AIM Initiatives and Experience in Japan

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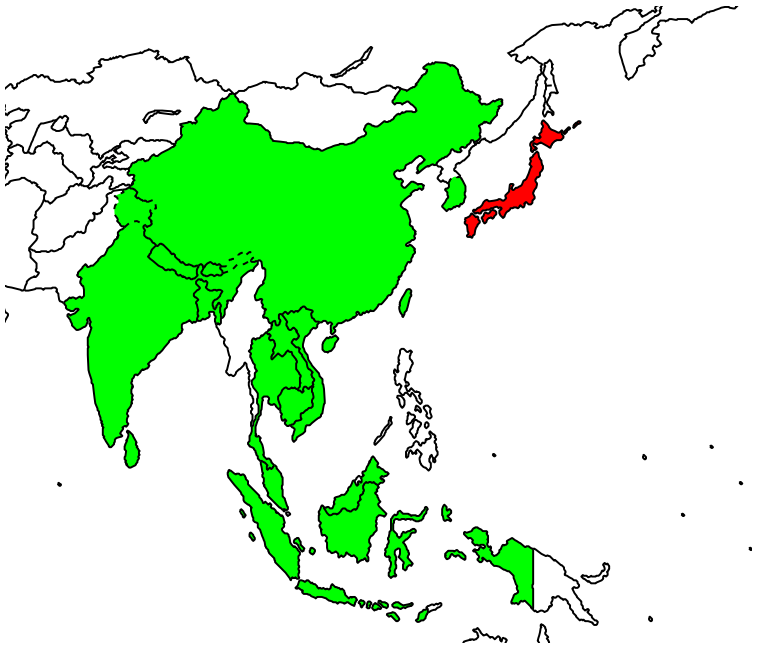
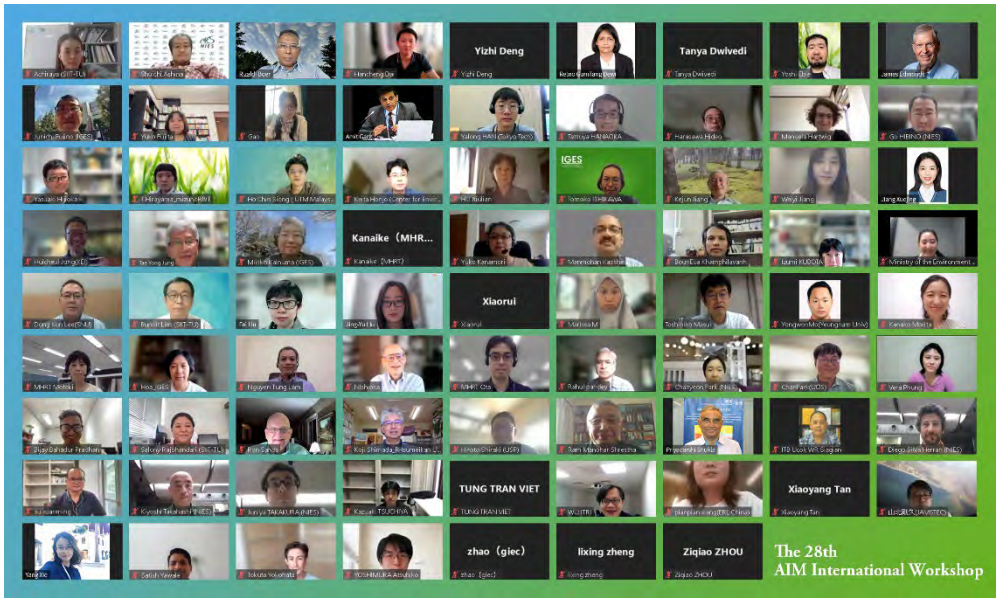
The 8th NIES International Forum
Online
February 16, 2023

AIM ASIA-PACIFIC INTEGRATED MODEL
Asia-Pacific Integrated Model
http://www-iam.nies.go.jp/aim/index.html

NIES JAPAN

International Network of AIM (Asia-Pacific Integrated Model)





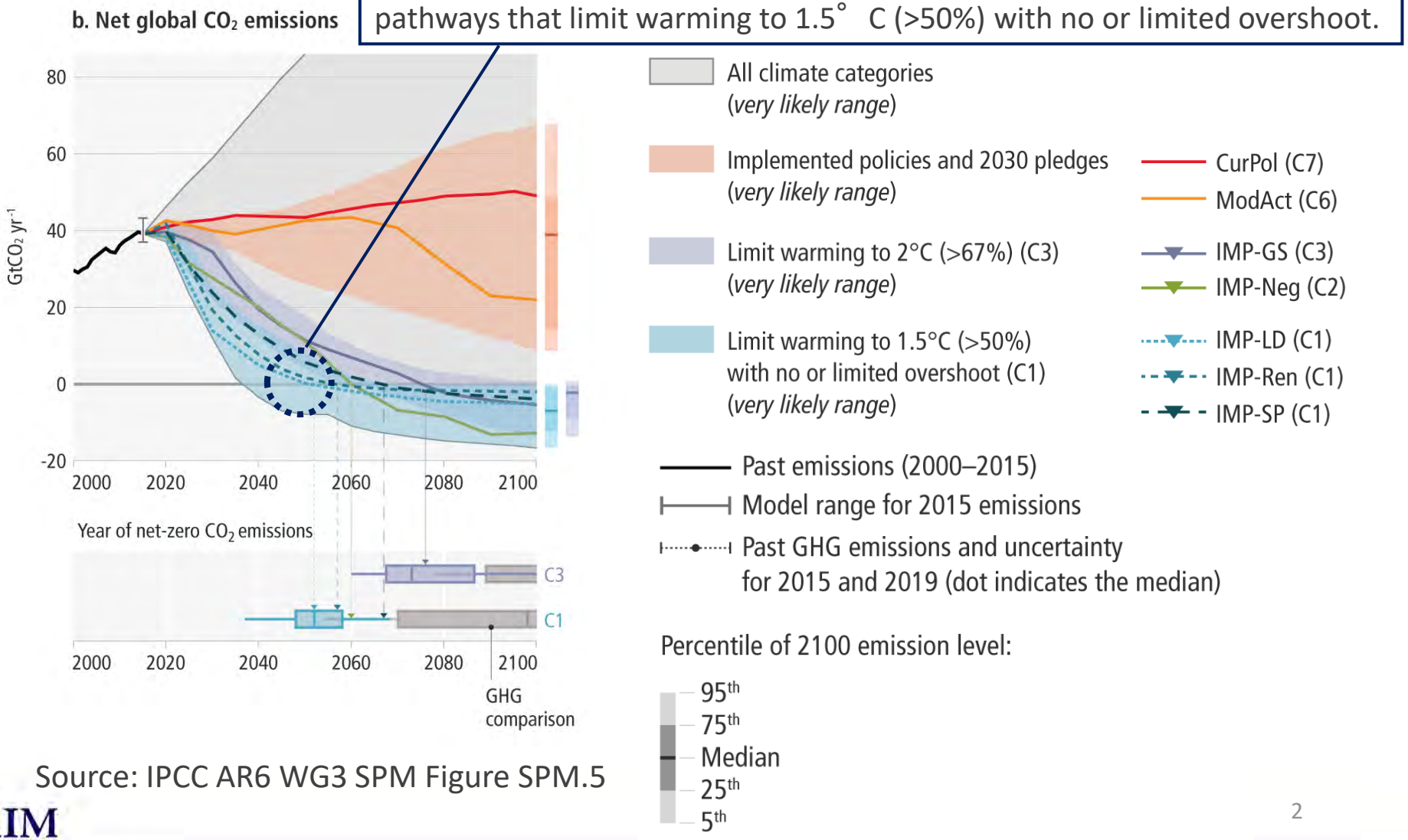
The 28th AIM International Workshop（Sept.13-14, 2022; Online）
http://www-iam.nies.go.jp/aim/index_j.html

- AIM (Asia-Pacific Integrated Model) project started in 1990.
- Asian countries/regions will update their mitigation target and roadmap to achieve the 1.5/2 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/region will need the capacities to develop model and scenarios by itself.
- AIM has supported Asian countries/regions to develop the integrated assessment model (IAM) and their long-term low carbon/decarbonized scenarios.
- https://www-iam.nies.go.jp/aim/index.html

AIM
ASIA-PACIFIC INTEGRATED MODEL

From IPCC AR6: We agreed with Paris Agreement, but to achieve 1.5℃ target, global net-zero CO2 is needed around 2050.

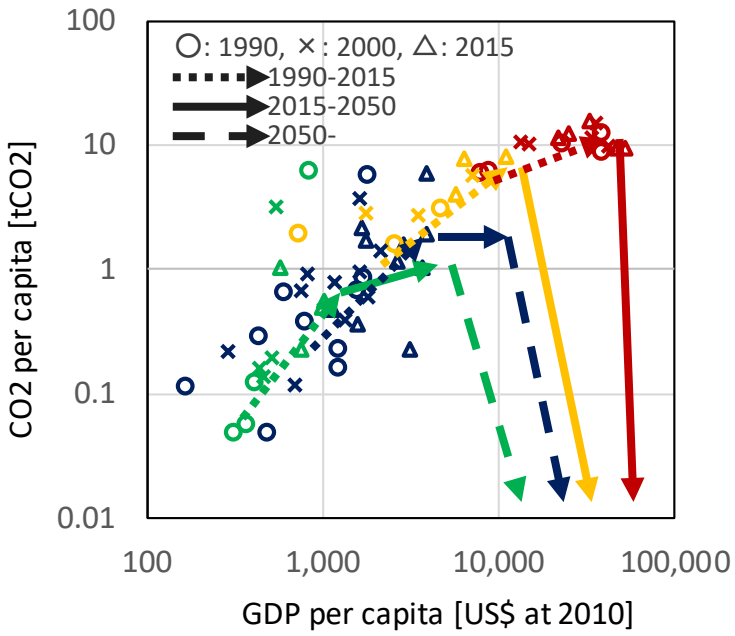
Global net zero CO2 emissions are reached in the early 2050s in modelled pathways that limit warming to 1.5° C (>50%) with no or limited overshoot.



Source: IPCC AR6 WG3 SPM Figure SPM.5

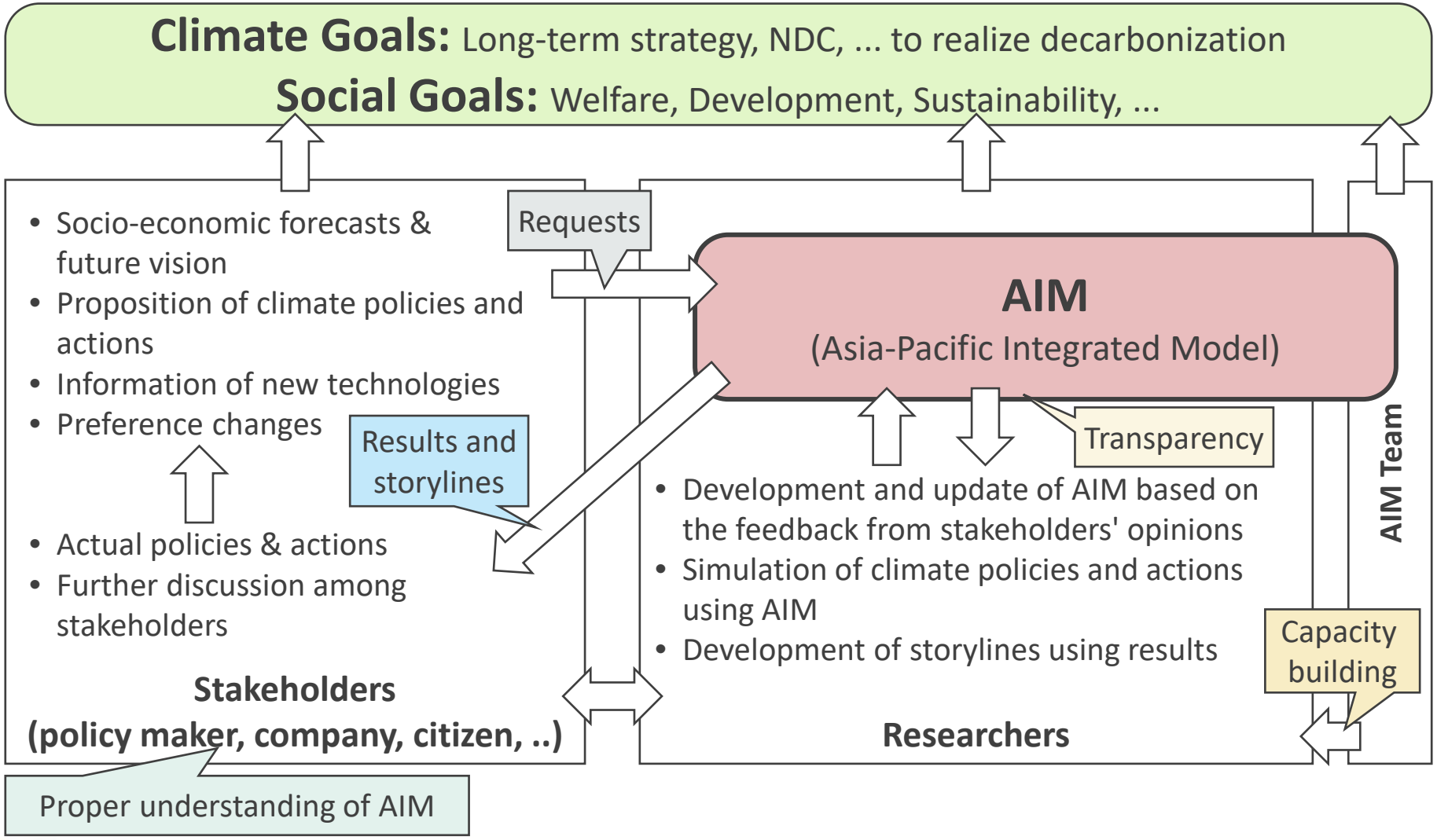
Toward sustainable decarbonized Asia

- Final goal is common among countries/regions;
  - SDGs (economy, society, environment)
  - GHG mitigation target (NDCs, long-term strategy, net-zero emission)
- But process/strategy may be different among countries/regions;
  - Viewpoint of economy and CO2
    - Japan, Korea, Taiwan: steady state economy with drastic CO2 reduction?
    - China, Thailand, Malaysia: strong decoupling between economic growth and CO2 reduction
    - Bhutan, India, Indonesia, Lao, Vietnam: economic growth with maintaining CO2 emissions
    - Cambodia, Nepal: First priority is economic growth, but soon CO2 reduction is needed.
    - In developing countries/regions: correction of disparities between urban and rural
  - Other viewpoints
    - Endowed resources
    - Social conditions such as aging, available technology, etc

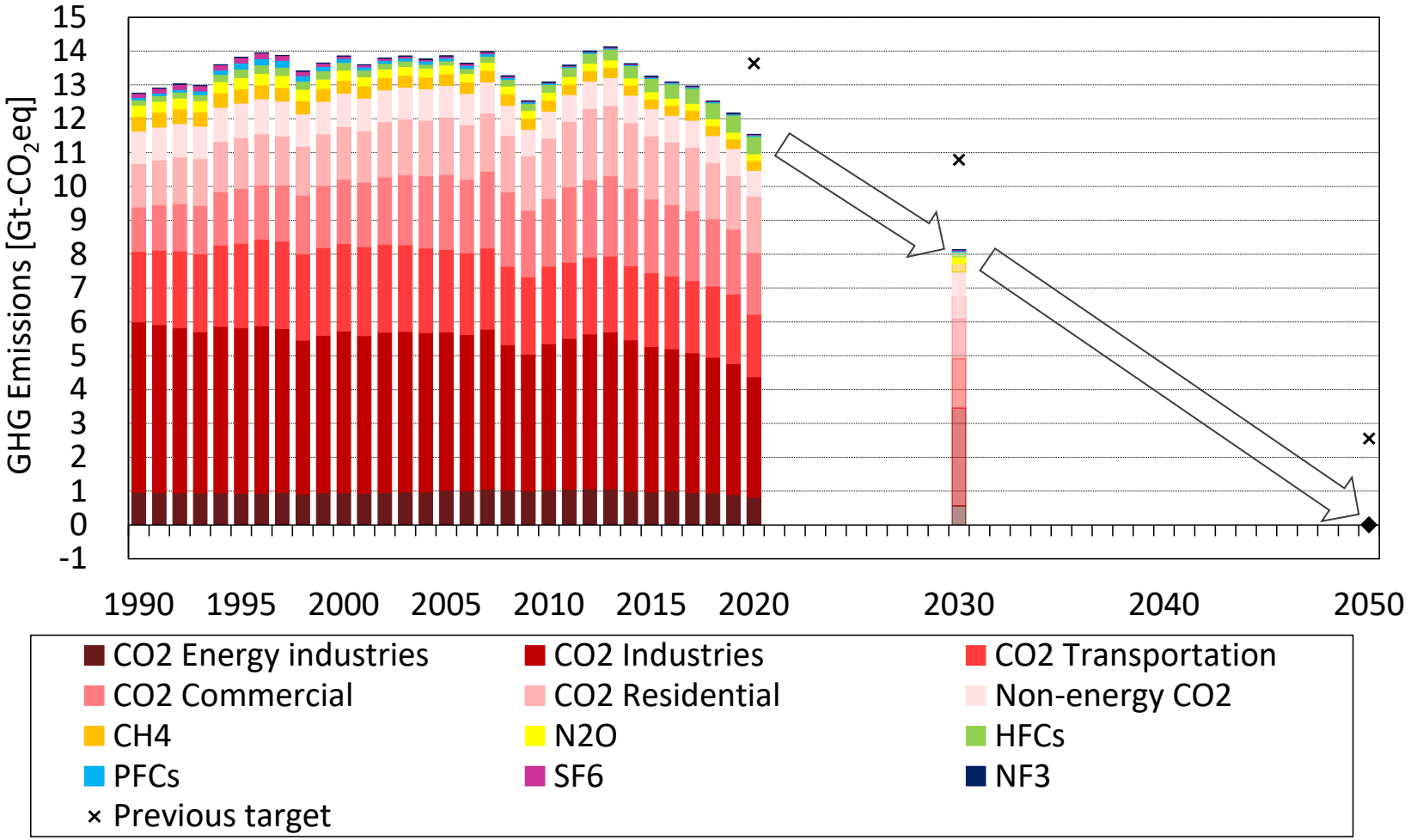


> "How to achieve the net-zero" becomes an important issue.

How to realize decarbonized society and roles of the AIM?



Past trend and future targets of GHG emissions in Japan



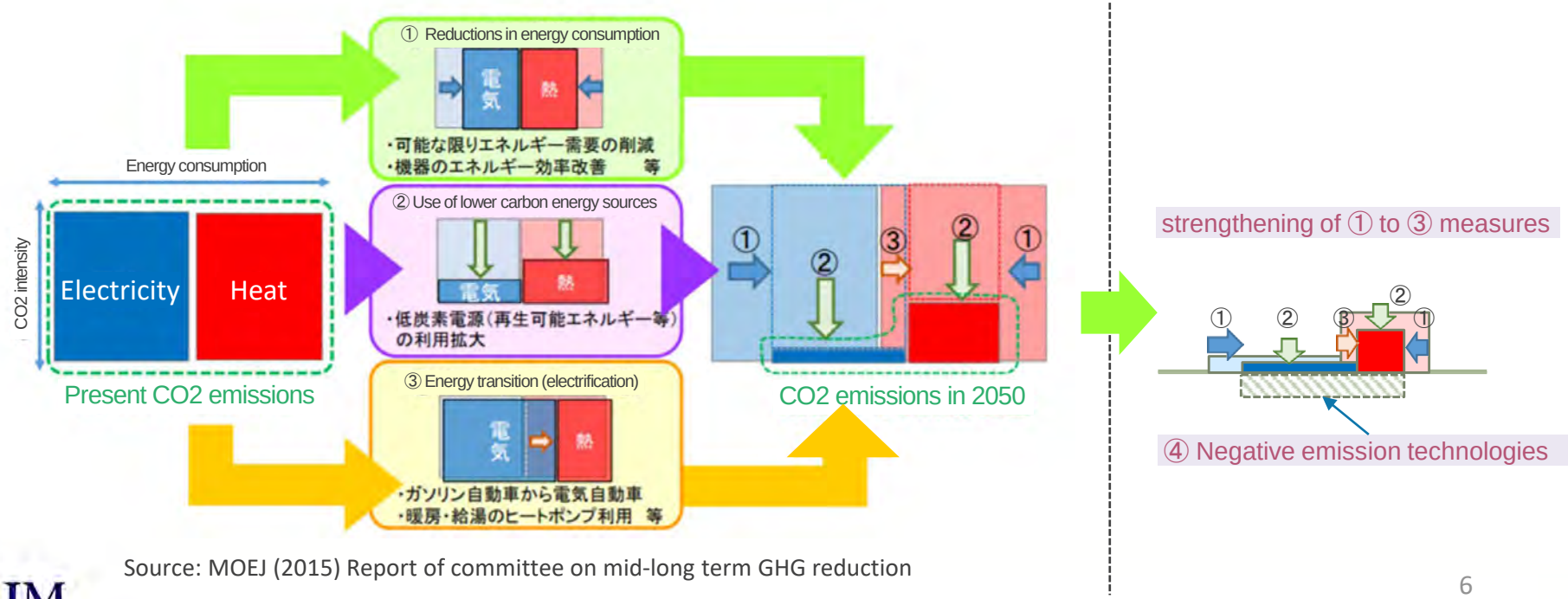
Source:

Historical data: Greenhouse Gas Inventory Office of Japan, Japan's National Greenhouse Gas Emissions

Target: Japan's Nationally Determined Contribution (NDC) and Long-Term Strategy under the Paris Agreement

Necessary actions to achieve a carbon neutral society

- Major directions toward low carbon society: **① Reductions in energy consumption**; **② Use of lower carbon energy sources**; and **③ Energy transition (electrification)**.
- To achieve carbon neutrality, in addition to ① – ③ measures, **④ Negative emission technologies** will be needed.
- Moreover, role of **⑤ Social transformation** will be important to realize carbon neutrality.



Source: MOEJ (2015) Report of committee on mid-long term GHG reduction

Brief history of climate policy in Japan and AIM

- 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**
- 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 detailed information on 6 options as GHG mitigation target. (Policymakers showed options. Final target from 6 options was selected by prime minister.)
  - 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.

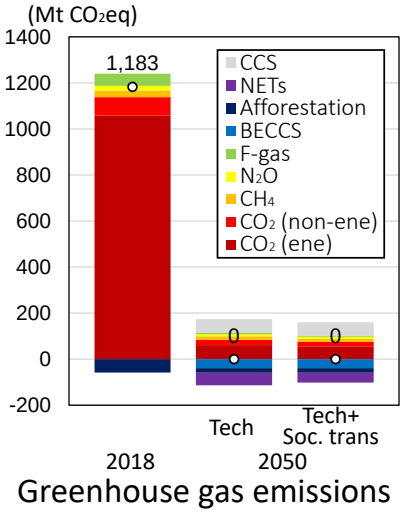
➢ Great East Japan Earthquake and Fukushima Dai-ichi Nuclear Power Plant Accident in 2011

- 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.

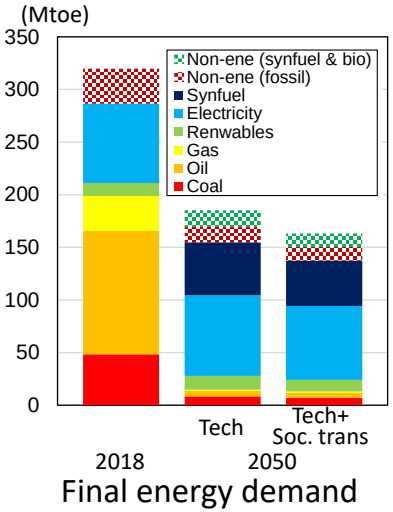
  Unfortunately, these days, models had no role to play for decision of mitigation target.
- In 2016, Cabinet decided **80% reduction of GHG in 2050 compared with present level**.
- Since 2016, MOEJ started to discuss long-term low carbon vision in Japan.
- In August 2018, Long-Term Strategy under the 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.
- In June 2019, the long-term strategy of Japan was approved by the Cabinet.
- In October 2020, "**net zero GHG in Japan by 2050**".
- In April 2021, the updated NDC "**46% reduction of GHG in 2030 compared with 2013 level**".
- In October 2021, new NDC and LTS were approved by the Cabinet and submitted to UNFCCC.

Quantification of decarbonized society of Japan in 2050 using AIM

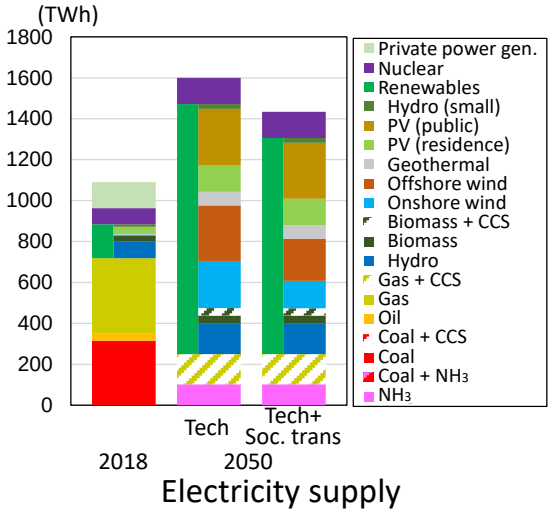
Combining Enduse model, Power Plan model, and CGE model, energy supply and demand, GHG mitigation technologies, and additional investment to achieve decarbonized society in Japan in 2050 are estimated.



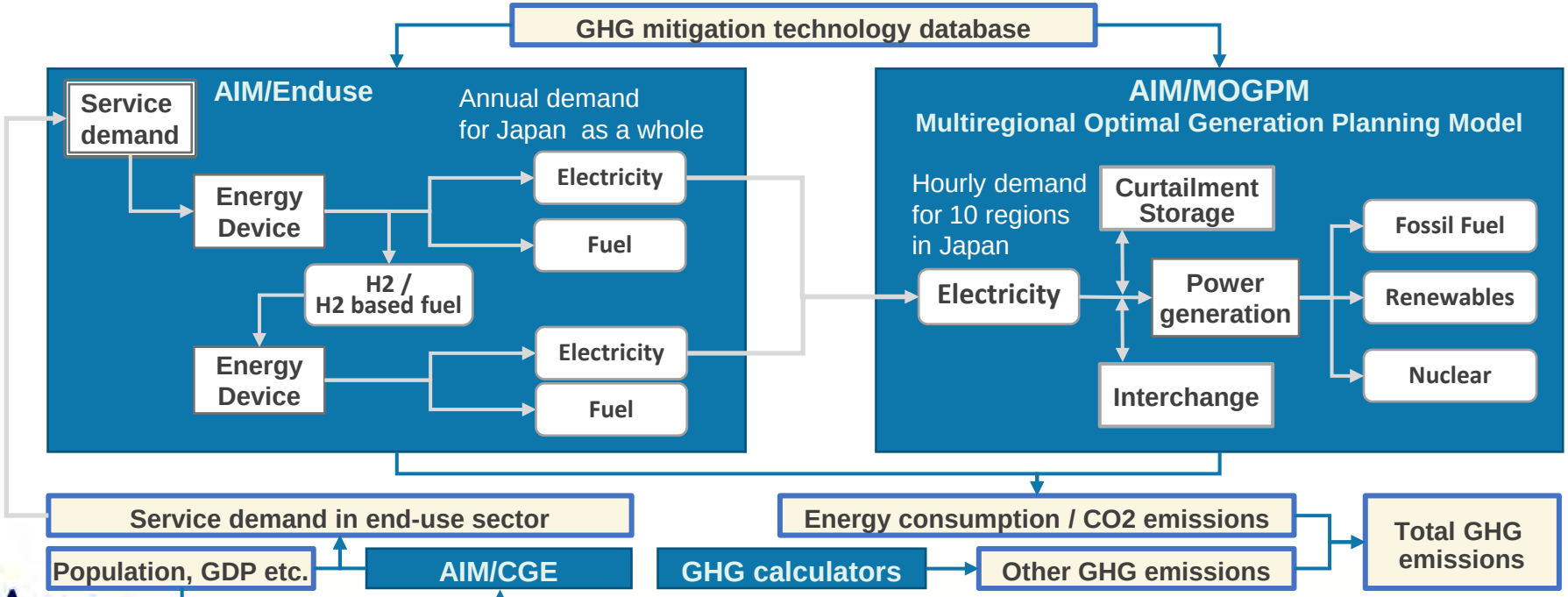
Greenhouse gas emissions



Final energy demand

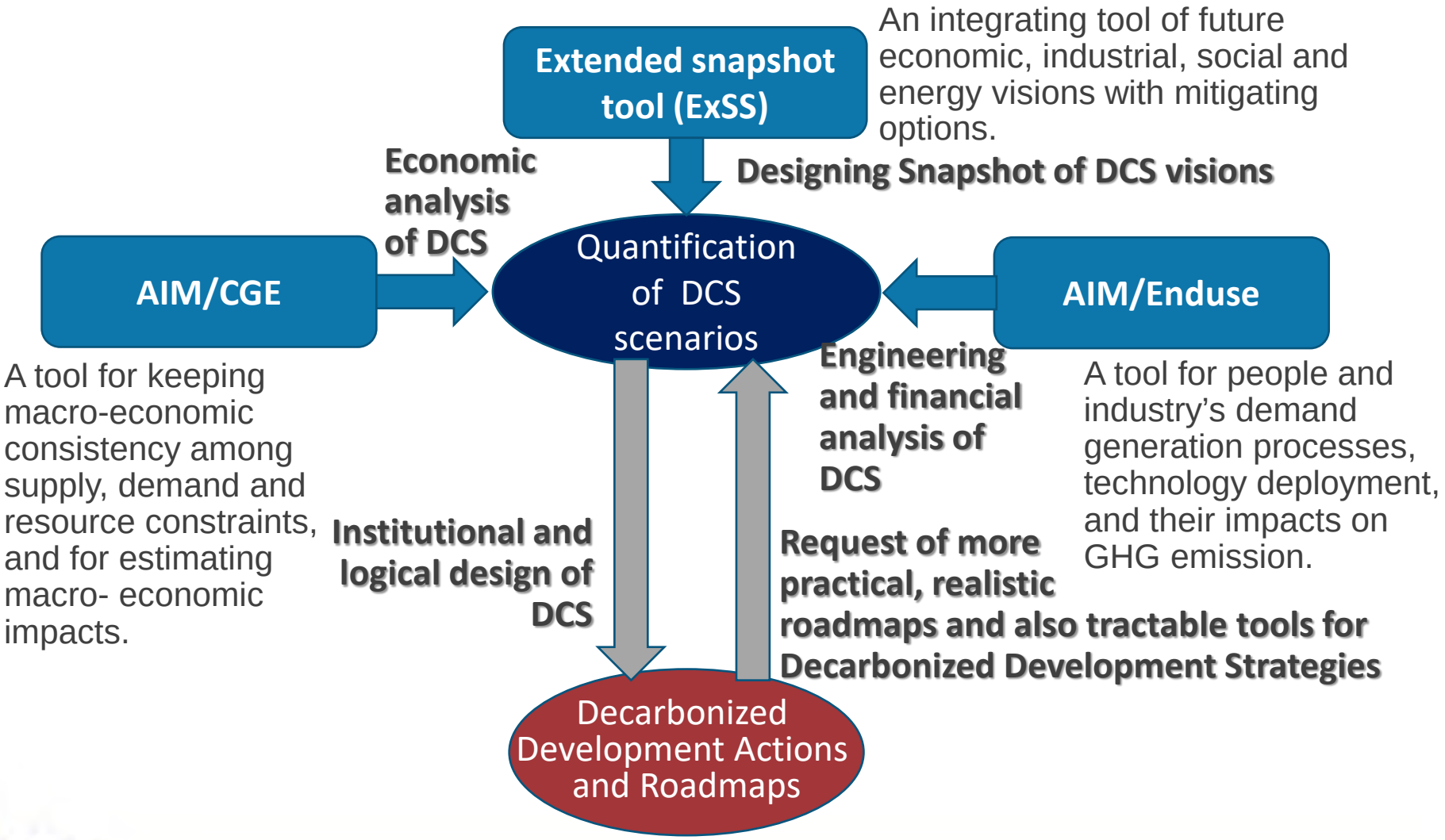


Electricity supply



https://www-iam.nies.go.jp/aim/projects_activities/prov/index_j.html

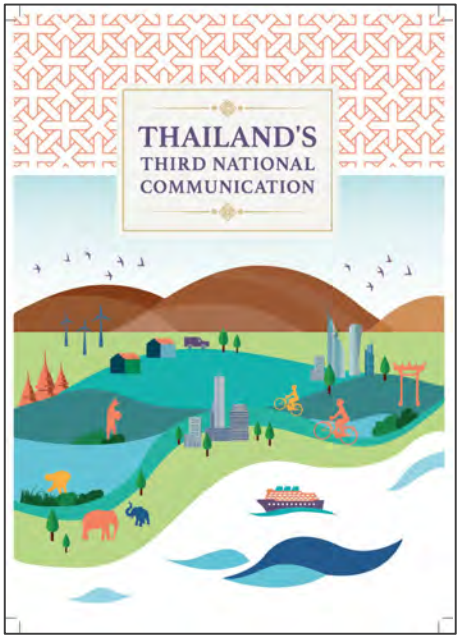
Flamework to assess DCS (decarbonization society) actions and socio-economic policies using AIM in developing countries/regions



Thailand

Third & Fourth National Communication and Long-term Strategy

Prof. Bundit Limmeechokchai
(Sirindhorn International Institute of Technology, Thammasat University)



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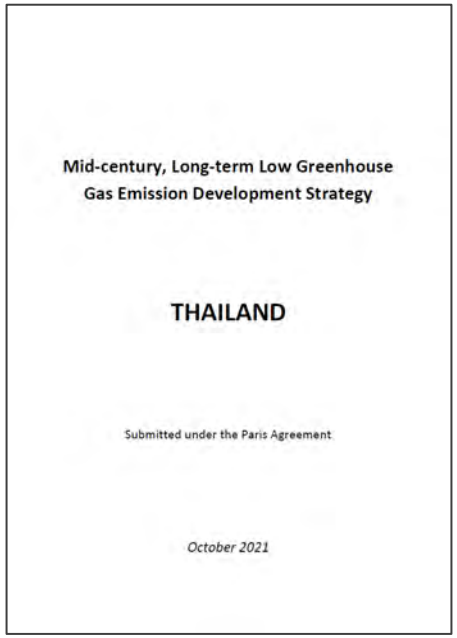


https://unfccc.int/sites/default/files/resource/Thailand_LTS1.pdf
https://unfccc.int/sites/default/files/resource/Thailand%20LT-LEDS%20%28Revised%20Version%29_08Nov2022.pdf

Indonesia

Long-term strategy for Low Carbon and Climate Resilience 2050

Prof. Rizaldi Boer
(Bogor Agricultural University)
Prof. Retno Gumilang Dewi and
Dr. Ucok WR. Siagian
(Bandung Institute of Technology)

4.1. Scenario Development

4.1.1. Models for Mitigation Pathways

Indonesia used a set of models in developing the emission pathways with two stages of analysis. In the first stage, separate models were developed for modelling agriculture, forestry and other land uses (AFOLU), and energy. The AFOLU sector used AFOLU Dashboard (a spreadsheet model), meanwhile energy sector used AIM-EndUse and the AIM-ExSS (Extended Snapshoot). In both models, economic and population growth are the key drivers for changes in food and energy demand. In the second stage, the economic and economic impact of both AFOLU and energy sector mitigation are analysed by utilizing the Asia Pacific Integrated Model/Computable General Equilibrium (AIM/CGE)-Indonesia (see Figure 3).

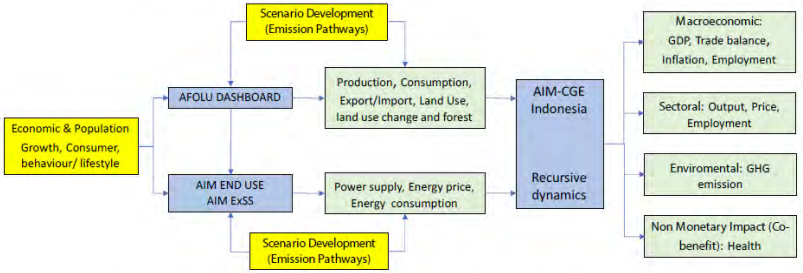


Figure 3. Models for developing emission pathways in Indonesia

https://unfccc.int/sites/default/files/resource/Indonesia_LTS-LCCR_2021.pdf

Contribution of AIM to develop long-term strategies in Vietnam

Joint Ministerial Statement
6th Viet Nam - Japan Environmental Policy Dialogue

The 6th Viet Nam - Japan Environmental Policy Dialogue between the Ministry of Natural Resources of Viet Nam and the Ministry of the Environment of Japan was organized virtually on 24th and 25th August 2020. Following is the summary of discussions of the meeting:

Session 1: Review on Progress of the Cooperation

1. Both sides welcomed the outcome of the cooperation between the two Ministries since the 5th Policy Dialogue and shared the progress of the cooperation in various areas within the framework of the dialogue, including in the Joint Credit Mechanism (JCM), Partnership to Strengthen Transparency for co-innovation (PaSTI), supporting climate adaptation plans for three provinces in Viet Nam, revision of Environmental Protection Law 2014, amongst others.

Session 2: Climate Change

2. Both sides shared the review of climate change measures after the adoption of Paris Agreement and confirmed commitment for continuous and enhanced cooperation in the areas of mitigation, transparency, and adaptation.
3. Regarding mitigation, both sides agreed on comprehensive cooperation for advancing transition towards decarbonization in Viet Nam through introducing and/or updating policies, instruments, capacity building and diffusion of low-carbon and decarbonized technologies, including developing the long-term strategy and mainstreaming renewable energy by for instance utilizing AIM model.
4. Both sides welcomed the progress of renewing the bilateral document on the JCM and confirmed that the JCM continues to be an important mechanism in contributing to mitigation activities. Both sides also recognized the potential in utilizing the JCM for the achievement of SDGs and facilitating multilateral partnerships among the JCM partner countries and relevant stakeholders through the JCM Global Partnership.
5. Regarding transparency, both sides agreed to promote identification of specific activities in the Partnership to Strengthen Transparency for co-Innovation (PaSTI) and to cooperate in Long-term Strategy towards reducing emissions, and confirmed to discuss detailed activities.
6. Both sides also agreed on accelerating efforts to advance lifecycle management of fluorocarbon including continued engagement to global actions, such as the Initiative on Fluorocarbons Life Cycle Management, amongst others.
7. Recognizing the strategic importance of engaging cities in advancing decarbonization, both

Joint Ministerial Statement: 6thViet Nam - Japan Environmental Policy Dialogue (August 25, 2020)
https://www.env.go.jp/press/files/jp/114598.pdf

Joint Cooperation Plan
on Climate Change toward Carbon Neutrality by 2050
between the Minister of the Environment of Japan
and the Minister of Natural Resources and Environment of Viet Nam

The Minister for the Environment of Japan, H.E. Yamaguchi Tsuyoshi, and the Minister of Natural Resources and Environment of Viet Nam, H.E. Tran Hong Ha,

Recognizing the statement by the Viet Nam Prime Minister, H.E. Pham Minh Chinh at the 26th session of the Conference of Parties to the United Nations Framework Convention on Climate Change (COP26) in Glasgow, UK in early November 2021, which expressed Viet Nam's intention to become carbon neutral by 2050;

Emphasizing the ASEAN-Japan Climate Change Action Agenda 2.0 on October 27, 2021 and the renewal of Memorandum of Cooperation on Low Carbon Growth between Japan and Viet Nam on October 14, 2021;

Fully aware of the comprehensive cooperation for advancing transition towards decarbonization in Viet Nam confirmed in the sixth Viet Nam - Japan Environmental Policy Dialogue on August 24 and 25, 2020; and

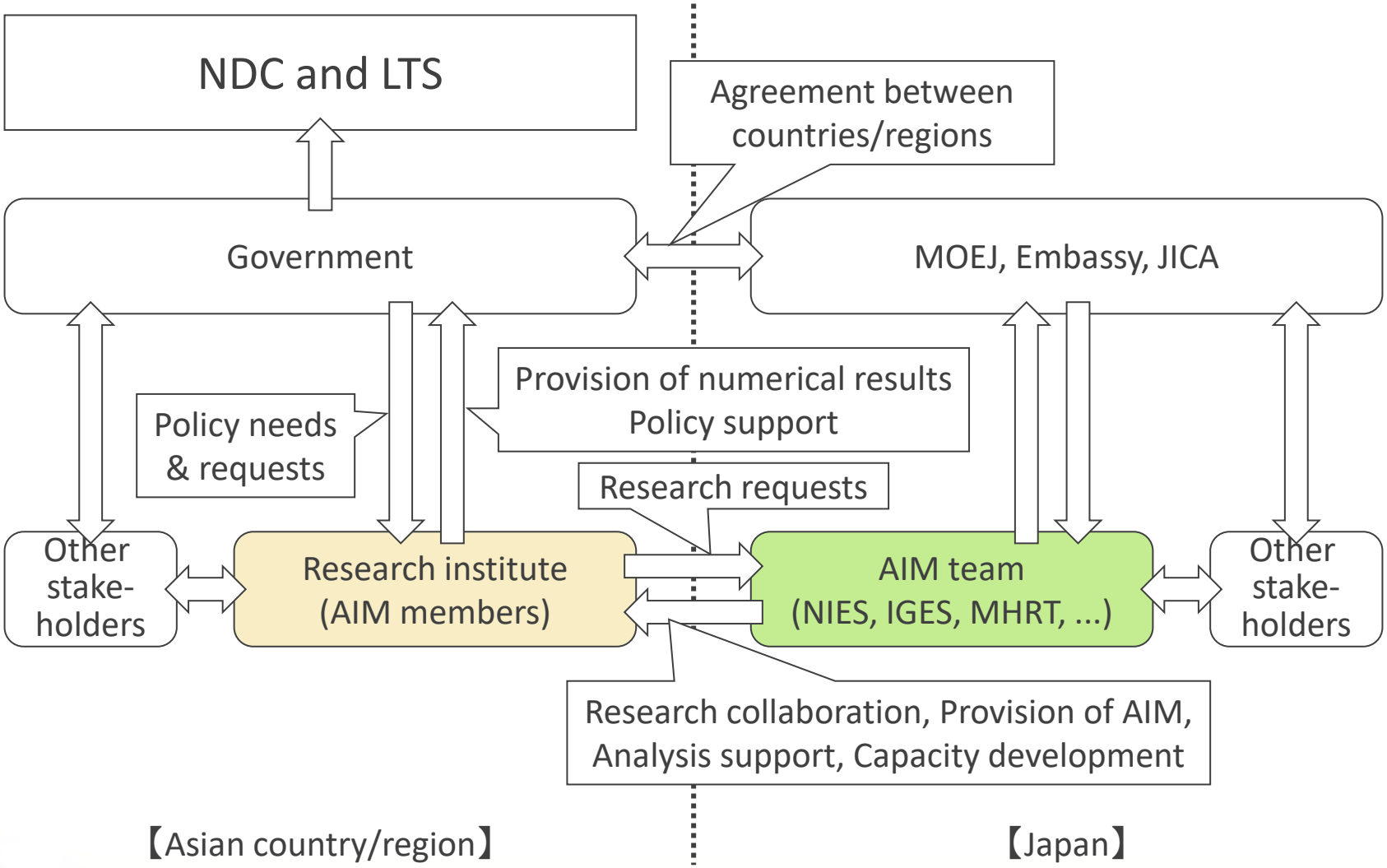
Recognizing the importance of enhancing environmental business between two countries towards realization of sustainable and decarbonized society in Viet Nam,

Have consented as follows:

1. The Ministry of the Environment of Japan and the Ministry of Natural Resources and Environment of Viet Nam will strengthen further their bilateral cooperation on climate change responses toward carbon neutrality by 2050, in line with Viet Nam's Nationally Determined Contribution which extends from 2021 to 2030, as well as other fields including environment and plastic pollution.
2. The two Ministries will enhance their cooperation in the following areas:
   a. The development of National Strategy on Climate Change for the period to 2050 including the Long-Term Strategies (LTS) as required by Paris Agreement especially through analysis of future emission scenarios utilizing Asia-Pacific Integrated Model (AIM);
   b. The development of city-level LTS especially through analysis of future emission scenarios utilizing AIM and formulation of decarbonizing projects through City to City collaboration such as Hai Phong City and Kitakyushu City;
   c. Improving monitoring, evaluation and reporting system and facilitating private sector engagements in climate actions through Partnership to Strengthen Transparency for co-Innovation (PaSTI);

Joint Cooperation Plan on Climate Change toward Carbon Neutrality by 2050 between the MOEJ and the MONRE of Viet Nam
(November 24, 2021)
https://www.env.go.jp/press/files/jp/117125.pdf

Expected structure to support climate policy in Asian countries/regions



We are facing other difficulties now.

- Goal is changed from Low carbon to Decarbonization.
- To show more practical roadmap is required.

- Moreover,
  - Existing approach is based on the stable future trend, but present new problems including COVID-19 pandemic and War by Russia were unpredictable. This is a new challenge for the AIM.
  - Scenarios are not prophecies, but rehearsals for the future.
  - We can't predict when a catastrophic event will happen. Therefore, we may need a new scenario as an example that contributes to such preparation, but it is not a generalization but only one example.
  - Short-term shocks can be put in scenarios, but long-term trends remain the same, because driving forces that change social trends are assumed separately.

Main sessions of the 8th NIES International Forum

Session 1: Toward the Realization of a Decarbonized Society

[Chairperson] Dr. Tatsuya Hanaoka (NIES, Japan)

[Case study 1] Prof. Kejun Jiang (ERI, China)

[Case study 2] Dr. Ucok Siagian (ITB, Indonesia)

[Discussants] Mr. Nuttavut Intarode (The Siam Cement, Thailand) and Mr. Makoto Kato (OECC, Japan)

Session 2: AIM as a Policy Support Tool

[Chairperson] Dr. Yusuke Arino (IGES, Japan)

[Case study 3] Prof. Chin Siong Ho (UTM, Malaysia)

[Case study 4] Prof. Bundit Limmeechokchai (SIIT-TU, Thailand)

[Discussants] Dr. Vong Sok (ASEAN), Mr. BounEua Khamphilavanh (MONRE, Lao) and Ms. Tomoko Ishikawa (IGES, Japan)

Toward sustainable decarbonized Asia;

If you are interested in AIM,

please visit our website

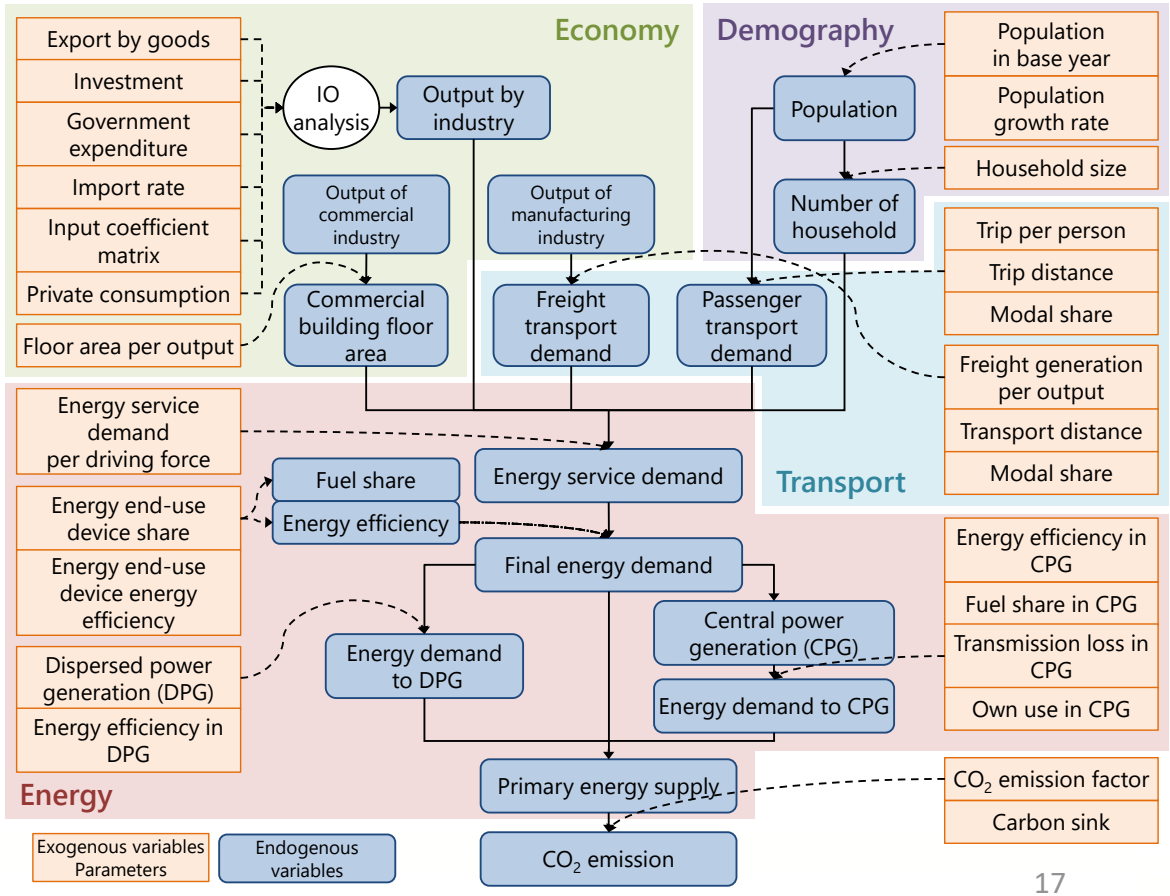
https://www-iam.nies.go.jp/aim/index.html ,

and send your mail to

aim-as-nies@nies.go.jp .

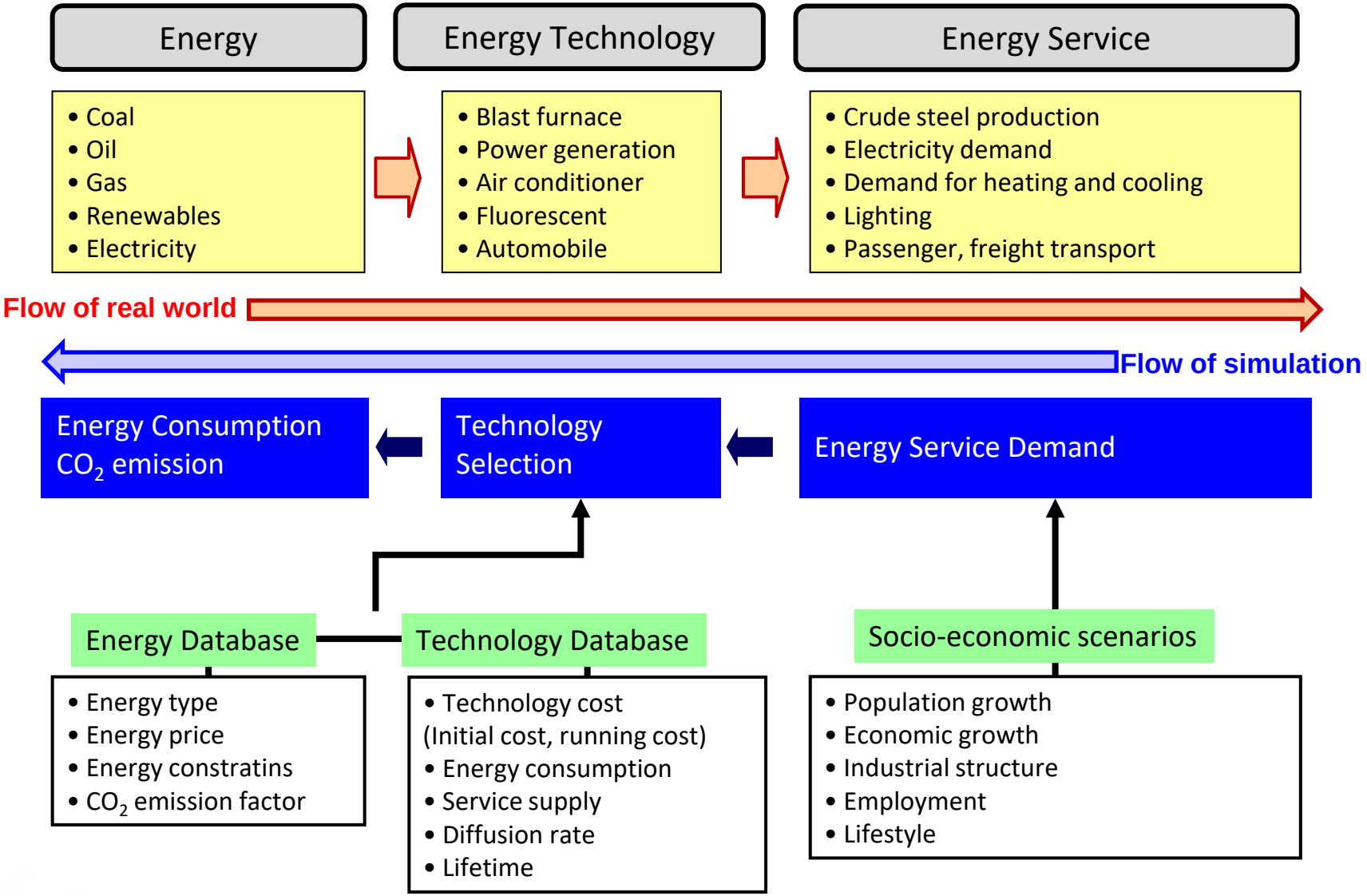
Extended Snapshot Tool (ExSS)

- Extended Snapshot Tool (ExSS) is an accounting type, static model consisting 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.



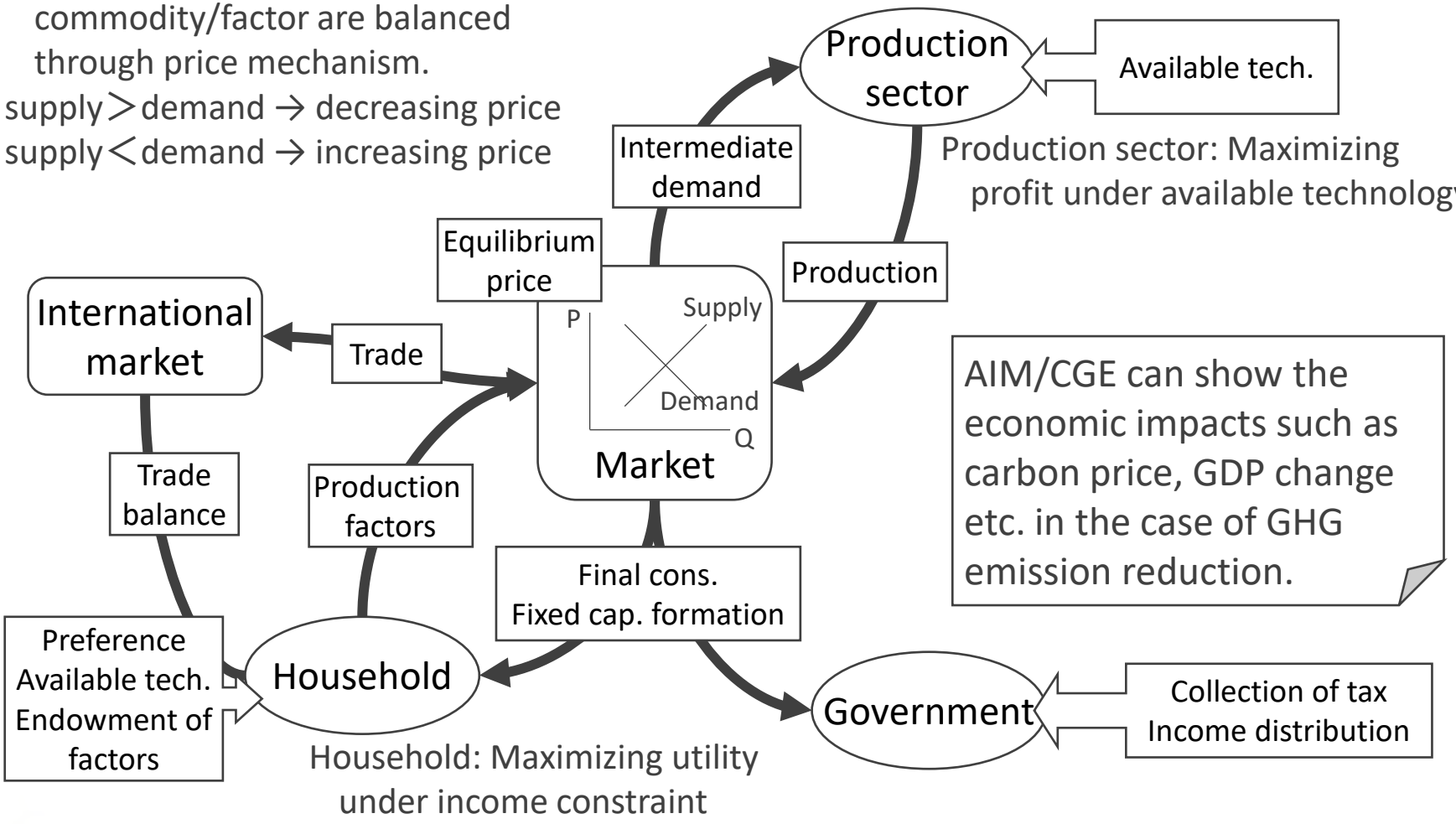
AIM/Enduse model

Minimizing total cost (initial + operation costs) under constraints on energy service demands.



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



Session 1: Toward the Realization of a Decarbonized Society

AIM as a tool to assess transition options toward a decarbonized society

[Chairperson] Dr. Tatsuya Hanaoka (NIES, Japan)

[Case study 1] Prof. Kejun Jiang (ERI, China)

[Case study 2] Dr. Ucok Siagian (ITB, Indonesia)

[Discussants] Mr. Nuttavut Intarode (The Siam Cement, Thailand) and
Mr. Makoto Kato (OECC, Japan)

In response to the Paris Agreement, Asian countries have also begun to analyze the realization of 2° C and 1.5° C targets.

In session 1, the researchers in China and Indonesia will report on their efforts to quantify future scenarios using the AIM in each country.

Then, from the viewpoints of company and international cooperation, requests on AIM and scenarios will be shared, and "How can AIM be utilized to contribute to initiatives to realize decarbonized society?" will be discussed

Session 2: AIM as a Policy Support Tool

Expectations from climate policy making process

[Chairperson] Dr. Yusuke Arino (IGES, Japan)

[Case study 3] Prof. Chin Siong Ho (UTM, Malaysia)

[Case study 4] Prof. Bundit Limmeechokchai (SIIT-TU, Thailand)

[Discussants] Dr. Vong Sok (ASEAN),
Mr. BounEua Khamphilavanh (MONRE, Lao) and
Ms. Tomoko Ishikawa (IGES, Japan)

AIM is also expected to play a role as a policy tool by providing quantitative information to support the development of climate mitigation policies including long-term strategies, and to assist local areas in their decarbonization policies.

In session 2, the researchers in Thailand and Malaysia will make their presentations how the simulation results from the AIM have been used in the climate mitigation policies in these countries.

Then, from the viewpoint of climate policy making process, expectations for the integrated assessment model will be introduced, and we will discuss the contribution of the AIM and its new direction to support decarbonization policies.