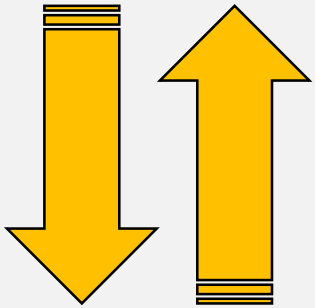
Quantifying the influential factors on power generation efficiency of photovoltaic power generation systems

Outlook for PV power generation in Japan

Renewable energy sources supplied 21.2% of the total electricity generation in 2020.

- The government plans on increasing this ratio to around 36-38% by 2030.
- PV power generation will play a significant role.



Comparison of the shade at different PV plants

- On the other hand, electricity generation in PV systems fluctuates depending on weather conditions, seasonality and location
- In Japan, where the sites for building PV systems are limited, it's essential to improve and stabilize power generation efficiency of PV systems at plant levels

Research objectives

(i) Joint research with a private company

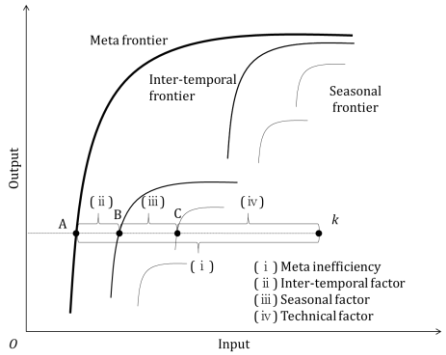
✓ Visualize the impacts of seasonality, quality of the module and surrounding environment on power generation efficiency of PV systems at plant levels.

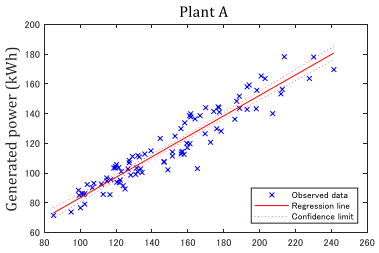
(ii) Research based on the open data

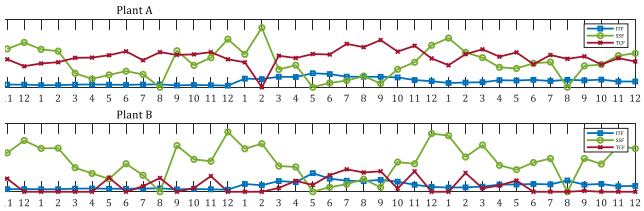
✓ Quantify the regional heterogeneity on power generation efficiency.

✓ Discuss the optimal production scale and management corresponding to the location for the PV plants built on future research framework.

Research framework







- This study Introduces Data Envelopment Analysis (DEA).
- Using DEA, we can quantify the impacts of factors such as production scale and location of the PV power plants.
- This study also uses a statistical approach to consider the uncertainty in the solar irradiation.

Offering a new proposal for expanding the utilization of renewable energy sources from the viewpoint of social science!