

EFUNDJA: AN ANGOLAN GEOSPATIAL PROJECT FOR FLOODING CONTROL

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Since the mid-twentieth century, significant changes have been observed in the intensity and frequency of extreme climatic events, exposing the communities to occasions of crisis due to the irregular distribution of precipitation in time and space.

The Republic of Angola is a tropical African country, with one of the richest and diverse drainage network among the Southern Africa region, holding 140 km³ in a total of 73 watersheds. However, regardless of it, Angola is facing over the last 35 years, cycles of intense droughts and floods, where the precipitation rate can highly vary from 800 mm/year in the north, up to 50 mm/year in the southern provinces – which were the most affected by the drought event of 2015-2019.

With the drought, more than 2,1 million inhabitants (491.000 children under the 5 years old) of the provinces of Huila, Namibe, Bié and specially Cunene, have experienced the negative impacts of climate change, materialized in the effect of the unavailability of water in terms of quantity and good quality on the death of more than 72 thousand cattle. On the other hand, in 2020, with the unexpected and intense precipitation events between the drought cycles, at least 400 families have lost their homes due to the consecutive flooding events, and people have died electrocuted on the streets.

Unfortunately, due to the 22 years of civil war that Angola had to pass through, the climatic monitoring equipment and documentation were almost destroyed,

resulting in the lack of historical information, which is crucial for hydrological extreme events management and decision making.

In order to deliver the necessary responses to the climatic issues related to water resources management, Space Agencies have been contributing since 1976, when NASA started developing water-related spin off technologies, which are more than 2000 up to now, as well as ESA, that have developed more than 150 over the past 10 years. In addition to this fact, satellite information and remote sensing have been providing useful information that helps either developing new knowledge about water resources investigation and improving the indigenous methods for water storage and consuming.

The EFUNDJA project, whose name is derived from the Angolan national language Cuanhama, spoken by the indigenous people from the south of Angola, and meaning seasonal flooding events, consists of a Geographic Information System (GIS) aimed to acquire climatic and geospatial data, to analyze and continuously monitor them, and as well as to emit an early warning regarding to the probability of flooding occurrence.

The project uses satellites to acquire data such as precipitation rate, soil wetness, land use and land cover, vegetation cover, as well as topography-related input data, which are the key-parameters to be analyzed in order to achieve its main objective.

EFUNDJA has been along an investigation on Groundwater Recharge of the shallow aquifers of Cunene province, in the south of Angola, where a set of satellite daily precipitation data from 37 hydrological years (1983/1984 to 2019/2020) were acquired from PERSIANN (Hydrometeorological and Remote Sensing Centre, University of California), as well as from the TRMM (NASA). The data obtained from both satellites have a resolution of 0,25 degrees and were submitted to the determination of the Pearson Correlation Coefficient, ensuring that both satellite data can be used together for further interpretations.

By using SRTM and Landsat images, in addition to in situ evaluation, and applying mathematical models to calculate the effective infiltration and groundwater recharge, it was possible to achieve a result of 396,5 mm/year, for the wettest year of the series, distributed across 15,112.5km², and the recharge areas were georeferenced,

mapped and characterized thanks to remote sensing and GIS tools, such as SAGA and ArcGIS.

For long times, the Cuanhama people from the southern region of Angola is using the traditional artificial lakes, named Chimpaca, to store the rain water in order to use it for several activities. Hence, this study in addition to EFUNDJA project is a manner of acquiring information related to the conditions of the Chimpacas, in terms of quantity of water and its quality for human consumption, knowing that Groundwater artificial recharge using the flooding water, can be a better, sustainable and preventive solution for the severe drought times.

The investigation has proven to be a good application of spatial tools, filling the gaps on hydro-meteorological and geospatial data, serving as useful information for water resources management and decision making, contributing to the achievement of the 6th, 11th and 13th Sustainable Development Goals.

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