

Water, Energy, and Food Nexus Simulation Considering Inter-Basin Trade

Albert Wicaksono*, Gimoon Jeong**, Doosun Kang***

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Abstract

The Water, Energy, and Food (WEF) nexus is an emerging concept for sustainable resources planning and management. The three valuable resources are inevitably interconnected, that is, it takes water to produce energy; it takes energy to extract, treat, and distribute water; and both water and energy are required to produce food. Although it is challenging to fully understand the complicated interdependency, a few studies have been devoted to interpret the concept and develop the assessment tools. The tools were mainly developed for nation-wide simulations without considering inter-basin or inter-state resources trade.

This study tries to present an idea to develop and implement the WEF nexus simulation model in regional scale by advancing the existing nation-wide model with additional capability to simulate the inter-basin trade. This simulation could help local planners and engineers to determine optimal policies and infrastructure solutions to reach and ensure local demand satisfaction.

The simulation model is implemented in hypothetical areas with different conditions of WEF demands and supplies. Although the inter-basin trade scenarios are simulated manually, it shows that the inter-basin resources trade could enhance the resources security for a longer time period. In future, an optimization model might be developed to provide the automatic calculation to reach optimum amount of WEF for the trade, which can be a helpful tool in decision making process.

Keywords: WEF nexus, Simulation model, Inter-basin trade

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* Ph.D. Student, Dept. of Civil Engineering, Kyung Hee University (E-mail: albert.wcso@gmail.com)
** Graduate Student, Dept. of Civil Engineering, Kyung Hee University (E-mail: gimoon1118@gmail.com)
*** Assistant Professor, Dept. of Civil Engineering, Kyung Hee University (E-mail: doosunkang@khu.ac.kr)