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FUTURE DROUGHT RISK ASSESSMENT IN CHANGING CLIMATE USING HYDRO-METEOROLOGICAL AND SOCIO-ECONOMIC INDICATORS

Joo-Heon Lee*, Hyun-Pyo Hong, Seo-Yeon Park, Chanyang Sur

Climate change is a major crisis facing the world and future generations, and the frequent occurrence of extreme weather phenomena can lead to changes in the stabilized hydrologic cycle. In addition, the extreme drought caused by climate change should be prepared not only for natural disasters but also for the level of catastrophic that have enormous socio-economic impacts. For sustainable management of water resources, it is very important to understand the frequency and severity of the extreme climate and the impacts and vulnerabilities of the climate damage to the economy.

In this study, 26 GCMs of CMIP5 based on the RCP scenario were evaluated for the extreme drought risk assessment considering future climate change (2011 ~ 2099). Through analyzing the annual average rainfall, the number of rainless days, the drought frequency, and the average drought severity, we selected the GCMs that predict the future drought most severely. In order to evaluate the historic drought using observed meteorological data, KMA(Korean Meteorological Administration) ASOS(automated synoptic observation system) data (1976 ~ 2005) were used to quantitatively assess past and future Korean drought to predict changes in drought risk.

In this study, Drought Hazard Index (DHI) was calculated for the future period (2012 ~ 2040, 2041 ~ 2070, 2071 ~ 2099) divided into three time windows based on RCP 4.5 and RCP 8.5 scenarios considering meteorological drought occurrence characteristics. For calculating the drought hazard index, the frequency of drought, average drought severity, and probable drought severity were used.

The Drought Vulnerability Index(DVI) was calculated using socioeconomic indicators including population, agricultural land area, and municipal, industrial, agricultural water use. The calculated indicators were transformed into dimensionless variables through the re-scaling method, which is a standardization method, and the DHI and the DVI were calculated by applying the weighting factors for each indicators with use of Analytic Hierarchy Process(AHP).

The Drought Risk Index(DRI) was calculated as the product of DHI and DVI. According to the results of this study, the risk of future extreme drought calculated through Hazard and Vulnerability changes in time and space in the future. Based on the results of this study, it will be possible to predict the future extreme drought risk and to develop customized drought countermeasures.

Keywords: drought risk, climate change, vulnerability, hazard

*Joongbu University Gyeunggi-do, 10279, Republic of Korea
leejh@joongbu.ac.kr