# Modeling GHG Mitigation Policies - Carbon Pricing vs. Standards

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## 1. Overview

The current IPCC report and the Stern Report have drawn public attention to climate change and its ecological as well as its economic consequences. Transportation has a significant and still rising share of aggregate GHG emissions. Thus, the European Union and its member states are under increasing political pressure to integrate the transport sector into its future climate policy, in particular its future $CO_2$-regime. This paper aims at providing an analysis of the options currently discussed, assessing potential climate change policies for the transport sector, and identifying the most promising instruments. The paper's intention is to derive recommendations for actual transport and climate change policy at the European and at the national level.

Our analysis will be based on a bottom-up model and will focus particularly on carbon pricing and technological and emission standards. Schäfer / Jacoby (2003) have already analyzed by means of a CGE-model the technological development in the transport sector induced by a tightened climate protection policy. Paltsev et al. (2004) examine the interrelation between fuel taxes and the realization of $CO_2$-mitigation in the transport sector. However, the TREMOVE model used for this paper is a partial model, allowing the simulation of detailed policy measures.

## 2. Methods

In order to assess the effects of different policy options to mitigate emissions in the transport sector, different scenarios, which consist of one or more policy options, were defined. The different scenarios will be analyzed with the assessment model TREMOVE, which was originally developed by the K.U.Leuven and DRI and is still enhanced by Transport & Mobility Leuven[3]. TREMOVE is a policy assessment model, designed to study the effects of different transport and environmental policies on the emissions of the transport sector. The model can be used to model policy options like road pricing, public transport pricing, emission standards, subsidies for cleaner cars. TREMOVE is a partial equilibrium model that allows the simulation of the modal choice (road, rail, air, IWW) for passenger and freight transport and the choice of the vehicle type (size and technology). The

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[3] For additional information see www.tremove.org

consumer's choice of mode and vehicle types depends on generalized costs, which are directly or indirectly affected by the analyzed policy options.

Results of the model are changes in the transport demand, modal shifts, vehicle stock renewal and scraping decisions as well as the emissions of air pollutants and the welfare level. In this analysis the changes of greenhouse gas emissions and the corresponding changes of the welfare level are of special interest, as the aim is to reduce the emissions of greenhouse gases with policies or a bundle of policy options, which have a positive or only a slightly negative effect on the total welfare.

## 3. Results

Simulations of policy scenarios have just begun; therefore, only very few results can be presented currently. First simulations carried out suggest that a harmonization of fuel taxes, i.e. equal tax burden on gasoline and diesel, has a significant impact on the development of the fleet structure, but does hardly affect total $CO_2$-emissions. The welfare effect of the tax convergence is negative as the loss in consumer and producer surplus exceeds gains from reduced environmental externalities.

## 4. Conclusions

The paper compares different policy options to mitigate the energy consumption GHG emissions of the transport sector, particularly carbon pricing and regulatory measures. The underlying question is whether price signals can induce necessary changes of the mobility patterns more efficient than technological or emission standards. Relative advantages and interdependencies between these policy options are analyzed, complementary and substitutive impacts are identified. Results from comparable policy assessments with TREMOVE [Transport & Mobility Leuven (2006)] suggest that mandatory fuel economy standards could prove beneficial, because the resulting fuel savings exceeds the costs of the standard introduction. Considering the concurrently occurring emission reduction the gain in social welfare is even higher. On the other hand, increasing the tax burden on diesel until equalization with gasoline is achieved has shown only very modest $CO_2$-emission reductions at the price of a net welfare loss. However, it is too early for drawing final conclusions as the simulation of scenarios is still undergoing.

## References

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