Analysis of GHG emission compositions
and national reduction targets in Asian countries

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Background

● **The need for an acceleration of NDC reduction targets at the country level**
- In preparation for the implementation of the Paris Agreement, in addition to creating a low-carbon development strategy, it is necessary to review the NDC (Nationally Determined Contribution) at the country level. NDC targets already proposed at the individual country level is not sufficient to achieve the 2 degree and 1.5degree targets outlined in the Paris Agreement, and it will be necessary to accelerate GHG emissions reduction targets.

● **The need for emissions reductions in line with the development of Asian countries**
- In Asia, where GHG emissions are expected to increase significantly, there is a need for both economic development and strengthened efforts to reduce emissions, particularly in countries with high GHG emissions, such as China and India.

● **The need for support from developed countries to developing countries**
- For the NDC of Thailand and Indonesia and so forth, in addition to the reduction targets set by those countries, there are also reduction targets applicable when international support is available, and there is expected to be technical support from Japan among other countries.

Purpose

● **Organizing GHG compositions of emissions in major Asian developing countries**
● **Consideration of NDC reduction targets set by each country**
● **Analysis of leeway for the accelerated of reduction targets using a bottom-up model**
● **Analysis of reduction contribution by Japanese technology using a bottom-up model**

- In this study, in order to clarify the possibility of further carbon reductions in the Asian region, after organizing the current structure of GHG emissions, we conducted future emissions estimations using a technology selection framework.
- And we performed quantitative analysis on the relationship between factors such as the further deepening of GHG reduction targets set at the country level and the emissions pathways that are consistent with hitting the 2 degree target.

Trend Analysis

GHG emission composition by source in Asia
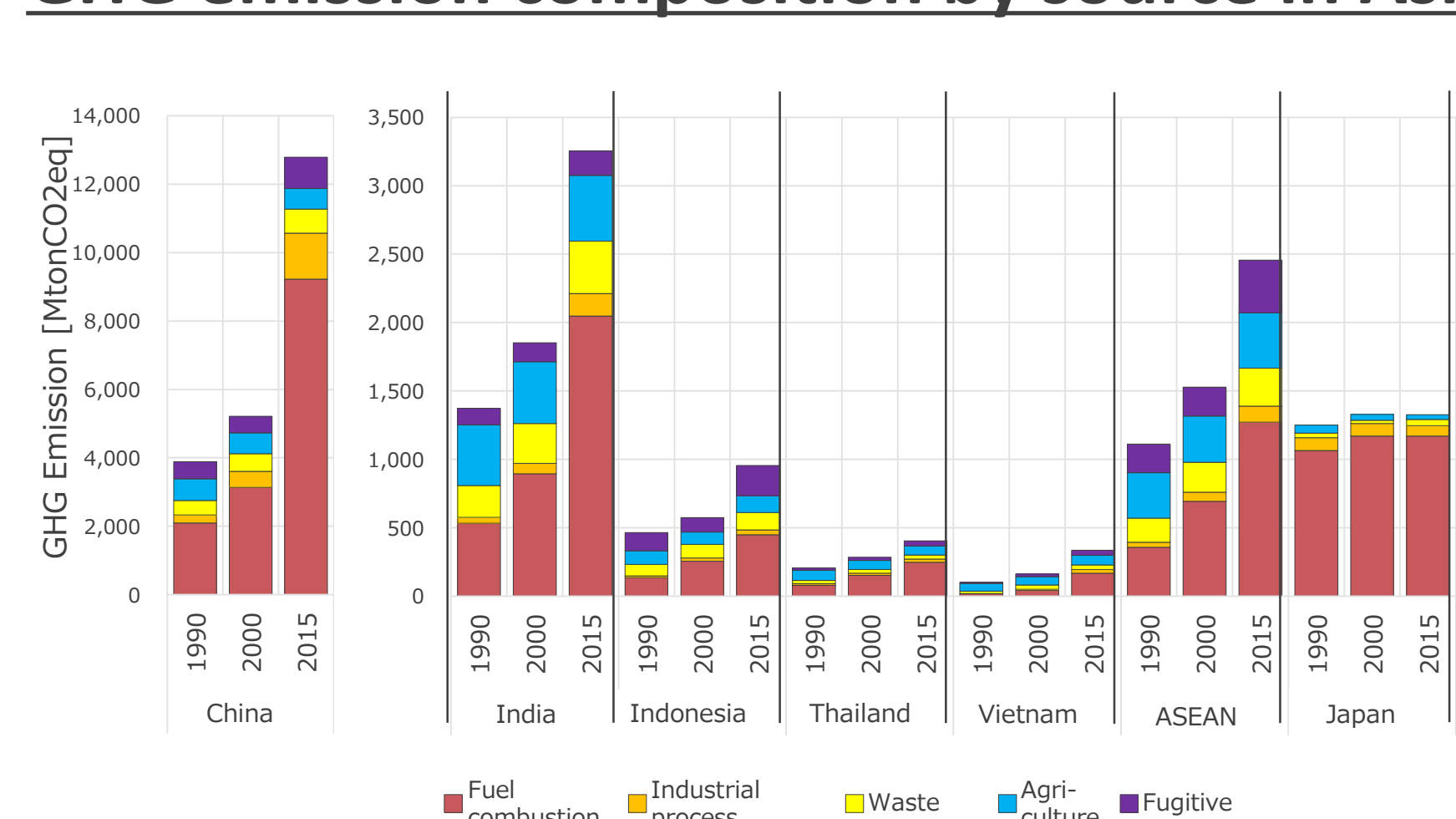
● **Japanese technology can contribute to curbing the increase in emissions associated with future economic development in Asian countries.**
- Fuel combustion, industrial processes and waste account for over 95% of GHG emissions in Japan.
- When looking at past reduction, technologies in these fields stands out as a strength for Japan.

Summary of NDCs in Asian developing countries

	Target in 2030	Conditional Target in 2030	Base Year
China	CO2/GDP	-60~-65%		2005
India	GHG/GDP	-33~-35%		2005
Indonesia	GHG	-29%	-41%	BaU in 2030
Thailand	GHG	-20%	-25%	BaU in 2030

- In China and India, the target value is the 2030 reductions target, in terms of emissions reduction unit per GDP unit.
- In Indonesia and Thailand, as well as BaU reduction targets for 2030, there are also conditional targets premised on international support, such as technology transfer and funding.
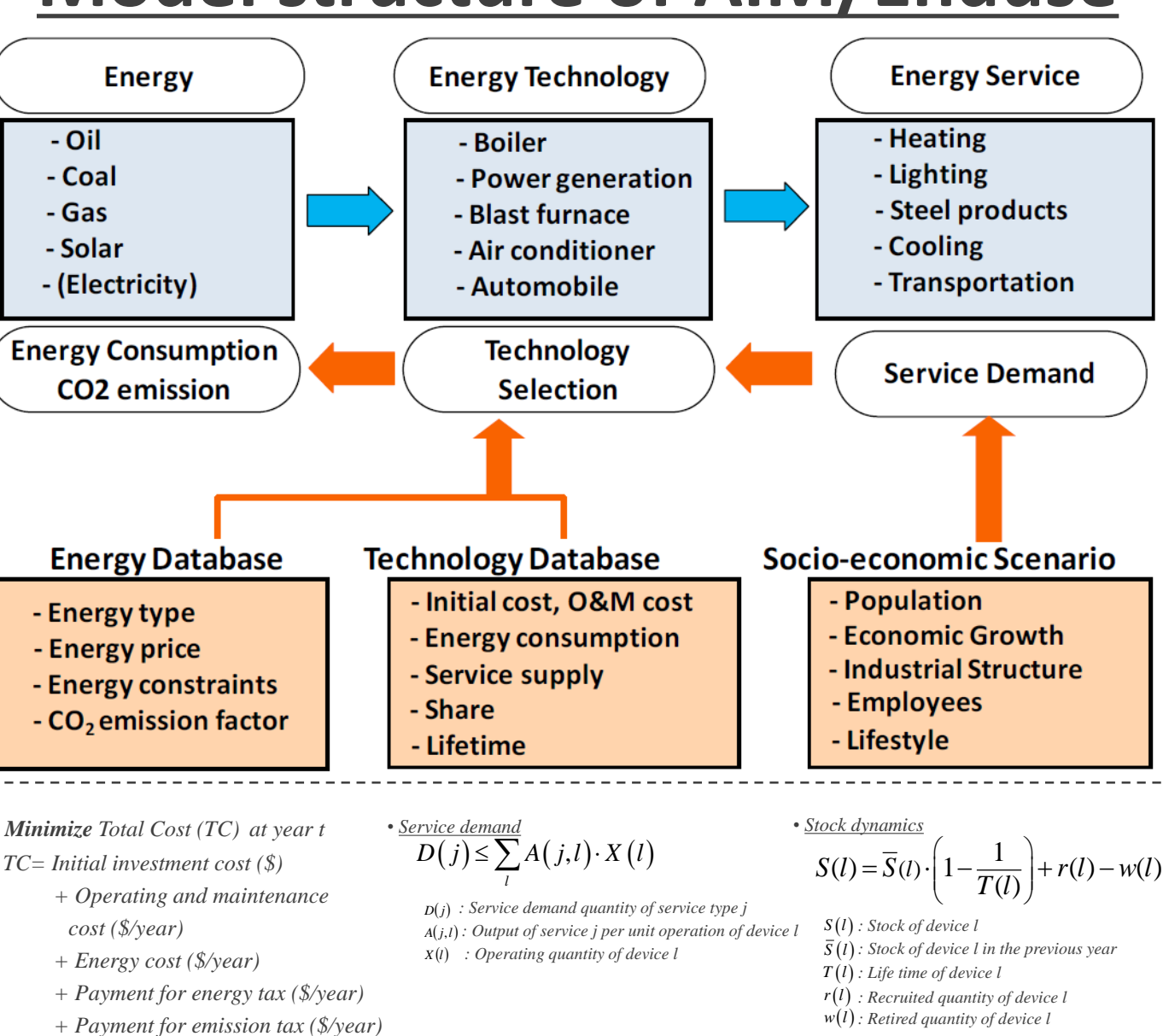
Analysis of GHG per capita in Asia

Globally equalized GHG emission per capita To achieve 2.0 target 1.4 - 2.8 tCO2eq/capita
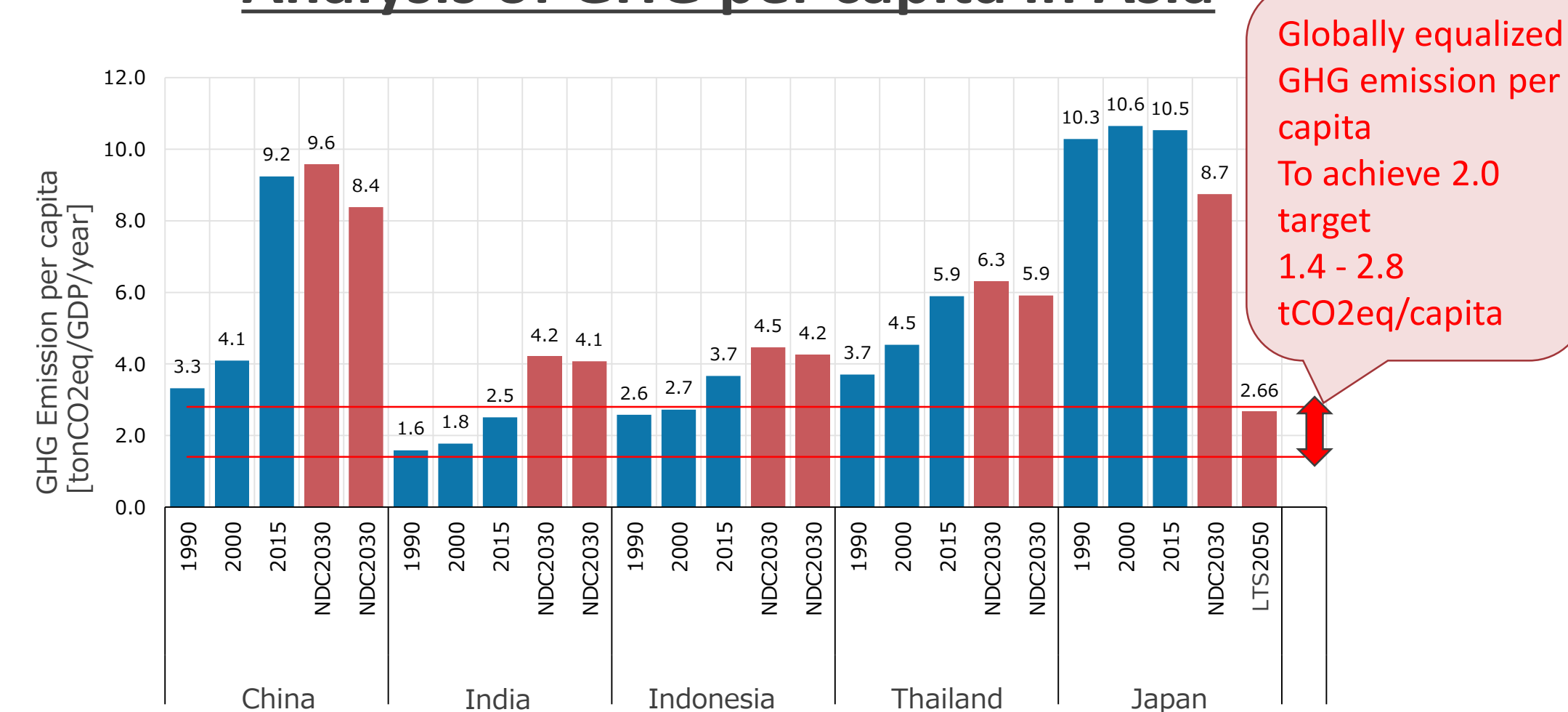
● **In the current NDC targets of individual countries, GHG emissions exceed emissions per capita needed to achieve the 2 degree target.** When considering future expected economic growth, it may not be possible to achieve the targets even by 2050.
- It is apparent that NCD targets must increase and it is highly feasible that Japan's energy-saving and low-carbon technologies can contribute to increasing those targets.

Methodology

Model structure of AIM/Enduse

Example of technology dataset

● Low Carbon Technologies

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Energy Sector	Efficient power generation; coal and gas with CCS; hydropower; wind power; solar PV; geothermal; bioenergy; ocean; PHS; reinforcing electricity interconnection; Hydrogen generation (electrolysis)
Transport Sector	Efficient train, maritime, and aviation; NGV; BEV, PHEV; FCEV; biofuels; eco-driving
Building Sector	Energy-efficient buildings (e.g. insulation); high-efficiency equipment and appliances; electric heat pump water heaters; electrification for heating, cooling, and cooking; energy-management systems
Industry Sector	Energy-efficient industrial processes; CCS for iron making and cement lime; high-efficient boiler, furnace, and motor; industrial heat pump; agricultural machines; bioenergy use

● End-of-pipe Technologies

Desulfurizer	Limestone injection, Wet FGD, High-efficiency FGD
Denitrator	Combustion improvement, Selective reduction, Non-selective reduction
Dust Collector	Cycron, Wet scrubber, Fabric filters, Electronic precipitator

● **In order to conduct quantitative analysis of NDC reduction targets in China and India, GHG emissions up to 2050 were estimated using a sequential dynamical system technology selection framework, AIM/Enduse.**
- A sequential dynamical system is used to estimate the combination of technologies that minimizes total costs (technical introduction, operation and maintenance costs) to meet service demands imposed externally.
- For the socio-economic scenario, energy services were calculated based on a "SSP2" which concerns factors such as moderate population growth and GDP, and is taken from the Shared Socio-Economic Pathways.
- GHG emissions scenarios were analyzed in a countermeasure scenario that achieves a reduction equivalent to the 2 degree target in 2050, in addition to the current BaU scenarios.
- We will work in collaboration with state researchers in the relevant countries to refine estimates while incorporating regional policy and technical information.

Result

● **Emissions of both the ─BaU and ─Countermeasure scenarios may fall below the reduction targets. In particular, emissions in 2030 that pass through the countermeasure scenario will be equivalent to about half of the reduction target.**

Estimated emissions and reduction of China's BaU scenario and Countermeasure scenario
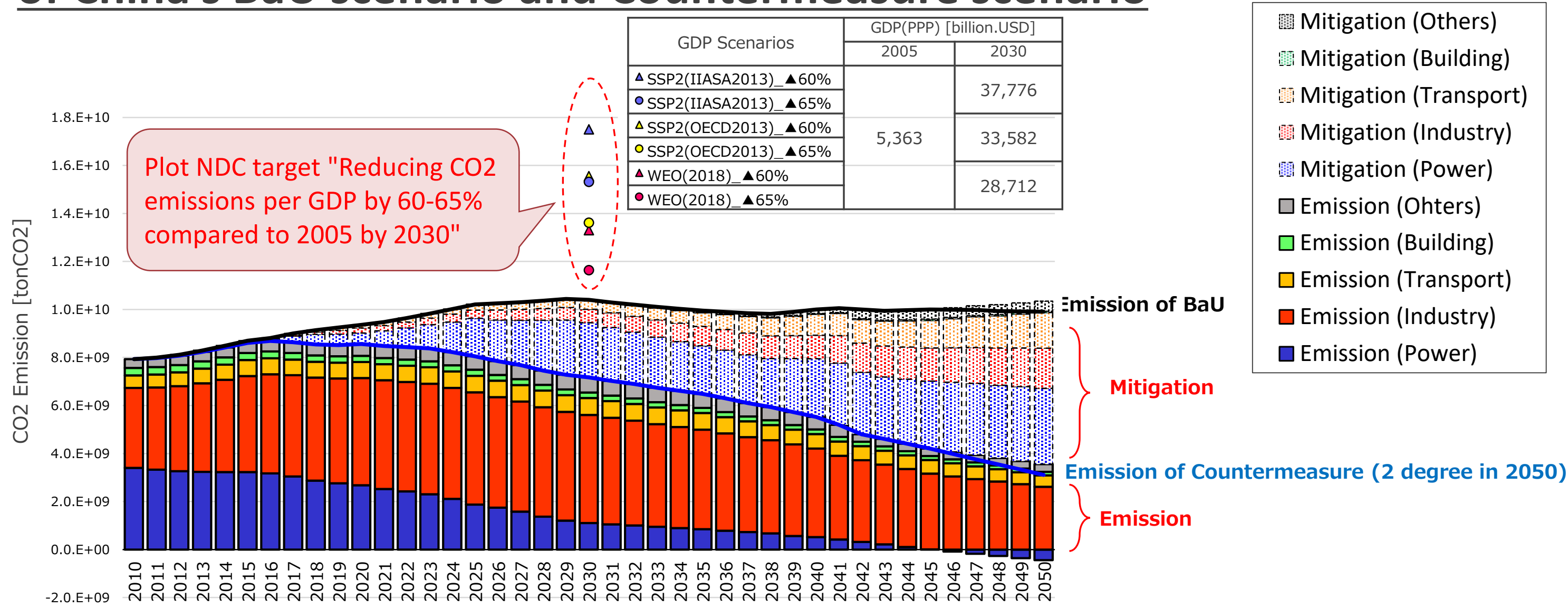
Estimated emissions and reduction of India's BaU scenario and Countermeasure scenario
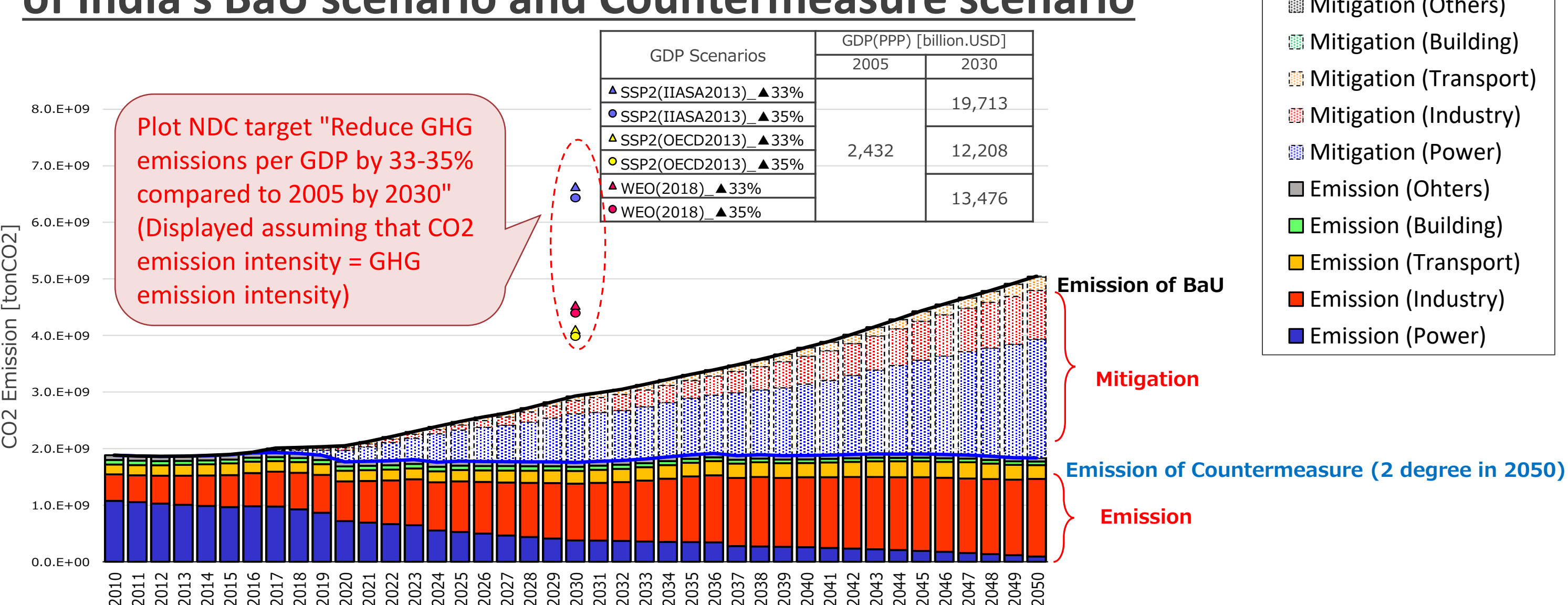
Outlook

● We will continue to conduct analysis while expanding the scope of research, such as the target countries, and the intensity of the emission scenarios (2 degree target, as well as 1.5).
● We will continue to prepare data on the efficiency and price information of Japanese technology going forward, to refine the model output from AIM/Enduse.
● We will work in collaboration with state researchers in the relevant countries to refine estimates while incorporating regional policy and technical information.

Conclusion

● **In the current NDC targets, GHG emissions exceed emissions per capita needed to achieve the 2 degree target. And when considering future economic growth, it may not be possible to achieve the targets by 2050 either. It is apparent that NCD targets must increase and it is highly feasible that Japan's energy-saving and low-carbon technologies can contribute to increasing those targets.**

● **In the Asian region, the ratio of emissions from energy combustion and waste is high, and in developing Asian countries, for which future economic development is expected, there is a high possibility that contribution to emissions reduction can be expected through the spread of decarbonization technology from Japan.**