

A projection of future CO₂ emissions from the transportation sector of the world

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1. INTRODUCTION

The global annual CO₂ emissions from the transport sector are about 5,000 Mt-CO₂. The transport sector contributes about 20% of the CO₂ emission from fossil fuel consumption. Future CO₂ emissions from transportation sector depend on two factors. One is increase of transportation volume; the other is improvement of efficiency of transport devices. In this research, focusing on those two factors, CO₂ emissions from transportation sector of the world, which is divided into 21 regions, are projected. The methodology is (1) to make a scenario about future transportation volume of both passenger and freight transport, (2) to estimate diffusion rate of each transportation device, using bottom-up type model.

2. FUTURE TRANSPORTATION VOLUME SCENARIO

To make a future transportation scenario, 16 scenarios in earlier studies are collected. After comparing those scenarios, SAGE scenario (USDOE, 2003) is adopted. In SAGE scenario, global passenger transportation volume will increase 2.2%/year and freight transportation volume will increase 3.0%/year on average.

3. MODEL

In this research, AIM/Enduse[global] model is used to estimate CO₂ emission. In this model, concrete transportation devices are treated. The model simulates how many those devices will be introduced by market mechanism. Amounts of devices introduced are determined by economically rationalized people's selection of individual devices. People's selection is described as an optimization problem which minimizes the total of annualized fixed cost and operation cost under certain constraints. 37 concrete devices, such as Hybrid vehicle, CNG truck and so on, are set to simulate.

4. RESULT

The result of simulation is shown in Fig. 1. Global emission was estimated to reach 8,900 Mt-CO₂ in 2030 (about 3,900 Mt-CO₂ increase from the 2000 level). And it is shown that CO₂ emissions in 2030 in developing countries are about 2.65 times of the 2000 level, whereas it is about 1.30 times in developed countries. Breaking down the change of CO₂ emissions, increase of transportation volume accounts for 5,700 Mt-CO₂ increase of CO₂, emissions, and diffusion of high efficiency devices accounts for 1,800 Mt-CO₂ reduction of CO₂ emissions. Analyzing amount of CO₂ emissions reduction by each device, passenger vehicles, especially with engine improvement technologies such as GDI and variable valve system, are shown to have a large potential to reduce CO₂ emissions.

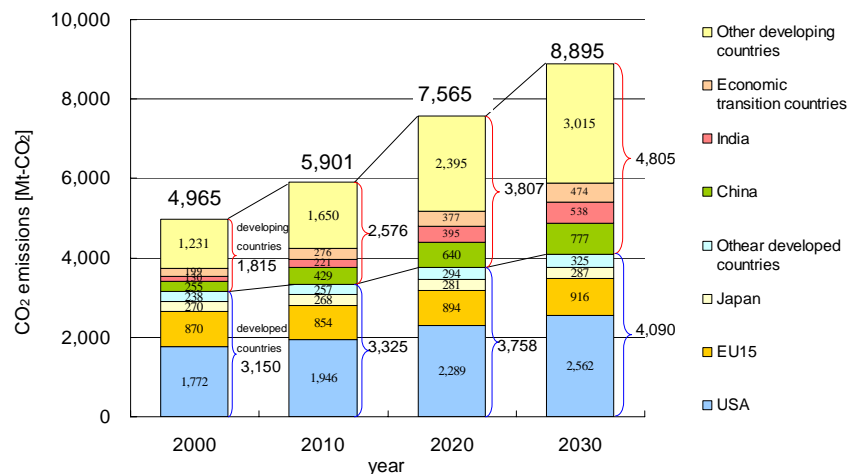


Figure 1 Simulated CO₂ emissions from transportation sector