UNOSAT Use Case / Migration and Urban Growth in Colombia
Key dates

- Conducted by UNITAR starting from 19/03/2019
- Last products delivered to the World Bank within 3 months, on 07/06/2019, through PDF maps and raster files

Situation

- People fleeing Venezuela mostly came to Colombia through the Cúcuta border crossing and allegedly often live in permanent structures in urban areas.
- The World Bank showed interest in obtaining data about the evolution of urban areas which might have been impacted by the Venezuelan migration.
• WB staff asked to focus our work on the **Cúcuta** area (Norte de Santander), near the border with Venezuela, and later requested us to analyze four other locations: **Barranquilla** (Atlantico), **Ibagué** (Tolima), **Arauca** (Arauca) and **Puerto Carreño** (Vichada).

• To answer WB’s needs, UNOSAT staff produced several maps with corresponding raster files for the urban areas selected by the World Bank.
• In terms of satellite imagery, UNOSAT used numerous Sentinel-2, Landsat-5 and Landsat-8 images covering the areas of interest each year from 2013 to 2019.

• In the case of Cúcuta, images went as far back as 2011 and analysts supplemented the map with VHR images (WorldView-1 and WorldView-2) from 2016 and 2019 to provide additional details.

• Auxiliary data used in this analysis included administrative boundaries from GADM, roads from OpenStreetMap and the Global Urban Footprint database (granted by DLR for the project).
UNITAR-UNOSAT analysts used **supervised classification** to detect the extent of the urban area in the various locations of interest at different time periods.

- Pre-processing of images (to get level 2A for all)
- Use of **various indexes** (NDVI, NDWI, etc.) to extract data into categories (vegetation, water, urban, etc.)
- Use of **random forest model for categorization** (machine learning)
- Ground truth for accuracy: mostly DLR’s Global Urban Footprint 2015
For all locations of interest, UNOSAT staff produced and shared:

- **9 PDF maps** compiling the data in an intuitive way
- associated **raster files**

**Limitations**: region is very prone to **clouds** and which prevents regularly-paced analysis. If needed in the future, one way to mitigate this issue is to work with radar data from **Sentinel-1** and modify classification algorithm.
Results

Urban growth map of the Cúcuta area (2011-2019)

Analysis shows construction of new structures, mostly in the western part of the city. Results show yearly evolution. Overall, the urban area increased by about 17% between 2011 and 2019.
Results

Urban growth map of the Puerto Carreño area (2013-2019)

Analysis shows construction of new structures, with an overall urban area increase of approximately 37% between 2013 and 2019.
Results


Analysis shows construction of new structures, with an overall urban area increase of approximately 28% between 2013 and 2019.
Integration with additional data

However, it is clear that **not all urban growth is due to Venezuelan migration.**

The World Bank reported that they would use additional data such as **land use plans and household surveys** in collaboration with the Colombian government to further refine results.
How Venezuelan migration is changing urban expansion in Cucuta, Colombia

IVONNE ASTRID MORENO HORTA & PAULA ROSSIASCO | DECEMBER 11, 2019

This page in: English | Español

Migrants in Cucuta
We also found that human settlements are increasingly located in high-risk areas. By contrasting satellite imagery with the land use classification provided by Cucuta Municipal Land Use Plan, we can observe urban expansion beyond the city’s official boundary. The data shows detailed information about settlements established on low and erosional stubble soils unsuitable for building housing on the way out to El Zulia (see Map 2).