



Changes of Industrial Structure towards Zero Carbon Society: Application of Extended Input-output Table

By using an extended input-output table and a table of CO₂ emission factors by industry, a method has been developed to quantitatively analyze the impact on the economy and environment towards a zero-carbon (ZC) society such as the introduction of renewable energy and to present scenarios for the realization of ZC society.

- By using published input-output tables and CO₂ emissions data, an extended input-output table with renewable energy added and a table of CO₂ emission factors by industry were created.
- The results of the LCS evaluation of economic viability and material use were used to determine an input factor for renewable energy. Then the results of the ZC power system calculations and the changes shown in Table 1 were used to perform an input-output analysis.
- An example of calculation results of GDP and CO₂ emissions are shown in Table 2 as quantitative indicators of scenarios for a bright and prosperous ZC society.

Table 1: Examples of changes added to input-output analysis

Symbol	Item
a	ZC power system (electricity demand is the same as in 2013, zero CO ₂ emissions from power generation sector)
b	Reductions in town gas through electrification
c	Reductions in kerosene and LP gas through electrification
d	100% penetration of electric vehicles (EVs) and 50% penetration of ride-sharing (RS)
e	Use of recycled materials reducing production of pig iron and converter crude steel by 50% and increasing production of electric furnace crude steel by 50%
f	Recycling reduces chemical production by 50%
g	Production of cement products decreases by 70% due to improvements in the properties of cement
h	Exports of general-purpose and industrial machinery double
i	Visitors to Japan create a 10 trillion yen increase in accommodation services, 6 trillion yen increase in food and beverage services, and 30 trillion yen increase in medical costs
j	20 trillion yen increase in production in the information services industry and 10 trillion yen increase in household demand for education

Table 2: Results of input-output analysis calculation

Case	Item refer to table 1 for symbols	GDP (trillions of yen)	Difference in GDP standards (trillions of yen)	CO ₂ emissions (Mt-CO ₂)	CO ₂ reduction rate (%)	Demand for electric power (TWh)
0	2013 (Standard)	503	0	1,311	0	982
1	a ZC power	510	7	733	44	1,018
2	a+b Town gas	511	8	653	50	1,216
3	a+c Kerosene/LPG	511	8	688	48	1,149
4	a+d EVs, RS	513	10	482	63	1,295
5	a+e Steel	510	6	668	49	1,013
6	a+f Chemical products	510	7	720	45	997
7	a+g Cement	510	7	677	48	1,012
8	a+h Machinery	517	13	745	43	1,026
9	a+i Visitors to Japan	554	51	785	40	1,063
10	a+j Information	538	35	732	44	1,064
11	Combined (a to j)	595	92	242	82	1,752

Proposals for Policy Development

For a prosperous ZC society:

- 1) It is needed to quantify the impact of the introduction of ZC power systems on the society and environment through the input-output analysis and to present scenarios for the realization of ZC society.
- 2) Research and deregulation are needed to increase the potential of solar, wind and other renewable energy to realize ZC power generation.