Chapter 5

China Country Report

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Chapter 5
China Country Report

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1. Background

Since the outbreak of the coronavirus disease (COVID-19) pandemic, the rampant expansion of infection has threatened the global economy, society, and public health. Despite China being hit hardest at the beginning, its responses—such as policies to lock down cities, shut down businesses, and impose social distancing—allowed it to bring the outbreak under control and resume production. As it recovered, China has continued to make significant progress in various areas, such as overall success in poverty alleviation, enhanced vitality in market bodies, outstanding achievements in pollution control, and rapid development in emerging technology industries. Against this background, this chapter assesses the short- and long-term impacts of the COVID-19 pandemic on energy and recommends policies.

2. Macro Assumptions of the COVID-19 Scenario

The COVID-19 pandemic severely inhibited economic growth. Although gross domestic product (GDP) grew by 2.3% in 2020—allowing it to top CNY100 trillion for the first time—growth was more sluggish than in recent years, when it fluctuated at about 6%. However, a sharp economic rebound is expected. The growth rate peaks in 2021—7.0% in the COVID-19 and 10.4% in the business-as-usual (BAU) scenarios—and then slows down in both. In the COVID-19 scenario, the growth rate is 5.8% in 2022 and 5.7% in 2023, above the BAU level. In the short term, the annual growth rate in the COVID-19 scenario is 5.4% during 2020–2030 (5.7% in BAU). In the long term, the growth rate in the COVID-19 scenario gradually converges with that in BAU, indicating that the economy may finally adapt to the pandemic impacts. Economic growth in the two scenarios becomes identical in 2030–2040 (4.1%) and 2040–2050 (2.7%) (Table 5.1). However, in the forecast to 2050, the GDP level in the COVID-19 scenario is constantly lower than in BAU, implying that the pandemic shock is profound.

Table 5.1. Assumptions of Gross Domestic Product and Annual Growth Rates, Business-as-Usual vs. COVID-19 Scenarios, 2018–2050

	2018	2019	2020	2021	2022	2023	2020–2030	2030–2040	2040–2050
COVID-19	6.3%	6.1%	2.3%	7.0%	5.8%	5.7%	5.4%	4.1%	2.7%
BAU	6.3%	6.1%	2.3%	10.4%	5.7%	5.6%	5.7%	4.1%	2.7%

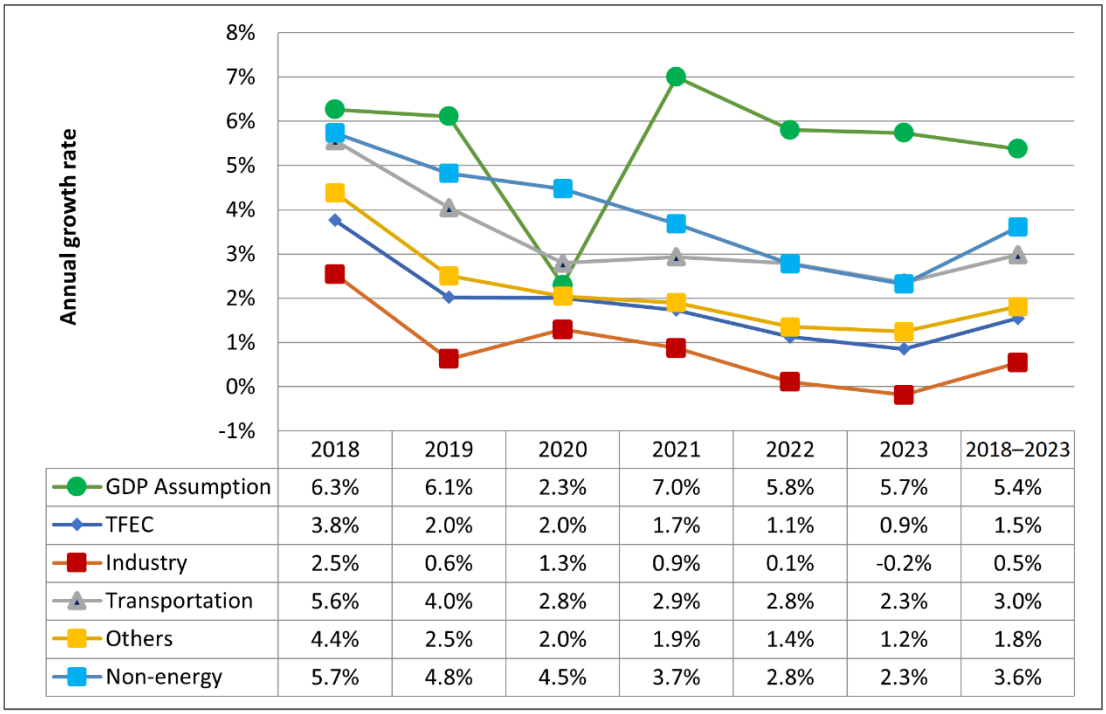
BAU = business as usual, COVID-19 = coronavirus disease.
Source: Economic Research Institute for ASEAN and East Asia, based on International Monetary Fund data for 2020.

3. Short-term Impact (2018–2023)

3.1. Final Energy Consumption

Figure 5.1 shows the annual growth rate of total final energy consumption (TFEC) by sector from 2018 to 2023 in the COVID-19 scenario. Overall, TFEC increases by 2% in 2020, maintaining the same growth rate as in 2019. TFEC increases by 1.7% in 2021 and 1.1% in 2022 (2.1% and 1.2% in BAU). By 2023, the growth rate of TFEC in the two scenarios tends towards the same level of 0.9%. From 2018 to 2023, TFEC grows at an annual average rate of 1.5% (1.6% in BAU), resulting in a persistent TFEC gap between the scenarios. The lockdown policy and stay-at-home order severely restricted transport, resulting in the most substantial decrease in TFEC growth in transport, from 4.0% in 2019 to 2.8% in 2020. However, industry sees accelerated TFEC growth, from 0.6% in 2019 to 1.3% in 2020. People spending more time at home leads to increased residential energy consumption. From 2018 to 2023, the annual growth rate of TFEC in the non-energy sector is 3.6%, more than in other sectors. TFEC in transport increases by 3.0% and in industry by 0.5% in 2018–2023, while other uses increase by 1.8% per year.

Figure 5.1. Annual Growth Rate of Final Energy Consumption, by Sector, COVID-19 Scenario, 2018–2023

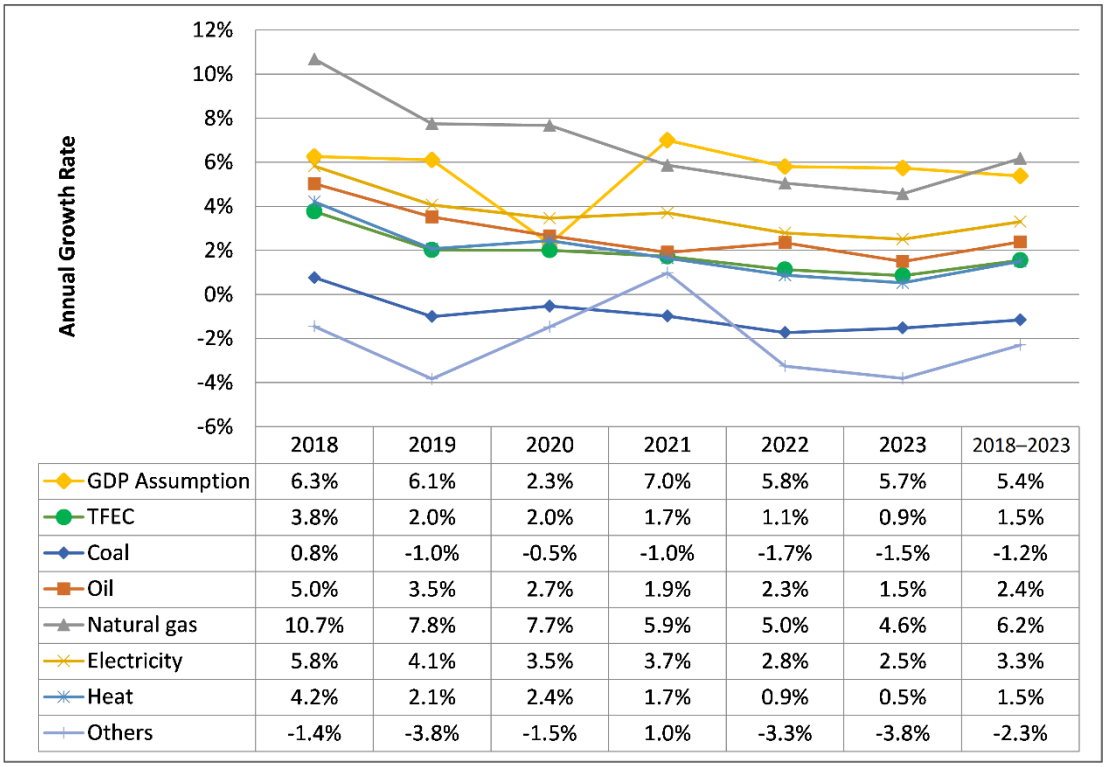


	2018	2019	2020	2021	2022	2023	2018–2023
GDP Assumption	6.3%	6.1%	2.3%	7.0%	5.8%	5.7%	5.4%
TFEC	3.8%	2.0%	2.0%	1.7%	1.1%	0.9%	1.5%
Industry	2.5%	0.6%	1.3%	0.9%	0.1%	-0.2%	0.5%
Transportation	5.6%	4.0%	2.8%	2.9%	2.8%	2.3%	3.0%
Others	4.4%	2.5%	2.0%	1.9%	1.4%	1.2%	1.8%
Non-energy	5.7%	4.8%	4.5%	3.7%	2.8%	2.3%	3.6%

COVID-19 = coronavirus disease, GDP = gross domestic product, TFEC = total final energy consumption.
Source: Economic Research Institute for ASEAN and East Asia.

In the COVID-19 scenario, coal consumption decreases by 1.2% per year in 2018–2023, while TFEC of other sources grows at varying rates (Figure 5.2.). Natural gas consumption expands at an annual growth rate of 6.2% in 2018–2023, followed by electricity (3.3%), and oil (2.4%), while heat consumption grows by 1.5%. Consumption of other energy types, such as biomass, decreases by 2.3% per year. As shares of TFEC, oil is relatively stable, coal declines, and electricity and natural gas rise.

Figure 5.2. Annual Growth Rate of Final Energy Consumption, by Fuel, COVID-19 Scenario, 2018–2023



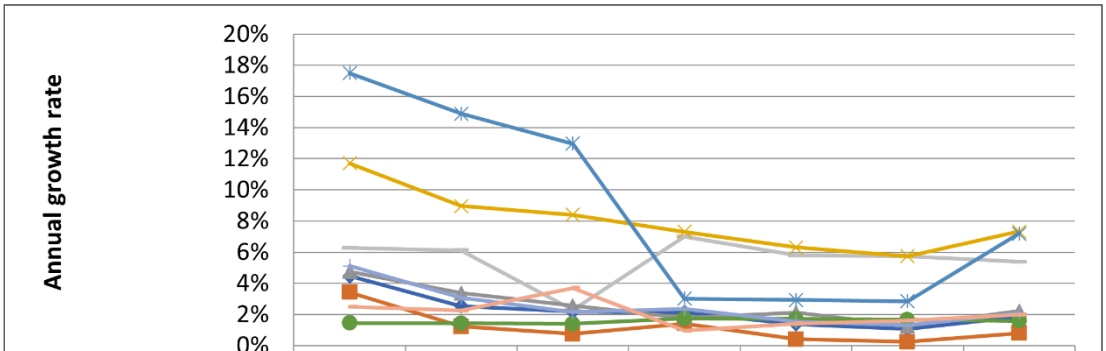
	2018	2019	2020	2021	2022	2023	2018–2023
GDP Assumption	6.3%	6.1%	2.3%	7.0%	5.8%	5.7%	5.4%
TFEC	3.8%	2.0%	2.0%	1.7%	1.1%	0.9%	1.5%
Coal	0.8%	-1.0%	-0.5%	-1.0%	-1.7%	-1.5%	-1.2%
Oil	5.0%	3.5%	2.7%	1.9%	2.3%	1.5%	2.4%
Natural gas	10.7%	7.8%	7.7%	5.9%	5.0%	4.6%	6.2%
Electricity	5.8%	4.1%	3.5%	3.7%	2.8%	2.5%	3.3%
Heat	4.2%	2.1%	2.4%	1.7%	0.9%	0.5%	1.5%
Others	-1.4%	-3.8%	-1.5%	1.0%	-3.3%	-3.8%	-2.3%

COVID-19 = coronavirus disease, GDP = gross domestic product, TFEC = total final energy consumption.
Source: Economic Research Institute for ASEAN and East Asia.

3.2. Primary Energy Supply

Figure 5.3 demonstrates the annual growth rate of total primary energy supply (TPES) by source in 2018–2023. In the COVID-19 scenario, TPES increases by 2.2% in 2020 (2.5% in 2019), and by 1.9% per year in 2018–2023 (2.0% in BAU). TPES decreases for coal (0.7% in 2020 from 1.2% in 2019), oil (2.5% from 3.4%), and geothermal energy (2.1% from 3.1%), and is projected to increase by 0.8% for coal, 2.2% for oil, and 2.1% for geothermal in 2018–2023. The growth rates of natural gas, nuclear, and hydro energy are less influenced by events in 2020. As China transitions to clean energy in the industrial and residential sectors, natural gas increases by 7.3% and nuclear supply by 7.2% in 2018–2023, faster than other energy types.

Figure 5.3. Annual Growth Rate of Primary Energy Supply, by Source, COVID-19 Scenario, 2018–2023



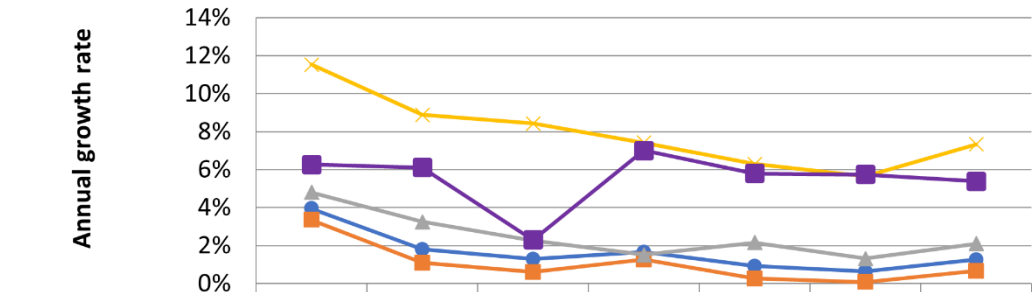
	2018	2019	2020	2021	2022	2023	2018–2023
GDP Assumption	6.3%	6.1%	2.3%	7.0%	5.8%	5.7%	5.4%
TPES	4.5%	2.5%	2.2%	2.1%	1.4%	1.1%	1.9%
Coal	3.4%	1.2%	0.7%	1.4%	0.4%	0.2%	0.8%
Oil	4.7%	3.4%	2.5%	1.8%	2.1%	1.3%	2.2%
Natural gas	11.7%	8.9%	8.4%	7.3%	6.3%	5.7%	7.3%
Nuclear	17.5%	14.9%	13.0%	3.0%	2.9%	2.8%	7.2%
Hydro	1.4%	1.4%	1.4%	1.7%	1.7%	1.7%	1.6%
Geothermal	5.1%	3.1%	2.1%	2.3%	1.6%	1.3%	2.1%
Others	2.5%	2.2%	3.7%	0.9%	1.4%	1.6%	2.0%

COVID-19 = coronavirus disease, GDP = gross domestic product, TPES = total primary energy supply.
Source: Economic Research Institute for ASEAN and East Asia.

3.3. CO_2 Emissions

Because of restricted traffic and industrial activity during the pandemic, China's CO_2 emissions increases by 1.3% in 2020 (1.8% in 2019) (Figure 5.4). CO_2 emissions grow by 1.3% per year in 2018–2023 (1.4% in BAU). CO_2 emissions from coal decrease from 1.1% in 2019 to 0.6% in 2020 and oil from 3.2% to 2.3%. In 2018–2023, CO_2 emissions from coal increase by 0.7% in the COVID-19 scenario (0.8% in BAU). CO_2 emissions from oil in 2018–2023 grow by 2.1% in the two scenarios. CO_2 emissions from natural gas decrease less obviously from 8.9% in 2019 to 8.4% in 2020. In 2018–2023, CO_2 emissions from natural gas grow by 7.3% per year in the two scenarios. The difference in annual growth rate of CO_2 emissions by source in the two scenarios indicates that the pandemic may accelerate coal replacement, with little impact on oil and natural gas in the short term.

Figure 5.4. CO_2 Emissions, by Source, COVID-19 Scenario, 2018–2023



	2018	2019	2020	2021	2022	2023	2018–2023
Total	3.9%	1.8%	1.3%	1.7%	0.9%	0.6%	1.3%
Coal	3.3%	1.1%	0.6%	1.3%	0.3%	0.1%	0.7%
Oil	4.8%	3.2%	2.3%	1.5%	2.1%	1.3%	2.1%
Natural Gas	11.5%	8.9%	8.4%	7.4%	6.3%	5.7%	7.3%
GDP Assumption	6.3%	6.1%	2.3%	7.0%	5.8%	5.7%	5.4%

COVID-19 = coronavirus disease, GDP = gross domestic product.
Source: Economic Research Institute for ASEAN and East Asia.

4. Long-term Impact (2017–2050)

4.1. Final Energy Consumption

The growth rates for GDP and TFEC in the COVID-19 scenario are nearly identical to those in BAU for 2017–2050 (Table 5.2), indicating weakening pandemic influence on energy consumption in the long term. In the COVID-19 scenario, GDP increases by 4.1% per year in 2017–2050 (4.2% in BAU). TFEC grows by 0.4% in the two scenarios.

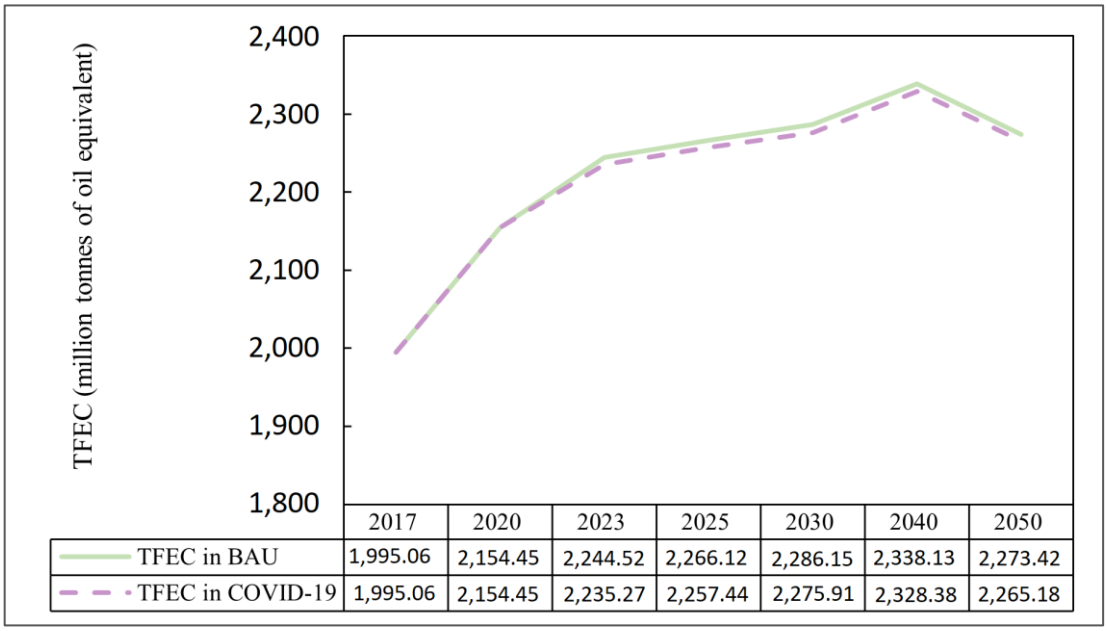
Table 5.2. Gross Domestic Product and Total Final Energy Consumption, Business-as-Usual vs. COVID-19 Scenarios, 2017–2050

		2017	2023	2030	2040	2050	AAGR (2012–2050)
GDP (constant $ billion, 2010)	BAU	10,161	14,450	20,439	30,536	39,687	4.2%
	COVID-19	10,161	14,029	19,908	29,743	38,657	4.1%
	COVID-19 vs. BAU	0.0	-2.9%	-2.6%	-2.6%	-2.6%	
TFEC (Ktoe)	BAU	1,995,056.9	2,244,523.0	2,286,148.5	2,338,129.8	2,273,418.5	0.4%
	COVID-19	1,995,056.9	2,235,273.8	2,275,905.0	2,328,384.8	2,265,183.0	0.4%
	COVID-19 vs. BAU	0.0	-0.4%	-0.4%	-0.4%	-0.4%	

AAGR = annual average growth rate, BAU = business as usual, COVID-19 = coronavirus disease, GDP = gross domestic product, Ktoe = kilotonne of oil equivalent, TFEC = total final energy consumption.
Source: Economic Research Institute for ASEAN and East Asia.

After the pandemic, TFEC and GDP in the COVID-19 scenario are lower than in BAU (Figure 5.5). Because of the optimized industry structure and improved energy efficiency, TFEC decreases by about 0.3% per year in 2040–2050 in both scenarios. In 2017–2050, TFEC increases by 0.4% per year in both scenarios. However, identifying when TFEC peaks is a challenge.

Figure 5.5. Total Final Energy Consumption, Business-as-Usual vs. COVID-19 Scenarios, 2017–2050



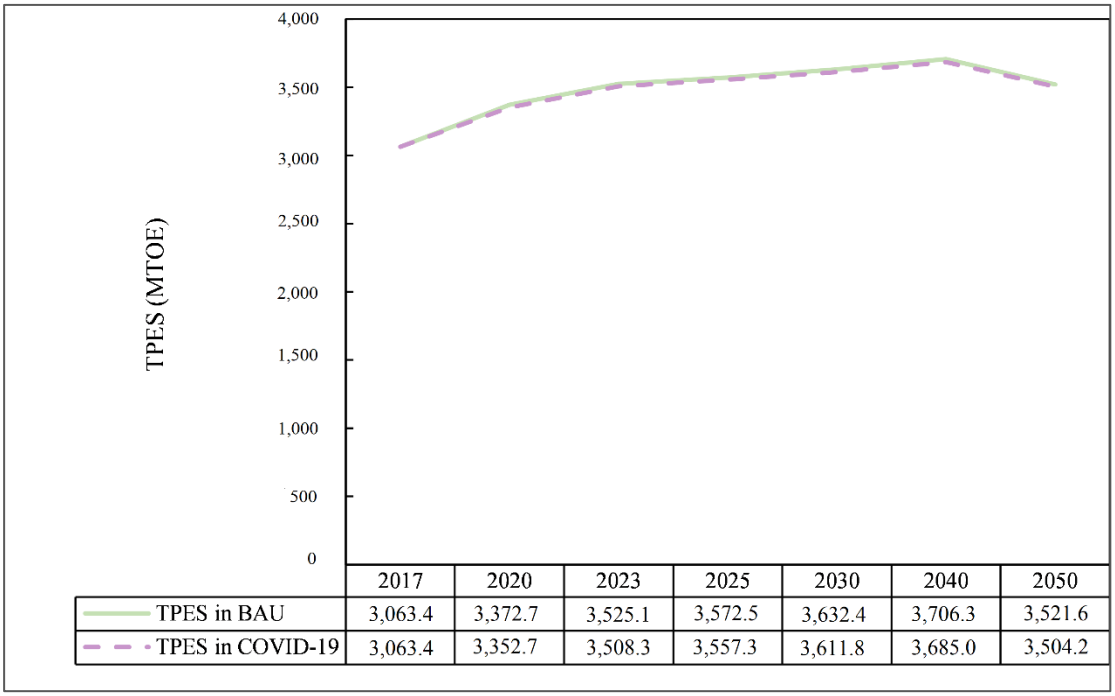
	2017	2020	2023	2025	2030	2040	2050
TFEC in BAU	1,995.06	2,154.45	2,244.52	2,266.12	2,286.15	2,338.13	2,273.42
TFEC in COVID-19	1,995.06	2,154.45	2,235.27	2,257.44	2,275.91	2,328.38	2,265.18

BAU = business as usual, COVID-19 = coronavirus disease, TFEC = total final energy consumption.
Source: Economic Research Institute for ASEAN and East Asia.

4.2. Primary Energy Supply

As the pandemic takes a turn for the better in China, the energy system gradually resumes production. TPES is projected to increase at an average growth rate of 0.42% in 2017–2050 in BAU and 0.41% per year in the COVID-19 scenario. TPES in the two scenarios is similarly close and the peak time is hard to identify based on Figure 5.6.

Figure 5.6. Total Primary Energy Supply, Business-as-Usual vs. COVID-19 Scenarios, 2017–2050



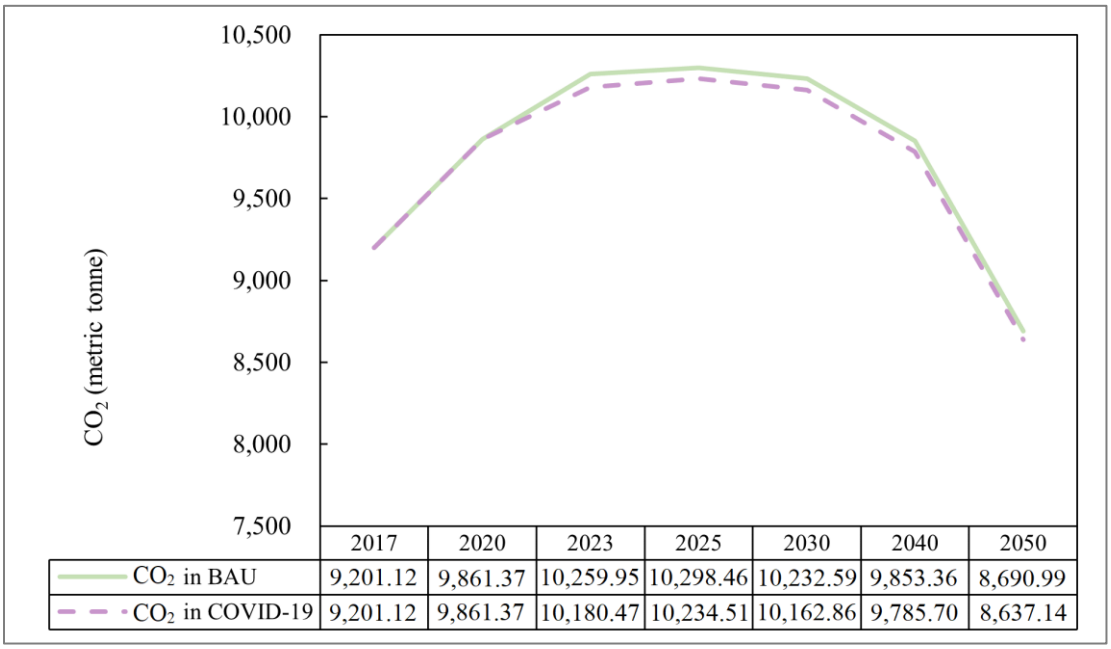
	2017	2020	2023	2025	2030	2040	2050
TPES in BAU	3,063.4	3,372.7	3,525.1	3,572.5	3,632.4	3,706.3	3,521.6
TPES in COVID-19	3,063.4	3,352.7	3,508.3	3,557.3	3,611.8	3,685.0	3,504.2

BAU = business as usual, COVID-19 = coronavirus disease, TPES = total primary energy supply.
Source: Economic Research Institute for ASEAN and East Asia.

4.3. CO_2 Emissions

In the COVID-19 scenario, CO_2 emissions are lower than in BAU (Figure 5.7) and projected to decrease by 0.19% in 2017–2050 (0.17% in BAU). In the long term, the pandemic reduces energy consumption and results in less CO_2 emissions in the COVID-19 scenario than in BAU. CO_2 emissions continue to rise until 2025 (10,234.5 metric tonnes) in the COVID-19 scenario. More efforts are needed to reduce CO_2 emissions to achieve carbon peak before 2030. CO_2 emissions are reduced by 15.6% in 2050 from 2025 levels in the COVID-19 scenario.

Figure 5.7. Total CO_2 Emissions, Business-as-Usual vs. COVID-19 Scenarios, 2017–2050



	2017	2020	2023	2025	2030	2040	2050
CO_2 in BAU	9,201.12	9,861.37	10,259.95	10,298.46	10,232.59	9,853.36	8,690.99
CO_2 in COVID-19	9,201.12	9,861.37	10,180.47	10,234.51	10,162.86	9,785.70	8,637.14

BAU = business as usual, COVID-19 = coronavirus disease.
Source: Economic Research Institute for ASEAN and East Asia.

5. Implications and Policy Recommendations

The COVID-19 outbreak impaired China's economy and social development. The lockdowns and social distancing severely restricted business, transport, and trade, slowing economic growth in 2020. Energy supply and demand fluctuated significantly in 2020 and threatened energy security. As China recovers, the economic growth rate gap between the COVID-19 and BAU scenarios will narrow. Therefore, the influence of the pandemic on energy may fade in the long term. To achieve carbon peak and carbon neutralization goals, the share of coal in TFEC must continue to decrease, the energy system be decarbonised, and the industry structure optimised. However, the pandemic has profoundly influenced public sentiment, expectations of investors, and basic lifestyles, giving rise to uncertainties in economic recovery. Three policies are, therefore, recommended:

(i) The disruption brought about by the pandemic has not dramatically altered the expected BAU energy trajectory, while China continues to face many post-pandemic uncertainties. To achieve carbon peak and carbon neutrality, the goals of economic growth should shift from total expansion to quality improvement in the post-pandemic era, requiring a clean, efficient, low-carbon energy system. To control carbon emissions and mitigate air pollution, economic growth should be gradually decoupled from fossil energy consumption, requiring upgradation of the energy structure. Therefore, solar and wind energy development should accelerate to meet mounting energy demand. The transition pattern should vary by sector. Specifically, the electrification of vehicles should be encouraged in transport. Traditional fuels such as wood, straw, and coal should be gradually replaced by cleaner energy such as electricity and natural gas in

the residential sector, especially in rural areas. In industry, the increased proportion of cleaner energy should be combined with carbon capture, utilisation, and storage technology to control carbon emissions.

(ii) The pandemic threatened energy security, raising concerns about the security and sustainability of the energy system. Considering the high dependence of oil and natural gas on imports, a stable energy reserve for emergencies is highly significant. The renewable energy sector, however, should guarantee adequate storage of essential raw materials and renewable energy semi-products. Gaining technological independence in renewable production is crucial to maintain energy security.

(iii) The pandemic created sophisticated and non-linear variations in the energy market, such as extreme fluctuation of crude oil prices, suggesting that historical experience cannot be applied to the pandemic situation. Policymakers and researchers should establish a more flexible and comprehensive model to predict energy demand, energy price, and supply ability to formulate a more reasonable and feasible energy policy. The pandemic may affect climate change, which should receive more attention from scholars and policymakers.

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