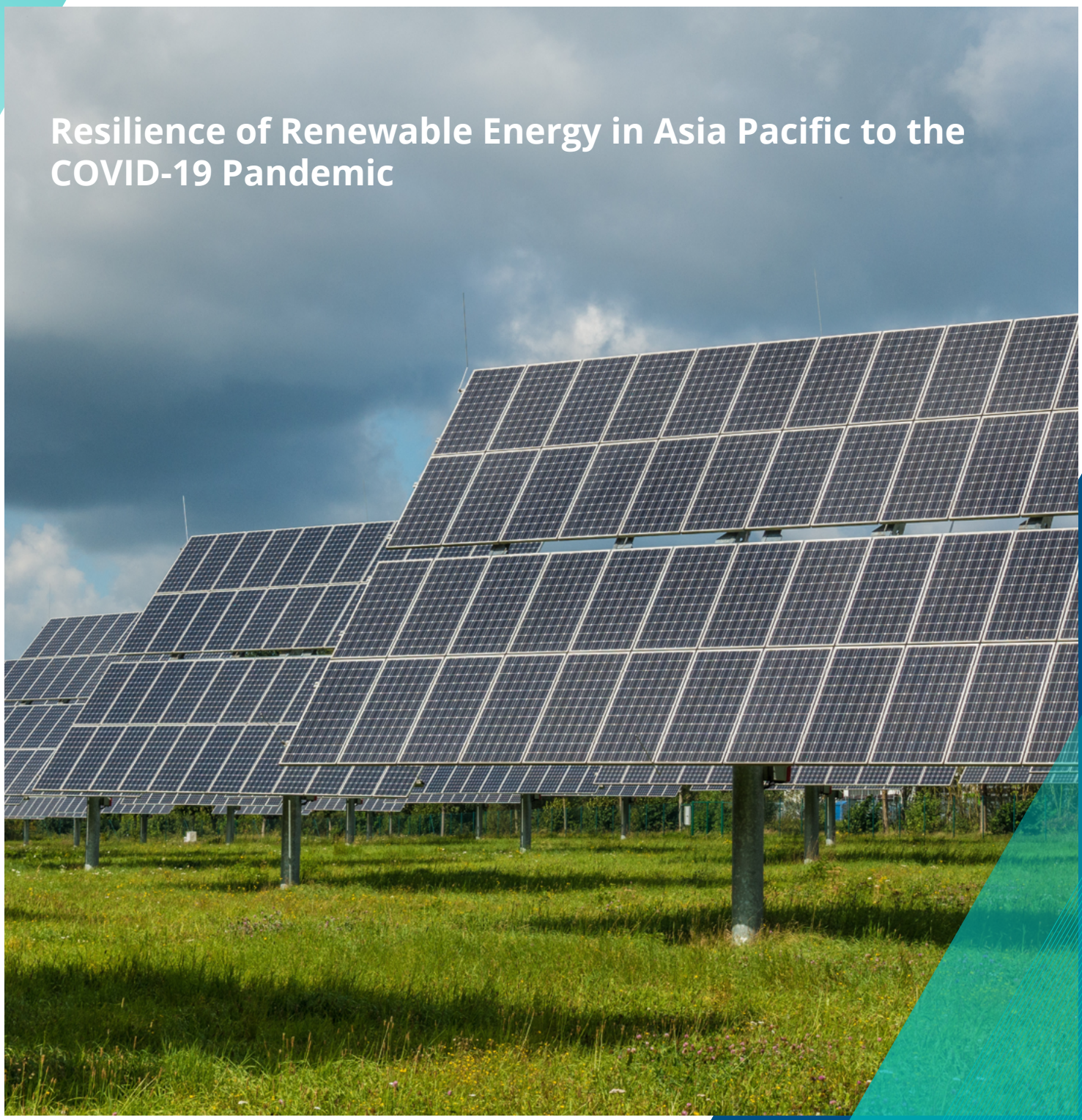
KONRAD ADENAUER STIFTUNG

Resilience of Renewable Energy in Asia Pacific to the COVID-19 Pandemic



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1. Foreword

Since the beginning of 2020, the uncertainties arising from the COVID-19 outbreak have resulted in temporally disruptions of the global supply chain and the reduction of energy use. The energy industry has been undertaking a review on the current energy mix, seeking to diversify sources of energy supply. An intense competition is thus taking place between fossil fuels and renewable energy to supply the reduced energy demand. The resilience of renewable energy compared to fossil fuels in times of a crisis could become a crucial factor for it future deployment.

Some are optimistic about the growth of renewable energy in the long term. Before COVID-19, national governments in the Asia Pacific region were taking active steps to pursue low carbon energy transitions. Amid the pandemic, China, Japan and South Korea have committed to national carbon neutrality targets. Due to its decreasing prices and constant technical improvement, renewable energy remains economically attractive for investors, even though investment may drop in the short term. On the other hand, others see the development of renewable energy is negatively affected by the pandemic, as national efforts focus currently on the containment of the virus. Economic recovery is prioritized over climate change and energy agenda during the global economic recession. In addition, many see coal plays a dominant role in some developing countries in Asia because of vested interests in politics.

Against this backdrop, we have commissioned the Energy Studies Institute, National University of Singapore to conduct a study to examine the performance of fossil fuels and renewable energy amid the COVID-19 pandemic in the Asia-Pacific region. Taking the impacts of the COVID-19 crisis into account, it analyses the change of policies, energy mix and investment on the energy sources in depth in selected Asian countries.

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2. Executive Summary

Since the beginning of 2020, the economic slowdown resulting from the COVID-19 pandemic has resulted in a short-term reduction of energy demand in many countries. As a result, there has been competition between renewable energy and fossil fuels to satisfy this reduced energy demand. This competition has been shaped by economic and political factors that govern respective national energy markets. This situation has provided an opportunity to assess the short-term resilience of renewable energy, for if suitable policies and systems are in place, the share of renewable energy should increase at the expense of fossil fuels during a decline in demand. Likewise, the pandemic has provided governments with the opportunity to launch "green" economic recovery strategies and strengthen policies which support renewable energy.

The Asia-Pacific region has global significance for the low-carbon energy transition because of its large population, its share of the global economy, the size and rate of growth of its energy consumption, and the fossil fuel-rich nature of its primary energy mix.

This study examines the experience of selected countries in the Asia-Pacific region to assess the short and long-term resilience of renewable energy relative to fossil fuels during and after the pandemic. It focuses specifically on renewable electricity and biofuels for transport. The assessment of short-term resilience focuses on the period of significantly reduced economic activity and energy demand. Longer-term resilience is assessed by examining the nature of the economic recovery packages announced during the pandemic and the presence of any new energy policies.

The countries selected for the study are China, India, Indonesia, Malaysia, the Philippines, Thailand and Vietnam. These were chosen from among the lower and upper middle-income countries in the region because of their large populations and large and rising energy consumption.

The available data suggest that the share of non-fossil fuel electricity generation increased by a few percent during the period of significantly lower demand in five of the seven countries studied. The percentage of non-hydro renewable electricity (mainly utility-scale) increased in all the countries studied. These successes resulted from purchase obligations on the grid companies or in Malaysia's case, a least-cost dispatch rule. In some countries, the higher share of non-hydro renewables may be attributable in part to an increase of installed capacity in the second half of 2019.

Thus, both non-fossil fuels and non-hydro renewable electricity displayed a moderate degree of short-term resilience in the period of lower demand caused by the pandemic. However, in those cases with the relevant data available, these gains were quickly offset once the economies started to recover and electricity demand rose. In all cases studied, the construction of new non-hydro renewable electricity generating capacity slowed down or halted due to a combination of movement restrictions and supply chain disruptions.

Data on changes in proportions of biofuel blending in transport fuels during the pandemic were not available. In most of the countries studied, the absolute quantity of biofuel declined along with the falling consumption of liquid transport fuels. The absence of an increase in biofuels' share can probably be attributed to their generally high cost compared to gasoline and diesel and the disruption of supply chains. This is not unexpected given the low level of international oil prices during 2020.

Governments of none of the Asian countries studied framed their economic recovery packages as being "green". This is understandable because the immediate priority was to protect livelihoods and support healthcare. Nevertheless, some governments did announce new energy policies. In several countries, governments declared continuing or even enhanced support for renewable energy, but also called for additional thermal generation capacity. Therefore, it is not clear how fast the share of renewable energy will grow in these countries. One key factor will be the extent to which national policies requiring the dispatch of low-carbon electricity are rigorously enforced.

Overall, renewable energy's longer-term resilience across the Asia Pacific region's middle-income countries is uncertain and likely to be quite variable. It cannot yet be said that the pandemic will have enhanced the share of electricity from non-fossil fuels or non-hydro renewable sources above pre-existing trends in the countries studied. That is not to deny that governments might reconsider their strategies for electricity supply once the worst effects of the pandemic are past.

The resilience of policies in support of biofuel use in the transport sector appears to be quite variable. Biofuel blending is likely to increase as planned in some countries studied once economies return to normal. However, the cost of biofuels relative to oil products will remain a constraint.

Governments will encounter competing tensions in formulating and implementing their energy policies in nearly all the countries covered by this study. They will continue to face international and domestic pressure to switch to cleaner energy sources to constrain rising carbon emissions and air pollution. Opposing pressures will come from the need to boost national energy supply as fast as possible, from interest groups in the fossil fuel industry keen to sustain their economic dominance, and from wider society seeking affordable energy supplies which have traditionally been from fossil fuels.

As the costs of non-hydro renewable electricity sources continue to decline, it is incumbent on national governments in the region to put in place and enforce credible policies to support the deployment and dispatch of renewable energy, both utility-scale and off-grid. Such measures can be market-based or administrative, or both, depending on national circumstances. Where relevant, these should be supplemented by the development of regional grids to transmit renewable electricity from areas of surplus to those in deficit. In the long term, these efforts will support economic growth, emissions reduction, and energy access. Governments will also need to reinforce policies which support the manufacture and use of biofuels.

These renewable energy programmes will require national governments to co-opt traditional industry actors as well as local governments and broader society. Governments will also need to support new actors along the supply chain for renewable energy. However, obstacles to accelerating the advance of renewable energy will be substantial in some countries of the region. The persistence of the COVID-19 pandemic will further deplete government funds available to provide price support, companies will be more indebted, demand for additional energy supply may be lower than previously expected, and governments will continue to focus their attention on economic growth, livelihoods, and healthcare. Sustained low oil prices will undermine efforts to boost the use of biofuels.

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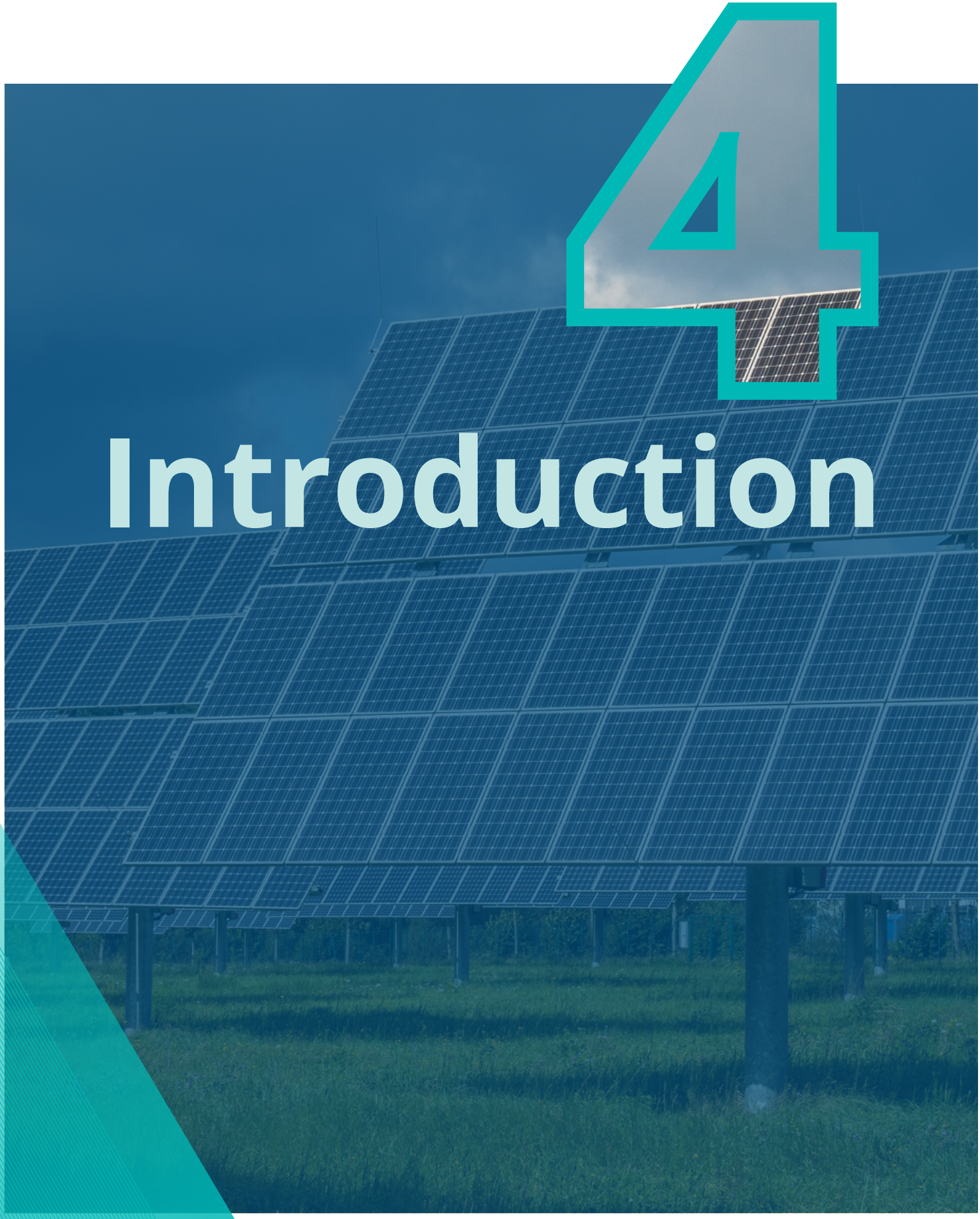


4 Introduction

Renewable energy has many advantages over fossil fuels: life-cycle greenhouse gas emissions and air pollution are generally lower; operating costs are lower in most circumstances, though capital costs are high; renewable energy can be used to provide electricity to remote communities, and it can reduce the import dependency of a country or region. The question being asked around the world is: "what has been and will be the consequences of the COVID-19 pandemic on the world's energy mix, particularly on the balance between fossil fuels and renewable energy?"

Since the beginning of 2020, the economic slowdown resulting from the COVID-19 pandemic has resulted in a short-term reduction of energy demand in many countries. As a result, there has been competition between renewable energy and fossil fuels to satisfy this reduced energy demand. This competition has been shaped by economic and political factors that govern respective national energy markets.

There has been a wide range of views on the pandemic's impacts on the short- and long-term energy mix. The renewable energy optimists have pointed to the rising share of renewable energy in the electricity mix in many OECD countries with fully competitive power markets. In such markets, renewable energy will always gain market share when demand for their low marginal cost declines. Some OECD countries are also putting in place green recovery plans that aspire to rebuild economic growth and employment on the back of accelerating the low-carbon energy transition. Support from financial institutions that have forsaken fossil fuels will assist the delivery of such policies.

An alternative perspective is more cautious, particularly in the context of low- and middle-income countries. These countries are distinct in several ways from OECD member states. First, renewable electricity tariffs may not be competitive with those of fossil fuels and/or dispatch may be driven by political rather than economic factors. This could result in a decline in electricity demand not benefiting renewable energy. Second, as demand picks up, national governments may lack the motivation and funds to implement a green recovery plan. Along with low fossil fuel prices and local fossil fuel interest groups, the opportunity to accelerate the low-carbon energy transition may be missed in some low- and middle-income countries.

Whilst these optimistic and cautious arguments have mainly focused on power generation, they are also relevant to the transport sector, particularly concerning biofuels and electric vehicles.

The Asia-Pacific region has global significance for the low-carbon energy transition. In 2019 it was home to 60 per cent of the world's population, about 40 per cent of annual GDP in purchasing power parity terms. The region also accounted for 44 per cent of primary energy consumption. Moreover, its energy mix is dominated by fossil fuels (87%), notably coal (47.5%). Whilst fossil fuels made up 82 per cent of the energy mix for the rest of the world; coal made up only 11 per cent of the total (Fig. 4.1). Asia-Pacific accounted for 77 per cent of global coal consumption in 2019, up from about 50 per cent in 2000, over which period global coal consumption has risen by nearly 50 per cent.[1] The difference between the energy mix of the Asia-Pacific region and the rest of the world is even more pronounced in regard to electricity generation. Coal provides 58 per cent of Asia-Pacific's electricity supplies, compared to 17 per cent in the rest of the world (Fig. 4.2.).

Over the last few years, governments of middle- and lower-income countries in the Asia-Pacific region have been pursuing clean energy strategies with varying degrees of commitment and success. Such variability has persisted under the shadow of the COVID-19 pandemic. National and sub-national governments put in place a range of restrictions that have constrained economic activities over different periods of 2020. As a result, economies have been growing less rapidly, and many have experienced negative growth. Demand for most forms of energy, including electricity, has undergone a sharp decline in most countries. This sudden reduction has provided an opportunity to assess the short-term resilience of the countries' renewable energy. Its share in the energy mix has increased in states where renewable energy receives supportive policies. In the electricity

sector, this occurred either in a competitive electricity market, with or without carbon pricing, or in a tightly regulated market where renewable energy ranked high in the merit order.

In response to the economic slowdown, most governments in the Asia-Pacific region have implemented economic recovery packages. Strategies have varied. Some have focused directly on livelihoods and healthcare, while others have increased investment in infrastructure. A few have declared strong green recovery strategies intended to guide the entire economy in a new direction. Similarly, some governments have announced plans to accelerate the low-carbon energy transition, whilst others have yet to promulgate new energy policies that would support renewable energy.

This study examines the experience of selected countries in the Asia-Pacific region: to assess the short- and long-term resilience of renewable energy relative to fossil fuels during and after the pandemic. The report focuses specifically on renewable electricity and biofuels for transport.

Short-term resilience focused on the period of reduced economic activity and energy demand is examined by reference to:

- The extent to which the share of renewables in the energy mix for electricity and transport has changed.
- The extent to which the share of renewables in the energy investment for electricity and transport has changed.
- The respective roles of public policy, political factors, and economic forces to determine these trends in regard to energy mix and investment.

Longer-term resilience is assessed by examining the nature of the economic recovery packages announced during the pandemic and the presence of any new energy policies.

The countries selected for the study are China, India, Indonesia, Malaysia, the Philippines, Thailand and Vietnam. These were chosen among the lower and upper middle-income countries in the region because of their large populations and large and rising energy consumption.

Given the travel restrictions, the study was carried out mainly through desk research — drawing on publicly available information and was qualitative in nature. Where necessary, in-country experts were consulted to verify data or interpretation. In most cases, the electricity data for 2020 were available for the first three quarters of 2020, but this was not the case for all the countries studied. The available data on biofuel consumption for 2020 are generally minimal.

Figure 2.1.a. Primary commercial energy mix in the Asia-Pacific region, 2019 [2]

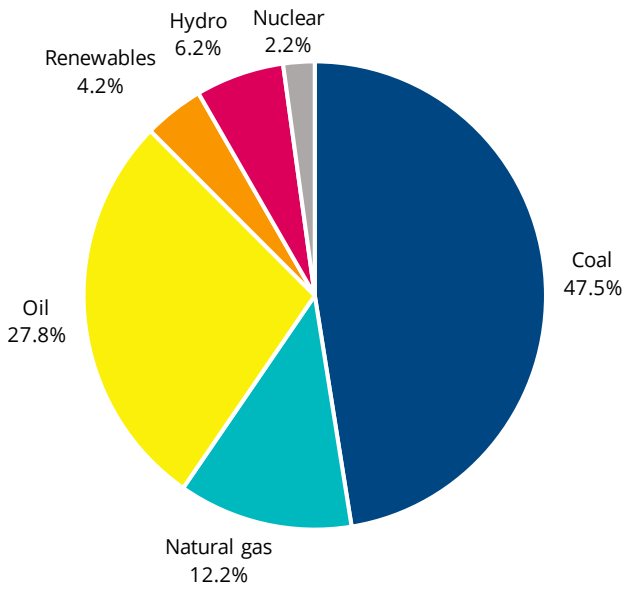


Figure 2.1.b. Primary commercial energy mix in the rest of the world, 2019 [3]

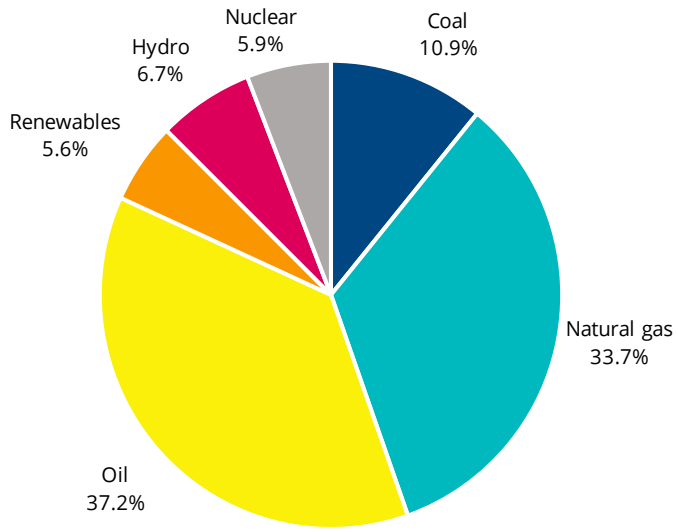


Figure 2.2.a. Electricity generation mix in the Asia-Pacific region, 2019 [4]

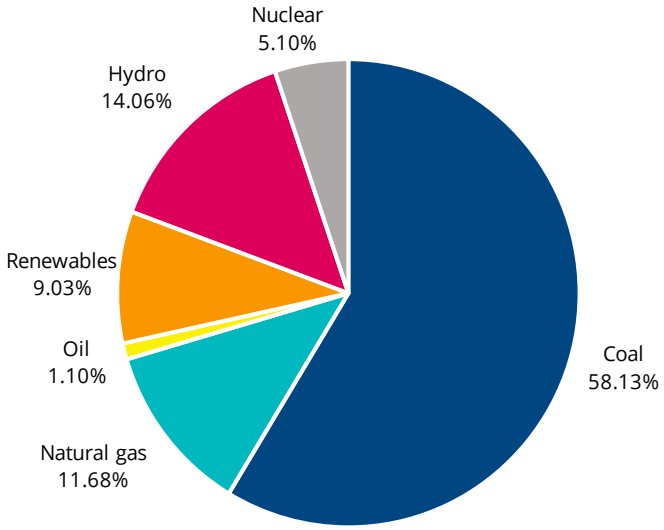
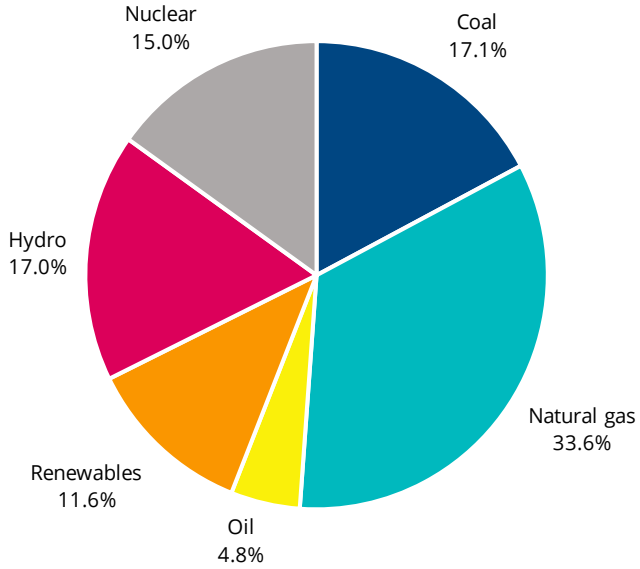


Figure 2.2.b. Electricity generation mix in the rest of the world, 2019 [5]



5 China

Overview — China

Energy mix before the pandemic

- The share of coal in the primary energy mix is declining.
- The share of non-hydro renewable energy in the electricity supply is growing strongly.
- The introduction of biofuels is much slower than initially planned, and the ethanol target for 2020 drops.

Energy mix and investment during the pandemic

- Period of lowest electricity demand: February–March 2020.
- Non-fossil electricity, wind and solar power, all increase their share in 1Q2020 year on year due to obligations on the grid, but only marginally.
- These slightly higher shares persist into 2Q2020 and 3Q2020 as the economy recovers.
- Investment in new wind and solar capacity slows in 1H2020 due to supply chain problems, but picks up afterward.

Economic recovery plan and new energy policies

- The economic recovery plan is not notably green.
- Energy-intensive industries are recovering rapidly.
- Emphasis on energy self-sufficiency supports fossil fuels as well as renewable energy.
- Support for ethanol has been delegated to localities.

Outlook for renewable energy

- Installed capacity and generation of renewable and non-fossil electricity continue to grow, but also for coal-fired power.
- The share of renewable electricity will grow slowly.
- Little progress is being made with biofuels.
- How policies will be adapted to meet Xi Jinping's carbon neutrality pledge is not yet clear.

5.1 Policies and energy mix before the pandemic

China is an upper middle-income country with a per capita GDP (PPP) in 2019 of around US$16,800.[6] Annual rates of economic growth have declined steadily from 10.6 per cent in 2010 to 6.1 per cent in 2019. Over this period, the share of the service sector within the GDP rose from 44 per cent to 52 per cent at the expense of the secondary sector.[7]

Since the domestic energy supply crisis of 2003-2004, a succession of policies to constrain the rise of energy consumption, promote non-fossil fuel energy and substitute gas for coal have met with substantial success. The government also set several targets relating to energy intensity, coal consumption and the share of non-fossil fuels in the energy mix. At the Paris Conference of the Parties (COP 21), China's Nationally Determined Contribution included pledges that by 2030 carbon dioxide emissions would peak, emissions per unit of GDP would fall by 60 per cent to 65 per cent compared to 2005 levels, and the share of non-fossil fuels in the primary energy mix would reach 20 per cent.[8]

As a result of these measures, there has been a significant divergence between energy consumption and economic growth. Annual primary commercial energy consumption increased by 250 per cent between 2003 and 2019, with China accounting for some 24 per cent of the global total in 2019.[9] However, real GDP grew fourfold over the same period. The primary energy mix also improved. Annual coal consumption reached a peak in 2013 and then declined marginally before picking up again in 2017. Since 2007 the share of coal in the primary energy mix had dropped from 74 per cent to 57 per cent by 2019. Over the same period, the natural gas percentage in the primary energy mix rose from three per cent to eight per cent. The share of non-fossil fuels (nuclear, hydro, and other renewables) increased from six per cent to 15 per cent.[10]

The share of non-fossil fuels in electricity supply has risen from 20 per cent in 2010 to more than 31 per cent in 2019 (Table 5.1). Hydroelectricity has maintained its share within the range 15 per cent-19 per cent of supply, depending on the rainfall, whilst the share of nuclear power rose from less than two per cent to nearly five per cent. The growth of non-hydro renewable energy has been particularly strong, with its contribution increasing from 1.9 per cent of electricity supply in 2010 to 9.9 per cent in 2019. This success has been due to massive investment programmes in installed generation capacity, mainly utility-scale, through a combination of ambitious targets and feed-in tariffs. These incentives have been steadily reduced as equipment costs have declined, and the first competitive auction for utility-scale solar PV projects was held in 2019. By the end of 2019, China had by far the largest installed capacity in the world of wind energy (210 GW) and solar power (205 GW). For several years these renewable energies had suffered a high degree of curtailment arising from a combination of technical and administrative sources. These problems were gradually overcome, and the curtailment of wind energy declined from 17 per cent in 2016 to four per cent in 2019 and of solar energy from 12.6 per cent in 2015 to two per cent in 2019.[11]

Nevertheless, the installation of new renewable energy capacity fell from 66 GW in 2018 (20 GW of solar PV, 44 GW of wind) to 56 GW in 2019 (26 GW of solar PV, 30 GW of wind). This decline was driven mainly by the reduction of feed-in tariffs.[12]

Policy support for transport biofuels has been much weaker than that for renewable electricity. Policies and subsidies have been directed mostly at ethanol rather than biodiesel. Even then, the support for ethanol has fluctuated depending on the price and availability of domestic corn supplies. In 2017, the government announced a target of blending all gasoline with ten per cent ethanol (E10) by the end of 2020. In December 2019, this target was dropped due to a shortage of corn and ethanol manufacturing capacity. Between 2011 and 2019, the blended rate of ethanol in gasoline never rose above two per cent. Support for biodiesel has been much weaker, resulting in a blended rate of just 0.2-0.3 per cent.[13]

Table 5.1. Fuel mix in power generation, 2017- 2019 [14]

Fuel	2017		2018		2019	
	TWh	%	TWh	%	TWh	%
Coal	4,361	*67.2%*	4,765	*67.0%*	4,854	*65.2%*
Gas	203	*3.1%*	215	*3.0%*	236	*3.2%*
Oil	9.9	*0.2%*	5.5	*0.1%*	6.0	*0.1%*
Hydro	1,165	*18.0%*	1,199	*16.8%*	1,269	*17.0%*
Nuclear	248	*3.8%*	295	*4.1%*	349	*4.7%*
Wind	305	*4.7%*	366	*5.1%*	406	*5.5%*
Solar	118	*1.8%*	177	*2.5%*	224	*3.0%*
Other renewable	80	*1.2%*	94	*1.3%*	103	*1.4%*
Total	**6,490**	*100.0%*	**7,116**	*100.0%*	**7,446**	*100.0%*
Non-fossil fuel	1916	*29.5%*	2131	*29.9%*	2351	*31.6%*

5.2 Energy mix and investment during the pandemic

The combination of the Chinese New Year holiday and the outbreak of the COVID-19 pandemic resulted in a decline in total power generation in the first quarter of 2020 compared to the same quarter in 2019 (Table 5.2.a). This should have provided an opportunity for wind and solar power to significantly increase their share of the mix in the first quarter. The low hydroelectricity production level in the first quarter due to seasonal factors should have provided additional scope for solar and wind power to be dispatched had they received priority. However, this does not seem to have been the case. The share of wind and solar energy rose by only a modest amount in the first quarter of 2020 compared to the same quarter in 2019 (Table 5.2.b).

Electricity demand picked up in the second and third quarters of 2020 as the economy recovered, resulting in generation exceeding the levels seen in the same quarters of 2019. Likewise, all sources of electricity saw a rise in output in these quarters year on year, except for hydroelectricity output which was lower in 2Q2020 year on year. Solar and wind installations not only provided 15 per cent more electricity in absolute terms; they also increased their share of total output over the three quarters from 8.6 per cent to 9.6 per cent. At first sight, this suggests that the dispatch rules favouring clean energy are having some effect.[15] However, it is also significant that solar and wind energy's installed capacity in China increased by 17.3 per cent and 14.0 per cent respectively in 2019.[16] Therefore, a more substantial contribution from these sources should have been expected on capacity grounds alone. The share of fossil fuels over the three quarters declined marginally from 70.2 per cent in 2019 to 69.2 per cent in 2020.

The first six months of 2020 saw a sharp fall in new installed renewable energy capacity due to bottlenecks in the supply chain. The declines were 30 per cent year on year to 6.3 GW for wind energy and 13 per cent to 10.1 GW for solar PV. Over the same period, thermal power installation dropped just 3.7 per cent, and hydropower rose 126 per cent year on year. Nevertheless, commitments to invest in new renewable energy capacity, mainly offshore wind, rose sharply in the first half of 2020. In 2019, the government approved 40 GW of new offshore wind capacity to receive a feed-in tariff if connected by the end of 2021. However, supply chain and transport bottlenecks may prevent the completion of all this capacity by the deadline.[17]

Table 5.2.a. Power generation by fuel in different periods of 2019 and 2020, and ratios between different periods[18]

Fuel	Output TWh							
	1Q 2019	2Q 2019	3Q 2019	1Q 2020	2Q 2020	3Q 2020	1-3Q 2019	1-3Q 2020
Thermal	1266	1183	1353.3	1175	1259	1397.6	3802.3	3831.6
Hydro	215.9	297.9	380	196.3	280.6	425.6	893.8	902.5
Nuclear	77	83	93.8	78	93.6	98.4	253.8	270
Wind	104.1	110.4	76.9	114.9	123	95.1	291.4	333
Solar	44	62.7	64.8	52.8	75	72.7	171.5	200.5
Total	1707	1737	1969	1617	1831	2089.4	5412.8	5537.6
Non-fossil	441	554	615	442	572.2	691.8	1610.5	1706
Wind & solar	148	173	142	168	198	168	462.9	533.5

Table 5.2.b. Shares of different fuels for power generation in different periods of 2019 and 2020

Fuel	1Q 2019	2Q 2019	3Q 2019	1Q 2020	2Q 2020	3Q 2020	1-3Q 2019	1-3Q 2020
Thermal	74.2%	68.1%	68.7%	72.7%	68.8%	66.9%	70.2%	69.2%
Hydro	12.6%	17.2%	19.3%	12.1%	15.3%	20.4%	16.5%	16.3%
Nuclear	4.5%	4.8%	4.8%	4.8%	5.1%	4.7%	4.7%	4.9%
Wind	6.1%	6.4%	3.9%	7.1%	6.7%	4.6%	5.4%	6.0%
Solar	2.6%	3.6%	3.3%	3.3%	4.1%	3.5%	3.2%	3.6%
Non-fossil	25.8%	31.9%	31.3	27.3%	31.2%	33.1%	29.8%	30.8%
Wind & solar	8.7%	10.0%	7.2%	10.4%	10.8%	8.0%	8.6%	9.6%

5.3 Economic recovery plan and new energy policies

China was one of the first countries to start rolling out an economic recovery plan. Though early, the scale of the stimulus package was modest at an estimated seven per cent of annual GDP[19] — much smaller than those of some OECD nations that exceeded ten per cent[20] and the country's response to the 2008 global financial crisis that reached twelve per cent.[21] The recovery package comprised two distinct elements: short-term relief and longer-term stimulus. The relief effort was financed through an increase of the budget deficit by RMB1 trillion as well as by RMB1 trillion of special treasury bonds for city and county governments to safeguard employment, provide for basic needs and protect small enterprises. The stimulus plan was intended to boost investment. This has been financed by RMB3.75 trillion of local government bonds and part of the RMB1 trillion of special treasury bonds mentioned above. The targets for this investment range from poverty reduction and agricultural production to healthcare and environmental management. Of most significant relevance to this study are the plans for "new infrastructure", urban renewal, traditional infrastructure, and energy security.[22]

As China emerged from the COVID-19-induced economic shock, the government's fiscal support measures and monetary easing seemed to be paying off. GDP grew by 3.2 per cent in the second quarter of 2020, following the steep 6.8 per cent decline in the first quarter. Growth in the third quarter rose to 4.9 per cent. The economy moved from negative to positive growth, though the first half saw an overall contraction of 1.6 per cent. The most considerable change was in the secondary sector, comprising mainly manufacturing and construction, which swung from a decline of 9.6 per cent in the first quarter to a rise of 4.7 per cent in the second quarter and 6.0 per cent in the third quarter.[23]

Whilst this recovery plan is proving successful at boosting economic growth, at least in the short term, it is far from being green.[24] Data from October 2020 revealed that the production of coal-intensive products rose sharply compared to October 2019: steel by 13 per cent, aluminium by eleven per cent, cement by ten per cent and electricity by seven per cent.[25] Although the amount of funds directed at green projects is almost double that devoted to brown projects, the Eurasia Group[26] has estimated that life-cycle carbon emissions from all the projects' aggregate will be positive. Commentators have been especially critical of the new infrastructure programme, not least because most of the types of project will require substantial amounts of electricity, which remains dominated by fossil fuels.[27]

The recovery package also called for steps to boost energy security by increasing strategic storage and enhancing energy supply self-sufficiency. Further, the focus on infrastructure, both traditional and new, has lifted energy demand. Taken together, these measures are resulting in increased investment across the energy sector, in fossil fuels as well as non-fossil fuels. There is also talk that annual coal mine capacity could rise from 4.1 billion tonnes in 2020 to 4.9-5.0 billion tonnes by 2025.[28] At the same time, the government wants to increase the production of all possible sources of liquid fuels and gas.

This focus on fossil fuels can also be seen in the power sector. Early in 2020, the government relaxed the restrictions on the construction of new coal-fired plants introduced in 2016 to curb a surge of construction. As of May 2020, a reported 46 GW of new coal-fired capacity was under construction, and a further 48 GW were in the early stages of planning and development. The Five-Year Plan for 2016-2020 set a cap on coal-fired capacity of 1,100 GW for the end of 2020. Whilst this cap may not be breached in 2020, the State Grid Corporation and the China Electricity Council are calling for the capacity to reach 1,200 GW and 1,300 GW respectively to support system stability and provide a reserve.[29] Moreover, in late July 2020, the government responded to the deterioration in its international relations by declaring that the country would need to enhance further its self-reliance in both production and consumption — the so-called "dual circulation" strategy.[30] All these moves are likely to support the growing use of fossil fuels.

Policy support for non-fossil electricity has continued. Renewable energy, including hydroelectricity, is targeted to supply 28.2 per cent of the electricity supply in 2020, with non-hydro renewables amounting to 10.8 per cent of the total.[31] Non-fossil fuel power generating capacity is set to increase from 820 GW at the end of 2019 to 900 GW by the end of 2020.[32] The budget for renewable energy subsidies has increased by 7.5 per cent, though the targeted recipients have undergone some change. Subsidies for wind power have shifted to offshore installations. Also, support for utility-scale solar PV has declined sharply as many projects attain grid parity.[33] The number of subsidised solar PV projects fell from 3,291 in 2019 to 434 in 2020.[34] Subsidies for rooftop solar PV continue, though at a lower level.[35]

With the 2020 target for E10 biofuel having been dropped, the government has chosen to encourage selected provincial governments to do what they can to enhance ethanol use. Only in the corn-producing northeast of the country is significant progress being made. A shortfall of corn supplies has required China to import ethanol from the US as part of the trade deal.[36]

In summary, neither the economic recovery plan nor specific new energy policies announced in the first nine months of 2020 would indicate that the pandemic had stimulated a significant increase in China's share of renewable energy. Whilst support for renewable electricity and biofuels continues, the energy-intensive nature of the economic recovery package will likely lead to the continued growth of energy consumption, including fossil fuels.

5.4 Overall conclusion

The share of solar and wind energy in the electricity mix increased by a small amount in both the first and second quarters of 2020 compared to the same periods in 2019. Whilst this reflects a stronger implementation of dispatch rules favouring renewables, it is less than might have been expected given the decline in hydroelectricity availability. As a result, the share of fossil fuels in the power mix increased from 28.9 per cent in the first half of 2019 to just 29.4 per cent in the same period of 2020.

The economic recovery plan lacks strong green credentials and appears to be energy-intensive. Whilst policy support for renewable energy continues, fossil fuels have also received encouragement in two contexts: the relaxation of constraints on constructing coal-fired power stations and the clearly stated priority to maximise energy self-sufficiency.

Set against this assessment are President Xi Jinping's two pledges in a 22 September 2020 announcement to the United Nations General Assembly concerning China's carbon emissions: first, that emissions would peak before 2030 rather than just "around" 2030 and, second, that the country would strive to achieve carbon neutrality by 2060.[37] The first target is realistically achievable with a combination of low economic growth levels, a sustained decline of heavy industry and the concomitant expansion of the service sector, and continued rise of non-fossil energy. The second objective is profoundly challenging.

In December 2020, the President announced to the United Nations that the 2030 ambitions for the country's Nationally Determined Contributions were being raised: the carbon dioxide emissions per unit of GDP would decline by 65 per cent from 2005 levels, compared to the original commitment of 60-65 per cent made in 2015; and the share of non-fossil fuels in the energy mix would rise to 25 per cent, compared to 20 per cent in the initial commitment.[38]

The first indications of the government's plans will presumably appear in the 14th Five-Year Plan for 2021-2025, expected to be released before the end of 2021. Nevertheless, the current pace and energy-intensive nature of the economic recovery[39] combined with Xi's proposal that GDP should double by 2035[40] will make it difficult for the planners to reconcile these trends and goals, at least in the short term.

6 India

Overview — India

Energy mix before the pandemic	Energy mix and investment during the pandemic
The share of coal in the primary energy mix declines slowly in the years 2015–2019. The share of non-hydro renewable energy in the electricity supply is growing strongly. Ethanol use in transport is growing steadily, but little progress is made with biodiesel.	Period of lowest electricity demand: April–May 2020 Non-fossil electricity, notably wind and solar, all increased in share in 2Q2020 year on year, due to "must-run" status enforced by the government. These higher shares do not persist into 3Q2020 as the economy shows signs of recovery. Investment in new wind and solar capacity slows in 1H2020 due to supply chain problems but is expected to pick up. The level of ethanol blending continues to rise marginally.

Economic recovery plan and new energy policies

- The economic recovery plan is not notably green.
- Policy support for renewable energy will be continued.
- But coal production and consumption will also continuously rise.
- Support for ethanol blending will continue, but the original targets may not be reached if the current pace continues.

Outlook for renewable energy

- Installed capacity and generation of renewable electricity continue to grow, but thermal power (coal and gas) is expected to increase.
- The shares of renewable electricity will probably rise slowly.
- Progress with boosting ethanol blending is slow but steady.

6.1 Policies and energy mix before the pandemic

India is the second-most populous country in the world, the fastest-growing trillion-dollar economy in the world and the fifth-largest overall, with a nominal GDP (at current prices) of US$2.88 trillion and a per capita GDP (PPP at current prices) of US$7,034.2 in 2019. India's economy grew rapidly with a real annual growth rate averaging around 7 per cent in 2011–2018 and 4.2 per cent[41] in 2019. Over the years, manufacturing (via government's initiatives, such as "Make in India") and the services sector have emerged strongly, with the service sector contributing more than two-thirds to the economy.

According to the 2020 BP Statistical Review,[42] from 2008 to 2018 India witnessed a 5.2 per cent average growth rate per annum in primary energy consumption which was largely met by fossil fuels (coal and oil). In 2019, the primary energy consumption grew by 2.3 per cent with a global share of 5.8 per cent, making India the third-largest in the world after the United States and China and second-largest growth driver after China. In 2019, the total primary energy consumption comprised coal (55%, 443.7 Mtoe), oil (30%, 244.6 Mtoe), natural gas (6%, 51.3 Mtoe), hydro (4%, 34.4Mtoe), nuclear (1%, 9.6 Mtoe), and renewables (3.5%, 28.9 Mtoe). In recent years, the share of coal has been declining slowly. India's net imports in 2019 were at 205.3 Mtoe crude oil and its products, 135.9 Mtoe coal, 28.3 Mtoe Liquefied Natural Gas (LNG), together representing 45 per cent of the primary energy consumption in 2019. India under its Nationally Determined Contribution (NDC) intends to reduce the emissions intensity of its GDP by 33–35 per cent by 2030 from 2005 levels and achieve about 40 per cent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030.[43]

With an annual growth rate of 14.1 per cent in coal imports in the past decade, India became the second-largest net importer of coal after China. Similarly, crude oil and LNG imports have witnessed an annual growth rate of 5.4 per cent and 10.5 per cent in the past decade. India became a net exporter of electricity in 2017 after being a net importer of hydroelectricity from Bhutan for several decades. In 2018, India began exporting power to Bangladesh, Myanmar, and Nepal.

India's electricity consumption is aligned with its primary energy consumption with an average annual growth rate of 6.3 per cent[44] in the past decade. As noted in Table 6.1, coal continues to dominate the electricity generation mix. Hydropower has been the dominant source of renewable electricity for a long time, providing a stable share of electricity generation in the last five years. Despite being a cleaner fossil fuel than coal, natural gas remains low in the electricity generation mix due to domestic supply shortages and expensive imported LNG. India plans to build a gas-based economy with natural gas reaching 15 per cent of the energy mix by 2030. However, this is deemed ambitious due to inadequate domestic supply coupled with infrastructure and financial woes plaguing the sector.[45] Nuclear energy has also been providing a stable share of electricity generation in the past five years. In 2019, the Department of Atomic Energy announced plans to build 21 new nuclear power reactors[46] to be operational by 2031.

As part of its NDC, India announced one of the most ambitious renewable energy targets to reach 175 GW of installed capacity by 2022, including 100 GW solar, 60 GW wind and the rest from biomass and small hydro. The share of non-hydro renewable energy sources in the overall electricity mix and overall installed capacity has since doubled compared to coal-fired generation in FY 2017–2020 (Table 6.1). This has boosted the share of non-fossil fuels.

All of the following reasons accelerated the growth of renewables: (1) the falling cost of renewables[47] with a record low tariff[48] of US$0.04/kWh in 2017 and 2018 for utility-scale solar and (2) wind through competitive reverse-auctions, (3) renewable purchase obligations on state-power distribution companies and private-sector entities, and (4) "must-run" status (that is, it is not subjected to merit order dispatch) for all renewable energy sources (except biomass). In September 2019,

India further pledged to increase its renewable energy installed capacity much beyond 175 GW in 2022, and further increase it to 450 GW without specifying a timeline.[49]

Although the outlook for non-hydro renewable energy development has been positive so far, there are still impediments to adding new capacity and in increasing the share in the electricity generation mix. This is due to high tariff duty on imports of solar panels and modules, long-term (25 years) power-purchase agreements by distribution companies for coal-based generation, high levels of solar and wind energy curtailment[50] by grid operators despite "must-run" status, high retail electricity tariffs, low investor sentiment due to delayed or non-payment by distribution companies to renewable energy developers, land acquisition challenges, and inadequate grid infrastructure and transmission networks to facilitate variable renewable energy integration in the absence of large-scale energy storage systems.

India has a long-standing biofuel blending programme but has[51] consistently fallen short of achieving its blending mandate target in the past. This was primarily due to feedstock shortage, failure to adopt the right pricing, limited economic support from the government, and delayed procurement in individual states. In 2018, the government revised its targets[52] to achieve ethanol blend levels of 10 per cent by 2022 and 20 per cent by 2030. After diversification of feedstocks for bioethanol production, providing financial incentives, setting production targets at various sugar mills across the country, and simplifying procurement, an ethanol blend level of 5 per cent[53] was achieved in 2018–2019. In contrast, biodiesel faces significant challenges in regard to market penetration (blend level <0.1%[54] in 2018) due to insufficient feedstock availability, supply chain constraints, and limited procurement support. Nonetheless, the government has set a national blending target of 5 per cent biodiesel in diesel by 2030.

Table 6.1. Power generation mix from FY 2017–2020 [55]

Fuel	2017		2018		2019	
	TWh	%	TWh	%	TWh	%
Coal	951.8	*73.0%*	987.7	*72.0%*	961.2	*69.5%*
Lignite	34.8	*2.7%*	34.6	*2.5%*	33.0	*2.4%*
Gas	50.2	*3.90%*	49.8	*3.60%*	48.4	*3.50%*
Hydro	126.1	*9.70%*	134.9	*9.80%*	155.8	*11.30%*
Nuclear	38.3	*2.90%*	37.8	*2.80%*	46.5	*3.40%*
Solar	25.9	*2.00%*	39.3	*2.90%*	64.6	*4.70%*
Wind	52.7	*4.00%*	62	*4.50%*	50.1	*3.60%*
Other RE	23.4	*1.8%*	25.4	*1.9%*	23.6	*1.7%*
Total	**1,303.4**	*100%*	**1,371.7**	*100%*	**1,383.3**	*100%*
Non-fossil	266.4	*20.4%*	299.4	*21.8%*	340.6	*24.6%*

6.2 Energy mix and investment during the pandemic

While the economy was already sluggish before the pandemic,[56] the national lockdown, from 25 March until 31 May, with restrictions gradually lifted after that, caused a sharp contraction of the Indian economy. GDP shrank by a record 23.9 per cent from April to June period compared to a year before.[57] As soon as the lockdown measures were imposed in late March 2020, India's peak power demand slipped by 25 per cent in April 2020 compared to its peak demand recorded in April 2019.[58] India's electricity consumption dropped by 8 per cent year on year in 1H2020 compared to 1H2019. Renewables (excluding hydropower) continued to play a vital role, noticeably the gap between the share of renewables (excluding hydropower) and coal-fired power in electricity generation narrowed, with renewables sharply increasing to 12.3 per cent and coal-fired power declining to 63.4 per cent until the end of 2Q2020 (see Table 6.2.b). Comparing 1H2019 to 1H2020, the share of renewables rose from 9.3 per cent to 11.1 per cent, and coal-fired power declined from 73.3 per cent to 68.3 per cent. This resulted from strict implementation of the "must-run" status of renewable energy plants, bundling[59] of renewable power generation (at least 51 per cent of the total power generated) including storage with thermal-fired generation for distribution by the power producers, and a drop in overall industry demand.

As lockdown measures were progressively lifted from June in 2Q2020, electricity consumption began to rise to 2Q2019 levels. On comparing 3Q2020 to 3Q2019, solar PV and wind capacity grew by 14 per cent and 3 per cent respectively.[60] Consequently, as noted in Table 6.2.a, the electricity generation from solar PV increased by 27 per cent from 10.6 TWh in 3Q2019 to 13.5 TWh in 3Q2020. However, it declined by 19 per cent for wind, from 26.5 TWh in 3Q2019 to 21.5 TWh in 3Q2020, because of the extensively low generation observed in July 2020. Seasonal variations in wind speeds resulted in low-capacity utilisation of plants, which rendered wind power uneconomical for state-owned distribution companies to buy.[61] Electricity generation from hydropower rose by 13 per cent in 1Q2020 compared to 1Q2019 and 9 per cent in 2Q2020 compared to 2Q2019. Also, it exhibited the largest source of flexibility[62] in the power system besides fossil-based generation during a planned blackout event on 5 April 2020.

New renewable energy builds slowed in 1Q and 2Q of 2020 with new additions of only 2.9 GW, a decline of almost 60 per cent year on year. The first half of 2020 saw about 1 GW new builds of utility-scale solar PV and about 0.3 GW new builds of wind resulting in 70 per cent and 80 per cent drops in the new installations of utility-scale solar PV and wind respectively compared to 1H2019. In 2Q2020, about 5.2 GW of new tenders were issued across solar and hybrid segments, of which 4.5 GW of tenders completed auctions.[63] Besides, this quarter recorded a historic low tariff of INR2.36/kWh (US$0.03/kWh) for utility-scale solar PV.[64] The current pipeline of solar, wind and hybrid projects stands at 47 GW while another 24 GW of projects are undergoing the bidding phase where tenders have been issued, but auctions are yet to complete.[65] IEA's recent report indicates that utility-scale solar PV and wind installations are expected to rebound in 2021 and 2022.[66]

In 3Q2020, peak power demand rose back in September and surpassed the peak level recorded in September last year, showing a spurt in commercial and industrial activities across the country.[67] The demand was fulfilled mainly by 35 per cent and 15 per cent additional electricity generation from hydropower and coal respectively compared to 2Q2020. As of September 2020, thermal installed capacity totalled 231.3 GW while renewable energy, hydro, and nuclear energy installed capacity totalled 89.2 GW, 45.7 GW and 6.8 GW, respectively.[68]

A marginal increase in ethanol blending was observed through the pandemic, with India achieving ethanol blending of 5.1 per cent[69] until 2Q2020. The government hopes to reach 7.5–8 per cent ethanol blending levels from December 2020.[70] In August 2020, a government-led effort persuaded various Indian sugar mills, oil companies and banks to agree to a tripartite financing mechanism to boost funding for expansion of the ethanol industry.[71] In contrast, biodiesel continues to face low market development.

Table 6.2.a. Power generation by fuel in different periods of 2019 and 2020 [72]

Fuel	Output TWh							
	1Q 2019	2Q 2019	3Q 2019	1Q 2020	2Q 2020	3Q 2020	1-3Q 2019	1-3Q 2020
Coal	246.8	266.6	227.1	242.5	198.9	230.3	740.5	671.7
Lignite	9.0	8.1	7.6	9.0	8.7	6.5	24.7	24.3
Gas	10.9	13.0	12.5	11.4	15.2	13.6	36.4	40.1
Hydro	23.2	37.8	56.5	26.2	41.2	55.8	117.5	123.1
Nuclear	9.4	10.7	12.9	10.7	11.4	10.8	32.9	32.9
Solar	11.5	12.4	10.6	15.3	15.7	13.5	34.5	44.5
Wind	8.9	19.1	26.5	10.2	17.6	21.5	54.5	49.3
Other renewables	8.2	4.7	4.8	7.7	5.0	5.5	17.7	18.2
Total	**327.9**	**372.4**	**358.4**	**333.0**	**313.8**	**357.5**	**1058.7**	**1004.3**
Non-fossil	61.2	84.7	111.3	70.1	90.9	107.0	257.1	268.0
Solar & wind	20.4	31.5	37.1	25.6	33.3	34.9	89.0	93.8

Table 6.2.b. Shares of different fuels for power generation in different periods of 2019 and 2020 [73]

Fuel	1Q 2019	2Q 2019	3Q 2019	1Q 2020	2Q 2020	3Q 2020	1-3Q 2019	1-3Q 2020
Coal	75.3%	71.6%	63.4%	72.8%	63.4%	64.4%	69.9%	66.9%
Lignite	2.8%	2.2%	2.1%	2.7%	2.8%	1.8%	2.3%	2.4%
Gas	3.3%	3.5%	3.5%	3.4%	4.8%	3.8%	3.4%	4.0%
Hydro	7.1%	10.2%	15.8%	7.9%	13.1%	15.6%	11.1%	12.3%
Nuclear	2.9%	2.9%	3.6%	3.2%	3.6%	3.0%	3.1%	3.3%
Solar	3.5%	3.3%	2.9%	4.6%	5.0%	3.8%	3.3%	4.4%
Wind	2.7%	5.1%	7.4%	3.1%	5.6%	6.0%	5.2%	4.9%
Other renewables	2.5%	1.3%	1.3%	2.3%	1.6%	1.5%	1.7%	1.8%
Non-fossil	**18.6%**	**22.7%**	**31.0%**	**21.1%**	**29.0%**	**29.9%**	**24.3%**	**26.7%**
Solar and wind	6.2%	8.5%	10.3%	7.7%	10.6%	9.8%	8.4%	9.3%

6.3 Economic recovery plan and new energy policies

India's real GDP growth for 2020 was projected to see a drop of 10.3 per cent before rebounding by 8.8 per cent in 2021 compared to the 4.2 per cent growth achieved in 2019.[74] India announced an economic stimulus package of INR20 trillion (US$266 billion) in May, which included substantial support of INR50,000 crore (US$6.7 billion) for the coal sector. This is to enhance commercial mining of domestic coal and reduce coal imports, INR6,000 crore (US$780 million) to support afforestation programmes and relief measures worth INR90,000 crore (US$11.7 billion) to help distribution companies with immediate debt repayments and delayed payments to power producers.[75] Vivid Economics' recent assessment scored the overall green stimulus index of India to be negative due to poor underlying environmental performance and compliance and continued support for coal mining activities.[76] Lately, India announced another stimulus package worth INR2.6 lakh crore (US$2.6 billion), of which greater relevance to this study are the INR10,200 crore (US$0.1 billion) stimulus for infrastructure development, green energy and INR1.46 lakh crore (US$1.46 billion) to help boost the competitiveness of domestic manufacturing in various sectors including the manufacture of solar PV modules and batteries for energy storage and electric vehicles.[77]

The outlook for renewable energy remains bright despite the sharp disruption brought about by the lockdown. In 2Q2020, the Power Minister expressed confidence that India is expected to cater for around 60 per cent of its installed electricity generation capacity from clean sources by 2030 at 510 GW. This consists of 450 GW of renewable energy capacity and 60 GW of hydropower,[78] and that renewable energy capacity will replace coal-based plants.[79] India's broader plan to lower its dependence on coal in its electricity generation mix and generate more power from cleaner sources and cut emissions, seems to be a double-edged sword in terms of overall emissions reduction in the energy sector. In late 3Q2020, India successfully auctioned 19 coal mines of 51 Mt/year mining capacity from a total of 38 coal mines put up for auction in 2Q2020,[80] right after the government ended its monopoly over coal mining. India's coal production is expected to reach 700 Mt in FY 2020–2021, corresponding to a 16 per cent annual increase, as the government aims to stop most of the substitutable coal imports and encourage higher domestic production.[81]

In the next decade, the power sector will witness a significant transformation concerning demand growth, energy mix, and market operations. Based on the data from a Central Electricity Authority report from January 2020,[82] it can be estimated that by 2029–30, renewables (including hydropower) will increase compared to the 2019–2020 period from 18 per cent to 44 per cent. Thermal is expected to reduce from 78 per cent to 52 per cent. Likewise, the projected installed capacity in the year 2029–30 is around 832 GW — more than a twofold increase compared to 2019–2020, comprising 291 GW from thermal and 523 GW from renewables (including hydropower). Ethanol blending levels in gasoline are anticipated to grow post-2020. However, currently trailing at 5.1 per cent (until 2Q2020), half the set target of ten per cent in 2022, India may fall short of this national target.

6.4 Overall conclusion

India's pandemic economic recovery plan does not constitute a green stimulus, and it appears to be a missed opportunity for India to further accelerate its green agenda. However, as is consistent with global trends, where renewable energy continues to record growth despite the pandemic with strong investor appetite, India likewise appears to be on track with its pre-pandemic goals to rebalance its energy mix.

Interest in renewables continues to be robust and resilient, although comparatively more so in the electricity sector compared to the transport sector. Although electricity demand dropped during the lockdown (in 2Q2020), renewables (including hydropower) generated 34 per cent more electricity in absolute quantities compared to 1Q2020 owing to the "must-run" status of renewables.

To unlock India's full renewable energy potential, several issues remain unaddressed despite

tremendous opportunities arising from falling solar and wind tariffs with already achieved grid parity. Apart from high tariffs on imports, in the absence of structural reforms, mounting debts and payment delays by distribution companies to the renewable power producers, future renewable projects could be rendered unviable. One such example is Adani Green's US$6 billion 8 GW utility-scale solar PV project, which now has no potential buyers to purchase power.[83]

Structural reforms are required whereby distribution companies exercise the flexibility to procure power from the least expensive sources and to operate in a more competitive liberalised market. Further, opening-up of the power distribution sector for private competition could fulfil the shortcomings of the state-run distribution companies. Large-scale energy storage systems are required, along with better coordination between central and state governments to accommodate more renewables in the generation mix and improve grid stability.

India may fall short of its national target for ethanol blending levels in gasoline. To address this issue, the government would need to provide adequate financial incentives and a stable policy environment to mitigate investment risks and sustain the biofuels industry's long-term growth.

There is still a long road ahead for India's clean energy transition. Subsidies for fossil fuels were seven times larger than subsidies for renewables and electric mobility in FY2019 with coal continuing to dominate the primary energy mix.[84] That said, efforts have been made to increase domestic coal production efficiency and improve the air pollution standards of coal power plants. More importantly, renewables' role has been recognised as being fundamental to the government's long-term energy transition strategy, even with the disruption brought about by the pandemic.

7 Indonesia

Overview — Indonesia

Energy mix before the pandemic

- Fossil fuels dominate the energy mix.
- Coal provides most of the electricity, and this share is increasing.
- Renewable electricity is supplied mainly by hydro and geothermal.
- The use of biofuels in transport has grown significantly.

Energy mix and investment during the pandemic

- Period of lowest electricity demand: April–June 2020.
- The share of non-fossil fuels in the electricity mix rises during 1H2020.
- Investment in new renewable energy capacity is halted, but the construction of new coal-fired plants continues.
- Indonesia rolls out its B30 policy.

Economic recovery plan and new energy policies

- The economic recovery plan is not notably green.
- The government continues to support investment in coal mining and coal-fired power plants.
- Several measures are put in place to support renewable electricity, but the government's commitment to the sector is lukewarm.
- Funding the B30 policy is challenging, and the roll-out of the B40 policy is postponed to 2022.

Outlook for renewable energy

- Investment in renewable electricity capacity is likely to grow, but the growth rate is uncertain and may be exceeded by coal-fired plants.
- Biofuel blending will remain a priority for the government.
- The share of renewable electricity will likely grow, but it is unclear whether Indonesia will meet its policy targets.

7.1 Policies and energy mix before the pandemic

Indonesia is an upper middle-income country with a per capita GDP (PPP) in 2019 of US$12,301.8.[85] Before the pandemic, Indonesia experienced a decade of relatively stable economic growth of 5–6 per cent per annum, mostly driven by the tertiary sector.[86]

Indonesia aims to become a high-income country by 2036 and achieve the fifth largest GDP in the world by 2045.[87] Its national energy policy sets out to transform the country's energy mix by 2025 and 2050, as follows:[88] (i) increase the share of new and renewable energy to at least 23 per cent by 2025 and 31 per cent by 2050; (ii) reduce the percentage of oil to less than 25 per cent by 2025 and 20 per cent by 2050; (iii) cap the share of coal at a maximum of 30 per cent in 2025 and 25 per cent in 2050; and notably, (iv) increase the share of natural gas to a minimum of 22 per cent in 2025 and 24 per cent in 2050.

These targets are reiterated in Indonesia's 2016 Nationally Determined Contributions (NDCs) within the broad framework of commitments to reduce GHG emissions as follows:[89] (i) Firstly, by 26 per cent (or 41 per cent with international support) against the business-as-usual scenario by 2020;[90] and (ii) secondly, by 29 per cent (unconditionally) and up to 41 per cent (conditionally) against the business-as-usual scenario by 2030. In this regard, the national energy policy underpins the country's GHG emissions reduction strategy for the energy sector.

Over the past two decades, Indonesia's annual primary energy consumption has increased two-fold, with more than 60 per cent currently in the form of fossil fuels.[91] Coal accounted for almost 40 per cent of primary energy supply in 2019, and oil supplies another 35 per cent, although at a declining rate as Indonesia continues to wean itself off oil imports.[92] The share of natural gas in the energy mix is also declining, despite efforts to increase reliance in line with national targets (accounting for 19% in 2019).[93]

The new and renewable energy share in the energy mix has increased two-fold over the past decade to 9.18 per cent in 2019.[94] However, it is nowhere near the 23 per cent target that needs to be achieved in the next five years.[95] Notably, the share of biofuels has increased almost three-fold over the past decade, owing to a successive number of national biodiesel consumption mandates since 2006.[96] On 1 January 2020, Indonesia kicked-off its B30 policy, which mandates biodiesel blend targets of at least 30 per cent for the transport, industry and commercial sectors. This is to implement a B40 policy by June 2021. As it is mainly used in the transportation sector, biofuels represent a small share of renewable energy consumption. Most renewable energy fuels (up to 75 per cent) are utilised in the electricity sector (mainly in large hydro and geothermal facilities).[97]

Indonesia's electricity plan centres around its 35,000 MW programme, which was launched in 2015.[98] It was intended to double generating capacity by adding 35 GW, initially by 2019.[99] As of August 2020, 96 per cent of projects have received power purchase agreements (PPAs), accounting for 33.98 GW of planned additional capacity and 401 new power plants.[100] Approximately 57 per cent of this total additional capacity will come from coal, which is at odds with both Indonesia's energy mix and GHG emissions reduction targets.[101] As for renewable energy power plants, only 3.7 GW of additional capacity is planned as part of the programme.[102]

The electricity sector's reliance on coal-fired power plants doubled between 2010 and 2015 and in 2019 accounted for half of the total installed capacity at 34.74 GW. The share of coal in the fuel mix rose from 57 per cent in 2017 to 63 per cent in 2019 (Table 7.1). There is also an increased reliance on gas-fired power plants, which accounted for almost a third of electricity installed capacity in 2019 at 20 GW, but only 21 per cent of generation, down from 25 per cent in 2017.

In the renewable energy sector, the increase in installed capacity has been more gradual. Since the start of the 35,000 MW programme in 2015, installed capacity has only increased by 20 per cent.

Large hydro continues to dominate accounting for 60 per cent of renewable energy installed capacity in 2019. After close to a decade of several feed-in tariff (FiT) schemes for solar, geothermal, and other small- and medium-scale plants up to 10 MW, capacity has increased but failed to make much of an impact. All in all, renewable energy power plants only accounted for 10 GW or less than 15 per cent of the total installed capacity in 2019. The primary source of non-hydro renewable energy is geothermal, which accounts for about five per cent of the generation mix (Table 7.1). The share of hydropower declined marginally from 7.4 per cent in 2017 to 6.0 per cent in 2019. As a result, the percentage of non-fossil fuels also declined over this period

Renewable energy investment is struggling to gain a foothold in Indonesia because it cannot compete with fossil fuel interests, especially coal domination.[103] This is due to the coal industry's importance in the Indonesian economy and its vested interests. For example, government ministers commonly serve as shareholders of coal firms and are incentivised to continue supporting the sector.[104]

A major roadblock is the current electricity buy-in tariff. Since 2017, Indonesia has used the annual basic electricity generation cost (BPP) as a benchmark for determining the price at which renewable energy power plants can sell electricity to the grid.[105]

Instead of FiTs determined by the government, which under the old regime were higher, technology-specific, and fixed, the BPP now reflects the cost of PT PLN in power generation and procurement of electricity supply from third-party suppliers. It does not include the cost of transmitting the electricity and does not differentiate among energy sources.[106] The 2017 regulation is intended to encourage PT PLN to sign more PPAs with independent power producers (IPPs) by allowing BPP to result from a negotiation between them. Large-scale PVs are expected to benefit with experts predicting a surge of utility-scale solar projects in the Eastern part of the country where electricity supply costs are higher.[107] In practice, both national and local BPPs are stipulated annually by the Ministry of Energy and Mineral Resources (MEMR) based on PT PLN's recommendation. Thus, it is still difficult for renewable energy projects to be commercially viable as they compete with fossil fuels like coal that have lower production costs.

Table 7.1. Electricity generation by fuel type 2017–2020

Fuel	2017[108]		2018[109]		2019[110]		2020 (H1)[111]	
	TWh	%	TWh	%	TWh	%	TWh	%
Oil	14.79	*5.8%*	11.85	*6.0%*	9.97	*4.2%*	4.0	*3.7%*
Biofuels			3.03		1.57		0.99	
Gas	63.15	*24.8%*	57.37	*21.7%*	59.04	*21.4%*	23.73	*17.8%*
Coal	145.63	*57.2%*	159.37	*60.3%*	173.75	*63.0%*	85.61	*64.3%*
Hydro	18.63	*7.4%*	16.82	*6.4%*	16.57	*6.0%*	10.72	*8.0%*
Geothermal	12.68	*5.0%*	14.02	*5.3%*	14.1	*5.1%*	7.78	*5.8%*
Other renewables	0.62	*0.25%*	0.83	*0.31%*	0.90	*0.33%*	0.39	*0.29%*
TOTAL	**254.49**	*100%*	**264.37**	*100%*	**275.90**	*100%*	**133.22**	*100%*
Non-fossil fuels	31.93	*12.7%*	31.67	*12.0%*	31.57	*11.4%*	18.89	*14.2%*

7.2 Energy mix and investment during the pandemic

Although total electricity consumption in June 2020 still experienced positive growth of 5.46 per cent year on year, there was a decline of 7.06 per cent between January and June, especially after pandemic restrictions were in full swing.[112] Electricity generation of 133.22 TWh in the first half of 2020 is almost proportionate to the 275.90 TWh generated for the entire year of 2019, with slight declines in the share of biofuels and natural gas, but notable increases of coal, hydro and geothermal compared to previous years (Table 7.1).

These electricity generation increases are because PT PLN is required to prioritise electricity dispatch from renewable energy sources, followed by coal.[113] Unfortunately, increases in household electricity demand during the pandemic have not compensated for the significant loss in demand from industry, transport, and commercial sectors. Thus, in the first half of 2020, the MEMR reported that up to 3 GW of installed capacity could not be deployed.[114]

Overall installed capacity across technologies went up in the first half of 2020, led by coal and gas projects. Among renewables, significant capacity growth occurred only for on-grid hydropower.

Generation overcapacity coupled with the drastic slump in energy demand has put immense pressure on PT PLN's financials. Even before the pandemic, the utility was locked into fixed prices with coal IPPs. This led to oversupply in several parts of the country. Since February 2020, however, PT PLN was also required to operate renewable power plants continuously or on a must-run basis.[115] Previously, this obligation was only applicable for plants with less than 10 MW installed capacity. Consequently, PT PLN is reportedly renegotiating PPAs with the coal sector — both for power plants that are already on the grid and those projects that are still in the pipeline.[116] The utility is also delaying further investments in the renewable energy sector.[117]

From the transport sector, data from 2019 show that the share of biodiesel consumption was already at 41 per cent — having more than tripled since 2010. This positive growth is also reflected in the steady decline of oil in the energy mix over the years.[118] However, with transport being one of the hardest-hit sectors during the pandemic and as palm oil premiums against gasoil (POGO) remain at three-year highs, the current subsidy mechanism has struggled to support the B30 policy.[119] In November 2020, it was announced that the implementation of the B30 policy would be slowed down and the implementation of the B40 policy postponed to 2022.[120]

7.3 Economic recovery plan and new energy policies

Economic data for the first three quarters of 2020 show a contracted economy still recovering from the pandemic, the hardest-hit sectors being transportation and the services industry. GDP experienced the most negative growth in the second quarter at -5.32 per cent .[121] It climbed to -3.49 per cent by the third quarter, which was an improvement but in no way indicative of recovery. The National Planning and Development Agency also announced that unemployment rates could hit their highest in more than a decade, rising to 9.2 per cent (nearly 13 million people) by the end of 2020.[122]

In June 2020, the Indonesian government announced an increase in state budget support to IDR 695.2 trillion (US$50 billion) from the initial IDR405.1 trillion (US$28 billion) announced in March for handling COVID-19 and the national economic recovery plan.[123] The plan's main thrust is to achieve economic sufficiency by reducing import dependence and strengthening domestic capacity in priority sectors, including health, food, and energy.[124] The main relief instruments are tax measures; economic stimulus measures for healthcare, social protection and the business sector; and customs measures.[125] Apart from a declared strengthened commitment to biodiesel, very little has been said regarding Indonesia's energy transition support.[126]

Despite the energy and mineral resources sector being the largest contributor of non-tax revenue in 2019,[127] the MEMR's 2020 budget was cut by a third to IDR6.2 trillion (approximately US$430 million)

for pandemic relief, including a 42 per cent cut in renewables spending.[128] However, protecting the coal industry remains a priority, and coal mining is one of the business sectors deemed eligible to receive the stimulus.[129] Four types of incentives have been offered under the recovery plan: (i) an exemption from import tax for six months; (ii) a reduction in income tax by 30 per cent for six months; (iii) the government bears personal income tax; and (iv) accelerated restitution with the limit raised to IDR5 billion (US$354,000).[130] The MEMR also issued a new regulation to facilitate administrative and business procedures for the mining sector, which offered many incentives and ease of doing business for the coal industry.[131] Moreover, before the pandemic, the government reviewed plans to retire around 13 GW of fossil fuel power capacity and replace it with renewables.[132] However, reports now indicate that diesel power plants may be converted to steam gas or coal gasification plants to support the coal industry further.[133]

As regards electricity generation, although some experts expect the pandemic to put the 35,000 MW programme at risk, new coal-fired power plants are still being approved with financing arrangements. The MEMR reported 8.4 GW of new installed capacity in coal approved in 2020, an increase of 1.4 GW compared to the new installed capacity of 6.9 GW approved in 2019.[134]

Nevertheless, some specific allocations for an energy transition are reported, constituting 0.9 per cent of the recovery plan:[135] firstly, a state capital injection of IDR5 trillion (US$353 million), which includes assistance to deploy renewable energy technologies and build village electricity distribution networks; and secondly, an IDR2.78 trillion (US$1.9 million) state budget subsidy for PT Pertamina, Indonesia's state-owned oil and gas company, to support the B30 policy.

Other potential COVID-related measures not specified by the Ministry of Finance include budget allocation to four ministries to create labour-intensive programmes for temporary workers (valued at approximately IDR18.4 trillion or US$1.3 billion).[136] There is also state budget allocation and concessional loans from PT Sarana Multi Infrastruktur (SMI), Indonesia's state financing company, for economic recovery targeted at regional governments. Both assistance schemes could potentially be used to fund small-scale renewable energy and energy efficiency projects.

Rising pressure for a "green" COVID-19 recovery plan has also resulted in the possible establishment of an Energi Surya Nusantara (Solar Archipelago) programme.[137] The scheme, which is still currently under discussion with a local think tank, involves installing solar panels with a combined capacity of 1 GWp per year for millions of the country's poorest households over the next half-decade. It is expected to cost over US$1 billion annually. Still, it may generate more than 20,000 jobs and reduce the annual burden of electricity subsidies for lower-income households by up to IDR1.3 trillion (US$92 million).[138]

COVID-19 has also accelerated the issuance plan for PT PLN's transition/sustainable bond, financed by the Asian Development Bank (ADB), leading to more renewable energy deployment.[139] Separately, the ADB is also providing PT PLN with a US$600 million loan for grid development, part of which will assist in the replacement of the older coal-fired power plants mentioned above with renewables.[140] Concretely, both plans could support the government's efforts to accelerate the development of large-scale PV, which has remained at a negligible cumulative installed capacity of 198 MW in 2019, despite targets to deploy 6.5 GW by 2025 and 45 GW by 2050.[141]

There may also be some promising developments for renewables in the longer term. The new and renewable energy bill that languished at the end of President Widodo's first term in 2019 has been included by the new parliament in the national legislative programme for 2020–2024 and is currently being debated in Commission VII.[142]

In February 2020, before the COVID-19 measures had been put in place, the MEMR amended a regulation to make investments in the renewable energy sector more attractive.[143] One of the most critical changes in this new regulation

for renewable energy IPPs is abolishing the Build-Own-Operate-Transfer (BOOT) scheme. IPPs may now own all project assets instead of transferring them to PT PLN at the end of the project. PT PLN must also prioritise the purchase of electricity from renewable energy IPPs based on a must-run basis without any restrictions on generation capacity. However, the regulation stops short of changing the electricity buy-in tariff requirements based on the BPP — the regulatory overhaul much-awaited by the renewable energy sector.

7.4 Overall conclusion

Indonesia aims to increase the share of new and renewable energy sources from the current 9.18 per cent in 2019 to 23 per cent in 2030 and 31 per cent in 2050 in the national energy mix. Meeting these targets would require a significant increase in the deployment of renewable energy technologies currently dominated by hydro. Biofuels are expected to play a larger role in the future as the country weans itself off its reliance on fossil fuels. Yet, Indonesia has also decided to continue relying on coal to spur economic development and appease vested interests. Before the pandemic, fossil fuels continued to dominate Indonesia's primary energy mix, particularly coal, which accounted for 37 per cent of the energy mix in 2019 and fuelled two-thirds of all power plants.

Despite a sharp reduction in energy demand during the pandemic, electricity generation from hydro and geothermal rose, together with coal. This is owing to the requirement for PT PLN to prioritise electricity dispatch from renewable energy sources and operate renewable power plants continuously or on a must-run basis. However, investments in new renewable energy capacity have declined, likely because the utility was trying to delay or cancel new projects to ease its financial pressure.

As one of the countries hardest hit by the pandemic, the COVID-19 recovery plan's priority is to achieve economic sufficiency by reducing import dependence and strengthening domestic capacity in priority sectors, including health, food and energy, with no clear green features. Supporting the coal industry is an essential part of the relief effort, with several stimulus measures and favourable regulations put in place. Assistance towards the new coal-fired power plants also continues as part of the current 35,000 MW programme.

Despite the government's lukewarm support for renewable energy development, there are some promising developments in the recovery plan for an energy transition, including budget allocations for renewable energy technology deployment. On the regulatory front, the MEMR's newly amended regulation is expected to make investments in the sector more attractive, including abolishing the BOOT requirement for IPPs. However, the regulation stopped short of overhauling the current buy-in tariff requirement. Should the new and renewable energy bill currently being debated in parliament be passed, it may go some way to introduce more political and policy certainty for the sector.

8 Malaysia

Overview — Malaysia

Energy mix before the pandemic

- Fossil fuels dominate the primary energy mix, and the share has been declining very slowly.
- The share of coal in the primary energy mix and power generation mix has been rising.
- The share of non-fossil fuels in the electricity mix has been relatively stable.
- Growth in the use of biodiesel has been slower than planned.

Energy mix and investment during the pandemic

- Period of lowest electricity demand: March–May 2020. The share of non-fossil fuels in the electricity mix rose during the lockdown due to least-cost dispatch.
- Investment in new solar PV capacity slows.
- Biodiesel consumption falls as demand declines.

Economic recovery plan and new energy policies

- Whilst the economic recovery plan is not notably green, the government has announced several initiatives to support investment in solar power.
- Investment in thermal power generation capacity will switch from coal to natural gas.
- Plans to increase biodiesel blending continue to be implemented, after a delay to the pandemic.

Outlook for renewable energy

- Investment in new renewable energy capacity is likely to grow, but so is that of gas-fired power.
- The government plans for the share of non-fossil fuel (excluding hydro) in the electricity supply to rise to 20% by 2025, up from an average of two per cent in recent years.
- Biodiesel blending will continue to increase.

8.1 Policies and energy mix before the pandemic

Malaysia has an upper middle-income economy[144] with a per capita GDP PPP of US$29,525. The largest contribution to GDP was services (55%), manufacturing (23%), mining and quarrying (8.5%), agriculture (8.3%) and construction (4.6%) in 2019.1 The average GDP growth of Malaysia over the last five years was 4.8 per cent .

The country's energy policy has evolved over the years, reflecting its priority of providing energy to sustain its demand at a different development stage. In the early days, Malaysia's energy policies were mainly focused on developing and maintaining domestic natural resources and aimed to ensure reliability and security of energy supply through fuel mix diversification comprising oil, gas, hydro, and coal, particularly in the power sector.[145]

In 2001, renewable resources like biomass, solar and mini-hydro utilisation were encouraged for the first time. This was then followed by the Renewable Energy Policy and Action Plan (NREPAP) in 2010, which introduced a Feed-in Tariff (FiT) to facilitate RE penetration in the power sector.

Malaysia's total primary energy supply increased by 31.3 per cent between 2009 and 2019, of which oil formed the largest share at 36.8 per cent , followed by natural gas at 35.7 per cent and coal at 21.0 per cent .[146] The country is a significant exporter of crude oil and natural gas. Net imports of coal in Malaysia reached 18.8 million tonnes in 2019, making the country the eighth largest net coal-importer globally.[147] Meanwhile, it has pledged to reduce its greenhouse gas emission intensity by 35 per cent unconditionally by 2030 and an additional ten per cent with international support through climate financing, technology transfer and capacity building from a developed country.[148]

Malaysia's total power generation was 171.9 TWh in 2019, an increase of 48.2 per cent from 2009.8 Peninsular Malaysia has the highest consumption share at 79.6 per cent , followed by Sarawak at 16.7 per cent and Sabah at 3.8 per cent .[149] Allocation of coal increased from 32 per cent in 2009 to 41 per cent in 2019, replacing natural gas as the most significant fuel input. Renewables (excluding large-scale hydro) have risen from 8.28 TWh in 2009 to 29.52 TWh in 2019 (Table 8.1). Grid-connected renewable energy only gained momentum in 2012 when feed-in tariffs were introduced. Since then, power generation from renewable energy has increased at an average annual rate of 43 per cent with solar PV having the highest share of RE at 46 per cent , followed by biomass at 25 per cent and biogas (landfill or agricultural waste) at 22 per cent in 2018.[150] The relative higher intake is also facilitated by investment incentives for green technology provided under the Green Technology Financing Scheme (GTFS).

As of 2019, seven years since FiTs were introduced, non-hydro RE comprised less than two per cent of the power generation fuel mix. There are many reasons for the low uptake. It is limited by distance constraints for biogas as most palm oil mills are located in remote regions, which make power connection to the grid beyond 10 km less feasible economically.[151] For biomass, the indefinite quantity and quality of the fuel, and competition for the use of biomass waste has dissuaded millers from utilising biomass waste for power generation.[152] Small-scale solar, land space availability and the high upfront cost, especially in rural areas where an additional fee is needed to bring the solar panels into the deep interior, have limited solar uptake.[153] Solar RE would make more economic sense through the large-scale implementation or utilising rooftop space. However, before 2017 these options were not available.

Malaysia has been committed to establishing large-scale solar (LSS) projects since 2017, targeting 2,000 MW installation between 2017 and 2020. The government also introduced Net Energy Metering (NEM) in 2019, to encourage consumers to install rooftop solar by allowing them to sell excess electricity to the grid on a "one-on-one" offset basis.[154]

The government also introduced the National Biofuel Policy in 2006 with the objectives to utilise sustainable energy sources and reduce the reliance on fossil fuels while stabilising the palm

oil industry. The National Biofuel Policy included a plan to implement a biodiesel blend mandate. The country's total fuel consumption of the on-road transport sector was 10,084 million litres in 2018, an increase of 23 per cent from 2010. The share of biodiesel increased from 0.4 per cent in 2010 to 6.5 per cent in 2018, with the expected blending rate rising to 9.1 per cent in 2019. The drastic increase of biodiesel consumption is due to the higher blending rate when the government mandated the roll-out of B10 in early 2019.[155] However, blending progress has been slower than initially planned due to the transportation industry's objections to the high cost of retrofitting vehicles to accommodate the higher blend rate.13

Table 8.1. Power generation fuel mix of 2017, 2018 and 2019[156]

Fuel	2017		2018		2019	
	TWh	%	TWh	%	TWh	%
Coal	68.9	*42.9%*	73.5	*43.9%*	71.1	*41.6%*
Natural gas	62.1	*38.7%*	64.8	*38.7%*	68.6	*40.1%*
Oil	1.7	*1.1%*	1.25	*0.7%*	2.6	*1.5%*
Hydroelectric	26.9	*16.7%*	26.5	*15.8%*	27.1	*15.8%*
Other renewables	1.1	*0.7%*	1.3	*0.8%*	1.7	*1.0%*
Total	**161.0**	*100.0%*	**167.8**	*100.0%*	**171.9**	*100.0%*
Non-fossil fuel	27.9	*17.4%*	27.8	*16.6%*	28.7	*16.8%*

8.2 Energy mix and investment during the pandemic

The nationwide shutdown of economic activities from March to May 2020 led to a contraction of year-on-year (y-o-y) GDP in 1H2020 by 8.3 per cent . The economy's GDP decreased drastically by 17.1 per cent in 2Q2020, marking Malaysia's worst performance since the Asian Financial Crisis. Malaysia gradually opened its economy from 4 May 2020 as some restrictions were eased under a Conditional MCO.

The total power generation of Peninsular Malaysia was 60 TWh in 1H2020, a decrease of 6.1 per cent from 1H2019 (Table 8.2.a). The drop-in power generation was observed at 0.68 per cent in 1Q2020, followed by a more noticeable reduction of 11.38 per cent in 2Q2020.

Comparing the fuel mix in 1H2020 and 1H2019, we see a slight drop in fossil fuel generation by 6.58 per cent while non-fossil generation (hydropower) increased by 11.45 per cent (Tables 8.2.a and 8.2.b). The trend continued to 3Q2020, where hydropower generation increased by 117.05 per cent compared to 3Q2019. This reflects the lower marginal cost of hydropower than other fuel sources during demand disruption as single buyers develop dispatch schedules based on the least cost.[157]

Power generation from solar plants appeared to increase in selected industrial plants (1 MW) in 1Q2020 and 2Q2020, mostly from plants located in west Peninsular Malaysia (Table 8.3). While the increase could be caused by higher solar irradiance during 1H2020 at west Peninsular Malaysia, it also shows that the demand disruption during the first half of the year did not cause power generation from these sources to decrease. The decrease in power generation from a solar plant located at Terengganu could be due to the Northeast Monsoon that affected the solar irradiance at east Peninsular Malaysia.

The movement restriction controls constrained the construction of new solar power installations in the first half of 2020. Nevertheless, Malaysia announced the fourth round of its large-scale solar (LSS) programme, aiming to offer 1 GW tender contracts in 2020 as part of its economic recovery plan (NST, 2020). This is an increase from the original plan to award 500 MW every year in the next four years. The bidding exercise was carried out in 3Q2020. Shortlisted bidders are expected to be announced by the end of the year.[158] The Ministry of Energy and Natural Resources hopes the tender to attract MYR4 billion (US$927 million) in investment and create 12,000 new jobs. A further MYR13 billion (US$2.9 billion) is also planned to install rooftop solar panels and other infrastructure. During 1H2020, SEDA was actively promoting NEM to attract more TNB consumers to adopt rooftop solar.

The nationwide shutdown of economic activities from March to May 2020 caused overall fuel demand to decline, which has also affected biodiesel consumption that is mixed depending on government mandates. The global recession caused by the pandemic and the all-time low oil price could further hamper biodiesel's transition due to the cost disadvantage of unblended biofuel to subsidised diesel.

While the energy transition plan to renewables in the power sector proceeds, the Malaysian government postponed implementing B20 in the transportation sector this year.[159] Released in February 2020, the National Automotive Policy proposed a B30 blend by 2025. The government is also spending MYR35 million (US$8 million) to conduct studies and upgrade 35 biodiesel blending terminals to handle the B30 blend. However, due to COVID-19 and crude oil being priced at a low level during 1H2020, B20 was postponed in April 2020. The national B20 program was then recommenced in September 2020 after some adjustment, according to the minister.[160]

Table 8.2.a. Power generation fuel mix in different periods of 2019 and 2020 in Peninsular Malaysia, excluding non-hydro renewables[161]

Fuel	Output TWh							
	1Q 2019	2Q 2019	3Q 2019	1Q 2020	2Q 2020	3Q 2020	1-3Q 2019	1-3Q 2020
Coal	17.4	18.2	18.0	20.4	18.9	20.2	53.6	59.5
Oil	0.0	-	-	-	-	-	0.0	0.0
Gas	13.0	13.4	13.7	9.9	8.8	8.8	40.1	37.0
Hydro	0.9	0.7	0.8	0.9	1.0	1.8	2.5	2.4
Total	**31.3**	**32.4**	**32.5**	**31.2**	**28.7**	**30.7**	**96.2**	**90.6**
Non-fossil	0.9	0.7	0.8	0.9	1.0	1.8	2.5	3.6

Table 8.2.b. Share of fuel for power generation in different periods of 2019 and 2020 in Peninsular Malaysia

Fuel	Output TWh							
	1Q 2019	2Q 2019	3Q 2019	1Q 2020	2Q 2020	3Q 2020	1-3Q 2019	1-3Q 2020
Fossil	97.1	97.7	97.5	97.2	96.6	94.3	97.5	96.1
Non-fossil	2.9	2.3	2.5	2.8	3.4	5.7	2.6	4.0

Table 8.3. Average solar power generation at selected plants during different periods of 2019 and 2020 (MWh)[162]

Plant (location)	Output TWh					
	1Q 2019	2Q 2019	1Q 2020	2Q 2020	Change (%) 1Q2019 vs 1Q2020	Change (%) 2Q2019 vs 2Q2020
27 (Selangor)	1.90	1.67	2.90	2.32	52.19%	38.74%
89 (Kedah)	1.71	1.84	4.17	3.74	143.52%	102.89%
90 (Kedah)	2.14	2.01	4.27	2.92	99.42%	45.40%
110 (Terengganu)	3.18	2.91	2.72	2.44	-14.41%	-16.11%

8.3 Economic recovery plan and new energy policies

As of September 2020, the Malaysian government has rolled out economic stimulus packages worth 305 billion ringgit (US$73.2 billion).[163] Besides supporting the badly hit tourism industry, the stimulus package also provides various tax incentives, ranging from tax exemption and deductions for the manufacturing sector, thereby attracting foreign investment, to the establishment of new businesses.[164] That includes a fiscal injection of 45 billion ringgit (US$10.4 billion), raising Malaysia's debt ratio to 56 per cent .[165] Parliament has recently approved the government to borrow up to 60 per cent as a temporary measure, to mitigate against the economic impact of disruption caused by the pandemic. According to the finance minister, the stimulus packages are expected to contribute 3.7–4 per cent of the nation's GDP this year.[166]

On 16 March 2020, a two per cent discount on electricity bills for commercial, industrial, agricultural, and all households in Peninsular Malaysia was announced. By 27 March, a discount of between 15 per cent and 50 per cent had been declared under a tiered discount rate depending on electricity usage (up to 600 kWh per month). Consumers received the discount in the form of automatic rebates effective from 1 April until 30 September.[167]

Whilst the economic recovery package was not notably green, the government's Economic Stimulus package has also benefited the renewable sector, particularly the solar PV industry, where 1.4 GW of solar PV tender is to be awarded. The government announced approximately US$2.9 billion in expenditure to install new grids, LED streetlights and rooftop solar panels. This includes an open tender of 400 MW rooftop solar PV installation under the NEM with 1 GW large-scale solar under the LSS4@MEnTARI by the Energy Commission,17 which is expected to generate US$2.2 billion in investment.[168]

SEDA has delayed the roll-out of the Renewable Energy Transition Roadmap (RETR) 2035, which was initially scheduled to launch in April due to disruption caused by the pandemic. According to SEDA, the authority is currently at the final stage of completing RETR 2035. It is also expected that a green hydrogen economy roadmap by 2025 and post-2025 will also be included together with other RE strategies and action plans.17

8.4 Overall conclusion

Overall, the share of renewable energy (including hydro) in the power generation fuel mix increased by 11.45 per cent in 1H2020 while non-hydro RE, namely solar generation, has increased by between 38.74 per cent and 143.52 per cent for selected plants in west Peninsular Malaysia. The higher power generation from hydro is due to the lower marginal cost of the generating unit during this period. With new non-hydro renewable energy projects continuing to be tendered and new quota for the large-scale solar programme being introduced by the government in 1H2020, renewable energy has shown higher resiliency in the short term for power sector. SEDA is also actively promoting the adoption of rooftop solar. However, with companies being cash-tight, especially small businesses and homeowners, it is foreseen that there will be restricted spending on big-ticket items like solar modules. In the long run, a global recession post-pandemic, coupled with the low oil price, might affect investment in renewables. This is especially true for the transportation sector, where biodiesel is relatively more expensive than diesel fuel.

To achieve a 20 per cent share of renewable energy in power generation by 2025, Malaysia aimed to have 3,758 MW of new renewable energy capacity installed in 2020, consisting of 1,172 MW of solar and 1,586 MW of non-solar.[169] According to the country's power generation plan, another 5,100 MW of gas-fired capacity will be installed by 2030. This is consistent with a recent think tank policy brief produced by IDEAS[170] urged the government to stop building coal-fired power plants and utilise natural gas as a bridge for low carbon transition towards renewable energy.[171]

It is also much anticipated that the 12th Malaysia Plan (2021–2025) is a pivotal moment for Malaysia to navigate through the decarbonising energy sector while reviving the economy in the long run. However, at the point of writing, Malaysia was experiencing a third wave of COVID19, which prompted a second MCO since the first in March 2020. Meanwhile, the ongoing political instability might continue to cause government priorities to change. Nevertheless, economic recovery and sustainable energy do not have to be mutually exclusive.[172] Renewables can emerge stronger than pre-COVID-19. This is especially when the government integrates support for clean energy into the economic recovery plan.

9 Philippines

Overview — Philippines

Energy mix before the pandemic

- The share of coal in the primary energy mix and power generation mix has been rising.
- The share of non-fossil fuels in the electricity mix has been declining.
- Growth in the use of biofuels has been slower than planned.

Energy mix and investment during the pandemic

- Period of lowest electricity demand: March–May 2020.
- The share of non-fossil fuels in the electricity mix rose during the lockdown, on account of the inflexibility of coal-fired power plants.
- This higher share did not persist into 3Q2020, except for a rise of hydro due to the rainy season.
- Investment in new renewable energy capacity slows due to supply chain and financial problems.
- Biofuel blending continues unchanged.

Economic recovery plan and new energy policies

- Whilst the economic recovery plan is not notably green, a new national energy plan highlights the role of renewable energy.
- A moratorium is placed on new coal-fired power plants, but this excludes 22 proposed plants that already have approval.
- Coal still seems to be the preferred source of electricity.
- The government will continue to enforce biofuel blending requirements, but the target shares for ethanol and biodiesel remain at the levels achieved in 2019.

Outlook for renewable energy

- Investment in new renewable energy capacity is likely to grow, but so is that of coal-fired power.
- It is not clear whether the share of renewable electricity will grow or not.
- The blending percentages for biofuels may not increase.

9.1 Policies and energy mix before the pandemic

The Philippines sustained its position as one of the fastest-emerging economies in Southeast Asia, with an average annual growth of 6.4 per cent from 2010–2019.[173] The archipelagic state was expected to rise from being a lower middle-income to upper middle-income country. In 2019, the country's gross national income per capita was US$3,850. It is anticipated to increase to US$4,046 to $12,535 in the coming years.[174]

Fossil fuels dominate the primary energy mix. In 2019 the shares were 45 per cent oil, 36 per cent coal and seven per cent natural gas. As demand grew, the proportion of coal increased at the expense of oil.[175]

Likewise, the continuous expansion of the economy meant a consistent increase in demand for electricity. From 2015 to 2019, the average year-on-year increase in national energy sales was around 6.6 per cent .[176] By the end of 2019, the total electricity sales and consumption had risen to 6.3 per cent with an absolute level of 106,041 GWh. Most of the power sales come from the residential sector (28.8%), followed by the industrial sector[177] (26.6%) and the commercial sector (24%).[178]

On the supply side,[179] the country's total installed capacity rose by 7.2 per cent from 23,815 MW in 2018 to 25,531 MW in 2019; 97.9 per cent of this was for Luzon, Visayas and Mindanao's main grids while off-grid islands contributed 2.1 per cent . The Philippines' primary power supply is still highly dependent on fossil fuel-based resources. In 2019, the new coal-fired power plants across the country increased their share of the national power mix by 54.7 per cent from 52.1 per cent in 2018. Natural gas contributed 21.1 per cent , and oil 3.6 per cent .

Because of the heavy reliance on coal generation, there was limited penetration of renewable energy technologies to the national grid in 2019 at utility-scale.[180] The overall shares of renewables decreased from 23.3 per cent in 2018 to 20.7 per cent in 2019. Geothermal contributes to the largest renewable energy share with ten per cent, followed by hydro with eight per cent and other RE (biomass, solar and wind) with two per cent.

Under the revised National Renewable Energy Programme (NREP), the Department of Energy (DOE) committed to increasing the share of renewable energy (around 35%) to the national energy mix by 2030.[181] The main drivers were (1) to establish a more diversified energy portfolio and (2) decrease the country's reliance on coal. The push for cleaner energy sources is also seen to help achieve the country's intended nationally determined contribution (INDC) which is a 70 per cent greenhouse gases (GHG) reduction by 2030 below the business-as-usual scenario.[182]

Between 2018 and 2019, the national government had passed various policies and tools to support renewable energy generation and distribution. These included the Renewable Portfolio Standards (RPS) and the Renewable Energy Market System (REMS), the Green Energy Option Programme (GEOP) and the Green Energy Tariff Programme (GETP).[183] In July 2019, Congress granted the first solar energy company, "Solar Para sa Bayan" (solar energy for the country), a 25-year franchise to provide electricity to off-grid areas of the country.[184]

Despite the ambitious renewable energy target for 2030 and supportive policies, the Department of Energy's investment priority remained technology-neutral.[185] The long-term vision is for the country to have an additional 43 GW capacity (from any source) by 2040 to meet the population's increasing energy demands. According to the Energy Department's investment portfolio, the Philippines' three significant investment opportunities are: meeting the baseload demand, developing indigenous resources (coal, petroleum, and natural gas), and LNG as a transition fuel (to compensate for the depletion of the Malampaya Onshore Gas Plant).

The Biofuels Act 2006 (RA 9367) required the Philippines' ethanol and biodiesel blends to be five per cent and two per cent by 2008, respectively. The national government's target was to increase the

biofuels blend to E20 and B10 by 2020.[186] However, in 2019, the mix remained at E10 and B2, and this mix was the new target for the year 2040 reported in the Philippine Energy Plan (PEP) 2018–2040.[187] In other words, the share of biofuels will not change, although the absolute quantity will rise if the use of liquid transport fuels increases. According to a study by the US Department of Agriculture — Foreign Agriculture Service, the inability to reach the 2020 goal for biofuel mix was due to various reasons: "inadequate investments in new biofuel plants and distribution infrastructure, inadequate tax policy, and no other support programmes for biofuels."[188]

Table 9.1. Power generation mix in 2017, 2018 and 2019[189]

Fuel	2017		2018		2019	
	TWh	%	TWh	%	TWh	%
Coal	46.8	*49.7%*	51.9	*52.1%*	57.9	*54.7%*
Gas	20.5	*21.8%*	21.3	*21.4%*	22.3	*21.1%*
Oil	3.8	*4.0%*	3.2	*3.2%*	3.8	*3.6%*
Geothermal	10.2	*10.8%*	10.4	*10.4%*	10.7	*10.1%*
Hydro	9.6	*10.2%*	9.4	*9.4%*	8	*7.6%*
Biomass	1	*1.1%*	1.1	*1.1%*	1	*0.9%*
Solar	1.2	*1.3%*	1.2	*1.2%*	1.2	*1.1%*
Wind	1.1	*1.2%*	1.1	*1.1%*	1	*0.9%*
Total	**94.2**	*100%*	**99.6**	*100%*	**106**	*100%*
Non-fossil fuel	23.1	*24.5*	23.2	*23.3*	21.9	*20.7*

9.2 Energy mix and investment during the pandemic

The country experienced one of the world's longest lockdowns (from April to June 2020) which caused a substantial slowdown in economic activity including the power sector. The country's GDP shrank by 11.5 per cent in the third quarter of the year, which was a better situation than a 16.9 per cent contraction during the second quarter.[190] Power demand decreased by six per cent during the lockdown period and slowly picked up in the second half of the year.[191] Meralco (Manila Electric Co), the largest power distributor in the Philippines, witnessed a massive drop in electricity sales during the first half of 2020 (PHP6.8 billion net profit loss).[192]

Coal-fired generation declined from 56.5 per cent (26 February to 15 March) to 50 per cent during the lockdown (16 March to 20 May). The share of renewables in total generation mix rose to 21.4 per cent from 19.4 per cent with geothermal energy increasing its output by almost two per cent. This was due to the must-dispatch policy towards renewable energy sources provided by the Renewable Energy Act of 2008 and the inflexibility of coal power production.[193] As this was the summer, solar and wind energy also contributed 0.8 per cent more to the national grid compared to the pre-lockdown period. As the lockdown relaxed, there was a resurgence in generation output from coal-fired power plants to 55.8 per cent in Q3. Together with natural gas, coal contributed about 75 per cent of the total generation mix. Geothermal energy decreased from 12.6 per cent to 11.8 per cent , as did the share of the other non-hydro renewable energy resources, while hydropower increased its contribution from 3.9 per cent to 5.5 per cent because of the rainy season.[194]

Conversely, the economic downturn caused by the pandemic affected the ongoing investments in renewable energy projects. Demand for residential solar PV during the lockdown decreased because of consumers' financial constraints.[195] Renewable energy industrial and commercial installations were halted as discretionary spending was delayed and short-term cash flow was prioritised. In general, the "supply chain disruption, regulatory delays, and workforce issues" slowed down the renewable energy projects in the pipeline.[196]

Green investors seemed to be more hopeful towards the end of the year. The Department of Energy reported an influx of solar project applications totalling about 13 GW. This is because of the anticipation of the RPS policy launch next year, which estimates a 2GW target capacity across all renewable energy technologies.[197] Earlier in July, the Department of Energy Secretary Cusi also mentioned the plan to allow 100 per cent foreign ownership of renewable energy projects from the current 60–40 equity requirement between local and foreign investors.[198] Finally, another parallel effort was to extend the renewable energy service contracts given to investors to more than 25 years.[199] This would help improve the feasibility of renewable energy projects in the Philippines.[200]

During the lockdown, there was a push to suspend the bioethanol blending programme due to the low oil prices and demand, and more profit from anhydrous bioethanol to make ethyl alcohol for disinfectant products.[201] However, this was opposed by local ethanol stakeholders. According to them, this would only aggravate the health and economic crisis. There was no official suspension from the Department of Energy, and the blending programme continued.

Table 9.2. Power generation mix in 2019 and 2020

Fuel	2019		2020				
			Pre-lockdown (26 February to 15 March)		**During lockdown** (16 March to 20 May)		**Jul to Sept**
	TWh	**%**	**MWh**	**%**	**MWh**	**%**	**%**
Coal	57.9	*54.6%*	5870	*56.5%*	4338	*50%*	*55.8%*
Gas	22.3	*21%*	2379	*22.9%*	2367	*27.3%*	*23.4%*
Oil	3.8	*3.6%*	130	*5.2%*	101	*1.2%*	*0.7%*
Geothermal	10.7	*10%*	1180	*11.3%*	1139	*13.1%*	*11.8%*
Hydro	8.0	*8.0%*	396	*3.8%*	306	*3.5%*	*5.5%*
Biomass	1.0	*1.0%*	154	*1.5%*	160	*1.8%*	*1.0%*
Solar	1.2	*1.0%*	164	*1.6%*	160	*1.8%*	*1.5%*
Wind	1.0	*1.0%*	122	*1.2%*	101	*1.2%*	*0.3%*
Total	**106**	*100%*	**10,394**	*100%*	**8,673**	*100%*	*100%*
Non-fossil fuel	21.9	*21%*	2016	*19.4%*	1866	*21.4%*	*20.1%*

9.3 Economic recovery plan and new energy policies

In March 2020, the Duterte Administration passed Republic Act 11469 (also known as Bayanihan to Heal as One Act (or Bayanihan 1) to grant special powers to the President to "reallocate, realign, and reprogram" a budget of almost PHP275 billion (the US$5.37 billion) in response to COVID-19. The Act's main beneficiary was the health sector, including the first responders and the disadvantaged population (low-income families). The President was also able to "temporarily direct the operation of public utilities and privately-owned health facilities and other necessary facilities for quarantine, the accommodation of health professionals, and the distribution and storage of medical relief; and facilitate and streamline the accreditation of testing kits".[202] As for other sectors,[203] tax incentives were awarded to manufacturing and importing businesses of health equipment and supplies. A mandatory 30-day grace period was also given to the private sector for all loans within the lockdown period.

Despite the passage of the Bayanihan Act in the first quarter of the year, GDP declined by 16.9 per cent , and the country's unemployment rate hit a record of 17.7 per cent (more than 7.3 million jobs lost) one of the highest in the region.[204] The law expired in June 2020 and was not extended by the Executive branch. Instead, another Act was passed — the Bayanihan to Recover as One (Bayanihan 2) in September this year. Bayanihan 2 aims to improve the country's socio-economic conditions while addressing the continuously high number of COVID-19 cases. This has shown some improvement from the third quarter's GDP of the country.

In terms of sustainable development and energy-related programmes during the pandemic, the National Economic and Development Authority (NEDA) proposed an economic recovery plan, which included loans and time-bound and conditional equity infusions to assist the sectors most affected by COVID-19. This period also allowed the Department of Energy to "reset energy development policy by enabling flexible energy generation, allowing greater renewable absorption in the grids, and redirecting resources to support energy price stability."[205] The Central Bank of the Philippines also approved the Sustainable Finance Framework that requires banks to integrate environment and social risk management into their governance and risk management frameworks, overall strategic objectives, and operations.[206] The Bank's framework complemented the ongoing guidelines for mandatory environmental, social, and governance reporting by publicly listed companies in the country.[207]

The Department of Energy also updated the Philippine Energy Plan (PEP) 2018–2040 in August 2020. It emphasised the role of green energy sources in the economic recovery plans of the country. Notably, the objectives[208] of the revised PEP are as below:

1. Increase the production of clean and indigenous sources of energy to meet the growing economic development of the country;
2. Decrease the wasteful utilisation of energy using energy efficiency tools and strategies; and
3. Ensure the balance between reliable and reasonably priced energy services, support for economic growth, and environmental protection.

The Department of Energy also placed a moratorium on the construction of new coal-fired power plants. This sent a strong signal to green investors of the Department's rethinking of their initial technological-neutral policy. Secretary Cusi mentioned that this would help the Philippines to achieve a "more flexible power supply mix ... flexible enough to accommodate the entry of new, cleaner, and indigenous technological innovations".[209] The current health crisis exposed the country's energy grid's inflexibility to meet the fluctuating power demands. As mentioned in the previous section, the national grid depends on coal power plants to provide baseload power to the Philippines' on-grid islands.[210]

This declaration came in time to ease the pressure from climate change activists in the Philippines who criticise the current administration for not pursuing carbon-free energy policies. There are currently 28 coal-fired power plants with a total installed capacity of 9.88 GW in the country. Additionally, the Energy Department approved 22 proposed plants, which would raise coal's share to 53 per cent by 2030 in the primary energy mix (up from 36% in 2019). Critics mentioned that although this coal ban sends a strong statement to support greener growth, they remained sceptical. This is because (1) the moratorium does not cover pre-approved coal projects and (2) the country will continue to exploit coal resources through open bidding to mine two new coal blocks in the South.[211] Environmental groups also had reservations about the opening of renewable energy projects to 100 per cent foreign ownership. Without proper environmental impact assessment, these planned large-scale hydro and nuclear power plants may negatively affect the local communities.[212] Finally, even in the updated Philippine Energy Plan clean energy scenario, the share of renewables in the national primary energy mix still falls short at 31.9 per cent compared to the original target of 35 per cent .

On the other hand, the biofuel market seems to have a more positive outlook.[213] The demand is expected to consistently expand at an average of 5.2 per cent up to 2040, although the mandated blend remains unchanged. Consumption for bioethanol and biodiesel grows by 5.4 per cent and 4.6 per cent per year, respectively. According to the updated Energy Plan, these trends are due to the Department of Energy's continuous and strict monitoring of oil companies' compliance with the required biofuel blend.

9.4 Overall conclusion

The economic recovery framework of the Philippines from COVID-19 is not notably green. Still, the pandemic encouraged energy policymakers to rethink their current policies — from being technology-neutral to pushing for an "energy transition".[214] In its newly updated Philippine Energy Plan 2018–2040, the Department of Energy emphasised that it plans to synergise the country's economy "from the crippling effect of the pandemic with sustainable energy goals".[215] By 2040, the Department of Energy estimated 44.6 GW of new capacity from geothermal, renewable energy sources and possibly nuclear energy.[216] The declaration of a moratorium on coal power plants in October 2020 also signalled the types of future energy projects that the government will support during the recovery period. The Duterte administration is also expected to go back to its infrastructure strategy, "Build Build Build Campaign", when the pandemic subsides, which will be generous support to the power sector.

The pandemic has exposed the weaknesses of the energy sector and the current grid system. The country remains highly dependent on coal-fired power plants which are inherently inflexible and vulnerable to fluctuating energy demand. COVID-19 also highlighted the challenges faced by smaller power stakeholders such as electric cooperatives who could not negotiate force majeure[217] compared to big players like Meralco. On the other hand, the variable renewable energy systems, like small- to medium-scale solar PV systems, proved useful and increased their share of power generation during the lockdown. The Energy Department's adherence to the mandatory blend's strict compliance despite oil companies' pressure also positively affected the biofuel outlook.

These challenges to conventional sources of electricity during the health crisis encouraged forward-thinking greener energy sources. However, these grand schemes will need to include more actionable plans that allow immediate solutions to the country's specific energy needs and problems. These are on top of other challenges that may be brought about by the persistence of COVID-19 and its new variants that could shift the government's current priorities. The government has numerous policy documents and a supportive framework and incentives to drive large-scale renewable energy projects. However, energy planning remains based on "what is available" rather than "what could be developed".[218]

10 Thailand

Overview — Thailand

Energy mix before the pandemic	Energy mix and investment during the pandemic
Fossil fuels dominate the primary commercial energy mix. Gas dominates the electricity mix, but the government is now prioritising coal. The share of non-hydro renewables in the electricity generation mix has been increasing slowly. The share of biofuels in the transport sector has been rising.	Period of lower electricity demand: March–August 2020. The quantity of hydropower and non-hydro renewable electricity generated declines despite obligations on the grid to purchase. Construction of new electricity generating capacity slows for both coal-fired and renewable energy. Biofuel consumption for transport falls due to travel restrictions.

Economic recovery plan and new energy policies

- The economic recovery plan is not notably green.
- No new policies in support of clean energy have been issued.

Outlook for renewable energy

- Investment in new renewable electricity capacity will continue growing.
- Investment in new gas-fired generating capacity is set to grow whilst support for coal-fired capacity is declining.
- The government will continue supporting the growing use of biofuels.

10.1 Policies and energy mix before the pandemic

During the past two decades, Thailand's GDP grew steadily from US$126.392 billion in 2000 to US$543.65 billion in 2019,[219] with a per capita GDP (PPP) of US$18,463 in 2019.[220] The GDP growth rate was 2.4 per cent in 2019. Making remarkable progress in economic development, Thailand has moved from being a lower middle-income to an upper middle-income country.[221] However, the growth rate is projected to be -7.8 per cent to -7.3 per cent in 2020 due to COVID-19.[222]

The country's primary commercial energy mix is dominated by fossil fuels. In 2019, oil accounted for 48.5 per cent , natural gas for 32.6 per cent and coal for 12.7 per cent . The balance of 6.2 per cent was provided by renewable energy including hydro, a share that has been rising steadily.[223]

Focusing on reducing its dependenceyear on natural gas to enhance energy security, Thailand's energy policy evolves with advanced technologies' uptake. The country has increasingly included renewable energy resources to generate electricity, as its natural gas reserves are depleting. Along with this strategy, the Thai government has been trying to make the environment for energy diversification and investment exceedingly attractive. Supportive policies for solar equipment manufacturing and gains in efficiency have made the country a recognised leader of solar power development in ASEAN.[224] Also, the Electricity Generating Authority of Thailand (EGAT) is obliged to purchase all renewable electricity.[225] The renewable development policies are intended to help achieve Thailand's Intended Nationally Determined Contribution (INDC) target: to reduce GHG by 20 per cent from the business-as-usual (BAU) level by 2030, and the level of GHG reduction could increase up to 25 per cent with supportive policies.[226]

Thailand's electricity mix is relatively clean and efficient, combining old and new technologies. According to the Energy Policy and Planning Office (EPPO) of the Ministry of Energy, in 2019 natural gas was used to generate 65 per cent of electricity, and coal (including lignite) supported 19 per cent. Renewables — excluding imported hydropower — produced ten per cent. Table 10.1 shows the power generation mix by type before and during COVID-19. Despite a steady transition to renewables, the largest problem faced by Thailand's power sector is its dependence on natural gas. The fuel is fast depleting in Thai-controlled fields, and the country is trying to restructure its energy mix to ensure continuous, cost-effective generation. To achieve this purpose, the Thai government and the National Energy Policy Council approved the Power Development Plan (PDP 2018–2037) in 2019, after several years of revision. This Plan explicitly expresses that Thailand aims to become a low-carbon country, with renewables, including hydro, accounting for approximately 35 per cent of the energy mix by 2037. Natural gas continues to provide a large share of the power supply.[227]

To implement the Plan, the Electricity Generating Authority of Thailand (EGAT) is conducting several projects including a pilot project to develop and install the world's largest floating solar hybrid power, which combines hydropower and solar power with an output of 45 MW. EGAT aims to develop floating solar farms at nine dams nationwide with a combined capacity of 2,725MW. Thailand's Board of Investment (BOI) also has introduced several tax incentives, such as tax holidays and exemptions on selected import duties, for investment in both renewable power generation and the manufacture of parts or equipment for solar power.[228] As of 2017, the installed capacity of solar PV was about 3148 MW, of which 188 MW was rooftop solar PV, and 2960 MW was ground-mounted solar PV.[229] By the end of 2019, Thailand had nearly 5 GW of cumulative wind and solar installations.[230] All these efforts have been diversifying the power generation mix to reduce dependence on gas. Between 2017 and 2019 the share of non-hydro renewables in the power mix rose from 11.0 per cent to 14.9 per cent, the most significant increase being by biomass (in the "other renewables" category; Table 10.1).

Petroleum products dominate the energy consumption of Thailand's transportation sector. As mentioned before, the Thai government initiated policies to diversify its energy resources and to develop renewable energy sources to reduce its over-reliance on fossil fuel. Biofuels is one of Thailand's national renewable energy policy priority

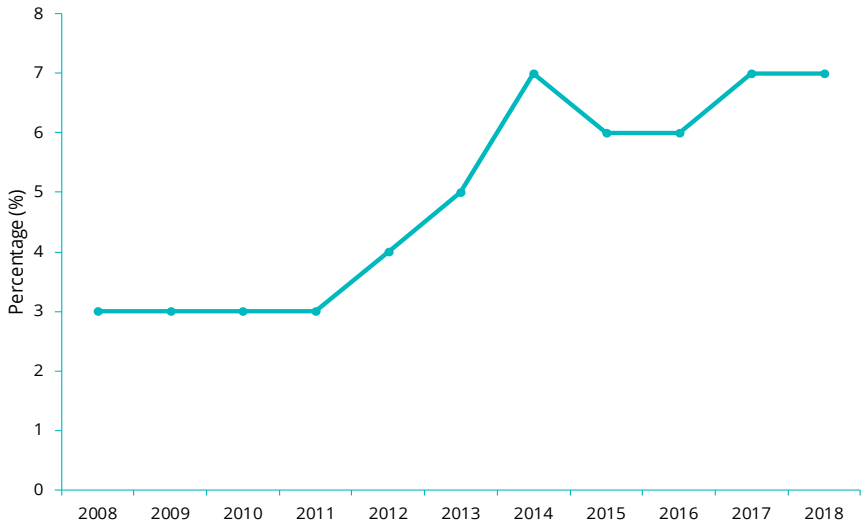
areas, particularly for the transport sector. The Thai government has regularly issued guidelines to increase the production and consumption of biofuels.[231] It had been planning for biofuels to substitute 44 per cent of oil consumption in 2021. The Thai government is looking to produce 253 million litres of biodiesel and bio-ethanol per day by 2036.[232] To increase biodiesel consumption, the government imposed a mandatory blending requirement for biodiesel in diesel used for transportation, agriculture, and industry. In the transport biofuel sector, in particular, the production of biodiesel has increased. The key reason is the government requirement for additional mandatory use of biodiesel B10, a ten per cent biodiesel blend.[233] Biodiesel producers have also received various privileges such as exemption from corporate income tax and import machinery duties. Manufacturers of higher-percent biodiesel compatible vehicles also have tax privileges.[234] All these policies have great potential to promote biofuel consumption in the transport sector in Thailand, although currently, the growth of the biofuel share is not fast. Figure 10.1 shows the share of biofuels in transport consumption in Thailand in the past decade.

Table 10.1. Fuel mix in power generation, 2017–2020[235]

	2017		2018		2019	
	TWh	%	**TWh**	%	**TWh**	%
Coal	35.7	*20.2%*	35.8	*20.1%*	35.8	*19.2%*
Gas	121	*68.6%*	116.3	*65.4%*	121.8	*65.3%*
Oil	0.3	*0.2%*	0.2	*0.1%*	1.1	*0.6%*
Hydro	4.7	*2.7%*	7.6	*4.3%*	6.3	*3.4%*
Solar	4.5	*2.5%*	5.0	*2.8%*	5.0	*2.7%*
Wind	1.1	*0.6%*	1.9	*1.1%*	2.7	*1.4%*
Other renewables	9.3	*5.3%*	10.9	*6.1%*	13.7	*7.3%*
Total	**176.6**	*100.0%*	**177.7**	*100.0%*	**186.4**	*100.0%*
Non-fossil fuels	19.6	*11.0%*	25.4	*14.3%*	27.7	*14.9%*

'Other renewables' comprises mainly biomass.

Figure 10.1. Share of biofuels in Thailand's transport fuel consumption[236]



10.2 Energy mix and investment during the pandemic

In Thailand, the first confirmed COVID-19 case was on 13 January 2020. From 26 March, a state of emergency was implemented, and social gatherings banned with travel between provinces curbed. The country finally went into a broad lockdown to fight the pandemic.[237] The lockdown and pandemic severely affected the Thai economy. Its GDP shrank by 6.4 per cent from 2019. In the third quarter of 2020, Thailand's economy improved slightly after implementing a series of stimulus measures and eased movement restrictions. GDP in the third quarter rose by 6.5 per cent compared with the second quarter when GDP saw a contraction of 9.9 per cent .[238]

Coal's share in the power generation mix increased, despite the shrinking of the economy. Compared to the first three quarters of 2019, Thai coal-fired power generation increased by 545 GWh during the same period in 2020 (Table 10.2). A significant reason is that the Thai government had planned to reduce dependence on natural gas power generation by increasing the share of coal power generation via clean coal technology in its Power Development Plan (PDP) issued in 2015. Compared to China and India that rely on coal for about 60 per cent of power generation, Thailand only has a coal share in the generation mix of about 20 per cent . The Thai government had planned to increase the coal share to 25 per cent by 2036.[239] This plan has played a role in expanding the coal share in the generation mix, although the new PDP issued in 2018 adjusted the target coal share to twelve per cent,[240] yet it seems that the new plan has not had time to make a difference. Total non-hydro renewable power generation declined slightly from 16,114 GWH to 15,449.4 GWH, while the total power generation's share remained at 11.4 per cent . Overall, the absolute quantity and share of non-fossil fuel in the power mix in the first three quarters of 2020 were both lower than the same period of 2019, despite the requirement for EGAT to purchase all renewable electricity.

The lockdown measures in Thailand during COVID-19 curbed construction of new renewable energy capacity. Project developers have been invoking force majeure in some cases where they cannot meet their contracts' obligations.[241] The construction of coal-fired power plants has also been delayed.[242] As there is still no definite end to the COVID-19 pandemic, the renewables sector players are very cautious with investment. The pandemic has significantly reduced and disrupted cash flow and limited access to manpower. Nonetheless, the contractors of existing projects have a legal obligation to complete works, and these are set to resume as soon as it is deemed safe to do so. Projects that are already underway will be completed as a priority.[243]

Biodiesel consumption fell because COVID-19 quarantine orders keep people off the road.[244] However, despite reduced diesel consumption, biodiesel's demand is still expected to increase in 2020 due to the additional mandatory use of biodiesel and a government incentive price subsidy, which will promote the average on-road blend rate for biodiesel to jump to 9.6 per cent in 2020.[245] Regarding the biodiesel production at present, there are 13 producers with an estimated total production capacity of 2,580 million litres per year. Blending of biodiesel among petroleum refineries is strictly monitored to comply with the mandatory biodiesel blending requirements. The government-mandated biodiesel production is expected to reach 1,980 million litres in 2020, higher than the total production of 1,845 million litres in 2019.[246]

Fuel ethanol consumption in Thailand in 2019 totalled 1,613 million litres. Ethanol consumption is expected to decline to 1,530 million litres in 2020, down approximately five per cent from 2019 due to the pandemic. The total production capacity was about 1.95 billion litres in 2020. However, due to reduced gasoline and gasohol consumption during the lockdown, ethanol production totalled 744 million litres during the first half of 2020, an eight per cent reduction from the same period of 2019.[247] The total ethanol production is expected to be 1.5 billion litres in 2020, a seven per cent decrease compared to 2019. This is the result of a six per cent decrease in gasoline demand.[248] Figure 10.2 shows the production of transport biofuels in Thailand from 2011 till 2020. As such, Thailand's transport biofuel sector still shows resilience during the COVID-19 pandemic.

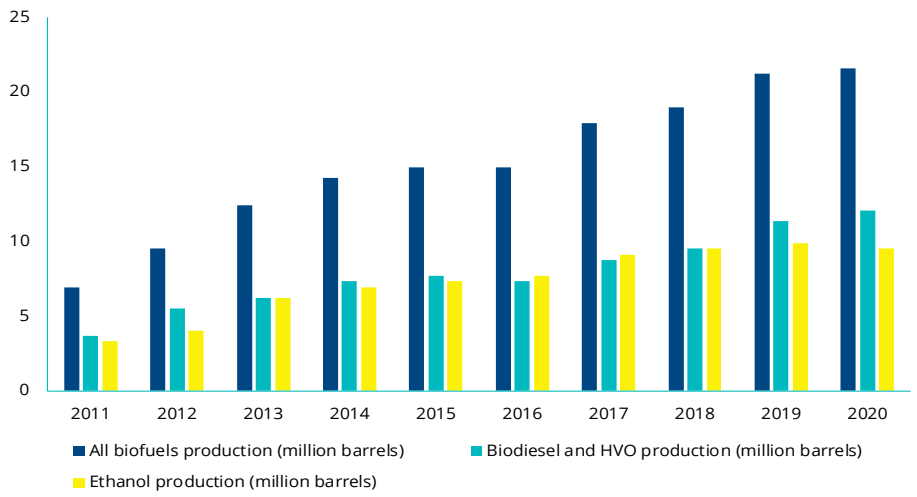
Table 10.2.a. Power generation by fuel in different periods of 2019 and 2020, and ratios between different periods[249]

Fuel	Output TWh							
	1Q 2019	2Q 2019	3Q 2019	1Q 2020	2Q 2020	3Q 2020	1-3Q 2019	1-3Q 2020
Coal	8,747.0	9,386.6	9,313.9	9,454.9	9,783.2	8,754.2	27,447.5	27,992.2
Gas	29,508.2	33,395.8	28,810.9	30,255.2	29,150.2	28,706.3	91,714.9	88,111.8
Oil	228.9	457.4	301.2	98.0	275.6	193.5	987.6	567.2
Diesel	19.8	13.7	93.1	10.0	10.2	64.5	126.6	84.7
Hydro	1,930.4	1,797.8	1,300.5	1,372.0	1,295.1	1,072.3	5,052.9	3,739.3
Renewables	5,348.8	5,247.5	5,517.6	5,486.6	5,156.8	4,805.9	16,114.0	15,449.4
Total	**45,807.3**	**50,298.8**	**45,337.3**	**46,676.8**	**45,671.1**	**43,596.7**	**141,443.4**	**135,944.6**
Non-fossil	7,279.2	7,045.3	6,818.1	6,858.6	6,451.9	5,878.2	21,166.9	19,188.7

Table 10.2.b. Shares of different fuels for power generation in different periods of 2019 and 2020[250]

Fuel	1Q 2019	2Q 2019	3Q 2019	1Q 2020	2Q 2020	3Q 2020	1-3Q 2019	1-3Q 2020
Coal	19.1%	18.7%	20.5%	20.3%	21.4%	20.1%	19.4%	20.6%
Gas	64.4%	66.4%	63.5%	64.8%	63.8%	65.8%	64.8%	64.8%
Oil	0.5%	0.9%	0.7%	0.2%	0.6%	0.4%	0.7%	0.4%
Diesel	0.0%	0.0%	0.2%	0.0%	0.0%	0.1%	0.1%	0.1%
Hydro	4.2%	3.6%	2.9%	2.9%	2.8%	2.5%	3.6%	2.8%
Renewables	11.7%	10.4%	12.2%	11.8%	11.3%	11.0%	11.4%	11.4%
Non-fossil	**15.9%**	**14.0%**	**15.0%**	**14.7%**	**14.1%**	**13.5%**	**15.0%**	**14.1%**

Figure 10.2: Transport biofuel production in Thailand[251]



10.3 Economic recovery plan and new energy policies

As of this report's writing, the Thai government had issued three stimulus packages to counter COVID-19. They were not touted as green recovery packages. Phase 1 was published on 4 March 2020, valued at 100 billion baht (US$3.2 billion). This first package provides financial assistance to small and medium-sized enterprises (SMEs) as well as tax relief and cash handouts. Phase 2 was issued on 24 March 2020, valued at 117 billion baht (US$3.56 billion). The second phase package focuses on enhancing the incentives provided in Phase 1 and extending the filing of tax returns for businesses and employees. Phase 3 was issued on 7 April 2020, with a value of 1.9 trillion baht (US$58 billion). The third stimulus package aims to mitigate the economic impact caused by the COVID-19 outbreak. Targeted sectors for assistance include commercial banks, financial services, small- and medium-sized businesses, households, temporary and contract workers, and the self-employed.[252]

In the energy sector, Thailand aims to achieve 30 per cent of its power generation from renewables by 2036 as part of its low carbon transition plan. The growth of renewable resources will be led by biofuels, followed by solar PV and then wind.[253] Yet there have been no new energy policies issued by the Thai government since the outbreak of COVID-19, except for the government's measures to cut electricity charges to help people and enterprises reduce their spending on electricity.[254] However, the government's relief measures to support vulnerable households and businesses have not offset the contraction of aggregate demand for energy in 2020.[255]

Nevertheless, the stimulus packages have given confidence to business, including the renewable sector. Thailand's most prominent private power company by capacity, B. Grimm, is continuing its planned renewables expansion. Despite the pandemic, the company will continue searching for business opportunities in the renewable sector. They have prepared THB20 billion for business expansion and a THB9 billion credit line for development and acquisitions.[256]

10.4 Overall conclusion

Thailand's economic stimulus packages were not notably green as they were focused on supporting livelihoods and the financial sector. In the short term, the quantity of electricity generated from hydropower and non-hydro renewable resources declined in the first nine months of 2020 compared to the same period in 2019. All other sources of electricity also fell except for coal which showed a small increase. This suggests that the obligation on EGAT to purchase renewable energy was not fully effective in 2020. The lockdown measures during the COVID-19 also curbed the construction of renewable electricity projects.

Despite the disruption caused by COVID-19, the government continues to support renewable energy development. Five proposals were submitted to the Energy Ministry and other relevant government agencies in December 2020. These are electric vehicles and charging stations, power generation from waste energy, electricity generation from crops, electricity generation from solar and wind energy, and power generation for own use.[257] The government is dedicated to developing not only solar and wind power but also various renewable energy sources.

Although renewable electricity projects in the pipeline have experienced slowdowns due to COVID-19, many of these projects will come online once the pandemic is under control. Thailand's power generation businesses can expect to continue growing steadily, supported by domestic demands for electricity and government support for investment. Increasing investments in business and industry shall continue to feed the rising consumption of electrical power.[258] Once the pandemic finally comes to an end, the Thai government could apply lower interest rates, making investments more profitable. This may lead to a boom in renewables investment after COVID-19.[259] In the long term, the recovery of the economy and growing demand for electricity will continue to make non-hydro renewables resilient with government support. However, natural gas will continue to provide the largest electricity supply share, increasing the gas share through importing LNG.[260]

Although biofuel demand decreased slightly in the transport sector, the production has increased, showing resilience in the short term. The key reason is the government requirement for biodiesel's additional mandatory use and the government incentive price subsidy. In the renewable electricity sector, contracts that have already been signed are immediately executed once safety is ensured. Therefore, in the short term, it is the government support that has made renewable energy fairly unaffected by COVID-19.

11

Vietnam

Overview — Vietnam

Energy mix before the pandemic

- The share of coal in the primary energy mix has been rising.
- The share of non-fossil fuels in the electricity generation mix has been increasing but is highly dependent on the quantity of hydropower available in the wet season.
- The share of non-hydro-renewables has been rising rapidly.
- Growth in the use of biofuels has been slower than planned.

Energy mix and investment during the pandemic

- Period of lowest electricity demand: June–August 2020.
- The share of non-fossil fuels in the electricity mix rose during the period of lower demand due to the availability and dispatch of hydro.
- Investment in new renewable energy capacity slows due to supply chain problems.

Economic recovery plan and new energy policies

- The economic recovery plan is not notably green.
- New policies have been issued to support solar and wind energy.
- However, the construction of coal and gas-fired power plants continues.
- The government has taken steps to boost the use of ethanol in transport.

Outlook for renewable energy

- Investment in new renewable energy capacity will continue growing, but so will that for thermal power.
- It is not clear whether the share of non-hydro renewable electricity will grow or not.
- The blending percentage of ethanol should increase, depending on the overall demand for gasoline.

11.1 Policies and energy mix before the pandemic

Vietnam is a lower middle-income country with a per capita GDP (PPP) in 2019 of US$8,374.[261] Since the year 2000, real annual GDP growth has averaged 6.5 per cent , fluctuating between 5.0 per cent and 7.5 per cent .[262] In other words, the size of the economy has grown more than three-fold over 19 years. The service sector and industry are driving this economic growth.[263]

These two decades of sustained economic growth resulted in annual commercial primary energy consumption rising 5.5-fold,[264] reflecting a dramatic increase in energy intensity as the country industrialised and modernised. Fossil fuels provide about 85 per cent of Vietnam's commercial energy. Coal continues to dominate the primary energy supply, reaching a high of 50 per cent in 2019. Declining domestic reserves of coal and rising extraction costs have forced the country to switch from being an exporter to a net importer of coal in 2015.[265] Oil accounts for more than 25 per cent of energy consumption. The share of natural gas in the energy mix declined steadily to 8.6 per cent in 2019 as domestic reserves are exhausted. The percentage of hydroelectricity fluctuates between 15 per cent and 20 per cent depending on the weather. At the Paris Conference of the Parties (COP 21), Vietnam in its Nationally Determined Contribution pledged to reduce greenhouse gas emissions by eight per cent over 2021–2030 compared to business as usual. With international support, this could be raised to 25 per cent .[266]

Electricity consumption has been rising at an average annual rate of about eleven per cent for more than ten years. Most of this growth has been supplied by domestic coal-fired and hydroelectric plants, with natural gas playing a steadily declining role. The desperate need for additional supplies of power, the difficulty in securing finance for coal-fired power plants and public anger at growing air pollution has forced the government to take two significant steps. First, it gave the go-ahead to construct several LNG import terminals to feed gas-fired power stations, with the first terminal due to be commissioned in 2021.[267] Second, it began vigorously promoting the installation of utility-scale solar energy capacity.

In support of solar PV, the government provided a feed-in tariff of USc9.35/kWh, available until the end of June 2019.[268] The grid company is also required to connect, dispatch and purchase renewable energy.[269] These policies boosted solar PV's installed capacity from 106 MW at the end of 2018 to 5.7 GW at the end of 2019.[270] Investment in wind energy proceeded much more slowly due to a combination of approval delays and an unattractive feed-in tariff of USc7.8/ kWh for both onshore and offshore installations.[271] As a result, only 375 MW of wind energy capacity was in place by the end of 2019.

Nevertheless, solar and wind energy contributed 2.1 per cent of the nation's power supply in 2019, up from 0.2 per cent in previous years (Table 11.1). The share could have been higher had it not been for curtailment due to a lack of grid capacity to transmit the power away from the southern part of the country where the solar PV installations were concentrated.[272] At the same time, dry weather constrained the availability of hydroelectricity that year.[273] As a result, the output of coal-fired power rose by 35 per cent and accounted for nearly 50 per cent of national supplies in 2019. Meanwhile, the share of fossil fuels in the power mix increased from 60 per cent in 2018 to 69 per cent in 2019.

Vietnam's efforts to develop a biofuel industry dates back to 2007 and had the goals of reducing both air pollution and dependence on imported oil. The government introduced several policies to support scientific research and technological development, build a domestic biofuel production industry, and promote investment, both domestic and foreign.[274] These were followed by a roadmap issued in 2012 to introduce E5 gasoline (5% ethanol) in December 2014 and E10 (10% ethanol) in December 2016. To accelerate the uptake of E5 RON92, in 2017 the government issued a ban on the sale of fossil RON92 from January 2018.[275] This resulted in a surge of E2 RON92 in 2018 when it accounted for about 40 per cent of all gasoline sales. However, sales fell

by 30–35 per cent the following year.[276] Reasons for the sharp decline included: the small consumer price difference between E5RON92 and RON92; consumers' distrust of E5 RON92; the high cost of cassava-based ethanol; and a shortage of domestic production capacity due to technical and financial difficulties at some of the biofuel factories.[277] As a result of the domestic production constraints, the country imports significant quantities of fuel ethanol from the USA as well as from South Korea (probably transhipped from the USA).[278]

Table 11.1. Power generation mix in 2017, 2018 and 2019[279]

Fuel	2017		2018		2019	
	TWh	%	TWh	%	TWh	%
Coal	74.3	*39.1%*	83.9	*40.1%*	112.5	*49.5%*
Gas	44.4	*23.4%*	40.1	*19.2%*	43.1	*19.0%*
Oil	0.8	*0.4%*	0.2	*0.1%*	1.4	*0.6%*
Hydro	70.2	*36.9%*	84.5	*40.4%*	65.6	*28.9%*
Renewables	0.4	*0.2%*	0.5	*0.2%*	4.7	*2.1%*
Total	**190.1**	*100.0%*	**209.2**	*100.0%*	**227.3**	*100.0%*
Non-fossil fuel	70.6	*37.1%*	85.0	*40.6%*	70.3	*31%*

11.2 Energy mix and investment during the pandemic

The relative effectiveness of Vietnam's management of the pandemic prevented the economy from falling into recession. However, GDP growth declined from an average of 6.0 per cent in 2019 to 3.68 per cent in the first quarter of 2020 and to 0.39 per cent in the second quarter before picking up to 2.62 per cent in the third quarter. However, average monthly electricity consumption remained steady in the first five months of 2020 but declined sharply from June to August (Table 11.2.a).

When assessing the power mix in 2020, it is probably not valid to compare it with the first half of 2019 as many of the new solar PV installations were not operating throughout that period. Instead, it is more useful to compare with the second half of 2019. This shows that non-hydro renewable energy increased its share from 3.3 per cent in the second half of 2019 to 4.9 per cent in the first quarter of 2020. This was before declining to 4.3 per cent in the period June to August 2020. This latter period of the year saw a surge in hydropower share in response to seasonal rains. However, monthly electricity consumption was lower than earlier in the year, and there was a sharp decline in the share of coal (Table 11.2.b). The higher percentage of non-hydro renewables in 2020 compared to 2019 may be due to increased installed capacity in the second half of 2019. Nevertheless, the sharp rise in the share of the hydro and concomitant decline in coal share shows that the mechanisms to support low-carbon electricity consumption were operating effectively.

The disruption of supply chains in China slowed the construction of new renewable energy installations. Nevertheless, the Trungnam Group managed to complete the construction of the 450 MW Trung Nam Thuan Nam solar PV plant in Ninh Thuan province in October 2020, just 102 days after financing was agreed. This is probably the largest PV plant in the country.[280]

Table 11.2.a. Power consumption mix in different periods between 2019 and 2020[281]

Fuel	1H 2019	2H 2019	2019	1Q 2020	April–May 2020	June–Aug 2020
Coal	60.1	52.4	112.5	33.9	24.19	19.1
Gas	22.8	20.3	43.1	9.5	6.5	5.8
Oil	0.7	0.66	1.4	1.0	0.03	0
Hydro	29.8	35.7	65.6	8.9	6.82	17.4
Renewables	1	3.7	4.7	2.8	1.79	1.89
Total	**114.5**	**112.7**	**227.3**	**56.1**	**39.33**	**44.19**
Non-fossil fuel	30.8	39.4	70.3	11.7	8.61	19.29
Monthly consumption	*19.1*	*18.8*	*18.9*	*18.7*	*19.7*	*11.0*

Table 11.2.b. Shares of different fuels for power generation in different periods of 2019 and 2020

Fuel	1H 2019	2H 2019	2019	1Q 2020	April–May 2020	June–Aug 2020
Coal	52.5%	46.4%	49.5%	60.5%	61.5%	43.2%
Gas	19.9%	18.0%	19.0%	16.9%	16.5%	13.1%
Oil	0.6%	0.6%	0.6%	1.8%	0.1%	0.0%
Hydro	26.1%	31.7%	28.9%	15.9%	17.3%	39.6%
Renewables	0.9%	3.3%	2.1%	4.9%	4.6%	4.3%
Total	**100%**	**100%**	**100%**	**100%**	**100.0%**	**100%**
Non-fossil fuel	27.0%	35.0%	31.0%	20.8%	25.10%	43.90%

11.3 Economic recovery plan and new energy policies

Vietnam's government implemented several fiscal and monetary policies to ease the pandemic's impact on households and businesses.[282] Its longer-term recovery plans have revolved around continuing to attract foreign direct investment and reinvigorating exports. The level of new foreign investment in the first nine months of 2020 was just 19 per cent below that in the same period of 2019, whereas actual foreign investment funds dispersed were only four per cent down. As in 2019, manufacturing and processing received the largest share of foreign investment, followed by energy, retail and wholesale, and real estate. The government aims to shift from low-tech to high-tech products.

Although the economic recovery plan is not distinctively green, the government has issued several reports and made several critical decisions to continue promoting renewable energy investment. In October, it announced that it plans to double the output of renewable energy power sources by 2030. Whilst the main aim is to satisfy the ever-rising demand for electricity, it will also help constrain the rise of carbon emissions.[283]

To revitalise investment in wind energy, the government raised the target for installed capacity from 4,800 MW to 11,630 MW by 2025. This was accompanied by an increase of feed-in tariffs to USc8.5/kWh for onshore installations and USc9.8/kWh for offshore. A report also recommended that the end date for these feed-in tariffs be extended from November 2021 to December 2023, but with a lower tariff level. From then on, auctions will be used. The strategy also included plans to ensure that the grid was developed to connect all the projects.[284] Formal approval for 7,000 MW of projects was granted in June 2020.[285]

In April 2020, the government announced continuing support for solar energy but more discriminatingly than before. The earlier USc9.35/kWh tariff will only apply to projects already approved in the southern province of Ninh Thuan. Grid-connected, ground-mounted, and floating solar installations will receive USc7.69/kWh and USc7.09/kWh respectively, provided they were approved before November 2019 and are in commercial operation by the end of 2020. Rooftop solar projects that sell to the grid and are operating by the end of 2020 will receive USc8.38/kWh.[286] Disruption to solar PV supply chains in China due to the pandemic makes these deadlines very challenging. As with wind energy, future tariffs for solar energy will be determined by auction.[287]

Once the economy returns to its earlier rates of growth, electricity shortages are likely to return. These will be exacerbated if manufacturers continue to relocate to Vietnam from China.[288] Despite the aggressive promotion of renewable energy, coal may remain the core fuel for the economy in general and power generation for some time to come. A total of 7,000 MW of new coal-fired capacity was due to be commissioned by 2020. However, all the projects have been delayed.[289] Whilst many multinational organisations and banks have decided to stop financing coal-fired power stations, the Export-Import Bank of Korea has agreed to provide loans and guarantees for a 1,200 MW plant in northern Vietnam.[290] Meanwhile, the government continues to push ahead with planned LNG import terminals linked to power plants[291] and the possibility of restarting the nuclear power programme is under consideration.[292]

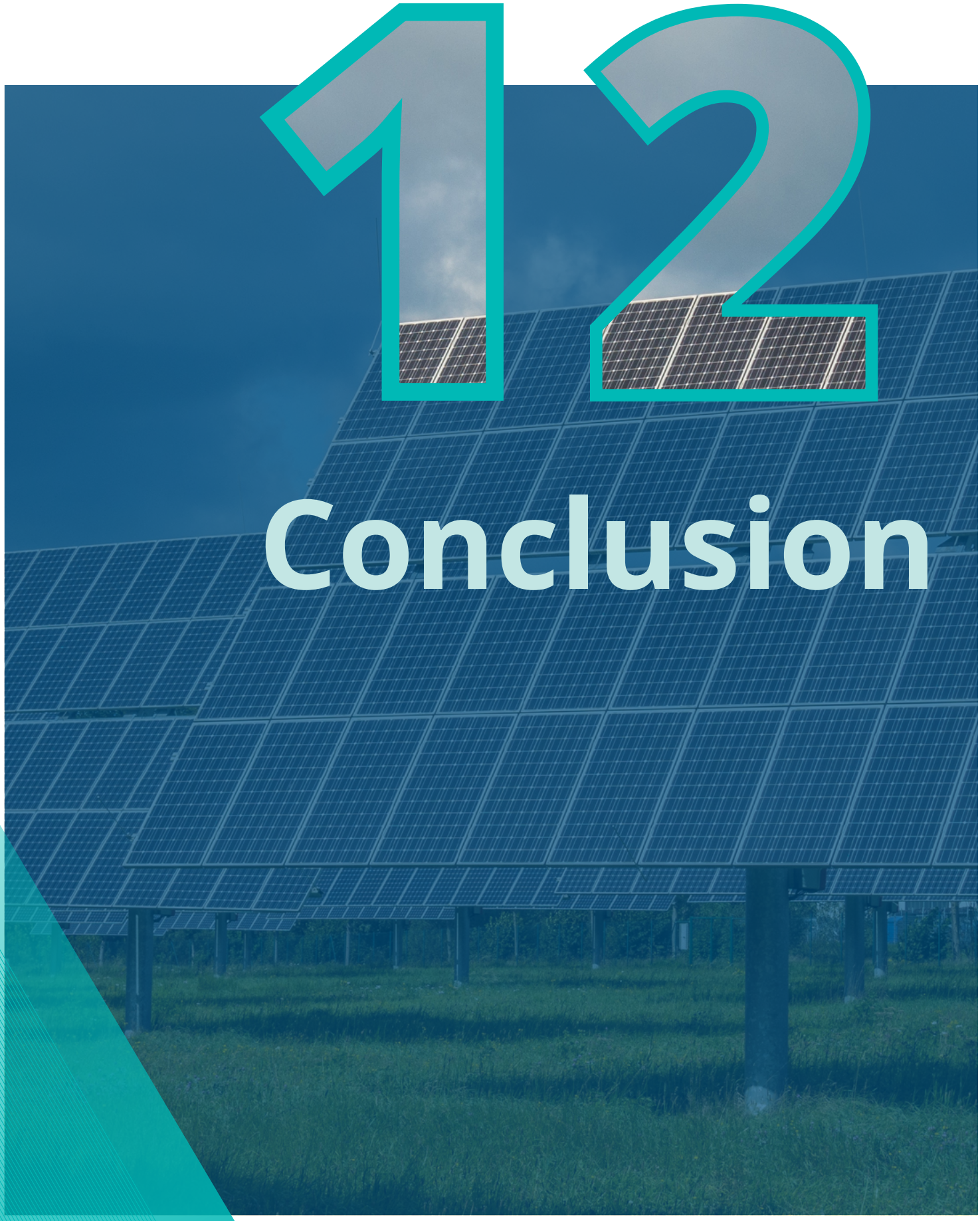
The government has also been trying to boost the consumption of biofuels after the decline in 2019. In May 2020 the Prime Minister signed a decree that reduced the import tariff on fuel ethanol.[293] Later in the year, Vietnam and the US signed a memorandum of understanding to further enhance ethanol fuel use in Vietnam through technical assistance and export.[294] These steps should boost the opportunity for US ethanol producers and assist the government to meet its goal of supplying E10 across the country.

11.4 Overall conclusion

In the two years before the COVID-19 pandemic, Vietnam had become one of the most active countries in Southeast Asia in regard to the installation of non-hydro renewable energy capacity, notably solar PV. This was principally due to generous feed-in tariffs and a requirement of the grid company to connect, dispatch and purchase renewable energy. Nevertheless, the level of curtailment was high due to a shortage of grid capacity. During the first eight months of 2020, the share of non-hydro renewable energy in the electricity mix was higher than in the second half of 2019. This may have been the result of new capacity coming online in late 2019. What is more notable is that hydropower's share increased dramatically at the expense of coal-fired power in June–August when the seasonal rains arrived.

The economic recovery plan aims to boost foreign investment, notably in manufacturing and processing. But it lacks any robust green features. During 2020, the government pushed forward with new policies to support both solar and wind energy. The most significant potential for new capacity lies with offshore wind, but feed-in tariffs' reduction may deter investors. Numerous coal-fired plants are also under construction. In the future, LNG imports to feed power stations will reduce the dependence on coal. Still, fossil fuels are likely to continue dominating the electricity mix for many years to come, assuming that the economy continues to grow as the government hopes.

The outlook for biofuels looks more positive than in recent years after moves that should boost ethanol imports from the US. However, with oil demand continuing to rise at 4–5 per cent per year, considerable effort will be needed from the government to boost biofuels' share in the transport fuel mix substantially.



12 Conclusion

This study has assessed the short- and longer-term resilience of renewable energy to the COVID-19 pandemic relative to fossil fuels during the first nine months of 2020 in seven populous, middle-income Asian countries. The study focused on renewable electricity and biofuels for transport.

In brief, renewable sources of electricity increased their share of the generation mix during periods of lower demand in most of the countries studied. However, the construction of new capacity was interrupted by the pandemic. The longer-term outlook for non-hydro renewable electricity varies between countries. There was little useful data on any changes in biofuel blending percentages during periods of low demand in terms of biofuels. Similar to renewables, its future trajectory differs between the countries. In none of the countries studied was the government's economic recovery plan notably green.

Before the pandemic stuck in early 2020, fossil fuels accounted for 85 per cent or more of the primary commercial energy mix in all the countries studied (Table 12.1). This share had been declining except in the Philippines where it had been rising and in Vietnam where it had been relatively steady. Coal and oil were the dominant fuels, except in Malaysia and Thailand, where natural gas plays an important role.

Coal has long been the dominant fuel for generating electricity, with shares in 2019 ranging from 50 per cent in Vietnam to 80 per cent in Malaysia. Thailand was an exception where natural gas was the primary feedstock. The share of non-fossil fuels in the generation mix was highest in China and Vietnam at 31 per cent and the lowest in Indonesia at twelve per cent. This percentage has been increasing in all the counties except for Indonesia and Malaysia where the proportion is relatively stable and in Vietnam where it fluctuates depending on hydropower availability. The Philippines has the largest share of non-hydro renewable energy in its generation mix at 15 per cent . Among the lowest are Indonesia and Malaysia both with five per cent and Vietnam with two per cent. Conversely, the proportion of non-hydro renewables in the generation mix has been rising in all cases due to supportive policies, except for Indonesia.

Table 12.1 Approximate shares of fossil fuels in the primary commercial energy consumption mix and non-hydro renewables and non-fossil fuels in electricity generation, and trends 2017-2019

	Fossil fuel in primary commercial energy consumption		Non-hydro renewable electricity generation		Non-fossil fuel electricity generation	
	Share % 2019	Trend 2017–2019	Share % 2019	Trend 2017–2019	Share % 2019	Trend 2017–2019
China	85%	-ve	10%	+ve	31%	+ve
India	90%	-ve	10%	+ve	25%	+ve
Indonesia	95%	-ve	5%	=	12%	=
Malaysia	90%	-ve	5%	+ve	17%	=
Philippines	90%	=	15%	+ve	21%	-ve
Thailand	95%	-ve	11%	+ve	15%	+ve
Vietnam	85%	+ve	2%	+ve	31%	+/-ve

Positive (+ve), negative (-ve), steady (=), fluctuating

In response to the pandemic, the governments of all the countries implemented restrictions on activity and movement. These restraints varied in intensity and timing between the countries and, in some cases, within countries. However, in all cases, they led to the decline of economic activity, as well as demand for electricity and liquid transport fuels. This has provided an opportunity to assess the short-term resilience of renewable energy, for if suitable policies and systems are in place the share of renewable energy should increase during a decline in demand at the expense of fossil fuels.

In the case of electricity, sufficient data were publicly available to assess the change in share on non-fossil fuel and non-hydro renewables in the electricity generation mix during the period of lower demand. However, such estimates are approximate for the following reasons:

- The periods for reporting generation mix generally do not precisely match the periods of maximum economic decline.
- Most forms of renewable energy are seasonal, and therefore, it is necessary to compare 2020 data with the same period in 2019. Even then, there will be annual climatic differences for the same time of year.
- Any significant new renewable energy capacity commissioned in the second half of 2019 might alone boost the share of non-fossil and non-hydro renewable energy in the generation mix.

Considering these limitations, the available data suggest that the share of non-fossil fuel electricity generation (mainly utility-scale) increased by a few percent in five of the seven countries studied (Table 12.2). The most pronounced rises were in India and the Philippines. In all the countries studied, the share of non-hydro renewable electricity increased during periods of lower demand. These successes resulted from purchase obligations imposed on the grid companies or in Malaysia's case, a least-cost dispatch rule. In some countries, the higher share of non-hydro renewables may be attributable in part to an increase of installed capacity in the second half of 2019. Thus, both non-fossil fuels and non-hydro renewable electricity displayed a moderate degree of resilience in the period of lower demand caused by the pandemic. The exceptions were Vietnam, where the positive change could not be quantified with any confidence, and Thailand, where the share declined because less hydropower was generated.

However, in those cases with the relevant data (China, India, Philippines), these gains were quickly offset once the economies started to recover and electricity demand rose. In all cases studied, the construction of new non-hydro renewable electricity generating capacity slowed down or halted due to a combination of movement restrictions and supply chain disruptions.

Table 12.2. Summary of changes in shares of non-hydro renewable electricity generation and non-fossil fuel electricity generation during the period of lower demand

	Non-hydro renewable electricity generation		Non-fossil fuel electricity generation	
	Change in share % year on year	Explanation	Change in share % year on year	Supplementary Explanation**
China	+ 1.4%	Purchase obligation & increased capacity in 2019	+5.4%	
India	+2.4%		+6.3%	
Indonesia*	+0.4%		+2.8%	
Peninsula Malaysia	+ve***	Least cost dispatch & increased capacity in 2019	+3.2%	
Philippines*	+2.3%	Purchase obligation	+2.0%	
Thailand	+0.9%	Purchase obligation	-ve	Less hydro
Vietnam*	>+1.0%	Purchase obligation & increased capacity in 2019	+ve	

All estimates are approximate
*Detailed data across time periods in 2019 and/or 2020 are not available.
** Explanation supplements for non-hydro renewable electricity.
***Data were available only for selected solar PV plants.

Data on changes in proportions of biofuel blending in transport fuels during the pandemic were not available. In most of the countries studied, the absolute quantity of biofuel declined along with the falling consumption of liquid transport fuels. Only in India was it reported that blending persisted at an increasing rate. The absence of an increase in biofuels' share can probably be attributed to their generally high cost compared to gasoline and diesel and the disruption of supply chains. This is not unexpected given the low level of international oil prices during 2020.

In contrast to some European countries, none of the governments studied framed their economic recovery packages as being "green" in Asia-Pacific. This is understandable because the immediate priority was to protect livelihoods and support healthcare. Nevertheless, many Asian states announced new energy policies or visions. The most notable of these was China's pledge to achieve carbon neutrality by 2060. However, this seemed to be in tension with a call to further develop self-sufficiency in energy supply that would require increased coal, oil, and natural gas production.

In several countries (India, Malaysia, Philippines, Thailand, Vietnam), governments declared continuing support for renewable energy, but at the same time called for additional thermal generation capacity — with a gradual switch from coal to gas in Malaysia and Thailand. Therefore, it is not clear how fast the share of renewable energy will grow in these countries. The outlook for renewable electricity in Indonesia is even more uncertain — the coal industry and coal-fired power generation continue to receive strong support from many quarters. A critical factor in all the countries studied will be the extent to which national policies requiring the dispatch of low-carbon electricity are rigorously enforced.

For these reasons, it cannot yet be said that the pandemic will have enhanced the share of electricity from non-fossil fuels or non-hydro renewable sources above pre-existing trends in the countries studied. That is not to deny that governments might reconsider their strategies for electricity supply once the worst effects of the pandemic are past.

Finally, the resilience of policies in support of biofuel use in the transport sector appears to vary. China has abandoned national biofuel mandates and targets. It delegated the issue to local governments. Likewise, the Philippine government does not have concrete plans to prioritise biofuels over fossil fuel. In the other countries studied, biofuel blending is likely to increase as planned once economies return to normal. However, the cost of biofuels relative to oil products will remain a constraint.

Governments will encounter competing tensions in formulating and implementing their energy policies in nearly all the countries covered by this study. They will continue to face international and domestic pressure to switch to cleaner energy sources to constrain rising carbon emissions and air pollution. Opposing pressures will come from the need to boost national energy supply as fast as possible, from interest groups in the fossil fuel industry keen to sustain their economic dominance, and from wider society seeking affordable supplies of energy which has traditionally been from fossil fuels.

As non-hydro renewable electricity sources' costs continue to decline, it is incumbent on national governments in the region to put in place and enforce credible policies to support the deployment and dispatch of renewable energy, both utility-scale and off-grid. Such measures can be market-based or administrative, or both, depending on national circumstances. Where relevant, these should be supplemented by the development of regional grids to transmit renewable electricity from areas of surplus to those in deficit. In the long term, these efforts will support economic growth, emissions reduction, and energy access. Governments will also need to reinforce policies which support the manufacture and use of biofuels.

These renewable energy programmes will require national governments to co-opt traditional industry actors as well as local governments and broader society. Governments will also need to support new actors along the supply chain for renewable energy. However, obstacles to accelerating the advance of renewable energy will be substantial in some countries of the region. The persistence of the COVID-19 pandemic will further deplete government funds available to provide price support, companies will be more indebted, demand for additional energy supply may be lower than previously expected, and governments will continue to focus their attention on economic growth, livelihoods, and healthcare. Sustained low oil prices will undermine efforts to boost the use of biofuels.

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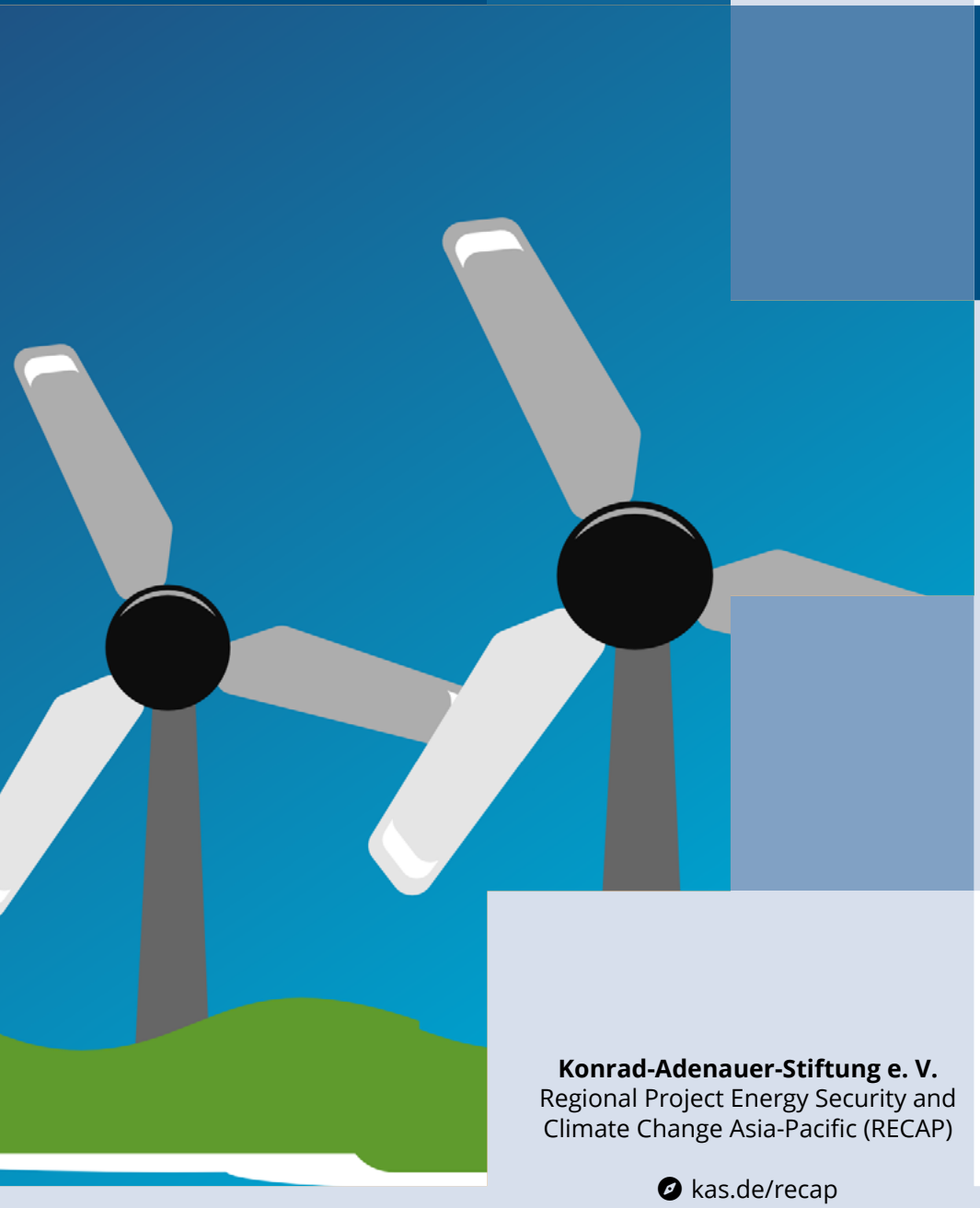

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