Seminar on Carbon Leakage

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Impacts of Carbon Leakage by Climate Policies in Japan

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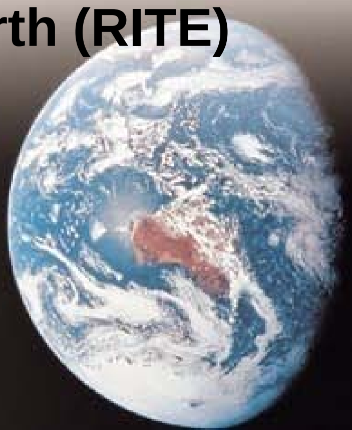
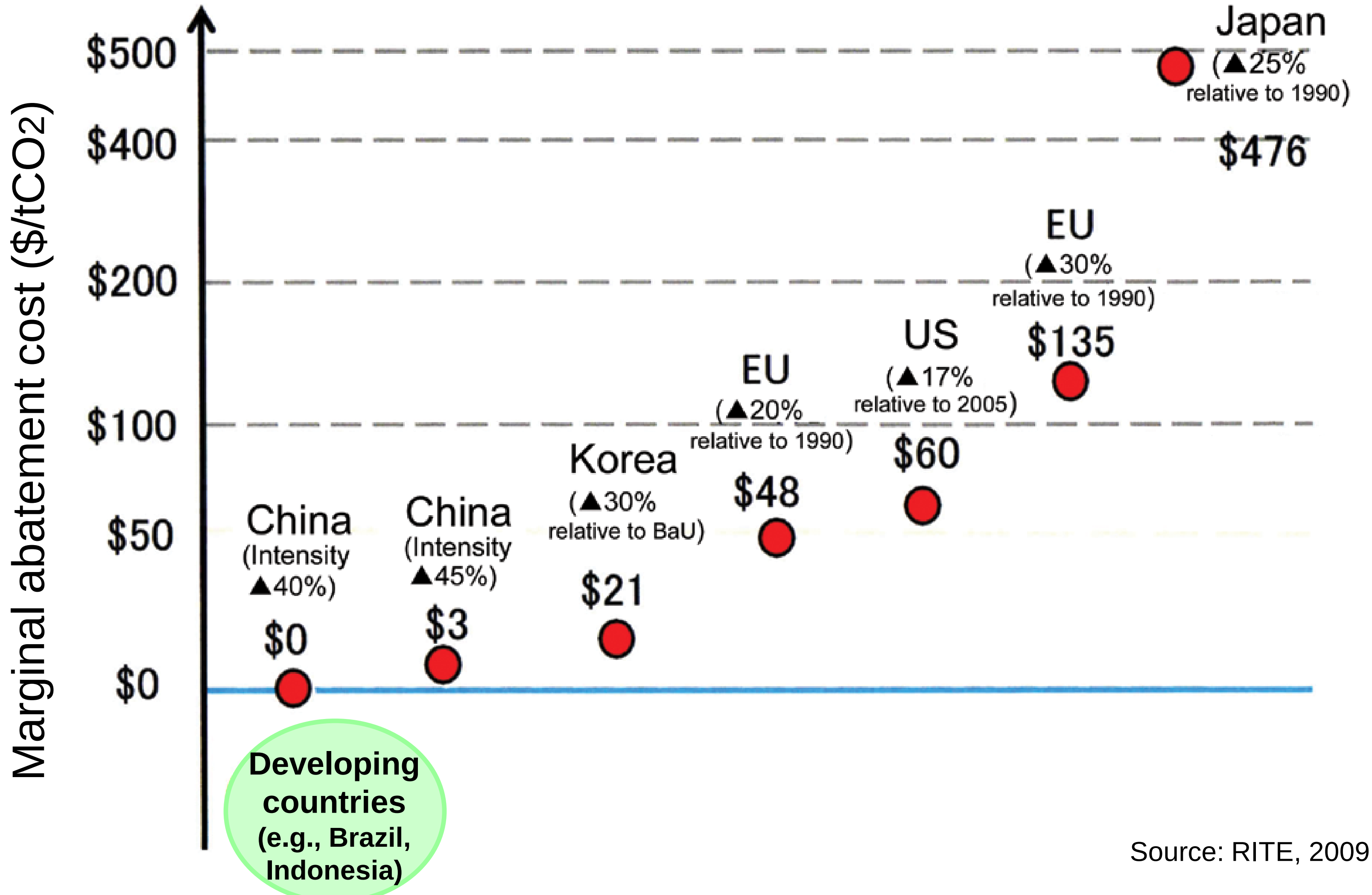


Comparison of Mid-term Targets in Marginal Abatement Cost (Carbon Price)

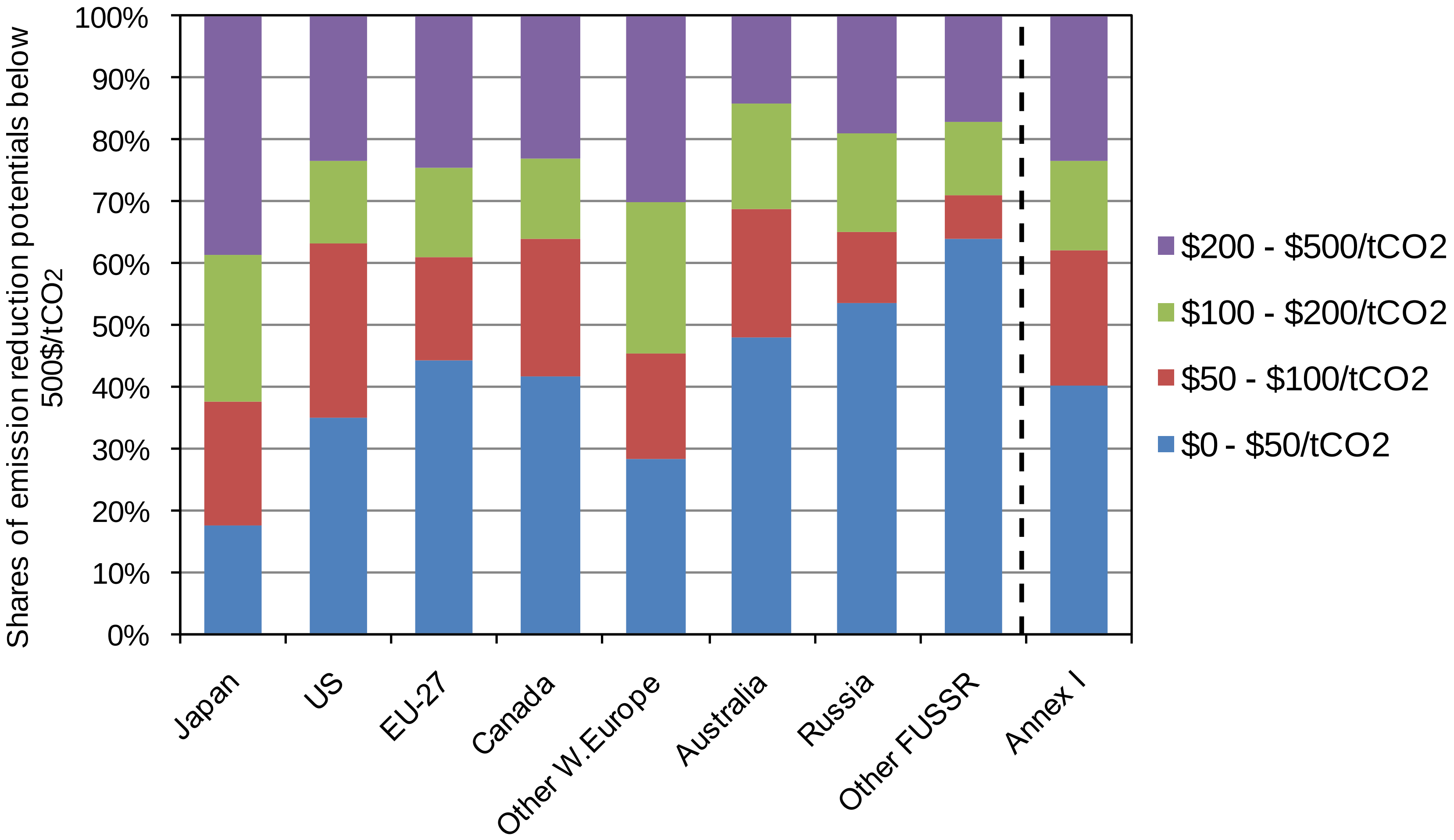


Source: RITE, 2009

There are large differences in marginal abatement cost (carbon price) among countries. Potential carbon leakages are caused from the differences.

Share in Emission Reduction Potentials by Cost for Annex I Countries in 2020

The figure shows shares of GHG emission reduction potentials by cost below 500$/tCO2 in each country.



The share of reduction potentials below 50 $/tCO2 is relatively low in Japan compared with other countries.

Share of Emission Reduction Potentials by Cost in Industrial Sector for Annex I Countries in 2020

[%] (Share of emission reduction potential by cost in baseline emissions (BaU case) in inddustrial sectors of each country.)

	Japan	EU27	US
0-50 $/tCO2	**2.0%** (Representative measures) Increase in waste biomass use in various industrial sectors	**9.0%** (Representative measures) Energy saving in iron&steel and alminium sectors Increase in waste biomass use	**17.4%** (Representative measures) Energy saving in iron&steel, chemical, and alminium sectors Increase in waste biomass use
50-100 $/tCO2	2.0% (Representative measures) Energy saving in iron&steel, cement and petrochemical sectors	7.1% (Representative measures) Energy saving in petrochemical and chemical sectors	10.8% (Representative measures) Energy saving in cement and petrochemical sectors
100-200$/tCO2	5.5% (Representative measures) Energy saving in various industrial sectors	5.8% (Representative measures) Energy saving in cement and other industrial sectors	8.1% (Representative measures) Energy saving in various industrial sectors
200-500$/tCO2	7.6% (Representative measures) Energy saving in iron&steel, chemical sectors etc. by replacement of facilities with long remaining lifetime	5.2% (Representative measures) Energy saving in iron&steel, cement, petrochemical sectors etc. by replacement of facilities with long remaining lifetime	1.0% (Representative measures) Energy saving in iron&steel, cement, petrochemical sectors etc. by replacement of facilities with long remaining lifetime
Total	17.0%	27.0%	37.3%

Note: The shares of emission reduction potentials represent those not from the emissions in a certain base year (e.g., year of 1990) but from baseline emissions (BaU case) in 2020 .

The share of reduction potentials in industrial sectors below 50 $/tCO2 is relatively low in Japan compared with other countries.

Estimates of Cost Increase in Energy-intensive Sectors

	Estimated by RITE (Japan)		Climate Strategies, 2007 (EU)		Carbon Trust, 2008 (UK)
Emission reduction target in carbon price	50 $/tCO2 (corresponding to -4% relative to 2005)	476 $/tCO2 (-25% relative to 1990)	15 €/tCO2	45 €/tCO2	20 €/tCO2
Iron & steel	+18%	+173%	+3%	+9%	+4.28%
Cement	+42%	+397%	+22%	+65%	+14.54%

Notes:
No free allocations are assumed in all the studies.
Estimations of cost increase under free allocations are complex because allocation methods, e.g., grandfathering, benchmarks, affect the costs, and it is not easily nor uniquely done to compare the cost estimates among research studies, and therefore, only no free allocation cases are shown.
Reference price of crude steel, clinker and electricity is assumed to be 55,000 JPY/ton of crude steel, 10,000 JPY/ton of clinker and 20 JPY/kWh, respectively, for the estimates by RITE.

Sources:
Climate Strategies, 2007; Differentiation and dynamics of EU ETS competitiveness impacts
Carbon Trust, 2008; EU ETS Impacts on Profitability and Trade

Free allocations will be expected necessary for energy-intensive sectors even under low carbon prices, e.g., below 50 $/tCO2.

Implications on Carbon Leakage from Broad Existing Analyses

Broad existing analyses indicate:

- There are significant impacts on energy-intensive and trade-exposed sectors including cement, iron & steel and aluminum sectors, if no free allocations are introduced.
- However, the impacts on other sectors are not large, and large impacts on such energy-intensive sectors can be also avoided if appropriate free allocations are introduced.

Such basic insights can be commonly drawn from the literatures. However, all the analyses have been conducted assuming low carbon prices (e.g., 20 €/tCO_2).

Another challenge is how to allocate free allowances appropriately without disrupting the economy. Top-down allocations by governments will not be able to achieve them.

Literature Review on Impacts of Carbon Leakage

Source	Assumed carbon price for analyzing impacts of carbon leakage
European Commission, McKinsey, Ecofys, 2006; EU ETS Review – Report on International Competitiveness	20 €/tCO_2 (Elec. price: +10 €/MWh)
Climate Strategies, 2007; Differentiation and dynamics of EU ETS competitiveness impacts	15 €/tCO_2 (Elec. price: +10 €/MWh); sensitivity analysis: 30 and 45 €/tCO_2
Grubb, M. et al., 2009; Climate Policy and Industrial Competitiveness: Ten Insights from Europe on the EU Emissions Trading System	20 $/t$CO_2$ for US 20 €/tCO_2 (Elec. price: +10 €/MWh) for EU
Carbon trust, 2009; Tackling carbon leakage – Sector-specific solutions for a world of unequal carbon prices	EU ETS price in 2016: 14.5 €/tCO_2 Analysis price: 30 €/tCO_2
Aldy, J. and Pizer, W., 2009; The Competitiveness Impacts of Climate Change Mitigation Policies	15 $/t$CO_2$
European Commission, 2009; Commission Decision determining a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage …	30 €/tCO_2
Monjon S. and Quirion, P., 2009; Addressing leakage in the EU ETS: Results from the CASEII model	14-27 €/tCO_2

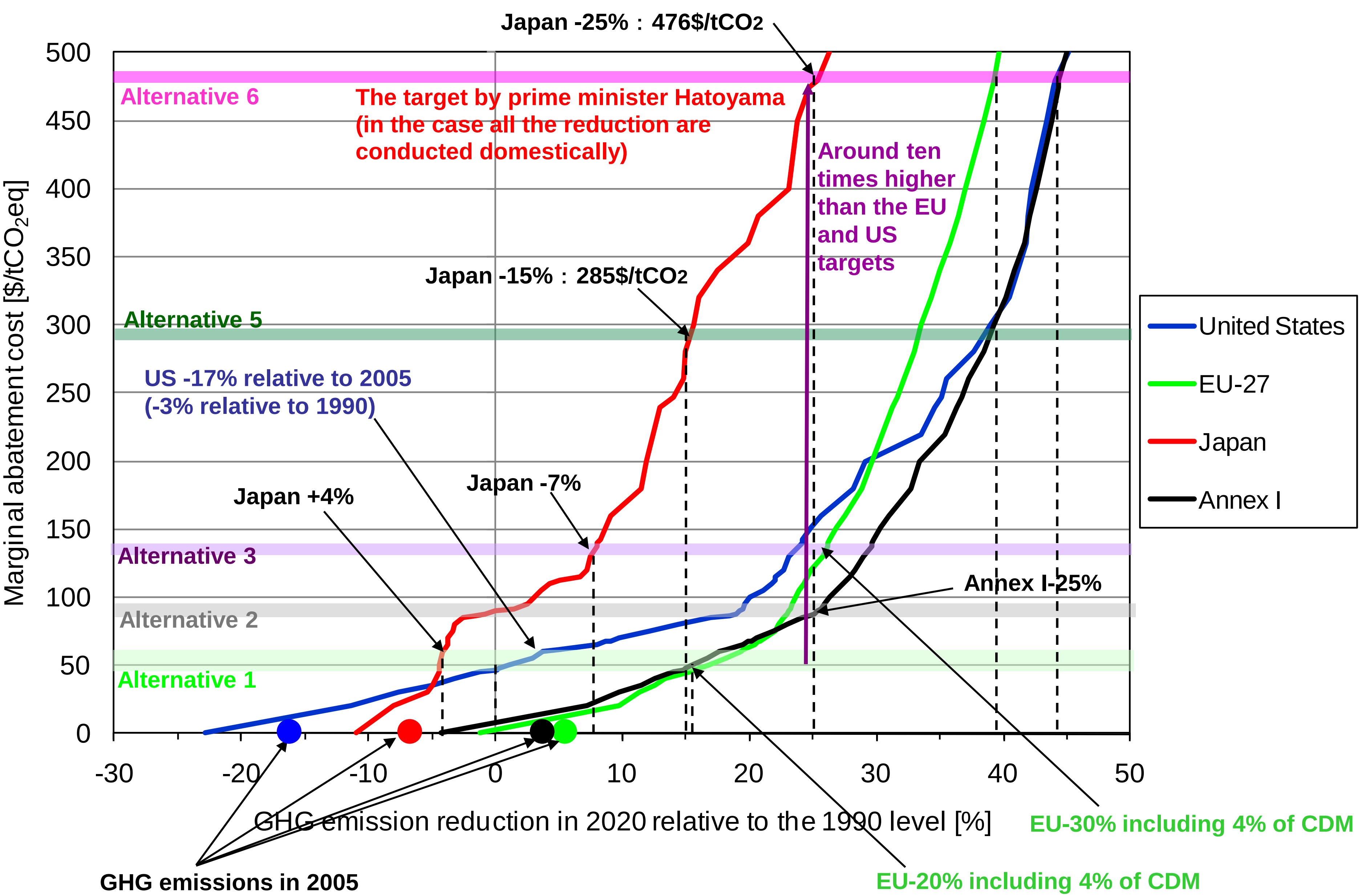
All the analyses assume low carbon prices (below about 50 $/t$CO_2$, mainly of 20 $/t$CO_2$ or 20 €/tCO_2).

Key Messages

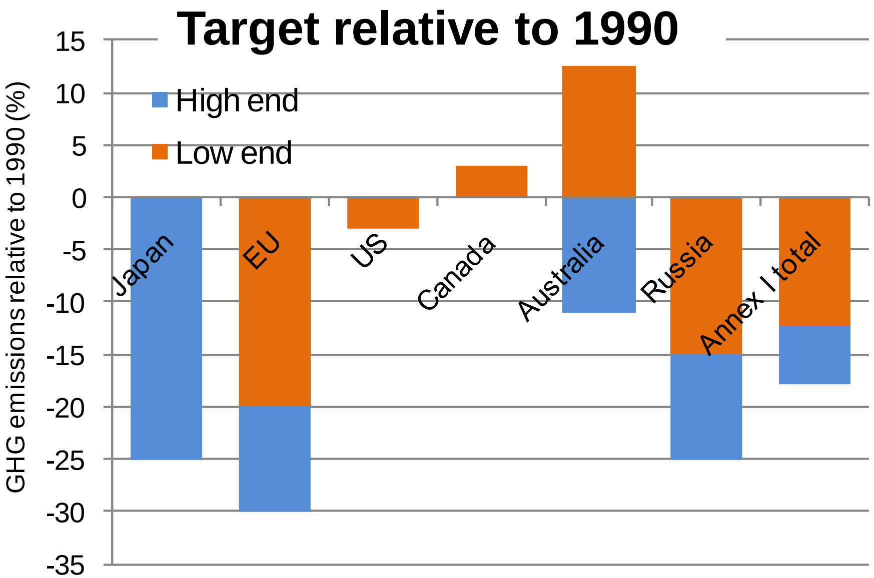
- A large gap of the carbon price exists between international analyses/discussions, assuming only 15-30 \$/tCO_2 or €/tCO_2, and the Japanese situations, where the estimated carbon price is 476 and 285 \$/tCO_2, if 25% and 15% reductions, respectively, relative to 1990 is achieved domestically. Neglecting this gap of carbon price will mislead discussions on the carbon leakage.
- ETS will work only under carbon prices below about 50 \$/tCO_2 in a real world, considering impacts of carbon leakage which takes place in case of large differences in marginal abatement cost among countries.
- However, the emission reduction potentials below 50 \$/tCO_2 is small particularly in industrial and power sectors of Japan.
- Best policy mix and policy designs are required considering different situations among countries.

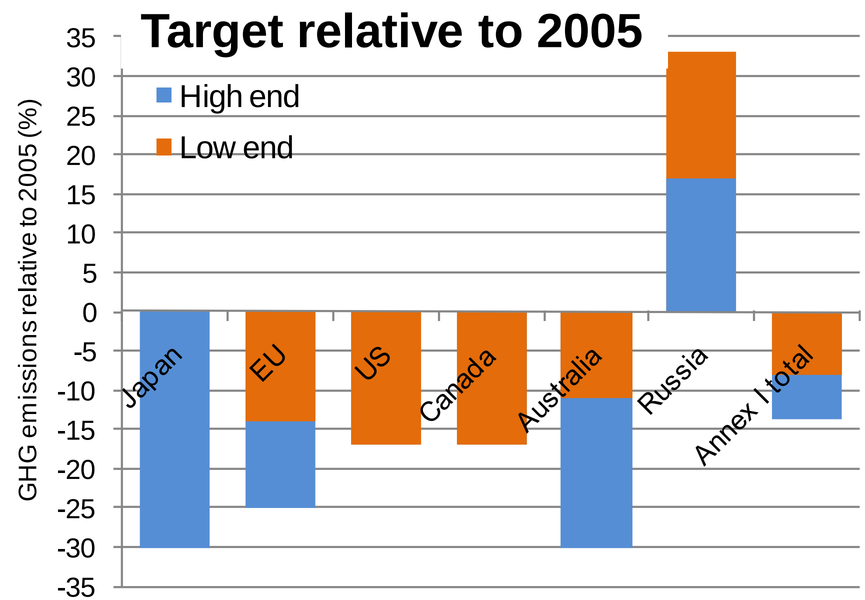
Appendix

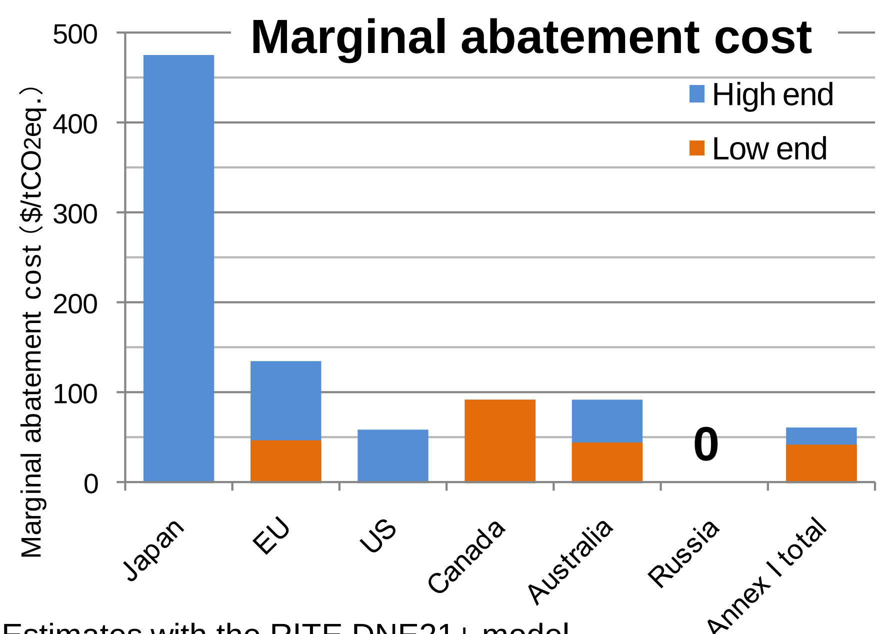
Marginal Abatement Cost Curves in 2020

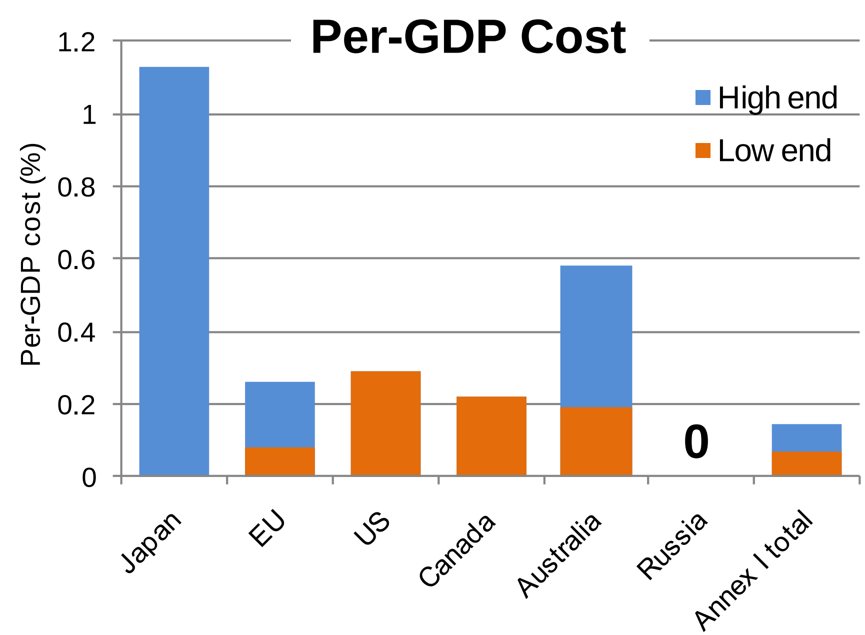


Mid-term Emission Reduction Target of Major Annex I Countries (Y2020)



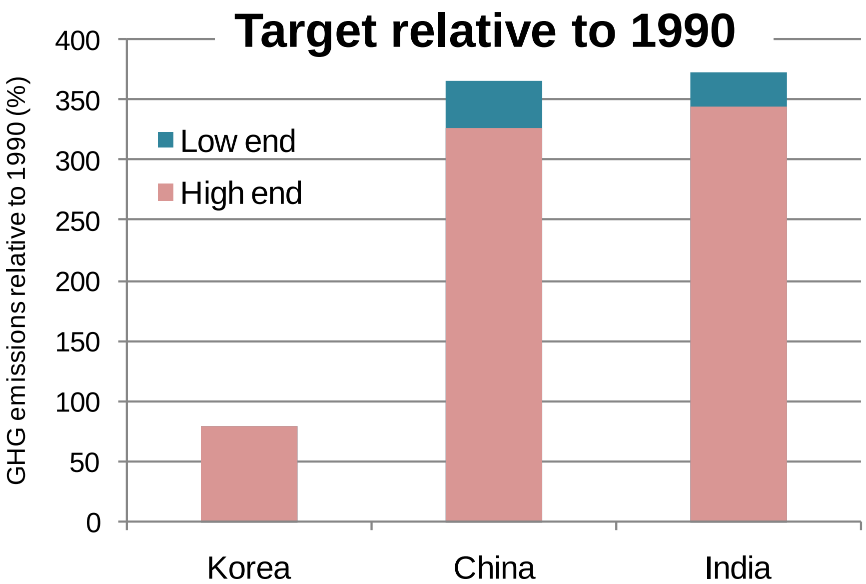


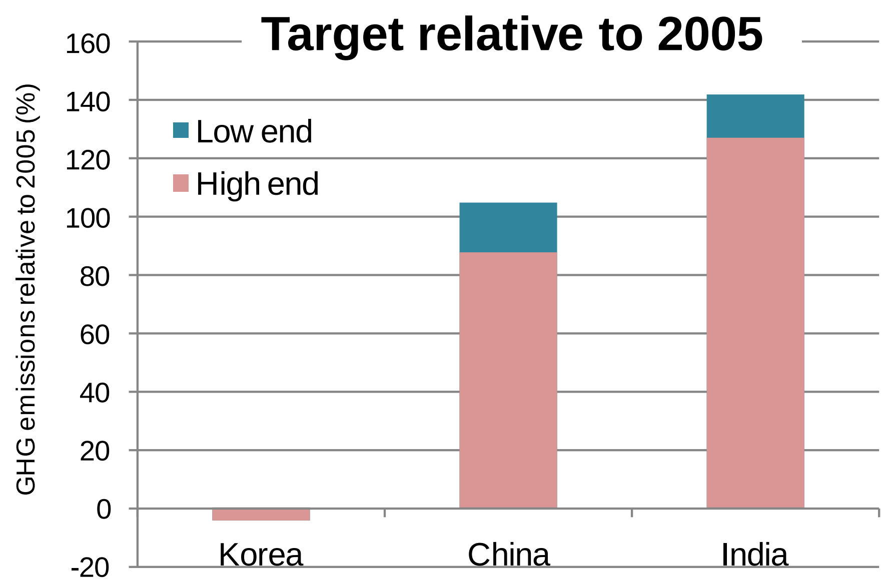


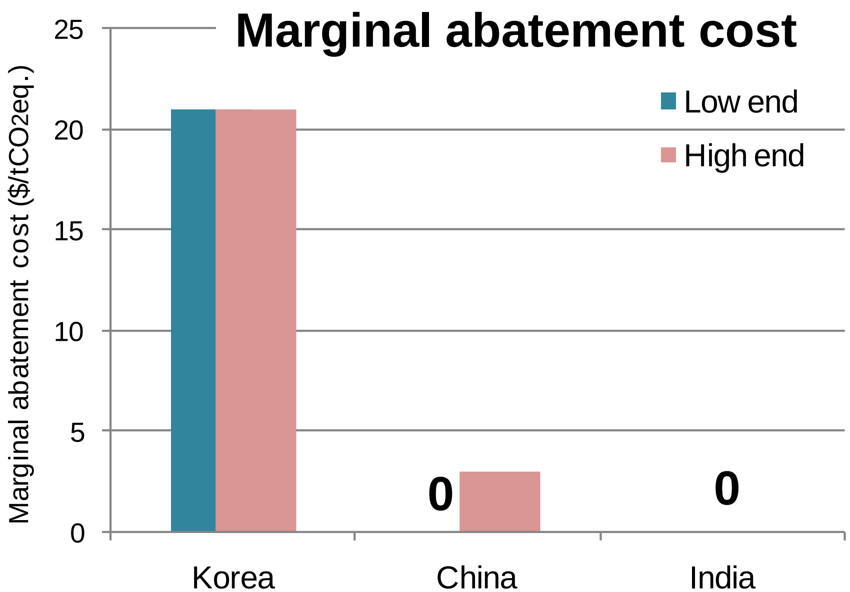


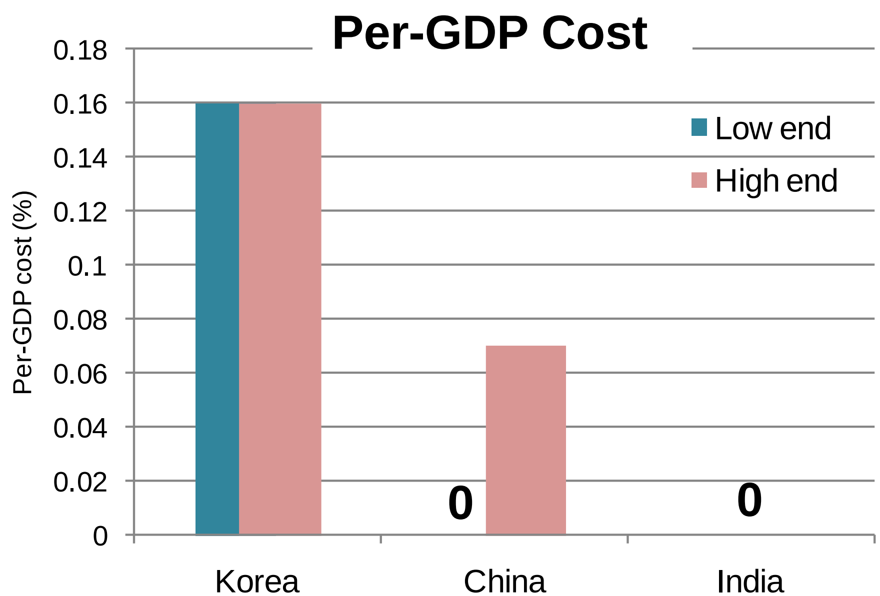
Estimates with the RITE DNE21+ model

Mid-term Emission Reduction Target of Major Non-Annex I Countries (Y2020)



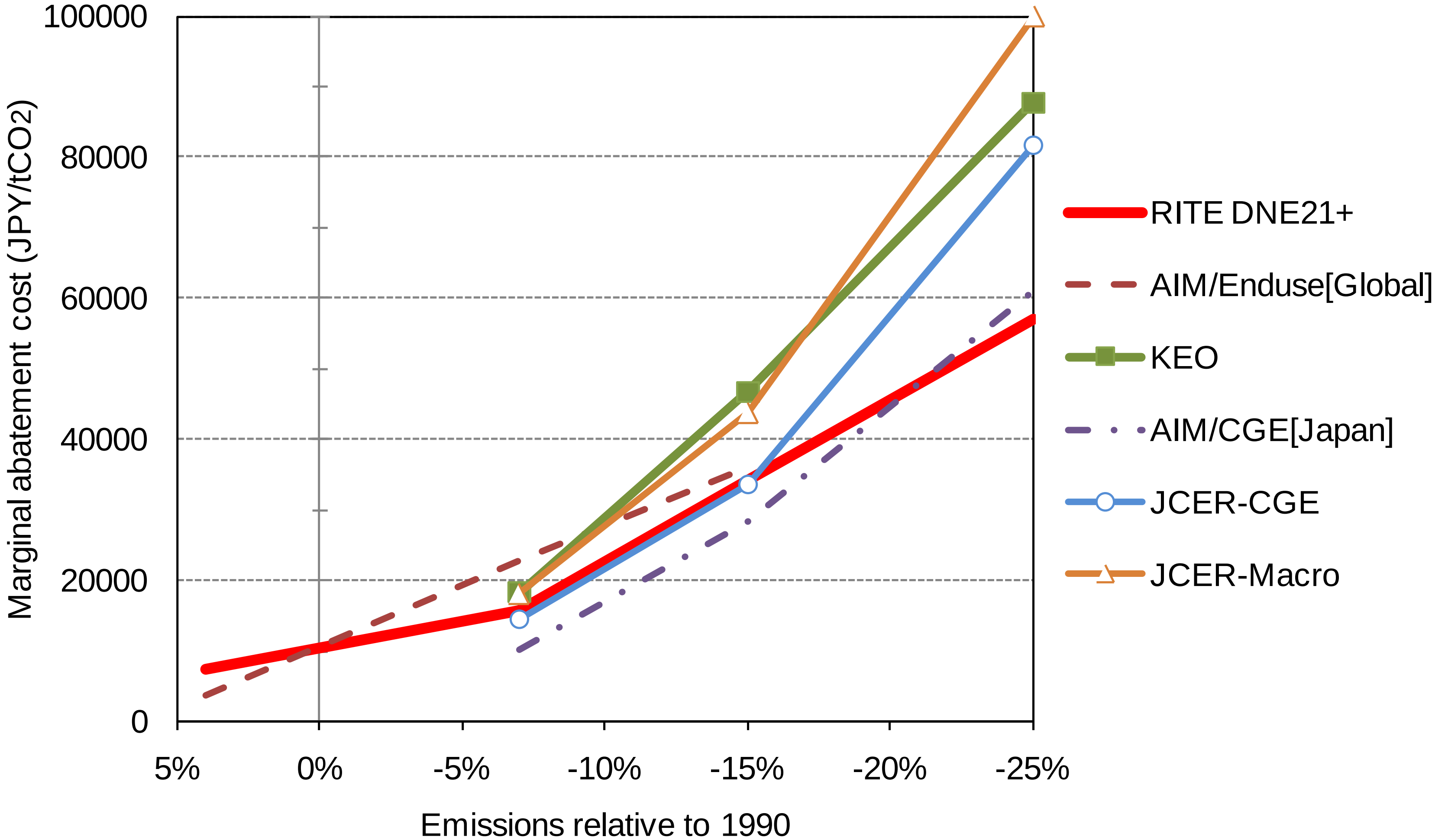






Estimates with the RITE DNE21+ model

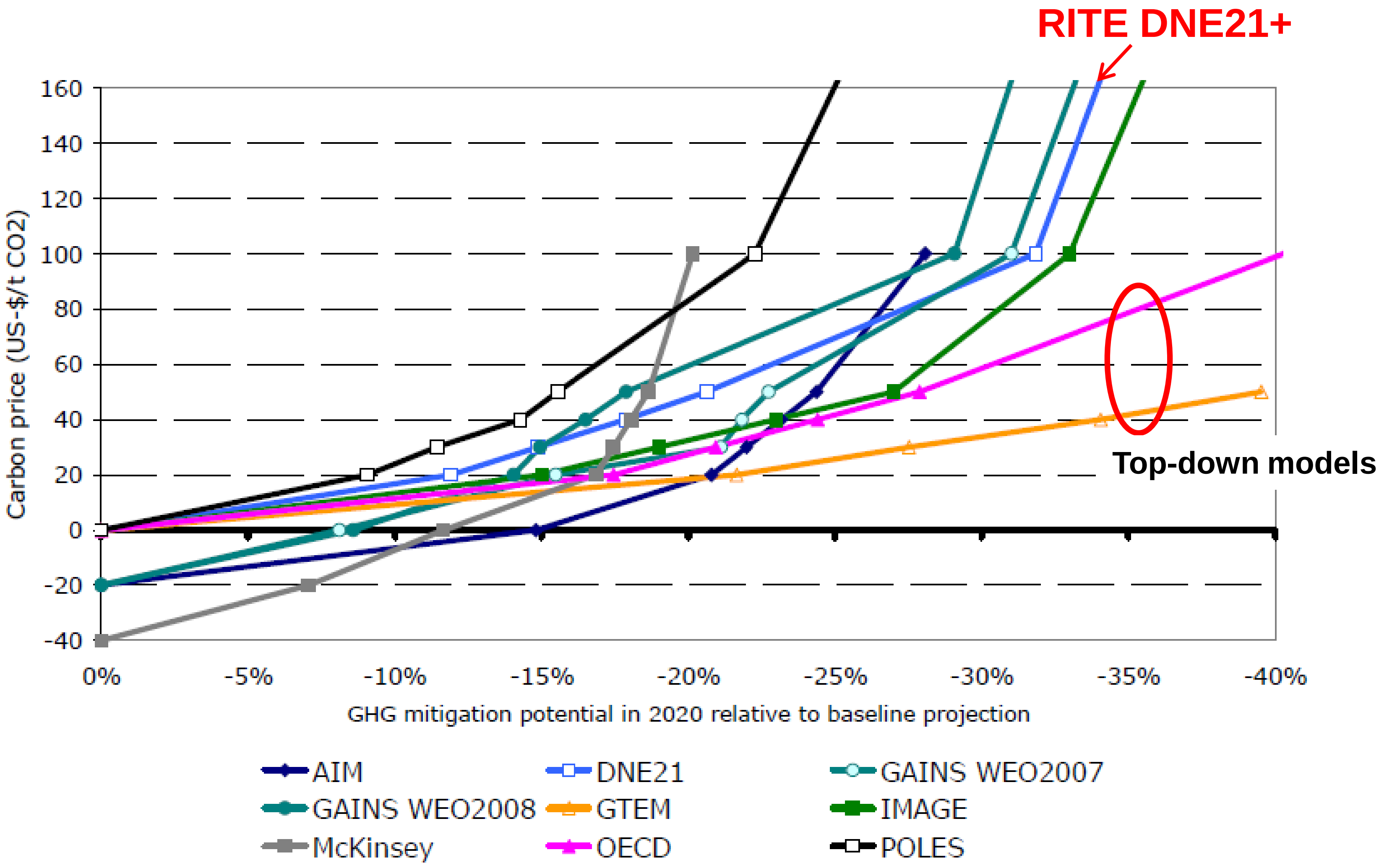
Comparison of MAC in Japan for 2020 among Different Models



Source: Analyzed by Advisory Committee for Mid-term Target, 2009

Note: The prices of two global models of RITE DNE21+ and AIM/Enduse[Global] are converted by using 1$=120JPY.

Comparison of MAC in the World for 2020 among Different Models



Source: M. Amann et al.; GHG mitigation potentials in Annex I countries-Comparison of model estimates for 2020, (2009), IIASA Interim Report IR-09-034