

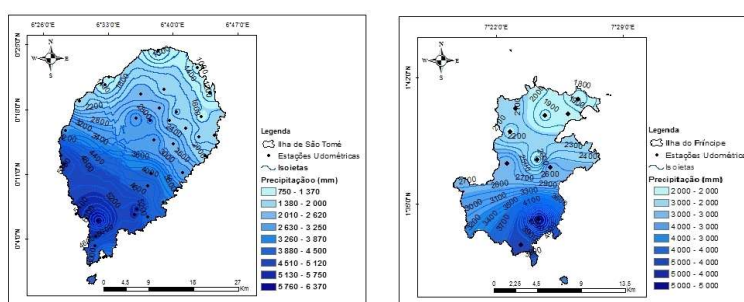
The impacts of climate change in the water resources of São Tomé and Príncipe

Summary

Climate change is extremely likely to have significant implications on climate, hydrology, agriculture, health and energy sector all around the world, particularly on small island countries, which are highly susceptible and vulnerable to this change when their small dimension, isolated location in arid regions, scarcity of resources and reduced diversity highlight the relevance of the impact and limit possible adaptation solutions, especially in developing island countries, such as São Tomé and Príncipe. In addition, because of their transversal importance in all human activities, water resources represent a fundamental tool to evaluate climate change impacts and plan effective water resources adaptation strategies. The main purpose of this work is to evaluate climate change impacts on water resources of the São Tomé and Príncipe islands and contribute to a national climate adaptation strategy. Unfortunately, the state of knowledge about the São Tomé and Príncipe islands water resources requires a significant effort on the collection and organisation of hydro-meteorological data, hydrological modelling processes and characterisation of water demand and availability. The São Tomé and Príncipe islands, located in the Gulf of Guinea, cover an area of 1001 km². These islands own a great water potential, however, most of the population does not have access to appropriate drinking water and sanitation. The economic development is also constrained due to the lack of storage infrastructure. Recently, the institutional framework has changed, and its implementation is still starting to take their first steps. The terrestrial-monitoring stations (in situ) are deficient, and the collected data were found scattered and disorganised by various entities. Thus, this work required a significant effort on data collection, organisation, fulfilment and validation, which has resulted in a database that is thought to be the most up to date in the country. Therefore, diverse sources of remote monitoring and climate reanalysis dataset were carried out, which provide estimations of many climate variables, namely, temperature and precipitation. The São Tomé and Príncipe's dimension and location poses many challenges on the use of these data that this study has tried to overtake. The thesis identified products that have a better performance in São Tomé and Príncipe, which is an indication of their performance in the Gulf of Guinea. The evaluation of the precipitation estimates by the reanalysis-datasets and the remote sensing, for the entire Gulf of Guinea, show an increase in precipitation patterns as gets closer to the continent. Paradoxically, the precipitation in the island is higher in the South region, even though, there is significant uncertainty in the observation data due to the lack of monitoring stations. To surpass the monitoring stations gap, a water balance hydrological model was used, which has allowed the estimation of streamflow regime in all sub-basins of the islands. The hydrological model has demonstrated a reasonable performance, considering data scarcity for calibration. Aiming to comprehend future trends in the main climate variables, the results of the models covered by the CORDEX-Africa project were used, having previously evaluated the capacity of these models to reproduce the historical climate of São Tomé and Príncipe. Regarding the climate projections, the regional models cannot confidently simulate the climate for small islands. The impacts of climate change on water resources can cause many problems on the population and the environment. This work has tried to identify those problems in order to contribute to an appropriate adaptation strategy.

Keywords

São Tomé and Príncipe islands, remote detection, climate reanalysis, hydrological modelling in island regions, climate change.



Map of Isohyets of Sao Tome and Principe from 1951 to 1970.



PhD student

Dudene Vaz Lima

PhD program

Climate Change and Sustainable Development Policies (IST, University of Lisbon)

Supervisor

Rodrigo Proença de Oliveira (CERIS, IST, University of Lisbon)

Co-supervisor

-

Period

2015-2021

Funding

Camões Institute, IPAD, Fundação Calouste Glubenkian