A COP29 side-event at Japan Pavilion



Achieving Green Transformation through

Demand-side Changes Brought by Technological and Social Innovations (EDITS)

# 15. November 2024 15:45-17:00 (GMT+4)

Moderator:Prof. Joyashree Roy, AITSpeakers:Mr. Hiroshi Maeda, METIDr. Bas van Ruijven, IIASADr. Keigo Akimoto, RITEProf. Gregory Nemet, University of Wisconsin-MadisonProf. Diana Ürge-Vorsatz, CEU, IPCCProf. Joyashree Roy, AITContast:edits-cop29@iiasa.ac.at

The COP29 side event on "Achieving Green Transformation through Demandside Changes Brought by Technology Progress And Social Innovations" on November 15, 2024 at the Japan Pavillion of COP29

# Importance of demand-side solutions for the net-zero society transformation

**Keigo Akimoto**, Research Institute of Innovative Technology for the Earth (RITE); Science Tokyo (former Tokyo Institute of Technology)



Please consider the environment before printing this slide deck Icon from <u>all-free-download.com</u>, Environmental icons 310835, by <u>BSGstudio</u>, license CC-BY

> This presentation is licensed under a <u>Creative Commons Attribution 4.0 International License</u>



### CO2 emission trajectories in the world and major countries



The coupling between the economy and CO2 emissions continues on the global level. When CO2 emissions decrease significantly, economic conditions (GDP, income) worsen.



Source) The Government of Japan (Ministry of Environment), 2023

### Weighted Production Index in Japan, Germany, US, and China: Industry leakage



単位: 2015年値=100。出典: ECM\_JPN\_202407 (慶大産研野村研究室, 2024年8月3日公表)。測定の詳細はNomura and Inaba (2024)"Post-Pandemic Surges of Real Unit Energy Costs in Eight Industrialized Countries," RCGW Discussion Paper, Research Center on Global Warming, Development Bank of Japan.

 Manufacturing industries, with high CO2 intensity in particular, are being transferred from developed to developing countries.

 Demand reductions and end-use measures will be important to reduce global CO2 emissions.

### Costs and potentials evaluation: 2030 global emissions –Sectoral bottom-up studies vs. IAMs–



## Substitutions among KLEMS



### Q (Output) = f {K (capital), L (Labor), E (Energy), M (Material), S (Service)}

- E(Energy) ⇔ K (capital): energy saving, historically has been success, and still have great opportunities particularly in developing countries.
- However, further energy saving will bring decreases in total productivities.
- CO2 intensity improvements will usually reduce capital productivity (Q/K).
- Decrease in capital productivity (Q/K) will often decrease material productivity (Q/M) too.
- Service (S) including digital big data and IoT will be able to substitute capital (K), labor (L), energy (E), and material (M).

 ✓ DX (service) may bring large substitutions of energy and embedded energy (i.e., capital and material) as well as achievements of multiple SDGs.

## Decent Living, Efficiency and Sufficiency



## "Sufficiency"



Ryoanji temple in Kyoto

Rebound effects will be unavoidable, and it is also important to change our mind.

#### Tsukubai (stone water basin)

It looks like an antique coin with four characters. Combining each of the characters to the central square hole which is the shape for a Japanese character meaning "mouth," show a Chinese proverb "吾唯足知."







"足", sufficiency

It means "I realize that I have been under sufficiency," and is an important Zen teaching.

### Scenario assumptions



	Emissions reduction	Energy demand reductions due to mainly digitalization						Rapid cost red.	Demand
		Transport 1)	Residential 2, 3, 4)	Building 5)	Food 6)	Industry 7)	Spill over 8)	in granular tech's, e.g., PV, Wind, EV	flexibilities in electricity (EV, HP, CGS)
BL-Std	Baseline (without additional climate policies)	_		_			_		
BL-Mobil		Х							
BL-Resid			X						
BL-Build				X					
BL-Food					X				
BL-Ind						X			
BL-AII_CE		Х	Х	X	X	X	X		
BL-AII_CE+FL		X	Х	X	X	X	X	X	Х
B2DS-Std	B2DS (well below 2C; NDCs in 2030; CN by 2050 in G7 countries)	_		_		_	_	—	
B2DS-Mobil		Х							
B2DS-Resid			Х						
B2DS-Build				X					
B2DS-Food					X				
B2DS-Ind						X			
B2DS-AII_CE		X	Х	X	X	X	X		
B2DS-AII_CE+FL		X	Х	X	X	X	X	X	X

### Final energy consumption (preliminary)

#### Baseline (without additional climate policies); relative to the BL-Std scenario



While this preliminary study assumes only limited impacts of circular/sharing economies due to digitalization mainly, significant reductions (by around 10%) in final energy consumptions are estimated.

10

Ref.) Global final energy consumption in 2019: 10 Gtoe/yr; baseline final energy consumption in 2050: 14 Gtoe/yr Source) RITE

### Final energy consumption (preliminary) B2DS (well below 2 °C)



Industry

Building

Transport

**DX** solutions including circular and sharing consumption, which similar level of energy savings due to carbon prices for the B2DS.

Ref.) Global final energy consumption in 2019: 10 Gtoe/yr; baseline final energy consumption in 2050: 14 Gtoe/yr

Source) RITE

## IPCC AR6 Ch.5 – Knowledge Gaps



Authors: Felix Creutzig, Joyashree Roy, Arnulf Grubler, Eric Masanet, and others

- **1.** Better metric to measure actual human well-being
- 2. Evaluation of climate implication of the digital economy
- 3. Scenario modelling of services
- 4. Dynamic interaction between individual, social, and structural drivers of change

These gaps should also be tackled in our EDITS project, and it is desirable for the EDITS project to contribute to the next IPCC report and other opportunities.

### Conclusion

- All the technological measures including energy supply technologies will be needed; But energy supply measures with higher cost measures will bring carbon leakages across countries, and continuing increase of global emissions is concerned.
- Energy demand-side measures are key to achieve deep emissions reduction and multiple SDGs.
- We should focus not only on direct costs but also on implicit or hidden costs for deploying end-use measures. Behavior changes with DX and better institutions will reduce implicit or hidden costs.
- Comprehensive and quantitative analyses as well as qualitative analyses will be important for having large impacts on the IPCC and others.
- The "avoided emissions" developed by WBCSD is one of the schemes to induce firms to implement the demand-side measures.
- Integration of sectors, disciplines, and policies is a key considering differences among countries.



#### Thank you very much for your attention!



#### Keigo Akimoto

E-mail: aki@rite.or.jp

EDITS is an initiative coordinated by the <u>Research Institute of</u> <u>Innovative Technology for the Earth (RITE)</u> and International Institute for Applied Systems Analysis (IIASA), and funded by <u>Ministry of</u> <u>Economy, Trade, and Industry (METI)</u>, Japan.

Group Leader of Systems Analysis Group Research Institute of Innovative Technology for the Earth (RITE)

https://iiasa.ac.at/web/home/research/researchPrograms/Energy/Research/EDITS/EDITS.html

**C** 

a <u>Creative Commons Attribution 4.0 International License</u>