

Emissions Scenarios Database Contribution for the IPCC Fourth Assessment Report

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Overview

- 1. Previous work on Emissions Scenarios Database**
- 2. Classification of mitigation scenarios**
- 3. Progress of Emissions Scenarios Database**
- 4. Examples of quantitative analysis based on the updated Emissions Scenarios Database.**

Emissions Scenarios Database

- Morita Database -

- ◆ **Nakicenovic, N., Victor N. and Morita T. (1998)**
 - 428 scenarios of global and regional GHG emissions from 176 literature sources
 - utilized for discussions in SRES
- ◆ **Rana, A. and Morita. T (2000)**
 - 75 scenarios of global and regional GHG emissions from 25 literature sources
 - utilized for discussions in TAR

Scope of Work

- ◆ **Update the current Emissions Scenarios Database**
- ◆ **Analyze various new mitigation scenarios since TAR.**
- ◆ **Contribute for the IPCC Fourth Assessment Report**
 - **First, classify characterization of mitigation scenarios systematically**
 - **Second, analyze quantitatively on GDP, population, carbon intensity, energy intensity and carbon tax at a regional level in SRES 4 regional aggregations as well as at a global level.**

Classifications of Mitigation Scenarios

- ◆ **Current definition of mitigation scenarios in TAR**
a description and a quantified projection of how GHG emissions can be reduced in comparison to respective baseline scenarios
- ◆ **Classifications of mitigation scenarios in TAR**
concentration stabilization scenarios
emission stabilization scenarios
safe emission corridor (tolerable windows/safe landing) scenarios
other mitigation scenarios.

the categorization in TAR was only based on “**climate policy goals**”.
=> classify mitigation scenarios based on other characteristics.

Reclassifications of Mitigation Scenarios

To understand mitigation scenarios more systematically, mitigation scenarios can be classified based on four key aspects:

- 1st aspect: scenario characteristics**
- 2nd aspect: climate policy goals**
- 3rd aspect: emission allocation strategies**
- 4th aspect: mitigation measures**

1st: Scenario Characteristics

Geographical coverage	● single global scenario, ● multiregional global scenario, ● single regional scenario, ● multinational regional scenario, ● national scenario,
Time horizon	● short term scenario (~ 2030), ● medium term scenario (2030 ~ 2050), ● long term scenario (2050 ~).
Sector scale	● a specific sector (energy, transport,etc.) scenario, ● multisector scenario,
GHG scale	● CO2 only scenario, ● six Kyoto GHGs scenario (CO2, CH4, N2O, HFC, PFC, SF6), ● all anthropogenic GHGs scenario (CO2, CH4, N2O, HFC, PFC, SF6, CFCs, HCFCs, SOx, NOx, CO, NMVOC, black carbon etc.)

2nd: Climate Policy Goals

Target setting approach	● concentration stabilization target, ● emission stabilization target, ● climate change target such as temperature rise or sea level rise, ● direct impact target such as food production or ecosystem, ● indirect impact such as economic activities, ● political target based on international agreement such as the Kyoto Target, ● political target based on multilateral agreement ● national action plan, and so on
Non-target approach	● best available technologies, ● best economic technologies, ● best practicable environmental potions, and so on.

3rd: Emission Allocation Strategies

Regional/national-wise emission allocation framework	● Kyoto forever, ● contraction and convergence, ● intensity target, ● multi-stage approach, ● widening Brazilian proposal and so on.
Sector-wise emission allocation framework	● multi-sector convergence, ● triptych approach, and so on.

4th: Mitigation Measures

Economic policy options	• subsidies, • carbon tax, • Kyoto mechanisms such as emissions trading, joint implication and clean development mechanism
Technological policy options	• carbon capture and storage, • land-use change, • change of energy mix, • improvement of energy efficiency, • infrastructure development, and so on.
Socioeconomic policy options	• changes of lifestyle, • changes in the social structure, • population decline, • GDP changes and so on.

Call for New Mitigation Scenarios

The process of Post-SRES analysis since TAR

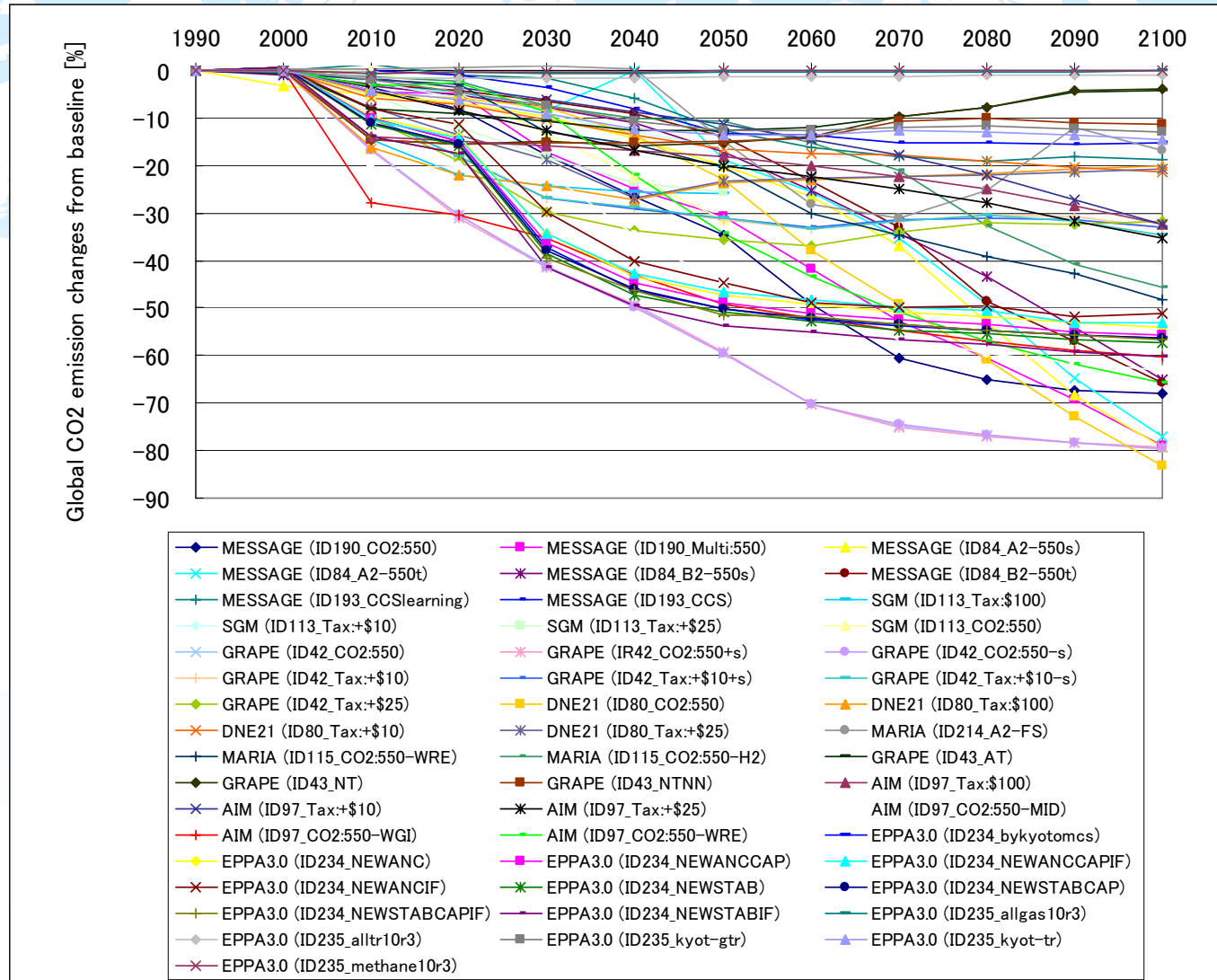
- ◆ **Regional scale:** Global, regional and national level analysis
 - **Global and sub-regional scenarios : HANAOKA**
 - **National scenarios : KAWASE**
- ◆ **Temporal scale:** Scenarios with horizons beyond 2030
- ◆ **Gas classifications:** all anthropogenic GHGs
CO₂, CH₄, N₂O, CFCs, HCFCs, HFCs, PFCs, SF₆, CO,
NMVOC, SO_x, NO_x and Black Carbon
- ◆ **Sector classifications:** Multisector scenarios

Progress: 194 new scenarios from 47 literature sources

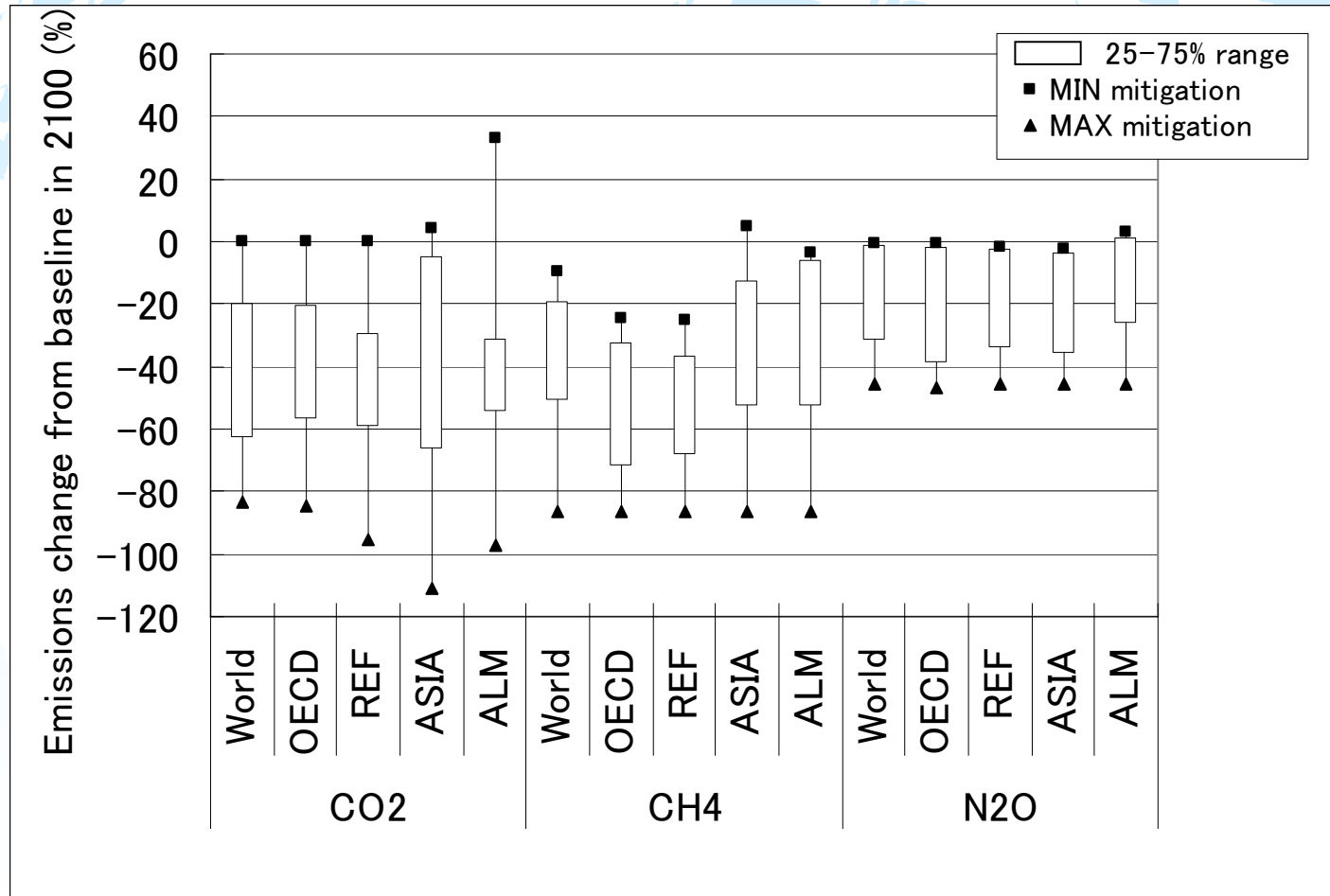
Regional Aggregations among SRES4, SRES9 and AR13

Tier1	Tier2		Tier3	
SRES4	SRES9		AR13	
Code	Code	Description	Code	Description
REF	REF	FSU+EEU	FSU	Former Soviet Union
			EEU	Eastern Europe
OECD90	WEU	OECD-Europe	WEU	OECD-Europe
	NAM	North America	CAN	Canada
			USA	USA
	PAO	Pacific OECD	ANZ	Australia, New Zealand
			JPN	Japan
ASIA	SPA	South Asia and Other Pacific Asia	PAS	Other Pacific Asia
			SAS	South Asia
	CPA	Centrally planned Asia and China	CPA	Centrally planned Asia and China
ALM	MEA	Middle East and North Africa	MEA	Middle East and North Africa
	AFR	Sub-Saharan Africa	AFR	Sub-Saharan Africa
	LAM	Latin America and the Caribbean	LAM	Latin America and the Caribbean

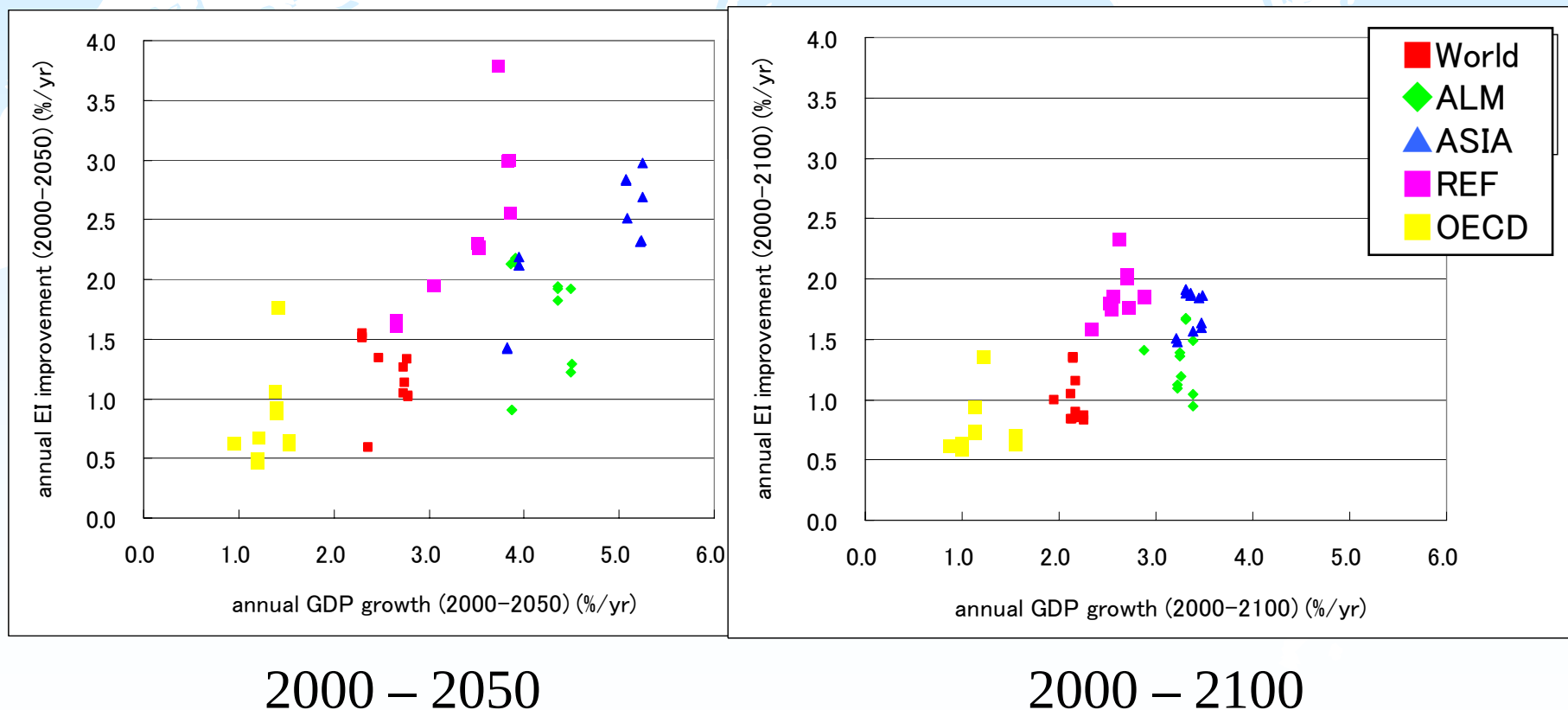
Global CO2 emission changes from baseline



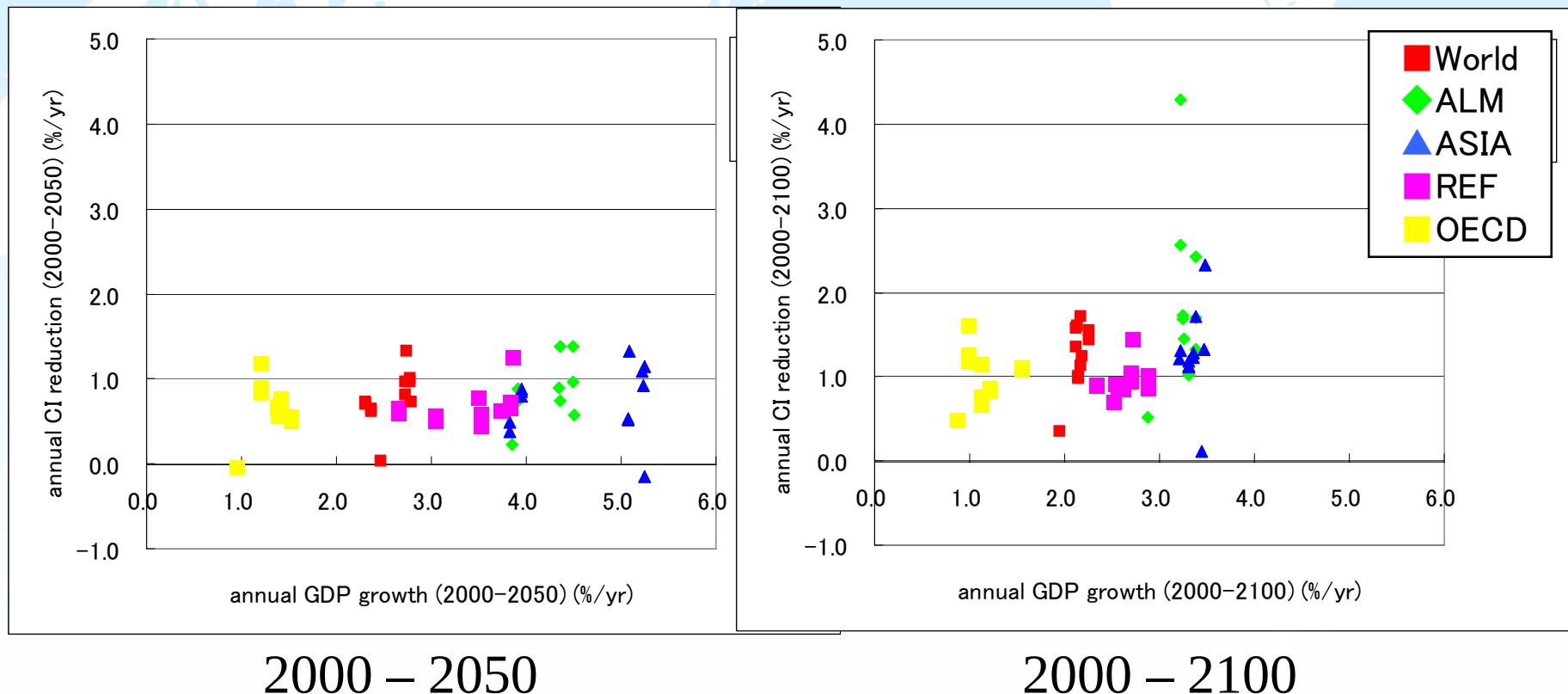
Total CO₂, CH₄ and N₂O emission changes from baseline in 2100



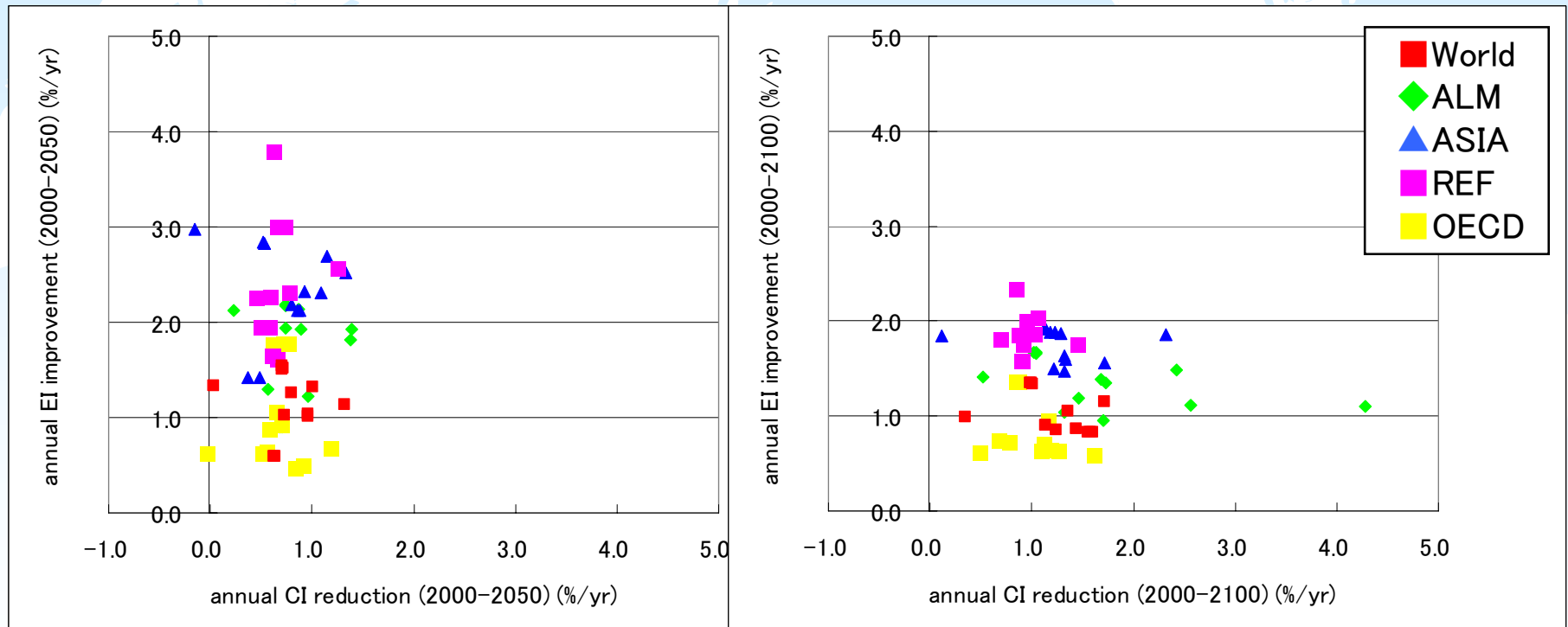
GDP growth & Energy Intensity Improvement under 550 ppmv Stabilization Scenarios



GDP growth & Carbon Intensity Reduction under 550 ppmv Stabilization Scenarios



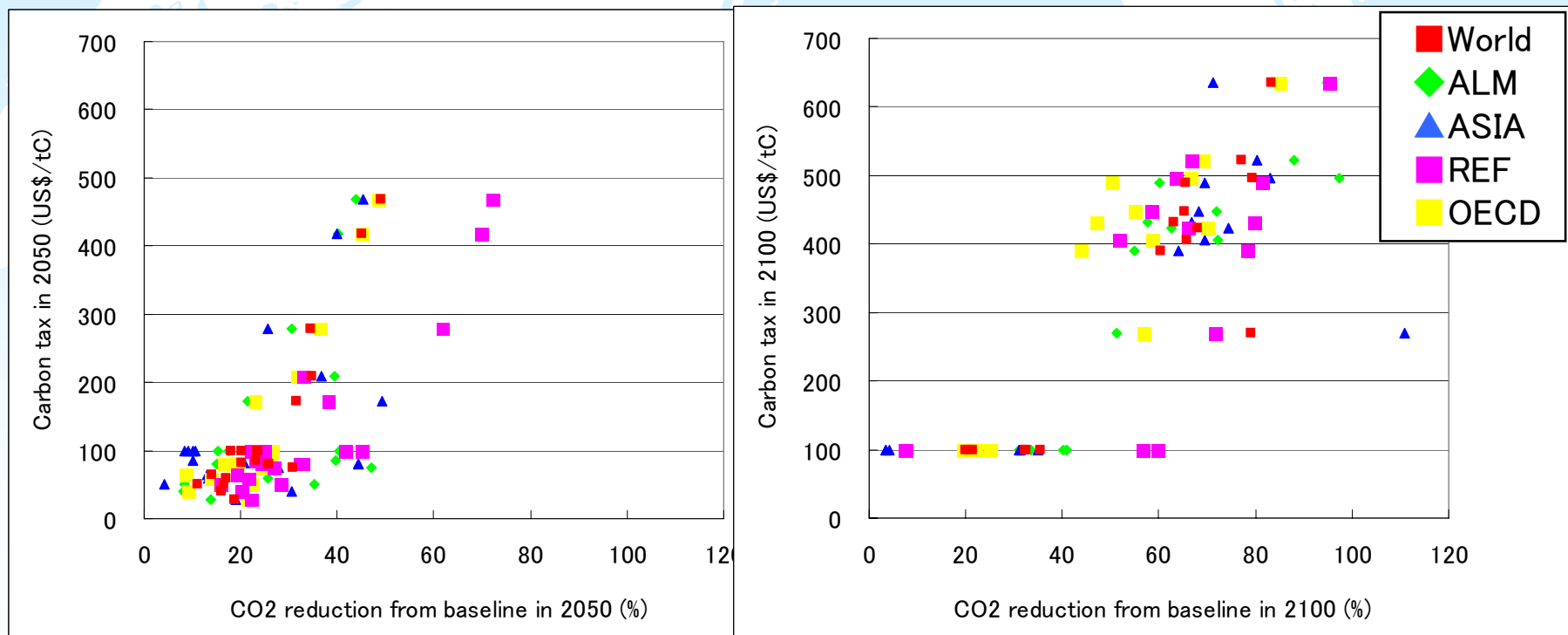
Carbon Intensity & Energy Intensity under 550 ppmv Stabilization Scenarios



2000 – 2050

2000 – 2100

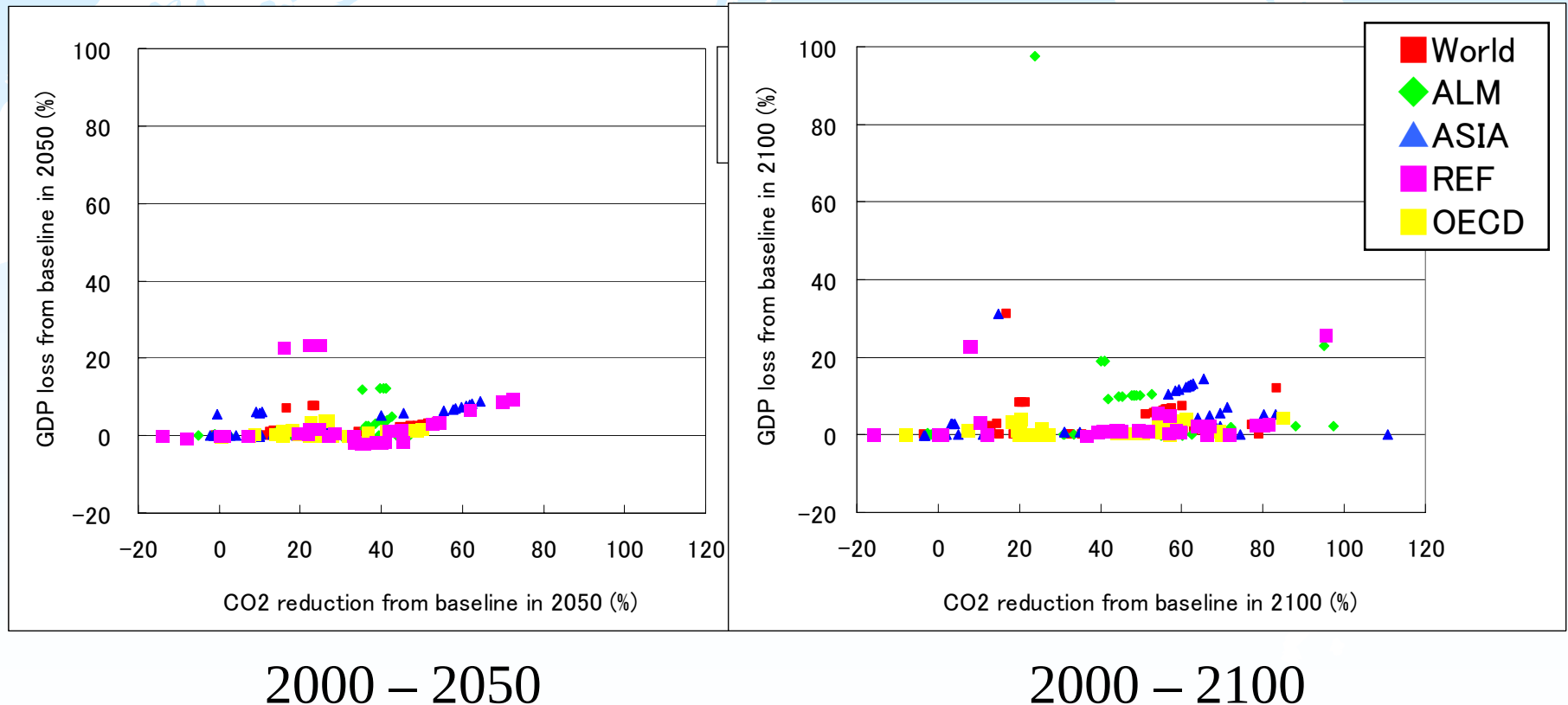
Carbon Tax & Regional CO2 mitigation rate



2000 – 2050

2000 – 2100

Cost of CO2 abatement relative to baseline projection



Future Work

This study is in an intermediate stage and there is scope for further refinement.

- ◆ **contact as many researchers as possible in the world and collect and clarify more detailed data**
- ◆ **collect more data from regional or national scenarios and analyze emission reduction factors in detail at the sub-regional and national levels**
- ◆ **pay attention to reduction measures for non-CO₂ emissions such as CH₄, N₂O, F gases etc**