Multi-Regional Resources Management Practice using Water-Energy-Food Nexus Simulation Model

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

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Abstract

The rapidly growing global population increases the awareness of water, energy, and food security worldwide. The concept of Water, Energy, and Food nexus (hereafter, WEF nexus) has been widely introduced as a new resources management concept that integrate the water, energy, and food in a single management framework. Recently, WEF nexus analyzes not only the interconnections among the resources, but also considers the external factors (such as environment, climate change, policy, finance, etc) to enhance the resources sustainability by proper understanding of their relations. A nation-level resources management is quite complex task since multiple regions (e.g., watersheds, cities, and counties) with different characteristics are spatially interconnected and transfer the resources each other. This study proposes a multiple region WEF nexus simulation and transfer model. The model is equipped with three simulation modules, such as local nexus simulation module, regional resources transfer module, and optimal investment planning module. The model intends to determine an optimal capital investment plan (CIP), such as build-up of power plants, water/waste water treatment plants, farmland development and to determine W-E-F import/export decisions among areas. The objective is to maximize overall resources sustainability while minimize financial cost. For demonstration, the proposed model is applied to a semi-hypothetical study area with three different characterized cities. It is expected the model can be used as a decision support tool for a long-term resources management planning process.

Keywords : Decision support tool, Resources management, WEF nexus simulation

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* Assistant Professor, Dept. of Civil Engineering, Parahyangan Catholic University · E-mail : albert.wcso@gmail.com

** Ph.D. Candidate, Dept. of Civil Engineering, Kyung Hee University · E-mail : gimoon1118@gmail.com

*** Professor, Corresponding Author, Dept. of Civil Engineering, Kyung Hee University · E-mail : doosunkang@khu.ac.kr