Symposium "Towards Low-Carbon Society in Asia"

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Panelist

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The transition from a society characterized by "mass production, mass consumption and mass disposal" to a Sound Material-Cycle Society has been discussed mainly in the context of waste minimization and resources saving, but such transition is also essential for reduction of energy consumption and GHG emissions. Though GHG emission reduction effects by cyclical and efficient use of resources have been studied for specific materials and products, an overall effect and future potential by such effort have not been well quantified even in Japan. Less is known for developing Asia, in which rapid growth of material resource consumption is anticipated. In Asia, GHG emissions from energy-intensive and carbon-intensive material production industries will increase to meet increasing demands for infrastructures and consumer durables. In addition, accumulation of such durables is closely linked with future energy demand through their operation stage, whereas they could also contribute as secondary resources. Thus, new viewpoint on relationships between material / energy flows and material stocks is required.

Moreover, supply and demand of material resources as well as their interactions with global warming mitigation options will significantly change. Energy consumption and GHG emissions associated with natural resource extraction may increase by degradation of metal ores and deeper mining. Innovation such as in information and communication technologies may realize more resource efficient development pathways, whereas wide spread of new technologies for mitigation options may cause significant impact on supply and demand of rare metals.

The target of S-6-4 "Study on Reduction of GHG Emission Associated with Increasing Resource Consumption by Economic Development" is to predict greenhouse gas emissions from Asian countries from the future resource demand and production of materials associated with economic developments and popularization of low-carbon technologies, and to examine the potential for these countries' contribution to a low-carbon society through balanced demand and supply and efficient and cyclical utilization of material resources. Specifically, we adopted two points of view. The first is the viewpoint of material supply side such as efficiency improvement and switching energy sources in material production, application of alternative resources by stocked recyclable and renewable resources, international specialization, and international resource circulation. The second is the viewpoint of the demand side such as developing social infrastructure with lower resource consumption levels, taking advantage of area characteristics of Asia, switching possession types of durable goods (ex. car sharing), and shifting to types of consumption which are less resource intensive.

The following studies have been undertaken up to now:

(1) We designed a model framework that enables to describe energy consumption during the use of products by supplementing the material flow and stock model that has been constructed at National Institute for Environmental Studies. As a case study, we estimated the demand for rare metals to be used for new-generation vehicles and revealed the possibility of reducing CO_2 emissions, even under the condition of a limited supply of rare metals. We collected historical data of the use of carbon-intensive materials such as iron and steel. Based on this data set, we examined, for example, factors that affect the demand for paper and paperboard and estimated CO_2 emissions associated with paper and paperboard production in coming few decades.

(2) We collected information of material flows for copper, zinc, lead, indium, lithium, and metals in the platinum group and began to develop an analytical tool for specifying emission of greenhouse gas in mine exploitation. We selected copper as the metal to be discussed, considering our interest in emissions of greenhouse gases in mines and the effect of changes in technology on emission of those gases. We identified some examples of seemingly capital-intensive mines that emitted smaller amounts of greenhouse gases. Further, we run a simulation regarding future material flows by using a system dynamic model that contains multiple material flow information.

(3) We organized basic data regarding the relation between the history of infrastructure development and resource demand in China. Based on this data set, we analyzed the resource productivity by province. The analysis reflects some regional differences in resource productivity, which is overall lower than that in Japan. Examination of consumption of resources and energy in the cement industry during 1997–2008 demonstrates that the consumption has increased year by year. We also analyzed the amount of stocks and industrial structure in Japan using Japanese input–output tables for the period 1960–2000 for the estimation of future demand for resources and energy in China.