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Scenario approach and climate mitigation actions toward sustainable society

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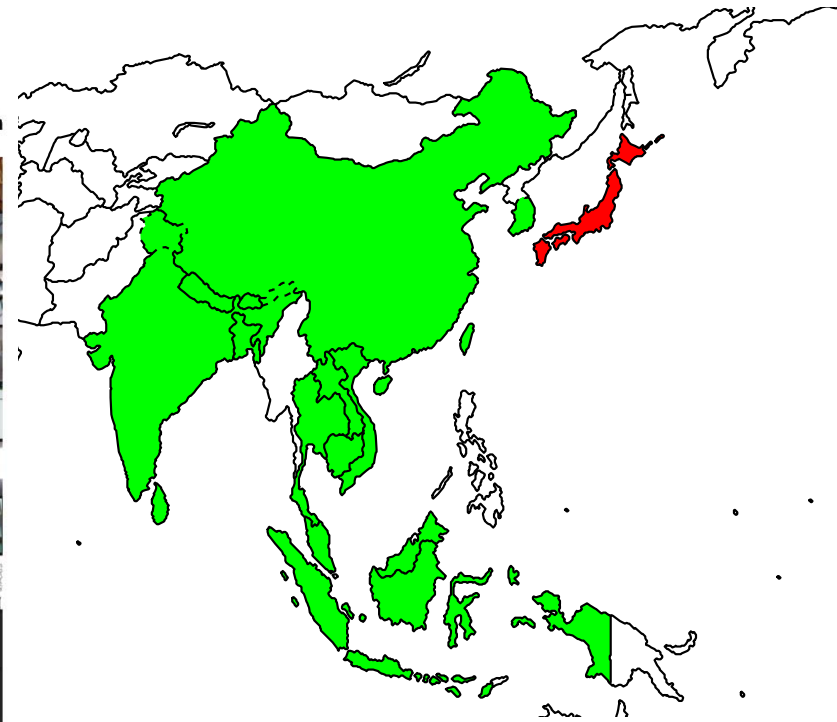
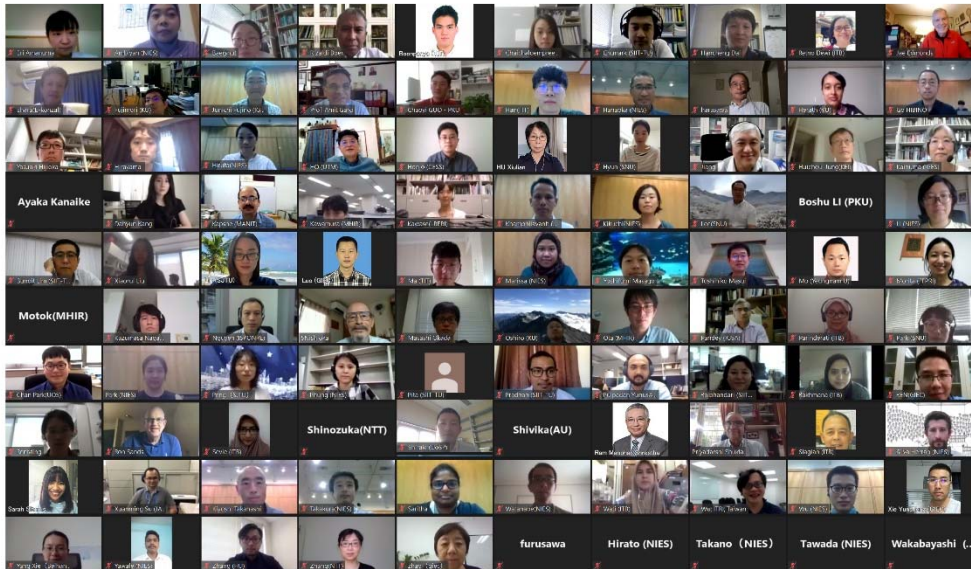
Minamata online science sessions

Mercury emissions: Estimation and projection

November 5, 2020

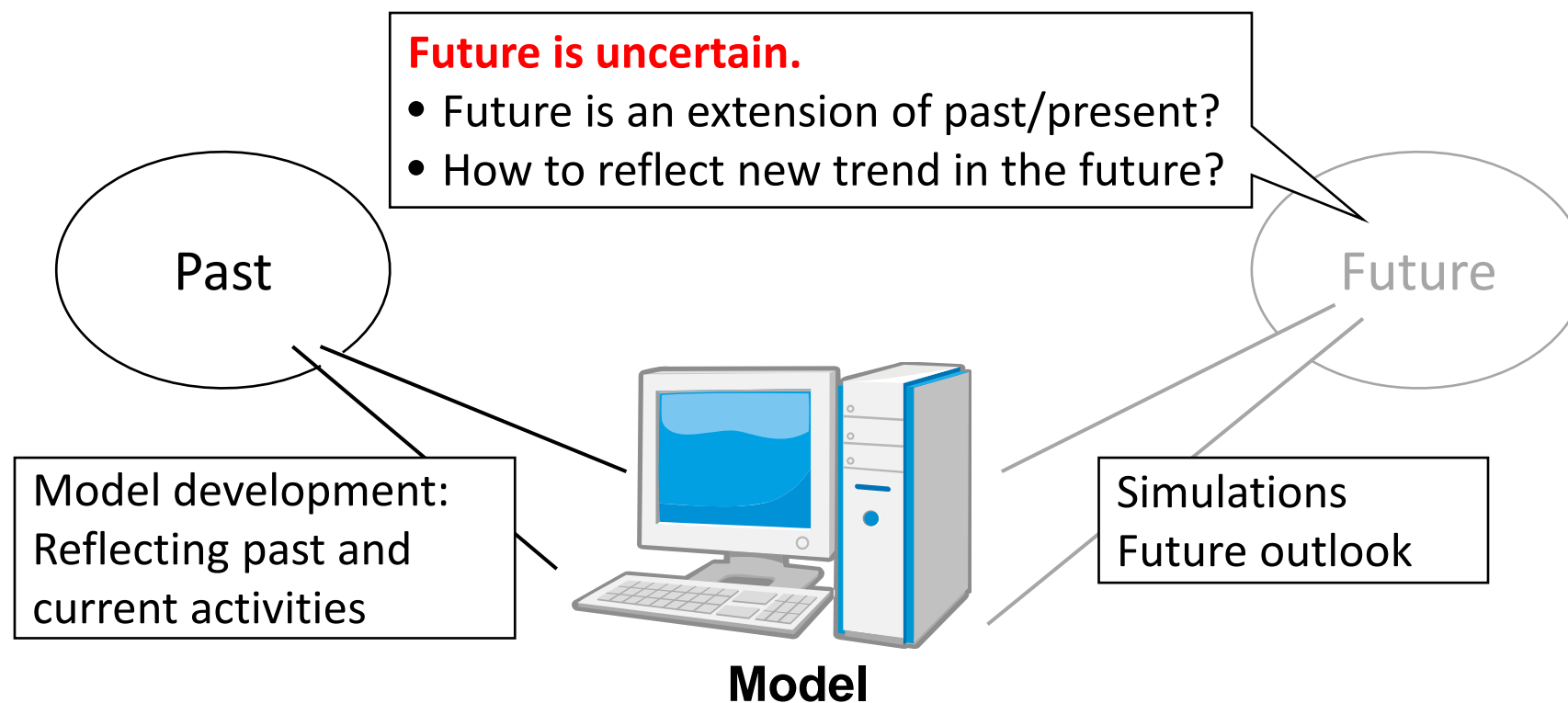
International Network of AIM (Asia-Pacific Integrated Model)

AIM International Workshop 26th



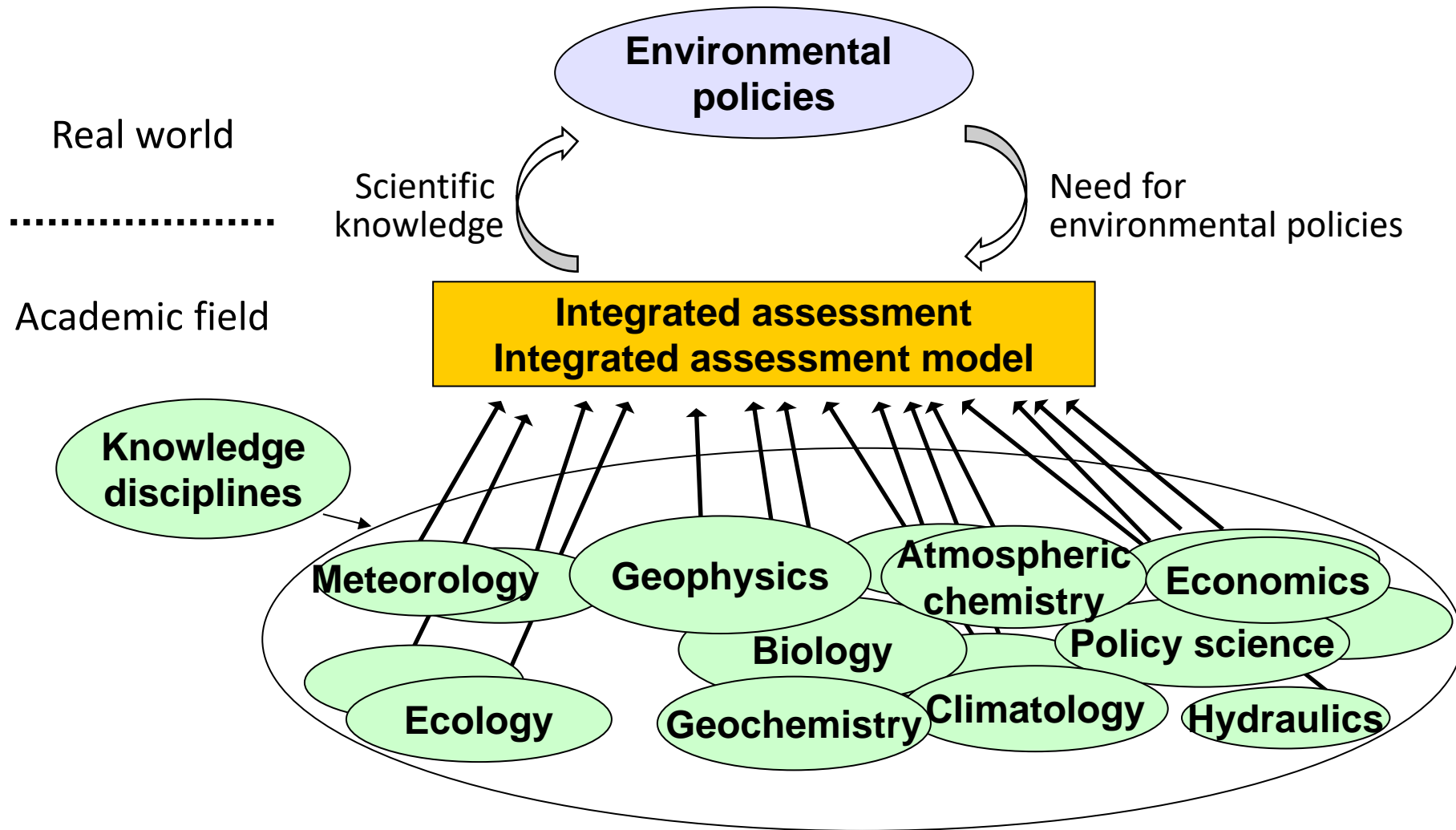
- Asian countries will update their mitigation target and roadmap to achieve the 2/1.5 degree target reflecting their issues to be solved and the resources to be endowed.
- Model can be a collaboration tool between science and decision making process. From the long-term viewpoint, each country will need the capacities to develop model and scenarios by itself.
- AIM (Asia-Pacific Integrated Model) has supported Asian countries to develop the integrated assessment model and their long-term low carbon scenarios.

How to assess the future using a model?

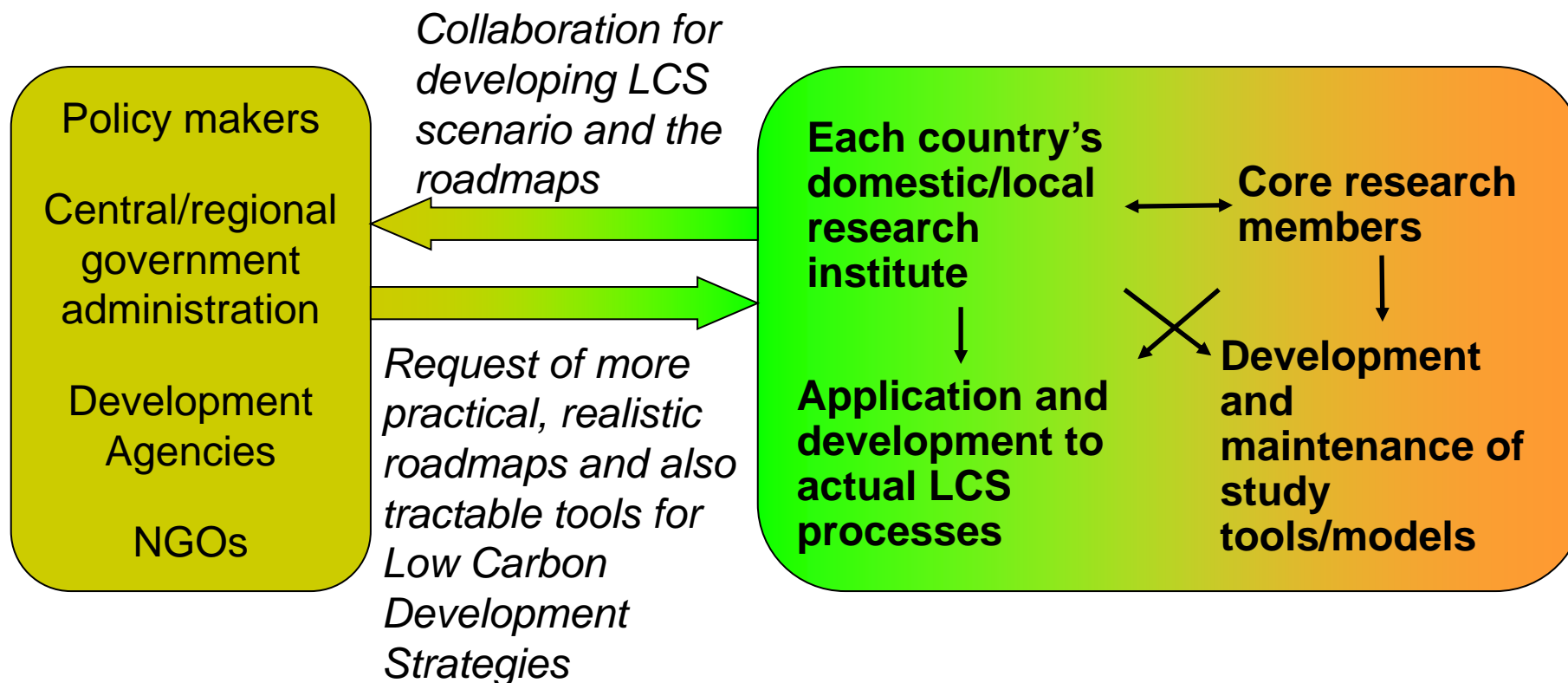


- Model cannot predict the future, but only shows a result corresponding to a set of inputs.
 - Model has both subjective and objective aspects.
 - Model has both advantages and disadvantages.
- We need to use model to meet a purpose.

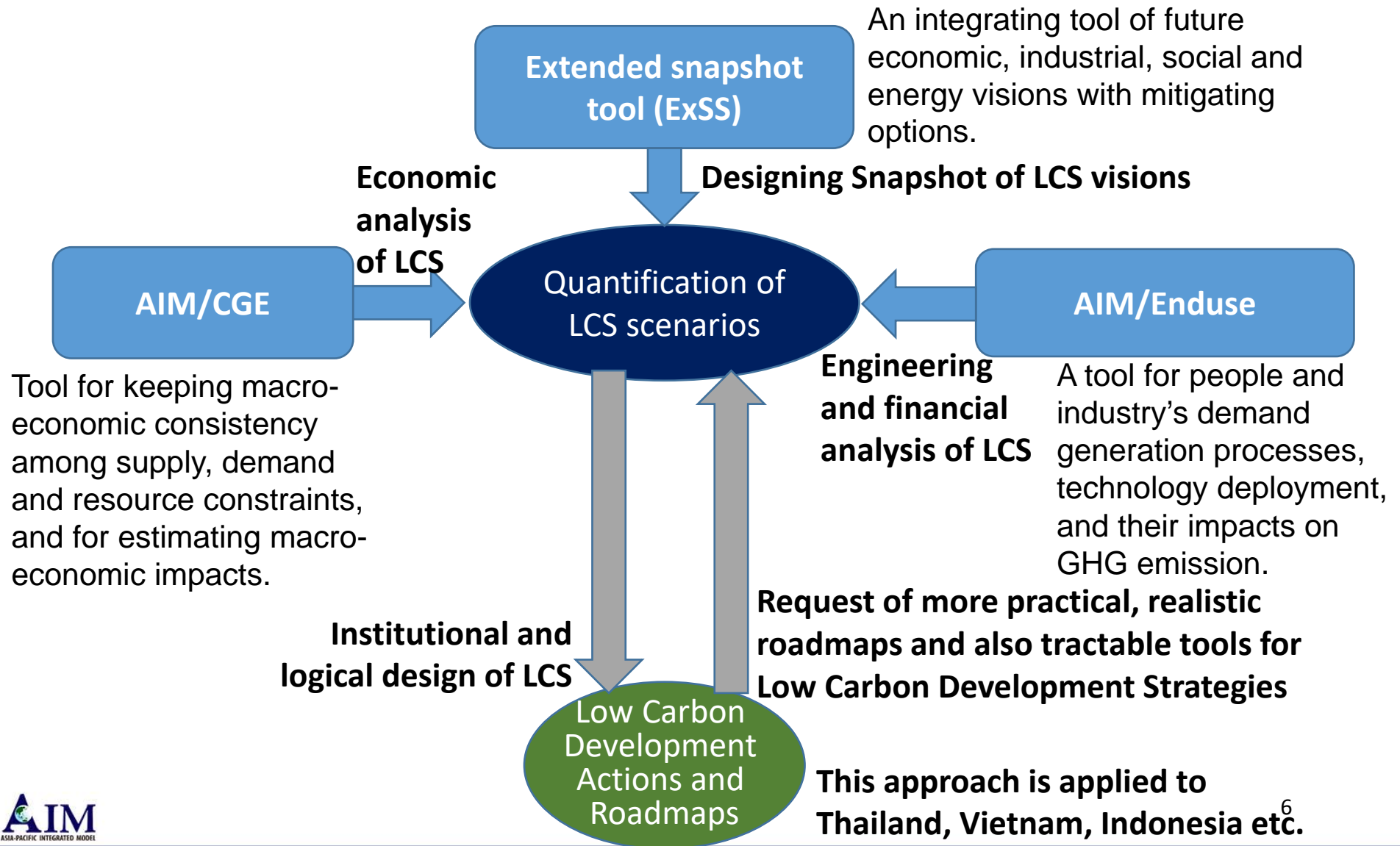
Integrated Assessment Model as a tool to support environmental policies



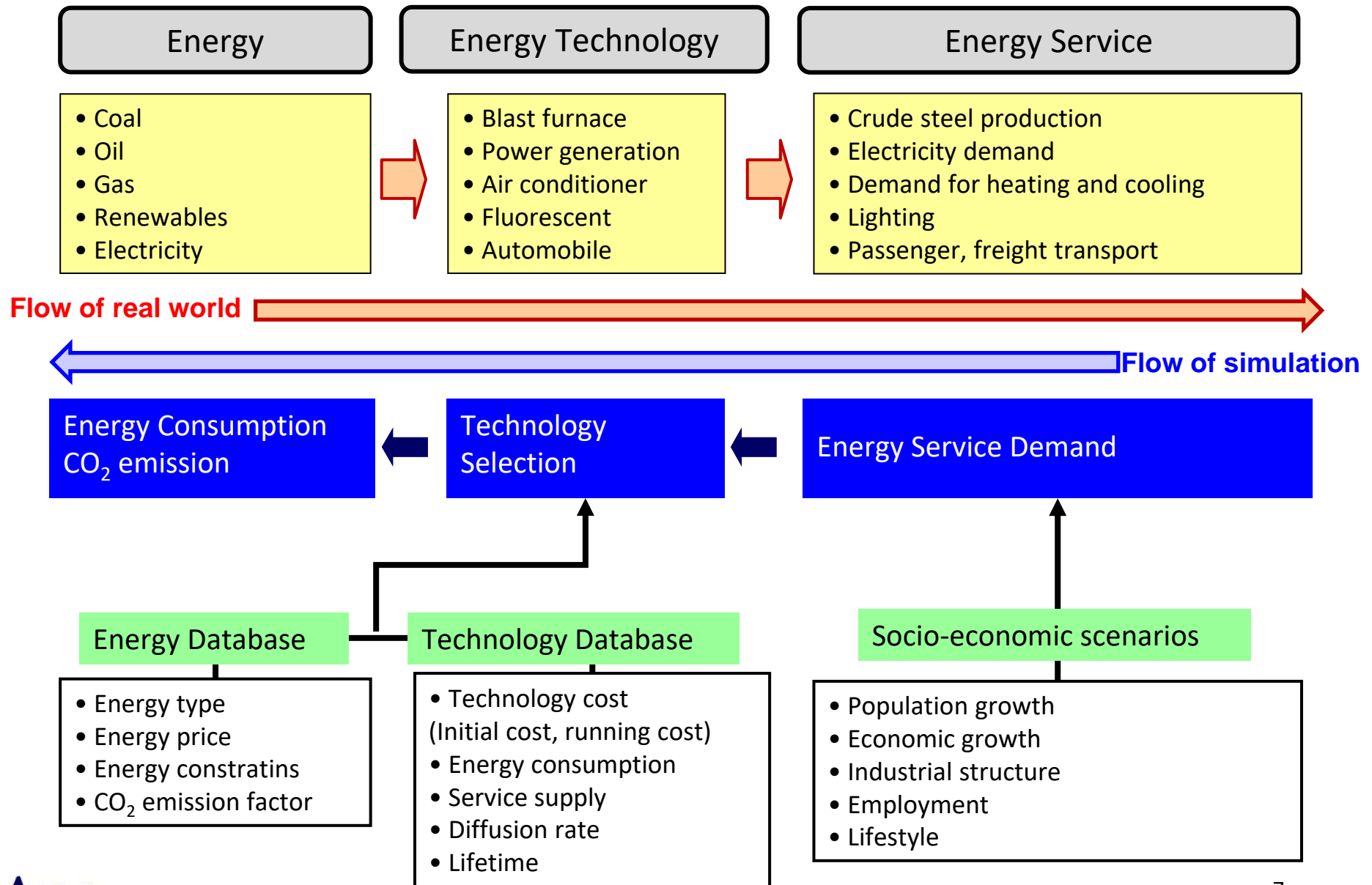
Scenario approach towards Low Carbon Society in Asia



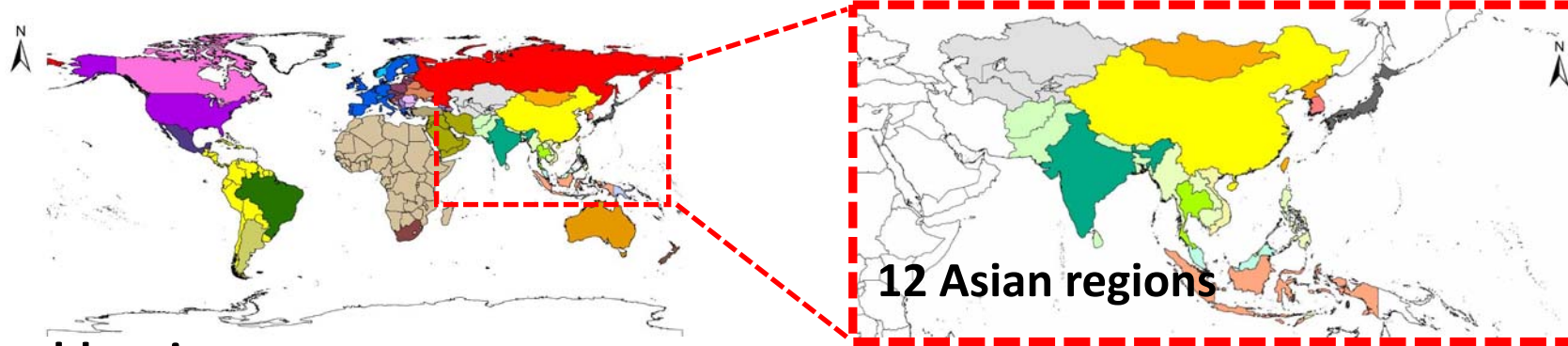
How to combine the tools in order to keep consistency and unity among socio-economic policies and LCS actions



Overview of AIM/Enduse model



AIM/Enduse [Global]



32 world regions

- JPN(Japan)
- USA(USA)
- CAN(Canada)
- KOR(Korea)
- AUS(Australia)
- XE15(EU-15 in Western Europe)
- TUR(Turkey)
- MEX(Mexico)
- NZL(New Zealand)
- XE10(EU-10 in Eastern Europe)
- XEWI(Other Western Europe in Annex I)
- BRA(Brazil)
- RUS(Russia)
- XE2(EU-2 in Eastern Europe)
- XEEI(Other Eastern Europe in Annex I)
- ARG(Argentine)
- CHN(China)
- XSA(Other South Asia)
- XENI(Other Europe)
- XLM(Other Latin America)
- IND(India)
- XEA(Other East Asia)
- XCS(Central Asia)
- ZAF(South Africa)
- IDN(Indonesia)
- XSE(Other South-east Asia)
- XOC(Other oceania)
- XAF(Other Africa)
- THA(Thailand)
- MYS(Malaysia)
- VNM(Viet Nam)
- XME(Middle East)

	CO ₂	CH ₄	N ₂ O	SO ₂	NO _x	BC	OC	PM ₁₀	PM _{2.5}	CO	NM VOC	NH ₃	HFCs	PFCs	SF ₆	CFCs	HCFCs
Energy supply	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
Fuel mining		✓									✓						
Industry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transport	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
Building	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
Waste		✓	✓								✓						
Agriculture		✓	✓									✓					
Others	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					

Note1) ✓ shows the coverage of target gases in the model

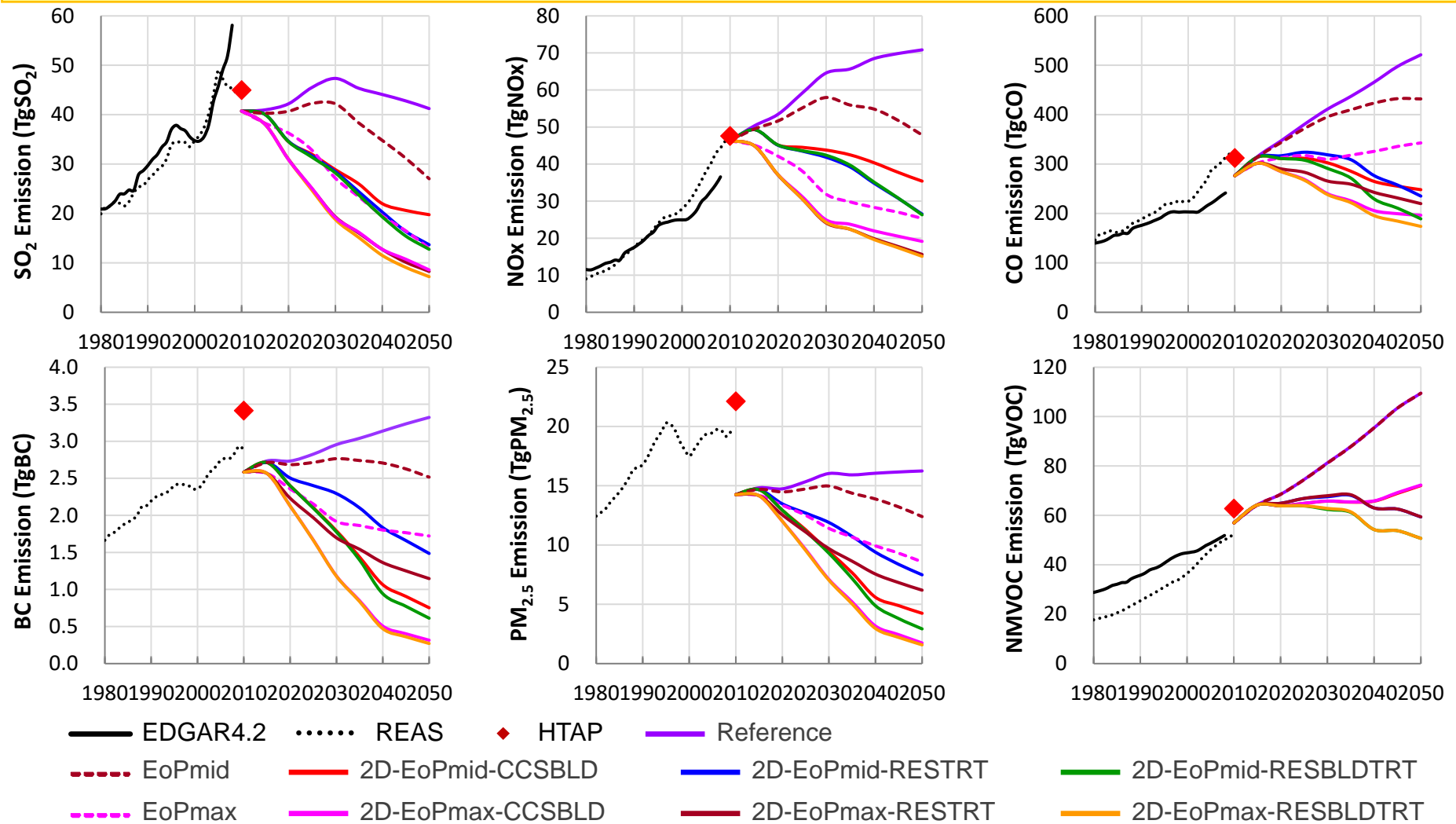
Note2) Within the same gas-type,

- shows most emitting sector
- shows 2nd major emitting sectors

- shows moderately emitting sectors
- shows minor sectors

SLCP and Air Pollutant emissions pathways in Asia - compared to emission inventory (EDGAR, REAS, HTAP) -

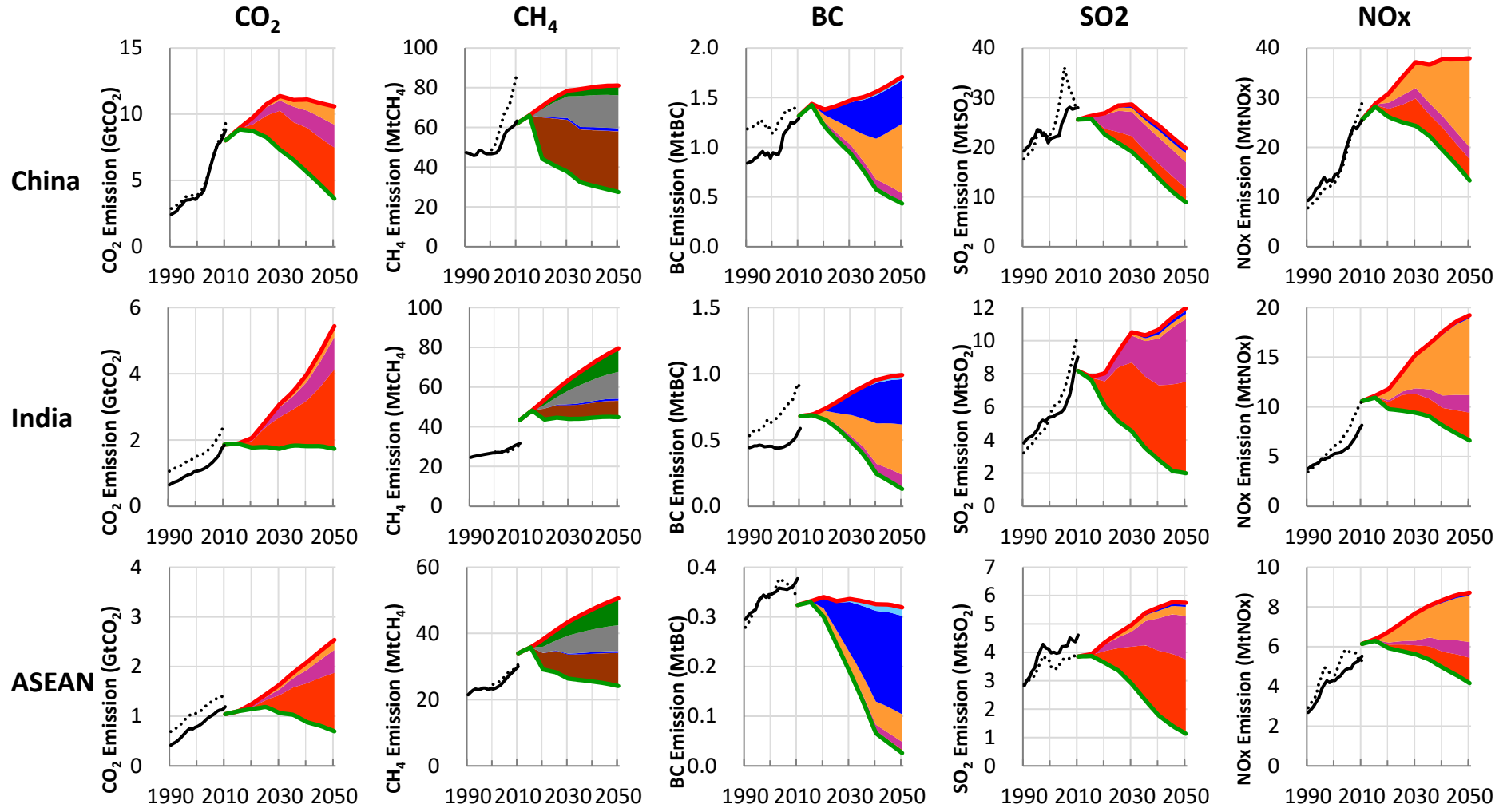
Emissions pathways of SLCPs and air pollutants are different due to combinations of low-carbon and end-of-pipe measures, even if CO₂ emission pathways equivalent to 2°C are similar.



Sector-wise Mitigation Potentials

Major sectors with mitigation potentials are different depending on gas types.

- China, India and ASEAN toward the 2°C target-



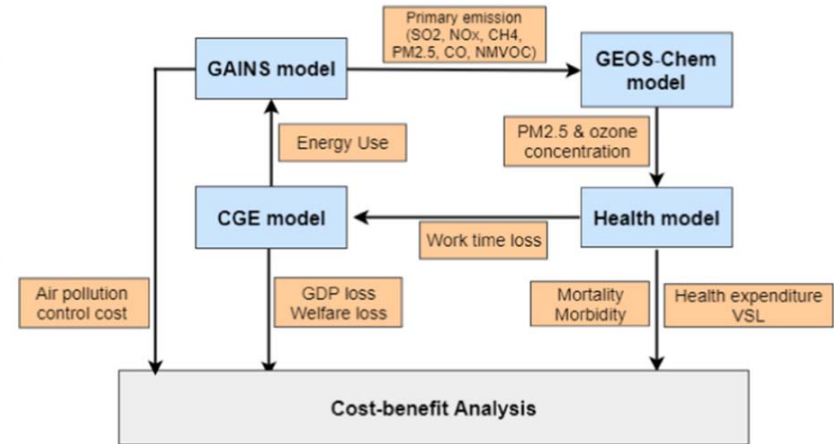
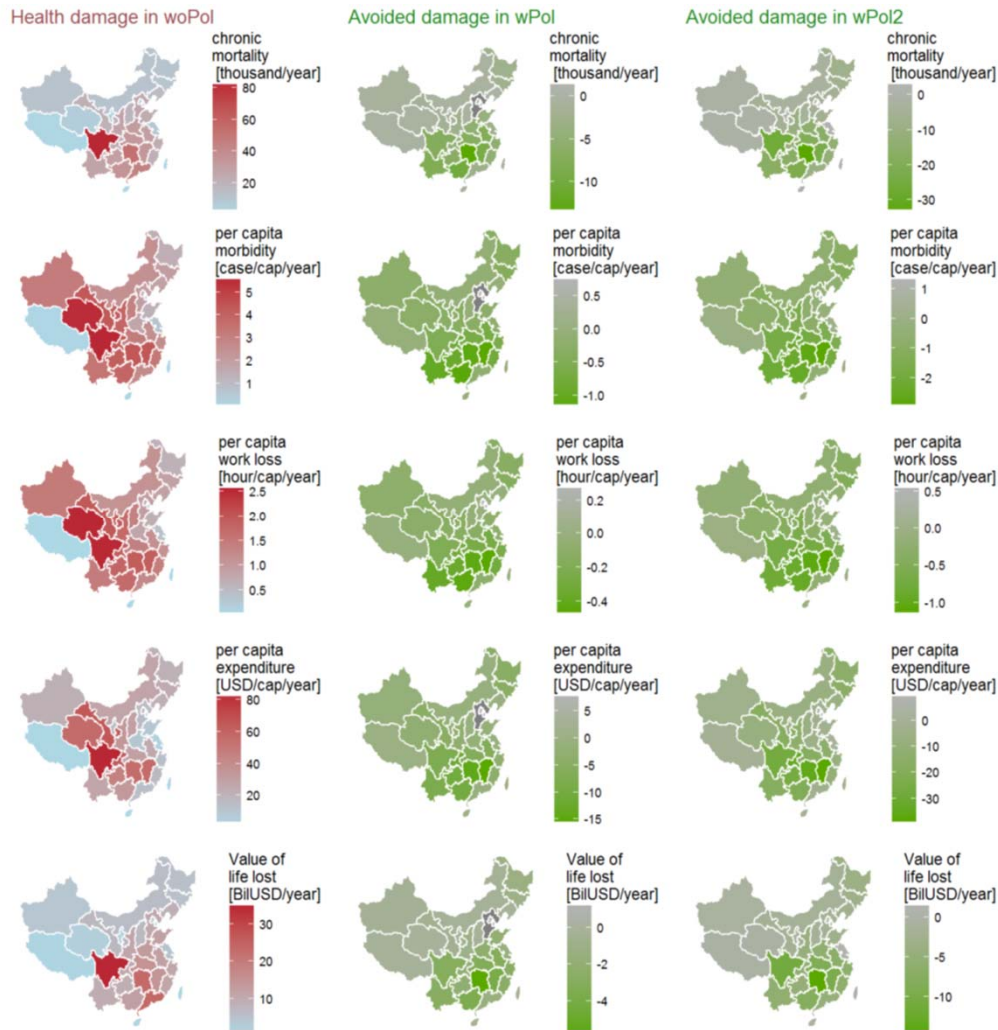
Emission Pathway ——— EDGAR v4.3 REAS v2 ——— Reference ——— 2°C target

Mitigation potential ■ Power ■ Fuel mining ■ Industry ■ Transport ■ Residential ■ Commercial ■ Waste ■ Agriculture



Source) Hanaoka, T, Hirayama, T, Hibino, G. Masui, T. (2020) JpGU-AGU Joint Meeting

Health damage due to ozone pollution (left/red) and damage avoided due to mitigation in 2030 (right/green).



Scenario	Description
Reference	Ignore health impacts of air pollution, health service cost, premature deaths and work loss days.
wPol	Penetration rate of mitigation technologies is fixed to the 2005 level.
wPol	Various air pollution control technologies are introduced to reduce pollutant emissions and air pollutants concentrations to levels below wePol scenario.
wPol2	Further reduction of emissions in 2030; NOx, VOC and CO by 50% and CH4 by 20% from the wPol scenario.

Source) Xie, Y., Dai, H., Zhang, Y. Hanaoka, T. and Masui, T. (2017). Health and Economic Impacts of Ozone Pollution in China: a provincial level analysis. Atmospheric Chemistry and Physics Discussions. 1-63. 10.5194/acp-2017-849.

Discussion:

How to use model realize sustainable society?

- Identify sources of pollutants and direct/indirect impacts due to pollutants.
- Reflect how to control future pollutants to model.
 - ✓ Technologies
 - ✓ Socio-economic conditions
 - ✓ Policies
- Draw various future pathways using model and its simulations.
- Discuss the future scenarios with stakeholders.
 - ✓ co-benefit
 - ✓ trade off
 - ✓ how to consider non-market cost/benefits?
- IPCC AR6 WG3 covers both long-term global emission scenarios (Ch3) and near/mid-term national scenarios (Ch4) using various integrated assessment models.