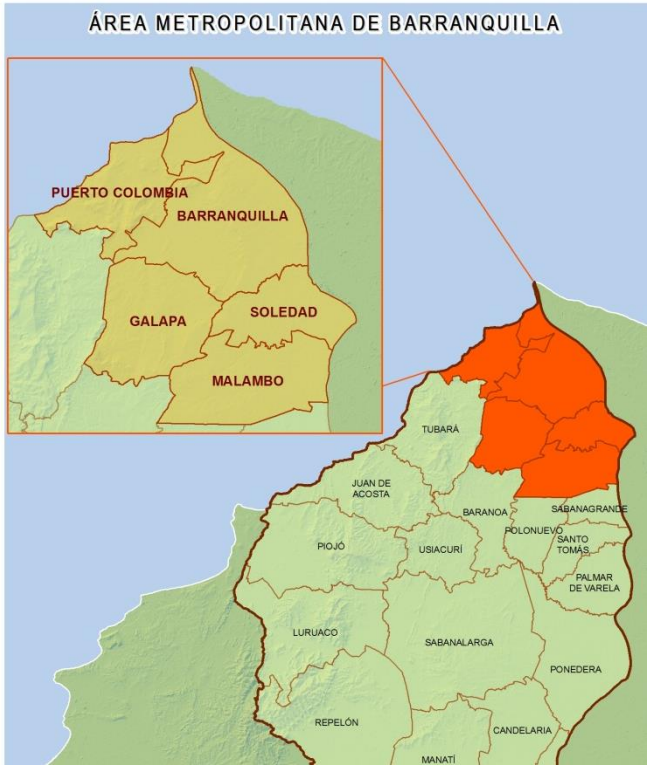
Using satellite images to calculate land use and land cover statistics

National Administrative Department of Statistics – DANE

Colombia

October 2015

Background (1)



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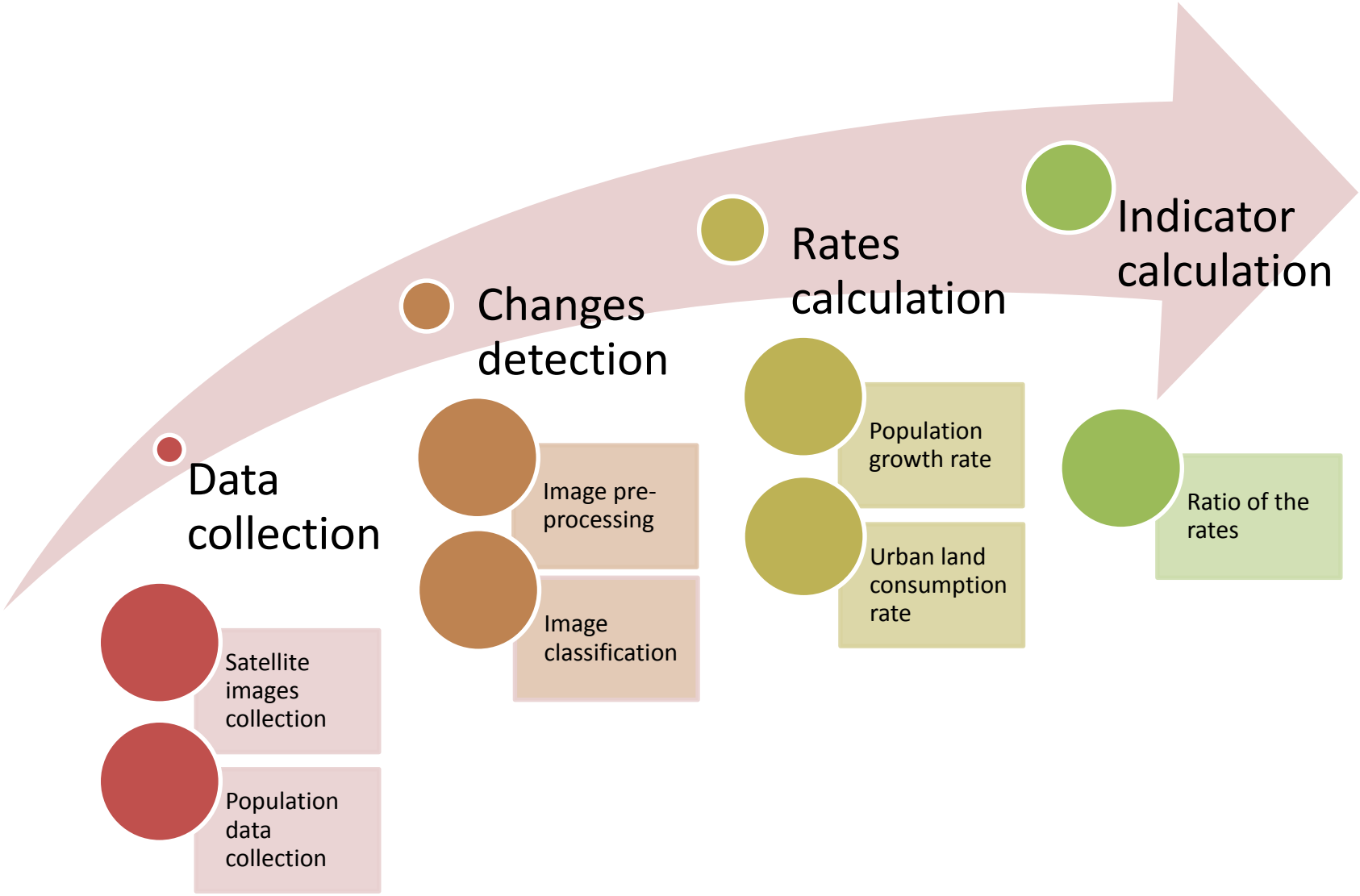
Objective

- Explore the usefulness of Big Data from satellite land images for the updating and improvement of statistic information.
- Calculate an indicator that shows the urban agglomeration degree by using satellite images and population data.
- This indicator would provide additional information to the framework for the implementation of several goals referred to in health and food security.

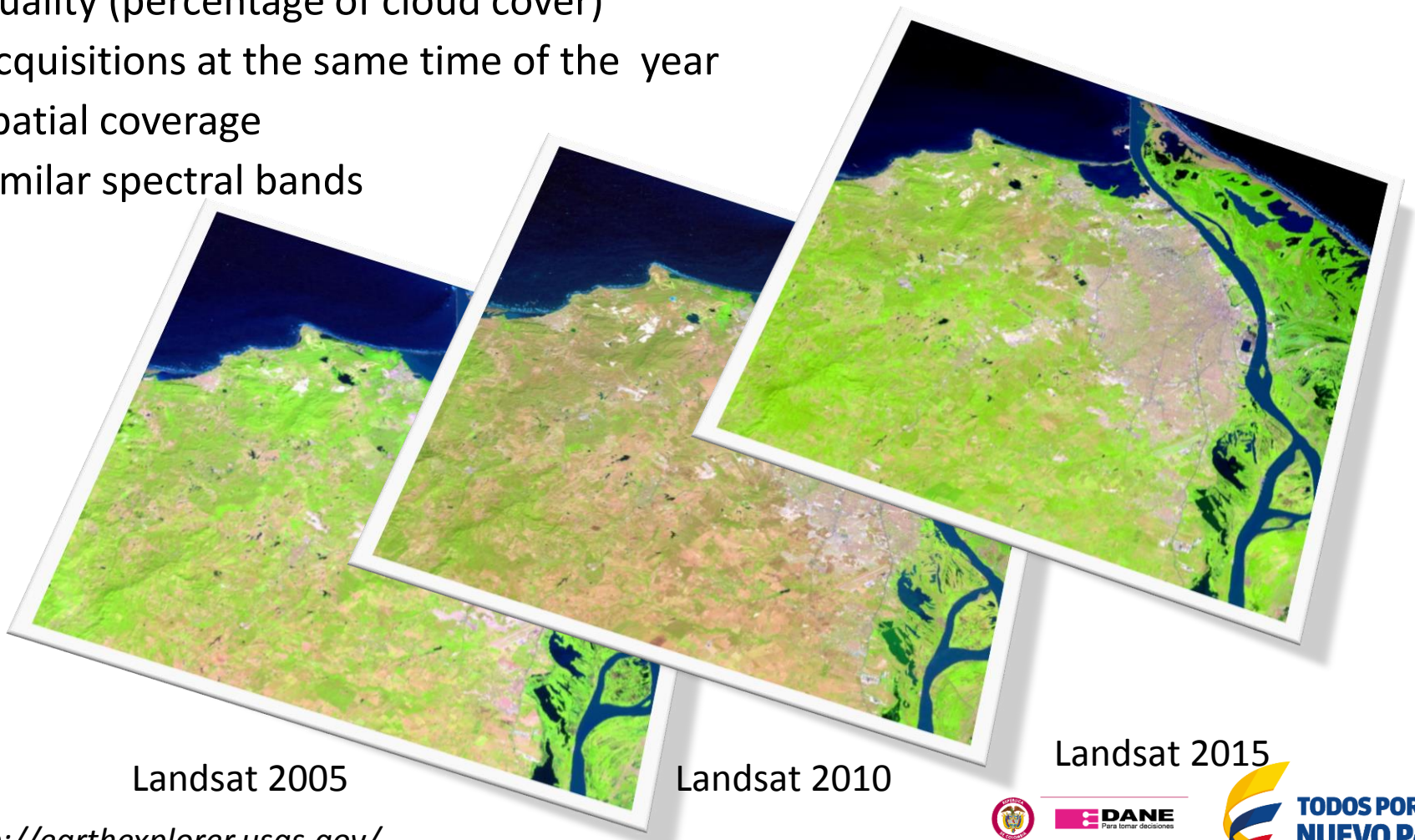
Methodology



Imagery collection

Criteria:

- Availability
- Quality (percentage of cloud cover)
- Acquisitions at the same time of the year
- Spatial coverage
- Similar spectral bands



Landsat 2005

Landsat 2010

Landsat 2015

http://earthexplorer.usgs.gov/

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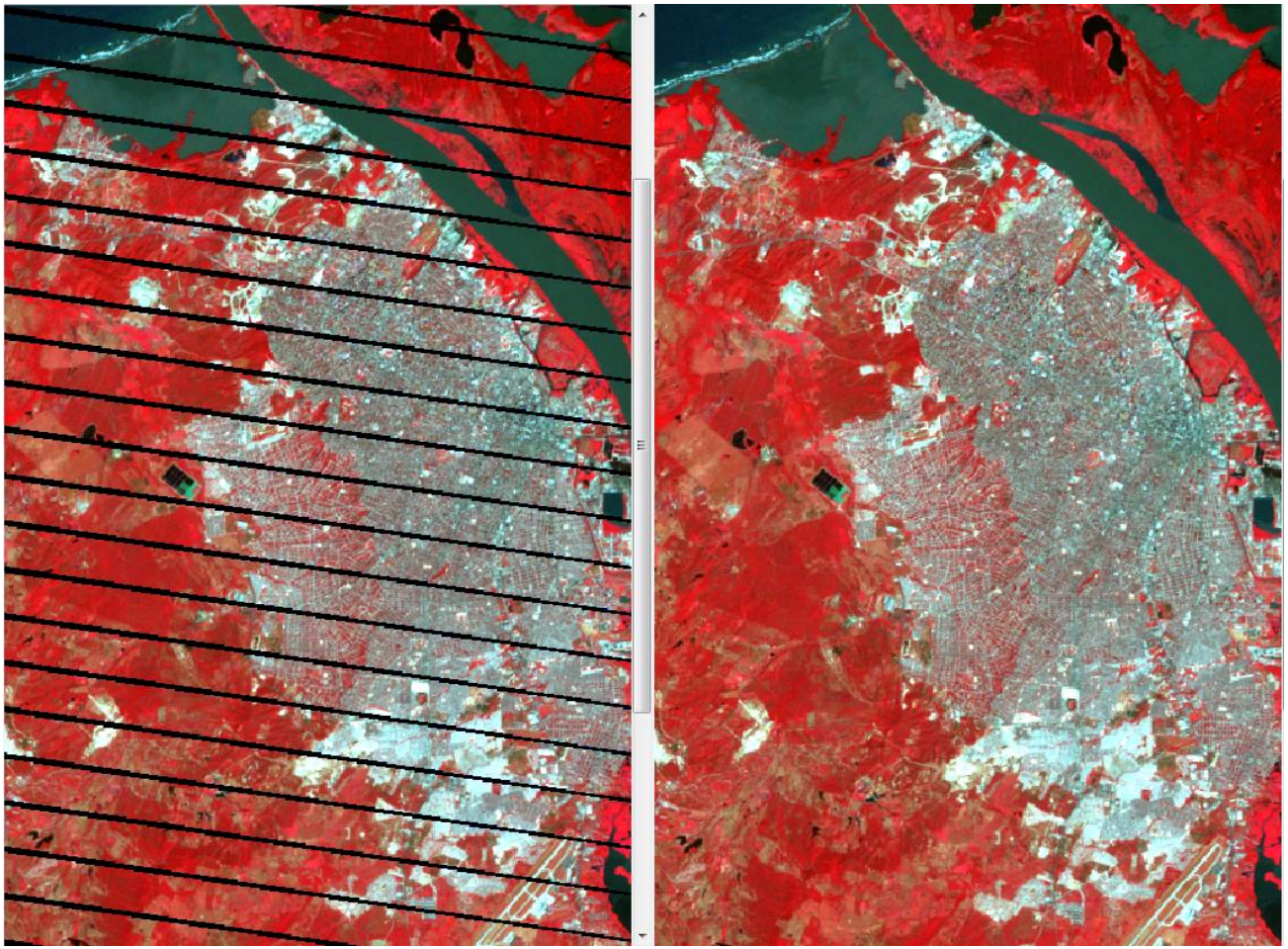
Imagery pre-processing

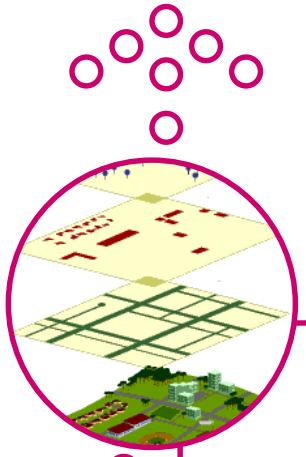


Original 2005 Image

Pre-processed image

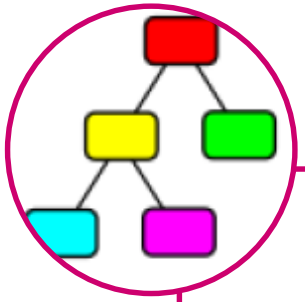
Coverages generation with object-oriented classification

INTERIMAGE
interpreting images freely



Coverages generation

Rules and operators definition



Semantic net

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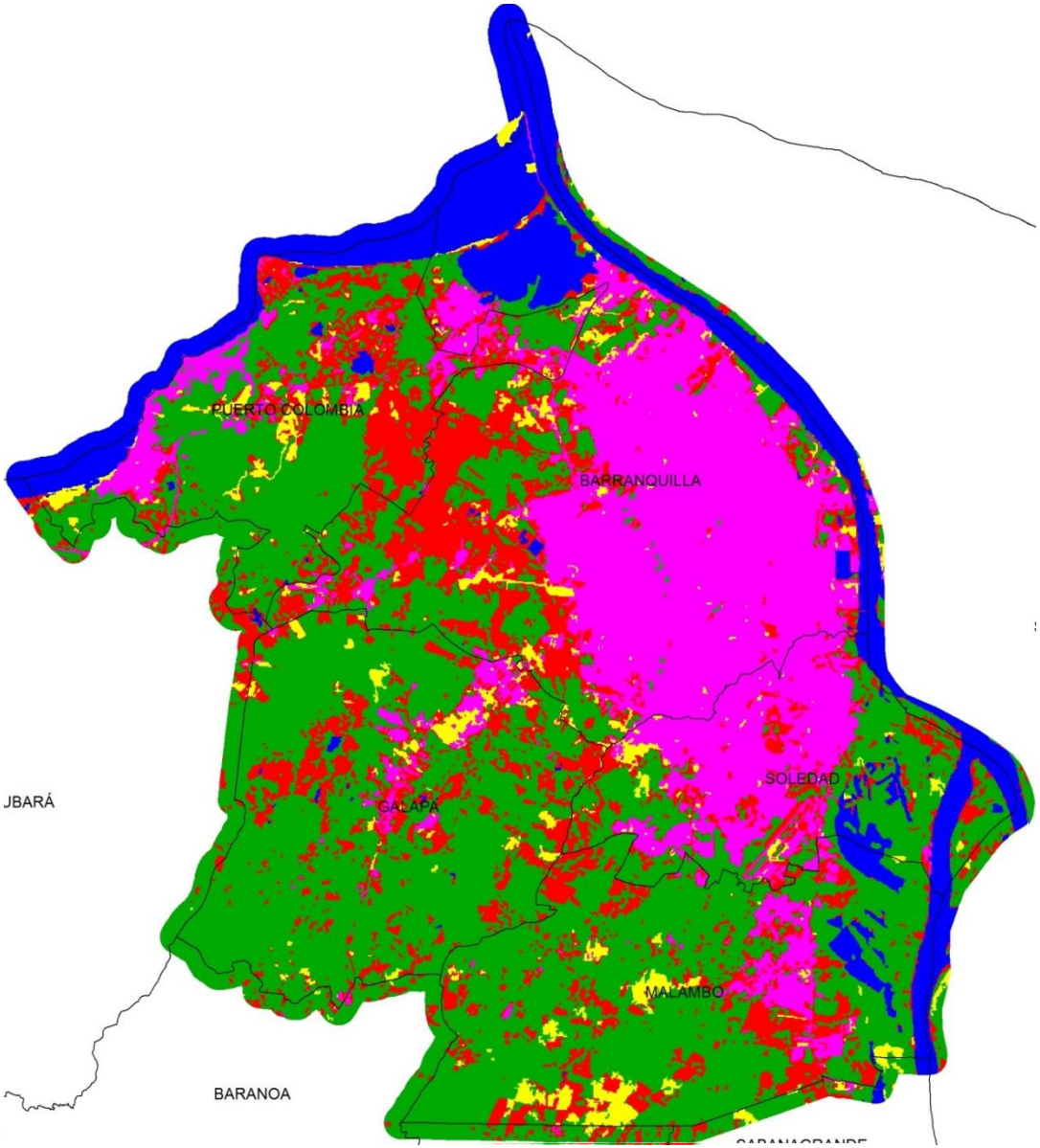
Coverage map



Coverage map 2015

Map Legend

- Water
- Urban/Built - Up
- Grassland
- Barren/Minimal Vegetation
- Forest, Shrub and Scrubland

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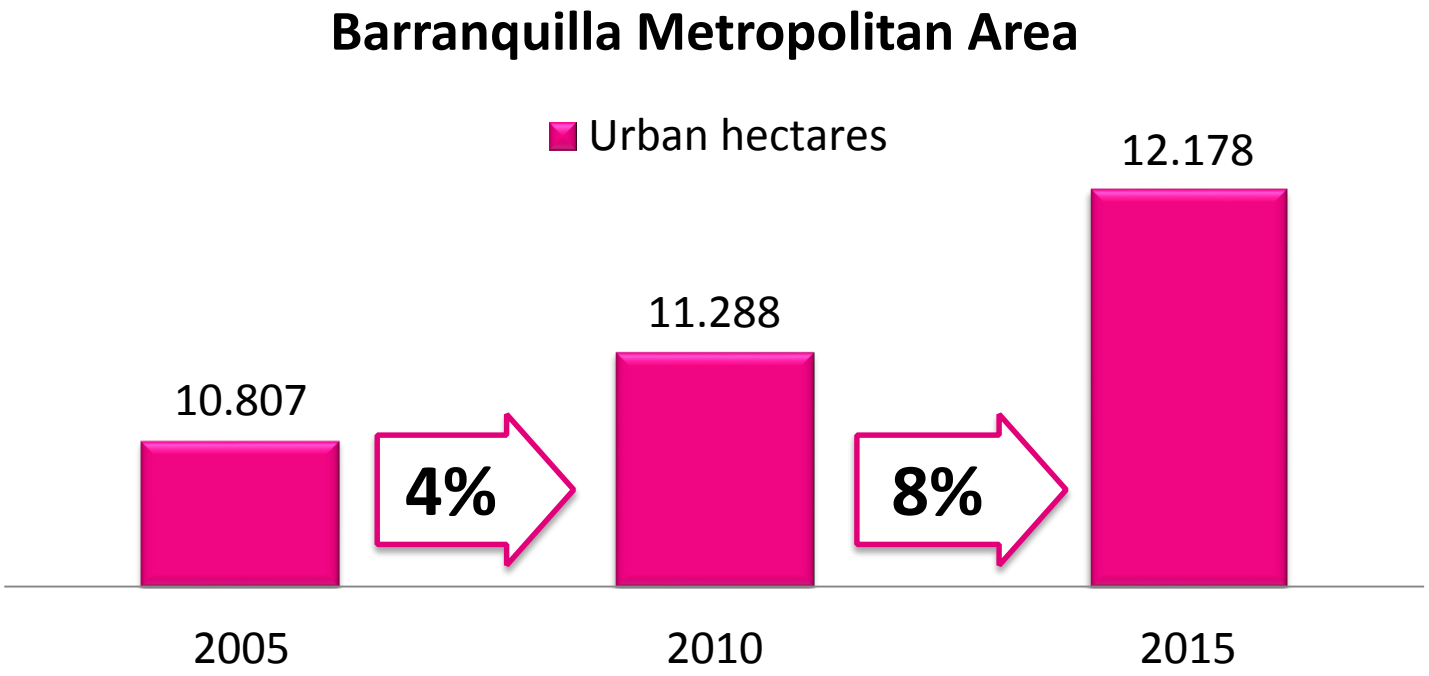
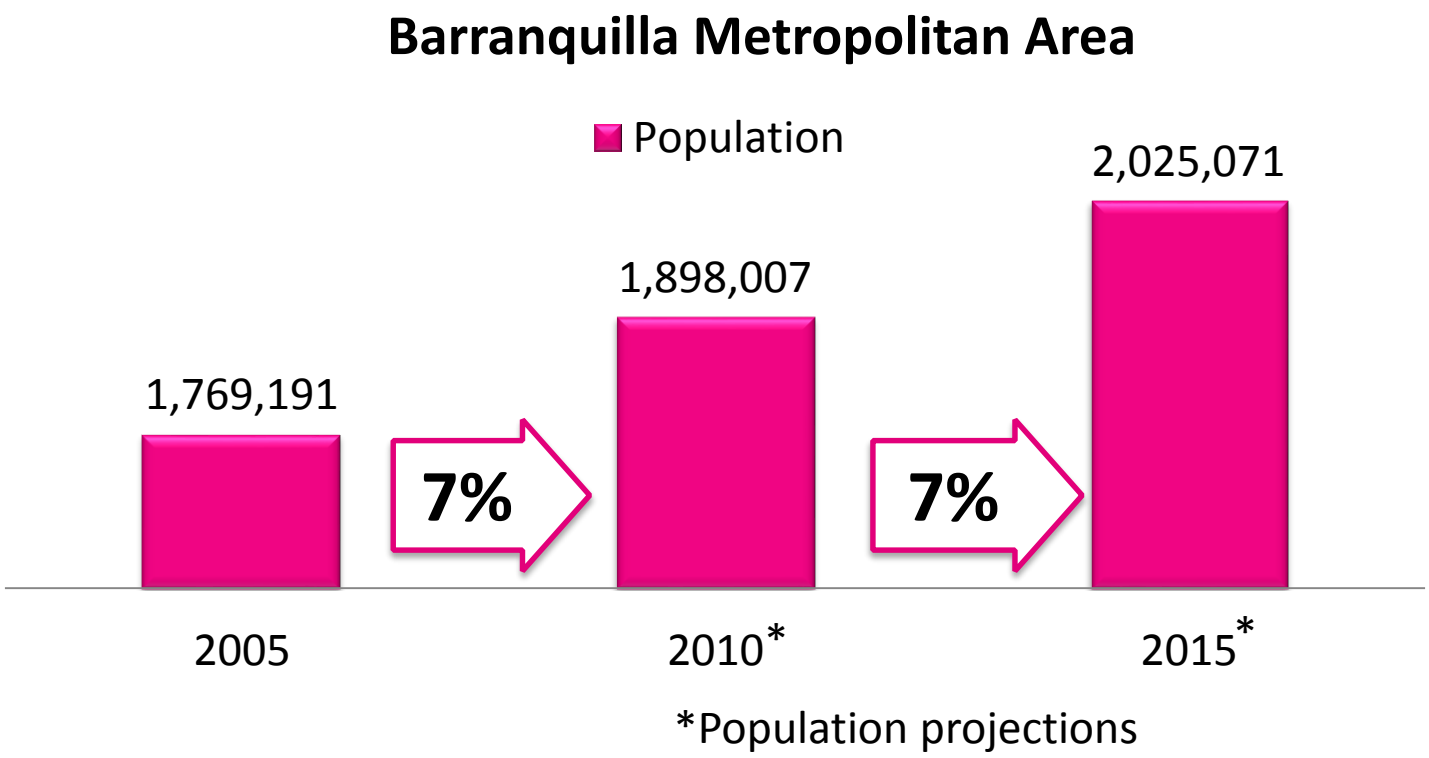
Approach to the Land Consumption Rate (ULCR)

$$LCR = \frac{Urban\ Land\ \ Area(t_2) - Urban\ Land\ \ Area(t_1)}{Urban\ Land\ \ Area(t_1)}$$



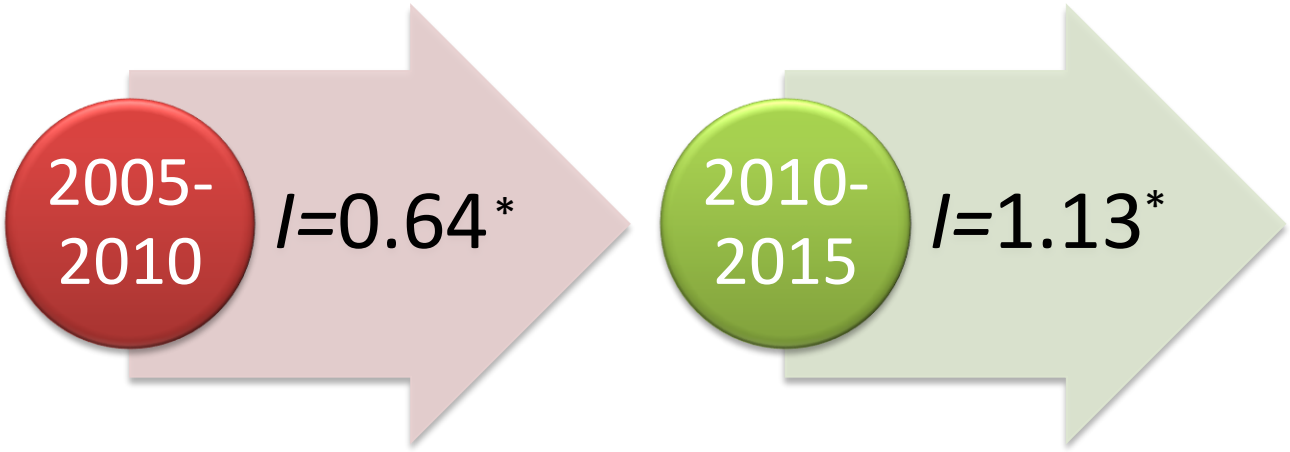
Approach to the Population Growth Rate (PGR)

$$PGR = \frac{Population(t_2) - Population(t_1)}{Population\ (t_1)}$$



Proposed Indicator

$$Indicator(I) = \frac{Land\ Consumption\ Rate}{Population\ Growth\ Rate}$$



* *Preliminary data*

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Comments

- Big Data from satellite imagery is a powerful tool to increase the potential applications of statistics and to improve the quality of statistics data. This integration allows the exploration of new methodologies and the improvement of those already available.

- The benefits generated by the use of remote sensing, create the opportunity to make the information more traceable and allow the design of different types of multitemporal studies.

- This project is a good example for the use of open source software and satellite images, which are both available on the web for free.

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