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Hydrological Impact of Climate Change on Runoffs the Gumara and Gilgel Abbay Watersheds, the Upper Blue Nile Basin, Ethiopia

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ABSTRACT

Water is the most climate sensitive sector in changing climate. Hydrological vulnerability assessment is critical to the implementation of adaption measures. In this study, projections of 7 GCMs in association with high (RCP8.5) and medium low (RCP4.5) representative concentration path way from the CMPI5 (fifth phase of the Coupled model Intercomparison Project) for the period 2021-2040 and 2081-2100 were adopted to assess the hydrological impacts of climate change on the runoffs of Gumara and Gilgel Abbay watersheds, the upper Blue Nile basin, in Ethiopia. The GCMs selected were first screened in harmony with baseline climate statistics of study areas. Based on climate projections and statistical characteristics of historical weather data, a weather generator was employed to generate daily temperature and precipitation as inputs for the GWLF hydrological model to simulate runoffs. Changes of projected temperature and precipitation were analyzed to explain variations of evapotranspiration and influences on future runoffs. We found that, despite the fact that the projected magnitude varies among different GCMs, increasing in the wet and a decreasing in dry seasons runoffs were observed in both time windows in Gilgel Abbay and Gumara watersheds. In both watersheds the results observed on the runoff is mainly attributes to the increase of precipitations projected by most of GCMs. In contrast to great increases in runoffs, the increase of evapotranspiration by elevating temperature is less significant. The increasing runoffs in both time windows will provide more water inflow to the Lake Tana. On the other hand, the increase of precipitation in wet season makes the wet season wetter and implies higher possibility of flash floods. This will have deleterious consequences in the local community. Therefore, concerned water organizations in local, state, and federal levels shall be prepared to harness the opportunities with more water resources for utilization and management, as well as flood preventive measures.