Effects and Evaluation Methodologies of Environmental Policies for Reducing CO_2 Emission in Social Capital Construction

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[Abstract]

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Cement is the 2nd largest consumed material all over the world next to water, because it has been contributing to constructing our social capital such as transportation, water supply infrastructure, buildings, and dams. As a result, it keeps comfort and safety of our society.

However, CO_2 in limestone inevitably diffuses in producing cement and its volume is assumedly 5% of total CO_2 emission over the world (see IPCC report 1996). Total CO_2 emission from comprehensive construction sector including cement as well as other materials and activities related to construction cannot be ignored, as it is illustrated by the statistics of cement (5% of world CO_2 emission), and steel production (4.1%).

The purpose of this research project is to understand the effects of environmental policies for reducing CO_2 emission through understanding social mechanisms and apply it to make the optimal proposal for reducing CO_2 emission in construction sector in Japan.

Some environmental policies for reducing CO_2 emission in Japan has already been introduced into construction sectors, but it is pointed out that the effects of the policies have the spatial dependency and hence region-based environmental policies are effective.

For example, the policies optimized to urban areas are not suitable to suburban areas because of some differences of economic structure, transportation situation, and social demands. Therefore, the best policy to reduce CO_2 emission in construction sector must be discussed by region.

We developed the simulator named ecoMA for realizing regional situation, such as economic situation, transportation structure, factory distribution and demand distribution, and finally found the optimal philosophies for reducing CO_2 emission as described below.

1. Compact material orders into as few factories as possible to improve production efficiency of factories. Approximately 20% reduction of CO_2 emission is expected at the ready-mixed concrete factories, and ready mixed concrete transactions.
2. Keep using a low carbon technology and materials intensively in the long run. Approximately 20% reduction of CO_2 emission is expected in maintaining road.
3. Use multi-modal transportation and various transportation systems for optimizing CO_2 emission. Approximately 20% reduction of CO_2 emission is expected in comprehensive transportation in concrete industry.

Finally, approximately 20-30% reduction of CO_2 emission is expected through introducing several environmental policies into construction sector which were confirmed effective to reduce CO_2 emission by using ecoMA.