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Future Climatological Drought Projections Over Quetta Valley, Balochistan, Pakistan

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FUTURE CLIMATOLOGICAL DROUGHT PROJECTIONS OVER QUETTA VALLEY, BALOCHISTAN, PAKISTA

The historical climatological records provide eminent evidence that drought is a permanent disastrous natural phenomenon of Balochistan. The precipitation data from 1872 to 1960 characterized that 25 drought events flashed with an interval of 7 to 14 years when average precipitation deficiency ranges from 20 to >40%. The eleven years longest historical drought span over 1945 to 1955 and the most recent recorded dry-spell extended from 1997 to 2003. During the last recorded dry spell, the average precipitation values decreased from 0-21% in Balochistan, while in Quetta Valley from 40-70%. The variability in precipitation and temperature has an enormous social and economic impact on the residents of Quetta Valley. The climatological variability devastated the ecosystem, depleted the groundwater resources and an exhausted environment. The precipitation and mean temperature data have been downscaled for mid (2040-2069) and far future (2071-2100) using different regional climate model (RegCM3) namely ERA40, ECHAM5 and FVGCM to identify its association with the observational data of Quetta valley. The observational data of mean temperature and precipitation shows a strong correlation to the downscaled data of ERA40 as R2=0.97 and R2=0.47 respectively. Furthermore, the ERA40 shows somewhat underestimate the mean temperature and overestimate the precipitation data. The observational data used to calibrate the downscaled data. The Representative Concentration Pathways RCP45 and RCP85 have been used for future behavior of these meteorological parameters. The both RCPs show positive increasing trend for mean temperature and negative trend for precipitation for the 21st century. The Mann Kendall and Sen's Slope Methods are used to identify the trend and its magnitude at 95% significance level respectively. The historical record from 1951-2010 depicts that drought frequency has increased and continuously increasing thereafter, that increase pressure on the moisture regime for Quetta valley. The study also identifies the historical and future drought frequency and drought years along with return period over the time. The strong relationship has been identified between the soil moisture and standardized precipitation index (SPI) which ultimately helps to identify the spatial behavior of droughts. The study outcome may assist different stakeholders to predict and device immediate, short and long-term strategies to combat the droughts. The water resource Managers and surface and groundwater Planners may develop preeminent future drought contingency plans in the light of climate change over the Quetta valley.

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