Modeling water supply and demand under changing climate and socio-economic growth over Gilgit-Baltistan of Pakistan using WEAP

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Abstract

Gilgit-Baltistan (GB) is a highly mountainous and remote region covering 45% of Upper Indus Basin (UIB) with around 1.8 million population is vulnerable to climate change and socio-economic growth makes water resources management and planning more complex. To understand the water scarcity in the region this study is carried out to project water supply and demand for agricultural and domestic sector under various climate-socio-economic scenarios in five sub catchments of GB i.e., Astore, Gilgit, Hunza, Shigar and Shyok for a period of 2015 to 2050 using Water Evaluation and Planning (WEAP) model. For climate change scenario ensembled mean of three global climate models (GCMs) was used under three different Representative Concentration Pathway (RCP) scenarios (RCP2.6, RCP6.0 and RCP8.5). The Shared Socioeconomic Pathways (SSPs) and agricultural Land Development (LD) scenarios were combined with climate scenarios to develop climate-socio-economic scenario. Our results indicate that the climate change and socio-economic growth would create a gap between supply and demand of water in the region, with socio-economic growth (e.g. agricultural and population) as dominant external factor that would reduce food production and increase poverty level in the region. Among five catchments only Astore and Gilgit will face shortfall of water while Shyoke would face shortfall of water only under agricultural growth scenarios. We also observed that the shortfall of water in response to climate-socio-economic scenarios is totally different over two water deficient catchments due to its demography and geography. Finally, to help policy makers in developing regional water resources and management policies we classified five sub catchments of UIB according to its water deficiency level.

Keywords: Climate, WEAP, Upper Indus Basin, Supply and demand

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