COP25 side-event at the Japan Pavilion: International Coordination in Efforts of Climate Change Response Measures

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Evaluations on International Competitiveness of NDCs and the Implications of Long-term Deep Emission Reductions

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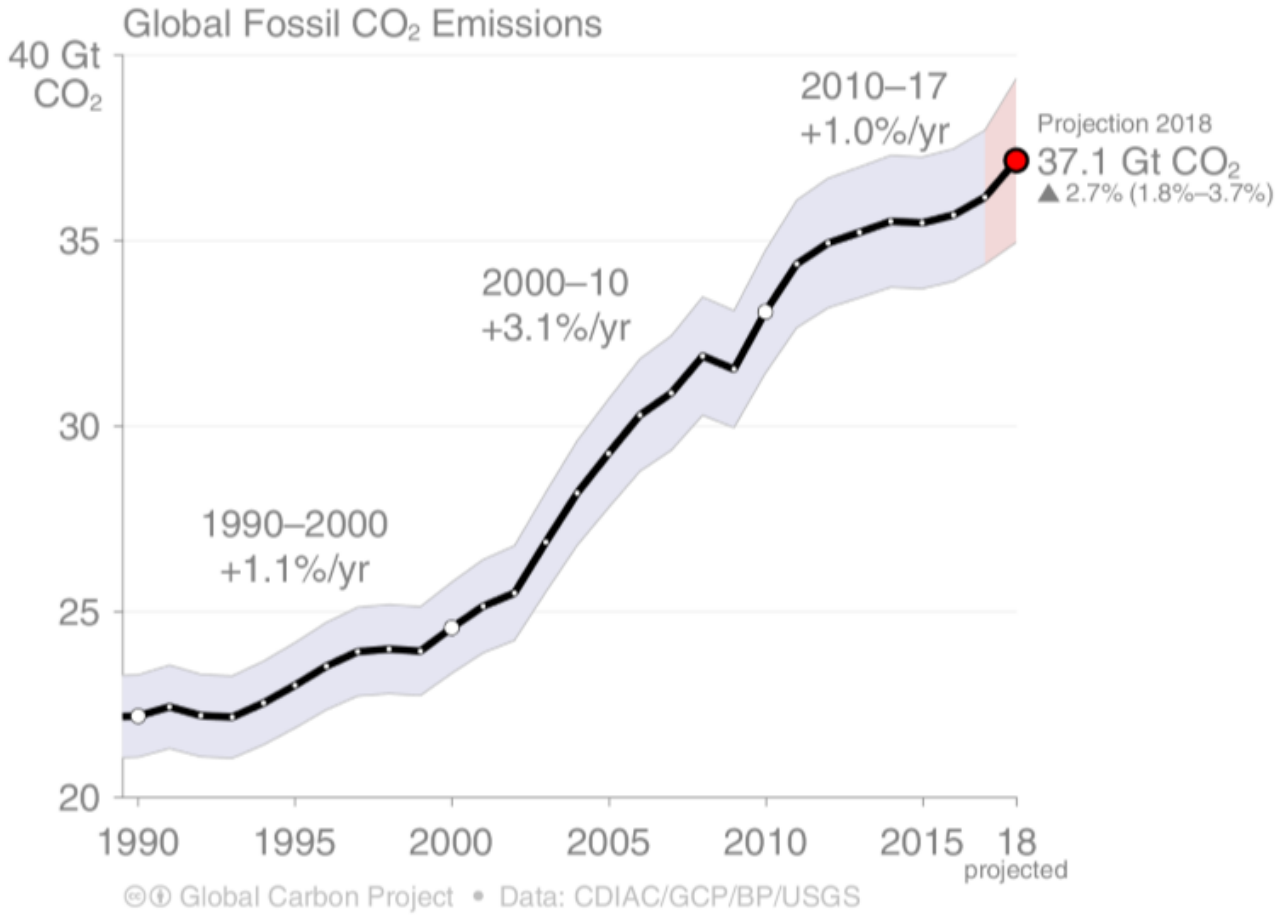
Global CO_2 Emissions Trajectory



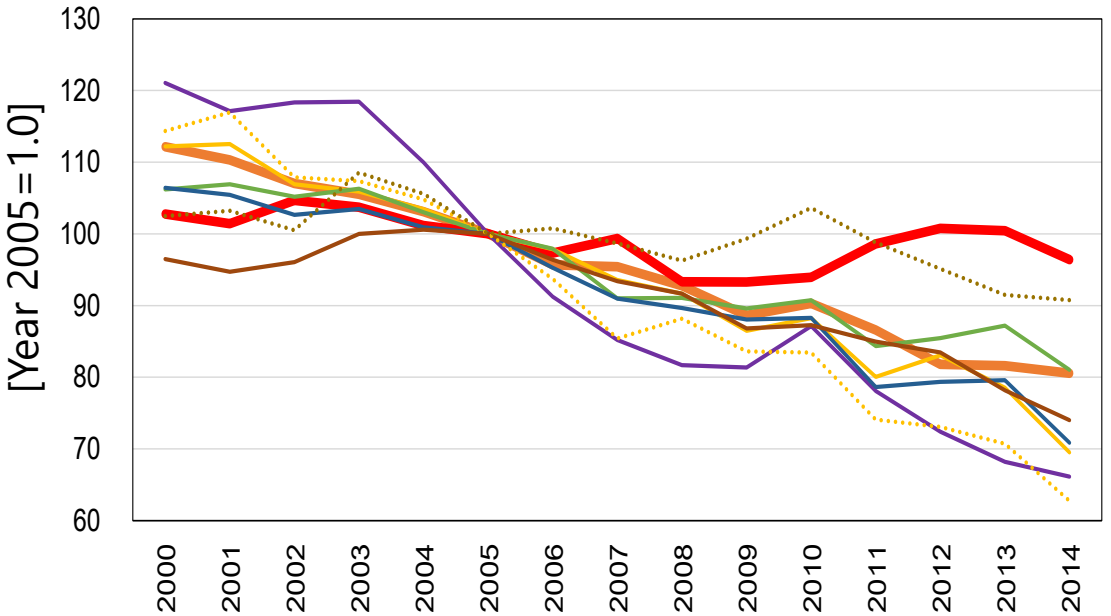
Estimates for 2015, 2016 and 2017 are preliminary; 2018 is a projection based on partial data.
Source: CDIAC; Le Quéré et al 2018; Global Carbon Budget 2018

Source) Global Carbon Project

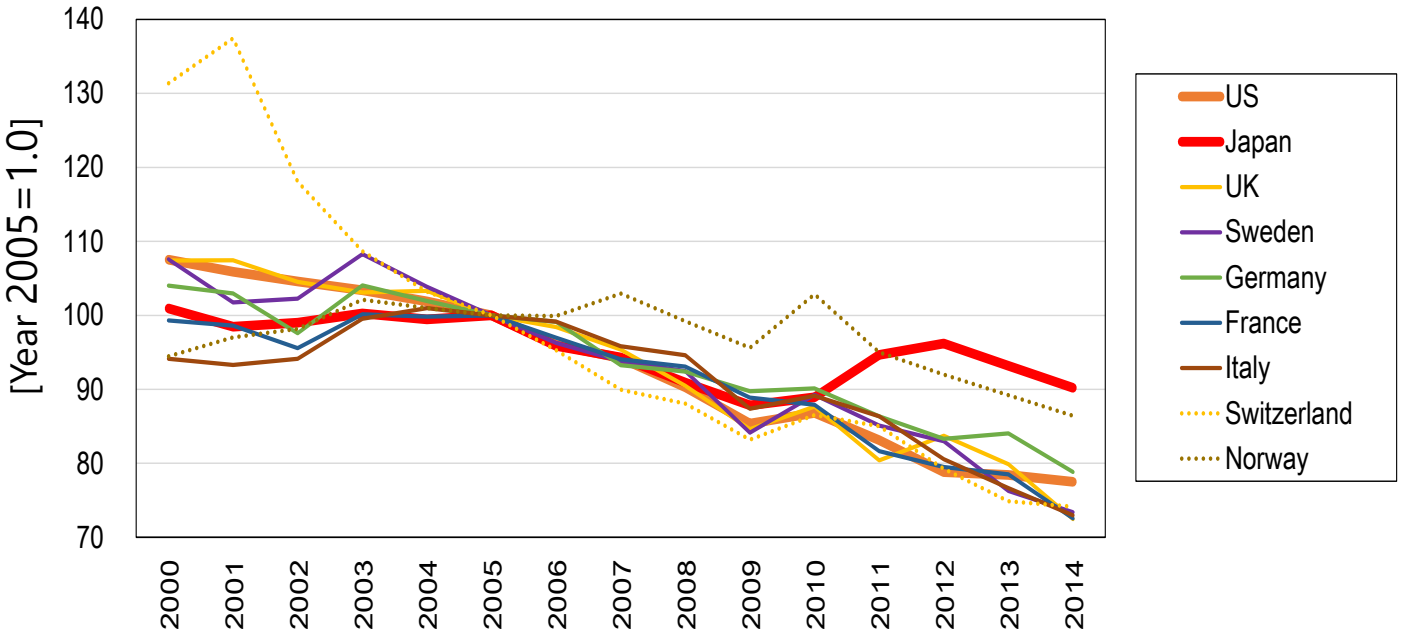
- Global CO_2 emissions increased more rapidly since 2000.
- The emissions were almost constant from 2013 to 2016 while the global GDP increased.
- According to our analysis, the largest contributor to this apparent decoupling was production adjustment of iron & steel etc. mostly in China (for a few years after 2010, the productions were too large), and the second largest was the shale gas revolution in the US.
- The global CO_2 emissions after 2016 are increasing again mainly due to repercussion of the production adjustments in China.

Per-GDP CO2 Emission in European nations, US and Japan: Production-base v.s. Consumption-base

Production-based CO_2 per GDP



Consumption-based CO_2 per GDP

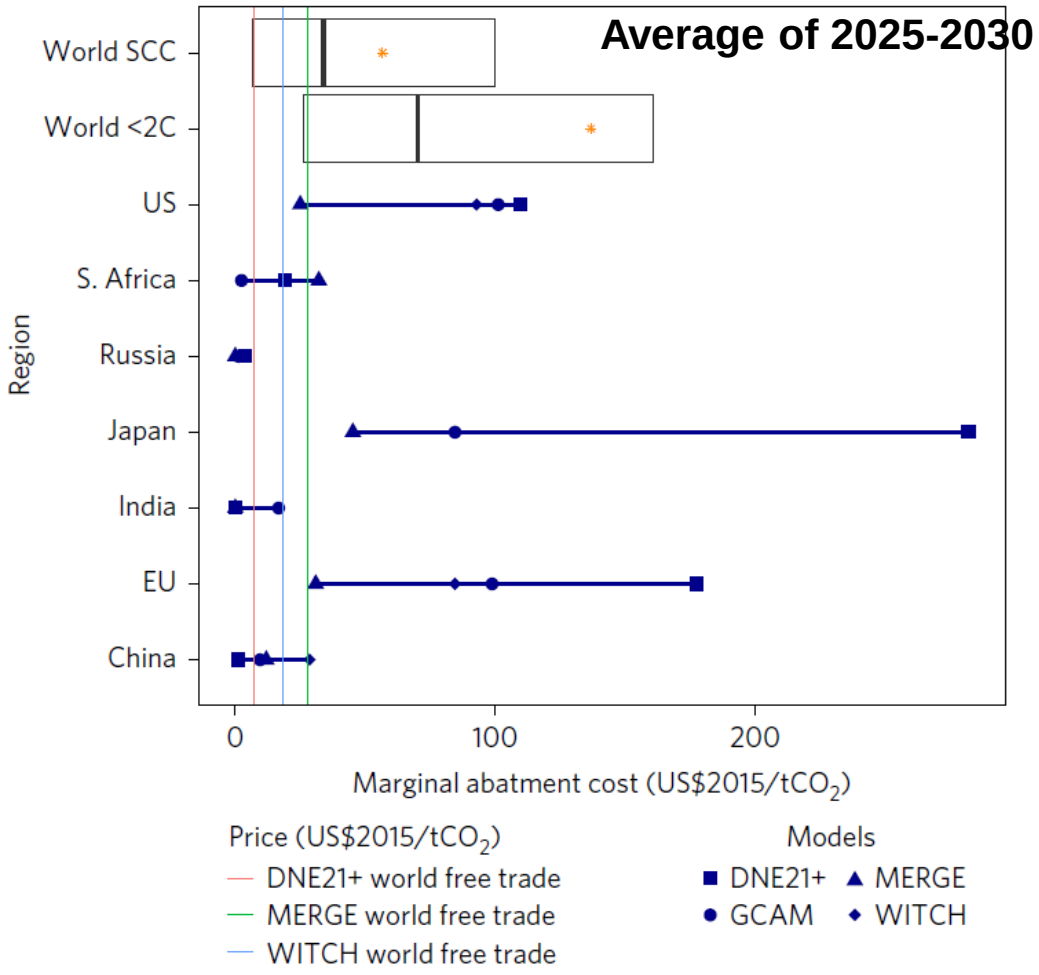


Note: 2010 local currency base

Source: estimated by RITE

- In terms of the production-based CO2 emissions per GDP, the degrees of improvement of the nine countries differs greatly.
- However, concerning the consumption-based emissions, the improvement rate of these countries does not differ that much when excluding the impact of Japan's emission increase due to the shutdown of nuclear power generation after the Fukushima Daiichi nuclear power accident caused by the Great East Japan Earthquake.
- Focusing only on production-based emissions may lead to wrong interpretation of emission reduction efforts of individual nations.

CO_2 marginal abatement costs of the NDCs

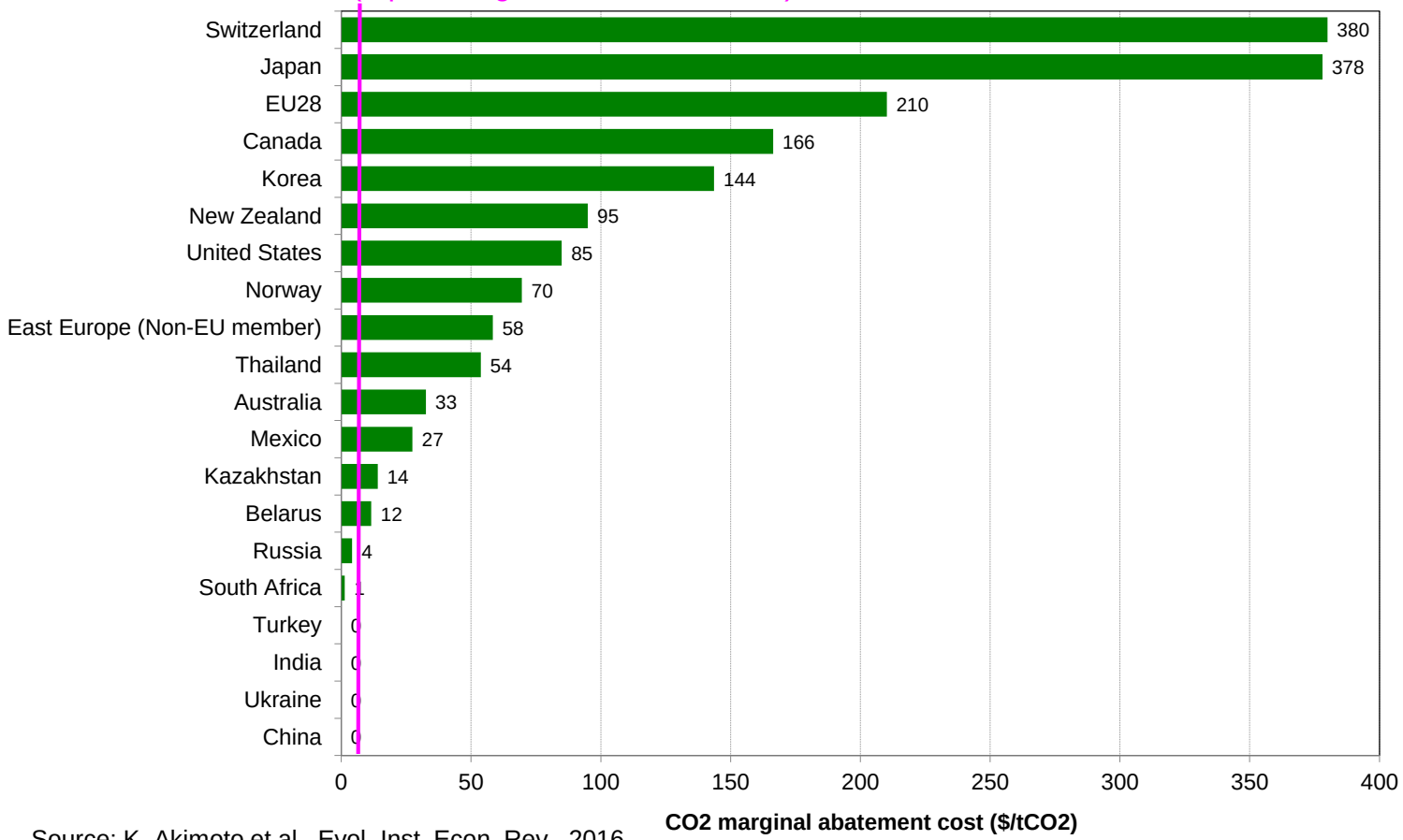


Source: J. Aldy et al., Nature Climate Change, 2016

2030 (2025 for the U.S.)

【World GDP loss due to mitigation】NDCs:0.38%; the global least cost：0.06%

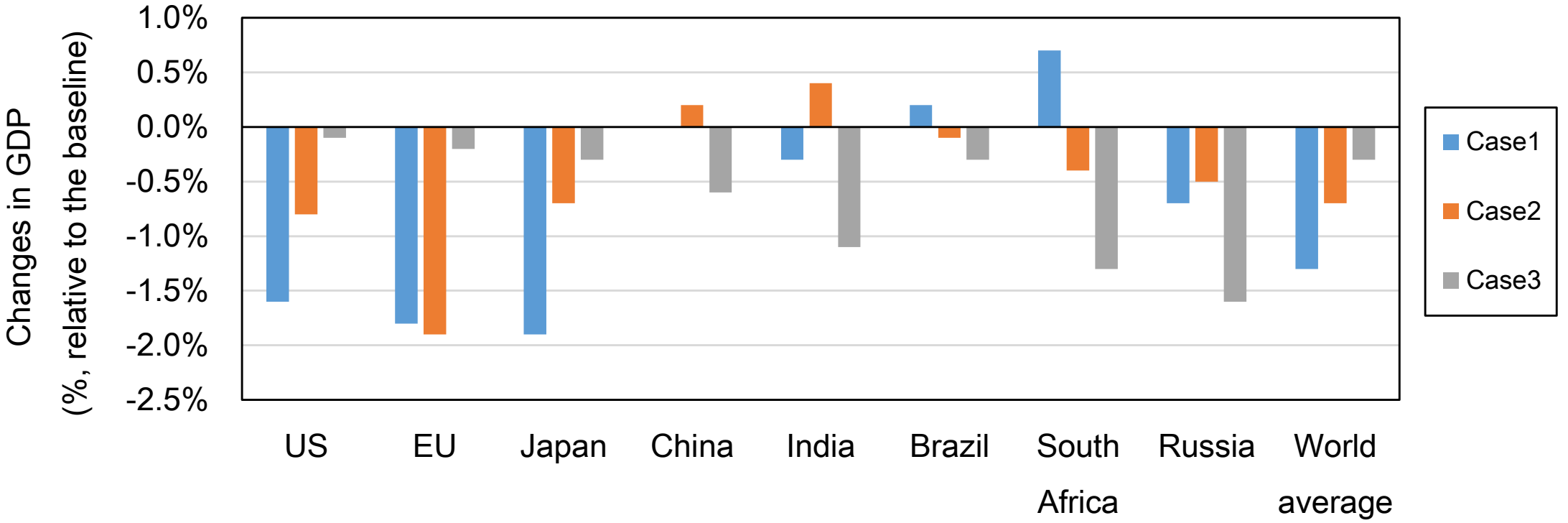
The least cost (equal marginal abatement costs)：6$/tCO2



Source: K. Akimoto et al., Evol. Inst. Econ. Rev., 2016

- **The estimated marginal abatement costs of NDCs are largely different among countries, and therefore the world total mitigation costs are much larger than those for achieving the aggregated emission reductions under the least cost measures, i.e., under globally uniform MAC.**
- **Current economic conditions where lower GDP growth is projected will bring lower MACs in developed countries and higher MACs in developing countries which have intensity targets, e.g., China.**

GDP impacts of the NDCs for the major countries in 2030



Case 1: NDCs (including typical energy policies within NDCs)

Case 2: Equal MACs among sectors within each nation

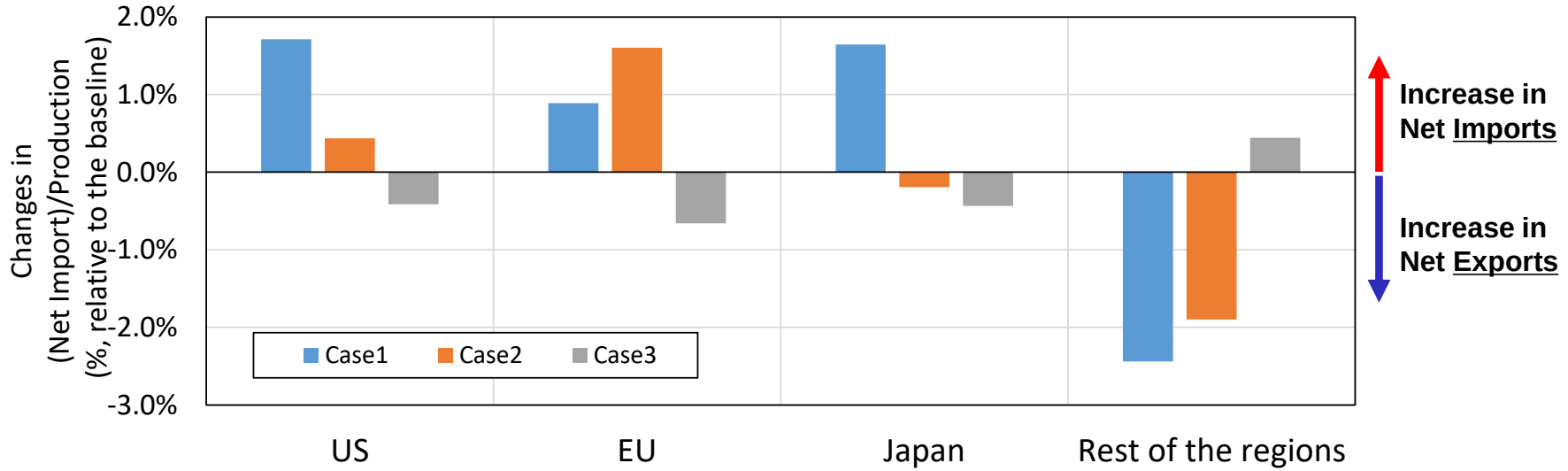
Case 3: Equal MACs among nations and sectors (Global trade)

Source: estimated by a CGE type DEARS model developed by RITE

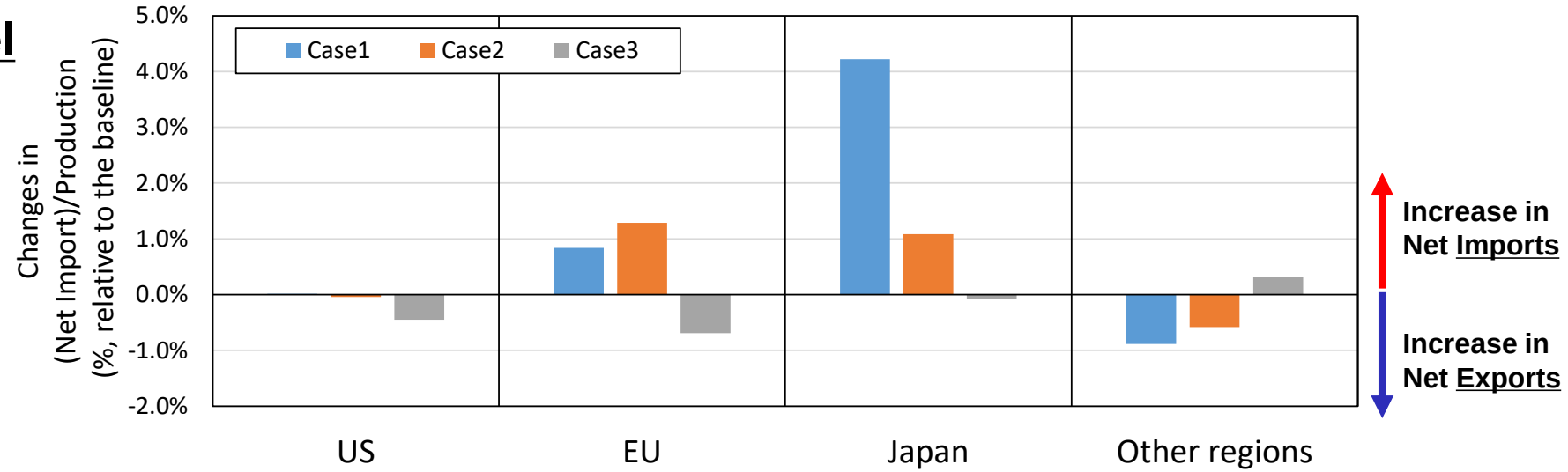
- **The negative GDP impacts are large in the US, EU, and Japan in Case 1 (NDC case).**
- **The negative GDP impacts for the US and Japan in Case 2 (Equal MACs among sectors within each nation) will be smaller than those in Case 1.**
- **The negative GDP impacts for the US, EU, and Japan, and the global impacts in Case 3 (Equal MACs among nations and sectors) will be much smaller than those in Cases 1 and 2.**
- **The positive GDP impacts in Cases 1 and 2 for some developing countries are estimated.**
- **The negative GDP impacts for Russia are estimated in all of the three cases mainly due to the decreases in fossil fuel exports.**

Trade impacts in Chemical and Iron & steel sector in 2030

Chemical



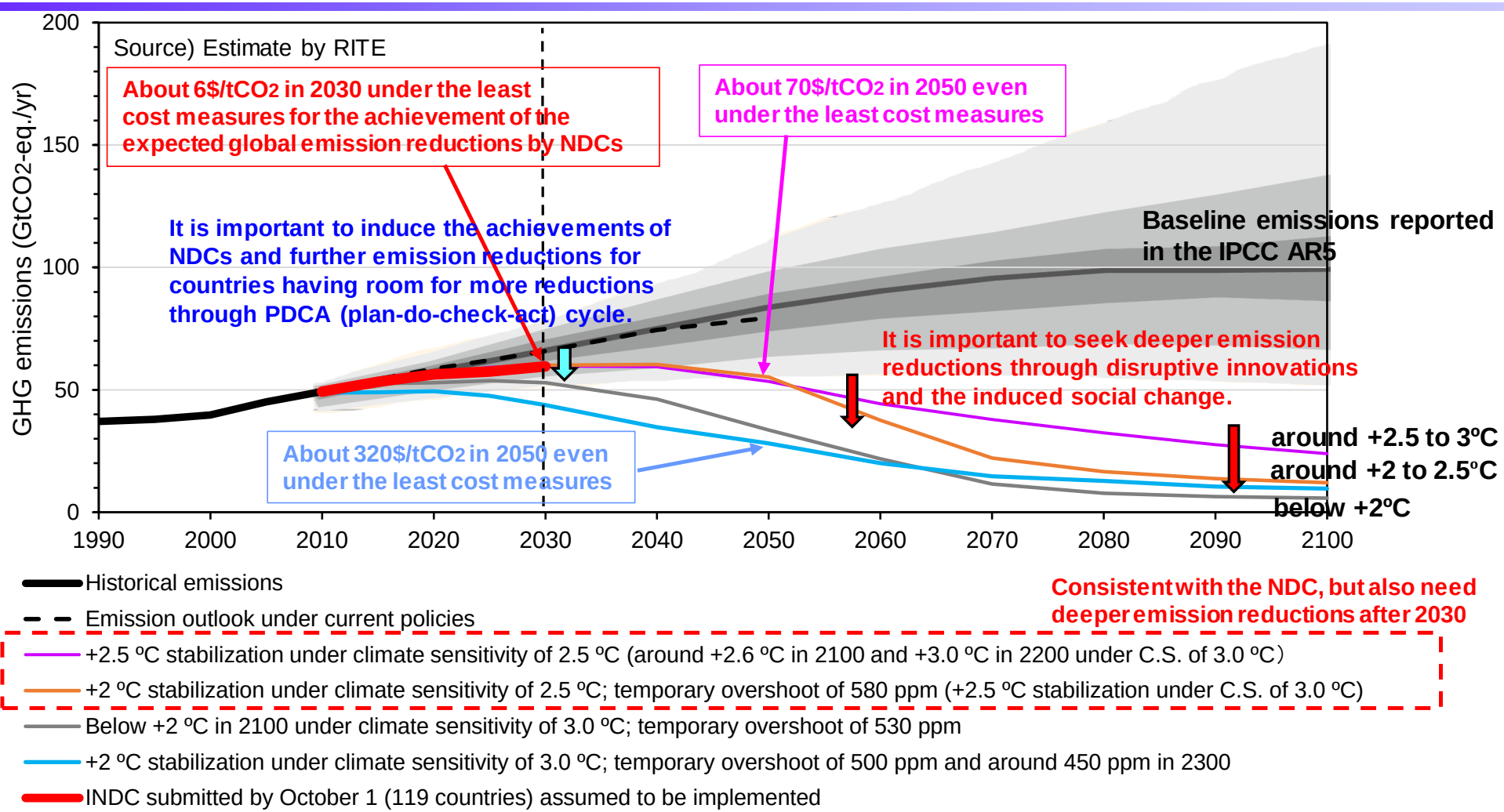
Iron & steel



Source: estimated by a CGE type DEARS model developed by RITE

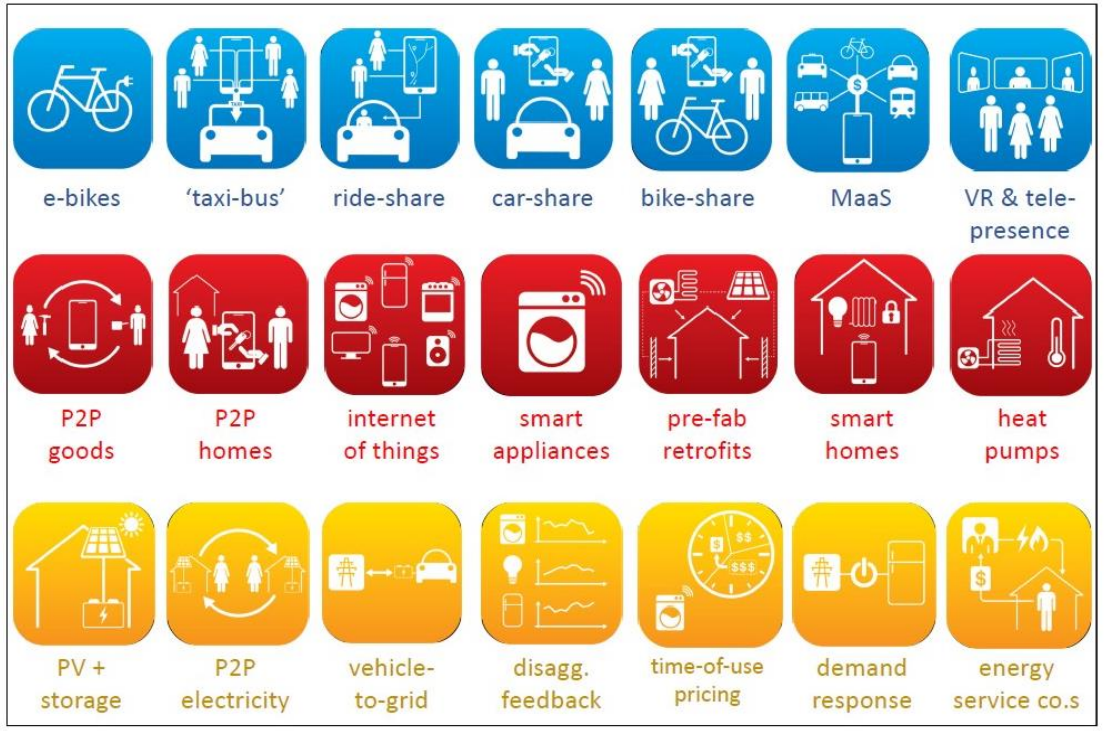
- The NDCs will make large impacts on the potential international trade balances in Chemical sector in the US, EU and Japan, and in Iron & steel sector in Japan and EU. (Cases 1 and 2)
- Under the global emission trade case (equal MACs), the impacts will be relatively small. (Case 3)

Expected global GHG emissions of the aggregated NDCs and the corresponding emission pathways up to 2100 toward +2 °C goal



- **The expected global GHG emission in 2030 under the NDCs corresponds to the emission to be achieved under only 6 $/tCO2 of global carbon price. But the required global carbon price for the 2 °C goal will be 320 $/tCO2 in 2050. Disruptive innovations and the induced social change are necessary to lower the carbon price.**
- **Global cooperation harmonizing emission reduction efforts is important, but broad innovations both of energy supply and demand sides are key to achieve the 2 °C goal or much deeper emission reduction.**

Disruptive Innovations of End-use Technologies



Source: C. Wilson (IIASA)

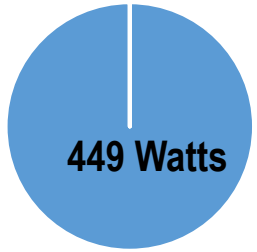
Disruptive innovations of end-use technologies such as IoT, AI, will be able to induce:

1) **Shift from atomized to connected**
2) **Shift from ownership to user-ship**
3) **Sharing economy & circular economy**

Human society will be able to continue economic growth and resolve many social issues through building highly integrated systems of Cyberspace (virtual) and Physical space (real)

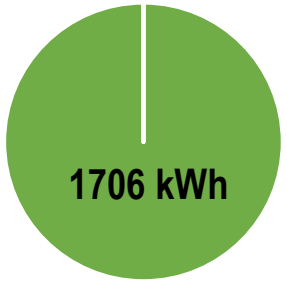
Source: Government of Japan (Cabinet Office)

Innovations in end-use technologies through IT and AI, and the induced social changes



Power

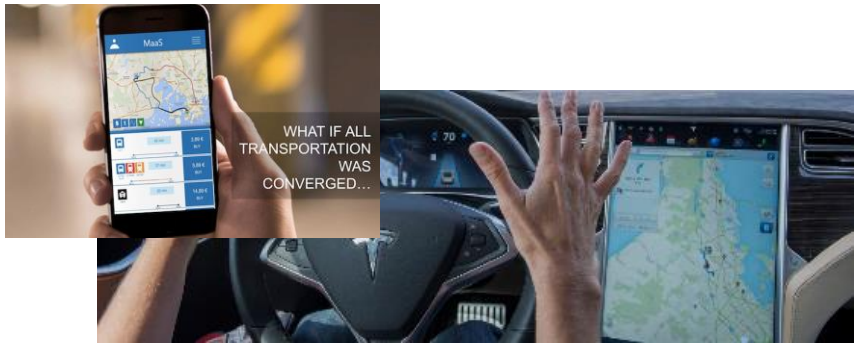
Stand-by energy use



Embodied energy

Weight

- **Energy consumption is not our purpose, but is just a phenomenon accompanied with consumption of goods and services, which is conducted for our welfare increase. Energy embodied in goods and services must be taken into account.**
- **The end-use products and services will usually diffuse rapidly, and the embodied energy and CO_2 may decrease rapidly.**



Operation ratio of automobiles is about 5%. Large room exists for its improvement by the achievement of fully autonomous cars.

There are large opportunities to achieve social changes and to increase energy efficiency through fully autonomous cars, food system improvement, etc. which can be induced by innovations of IoT, AI etc.

Source : IIASA

Conclusions

- Increasing trend of global CO2 emissions continues.
- In some developed nations, a relatively long decreasing trend of the emission can be observed, but it was induced mainly by industrial structure change, and the consumption-based CO2 emissions were not reduced in most of the nations. High energy cost burden induced the overseas transfer of industries. The international competitiveness issue is very important.
- The marginal abatement costs for the currently submitted NDCs are greatly different among nations. Such large differences will hinder global efficiency of emission reductions and sustainable efforts of participating nations.
- According to the assessments for the macro economic impacts, some developing nations/regions with almost zero marginal abatement costs will have positive impacts on GDP and on outputs of some energy-intensive sectors as carbon leakages take place through international trade. The coordination of the NDCs through the review process will be important.
- On the other hand, the coordination based on high carbon prices are unrealistic in the real world. Broad innovations both of energy supply and demand sides will be necessary and key to achieve the 2 °C goal or much deeper emission reduction.
- The energy demand decrease opportunities particularly through IT, IoT, AI will be desired/expected for deep reductions in the mitigation costs.