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Economic Expansion and Land Use Change in Thailand: An Environmental Impact Analysis Using Computable General Equilibrium Model

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Abstract : The process of economic development incurs spatial transformation. This spatial alternation also causes environmental impacts, leading to higher pollution. In the case of Thailand, there is still a lack of price-endogenous quantitative analysis incorporating relationships among economic growth, land-use change, and environmental impact. Therefore, this paper aimed at developing the Computable General Equilibrium (CGE) model with the capability of stimulating such mutual effects. The developed CGE model has also incorporated the nested constant elasticity of transformation (CET) structure that describes the spatial redistribution mechanism between agricultural land and urban area. The simulation results showed that the 1% decrease in the availability of agricultural land lowers the value-added of agricultural by 0.036%. Similarly, the 1% reduction of availability of urban areas can decrease the value-added of manufacturing and service sectors by 0.05% and 0.047%, respectively. Moreover, the outcomes indicate that the increasing farming and urban areas induce higher volumes of solid waste, wastewater, and air pollution. Specifically, the 1% increase in the urban area can increase pollution as follows: (1) the solid waste increase by 0.049%, (2) water pollution– indicated by biochemical oxygen demand (BOD) value– increase by 0.051% and (3) air pollution– indicated by the volumes of CO_2, N_2O, NO_x, CH_4, and SO_2– increase within the range of 0.045%–0.051%. With the simulation for exploring the sustainable development path, a 1% increase in agricultural land use efficiency leads to the shrinking demand for agricultural land. But this is not happening in urban, a 1% scale increase in urban utilization results in still increasing demand for land. Therefore, advanced clean production technology is necessary to align the increasing land-use efficiency with the lowered pollution density.

Keywords : CGE model, CET structure, environmental impact, land use
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