Chapter 9

Republic of Korea Country Report

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Chapter 9
Republic of Korea Country Report

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1. Background

In 2020 and 2021, the coronavirus disease (COVID-19) pandemic had an unprecedentedly huge impact on the world economy. Consequently, the need for sustainable development and a balanced ecosystem was imprinted in people's mindsets. Each country, including the Republic of Korea (henceforth, Korea), has declared its carbon-neutral goal and promotes a departure from the centralised energy supply system. Korea is building the foundation for an inclusive energy transition and clean energy system through policies such as the Green New Deal and Carbon Neutral.

2. Macro Assumptions of the COVID-19 Scenario

Korea's economy grew at an annual average growth rate (AAGR) of 5% in 1990–2017. However, it fell to –1.6% in 2020 because of the COVID-19 pandemic (Table 9.1). The economy is projected to rebound and grow by 2.3% in 2021 as it gradually recovers. The trend is expected to continue until 2025, with an AAGR of 2.5% in 2021–2025.

A longer-term projection shows a slight downward trend, with AAGR slowing but remaining positive. Gross domestic product (GDP) AAGRs are projected to be the same as those in the business-as-usual (BAU) scenario: 2.1% in 2023–2030, 1.6% in 2030–2040, and 0.7% in 2040–2050 (Table 9.1).

Table 9.1. Assumptions of Gross Domestic Product Annual Growth Rates, Business-as-Usual vs. COVID-19 Scenarios, 2017–2050

Year	2018	2019	2020	2021	2022	2023	2023–2030	2030–2040	2040–2050	2017–2050
COVID-19	2.7%	2.0%	–1.6%	2.3%	2.8%	2.4%	2.0%	1.6%	0.7%	1.4%
BAU	2.7%	2.0%	3.4%	2.9%	2.8%	2.9%	2.1%	1.6%	0.7%	1.6%

BAU = business as usual, COVID-19 = coronavirus disease.
Source: Author, based on International Monetary Fund (2020).

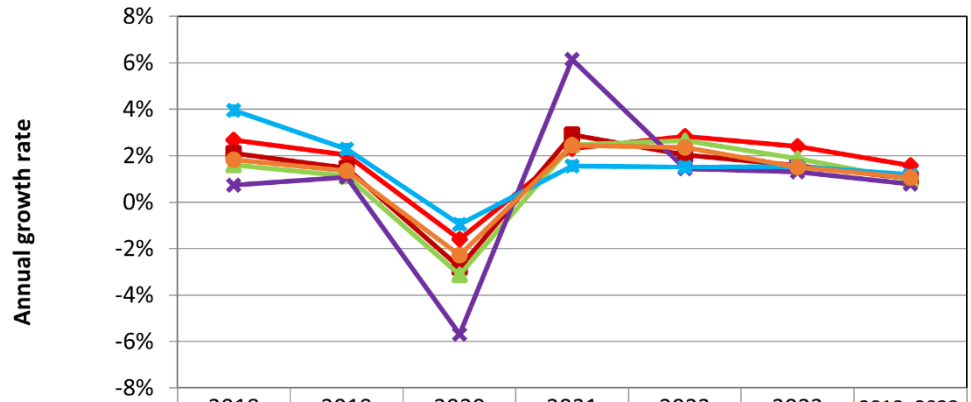
3. Short-term Impact (2018–2023)

3.1. Final Energy Consumption

In the COVID-19 scenario (Figure 9.1), based on GDP, total final energy consumption (TFEC) decreases by 2.8% in 2020 or by 6.8% less than in the business as usual (BAU) scenario. However, as real GDP is expected to grow by 2.3% in 2021, gradually recovering from the impact of COVID-19, TFEC increases by 2.9% in 2021, 2.0% in 2022, and 1.6% in 2023.

Transport decreases the most, by 5.7% in 2020 or by 6.8% less than in BAU, mainly because of social distancing, which resulted in massive cancellation of mass transit and air travel caused by an abrupt decrease in domestic and overseas demand (Table 9.2). However, in 2018–2023, transport increases by an AAGR of 0.8% (1.1% in BAU). The increase is followed by the decrease in industry, with an energy consumption growth rate of 3.1% in 2020 (5.4% in BAU) and non-energy use with 2.3% (4.1% less than in BAU). 'Others' (residential and commercial sectors) decrease by 1.0% in 2020 (1.9% less than in BAU).

Figure 9.1. Annual Growth Rate of Final Energy Consumption, by Sector, COVID-19 Scenario, 2018–2023



	2018	2019	2020	2021	2022	2023	2018–2023
GDP Assumption	2.7%	2.0%	-1.6%	2.3%	2.8%	2.4%	1.6%
TFEC	2.1%	1.5%	-2.8%	2.9%	2.0%	1.6%	1.0%
Industry	1.6%	1.1%	-3.1%	2.5%	2.6%	1.9%	1.0%
Transportation	0.7%	1.1%	-5.7%	6.1%	1.4%	1.3%	0.8%
Others	3.9%	2.3%	-1.0%	1.6%	1.5%	1.5%	1.2%
Non-energy	1.8%	1.3%	-2.3%	2.4%	2.4%	1.5%	1.1%

GDP = gross domestic production, others = residential and commercial, TFEC = total final energy consumption.
Source: Author, based on International Monetary Fund (2020).

Table 9.1. Total Final Energy Consumption, by Sector, COVID-19 vs. Business-as-Usual Scenarios, 2020

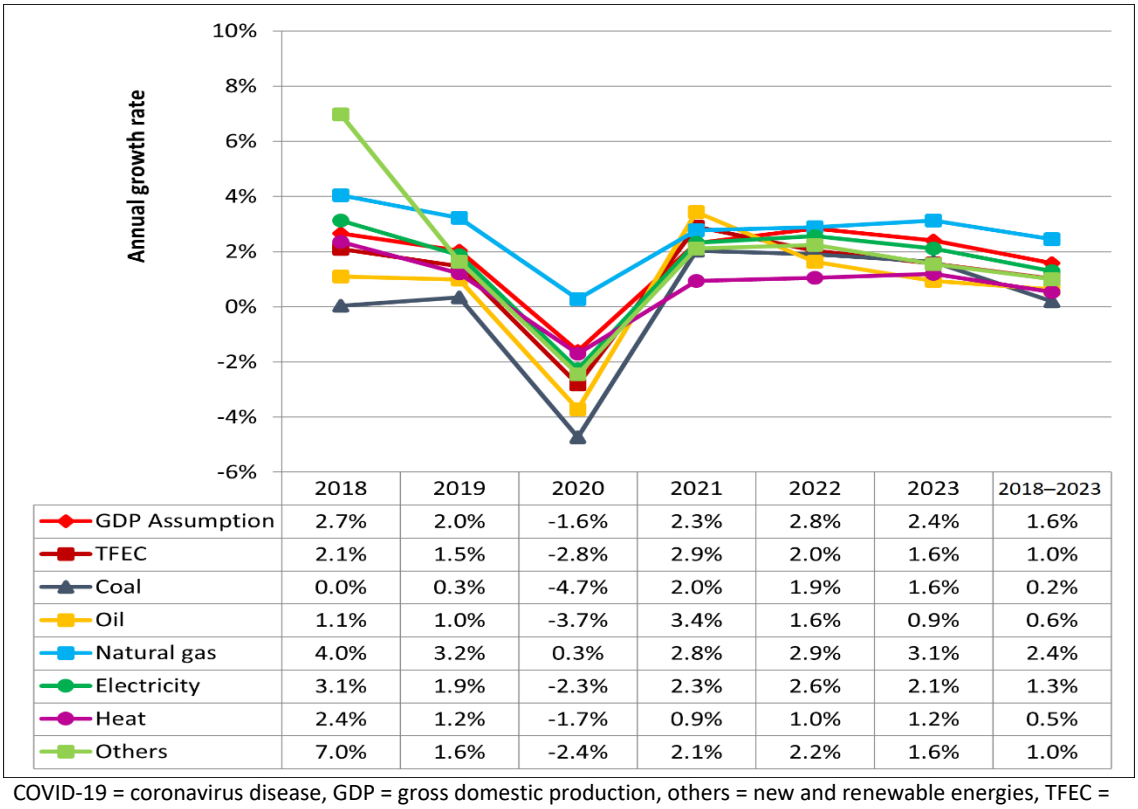
(million tonnes of oil equivalent)

	BAU (A)	COVID-19 (B)	(B-A)/A (%)
Industry	50.9	48.2	–5%
Transportation	36.7	34.2	–7%
Others	50.1	49.1	–2%
Non-energy	55.2	53.0	–4%

BAU = business as usual, COVID-19 = coronavirus disease, others = residential and commercial.
Source: Author.

The biggest decrease in TFEC in the COVID-19 scenario is for coal, with 4.7% in 2020, or 7.3% less than in BAU (Table 9.3). Coal has a marginal share (4.6%) in TFEC. However, oil has the largest share (52%) in TFEC in 2019, with a decrease of 3.7% (4.9% less than in BAU) in 2020, followed by electricity with 2.3% and heat with 1.7%. In contrast, natural gas is only slightly affected by the COVID-19 pandemic, increasing by 0.3% in 2020. TFEC of 'others', which include new and renewable energies, decreased by 4.4% less than in BAU. Only natural gas shows an increase despite the impact of COVID-19, which, however, is 1.9% less than in BAU.

Figure 9.2. Annual Growth Rate of Final Energy Consumption, by Fuel, COVID-19 Scenario, 2018–2023



	2018	2019	2020	2021	2022	2023	2018–2023
GDP Assumption	2.7%	2.0%	-1.6%	2.3%	2.8%	2.4%	1.6%
TFEC	2.1%	1.5%	-2.8%	2.9%	2.0%	1.6%	1.0%
Coal	0.0%	0.3%	-4.7%	2.0%	1.9%	1.6%	0.2%
Oil	1.1%	1.0%	-3.7%	3.4%	1.6%	0.9%	0.6%
Natural gas	4.0%	3.2%	0.3%	2.8%	2.9%	3.1%	2.4%
Electricity	3.1%	1.9%	-2.3%	2.3%	2.6%	2.1%	1.3%
Heat	2.4%	1.2%	-1.7%	0.9%	1.0%	1.2%	0.5%
Others	7.0%	1.6%	-2.4%	2.1%	2.2%	1.6%	1.0%

COVID-19 = coronavirus disease, GDP = gross domestic production, others = new and renewable energies, TFEC = total final energy consumption.
Source: Author.

Table 9.3. Final Energy Consumption, by Fuel, Business-as-Usual vs. COVID-19 Scenarios, 2020

(million tonnes of oil equivalent)

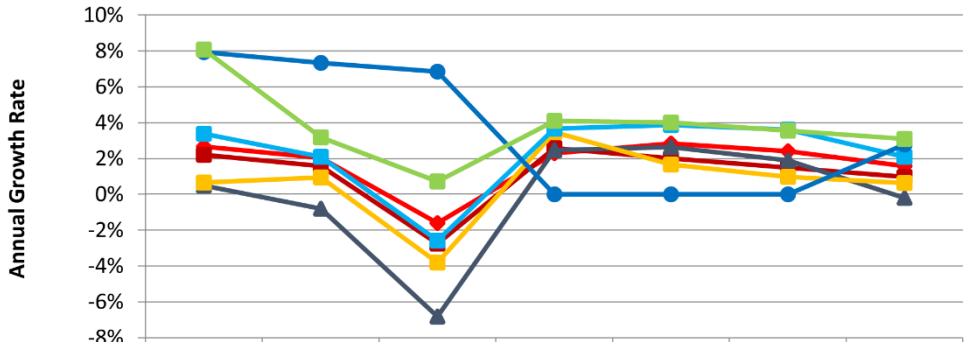
	BAU (A)	COVID-19 (B)	(B-A)/A (%)
Coal	8.9	8.2	–7%
Oil	100.6	95.7	–5%
Natural gas	24.3	23.9	–2%
Electricity	48.3	46.2	–4%
Heat	5.3	5.2	–2%
Others	5.5	5.3	–4%

BAU = business as usual, COVID-19 = coronavirus disease, others = renewables and waste.
Source: Author.

3.2. Primary Energy Supply

In the COVID-19 scenario, total primary energy supply (TPES) decreases by 2.7% in 2020 or a 4.5% drop from that in BAU. The largest decline occurs in coal, with 6.8% in 2020 (0.1% in BAU) and rebounds by up to 2.4% in 2021, slowing in 2022–2023. Oil follows a path similar to that of coal, but other fuels such as natural gas and renewable energy slowly increase or stay at the same level (Figure 9.3).

Figure 9.3. Annual Growth Rate of Primary Energy Supply, by Fuel, COVID-19 Scenario, 2018–2023



	2018	2019	2020	2021	2022	2023	2018–2023
GDP Assumption	2.7%	2.0%	-1.6%	2.3%	2.8%	2.4%	1.6%
TPES	2.2%	1.6%	-2.7%	2.6%	2.0%	1.5%	1.0%
Coal	0.5%	-0.8%	-6.8%	2.4%	2.6%	1.9%	-0.2%
Oil	0.7%	0.9%	-3.8%	3.5%	1.7%	1.0%	0.6%
Natural gas	3.4%	2.1%	-2.6%	3.7%	3.9%	3.6%	2.1%
Hydro	7.9%	7.3%	6.8%	0.0%	0.0%	0.0%	2.8%
Others	8.1%	3.2%	0.7%	4.1%	4.0%	3.5%	3.1%

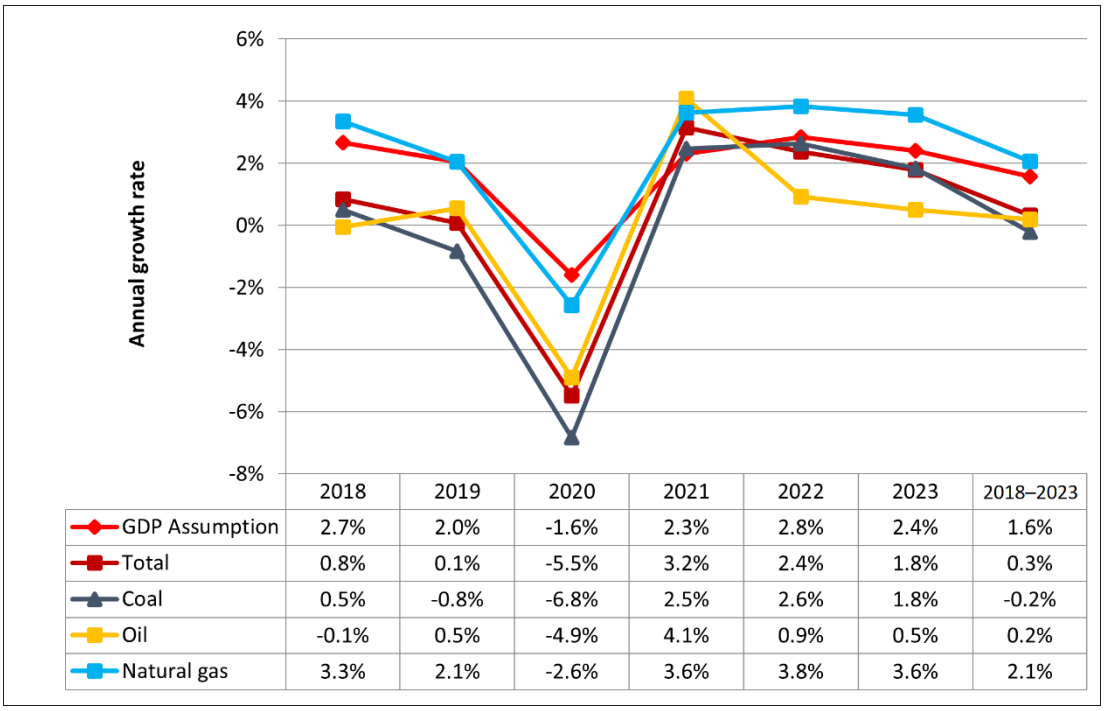
COVID-19 = coronavirus disease; GDP = gross domestic product; others = other renewables, waste, electricity, and heat; TPES = total primary energy supply.
Source: Author.

3.3. CO_2 Emissions

In the COVID-19 scenario, greenhouse gas (GHG) emissions drop sharply by 5.5% in 2020 (increase by 0.5% in BAU), then increase by 3.2% in 2021, 2.4% in 2022, and 1.8% in 2023. GHG emissions increase at an AAGR of 0.3% in 2018–2023.

Coal sees the largest reduction in GHG emission growth rate, with 6.8% in 2020 (0.1% in BAU) and increasing by 0.3% per annum in 2018–2023, followed by oil with a 4.9% reduction in 2020 and an increase of 0.2% per annum, and natural gas with a 2.6% reduction in 2020 and an increase of 2.1% per annum. The positive growth of hydro and 'others' (mainly renewable energy), which do not emit GHGs, may largely help reduce GHG emissions.

Figure 9.4. CO_2 Emissions, by Fuel, COVID-19 Scenario, 2018–2023



	2018	2019	2020	2021	2022	2023	2018–2023
GDP Assumption	2.7%	2.0%	-1.6%	2.3%	2.8%	2.4%	1.6%
Total	0.8%	0.1%	-5.5%	3.2%	2.4%	1.8%	0.3%
Coal	0.5%	-0.8%	-6.8%	2.5%	2.6%	1.8%	-0.2%
Oil	-0.1%	0.5%	-4.9%	4.1%	0.9%	0.5%	0.2%
Natural gas	3.3%	2.1%	-2.6%	3.6%	3.8%	3.6%	2.1%

COVID-19 = coronavirus disease, GDP = gross domestic product.
Source: Author.

4. Long-term Impact (2023–2050)

4.1. Final Energy Consumption

In the longer term, the global economy is expected to recover from the impact of the COVID-19 pandemic. GDP is projected to return nearly to BAU, slightly slowing by 1.4% per annum. TFEC is projected to increase by 0.4% per annum in 2017–2050, 0.1% lower than in BAU, which confirms the continuous decoupling of GDP and energy consumption (Table 9.4).

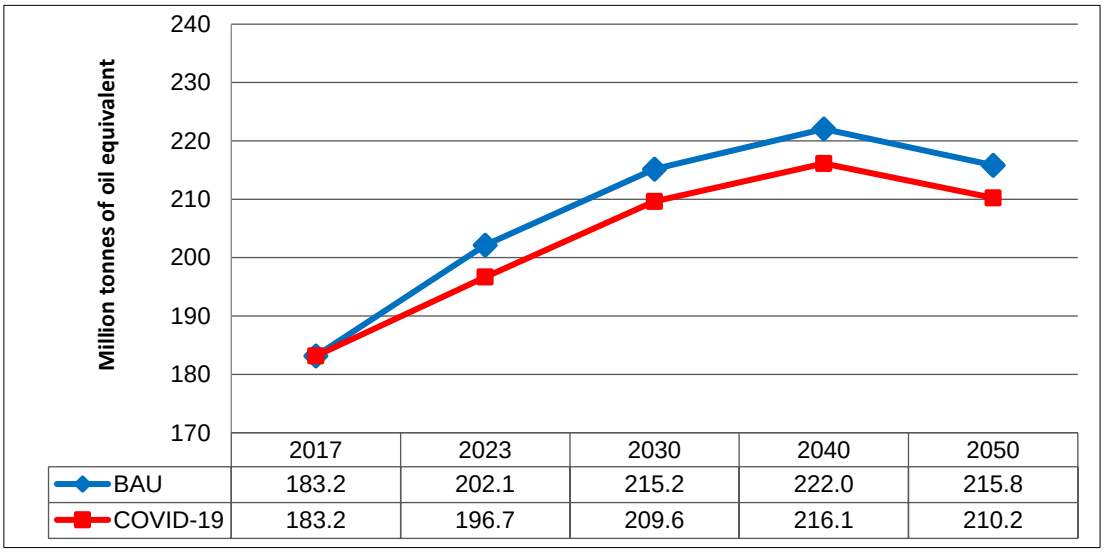
Table 9.4. Gross Domestic Product and Total Final Energy Consumption, Business-as-Usual vs. COVID-19 Scenarios, 2017–2050

		2017	2023	2030	2040	2050	AAGR (2017–2050)
GDP (US$ billion, 2010)	BAU	1,345.9	1,586.9	1,829.6	2,135.2	2,299.9	1.6%
	COVID-19	1,345.9	1,494.7	1,712.4	1,998.5	2,152.6	1.4%
	COVID-19 vs. BAU	0.0%	–5.8%	–6.4%	–6.4%	–6.4%	
TFEC (Mtoe)	BAU	183.2	202.1	215.2	222	215.8	0.5%
	COVID-19	183.2	196.7	209.6	216.1	210.2	0.4%
	COVID-19 vs. BAU	0.0%	–2.7%	–2.6%	–2.7%	–2.6%	

BAU = business as usual, COVID-19 = coronavirus disease, GDP = gross domestic production, Mtoe = million tonnes of oil equivalent, TFEC = total final energy consumption.
Source: Author.

As the global economy gradually recovers from the COVID-19 pandemic, TFEC will increase, peaking by 2040 then declining until 2050 (Figure 9.5). The differences in TFEC between the COVID-19 and BAU scenarios are not significant (2%–3%), indicating that the pandemic's impact is only short term.

Figure 9.5. Total Final Energy Consumption, Business-as-Usual vs. COVID-19 Scenarios, 2017–2050

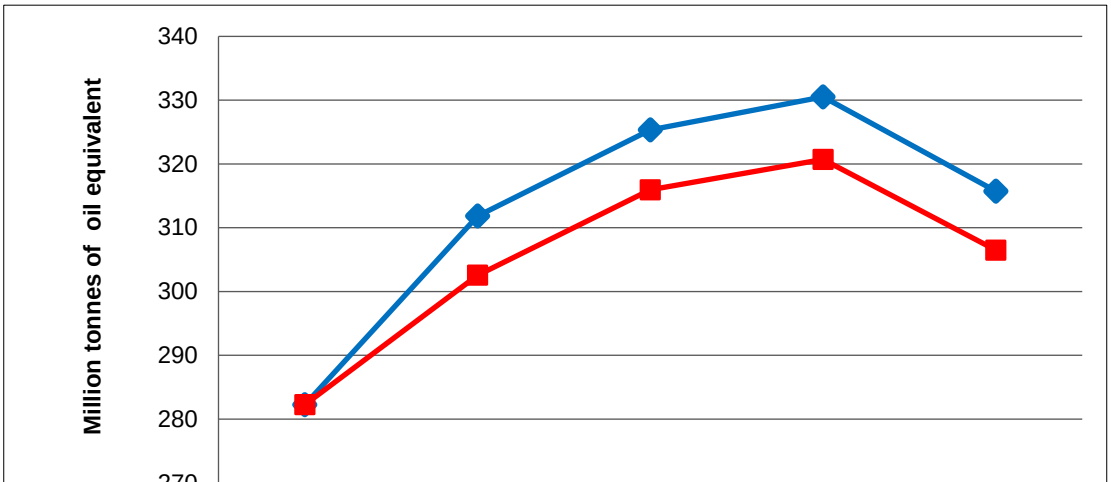


BAU = business as usual, COVID-19 = coronavirus disease.
Source: Author.

4.2. Primary Energy Supply

In the long-term COVID-19 scenario, primary energy supply follows the pattern of final energy consumption and is expected to increase by an AAGR of 0.2% in 2017–2050. TPES in the COVID-19 scenario shows the same pattern as in BAU after 2023, when the economy and energy demand return to normal (Figure 9.6).

Figure 9.6. Primary Energy Supply, Business-as-Usual vs. COVID-19 Scenarios, 2017–2050



	2017	2023	2030	2040	2050
BAU	282.3	311.8	325.3	330.5	315.7
COVID-19	282.3	302.6	315.9	320.7	306.5

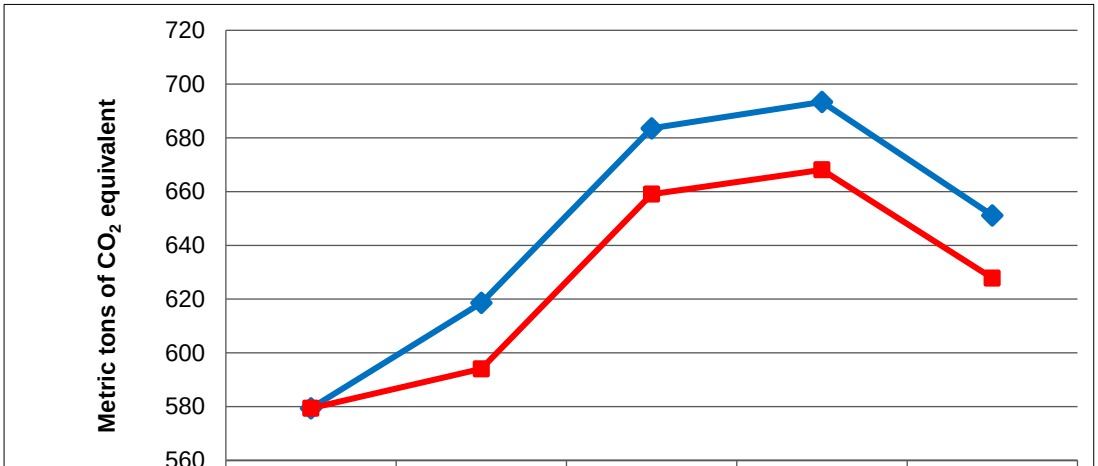
BAU = business as usual, COVID-19 = coronavirus disease.
Source: Author.

4.3. CO_2 Emissions

Based on previous primary energy consumption by fuel type in the COVID-19 scenario, projected GHG emissions follow the pattern of TPES, increasing and then peaking by 2040, thereafter decreasing until 2050 with an AAGR of 0.2% in 2017–2050 (0.4% in BAU). However, after 2023, the AAGR in the COVID-19 scenario is 0.20% (0.19% in BAU) (Figure 9.7).

As a result, energy-related CO_2 emissions in 2050 increase by only 8.4% in the COVID-19 scenario from 2017 (12.4% in BAU), indicating that the pandemic has a limited long-term impact on reducing CO_2 emissions, with a margin of 4.0%. The government, therefore, must transform the energy system with green energy options, such as energy efficiency on the demand side and new and renewable energy on the supply side, to realise the goal of carbon neutrality (net-zero emissions) by 2050.

Figure 9.7. Total CO_2 Emissions, Business-as-Usual vs. COVID-19 Scenarios, 2017–2050



	2017	2023	2030	2040	2050
BAU	579.4	618.6	683.6	693.4	651.1
COVID-19	579.4	594.0	659.0	668.1	627.8

BAU = business as usual, COVID-19 = coronavirus disease.
Source: Author.

5. Implications and Policy Recommendations

COVID-19 has delivered an unprecedented socio-economic shock to Korea, with a huge negative impact on GDP, energy demand and supply, and CO_2 emissions. The economy will recover to pre–COVID-19 levels after 2023, returning to BAU. In the long term, by 2050, following the path of economic growth and energy consumption in BAU, the COVID-19 scenario will not affect the existing trend of energy consumption and CO_2 emissions.

On 14 July 2020, the government, to overcome the economic recession caused by the COVID-19 pandemic and to promote energy transition, announced the Green New Deal, the Korean version of the European Green Deal (11 December 2019). The European Union announced the European Green Deal Investment Plan and the Just Transition Mechanism, with a budget of EUR1 trillion for the following 10 years. The government, however, will invest KRW73.4 trillion in economic recovery by 2025. This ambitious plan to invigorate business includes the largest national investment amongst the major economies.

The Green New Deal includes three key projects: Green Transition of Infrastructures, Low-carbon and Decentralised Energy, and Innovation in the Green Industry. Low-carbon and Decentralised Energy includes the following:

(i) building a smart grid for more efficient energy management (demand-side policy),
(ii) promoting renewable energy use and supporting a fair transition (supply-side policy), and
(iii) expanding the supply of electric and hydrogen vehicles (mobility policy).

Through the Green New Deal, the government plans to move towards a carbon-neutral (net-zero) society by supporting ongoing policies such as the 2030 target for GHG emission

reduction and the plan to have renewables account for 20% of the country's generation capacity by 2030, along with continuous implementation of the Hydrogen Economy Roadmap.

The Green New Deal needs to be augmented not only to respond to the economic crisis but also to pursue the long-term transformation of the energy system to overcome the climate crisis. Many critics argue that the Green New Deal is merely an expansion and reorganisation of existing businesses and is insufficient in differentiation and cost-effectiveness.

The Green New Deal could, therefore, be better designed to consider Korea's unique conditions, such as the market mechanism, industrial structure and capacity, and institutional arrangements. The plan should integrate the '5Ds' – decarbonisation, decentralisation, digitalisation, deregulation, and democracy – to comprehensively address all aspects of the economy, energy, and the environment.

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