

Regional Drought Risk Assessment Using a Gaussian Mixture Model

JIEUN KIM¹, JI YEON PARK¹, GUN HUI CHUNG³, TAE-WOONG KIM^{*2}

¹Hanyang University, ²Hanyang University (ERICA), ³Hoseo University

(a) Purpose of study or research hypothesis

The purpose of this study is to provide a stochastic approach for assessing drought hazard and identifying drought vulnerability, leading to drought risk assessment in South Korea.

(b) Key issue(s) or problem(s) addressed

Drought occurs more extensively over a long period than other natural disasters, resulting in significant damage. To cope with extreme droughts, it is necessary to assess risk of drought considering their potential impacts on ecosystem and human society. The risk of drought depends on the interaction among physical, environmental, human, socioeconomic system. Assessment of drought risk should be performed considering these factors. While many studies on the drought risk are ongoing, few are focused on socio-economic drought vulnerability. Therefore, in this study, the risk of drought considering socio-economic factors as well as hydro-meteorological factors is evaluated using a stochastic method.

(c) Methodology or approach used

In this study, the drought risk index (DRI) is calculated by combining the drought vulnerability index (DVI) and the drought hazard index (DHI). The DVI is the product of indicator and weight, in which the weight is estimated by a Gaussian Mixture Model. The DHI is calculated by grading Palmer Hydrological Drought Index.

(d) Results or conclusions derived from the project

Overall results indicate that Changwon-si has the highest value of DHI because of recent extreme droughts and Iksan-si has the highest value of DVI because of strong dependence on the agricultural factors. Consequently, Dangjin-si has the highest DRI because of both high DHI and DVI. Thus, Dangjin-si is supposed to hold the first priority when establishing regional drought measures and policies in South Korea. In conclusion, it is possible to grasp drought-prone areas and drought vulnerable factors through the drought risk assessment.

(e) Implications of the project relevant to congress themes

The theme of Congress is "Reducing disaster risks: imputing preparedness and resilience." The purpose of this study is to develop a drought risk considering hydro-meteorological and socioeconomic factors by applying grading method and GMMs. It will be useful in guiding the operational responses aimed at disaster risk reduction.

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