ECO-BUSINESS FORUM OF KAWASAKI CITY
12TH (WED) NOVEMBER 2025

Synergy Analysis of Energy Consumption in Niigata City toward 2050

MEIHUA ZHU
HEAD, PLANNING & TRAINING DEPT
ASIA CENTER FOR AIR POLLUTION RESEARCH (ACAP)

Global Warming Countermeasure Plans (Climate Change Countermeasure): Collaboration between Central and Local Governments

Plan for Global Warming Countermeasures
(Ministry of the Environment, Japan)

↓

Local Government Action Plans
(Regional Measures Section)

Niigata City Global Warming Countermeasure Action Plan (Regional Promotion Version)

2009: Niigata City Global Warming Countermeasure Action Plan (Regional Promotion Version) formulated
2016: Second Plan
2020: Third Plan revision
2023: Review and Update

Prefectures and designated cities are required, under Article 21, Paragraph 3 of the Act on Promotion of Global Warming Countermeasures, to formulate measures for reducing greenhouse gas emissions **tailored to the natural and social conditions of their regions** (so-called "Regional Measures Section").

Progress of Climate Change in Niigata City

Rising Temperatures Niigata City

Past Trends

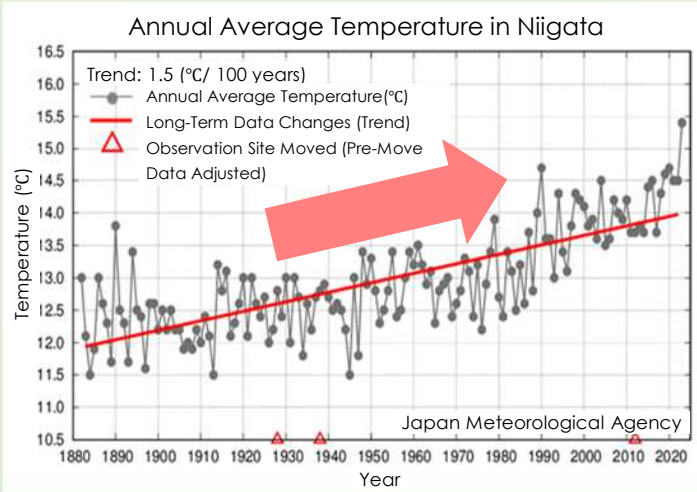
1.5°C Rise
per 100 Years*

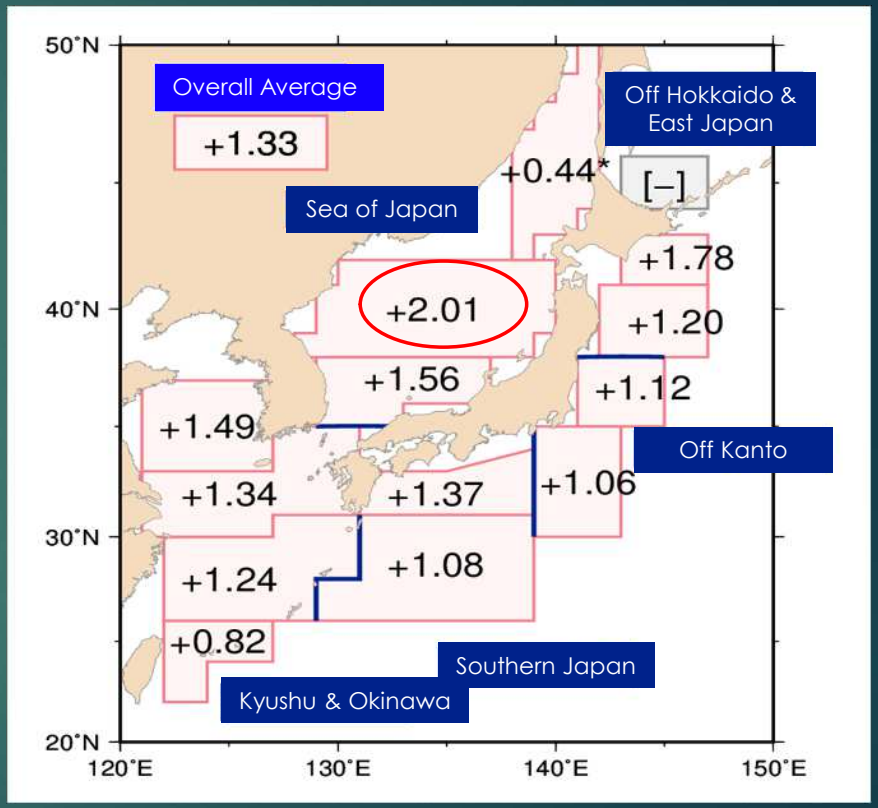
*Average Century-Scale Increase from the Right Graph

See A-PLAT for the Latest Trends: "Long-Term Meteorological Data Changes."

A-PLAT

https://adaptation-platform.nies.go.jp/data/jma-obs/index.html





Rising annual average surface temperature around the Sea of Japan

Source: Climate of Japan 2025

ECONOMIC LOSSES FROM CLIMATE CHANGE
— NIIGATA PREFECTURE —

Damage to rice from extreme heat: reduced quality and yields

Loss in rice production revenue due to high temperatures: ¥13.5 billion
2024: 13% decrease compared to average year

Oct. 25, 2023, Niigata Daily News

NHK WEB NEWS Oct. 7, 2023

Niigata: Rice Quality Downgrade Estimated to Reduce Farmers' Income by About 8.4 Billion Yen Across the Prefecture

According to Niigata Prefecture, the grading ratio of non-glutinous rice (uruchi rice) in the region has been affected by summer heat and water shortages. As of the end of September:

Grade 1 rice: 15%
Grade 2 rice: 49%
Grade 3 rice: 34%

The proportion of Grade 1 rice has fallen significantly compared to the average year.

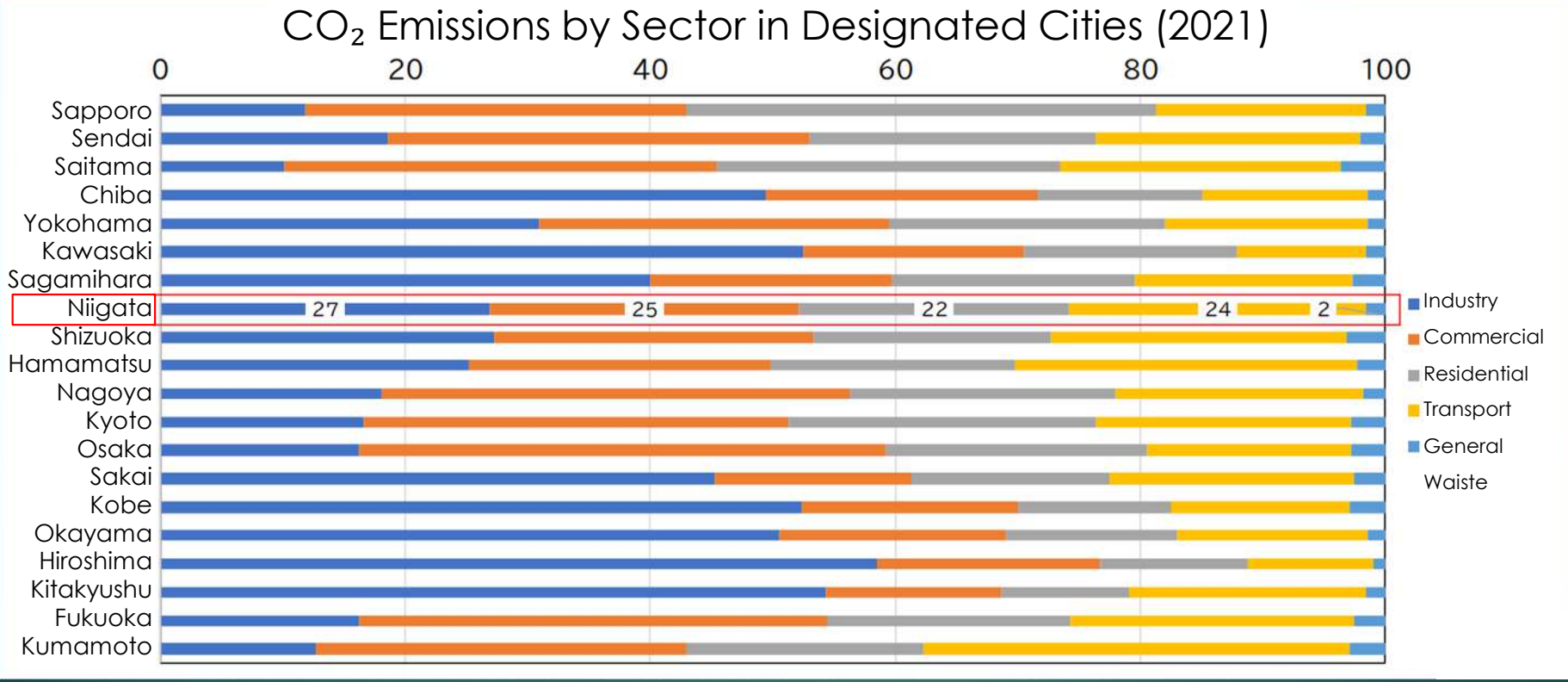
Research Objectives

- Focus on Niigata City, a medium-sized city in Japan
- Assess co-benefits of a series of carbon neutrality policies in transport, energy, industry, and waste sectors
- Forecast future energy demand from 2013 to 2050
- Co-Benefits of CO_2 and PM2.5 Reductions under BAU (Business As Usual) and Carbon-Neutral Policies

Research Methods

- Applied the GAINS model
- For estimating energy demand, sector-specific energy consumption data from 1990, 2013, 2019, and 2020 were used to calculate the compound annual growth rate. Based on this, with 2013 as the base year for emission reduction targets, future energy demand for 2030 and 2050 was projected.
- For estimating CO_2 and PM2.5 emissions, energy consumption data from both cities were used to project future values for 2030 and 2050.

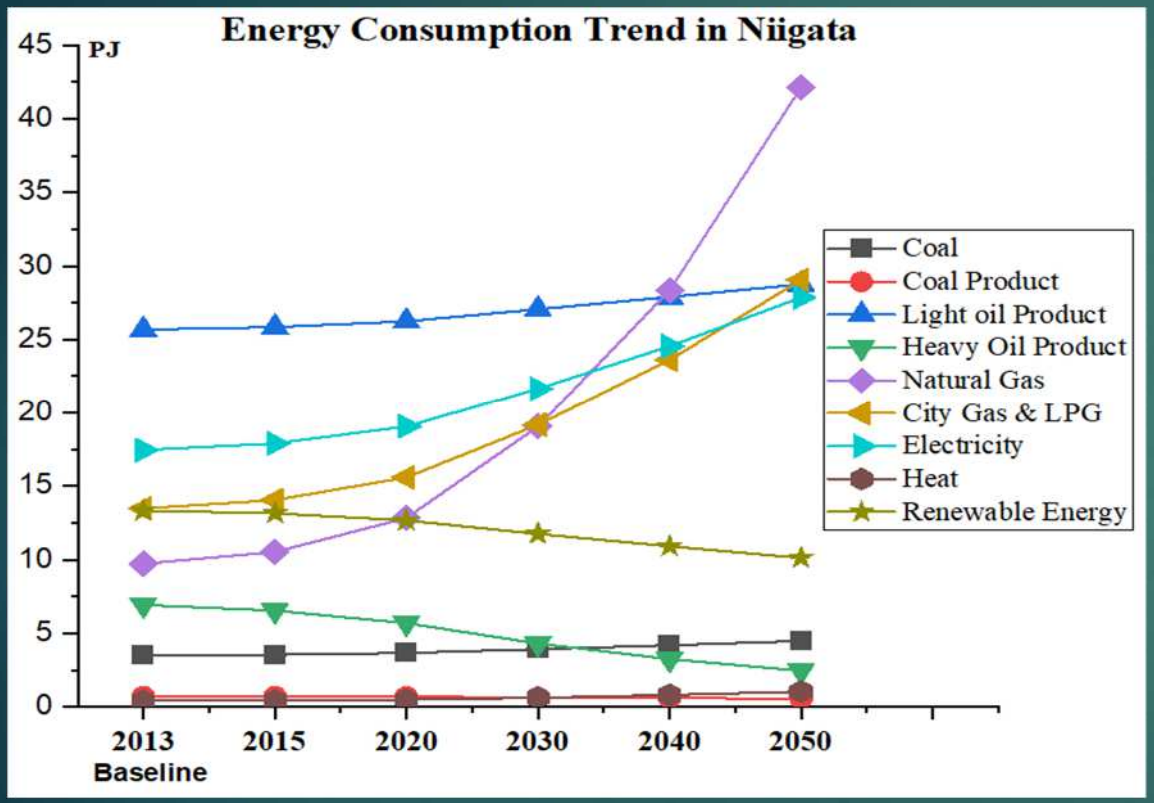
Greenhouse Gas Reduction Status (Comparison Among Designated Cities)



- Niigata City ranked relatively high in CO_2 reduction, achieving the 3rd position nationwide in 2021 with a 28.8% decrease compared to 2013.
- All four sectors contribute similarly to CO_2 emissions, so reduction efforts are needed in all sectors.
- Features of municipalities with significant reductions:

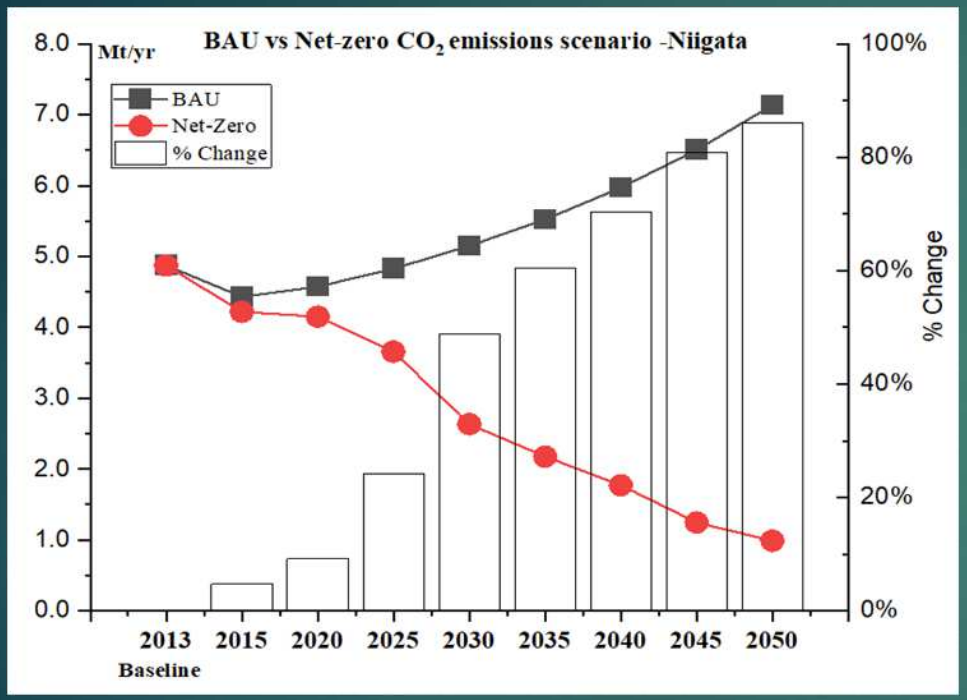
Kumamoto: 39.5% reduction overall, 56% reduction in households, Kobe: 30.6% reduction overall, 52% reduction in industry

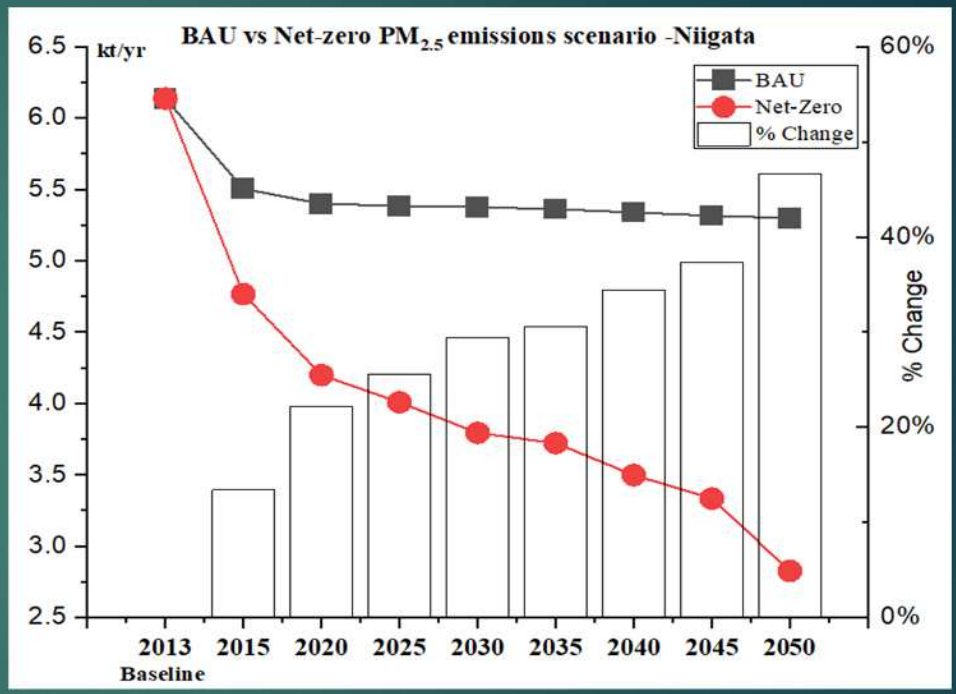
Forecast of Niigata City's Energy Consumption



Sector	Niigata City		
	2013	2030	2050
Manufacturing	43.70%	44.70%	49.30%
Households	16.80%	17.70%	17.20%
Commercial	15.30%	16.00%	16.20%
Transport	21.10%	18.90%	14.90%
Agriculture	3.20%	2.70%	2.40%

Co-Benefits of CO_2 and PM2.5 Reductions in Niigata City under BAU and Carbon-Neutral Policies





	2020	2030	2040	2050
CO2 emissions	-9.2%	-48.8%	-70.3%	-86.1%
PM2.5 emissions	-22.2%	-29.4%	-34.5%	-46.7%

Summery of Research Results

Major energy consumption sectors

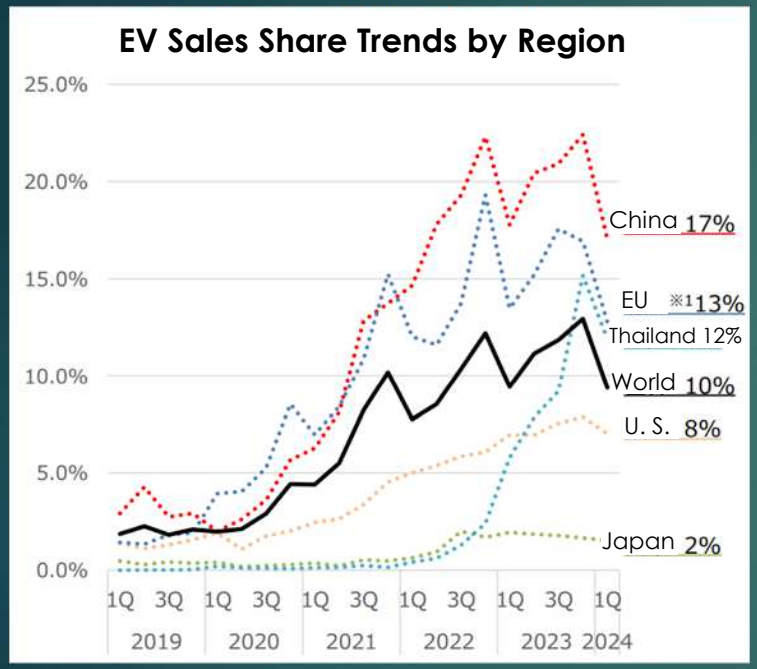
- Manufacturing, followed by households, transport, commercial, and agriculture-related sectors
- Strong correlation between energy consumption and CO_2/PM2.5 emissions

Co-benefit effects of climate change policies

- CO_2 emissions projected to decrease by 45.9% in 2030 and 79.7% in 2050
- PM2.5 emissions projected to decrease by 29.4% in 2030 and 46.7% in 2050
- However, achieving carbon neutrality requires the introduction of 100% renewable energy.

Challenges in Policy Implementation

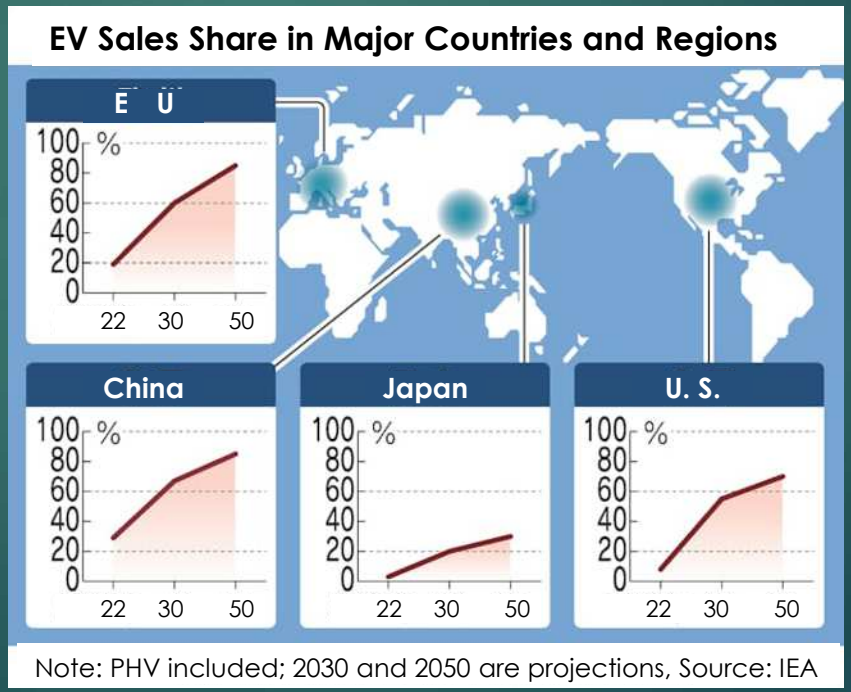
Gap between Ideal and Reality (1): Low Adoption Rate of Next-Generation Vehicles



https://www.iea.org
IEA, Trends in the EV Market — Japan and Global Adoption Rates and Initiatives (SMART ENERGY WEEK)

Policy Targets

2030: 50% adoption rate
2050: 90% adoption rate



Note: PHV included; 2030 and 2050 are projections, Source: IEA

Source: Nikkei Shimbun, April 23, 2024

2024 Electric Vehicle Ownership Ranking

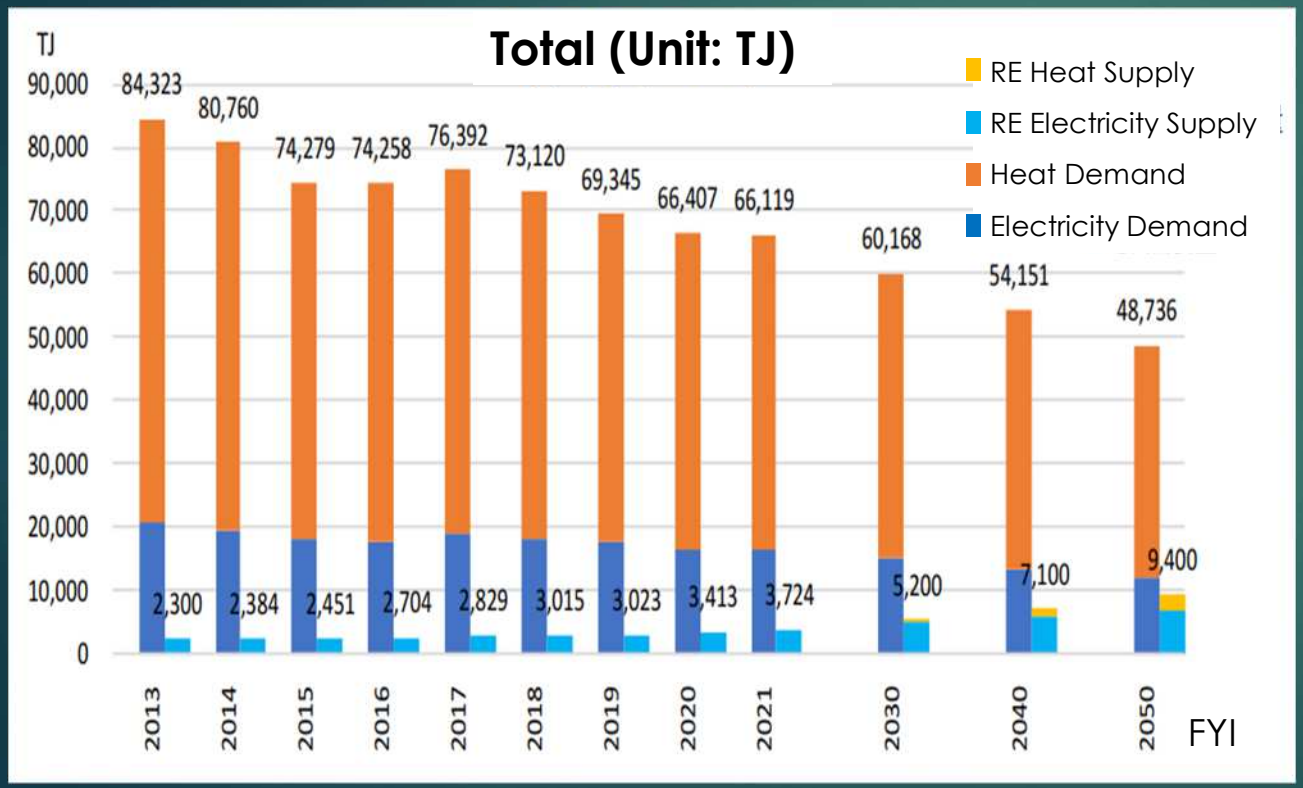
TOP 10		BOTTOM 10	
Nara	42.1	Hyogo	2.0
Tokyo	35.7	Aichi	2.5
Ishikawa	29.9	Aomori	2.5
Shizuoka	24.5	Akita	3.0
Kanagawa	14.0	Nagano	3.2
Osaka	13.8	Mie	3.2
Toyama	13.3	Hokkaido	3.2
Kyoto	12.3	Iwate	3.3
Fukuoka	12.0	Niigata	3.4
Fukui	11.6	Okinawa	4.4

Data sources:
Subsidy allocation status by prefecture
https://www.cev-pc.or.jp/tokei/koufu.html
Japan Automobile Inspection & Registration Association
https://www.airia.or.jp/publish/statistics/number.html

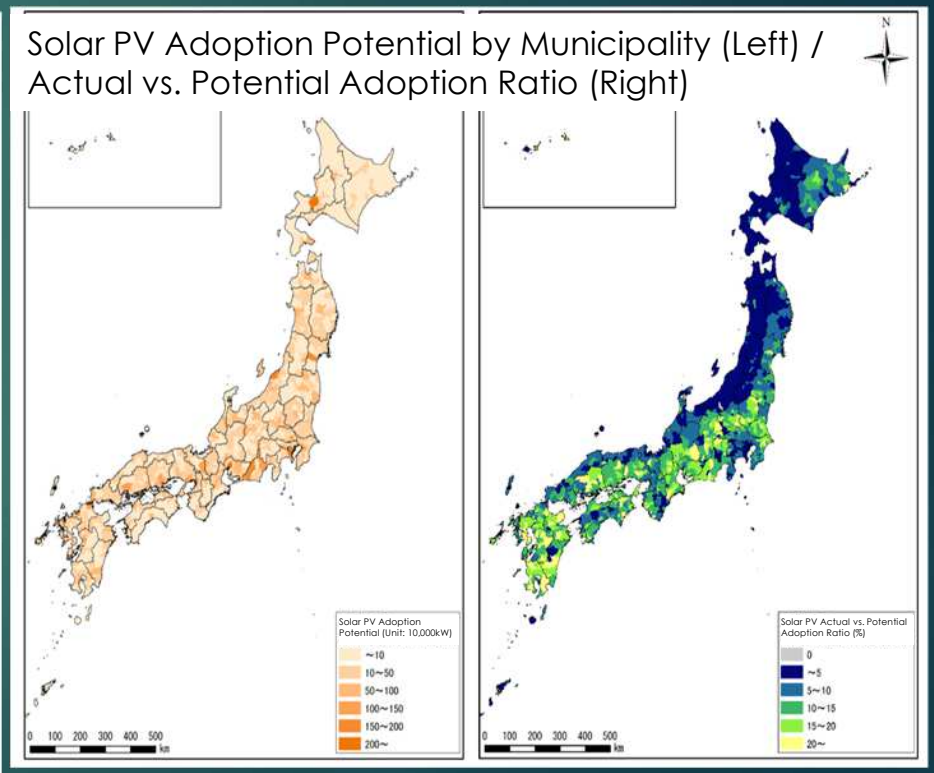
Challenges in Policy Implementation

Gap between Ideal and Reality (3): Introduction of Renewable Energy

High demand and large potential for renewable energy, but low adoption rate



Source: Niigata City Global Warming Countermeasure Action Plan Review Committee materials



Source: MOE's materials of Visualization of Renewable Energy Introduction Status https://www.env.go.jp/content/900449482.pdf

Thank you for your attention.