CLIMATE CHANGE INDUCED MIGRATIONS FROM A CELL PHONE PERSPECTIVE

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ABSTRACT

Cell phone traces have been successfully used to study human mobility during natural disasters such as earthquakes and flooding [1,2,3]. Climate change, understood as the change in weather patterns for a long period of time, also has the potential of causing changes in human mobility and cause migrations that have a wider and long standing impact. A *climate migrant* is an individual that is forced to leave their local environment due to long or sudden weather changes. In this study we present initial results of the migrations caused by the severe drought that happened in La Guajira, Colombia, in 2014. Our initial results indicate a linear reduction of the population of 10% during the 6 months considered.

La Guajira is a department of Colombia located in the northwest tip of the country and borders Venezuela. According to the UN Office for the Coordination of Humanitarian Affairs (OCHA)[4], since the beginning of 2014 an extreme drought has affected La Guajira. The drought caused a declaration of the state of public calamity in the municipality of Uribia (La Guajira) in February of 2014[5]. It is estimated that around 65,000 people have been affected by the severe droughts in La Guajira. Consequences to the population are mainly regarding malnutrition, especially for infants, with extreme consequences for the agricultural and livestock sectors.

Using a 6-month (December 2013 through May 2014) anonymized CDR dataset from Colombia we wanted to measure the impact, if visible, in the number of inhabitants of both Uribia and La Guajira during the drought period. A home detection algorithm based on when phone calls were made was applied weekly for any cell phone that was present in La Guajira during the period of study. Note that all calls independently of where they were made have been considered when applying the home detection algorithm, i.e. homes were assigned anywhere in Colombia. If there was not enough information to assign a home tower we assumed the last known position to be the current home. Figure 1 presents the number of cell phones whose home location was assigned in the towers that cover Uribia and La Guajira from January to June during each week, showing a linear decrease in both cases of 10% of the population during the period of study. Both cases can be model with a linear regression showing an r^2 of 0,78 and 0,93 for Uribia and La Guajira respectively.
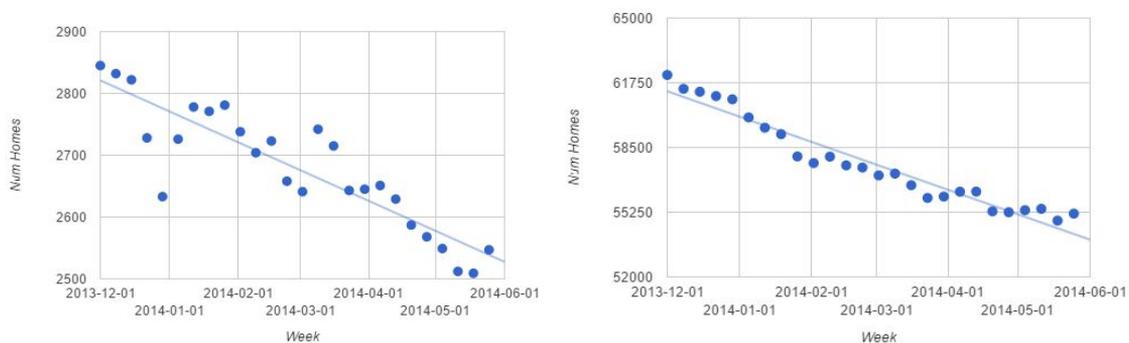

Figure 1. Number of Homes detected in (left) municipality of Uribia and (right) the department of La Guajira from December 2013 to June 2014.

Regarding where those climate migrants go, 90% of them stay in La Guajira relocating to other municipalities where access to help, food and water is probably easier. The other 10% move to other departments. In general, the closer the department to La Guajira the higher the number of people relocating is, i.e. climate migrants move to neighboring departments, with the exception of Bogota. Figure 2 presents in a red color scale where the migrants move from the second week of January 2014.
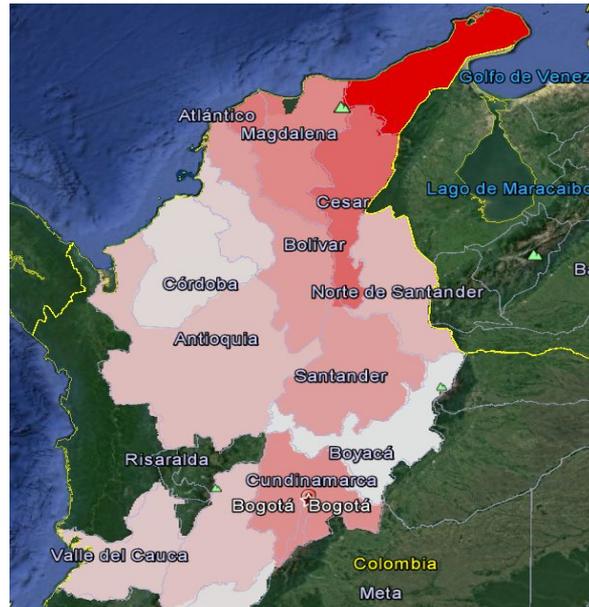

Figure 2. Departments where climate migrants move in Colombia for the second week of January 2014.

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