Development and Application of the Evaluation Method for Ecohydrological Cycle Soundness in Korean Watersheds

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(a) Purpose of study or research hypothesis

In Korea, water management and watershed management focused on securing the amount of available water resources in terms of quantity, but the current paradigm of water use and management is changing to a paradigm that can meet various needs such as qualitative and ecological protection(KICT, 2015). Due to long-term droughts and floods caused by climate change or natural and artificial factors caused by human activities, the imbalance in the existing eco-hydrological circulation leads to the destruction of the ecosystem. As a result, this research that can take preemptive action is needed.

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

Existing studies have been conducted using individual elements of the eco-hydrological circulation including water quantity, water quality, aquatic ecosystem, or using correlation between the two elements. And, in many studies, EPA's Basin Health Evaluation Techniques are being applied, but the Basin Health is being evaluated by producing modeling-based data on quantity, water quality and aquatic ecosystem elements. In addition, for modeling-based data, even if the calibration and validation processes are faithful, they cannot be considered to be a complete imitation of the real natural environment.

(c) Methodology or approach used

The procedure of this study is as follows. 1) Criteria for evaluation shall be established for evaluation of the soundness of eco-hydrological circulation by watershed, targeting Korean watersheds. 2) Time series observation data on the evaluation criteria of hydrologic cycle, water quality, and ecology are collected. 3) Through correlation analysis, the mutual influence between the criteria for evaluation in the basin is analyzed. 4) Weights by criteria are determined for each evaluation indicator. 5) The eco-hydrological circulation soundness by watershed is evaluated using the Multi-Criteria Decision Making Technique (MCDM). 6) The eco-hydrological circulation soundness by watershed on a monthly, quarterly, and seasonal is evaluated.

(d) Results or conclusions derived from the project

Research results can suggest a suitable technique for evaluating the soundness of the eco-hydrological cycle for Korea. In addition, the results of the study can be represented by an eco-hydrological circulation soundness map along with the eco-hydrological circulation soundness evaluation index due to time fluctuations in months, quarters, and seasons.

(e) Implications of the project relevant to congress themes

Based on the results of the evaluation of the soundness of the eco-hydrological circulation in the basin, it can determine the expected areas and timing of damage to apply measures to solve the disasters by climate change. By anticipating the region and timing of the eco-hydrological imbalance problem, the possibility of future disasters can be reduced through the application of damage reduction measures.

Keywords : Eco-hydrological Circulation Soundness, Spatio-temporal, MCDM, Correlation Analysis,

Watersheds in Korea