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“CLEANER PRODUCTION FOR ACHIEVING SUSTAINABLE DEVELOPMENT GOALS”

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**Managing the Food-Energy-Water Nexus for Achieving the Urban Sustainable Development Goals in China**

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One of the 17 sustainable development goals (goal 13) adopted by the United Nations on According to the report of United Nations (2014), the current average urbanization rate has reached 54%, while in 2050, it will become 66%. With the speeding up of urbanization and industrialization, the cities in China have developed fast as well. In the last 30 years, the urban population in China raised from less than 200 million to 700 million rapidly. Nowadays more than half of all the Chinese people live in urban areas. Urban areas consume 26% freshwater, 67~76% energy of all the consumption globally; while emit 75% greenhouse gases. Cities will face numerous problems in meeting the increasing needs of their urban populations. Among these problems, the efficient provision of food, energy, and water is particularly challenging. This is not only because they are essential resources for meeting basic human needs, but also due to the complex interconnectedness of the food, energy, and water systems. Policy and technology solutions addressing challenges in individual FEW systems need to be evaluated through the lens of FEW nexus to identify co-benefits and avoid unintended consequences. Thus, figuring out the multi-resources constraint (FEW) and the coupling relationship of FEW in cities is the top priority for solving the problems of urban development formation as well as a necessary prerequisite for sustainable urban development.

Energy, water and food are related closely, thus study them under one framework will contribute to finding the directions and strength of interactions among them, while avoiding the adverse impacts caused by the policy about one factor to another one. The evaluation ways before is only from the perspective of production, which induces the inefficiency of the command of the whole production chains from above as the consumption of FEW in cities are closely related with production chains and trade.

Therefore, this study constructed a step-by-step nesting model for FEW of cities, which made the open urban economic system expand gradually to the state and global economic systems. From both the production and consumption perspectives, the sources and whereabouts of urban implied FEW on state and global scales were clearly figured out; the relationship of FEW with the basis of the exchanges of products and services for cities with other areas were explored; the balance of FEW of cities and the relative dependency for cities with other areas were evaluated and analyzed after the construction of balance and relative-balance factors. This innovative approaches to model the urban food-energy-water nexus as an integrated whole, instead of examining them individually, for sustainable provision of food, energy, and water in urban areas with improved efficiency.

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