Plenary Session: How We Could Promote Evidence-Based Policymaking by Bridging the Gap between Policymakers and Research Communities?
Introduction of this session:
Model and policy making process

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LoCARNet 7th Annual Meeting Program
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Asia-Pacific Integrated Model
http://www-iam.nies.go.jp/aim/index.html

AIM ASIA-PACIFIC INTEGRATED MODEL

NIES *JAPAN*

International Network of AIM (Asia-Pacific Integrated Model)

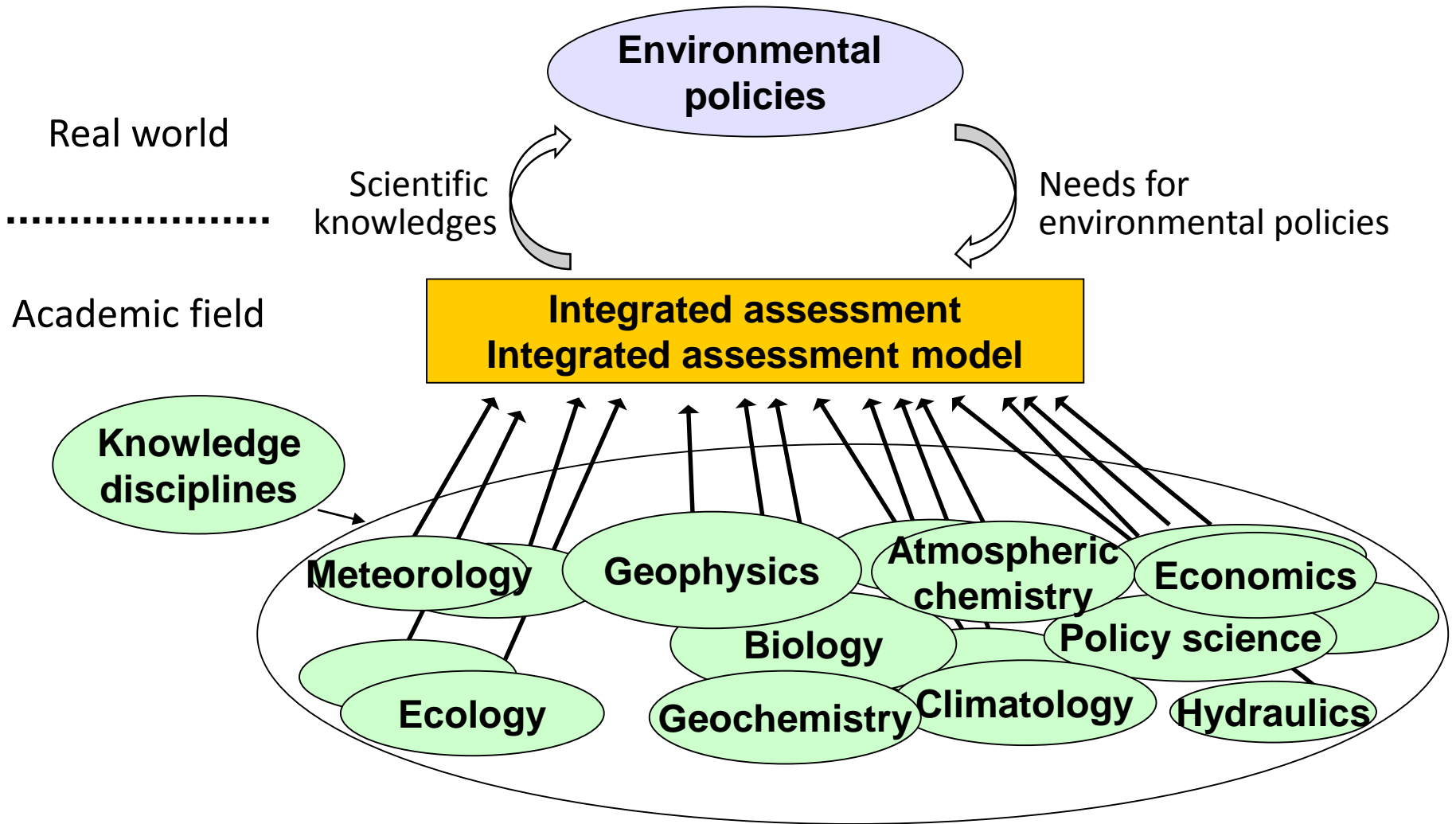The 24th AIM International Workshop
@NIES, Japan, Nov 5-6, 2018
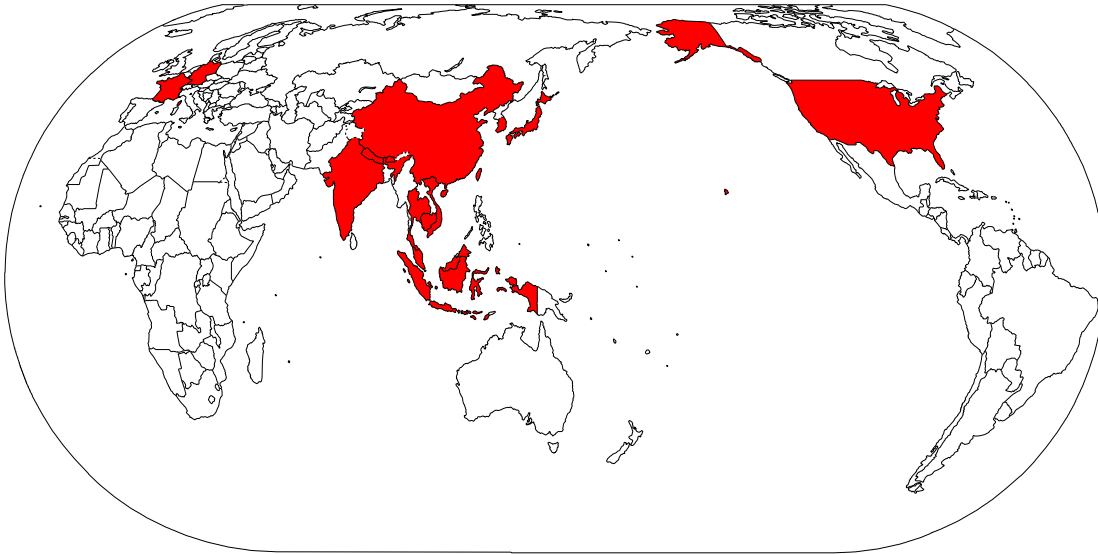
- Asian countries will update their mitigation target and roadmap to achieve the 2/1.5 degree target reflecting their issues to be solved and the resources to be endowed.

- 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.
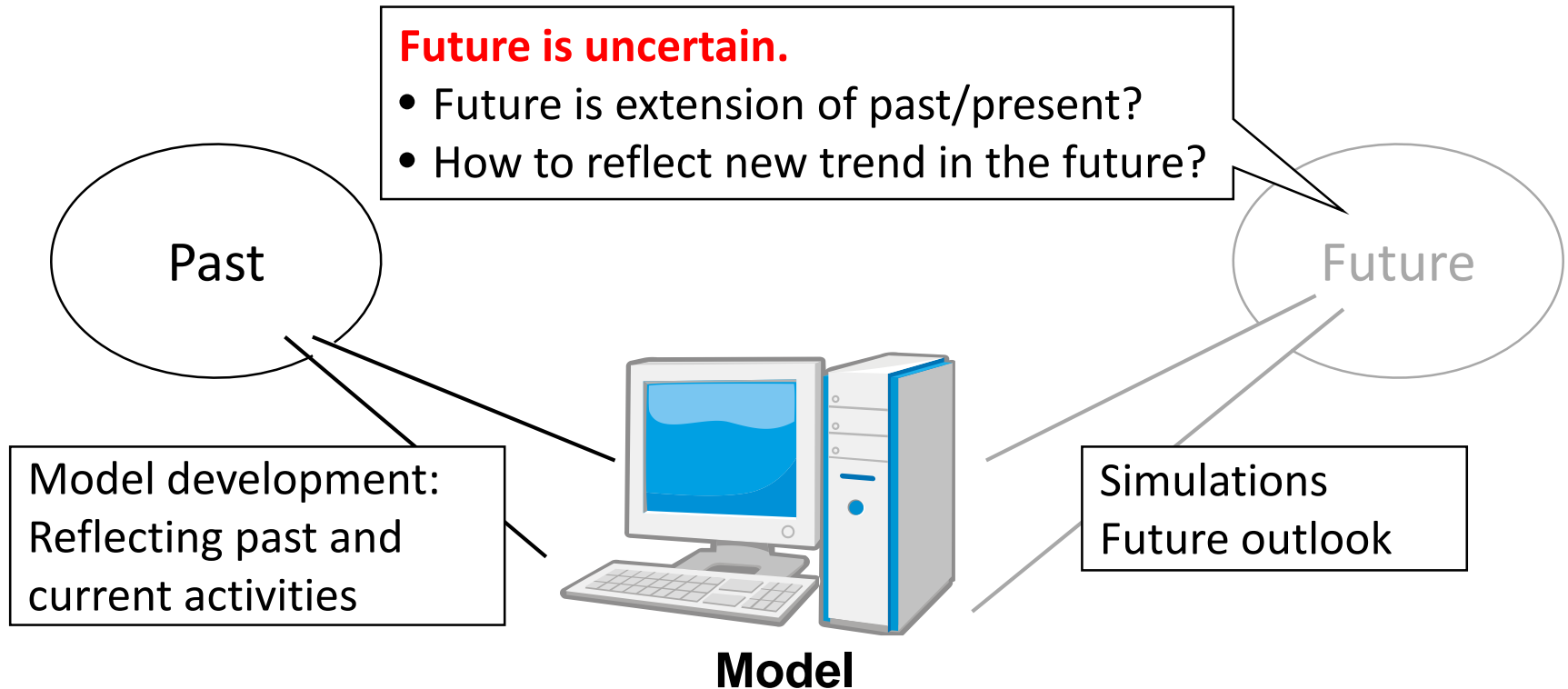
Overview of AIM (Asia-Pacific Integrated Model)

Real World

Mitigation Target, Climate Policy, Capacity building, …

Model World

Emission Model

carbon tax

IPCC/WG3

GHG emissions

Simple Climate Model

【Account model】
【Enduse model】
【Economic model】

【Global】
【Country】
【Local/City】

long-term vision

AIM/Impact [Policy]

temperature

mid-term target

【sequential dynamics】 【dynamic optimization】

Impact/Adaptation Model

IPCC/WG2

low carbon scenario

IPCC/integrated scenario

feedback

Agriculture

Water

Human health

future society

Other Models

| Population | Transportation | Residential |
| AFOLU | Stock-flow | Life-style |

【Global】↔【National/Local】

adaptation

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Model as a tool to support environmental policies

How to assess future using model?

Future is uncertain.
- Future is extension of past/present?
- How to reflect new trend in the future?

Past

Future

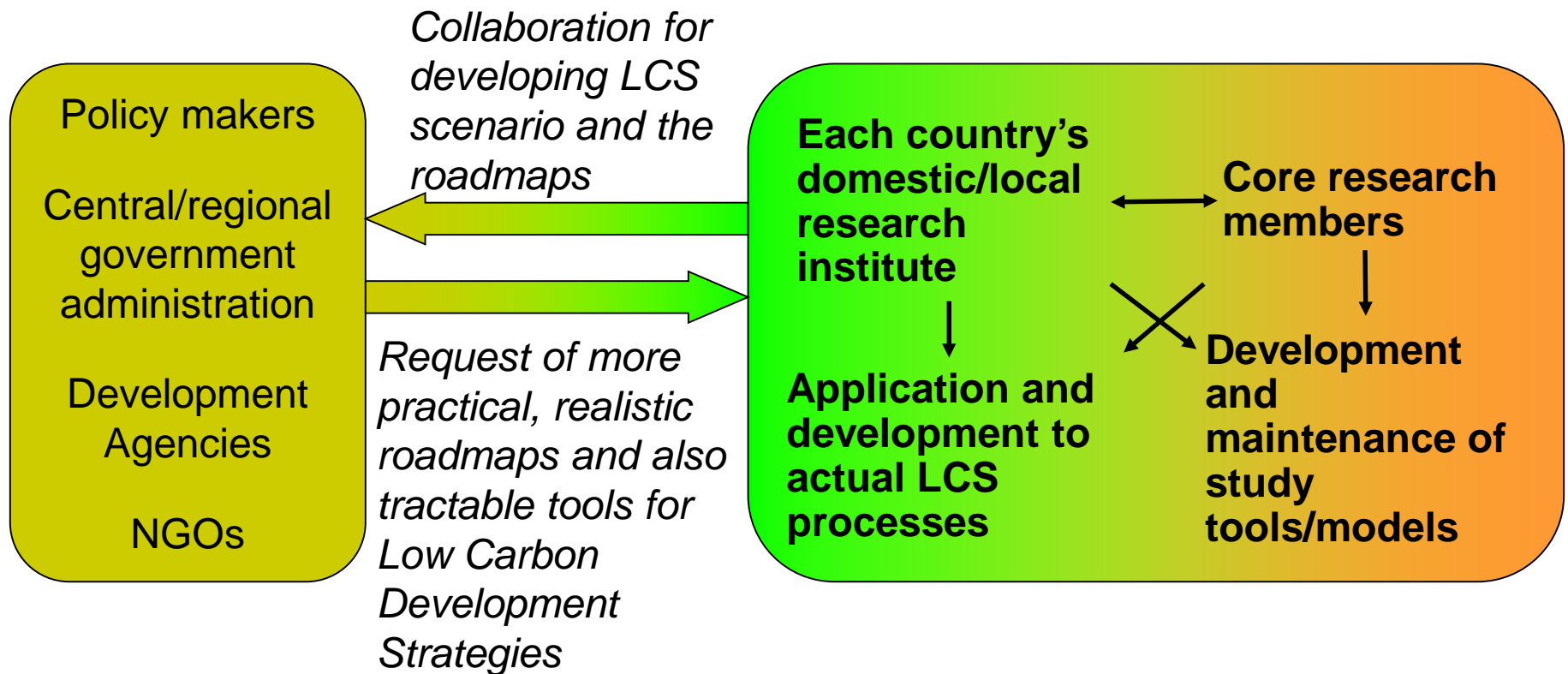Model development:
Reflecting past and
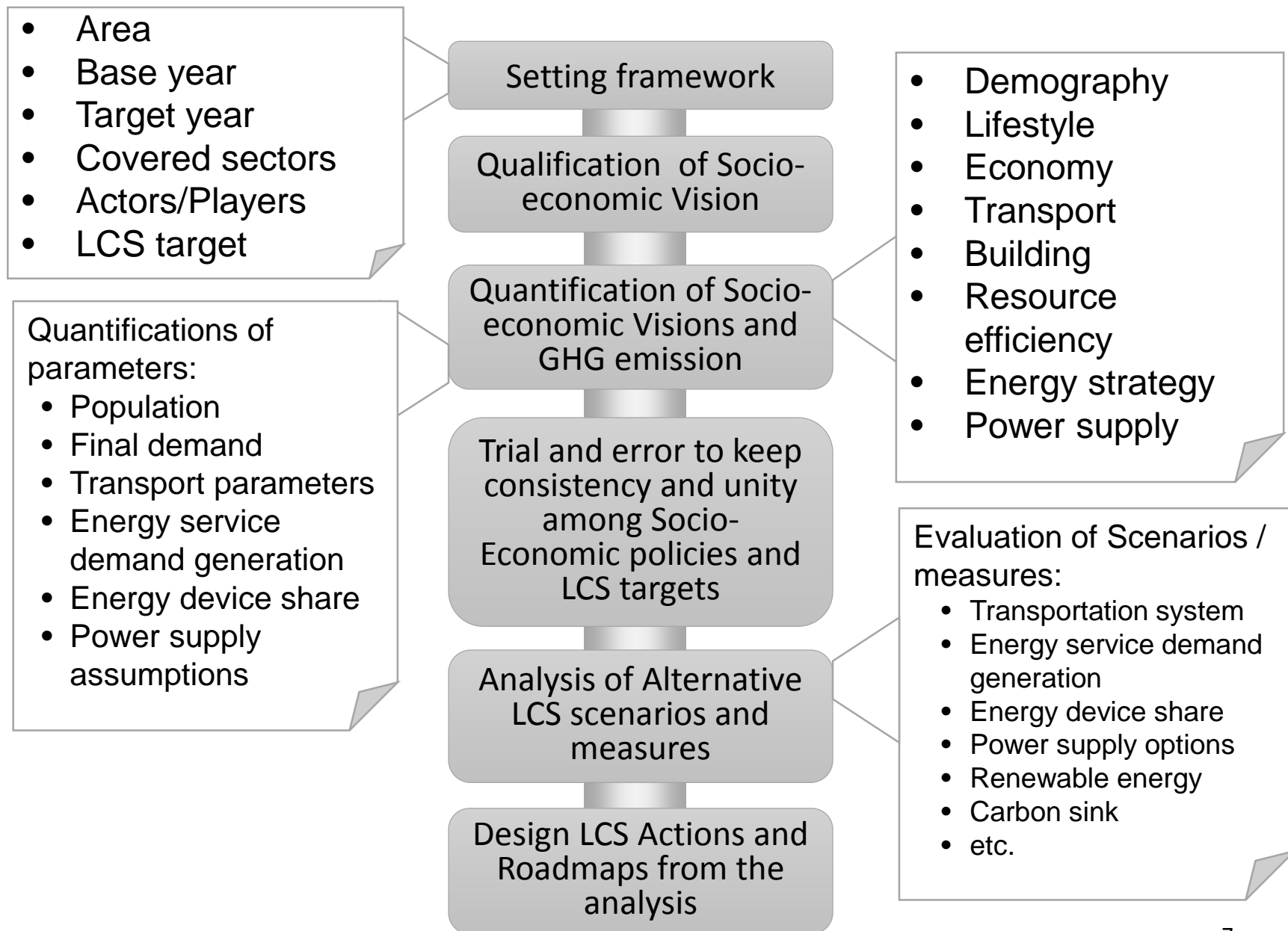current activities

Simulations
Future outlook

Model

- Model cannot predict 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.
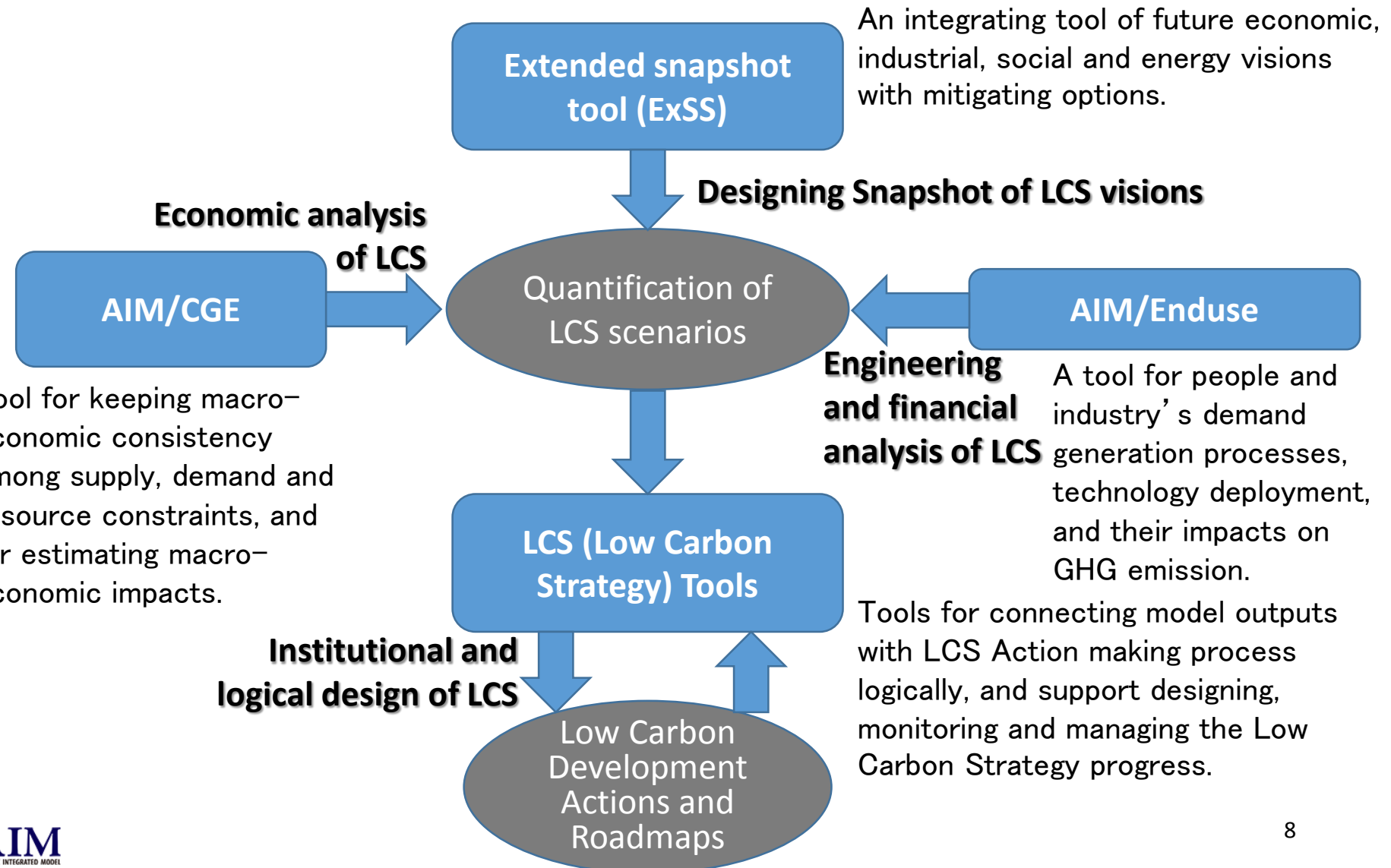- → We will have to use model to meet purpose.

Collaboration with Asian countries;
Scenario approach towards Low Carbon Society in Asia

Policy makers

Central/regional government administration

Development Agencies

NGOs

Collaboration for developing LCS scenario and the roadmaps

Request of more practical, realistic roadmaps and also tractable tools for Low Carbon Development Strategies

Each country's domestic/local research institute

Core research members

Application and development to actual LCS processes

Development and maintenance of study tools/models

Overall research procedure of our LC Society Scenario approach

- Area
- Base year
- Target year
- Covered sectors
- Actors/Players
- LCS target

Quantifications of parameters:
- Population
- Final demand
- Transport parameters
- Energy service demand generation
- Energy device share
- Power supply assumptions

Setting framework

Qualification of Socio-economic Vision

Quantification of Socio-economic Visions and GHG emission

Trial and error to keep consistency and unity among Socio-Economic policies and LCS targets

Analysis of Alternative LCS scenarios and measures

Design LCS Actions and Roadmaps from the analysis

- Demography
- Lifestyle
- Economy
- Transport
- Building
- Resource efficiency
- Energy strategy
- Power supply

Evaluation of Scenarios / measures:
- Transportation system
- Energy service demand generation
- Energy device share
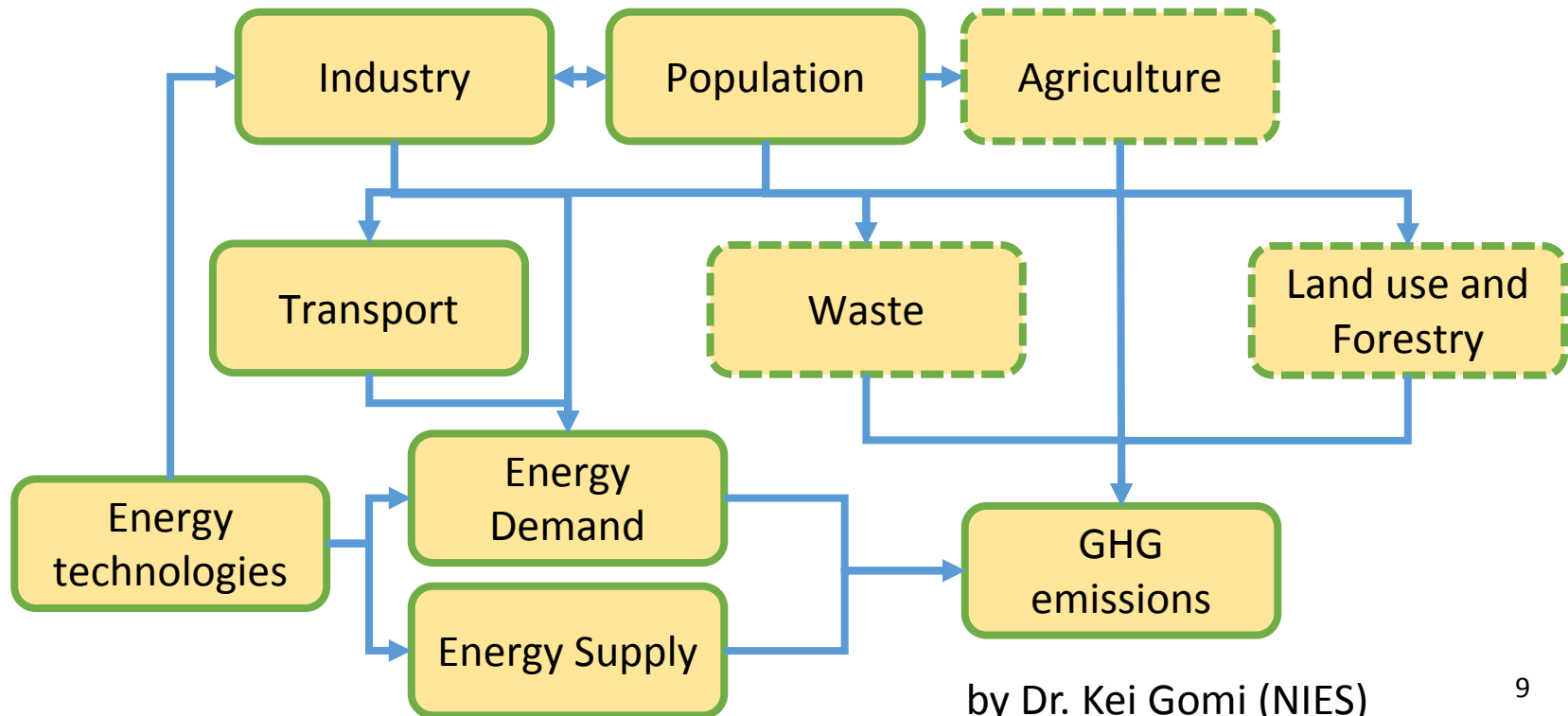- Power supply options
- Renewable energy
- Carbon sink
- etc.

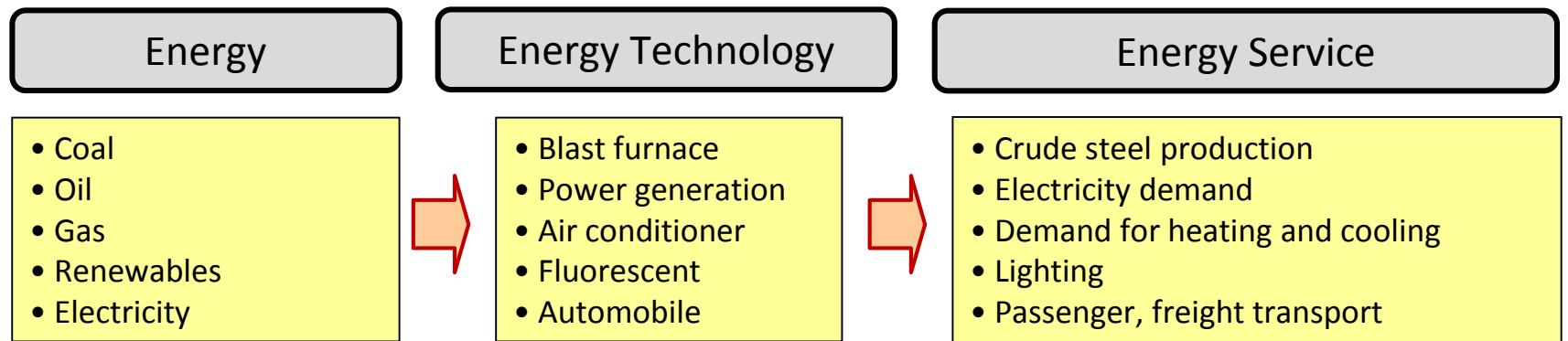# How to combine the tools in order to keep consistency and unity among Socio-Economic policies and LCS actions

Extended snapshot tool (ExSS)

An integrating tool of future economic, industrial, social and energy visions with mitigating options.

Designing Snapshot of LCS visions

Economic analysis of LCS

AIM/CGE

Tool for keeping macro-economic consistency among supply, demand and resource constraints, and for estimating macro-economic impacts.

Quantification of LCS scenarios

AIM/Enduse

Engineering and financial analysis of LCS

A tool for people and industry's demand generation processes, technology deployment, and their impacts on GHG emission.

LCS (Low Carbon Strategy) Tools

Institutional and logical design of LCS

Tools for connecting model outputs with LCS Action making process logically, and support designing, monitoring and managing the Low Carbon Strategy progress.

Low Carbon Development Actions and Roadmaps

Extended Snapshot Tool (ExSS)

- Extended Snapshot Tool (ExSS) is an accounting type, static model consists of simultaneous equations with about 6000 variables.

- It describes socio-economic activity, energy consumption, power generation, technology diffusion and GHG emissions in a future year.

- Coupled with waste and AFOLU model, it can show a comprehensive vision of a country or a region as a low-carbon society.

- Data requirement: Input-output table, energy balance table, demography, and transport data in a base year.

by Dr. Kei Gomi (NIES)

Overview of AIM/Enduse model

Energy	Energy Technology	Energy Service

| • Coal
• Oil
• Gas
• Renewables
• Electricity | • Blast furnace
• Power generation
• Air conditioner
• Fluorescent
• Automobile | • Crude steel production
• Electricity demand
• Demand for heating and cooling
• Lighting
• Passenger, freight transport |

Flow of real world →

← **Flow of simulation**

Energy Consumption CO_2 emission	←	Technology Selection	←	Energy Service Demand

Energy Database	Technology Database	Socio-economic scenarios

| • Energy type
• Energy price
• Energy constratins
• CO_2 emission factor | • Technology cost
(Initial cost, running cost)
• Energy consumption
• Service supply
• Diffusion rate
• Lifetime | • Population growth
• Economic growth
• Industrial structure
• Employment
• Lifestyle |

by Dr. Tatsuya Hanaoka (NIES)   10

Concept of AIM/CGE (Computable General Equilibrium)

Market: supply and demand of every commodity/factor are balanced through price mechanism.

supply＞demand → decreasing price
supply＜demand → increasing price

Production sector: Maximizing profit under available technology

CGE model can show the economic impacts such as carbon price, GDP change etc. in the case of GHG emission reduction.

Production sector

Available tech.

Intermediate demand

Equilibrium price

Production

International market

Trade

P

Supply

Demand

Q

Market

Trade balance

Production factors

Final cons.
Fixed cap. formation

Preference
Available tech.
Endowment of factors

Household

Government

Collection of tax
Income distribution

Household: Maximizing utility under income constraint

Examples of brochures introducing Asian Low Carbon Scenarios
Communication and feedbacks of LCS study to real world

Malaysia
- Putrajaya
- Cyberjaya
- Iskandar Malaysia

India
- Bhopal
- Ahmedabad

Vietnam
Bangladesh
Indonesia
Cambodia

Japan
- Kyoto
- Shiga

China
- Guan Zhou
- Dalian

Thailand
- Ratchaburi
- KhonKaen

S. Korea
- Kyonggi-do

http://2050.nies.go.jp/

Training workshop of AIM

For policy makers

- To understand
  - the model concept and meaning,
  - necessary inputs to assess the specific environmental policies,
  - how to use the model results.

- for 2-3 days training

For researchers

- To understand
  - in addition to the points for policy makers,
  - the model detail,
  - how to revise the program to meet the clients' requests,
  - how to explain the model results to the stakeholders.

- at least for several months

Training Workshop to introduce ExSS, Enduse and CGE

- Jan. 30-Feb. 1 2017, SIIT-TU, Thailand
- Bhutan, Cambodia, China, Indonesia, Korea, Malaysia, Nepal, Thailand, Vietnam

Capacity development in Asia by AIM

- Sep. 4 - Oct. 13, 2017 at NIES: CGE
  - ✓ Bhutan, Malaysia, Nepal, Thailand and Vietnam

- Oct. 23 - 27, 2017 at NIES: Enduse
  - ✓ China, Sri Lanka and Vietnam

Training workshop of AIM/Enduse model at SIIT, Thammasat University, Thailand

AIM team had a training workshop of AIM/Enduse model at SIIT, TU, Thailand from June 11 to 15, 2018.

Beginners course on 11th June: 11 participants including ONEP, CITC/TGO

Advanced course on 12th – 15th June: 5 participants

Training workshop of AIM/CGE model at SIIT, Thammasat University, Thailand

With support from Prof. Bundit Lim, AIM team had a training workshop of AIM/CGE model at SIIT, TU, Thailand from June 26 to July 5, 2018.

Discussion with policymakers in Thailand and JICA

CGE model development for Thailand, Nepal and Bhutan

Stakeholder meeting using AIM/CGE
in Bhutan, on May 17-18, 2018

Capacity Building Workshop on Low Carbon Development for Lao PDR and Cambodia

@ National University of Laos, on November 19, 2018

From experiences of Japan

- Model can be a core tool to assess future vision.
  - ✓ All stakeholders must understand the model correctly.
  - ✓ Model cannot predict the future but only show a consistent figure.
  - ✓ By using model, we can experiment.

- Data to be input to model is the most important.
  - ✓ Latest technologies will have to be updated continuously, because speed of technology improvement is very rapid.
    Support of business sectors are required.
  - ✓ Not only direct mitigation actions but also indirect mitigation actions including preference change become important.
  - ✓ Scheduled revision of simulations can support climate policy.

- Not only model but also clear narrative storylines are needed in order to communicate with various stakeholders and disseminate accurate information about simulation results.

Stakeholder dialogue in France

The National Council for Energy Transition (2012-2013): 7 x 16 members

1. Environmental NGOs

2. Consumer Associations

3. Trade-Unions

4. Industry

5. Local authorities

6. Parliament

7. Administration

+ Expert Group

+ Citizen Group

*P. Criqui, UGA-CNRS, GAEL-edden*   *LCS-RNet*   *Wuppertal September 2016*   *7*

Patrick Criqui (2016) Governance levels, scientific paradigms and policy instruments for Deep Decarbonization Pathways, The 8th LCS-RNet Annual Meeting, Wuppertal

Brief history of climate policy in Japan and AIM

◆ 1990; AIM project started.

• 1997; Toward UNFCCC COP3, Japan technology model (AIM/Enduse) model was used to assess the mitigation target in Japan.
  - ✓ GHG mitigation target in Japan: **-6% compared to 1990 level**

◆ 2004; Japan LCS research started (in 2009, Asia LCS research started).

➤ 2008; At G8 Toyako Summit, at least 50% reduction of global emissions by 2050 was agreed.

• 2008; Based on three types of models (global technology model, Japan technology model and Japan economy model), options of Japan's middle-term target (2020 target) on GHG reduction were calculated.
  - ✓ Role of model was to provide 6 options as GHG mitigation target. (Final decision was done by policymakers.)
  - ✓ GHG mitigation target in Japan: -15% compared to 2005 level (-7% to 1990 level)

• 2009-2011; By using Japan technology model and Japan economy model, the possibility of "**25% reduction in 2020 compared to 1990 level**" was assessed.
  - ✓ Role of model was to show how to achieve the -25% target.

➤ Great East Japan Earthquake and Fukushima Dai-ichi Nuclear Power Plant Accident in 2011

• The new mitigation target in 2020 was decided to be **"-3.8% compared to 2005 (+3.1% to 1990 level)"** on November 15, 2013.
  - ✓ Assumption: No nuclear power in 2020.

• As a Japan's mitigation target, **"26% reduction compared with 2013 level"** was endorsed by the Cabinet on July 17, 2015.

    Unfortunately, these days, models have no role to play for decision of mitigation target.

• In 2016, Cabinet decided **80% reduction of GHG in 2050 compared with present level**.

• Since 2016, MOEJ started to discuss long-term low carbon vision in Japan.

• In August 2018, Long-Term Strategy under the Paris Agreement as Growth Strategy started at the Prime Minister's Office.

• In July 2018, the 5th Strategic Energy Plan was approved by the Cabinet.

Sectoral GHG emissions in Japan in 2030

High economic growth case estimated by AIM/Enduse model
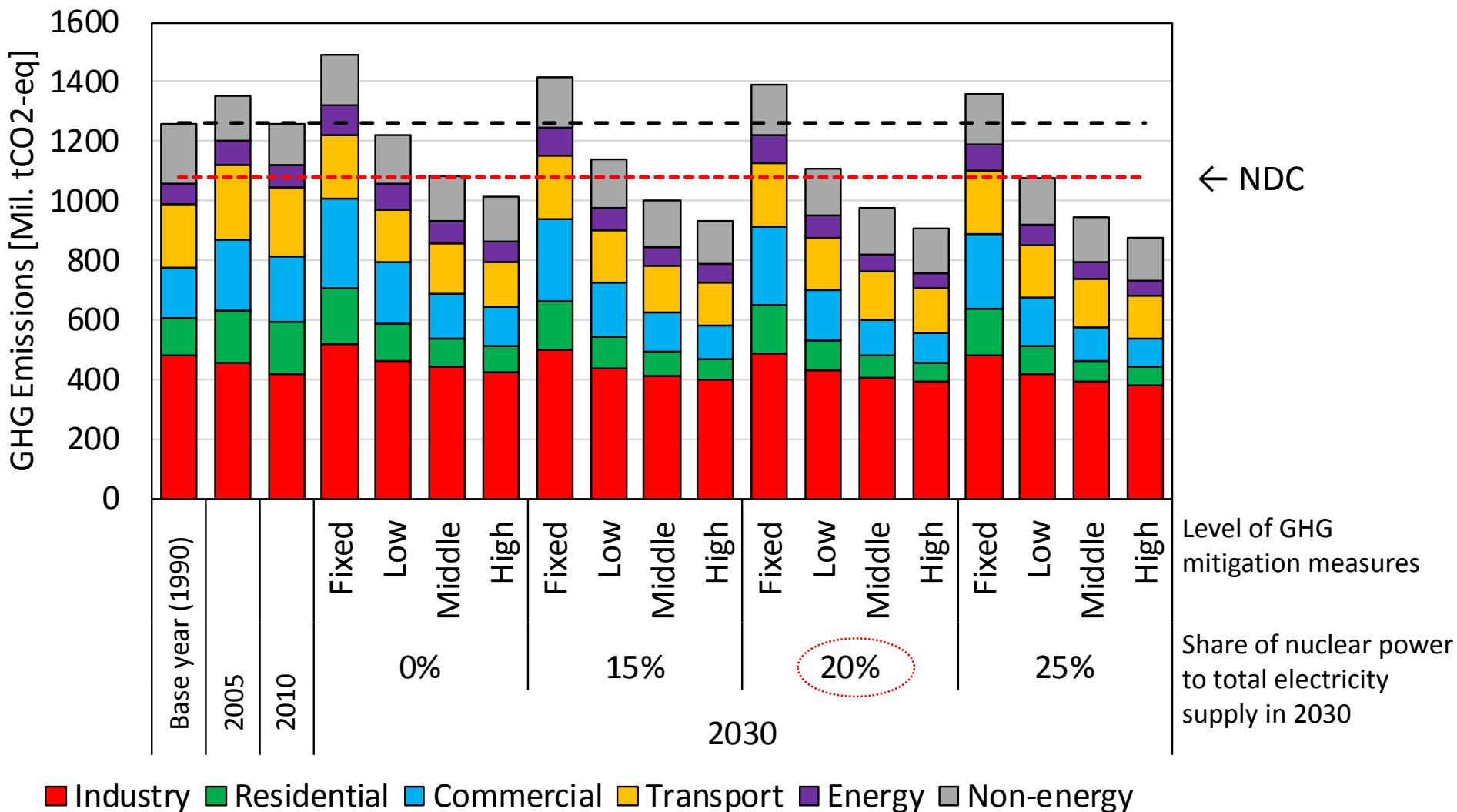
Data: Central Environment Council, as of June 2012

Necessary additional costs and saved energy costs
estimated by AIM/Enduse model

Investment options to reduce GHG emissions

| Industry | Energy intensive industries |
	Industrial furnace, boiler, etc
Residential	High insulation house
	High efficient & solar water heater
	High efficient appliances & HEMS
Commercial	Energy efficient building
	High efficient & solar water heater
	High efficient appliances
Transportation	Next generation vehicles
	Low fuel consumption
Energy	PV
	Wind power
	Small scale hydro & geo-thermal
	Biomass power
	power system stabilization
	Gas pipelines
	CCS
Others (Non-Energy)	Agriculture
	Waste
	F-gas

mitigation options
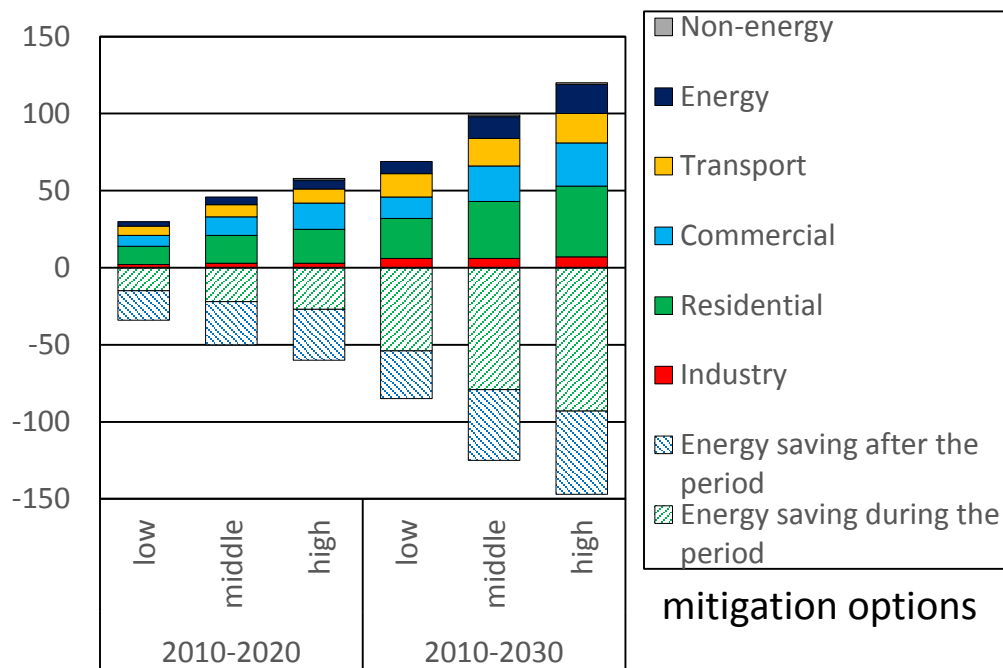
Cumulative additional investment and saved energy costs by 2020 and 2030 (unit: tri. yen)
discount rate: 3%/year

Low carbon society will need the new investment.

Data: Central Environment Council, as of June 2012

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Results of AIM/CGE as of June 2012
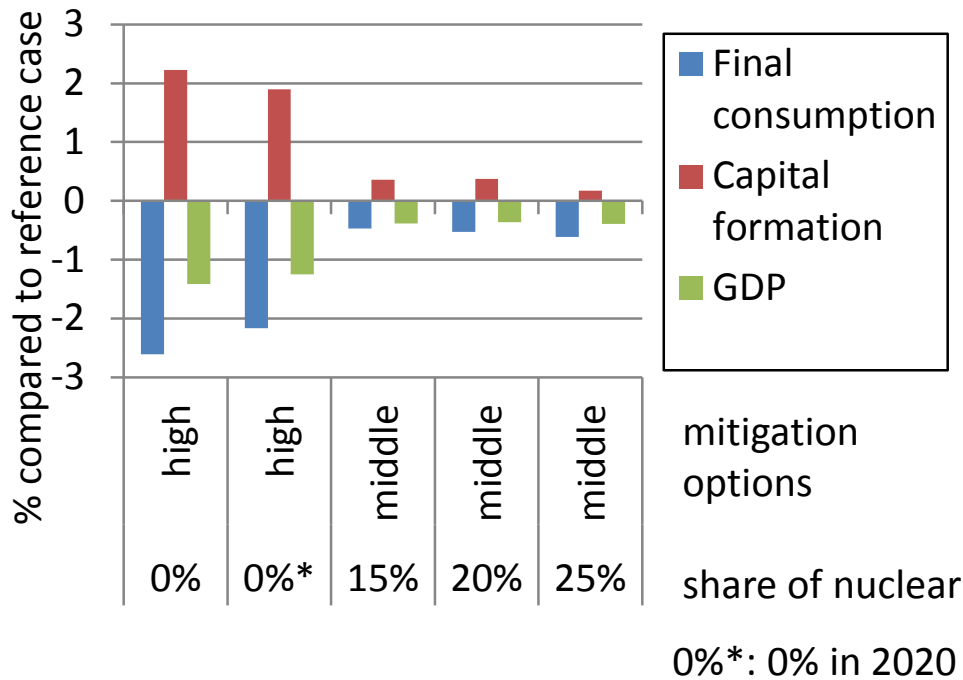
Additional investment to GHG mitigation will contribute to a domestic demand increase.
As a result, the GDP loss will be mitigated.

Macro economic impact compared to reference case in 2030, Low growth case

Long-term Low-carbon Vision by MOEJ

- Background: "Simultaneous solution" of economic and social problems such as population decrease and aging issue etc., and climate change
  - ✓ Contribution to global reduction as well as domestic reduction
  - ✓ Innovation (on technology, socioeconomic system and lifestyle) is the key
- Actions to reduce GHG by 80% by 2050
  - ✓ Energy efficiency,
  - ✓ Low-carbon energy supply, and
  - ✓ Switch to low-carbon energies in end-use
- Taking into account "Carbon budget"
- Avoiding "Lock-in" effects
- Introducing "Carbon Pricing" as a policy to strengthen market competitiveness

English summary http://www.env.go.jp/press/103822/713.pdf
Japanese full report http://www.env.go.jp/press/103822/105478.pdf

Some Asian countries' NDCs

- Bhutan: To remain carbon neutral.

- Cambodia: 27% reduction in the year 2030 compared to the baseline.

- China: To reduce carbon intensity by 60% to 65% by 2030 below 2005 levels;

- India: To lower the emissions intensity of GDP by 33% to 35% by 2030 below 2005 levels.

- Indonesia: An unconditional 2030 GHG emissions reduction target of 29% below BAU including LULUCF emissions and a conditional 41% reduction below BAU by 2030 (with sufficient international support)

- Japan: To reduce emissions by 26% below 2013 emission levels by 2030.

- Korea: To reduce greenhouse gas emissions by 37% below BAU by 2030.

- Malaysia: To reduce GHG emissions intensity of GDP by 45% by 2030 relative to the emissions intensity of GDP in 2005.

- Nepal: 50% reduction in dependency to fossil fuels by 2050.

- Thailand: An unconditional 20% reduction in emissions by 2030, compared to BaU levels. This could increase to 25%, conditional upon the provision of international support.

- Vietnam: An 8% reduction in emissions by 2030, compared to BaU. This could be increased to 25% conditional upon international support.

- USA: To reduce economy wide emissions by 26% to 28% below 2005 domestically.

- EU: To reduce greenhouse gases emissions by at least 40% domestic below 1990 by 2030.

Long-term low GHG emission development strategy

Country	Date submitted	GHG reduction target
USA	Nov. 16, 2016	80% reduction of GHG in 2050 compared to 2005 level
Mexico	Nov. 16, 2016	50% reduction of GHG in 2050 compared to 2000 level
Canada	Nov. 17, 2016	80% reduction of GHG in 2050 compared to 2005 level
Germany	Nov. 17, 2016	80-95% reduction of GHG in 2050 compared to 1990 level
France	Dec. 28, 2016	75% reduction of GHG in 2050 compared to 1990 level
UK	April 17, 2018	80% reduction of GHG in 2050 compared to 1990 level

In addition to above countries, Benin, Czech Republic, Ukraine and Republic of the Marshall Islands have already submitted their strategies.

GHG emissions in Japan; trend and future targets

Source: GIO, NIES   http://www-gio.nies.go.jp/aboutghg/nir/nir-j.html
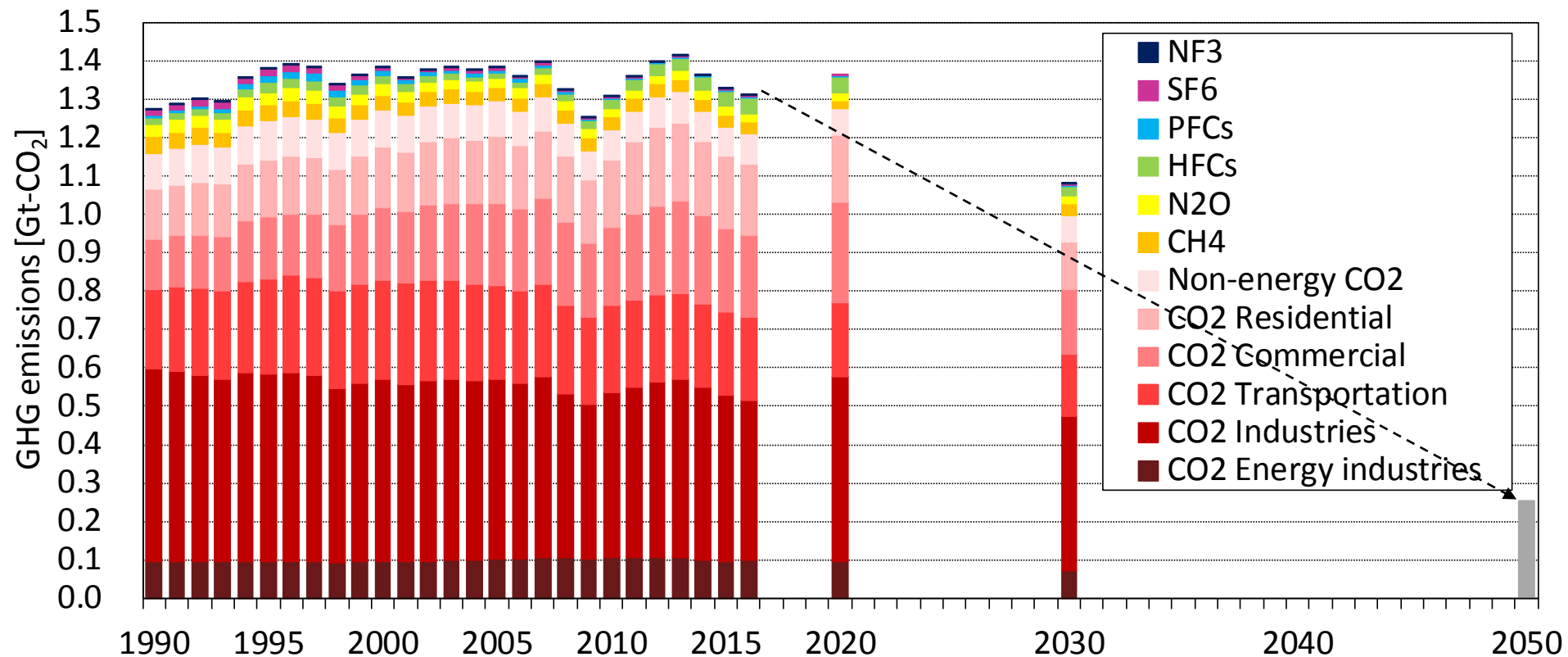
Toward 2 ℃ target / 1.5 ℃ target

- **Present NDCs are not enough to achieve 2/1,5 ℃ target.**

  ✓ Paris agreement: peak out as soon as possible, and net zero during latter half of 21st century.

  ✓ SR1.5: Reduction after 2020, and net zero emissions during 2040-2055.

Source：http://unfccc.int/resource/docs/2016/cop22/eng/02.pdf
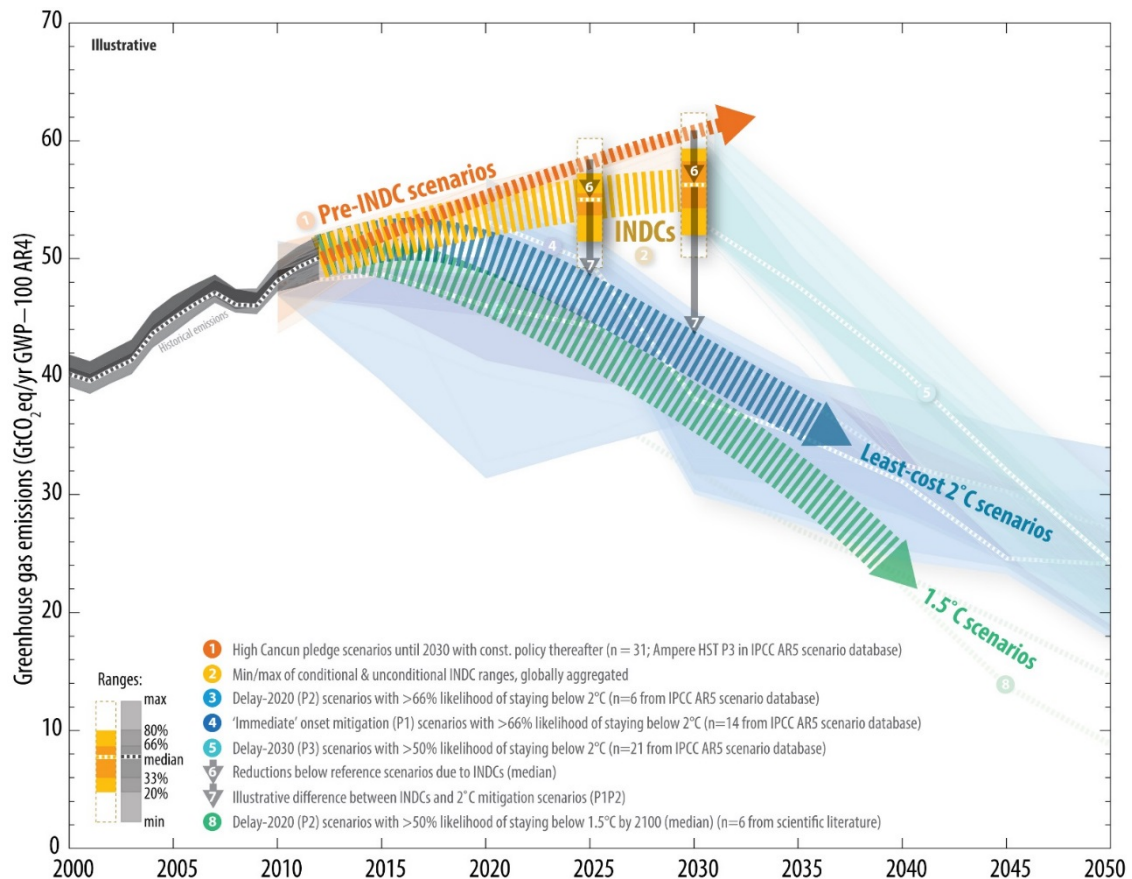
- **GHG mitigation targets of all countries should be strengthened.**

How to update mitigation target?

We need
- Narrative storyline,
- Consistent quantification,
- Stakeholders participation, and
- Concrete roadmap.

The above process includes
- Future vision,
- Role of each stakeholder, and
- Necessary innovations.

→ Model is a core tool to discuss the zero carbon society. "To develop model and scenarios with your own hands" is the most important.

Speakers and topics

Some Asian countries started to discuss roadmaps toward decarbonized society and sustainable development based on models.
Following speakers will explain their experiences on scientific assessments and contribution to climate/environmental policies.

- Prof. Bundit Limmeechokchai, SIIT-TU, Thailand
  Climate mitigation policies and role of models in Thailand

- Mr. Phuntsho Wangdi, NEC, Bhutan
  Carbon neutral target and role of models in Bhutan

- Prof. Ho Chin Siong, UTM, Malaysia
  Climate development and model in ISKANDAR Malaysia

- Dr. Tsuyoshi Fujita, NIES, Japan
  SDGs and national policies

- Discussion: How to bridge the gaps between policymakers and research communities toward 2/1.5 ℃ target.