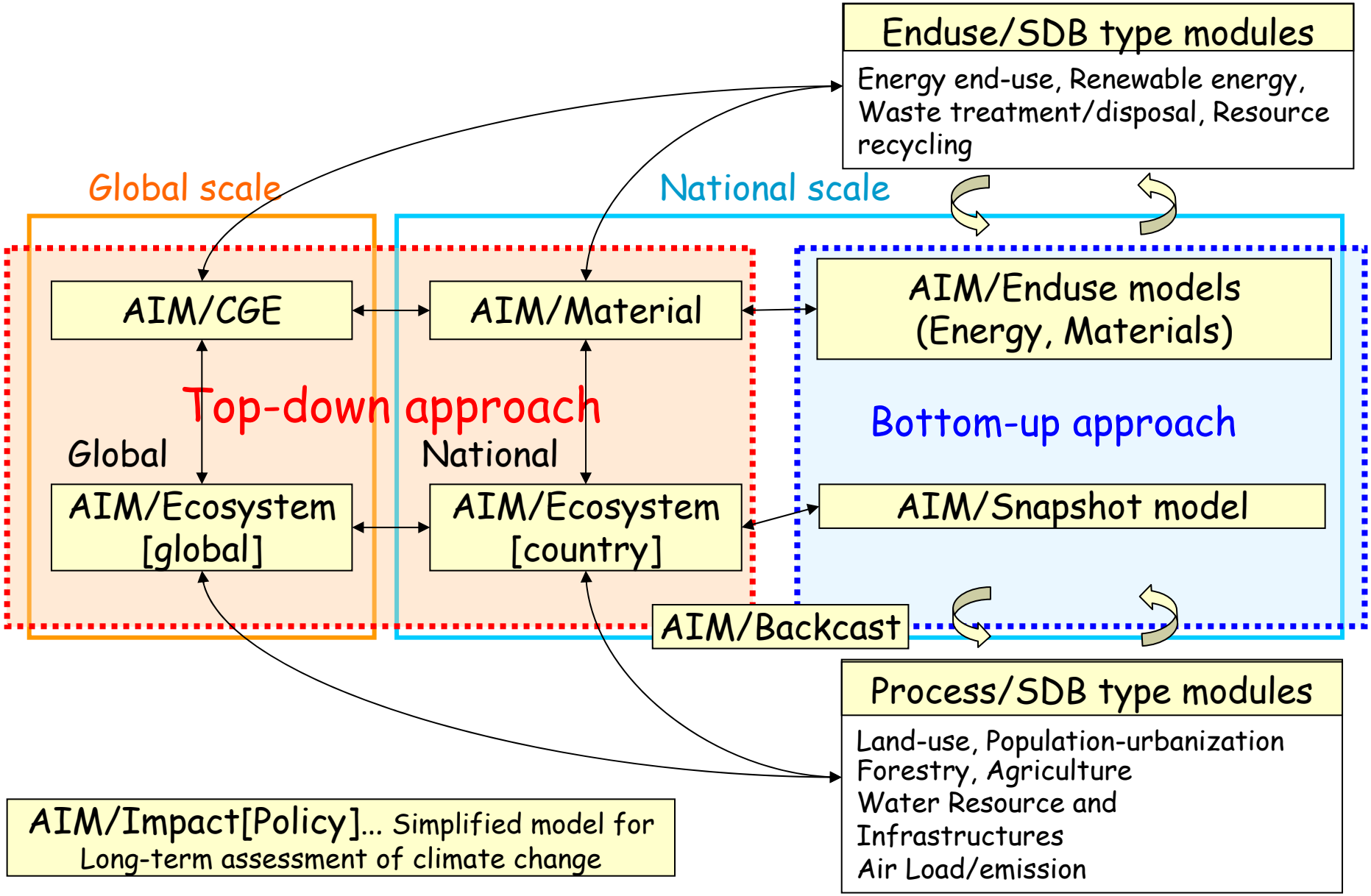
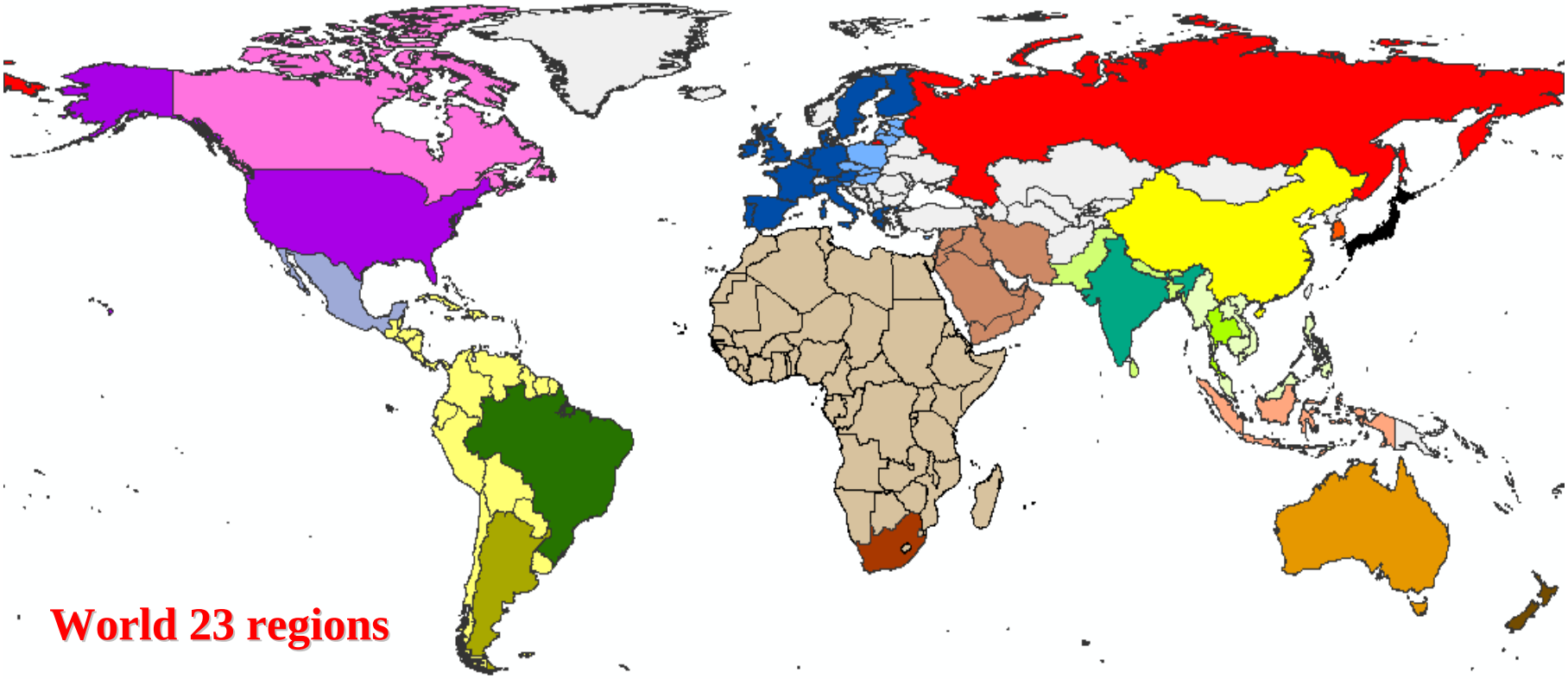
AIM (Asia-Pacific Integrated) Emission Models



Regional Classification



- JPN (Japan)
- CHN (China)
- IND (India)
- IDN (Indonesia)
- KOR (Korea)
- THA (Thailand)
- XSE (Other South-east Asia)
- XSA (Other South Asia)
- XME (Middle East)
- AUS (Australia)
- NZL (New Zealand)
- CAN (Canada)
- USA (United States)
- XE15 (EU15 in Western EU)
- XE10 (EU10 in Eastern EU)
- RUS (Russia)
- ARG (Argentina)
- BRA (Brazil)
- MEX (Mexico)
- XLM (Other Latin America)
- ZAF (South Africa)
- XAF (Other Africa)
- XRW (Rest of the World)

Key Design Characteristics

- ***Participating Model: AIM/CGE[global], AIM/Enduse[global], AIM/LCS model (ex. AIM/Snapshot model, AIM/Extended Snapshot model -> Ho's presentation, AIM/Backcasting -> Ashina's presentation)***
- ***Model Type: Top-down global CGE model, Bottom-up technology model***
- ***Participating Modelers: CGE: Masui, Matsumoto, Fujimori, Shukla, Jiang et al., Enduse: Hanaoka, Akashi, Kanamori, Shukla, Jiang, Shrestha et al., AIM/LCS model (Fujino, Ashina, Gomi, Shukla, Pangotra, Jiang, Shrestha, Ho, Retno, et al.) & Matsuoka, Kainuma***
- ***Time Step: 10 yr for CGE and Enduse, 5yr for AIM/LCS***
- ***Time Frame: 2100 for CGE, 2020 for Enduse, 2050 for LCS***
- ***Solution Type: Recursive Dynamic for CGE and Partial Optimization for Enduse***
- ***Equilibrium Type: GE for CGE, partial equilibrium for Enduse***
- ***Underlying Computing Framework: CGE and Enduse by GAMS***

Inputs and Outputs

AIM/CGE[global]

- Basic data
  - Benchmark data: GTAP6 (2001)
  - Detailed classification of Asia (24 regions)
- Design to link with the global technology selection model and country CGE model
- Treated GHG: CO2, CH4, N2O, SOx, NOx, NMVOC, CO, NH3 from fuel combustion, production process, land use, ...
- Scenario development from developing countries' perspectives
  - technology change
  - consumption pattern change
  - industrial structure change

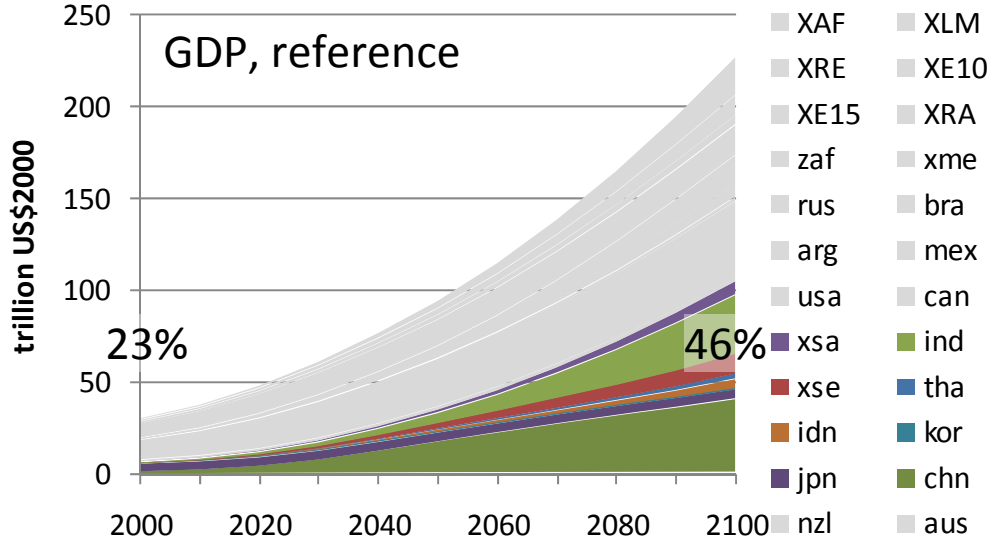
AIM/Enduse[global]

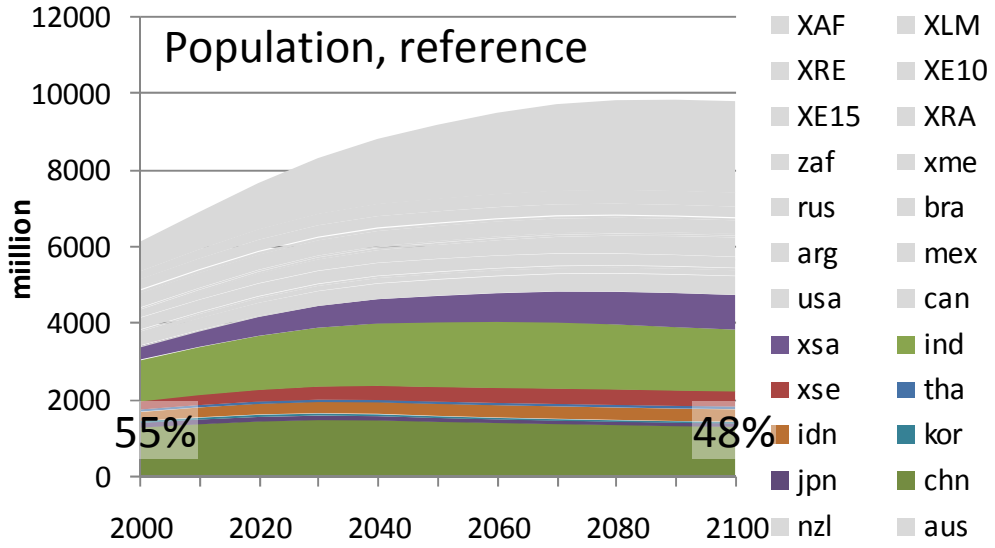
- 300 technologies (Technology cost, Energy consumption, Service supply, Diffusion rate, Lifetime) selection in multiple sectors based on Socio-economic scenarios

1) Estimation of marginal abatement costs and evaluate GHG mitigation potentials
   - - Region-wise mitigation potentials and costs
   - - Sector-wise mitigation potentials and costs

2) Analysis of the impact of policy instruments and consequent effects on GHG emission reductions.

GDP and population



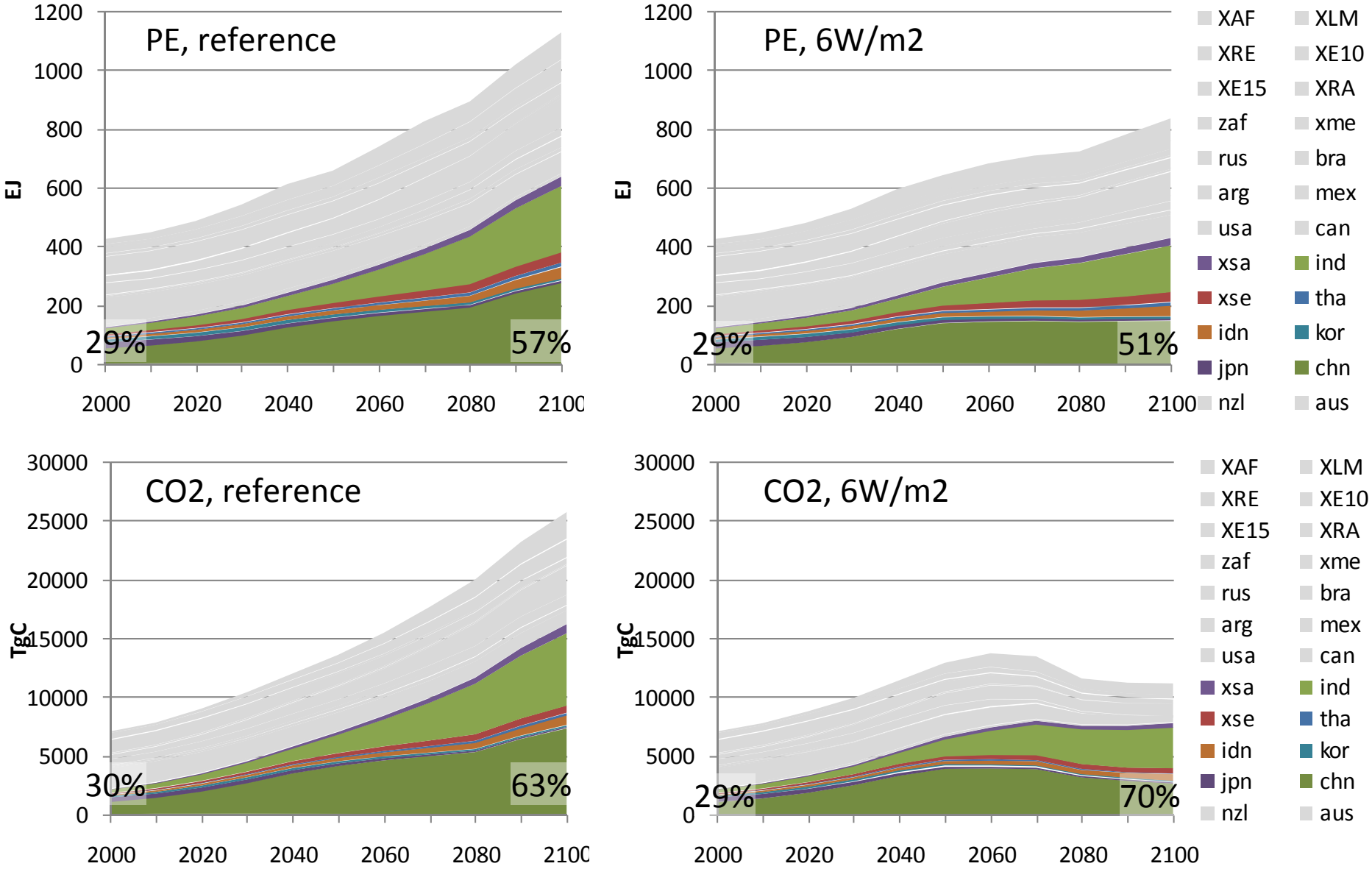


Share of economic activity of Asia in 2100 will be almost half.

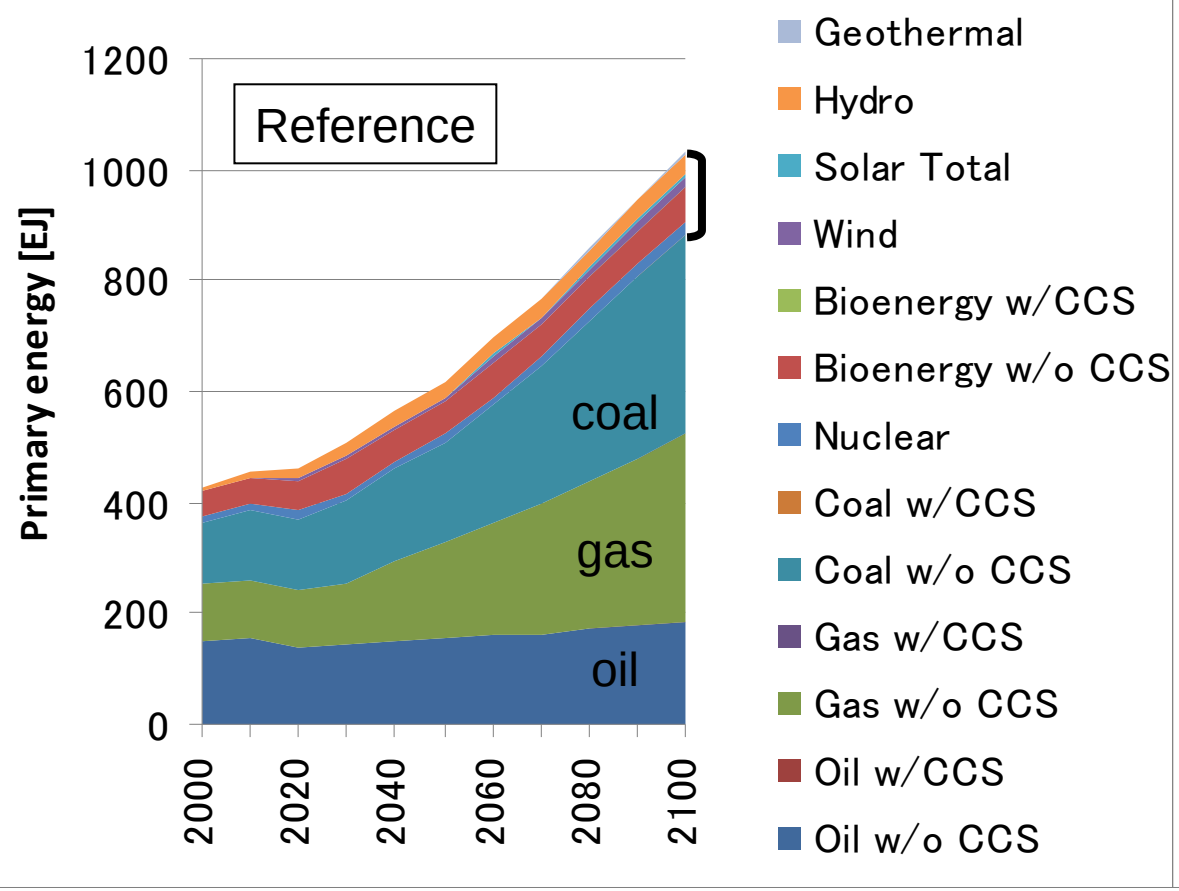
Energy share and CO2 emission share in 2100 will exceed 50%.

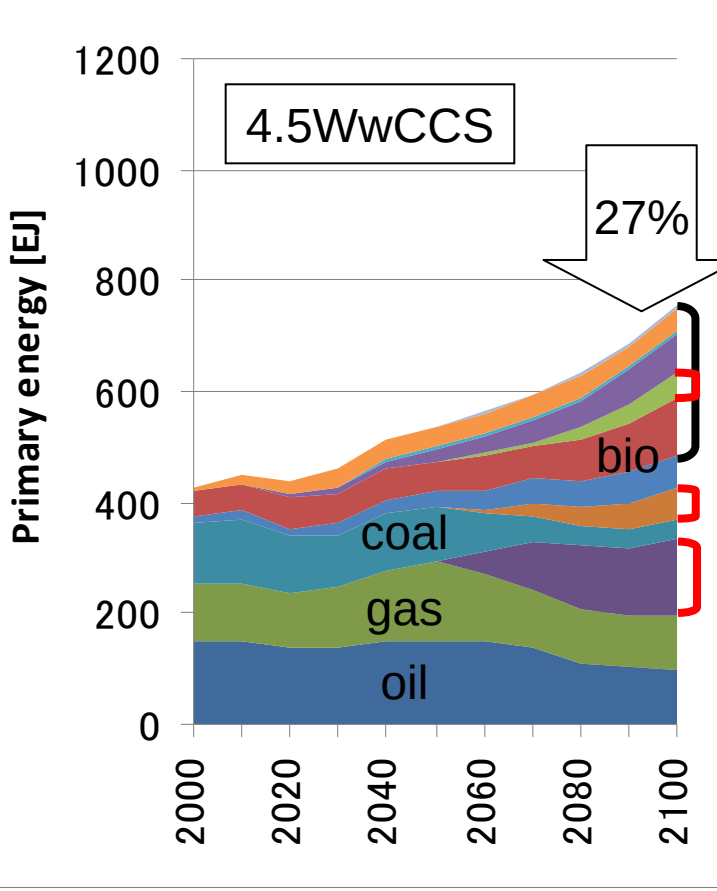
AIM/CGE[global]

Primary energy and CO2 emission from fossil fuels



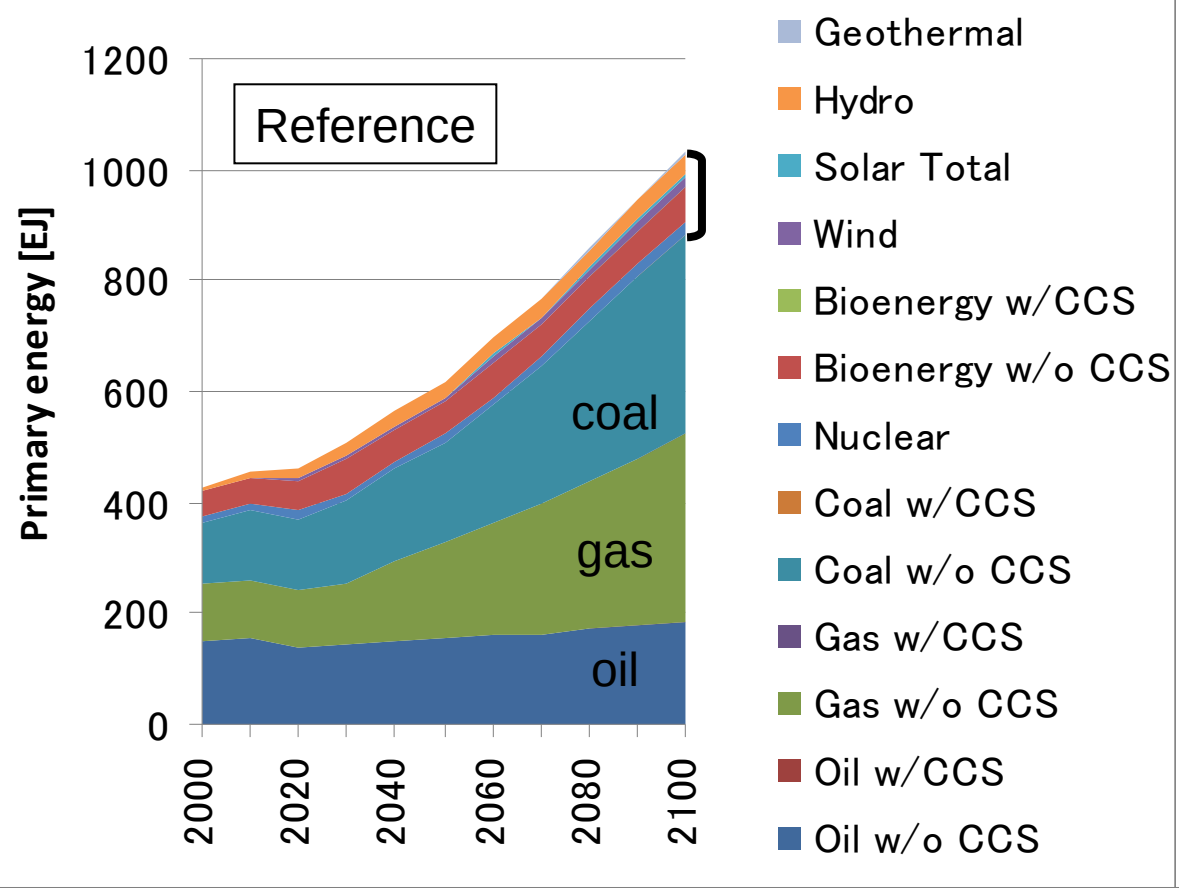
Reduction of CO2 in Asia will be quite important!

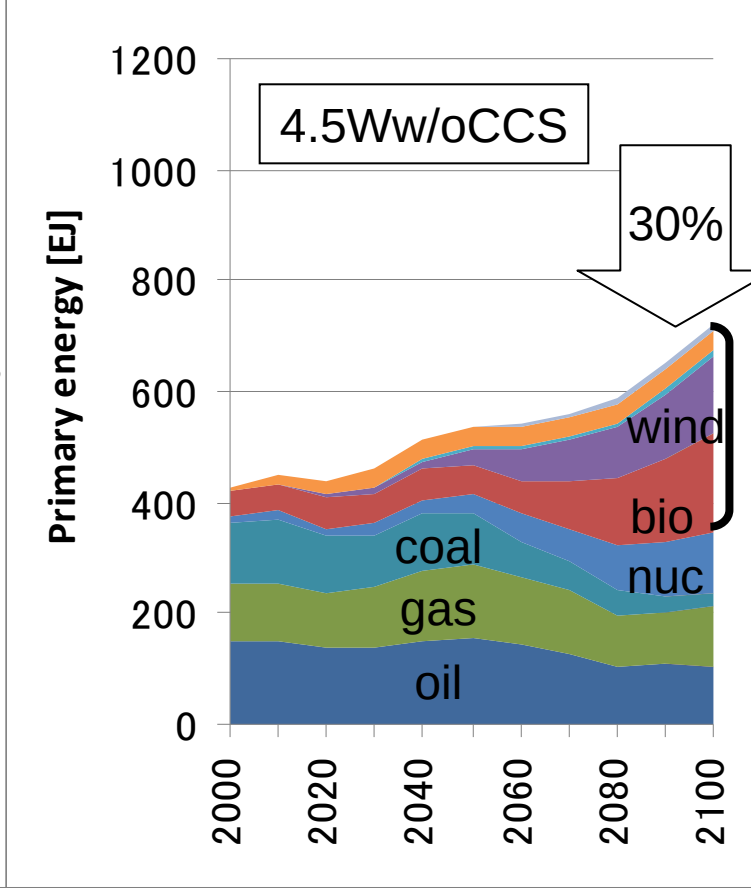




Renewable energy share
12%
Energy with CCS share
0%
Nuclear share
2%
14%

Renewable energy share
36%
Energy with CCS share
32%
Nuclear share
8%
76%

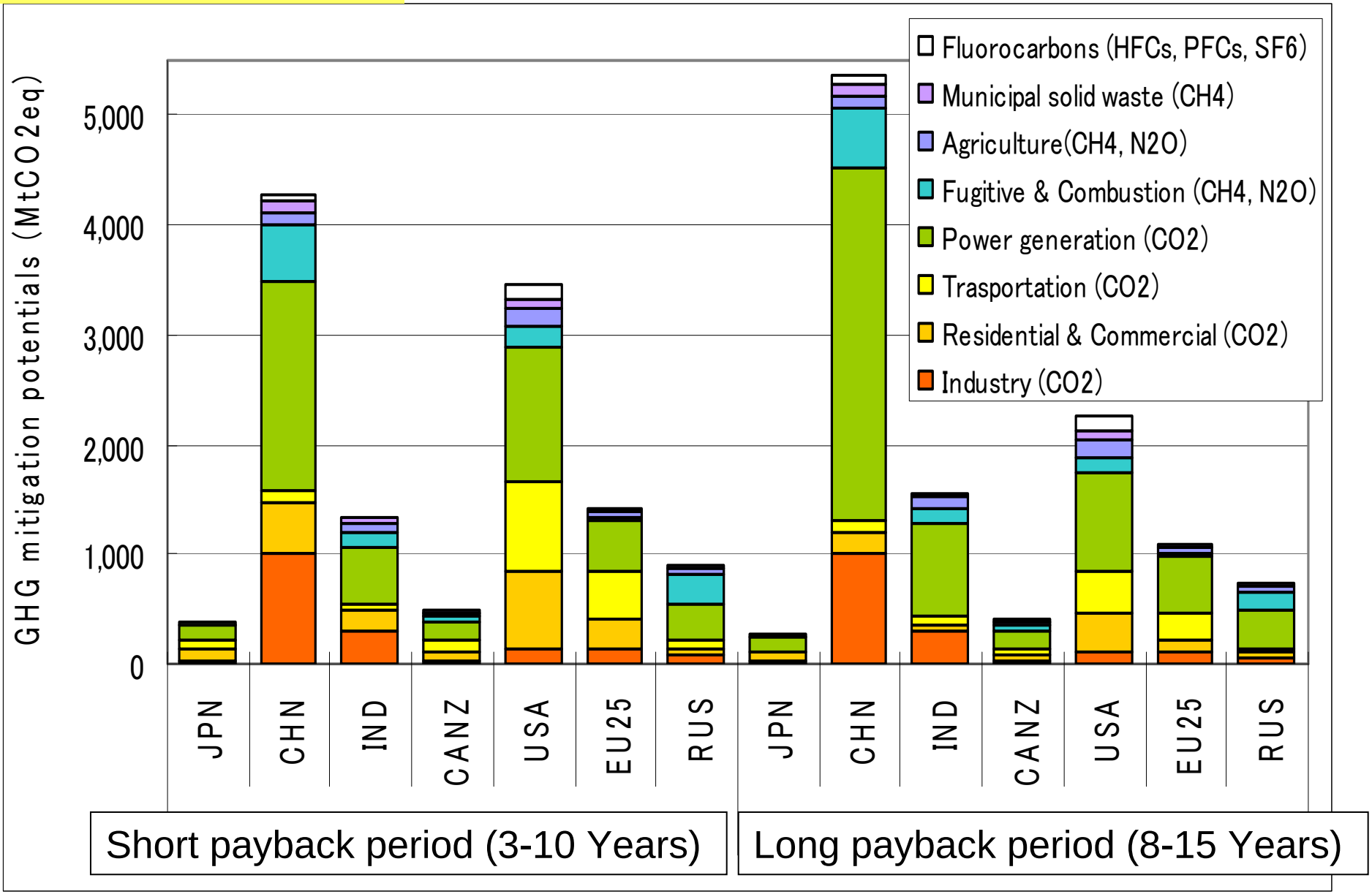




Renewable energy share
12%
Energy with CCS share
0%
Nuclear share
2%
14%

Renewable energy share
52%
Energy with CCS share
0%
Nuclear share
15%
67%

AIM/Enduse[global]

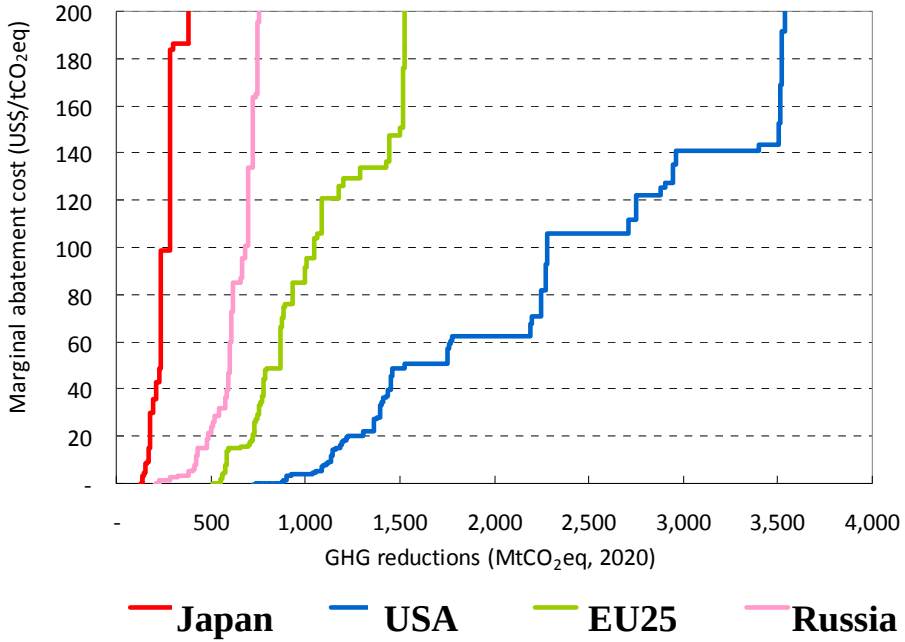


Sector-wise Mitigation Potentials below \$100/tCO_2 in 2020

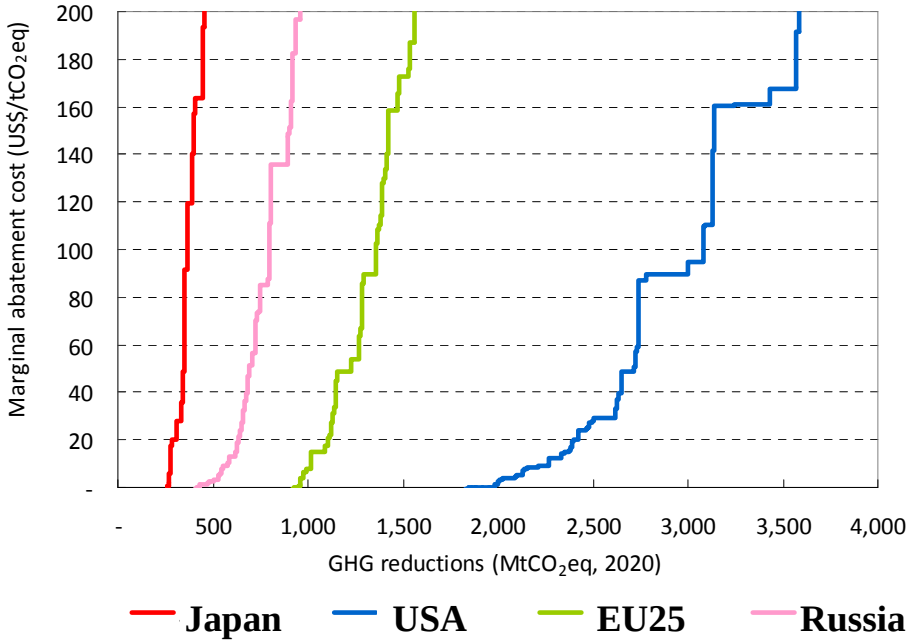
AIM/Enduse[global]

Marginal abatement cost curves in 2020 in major developed countries

Case 1
short payback period & cost optimization (i.e. no restrictions) in power sector

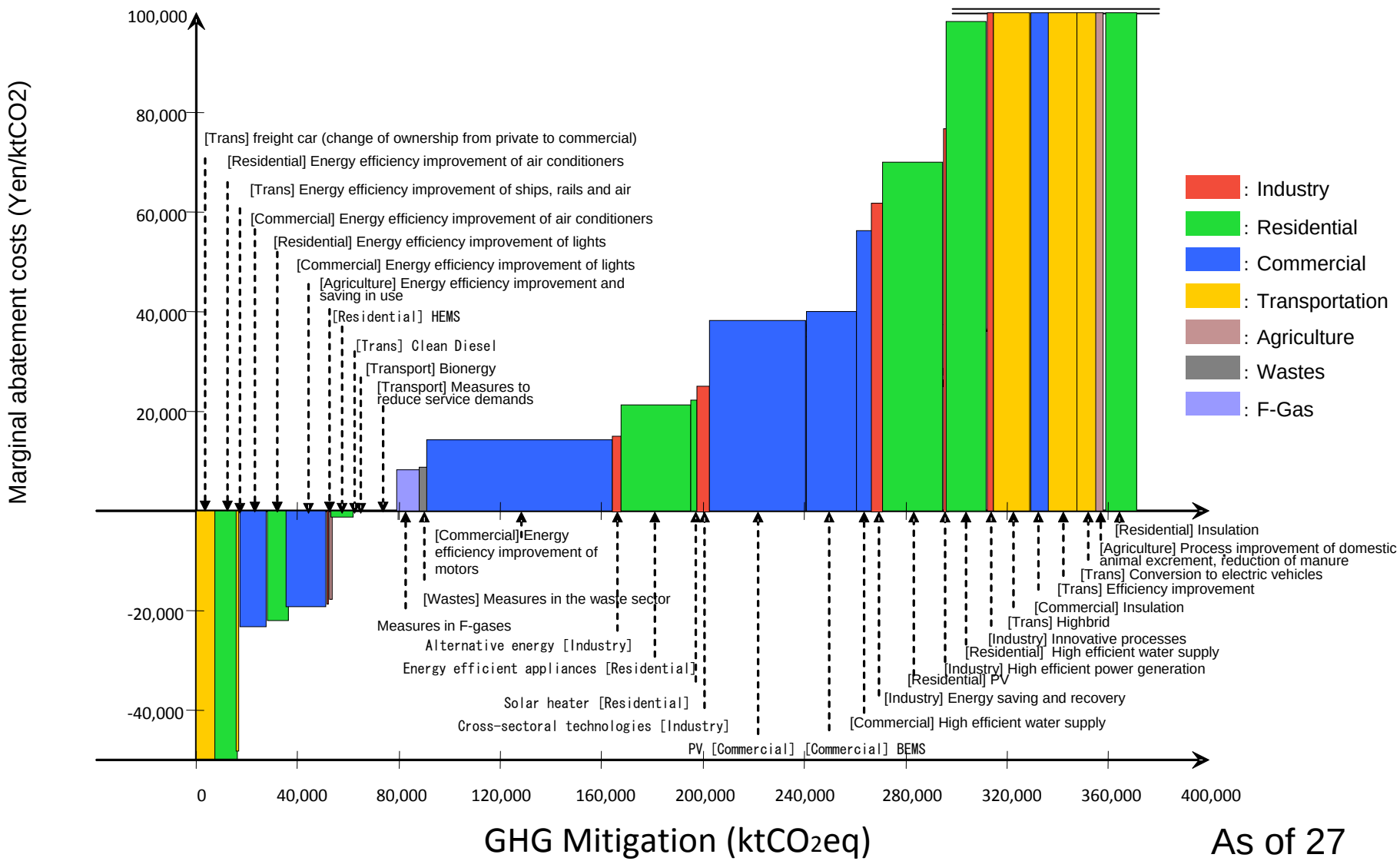


Case 2
long payback period by policy & energy security restrictions in power sector



- **Important point to note is that mitigation potentials and marginal abatement costs will vary depending on different data settings and assumptions as shown**
- **Under the long payback period in Case 2, more reduction potentials at lower costs are estimated due to the effects of promoting high efficient technologies on the demand side.**
- **Under cost optimization without energy security restrictions in power generation in Case 1, more mitigation potentials are estimated above 50 US$/t-CO2 eq due to the effects of a drastic energy shift from existing coal and oil power plants to new efficient gas power plants.**

Marginal Abatement Cost to Reduce GHG emissions in Japan



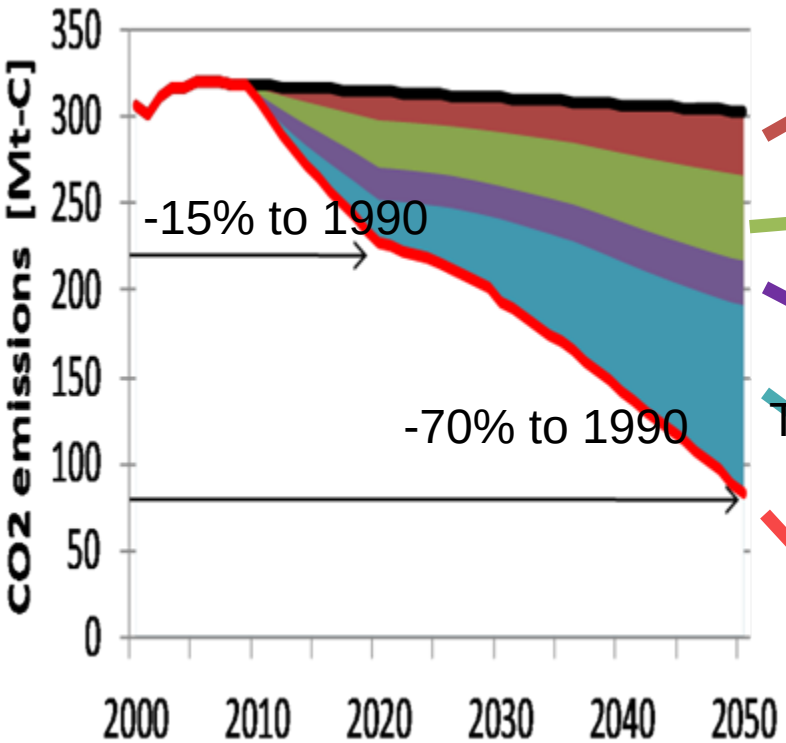
AIM/Enduse[Japan]

in 2020 (Case III)

As of 27 March 2009

AIM/LCS

CO2 emission projections based on a dozen actions toward 70% reduction



Residential/ commercial

Industrial

Transportation

Energy supply

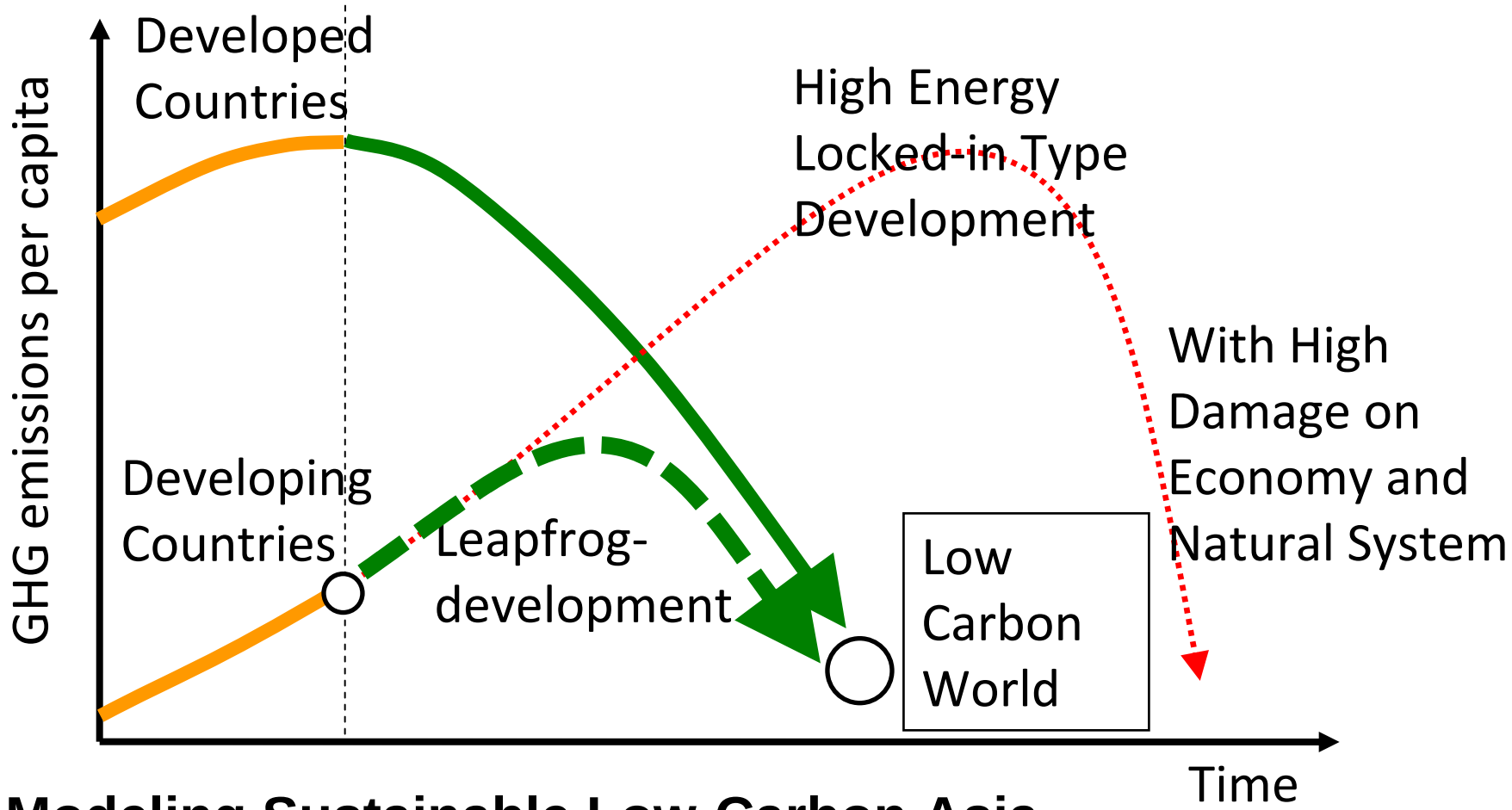
Cross-sector

A Dozen Actions

1. Comfortable and Green Built Environment
2. Anytime, Anywhere Appropriate Appliances
3. Promoting Seasonal Local Food
4. Sustainable Building Materials
5. Environmentally Enlightened Business and Industry
6. Swift and Smooth Logistics
7. Pedestrian Friendly City Design
8. Low-Carbon Electricity
9. Local Renewable Resources for Local Demand
10. Next Generation Fuels
11. Labeling to Encourage Smart and Rational Choices
12. Low-Carbon Society Leadership

Asian LCS scenarios study

AIM/LCS



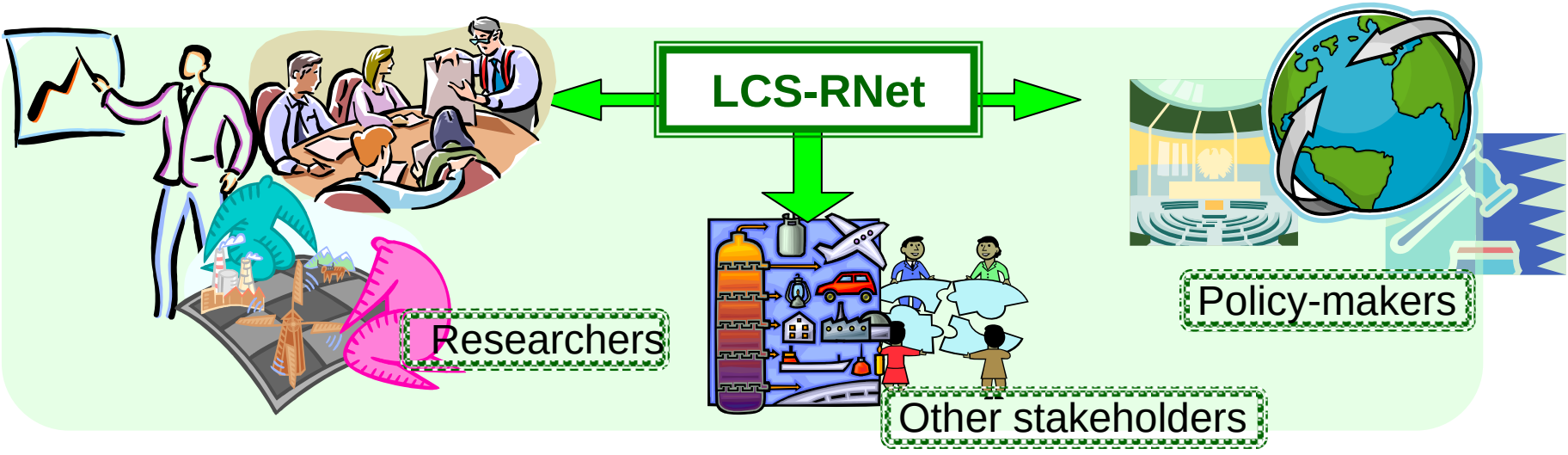
Modeling Sustainable Low-Carbon Asia

We have just started new research project "Asian Low-Carbon Society Scenario Development Study" (project leader: Mikiko Kainuma) during FY2009-2013, funded by Global Environmental Research Program, MOEJ

AIM International Workshop since 1995

LCS-Research Network

Linkages and interactions between research activities and policy processes for science-based policy making towards LCS

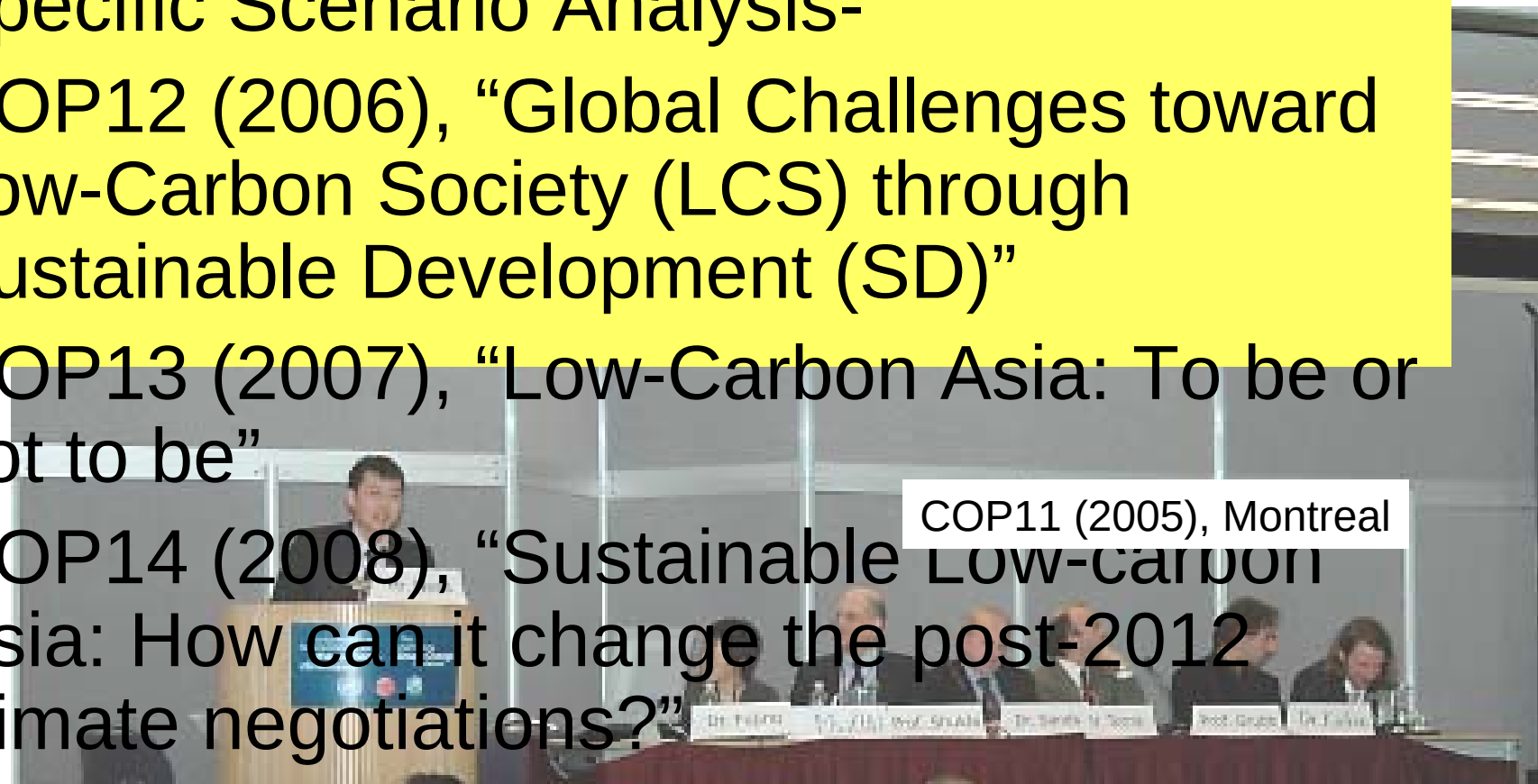


- Information exchange and research cooperation amongst research institutions of any CRS related fields,
- Dialogues with policy-makers, businesses, citizens and others to share possible visions on future LCS,
- Contribution to international political processes on climate change including the G8 process by providing research outcomes and recommendations.

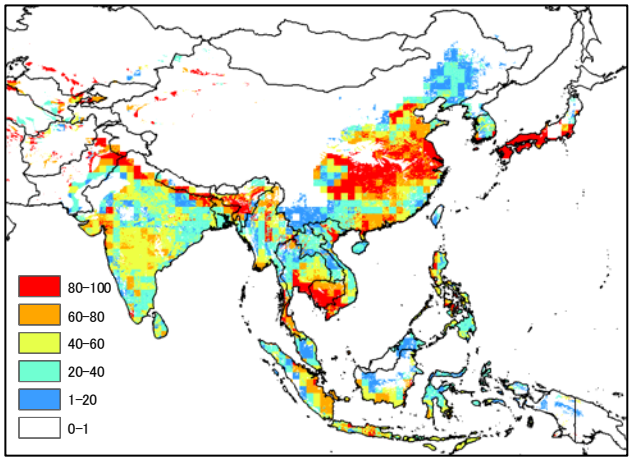
1st Annual Meeting will be held in Bologna Italy, 12-13 Oct 2009

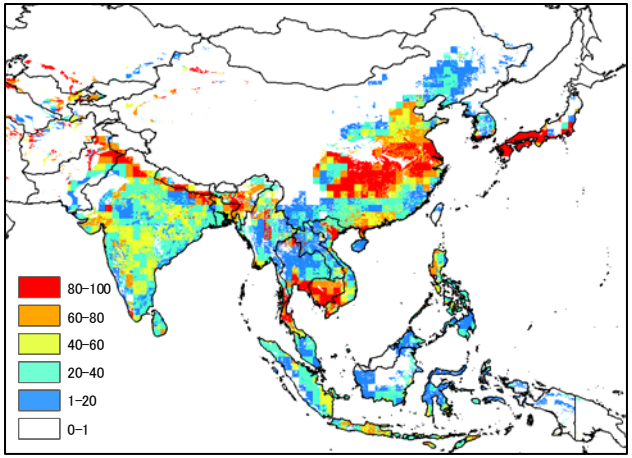
Side Event at UNFCCC/COP

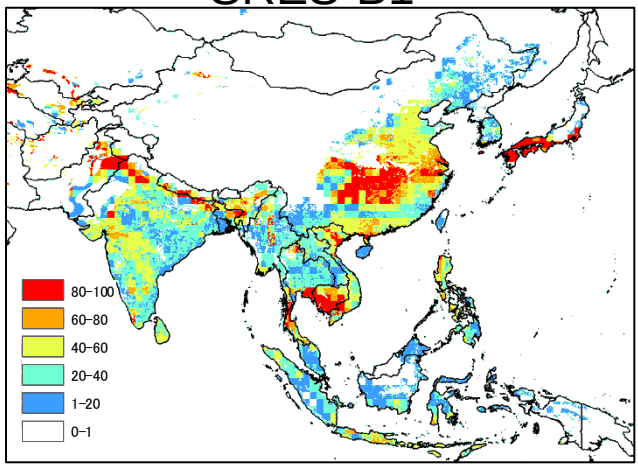
- COP11 (2005), “Global Challenges Toward Low-Carbon Economy -Focus on Country-Specific Scenario Analysis-”
- COP12 (2006), “Global Challenges toward Low-Carbon Society (LCS) through Sustainable Development (SD)”
- COP13 (2007), “Low-Carbon Asia: To be or not to be”
- COP14 (2008), “Sustainable Low-carbon Asia: How can it change the post-2012 climate negotiations?”

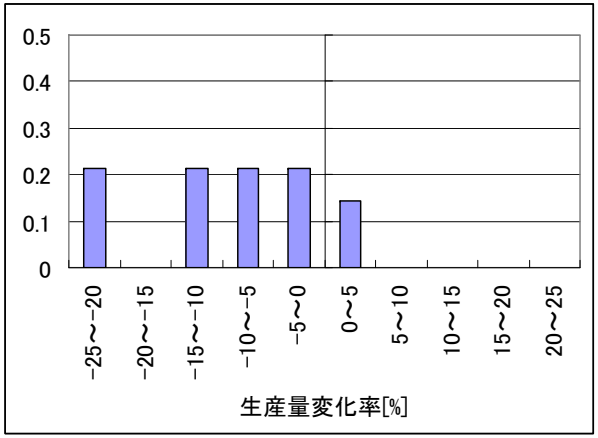


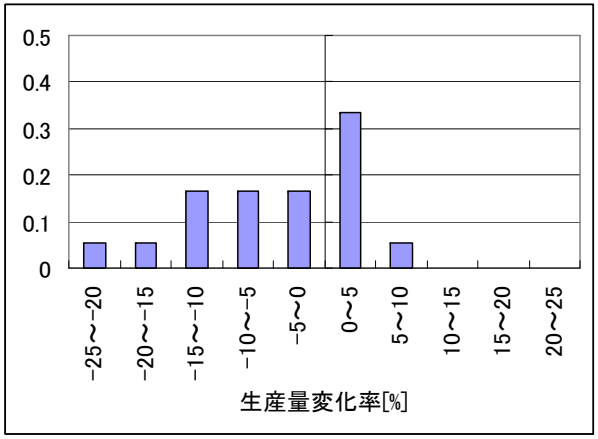
COP11 (2005), Montreal

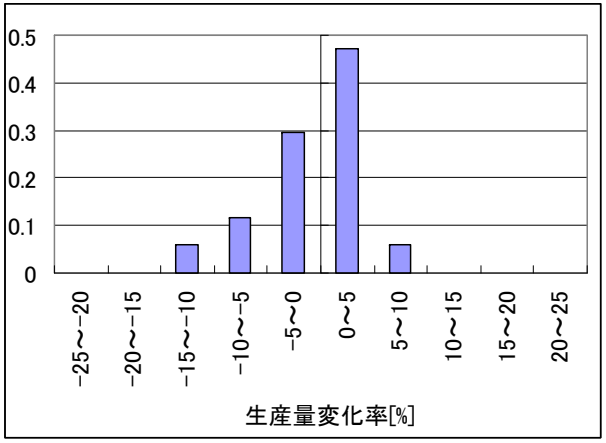












Example of impact assessment considering uncertainty of climate projection

Crop productivity assessments using plural GCM projections evaluated in IPCC-AR4

Impact on rice productivity

Probability of crop productivity decrease [%] (with CO2 fertilization；2080s-1990s)

PDFs of estimated productivity change (Asia；with CO2 fertilization； 2080s-1990s)