Measuring the Impacts of Barriers in Thailand

Tatsuya HANAOKA

Head, Social System Division, National Institute for Environmental Studies, Japan

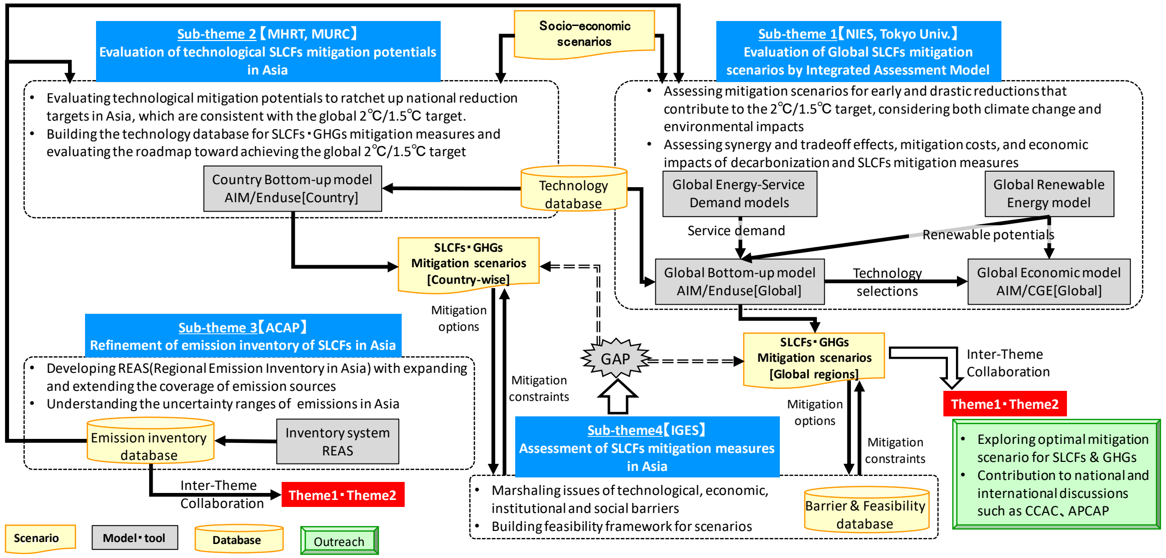
11 March, MR-E

Environment Research and Technology Development Fund S-20 Theme3 [FY2021 – FY2025]

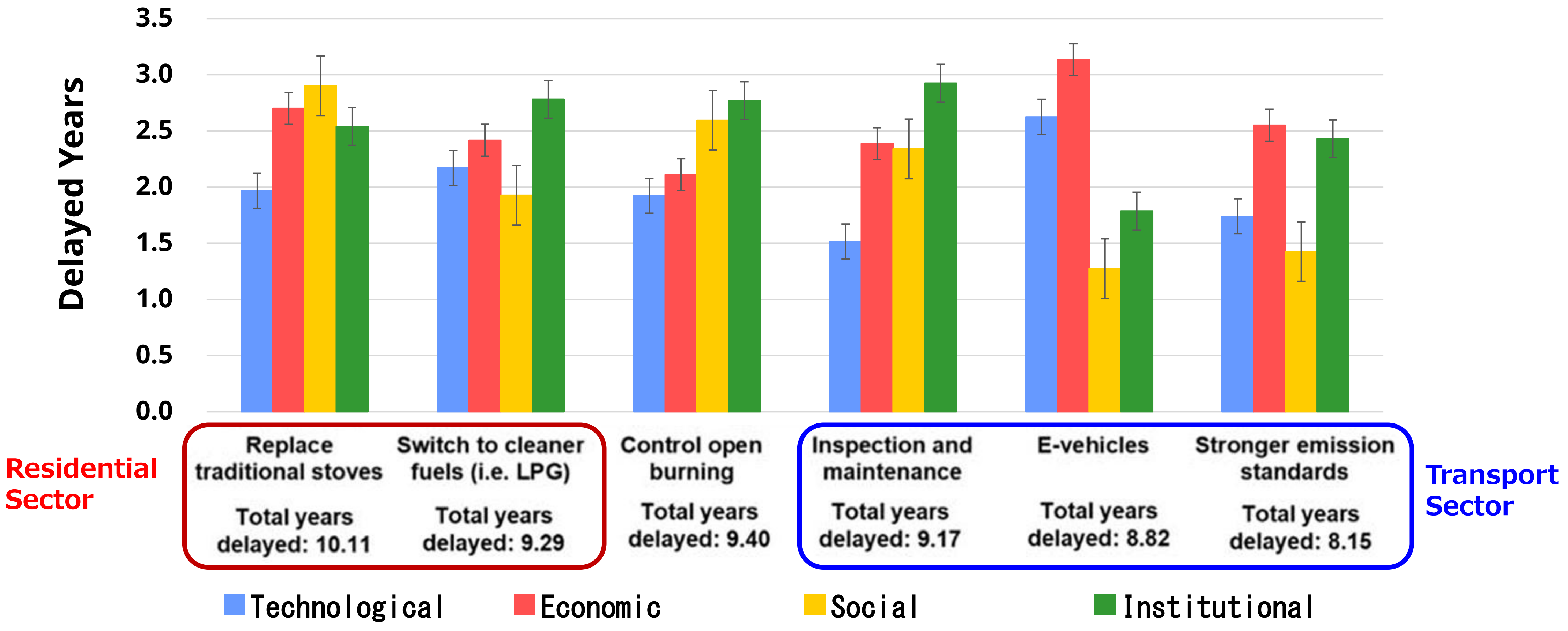
Evaluation of emission scenarios for mitigating environmental impacts caused by Short-Lived Climate Forcers

Considering the 1.5℃ targets, our objectives are

1. Exploring **mitigation scenarios** for reducing **short-lived climate forcing factors (SLCFs)** as well as **long-lived greenhouse gases (GHGs)**
2. Assessing **technological mitigation potentials** by region, by sector and by gas type and **economic impacts** of mitigation measures
3. Identifying **technological, economic, institutional and social barriers and challenges**, to discuss feasibility of drastic & early mitigation actions



Example of delayed years on major BC mitigation measures in Thailand



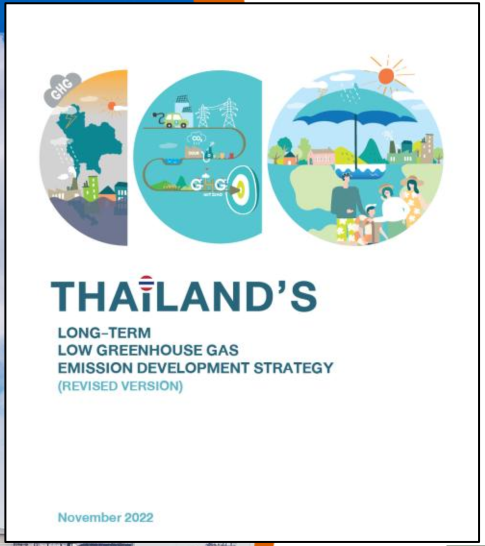
Zusman, E., Akahoshi, K., Hanaoka, T., et al (2025) *Environmental Research Communications*, DOI: https://doi.org/10.1088/2515-7620/adae5e
Akahoshi, K., Zusman, E., Hanaoka, T., et al (2025) *Climate*, DOI: https://doi.org/10.3390/cli13030064

Objectives:
Evaluating early action VS delayed action

- Analyzing the decarbonization scenario outlined in the Long-Term low-emission development Strategy (LTS) submitted by the Thai government to the UNFCCC in 2022

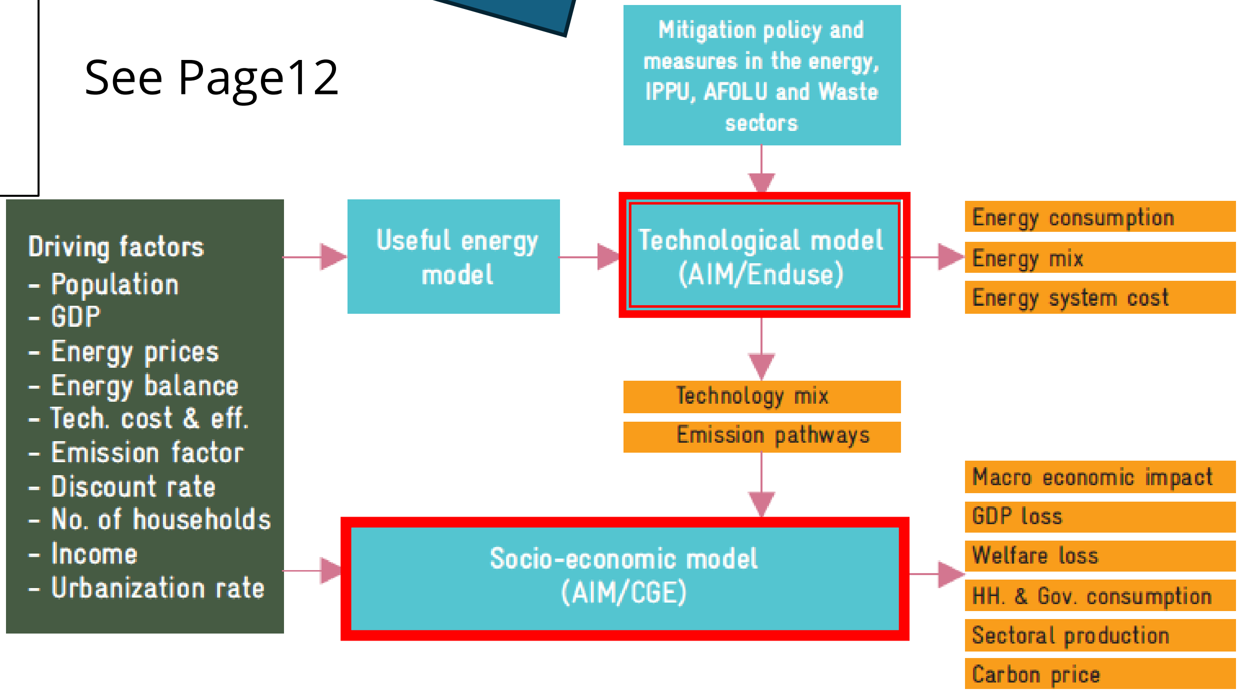
- **Evaluating the impact of delayed measures by quantitatively comparing the LTS scenario with a mitigation delay scenario**, where **barriers in the residential and transport sectors cause the implementation of measures to lag behind the LTS scenario**.

Why using the AIM/Enduse model?



Asia-Pacific Integrated Model (AIM)/Enduse model is used to quantify relevant policies to mitigate GHG emissions for achieving Thailand's carbon neutrality and net zero GHG emission pathway

See Page12



Scenario Description

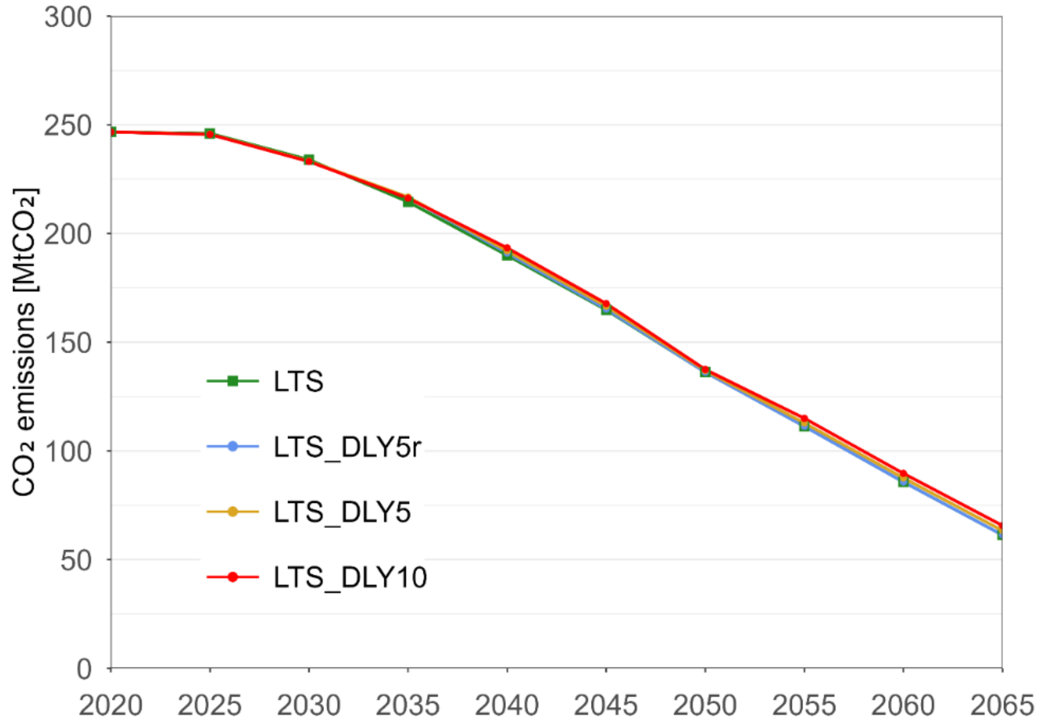
Scenario	2020 - 2050	2050～ 2065
REF	The technology efficiency and diffusion rate by technology after the base year remain constant under the same conditions as in 2020.	
LTS	Decarbonization measures are considered to achieve the 2050 carbon neutrality described in the **L**ong-**T**erm low GHG emission development **S**trategy	The CO_2 emission pathway aligns with the 2065 net-zero emission target outlined in the **L**ong-**T**erm low GHG emission development **S**trategy.
LTS_DLY5	▪ CO_2 reductions for 2050 and 2065 are set in the same way as in the LTS scenario. ▪ The **deployment of cooking and automobile measures for reducing BC**, i.e., moving away from biomass cooking in the residential sector and promoting next-generation vehicles in the transportation sector, **is delayed by about 5 years compared to the LTS scenario** from 2020 to 2050	
LTS_DLY5r	▪ CO_2 reductions for 2050 and 2065 are set in the same way as in the LTS scenario. ▪ The **deployment of cooking and automobile measures is delayed by about 5 years** compared to the LTS scenario from 2020 to 2050	From 2051 onward, **recovery from the impact of barriers** accelerate the deployment of cooking and automobile measures. As a result, the net-zero CO_2 emissions target is achieved by 2060, aligning with the LTS emissions pathway.
LTS_DLY10	▪ CO_2 reductions for 2050 and 2065 are set in the same way as in the LTS scenario. ▪ The **deployment of cooking and automobile measures is delayed by about 10 years** compared to the LTS scenario from 2020 to 2050	

Key Message 1
CO_2 emission pathways remain largely unchanged even with delays in BC measures

- **LTS_DLY5** & **LTS_DLY10** scenarios increase cumulative emissions from 2020 to 2065 **at 0.6% & 1.2%,** respectively, **compared to the cumulative emissions of the LTS scenario**.

- If delays caused by barriers are solved after 2050 (i.e., **LTS_DLY5r**), cumulative CO_2 emissions increase by only **0.1% compared to the LTS scenario**.

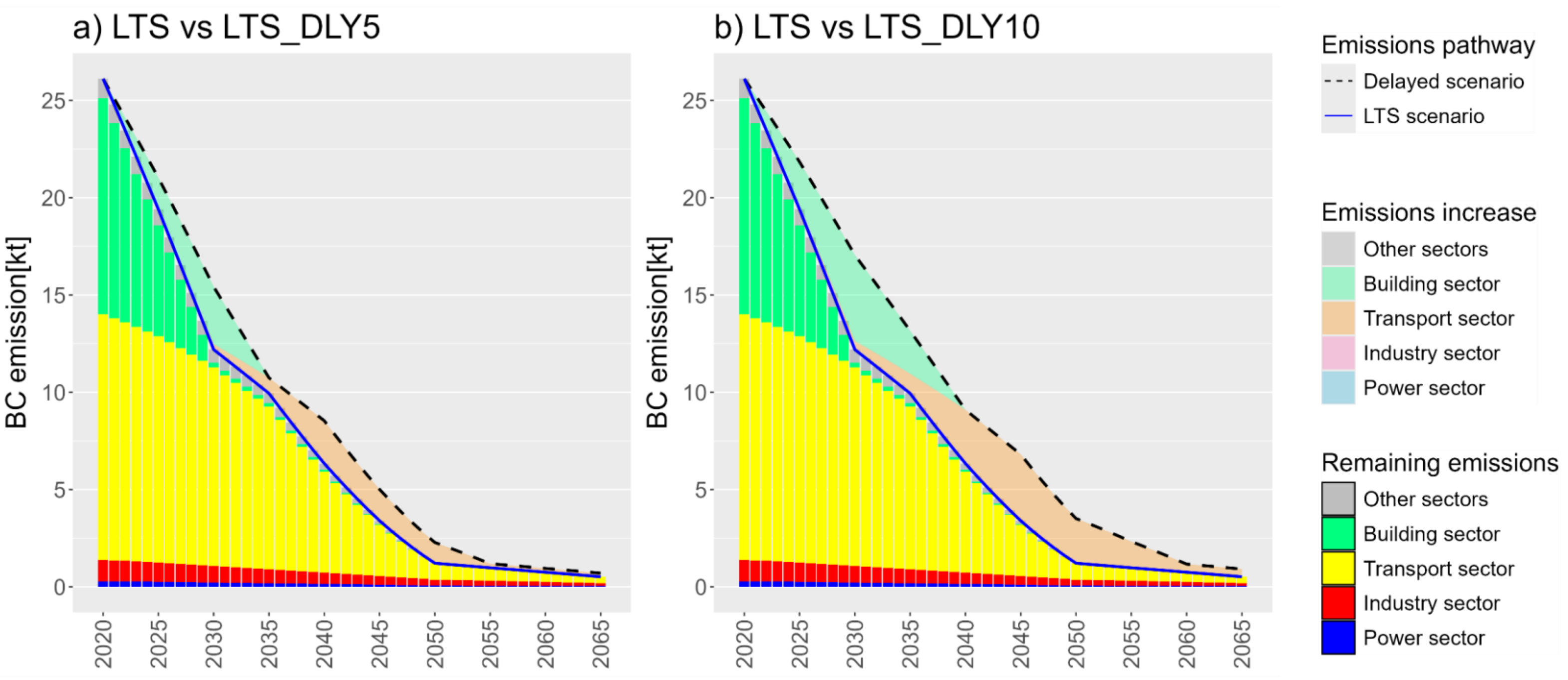
- This indicates that a policy delay of about 5 -10 years results in **a very small increase in cumulative CO_2 emissions**



Note) CO_2 absorption by LULUCF which is assumed in the Thai government's LTS, is considered exogenous in this study.

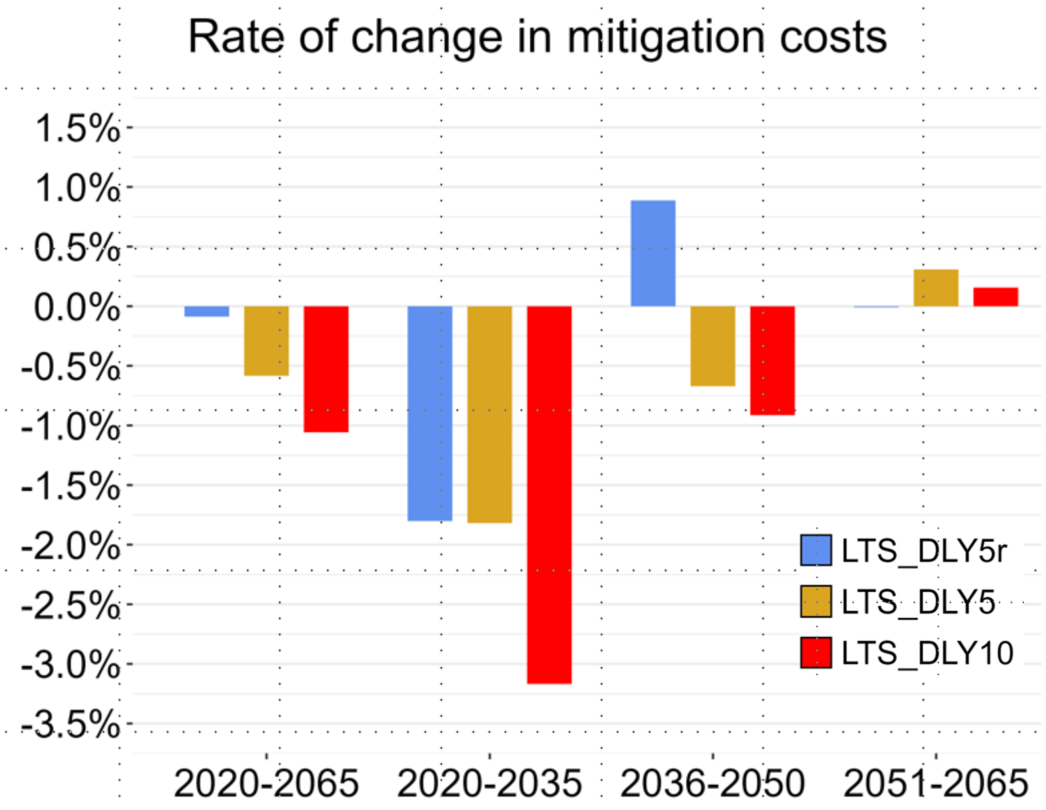
Key Message 2
Impact of delayed measures on BC emissions is significant

- The timing of the effects of delayed measures varies between the residential & transport sectors.
- **The longer the delay in measures, the greater the BC emissions**
- If the earlier reduction effects on climate mitigation will be delayed, thus their environmental impacts will be more significant.



Key Message 3
Long-term costs of delayed action exceed short-term investment savings (relative to the LTS scenario)

- Since **delaying measures decreases the adoption of costly high-efficiency equipment**, **the longer the delay, the greater the reduction in investment cost.**
- Conversely, **energy consumption cost rise because of increased fuel consumption caused by delays in installing high-efficiency equipment**.
- Considering both, **the incremental reduction in investment costs outweighs the incremental increase in energy consumption costs, which is only significant for the next 15 years**. **From a long-term perspective, the increase in energy consumption costs due to delayed measures will exceed the reduction in investment costs** and the net mitigation costs will also rise as measures are delayed.

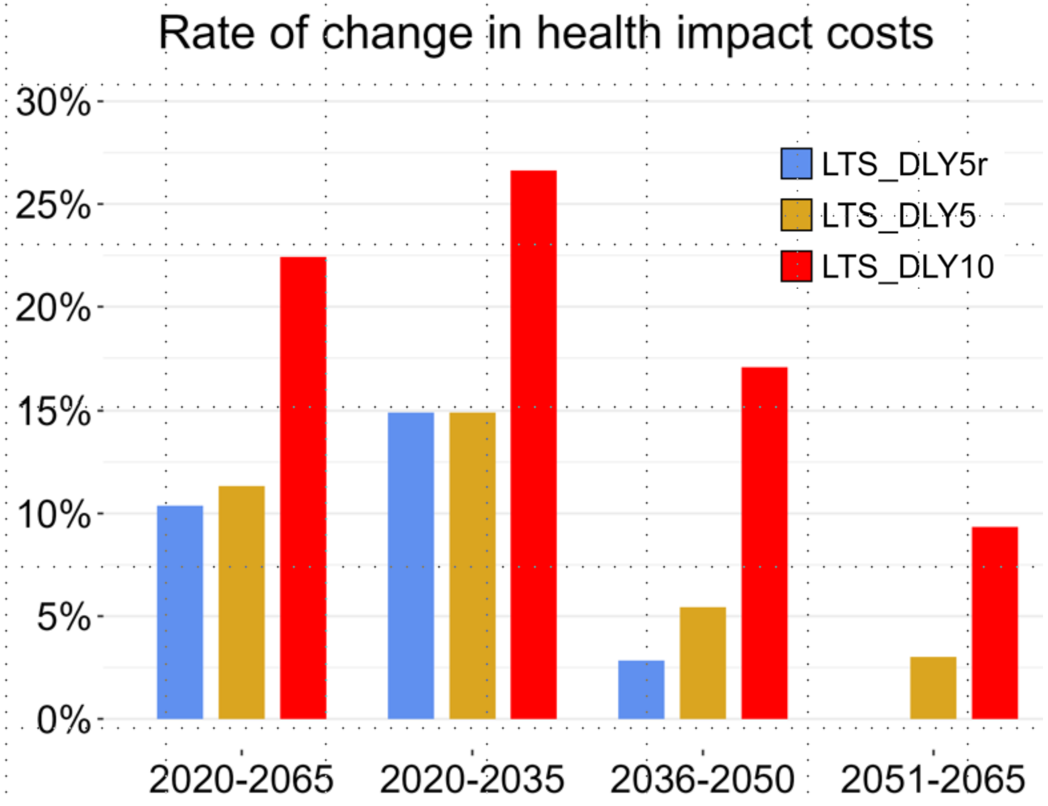


Note) mitigation costs include both capital investment costs for equipment and fuel consumption costs.

Key Message 4
Impact of costs of delayed action is larger than costs of mitigation action (relative to the LTS scenario)

- **The rate of increase in impact costs due to delayed measures is far larger than the rate of decrease in mitigation costs**.
- In particular, the rate of increase in health damage is very high, exceeding 15%, over the next 15 years. The reduction in mitigation costs is only -3% at most over the next 15 years.
- Cumulative health impact costs through 2065 increase significantly from +10% to +21%, as the number of years of delay increases, which cannot be ignored for the affected public.

  In other words, **the cost of not taking countermeasures (i.e., cost of inaction) has a greater impact than the cost of taking countermeasures (i.e., cost of action).**



Note) health impact to humans caused by $PM_{2.5}$ is considered as the impact costs in this study

Acknowledgment

This research was performed by the Environment Research and Technology Development Fund S-20-3 [JPMEERF21S12030] of the Environmental Restoration and Conservation Agency provided by the Ministry of Environment of Japan.