HYDROLOGIC IMPACT ASSESSMENT DUE TO CLIMATE CHANGE AT CHINCHINA RIVER BASIN, COLOMBIA

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The Andean High Mountain Basins are particularly vulnerable to climate change and therefore, local studies are required to estimate their vulnerability. The case study includes Chinchina River Basin, located at the South Central region of Caldas, Colombia; this river extends from the National Natural Park "Los Nevados". The research includes hydrological vulnerability assessment due to climate change, which has been evaluated considering the watershed susceptibility to preserve and maintain the current hydrological regime to possible climate changes. The potential impact assessment was performed using the following hydrological indicators: retention and water regulation capacity; aridity index; relative water stress index; water use, quality index and water availability per capita. All these indicators allowed estimating the vulnerability index.
Climate change hydrological impacts was carried out as follows: estimation of hydrological models parameters using climatic inputs and observed flows during model calibration; hydrological validation for the current period 1981-2010 and for historical periods (1971-2010 or 1961 -1990); climatic data estimation according to climate change scenarios; hydrological simulation for the period 2011-2040; model simulation comparison of current and possible future hydrological characteristics; and hydrological indicators comparison.
Historical series stations with daily records from the 50´s to current decade were used for calibration, validation and results analysis. Statistical models, conceptual balance and physically based models were used for hydrological simulation. The Nash-Sutcliffe efficiency index and other statistical parameters were applied for calibration and validation procedures.
The Institute of Hydrology, Meteorology and Environmental Studies from Colombia, IDEAM analyzed Colombian future conditions with three regional models to generate climate change scenarios: the Japan GSM-MRI high resolution global model with horizontal resolution of 20 km x 20 km; PRECIS with resolution of 25 km x 25 k m and WRF model with resolution 4 km x 4 k m. Based on these results for the scenario A2, the mean temperature would increase 1,4°C for the period to 2011- 2040; on the other hand, the rainfall would be decreased by 10% for the region under study.
Reductions in surface runoff up t o 25% have been estimated with hydrological modeling under climate change conditions for the period 2011-2040. As a result of increasing demand, from a population growth and economic activities, and decreasing supply, water use and relative water stress indicators would reach very high values; the water availability per capita index would be below the limit of 1000 m3/per capita-year, increasing the water vulnerability.