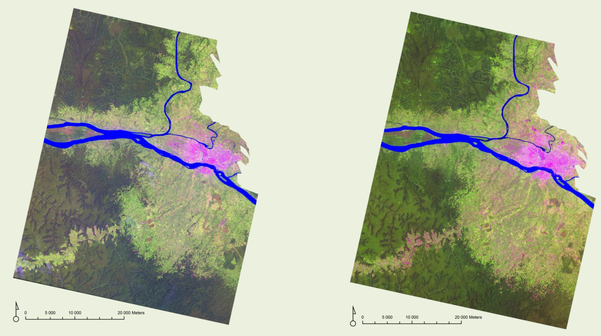
- 3rd economic city of DRC
- equatorial climate
- 1 300 000 inhabitants in 2011
- crossed by the Congo river (highest navigable point)

Material and method :

We used two SPOT 5 satellite images for each city, one image around the year 2000 and the other one around the year 2010 (depending on the availability of the images).
The SPOT 5 images have a spatial resolution of 10 m.

Lubumbashi: 16/07/2002 ; 18/06/2008, 17/05/2009 et 28/05/2009

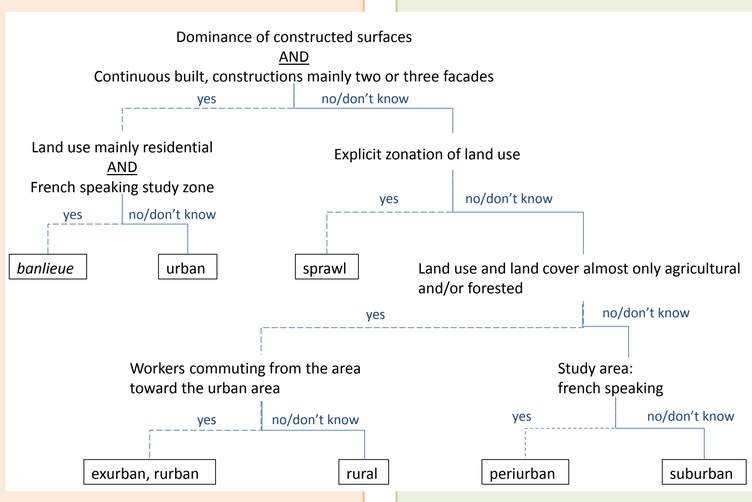
Kisangani: 28/12/2002 ; 02/03/2010



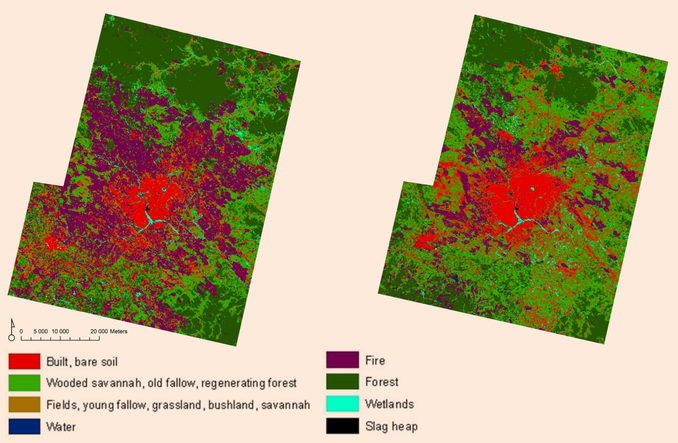
The **first step** of the methodology was a the recording of GPS points during two (one for each city) campaigns of field study, walking through the landscape constituting and surrounding both cities.

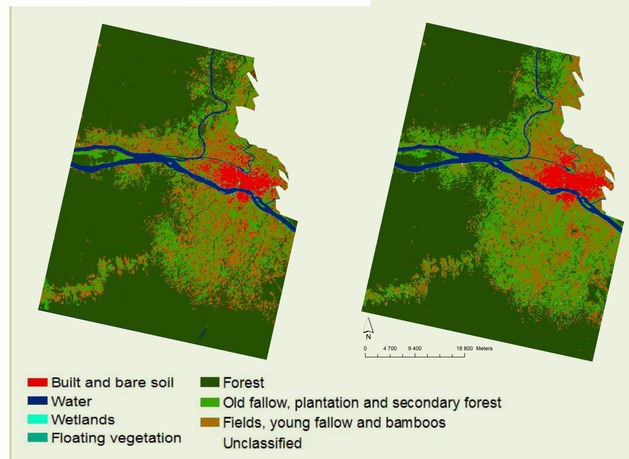
Each GPS point has been associated to a zone of the urban-rural gradient, using the decision tree elaborated by André *et al (*2014).

André, M., Mahy, G., Lejeune, P. & Bogaert, J., 2014, "Vers une synthèse de la conception et une définition des zones dans le gradient urbain-rural", *Base (in press)*.



The land cover corresponding to each GPS point was also recorded, permitting subsequently supervised image classification, using an object-oriented approach.
We obtained then a map representing the landscape classes of both cities for each year.
Through post-processes of the map, a value of built density was then attributed to each pixel.

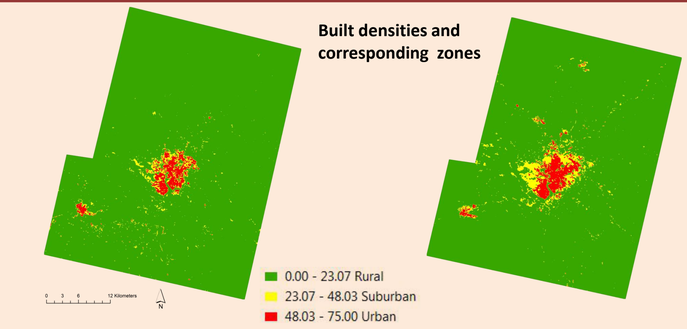


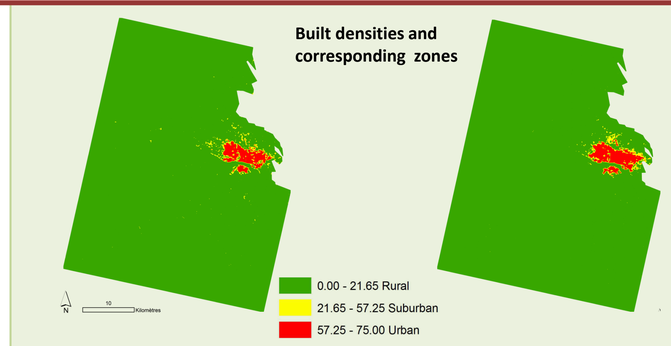


The **second step** has been to apply a recursive segmentation between the built densities (obtained from the classification) and the zones, in order to know the domain of built densities corresponding to each zone.

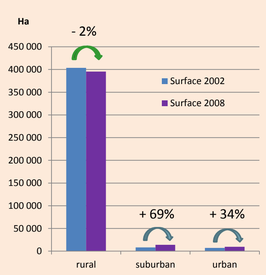
Results

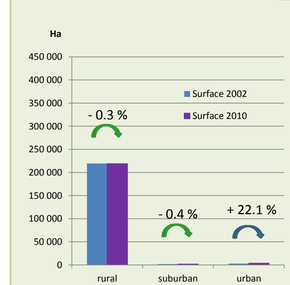
The maps of the built densities and the corresponding different areas composing the urban-rural gradient (beside) show that the thresholds are quite similar for both cities.





The chart (beside) show the dynamic of the different zones during the last decade (percentage of modification compared to the surface in 2002). We see that the suburban and urban zones in Lubumbashi have experienced a significative growth when in Kisangani, only the urban zone has experienced such a growth.





The pie (beside) show the repartition of the land cover classes in the expansion surface of the urban and suburban zones (in %). In both cases, the most impacted classes are the one that were already strongly anthropised in 2002 (burned areas, fields, young fallows, grassland, bushland, savannah, bamboos, continuous and discontinuous built).