A Construction of Energy Input-Output Tables based on a Life Cycle Approach: A Case Study of Korea Transportation Economy

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Corresponding to the crucial work of Climate Change Prevention from the transportation, it is necessary for decision makers to consider the energy consumption and GHGs emissions throughout the life cycle. In fact, it is extremely useful if a comprehensive LCA is conducted. But it tends to be time intensive and costly. As a result, most of the studies and models evaluate only one phase -- the use stage. Since all actions are in urgent need of prevention and reduction, it should not slow down the economic activity or vice versa. Nevertheless, it is not easy to indicate what would happen without knowing how this economy is constructed. Input-output analysis is the only method and database that is available now. It covers the sequence of commodities and service in the economy and is used to evaluate the effects of various policies and scenarios. The ultimate goal of this study aims at analyzing impact of energy, GHGs and economics when the mitigation strategies are made. This effort, firstly, intends to integrate the specific advantage feature of life cycle and Input-Output approach in order to construct energy I-O table. The statistical data on energy consumption and National Economic I-O table are the main sources of development. To construct energy I-O table for transportation precisely, several steps of work are implemented. A vital step includes categorizing intermediated sectors into the life cycle stage, disaggregating energy group, investigating the transportation economy value, calculating coefficient and making different interesting scenarios. The life cycle of this study consists of fuel and raw material extraction, fuel production, materials preparation, manufacturing, transportation, construction and supplement. This table is constructed with the column of life cycle stages and the row of eleven kinds of energy including three basic raw materials. Base on the year 2005, the amount of 35,559,000 ton oil equivalent (TOE) were directly consumed in this economy as a results 99,209,610 ton CO2-equivalent were generated. The main contributor was road mode accounting for 79 %, while the rail mode accounted for only 1 %. This amount has not included energy consumed in the supply chain of the transportation which is normally ignored during making a decision of prevention. Road and rail mode are the main work of this study because they are expected as the source and solution of the numerous problems. Although, rail tends to have lower environmental impact than road, the environmental effects including cost of infrastructure investments to accommodate such shift are substantial if capacity expansion is required. Final demand increment and structural coefficient change are the mitigation scenarios of this study. The profiles of economic change, amount of energy consumption have been investigated. The result obtained from this construction allows quick calculation, inexpensive way and more accurate energy consumption by tracing out the impacts from supply chain activities.