Assessment of climate mitigation goals with AIM/CGE

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NIES

AIM International Workshop, Nov 19th 2019

AIM ASIA-PACIFIC INTEGRATED MODEL

Asia-Pacific Integrated Model

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

NIES JAPAN

Outline

- Research on assessment of climate mitigation policies with AIM/CGE

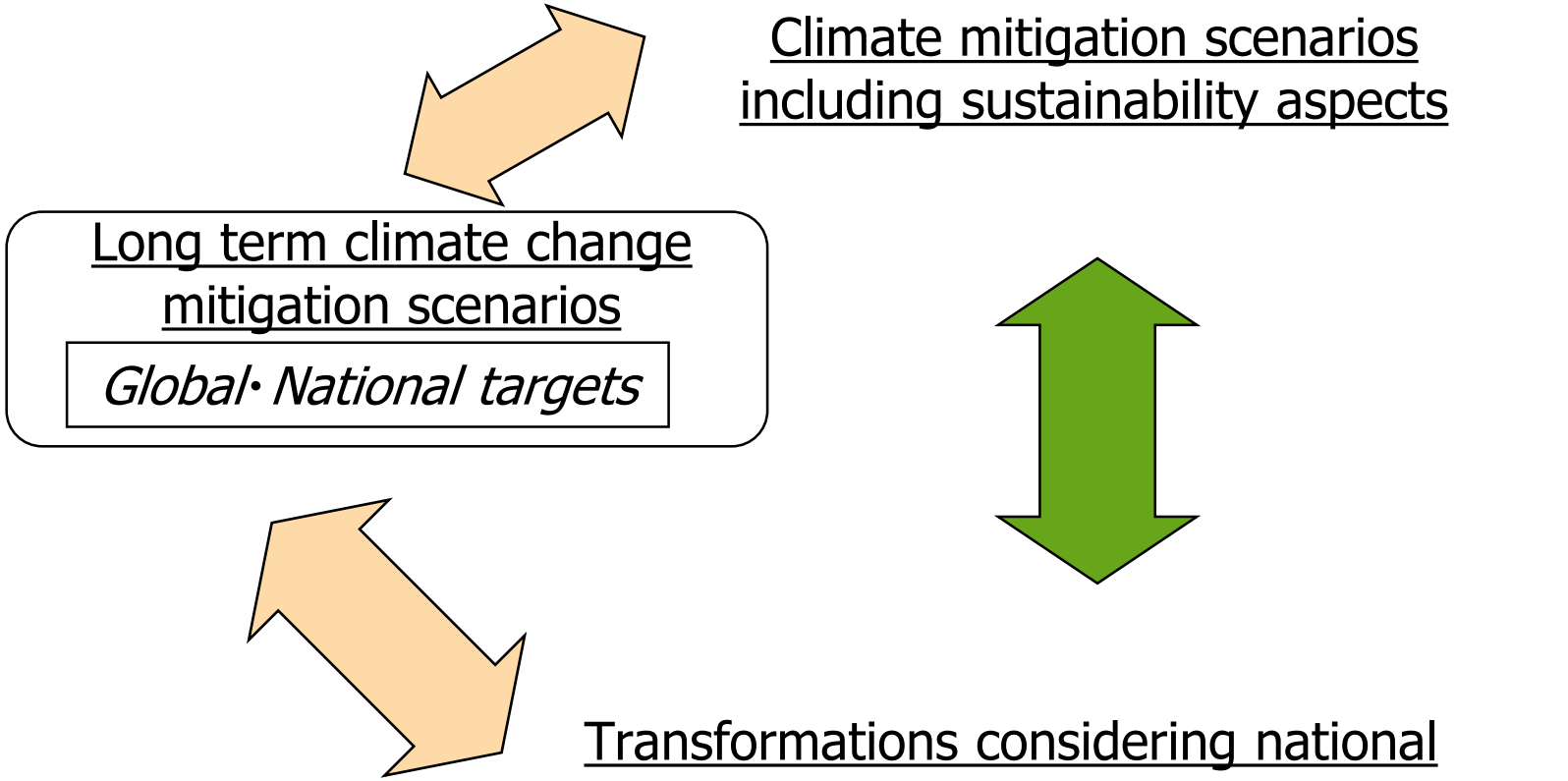
- International projects
  - COMMIT, EMF36, ENGAGE

- National projects
  - JMIP/EMF35
  - Assessment of Japan's long-term mitigation goal.

- Future works

Outline

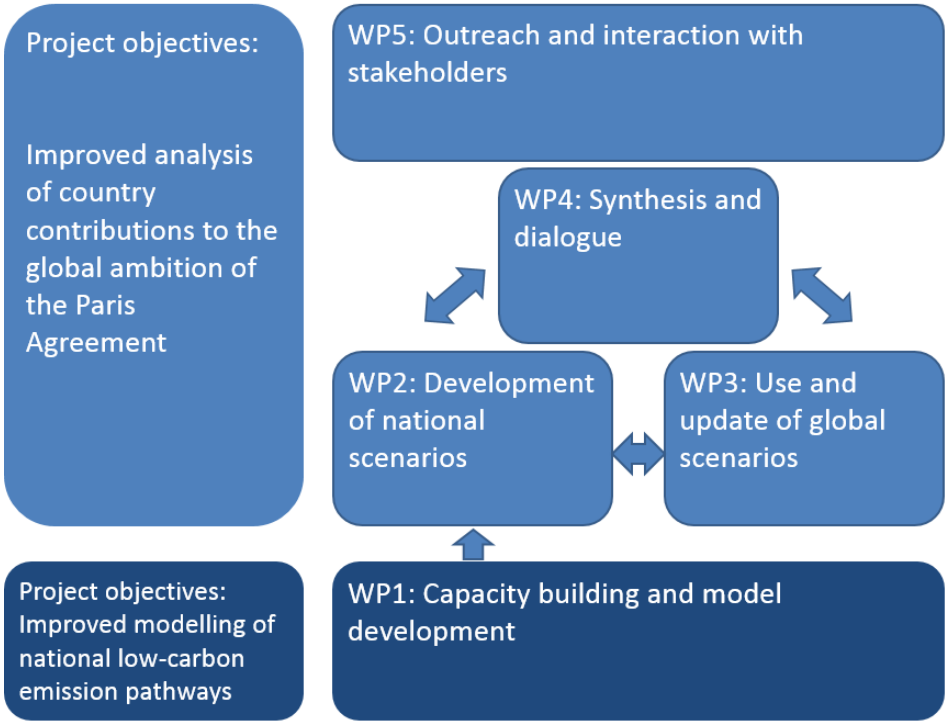
Long term climate change mitigation scenarios considering sustainability aspects and national circumstances



COMMIT

- Climate pOlicy assessment and Mitigation Modeling to Integrate national and global Transition pathways”

- Improved modelling and analysis of national low-carbon emission pathways and contributions the Paris Agreement (NDC, LTS).
- grant from European Commission DG CLIMA.
- Consortium institutes from 11 countries (NIES, IGES, some Asian AIM partners)
- Project outcomes: country factsheets, policy brief, scenario database, events for stakeholder involvement, papers.



https://themasites.pbl.nl/commit/about-commit

URL: https://themasites.pbl.nl/commit/

COMMIT outcomes

- Brief description of climate mitigation policy for each country in the project (11).
- Based on Talanoa Dialogue questions + national issue:
  - Where are we?
  - Where do we want to go?
  - How do we get there?
  - Country specific issue
- Combined factsheet of 5 countries submitted to Talanoa Dialogue (incl. Japan).

https://themasites.pbl.nl/commit/wp-content/uploads/COMMIT-Long-term-Low-emission-pathways-in-Brazil-Canada-EU-India-Japan.pdf

COMMIT outcomes

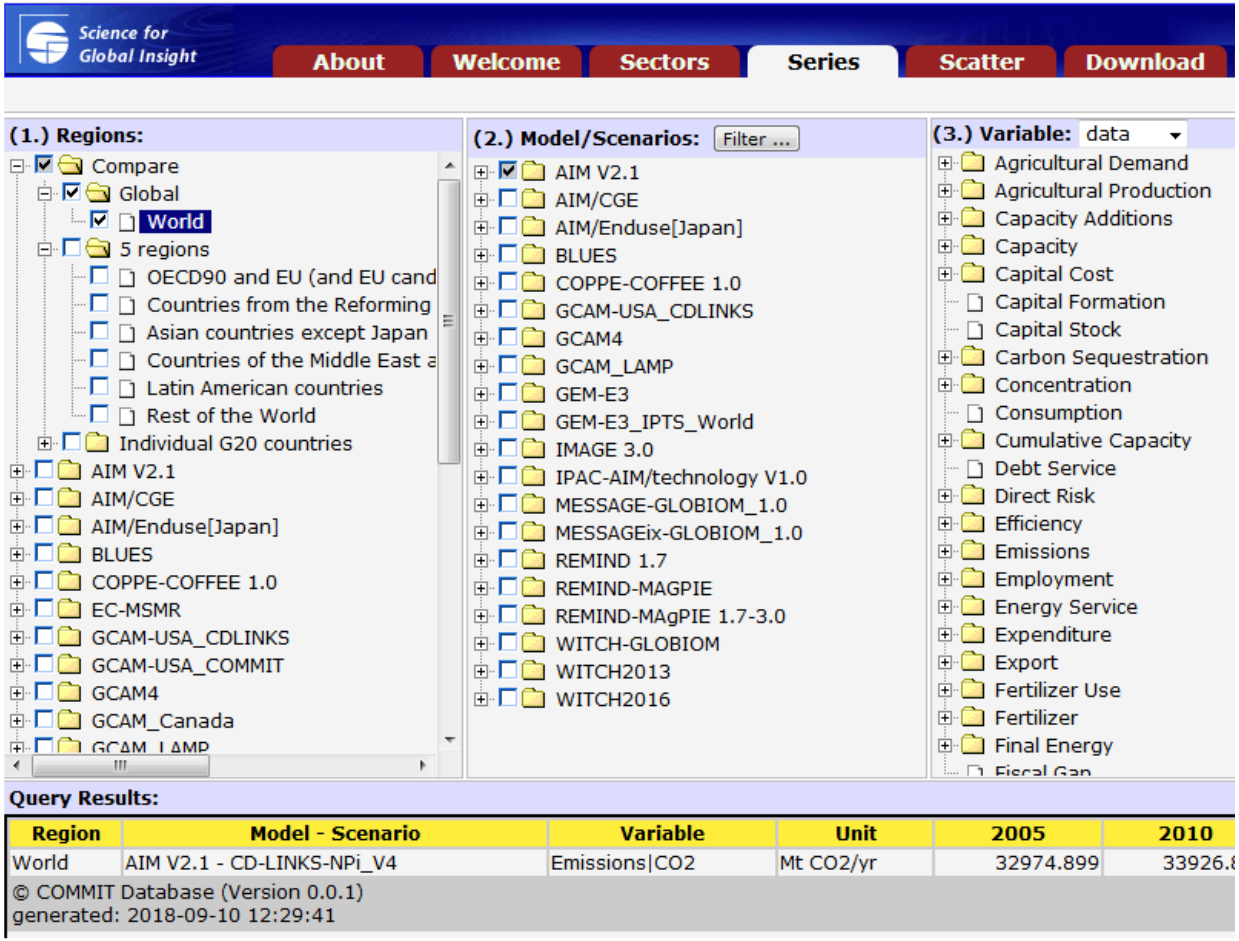
- Policy brief

Contents

https://themasites.pbl.nl/commit/wp-content/uploads/Opportunities-for-Enhanced-Action-to-Keep-Paris-Goals-within-Reach-COMMITCD-LINKS-policy-brief.pdf

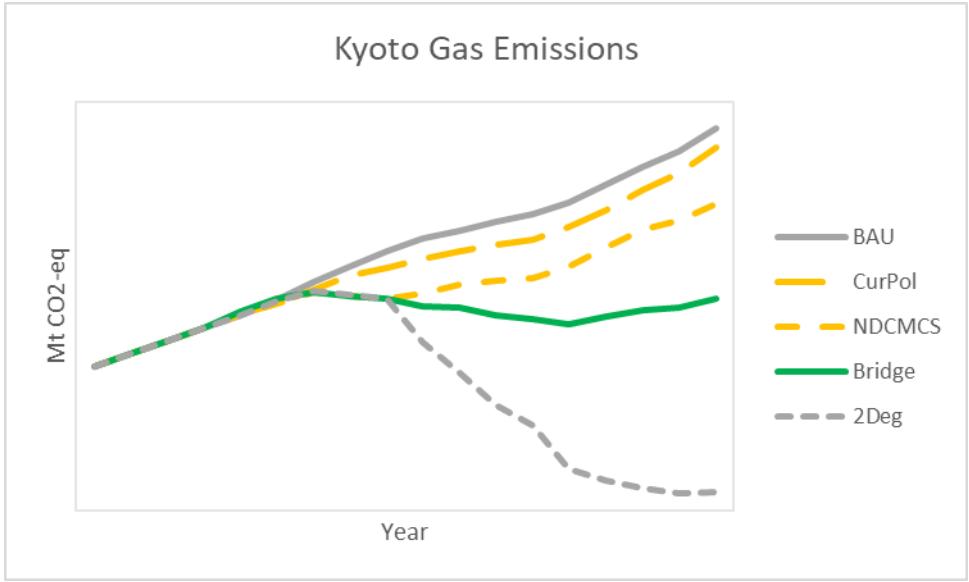
COMMIT Scenario database

- Existing global scenarios
- Existing national scenarios
- New scenarios
- Public release planned



COMMIT scenario analysis

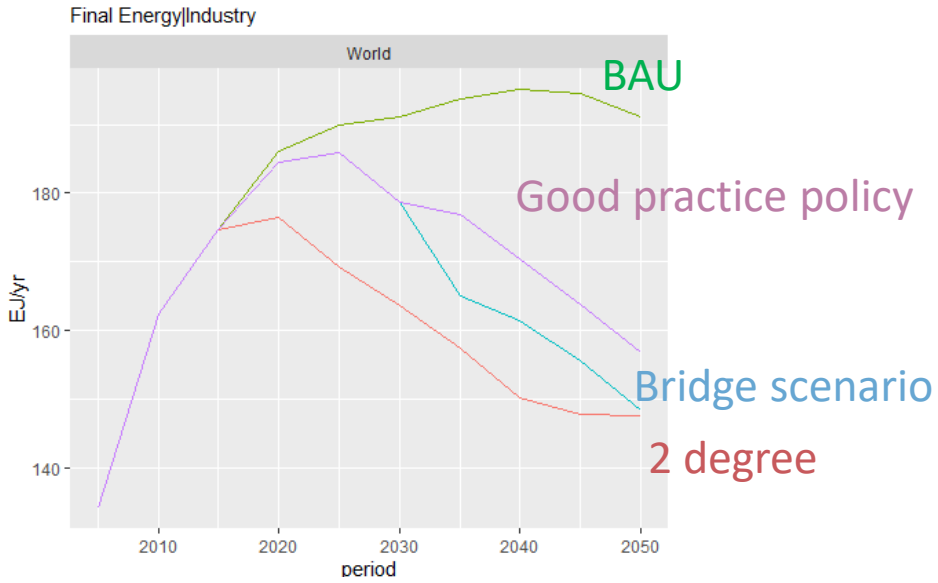
- more realistic scenarios than the national '2 °C' pathways based on cost-optimal

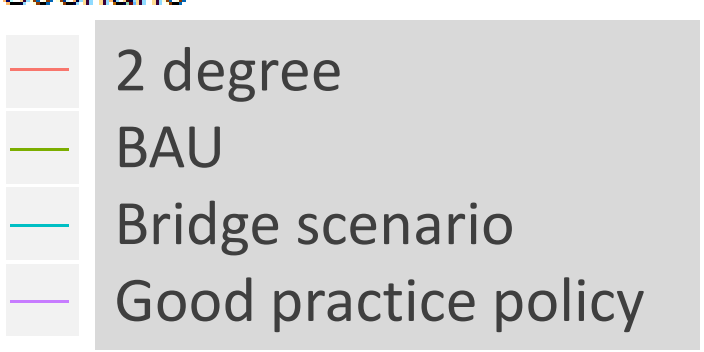


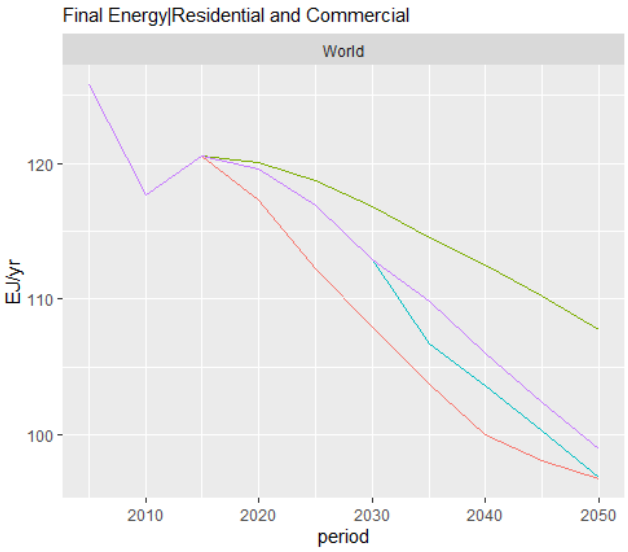
- Not stylised but based on policy
- Distinguishing country groups
- With both global and national models

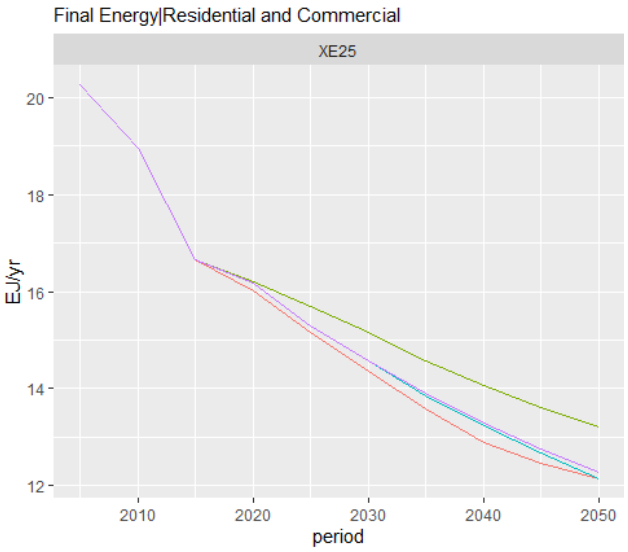
- Policies considered: final energy by sectors (transport, industry, buildings), renewable promotion, phase out non-CCS coal power, non-CO2 mitigation (N2O, CH4, F-gas).

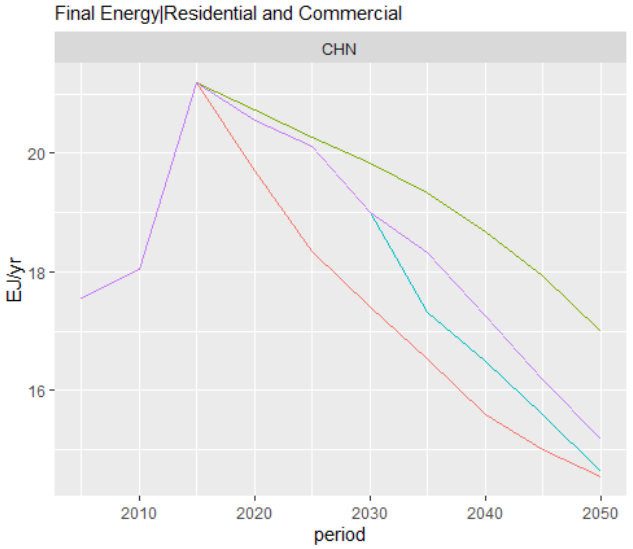
COMMIT scenario analysis

- 







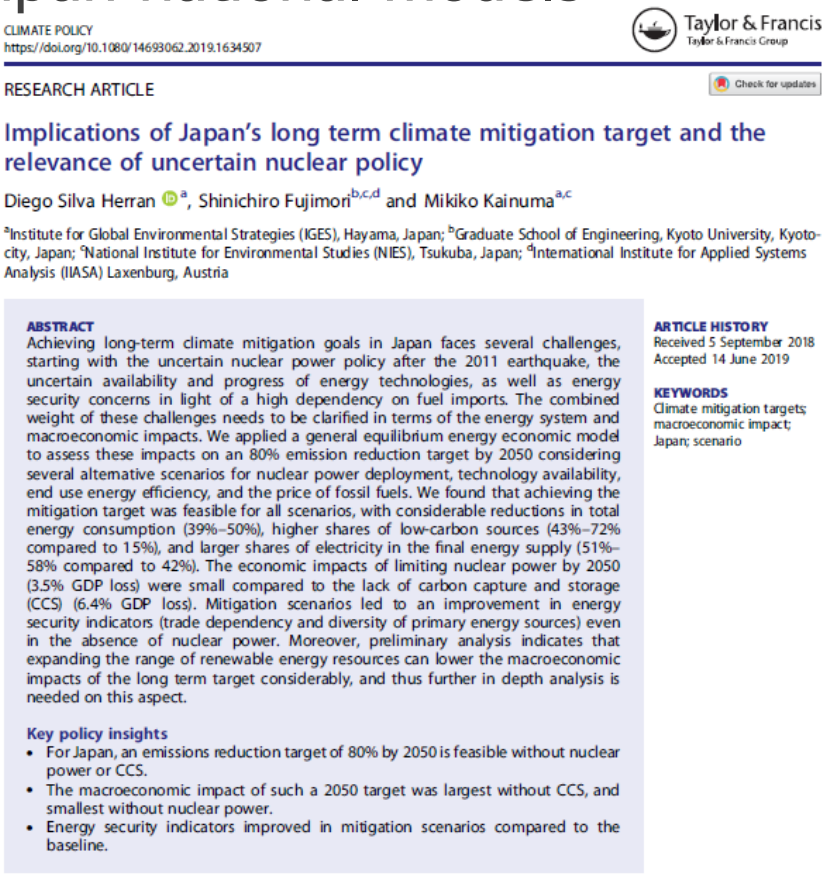


National analysis: JMIP/EMF35

- Assessment of Japan's long-term mitigation goal.
- Model inter-comparison of Japan national models
- Model and policy uncertainties.

Collaboration with EMF, IIASA.

- Special issue planned.



CLIMATE POLICY
https://doi.org/10.1080/14693062.2019.1634507

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RESEARCH ARTICLE

Check for updates

Implications of Japan's long term climate mitigation target and the relevance of uncertain nuclear policy

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ABSTRACT

Achieving long-term climate mitigation goals in Japan faces several challenges, starting with the uncertain nuclear power policy after the 2011 earthquake, the uncertain availability and progress of energy technologies, as well as energy security concerns in light of a high dependency on fuel imports. The combined weight of these challenges needs to be clarified in terms of the energy system and macroeconomic impacts. We applied a general equilibrium energy economic model to assess these impacts on an 80% emission reduction target by 2050 considering several alternative scenarios for nuclear power deployment, technology availability, end use energy efficiency, and the price of fossil fuels. We found that achieving the mitigation target was feasible for all scenarios, with considerable reductions in total energy consumption (39%–50%), higher shares of low-carbon sources (43%–72% compared to 15%), and larger shares of electricity in the final energy supply (51%–58% compared to 42%). The economic impacts of limiting nuclear power by 2050 (3.5% GDP loss) were small compared to the lack of carbon capture and storage (CCS) (6.4% GDP loss). Mitigation scenarios led to an improvement in energy security indicators (trade dependency and diversity of primary energy sources) even in the absence of nuclear power. Moreover, preliminary analysis indicates that expanding the range of renewable energy resources can lower the macroeconomic impacts of the long term target considerably, and thus further in depth analysis is needed on this aspect.

Key policy insights

- For Japan, an emissions reduction target of 80% by 2050 is feasible without nuclear power or CCS.
- The macroeconomic impact of such a 2050 target was largest without CCS, and smallest without nuclear power.
- Energy security indicators improved in mitigation scenarios compared to the baseline.

ARTICLE HISTORY
Received 5 September 2018
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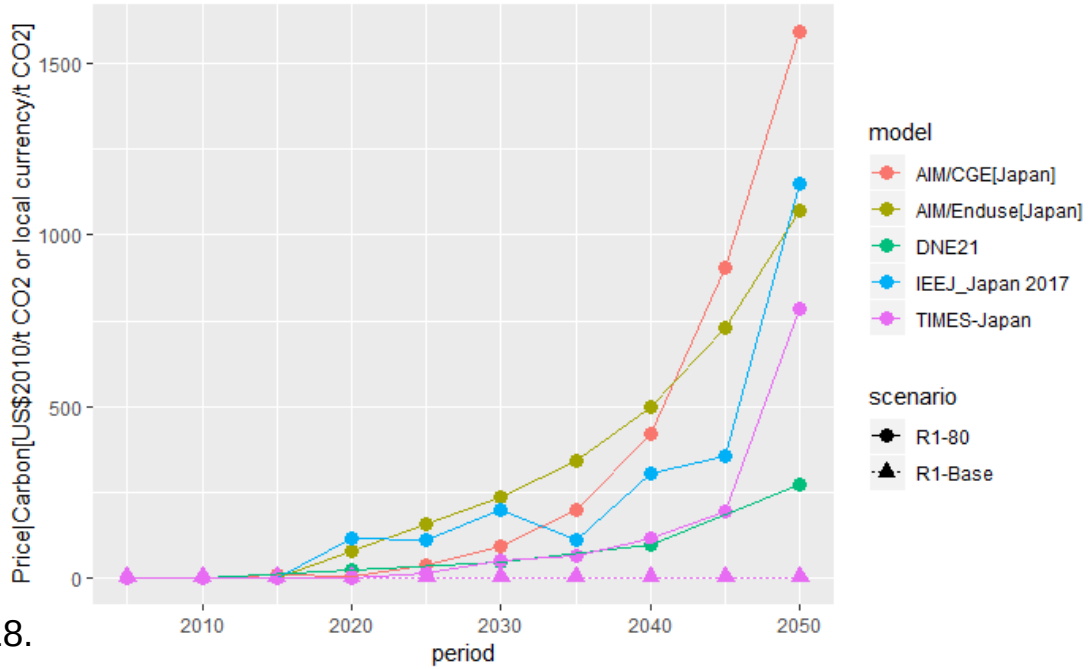
KEYWORDS
Climate mitigation targets; macroeconomic impact; Japan; scenario

Silva Herran et al., Climate Policy, 2019.

JMIP/EMF35

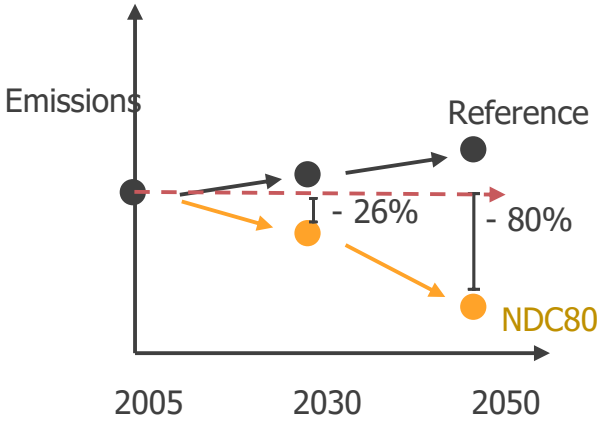
Model	Institute	Solution concept	Intertemporal treatment	Regional coverage
AIM/CGE	NIES	General equilibrium	Myopic	Japan
AIM/Enduse [Japan]	NIES	Partial equilibrium	Myopic	Japan
DNE21	UTokyo	Partial equilibrium	Intertemporal	Global
IEEJ (based on MARKAL)	IEEJ	Partial equilibrium	Intertemporal	Japan
TIMES-Japan	IAE	Partial equilibrium	Intertemporal	Japan

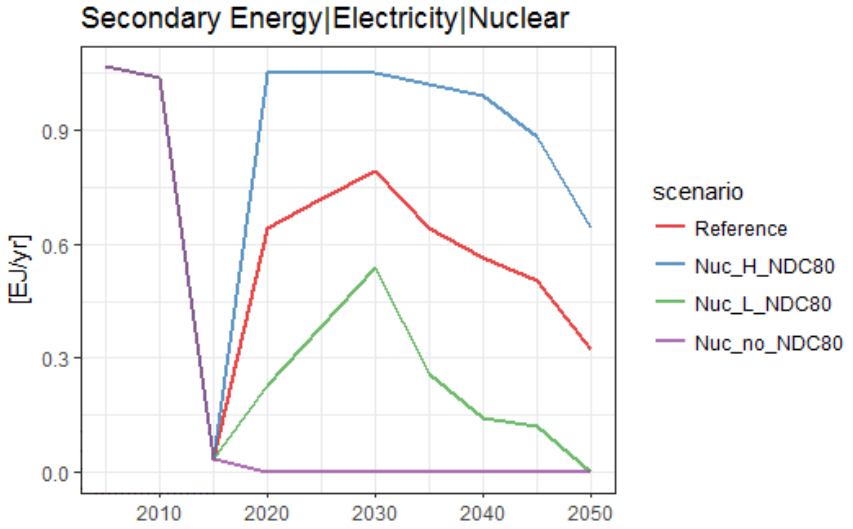


Slide from Sugiyama et al., IAMC 2018.

Assessment of Japan's long-term mitigation goal

Scenario	Mitigation target	Technology constraint
Reference	No mitigation	Nuclear 2030 NDC share and 2050 intermediate supply
Default_NDC80	NDC target 80% reduction by 2050.	Nuclear 2030 NDC share and 2050 intermediate supply
Nuc_L_NDC80		Nuclear 2030 NDC share and 2050 phase out
NoCCS_NDC80		Default without CCS.
RE_CostRed_L_NDC80		Default with 50% lower rate of cost reductions in renewables.





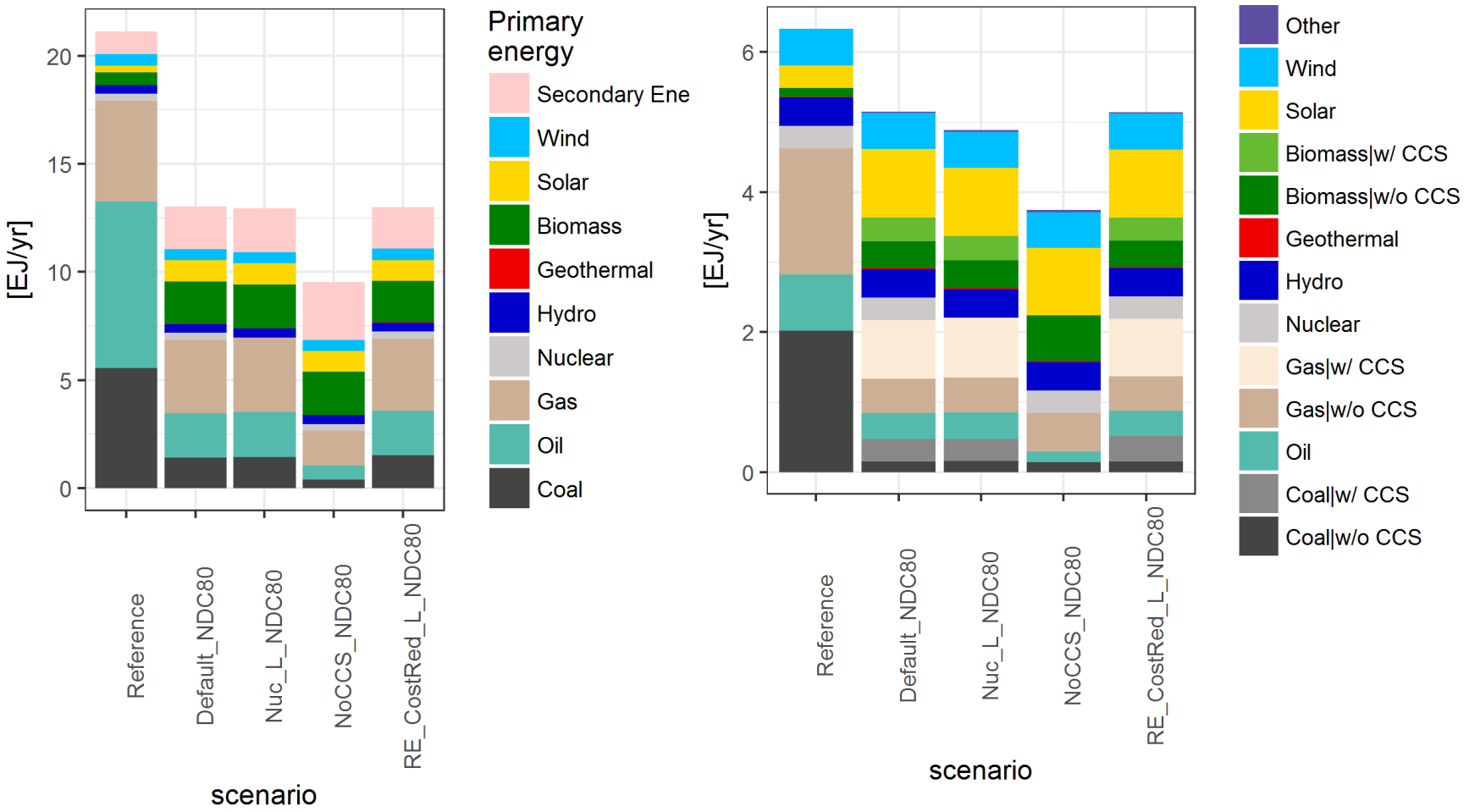
Silva Herran et al., Climate Policy, 2019.

Policy: BaU , NDC80 = NDC target by 2030 + 80% reduction vs 2005

Technology: nuclear power share in electricity = NDC target (20-22% by 2030) + 2050.

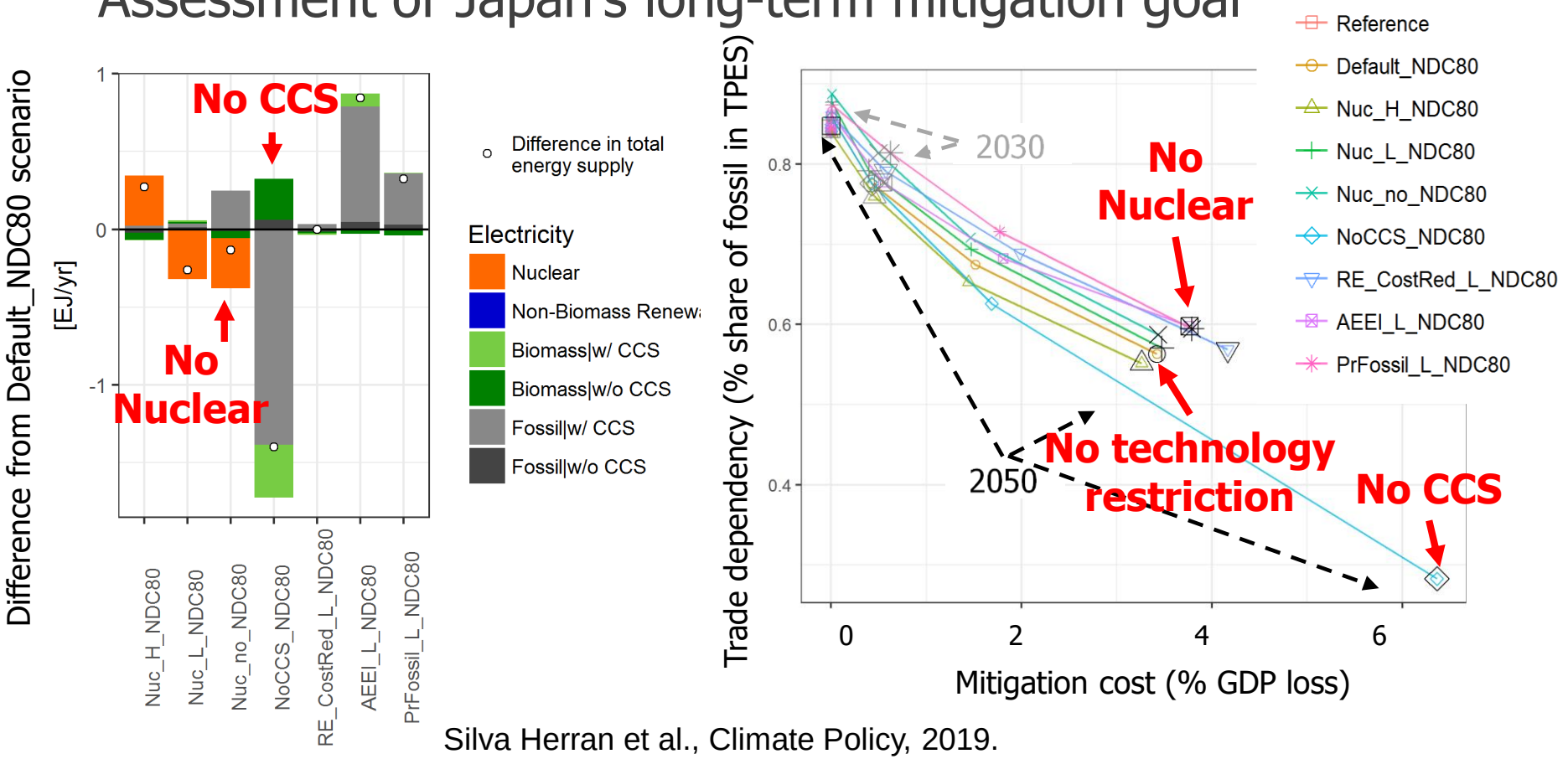
*Default = NDC target (22%) + 0.5x extended plant life (60 years) with 3 new installations.

Assessment of Japan's long-term mitigation goal



Silva Herran et al., Climate Policy, 2019.

Assessment of Japan's long-term mitigation goal



Silva Herran et al., Climate Policy, 2019.

- Assessed 2030 (NDC) and 2050 (80%) mitigation goals of Japan considering uncertainty in technology (nuclear, CCS, RE) and energy security.
- Effect of lack of CCS is largest, lack of nuclear is relatively small.

Assessment of Japan's long-term mitigation goal

Japan climate mitigation target (NDC + 80% 2050) feasible with constrained supply of nuclear power? → yes

If role of nuclear in mitigation decreases… what are the impacts?

→nuclear decrease compensated mainly by natural gas and overall decrease in energy consumption.

→Electricity prices increases driven by mitigation, and only slightly by nuclear power deficit.

Other technological constraints (CCS availability, renewable energy costs).

→Impact of mitigation and CCS availability considerably larger than nuclear availability.

→Cost reductions of renewables had small impact: small resource potential.

Considerations on the role of nuclear power in Japan.

→Relevance of nuclear power in other contexts in addition to climate mitigation: energy security, social acceptability

Future works

- International projects
  - COMMIT next stage, EMF36, ENGAGE
- National projects
  - JMIP/EMF35
- Sustainable development aspects and climate mitigation
- Collaboration with Asian partners.

Thank you very much!