

An assessment of Japan's 2030 emission reduction target based on the results from energy-economic models

- Applying decomposition method for historical and prospective factors of CO₂ emissions-

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1. Introduction

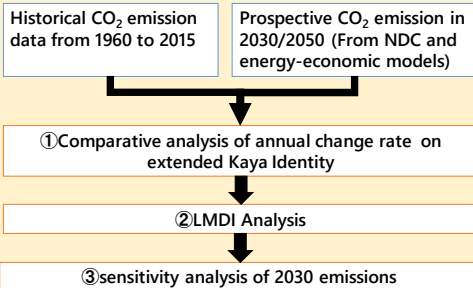
1.1 Purpose

- Assess the stringency of mitigation targets focusing on the main drivers of CO₂ emissions: GDP, energy intensity and carbon intensity
- Quantifies the impact of each factor on the changes in CO₂ emission changes using the Logarithmic Mean Divisia Index (LMDI) method
- Calculate the potential of enhancing the 2030 GHG emission reduction target, through the sensitivity analysis of CO₂ emissions in 2030 by changing the assumptions of each factor.

1.2 Features

- Assess the assumption of economic driver (i.e. GDP)
- Employ the Logarithmic Mean Divisia Index (LMDI) method to long-term time series data to major policy events as well as prospective data by focusing on energy-related CO₂ emissions.
- Conduct LMDI analysis to decompose energy efficiency impacts into structure of economy and energy saving measures at demand side as well as carbon intensity into carbon intensity in electricity and non-electricity sector

2. Methodology



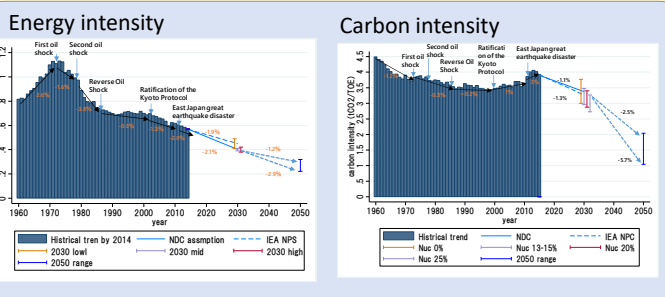
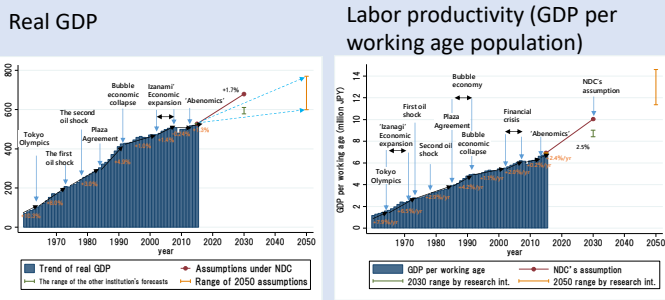
Benchmark:

- GDP assumption => Shared Socio-Economic Pathways, Private think-tank assumptions
- Energy-related factors => Outputs from energy-economic models

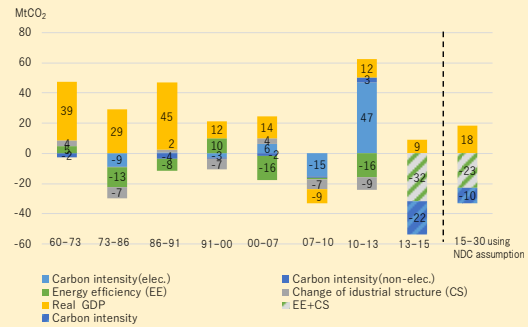
LMDI: Logarithmic Mean Divisia Index

3. Results

3.1 Data for factor analysis

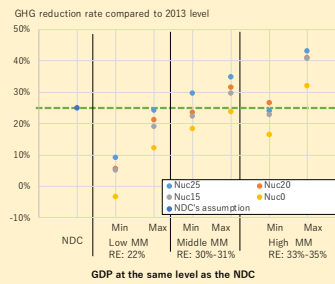


3.2 Data for factor analysis

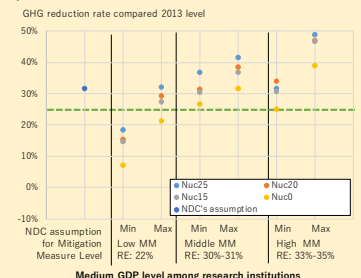


3.3 Sensitivity analysis of 2030 emissions

(a) GHG emission reduction rate based on real GDP assumption under the NDC



(b) GHG emission reduction rate based on the median value of real GDP assumption by the private think tanks and research institutions



- Low level: Mitigation measures that assume the continuation of current or already planned measures.
- Middle level: Mitigation measures that can promote the implementation of major low-carbon technologies and products by taking information policy and reasonable regulations towards the development of a low-carbon society.
- High level: Mitigation that can promote the massive installation of low-carbon technologies and products with reasonable cost compared to the benefits for the society even though the initial cost is huge.

4. Conclusion

4.1 Major findings

- The assumption of real GDP below the target is optimistic, unnecessarily requiring unreasonable mitigation measures to achieve the target.
- Achieving a level of energy intensity below the target is possible through the continuation of current policy measures.
- Target level of carbon intensity could be feasible with a 15% share of nuclear power in electricity, owing to the increase in the share of renewable energy to greater than 30% with reasonable regulations to implement low carbon technology.
- Overall, if real GDP grows at a rate equal to the median value of the forecasts by several institutions, Japan can achieve the target with existing mitigation measures and the 15% share of electricity from nuclear power by resuming only the plants under the conformity assessment that is required to restart its operation.

4.2 Limitation of this study

- This study uses only national-wide data, but it is desirable for energy intensity to be decomposed into sub-sectors if data is available.
- For the sensitivity analysis, the impact of structural change in economics needs to be counted.
- For the improvement of carbon intensity, the restrictions from electricity systems needs to be counted.

5. Further information

Detailed information is given in the IGES discussion paper entitled “要素分解分析に基づく日本の2030年CO₂削減目標に関する一考察(in Japanese)”.