Development of AIM/Enduse model and element models and application to global and national analyses in the mid-term transition scenarios

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The AIM/Enduse model is a bottom-up optimization model with detailed technology selection framework. The role of AIM/Enduse model in the AIM activities is to analyze technological feasibilities to achieve a certain mitigation target and assess transitions toward a low-carbon society in the mid-term (to the year 2030 or up to 2050 at most) in the context of the long-term greenhouse gases (GHGs) stabilization scenarios.

The AIM/Enduse model group consists of three parts: a macroeconomic model, element models (i.e. service demand models), and a technology bottom-up model. The AIM/Enduse model has been developed both in global and national scale. For example, the AIM/Enduse[Global] model has been developed focusing on the major GHG emitting regions, especially the Asian regions in detail such as Japan, China, India, Thailand, Indonesia, Korea, Malaysia, and covered the Kyoto basket of six GHGs in multiple sectors like power generation, industry, residential, commercial, transportation, agriculture, municipal solid waste, industrial processing including fluorocarbons, and fuel mining.

To evaluate mitigation options at regional and global levels, a necessary preliminary step is to estimate the future service demand in each service and each sector. In this fiscal year, the methods to estimate future service demand in each sector were discussed and analyses were extended upto time horizons of 2050. Next, the structure of AIM/Enduse model was improved such as constraints on changing rate of recruitment quantity, maximum and minimum share of technology, energy, service and so on; so that it became more flexible to analyze various types of scenarios. Then, to analyze technological feasibilities of achieving mitigation targets such as global GHG emissions reductions by half compared to the level in 1990, future innovative technologies such as carbon capture and storage (CCS), fuel cell devices have been considered and the role of energy efficiency improvement in demand side as well as the shift to less- or non-carbon intensive fossil fuels in supply side were analyzed.

Based on the improvement of models and technology option database, the AIM/Enduse model was applied to global and national policy analyses to evaluate the mid-term transition scenarios. The AIM/Enduse model was used to contribute to the following activities and some example results were shown in Figure 1, Figure2 and Figure 3.

- AME (Asia Modelling Exercise)
- EMF24 (Energy Modelling Forum 24)
- ADB (Asia Development Bank) project
- Japan Roadmap

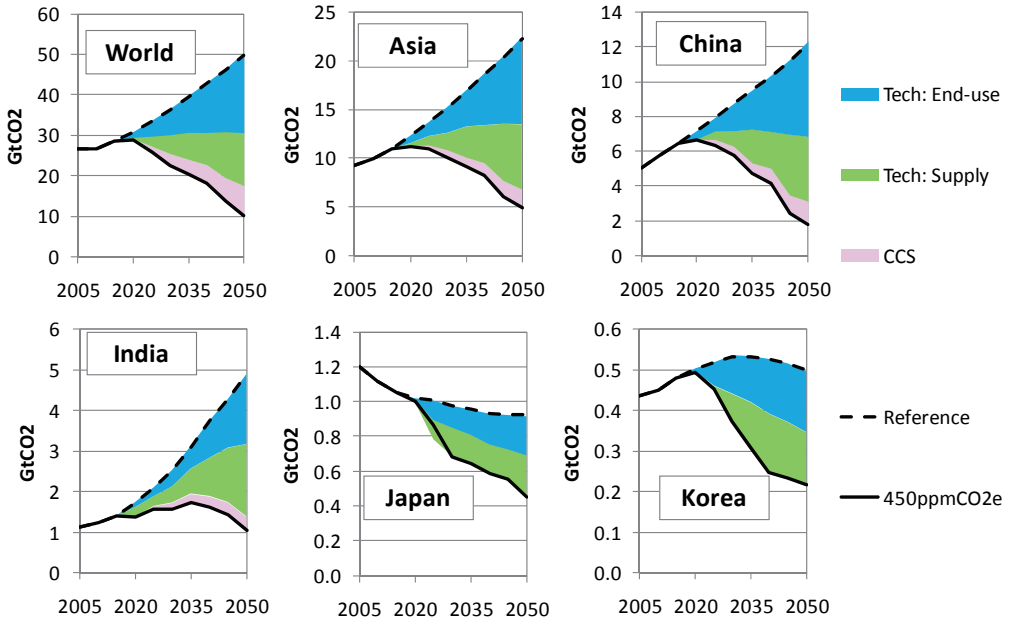

Figure 1 CO_2 emissions pathways under the 450 ppm-CO_2eq stabilization scenario and contribution of CO_2 emissions reduction options (based on the AIM/Enduse[Global] in the Asian Modeling Exercise)

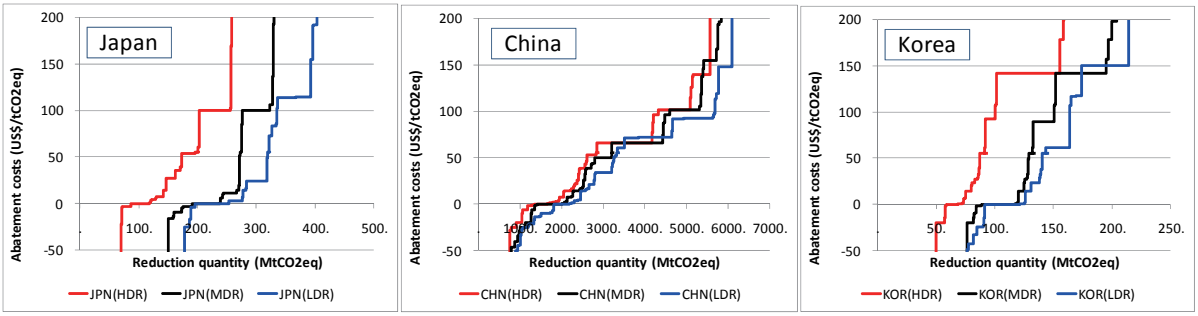

Figure 2 Technological mitigation potentials and costs curves under different settings of the discount rate for investments in 2020 (based on AIM/EnduseMAC[Global] in the ADB project)

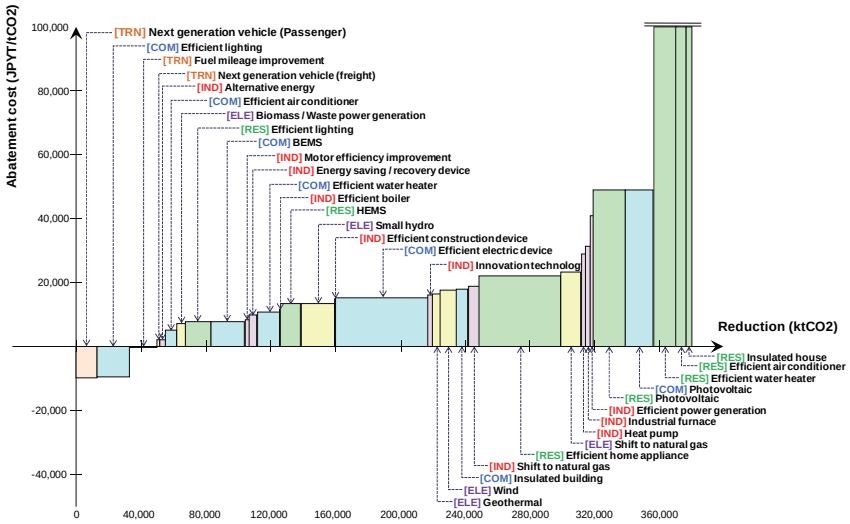

Figure 3 Technological mitigation potentials and costs curve under a high discount rate for investments to achieve a 25% reduction target in 2020 from the level in 1990 (based on the AIM/Enduse[Japan] in the Japan Roadmap)