

Multi-Dimensional Nature of Drought in Abbay/Upper Blue Nile Basin and the Importance of Regional Coordination Efforts for Mitigation

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Abstract

Drought is one of the least understood and complex natural hazards that can be characterized by a significant decrease in water availability for a prolonged period. It can be manifested in one or more than one form as meteorological, agricultural, hydrological, and/or socio-economic drought. The nexus between national meteorological and regional hydrological droughts is evident in the absence of water storage dams. The overarching objective of this study was to demonstrate the different forms of droughts that occurred in the Abbay/Upper Blue Nile River basin and its national and regional scale implication. Multiple drought indices derived from in-situ and earth observation-based hydro-climatic variables were used. The meteorological drought was assessed using the Standardized Precipitation Index (SPI) computed from the earth observation-based CHIRPS (Climate Hazards Group InfraRed Precipitation with Station) gridded rainfall data. The agricultural and hydrological droughts were characterized by using Soil Moisture Deficit Index (SMDI) and Standardized Runoff Index (SRI), respectively. The monthly time series of SMDI was derived from model-based gridded soil moisture, and SRI from in-situ streamflow data from 1982 to 2019. The preliminary result shows all the drought indices captured the historic drought events in the basin and most severe drought events occurred in 1984 and 2003. The results further indicated that all forms of droughts (i.e., meteorological, agricultural and hydrological) occurred in Abbay/Upper Blue Nile basin leading to multi-dimensional socio-economic crisis as indicated by rainfall, and soil moisture deficits, and drying of small streams. Multi-dimensional drought mitigation necessitates regional cooperation and watershed management to protect both the common water sources of the Abbay/Upper Blue Nile Basin and the socio-economic activities of the people in the basin. This study also underlines the need for multi-scale drought monitoring and management practices to mitigate drought impacts across the basin.

Keywords: Meteorological drought, Agricultural drought, hydrological drought, Abbay/Upper Blue Nile

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