Impacts of COVID-19 pandemic on Japan's CO_2 emissions in FY2020

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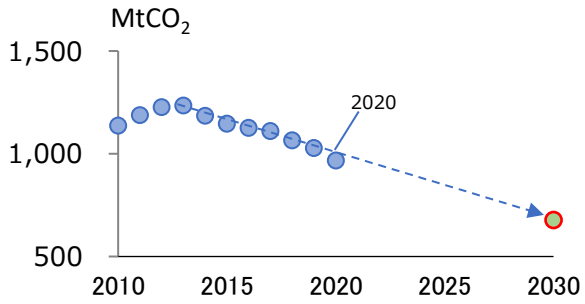
1. Energy-related CO_2 emissions in FY2020 decreased by 5.9% on a year-on-year basis but mainly due to the COVID-19 pandemic

According to the FY2020 Comprehensive Energy Statistics based on a wide range of energy-related statistics published in April 2022 by the Ministry of Economy Trade and Industry, energy-related CO_2 emissions in FY2020 were 967Mt-CO_2, a 61Mt-CO_2 (5.9%) fall from the level of FY2019 and the smallest since FY1990 when statistically available (Fig.1). This is the equivalent of 21.7% below the level of FY2013 and the reduction pace is ahead of the target, 45% below the level of FY2013 in FY2030 published in the revised strategic energy plan October 22, 2021.



Source: Ministry of Economy Trade and Industry "Comprehensive Energy Statistics"
Note: Actual data from FY2010 to 2020. Target of strategic energy plan for FY2030.

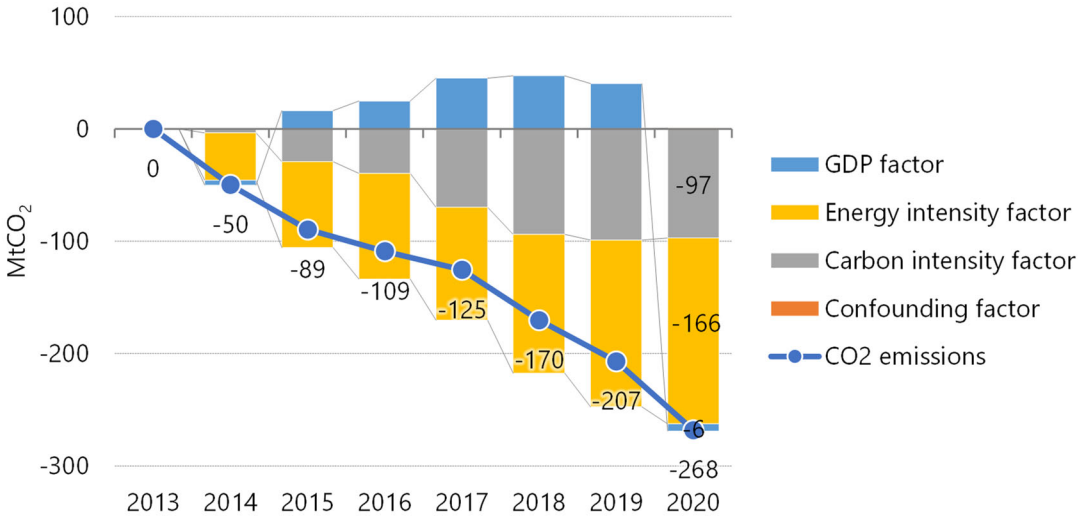
Fig.1 CO_2 emissions and the target

When the changes in CO_2 emissions from FY2013 are decomposed into three factors, a GDP factor, energy intensity factor[1], and a carbon intensity factor[2], while the GDP factor contributed to a 40Mt-CO_2 increase in FY2019 from the level of FY2013, it turned out to

[1] Energy consumption divided by GDP. If it gets smaller, it indicates an energy decrease, and if it gets bigger, it indicates an energy increase.

[2] CO_2 emissions divided by energy consumption. If it gets smaller, it indicates low carbon, and if it gets bigger, it indicates high carbon.

contribute a 6Mt-CO_2 decrease in FY2020 (Fig.2). CO_2 emissions decreases in FY2020 were achieved by economic depression triggered by the COVID-19 pandemic.



Source: Ministry of Economy Trade and Industry "Comprehensive Energy Statistics"

Fig.2 Decomposition analysis of CO_2 emissions

This article develops a case where there was no COVID-19 pandemic and evaluates the impacts of the COVID-19 pandemic on CO_2 emissions in FY2020. Economic activity and energy consumption in this case are based on economic and energy outlook estimations of FY2020 published on December 23, 2019, by the Institute of Energy Economics, Japan, before the COVID-19 pandemic. In this regard, however, we use actual data of FY2020 for temperature which affects consumption in commercial and household sector, and plans of electric power supply such as the timing of restart of nuclear power generation and the start of operation of renewable energy and coal-fired power generation because they are considered unrelated to COVID-19.

2. Passenger transport and crude steel production were largely affected by the COVID-19 pandemic

When actual data is compared to the case without the COVID-19 pandemic, real GDP fell greatly (-5.0%) (Fig.3).

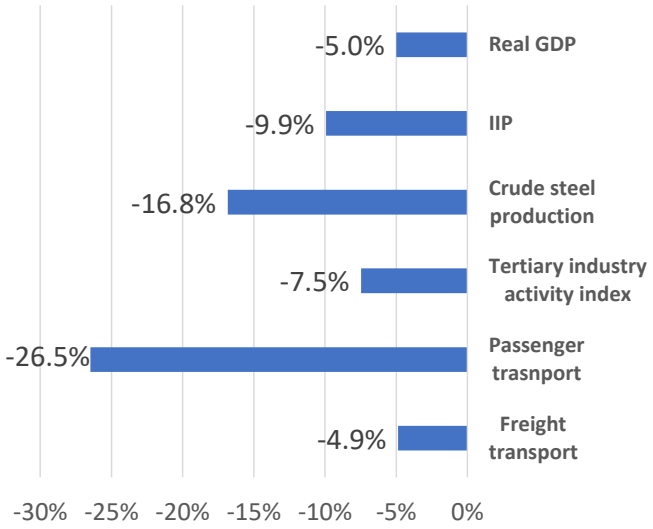


Fig.3 Effects of COVID-19 on economic activity indicators in FY2020
(Actual data compared to the case without the COVID-19 pandemic)

Passenger transport was affected most among energy-related economic indicators due to stay-at-home advisories (-26.5%). Crude steel production was affected most among energy intensive industries (-16.8%). This was due to automobile factory production halts and delayed construction due to COVID-19 infection control. The tertiary industry activity index fell 7.5% with shortened opening hours of restaurants and entertainment services.

3. Coal decreased most among fossil fuel consumption due to COVID-19 pandemic

Fossil fuel in FY2020 decreased due to the economic activity fall caused by the COVID-19 pandemic (Fig.4).

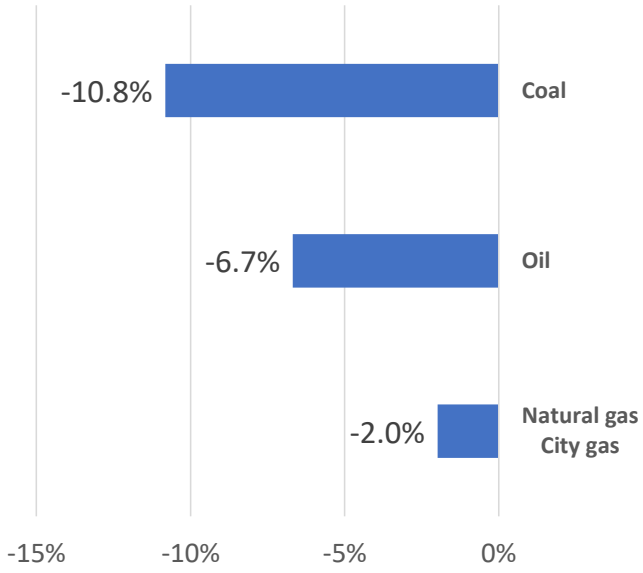


Fig.4 Effects of COVID-19 on fossil fuel consumption in FY2020
(Actual data compared to the case without the COVID-19 pandemic)

Coal decreased by 10.8% reflecting falls in coal-fired power generation in addition to decreases in crude steel production. Oil decreased by 6.7% along with a fall in passenger transportation. Natural gas/city gas decreased by 2.0% along with falls in electricity and city gas demand in the industry and commercial sectors.

4. Energy intensity factor and carbon intensity factor contributed to reducing CO_2 emissions as well as the GDP factor due to the COVID-19 pandemic

CO_2 emissions were estimated to be 1,039MtCO_2 in FY2020 in the case without the COVID-19 pandemic, a 1.0% increase from FY2019. This indicates that 72MtCO_2(6.9%) in emissions were reduced by the COVID-19 pandemic. With the decomposition analysis of this 72MtCO_2, the GDP factor contributed the most to the decrease (-51MtCO_2) (Fig.5). In addition, the carbon intensity factor and the energy intensity factor contributed to the decrease. The carbon intensity factor contributed to the decrease because energy consumption decreased due to the COVID-19 pandemic and most of that decrease came from fossil fuels. In addition, the energy intensity factor contributed to the decrease because passenger transportation which has a small correlation with GDP fell. This indicates that in the rebound process from the COVID-19 pandemic, the energy intensity factor and the carbon intensity factor will contribute to increased CO_2 emissions in addition to the GDP factor.

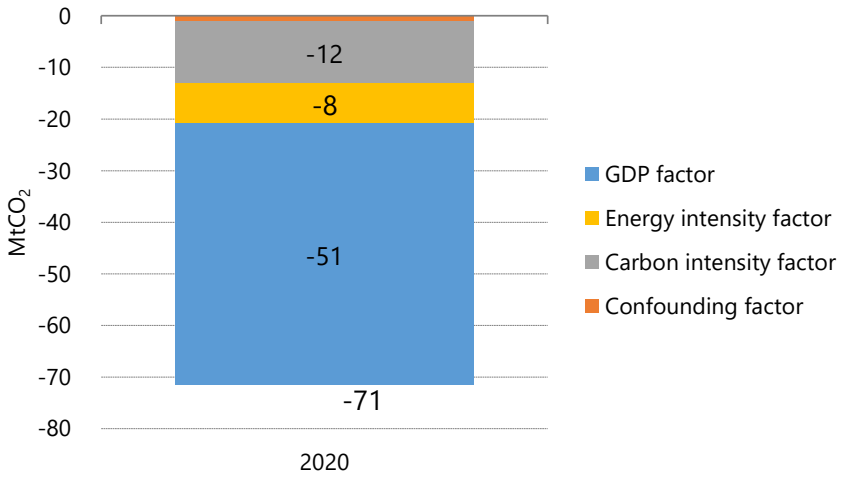


Fig.5 Decomposition analysis of CO_2 emissions due to the COVID-19 pandemic
(Actual data compared to the case without the COVID-19 pandemic)

5. Conclusion

While CO_2 emissions in FY2020 decreased 5.9% from the level of FY2019, this was caused by decreases in fossil fuel consumption mainly coal by COVID-19 pandemic. In the case without the COVID-19 pandemic, CO_2 emissions reach 1,039MtCO_2 in FY2020, an increase of 1.0% from the level of FY2019. The reduction pace, in that case, would be behind 45% below the level of FY2013 in FY2030. While the COVID-19 pandemic caused changes in consumption behavior, economic activity will be expected to be close to the case without the COVID-19 pandemic as back to a normal economic situation, fossil fuels will rebound and CO_2 emissions will increase. It is required for Japan to cut renewable energy costs and facilitate the restart of nuclear power plants in addition to energy saving investment in each sector.

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