Assessing the Impacts of COVID-19:

Regional Policies and Practices for Green Recovery

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National Library of Indonesia Cataloguing-in-Publication Data
ISBN: 978-602-5460-38-8

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Cover Art and Book Design by Alief Aurum
Layout by Fadriani Trianingsih and Rachmadea Aisyah

Published by
Economic Research Institute for ASEAN and East Asia (ERIA)
Sentral Senayan 2, 6th floor,
Jalan Asia Afrika no.8,
Central Jakarta 10270
Indonesia

Published in June 2022

FOREWORD

Asia's historical development is at a crossroads. Twenty months into the coronavirus disease (COVID-19) pandemic, the cumulative economic and financial impacts are estimated to be much worse than those of the 2008 global financial meltdown and the 1997 Asian economic crunch. Several projections express doubts as to whether Asian countries, which have been progressively integrated into the global economy, can continue to grow at the pace they have enjoyed for more than 3 decades, in the aftermath of the pandemic. The deceleration of the region's economic growth cannot simply be ignored, given the complex nature of the pandemic containment measures as well as its impacts on the industrial production structure and the economics of sustainable development.

Countries in the region differ widely in terms of development stage, health infrastructure provision, and level of economic integration. As the number of countries in the Association of Southeast Asian Nations (ASEAN) and East Asia that have reached middle-income status increases, reaching the next stage needs much more creativity in successfully addressing other challenges such as inequality, resilience, and sustainability.

The Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) stated categorically that the planet is heading irrevocably towards warming and that we should aim to keep climate change below pre-industrial levels by the turn of the century. In line with this, 130 countries have set or are considering to meet net zero emission targets. Within the region, Japan and the Republic of Korea have joined the pledge for net zero emissions by 2050 while China aims to achieve net zero emissions by 2060. Singapore has also announced ambitious plans to achieve net zero emissions beyond 2050. Although many ASEAN Member States have yet to set specific targets for net zero emissions, several are working hard to redesign their policies towards meeting the Paris Agreement climate targets, as expressed in the nationally determined contributions (NDCs).

This Economic Research Institute for ASEAN and East Asia (ERIA) book, Assessing the Impacts of COVID-19: Regional Policies and Practices for Green Recovery, reviews and assesses the low-carbon green growth policies and practices of the regional economies and identifies policy gaps and new opportunities. With input from international experts and regional think tanks, this study facilitates forging a regional perspective on net zero transition challenges, options, and issues.

Governments across ASEAN and East Asia have deployed a significant amount of emergency capital in the response to the pandemic, with an initial focus on protecting lives and livelihoods. The pandemic has its own global economic impacts but has also created a once-in-a-generation

opportunity to implement difficult domestic reforms towards a sustainable future that will simultaneously require technology, regulatory policy, and financing innovations. One should never let a good crisis go to waste. In this regard, this book proposes three key points of action.

First, clear and long-term policy frameworks are needed in the post-COVID-19 era as part of the stimulus recovery. This will send the right market signals and help speed up the development and uptake of low-carbon, resource-efficient, and carbon capture and utilisation (CCU) technologies.

Second, investment must be scaled up. Mobilisation of the private sector – including development banks, institutional investors, and bond markets – is crucial to the financing of low-carbon green growth initiatives. Public financing and development aid are also critical for leveraging private capital and meeting the Paris Agreement climate targets.

Third, stronger regional cooperation is needed to share knowledge, technology, and finance effectively and to coordinate action – leading to the effective implementation of strategies such as the ASEAN Comprehensive Recovery Framework.

As an international organisation and a strategic knowledge partner, ERIA provides policy support to the East Asia Summit countries on low-carbon initiatives in a range of sectors, including energy, transport, waste management, and agriculture. It promotes knowledge sharing by holding conferences, policy dialogues, and workshops; and by conducting research studies on the technical, economic, and legal standards of emerging technologies and the taxonomy of financing instruments. Holding capacity building and training workshops to bridge the knowledge gap amongst policymakers and the private sector is one of ERIA's most important contributions. As countries around the world struggle to repair their battered economies, resetting policy measures during the pandemic recovery towards an inclusive low-carbon green growth path is more than a climate response – it is essential in scaling up actions towards sustainable economic development.

I hope this book will encourage policymakers and practitioners who are considering and evaluating important policy options for building a better future for the citizens of this region. The book will also serve as a valuable knowledge resource for those seeking a comprehensive overview of low-carbon green growth initiatives in ASEAN and East Asia.

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Introduction

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Economic Research Institute for ASEAN and East Asia

Chapter 1: Introduction

1. Navigating the COVID-19 Uncertainties and Unknowns

The developing and advanced economies of the world have been structurally transformed by the COVID-19 crisis. Eighteen months into the crisis, the cumulative economic and financial impacts were estimated to be much worse than that of the 2008 global financial meltdown (Engstroem et al., 2020). Several projections (Agarwala, 2020; UNEP, 2021) have also expressed certain levels of doubt over whether Asian countries, which are progressively integrated into the global economy, could continue to grow at the pace they have previously enjoyed for more than 2 decades, in the aftermath of COVID-19. The deceleration of the region's economic growth cannot simply be ignored given the complex nature of the pandemic itself and the containment measures, as well as its impacts on supply and demand potential, production structure, and the economics of sustainable development. There are wide differences between countries in terms of their developmental stages, health infrastructure, and economic integration. As the number of countries in the Association of Southeast Asian Nations (ASEAN) and East Asia that have reached the middle-income status is increasing, reaching the high-income status needs more creativity in industrial restructuring for successfully addressing the challenge of growing inequalities within countries.

The Intergovernmental Panel on Climate Change's Sixth Assessment Report (IPCC, 2021) has categorically stated that the planet is irrevocably heading towards warming by 1.5°C in the next 2 decades. Keeping global warming below pre-industrial levels by the turn of the century was at the heart of the Paris Climate Agreement. Unchecked, and combined together with the pandemic, climate change will push 200 million people into poverty over the next 10 years, undoing the hard-won development gains of the last 3 decades (World Bank, 2021). Unless extremely deep emission cuts are undertaken by all countries immediately, climate goals are unlikely to be met by 2030. In line with this, the same IPCC report has recommended that countries strive towards net zero emissions by 2050. Achieving net zero emissions means that no additional greenhouse gases were emitted by that year. As of mid-2021, 52 countries and the European Union have pledged to meet net zero emissions targets. In total, they account for around 70% of today's global gross domestic product (GDP) and carbon dioxide (CO_2) emissions. In the Asia-Pacific region, Japan and the Republic of Korea (hereafter, Korea) have joined the pledge for net zero emissions by 2050, whilst China aims to achieve net zero emissions by 2060. Singapore has also announced ambitious plans to achieve net zero emissions beyond 2050. Although many ASEAN Member States (AMS) have yet to set any specific targets for net zero emissions, several of them are working hard to redesign their policies towards meeting the Paris Climate Agreement targets, as expressed as nationally determined contributions (NDCs).

As countries around the world rush to repair their pandemic-battered economies, policymakers must decide what type of economic recovery they want to promote. Resetting policy measures during the pandemic recovery towards a low-carbon economy is critical

for three reasons. First, all countries need to resume the battle against climate change that was interrupted by the COVID-19 pandemic. Heatwaves, droughts, floods, and cyclones have become more intense and frequent in developing countries. Recent research (IPCC, 2017) has found that the impacts of climate change on agriculture, tourism, energy demand, and labour productivity will collectively result in a loss of about 8%–11% of the world's combined annual economic growth by the end of the century. Second, stimulus policies combined with appropriate skill development programmes can generate more jobs in low-carbon sectors, such as renewable energy and resource-efficient services development. For example, Garrett-Peltier (2017) and Engstroem et al. (2020) found that every US$1 million spent on renewable energy created 7.5 full-time jobs and every US$1 million spent on energy efficiency created 7.2 full-time jobs, which is significantly more than the 2.7 jobs generated from the same investment in fossil fuels in the 2008 financial stimulus packages. Third, policies that support internalising externalities, such as carbon pricing, can strengthen the long-term competitiveness of industries in developing countries that cater to the needs of consumers in advanced economies, who increasingly demand climate-smart, environment-friendly products (WEF, 2020; Cable, 2016). Setting the right policies would also ensure foreign direct investments from the growing number of multinational companies that have made public commitments to move towards a net zero future (ETC, 2020). However, the economic recovery measures announced by several economies have not been well harmonised to combat climate change and achieve co-benefits, such as job creation and social inclusion (Vivid Economics, 2021). Placing these countries on a low-carbon green growth pathway requires coordinated risk mitigation policies and investment enablers. Pandemic plans will also need to carefully factor in addressing existing inequalities and vulnerabilities in countries, now further exacerbated by COVID-19 impacts.

Governments across ASEAN and East Asia have deployed a significant amount of emergency capital in response to the pandemic, with an initial focus on protecting lives and livelihoods. Further, the linkages between health impacts and climate change are becoming more evident. The pandemic has its own impacts, but it has also created new, once-in-a-generation opportunities for implementing hard reforms towards green growth that will require simultaneous technology, regulatory policy, and financing innovations, as well as sector-specific actions to tackle climate change and maintain the competitiveness of industries.

The European and Korean pandemic recovery packages provide a basic framework for low-carbon green growth with the core components being the promotion of low-emission and pollution abatement technologies and climate-resilient infrastructure in addition to leveraging public and private finance to invest in clean energy and infrastructure. The European Green New Deal type stimulus packages and their variants for economic recovery involve a comprehensive range of measures and initiatives to speed the transition of the economy and society towards a low-carbon and resilient future. These include a range of reforms to taxes and subsidies; tax credits and incentives for investment in renewables and low-carbon technologies; enhancing electricity network connections; incentivising the uptake of electric vehicles and the installation of charging stations; clean energy infrastructure and energy-efficient buildings; sustainable agriculture; upgrading the resilience of existing infrastructure to severe weather events; improving climate change-related disaster

preparedness; leveraging investment and lending for supporting the transition to a low-carbon economy; education, training and research and development focused on green growth; and the development of standards, codes, and regulations that support this transition.

Hence, a number of obstacles stand in the way of the effective implementation of a green recovery. Amongst the most important is the fact that existing policy frameworks and economic interests continue to be geared towards the conventional economic growth pattern, which is always coupled with increased carbon emissions. Inadvertently or not, this creates misalignment between existing regional policy frameworks, such as the ASEAN Economic Community (AEC), Regional Comprehensive Economic Partnership (RCEP), ASEAN Plan of Action for Energy Cooperation (APAEC), hindering the progress towards meeting global commitments such as the Paris Climate Agreement and the 2030 Agenda. The urgency for addressing climate change also requires ambition and the coordination of economic recovery policy responses, but in practice, there is no single standard to judge the adequacy of existing commitments and the design of recovery packages.

However, the ways in which economic recovery packages, new policy commitments, and technological change have produced real changes towards decarbonisation during the pandemic period is central to the future of sustainable economic growth. The level of commitment to fighting climate change and accelerating green growth has never been higher, but for the moment there remains a visible gap between growing carbon emissions and the needed investment and policy reforms. This book explores how and when this aspirational gap might be narrowed in the aftermath of the pandemic. The individual chapters, which are basically country-level assessments of the pandemic responses, are based on three major questions: First, how rapid and widespread is the economic recovery, given the different rates of vaccination and the spread of the virus, and are the policies and investment coming through to make it a sustainable one? Second, how close do the current economic recovery packages get the region towards the target of limiting global warming, whilst accelerating economic growth? Third, what more needs to be done, and which parts of the economic system need focus in terms of changes in the energy mix, technologies, capital, and trade flows across the border?

2. Guiding Questions for the Regional-level Assessment of the Pandemic Impacts and Recovery

There are different lenses through which to view the social impacts, economic recovery, and decarbonization in the post-pandemic era. A near-term perspective market for low-carbon goods and services could be tied with uneven recovery from the COVID-19 pandemic, which – in the absence of sufficiently rapid changes in the way that we use and consume energy and raw materials – is pushing up demand not only for renewables but for all sources of energy, and is leading to a rebound in prices and in CO_2 emissions. An alternate view comes from the increasingly ambitious pledges to curb carbon emissions that are being made by governments both national and local, companies, financial institutions, and others as the world prepares for a crucial 26th meeting of the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP26) in Glasgow. If and when implemented, the new pledges, such as the ASEAN Comprehensive Recovery Framework (ACRF) will have profound implications for the transition in the future, reinforcing

and accelerating the rise of a range of low-carbon technologies and financing channels. In addition, economically integrated AMS are keenly aware of the co-benefit opportunities associated with regional cooperation arrangements, such as the ASEAN Power Grid, without which they would risk being locked into high-carbon infrastructure investments.

In ASEAN, China, and India, decoupling economic growth from carbon emissions is a policy goal that is increasingly being prioritised for national benefit rather than as a result of international pressures or concerns. Perhaps more importantly from the perspective of many low- and middle-income countries in the region, the pandemic recovery can support a range of other policy goals, including local environmental protection, poverty alleviation, energy security, economic competitiveness, the development of new industries and jobs, and investment in knowledge and innovation. It is this combination that helps explain the strong interest from many developing countries in greening the industries and low-carbon growth trajectories. The following set of guiding questions was applied for the assessment of the country levels impacts and evolution of economic recovery packages. The government recompenses to the pandemic from March 2020 are categorised into three phases: Phase I – the emergency phase, Phase II – the recovery phase, and Phase III – the sustainable growth phase.

(i) National economies have been transformed by the COVID-19 Pandemic. What are the major impacts and how big and green are the recovery measures?

- Although the COVID-19 pandemic is a public health crisis, the lockdowns have resulted in severe economic impacts (due to demand side and supply side shocks), social impacts (job losses and worsening inequality in income, gender, and other social development dimensions), and environmental impacts (temporary reductions in emissions and pollutions and increased medical waste). What are the compound impacts, multiplicity trends, and close linkages of the impacts during lockdown?

- Most of the emerging and developing economies in the region were on unstainable and vulnerable paths in terms of public finance before the pandemic. Since then, governments across Asia have speedily released sizeable financing for relief and emergency assistance. How big are the economic measures provided in your country during Phase I (emergency)? What are the mechanisms and channels of the delivery and implementation of funds?

- Following immediate action to manage the crisis, policymakers need to design and implement recovery strategies that can support climate actions. How green are the announced recovery and stimulus packages?

(ii) Emerging markets and developing economies are preparing for a post-COVID 19 recovery. What could be the ambitious content of green stimulus packages that can help resuscitate economies, restore employment, and build a low-carbon economy?

- The right investments will need to be fast and labour-intensive in the short run and have multiplier effects and co-benefits in the long run. What are the desirable green investment

and low-carbon policies for your country in Phase 2?

- The quality, content, and strength of medium-term development plans will determine the pattern of inclusive and sustainable growth for decades to come. Therefore, moving onto Phase 3, what will be the desired green investment and low-carbon policies that your country will consider for achieving the 2030 Paris targets and 2050 goal of a carbon-neutral economy?

- There are a range of tools that can help policymakers get the green stimulus right and maximise the factors that are critical to the social well-being of communities. What sectoral-level guidance (public health, waste management, clean energy, and digital infrastructure) could be helpful for the cities/urban context, and where will most stimulus investment take place (in both Phase 2 and Phase 3) to maximise the well-being ?

(iii) Green stimulus packages also need supporting policies to maximise the benefits of inclusive and sustainable growth. What policy reforms and cooperation agreements are critical for a long-term low-carbon transformation in the post-COVID-19 pandemic setting?

- Phase 3 sustainable packages will be set in a difficult macro-fiscal context where economic expansion is necessary but fiscal space is severely constrained in many countries. Can carbon pricing and subsidy reforms provide a source of much-needed revenue, and can they be part of wider policy reforms to restore fiscal sustainability?

- The developing countries of ASEAN will face an extremely challenging situation where all sources of private finance in support of the low-carbon transition are more constrained. What competition and open trade policies in low-carbon technologies and services will unlock international investments and support green growth?

- A range of new low-carbon energy options, such as hydrogen, carbon capturing and utilisation, as well as digital technologies, are emerging but need regional cooperation for scale-up. How can ASEAN countries cooperate amongst themselves and with other advanced economies to drive innovation?

- Some large-scale, low-carbon projects, such as the ASEAN Power Grid, Trans-ASEAN Gas Pipeline, and common energy efficiency standards, have been already underway before the pandemic. However, there are also many small-scale projects that have multiplier effects in terms of the local economy, jobs, climate, and Sustainable Development Goal payoffs and can be implemented under a green stimulus in a faster way. How can countries in the region jointly evaluate the potential of such initiatives and analyse the content of stimulus packages that would also enable them to

share and learn from best practices and avoid mistakes?

The answers to these questions can act as the foundations for long-term, low-carbon green growth only by implementing support packages that maximise the social benefits in the short term and mitigate environmental degradation in the long term. Such measures offer governments a win–win solution. Did the governments choose policy options that reinforce old economic structures, particularly those that will further lock in carbon-intensive development? Or did they see COVID-19 as a once-in-a-generation opportunity to build a better future that significantly improves low-carbon development outcomes? The country-level assessment of the 10 countries or judications (Australia, China, Europe, India, Indonesia, New Zealand, Malaysia, Thailand, Viet Nam, and the United States (US) revealed that the actions taken so far are in between the two extremes.

3. Pandemic Lockdowns and the Economic, Social, and Environmental Impacts

Asia was the first region hit by the COVID-19 virus, which put a strain on its people's welfare, and policymaking for sustainable growth became exceptionally difficult. The impact of the initial lockdowns during the emergency period that started in March 2020 and the later lockdowns during the recovery period to contain the virus caused a decline in the level of output, household spending, corporate investment, and international trade. In particular, consumer expenditure dropped by around one-third in many economies, which far outweighed anything experienced during the global financial crisis in 2008–2009. (OECD, 2020a).

Data on infections, tracing and inoculation are incomplete and do not provide a fully aggregated picture for measuring the net socioeconomic impacts, which vary across countries and their economic jurisdictions. Table 1.1 presents a telling indication of countries' initial responses to the pandemic and the response mechanisms along with other risks.

As the pandemic is far from over, health indicators are still flashing red in many of the studied countries. All 10 of the countries studied have experienced multiple waves of COVID-19 infections, with new variants posing several risks. Overall, most of the advanced economies in the region appear to be on track to getting the virus under control over the course of 2021.

The COVID-19 pandemic and the associated lockdowns took a heavy toll on Asia's labour markets. Unemployment surged, and labour force participation plunged. Job losses that occurred during the emergency and recovery phases were more concentrated in industries with lower wages and amongst women and youth (ILO, 2020). The pandemic's effects on tourism and the associated hospitality sectors, as well as manufacturing industries that require in-person contact, are larger in ASEAN. Accounting for more than 10% of the regional economy and a major employer of youth and women, the tourism sector interconnects several industries with multiple subsectors dependent on its performance. Since March 2020, regional tourism came to a virtual standstill, a major concern for many economies in terms of sustainable recovery.

Table 1.1 Initial Fiscal Responses to the Pandemic and Existing Sustainability Risks

Country	Total Stimulus#		Environmental Performance Index (EPI)	Climate Risk Index for 2020 (CRI)
	US$ Billion	% of GDP		
Australia	191.40	14	74.9	28.00
Brunei Darussalam	-	3.2	54.8	118.00
Cambodia	1,174	1.2	33.6	75.83
China	594	4.1	37.3	42.83
European Union	2,130.20	30	-	-
Tindia	270	10	27.6	18.17
Indonesia	44.1	4.41	37.8	68.17
Japan	2,100	40	75.1	5.5
Korea, Republic of	100	12.8	66.5	76.5
Lao PDR	0.26	2.8	34.8	35.5
Malaysia	59.6	17	47.9	84.3
Myanmar	1.28	2.1	25.1	58.83
New Zealand	58.5	19.5	71.3	53.17
Philippines	11.9	3.2	38.4	11.17
Singapore	66.8	18.3	58.1	125
Thailand	744	3.6	45.4	68.83
Viet Nam	10	3.6	33.4	23.83
United States	2,835.3	11	69.3	26.17*

GDP = gross domestic product.

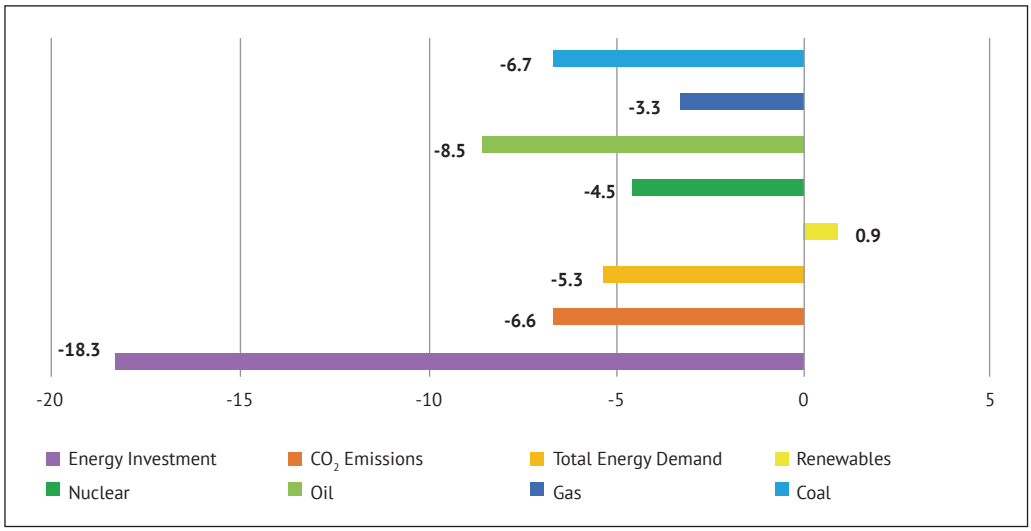
Source: compiled by authors.

The pandemic further became a cause of unemployment in 2021, when it accelerated the migration of low-skilled workers. The resulting higher levels of income inequality have been significant when compared to the 2008 financial crisis (ADB, 2021) . Unlike in the 1997 and 2008 crises, the prospects for global trade to lead countries back to recovery and an immediate bouncing back of employment are still uncertain in the developing countries of Asia. The pandemic is having disproportionate impacts on small and medium-sized enterprises (SMEs) and low-income households, exposing severe gaps in social protection and exacerbating already high inequality in several of the developing countries in Asia.

The success of lockdowns, social distancing, and work-from-home regulations to control the spread of COVID-19 reduced energy demand, especially oil consumption in the transport and production sectors, resulting in a reduction in the percentage of emissions emitted during March–November 2020. The IEA (2020) assessed that total energy demand globally dropped by around 5% in 2020, followed by energy-related CO_2 emissions by 7%. Figure 1.1 shows that the pandemic hit energy investment with a significant drop by 18%. Fossil fuel-based energy demand, notably oil and gas, plummeted significantly by around 8% and 7%, respectively. On the contrary, the contribution of renewables rose slightly.

Forcing people to do their activities from home, the pandemic caused a shift in how people work, travel, and trade, resulting in lower mobility via land and air transportation. One of the positive impacts of the COVID-19 situation was a drop in air pollution in urban areas during the 2020 lockdowns. Studies (Bonardi, et al. 2021; Sannigrahi et al., 2021, Narain, 2020) show that air pollution, particularly PM 2.5 concentrations in major cities like Bangkok, Jakarta, and New Delhi, dropped by around 40% (IEA, 2020) during the initial lockdown. This is an important consideration for decision makers when conducting careful measurements to avoid air pollution returning to the previous levels during the recovery and sustainable growth phases as well as designing post-COVID19 economic recovery programmes.

Figure 1.1 Changes in the Energy Investments and Carbon Emissions in 2020 Relative to 2019



Source: IEA, 2020.

In general, companies and bond markets invested in renewable energy power have outperformed listed fossil fuel companies and public equity market indices during the pandemic. Patenting activity for low carbon energy has, likewise, outstripped that for fossil fuels since 2000, with a new wave of digital technology-supported innovations coming in. Despite the pandemic, record breaking levels of capital have flowed into technology start-ups during the recovery phase, with estimated investment of US$4 billion, exceeding the early-stage equity raised in 2019 (IMF, 2021). Institutional investors are also actively seeking out more low-carbon-related technologies, such as hydrogen, and the geographical spread of companies is more balanced. Whilst the US still accounts for just over half the deal value, Europe was the only major region to increase investment in low-carbon technologies during the pandemic in 2020, and China's share has risen from 3% in 2010 to over 30% in the past 3 years (Agarwala, 2020). Half of the digitally aided low-carbon and energy start-ups founded in 2020 were in the emerging economies

of India, Indonesia, Malaysia, and Singapore. China, Japan, Korea, the European Union, and the US, meanwhile, have made high-level commitments to low-carbon energy R&D and innovation, after framing it as a critical area of technological competition in the coming years.

However, the pace of growth in low-carbon energy or green patents has slowed during the pandemic period. Analysis of the historical data by the World Intellectual Property Organization shows a clear divergence in trends since 2015 between a continued rise in patents for low-carbon technologies and a decline in patenting for fossil fuels compared with a decade ago, a finding that reinforces the call for a new wave of innovation accompanied by concerted policy support.

4. Pandemic exit strategies, economic recovery, and stimulus packages

The COVID-19 pandemic is an unprecedented global health crisis that forced many governments to implement immediate action to contain the virus. In the initial stages of emergency, many governments shifted their priorities and budgetary resources to deal with the health and social security needs. Unprecedented measures to contain the virus, such as lockdowns, travel restrictions, and curbed mobility, resulted in temporary closures of many businesses, created financial market turmoil, and heightened uncertainty amongst investors. On the other hand, the ability of governments to mobilise fiscal support during the emergency and recovery phases through stimulus and recovery packages has determined how households and companies have weathered the immediate risks and shaped the future of low-carbon investment in the post-COVID-19 era.

As of mid-2021, a cumulative amount of US$17 trillion in stimulus support has been provided at the global level (IMF, 2021) for near-term emergency and economic relief. Of this, around US$2.3 trillion has been directed to economic recovery, which is defined as spending that goes to new investments, including spending that could be directed at low-carbon infrastructure (OECD, 2020b) that is also mostly in advanced countries. The support for new low-carbon infrastructure, such as clean and new energy and energy efficiency, is set to be administered over the next few years – 70% of it by 2023 – and along the way it should also leverage additional spending from the private sector. The multiplier effects by country and sector suggest that this should amount to an additional US$1 trillion in sustainable recovery spending over the period to 2023 (HSBC, 2020).

There are huge geographical imbalances within ASEAN and East Asia in terms of their economic recovery packages and stimulus spending (Table 1.2). Governments in the advanced economies of Europe, the US, and Korea have mobilised about US$76 billion a year in public recovery spending for 2021–2023 for low-carbon energy.

The components of the EU Green New Deal by the European Commission include three concrete actions: a Just Transition Mechanism to leverage public and private money, including the European Investment Bank, to help those that are most affected by the move towards the green economy;

delivery of a Sustainable Europe Investment Plan, mobilising €1 trillion in investment for environmentally responsible projects; and a proposed European Climate Law to make the net zero by 2050 commitment legally binding (Baker et al., 2020).

Table 1.2 Covid -19 Impacts and Contents of Economic Recovery Packages (March 2020–August 2021)

Country	Economic Recovery Measures
Australia	
COVID-19 Impacts: First wave was in March 2020 and second wave was in August 2020. It is lower during 2020 but reached to 1,400 people affected in August 2021 **GDP :** -7% in June 2020; -2.4% in 2021. **Unemployment:** 1.3 million jobs lost in April 2020 but recovered. **Fiscal stimulus in 2021:** US$249.7 billion (18.4 % of GDP)	**Emergency phase:** Finance assistance for retaining workers and amendment of credit regulations for avoiding bankruptcy. **Recovery phase:** No special package but included in 2021 budget, under items such as infrastructure investment. **Sustainable growth phase:** No special package but aligned with Technology Investment Roadmap Discussion Paper: hydrogen, energy storage, Carbon Capture and Storage (CCS), etc.
China	
COVID-19 Impacts: The first wave was over in February 2020 and second wave was not observed. **GDP:** dropped in Jan-March but is already above the level of 2019 in July-September. Growth around 2.3% in 2020. **Fiscal stimulus in 2021:** US$710.6 billion (4.8 % of GDP)	**Emergency phase:** Social security reduction, refund of insurance payment Recovery phase: - Six guarantees, including employment, livelihood, food and energy, and industrial supply chain - Tax reduction, cash handouts, infra construction - Local economy supports by local government (fund transfer to local government) **Sustainable growth phase:** - 'Net zero emission by 2060' was announced in September 2021. Its detail was not released. Concrete measures would be a part of next five-years plan - Optimisation of energy structure, transportation, technology innovation, support measures: green finance, carbon market, etc.
European Union	
COVID-19 Impacts: Peak of first wave was between March and April 2020 and second wave started in September 2020. Number of infections varies from country to country. Wave of infections repeated itself in 2021, but new infections decreased in many member countries, after Q2 2021. **GDP:** -6.6% (2020) (EURO currency region) **Fiscal stimulus in 2021:** US$488.3 billion (3.8 % of GDP)	**Emergency phase:** By member states **Recovery phase:** - Green Deal under Multiannual Financial Framework and Next Generation EU: 30% of expenditure is allocated to climate change - By member states: France focusses on manufacturer support and stimulus on buying products like cars. **Sustainable growth phase:** - Green Deal by EU: EU released 'Fit For 55' in July 2021, which includes comprehensive climate policy. - By member states: Germany includes future package in addition to stimulus and crisis management package and international responsibility.

Country	Economic Recovery Measures
India	
COVID-19 Impacts: First wave ended in September 2020, but number of infections increased in 2021 and reached 40,000 people per a day in August 2021. **GDP:** -8.0% (2020) **Emissions:** first drop in 4 decades **Fiscal stimulus in 2021:** US$93.3 billion (3.5 % of GDP)	**Emergency phase:** - Food security system - Economic relief measures (cash and food) - RBI's Finance to banks - Economic package (US$280 billion) **Recovery phase:** - Self-reliant India: (1) economy: (2) infrastructure: (3) system: (4) vibrant demography: and (5) demand **Sustainable growth phase:** No special package. - Potential: Power sector, transportation, industry
Indonesia	
COVID-19 Impacts: Number of infections increased since April 2020 but was lower during 2020. It increased in 2021. New infection reached more than 50,000 in July 2021. **GDP:** -2.1% (2020), modest drop. **Fiscal stimulus in 2021:** US$48 billion (4.5 % of GDP)	**Emergency phase:** - First stimulus (February): cash payments for social assistance, food etc. - Three principles; health/life, purchasing power and bankruptcy **Recovery phase:** - Measures are a mixture of emergency support and fast recovery - Second Stimulus (March 2020); exports and imports, and financial sector support **Sustainable growth phase:** - No special package. Third stimulus (March 2020) includes some green component, such as micro grid construction. - 'Net zero by 2060' was announced in August 2021.
Japan	
COVID-19 Impacts: The first wave was April 2020, but new infections increased again in July 2020 and peaked in August 2020. It increased aging December 2020 and waves are repeating themselves, with a fifth wave in August 2021. **GDP:** -9.9% April-June 2020 and started recovery. -4.8% (2020). **Unemployment:** uneven impact in non-regular workers. **Fiscal stimulus in 2021:** US$830.7 billion (16.5 % of GDP)	**Emergency phase:** Supplemental budget (April and June 2020): employment support, working capital support, rent support, and medical care support **Recovery phase:** - Basic Policy for 2021 budget preparation (July 2020): some climate measures, like hydrogen, quality infrastructure, included but not higher priority. - Ad hoc measures: Go-To Travel Campaign (suspended in December 2020 due to the increase of new infections) **Sustainable growth phase:** No special measures - Innovation, fiscal system reform and market mechanism, local economy and local finance, global/regional approach.
Korea, Republic of.	
COVID-19 Impacts: The first wave was in March 2020. Number of new infections during 2020 is lower but increased and reached more than 20,000 people per day in August 2021. Waves are repeating themselves in 2021. **GDP:** -1.0% (2020). **Fiscal stimulus in 2021:** US$73.5 billion (4.5 % of GDP)	**Emergency phase:** Emergency relief grant: cash payments to all, medical leave subsidies, subsidies to vulnerable people and business, unemployment assistant fund. **Recovery phase:** Part of Green New Deal: no specific short-term recovery package **Sustainable growth phase:** - Aiming for Smart country, green country, and Safe country. (1) Digital New Deal (e.g., 5G, digital learning, remote healthcare), (2) Green New Deal (e.g., green infrastructure, low-carbon energy), (3) Stronger safety net (e.g., digital skills training) - Net zero by 2050 was announced in October 2050.

Country	Economic Recovery Measures
Malaysia	
COVID-19 Impacts: First peak was early April 2020. Number of infections are still increasing. New infections reached to over 40,000 people per day in august 2021. **GDP:** Biggest drop was -7.7% in Q2 2020 but started recovery with a decline of 2.7% in Q3; -5.6% (2020) **Fiscal stimulus in 2021:** US$17.7 billion (5.2% of GDP)	**Emergency phase:** - First stimulus (February 2020): tax relief and loan deferment for people. Guarantee and loan moratorium for business. - SME Aid program (April) **Recovery phase:** - Second Stimulus (March 2020): greater support for people and business than during the first stimulus, with more focus on economic recovery - Short-term recovery plan: improving people's skill, tax relief, digitalisation support and financing for SMEs, and promoting a 'Buy Malaysian' campaign. **Sustainable growth phase:** No major special packages aligned with sustainable growth strategy, such as Green Technology Master Plan, National Renewable Energy Policy, Shared Prosperity Vision 2030 - Poses challenges in attracting green investments - both domestic and foreign investments.
Thailand	
COVID-19 Impacts: The first peak ended in March 2020. But increased again in April 2021 and its peak was August 2021. **GDP:** -6.1% (2020). **Fiscal stimulus in 2021:** US$57.2 billion (11.4 % of GDP)	**Emergency phase:** Phase 1 stimulus (March 2020): tax relief, cash payments, SMEs support. **Recovery phase:** - Phase 2 stimulus (March 2020) : filing of tax return in addition to the first phase packages - Phase 3 stimulus (April 2020): SMEs through banks, households, liquidity for financial sector **Sustainable growth phase:** No special packages. - Agriculture (bio circular economy etc.), energy (electric vehicles, etc.), environment (green tourism, etc.), digital transformation.
Viet Nam	
COVID-19 Impacts: First wave was in April 2020 and second wave was in August 2020, but the number of infections is very low compared to with other countries during 2020. **GDP:** Q2 2020 is lower but still positive in 2020 (2.9%) Economic impact is mostly through trade. **Fiscal stimulus in 2021:** US$5.7 billion (1.7 % of GDP)	**Emergency phase:** - Labour support through cash payments, etc. - Support to business through bank credits, extension of tax payment and loan payment deferrals. **Recovery phase:** No special program but various measures, including removal of barriers for production and business, are taken (access to finance, fiscal and credits policies, etc.). **Sustainable growth phase:** No special packages but align with National Energy Development Strategy or policies.

GDP = gross domestic product.
Source: Compiled by authors based on country papers (chapters of the book).

In the US, the green recovery plan is not as far-reaching as the 2008 Green New Deal, but many of the core elements for low-carbon green growth are there. It has committed to a US$2 trillion infrastructure plan and the goal of net-zero emissions by 2050 (IMF, 2021). New infrastructure investment committed during the pandemic period in Asia potentially puts the region on the cusp of a slightly people-centred green recovery. The leading position of China, Japan, and Korea in the development and deployment of low-carbon technologies is noticed. Some growing opportunities in renewable

energy development are captured in countries such as Indonesia, the Philippines, Thailand, and Viet Nam.

During 2020–2021, the Australian government has budgeted further investment in renewables and waste and resource recovery infrastructure, and the states and territories also followed suit in committing to an increased renewable energy uptake through reverse auctions and the designation of low-carbon energy transition zones. The Australian Climate Change Authority has emphasised a pandemic recovery plan with the components promoting decarbonising the energy sector and circular economy.

The 37th ASEAN Summit in November 2020 adopted the ASEAN Comprehensive Recovery Framework and Implementation Plan. It includes five key strategies: (1) enhancing health systems; (2) strengthening human security; (2) maximising the potential of the intra-ASEAN market and broader economic integration; (4) accelerating inclusive digital transformation; and (5) advancing towards a more sustainable and resilient future. Strategy 5 is consistent with the Paris Climate Agreement, which includes promoting sustainable development in all dimensions; facilitating the transition to sustainable energy; building green infrastructure and addressing basic resilient infrastructure gaps; promoting sustainable and responsible investment; promoting high-value industries, sustainability, and productivity in agriculture; managing disaster risks and strengthening disaster management; and promoting sustainable financing. The framework implies that that a return to 'business as usual' is no longer an option for ASEAN in the post-pandemic world, and this paradigm shift will require ASEAN governments, businesses, and civil society to work collectively to enable systemic change needed by the region for a sustainable and resilient future.

Korea has announced the largest stimulus package (US$333.7 billion) in the region, followed by India (US$332.9 billion), Singapore (US$85.7 billion), Indonesia (US$74.7 billion), and the Philippines (US$17.0 billion). As a percentage of Gross Domestic Product (GDP), Singapore has provided the largest share of recovery packages (24%), followed by Korea (20%), India (12%), Indonesia (6%), and the Philippines (4%). The Korean New Deal has the highest share of green stimulus measures as well, accounting for more than 50% of the targeted action plans. Meanwhile, India has allocated about 12% of its stimulus for environment-related activities, and Indonesia has directed 4% of its stimulus towards green outcomes (Vivid Economics, 2021).

The composition of the emergency support of US$322.9 billion in India's fiscal stimulus packages is focused on support for healthcare and welfare, tax relief for businesses, and targeted credit support for the agriculture sector. The package offers support to industries and the pandemic-affected population in the form of loans, capital investment, and incentives and subsidies. Specific sectoral support has been given to agricultural infrastructure development, electricity distribution, and digital technology companies.

Generally, the social development component of the stimulus outweighs the recovery directed towards low-carbon green measures in almost all countries in ASEAN. The agriculture sector has seen notable support in the Philippines, Indonesia, Thailand, and Malaysia, in particular. Several sectoral measures involve support for businesses, including tax incentives, loans, and credit guarantees.

Additionally, some support has been directed towards citizens and businesses in the form of subsidies for electricity generation and reduced fuel prices, as well as social protection transfers to low-income households. The new infrastructure projects announced as a part of the recovery are targeted to strengthen digital infrastructure and support several sectors, including tourism, water, sanitation, housing, and national health. In the energy and electricity sector, projects include the construction of natural gas networks for households and support for rooftop solar (ACE, 2020).

However, most of the stimulus and recovery packages do not include carbon footprint measurement or conditionalities when providing support to new infrastructure projects and bailing out companies that are involved in high-carbon industrial and commercial activities. Whilst China, India, Indonesia, and Thailand have introduced several positive measures, including funding for afforestation, incentives for electric vehicles (EVs), and support for bio-gas plants, continued support for environmentally harmful activities is expected to have a severe impact on the future of carbon emissions and inclusive growth. Given that large volumes of funding during the recovery packages are directed towards strategic state-owned enterprises (SOEs), governments should consider including conditionalities that require companies to decarbonise. For example, green conditionalities for the aviation sector could include efforts to curb emissions along its supply and consumer chains. Alongside bailouts with carbon strings attached, there is an opportunity for major carbon-emitting economies like China, India, and Indonesia to support a sustainable recovery through green R&D subsidies and climate-smart infrastructure investments in the industrial and waste sectors.

In response to the initial effects of recovery programmes, spending on energy-efficiency improvements increased in 2021 by nearly 10% when compared to 2020 (Global Energy Institute, 2021). Stimulus spending is also spurring projects in new areas, such as low-carbon hydrogen and carbon capture utilisation and storage (CCUS). However, the amounts that are being dedicated to green recoveries are far from sufficient to jolt the regional investment regimes towards meeting the Paris Climate Agreement targets.

There is consensus on the need for the transition to a net zero economy by 2050 as rapidly as is practical. However, it is equally clear that transformational changes and structural changes in key economic sectors are not happening as observed in the economic recovery packages. Whilst there is no one-size-fits-all solution, several model-based analyses suggest that policies are effective in mitigating the adverse distributional consequences of the pandemic and accelerating low-carbon green growth.

5. Policy Responses and Regional Cooperation Strategies for Breaking the Vicious Cycle in the Post-COVID-19 Era

The policy adaptations that have happened during the COVID-19 pandemic emergency and recovery phases have tended to focus on minimising the destruction of income generation and international trade and maintaining production capacity

to help economies recover to their levels from before 2019. Low-carbon green growth needs the alignment of long-term policy goals into short- and medium-term investments in both public and private sector actions. The policy actions taken during the emergency and recovery phases have unfortunately put a temporary brake on hard reforms and brought more risk to future low-carbon investments.

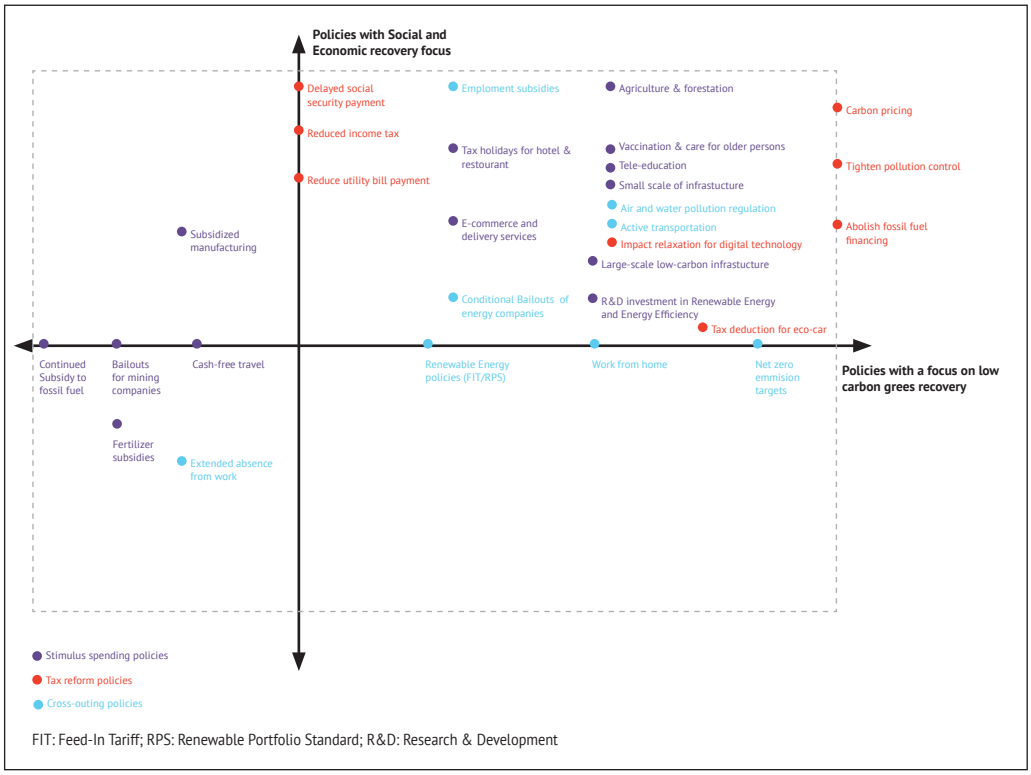
Economic growth in advanced economies before the pandemic was characterised by low growth, surplus savings, and stronger monetary policy and expansionary fiscal action (LSE, 2020). On the other hand, the developing countries of ASEAN, China, and India face a much more complex and challenging fiscal situation (Victor, 2020). There has also been a rapid erosion of fiscal space and foreign exchange reserves in several developing economies since the outbreak of the pandemic.

In Australia, the federal government and states have responded to the pandemic crisis with various policy reforms, such as planning and environmental legislation to address the immediate flexibility required for responses to the pandemic and to provide greater flexibility and centralisation of decision-making. The federal government and state governments have identified key developments and infrastructure to be fast-tracked for assessment and approval to support economic recovery from the pandemic. Policy actions, such as temporary reallocation from carbon-intensive sectors like airlines and transportation, provide an opportunity for job creation in more labour-productive and cleaner sectors. Figure 1.2 maps the varying types of policy instruments employed to reduce social vulnerability and promote low-carbon green growth – which could be categorised as tax-based instruments and technology-targeted instruments, with several lying in between.

The policy reforms introduced in Japan, Korea, the US, and New Zealand during the same period have focused on identifying and processing priority low-carbon green growth projects for fast-tracking. The policy instruments and criteria for identifying priority projects include net community benefits that comprise social and affordable housing and environmental sustainability and renewable energy. Australia, China, Japan, Korea, and New Zealand present examples wherein with strong institutions and fundamentals, stepping up economic reforms to boost low-carbon green growth and investments is feasible during the pandemic but requires the adequate reallocation of resources across sectors, and support for the small businesses and workers affected by the economic transition. These countries have provided significant fiscal and monetary policy support to cushion the impact of the pandemic on their economies.

On the other hand, many developing economies of ASEAN and India are quickly running out of fiscal policy space in the recovery phase. Some of them have used unconventional monetary and fiscal policies. A wide range of financial sector measures have been taken to ease the pressure on banks and borrowers, including debt service moratoria, targeted lending schemes, and liquidity support. Although these measures have provided appropriate short-term relief, modifications are needed to minimise distortions and have a clear exit strategy for continuing these measures in support of low-carbon green growth investments so as not to aggravate existing climate vulnerabilities.

Figure 1.2 A Taxonomy of Policy Instruments that Have Evolved During the Pandemic in Support of Inclusive and Low-carbon Growth



FIT: Feed-In Tariff; RPS: Renewable Portfolio Standard; R&D: Research & Development

Source: Compiled by authors based on country papers (chapters of the book).

Several unconventional monetary policies implemented in Indonesia, Malaysia, Thailand, and Viet Nam have been a surprise, as the circumstances do not resemble those prevalent in advanced economies when they used these tools. Malaysia and Thailand resorted to central bank lending operations to provide extra liquidity to firms, whilst Indonesia and the Philippines used large-scale asset purchases. The use of unconventional monetary policy reforms, whilst warranted, inevitably entails risks, which will increase the longer the tools are used, and steps should be taken to mitigate the risks, including by establishing frameworks delineating their use. The impact of the COVID-19 shock led to an unprecedented wave of corporate bankruptcies in the emergency phase, and in the absence of unconventional policy interventions, they might have generated further financial turmoil, with firms unable to generate enough earnings, and sustained declines in profitability to cover their interest payments.

On the other hand, the COVID-19 crisis has also underscored the importance of implementing effective carbon pricing reforms as a source of new revenue streams and of implementing bailout programmes for green industries. To date, six countries or jurisdictions have carbon pricing initiatives implemented for which the design and implementation was not disturbed during the pandemic period

Carbon price reforms, new fiscal regulations, and well-designed bailout conditions can be a powerful way of tilting incentives towards low-carbon green growth (IIPP, 2019). Carbon

pricing and the phasing out of pervasive fossil fuel subsidies can be critical components in the future policies needed to restore growth and decarbonise the economic system (IEA, 2020). Fuel subsidy reforms are an important complement to carbon pricing, or a substitute if political economy factors prevent a carbon tax, and can be particularly timely and effective in times of financial crisis (Bowen, 2015). By ensuring fossil fuel prices reflect both supply and environmental costs, carbon tax measures also reduce the risk of locking in carbon-intensive capital (Rosenbloom et al., 2020). Carbon pricing can take the form of carbon taxes, which charge the carbon content of the fuel supply, or emissions trading systems (ETS), where firms need permits to cover their emissions. In ETS, the government controls the supply of allowances, and trading establishes the allowance price. Fuel excise taxes, which are economically like carbon taxes, should also be part of the support policy framework during the pandemic recovery.

The continued prevalence of regulated energy prices and subsidies that favour fossil fuels makes the transition to low-carbon energy more difficult. These market distortions dilute the case for more efficient investments. Although these subsidies fell to a record low of US$180 billion in 2020, higher fuel prices and energy use, coupled with hesitant progress on carbon pricing reforms, are set to push this amount back up to US$440 billion in 2021 (Anbumozhi, 2021). This rebound to well above pre-pandemic levels is very worrying at a time when countries need to be redoubling efforts to cut wasteful consumption and accelerate low-carbon economy transitions. This rise in the subsidy burden adds to the fiscal pressures in developing economies, especially where subsidies are a specific incurred cost rather than foregone revenue.

It would be appropriate for some advanced economies to focus on fiscal neutrality in the stimulus example using the additional funds to reduce distortionary taxes. Countries with large funding needs can use the carbon tax revenues to support low-carbon infrastructure investments that are labour intensive. To meet the net zero targets by 2030, the World Bank (2020) and IEA (2021) estimated a carbon tax in the range of US$90–US$110/t CO_2. Nevertheless, for the developing countries in ASEAN, it will be important to use part of the additional revenue from such a carbon tax to also alleviate the distributional consequences of hard tax reforms, which may particularly affect SMEs and low-income households.

Policies for bailing out corporations have been found to be helpful when significant numbers of jobs have been at stake during the pandemic. They can save jobs and accelerate the eco-restructuring of erstwhile brown industries. However, their implementation will need to consider the existing status of the financial and banking system. Strengthening the financial systems to support pandemic recovery and low-carbon green growth is necessary. To mitigate the risks of financial instability, governments, central banks, regulators, and the commercial banking industry need to transform financial risk management practices, improve the transformation and disclosure of climate risks, and enable stakeholders to make informed decisions. In this regard, economic ministries are required to work with the Network of Central Banks and Supervisors for Greening the Financial System (NGFS).

Policy responses for regional cooperation must make use of sectoral specialisations in order to build resilience in the region's supply chains. Restoring and creating such robust supply chains will involve streamlining trade, transport, and digital connectivity policies. One of the ways to achieve this is through efforts to expand cross-border energy trade by supporting initiatives, such as the ASEAN Power Grid (APG) and the Trans-ASEAN Gas Pipeline (TAGP). Melo and Solleder (2021) and Megan (2021) emphasised that in order to meet its low-carbon renewable energy targets, ASEAN will require billions of dollars in investments to advance the APG and TAGP. Participating countries will need to build more extensive cooperation frameworks and coordinated policies and ensure greater data transparency to build confidence amongst investors. This will require transparency in legislation and energy pricing agreements, along with strong credit ratings, to attract greater amounts of investment, particularly in countries like Viet Nam and Indonesia that have been held back by their opaque regulatory frameworks.

The falling cost of low-carbon circular energy technologies offers a huge opportunity (Bhattacharya, 2019; Huges and Roy, 2020) for all countries to chart a new path for lower emission industries towards growth and prosperity. Low-carbon energy companies around the world have performed well in financial markets during the pandemic, with listed renewable power companies outperforming fossil fuel companies and public equity market indices in recent years. Moreover, new employment opportunities will be tied to innovative production networks and energy supply chains that may be located in other countries, particularly for solar, wind, batteries, smart grid components, and electrical vehicle components. Spending on these low-carbon technologies will grow faster in the post-pandemic era, requiring new manufacturing capacity to be expanded now.

However, for the moment, low-carbon technology transfer and investment remain far short of what would be required to meet the Paris Agreement targets. ASEAN countries, on average, place 5% taxation on low-carbon green goods, thus increasing the net cost of transformative low-carbon technologies. The tax structures of Cambodia, the Philippines, and the Lao PDR for imported low-carbon goods and services remain high above the regional average. ASEAN lessons on production networks in the automobile and electronic sectors as well as the easing of movement of essential supplies during the pandemic could be used to create similar cost-effective pathways for low carbon goods and services. As Scott Baker argues, economic uncertainty tends to reduce firm investment and innovation whilst limiting access to funding thus disproportionally impacting the low carbon energy sector which requires long-term commitment. The question remains how pandemic recovery policies can be recalibrated with the commitments made under the Paris Agreement and ongoing economic integration efforts.

Addressing the global net zero emission targets requires urgent policy actions at the national level. Countries are not starting their journey to net zero emissions from the same base and not with the same set of policy instruments. At present countries are implementing several combinations

of policy instruments in support of low-carbon green growth, including regulatory interventions, market-based instruments, and targeted support for low-carbon technology diffusion, innovation, and sustainable consumption. Advanced economies have a first-mover advantage and could reach net zero before developing economies and assist others in getting there by sharing their experiences. The context for individual companies' strategies on net zero likewise varies depending on their operations. It is much easier for industries reliant on electricity, such as digital technology companies, to take on ambitious emission reduction targets compared with those in the heavy industrial sectors. This creates a strong case for international collaboration to build up diverse capacities regionally and accelerate learning for the deployment of transformative low-carbon technologies whilst avoiding other potential risks, including energy security and negative spillovers, such as a loss of local jobs and lost manufacturing capacity. Although this international cooperation approach could result in a less open system of international trade, investments, and technology transfer, it would certainly manage the potential tensions between advanced and developing economies and will be crucial for ensuring an orderly and broad based inclusive transition, rather than a stalled journey.

6. The Way Forward: Action Areas for a Smart, Low-carbon, and Inclusive Recovery

The COVID-19 pandemic shocks gave us a glimpse of what a better sustainable future could hold. The chapters in the book first present the different ways advanced and developing countries are adjusting to the pandemic and developing their containment strategies, the socioeconomic impacts, and analysis of the potential for undertaking the low-carbon green growth agenda. Close examination of the economic recovery packages and policy actions that have evolved during the pandemic indicates the distributional effect of the pandemic across the sectors and huge gaps in meeting the aspirational goals of climate actions. Now we have a once-in-a-generation chance to set ourselves on a low-carbon, resilient, and inclusive development path. Today's policy actions will quickly become post-COVID-19 global net-zero transformation. All countries can gain from this transition if and when the recovery packages are aligned towards long-term sustainable development goals. The 2008 green stimulus experiences showed that for every dollar invested in low-carbon climate-resilient infrastructure, US$4 in benefits could be generated (Chen et al., 2020).

To ensure a smart, low-carbon, and inclusive recovery, there are five thematic areas that need full review, consideration, and quick actions. First, transformative public and private investments are needed in the key system areas of energy, agriculture, food, water and land, cities, transport, and manufacturing. These systems are being prioritised because they contribute the most to carbon emissions in ASEAN and East Asia – together, they produce over 90% of regional GHG emissions – and face significant transformation challenges. These sectors are also critical for achieving the Paris Climate Agreement goals and global net zero ambitions. The available indicators show that progress at the national and regional levels has been patchy and incremental.

Transforming them at speed is key for all the studied countries, which are at different stages of development and require action from the public sector to catalyse the private sector, both to unlock major economic opportunities and create new jobs and reduce carbon emissions. Without any policy changes or a monitoring system, it is expected that carbon emissions will continue to rise until 2030 and beyond to meet increasing energy demand. On the planning front, most governments are still looking at conventional models of economic drivers that are driven by carbon-intensive investments, meaning that bad investment decisions made during the pandemic will lock us into expensive mistakes for decades. The short-term cost considerations should not justify postponing low-carbon green energy choices.

The second area that requires priority action is innovation in low-carbon and digital technologies, business models, and approaches to finance. Countries should ramp up public investment in research that can lead to low-carbon green growth solutions and increase cross-border collaboration to lower costs and market risks. Public procurement practices should be leveraged to drive innovation and accelerate venture capital investments. The period from the pandemic recovery to Net Zero 2050 offers an unprecedented level of market opportunity for the best innovators and investors in emerging markets, which could become home to most of the new zero-carbon assets.

Public budgeting is the third action area. Too much government spending runs counter to zero emissions goals. In all the studied economies, governments continue to spend considerable budgetary resources in subsidising fossil fuels and incentivising inefficient production infrastructure. Government revenues and economic interests continue to be entangled in high-carbon assets. Governments must end their fiscal dependence on carbon-intensive growth, which would continue to deplete government revenues in the post-pandemic era. In the aftermath of the pandemic, a number of countries will have to contend with debt burdens that are possibly too large for them to manage. Given the likelihood of further exogenous shocks, debt relief or debt reduction for highly indebted and highly vulnerable economies may be required. Such relief could free up resources for crucial social spending on health, education, and social protection and help to catalyse an improvement in public debt management.

Public finance alone cannot help reach the Paris Climate targets by 2030 and accelerate low carbon green growth. The private sector, the fourth focus area, is essential to help shift the required financing from high-carbon to green infrastructure. The financial sector is beginning to factor climate change into its decisions, but an array of rules governing the financial system hinders the right allocation of resources. Governments should step up disclosure requirements, enhance governance, and improve the management of climate risks. Re-setting economic incentives for the finance sector to favour low-carbon investment options and long-termism is also essential. However, to be truly transformational, the national banking systems must get clearer mandates from their stakeholders in tackling climate change risks, re-think their incentive structures, and attract new sources of investments.

Lastly, getting low-carbon investments right is most urgent in cities, where most of the pandemic relief measures are being spent. Moreover, future energy, water, transport, waste management, and digital infrastructure investments will be spent in cities as urban populations grow. National governments must empower them to plan and build their capacity to finance net zero targets. There is a definitive need for building collaborative smart city networks that can bring together public–private actors for enhanced investments and act as effective platforms for sharing and fostering best practices.

Nevertheless, there will be some short-term trade-offs when aligning these action areas in the recovery packages and policy reforms during the pandemic recovery, including the transition costs, but these can be reduced through a people-centred approach. The cost of not addressing climate change is already immense and will only get more expensive. There can be no going back to the old normal if the above interconnected policy actions are taken up now. As Winston Churchill stated: 'One should never let a good crisis go to waste.'

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Chapter 2

Regional Strategies for Aligning COVID-19 Recovery and Stimulus Measures with Low-carbon Green Growth in Australia

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Chapter 2: Regional Strategies for Aligning COVID-19 Recovery and Stimulus Measures with Low-carbon Green Growth in Australia

1. Setting the Scene: From Pandemic Crisis to Sytems Change

Unlike the Global Financial Crisis (GFC), which exerted mostly idiosyncratic shocks on economies, the novel coronavirus disease (COVID-19) pandemic has created a systemic economic shock due to the synchronised nature of the downturn, both in terms of supply and demand that brought domestic disruptions as the virus spread across the countries. There are, however, differences amongst the individual countries due to differential spread of the pandemic, impacts of containment strategies, differences in economic structures (for example, tourism- and oil-dependent economies), reliance on external financial flows (including remittances), and growth trends before the crisis. Global trade in goods and services and commodity prices reduced by 8.5% (volume terms) and 32.7%, respectively, in 2020, while inflation grew 0.7% and interest rates (London interbank interest rate) showed mixed results in advanced economies in 2020 (IMF World Economic Outlook, 2021).

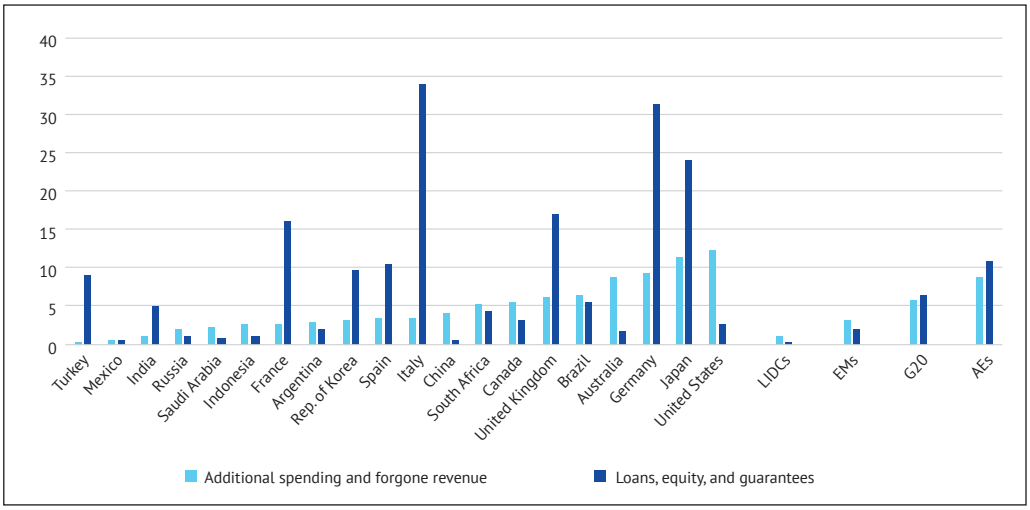
Social distancing, lockdowns, business closures, disruptions in supply chains, and restrictions on cross-border movement of people and air travel were employed to slow the COVID-19 transmission rate. However, these measures led to steep income losses, resulting in weak consumer and investor confidence. The aggregate demand declined, which was further compounded due to supply interruptions and lockdowns. This had a catastrophic effect on the labour market, as 300 million full-time jobs have possibly been lost in the second quarter of 2020 compared to the same period of the previous year (ILO, 2020).

Governments responded to the crisis by employing varying degrees of fiscal and financial countermeasures to forestall and minimise the adverse effects of the crisis as shown in Figure 2.1. Assistance was provided to the firms to retain the workers and also financial support and regulatory actions to ensure continued credit provision to avoid bankruptcies.

The governments relied on fiscal and financial support measures to mitigate the recessionary effects of the crisis and to position the economies on the path to recovery, as they did during the GFC. However, the abrupt contraction in output resulted in fall in revenues, which led to a sudden surge in government debt and deficits. As Figure 2.2 presents, the pattern of global debt and overall fiscal balance is similar to the GFC, though it is rather more pronounced during the COVID-19 recessionary impact in 2020.

The crisis affects the competitiveness and exporting environment of the exporting countries and creates inefficiencies both 'behind and beyond the borders' due to aggregate demand and supply shocks, tariffs and non-tariff barriers, distortions in the factor markets, restrictions in movement of people and goods, exchange rate movements, labour market and business regulations, and many others.

Figure 2.1 Country Fiscal Measures in Response to the COVID-19 Pandemic (% of gross domestic product)



AE = advanced economy, EM = emerging market, G20 = Group of Twenty, LIDC = low-income developing country.
Source: IMF (2020).

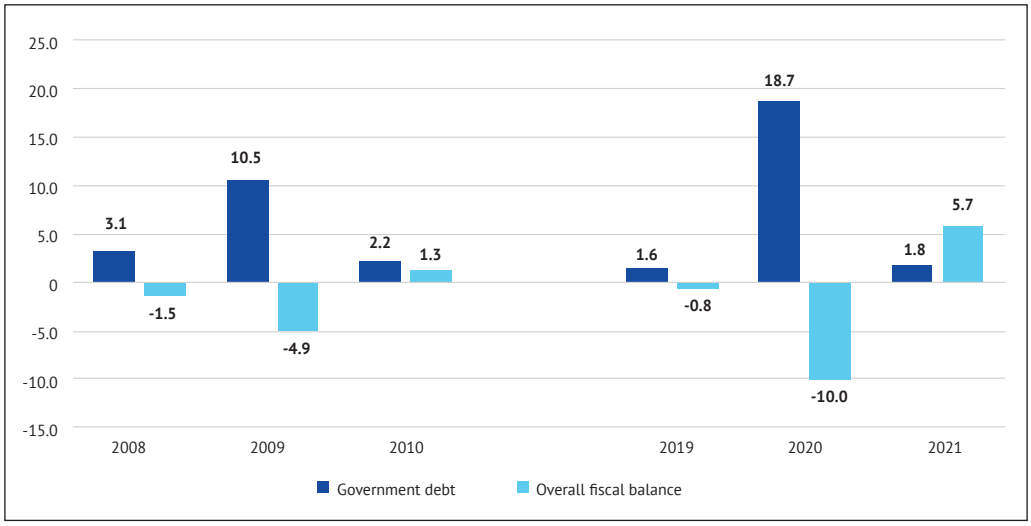
In light of the above-cited global scenario, the Australian situation is not an exception. COVID-19 was first confirmed in Australia in late January 2020. Reports on its incidence, severity, and distribution are published regularly in the Communicable Diseases Intelligence journal.[1] As of 21 June 2021, the total number of confirmed cases stands at 30,357, while the national death toll is at 910.[2] Since the onset of COVID-19, the health crisis exposed the vulnerabilities of the different sectors of the economy and each week more and more business enterprises announced job losses. As per the Australian Bureau of Statistics (ABS), 594,300 people lost their jobs in April 2020, largely due to restrictions put in place to protect Australians from the coronavirus. The ABS estimated in May 2020 that a total of 870,000 persons lost their jobs and 72% of businesses recorded decreases in revenues (ABS, 2021; see also Table 2.1).

Job losses occurred across a range of industries. The national flag carrier, Qantas postponed resumption of international flights to late December 2021 (Brandler, 2021). It is predicted that the COVID-19 pandemic would cost the Qantas Group A$16 billion (US$12.4 billion) in lost revenue (Chua, 2021). Virgin Australia in February 2021 announced it would make about a third of its workforce redundant, with about 3,000 jobs expected to go (Morgan and Khadem, 2021). The initial shock of the crisis was huge; for example, Virgin, besides suspending its international flights, reduced its domestic capacity by 90% and temporarily cut 8,000 jobs in March 2020. Table 2.1 also shows the uncertainties experienced by most of the sectors during the initial phase of the pandemic and presents the estimated number of job cuts in other major sectors

[1] Communicable Diseases Intelligence is a peer-reviewed scientific journal published by the Office of Health Protection and Response, Department of Health. The journal aims to disseminate information on the epidemiology, surveillance, prevention, and control of communicable diseases of relevance to Australia. https://www1.health.gov.au/internet/main/publishing.nsf/Content/cda-pubs-cdi-cdicur.htm (accessed on 27 August 2021).

[2] https://www.covid19data.com.au/states-and-territories (accessed 21 June 2021).

Figure 2.2 Change in Global Government Debt and Overall Fiscal Balance (% of gross domestic product)



Source: IMF (2020).

Table 2.1 Estimated Loss of Jobs in Selected Major Sectors Due to COVID-19 in Australia

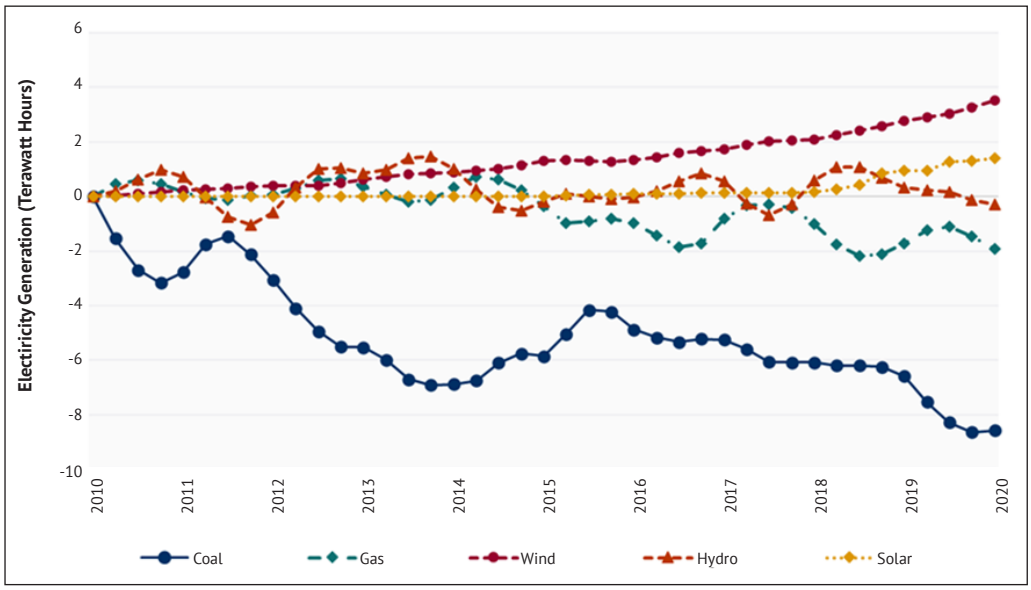
Sectors	Job cuts	Additional difficulties
Financial/Consultancy Services		
PwC	400	The majority of KPMG's 8,000-strong workforce in Australia agreed to accept a 20% pay cut for 4 months in May, 2020.
Deloitte	700	
KPMG	200	
Media		
ABC Television owned and funded by the Australian Government	250	A$84 million cut to ABC's budget.
News Corp.	925 from regional and community division. 100 from the metropolitan papers.	
Education		
Charles Stuart University	145	Loss of A$90 million
University of Wollongong	150–300	97 voluntary redundancies
Central Queensland University	99	250 voluntary redundancies
Australian National University	465	
University of Melbourne	450	Loss of A$70 million
Victoria University	190	La Trobe has also plans to cut its total costs by 20% in the next few years, and reduce the range of academic disciplines it offers.
La Trobe University	239	
Retail		
Woolworths	700	
Myer	90	
Target	1,000–13,00	
Harris Scarfe	1,300–1,500	

Source: ABC News, 2021.

Drawing on the data for total electricity demand from the National Electricity Market (NEM) between 16 March and 4 May 2020, which was the first 7 weeks of the lockdown in Australia, it can be gauged that the demand was 3% lower compared with the same period in 2019. It is interesting to note that only about two-thirds of the decrease was due to reductions in electricity usage, while one-third was due to extra rooftop solar panels installed since May 2019 that lowered the demand on the grid (Figure 2.3). However, metered electricity demand decreased in the month of June 2020, just 1.4% lower than in June 2019. The March 2020 quarterly report produced by the Department of Industry, Science, Energy, and Resources indicated a 5.5% decline in coal-generated electricity emissions from pre-COVID-19 levels. During that period, the renewable energy supply to the NEM increased by 12.2%. There was a 1.6% reduction in emissions from the NEM on a seasonally adjusted and weather-normalised basis in June 2020 compared with the previous quarter. It is interesting to note that emissions from the NEM were down by 5.2% over the year to June 2020 compared with the same period to June 2019.

With the shutting down of most of the state and international borders to tourists, emissions from the transport sector reduced by 79% in the case of air travel and 27% in the case of land transportation. In the June quarter 2020, the overall liquid fuel emission reduction worked out to be 17.9% from the June quarter 2019. On the other hand, emissions from exports increased by 1.9% due to the year-on-year rise in the shipment of liquefied natural gas overseas. Nevertheless, it is worth noting that in the year to June 2020, emissions were estimated to be 518 million tonnes, which were the lowest level observed since 1998 (Australian Government, 2020).

Figure 2.3 Source-wise Electricity Generation in the Australian National Electricity Market



Source: Department of Industry, Science, Energy and Resources, and IBSWorld (2019).

The declining emissions trend has continued, with the lowest intensity and per capita levels in 31 years in the year to December 2020. Emissions per capita were 46.7% lower than 1990 while the emissions intensity of the economy was 66.1% lower than in 1990. The national emissions have been estimated to be lower by 5% compared to the previous year and amounted to 495 Mt CO_2-e (Australian Government, 2020a).

Australia's demand for electric vehicles is much lower than most comparable developed nations mainly due to the lack of governmental incentive support. Australia, with a small market, could consider following the lead of countries like Norway, the Netherlands, and the UK, which have committed to banning petrol and diesel vehicles by 2025, 2030, and 2040, respectively. Because of Australia's relative lack of mandatory fuel efficiency standards, the possibility of Australia becoming the dumping ground for vehicles that are banned in other parts of the world cannot be ignored. A recent report on electric vehicles in Australia by Ernst and Young (2020) has suggested that 'there is an opportunity to align the policy and support framework for EVs in Australia to better reflect the government and societal benefits of EV uptake' (p.10).

COVID-19 reduced residential construction in 2020 by 12%. This has significantly contributed to the increase in unemployment rates nationwide. The use of digital technology in commerce, educational institutions, and government departmental activities has significantly increased to keep the economy functioning with less disruption. Internet service providers have been working hard to maintain connection speed.

2. Government Recovery Path to Combat the Major Impacts of COVID-19 on the Australian Economy

To arrest surging unemployment levels and to sustain the livelihoods of individuals negatively impacted by the economic shutdown resulting from COVID-19, Australia, like many countries, adopted both expansionary fiscal and monetary easing policies. These policies aimed at keeping temporarily closed companies in business, and providing minimum support for vulnerable households. Australia injected more financial support more quickly than it did earlier in the case of the global financial crisis, with the initial response being A$299 billion in overall support. Of this, A$70 billion was earmarked for the Job Keeper programme; this covered 70% of the median wage and was close to a replacement wage for many working in those sectors most affected, such as hospitality and retail. Unemployment benefits were doubled with the introduction of a temporary COVID-19 supplement for jobseekers. This, in addition to temporary cash-flow support, helped small and medium-sized firms to continue operating and retain their staff. The Reserve Bank of Australia (RBA) and the Australian Office of Financial Management made US$105 billion available for lending to businesses from both bank and non-bank lenders. The government also partnered with RBA in a US$40 billion small and medium-sized enterprise loan-guarantee scheme. The 2020–21 Budget committed further response and recovery support, increasing the Government's overall support to A$507 billion, which included A$257 billion in direct economic support (Australian Treasury, 2020).

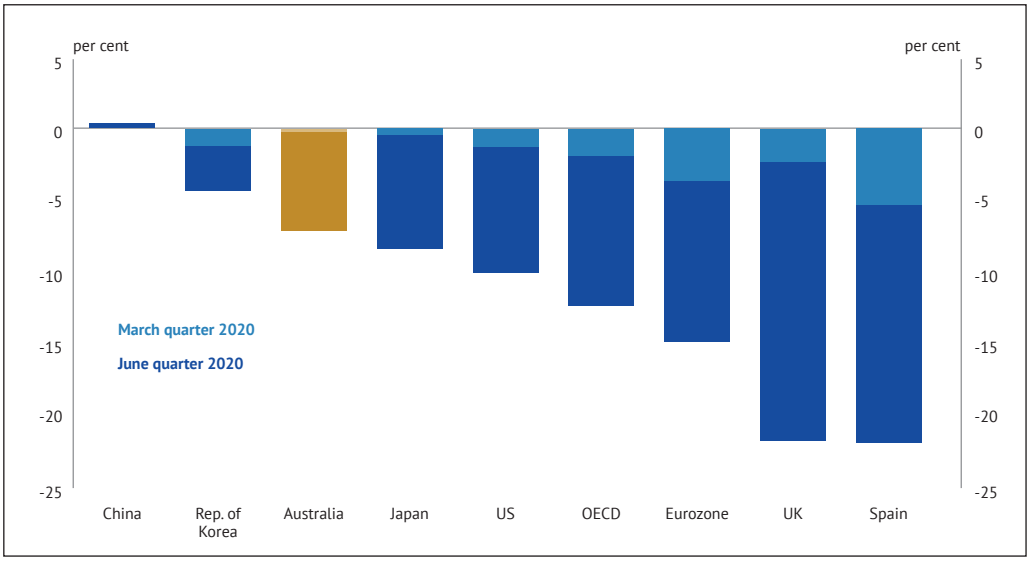
The 2020–21 Budget increased infrastructure funding to A$48.8 billion over the forward estimates, which was a surge of A$19.3 billion from the 4-year spend set out in last year's budget. It was expected that the A$7.5 billion in additional funding for

land transport projects on top of the A$2 billion for small-scale road safety projects and additional A$1 billion for the Local Roads and Community Infrastructure Program will drive broad-based job creation at the local level, where it is most needed (Australian Treasury, 2020).

The overall government assistance, particularly the A$257 billion in economic support, facilitated improving business and consumer confidence. Hence, economic recovery was expected to pick up strongly from late 2020 and into early 2021. The interventions started showing signs: for example, of the 1.3 million people who lost their job due to COVID-19 for economic reasons in April, almost 60% returned to work (Australian Treasury, 2020). The real GDP fell by 7.0% in the June quarter 2020, which was the lowest figure when compared with some of the major economies in the world (Figure 2.4).

As part of arresting the fall in residential construction and to create jobs, Australia announced a recovery plan to permit the building of 10,000 houses in 2020–2021. Further, to generate the aggregate demand by supporting the purchase, first-home buyers were able to secure a loan with a deposit of just 5%, with the Government guaranteeing up to 15%. Another recovery plan concerning the construction industry to boost employment growth was the Government commitment to invest an additional A$14 billion in new and accelerated infrastructure projects over the next 4 years. These projects were expected to support a further 40,000 jobs during their construction. This investment drew on the Government's record 10-year transport infrastructure investment pipeline, which was expanded to A$110 billion, supporting 100,000 jobs across the nation (Australian Treasury, 2020).

Figure 2.4 Cumulative Gross Domestic Product Growth Since December Quarter 2019



OECD = Organisation for Economic Co-operation and Development, UK = United Kingdom, US = United States.
Note: Data for China not broken down by quarters.
Source: National statistical agencies, Refinitiv. Budget 2020–21.

With respect to supporting new investment and increasing business cash flow mostly in non-mining businesses, the Government provided a temporary tax incentive, which was available to 99% of businesses that employed around 11.5 million workers. The Government announced that business losses through 2021–2022 can be carried back against profits made in or after 2018–2019.

An important impact of COVID-19 on Australian businesses and consumers was the increase in the use of digital technologies. The Government made use of this opportunity through its Digital Business Plan to support an even greater adoption of new technologies across the economy. In this context, an additional A$4.5 billion was invested in the National Broadband Network Company, which is a publicly owned corporation of the Australian Government, and is committed to meeting future customer and businesses demand for higher speed broadband services. Also, the funding of A$29.2 million accelerated the rollout of the 5G network in Australia (Australian Treasury, 2020).

As part of the regional cooperation, the Australian Government's COVID-19 recovery plan also included initiatives to help recovery primarily in the Pacific and Southeast Asia. The following programmes were initiated: Investing in the COVID-19 Vaccine Access and Health Security Program in Pacific and Southeast Asian countries; The Australian Infrastructure Financing Facility for the Pacific; COVID-19 Recovery—Support to the Pacific and TimorLeste; and Delivering Security Infrastructure Projects in the Southwest Pacific (Australian Treasury, 2020).

3. Government Recovery Path Towards Green Growth Investment

It is logical to assume that the expected long-term low interest rates would reduce the cost of capital. In this context, with respect to promoting green growth in the recovery program, the Clean Energy Council, which represents renewable energy companies that employ more than 28,000 workers, the Australian superannuation funds, and the International Energy Agency argued that both the State and Federal governments do have the opportunity to transform Australian energy consumption forever to be environmentally friendly. In its Clean Recovery report released in 2020, the Council said wind and solar projects totalling 30 gigawatts energy capacity, which already had the development approval, would generate A$50 billion in investment across the supply chain; 50,000 construction jobs; and 4,000 permanent positions. The Council also said that the support for large- and small-scale renewables, such as rooftop panels, and an accelerated roll-out of batteries would create a 'smart energy system' that could deliver flexibility and lower costs for consumers with low emissions (Clean Energy Council, 2020).

The Technology Investment Roadmap Discussion Paper produced by the Department of Industry, Science, Energy and Resources identified a roadmap for the short, medium, and long terms with five priority technologies: clean hydrogen; electricity from storage; low-carbon steel and aluminium; carbon capture and storage; and soil carbon (Figure 2.5). The Commonwealth of Australia committed to implement the roadmap through the Clean Energy Finance Corporation (CEFC) (A$13 billion), the Australian Renewable

Energy Agency (ARENA) (A$1.4 billion), the Clean Energy Regulator (A$2.9 billion), and CSIRO (A$1 billion). However, the CEFC and the ARENA were set up by the Labour and the Greens to offer loans and grants to new projects, but were initially barred from supporting carbon capture and storage (CCS). In May 2021, the Commonwealth allowed ARENA to fund CCS projects, and potentially gas projects, with new regulations to align them with its 'technology not taxes' emissions roadmap (Mazengarb, 2021). The Labour and the Greens are not in favour of the inclusion of CCS in the CEFC funding because it will reduce the annual funding for renewable energy.

The Government will invest A$249.6 million over 4 years to modernise recycling infrastructure, reduce waste, and recycle more within Australia. Energy and Emissions Reduction Minister Angus Taylor directed the CEFC to invest A$300 million in hydrogen projects, which can include gas power, and ARENA has a A$70 million fund to fast track development of wind- and solar-powered hydrogen projects. There are also sub-national hydrogen strategies and action plans. Examples include the Queensland Hydrogen Industrial Strategy, South Australia's Hydrogen Action Plan, the Western Australian Renewable Hydrogen Strategy, and the Tasmanian Renewable Hydrogen Action Plan. (Longden, 2020).

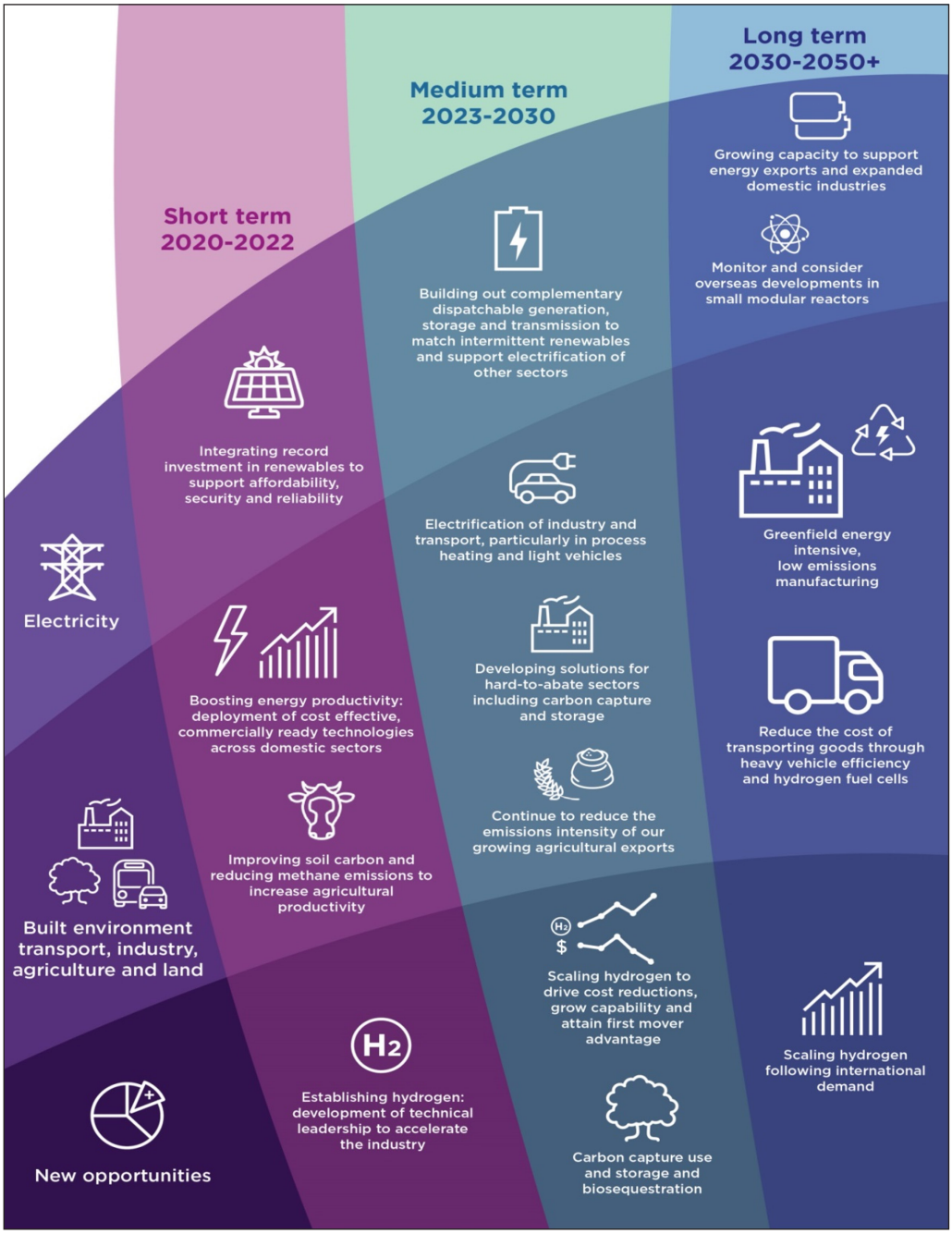
With respect to Australia's regional cooperation contribution to boost green growth, Sun Cable has been developing the A$22 billion Australia-Association of Southeast Asian Nations (ASEAN) Power Link, which has been awarded 'Major Project Status' by the Australian Government.[3] The Australia-ASEAN Power Link involves the world's largest battery with about 22 gigawatt-hours of storage, the world's largest solar farm (12,000 hectares of solar arrays), and a 4,500 kilometres of high-voltage direct current submarine cable producing 10GW of dispatchable electricity.[4] The project will provide dispatchable renewable electricity to the Northern Territory and will supply up to 20% of Singapore's electricity demand. Eventually, it will supply to Indonesia as well. It is expected that the APPL will export about A$2 billion of solar energy per year to Singapore by the end of 2027, connecting Australia into the ASEAN Power Grid (Sun Cable, 2020). Sun Cable could profit from letting other projects export electricity to Asia through shared-cost use of its infrastructure. This would encourage future renewable energy exports, especially to ASEAN. This would strengthen Australia's economic relationships with its ASEAN neighbours.

A report commissioned by the Pilbara Development Commission and authored by Australian and Indonesian researchers investigated the potential to export electricity generated by photovoltaic solar in Pilbara to Asia. The study found that it was feasible to deliver

[3] Major Project Status is the Commonwealth Government's recognition of the strategic significance of a project to Australia. It provides projects with support from the Major Projects Facilitation Agency, which acts as a single entry point for Commonwealth Government approvals, project support and coordination.

[4] Construction is expected to start in late 2023, with solar energy to reach Darwin in 2026 and Singapore in 2027.

Figure 2.5 Australia's Short-, Medium-, and Long-term Green Technology Roadmap



Source: Department of Industry, Science, Energy and Resources (DISER) (2020).

energy generated from a Pilbara solar facility and send it via a high-voltage direct current cable under the sea to Indonesia. A pilot project has been planned to involve the development of a three-gigawatt solar farm and a subsea transmission cable by 2030. The Queensland Government announced its support for the construction of Australia's largest solar farm, near Chinchilla.

As a regional cooperation in green growth, the hydrogen energy supply chain is provided as an example of Australia and Japan cooperating on a pilot project in 2020–21. The project will make use of the world's first liquefied hydrogen carrier named the SUISO FRONTIER. Liquefied hydrogen will be transported from Latrobe Valley in Victoria to Kobe in Japan. The ship has been launched, but the storage tank is scheduled to be launched by the last quarter 2020 (Longden, 2020).

4. Conclusions and Policy Suggestions

It is crucial to note that the Australian economy has not explicitly adopted a net zero carbon emissions target for 2050, while most of the major trading partners of Australia including China and Japan have committed to a net zero carbon emission target for 2050. This uncertainty has the potential to discourage investors from coming forward for increasing green investment in Australia. The governance arrangement of the Australian energy market model is a unique one. It is interesting to know that the energy policy is the domain of the State Governments, while climate change policy is the domain of the Federal Government. It is a serious concern that both the major parties—the Labour and the Liberal—so far find it difficult to work together for decarbonizing Australia's CO_2-intensive power system. Nevertheless, the current Government has acknowledged that technological innovations concerning solar, wind, and hydroelectric projects are instrumental to revive the Australian economy in the post-COVID-19 era. The Government has already made substantial investments in clean energy technology, with more than A$10 billion invested in more than 670 clean energy projects with a total project value in excess of A$35 billion (Taylor, 2020). Australia has grown to be one of the largest liquefied natural gas (LNG) exporters in the world. This means that Australia's LNG exports have the potential to reduce global emissions by up to 163 million tonnes by displacing more emissions-intensive fuels overseas. Acknowledging that fact shows that technology offers the best prospect of reducing global emissions while maintaining and strengthening Australia's position as an energy export leader.

Australia has been lagging many of the comparable developed countries in the use of electric vehicles for road transportation. Governments can accelerate this adoption by committing to fleet transitions. Currently, the Australian Capital Territory (ACT) and Queensland Governments have strong policies in place. For example, all newly leased ACT Government fleet passenger vehicles will be zero emissions vehicles from 2020–21 (ACT Government, 2018). To increase the public demand for electric vehicles, governments need to tailor proper incentive measures. These could be financial incentives to reduce the existing gap between the purchasing cost of an electric vehicle and an internal combustion engine. Further

benefits to consumers of electric vehicles may include tax rebates, infrastructure subsidies, stamp duty exemptions, and registration discounts. Non-financial incentives, such as access to bus lanes and parking, could also boost the demand for electric vehicles.

Australia is well placed to achieve low-cost green hydrogen production due to its low-cost renewable energy supply and the potential to achieve large economies of scale (Longden, et al. 2020), which have prompted regional collaboration with the Republic of Korea and Japan in the field of hydrogen energy. Acknowledging the fact that technology offers the best prospect of reducing global emissions without reducing economic growth, the Government should take on a leadership role in stimulating research and development and the early deployment of emerging economic clean technologies. Reinstating the carbon price will contribute billions of dollars to the exchequer.

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Chapter 3

China ‘s Strategies for Aligning C-19 Recovery and Stimulus Measures with Low-carbon Green Growth

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Chapter 3: China's Strategies for Aligning C-19 Recovery and Stimulus Measures with Low-Carbon Green Growth

1. Background

The coronavirus disease (COVID-19) outbreak in 2020 is a major public health emergency in China, with the fastest transmission, widest range of infections, and the highest difficulty in control and prevention. It not only had a marked impact on the economy, but tested the country's governance ability. The shutdown of factories and disruption of upstream and downstream industrial chains caused by the pandemic have triggered a global rethinking of industrial layout and added uncertainty to the policy choices for China's economic recovery. This paper summarises the effects of the COVID-19 crisis and China's economic resilience, and analyses its stimulus policies and measures, as well as its new climate commitment and potential impact.

2. COVID-19 Crisis and its Impact on China

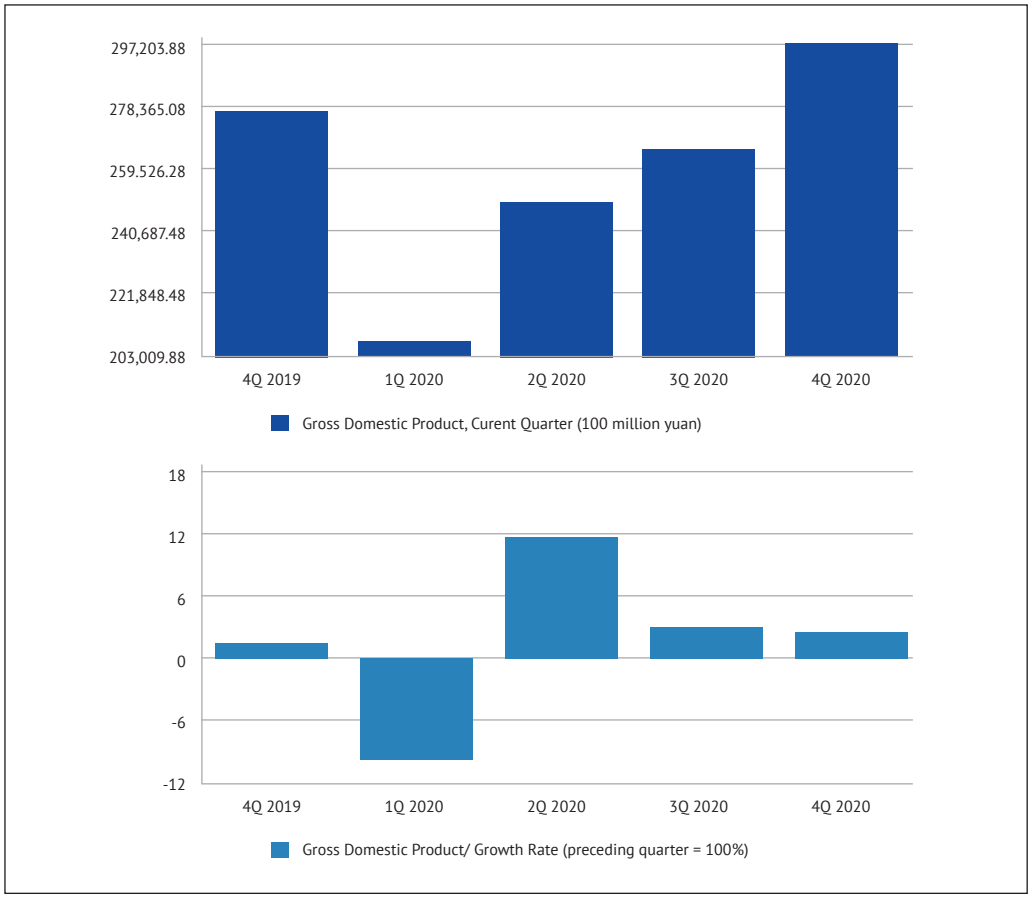
Since the outbreak of COVID-19, China has launched high-level measures to prevent the spread of the pandemic, strictly restricting the movement of people, and bringing the pandemic under control within a relatively short period of time.

China's economic performance in the first and second quarters was in the doldrums due to the impact of the pandemic, but it began to recover in the second quarter (Figure 3.1). In the first quarter, China's gross domestic product (GDP) reached CNY2.0554 trillion, down 6.8% year-on-year in terms of comparable prices; the added value of the primary industry was down 3.2%, the secondary industry down 9.6%, the tertiary industry down 5.2%. In the second quarter, GDP grew 3.2%, up 10 percentage points from the first quarter. In the fourth quarter, China's GDP already rose more strongly than a year earlier.

In terms of personal income and employment, the cumulative per capita disposable income was only CNY8,561 in the first quarter, sharply down from the previous quarter (Figure 3.2). The pressure on employment had increased significantly due to the increased number of loss-making companies in the first quarter (Figure 3.3). From January to April, only 3.54 million new urban jobs were created, 1.05 million fewer than the same period last year (Figure 3.4). The urban unemployment rate stood at 6.0% in April, 0.1 percentage point higher than in March. However, as prevention continues to improve, the employment situation shows positive changes. By the end of April, the number of migrant workers had returned to 90% of its usual level. With the implementation of various policies to stabilise employment and ensure people's livelihoods, such as social security reductions, refunds of unemployment insurance, and subsidies for ensuring job stability, people's income and employment situation have gradually improved.

From the perspective of industrial production, from January to April, the value added of industrial enterprises decreased by 4.9% year-on-year, and the profits of industrial enterprises decreased by 27.4%. Amongst them, manufacturing fell 5.4%, while high-tech manufacturing was up 0.5%; electricity, heat, gas and water production and supply fell 3.9%; the production of basic raw materials and new products maintained growth, and the output of natural gas, crude oil, 10 kinds of non-ferrous metals, ethylene and crude steel increased by 10.3%, 2.0%, 2.6%, 0.7%, and 1.3%, respectively.

Figure 3.1 China's Quarterly GDP And GDP Growth Rate

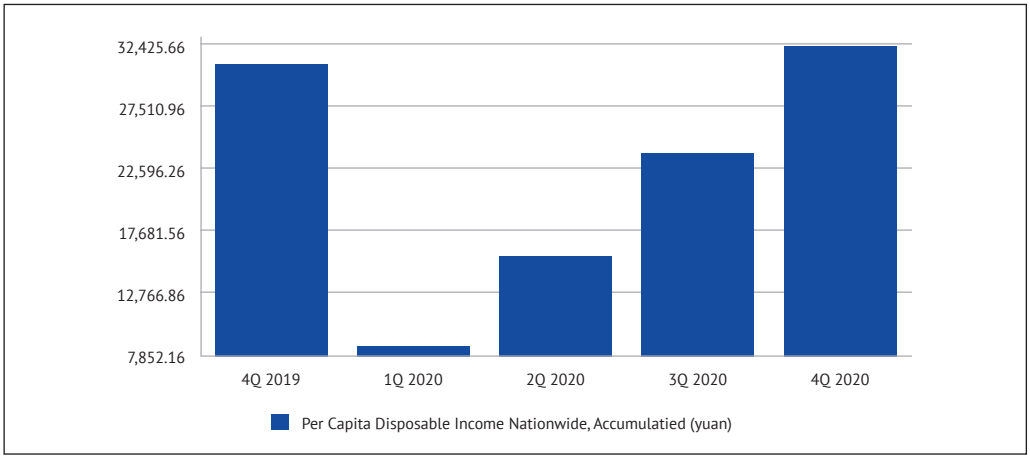


Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

With the accelerated resumption of work and the orderly restoration of economic and social order, the short-term impact of the pandemic on industrial production was gradually being eliminated (Figure 3.5). By the end of May, the average operation rate of scale industrial enterprises had reached 99.1%, and the resumption rate of small and medium-sized enterprises had exceeded 89%. In August, the high-tech manufacturing sector grew by 7.6% year-on-year, significantly faster than the growth of the above-scale industries. Production of new energy vehicles increased by more than 30% in the same month, while output of service robots and smartwatches all increased by more than 70%.

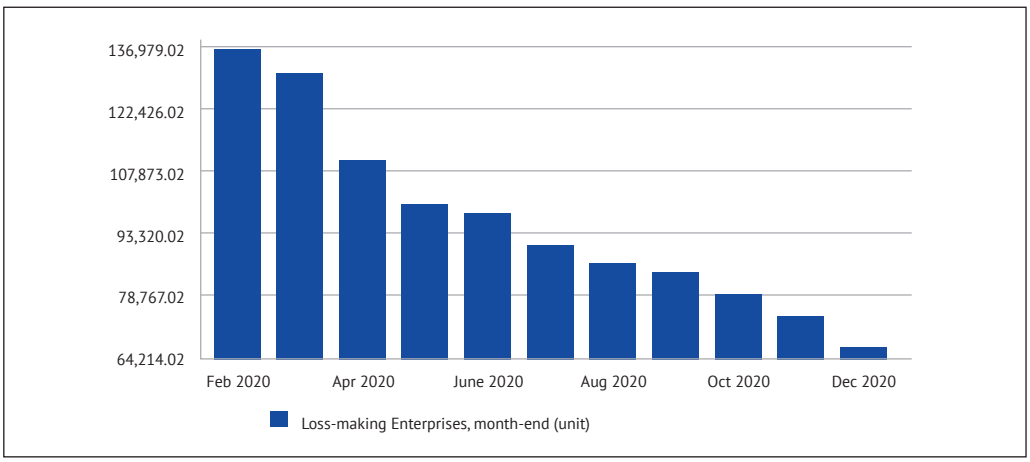
From January to April, fixed asset investment (excluding rural households) reached CNY13.682 trillion (Figure 3.6), down 10.3% from a year earlier, with the tertiary industry accounting for 67.8% of total investment, while investment in computer and equipment manufacturing, e-commerce services, and professional services grew by 15.4%, 25.6%, and 12.5%, respectively. Some areas of livelihood security, such as the production and supply of electricity, heat, gas, and water, saw an increase in investment. The actual use of foreign investment was down by 6.1% year-on-year from January to April, but the actual use of foreign capital in high-tech industries grew by 2.7%. Amongst

Figure 3.2 China's Quarterly Cumulative Per Capita Disposable Income (in yuan)



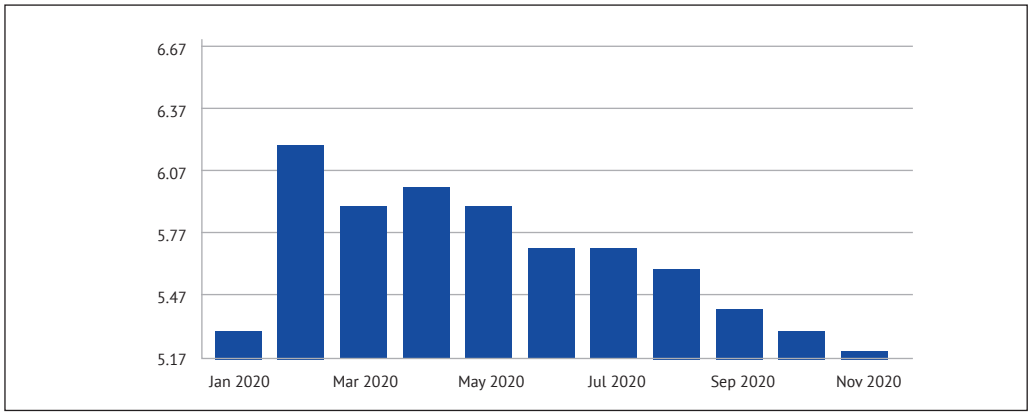
Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

Figure 3.3 The Monthly Number of Loss-Making Enterprises During the Pandemic



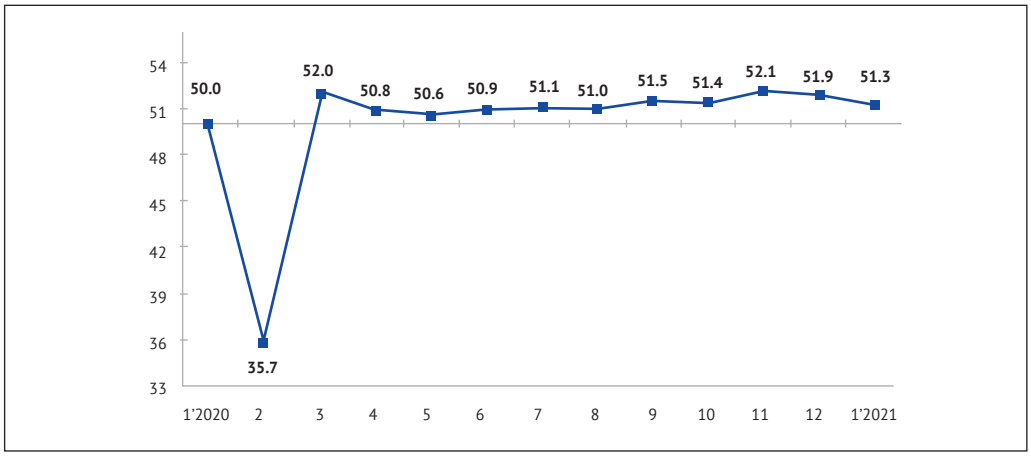
Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

Figure 3.4 China's Urban Unemployment Rate during the Pandemic (%)



Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

Figure 3.5 China's Manufacturing Purchasing Managers Index During the Pandemic

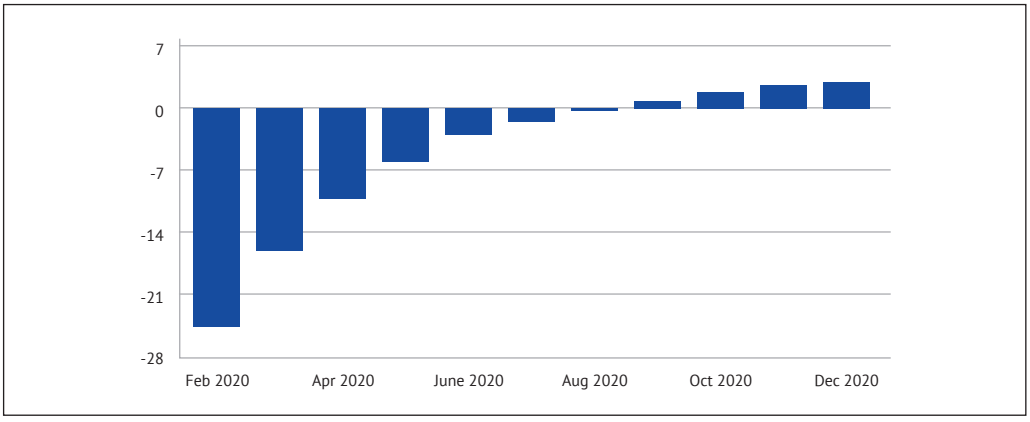


Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

them, information services, e-commerce services, and professional and technical services grew by 46.9%, 73.8%, and 99.6%, respectively.

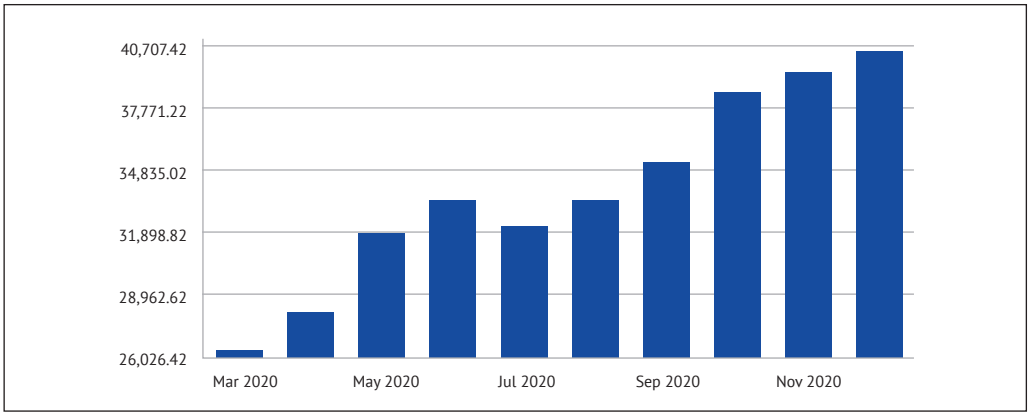
As for consumption, from January to April, total retail sales of consumer goods reached CNY10.675 trillion (Figure 3.7), down 16.2% year-on-year. Amongst them, catering revenue was down 41.2%, and retail sales of goods down 13.1%, while commodities closely related to people's life showed an increasing trend, with grain and oil, food, beverages, and medicine growing by 13.8%, 6.3%, and 4.3% respectively. Online retail and other emerging forms of consumption continued to maintain rapid growth (Figure 3.8). From January to April, online retail sales reached CNY2.575 trillion, up 8.6%. With the gradual elimination of pandemic factors and steady recovery of logistics and transportation, consumer demand gradually recovered, and China's consumer market will maintain a long-term stable and sustainable development trend. New forms of consumption, such as new retail sales and contactless

Figure 3.6 Cumulative Growth of Investment Actually Completed in Fixed Assets (%)



Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

Figure 3.7 Monthly Total Retail Sales of Consumer Goods (CNY100 Million)



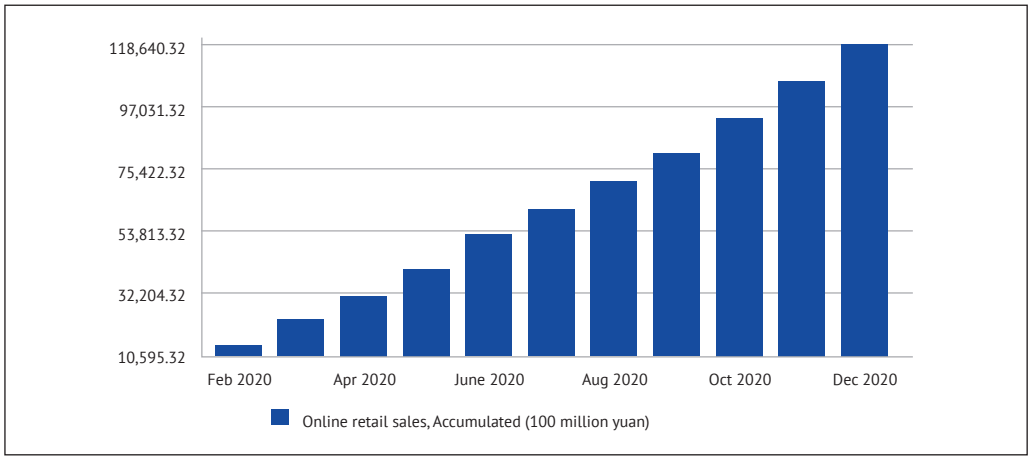
Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

consumption based on the digital economy, have developed rapidly, further strengthening economic recovery.

China's foreign trade was severely impacted by the pandemic. In US dollar terms, imports and exports from January to May totalled US$165 billion, down 8.0%, with exports down 7.7%, and imports down 8.2% (Figure 3.9). Since then, COVID-19 has had less and less impact, and the growth of both imports and exports turned positive in June. From January to July, China-ASEAN trade has surged by 6.6% to CNY2.41 trillion. In addition, China's trade with the EU and Japan are also growing. It is worth noting that the total trade volume between China and the US fell by 3.3% to CNY2.03 trillion.

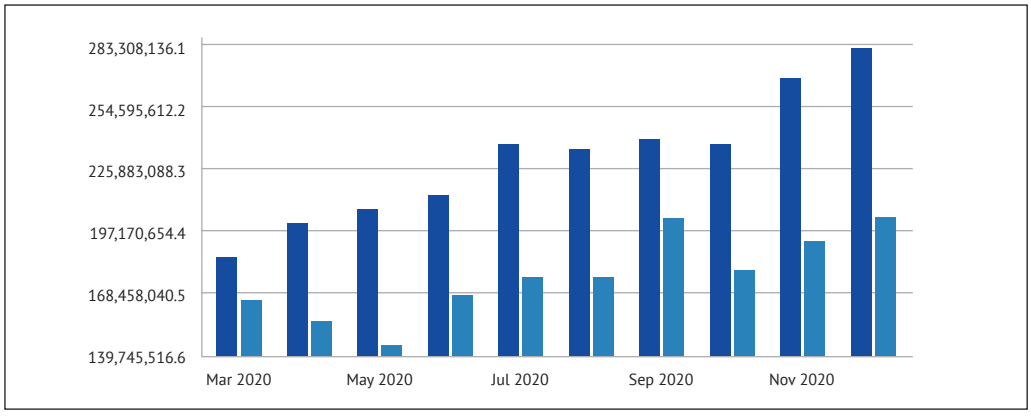
From the energy and power industry, installed capacity of wind and solar power has maintained rapid growth, and was less impacted by the pandemic.

Figure 3.8 Accumulated Online Retail Sales (CNY100 million)



Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

Figure 3.9 Exports and Imports During the Pandemic (thousand US$)

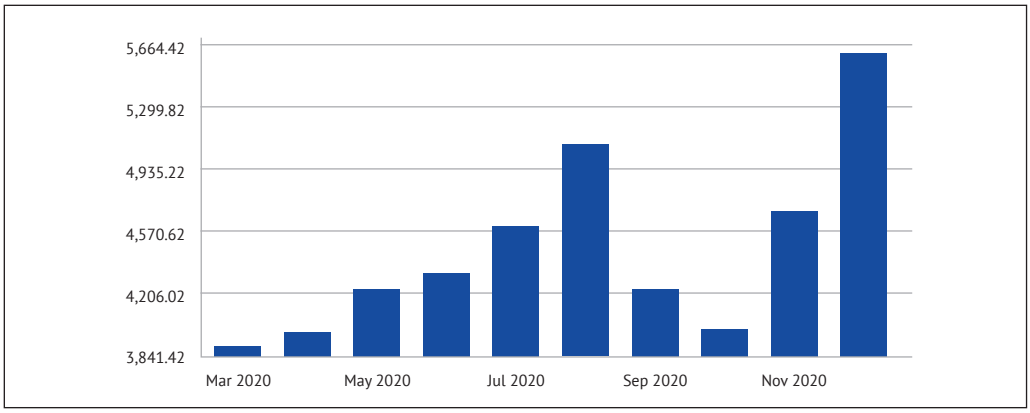


Note: Export on the left in red, and import on the right in blue.

Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

By the end of August, China's installed power-generating capacity reached 2.07 billion kW, up 5.8% year-on-year. Hydropower generated 360 million kW, up 2.7%. Thermal power reached 1.22 billion kW, up 3.9% (Figure 3.10), of which coal-fired power generation reached 1.06 billion kW, up 3.2%, and gas-fired power 95.31 million kW, up 6.4%. Nuclear power reached 48.77 million kW, up 3.8%, wind power 220 million kW, up 12.2%, and solar power 220 million kW, up 17.0%. From January to August, major power generation enterprises in China invested CNY255.5 billion in power projects, up 47.4% year-on-year, of which investment in clean energy accounted for 92.7%: by category, hydropower reached CNY55.2 billion, up 15.7%, thermal power reached CNY26.7 billion, down 33.2%, and nuclear power reached CNY20.2 billion, down 4.9%, while wind power reached CNY132.9 billion, up 145.4%.

Figure 3.10 Output of Thermal Power Generation During the Pandemic (100 Million kWh)



Source: National Bureau of Statistics 2021.2 https://data.stats.gov.cn/english/easyquery.htm?cn=B01 (accessed 13 September 2021).

In general, thanks to the government's policy efforts to stabilise growth, China's economy has achieved a V-shaped rebound, with GDP growth of -6.8% in the first quarter, 3.2% in the second quarter, 4.9% in the third quarter, and 6.1% in the fourth quarter. According to the Statistical Communique of the People's Republic of China on 2020 National Economic and Social Development issued by the National Bureau of Statistics on 28 February 2021, the annual GDP of the People's Republic of China reached CNY10.1598 trillion, an increase of 2.3% over the previous year, the only economy with positive growth. The forecasts of the International Monetary Fund (IMF), the World Bank, and the Organisation for Economic Co-operation and Development for China's GDP growth in 2021 are 8.2%, 6.9%, and 6.8% respectively, showing global confidence in China's economic recovery. But at the same time, it needs to be noted that some indicators about China are still weak, and the impact of the pandemic needs time to be made up. Due to the huge impact of the pandemic on the world economy, external risks and challenges facing China are significantly increasing, and China's economic recovery is still under pressure.

3. China's Stimulus Packages

Due to proactive and effective preventive measures, China's economy has been able to get back on track in the short term. Thus, China's current stimulus plan was not as drastic as the one implemented in the 2008 financial crisis. In response to the pandemic, China increased its policy stimulus by looking at the specific pandemic situation and economic situation step by step. At the meeting of the Political Bureau of the CPC Central Committee held on 17 April 2020, the 'six guarantees' were put forward for the first time, namely, to ensure people's employment, basic livelihood, market entities, food and energy security, stability of industrial and supply chains, and the construction of grassroots.

Based on the policies already introduced, China's stimulus plan has three main aspects: the first is the policy of rescuing the corporate sector, including reducing taxes and fees, and supporting the corporate rescue; the second is direct

assistance to the household sector, including cash vouchers and cash handouts, including tax cuts; and the third is to stimulate growth and domestic demand, such as speeding up the issuance of special local bonds to promote infrastructure construction.

In the Government Work Report 2020, the central government deficit broke 3% for the first time, and increased from 2.8% in 2019 to 3.6% of GDP in 2020, with expectations to be CNY3.76 trillion. The quota of special bonds issued by local governments will be expanded to CNY3.75 trillion, of which CNY600 billion will be allocated from the central government budget to support the development of new infrastructure and the new economy. A total of CNY1 trillion of special national debt will be issued to combat the pandemic. China continued to cut taxes and fees, reducing burdens by a total of CNY2.5 trillion.

To support local economies, the central government's transfer payments reached CNY8.4 trillion, an increase of 13% over 2019:

- CNY3.3 trillion transfer to local governments for education, old-age pension, medical insurance, basic public services, and other areas where the central and local governments share fiscal responsibility;
- Additional CNY3.7 trillion transfer to local governments in areas with severe economic difficulties;
- CNY0.8 trillion used to support government investment; and
- CNY0.6 trillion used for the one-time transfer payment plan to ensure people's basic living standards.

In general, the impact of the pandemic on China's economy is temporary and will not change its long-term fundamentals. Through a series of policy hedgings, the impact of the pandemic on the economy can be minimised.

To the end of the year, data from the Ministry of Finance show that expenditure in China's general public budget in 2020 will reach CNY24.59 trillion, an increase of CNY671.4 billion over 2019, of which central government expenditure will reach CNY3.51 trillion and local fiscal expenditure will reach CNY21.05 trillion. The expenditure in the general public budget mainly includes education, social security and employment, agriculture, forestry and water conservancy, urban and rural communities and health care. In 2020, China spent CNY3.63 trillion on education, CNY3.26 trillion on social security and employment, and CNY2.39 trillion on agriculture, forestry and water conservancy, along with CNY0.631 trillion on energy conservation and environmental protection (see Table 3.1).

4. China's Green Recovery Packages

China has continued to focus on green initiatives while tackling the pandemic. The Ministry of Ecology and Environment (MEE) has adopted economic and market measures to promote the adjustment and optimisation of industrial, energy, transport, and land use structures. It has also introduced a series of green measures, including carbon pricing, clean energy subsidies, and targets for new energy vehicles penetration.

Table 3.1 Major Expenditures of China's General Public Budget in 2020

Major expenditures	Amount (trillion)	Changes
Education	3.633	↑ 4.4%
Social security and employment	3.258	↑ 10.9%
Agriculture, forestry, and water conservancy	2.390	↑ 4.4%
Urban and rural communities	1.991	↓ 20%
Health care	1.920	↑ 15.2%
Transportation	1.219	↑ 3.2%
Debt servicing	0.982	↑ 16.4%
Science and technology	0.900	↓ 4.9%
Energy conservation and environmental protection	0.631	↓ 14.1%
Culture, tourism, sports, and media	0.423	↑ 3.6%

Source: Ministry of Finance of the People's Republic of China, 2021.

Climate goals and policy framework

Over the past few years, 'green development' and 'ecological civilisation' have become an indispensable part of China's development vision (Chai et al., 2018). The concept of 'green development' should also be fully taken into account as China strives to complete the building of a moderately prosperous society by 2020. The Chinese government announced four principal climate goals before the pandemic:

- to achieve peak carbon dioxide emissions around 2030, making best efforts to peak early;
- to lower carbon dioxide emissions per unit of GDP by 60%–65% from the 2005 level by 2030;
- to increase the share of non-fossil fuels in primary energy to around 20% by 2030; and
- to increase the forest stock volume by around 4.5 billion cubic meters from 2005 levels by 2030.

These goals were highlighted in the Intended Nationally Determined Contribution that China submitted to the United Nations Framework Convention on Climate Change in June 2015, as well as in other official documents. All these goals are implemented through a policy infrastructure that includes Five-Year Plans, guidance documents and regulations issued by relevant ministries, and financial support provided through diverse channels (Table 3. 2) (Zouji et al., 2016).

Table 3.2 China's Policy Framework in Addressing Climate Change

Policy development	- Implementing proactive national strategies on climate change, including strengthening laws and developing long-term strategies and roadmaps for low-carbon development - Improving regional strategies on climate change, including control of emissions and carbon intensity at the urban development zone level - Innovating a low-carbon development growth pattern through low-carbon pilots in provinces and cities - Promoting international cooperation on climate change, such as by actively engaging in international cooperation and establishing a Fund for South-South Cooperation on Climate Change
Energy system changes	- Building a low-carbon energy system, including the shift away from coal and the development of renewables and nuclear power
Support for science and technology	- Building an energy-efficient and low-carbon industrial system, including the promotion of low-carbon industries, control of industrial emissions and the promotion of recycling systems - Enhancing support for science and technology, including strengthening research and development on low-carbon technologies - Improving statistical and accounting systems for GHG emissions, including regular GHG inventories at national and provincial levels
Sectoral plans	- Controlling emissions from the building and transportation sectors, through low-carbon urbanisation planning and optimised green transportation systems - Increasing carbon sinks in forests, wetlands, and grasslands - Enhancing overall climate resilience, through infrastructure development and improved assessment and risk management of climate change
Incentives and behaviour	- Increasing financial and policy support, such as funds, financing mechanisms, preferential taxation policies, green government procurement systems and green credit mechanisms - Promoting carbon emissions trading markets, building on emissions-trading pilots - Promoting a low-carbon way of life, by supporting low-carbon choices in daily life - Increasing broad participation of stakeholders, in order to increase public- and private sector awareness of low-carbon development

GHG = greenhouse gas.

Source: Authors, based on National Development and Reform Commission's reports, https://en.ndrc.gov.cn/policies/ (accessed 13 September 2021).

To accelerate the green low-carbon development, and promote China's carbon dioxide emissions to peak around 2030, in October 2016, the State Council issued a Work Plan to Reduce Greenhouse Gas Emissions during the 13th Five-Year Plan period. Eight key areas have been identified for the control of greenhouse gas (GHG) emissions, and detailed arrangements have been made for key work, policies, and measures in each area (Table 3.3).

The work plan clearly requires all provinces to incorporate carbon dioxide reduction into their economic and social development plans, annual plans and government work reports and formulate specific work plans. As of June 2018, all 31 provinces have issued relevant plans or plans for controlling GHG emissions. In order to strengthen target responsibility, China formulated accountability assessment measures for provincial governments to control GHG emissions. From 2018 to 2020, the annual assessment shall be completed before the end of July each year. The final assessment of the 13th Five-Year Plan shall be completed by the end of June 2021.

Table 3.3 Eight Key Areas to Control Greenhouse Gas Emissions During The 13th Five-Year Plan Period

Promote low-carbon transformation of the energy system through the energy revolution	- In 2020, total energy consumption control was within 5 billion tonnes of standard coal, coal control was around 4.2 billion tonnes, natural gas consumption ratio reached 10%, the per unit GDP energy consumption fell by 15% compared to 2015, and the proportion of non-fossil energy reached 15. - Per unit of CO2 emission of large power generation enterprises was within 550 grams of CO2 per kWh.
Building low-carbon industries to promote low-carbon transformation.	- In 2020, the proportion of service industry and strategic emerging industry in GDP reached 56% and 15%, respectively. - Unit value added of industry CO2 emissions in 2020 dropped 22% compared to 2015; farmland nitrous oxide emissions to peak around the year 2020 and part of the heavy chemical industry to reach peak quantitative targets, etc. - To carry out pilot demonstration projects for carbon capture, utilisation, and storage, as well as carbon sequestration projects in forests, grasslands, wetlands, oceans, and other ecosystems - To put forward more detailed emission reduction requirements for other GHGs, including hydrofluorocarbons.
Creating low-carbon urbanisation to drive consumption transformation	- The plan puts forward specific tasks from aspects of urban and rural construction and management, transportation system construction, waste disposal, and low-carbon lifestyles. - The plan puts forward tasks and requirements for implementing the low-carbon concept and exploring an intensive, intelligent, green, and low-carbon new urbanisation model.
Promote low-carbon development fulling considering regional differences	- To reflect the characteristics of differentiated policies, the Plan puts forward different GHG emission control requirements for different regions. - It encourages some regions to set peak targets and carry out total emissions control work. - It identifies pilot projects as an effective means of exploring regional low-carbon development models.
To build a national carbon market	- First, establish a national carbon emission trading system, establish a national and local management system, and implement the carbon emission quota and control system; - Second, allocate emission allowances to key enterprises, improve trading institutions, rules, and varieties, and establish a market regulation and offset mechanism, as well as a risk prevention mechanism; - Third, strengthen capacity building for basic support, build a national carbon emission trading registration system, a disaster preparedness system, and a GHG emissions accounting, reporting, and verification system.
Increase investment in science and technology to promote low-carbon innovation	The plan emphasises the support for low-carbon technology research and development, demonstration, and application, including: - encouraging use of funds to speed up the government and market to promote low-carbon technology progress and industrialisation; - regularly updating low-carbon technology popularisation directory and promotion listing; and - strengthening low-carbon technology centralised demonstration applications.
Strengthen capacity building and consolidate relevant infrastructure	- The plan calls for efforts to improve the system of laws, regulations, and standards for addressing climate change, including formulation of a climate change law and the improvement of standards, labelling and certification systems for low-carbon products. - It requires strengthening the GHG emissions accounting and statistics, improving measurements and monitoring.
Deepening international cooperation and climate governance	Relevant requirements on the follow-up negotiation and implementation of the Paris Agreement and international cooperation on climate change have been put forward to deepen China's climate diplomacy.

GDP = gross domestic product; GHG = greenhouse gas.

Source: Author based on Work Plan to Reduce Greenhouse Gas Emission during the 13th Five-Year Plan Period, http://www.gov.cn/zhengce/content/2016-11/04/content_5128619.htm (accessed 13 September 2010).

In general, during the 13th Five-Year Plan period, China adhered to supply-side reform and eliminated much inefficient production capacity (Gallagher et al., 2019). As of the end of 2019, China's carbon intensity has been reduced by about 48.1% compared with 2005, and non-fossil energy accounted for 15.3% of primary energy consumption, fulfilling China's commitments by 2020 ahead of schedule. The energy consumption per unit of industrial added value has dropped by more than 15% in 2019 compared with 2015, which is equivalent to saving 480 million tonnes of standard coal, and saving energy costs of about CNY400 billion. Green buildings account for about 60% of newly built civil buildings in cities and towns. In terms of transportation, the government guides the popularisation of new energy vehicles through the dual driving of double integral policy and new-energy automobile industry policies. In terms of architecture, China has issued green building evaluation standards and logo certification. In terms of agriculture and land use, China has seen the largest net increase in forest area in the past decade.

National low-carbon pilots

The launch of the national low-carbon pilots is a major recent Chinese measure to address climate change and promote low-carbon urbanisation. China has carried out low-carbon provincial, municipal, community, park, community, and other multi-level and all-round low-carbon pilot demonstrations. The pilot provinces and cities have accelerated the transformation of low-carbon technologies to upgrade traditional industries, actively promote low-carbon development in key areas such as industry, energy, construction and transportation, and build a modern industrial system featuring low emissions on the basis of major projects.

- By October 2017, 73 low-carbon pilot provinces and cities had set their carbon emission peak targets in different ways. Amongst them, 37 pilot provinces and cities put forward preliminary targets to achieve peak carbon emissions around 2020 or 2025, respectively. Of these cities, 21 formed an Alliance of Peaking Pioneer Cities to peak energy-related CO_2 emissions before 2030.
- A total of 29 pilot provinces and cities have set up special funds for low-carbon development, providing financial support for research and low-carbon technologies, construction of low-carbon projects and demonstration of low-carbon industries.
- All have carried out regional GHG inventories. Of these, 10 have established the GHG emission statistical accounting system for key enterprises, and 17 cities built carbon emission data management platforms, so as to grasp the timely carbon emission status of districts, counties, key industries, and key enterprises.

Fourteen pilot provinces and cities have identified and certified low-carbon products to promote. In addition, some pilot provinces and cities have established low-carbon research institutes, expert committees, promotion associations, etc.

The construction of near-zero carbon emission zone demonstration projects is another important national task for controlling GHG emissions. It is also an important starting point for deepening trials in low-carbon provinces and actively exploring a near-zero carbon emission development model. Progress has been made in some local areas (Table 3.4), although a series of outstanding problems still exist, such as inadequate conceptual understanding, inconsistent construction standards and imperfect supporting measures, from the perspective of local construction practices (Liu, 2018).

Table 3.4 Progress Made by Some Near-Zero Carbon Emission Zones

	Characteristics and Progress
Guangdong province	- Priority has been given to six areas, not only including cities and towns, new areas and industrial parks proposed by the state, but also include industries, communities and enterprises and public institutions. - Specific targets corresponding to the three major time nodes of 2018, 2020, and 2025 were clearly set.
Zhejiang province	From the second batch of provincial low-carbon pilot projects to carry out near-zero carbon emission demonstration construction, which include: - six zero carbon emission pilot cities and towns; - four near-zero carbon emission communities; and - one New Energy near-zero carbon emission park. - Four near-zero carbon emission transportation enterprise pilot projects Ningbo city has launched a series of demonstration projects, including a zero-carbon industrial cluster, a zero-carbon port and logistics system, distributed power generation market trading, the utilisation of LNG cold energy, zero-carbon public buildings, and the promotion of electric vehicles.
Beijing	- Priority to renewable energy and conventional energy systems security. - Building green low-carbon heating system in the key administrative areas, promoting the application of solar energy and the building integration, to achieve the intelligent coupling operation of the new energy, renewable energy, and the conventional energy system. - By 2020, the proportion of new energy and renewable energy utilisation in the sub-central administrative and office areas will reach over 40%.
Hainan province	- Haikou city has decided to set up Jiangdong New Area on the east coast, focusing on building a zero-carbon new city. - Through the zero-carbon industry platform and facility environment, to build 'zero-carbon traffic', 'zero-carbon building', 'zero-carbon energy', 'zero-carbon family'.
Shaanxi province	Pilot demonstration will be carried out mainly in industrial and mining areas, agricultural parks and civil buildings, according to the characteristics of the three different regions. - Renewable energy will be used to replace fossil energy in industrial and mining areas, and carbon capture, utilisation, storage, and emission reduction technologies will be implemented. - The pilot production facilities in the agricultural park will realise all renewable energy power supply and heating, green energy for daily use, etc. - In the field of civil building, the roof and south facade of the building will be equipped with solar photovoltaic system, mining and distributed grid connection mode, so as to achieve spontaneous and self-use of electricity, waste heat and gas heating of nearby industrial and mining enterprises.

LNG = liquefied natural gas.

Source: Author based on official websites of Chinese Ministries.

Renewable energy

Renewable energy and electric mobility are amongst the most effective tools in the fight against climate change.

In order to speed up the construction of safe, efficient, clean low-carbon energy systems and promote the renewable energy development, in May 2019, the National Development and Reform Commission (NDRC) and National Energy Administration (NEA) jointly issued the 'Notice on Establishing Guarantee Mechanism' for renewable energy power consumption to set the responsibility for each province, and conduct comprehensive monitoring, evaluation, and formal assessment from 2020.

According to the latest report issued by NEA in the end of 2019, 10 provinces' weight of the minimum gross consumption liability are more than 30%, with nine more than 15%. The allowable weight of the eastern and central provinces is better than others. At the same time, the five national clean energy demonstration provinces, namely Zhejiang, Sichuan, Ningxia, Gansu and Qinghai, have appropriately raised the allowable weight, so as to better play a leading and exemplary role. It is estimated that the proportion of renewable energy power consumption will reach 28.2% and the proportion of non-hydropower consumption will reach 10.8% in 2020, an increase of 0.3 and 0.7 percentage points, respectively, over 2019.

In February 2020, the Ministry of Finance, NDRC and NEA jointly issued the 'Opinions on Promoting the Healthy Development of Non-aqueous Renewable Energy Power Generation', and confirmed that, starting from 2020, new offshore wind power and solar thermal projects will no longer be included in the scope of central financial subsidies, and local governments can provide support in accordance with actual conditions. According to the fund collection situation and electricity consumption growth and other factors, it is estimated that the additional subsidy amount will be CNY5 billion in 2020, which can be used to support new wind, photovoltaic, and biomass power generation projects. NDRC and NEA will further clarify the categories of subsidies that can be granted to renewable energy power generation in 2020, and introduce specific management measures accordingly to ensure total subsidies for new projects less than CNY5 billion.

In July, 2020, the Ministry of Finance issued another import 'Notice on Issuing the Additional Subsidy Budget for Renewable Energy Electricity Price in 2020', clarifying that the total national renewable energy subsidy budget for 2020 will be approximately CNY92.4 billion, a year-on-year increase of 7%. Of this, about CNY90.6 billion has been issued previously, and about CNY1.7 billion will be issued currently, accounting for about 18% of the total subsidy budget in 2020. State Grid has received about CNY77.1 billion, accounting for about 83%; China Southern Power Grid has received about CNY6.6 billion, accounting for about 7%; and local power grids have received about CNY8.7 billion, accounting for about 9%. For the distribution of different types of power generation projects: wind power projects received about CNY39.6 billion, accounting for about 43%; photovoltaic projects received about CNY47.3 billion, accounting for about 51%; biomass projects received about CNY5.5 billion, accounting for about 6%.

In November 2020, the Ministry of Finance issued the 'Budget Notice on Additional Subsidy Funds for Renewable Energy Electricity Prices in 2021'. According to the notice, electricity price subsidies for renewable energy will total CNY5.954 billion in 2021. On November 9th, the NEA's Comprehensive Department issued the 'Notice on the Work Concerning the Interconnection of New Energy Power Generation Projects in 2020', requiring the State Grid, China Southern Power Grid and Inner Mongolia Power Grid to ensure the interconnection on schedule for the new energy power generation projects that meet the conditions of grid connection. There is also action in the provinces. For example, on November 18, the Beijing Development and Reform Commission, together with three ministries and commissions, supported six major solar engineering projects, including the renovation and integrated application of photovoltaic power generation buildings.

These policies will increase the proportion of photovoltaic power generation in the application of urban renewable energy and promote the green development of energy. With the continuous promotion of the policy, it is a good time for developing renewable energy.

New energy vehicles

Since 2017, the Chinese government has implemented various policies to foster the renewable energy industry. In 2018, the NEA took pains to rectify the chaos in the new energy automobile industry. It established a 'retreat, adjustment, and withdrawal' mechanism to allow the subsidies policy to gradually withdraw from 2018 to 2020. The subsidy policy was originally scheduled to expire at the end of 2020. To smooth the intensity and pace of subsidy decline, on April, 2020, Chinese authorities jointly issued the 'Notice on Improving the Promotion and Application of New Energy Vehicles' financial subsidy policy, specifying that the new energy vehicle subsidy policy will be extended to the end of 2022.

This new notice optimises and adjusts the subsidy policy using multi-dimensional aspects, i.e. extending the period to 2022, optimising the technical indicators, setting the ceiling and threshold, etc. In terms of the new policy, the subsidy standards for 2020/21/22 will decline 10%/20%/30% on the basis of the previous year, and in the public transportation sector the decline will be 0%/10%/20%. Further, in order to support the development of the new energy automobile industry and promote automobile consumption, from January 2021 to December 2022, new energy automobiles purchased will be exempted from vehicle purchase tax.

Fuel cells are also supported by the policy. Fuel cell vehicles are expected to play a role as important as electric cars in China's new energy vehicle blueprint. China has set a goal to have 5,000 such vehicles on its roads by 2020, 50,000 by 2025, and 1 million by 2030. As of the end of 2019, China has promoted more than 6,500 fuel cell vehicles and 50 operating hydrogen stations, and still has around 130 hydrogen stations under construction. However, the fuel cell vehicles face two key problems: lack of core technology and key components, and insufficient infrastructure. Considering current technological progress for a driving range of 500 km, fuel cell vehicles will be more expensive than electric cars by 2025. Therefore, China selected some cities to focus on the core technology

of fuel cell vehicle key components and carry out fuel cell industrialisation demonstrations. The demonstration period is 4 years, and the model cities will be given a reward for compensation.

Carbon pricing

China's pilot carbon market started trading in 2013. The Chinese government launched its development plan for a national emissions trading system in late 2017. According to the deployment of the Plan, 2018 is the infrastructure construction period, which will mainly carry out the infrastructure construction of the carbon market, including the establishment of a sound institutional system, construction of basic support systems, and capacity building. 2019 is the simulated operation period, and the power generation industry quota simulation trading is mainly carried out. Currently, China's pilot carbon market has grown into the world's second-largest in terms of quota trading volume. As of the end of August 2020, the cumulative trading volume of the seven pilot carbon markets was 406 million tonnes, with a cumulative trading volume of approximately CNY9.28 billion. According to the average transaction price of the seven pilot carbon markets in 2019, Beijing carbon market has the highest transaction price, which is about CNY80/tonne. Shanghai is second only to Beijing, which is about CNY40/tonne. The average transaction price of Hubei carbon market is about CNY30/tonne. The total volume of transactions and the average price of transactions improved. The emissions trading system is expected to become the most important policy instrument to motivate companies to reduce GHG emissions in the coming decade.

Green finance

At the national level, the pace of building a green financial system has been accelerated, including the establishment of a unified standard, the promotion of green financial reform and innovation pilot zone pilot experience, and active support for the development of the green bond market (Table 3.4).

By the end of the first quarter of 2020, the balance of green loans in the pilot green financial reform zones was nearly CNY200 billion, accounting for 13.2% of the total loans in the pilot zones and 3.2 percentage points higher than the national average. The outstanding balance of green bonds was CNY57.5 billion, up 115% year on year. The total number of green projects in the pilot zone exceeded 2,000, and the cumulative investment in green projects exceeded CNY1.67 trillion.

Green loans

In July 2020, the Central Bank of China issued a 'Notice on the Issuance of the Green Finance Performance Evaluation Plan for Deposit-Related Financial Institutions in the Banking Sector'. The Plan is an amendment to the July 2018 version. It expands the coverage of assessment, gives overall consideration to the development of green loans and green bonds, and leaves room for further assessment of new forms of business such as green equity investment and green trusts. The performance evaluation indicators of green finance include quantitative and qualitative indicators, of which the weight of quantitative indicators is 80% and that of qualitative indicators is 20%. The quantitative indicators include the balance proportion of green finance business, the balance share

of green finance business, the year-on-year growth rate of the balance of green finance business, and the proportion of the risk balance of green finance business.

Green bonds

From 2016 to 2019, Chinese financial institutions and companies raised US$24.36 billion by issuing green bonds in overseas markets. In the first half of 2020, 101 domestic green bonds were issued, with an issuance scale of CNY108.2 billion, a year-on-year increase of 20.24%. The number and scale of green corporate bonds continued to lead the way, accounting for 43.56% and 32.12%, respectively. In May 2020, the People's Bank of China and NDRC proposed merging China's green bond standards and removing 'fossil-fuel-related projects' from the list of projects available to raise funds from green bonds.

Green Development Fund

The establishment of the National Green Development Fund is a part of improving the economic policy system for ecological and environmental protection (Table 3.4). It is China's first dedicated environmental fund, approved by the State Council, and jointly established by the Ministry of Finance, Ministry of Ecological Environment, and Shanghai City, with registered capital of CNY88.5 billion. In July, 2020, China's MEE officially launched the national green development fund.

The main objectives of the Fund are to implement the national decisions and plans, increase government trust and transfer profits, guide non-governmental funds to invest in key areas, solve financing difficulties, support industrial development, and promote the accelerated development of ecological civilisation. The fund will adopt a variety of investment methods such as project investment, equity investment, equity participation or establishment of sub-funds.

As noted, the fund has already raised CNY88 billion (US$12.59 billion) in its first phase, which will focus on environmental protection and pollution prevention along the Yangtze River Economic belt, implement major national strategies such as promoting the development of the Yangtze River Economic Belt, and pay attention to key areas of green industry development.

Environmental information disclosure

In recent years, listed companies have made great progress in the disclosure of key pollutant-discharging units. According to data from Shanghai Securities News Co., 58 A-share listed companies have publicly disclosed information about environmental penalties since 2019. Air pollution and water pollution are the 'worst-hit areas' due to the fact that steel, coal, chemical, and other industries with major pollution sources are the focus of supervision and have stricter environmental information disclosure requirements. Currently, MEE and the China Securities Regulatory Commission are taking the lead in drafting mandatory disclosure requirements for listed companies and issuers of debt, which are expected to be released by the end of this year. On 28 June 2020, the Shenzhen Special Economic Zone Green Financial Development Regulation (draft) was adopted, which emphasises the need to strengthen the system construction of information disclosure and standardise the content and manner of information disclosure (Table 3.5).

Table 3.5 Main Green Finance Policies Issued Since 2019

Time	Issuing authority	Contents
March 2019	NDRC	Green Industry Guidance Directory (2019 edition)
March 2019	Ministry of Justice, NDRC	jointly issued 'Opinions on Accelerating the Establishment of Green Production and Consumption Regulations and Policy System'
November 2019	NDRC	Overall Plan for Green Living Initiative
May 2019	PBC	Notice of the People's Bank of China on Supporting the Green Finance Reform and Innovation Pilot Zone to Issue green Debt Financing Instruments
March 2020	General Offices of the Central Committee and the State Council	issued the Guidance on Building a Modern Environmental Governance System, which included strict implementation of the Environmental Protection Tax Law in the environmental governance system.
April 2020	Ministry of Finance, Ministry of Industry and Information Technology, Ministry of Science and Technology, NDRC	Notice on Improving the Fiscal Subsidy Policy for the Promotion and Application of New Energy Vehicles, which explicitly extends the implementation period of the fiscal subsidy policy for new energy vehicles to the end of 2022.
June 2020	The Shenzhen Municipal People's Congress	Notice on Shenzhen Special Economic Zone Green Financial Development Regulation (draft). It is the first local green finance legislation in China.
July 2020	the Ministry of Finance, MEE and the City of Shanghai	jointly launched the National Green Development Fund
July 2020	PBC, NDRC, and China Securities Regulatory Commission	Notice on issuance of directory of projects supported by green bonds (2020 edition) for public comment. The coal-related projects will be excluded from directory for the first time
July 2020	PBC	Notice on the Green Finance Performance Evaluation Plan for Deposit Financial Institutions in the banking industry (Draft for Comments)
September 2020	NDRC	Notice on Organizing the Construction of Green Industry Demonstration Base
September 2020		The Guangdong-Hong Kong-Macao Greater Bay Area Green Finance Alliance was jointly established by Guangzhou, Shenzhen, Hong Kong, and Macao
September 2020		Bank of China issued the first blue bond in the world. On October 30, Industrial Bank Hong Kong Branch successfully issued a three-year US dollar fixed interest rate blue bond in the international capital market.
October 2020	MEE, NDRC, PBC, the Banking and Insurance Regulatory Commission and the China Securities Regulatory Commission	jointly issued a guideline on promoting investment and financing in addressing climate change.
Until the end of 2020		the number of Chinese banks adopting the Equator Principle has expanded to six, with the join of Chongqing Rural Commercial Bank, the Mianyang Commercial Bank and the Bank of Guizhou
On 1 March 2021	PBC Shenzhen Central Branch	China's first green finance laws and regulations, as well as the world's first comprehensive bill to regulate green finance -- 'Shenzhen Special Economic Zone Green Finance Regulations' was formally implemented

MEE = Ministry of Ecology and the Environment, NDRC = National Development and Reform Commission, PBC = People's Bank of China.

Source: Author based on official websites of Chinese Ministries.

5. New Ambitious Climate Commitment and Potential Impact

In the speech to the UN General Assembly on 22 September 2020, President Xi Jinping announced that China will scale up its Nationally Determined Contribution to tackling climate change by adopting more vigorous policies and measures in an effort to peak carbon dioxide emissions before 2030 and reach carbon neutrality before 2060. The announcement is amongst the most significant signs of progress concerning countries' efforts to mitigate climate change since agreeing to the Paris Agreement in 2015. To achieve the targets, top policymakers should take more targeted approaches when drafting the 14th Five-Year Plan. Five sectors – energy, transport, industry, construction, agriculture, and land use – need to work together to make a low-carbon transition under the guidance of the carbon neutrality target. From the perspective of a realisation path, the following green stimulus packages needed:

The first kind of green stimulus measures should focus on the further optimisation of China's energy structure and promote key technologies independent of fossil fuels, including:

Reasonable control of the scale of coal-fired power plants and means for decommissioning them. At present, China's power generation and industrial energy use are dominated by coal, and the two-carbon emissions account for 44% and 20% respectively. China's industrial emissions peaked in 2012, and emissions from the electricity and heat production and transportation sectors are still increasing. In order to achieve the goal of carbon neutrality, it is necessary to reasonably control the total scale of coal-fired power plants and promote the peak power generation of coal-fired power plants as soon as possible. Most of China's coal-fired power plants were built before 2015. Based on the 30-year life expectancy, they are expected to be decommissioned before 2045. This requires the replacement of about 1 billion kW of coal-fired units with different zero-carbon technologies in the next 20 years.

Optimise the pattern of natural gas supply. Given that the proportion of natural gas in the primary energy consumption structure in 2030 is increased to 15%, China's natural gas consumption in 2030 may be twice that in 2019. In the short to medium term, China must strengthen the diversification of natural gas sources, and at the same time, reduce the intensity of natural gas emissions through vigorous development of carbon capture and storage technology.

Photovoltaic power generation should play a leading role in achieving China's carbon neutrality goal. Compared with other renewable energy sources, photovoltaic power generation is cheaper and easier to achieve. In the past 10 years, the cost of photovoltaic power generation in China has dropped by 90%. The price of module silicon wafers in China has dropped from CNY100 to about CNY2 in 10 years (according to the original specifications), making the cost of photovoltaic power generation as low as 'a dime per kilowatt-hour.'

- There is also much to be done to adjust the energy structure through consumer stimulation. For example, the green industry can be promoted through the repurchase

of old home appliances and the consumption encouragement of energy-efficient home appliances. The United Nations Environment Program pointed out in the COVID-19 response report recently released that countries should consider promoting sustainable consumption and production in their intervention measures against the impact of the pandemic.

The second category of green stimulus measures focuses on further electrification and low-carbonisation of the transportation industry:

- The renewable energy and new energy vehicle industries will see an accelerated shift in investment activities.
- Renewable energy enterprises have more opportunities to expand their business overseas given its advantages in renewable energy production, as well attracting overseas consumers with lower prices.
- Measures to continue this momentum through the consumer side can also include: similar to the consumption of home appliances, encouraging the consumption of new energy vehicles by buying back old fuel vehicles, supporting residents to scrap old, high-emission vehicles, and supporting the replacement of new energy vehicles.

The third category of green stimulus measures should promote the development of key technologies (such as renewable and nuclear power generation and new energy vehicles), and combine emerging technologies such as energy storage, hydrogen energy, and fuel cells:

- It is expected that during the 14th Five-Year Plan period, the newly installed capacity of wind power and solar power will exceed 100 million kW. A power system with a high proportion of renewable energy needs the support of long-term energy storage technology.
- To reduce emissions from the transportation sector, it is necessary to accelerate the deployment of new energy vehicles and hydrogen fuel cell vehicles, and actively promote the progress of biofuels, hydrogen, electrification, and other technological routes in the aviation and maritime fields.
- China can consider increasing investment in transportation electrification, rather than continuing to increase investment in the oil and gas industry. By developing electric vehicles and promoting the electrification of trucks, China will reduce China's dependence on oil and gas imports. Since the cost of electrification of transportation is much lower than the development cost of upstream oil and gas production, this will be a more stable approach in the long run.

The fourth category of green stimulus measures should focus on proactive guidance and support measures, like green finance, carbon market, capacity building, etc.:

- Supporting investments in such industries as green buildings, clean transportation, and renewable energy. In the estimation of Boston Consulting Group (Chen et al., 2020), to achieve the carbon neutral goal, China needs a cumulative investment of CNY90–100 trillion between 2020 and

2050, accounting for about 2% of the total cumulative GDP over the 30-year period. The central bank can provide a favourable liquidity environment for bond issuance.

- Carbon pricing could be a key driver of efforts to accelerate energy conservation and emissions reduction. It is expected that the national carbon market will complete the first transaction in the power generation industry from 2020 to 2021, include 80% of key emission units, and gradually introduce national certified voluntary emission reductions. It may expand to other industries whose mid-year comprehensive energy consumption reaches 10,000 tonnes of standard coal, such as petroleum processing and coking industry, chemical raw material and chemical product manufacturing, non-metallic mineral products industry, paper and paper products, and civil aviation, etc. The GHG category includes not only the direct carbon emissions from fossil fuel combustion, but also the indirect carbon emissions caused by the use of electricity and heat. During this period, the national carbon market will also explore the trading of allowance derivatives and paid allocation of allowances.

- In the long run, providing workers with skills upgrades creates a higher-skilled workforce and helps a country gain a competitive edge in some advantageous projects. Well-trained workers have a spillover effect on the whole chain of economic production and have a positive impact on the economy.

In general, China's climate actions and commitments during the pandemic will give a strong boost to global confidence and determination in reducing greenhouse gas emissions. The pandemic has also provided an opportunity for China to speed up their transition into a more energy-friendly future. While considering the domestic and world situation, there are various challenges, such as a highly competitive domestic market, possible subsidy cuts, slowing global demand, the US-China trade war in the short run, and costly energy restructuring, Insufficient human capital reserve, financial gaps, technological hurdles, etc in the long term. Achieving decarbonisation by 2060 will require a significant and rapid shift from China's current economic structure and energy system, and need good top-level policy design and active climate action in the next 5 years.

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Chapter 4

Recovering from the COVID-19 crisis: How the EU, Germany, and France Plan to Build Back Better

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Chapter 4: Recovering from the COVID-19 Crisis : How the EU, Germany, and France Plan to Build Back Better

1. Introduction

The novel coronavirus disease (COVID-19) pandemic posed enormous challenges to all people and governments across the world, wrecking health systems and economic sectors in both developing and developed countries. In the European Union (EU), as in other regions of the world, the pandemic constituted a major obstacle to socio-economic progress, especially as countries struggled to cope with the sudden and rising cases of COVID-19 infections. Nevertheless, governments have had to take decisive actions to mitigate the negative impacts of the pandemic on their respective economies. Whilst attempting to address these impacts, there are concerns that recovery investments should not only tackle economic sectors but should also be aligned to green development goals and objectives. Some regions and countries of the world have started providing stimulus packages and programmes expected to revamp economies and restore jobs whilst safeguarding the environment. This paper presents highlights of plans laid down by the EU and its members to recover from the crisis and draw a path towards recovery. The paper also summarises green recovery plans from France and Germany, both of which have largely led efforts at the national and union levels.

2. COVID-19 Pandemic in the EU

Pandemic situation at the EU level

By mid-January 2020, the European Centre for Disease Prevention and Control (ECDC), an agency of the European Union, published its first risk assessment of the novel coronavirus that was detected in China's Wuhan region in December 2019 (ECDC, 2020b). At that time, no cases of the virus were reported in the EU. The first cases in the EU were detected in France and Germany; by the time the World Health Organization (WHO) declared on 30 January 2020 that the outbreak of the novel coronavirus constituted a public health emergency of global concern (WHO, 2020b), several EU countries had reported cases. The trend in infection cases and deaths rose quickly through the months of February and March: on 11 March 2020, the WHO declared COVID-19 a global pandemic (WHO, 2020c). This prompted governments in the EU and across the world to institute public health measures and temporary policies, all of which have had socio-economic implications on livelihoods.

Initial responses to the COVID-19 situation were made both at the national and EU levels. To consolidate efforts, the EU rallied its members towards coordinated actions to save lives and protect their health and wellbeing. Largely, the EU's response aimed to limit the spread of the virus; ensure the provision of medical equipment; promote research for treatments and vaccines; and support jobs, businesses, and the economy (European Council, 2020b).

Starting in late 2020, the main focus in the EU was on the roll-out of the vaccination campaign with a prioritisation of vulnerable groups. After this, starting in March 2021, the adult population was called to be vaccinated;

since summer 2021, children starting with those age 12 have been immunised. From August 2021 onwards, 70% of the adult population in the EU have been vaccinated. While caution remains and some restrictions are still in place, economic recovery has picked up speed.

3. Economic Impact of COVID-19 in the EU, France, and Germany

Impact on jobs

Measures to curb the pandemic at the initial stages included restrictions on social gatherings; in many cases, countries and cities imposed total lockdowns that shuttered almost all economic activities. Consequently, a great proportion of the populace experienced reduced working hours and many job losses were reported as employers and companies began to experience the economic brunt of the pandemic on their operations. Compared to previous years, unemployment rates in EU increased in 2020 and have been projected to range from as low as 2.7% (in Switzerland) to as high as 22.3% (in Greece). The EU unemployment rates were estimated at 7.2% in July 2020, rising from a low of 6.4% in March 2020. An interactive page created by the European Data Portal for COVID-19 based on data from the International Monetary Fund (IMF) projected that EU unemployment rates would remain amongst the highest in advanced countries even in 2021, but would see some reductions from 2020 figures, with Greece still recording the highest unemployment rate of 19% (European Data Portal, 2020).

Major job cuts were recorded in the transport and energy sectors, with giant EU industry players such as Airbus, Air France, Lufthansa, Tui, Scandinavia Airlines, Renault, and a host of energy sector employers across the region announcing big job cuts (Davies and Tidey, 2020). In France, for instance, Renault announced a 4,600-job cut, with an expected 15,000 job reductions globally. Similarly, Airbus revealed a plan to slash 5,100 jobs in Germany and 5,000 jobs in France due to delays in orders from airlines whose activities have largely been grounded because of the COVID-19 situation. Other large companies like Air France, Tui, and Lufthansa planned to reduce 7,500, 8,000, and 22,000 jobs, respectively. These phenomenal disruptions in the labour economy called for interventions from governments.

The pandemic also led to changes in work-life situation, as working from home, teleworking, and e-services have grown, especially in the peak period, where stringent restrictions were placed on the movement of people. An e-survey conducted by Eurofound entitled Living, Working and COVID-19 provides a glimpse of the impact of the pandemic on working lives within the EU (Eurofound, 2020).

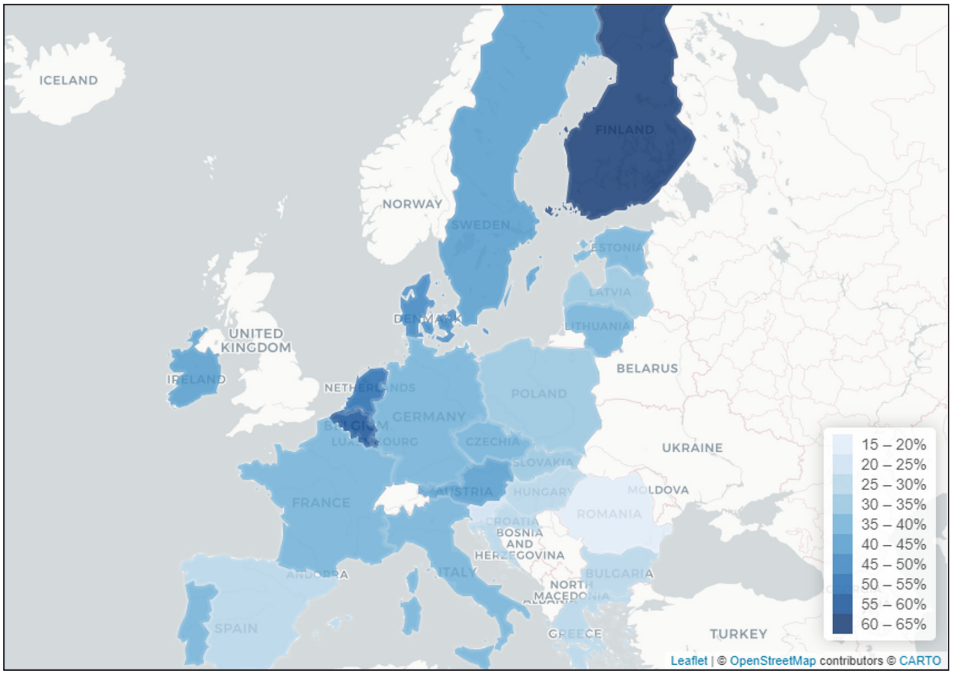
Figure 4.1 shows the percentage of survey respondents who indicated that they started working from home due to the COVID-19 pandemic. As many as 65% of workers in some EU countries like Finland and Belgium had to work from home as a result of the pandemic. Germany and France also had 35%–40% of workers working from home.

From April 2021 onwards, with immunisation rates rising, test stations being implemented, and cases decreasing, many workers could return to their offices. Precaution remains in place, such as keeping distance and wearing a face mask.

Impact on economic growth

The COVID-19 pandemic has taken a great toll on most EU economic sectors, including agriculture, manufacturing, and tourism. Save for four countries that

Figure 4.1 Percentage of Workers in the EU Working from Home Due to the COVID-19 Pandemic in April/May 2020



Source: Eurofound, 2020.

experienced stable or expanded economic yields, the EU recorded contracted economic outputs according to the European Economic Forecast (Summer 2020) conducted by the European Commission (European Commission, 2020b). In the first quarter of 2020, the EU's gross domestic product (GDP) contracted by an average of 3.2% compared to the last quarter of 2019.

France and Germany recorded negative growth of -5% and -2.2%, respectively. These figures are projected to worsen by the end of 2020, with the EU's GDP forecast to reduce by -8.3% compared to the previous year. It is also reported that losses in GDP correlated highly with reductions in employment rates, especially in EU regions which depend largely on tourism, a major sector massively hit by the pandemic (European Commission, 2020c). Projections by the Organisation for Economic Co-operation and Development (OECD), as depicted in Figure 4.2, also forecast contracted growth for the EU, Germany, and France in the first quarter of 2020.

Since the start of 2021, the contraction of GDP was milder than expected and falling numbers of new infections and hospitalisations have enabled EU Member States to reopen their economies. Thanks to the vaccination campaign, consumption has seen a considerable recovery, and tourism within the EU is beginning to recover. However, there are still temporary shortages of key components, e.g. semiconductors, and rising costs, which affect the manufacturing sector (European Commission 2021).

GDP in the EU is forecast to grow by 4.8% in 2021 and 4.5% in 2022 (European Commission 2021).

Figure 4.2 Economic Growth Forecasts in OECD Countries

OECD Interim Economic Outlook Forecasts, 2 March 2020

Real GDP growth

Year-on-year % change

	2019	2020		2021	
		Interim EO projetcions	Interim EO projetcions	Interim EO projetcions	Interim EO projetcions
World[1]	2.9	2.4	-0.5	3.3	0.3
G20[1,2]	3.1	2.7	-0.5	3.5	0.2
Australia	1.7	1.8	-0.5	2.6	0.3
Canada	1.6	1.3	-0.3	1.9	0.2
Euro area	1.2	0.8	-0.3	1.2	0.0
Germany	0.6	0.3	-0.1	0.9	0.0
France	1.3	0.9	-0.3	1.4	0.2
Italy	0.2	0.0	-0.4	0.5	0.0
Japan	0.7	0.2	-0.4	0.7	0.0
Republic of Korea	2.0	2.0	-0.3	2.3	0.0
Mexico	-0.1	0.7	-0.5	1.4	-0.2
Turkey	0.9	2.7	-0.3	3.3	0.1
United Kingdom	1.4	0.8	-0.2	0.8	-0.4
United States	2.3	1.9	-0.1	2.1	0.1
Argentina	-2.7	-2.0	-0.3	0.7	0.0
Brazil	1.1	1.7	0.0	1.8	0.0
China	6.1	4.9	-0.8	6.4	0.9
India[3]	4.9	5.1	-1.1	5.6	-0.8
Indonesia	5.0	4.8	-0.2	5.1	0.0
Russia	1.0	1.2	-0.4	1.3	-0.1
Saudi Arabia	0.0	1.4	0.0	1.9	0.5
South Africa	0.3	0.6	-0.6	1.0	-0.3

Note: Projection based on information available up to February 28. Difference from November 2019 Economic Outlook in percentage points, based on rounded figures.

1. Aggregate using moving nominal GDP weights at purchasing power parities.
2. The European Union is a full member of G20, but the G20 aggregate only include countries that are also members in their own right.
3. Fiscal years, starting in April.

GDP = gross domestic product, EO = economic outlook, OECD = Organisation for Economic Co-operation and Development.

Source: OECD, 2020.

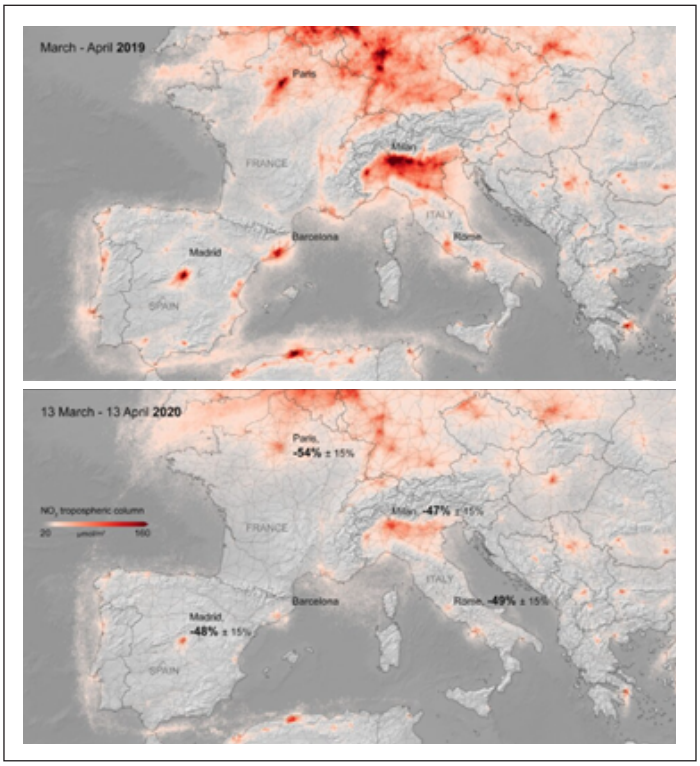
Impact on energy and environment

The COVID-19 pandemic has had an impact on energy investments in the EU as energy companies rescinded new investments because of declining demand (Eurelectric, 2020). In some EU countries, governments have had to institute a moratorium on bill payments since economic difficulties caused by the health crisis made it difficult for consumers to pay for energy. Though the EU considered its energy sector (considered as crucial for economic recovery) to be resilient even through the pandemic period, it acknowledges the potential detrimental impacts of COVID-19. The EU, through consultations with member states, drew conclusive statements on responses to the COVID-19 pandemic in its energy sector

(European Council, 2020a). The statement emphasises that 'the energy sector will require investments, particularly in energy efficiency (including renovation of buildings and heating and cooling systems), renewable energy (including offshore), integration of the energy systems, energy storage, electrification, cross-border interconnections and digitalisation as well as for completing key energy infrastructure projects that intend to help the EU achieve its energy policy and climate objectives' (European Council, 2020a).

Regarding the environment, the European Space Agency (ESA) reported that there was reduction in nitrogen dioxide concentration over Europe in March 2020 compared to the same period in 2019 as depicted in Figure 4.3. Bigger cities such as Paris, Madrid, Barcelona, Milan, and Rome recorded the highest drop in nitrogen dioxide (ESA, 2020a). Apart from weather conditions, nitrogen dioxide, which has harmful impacts on human health, concentrates as the result of emissions from power plants, vehicles, and other industrial activities.

Figure 4.3 Nitrogen Dioxide Concentration over Europe



Source: ESA, 2020a.

The phenomenon as presented by ESA suggests that there were reduced operations related to such activities within the EU, especially during the peak of the pandemic. Similar observations were made in other parts of the world, for example, in China, where nitrogen dioxide concentration over the country reduced significantly throughout the height of the pandemic when strict quarantine measures were imposed (ESA, 2020b).

4. Recovery Packages in the EU, France, and Germany

Green Recovery at the EU Level

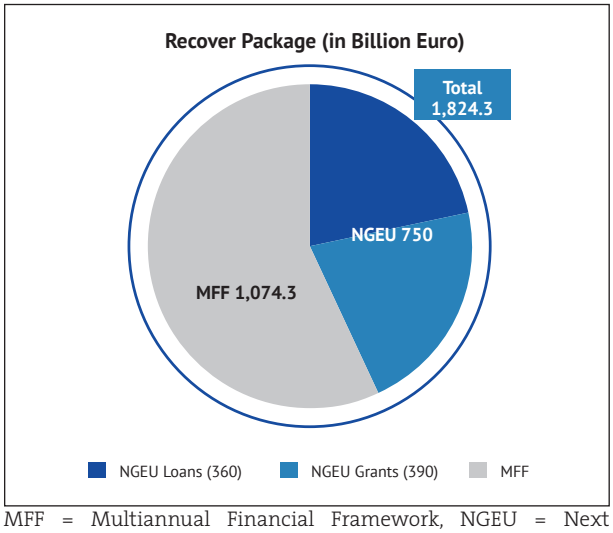
The impacts of COVID-19 on global and national economies have been unprecedented and have transformed some well-performing economies to near collapse. Efforts to recover have been expressed in recovery packages, programmes, and plans carved by national and local governments. The extent to which these measures address the ailing economies whilst protecting climate gains remains a topic of discussion, especially as concerns grow over the potential damage any massive economic restructure requiring intensive infrastructural development could cause to the environment. This paper summarises the EU's strategies and highlights key aspects of the plans intended to address climate concerns as it commits to ensuring that its economic recovery efforts do not harm its climate goals and objectives.

The EU's recovery plan has comprehensive details, particularly on green transition investments, as well as measures targeted at supporting youth, protecting jobs, and modernising healthcare systems. Recovery efforts by the EU are combined into its traditional Multiannual Financial Framework (MFF) and a specific recovery effort under the theme Next Generation EU (NGEU). In this sense, the MFF and the NGEU will run concurrently starting from 2021 to 2027. A total budget estimated at €1.8 trillion is allocated to this course (European Council, 2020c). Figure 4.4 depicts the total budget estimates expected to help revitalise regions and sectors that are most hit by the crisis. According to the EU, both NGEU and MFF will help transform it through its major policies, particularly the European Green Deal, the digital revolution, and resilience.

Of interest in this paper are the recovery aspects that focus on helping achieve climate objectives. It is worth mentioning that explicit provisions are made by the EU to ensure that climate actions are mainstreamed in policies and programmes of Member States financed under the MFF and NGEU. These policies are expected to comply with EU's objective of attaining climate neutrality by 2050 and achieving the Union's new 2030 climate targets. To this end, this paper summarises the following features of EU's MFF and NGEU:

- 30% of all expenditures from NGEU and MFT are to be allocated to climate actions
- Annual reporting on climate expenditure by the Commission

Figure 4.4 EU Recovery package estimates



MFF = Multiannual Financial Framework, NGEU = Next Generation European Union.

Source: Adapted from (European Council, 2020c).

- Programmes and projects carried out by Member States must:
  - ✓ Comply with EU climate neutrality by 2050
  - ✓ Contribute to achieving the EU's new 2030 climate targets
  - ✓ Be consistent with Paris Agreement objectives
- Creation of a Just Transition Mechanism, including a Just Transition Fund to address socio-economic consequences of achieving climate neutrality. Full access to the Fund is, however, dependent on Members' commitment to contributing to EU's objective of achieving a climate-neutral EU by 2050.

The NGEU, which is in the form of grants and loans provided to Member States, comprises seven programme components addressing different sectors of the economy. Under one of these components, i.e. Recovery and Resilience Facility (RRF), Member States are required to prepare national recovery and resilience plans that include growth potential, job creation, and economic and social resilience actions, as well as initiatives and projects that effectively contribute to the green and digital transition (see Table 4.1).

The various components and programmes of the MFF and corresponding summary actions are shown in Table 4.2. The MFF also contains elements relating to sustainable development in sectors such transport, energy, digital, agriculture, amongst others.

The EU also plans to continue supporting investments into large-scale projects such as the new European Space programme, as well as the International Thermonuclear Experimental Reactor (ITER). A total budget of €13.2 billion and €5 billion have been allocated to the aforementioned projects, respectively.

Table 4.1 Components of the Next Generation Eurpean Union (NGEU)

NGEU Components/Programmes	Total Budget (Billion Euro)	Percentage (%)
Recovery and Resilience Facility (RRF)	672.5 • 360 - loans • 312.5 - grants	89.7
ReactEU	47.5	6.3
Horizon Europe	5	0.7
InvestEU	5.6	0.7
Rural Development	7.5	1.0
Just Transition Fund (JTF)	10	1.3
RescEU	1.9	0.3
TOTAL	**750**	**100.0**

NGEU = Next Generation European Union.
Source: Adapted from European Council, 2020c.

Table 4.2 Components of the Multinational Financial Framework (MFF)

MFF Components / Programmes	Total Budget (Billion Euro)	Percentage (%)	Actions
Single Market, Innovation and Digital	132.781	12.4	Thermonuclear and Space programmes Reinforce EU's Research, Science, and Innovation base Mobilise public and private investment High-performance and sustainable infrastructure in the transport, energy, and digital sectors High-performance computing, artificial intelligence, and cybersecurity
Cohesion, Resilience and Values	377.768	35.2	Foster convergence, support investment, job creation and growth. Reduce economic, social, and territorial disparities within Member States and across Europe
Natural Resources and Environment	356.374	33.2	Deliver added value through a modernised, sustainable agricultural, maritime and fisheries policy Advance climate action and promote environmental and biodiversity protection.
Migration and Border Management	22.671	2.1	Coordinated action at EU level for management of external borders, migration, and asylum
Security and Defence	13.185	1.2	Actions in relation to internal security, crisis response, and nuclear decommissioning
Neighbourhood and the World	98.419	9.2	Stronger coordination between external and internal policies including the following: 2030 Agenda for Sustainable Development, the Paris Climate Agreement, the EU Global Strategy, the European Consensus on Development, the European Neighbourhood Policy, Partnership Framework with third countries on migration
European Public Administration	73.102	6.8	Consolidate reforms and constantly improve efficiency and effectiveness of the European Public Administration
TOTAL	**1,074.3**	**100.0**	

EU = European Union.

Source: Constructed based on (European Council, 2020c).

These projects aim at safeguarding the EU's global and regional satellite navigation systems, which facilitate the observation of global phenomenon including conditions at sea, the atmosphere, and climate change (Salini, 2020). The MFF and the NGEU are expected to go through approval stages in the second half of 2020 until the beginning of implementation in January 2021. Figure 4.5 shows the timeline of approval process.

Figure 4.5 Timeline in MFF and NGEU Approval

Source: European Commission, 2020a.

Green Recovery in Germany

Regarded as one of the best-performing and innovative economies in the world (Jamrisko and Lu, 2020), Germany has equally felt the economic burden from the COVID-19 pandemic. As mentioned previously, GDP in Germany suffered negative growth in the first quarter of 2020 as economic activities were extensively affected by COVID-19 restrictions. To save the economy and restore stability, German authorities outlined in June 2020 a comprehensive 2-year coronavirus economic recovery programme worth €130 billion to be rolled out in 2021 and 2022 (German Federal Ministry of Finance, 2020). The programme has three pillars in the form of: stimulus and crisis management package; future package; and international responsibility. This paper highlights the following measures which are directly linked to energy transition and climate policy.

- Government's capping of renewables levy to 6.5ct/kWh in

2021 and 6ct/kWh in 2022 (€11 billion)

- Allocation of €2 billion for a programme to increase investments in new technologies by carmakers and suppliers
- Expand government's share of the buyer's premium for e-cars until the end of 2021
- Setting up additional €2.5 billion for expansion in e-car charging infrastructure and supporting research and development in electromobility and battery cell production
- Providing financial support for municipalities, including €2.5 billion for public transport
- Allocation of €1 billion each for modern shipping and aviation
- Additional €2 billion allocated to promoting energy-efficient modernisation of buildings
- Actions targeted at the conservation and sustainable management of forests (€700 million)
- Making available €7 billion to promote hydrogen technology and support programmes to set up hydrogen production in Germany, including in partner countries

Other specific measures relating to the conservation and preservation of the environment are captured in the country's recovery plans. These include investments into sustainable mobility infrastructure, co-financing of energy transition research and innovation activities, incentives, and tax exemptions to promote the replacement of a conventionally fuelled vehicle fleet with climate- and environment-friendly electric vehicles. The plans also incorporate support for the electrification of the rail network and the rail system, as well as actions to promote a climate-friendly maritime sector.

Green Recovery in France

In France, as in many other advanced economies, the COVID-19 pandemic daunted the economic prospects and slowed the growth of most economic sectors. Struggling to cope with the effects, France initially committed about €470 billion in public spending and loan guarantees to support the ailing economy (Braun, 2020). As part of these expenditures, €8 billion was allocated in the form of aid, investments, and loans for decarbonising the automotive industry and making it more competitive. A component of the stimulus is directed to boost local manufacturing of electric and hybrid cars and incentivise buyers towards lower-emissions models through increased subsidies. The government's contribution towards people buying new electric cars would be increased to €7,000 from the current €6,000. Also, an allocation of €50 million was made to support road passenger transport, including coaches and buses. Other green measures included a bailout worth €7 billion for Air France, with the condition of cutting carbon emissions by half by 2030 (France Ministry of Finance and Economy, 2020).

In addition to the expenditures mentioned above, France has unveiled in September 2020 a medium- to long-term recovery plan estimated at €100 billion, which will span 2021 and 2022. The plan entails the following three pillars: greening the economy

(estimated at €30 billion), promoting economic sovereignty and France's competitiveness (at a cost of €34 billion), and funding 'solidarity and skills' through social expenses (with €36 billion) (Braun, 2020).

It is worth mentioning that cities in France supported sustainable mobility measures, especially during the peak of pandemic, whilst other regions have laid down plans to do same. For instance, the Île-de-France region, which hosts the capital Paris, promised financial support for an existing bike project consisting of a network of nine protected cycleways linking the centre of Paris with key suburbs (Reid, 2020). €300 million was expected to fund a mix of new infrastructure and temporary 'corona cycleways'. Also, the region planned 650 kilometres of cycleways for the post-lockdown period.

5. Outlook and Expected Outcomes

As described in this paper, the COVID-19 pandemic in the EU seems not to be over yet and governments across the region will have to deal with economic downturns as the pandemic continues. The contractions in the economies are largely associated with disruptions in demand and supply chains caused by closure of manufacturing and retail outlets and shops during lockdown periods. Measures being taken by the EU and summarised in this paper are expected to yield some growth results, propelling the EU's GDP to reach 5.8% growth in 2021. Support measures offered by EU members including France and Germany, aimed at assisting and preventing eventual collapse of sector activities, whilst protecting large firm employers who make enormous investments into the economy.

As seen in the EU, teleworking or working from home emerged as an important alternative that helped avoid job cuts in some instances. Teleworking helped avoid work-related trips during lockdown periods and contributed to averting pollution, as opinions have it that some cities experienced reductions in pollution during the lockdown periods (European Commission, 2020c). Despite the derived environmental benefits of teleworking, as have been shown in previous studies (Giovanis, 2018), there are concerns that the growth in teleworking could exacerbate inequalities in the labour economy since not all groups or categories of workers can have the opportunities to work from home, and might lose their positions as a result. For example, in the EU, there are reports that the feasibility of teleworking is greater for high-paid jobs and jobs in larger firms (European Commission, 2020c). It was estimated that only 20% of the employees in the retail, accommodation, and food sectors are able to work remotely, whilst there are higher possibilities (60% to 90%) for workers in sectors such as finance, insurance, information and communication, education, scientific and technical activities. For those who do not have the opportunity to telework, commuting meant that they had to use public transport systems, which were regarded as unsafe during the pandemic, or switch to private cars, which are also largely considered unsustainable. Such a divide in this new digital era presents challenges for policy makers and implementers to design innovative solutions to close any gaps thereof, whilst protecting the livelihoods of those in low-income brackets who are believed to have experienced greater economic impacts of the COVID-19 crisis (European Commission, 2020c).

The green recovery plans of Germany and France largely target the energy and the transport sectors. Considering that Germany has a vibrant automobile industry and a resilient renewable energy system, the recovery package as proposed by the German government constitutes a great effort to prevent a relapse in previous achievements made in the promotion of cleaner automobiles and expansions in the country's renewable power capacity. The government's recovery policy on capping renewables levy is intended to lessen the burden on renewable power consumers and facilitate expansion plans for renewable power generation. An assessment of the government's recovery plan points out that the plan can support municipalities in upgrading local public transport by promoting the rollout of e-buses and green innovations in bus and rail transport, and providing co-funding for the expansion of local bicycle infrastructure, including parking facilities (Oeko-Institut, 2020). Whilst investments in the automobile industry as proposed in the recovery plans aim at promoting electric and hybrid cars and incentivising purchases, the support for public transport operations, which were badly affected during the pandemic, consolidates the gains by promoting sustainable transport systems.

In France, investments proposed for green transport, including hydrogen as well as energy-efficient buildings, will revitalise jobs in these sectors and complement other government initiatives that address unemployment, training, and broader social initiatives. Such huge investments as detailed in economic recovery plans, will drive the country's transformation towards a green economy.

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Chapter 5

Policies on Green Recovery for India

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Chapter 5: Policies on Green Recovery for India

1. Setting the Scene

The COVID-19 pandemic has placed before us the unprecedented challenge of controlling the spread of infection without compromising socio-economic growth. Globally, the initial measures undertaken to control the spread of infection in the form of lockdown restrictions soon led to growing concerns of widespread and growing socio-economic challenges across countries. Worldwide, millions of businesses have suffered losses, regional supply chains have been disrupted, and large numbers of planned investments have been affected. Correspondingly, many people across the world have lost their jobs or suffered from wage cuts, pushing millions into poverty. It is estimated that the pandemic has pushed as many as half a billion people into poverty, leading to an increase in global poverty for the first time in 30 years (Sumner, Hoy, and Ortiz-Juarez, 2020).

An estimation of the magnitude of the job losses due to the pandemic by the International Labour Organization (ILO), taking the loss in global working hours as an approximation, suggested a loss of nearly 400 million full-time jobs from April to June 2020. Further, as the lockdown restrictions were expected to ease by the end of the year, in the baseline case, the ILO projected a loss in global working hours equivalent to 140 million full-time jobs in the last quarter of the year, whilst a loss equivalent to 340 million full-time jobs was predicted in the worst event of a second wave (ILO, 2020).

The pandemic has even more serious ramifications for countries like India, where sustained economic growth is critical for meeting development objectives. Rapid and inclusive growth has been highlighted as an overriding development priority in India's nationally determined contribution (NDC).

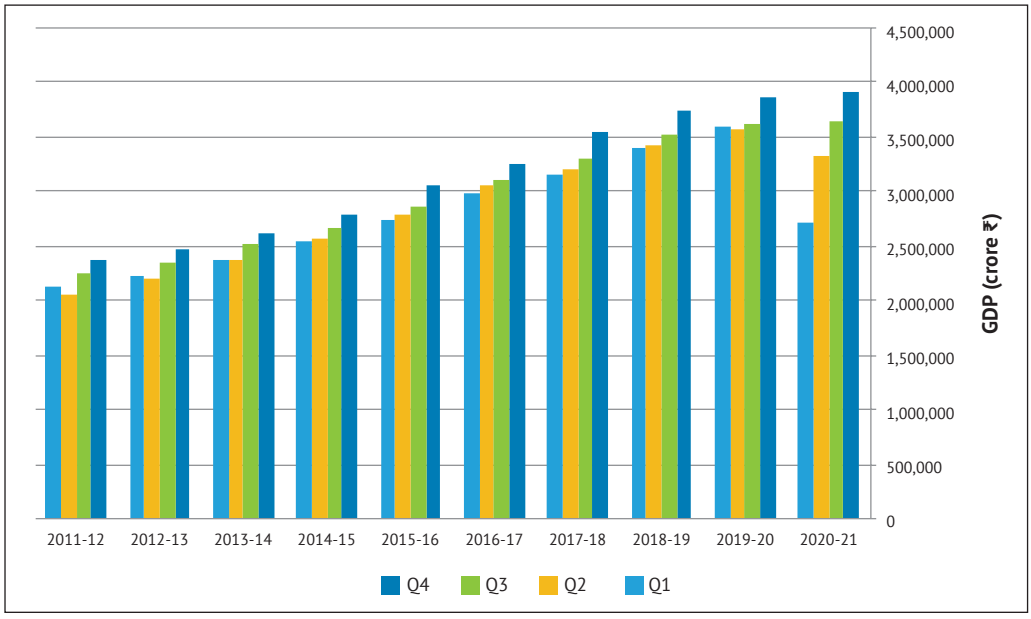
As the global infections are nearing 40 million, India, with around 7.2 million cases (Worldometer), ranks second in the list of worst-hit countries. India had already been witnessing a pre-pandemic slowdown. India's gross domestic product (GDP) grew at 4.2% during 2019–2020 compared to 6.1% during 2018–2019. GDP in Q4 2019–2020 grew at merely 3.1%. The economic impact of the 2020 coronavirus pandemic in India has accordingly been largely disruptive.

The current pandemic has magnified these pre-existing risks to India's economic outlook.

As per the latest statistics,[1] Indian GDP for 2020/21 was estimated at ₹135.13 lakh crore (at constant 2011/12 prices), against ₹145.68 lakh crore in 2019/20. Compared to the previous year's GDP, GDP for 2020/21 showed a 7.25% decline, whereas 2019/20 showed 4.04% growth over the previous year's GDP. Due to the COVID-19 pandemic, GDP declined in the first 2 quarters of 2020/21 compared to the previous year (2019/20). Whilst GDP for Q1 2020/21 declined by 24% (compared to GDP for Q1 2019/20) (as indicated in Figure 5.1), Q2 2020/21 GDP declined by 7% (compared to GDP for Q2 2019/20). In fact, GDP in Q1 2020/21 almost reached the level it was in Q1 2014/15. However, Q4 2020/21 GDP showed growth of 1.6% growth over Q4 GDP of the previous year (as indicated in Figure 5.2).

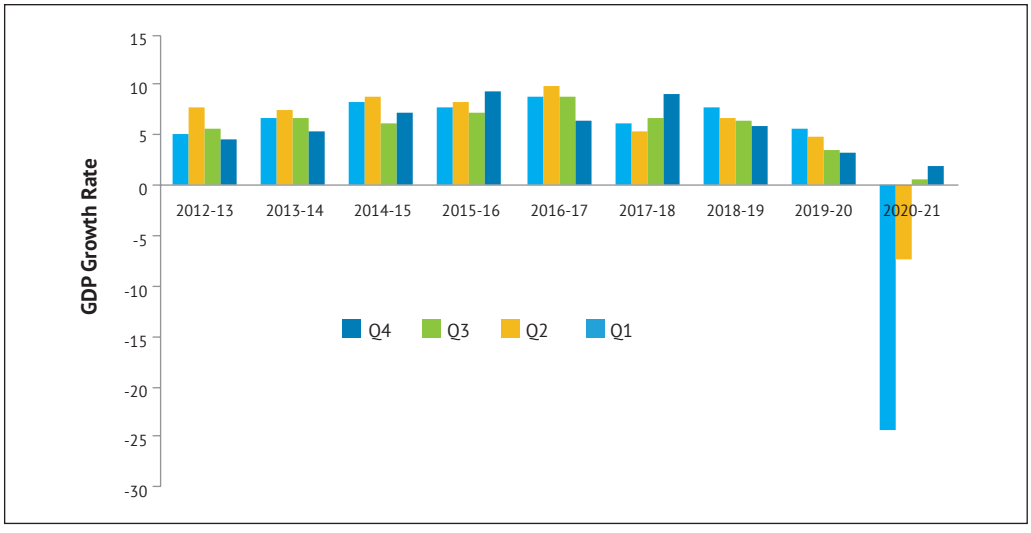
[1] https://statisticstimes.com/economy/country/india-quarterly-gdp-growth.php

Figure 5.1 Recent Trend in India's Quarterly GDP (constant 2011/12 prices)



GDP = gross domestic product.
Source: Statistics Times. Quarterly GDP Growth of India. https://statisticstimes.com/economy/country/india-quarterly-gdp-growth.php (accessed 21 June 2021).

Figure 5.2 Growth in Quarterly GDP in Recent Years (Compared to the Same Quarter of the Previous Year)



GDP = gross domestic product.
Source: Statistics Times. Quarterly GDP Growth of India. https://statisticstimes.com/economy/country/india-quarterly-gdp-growth.php (accessed 21 June 2021).

The countrywide lockdown imposed in India in March 2020 and the sudden closing of almost all manufacturing and commercial units (except a few under emergency services) led to an unexpected economic demise. All sectors excluding agriculture were adversely affected by the COVID-19 pandemic. During this period (as indicated in Table 5.1), agriculture showed growth of 3.5% and 3% in the first 2 quarters (vis-à-vis the similar quarters of the previous year). In Q1 2020/21, whilst the industry sector observed a 36% decline, a 3% decline was observed in Q2 compared to the same quarter of the previous year. In the same period, the service sector observed a 21.5% decline in Q1 and an 11.4% decline in Q2. In Q1 2020/21, the sector that suffered the most adverse impact was construction (49.5% decline), followed by trade, travel, transport, and communication services (48% decline) and manufacturing sectors (36% decline). However, in Q2, the electricity, gas, and water supply sector observed negligible (2.3%) growth. All other sectors were just able to manage to reduce the rate of decline in Q2 2020/21. In Q2, the trade, travel, transport, and communication services sector was the sector with the highest adverse impact (16.1%). Even though the countrywide strict lockdown ended after Q1, due to various internal and external restrictions (movement across areas, health and hygiene, etc.), the sector failed to recover like other sectors did. Within this sector, travel and tourism was the most important component that faced the most severe impact of the pandemic (see Section 2.6). However, after the strict lockdown period, the economy recovered slowly (as indicated in Figure 5.2). In fact, the overall GDP decline was 7.25% in 2020/21, which was slightly better than the expected decline of 8%.[2] However, the breakout of the second wave of the pandemic was another blow to the economic recovery of the country. To control the second wave, various states imposed partial/strict lockdowns in various phases during April–May 2021. According to the Reserve Bank of India (RBI), the impact of the second wave is expected to be temporary and likely to affect the first two quarters of 2021/22 only. Recent RBI estimates have revised the 2021/22 GDP growth to 9.5% from its previous estimate of 10.5% and also revised the quarterly GDP growth as indicated in Figure 5.3. On the other hand, as per recent World Bank estimates, GDP growth for India in 2021 (financial year 2021/22) could be as high as 12.5% (as indicated in Figure 5.4), which would be the highest growth amongst neighbouring countries. However, observation reveals that India was the most affected country by the COVID-19 pandemic amongst its neighbours[3] in 2020. Thus, even normal economic recovery would look high when compared with 2020 GDP data. Based on India's actual GDP and the forecast by the World Bank's World Economic Outlook, compared to the average GDP for 2017–2019, the forecasted GDP for 2021 is estimated to show only 2.2% growth. Again, as per WEO estimates, India could maintain 7% GDP growth until 2026, which is only comparable with the economic progress of Bangladesh. Consecutive GDP forecast comparisons (forecast by World Bank) indicate that the GDP forecast was revised downward for India as well as all its neighbours as a result of the COVID-19 pandemic.

2 https://www.hindustantimes.com/business/rbi-cuts-2021-22-gdp-growth-forecast-to-95-101622833373551.html

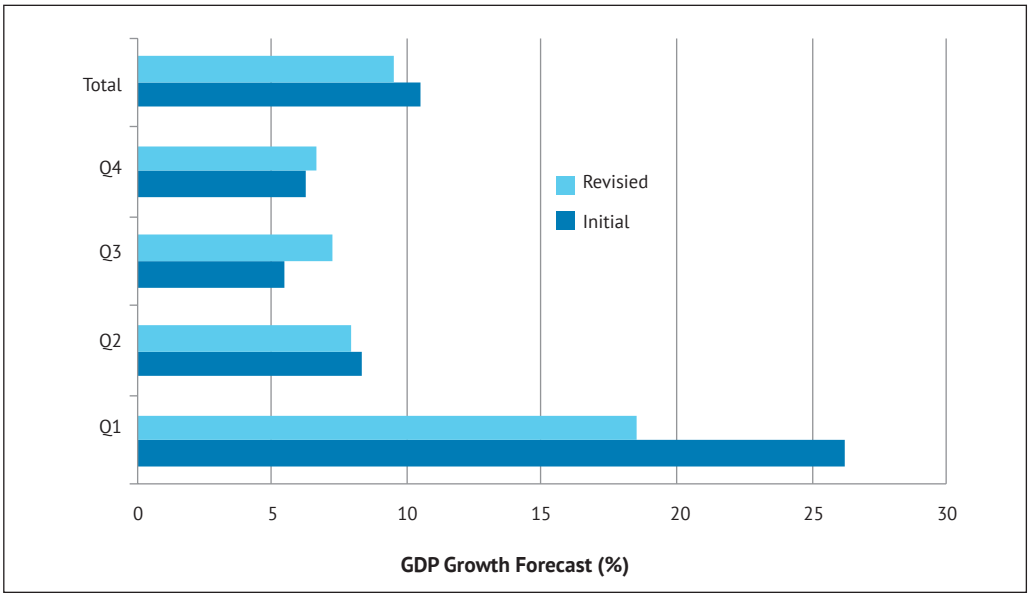
3 https://thewire.in/health/covid-19-data-in-south-asia-shows-india-is-doing-worse-than-its-neighbours

Table 5.1 Sector-wise Quarterly GDP Growth for 2020/21 vis-à-vis 2019/20 (%)

		Q1	Q2	Q3	Q4
1	Agriculture, forestry, and fishing	3.54	3.04	4.53	3.1
2	Industry Sector	-35.83	-2.99	2.91	7.93
2.1	Mining and quarrying	-17.17	-6.52	-4.44	-5.75
2.2	Manufacturing	-35.96	-1.51	1.7	6.93
2.3	Electricity, gas, water supply, and other utility services	-9.86	2.29	7.29	9.14
2.4	Construction	-49.47	-7.22	6.48	14.53
3	Service Sector	-21.46	-11.43	-1.21	1.5
3.1	Trade, hotels, transport, communications, and services related to broadcasting	-48.05	-16.12	-7.9	-2.31
3.2	Financial, real estate, and professional services	-5.04	-9.1	6.67	5.38
3.3	Public administration, defence, and other Services	-10.22	-9.22	-2.18	2.27
	Gross value added	-22.37	-7.31	1.04	3.72

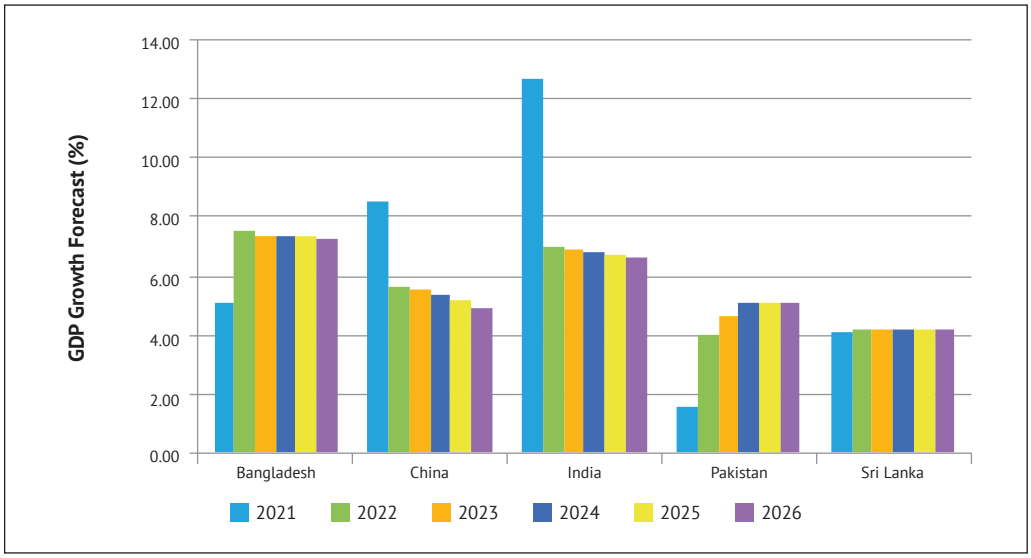
GDP = gross domestic product.
Source: Statistics Times. Quarterly GDP Growth of India. https://statisticstimes.com/economy/country/india-quarterly-gdp-growth.php (accessed 21 June 2021).

Figure 5.3 GDP Forecast for 2021/22



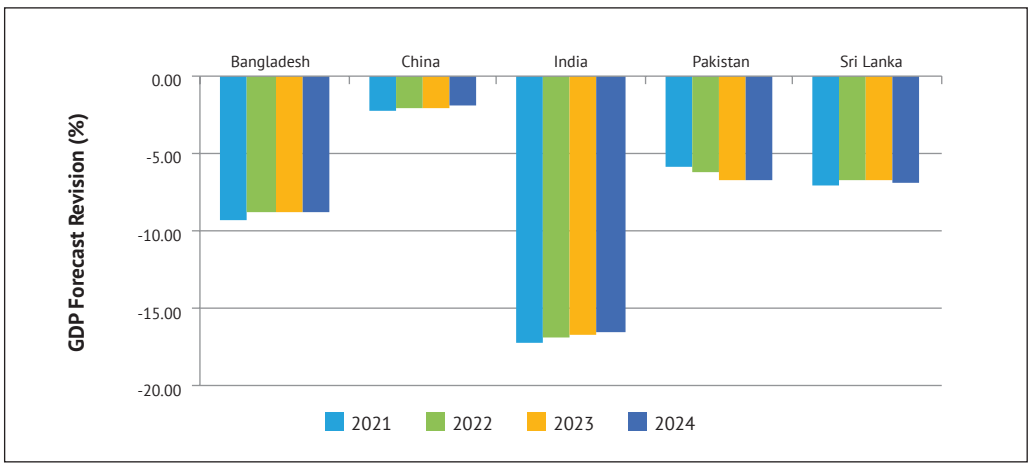
GDP = gross domestic product.
Source: Hindustan Times (2021), 'RBI Cuts 2021-22 GDP Growth Forecast to 9.5%', Hindustan Times, 5 June 2021. https://www.hindustantimes.com/business/rbi-cuts-2021-22-gdp-growth-forecast-to-95-101622833373551.html (accessed 1 June 2021).

Figure 5.4 Comparison of GDP Growth Forecasts for Major South Asian Countries



GDP = gross domestic product.
Note: GDP growth is measured by the year-to-year change in GDP (measured in constant prices).
Source: World Bank, World Economic Outlook database April 2021 (accessed 21 June 2021).

Figure 5.5 Revisions to GDP Forecasts in the Pre-pandemic and Post-pandemic Situations



GDP = gross domestic product.
Source: World Bank, World Economic Outlook database April 2021 (accessed 21 June 2021)..

However, amongst major South Asian countries, the downward revision of the GDP forecast was highest for India (as indicated in Figure 5.5), which also validates the fact that India was one of the worst-hit economies in the world.[4] Compared to the pre-pandemic (October 2019) GDP forecast, the post-pandemic (October 2020) forecast for India was reduced by more than 15% (as indicated in Figure 5.5), whereas the downward revision was only 2% for China and 6%–7% for Pakistan and Sri Lanka.

Unemployment and poverty are the two most crucial aspects of the COVID-19 pandemic other than the health issue for all economies. Across the world, almost all sectors have been affected by the recent pandemic. Due to the imposition of the countrywide lockdown, the complete closure of manufacturing and commercial units (except a few under emergency services), and various restrictions (travel and hygiene-related), India become one of the most vulnerable victims of the recent pandemic. Due to the significant share of the unorganised sector in the Indian manufacturing and service sector, estimating the job losses is difficult and varies across studies. As per the Centre for Monitoring Indian Economy (CMIE) economic outlook, the unemployment rate in India was 7.8% and 8.8% in February 2020 and March 2020, respectively (as indicated in Figure 5.6). Due to the imposition of the lockdown and the sudden closure of industries, unemployment suddenly increased and was the highest in April 2020 (23.5%) followed by May 2020 (21.7%). After the strict lockdown period, as the economy was opening its industries, the unemployment rate declined and reached 6.5% in November 2020.

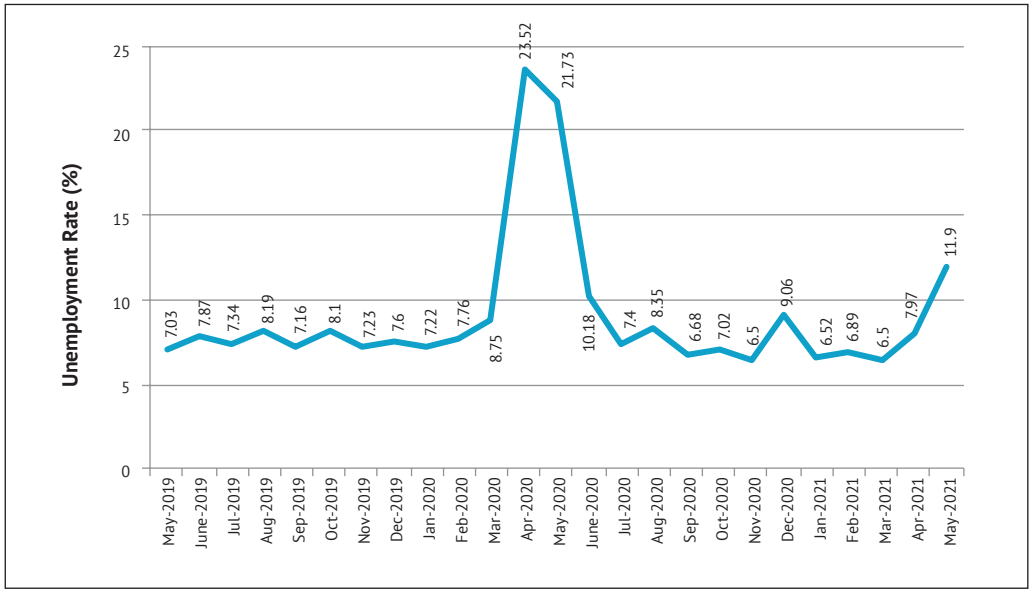
However, because of the economic slowdown, unemployment started to increase again and reached 11.8% in May 2021 due to the second-phase lockdown (COVID-19 second wave) in many states.

As per an ILO-ADB (2020) study, 41 lakh youth lost their job in India due to the COVID-19 pandemic. According to this report, youth (aged 15–24 years) were hit hardest compared to adults (aged 25 years and above) immediately after the crisis. The report also highlighted that approximately two-thirds of firm-level apprenticeships and three-fourths of internships were wiped out due to the pandemic situation in India. According to another estimate, youths in the age groups 20–29 (8.9%) and 30–39 (8.7%) were mostly affected by the job losses.[5] However, people in the age group of 40 years and above were in a relatively better position in terms of job opportunities. The cumulated job experience and/or various skills acquired by this group might play an important role in this context. Moreover, a CMIE (2021) unemployment report confirmed that the unemployment rate is highest amongst young people (15–24 years of age) as well as for persons with educational qualifications at the graduate level and above.

[4] Other badly affected countries across the world (in terms of the decline in real GDP) include Mexico, Argentina, France, the United Kingdom, and Spain, as indicated by International Monetary Fund as well as World Bank GDP estimates.

[5] https://www.statista.com/statistics/1125798/india-covid-19-impact-on-job-loss-by-age-group/

Figure 5.6 India's Monthly Unemployment Rate in the Recent Period



Source: CMIE Economic Outlook.

The same report also highlighted that the female unemployment rate is more than double the male unemployment rate, whilst the urban unemployment rate is significantly higher than the rural rate. A report by Naukri (2021) compared job vacancies (in the white-collar, urban, organised corporate sector with a focus on service industries) in January 2020 and January 2021 and observed that job opportunities declined by 26% in January 2021 (compared to January 2020) for candidates with 0–3 years of experience and 19% for 4–7 years of experience. The study found that job opportunities declined for other groups of candidates also, but the impact was relatively less. The same study also analysed the loss of job opportunities across various sectors. As per the report, the sector with the highest impact from COVID-19 (measured by a decline in job opportunities) was the hotel/restaurant/airlines/travel sector (61% decline), followed by the oil and gas sector (52% decline), telecom/internet service providers (34% decline), and retail (29% decline). Pharma/biotech (9% decline) and medical/healthcare (12% decline) were the least affected industries due to their growing importance in this pandemic and the aftermath situation. IT/software (11% decline) was another industry segment where the impact was relatively less, due to its growing importance in the new-normal world with greater preferences for 'work from home' and 'distance work' environments.

The COVID-19 pandemic also highlighted the stark inequalities within society and brought back into focus the already critical issues of poverty, inequality, and the environment and ecological linkages. The worst affected during the lockdown were the daily wage earners and the migrant labourers, whose livelihoods saw a complete disruption, and with no means to survive in the cities, large masses of migrants were forced to return to their villages and hometowns under extremely trying

conditions. Governments will need to introduce long-term legislation directed at improving social welfare in order to address the vulnerabilities of these most economically disadvantaged sections of society.

Whilst several offices and businesses were able to make use of IT to continue work-from-home arrangements, it was again the more vulnerable groups that had no such option. At the same time, several businesses related to travel and tourism, entertainment, etc. also closed down or were forced to let go of their workforce, at least partially, rendering several jobless at the end of the lockdown.

The role of digital technologies/IT saw an upswing, with education in particular shifting to a completely online mode since the lockdown. Similarly, there was a marked shift towards e-commerce during this period. However, there is considerable uncertainty regarding how long these trends might last.

One of the upsides of the lockdown was the stark improvement in the local environment. Environmental consciousness increased during this time with sudden reductions in pollution and an evident improvement in the local environment. Cities across India saw clear blue skies, the return of several species of flora and fauna, and clear sparkling water in rivers and streams that had degraded over the years. This was an eye-opener in some sense, which helped bring the realisation that a slowdown in human activities could in fact bring about such massive transformations in the surrounding environment rather quickly (Karnad, 2020). The decrease in fossil fuel consumption due to reduced activities across sectors has contributed to India's greenhouse gas emissions falling for the first time in 4 decades (Carbon Brief, 2020). Whether the learnings of behavioural changes will have long-lasting effects will depend on a multiplicity of factors. If the behavioural changes are to be maintained, efforts will need to be directed by providing appropriate cues and nudges.

India has been seen as one of the few countries with an NDC that is compatible with the Paris Agreement goals and as a global front-runner through the International Solar Alliance. With several policies and programmes directed at moving towards a low-carbon economy, India at this juncture needs to ensure a 'green recovery' as it puts in place economic, social, and environmental measures to emerge from the impacts of COVID-19. The economic slowdown has created new challenges for India's clean energy transition, including liquidity and financing constraints, supply-chain shortages, shifting priorities in the public and private sectors, a reduced workforce, and job losses. The impact of COVID-19 on India's clean energy transition will therefore need to be managed in order to keep up the momentum of policies and measures in the pre-COVID era.

2. Impacts of the Pandemic

With the lockdown in place during the initial months of the pandemic, India witnessed several impacts across the various economic sectors and activities. Some of the key impacts were witnessed in terms of a slowdown in economic growth, reduction in energy demand (specifically power demand), disruption in supply chains, reduced travel demand, and shutdowns/partial closures of industrial units.

In this paper, we focus mainly on the power, transport, and industry sectors, which hold the most relevance from a green recovery viewpoint.

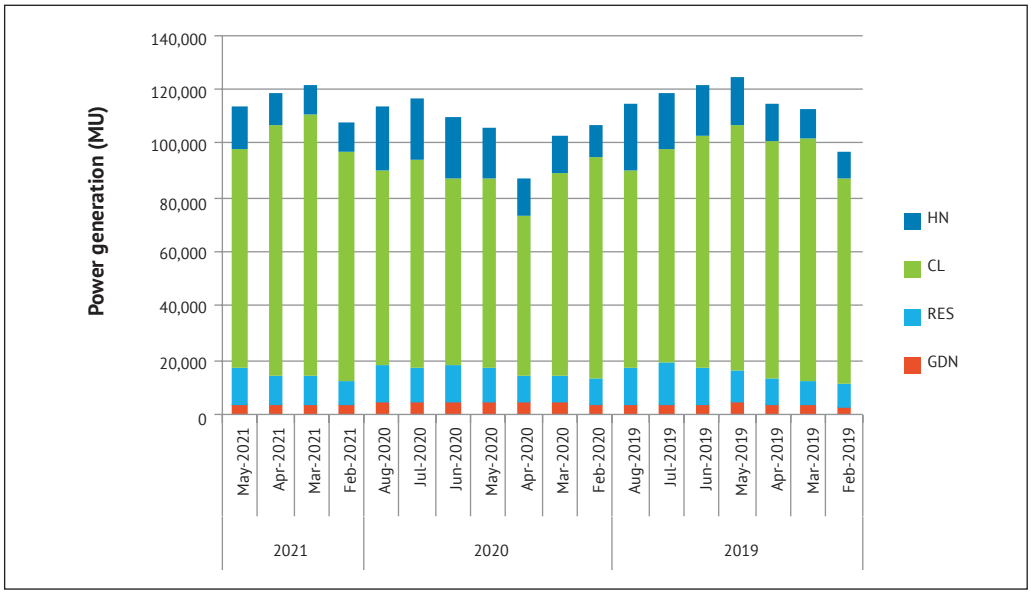
2.1. Impact of COVID-19 on the power sector and current measures for recovery

During the pandemic, as a strict lockdown was imposed in the last week of March 2020, almost all commercial and industrial units (except a few to serve essential services) were closed. This led to a significant reduction in power demand. Compared to the same month of 2019, monthly power generation was reduced in 2020 until August 2020, with the biggest dip in April 2020. When the strict lockdown ended, power demand increased with economic recovery. From September 2020 onwards, monthly power generation in 2020 started to surpass the monthly generation of 2019. However, during this pandemic period, the fuel mix for power generation also changed significantly (as indicated in Figure 5.7). The share of non-fossil (i.e. from renewable energy sources (RES), nuclear, and hydro) generation increased from March 2020 to August 2020 compared to the same months of 2019. A detailed analysis of fuel-wise generation reveals that during March–August 2020, monthly generation from gas and diesel was even higher than the monthly generation from these sources during 2019. During April, less than a 1% reduction in the total generation was on account of less generation from non-fossil fuels, whilst 99% of the reduction was on account of lower production from fossil fuels. In fact, the reduction in generation from coal was even higher than the reduction in total generation. Also, whilst the lower demand was mostly on account of the shutdown of coal plants, leading to a higher share of non-fossil generation during the pandemic period, this was largely due to the nature of renewable generation ('must run' and relatively low running costs) rather than a disruption in the coal supply[6]. Within non-fossil generation, generation from RES, nuclear, and hydro increased during the period. However, June–July 2020 witnessed above average rainfall in India. Thus, during these 2 months, due to the high rainfall and low sunlight availability, RES generation was reduced and compensated for by significant higher generation from hydro. From August 2020 onwards, in spite of the declining share of non-fossil generation, the monthly generation of RES increased, but hydro generation was lower compared to the similar month's generation in 2019. As the economy recovered, higher energy demand was mostly met by increasing generation from fossil fuels (coal, lignite, gas, and diesel). This might indicate a lack of reliability on renewable generation. Import dependency on modules and storage technology and the relatively higher prices (generation + storage) of renewables could play an important role in this regard. The incidence of a high share of renewables with declining shares of coal in the case of low demand was reconfirmed by data for the period of the lockdown phase in various states during second the COVID-19 wave in 2021 (April-May 2021).

Distribution companies (discoms) experienced demand reductions of almost 25% versus the 2019 levels since the beginning of the lockdown, facing

[6] https://prsindia.org/theprsblog/impact-of-covid-19-on-the-power-sector (accessed 21 June 2021).

Figure 5.7 Monthly Power Generation by Source



CL = coal and lignite , GDN = gas, diesel and naphtha, HN = hydro and nuclear , RES = renewable energy sources (solar, wind, biomass and others).
Source: Carboncopy. https://power.carboncopy.info/ (accessed 9 June 2021).

potential revenue losses of around 8%–10%. The power distribution companies in India had been facing financial challenges even in the past, but these may be expected to have increased manifold in the period due to erosion in their revenue collection from industrial and commercial consumers due to the closure of these units, the availability of cross-subsidies from these customers, and the non-availability of payments (moratorium on payment or equated monthly instalments as announced by state governments) (Beaton, Viswamohanan, and Aggarwal, 2020) from residential customers despite the increasing demand in this category. India has achieved 100% household electrification through the Saubhagya scheme, with a plan for 24/7 power for all households, but with the poor health of discoms and tariffs remaining partially unrationalised as the subsidies to the rural customer base continue to expand, discoms have been experiencing worsening financial health. Further, upgrading and the digitisation of the grid will be necessary to optimally integrate high levels of renewable energy at a low cost. Therefore, discom health is a critical leverage point for the decarbonisation of India's power sector. Moving ahead with recovery, India needs to ensure that it is able to keep up the momentum of renewable energy growth. Along with managing the structural issues, such as high losses, over-reliance on subsidies and distorted tariff structures, the poor health of the discoms is also a big concern that needs to be managed.

2.2. Current recovery measures in the power sector

The government has provided various intermediary measures under the Atma Nirbhar Bharat (ANB) programme to mitigate the bleak impact of COVID-19 on the solvency of the sector. The measures under the ANB include financial support in the form of a recovery package worth US$12 billion (₹90,000 crore), in addition to other measures like the lowering of the credit requirement for discoms, the allowance of a deposit letter of credit, and the announcement of a power sector reform through the draft electricity (amendment) bill 2020. The stimulus package from the central government includes conditional loans to discoms to pay off generating companies, given the condition that discoms along with state governments will undertake various reform measures. The entire loan amount needs to be guaranteed by the state government in addition to ensuring regular subsidies for discoms. The installation of smart meters or prepaid meters at state government departments for the timely payment of dues to discoms is also required for this loan transfer.[7] These measures were considered to be steps towards electricity sector reform for future benefit. However, there were a few concerns, like the higher rate of interest compared to that available in the market, and the stress on the state exchequer due to other COVID-19 control measures. Along with this financial package, an expansion of the state government borrowing limit was also proposed and permitted as a complementary policy measure.

However, as per the International Energy Agency (IEA), over and above the financial package by the government, the adoption of appropriate structural measures is very important for the improvement of the Indian power sector, which includes electricity tariff reforms, ensuring power quality and reliability, and improving the billing and support of digital payments. In a recent study,[8] Niti Aayog also identified that green recovery in the power sector can bring opportunities, including improvement in electricity distribution and operations and the promotion of the local manufacturing of renewable energy and energy storage technologies. According to a recent Greenpeace study,[9] measures like emphasising the promotion of decentralised models of renewable energy, employment with ecology, and the strict enforcement of new emission standards for coal power plants are also important for the healthy development of the Indian power industry.

Under the ANB, ₹50,000 crore was proposed by the Indian government to be spent on infrastructure development for the development of the coal sector. Within this proposed infrastructural development, ₹18,000 crore in investment was allocated for the mechanised transfer of coal from mines to railway sidings. By passing the Mineral Laws (Amendment) Bill in March 2020, the government has decided to open up the coal sector for commercial mining. The government has shown interest in offering coal blocks immediately through auction, and entry norms will be liberalised for easier participation of various entities

[7] https://www.iisd.org/articles/how-can-indias-energy-sector-recover-sustainably-covid-19

[8] https://niti.gov.in/sites/default/files/2020-06/India_Green_Stimulus_Report_NITI_VF_June_29.pdf

[9] https://www.greenpeace.org/india/en/towards-a-green-recovery-post-covid-19/

in coal block bids. These measures are expected to reduce import dependency (for coal) as well as offer better prices for coal-based power generators.

The ANB has also proposed an amendment of the Electricity Act 2003 for the reduction of cross-subsidies across various groups of consumers in the power sector. Eligible consumers can receive subsidies through Direct Benefit Transfer. Other than that, for the development of the power sector, the ANB also proposed the elimination of regulatory assets and the privatisation of utilities in union territories.

Despite the significant reliance on thermal generation, a focus on renewable generation in the power sector is mandatory for long-term sustainable energy security and access. Recently, India has announced its ambitious target of achieving 450 gigawatts (GW) in installed capacity for renewables only by 2030. Currently out of the total 370 GW of power generation installed capacity, renewables contribute only about a quarter (approximately 88 GW[10]). Thus, India needs to focus on a proper implementation strategy, including an attractive incentive structure, other than the modification of the necessary regulatory arrangements. In spite of the initial distress and lots of adverse impacts, the pandemic has provided a golden opportunity to channelise the growth path of the Indian economy towards sustainable energy solutions, if green recovery measures are strategically and effectively implemented at this juncture.

Two major barriers against complete dependency on renewables are import dependency on modules[11] as well as storage[12] technologies. As part of the green recovery from the COVID-19 pandemic, India has decided to increase its customs duty to 40% [13] (along with 25% on solar cells) effective from 1 April 2022. This policy measure is expected to incentivise local manufacturers. To promote and incentivise domestic storage technology, the ANB programme has introduced a structured framework[14] to ensure efficient risk allocation (through the effective bankability of projects) as well as proposes the ease of doing business for new investors in storage battery manufacturing in India. The ANB programme will help the prospective battery manufacturing firms to receive additional financial incentives, like cash subsidies, through a transparent mechanism. The cash benefit will help firms to overcome various infrastructural deficiencies and are not available to their global competitors. Moreover, under the ANB, the benefits will be available to firms on the basis of their performance specifications and output irrespective of their technology specifications.

[10] https://energy.economictimes.indiatimes.com/news/power/a-framework-for-a-comprehensive-energy-storage-policy-in-india/80312012

[11] https://www.businesstoday.in/current/economy-politics/india-to-impose-20-customs-duty-on-solar-equipment-more-riders-on-imports-from-neighbouring-nations/story/407809.html

[12] http://niti.gov.in/making-india-atma-nirbhar-advance-battery-storage

[13] https://www.livemint.com/industry/energy/solar-module-imports-to-face-40-customs-duty-cells-25-11607911934283.html

[14] http://niti.gov.in/making-india-atma-nirbhar-advance-battery-storagev

2.3. Impact of COVID-19 on the transport sector and current measures

In the case of the transport sector, despite the pandemic and economic crisis, India has continued its journey towards meeting the deadline for Bharat Stage Emission Standards VI (BS-VI) emissions standards for all internal combustion (IC) engines in April 2020. Simultaneously, India has been preparing for zero emissions electric mobility as a path towards the clean air and low-carbon mobility targets in urban India.

However, the pandemic has brought forth significant changes across many dimensions in the transport sector as well. Monthly registrations (which are a proxy for the sales of new vehicles) of both total vehicles and electric vehicles (EVs) declined during the pandemic period (February–September in 2020) compared to those in the previous year, as indicated in Figure 5.8. With economic recovery, registrations increased, but again they declined due to the outbreak of the second wave of the pandemic (April–May 2021). The average monthly registrations of total vehicles declined from 17 lakh in 2019 to 13.45 lakh in 2020 and 13.1 lakh in 2021. However, monthly average EV registrations declined from 13,400 in 2019 to 9,800 in 2020, but increased to 15,800 in 2021 (until May). This led to the highest share of monthly EV registrations (amongst all vehicle registrations) in 2021 (11.2% in 2021 compared to 8.2% in 2019 and 6.9% in 2020). In addition to the increasing environmental awareness[15] and the impact of government initiatives[16] (to promote EVs), the recent steady increase[17] in petrol-diesel prices in India plays an important role in this context.

As per a recent survey by ITDP India (Urbanlogue, 2019), due to the pandemic, people's choices and behaviour towards transport have changed significantly. Compared to the pre-pandemic period, preference for cycling (4.5% pre-pandemic to 6.7% in the post-pandemic period), private cars (19.9% to 23.6%), motorised two-wheelers (20.9% to 22.8%), and walking (8.5% to 9.2%) have increased for work/education purposes, whilst preferences for auto-rickshaws (11.8% to 7.2%), public transport (20.1% to 15.3%), and taxis (marginal) have declined.

The same survey also identified that for all other trips, preferences for cycling (3.5% to 5.8%), private cars (21.9% to 24.9%), walking (10.7% to 11.9%), and motorised two-wheelers (19.9% to 21.2%%) have increased at the cost of a decline in preference for taxis (15.9% to 11.5%), auto-rickshaws (10.2% to 8%), and public transport (16.2% to 12.9%) in the post-pandemic period vis-à-vis the pre-pandemic period.

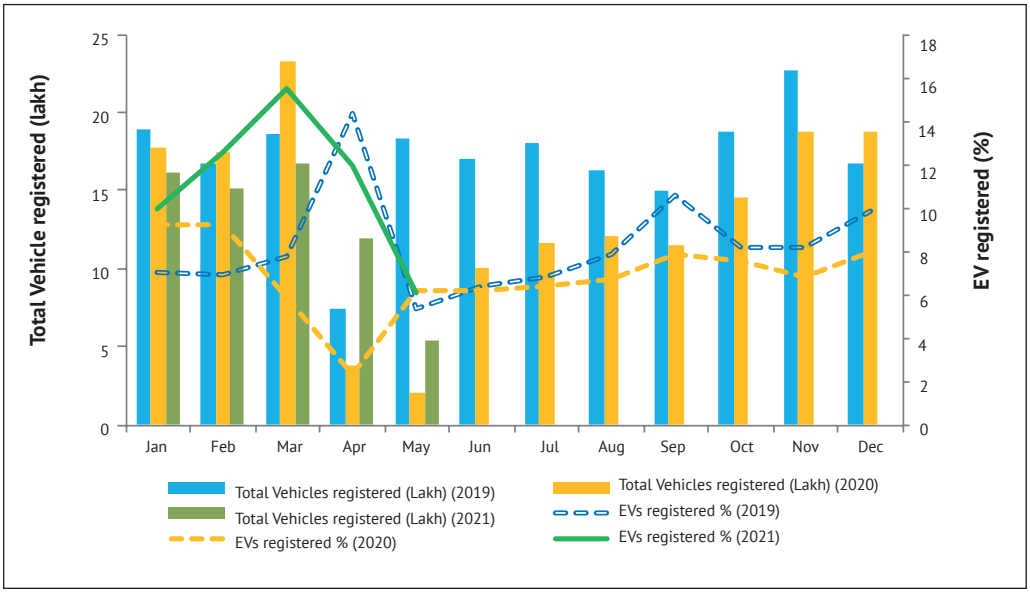
Based on a perception survey, a recent study by TERI (Thakur et al., 2020) found that in urban India, preferences for the metro (9%), buses (4%), and local trains (1%) have declined, whilst preferences for private vehicles (both four-wheelers and two-wheelers) (10%) and public taxis (2%) have increased in the post-pandemic time period as compared to the pre-pandemic time.

[15] https://auto.hindustantimes.com/auto/news/evs-may-play-greater-role-post-lockdown-as-environmental-consciousness-grows-41588653697236.html

[16] FAME India Phase II notification, GoI. 8 March 2019. https://fame2.heavyindustry.gov.in/WriteReadData/userfiles/8th%20March%

[17] https://www.newindianexpress.com/business/2021/may/27/electric-vehicle-sales-rise-amid-skyrocketing-petrol-diesel-rates-2308135.html

Figure 5.8 Monthly Vehicle Registrations in Selected Months of 2019, 2020, and 2021



EV = electric vehicle.
Source: Vahan Dashboard. https://vahan.parivahan.gov.in/vahan4dashboard/ (accessed 9 June 2021)..

The same survey also indicated that the preference for shared taxis has marginally declined, whilst car-pooling and the use of company vehicles has marginally increased in the post-pandemic situation. The preference for 'work from home' and the use of non-motorised transport (walking and cycling together by 3%) has also increased after the pandemic.

Both the ITDP and TERI survey indicate that because of the pandemic, people are preferring to avoid public transport and use either non-motorised (for shorter distances) or privately-owned vehicles (for longer travel). If this trend continues in the new normal, the increased preference for private vehicles could result in adverse environmental impacts.

The TERI (2020) survey also indicated a higher preference for online shopping after the pandemic situation. It revealed that 46% of the sample was already using online grocery shopping even in the pre-pandemic situation, whilst 54% were not comfortable with online shopping. Amongst the share who were familiar with online grocery shopping, 45% reported that they would increase online grocery shopping after the pandemic. On the other hand, amongst those who were not familiar with online grocery shopping, 24% reported that they would start online grocery shopping after the pandemic.

2.4. Banking and finance

The banking and finance sector is the backbone of any economy. The banking and finance sector needs to play a pivotal role during the post-COVID-19 recovery period.

To support the pandemic-hit economy and increase liquidity in the market, the RBI has adopted many important financial measures, including a reduction in the cash reserve ratio by 1% to enhance liquidity of ₹1.37 lakh crore in the economy, cuts in the repo and reverse repo rates to reduce the cost of borrowing, the allowance of moratoria by 3 months on term loans through all subsidiary banks and non-banking financial companies (NBFCs) to safeguard middle-class households, deferment of the Net Stable Funding Ratio (NSFR) until 1 October 2020, an increase in the Marginal Standing Facility, and an ease in working capital financing. As per the RBI governor, all these measures are expected to inject approximately 3.2% of GDP (ETBFSI, 2020) into the economy. However, the pandemic has led to further worsening of the debt status of most banks. As per a recent study (Hindustan Times, 2020), 70% of the banking debt is expected to be affected by the pandemic. Other than the above measures, as per a central government directive, the RBI has increased the advance limit (by 60%) for resource-crunched state governments and also enhanced the overdraft duration limits. Moreover, banks and NBFCs are expected to play an important role in implementing the measures adopted under the Aatmanirbhar Bharat package. For example, proposed loan schemes for micro, small and medium-sized enterprises (MSMEs) or street vendors will be disbursed through banks. NBFCs are also given the additional responsibility to contribute to the economic recovery process.

2.5. Current recovery measures for industries (especially MSMEs)

Within the current recovery package, MSMEs are allowed access to ₹3 lakh crore of collateral-free loans, and ₹20,000 crore of subordinate debt. They have been provided with concessions and moratoria on loans, provided cash refunds of goods and services tax (GST) credit, and 3 months of Employees' Provident Fund (EPF) contributions by the government for some specified sections.

Moreover, some other measures, such as providing access to Information Technology Enabled Services (ITES) at an affordable cost to compete with big players, and the technological upgrading of MSMEs by encouraging innovation and corporatisation are envisaged.

Longer-term measures that are largely directed at increasing indigenous production with a view to increasing employment opportunities include the introduction and promotion of the Smart Industrial Village policy, defining and introducing the Indian Quality Standard & Certification system to address non-tariff barriers for indigenous products, and the promotion of Swadeshi products by providing incentives for import substitution and indigenous product development.

The definition of MSMEs has also been modified to include more businesses. The auto component manufacturing industry will be covered under the MSME domain and can make labour payments once the funds are disbursed. MSMEs would also have access to ₹3 lakh crore of collateral-free loans and ₹20,000 crore of subordinate debt.

In the case of industry, central government agencies will also provide contractors with extensions of up to 6 months for construction, public works, and goods and services contracts. In the case of public sector undertakings (PSUs) and the private sector, the government will aim to privatise non-strategic PSUs and suspend new bankruptcy filings against companies.

Some of the other key elements within India's ₹20 lakh crore stimulus package are discussed below. In the agriculture sector, ₹30,000 crore of additional working capital is proposed to be made available through the National Bank for Agriculture and Rural Development, along with a ₹40,000 crore increase in allocation for the Mahatma Gandhi National Rural Employment Guarantee Act to create employment opportunities. Migrant workers will receive free food grain for 2 months. Industries and governments will set up affordable housing rental complexes, and the housing subsidy scheme for middle-income families will be extended until March 2021. A ₹5,000 crore special credit facility for street vendors and incentives for accepting digital payments will also be made available.

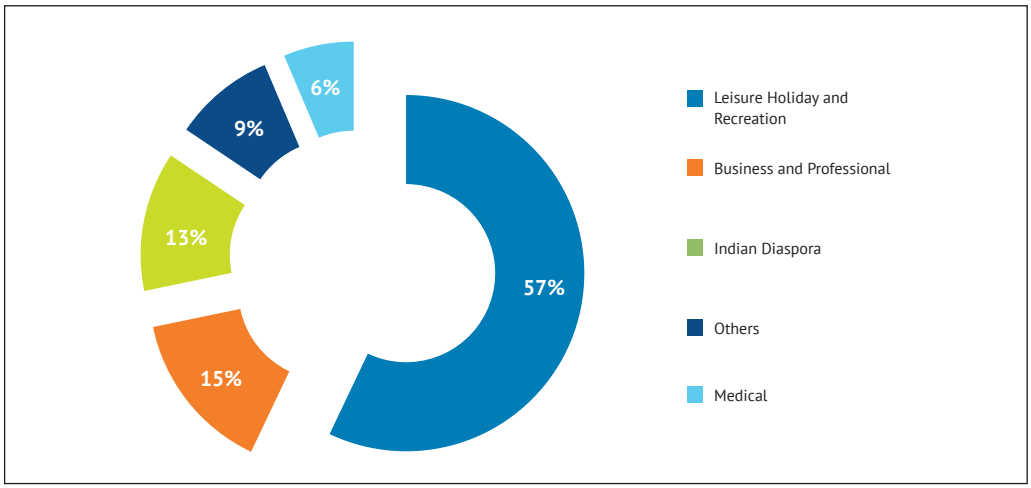
States' borrowing limits will be increased from 3% to 5% for 2020–2021, with the likelihood of granting extra resources of ₹4.28 lakh crore.

2.6. Tourism sector

As per recent Ministry of Tourism, Government of India (2020) data, 17.9 million international tourists arrived in India in 2019, which was 0.5 million higher than the 2018 estimate. In terms of international tourist arrivals, India was ranked 23rd in terms of tourist arrivals in the world and 8_{th} in the Asia-Pacific region in 2019. Various tourism-related activities (travel expenditures, boarding and lodging, monument/site-seeing entry fees, expenditure on various tourist activities) are important sources of foreign exchange earnings for India, and the country received US$30 billion in 2019 from international tourists. In terms of foreign exchange earnings, India was ranked 12th in the world (with 2.03% of global foreign exchange earnings from the tourism industry) and 6th (6.78% share) in the Asia-Pacific region. Out of 17.91 million international tourists that arrived in India, 10.93 million were foreign tourists, whilst 6.98 million were non-resident Indians (as indicated in Table 5.2). Amongst the foreign tourists that arrived in India in 2019, 57% came for leisure holidays and recreation, 14.7% for business and professional purposes, and 6.4% for medical reasons (as indicated in Figure 5.9). Other than these international tourists, 2.32 billion domestic tourists travelled across various Indian states in 2019 for travel and tourism purposes. This was 25% higher than the 2018 domestic tourist estimate (1.85 billion). Despite the fact that the affordability and expenditure patterns of domestic tourists were significantly less than international tourists, this gives an idea of the size of the Indian tourism industry. Whilst the number of domestic tourists was 130 times that of international tourists in 2019,[18]

[18] India Tourism Statistics at a Glance, 2020, Ministry of Tourism, GoI.

Figure 5.9 Foreign Tourist Arrivals by Purpose, 2019



Source: Ministry of Tourism, Government of India (2020).

about 83% of the tourism expenditure came from domestic tourists in 2019.[19] Including direct and indirect employment, the tourism industry provided 35 million jobs in 2017[20] and 42 million jobs in 2018.[21] The industry itself contributed to 9.2% of GDP and 8.1% of total employment in the Indian economy in 2018.[22] However, due to the COVID-19 pandemic, the countrywide lockdown was imposed, and international entry was strictly controlled. This had a severe adverse impact on the travel and tourism industry in India. The tourism sector has significant unorganised components and intensive linkages with other sectors (the handicraft market, etc.). Thus, the influence of the pandemic on the tourism industry has multiplicative implications on the overall economy through direct, indirect, and induced effects. Many studies have indicated significant job losses in the travel and tourism industry. Dogra (2019) estimated 38 million[23] job losses in the tourism industry, including direct and indirect employment. Another study estimated job losses of 70% of the total workforce[24] of the tourism industry, whilst 40 million job losses[25] were estimated by the Federation of Associations in Indian Tourism and Hospitality (FAITH), including organised and unorganised components of the industry. As per the estimate of FAITH, the financial loss in the industry could touch ₹15 trillion.[26] After the strict lockdown period, all other industries were recovering at their own pace, but due to various

[19] Tourism and Hospitality, IBEF, 2020

[20] https://www.statista.com/statistics/1012056/india-employment-number-in-the-tourism-industry-by-sector/

[21] https://www.journalijar.com/article/35360/impact-of-covid-19-on-the-tourism-industry-in-india/

[22] https://www.journalijar.com/article/35360/impact-of-covid-19-on-the-tourism-industry-in-india/

[23] https://www.journalijar.com/article/35360/impact-of-covid-19-on-the-tourism-industry-in-india/

[24] https://www.peoplematters.in/article/talent-management/how-the-pandemic-has-contributed-to-job-loss-in-the-travel-and-tourism-industry-27347

[25] https://www.livemint.com/news/india/tourism-body-estimates-rs-15-trillion-losses-due-to-covid-19-11595837800122.html

[26] https://www.livemint.com/news/india/tourism-body-estimates-rs-15-trillion-losses-due-to-covid-19-11595837800122.html

Table 5.2 International and Domestic Tourists (millions) and Fees from Tourism (US$ million)

Year	Foreign Tourist Arrivals (FTAs)	Arrivals of Non-Residents Indians (NRIs)	International Tourist Arrivals (ITAs)	Domestic Tourists (millions)	Fees from Tourism (US$)
2015	8.03	5.74	13.77	1431.97	21013
2016	8.8	6.22	15.02	1615.39	22923
2017	10.04	6.77	16.81	1657.55	27310
2018	10.56	6.87	17.43	1853.79	28586
2019	10.93	6.98	17.91	2321.98	30058

Source: Ministry of Tourism, Government of India (2020).

travel, hygiene, and safety-related restrictions, the travel and tourism industry failed to recover like other industries. However, after September–October 2020, as restrictions were withdrawn and the industry arranged various safety and hygiene measures, the situation is slowly improving. Revenge tourism can play an important role in this regard. In this new normal situation, outdoor and nature-related destinations will be preferred, and domestic tourism can recover at a quicker pace. India has the significant potential to recover its tourism industry compared to many other tourism-centric economies due to its diversified tourist attractions (including nature-related destinations) and large opportunities for domestic tourism. However, the outbreak of the COVID-19 second wave and the resultant lockdown and travel restrictions in various states have placed further challenges[27] on the revival of the tourism sector in India.

3. Discussion and Analysis of India's Recovery Package

The COVID-19 and its associated lockdowns caused multiple detrimental socio-economic repercussions that require measures to provide immediate relief, actions to support recovery, and long-term planning of subsequent recovery. The ₹20,000 lakh crore economic stimulus package announced by the government attempts to redress these damages through emergency measures, exit policies, and policies that shape the new normal of living with the pandemic. The stimulus supports some of the most affected social groups like migrant labourers and street vendors, and hard-hit industries like agriculture, power utilities, and MSMEs. Furthermore, the stimulus also supports a recovery plan that targets interventions like attaining self-sufficiency and fostering economic, infrastructure, and healthcare development.

[27] https://www.livemint.com/news/india/fresh-surge-in-covid-19-cases-poses-a-challenge-to-tourism-airline-recovery-11616675136926.html

The emergency measures aim to provide temporary relief to the affected individuals, industries, and institutions. The exit policies target strategies to overcome the negative consequences caused by the pandemic. The policies for the new normal aim to create an adaptive and resilient environment that can handle any such future disruptions. Table 5.3 categorises the summarised measures announced under the economic stimulus package into emergency measures, exit policies, and policies for establishing the new normal.

3.1. Recovery package after the second wave

India was severely affected by the second wave of COVID-19. After the first wave hit, when various sectors of the economy were starting to recover, the second wave made the situation more challenging. Other than the economic effects, the second wave clearly revealed the backwardness and limitations of the health infrastructure in India. As a response to the second-wave pandemic impacts, the Indian

Table 5.3 Summary of Measures Under the Economic Stimulus Package Announced by the Government of India

MFF Components /Programmes	Emergency measures	Exit Policies	Policies for establishing New Normal
1. Government Reforms			
Increase in borrowing limits	X		
Privatisation of Public Sector Enterprise (PSEs)			X
2. Measures for businesses (including MSMEs)			
Collateral free loans for businesses	X		
Corpus for MSMEs		X	
Subordinate debt for MSMEs		X	
Schemes for NBFCs		X	
Employee Provident Fund (EPF)	X		
Statutory PF contribution	X		
Street vendors		X	
Expediting payment of dues to MSMEs	X		
Insolvency resolution			X
Disallowing global tenders			X
Reduction in TDS and TCS rates	X		
Ease of doing business for corporates			X
Definition of MSME			X
Initiation of insolvency proceedings			X
Amendments to Companies Act, 2013			X
3. Agriculture and Allied sectors			
Concessional Credit Boost to farmers		X	
Agri Infrastructure Fund		X	
Emergency working capital for farmers	X		

MFF Components /Programmes	Emergency measures	Exit Policies	Policies for establishing New Normal
Support to fishermen		X	
Animal Husbandry infrastructure development		X	
Employment push using CAMPA funds			X
Amendments to the Essential Commodities Act			X
Agriculture marketing reforms			X
Agriculture Produce Pricing and Quality Assurance			X
4. Migrant Worker			
One Nation One Card			X
Free food grain Supply to migrants	X		
Affordable Rental Housing Complexes (ARHC) for Migrant Workers / Urban Poor		X	
5. Civil Aviation			
Efficient airspace management			X
Public Private Partnership (PPP) model for airports			X
6. Defence			
Enhanced FDI limit in defence manufacturing			X
Promotion of Make in India initiative in defence sector			X
7. Energy			
Liquidity support for distribution companies (discoms)		X	
Coal evacuation		X	
Safeguarding consumer rights			X
Regulatory assets			X
Privatisation of power distribution			X
Commercial coal mining			X
Reduction in cross-subsidy			X
8. Housing			
Credit Linked Subsidy Scheme for Middle Income Group (MIG)	X		
Support to real estate sector	X		
9. Social Sector			
Public Health			X
Allocation for MGNREGS	X		
Viability Gap Funding		X	
Technology driven education			X
10. Key Measures Taken by Reserve Bank of India (RBI)			
Reduction in Cash Reserve Ratio		X	
Increase in Banks' limits for borrowing under the marginal standing facility (MSF)		X	
Targeted Long Term Repo Operations (TLTRO) planned for investment in investment grade bonds		X	
Special Liquidity Facility (SLF) announced for mutual funds to provide liquidity support			

MSME = micro-, small, and medium-sized enterprise.

Source: PRS India and TERI Analysis (2020).

government announced a fresh economic recovery package of ₹6.28 Lakh crore in the last week of June 2021.

The new package is mostly focused on extending loan guarantees and concessional credit for COVID-affected sectors along with investment for improving health infrastructure. The major components of the package include:

1. Improvement in healthcare infrastructure

₹23,220 crore has been allocated for healthcare infrastructure expansion, especially for an increase in the number of intensive care unit facilities and the availability of medical equipment and medical oxygen. Special focus was given to infrastructure improvement for child and paediatric care.

2. Extension of the loan guarantee scheme and an increase in the credit guarantee cap

₹1.1 lakh crore has been announced for a loan guarantee scheme to support COVID-hit sectors. Within this allocation, ₹50,000 crore was specially allocated to the health sector. Approximately 25 lakh borrowers can benefit by borrowing ₹1.25 lakh under this scheme through micro-finance institutions. Moreover, the Emergency Credit Line Guarantee Scheme cap was increased by ₹1.5 lakh crore from its previous limit of ₹3 lakh crore.

3. Support for exporters and the tourism sector

₹33,000 crore was allocated for the National Export Insurance Account, which facilitates exporters by providing credit. Other than the huge shock to exporting units, the tourism sector was one of the most affected sectors due to the pandemic. To promote international tourism, the government has announced free visas for the first 5 lakh tourists. The government has also announced a loan guarantee scheme for travel agencies (100% guarantee up to ₹10 lakh) and regional tourist guides (100% guarantee up to ₹1 lakh).

4.Extension of Atmanirbhar Bharat Rozgar Yojana from 30 June 2021 to 31 March 2022.

5.Support for discoms and BharatNet

The Government of India has announced ₹3.03 lakh crore to upgrade the existing system and enhance the capacity of discoms along with ₹19,041 crore to BharatNet for the improvement of broadband networks in villages.

6. Support for the agriculture sector through subsidies for fertilisers

A ₹14,775 crore subsidy was announced for di-ammonium phosphate (DAP) and nitrogen phosphorus potassium (NPK)-based fertilisers along with ₹77.45 crore to enhance agriculture-related activities in Northeast India.

An analysis of the policy and regulatory support measures announced under these packages indicates that India's stimulus packages are well-balanced in terms of their temporal vision. A high thrust on establishing the new normal can be seen. Shaping the new normal is advocated to offer one of the most promising opportunities to push for a green recovery towards building sustainable and resilient societies. However, in the economic stimulus

packages, no specific emphasis is placed on incentivising green technologies or solutions.

Only a very few measures in the stimulus packages, like efficient airspace management, place stress on energy sustainability. Airspace, however, in the overall energy system is a small contributor in energy use and emissions; whereas the power, industry, and transport sectors are major energy-consuming sectors and also the highest emitters. Post-COVID-19, the markets for renewables and EVs, amongst the major players to support a green recovery in India, are plagued by financial stress at various levels of the supply chain due to a lack of liquidity support.

Therefore, whilst the stimulus packages do not talk about retracting any of the green policies or targets, as of now, they also do not provide any impetus or support to strengthen their penetration as a means to achieve a green recovery.

4. The Need for a Green Recovery in the Indian Context

As India moves forward with additional strategies, we must be cautious not to reverse past gains made in protecting the natural environment and inadvertently end up supporting growth in fossil fuel or carbon-intensive investments leading away from the Paris Agreement's target trajectory. At this juncture, with careful and deliberated planning, the country has a window of opportunity to re-orient the growth path of the economy and build back better towards a new normal.

Several studies have established that strong climate action can bring about several important co-benefits. The Global Commission on the Economy and Climate indicates that strong climate action has the potential to generate over 65 million new low-carbon jobs by 2030, deliver at least US$26 trillion in net global economic benefits, and avoid 700,000 premature deaths from air pollution. Green construction projects are also estimated to deliver higher multipliers. Clean energy infrastructure is generally very labour intensive in the early stages. One model suggests that every US$1 million in spending generates 7.49 full-time jobs in renewable infrastructure and 7.72 in energy efficiency but only 2.65 in fossil fuels. Therefore, in the long run, public investments in clean energy and infrastructure can provide high returns by driving down the costs of the clean energy transition. Adopting clean energy opportunities in a larger way could, therefore, help drive the economy towards a more efficient, innovative, and productive economy, with higher spillovers that benefit the wider economy (Hepburn et al., 2020).

The Global Commission on Adaptation also estimated that investing US$1.8 trillion globally from 2020 to 2030 in resilience-building measures could generate US$7.1 trillion in total new benefits.

Green recovery in the Indian context may be understood to include:

1. Continuation of policies and measures directed at the mitigation of greenhouse gas emissions through efficiency improvements, fuel switches, etc.

2. Additionally, green recovery should ensure that behavioural changes do not end up influencing consumption trends in ways that are more energy or carbon-intensive, e.g. shifts to private vehicles being preferred over public transport and carpools.

3. Finally, a green recovery needs to include the social dimension of ensuring equality, livelihoods, resilience, and inclusive development for all sections of the population.

India can benefit from a green recovery in multiple ways – be it in terms of generating additional employment through green investments, supporting public health by reducing air pollution, or enhancing economic growth and climate resilience and eventually achieving much higher multipliers of growth. Enhancing competitiveness and resource efficiency is another important element that needs to be strongly embedded in India's energy development path. India's future growth will need to be made resilient on multiple fronts, such as energy system design, urban development, transport design, industrial growth and supply-chain management, and the livelihoods of the underprivileged.

The design of recovery interventions will, therefore, be crucial, as decisions made now can have long-term repercussions on future pathways. Moreover, choices made now could have implications for both India's NDC trajectory as well its ability to meet its Sustainable Development Goals.

Accordingly, shifting development pathways towards increased sustainability can broaden the options for recovery by simultaneously addressing climate goals and socio-economic goals, such as eliminating poverty, reducing inequality, and enhancing affordable energy access, etc.

India should, therefore, pay special attention to phased planning to increasingly adopt least-cost solutions (and in certain cases second-best options) based on a holistic assessment of all the choices from a long-term perspective. Particularly important in this respect is the focus on enhancing prospects for jobs, Make in India, and re-skilling, and ensuring high and inclusive GDP growth and innovative schemes for decentralised renewable solutions, etc.

5. Recommendations for Moving Ahead Towards a Green Recovery

In the medium-to-long term, India's energy sector decarbonisation hinges mainly on three key elements, viz. energy efficiency improvements across sectors, the electrification of end uses, and the decarbonisation of electricity generation itself (Mathur and Shekhar, 2020).

It is in India's interest to increasingly continue to focus on these measures since they can also bring in additional benefits in the form of additional jobs and reductions in air pollution, apart from having a multiplier effect on economic growth. Also, keeping resilience in mind, a green transition needs to be centre stage, focusing on green infrastructure, improving productivity, and improved health systems, etc.

Therefore, as policymakers prepare interventions and industries re-evaluate their business models and operations, there is an opportunity to

prioritise efforts that work towards building a clean, resilient, and least-cost energy future for India.

In the subsequent section, we discuss the key areas, especially in the power, transport, and industry sectors, where clean interventions can be accelerated and up-scaled as the nation moves towards recovery.

5.1. Power sector

In the power sector, apart from maintaining an adequate governance structure for protecting the health of the distribution sector, this juncture should be viewed as an opportunity to bring about market reforms and a push for green recovery measures. India should particularly focus on ensuring that the pace of progress of renewables does not slacken.

Given that renewables have the scope for contributing to reduced air pollution, the generation of jobs, and larger multiplier effects, India should use this opportunity to raise its solar power ambition and focus on promoting decentralised models of renewable energy deployment, promoting the local manufacturing of renewable energy (especially solar), and focusing on energy storage technologies (NITI Aayog and Rocky Mountain Institute, 2020) whilst enforcing strict emission standards for coal power plants.

Further, over and above the financial package provided by the government, appropriate structural reform measures towards ensuring appropriate power quality and reliability, electricity tariff reforms, improvements in billing systems, and the enhancement of digital payments can further strengthen the power system (Greenpeace, 2020).

5.2. Transport Sector

In the transport sector, the emerging challenges include a likely rebound in demand, with people preferring to use their own private vehicles rather than public transport. For this, it is important to devise ways to encourage work from home (to the extent possible) in order to contain the rebound in private transport demand. Additionally, it is important to focus on safe and secure public transport and non-motorised and shared transport.

Moreover, in terms of a green recovery, apart from continuing the efforts towards the efficiency improvement of fleets, India should focus on enhancing electric mobility, and the auto manufacturing segment must continue to focus on research and development and efficient supply chains to enable the transition from internal combustion engines to EVs in the long term.

India is still lacking long-term commitments with firm targets or regulations like stringent fuel efficiency standards, except for the FAME incentive scheme. Some states like Delhi (25% of the new fleet to be EVs by 2024) have their own EV programmes. For a green recovery of the transport sector, the important steps that need to be adopted include the tightening of fuel efficiency standards. Other than EVs, focus is also required on promoting public transport. During the pandemic, public transport has been greatly affected due to the perceived risk of hygiene, sanitation, and social distancing issues. Given that users are taxed at a higher rate than private vehicles, the cost differential makes public transport relatively costly vis-à-vis two-wheelers (Roychowdhury et al., 2020).

Providing a fiscal stimulus for public transport, and especially promoting electric buses, can help address both public transport and EV issues and will assist in the green recovery. Accordingly, in the transport sector, several measures like incentivising demand for EVs, developing safer public transport to rebuild trust amongst people, redesigning urban transport to promote low-cost, active, and carbon-neutral transport options like walking and cycling, the enforcement of stricter regulations on air quality, promoting India as an automotive export hub, investment in climate-resilient infrastructure, reducing vehicle kilometres travelled through work-from-home where possible, and providing more affordable public transport can promote green recovery.

Towards this end, in the short term, an injection of liquidity to the auto industry could help the logistics providers, auto dealers, and fleet operators. Issuing guidelines and enforcing the adoption of standard operating procedures for the safe operation of public transport services (buses and metros) could increase the confidence of commuters to move back to public transport.

In the medium term, the implementation of the FAME II scheme should continue, and the introduction of EVs and hybrid vehicles must continue in a phased manner. Whilst compressed natural gas vehicles have been adopted in urban areas over the last few years, the expansion of gas-based infrastructure versus that for EVs will need to be judiciously planned in the coming years. Additionally, in the case of freight movement, focusing on optimising and digitising the freight sector and its supply chain is important. Enhancing rail-based freight movement to the extent possible, especially the shifting of long-haul bulk goods movement from road- to rail-based transport, can bring significant benefits. Encouraging the use of non-motorised mobility through walking and cycling and the use of electric micro-mobility solutions for last-mile connectivity in urban areas are other focus areas.

In the long term, India should focus on developing itself as an automotive manufacturing industry hub, especially for EVs. Towards this end, it is pertinent to promote local, resilient manufacturing and supply chains in the long term through tax incentives, lower land rent, and the promotion of local battery manufacturing.

5.3. Green finance

Whilst green investments can play a role in the pandemic-related recovery, they should be seen as measures designed to assist in the inevitable transition to a greener economy so that investments made now do not contribute to stranded energy assets likely to be obsolete in the next few years.

The need for large capital flows of finance to achieve such targets, whether in renewable energy, nature-based solutions, or other infrastructure sectors, is more critical now, as these can be engines of sustainable growth providing socio-economic benefits. Strategies that catalyse green finance from both the public and private sectors for resilient projects that create sustainable jobs, should be the centrepiece of post-COVID-19 economic recovery packages. Therefore, there is a need for innovative capital market mechanisms, bonds, and de-risking funds, etc. to frame effective green recovery strategies.

Whilst charting out the long-term recovery strategies, the government must try to leverage its resources for attracting capital from private, institutional, and commercial sources (via public-private partnerships, pension funds, and commercial banks, etc.).

Increasingly, concessional funds can be linked to green investment principles at a facility level including certain conditionalities that align with government priorities and will likely include: (i) linkages to clear green impacts; (ii) the number and type of green jobs created; (iii) the ability to attract a minimum of private capital; and (iv) best leveraging or lowest fiscal impact on government budgets.

Strategic international partnerships can further play an important role in helping build towards a green, digital, resilient, and socially just recovery.

The COVID-19 crisis could in fact trigger some long-term structural transformations in the economy that may be largely unpredictable now. For example, the rapid uptake and surge of the digital economy may continue in the post-COVID era and could even be further reinforced.

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Chapter 6

Aligning COVID-19 Recovery and Stimulus Measures with Low-carbon Green Growth through Green Bonds in Indonesia

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Chapter 6: Aligning COVID-19 Recovery and Stimulus Measures with Low-carbon Green Growth through Green Bonds in Indonesia

1. Introduction

1.1. Recent Economic Snapshot

Between 2000 and 2018, Indonesia enjoyed steady economic growth and significant socio-economic progress, with an average annual gross domestic product (GDP) growth rate of 5.6%. During this time, Indonesia maintained stability in terms of inflation, public finances, and the balance of payments and debt. All this was despite significant headwinds, including the global financial crisis, steep declines in primary commodity prices, and repeated turbulence in global financial markets (Bappenas, 2019b).

Although Indonesian economic growth may decline during 2020, the focus of national spending is not only to face the current challenges with the novel coronavirus disease (COVID-19), but also to build a stronger human resources foundation, improve productivity and competitiveness, and develop infrastructure. Table 6.1 shows the projection of economic growth in 2021 is estimated to be in the range of 5%, supported by a gradual recovery in consumption as economic activity begins to recover in a new normal condition.

Table 6.1 GDP Growth, 2017–2021

	2017	2018	2019	2020*	2021**
	% changes, volume (2010 prices)				
GDP growth	**5.1**	**5.2**	**5.0**	**-2.07**	**4.5–5.5**
Private consumption	5.0	5.1	5.2	-2.63	4.1–4.9
Government consumption	2.1	4.8	3.2	1.94	2.5–3.5
Gross fixed capital formation	6.2	6.6	4.4	-4.95	6.0–7.1
Exports of goods and services	8.9	6.5	-0.9	-7.70	3.5–5.1
Imports of goods and services	8.1	11.9	-7.7	-14.71	4.4–5.9

GDP = gross domestic product.

Source: *Statistics Indonesia, February 2021; **Presidential Regulation No. 86/2020: Government Action Plan 2021.

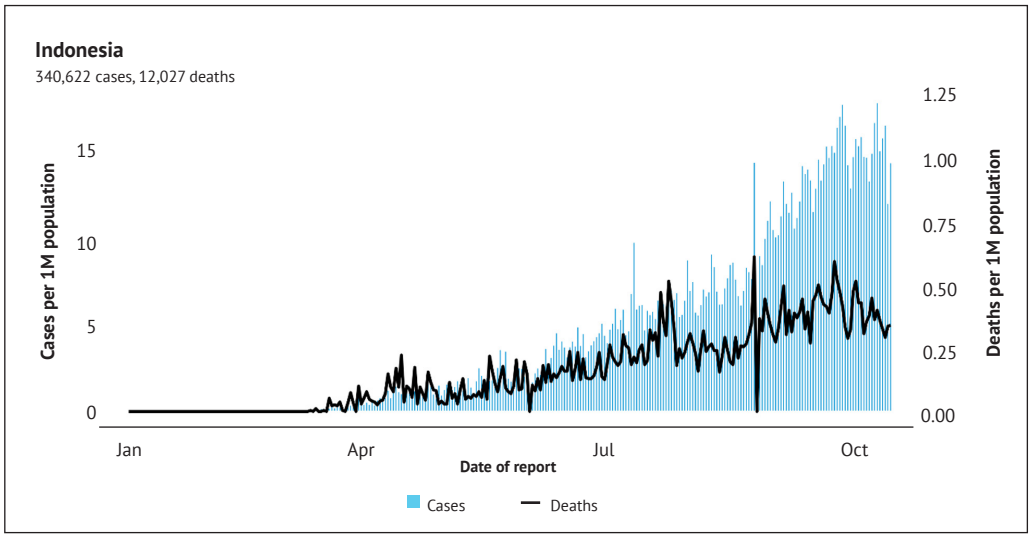
High uncertainty about the speed of the global recovery will also affect the economic projection next year. Following a sharp decline, the economy may incline and rebound in 2021 in the range of 4.5%–5.5%.

1.2 COVID-19's Spread in Indonesia

The coronavirus outbreak created a crisis for the global economy. In Indonesia, COVID-19 caused more than 1,700 deaths, infected 28,300 people, and dragged down more than 1.1 million into poverty (Ing and Vadila, 2020). The pandemic has also had a significant domino effect in the health, social, economic, and financial sectors. This is a serious challenge for the world as each country tries to prevent this crisis from getting worse (BKF, 2020).

Figure 6.1 shows more than 340,000 COVID-19 cases through October 2020, with more than 12,000 deaths. Total cases slightly declined in October 2020.

Figure 6.1 Total COVID-19 Cases in Indonesia



Source: https://worldhealthorg.shinyapps.io/covid/.

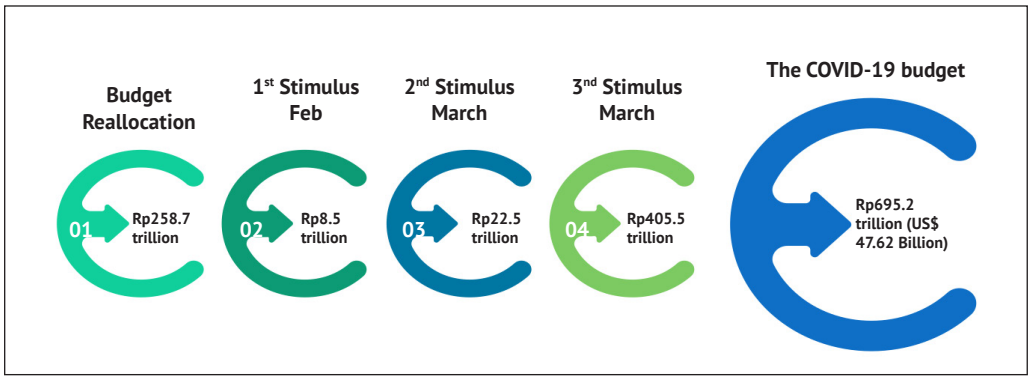
2. Stimulus Package to Combat the COVID-19 Pandemic

As a quick response to prevent worsening impacts of COVID-19 in health, social and economic sectors, Indonesia issued a regulation in lieu of law, Perppu No. 1/2020, that contains several policies for prompt and coordinated action. Perppu No. 1/2020 is expected to provide a basis for the government and related institutions to continue taking structured and systematic steps in order to overcome the COVID-19 threat in the health sector, social threats and economic threats, as well as macroeconomic financial system instability.

To mitigate the impacts of COVID-19, the government strengthened its commitment to providing economic stimulus with real benefits for the public. This is required as a jumpstart for the initial recovery of the national economy, which should then be followed by monetary expansion (BKF, 2020). The government has unveiled a Rp695.2 trillion (US$49 billion) stimulus package to fight the economic and public health impacts of COVID-19 (see Figure 6.2 on the following page).

There have been three financial stimuluses introduced by the government. The first stimulus package in February 2020 accelerated capital expenditure distribution, appointed official treasury officials, distributed social assistance and village fund transfers, and expanded the number of Staple Food Card (***Kartu Sembako***) beneficiaries. The second stimulus package of Rp22.5 trillion in February 2020 was earmarked for tax incentives, ease of export and import, and the financial sector.

Figure 6.2 COVID-19 Stimulus Package in 2020

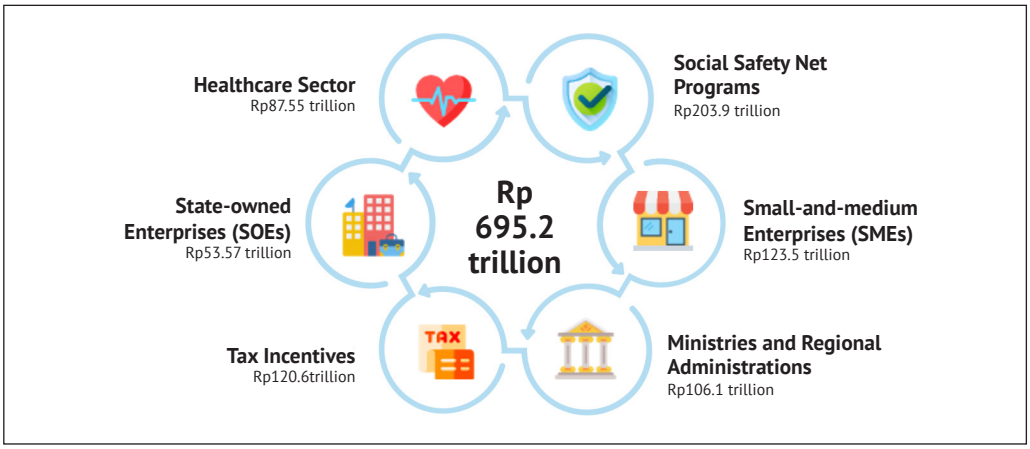


Source: National Covid Team and National Economic Recovery, Ministry of Finance, Bappenas.

Third, the government has determined to offer Rp405.5 trillion for handling the ongoing COVID-19 outbreak. The budget allocation consists of Rp75 trillion for the health sector, Rp10 trillion for the social protection/social safety net, Rp70.1 trillion for tax incentives and stimulus for a microcredit programme, and Rp150 trillion for the national economic recovery programme, as well as credit restructuring and business funding for micro, small, and medium-sized businesses (Ibadurrohman and Pamungkas, 2020).

With the stimulus packages, the government prioritised three aspects in responding to the crisis: protecting the health and life of the community; maintaining purchasing power, especially for the middle to lower class; and preventing the number of bankruptcies. These three aspects are implemented with the Large-Scale Social Restrictions policy, limiting physical distance, working and studying from home, expansion of the Family Hope Program and the Pre-employment Card, distribution of basic necessities, tax incentives, reduction of electricity bills, and National Economic Recovery Programs (BKF, 2020).

Figure 6.2 National Economic Recovery Program in 2020



Source: National Covid Team and National Economic Recovery, Ministry of Finance, Bappenas.

As a response to COVID-19, the government aims to implement the National Economic Recovery Program. This programme is an extraordinary measure as referred to in Government Regulation in Lieu of Law (Perppu) Number 1 of 2020, which is now (stipulated as) Law No. 2 of 2020 (Inayatillah and Bonaedy, 2020). The government provided Rp87.55 trillion for the healthcare sector, Rp203.9 trillion to strengthen social safety net programmes, and Rp123.46 trillion in incentives for micro, small, and medium-sized enterprises. The government also allocated Rp120.6 trillion for tax incentives and Rp106.11 trillion to support ministries and regional administrations, and Rp53.57 trillion as a stimulus for state-owned enterprises (SOEs).

Since COVID-19 is still occurring in 2021, Indonesia provide state budget around Rp. 699.43 trillion or US$ 47.91 billion. For reducing the impact of COVID-19, Indonesia allocated Rp176.3 trillion for health care, Rp157.4 trillion for accelerating the social safety net (social protection), and Rp186.8 trillion for micro, small and medium enterprises including Rp53.9 million stimulus for SOEs. The Committee for handling COVID-19 and the National Economy Recovery, headed by Coordinating Minister for Economy, explain that stimulus for the National Priority Program is Rp125.17 trillion.

3. Low-carbon Development Initiative

Indonesia is on an unsustainable development pathway, as boundless technological and innovative advances result in natural resources exploitation and investments in high amounts of carbon, and inefficient energy and transport systems, resulting in pollution, depletion of fisheries, and the damaging effects of global climate change (Bappenas, 2019b).

With this understanding, Indonesia is transforming its economy into one wherein development is measured no longer by GDP growth only, but also environmental sustainability, resource efficiency, and social equity (Bappenas, 2019b). A decline in the quality of the environment and depletion of natural resources has the potential to hamper Indonesia's economic growth, which still relies on the commodities and natural resources sectors.

Indonesia has committed to becoming a pioneer of sustainable development with its Low Carbon Development Indonesia (LCDI), which was first initiated at the 2017 United Nations Conference on Climate Change. LCDI was launched at Indonesia's Ministry of National Development Planning (Bappenas) (Bappenas, 2018).

LCDI is essential to deal with a variety of challenges stemming from increasing earth temperature, which will considerably affect food productivity and increase the risk of climate-related disasters. Likewise, deforestation, land degradation, and air pollution from peat fires and fossil fuels will negatively affect productivity and quality of life. LCDI expects to incorporate greenhouse gas (GHG) emissions reduction targets into policy planning, along with other interventions for preserving and restoring natural resources (Bappenas, 2018).

GHG emissions are the main cause of climate change. Low-carbon development is crucial, not only to minimise the risk from climate change, but also to increase the competitiveness of the Indonesian economy in a more sustainable manner. This requires that

low-carbon development maintains economic and social growth through development activities to produce low GHG emissions and reduce excessive use of natural resources. Bappenas' Pembangunan Rendah Karbon concept emphasises the cross-sectoral policy trade-offs needed to balance economic growth targets and poverty alleviation with emission reduction efforts, and to encourage the growth of green investment for more sustainable development (Bappenas, 2019a).

Low-carbon development and the green economy are key to boosting economic growth while not sacrificing environmental sustainability and social inclusivity. Therefore, the Ministry of National Development Planning/Bappenas will streamline the LCDI report on low-carbon development into a Five-Year 2020–2024 National Medium-Term Development Plan (Bappenas, 2019b).

In accordance with strengthening low-carbon development, green bonds have risen as a real force in generating private sector financing for renewable energy, and other eco-friendly industries. In 2018, globally, the green bond market is predicted to attract as much as US$250 billion (Houérou, 2018). With a US$150 million investment from International Finance Corporation, a member of the World Bank Group, OCBC NISP Bank, a subsidiary of OCBC Singapore, is launching Indonesia's first green bond, which is expected to catalyse a green bond market (Houérou, 2018).

Indonesia introduced the Budget Tagging Mechanism to gauge the effectiveness and efficiency of current climate change spending. This generates recommendations in the form of output- and outcome-oriented budgeting that is regulated under Ministerial decree No. 214/2017. Another result of the budget tagging process is the creation of fiscal instruments for climate change action, one of which is Green Sukuk, issued in 2018 (UNDP, 2018).

4. Financing Low-carbon Development Before the COVID-19 Pandemic

Indonesia is vulnerable to climate-induced hydrometeorological disasters. More than 95% of disasters are related to climate change, including flash floods, landslides, forest and land fires, drought, and extreme weather (Bappenas, 2019a). In addition, an increase in sea level and surface temperature will worsen natural disasters, especially in low-lying areas throughout Indonesia, which will directly impact health, agriculture, and the economy (UNDP, 2018).

Indonesia has made several financial commitments to climate change adaptation and mitigation, such as Green Bonds and Green Sukuk (UNDP, 2018). Indonesia has designed its Green Bond and Green Sukuk framework to back or re-account Eligible Green Projects (Abubakar and Handayani, 2020). Issuance is guided with the aid of the Green Bond and Green Sukuk Framework, reviewed by international independent reviewer Center for International Climate Research and graded with colours that indicate the degree to which eligible listed projects represent the country's long-term vision for carbon emissions

reduction (UNDP, 2018). The issuance of Green Bonds will attract investors to enter into environmentally based development without the risks associated with individual projects (Setiawan, Asidiq, and Sholihin, 2019).

Beside Green Bonds, Green Sukuk is the other alternative for low-carbon development financing. Green Sukuk is an innovative, shariah-compliant bond, where 100% of the return is restricted to financing or refinancing green projects (UNDP, 2018). Green Sukuk has the capacity to connect the conventional social responsibility market with the Islamic financial market. Green Sukuk can also prove shariah finance's viability, both in the Muslim and global markets (Setiawan, Asidiq, and Sholihin, 2019). Green Sukuk is a decent and promising approach to align with global trends where the world focuses on sustainability-based projects, particularly on the environment and reforestation (Abubakar and Handayani, 2020).

The issuance of Green Sukuk is one of the government's endeavours in actualizing green financing. Green finance is an expansive term that can refer to sustainable development projects and initiatives, environmental products, and policies that support sustainable development. Green finance incorporates climate finance, but is not restricted to it and can include, for example, industrial pollution control, sanitation, or biodiversity protection. Mitigation and adaptation finance are explicitly identified with climate change-connected activities: mitigation finance refers to investments in projects and programmes that contribute to reducing GHGs, whereas adaptation finance refers to investments that reduce the vulnerability of products and persons to climate change (Abubakar and Handayani, 2020).

Indonesia is the first country to be issuing Green Sukuk at the global level. In March 2018, the government issued US$1.25 billion state sukuk on the global market. Green Sukuk will exclusively go to selected Eligible Green Projects (UNDP, 2018). Indonesian Sukuk has been recognised in the global market through positive press coverage. Indonesia's Green Sukuk have been distributed around the globe into high-quality accounts, mostly top-tier funds and banks, with 32% going to Islamic markets, 25% to Asia, 15% to the European Union (EU), 18% to the United States (US), and 10% to Indonesia. In the global market, new investors who are willing to invest in green projects have reached 29% of the total (Abubakar and Handayani, 2020).

5. Financing through Green Sukuk During COVID-19

COVID-19 is different from previous crises, impacting not only the economic sector, but also the national health system, and increasing social vulnerability (Firdaus and Djumena, 2020). Indonesia needs a significant increase in funding to address their widening budget deficit due to the pandemic.

Adopting a positive perspective, COVID-19 has become a signal for countries to make structural changes that align with sustainable economic practices, and it has had a positive impact on reducing

emissions, although it is estimated that it will only be temporary. As Joseph Stiglitz stated, the world needs a green economy to build a better economy (build back better). In accordance with this, economic stimulus must be in line with efforts to transition to a low-carbon economy (Firdaus and Djumena, 2020).

The Ministry of Finance mentioned three strategies that could be implemented to keep Indonesia focused on achieving climate targets: (i) aligning action plans with the National Economic Recovery Policy; (ii) prioritising plans that can simultaneously restore the economy; and (iii) developing innovative funding schemes and policies in order to encourage the participation of non-government agencies(Firdaus and Djumena, 2020).

Indonesia had sold Rp369 trillion worth of government bonds as of May 2020, an increase of 98.3% from the same period last year. The government is making plans to issue another Rp990 trillion worth of government bonds, including samurai bonds and diaspora bonds, from June to December of this year to cover the widening deficit. As with Indonesia's third global obligation issuance this year, the government is also offering sukuk (Akhlas, 2020). According to Moody's, Green Sukuk accounted for around 3% of sukuk issuance as of June 2020. Indonesia's sukuk issuance is expected to increase by about 68.75% as the government unveiled a Rp695.2 trillion (US$47.3 billion) stimulus package to fight the pandemic (Rahman, 2020).

Sukuk issuance in 2020 was set to be higher than in 2019 as the government needed to finance the widening state budget and the national economic recovery programme. As of 6 August 2020, the government issued a total of Rp236.82 trillion in domestic sukuk. The figure almost reached the 2019 amount, which was Rp258.28 trillion (Rahman, 2020).

Indonesia has raised US$2.5 billion from a three-tranche global sukuk offering to help the government fund the fight against COVID-19. Each tranche has been rated Baa2 by Moody's Investor Service, BBB by S&P Global Ratings Services and BBB by Fitch Ratings. The sukuk were offered on the Singapore stock exchange and NASDAQ Dubai in the United Arab Emirates on 23 June 2020. The 10-year maturity sukuk brought in US$1 billion, and the 5-year and 30-year maturities amounted to US$750 million each (Akhlas, 2020). This issuance of a tenor of 5- and 10-years are the lowest issuance of global sukuk by the government on the global financial market and a tenor of 30 years is the largest in Asia.

The government designates the issuance of a 5-year tenor as Green Sukuk to show global commitment, leadership, and contribution to climate change finance. This is the third issuance in the global market, apart from that of retail Green Sukuk at the end of 2019 (Antara, 2020). This transaction is in line with the government's 2020 financing plan, including dealing with the impact of COVID-19, as well as strengthening Indonesia's position in the global Islamic financial market and supporting its development in the Asian region.

This transaction received great demand from qualified and diverse global investors, which shows investors' trust in Indonesia. In 2020, the distribution of investors for a 5-year tenor was 32% Islamic investors from the Middle East and Malaysia, 5% Indonesian investors, 40% Asian investors except Indonesia, 12% US investors and 11% European investors. Meanwhile, for sukuk with a tenor of 10 years, 31% were distributed to sharia investors, 5% to Indonesian investors, 34% to Asian investors except for Indonesia, 18% to US investors, and 12% to European investors. As for Global Sukuk with a tenor of 30 years, 10% were distributed to Islamic investors, 5% to Indonesian investors, 44% to Asian investors except for Indonesia, 8% to US investors, and 33% to European investors (Antara, 2020).

This issuance of Global Sukuk received a good reaction from global and local investors. With this large orderbook, Indonesia can reduce prices up to 70 basis points from the initial offering price and below the indicative fair value. The Global Sukuk is issued by SBSN Indonesia III Issuing Company, a legal entity established solely for the purpose of issuing government sukuk (Antara, 2020).

6. Conclusion

Indonesia has a strong commitment to supporting low-carbon development, which has been mainstreamed into the Five-Year 2020–2024 National Medium-Term Development Plan. As a key to further boosting economic growth, while not sacrificing environmental sustainability and social inclusivity, low-carbon development needs a complete advancement strategy and financing system. Therefore, Indonesia became a pioneer with issuing green bonds and Green Sukuk globally.

The COVID-19 pandemic since the beginning of 2020 has had a massive impact on the global economy, including Indonesia, which is experiencing a widening deficit. However, Indonesia has turned this into an opportunity to strengthen low-carbon development. The government issued Green Sukuk in three tranches as one of the strategies to cover the deficit due to the pandemic; this global sukuk issuance received a good reaction from global and local investors.

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Chapter 7

Low- carbon Green Growth Policies and Budgetary Support During the Pandemic in Japan

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Chapter 7: Low-carbon Green Growth Policies and Budgetary Support During the Pandemic in Japan

1. Setting the Scene: From pandemic crisis to system change

1.1. The pandemic crisis and infection control measures

The first Japanese case of COVID-19 was reported on 26 January 2020. The person was a returnee from Wuhan, China. Then, on 28 January, the infection of a bus driver who worked for a tourist group from Wuhan was reported and was the first infection that occurred in Japan.

Japan did not enforce lockdowns, but the government and local governments made efforts to prevent the spread of infection through the isolation of people testing positive for COVID-19 and by asking people to voluntary refrain from going out. When infections spread explosively, the government requested a temporary schools closure on 27 February and announced the State of Emergency Declaration on 7 April. Instead of using lockdowns, the government and local governments have urged companies and citizens to voluntarily avoid the '3Cs': confined spaces, crowded spaces, and close contact. This is not compulsory, but people's behaviour has changed significantly. Looking at the year-on-year weekly change in the rate of grocery sales at supermarkets and convenience stores, it increased by more than 20% during the temporary school closure period in February, and it continued at more than a 20% increase during most of the emergency declaration period (METI, 2020).[1] This number indicates how many people were staying at home. An interesting observation is that grocery sales increased when the Governor of Tokyo mentioned the possibility of a lockdown at the end of March, prior to the announcement of the State of Emergency Declaration, but was down some 10% when the government was considering a cancellation of the emergency declaration.

The number of new infections per day was over 700 but began to decline afterwards. This was the first wave. In early July, the number of infections increased again and reached around 2,000 people per day, but due to the call for self-restraint, the number gradually decreased. This is understood as the second wave.

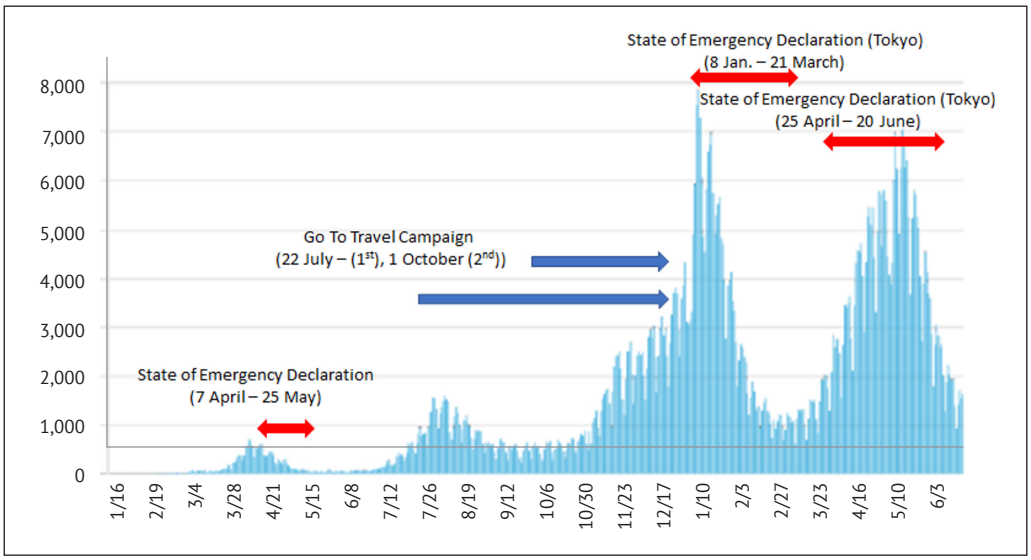
However, in mid-November, the number of new infections started increasing again. The government decided to control the movement of people across prefectures on 28 December and on 8 January 2021 declared a State of Emergency Declaration for the Tokyo Metropolitan City and three prefectures. It was planned to be ended on 7 February but extended to 21 March. This is considered the third wave. Infection numbers increased again in April in Tokyo and other prefectures and a State of Emergency Declaration was started on 25 April and ended on 20 June 2021. This is understood as the fourth wave.

1 Point-of-sale data, which are released 1 week late, are available on the digital data platform.

The lessons from Japan are that lockdowns were not forced but a voluntary approach was effective to control infections to some extent. People had enough information to change their behaviour through their own decisions. Information is important for behaviour change, and digital data will be useful for implementing policy in a timely manner.

However, if voluntary control is too long, some people will not be able to endure it economically or psychologically. In the fourth wave, its effects diminished compared to the previous waves. Vaccines are indispensable for the control of COVID-19. The government has secured sufficient volumes of vaccines, and local governments will implement vaccination. Vaccination started from medical staff in March 2021 and was

Figure 7.1 Number of COVID-19 Infections, January 2020–June 2021(as of 6 January 2021)



Source: Ministry of Health, Labor and Welfare (2021).

followed by vaccination of the elderly. Prime Minister Suga explained that vaccination for everyone who wants to be vaccinated will be completed by October or November 2021.

1.2. Emergency economic measures

Economic activity declined due to restrictions on going out. As an emergency measure, ¥100,000 was given to all citizens in June, and economic compensation was paid to restaurants and other businesses subject to restrictions on business hours. However, with the prolonged restrictions, there have been increasing demands that the economic compensation is insufficient, and with the increasing unemployment of non-regular workers, additional relief measures are becoming necessary.

On the other hand, some businesses, such as those related to

online shopping, digital devices to support telecommuting, consumer electronics, and food delivery and sales, have seen extremely high increases in sales due to the restrictions on going out and increases in remote work. The need for appropriate financial support is becoming more complex.

The service sector, particularly tourism, has been most severely affected. The government launched the 'Go to Travel' campaign in July 2020 to stimulate travel and travel-related consumption, including eating and drinking. The campaign was intended to both support the seriously affected sector as an emergency measure and to stimulate the economy by increasing consumption as a measure for a ripple effect.

However, in mid-November, the number of new infections began increasing again. The government decided to suspend the Go to Travel campaign and restrict the movement of people across prefectures on 28 December. It is clear that when the number of infections increased, the economic stimulus was stopped. A 'stop and go' policy implementation was inevitable. Key for this approach was the timely manner of the monitoring of infections being operated by municipalities. The Japanese government restructured health centres operated by municipalities and cut their budgets in order to cope with the budget deficit, and there are policy arguments that a review of the public health system is needed following the experience of COVID-19.

1.3. Economic impact

a. Economic growth

Gross domestic expenditure dropped to -1.8% in January–March 2020 and decreased further to -10.3% in April–June 2020 (year-on-year percentage change) (JCER 2021). Economic recovery started in July 2020 and, therefore, April–June is thought to be the bottom. Because of the medical system in place, Japan's economy is understood to have gradually recovered from mid-2020. GDP dropped by 4.8% in 2020 and is forecast to grow by 3.3% in 2021 (IMF 2021).

b. Uneven impacts on employment

The number of unemployed increased from April 2020 and approached 200,000 in May 2020 compared to 160,000–170,000 during 2018–2019. Since then, it has remained high at around 200,000, even in 2021. The unemployment rate jumped to 2.9%–3.1% from May 2020 but was still lower than its levels in 2009 and 2010 during the financial crisis period. Many companies have maintained employment through various support programmes and still need these measures.

Overall, the increase in unemployment has been somewhat contained, but its impacts have been uneven. Unemployment is greater in the service sector, such as in hotels and restaurants, than in the manufacturing sector, and the impacts on non-regular employees are larger than for regular employees. The share of non-regular female employees is much higher than for men, so the impact on female workers is bigger.

In Japan, labour market liberalisation policies have been in place for improving the competitiveness of industry, but in situations such as the COVID-19 crisis, vulnerable workers tend to be more affected, confirming the need for safety nets.

c. Impacts on the supply chain

With regard to the supply chain for energy and resources, the mechanisation of the value chain is progressing, and no significant impacts have been observed, including on imports (as of 25 June 2021). Regarding the trade of final products and parts, imports from China, Thailand, and other countries are delayed, leading to shortages of some goods. However, overall, there has been no big impact because demand for many products has been decreased by self-restraint.

However, the security of the supply chain has become an issue. This was caused by the shortage of medical products in the first half of 2020 due to the heavy reliance on imports. Medical products, such as masks and alcohol disinfectant, disappeared from stores and some hospitals had to restrict to receiving new patients due to the shortage of medical goods, such as protective clothing and disinfectant. This became a serious social problem, and the government banned the resale of these goods at higher prices through online shops and supported the production of masks, ethanol, and disinfecting protective clothing, etc. in Japan. In addition to these consumer medical goods, shortages of advanced medical equipment, such as respirators known as ECMO, led to serious bottlenecks. The government implemented countermeasures for infection, such as securing vaccines and medical equipment, as a part of national security.

The system for collecting and incinerating medical waste and personal anti-infection products functioned well by using the existing medical waste treatment system, which is operated privately but regulated by municipalities. Therefore, medical waste was not a problem.

d. Digitalisation as an indispensable tool

The importance of digitisation has been reaffirmed during the pandemic. Many companies moved smoothly to using online systems, and telecommuting became common. On the other hand, the delay of digitalisation was noticeable in the government sector and in education. The lack of equipment and experience became apparent, and countermeasures were taken, such as the distribution of tablet computers to schools for online education. Vaccinations, which began in April 2021, are administered by local governments, but local governments have lagged behind in digitalisation, and delays in managing the ordering of vaccinations have been noticeable and criticised. The Digital Agency for pushing a digital government has been announced by Prime Minister Suga and will start in September 2021. But the environment for the digital telecommunication network is not enough for large-scale use, and this is a bottleneck. This reconfirms the need for improvement in the telecommunication infrastructure.

In addition, in order to balance infection protection and the economy, it is necessary to undertake a ‘stop and go’ policy. New tools, such as POS data, for knowing consumers’ activities and mobile GPS data for tracking the movement of people, can be very useful in accelerating or suspending economic measures in a timely manner.

The delay in digitalisation has been a major problem in Japan, but COVID-19 is pushing digital transformation.

Table 7.1 Long-term Outstanding Issues for Japan

Long-term outstanding issues	Impacts of COVID-19 and countermeasures
Revitalisation of the local economy - Increase in the gaps between local areas and Tokyo because of the concentration in Tokyo	- Serious impacts on inbound tourism, affecting the revitalisation of the local economy.
Promotion of the digital economy - Digitalisation as a key for growth strategy	- Slow progress in government was a bottleneck. Digitalisation is planned to be pushed by the Digital Agency.
Elimination of disparities in income and education - Negative impacts from labour market liberalisation	- Much bigger impacts on vulnerable people and the necessity of a safety net system have been reconfirmed.
Transformation of the energy system and climate change - Energy market reformation for a net zero emission society	- Risk of delay due to budget constraints for the science and technology support programme and private R&D investment.
Financial sector reform - Reform is needed under less demand and a saving surplus, particularly for regional banks	- Liquidity was supplied quickly by banks and a safety net function for small and medium-sized enterprises and the local economy was confirmed. - Risk of non-performing assets is increasing.
Rebuilding of the government budget deficit - Primary balance by 2025	- ¥57.8 trillion additional government bond issuances (outstanding will be ¥1,125 trillion at the end of FY2020). Delay in realising a primary balance. - Fiscal system reform is needed.

Source: Author.

1.4. Concerns for long-term impacts

Long-outstanding issues, such as disparities in income and education and the delay in digitalisation, have been highlighted by the pandemic. Some issues, like digitalisation, will be pushed by the COVID-19 countermeasures, but others, like disparity, are becoming more serious. In addition, many issues were suspended during the crisis. Economic recovery and post-COVID-19 growth strategies need to address these challenges.

2. Low-carbon Green Growth During the Pandemic: Changes in policy and budgetary and non-budgetary support before the COVID-19 outbreak and from March 2020

2.1. Economic outlook

The peak of the second wave was June or July 2020, but the pandemic was still not over. Since the cancellation of the Declaration of Emergency, the government has been trying to balance the economy and COVID-19 control measures, particularly the revitalisation of the service industry, which was most severely depressed. The Go to Travel campaign, which provides subsidies for travel, is an example.

Table 7.2 Economic Growth Outlook

FY 2020	FY 2021	Apr/Jun 2020	Jul/Sep 2020	Oct/Dec 2020	Jan/Mar 2021	Apr/Jun 2021	Jul/Sep 2021
-4.6	5	-10.1	-5.6	-1.1	-1.6	7.9	4.7

Note: April 2020–March 2021 show the actual statistics. The quarters show the year-on-year statistics.
Source: JCER (2021).

A big economic stimulus is needed, but a 'stop and go policy' has been necessary to attempt to contain the pandemic.[2]

Before the COVID-19 crisis, the government expected economic growth in 2020 to be 1.4%, but in July 2020, the government revised the growth rate to -4.5% in 2020 and 3.4% in 2021. The Japan Center for Economic Research (JCER), a leading private research institute in Japan, forecast 7.9% growth for April–June 2021 and 5% growth in FY2021. However, the growth rate will be lower if the vaccination process is delayed.

2.2. Impact on industry and the energy sector

The industrial production index dropped to -20.3% in April–June 2020 (year-on-year) but the annual average recovered to -9.5% in 2020 and 11.2% in 2021. Energy and resource imports declined; for instance, in May, oil imports fell to about two-thirds of the 2019 average, and coking coal imports dropped to -20%. But now, these imports are recovering, and symptoms of structural change have not been observed at this point.

In the electric power sector, demand in April and May 2020 was lower than that in 2019 and 2018. The share of thermal power in April and May 2020 was around 3 percentage points lower compared to the level of 2019. If the demand for electricity decreases, from an economic standpoint, power companies will reduce their output of thermal power generation, which requires fuel costs, and use renewable energy, which has low operating costs. In addition, under the feed-in-tariff (FIT) system, renewable energies are legally required to be connected to the grid on a priority basis. Increases in renewable energy supported by the FIT system and continuous improvements in energy efficiency are a trend in Japan, but, at this time, it is not clear whether the COVID-19 crisis has accelerated structural change.

In the first half of January 2021, electricity demand surged due to very cold weather. However, due to a shortage of liquefied natural gas (LNG), the supply of electricity could not keep up, and the ratio of demand to supply capacity for some power companies exceeded 95%, which was very dangerous. One of the reasons for the shortage of LNG was the tightening of the market due to the shift from coal to natural gas in China and other Asian countries. LNG supply investment in 2020 decreased to one-third, and a shortfall is expected by 2025 (IEA 2021). In order to achieve net zero, unabated gas will not be used in the long term, but in the medium term,

[2] Japan hosted the Olympics, which were postponed to July 2021, during which the balance between the economy and pandemic control was crucial.

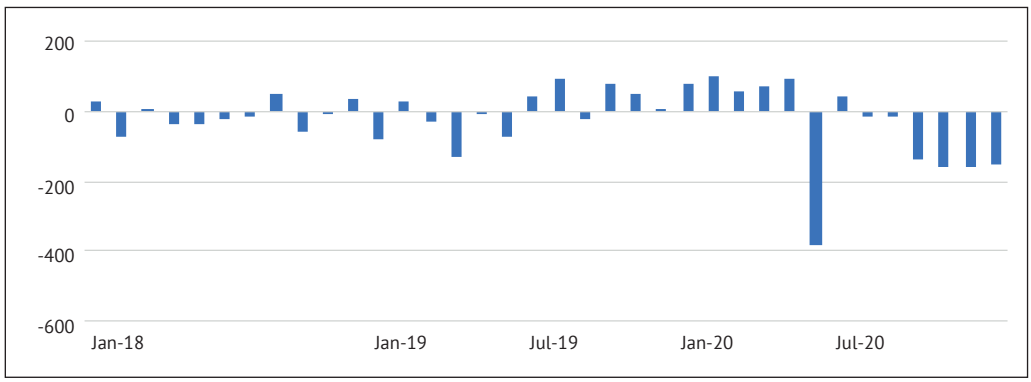
it is necessary to switch from coal to LNG as fuel for power generation. The transition needs to pay close attention to the stable supply of electricity, and the transition strategy is becoming important in Japan.

Emissions for 2020 are expected to decrease compared to the previous year due to the decrease in fossil fuel imports: crude oil to -11.5%, LNG to -5.7%, and coal to -1.0% during January–June 2020 (year-on-year) (Ministry of Finance of Japan 2020). Emissions in Japan are expected to show a similar percentage drop as the world average, -8% (IEA 2020). But due to the economic recovery in 2021, a rebound is expected. The acceleration of climate change policy and the restructuring of industry is needed for the post-COVID-19 growth strategy.

2.3. Financial sector

In Japan, the financial sector has faced difficulties since the mid-1990s because of the low demand for finance due to the lower economic growth rate and savings surplus that have persisted over time. Local banks, in particular, have encountered challenges due to the slump in the local economy and the restructuring of local banks.

Figure 7.2 Number of Bankruptcies (increase/decrease; year-on-year)



Source: Japan Institute for Labor Policy and Training (2021).

Many subcontracting companies in the manufacturing industry, mostly SMEs, operate in rural areas. Orders from their clients are decreasing and they face strong pressure due to cost cuts from their clients because the companies are vulnerable in the supply chain. The number of bankruptcies was generally stable during 2020 (Figure 7.2). Local banks and credits unions have supported companies based on their long and continuous relationships. The government provided a huge amount of support to companies, including SMEs, but this took time for delivery, so local finance was the first to provide funding. Finance demand from large companies, like airlines and car manufacturers, has been funded mainly by major banks. The role of public finance in the domestic finance market in Japan is limited to SMEs because an ex-development bank is being privatised.

However, lending by local banks and credit unions has been stretched, and the number of bankruptcies has increased slowly since the end of December 2020, particularly in the service sector, so it is necessary to support their operation. The government has begun to consider the restructuring of local banks, but it is reminded that local banks and credits unions play the role of a safety net for the local economy. In March 2021, the Bank of Japan (BOJ) started a special zero interest lending programme to boost funding from regional banks to local companies (BOJ, 2020). This will continue to March 2023. Furthermore, on 18 June 2021, the BOJ's Policy Board and Monetary Policy Committee decided that it would create a new funding mechanism to help strengthen the funding capacity of financial institutions to support industry working to combat climate change. The BOJ should ensure its neutrality as a central bank, and attention has been focused on the detailed requirements for what kinds of businesses it will support (BOJ, 2021).

2.4. Changes in working styles

Companies have become aware of the effectiveness of teleworking and have switched to online meetings during the crisis. When COVID-19 subsides, there will be some swing-back in working style, but it is clear that the pandemic has accelerated the use of online working styles.

In Japan, concentration in megacities is a big trend, and the energy system has been constructed to support this trend. When online working styles take hold, concentration in megacities stops, providing more flexibility for the energy system. It is helpful to reduce the bottleneck of transmission infrastructure, which carries renewable electricity from the most appropriate places for generation to the megacities. The renewable-based decentralised network is gaining attention, and digitalisation may contribute to both revitalisation of the local economy and emissions reductions. Thus, policy measures for upgrading the digital infrastructure and improving digital literacy are needed.

2.5. The public health system and the role of local governments

The hospitalisation and isolation of infected people are managed by the health centres of municipalities as part of their administrative services. However, it has been pointed out that the number of infected people exceeding the capacity of public health centres has become a bottleneck in the monitoring of infectious diseases and the management of medical services.

One of the reasons for the lack of capacity in health centres is that the Japanese government has restructured health centres operated by municipalities and cut their budgets in order to cope with the budget deficit. There are policy arguments that a review of the public health system is needed in the wake of a major epidemic such as COVID-19.

In addition, infectious diseases need to be managed beyond the boundaries of the local governments, and the need for national health care centres has been mentioned. The expansion of hospital facilities alone is considered insufficient, and the entire public health care system needs to be reviewed. A review of the roles of the

Table 7.3 Package of Emergency Countermeasures
(¥ trillion)

Supplemental budget	Magnitude of stimulus	Government budget	Of which cash expenditure	Of which public finance
1st	117.1	48.4	33.9	12.5
2nd	117.1	72.7	33.2	39.3
Total	233.9	120.8	66.8	51.9

Source: Author, using data from various Japanese government presentations.

Table 7.4 Major Components of Emergency Countermeasures
(¥ trillion)

Major component	Amount
Employment support	0.5
Working capital support	11.6
Rent support	2.0
Medical care support	3.0
Others (to local government, low-income households, etc.)	4.7
Reserve fund	10
(Subtotal)	31.8

Source: Author, using data from various Japanese government presentations.

national and local governments may lead to a reconsideration of the nature of local autonomy, including the budget system

3. Composition of Recovery and Stimulus Packages

3.1. Measures for the COVID-19 crisis and the Green Growth Strategy

The total amount of the emergency countermeasure packages by the Japanese government was ¥233.9 trillion, and the sum of the budgets was ¥120.8 trillion, which were prepared by two Supplemental Budgets in April and June 2020 (Table 7.3). Even for the second budget, the majority of the spending was for emergency support, such as employment support, working capital support, rent support, and medical care support. There was no specific climate component (Table 7.4).

On 17 July 2020, the Basic Policy for Economic and Fiscal Management and Reform 2020 (Basic Policy) for the 2021 budget preparation was approved by the cabinet. It aims for the control of COVID-19 and the reconstruction of Japan post COVID-19, in the 'new normal'. It states natural disaster management and digital transformation as policy priorities but does not refer to 'green recovery' explicitly. However, some components, such as quality infrastructure support, hydrogen innovation, smart city and digitalisation, can be constituted as green recovery. Also, it stresses the positive cycle of environment and economy as a principle.

Table 7.5 Basic Plan for 2020 and Low-carbon Components

Structure of the Basic Plan	Low-carbon components
Improve resilience - Control of COVID-19 and economic stimulus - Resilience against natural disaster	 - Digital transformation, bail-out finance - Resilience under climate change
Construction of the new normal - Digital transformation - Revitalisation of the local economy - Innovation and human capital - Inclusive society - Economic growth and international cooperation	 - 5G and beyond 5G - Smart city, de-concentration on megacities - Innovative energy development, such as hydrogen - Quality infrastructure, 'beyond zero', Sustainable Development Goals, global supply chain, hydrogen society

Source: Author.

On 16 September 2020, Prime Minister Suga was elected as the new prime minister, and he committed to continuing basic policies. It is expected that ministries will propose policy measures for low-carbon investment following the Basic Plan (Table 7.5).

On 25 December 2020, the Japanese government disclosed its Green Growth Strategy (Table 7.6). This seems to be a combination of the Basic Plan and a long-term strategy that has already been disclosed. Amongst the long-term outstanding issues, digitalisation is focused on as a megatrend of the post-COVID-19 new normal. For instance, the Post-COVID-19 Growth Facility is implemented by the Japan Bank for International Cooperation, and consists of two areas, the promotion of decarbonisation and improvement of supply chain resilience.

Table 7.6 Green Growth Strategy

Policy	Priority technology
- Budget • Green Growth Fund (¥2 trillion) • Induce ¥15 trillion in private R&D leveraged by the Green Growth Fund - Tax incentives • Tax deduction for investment • Accelerated depreciation • Carry forward of losses • R&D tax incentives - Finance • Enhancing transition finance through subsidies to interest payments • Green Investment Promotion Fund (¥80 billion) • Post COVID-19 growth facility (¥1.5 trillion) • Taxonomy for private finance (Japanese style) - Carbon pricing • Carbon tax emission trading/offset, border tax adjustment	- Offshore wind - Ammonia for fuel - Hydrogen - Nuclear - Automobiles (electric vehicles and fuel cell vehicle) and batteries - Ships - Logistics, human flow, civil infrastructure - Food, agriculture, and fishing industry - Aircraft - Carbon recycling - Housing, construction, next-generation solar - Circular economy - Lifestyle

Source: Author.

The decarbonisation facility supports hydrogen and other zero-emission fuels in addition to energy-saving and the use of renewable energy, and the supply chain resilience facility may support the supply chain in ASEAN, too. However, countermeasures for expanding the disparities in Japan are not stressed upon.

Apart from long-term measures and growth strategy, an important policy issue is the 'stop and go' countermeasures. The Go to Travel campaign was proposed for stimulating the economy, particularly the service sector. However, there was a trade-off relationship between the increase of movement of people for the Go to Travel campaign and the containment of infections, so the timing was important. The campaign was started in July 2020 but then suspended on 4 December 2020 after a long policy debate. This is a typical case of the trade-off between economic recovery and infection containment.

On 2 June 2021, the government announced a draft plan to implement the Green Growth Strategy. In this plan, economic recovery from COVID-19 was analysed and specific areas and policies were outlined. The plan focuses not only on fiscal spending but also on stimulating private sector activities, and includes deregulation to ensure that the introduction of new technologies is not disturbed. It also states that carbon pricing will be introduced without hesitation if it is conducive to growth, and that offset markets, such as J-credits, will be developed, but no conclusions have been reached on raising the carbon tax or on emissions trading. From the perspective of international competitiveness, the government will closely monitor the European Union's Border Carbo Adjustment Mechanism and prepare for responding strategically.

On 18 June 2021, the Basic Plan 2021 for the FY2022 budget was released (Table 7.7). This was the first Basic Plan under Prime Minister Suga, and it has a strong focus on economic recovery and growth, as economic growth for FY2022 is likely to be lower than expected due to the continued effects of COVID-19. The four engines of economic growth are green growth, digitalisation, revitalisation of the local economy and society, and measures for the declining birth rate. As in the 2020 plan, the Basic Plan proposes digitalisation and local economy revitalisation, but green growth is listed as one of the four pillars. The prime minister intends to place a higher priority on climate change than the previous administration.

3.2 Lesson learnt from the financial crisis

The 'Green Deal' was a big global trend during and after the financial crisis period in Japan, too. For the election in August 2009, two big parties at the time, the Liberal Democrat Party (LDP) and the Democrat Party of Japan (DPJ), proposed the Green Deal and competed on climate policy. The DPJ won the election and promoted their climate policy, such as support for renewable energy, electricity market liberalisation, and the deployment of emissions trading. However, the Great East Japan Earthquake in 2011 changed everything. Feed-in-tariffs (FITs) for renewable energy were

Table 7.7 Comparison of the Basic Plan, 2020 and 2021

Basic Plan 2021 (18 June 2021)	Basic Plan 2020 (17 July 2020)
◆ Positive cycle of overcoming infections and economic growth ◆ Four diving forces for economic growth - Green growth • Private investment and innovation by green growth: Green Innovation Fund, International Green Finance Hub • Energy and resource policy for decarbonisation • Carbon pricing for green growth - Digitalisation • Revitalisation of the local economy and society - Smart cities • Measures for the declining birth rate ◆ Economic and financial reforms	◆ Protect the lives, employment and businesses of the people ◆ Realise the new normal - Digital new deal • 5G, post 5G, beyond 5G • Measures for the digital disparity - Revitalisation of the local economy and society • Smart cities • Supply chain efficiency - Investment in the innovation of human resources • ICT education • Open innovation - Inclusive society • Healthcare system • Relief of depressed generation for employment - Active Japanese economy under the new global economy • Trade rules • International contribution, including decarbonisation ◆ Economic and financial reform

Source: Author; Cabinet Office (2020) and Cabinet Office (2021).

adopted, but emissions trading was not implemented. After the LDP's comeback as the ruling party, Japan withdrew its emissions reduction target in 2020 under the UNFCCC framework due to the uncertainty of energy supply without nuclear power. The costs of renewable generation in Japan have been slow to fall. The economic burden for consumers is high under the current extremely high FITs for renewable power generation, and reforms of FITs are under discussion. Thermal power is still important due to the limitations of electricity from zero-emission energy sources, such as renewable and nuclear power. So, the government is aiming for the new option of zero emission fuel for thermal power generation, such as hydrogen and ammonia. The restructuring of the energy system is delayed in Japan, but policy debate for energy system restructuring is more active. In general, Japan can learn from its experience of the financial crisis in 2009 for the combination of economic stimulus with climate policy, but there are differences in circumstances as follows:

Domestic – the energy supply options are limited because nuclear was planned to play an important role for reducing emissions, but public sentiment changed after the Fukushima Daiichi accident. Technology innovation, such as for the cost of renewable power generation, is needed.

International – change in US climate policy and the global trend towards a net-zero commitment. However, there is still the risk of a global trend of 'home country first principle' and a trade war.

3.3. Climate policy and economic recovery

Japan's commitment for emissions reduction under the Paris Agreement is a 26% reduction by 2030 from the

level in 2013 and an 80% reduction by 2050. In June 2019, the government announced that emissions will be net zero as early as possible after 2050. In September 2020, Prime Minister Suga declared net-zero emissions by 2050 at his first speech to parliament.

Emissions have been decreasing since 2013, but it will be tough to achieve a 26% reduction by 2030. The most important assumption for the 2030 target is reduction of emissions from the power sector, and the measures are described in the Basic Energy Plan. It is assumed that 44% of electricity should come from zero-emission energy and the carbon emission factor should be 370 g/kwh. Nuclear power was expected to supply half of the zero-emission power, but only 6% came from nuclear in 2019. How to secure a stable and sufficient supply of electricity is a critical concern because phasing out coal requires discussing and considering the way to reduce the economic burden from the higher tariff of renewable energy under the FITs.

As mentioned above, it will not be easy to achieve the 2030 target under the current policies. In December 2020, Prime Minister Suga decided to make active use of carbon pricing and instructed the Minister of Economy, Trade and Industry and the Minister of the Environment to consider 'carbon pricing to contribute to economic growth' in order to achieve net zero emissions by 2050.

In April 2021, before the climate change summit hosted by United States President Biden, Prime Minister Suga stated that the 2030 target will be raised from 26% to 46%. This is a very ambitious target, because time until 2030 is limited, so it will not be easy to achieve the target. It is said that a concrete strategy will be announced before COP26 in November 2021. It is not surprising that the Basic Plan for 2022 emphasises economic growth strategies through climate change activities.

4. Post-crisis Design of a Green Stimulus for ASEAN+6

The SARS outbreaks in 2002 and 2003 had little impact on Japan, and, therefore, Japan's preparedness for the pandemic was not sufficient. The response to COVID-19 was a trial-and-error process, and it is difficult to say it was perfect. Also, because the outbreak has not been as explosive as in Europe and the United States, measures for the pandemic were implemented to maintain economic activities as much as possible. The repetition of Japan's pandemic measures and economic policies may be a valuable experience for ASEAN's green growth policy, although the situation is not the same.

4.1. Phased approach for economic measures

The appropriate economic measures vary by the situation of infection because measures for COVID-19 restriction, such as self-restraint, can conflict with economic enhancement. A phased approach is practical. There are three phases: the emergency phase (Phase I), the recovery phase (Phase II), and the growth phase (Phase III). Measures taken in Japan prepared by two supplemental budgets are mainly for emergency purposes, but the Budget Plan includes recovery purpose measures.

In Phase I, measures controlling infection are focused on and low-carbon measures are limited. An example could be bail-out finance with climate-related conditions. For instance, France supported Air France but with the condition of a low-carbon commitment, such as an emission reduction target (to half by 2030), 2% bioenergy use, the abolishment of short-distance routes that can be replaced by high-speed trains, and Canada asked for climate risk disclosure in line with the recommendation by the Task Force on Climate-related Financial Disclosures (TCFD) and alignment with Canadian climate policy. Japan had a similar experience during its recovery from the financial crisis. In 2010, the BOJ provided liquidity for activities for economic growth, including environment-related investment. Conditional finance seems to be a realistic option during Phase I.

In Phase II, during the recovery from the pandemic, the first priority is the impacts on employment and economy and, therefore, policies that stimulate personal consumption, such as the Go to Travel campaign, are the core of measures. Some climate-related investments are also fit for the recovery phase, for instance, retrofit energy efficiency investment, including in building and homes, which is labour intensive and can start quickly and provide business for the local economy. Policy to support the sales of electric vehicles (EV) and other low-carbon cars and the expansion of charging stations can avoid the lock-in effect of higher carbon emission cars.

Improvement in digital infrastructure is urgently needed, so it should start in Phase II and continue during Phase III. In addition to domestic measures, resilience of the global supply chain should be supported to avoid the bottleneck in the production of low-carbon products.

However, there were no large-scale stimulus packages aimed at economic growth or targeting the long-term challenges, such as climate change, in 2020. Infectious diseases are still not well controlled in Japan, and the emphasis is on digitisation support to help with both Phase I and Phase 2. But following the Green Growth Strategy in December 2020, the implementation plan and the Basic Plan for the 2022 budget were announced in June 2021. In Japan, it looks like green components are going to be incorporated into the budget from now on. Also, it seems to include components for not only Phase I but also Phase II and Phase III.

In Phase II, there is a risk that the infection will spread again. It remains to be studied whether the timing of the start and stop of the Go to Travel campaign in Japan was appropriate, but this is an important lesson that the monitoring of infections and stop and go measures is inevitable. Many measures are included in the implementation plan, but it is necessary to clarify the purpose of each measure and to manage the implementation in a timely manner responding to the infection and socio-economic situation.

For Phase III, the growth phase, low-carbon infrastructure investment and support for R&D investment for innovation shall be included:

Infrastructure – the stability of the electricity networks system, including countermeasures for cyber security,

the supply chain of low-carbon or zero emission fuel supply, and digital infrastructure.

Innovation – carbon recycle and carbon capture and storage (CCS), energy storage including battery and hydrogen storage, and enhanced quality infrastructure.

Digitalisation, which has multiple effects, such as infection-related measures on shifting to remote work, climate change, economic growth, and the revitalisation of the local economy, is used at all phases. The provision of digital equipment is made in Phase I and job training in Phase II. In addition to the these measures, the improvement in infrastructure and education for improving digital literacy is needed for Phase III. Investment in human capital should not be missed.

In Phase III, growth strategy is a long-term challenge and will require long-term commitments. It is not a major objective for Phase II, where economic recovery is a top priority. However, an early indication of the plan will provide an important message to industries that are considering a long-term business strategy post COVID-19. Also, for a zero emission fuel supply, it takes longer to construct the supply chain infrastructure and a concrete plan should be considered. Although the announcement of Japan's Green Growth Strategy was made during the third wave of the surge in infections, it is never too early to announce. There is a time lag between the announcement and the actual start of its implementation. Table 7.8 shows the recommended measures for each phase.

4.2 Adoption of a market mechanism for fiscal system reform

In 2020, ¥90 trillion in government bonds, including ¥57 trillion in additional bonds, was planned to be issued, and the outstanding amount is assumed to reach ¥1,125 trillion following the plan, almost twice the amount of GDP. The debt service of the government will be increased and the recovery of the primary balance will be delayed. Incentives are effective in accelerating low-carbon investment, but there are limitations under budgetary constraints. Ultimately, carbon externality should be removed by incorporation into the market economy. The first step is the adoption of carbon pricing. Since February 2021, the Ministry of Environment and the Ministry of Economy, Trade and Industry have been examining emissions trading, a carbon tax, and carbon border adjustment separately. The main issues are whether they can be effectively reduced, whether the burden is equal on companies and industries, and the impact on international competitiveness. All policies have their strengths and weaknesses, and the appropriate combination for adoption in ASEAN will vary from country to country. Carbon pricing and the market base mechanism is recommended for the government policy system reform, too.

a. Recovery phase: performance/ outcome-based incentive mechanism that can deliver incentives more efficiently, and incentives through local banks, which may revitalise the local economy and banking sector.

Table 7.8 Phased Approach and Recommended Investment

Categories	Phase 1 (Emergency)	Phase 2 (Recovery)	Phase 3 (Low-carbon growth)
Electricity and energy supply	- Stable supply	- RE generation - Review of efficiency benchmarks - Resilience of the supply chain, such as LNG	- Grid security, including stability and resilience - Market liberalisation with carbon cost - Lower carbon fuel, including waste-based bio fuel
Industry, building, transport	- Efficient air conditioners - Clean personal mobility - Congestion relief of public transport	- Retrofit efficiency improvement - Retire of inefficient equipment - Electrification/fuel cells	- Electrification and switch to low-carbon energy (hydrogen, etc.) - Restructuring of industry (retirement) - New building code - Electrification and/or lower carbon energy - New transportation system (combination of modal shift and personal mobility)
Technology innovation including digitalisation	- Continuity of R&D (secure of its budget) - IT equipment support	- Hydrogen, ammonia, etc. (R&D, production, and use) - CCS/CCUS (R&D) - Application for efficiency and digital infrastructure	- Energy storage (battery, hydrogen, etc.) - Infrastructure for new energy systems - CCS/CCUS - Digital infrastructure and literacy improvement
Finance	- Bail out finance with conditions	- Outcome-based incentives (pilot) - Incentives through local banks	- Outcome-based incentives (mainstreaming) - Carbon market (budget neutral finance
Regional Cooperation	- Support for clean energy access	- Joint procurement of natural gas - Minimise lock-in effects - Improving digital security - Resilience of global supply chain	- Harmonisation of regulations - Common electricity and gas market - Common carbon market - 'Quality infrastructure'

Source: Author; Cabinet Office (2020) and Cabinet Office (2021).

b. Growth phase: incentive for innovation by competition and portfolio-type investment in new technology for enhancing competition amongst different technologies, and emission trading and/or an offset mechanism.

The Green Innovation Fund, established to implement the Green Growth Strategy, will work on the 14 green growth sectors identified by the government. In each of the 14 sectors, there are various technologies options, and companies are competing to develop them. There is uncertainty as to which technology will succeed. It will be interesting to see whether the government will concentrate its support on specific technologies or consider diversified investment as a portfolio approach, what technologies will be selected, and how the responsibilities of companies and the government will be shared.

4.3. Financial system

Banks have made a great contribution to supporting businesses affected by COVID-19 by providing huge amounts of finance prior to the government support programme. But, in general, the

banking system in Japan is suffering from a structural problem. Amongst them, local banks are depressed, and, in the long run, it is understood that restructuring for revitalisation is needed. In the short term, like the BOJ's financial operations, financial support for banks is needed for supporting green projects because the financial conditions of banks have been weakened by the continuing pandemic.

Government subsidies will not cover 100% of the investment costs, and additional finance by banks is needed to fill the finance gap. The implementation of incentive systems by banks that have long and close relationships with local companies may provide one-stop services for financing low-carbon investment smoothly. This may contribute to both low-carbon investment and the local economy. Recommended measures are as follows:

a. Delivery of incentives through local banks and a combination of outcome-based incentives for SME finance

b. Conditional lending, including bail-out finance in Phase I, with climate change commitment/actions.

Careful consideration is needed on which climate change activities are eligible. ASEAN does not have the same economic and energy structure as Europe, the United States, or Japan. A diversified approach may be realistic. Central banks are not experts in industrial finance and have limited information on energy and climate change. There are different opinions on how deeply they should intervene.

4.4 Digitalisation

Digital technology is indispensable for sustainable growth as it can contribute to emissions reductions, such as through energy efficiency and the optimisation of electricity networks. Also, it supports reductions in disparities in income and education because it can provide equal opportunities for all. It has been pointed out that the widespread use of remote work has led some people to move their residences from city centres to suburbs and even to the countryside, and this may provide great opportunities for local companies. Digitalisation could be a chance for ASEAN to reap the positive effects of Industry 5.0.

a. Both hard infrastructure and soft infrastructure need to be improved. Soft infrastructure includes application development and the improvement of data literacy.

b. Rules for the digital economy, such as on intellectual property rights, the ownership of data, and privacy rules, should be in place.

c. Cyber security is critical for the digital economy and energy security. New international rules are an important condition of the digital revolution.

It is also necessary to deal with the negative aspects of digitalisation. Not all companies and not all people can make good use of digitalisation. Worker training and equal educational opportunities also need to be addressed.

4.5. ASEAN+6 cooperation

Huge investment is required for the transition to low-carbon growth, but international and regional collaboration can be reduced costs through economies of scale and the sharing of experiences, technologies, and resources. New technologies need to be developed for the changing long-term goals. There is uncertainty in developing new technologies, and relying on one technology is risky. It is better to have as many technology options as possible. The resources of a single country are limited and international cooperation is necessary. Open policy is better than a 'home country first' policy.

a. ASEAN energy security pool – the supply of low-carbon energy is crucial for climate change actions in ASEAN, where energy demand is increasing. Ongoing projects, such as the ASEAN Power Grid and the Trans-ASEAN Gas Pipeline, are improving the connectivity of electricity markets. Looking at the energy system for 'beyond 2030' and 'net zero emissions' until 2050 and afterwards, hydrogen and ammonia, or other low or zero-carbon energy supply chain and carbon recycle systems using carbon capture and sequestration, should be jointly studied and constructed. The infrastructure construction and R&D investment are too big for ASEAN member countries alone. Therefore, ASEAN+6 cooperation is needed. The Japanese government will cooperate with ASEAN for constructing a zero or lower emission energy system, including zero-emission hydrogen and ammonia, by using the Post-COVID-19 Growth Facility as a part of the Green Growth Strategy. Zero-emission fuels increase flexibility in zero emission energy options.

b. Harmonisation of regulations – due to the deepening of the supply chain, the harmonisation of the energy and carbon standard is progressing. The influence of climate-related voluntary initiatives, such as green bonds, sustainability bonds, and sustainable finance taxonomy, is increasing. Also, varieties of ISO for sustainability, including climate change, are being prepared. It is important to adjust to these global trends, but each country has its own national preference because the economy, industry, and energy vary from country to country. The SDGs are a useful tool for the balance of global or regional movements and national or local preferences. Japan is going to promote transition finance, which balances practicability and ambition. This is an option for cooperation with ASEAN for harmonisation.

c. ASEAN+6 common carbon market – the average cost for achieving the Paris Agreement target has been reduced to US$40 per tonne of carbon dioxide equivalent, and an additional 5 billion tonne reduction a year can be realised when international emission trading is used (IETA 2019). The ASEAN common carbon market is recommended to reduce the burden and speed up the transition.

d. Another important thing is to share the transition scenario: ASEAN's energy demand will continue to increase. This is different the European Union, the United States, and Japan, where energy demand will

decrease if policies are implemented in line with the Paris Agreement – therefore, the adoption of the same policies is not appropriate. ASEAN and Japan may have a lot of potential for cooperation in developing decarbonised energy, including zero-emission fuels. In order to achieve the goals of the Paris Agreement, it would be beneficial for ASEAN to develop their energy and climate change scenarios in cooperation with Japan.

5. Game-changing Recommendations for ASEAN +6

There are many challenges for the long-term sustainable development of Japan – disparities in income and education, the shrinking local economy, and increasing natural disaster risks and energy insecurity under climate change. The transition to a low-carbon economy is a very important challenge, but not the only one, and it is interrelated with other challenges. Therefore, it needs to be tackled by comprehensive policy packages.

Three principles for approaches are recommended.

Fiscal system reform through a market-based approach

Ultimately, carbon externality should be removed by regulations, and the government should change its role to a 'rule maker' from a 'market player.' Subsidies cannot be a permanent measure, and direct intervention by the government should be minimised. COVID-19 has expanded the budget deficit, and this is a chance to accelerate the transformation of fiscal and financial policy measures by using a market-based mechanism as an option for a budget-neutral approach.

Balance of a global approach and a national approach

Climate change is a global issue, and all countries have to tackle it. International collaboration can reduce the cost of transition. Free trade and investment are essential not only for economic growth but also for climate change. It is important to respect the local conditions because the structure and background of the economy, industry, and energy vary from country to country. However, recently, 'home country first' has become a big movement. This is a threat to economic growth and climate change even though national security is one of the most important issues. SDGs can be a useful tool for balancing the global and local approaches.

Digitalisation for all

Digital technology contributes to the low-carbon transition in addition to reducing the gaps in income and education and enhancing the local economy. It has multiple benefits and is an indispensable technology. Digital information has a different nature from conventional goods and services and, as such, can cross national borders, and property rights are not clear. New rules, such as for intellectual property rights, ownership, and privacy, are required to utilise its potential fully and mitigate its negative impacts. In addition, cybersecurity is a real threat to the economy and society, and ASEAN and countries with close ties to ASEAN, such as Japan, should cooperate to tackle cybercrimes. As for the telecommunications system, this is an important form of infrastructure.

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Chapter 8

Strategy for Aligning COVID-19 Recovery and Stimulus Measures with Low-carbon Green Growth in the Republic of Korea

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Chapter 8: Strategy for Aligning COVID-19 Recovery and Stimulus Measures with Low-carbon Green Growth in the Republic of Korea

1. Introduction

The COVID-19 pandemic has been having an enormous impact on human life around the world. This paper focuses on the impact of the COVID-19 pandemic on the economic environment of the Republic of Korea (henceforth, Korea). Although the COVID-19 crisis is basically a health issue, it has brought limitations on transportation and industry output and these have caused an economic downturn. Governments have been trying various policies to prevent the negative impacts of the COVID-19 pandemic on national economies. We summarise how serious the spread of COVID-19 and the economic downturn have been in Korea and how the Korean government and Korean people are trying to minimise disastrous outcomes from the pandemic. The responses by the Korean government to the COVID-19 crisis consists of two steps, that is, a stimulus package in the short term and a green new deal in long term.

2. The COVID-19 Crisis in the Republic of Korea

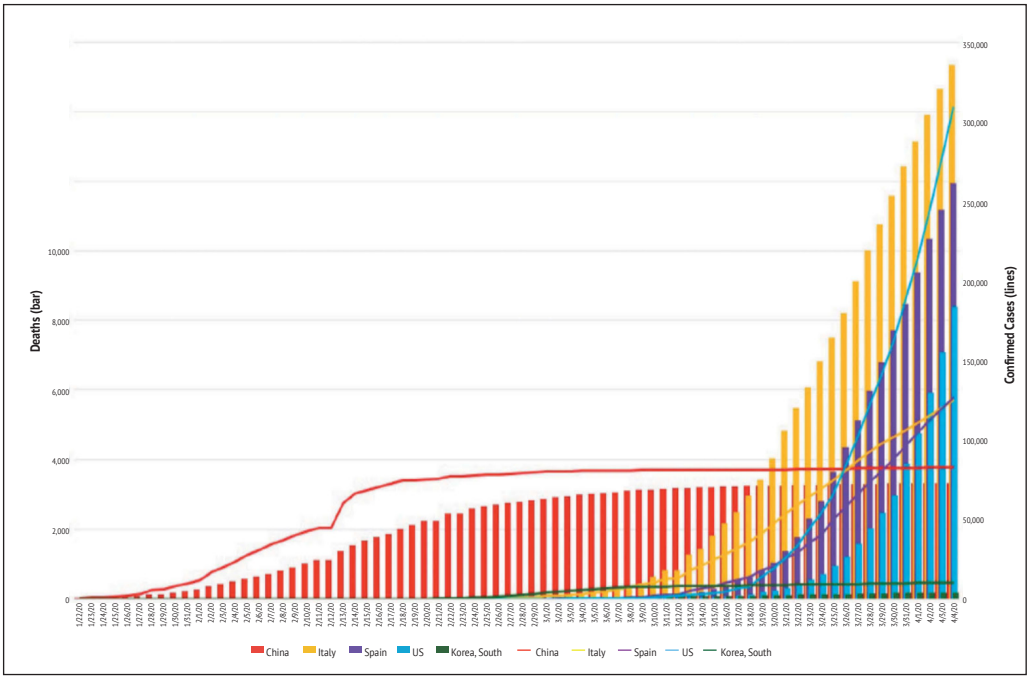
In the first two months of the COVID-19 pandemic, Korea had the second-highest number of cases of any country, behind only China. Despite this initially high burden from the disease, Korea was able to dramatically lower the incidence of new cases and sustain a low mortality rate, making it a promising example of a strong national response. Importantly, Korea achieved this control and mortality rate with a relatively blunted economic impact given the extent of the outbreak when compared with other Asia-Pacific countries with a lower early COVID-19 burden.

We aim to describe the key elements of Korea's national response, focusing on measures that may have contributed to reducing the surge in incidence ('flattening the curve') and minimising economic collapse. The key features of the response to date have included specific strategies and strong national leadership and work to ensure an effective, coordinated and intersectoral response. The strategies have included the following (Oh et al., 2020):

- Early recognition of the threat and rapid activation of national response protocols led by national leadership;
- Rapid establishment of widespread diagnostic capacity;
- Scaling-up of measures for preventing community transmission, including contact tracing, quarantine, and isolation; and
- Redesigning the triage and treatment systems and mobilising the necessary resources for case management.

The successful response of Korea in early 2020 was characterised by the rapid implementation of widespread diagnostic tests for COVID-19. After the significant increase in confirmed cases in February was stabilised, the number of confirmed cases has been controlled successfully. Figure 8.1 shows the stabilised situation of the COVID-19 pandemic in the first half of 2020 in Korea. This success during the beginning stage of the pandemic made the test tools produced in Korea popular worldwide, and the tools were exported to many countries. Table 8.1 and Table 8.2 show that the confirmed cases in Korea have been relatively small compared with other major countries, even in 2021.

Figure 8.1 Cumulative Number of Deaths and Confirmed Cases in China, the Republic of Korea, Italy, Spain, and the United States



Source: Daily Reports. https://github.com/CSSEGISandData/COVID-19/tree/master/csse_covid_19_data (accessed 6 April 2020).

Table 8.1 Comparison of Cumulative Cases Amongst Countries (as of 10 January 2021)

Country	Cumulative cases
United States	22,137,931
India	10,450, 284
Brazil	8,075,998
Russia	3,344,175
United Kingdom	3,026,342
France	2,824,920
Turkey	2,317,118
Italy	2,257,866
Spain	2,050,360
Germany	1,928,462
Republic of Korea	68,864

Source: Johns Hopkins Covid-19 Resource Center (https://coronavirus.jhu.edu/).

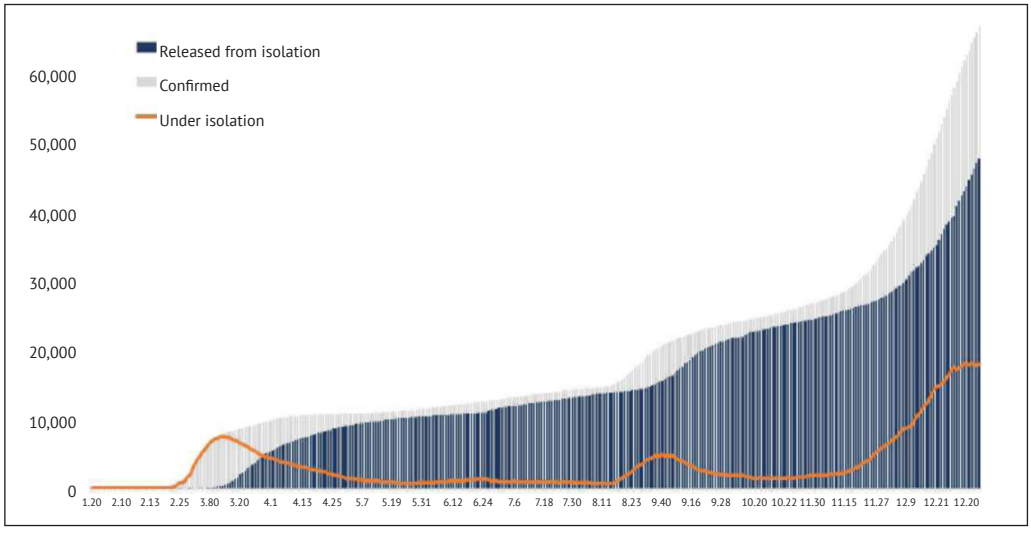
Table 8.2 Confirmed COVID-19 Case Distribution in the Republic of Korea (as of 6 January 2021)

	Number of cases	%
Number of cumulative tests	4,504,866	100
Cumulative negative test results	4,246,968	94.3
Testing in progress	192,082	4.3
Cumulative confirmed cases	65,816	1.9
Under isolation	17,794	
Deceased	1,027	
Imported cases	5,606	8.5

Source: Constructed using data from the Korea Control & Prevention Agency (kdca.go.kr/index.es?sid=a3).

As already explained, early diagnosis tests and effective social distancing have allowed the Korean government to take pride in its successful response to the COVID-19 pandemic. However, since December 2020, the dramatic increase in infection numbers and concerns about late vaccine supplies have caused many Korean people to criticise the government. Social distancing was tightened, and the government is trying to supply the vaccine as early as possible. The vaccine injections started in February 2021, and the medicines for COVID-19 developed in Korea are reported to be supplied in 2022, too. Figure 8.2 shows that the infection numbers in Korea increased greatly in December 2020.

Figure 8.2 Total Confirmed Cases of COVID-19 in the Republic of Korea



Source: Korea Disease Control and Prevention Agency (2021).

3. Economic Impact of COVID-19

The COVID-19 pandemic has had serious impacts on the economies of most countries. Many factories have been closed and the production output from factories has dropped. The decrease in production output has influenced the global production system. For example, in the early stage of the COVID-19 pandemic, the shutdown of manufacturing plants in China had serious impacts on the global value chains for most multinational companies. The most serious impact can be found in industries related to international travel. Many tourism agencies went bankrupt, and most international travel by aeroplane was banned. In Korea, two airline companies, Korean Air and Asiana Air, have faced significant drops in their sales and profits.The economic crisis As already explained, early diagnosis tests and effective social distancing have allowed the Korean government to take pride in its successful response to the COVID-19 pandemic. However, since December 2020, the dramatic increase in infection numbers and concerns about late vaccine supplies have caused many Korean people to criticise the government. Social distancing was tightened, and the government is trying to supply the vaccine as early as possible. The vaccine injections started in February 2021, and the medicines for COVID-19 developed in Korea are reported to be supplied in 2022, too. Figure 8.2 shows that the infection numbers in Korea increased greatly in December 2020. sides. Many industrial bases were shut down, so the production of many products fell. At the same time, the significant decrease in demand in several industries became a serious threat. The sharp drop in demand for airlines and foreign tours are typical examples. Third, less-competitive firms, especially small and medium-sized enterprises, have not had the capacity to survive this crisis. Sales decreases in these firms have caused cash shortages in their management, and this may lead to bankruptcy or bailouts from the government. In addition, the bad performance and increased debt for manufacturing companies can spread to the credit risk in financial institutions.

As result, the COVID-19 pandemic will decrease gross domestic product (GDP) and trade volumes in most countries. Tables 8.3 and 8.4 show the forecasts for GDP and trade volumes for major countries in 2020 and 2021. The international trade volume is predicted to drop more than 10%. From a conservative viewpoint, the forecasted drop in 2020 is about 30%. The figures around 2021 are quite positive. However, the report that made these forecasts was published in July 2020. From news reported on 28 September 2020 by Naver,[1] the largest internet portal in Korea, Bill Gates predicted that the vaccine would be supplied in summer 2021, and the pandemic would be over in early 2022. In this scenario, the economic downturn would continue even into 2021.

The economic growth rate of Korea in 2019 was about 2%, and the estimate for 2020 made in 2019 was also around 2%. After the outbreak of the COVID-19 pandemic, the growth estimate for 2020 was decreased to about -1%. This estimate was made in April 2020, and the estimate reported in September 2020 was also between -1.0 and -1.5%. Compared with Western countries, such as the United States and countries in the European Union, this figure is small. In these Western countries, the economic growth rates in 2020 are forecast to be larger than -5%. In preventing both the spread of COVID-19 and economic recession, Korea seems to be more successful than major Western countries.

[1] https://www.ilyosisa.co.kr/news/article.html?no=222012

Table 8.3 Expected Change in Trade Volume

	Past	Positive view		Conservative view	
	2019	2020	2021	2020	2021
Trade volume	-0.1%	-12.9%	21.3%	-31.9%	24.0%
Exports					
North America	1	-17.1	23.7	-40.9	19.3
South America	-2.2	-12.9	18.6	-31.3	14.3
Europe	0.1	-12.2	20.5	-32.8	22.7
Asia	0.9	-13.5	24.9	-36.2	36.1
Imports					
North America	-0.4	-14.5	27.3	-33.8	29.5
South America	-2.1	-22.2	23.2	-43.8	19.5
Europe	0.5	-10.3	19.5	-28.9	24.5
Asia	-0.6	-11.8	23.1	-31.5	25.1

Source: Samjung KPMG Economic Research Institute (https://home.kpmg/kr/ko/home/services/eri.html).

Table 8.4 GDP Forecast for Major Countries

(%)

	Growth rate	Revised forecast (Dec 2020)		Original forecast (Jan 2020)	
	2019	2020	2021	2020	2021
Rep. of Korea	2.0	-1.1	2.8	2.2	N/A
United States	2.3	-3.7	3.2	2.0	1.7
China	6.1	1.8	8.1	6.0	5.8
Japan	0.7	-5.3	2.3	0.7	0.5
Germany	0.6	-5.5	2.8	1.1	1.4
France	1.3	-9.1	6.0	1.3	1.3
United Kingdom	1.4	-11.2	4.2	1.4	1.5
Italy	0.3	-9.1	4.3	0.5	0.7
Spain	2.0	-11.6	5.0	1.6	1.6
India	4.2	-9.9	7.9	5.8	6.5

Source: Samjung KPMG Economic Research Institute (https://home.kpmg/kr/ko/home/services/eri.html); OECD data (https://www.oecd.org/coronavirus/en).

4. Economic Recession and Stimulus Packages

The International Monetary Fund (IMF) predicted in June, 2020 that the world economic growth rate would be -4.9% in 2020. This figure was lower than the IMF's forecast in April 2020 of -3.0%. The Organisation for Economic Co-operation and Development (OECD) also reported in June,2020 that the growth rate of 2020 would be -6.0%. The world economic crisis coming from COVID-19 can be found in many areas (Health Focus News, 2020).

- The rapid decrease in consumption originates from closed borders and airports, limited mobility, closed schools, and reduced social credit.
- Consumption decreases and increased market uncertainty have made companies drop their investments.
- In many companies in which sales amount and profit levels have dropped, large layoffs have been made. Unemployment levels have become higher and governments have had to pay unemployment compensation.
- The size of trade in the world has dropped significantly, and exporting companies have faced challenging business environments.

The negative impact on the economy has been huge, as is the same in most countries. Interestingly, the impact of COVID-19 is different across industries. Some industries were severely threatened, and significant layoffs or no-payment breaks occurred in many corporations. In contrast, in some industries, sales increased significantly, and firms obtained remarkable performance. From a report by Hana Economic Research Institute (2020) in Korea, industries can be divided into four categories based on the impact from COVID-19.

Table 8.5 Impact of COVID-19 on Various Industries in the Republic of Korea

Impact	Industries
Large negative impact	Theatres, theme parks, duty-free stores, airlines, tour agencies, hotels
Small negative impact	Fitness centres, public saunas, karaoke, bars, department stores, large discount stores, wedding services, express buses, rail services
Small positive impact	Cosmetics, electric vehicle charge stations, furniture, interior, liquor stores, supermarkets (vegetables, meat, fish), bicycles
Large positive impact	Cable TV, online shopping and delivery services

Source: Hana Economic Research Institute (2020).

To respond to the world economic crisis, most countries supplied stimulus packages to support their firms, workers, and consumers facing financial difficulties. The stimulus packages comprise fiscal subsidies or liquidity support, such as tax reductions, loans from public banks, and credit guarantees. Table 8.6 shows how much major countries' carried out such financial support.

Table 8.6 Size of Stimulus Packages in Major Countries (support amount as a share of GDP)

	Fiscal subsidy	Liquidity support
United States	12.3%	2.6%
Japan	11.3%	24.05
Germany	9.4%	31.5%
Rep. of Korea	3.1%	9.7%

Source: Health Focus News (2020).

The average stimulus package ratios in G20 countries are 5.8% for fiscal subsidies and 6.4% for liquidity support.

Korea launched economic temporary stimulus packages to boost the domestic market and export industries amid the fallout of COVID-19. There were nine temporary stimulus packages as of 30 April 2020 (see Table 8.7). This package was the first attempt by the Korean government, and the second emergency relief grant was offered in early October. Whilst the first grant was made to all Korean people, the second grant was made only to vulnerable people. The third grant was offered in January 2021 and this grant was made to micro businesses that were seriously damaged by COVID-19. The fourth relief grant was paid in April 2021. Most of the government's plans were focused on injecting liquidity to stalled areas. Specifically, as for the domestic market, the government came up with extensive plans, such as temporary stimulus payments, temporary paid leave and family medical leave, temporary emergency welfare support, and temporary employment assistance funds, etc. to boost prepayments to help the people.

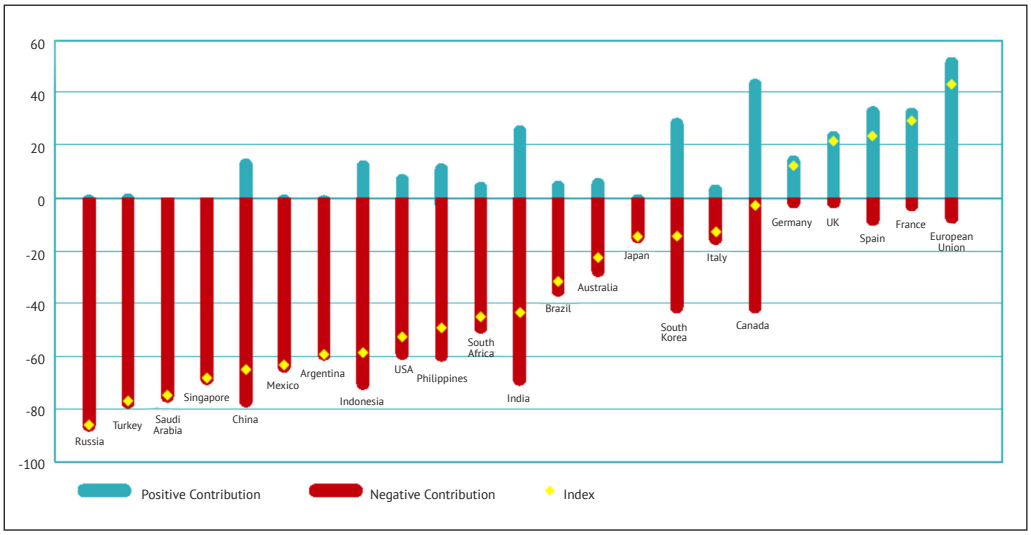
Table 8.7 Emergency Relief Grants in the Republic of Korea (as of July 2020)

Strategy	Content
Emergency	Plan to provide stimulus payment (cheque, cash, cash deposit to credit card) to all Korean people.
Stimulus cheque for small businesses with decreased sales	Plan to provide stimulus cheque to small business owners who had to reluctantly shut down due to the incidence of a confirmed COVID-19 case.
Paid leave and family medical leave subsidy	Plan to provide paid leave and family medical leave to workers who have family members infected by COVID-19.
Emergency welfare subsidy	Plan to provide emergency welfare support to households experiencing difficulty due to COVID-19.
Unemployment assistance fund	Plan to provide unemployment assistance fund for workers who, to maintain employment, reduce more than 20% of their total working hours or leave work for more than 1 month.
Paid leave and family medical leave for business owners	Plan to provide subsidy to business owners who provided paid leave and family medical leave to employees who have to care for their families due to COVID-19.
Living expenses subsidy for isolated patients	Plan to provide living expenses subsidy to confirmed quarantine patients not taking paid leave.
Subsidy for freelance workers	Plan to provide subsidy to freelance workers who lost their jobs due to COVID-19.
Living expenses subsidy for workers who are on unpaid leave	Plan to provide temporary living expenses subsidy to workers who are on unpaid leave due to COVID-19.

Source: Central Disaster Management Center, Republic of Korea (http://ncov.mohw.go.kr/en/).

One interesting question is how much the stimulus efforts in a country are related to green policy. From Vivid Economics (2020), Figure 8.3 shows how much stimulus programmes contributed to the greening of the economy. In this figure, the green bars represent positive contributions, and the red bars mean negative contributions. The green performance of stimulus programmes in Korea is relatively good.

Figure 8.3 Greenness of Stimulus Index



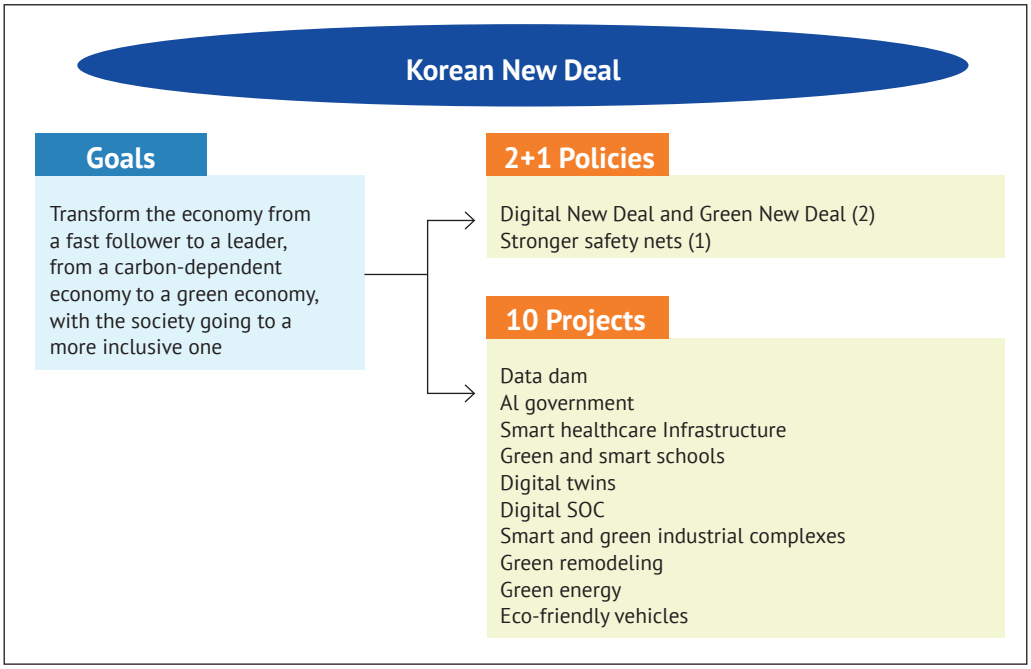
Source: Vivid Economics (2020).

5. Green New Deal Initiative

Korea achieved high economic growth since it began its economic development in the 1960s. The country experienced a national crisis and economic downturn caused by the IMF financial crisis in 1997. The Korean economy entered the maturity stage after overcoming the IMF financial crisis through restructuring of the economy and the business system. After entering the maturity stage of the economy, the high growth rate trend stopped, and the social polarisation emerging from income inequality, real-estate fluctuations, and economic displacements started to become worse. Recently, Korea has been facing an economic downturn and employment instability due to the process of strict economic lockdown during the COVID-19 pandemic.

The pandemic has brought about changes in the overall economic and social structure, and the transition to online business models, digital transformation, and the green economy is being accelerated. It is generally agreed that the recovery programmes and economic reform plans adopted by the government will determine the status of the economy after the pandemic. As a plan to build the green economy, President Moon announced the Korean-style Green New Deal Initiative in July 2020. According to the announcement, the framework for the Korean Green New Deal can be illustrated as shown in Figure 8.4.

Figure 8.4 Framework for the Green New Deal in the Republic of Korea



Source: Ministry of Economy and Finance, Republic of Korea (2020).

The goal of the Korean-style New Deal is to transform the economy from a fast follower to a leader and from a carbon-dependent economy to a green economy, with a more inclusive society. The Korean New Deal includes '2+1 policies', and '10 major projects' out of a total of 28. The Government of Korea is actively going to implement 2+1 policies towards a digital and green economy (2), as well as strengthened social safety networks (1).

1) Major projects

The major projects are the three types of policy: Digital New Deal, Green New Deal, and stronger safety nets.

a. Digital New Deal

The Digital New Deal is about preparing for surging demand for remote services and paving the way to a digital economy, through which the economy will increase its dynamism. The Digital New Deal has six strategies as shown in Table 8.8.

Table 8.8 Implementing Strategies and Content for the Digital New Deal

Strategy	Content
Create industrial convergence with data, networks, and artificial intelligence (AI) across the economy	Make data open to the public and build big data platforms, promote 5G-AI industrial convergence, launch a smart government based on 5G and AI.
Make education infrastructure digital	Build digital learning infrastructure in primary and secondary schools, promote online classes for college education and job training.
Promote 'non-contact' industries	Build 18 smart hospitals to provide remote healthcare services, provide digital caring services for seniors and other vulnerable groups in terms of health, help SMEs jointly set up virtual conference rooms, and provide small businesses with support for online sales.
Make social infrastructure digital	Introduce digital management systems to the four major SOC areas of transportation, underground structures (digital twins), water management, and disaster response.
Make cities and industrial complexes digital	Build smart cities and smart industrial complexes.
Make logistics digital	Build smart logistics centres, including those near ports, and build online platforms for farm product transactions.

Source: Ministry of Economy and Finance, Republic of Korea (2020).

b. Green New Deal

The Green New Deal is about pursuing a low-carbon and eco-friendly economy, such as by building eco-friendly energy infrastructure, including a 'green energy dam', and working to make the country's eco-friendly industries the most competitive in the world market, such as eco-friendly vehicles, renewable energy generation, and other technologies. The Green New Deal has four strategies as shown in Table 8.9.

Table 8.9 Implementing Strategies and Content for the Digital New Deal

Strategy	Content
Pursue eco-friendly infrastructure and renewable energy production	Work to achieve the 2030 greenhouse gas emission reduction target and RE30203.*
Green transition of infrastructure	Remodel public buildings and schools.
Promote low-carbon and decentralised energy	Build smart grids and promote distributed energy production and eco-friendly vehicles.
Promote innovation in green industries	Provide technology development support for environment and energy SMEs, build a green industrial cluster to help with technology development, testing, production and marketing, and create about W215 billion worth of public-private joint funds to grow green businesses, as well as make W1.9 trillion worth of loans available for businesses investing in environmental protection tools and facilities.

* Initiative to reach 20% renewable energy production by 2030.
Source: Ministry of Economy and Finance, Republic of Korea (2020).

c. Stronger safety nets

Stronger safety nets are about reducing income inequality amongst workers, expanding social securities and job securities, and improving education and vocational training programs for a successful digital and green transition. Stronger safety nets have two strategies, as shown in Table 8.10.

Table 8.10 Implementing Strategies and Content for the Digital New Deal

Strategy	Content
Pursue eco-friendly infrastructure and renewable energy production	Invest in employment security and social security programmes to expand coverage.
Green transition of infrastructure	Increase investment in digital and green workforce training programmes, improve vocational training programmes to adequately equip trainees with skills for the future, and expand internet excess in rural areas.

Source: Ministry of Economy and Finance, Republic of Korea (2020).

2) Ten major projects

The government has chosen 10 major projects out of a total of 28 projects (12 for the Digital New Deal, 8 for the Green New Deal, and 8 for social safety nets) through close cooperation with the Office of the President and the private sector. The 10 tasks have been selected as those that will likely create new markets and more jobs and have a larger impact on the real economy (see Table 8.11). The Digital New Deal consists of three projects: a data dam, AI government, and smart healthcare infrastructure. Digital-green industrial convergence has four projects (green and smart schools, digital twins, digital SOC, and smart and green industrial complexes), and the Green New Deal has three projects (green remodelling, green energy, and eco-friendly vehicles).

Table 8.11 Ten Major Projects of the Korean New Deal

Digital New Deal	- Data dam - AI government - Smart healthcare infrastructure
Digital-green industrial convergence	- Green and smart schools - Digital twins - Digital SOC - Smart and green industrial complexes
Green New Deal	- Green remodelling - Green energy - Eco-friendly vehicles

Source: Ministry of Economy and Finance, Republic of Korea (2020).

3) Investment plans and major projects

Table 8.12 presents the investment plan for the 10 major projects. As shown in Table 8.12, by 2022, a total of W43.4 trillion (W29.5trillion from fiscal investment) will be spent on the 10 projects, and 516,000 jobs are expected to be created. By 2025, a total of W100.9 trillion (accumulative, W68.7 trillion from fiscal investment) will be spent and 1,111,000 jobs are expected to be created.

Table 8.11 Ten Major Projects of the Korean New Deal

Digital New Deal (3 projects)	Total investment (fiscal investment) trillion W		Jobs created (thousand)
	2020–2022	2020–2025	2020–2025
Data dam	8.5 (7.1)	18.1 (15.5)	389
AI government	2.5 (2.5)	9.7 (9.7)	91
Smart healthcare	0.1 (0.1)	0.2 (0.1)	2
Digital-Green Industrial Convergence (4 projects)	**Total investment (fiscal investment) trillion W**		**Jobs created (thousand)**
	2020–2022	**2020–2025**	**2020–2025**
Green and smart schools	5.3 (1.1)	15.3 (3.4)	124
Digital twins	0.5 (0.5)	1.8 (1.5)	16
Make SOC digital	8.2 (5.5)	14.8 (10.0)	143
Smart and green industrial complexes	2.1 (1.6)	4.0 (3.2)	33

Green New Deal (3 projects)	Total investment (fiscal investment) trillion W		Jobs created (thousand)
	2020–2022	2020–2025	2020–2025
Green remodelling	3.1 (1.8)	5.4 (3.0)	124
Green energy production	4.5 (3.7)	11.3 (9.2	38
Eco-friendly vehicles	8.6 (5.6)	20.3 (13.1)	151
Total (10 projects)	43.4 (29.5)	100.9 (68.7)	1,110

Source: Ministry of Economy and Finance, Republic of Korea (2020).

Specifically, first, for the data dam, the government will invest a total of W8.5 trillion (W7.1 trillion from fiscal investment) by 2022 and 207,000 jobs are expected to be created. By 2025, a total of W18.1 trillion (W15.5 trillion from fiscal investment) will be invested and 389,000 jobs will be created. Second, for the AI government, the government will invest W2.5 trillion by 2022, with as many as 23,000 jobs expected to be created, and W9.7 trillion by 2025, with 91,000 jobs expected to be created. Third, for smart healthcare, a total of W0.1 trillion (W0.1 trillion from fiscal investment) will be invested by 2022, creating 1,000 jobs, and by 2025, a total of W0.2 trillion (W0.1 trillion from fiscal investment) will be invested, creating 2,000 jobs. Fourthly, for green and smart schools, a total of W5.3 trillion (W1.1 trillion from fiscal investment) will be invested by 2022, creating 42,000 jobs, and by 2025 a total of W15.3 trillion (W3.4 trillion from fiscal investment) will be invested, creating 124,000 jobs. Fifth, for digital twins, the government will invest W0.5 trillion by 2022 and 5,000 jobs are expected to be created, and a total of W1.8 trillion (W1.5 trillion from fiscal investment) will be invested by 2025, creating 16,000 jobs. Sixth, for the digital SOC, a total of W8.2 trillion (W5.5 trillion from fiscal investment) will be invested by 2022, creating 73,000 jobs, and by 2025 a total of W14.8 trillion (W10.0 trillion from fiscal investment) will be invested, creating 143,000 jobs. Seventh, for smart and green industrial complexes, a total of W2.1 trillion (W1.6 trillion from fiscal investment) will be invested, creating 17,000 jobs, and by 2025, a total of W4.0 trillion (W3.2 trillion from fiscal investment) will be invested, creating 33,000 jobs. Eighth, for green remodelling, a total of W3.1 trillion will be invested (W1.8 trillion from fiscal investment) by 2022, creating 78,000 jobs, and by 2025 a total of W5.4 trillion (W3.0 trillion from fiscal investment) will be invested, creating 124,000 jobs. Ninth, for green energy, a total of W4.5 trillion (W3.7 trillion from fiscal investment) will be invested by 2022, creating 16,000 jobs, and by 2025, a total of W11.3 trillion (W9.2 trillion from fiscal investment) will be invested, creating 38,000 jobs. Tenth, for eco-friendly mobility of the future, a total of W8.6 trillion (W5.6 trillion from fiscal investment) will be invested by 2022, creating 52,000 jobs, and by 2025, a total of W20.3 trillion (W13.1 trillion from fiscal investment) will be invested, creating 151,000 jobs.

4) Expected outcomes

The goal of the Korean government is to build a smart country, a green country, and a safe country with these investments.

First, the government expects that smart industries, a smart government, and smart cities will be built through the investments for a smart country. Specifically, for smart industries, a total of W43 trillion worth of data markets are expected to be created, and 18 smart hospitals will be in service with up to 40% of work done remotely. For the smart government, 80% of public services will become digital, and the government will use cloud computing by 100%. And for smart cities, there will be high-precision road maps for most of the roads across the country, and 108 smart city management platforms will be set up.

Second, the government expects that the three targets of protecting environment, introducing low-carbon green energy, and developing green industries will be achieved through investments for a green country. Specifically, for a clean environment, as many as 225,000 public rental houses will be remodelled to be energy-efficient and eco-friendly houses, whilst 25 cities will be transformed to become smart and eco-friendly ones, and 723 hectares of urban forests will be set up to reduce fine dusts. To 'use low-carbon green energy', there will be 1,130,000 electric cars and 200,000 hydrogen fuel cell cars running across the country, renewable energy production capacities will reach 42.7 gigawatts, and 5,000,000 households will get electricity through smart grids. For green industries, about 1,750 factories will be transformed into clean factories, fine dust reduction systems will be installed in 13,182 small manufacturers, and 10 smart energy platforms will be built.

Third, the government expects that an income guarantee, human resources, and digital inclusion will be achieved through the investments for a safe country. Specifically, for the income guarantee, about 21 million workers will be covered by 'employment insurance' programmes, and 1.13 million households will be made eligible for social security benefits. For human resources, there will be 100,000 high-tech workers available for the artificial intelligence and software sectors and 20,000 high-tech workers for green industrial convergence. For digital inclusion, internet access will be made available to all rural areas of the country, and 70% of people aged over 70 will be able to enjoy mobile internet access.

6. Policy Recommendations

From the experiences of Korea explained above, the following policy recommendations can be made. First, the role of digital technology is critical. Greenness and sustainability is a huge trend in the world society, and one way for 'building back better' after the COVID-19 pandemic is to pursue the green economy and sustainable development. Another mega trend in the world is digital transformation. These two trends can affect each other. In the process of greening industries and organisations, digital technologies can be effectively used.

Second, the clear and consistent policy of governments is necessary. For the success of any social change, the vision of the leader should be offered effectively. In Korea, different presidents have tended to present different visions and policies. Under President Lee from 2008 to 2012, green growth policy was stressed as a vision of the Korean economy, but the next President Park did not pay attention to green policy. The current President Moon declared the Green New Deal again. There is a possibility that the next president, whose term will begin in 2022, may change the national policy again.

Third, policies and programmes for a low-carbon economy should be localised. The European Union seems to be the most advanced in green movements, and most developing countries tend to imitate the programmes created in developed countries. This attitude can give a signal effect to the outside stakeholders, but real transformation may not be expected. ASEAN countries have different environments for politics and the economy from the European Union and the United States. The green policies and programmes created in the European Union or the United States cannot be applied directly to ASEAN.

Fourth, regional or international cooperation is helpful for greening ASEAN economies. One possible form of cooperation is technology transfer amongst countries. Various technologies are necessary for the development of green industries and green organisations, and these technologies should be imported from advanced economies. Investments from global corporations can provide technology and capital that can be used as inputs for the development of green economies in ASEAN. Technology transfer can also be made in the public sector.

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Chapter 9

COVID-19 and the Low-carbon Economy in Malaysia

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Chapter 9: COVID-19 and Low-carbon Economy in Malaysia

1. Introduction

Structural transformation is indeed important as a post-COVID-19 recovery plan for many of the Asian economies and, more importantly, for Malaysia, which largely depends on its external markets. Nevertheless, this time around, the transformation is not about sectoral transformation, such as promoting the more productive sectors like manufacturing and moving away from the less productive sectors like agriculture, but more on how to engage in transformation efforts within specific sectors, transform the sectors towards adopting greener practices, and drive the Sustainable Development Goals (SDGs) – that is, transformation in adopting the needed instruments like green technology and green financing. One may ask why this is timely and more important now than before. For Malaysia, this depends on its exporting industries for driving employment and the economy. This has become crucial since the world is moving towards the SDGs and green initiatives. More trade barriers and standards related to the SDGs and the environment are expected due to the aftereffects of COVID-19. Indeed, the social responsibility agenda is back on policymakers' lists given that COVID-19 had taught us how resilient our economy is to such shocks. Issues of poverty, labour discrimination and safety, social safety nets, wages and productivity, healthcare, and housing affordability have become societal challenges. Indeed, by recognising the current challenges and paving its way to more balanced development, Malaysia has already embarked on a journey to promote inclusive development and a shared prosperity vision.[1] Malaysia needs to catch up on its agenda for sustainability and greener development. Most importantly, progress should be monitored and reported as part of Malaysia's national voluntary review.

The future competitiveness of Malaysia's industrial and service sectors is determined by new norms and standards, that is, greener practices and other measures as well as the achievements of SDGs. This does not only impact the manufacturing sector but also services. For instance, with financial institutions, such as the banking sector, green financing provides new opportunities. Malaysia has already made its footprint in green sukuk financing and should now seize its opportunities as a green financing provider to take advantage of the opportunities that the new norm has put in place. For this, policymakers should find ways to accelerate and provide a post-COVID-19 recovery plan that strengthens green infrastructure investment as well as new growth areas that would otherwise provide Malaysia with the pulse to promote job creation and kickstart the economy in new ways. Indeed, any stimulus package should be used to promote new industries as well as to strengthen the competitiveness of existing industries so that job losses can be minimised, or indeed more decent jobs can be created. In fact, Malaysia's efforts in attracting investments via various incentives launched under the stimulus packages can also be prioritised to attract SDG-focused investments.

[1] Malaysia launched its Shared Prosperity Vision 2030 in October 2019. The current stimulus package, because of COVID-19, is aligned to some of these initiatives.

This chapter discusses the impact of COVID-19 on the Malaysian economy. It further examines the details of the stimulus packages to position Malaysia towards a more sustainable path considering a low-carbon economy as the basis and further provides policy ideas and thinking on how to best position the recovery plans.

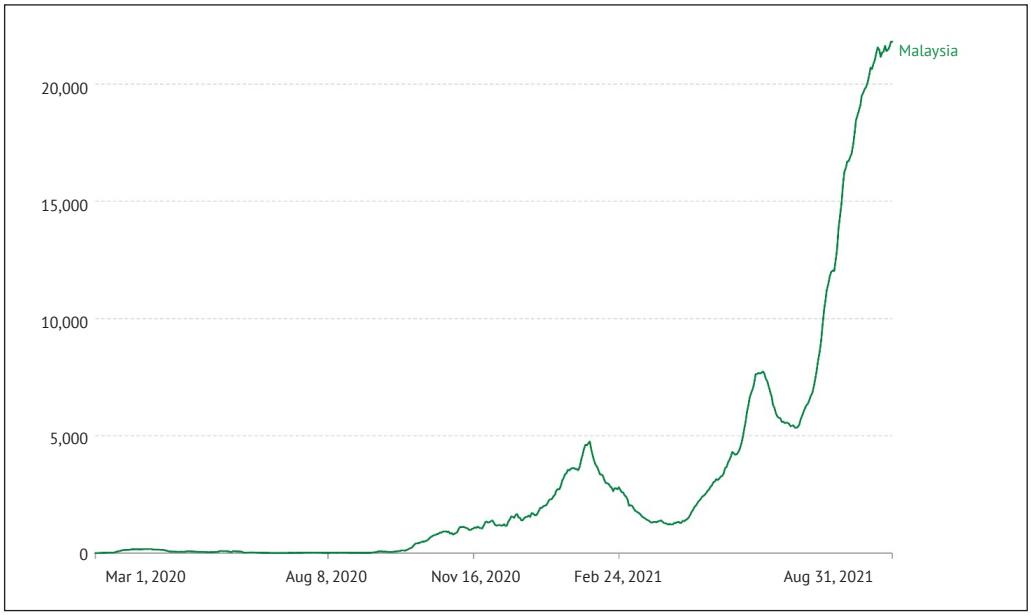
2. The Pandemic and its Impacts

Malaysia has been one of the more successful countries in mitigating the spread of the COVID-19 pandemic at the beginning stage, given that the health response determines not only the health risk of the pandemic but also how soon the economy can take on a recovery mode. As Malaysia is largely driven by a public health system, the response was immediate, and the country was able to handle complex emergencies and advise the public adequately. Whilst this put pressure on the health facilities, Malaysia's quick response with a lockdown prevented the spread of the virus, and within 6 months, the economy was able to operate as usual. The first lockdown, the Movement Control Order (MCO) was announced on 18 March 2020, whilst the Conditional Movement Control Order (CMCO) and the Recovery Movement Control Order (RMCO) were subsequently announced on 4 May 2020 and 10 June 2020, respectively. However, due to the spike in active cases, MCO 2.0 was started on 13 January 2021 and extended further as MCO 3.0 in several states, depending on the COVID-19 condition in each state. Nevertheless, the slow vaccination rate has contributed to spikes in active cases. From mid-June 2021, the four-phase National Recovery Plan was announced. The gradual opening of the economy activities in these phases depends on the vaccination rate, daily infection cases, and ICU ward operations.

Figure 9.1 shows the new confirmed cases. After peaking at nearly 2,500 active cases in early April 2020, the active cases saw a drastic drop to below 1,500 cases in May and June 2020. The MCO and CMCO were effective in containing the virus spread. Nevertheless, starting September 2020, the cases started to peak again as election activities[2] sparked the spread of the virus. Indeed, the active cases started to increase again at the beginning of December 2020 until the government imposed MCO 2.0 in January 2021. New confirmed cases were recorded as high as nearly 6,000 cases in February 2021. While some decline was recorded in mid-February 2021, the active confirmed cases started to peak again and recorded above 20,000 cases in August 2021. The current higher rate of vaccination is expected to allow the opening of the economy's sector to cushion economic recovery.

[2] Due to the political crisis, the 2020 Sabah state snap election was held on 26 September 2020, with the outcome of 73 members of the 16th Sabah State Legislative Assembly elected.

Figure 9.1 Daily New Confirmed COVID-19 Cases



Note: Based on the rolling 7-day average; the number of confirmed cases may be lower than the actual cases due to limited testing.

Source: Our World in Data and Johns Hopkins University CSSE COVID-19. https://ourworldindata.org/covid-cases?country=~MYS#confirmed-cases (accessed 1 September 2021).

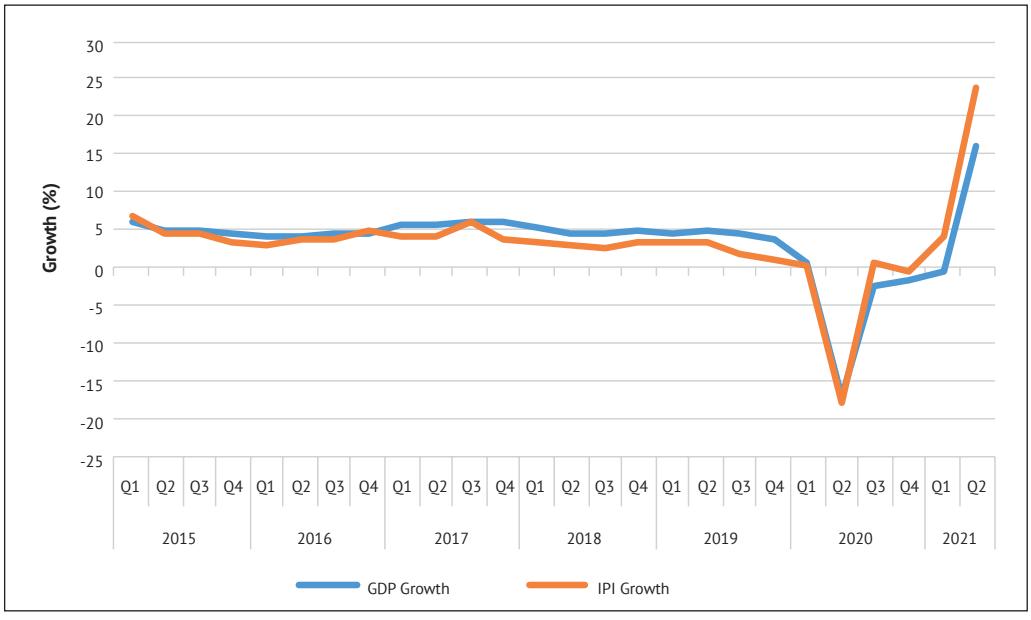
2.1. Economic impact

Malaysia recorded its lowest economic growth in Q1 2020 at 0.73%, and because of the complete lockdown that started on 18 March 2020[3] (and ended on 9 June), Q2 growth contracted by nearly 17% (Figure 9.2) in 2020. Q3 and Q4 growth was -2.6 and -3.4%, respectively. Overall, Malaysia's gross domestic product (GDP) declined by 5.6% in 2020. Manufacturing sector is key for Malaysia's development especially in contributing to exports and employment. Tracking the industrial production index (IPI) progress indicates that manufacturing production rebounded after Q2 2020, recording positive growth in Q3, 2020 as well as in Q1 and Q2 of 2021, hence, showing signs of recovery, albeit slowly (Figure 9.2). This is mainly due to the global recovery, with exports and manufacturing sectors contributing to the positive economic growth. Sectoral-wise, in Q2, 2020, the most significantly impacted sectors were construction (44.5%), mining (20%), manufacturing (18.3%), and services (16.2%), as shown in Figure 9.3. The agricultural sector showed growth of 0.99% and, given the adoption of technology in terms of the delivery system and e-hailing transportation system in the food sector, it managed to cushion the agriculture supply system, and the sectors were able to minimise the impact on them to some extent. In Q3, 2020, all the sectors showed negative

[3] Malaysia has officially propagated the Movement Control Order under the Prevention and Control of Infectious Diseases Act 1988 and the Police Act 1967.

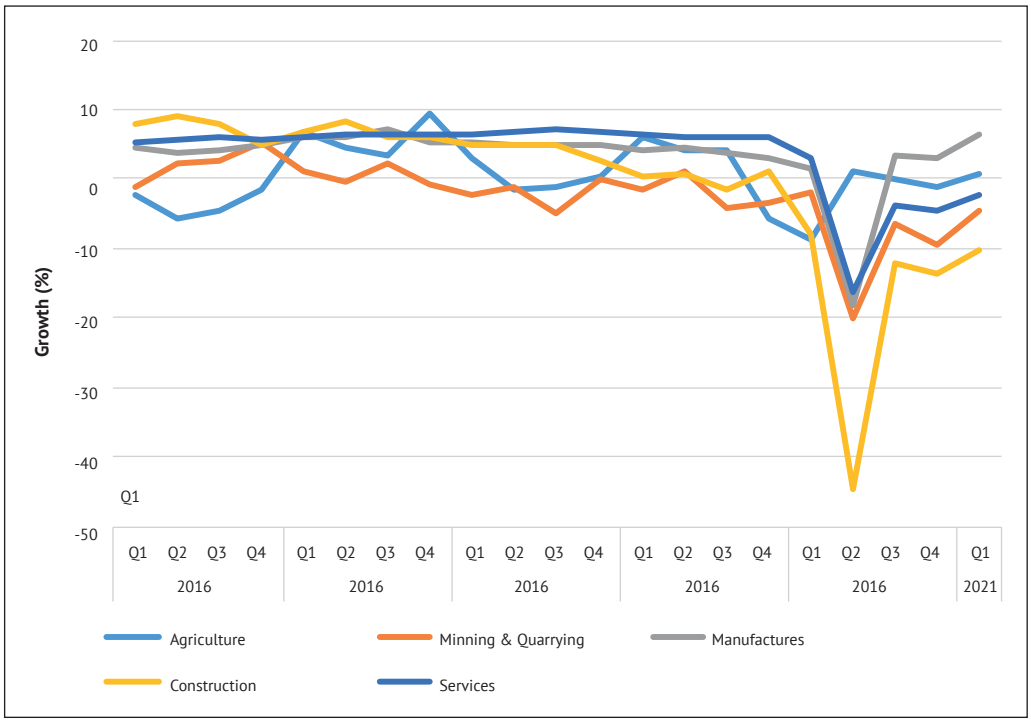
growth, except the manufacturing sector (which recorded growth of 3.3%). Similarly, within services, the two most important sectors that contribute to CO2 emissions are electricity (energy) and transportation, which contracted 13.27% and 44.77%, respectively, in Q2 2020 due to the lockdown. Whilst the revival of the economy after the lockdown has seen an increase in energy demand, the same is not happening in the transportation sector. The implications of COVID-19 on tourism and other related sectors have limited the revival of the transportation sector. Along with that, the environmental implications are minimised.

Figure 9.2 Growth in GDP and the Industrial Production Index



GDP = gross domestic product, IPI = Industrial Production Index (growth).
Note: GDP growth is based on 2015 constant prices.
Source: Author's calculations based on data from the Department of Statistics of Malaysia.

Figure 9.3 Sectoral Impact of the Pandemic

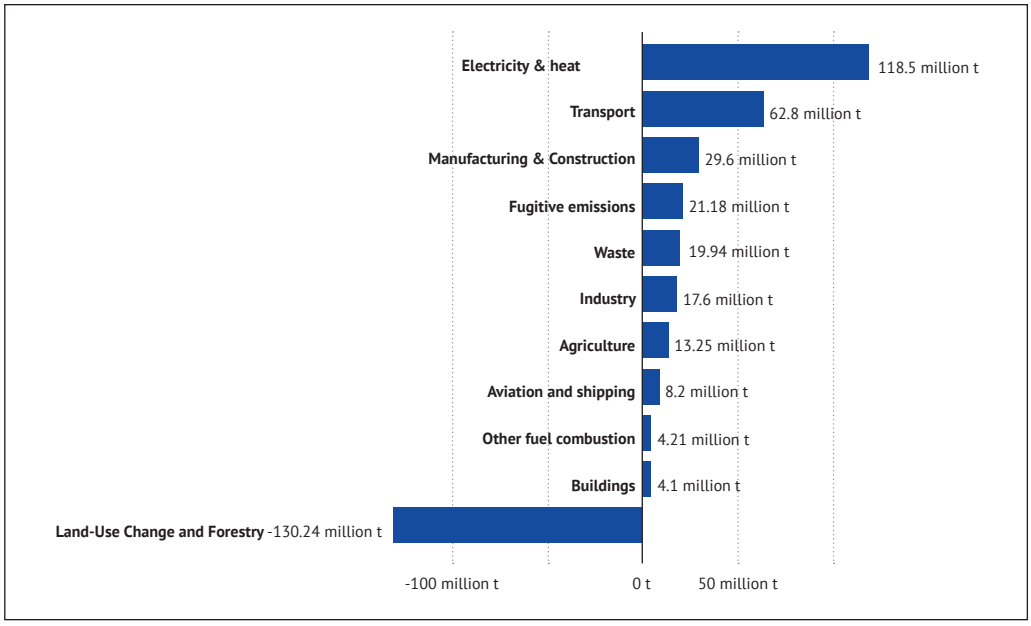


Note: Growth is based on the year-to-year growth rate.
Source: Author's calculations based on data from the Department of Statistics of Malaysia. https://www.bnm.gov.my/-/monthly-highlights-and-statistics-in-june-2021 (accessed 27 August 2021).

2.2. Impact on environment and low-carbon and green growth

Malaysia's source of greenhouse gas emissions is mainly from three sectors, energy, transportation, and manufacturing and construction, contributing 118.5, 62.8, and 29.6 million tonnes of CO_2 equivalent, respectively. Malaysia's commitment to reducing carbon footprints and taking a new growth path involves strategising its future plans, including its stimulus packages towards these sectors and industries. Indeed, given the current emphasis on SDGs and green standards and requirements, Malaysia needs to prepare its industrial sectors to embrace green and low-carbon strategies. International marketing competitiveness will be severely impacted if Malaysia chooses not to align its current initiatives towards these new challenges and the new global norms.

Figure 9.4 Greenhouse Gas Emissions by Sector in Malaysia, 2016



Note: Greenhouse gas emissions are measured in tonnes of carbon dioxide-equivalent.

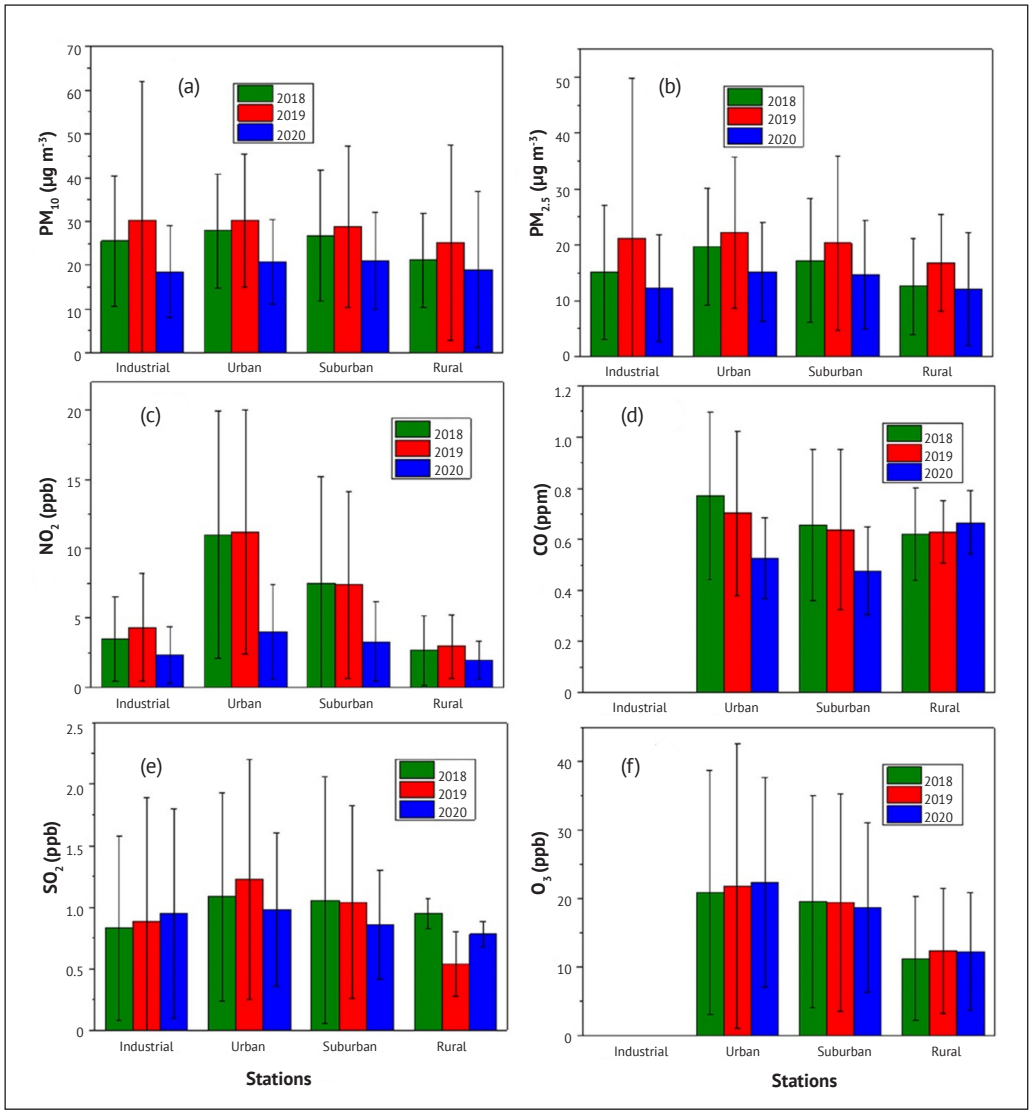
Source: CAIT Climate Data Explorer via Climate Watch and Our World in Data. Available at https://ourworldindata.org/emissions-by-sector

The COVID-19 pandemic has sent a strong message that it is possible for countries to pursue a more sustainable path, and the impact is immediate if society, industry, and the government work closely to accelerate the aim of reaching the SDGs and green growth targets. During the lockdown (March–June 2020), various environmental indicators in Malaysia show a significant contraction. The Air Pollutant Index went down by 14%, reaching the clean index status. Sulphur dioxide (SO_2) and particles below 2.5 microns ($PM_{2.5}$) went down by 27% and 29%, respectively. Similarly, carbon monoxide (CO) and nitrogen dioxide (NO_2) levels dipped by 49% and 70%, respectively. In addition, total volatile organic compound readings were at normal or below alert levels at 1 part per million. Figure 9.5 shows significant changes in the emission levels across industrial, urban, suburban, and rural areas. In general, the comparison shows a notable decrease in particles below 10 microns (PM_{10}), $PM_{2.5}$, and NO_2 concentrations at the industrial and urban sites during the MCO period. It indicates that if industry and society at these levels can make the transition to a more productive green transition by adopting technology and adjusting the ways in which society consumes, works and moves, a significant impact on the environment can be made.

However, the opening of the economy will increase emission levels back to the levels that they were previously or even higher if the government only aims at recovery and post-pandemic plans for the revival of the economy without thinking further of moving the economy towards a greener growth path. In Malaysia, the opportunity exists to place the recovery path on a greener path since the government in the past had put forward numerous regulatory frameworks,

targets, plans, and specific programmes, such as the Green Technology Master Plan (2017–2030), National Renewable Energy Policy, Shared Prosperity Vision 2030, and others. However, one limitation that the government may face is the fiscal constraint that the pandemic had put on the government budget. This is in addition to the declining oil price that had put a deep hole in the government's revenue and that consequently allowed Malaysia to explore other sources of income via resource extraction industries, such as mining and forestry. Indeed, in a larger context, due to managing the debt-to-GDP ratio, the government may have no choice but to use the existing resource-based industries and focus on new growth areas that require time to build.

Figure 9.5 Emissions in Malaysia During 18 March–30 April in 2018, 2019, and 2020



Note: The emissions shown are particulate Matter less than 10 µm (PM10); particulate matter less than 2.5 µm (PM2.5); nitrogen dioxide (NO2) parts per billion; carbon monoxide (CO) parts per billion; sulphur dioxide (SO2) parts per billion; and ozone (O3) parts per billion.
Source: Kanniah et al (2020).

3. Stimulus, Recovery Plan, and the Low-carbon Economy

Given the adverse impact of the pandemic, the Malaysian government has launched a series of stimulus packages to, first, mitigate the immediate effects of the pandemic and, second, to recover the economy. On 27 February 2020, the government launched the first economic stimulus package worth RM20 billion, and on 27 March 2020, the government announced the second stimulus package to further broaden the economic stimulus package to benefit industry and the people further. The second stimulus package amounted to RM230 billion (excluding the first package of RM20 billion). The RM230 billion stimulus package focuses on people (126 billion), SMEs (101 billion), and economic revival (3 billion). The RM250 stimulus package accounts for 17% of the GDP. The actual fiscal spending of the government for both the stimulus package amounts to RM25 billion, of which 3.5 billion was for the first economic stimulus package, given that many other packages are in the form of tax relief, loan deferment, and other forms of incentives and supports. Additionally, the SME stimulus package, amounting to RM10 billion, was announced on 6 April 2020, specifically to aid the ailing industrial and service sectors. On 23 September 2020, an additional RM10 billion Prihatin Supplementary Initiative Package was launched.

The stimulus package aimed at assisting society, especially the poor and the middle income (RM7 billion), and providing wage subsidies (RM2.4 billion) and a Special Grant (RM600 million) for SMEs. In total, the stimulus package, amounting to RM305 billion, was the largest compared to the stimulus packages provided during the Asian financial crisis and global financial crisis combined[4] Additionally, in 2021, two new stimulus packages were announced amounting to RM35 billion and focusing on the economy recovery plans, including reducing the burden on society. In June 2021, the National People's Well-Being and Economic Recovery Package (PEMULIH) valued at RM150 billion was announced.

Table 9.1 provides the nature of the allocation and programmes within specific stimulus packages. In the first stimulus package, the government mainly aimed at three strategies, which were catalysing society, centralising economic growth, and accelerating quality investments to mitigate the COVID-19 impacts. In accelerating investment, the target was also to accelerate the existing plans for the green growth path, such as by opening a quota bid of 1,400 MW for solar power generation, implementing up to RM3 billion on works related to the National Fiberisation and Connectivity Plan, and accelerating projects such as LED street lights, transmission lines and rooftop solar installations, and the SME Automation & Digitalization Facility. Some of these initiatives will have a positive impact on sustainability.

[4] In 1998, to mitigate the effects of the Asian financial crisis, the government rolled out RM7 billion in stimulus measures, and during the global financial crisis, the government injected two stimulus packages in 2009 and 2010, amounting to RM67 billion and RM60 billion, respectively.

Subsequently, the second stimulus package focuses on the people, businesses (specifically SMEs), and the economy in a larger context. The people-centric budget aligns well with some of the SDG goals since the immediate concern is with the most vulnerable groups, known as the B40. Efforts are also being made to reclassify the poverty line and to prepare the labour force for the new labour market. However, the recovery stimulus at present has yet to be aligned to address the environment and green economy, specifically with regards to accelerating technology adoption and changing the landscape of the energy and transportation sectors (the main contributing sectors). How well is the recovery plan aligned to move the economy towards a new path, specifically towards a low-carbon economy and, to a larger context, sustainable development? The stimulus package is a short-sighted one whereby it only allows a response to the immediate impact on society. Indeed, the recovery plan supporting SMEs is none other than one supporting the survivability of the existing businesses and not of creating new growth areas or even industries. Fiscal constraint may not allow Malaysia to announce additional packages, and the political uncertainty may encourage politicians to focus on the immediate needs of society and business as a response in preparation for elections.[5] However, unpacking past stimulus packages has revealed that new thinking and opportunities were not incorporated into the stimulus packages that Malaysia designed so that the country could position its competitiveness and seize new opportunities, especially in driving new growth areas. The aim of the packages was more towards mitigating the impact and recovering the existing businesses and the economy to their pre-pandemic states. A greater focus on people could also be added, given that the more vulnerable are more greatly impacted by COVID-19 than others. It is also true that political instability has led the newly formed government to focus on packages that would not otherwise be considered.

The creation of these so-called new industries or the transformation of existing ones into greener industries would provide a huge opportunity for Malaysia. This includes commodity-based industries, e.g. the palm oil industry, which faces obstacles in exporting its commodities and sustaining its value-added contribution. Green infrastructure like green technology and green financing would be instrumental for these industries to venture into new markets and markets that now demand new standards. Malaysia does not have any direct stimulus package that directly supports a low-carbon economy; however, some of its stimulus support would have indirect implications on green development. For instance, the efforts of digitalisation would allow firms to save resources and be more efficient in delivery and other forms of activities.

[5] Again, some of the European Union countries focus their stimulus packages on targeting green initiatives due to the pressure that they receive from environmentalist groups. For instance, Macron has made green recovery a priority since his ruling party suffered losses to environmentalists in municipal elections this year.

Table 9.1 Composition of the Stimulus Packages

Packages	Focus	Amount (RM billion)
First and Second Stimulus Packages	**People:** Medical equipment; assistance to students; Employee Provident Fund (EPF) withdrawal; loan moratorium; house rental exemption; electricity discounts; free internet; insurance premium suspension; income replacements; wage subsidy; special allowance to front-liners; one-off cash payments (households and individuals); assistance to vulnerable groups. **Supporting business:** Guarantee scheme; micro credit scheme; facility for all economic sectors; loans; increasing the cashflow of employer advisory services, exemption of levy, postponement of income tax payments, and loan moratoriums. **Economy:** small projects and infrastructure development.	250
SME Aid (Additional Package)	Wage subsidy; special grant; rental discounts; micro credit; foreign worker levy reduction; moratorium.	10
Short-term Recovery Plan	**People:** Wage subsidy; hiring and training assistance for businesses; reskilling and upskilling; gig economy social protection and skilling; flexible work arrangement incentives; child care subsidy; public transport subsidy; healthcare support; internet connectivity for education and productivity; social assistance support for vulnerable groups. **Business:** Micro and SMEs E-commerce Campaign; 'Shop Malaysia Online' for online consumption; technical and digital adoption for small and medium-sized enterprises (SMEs) and mid-tier companies (MTCs); MyAssist Micro, Small, and Medium Enterprise (MSME) One Stop Shop; SME financing; tourism financing; microfinancing bumiputera relief financing; SME Go-scheme for Liquidity Support; accelerated payment terms for government-linked companies (GLCs) and large corporates' supply chain; tax relief for COVID-19-related expenses; financial stress support for businesses; social enterprise elevation; spur set-up of new businesses. **Economy:** Dana Penjana Nasional; technology innovation sandbox; digitalisation of government service delivery; national 'Buy Malaysia' campaign; ePenjana credits in e-wallet; incentives for the property sector; tax incentives for the purchase of passenger cars; extended service hours in the new normal; Malaysia as an attractive horizon for businesses; tourism sector support; arts, culture, entertainment, events, and exhibitions sector support; agriculture and food sector support; commodity sector support; proposed COVID-19 Temporary Measures Act; Sukuk Prihatin.	35
Prihatin Supplementary Initiative Package	**People:** B40 and M40 and wage subsidy. **Economy:** SME grants.	10
Permai Assistance Package	Tax relief; wage subsidy; cash handouts; sales tax exemptions; loan moratorium extensions	15
Pemerkasa	Control of COVID-19 (immunisation, healthcare); economy recovery (small projects, grants, micro credit, employment); strengthening competitiveness (business environment; investment and export markets; automation and digitalisation; sustainable development); inclusiveness (wage loss programme, living costs, youth and women programmes); economic transformation.	20
Pemulih Aid Package	Business support; food baskets; cash handouts; micro credits; subsidies; healthcare.	150

Source: Compiled by author from stimulus package speeches by the prime ministers, available at https://www.pmo.gov.my (accessed 1 September 2021).

Similarly, some of its stimulus packages are counterproductive for the development of green infrastructure and the low-carbon growth path. For instance, the postponement of electricity payments and, later, the electricity subsidisation programme by the national energy producer would have had a counterproductive effect. Although overall demand[6] contracted by 28% in May 2020 (compared to May 2019), the electricity usage in the residential sector surged between 20% and 50% during the MCO. TNB, the national energy producer, has allocated RM10 million to the Ministry of Health and another RM17.5 million to the state government to secure essential medical supplies and protective equipment and to address the most pressing needs in the early stages of the MCO. TNB further allocated RM150 million to fund the tiered electricity discounts of between 2% and 50% from April to September 2020, and this was announced as part of the government's PRIHATIN stimulus package as well as in other stimulus packages. To further cushion the impact of COVID-19 on society, TNB has offered a six-month instalment plan to all its 7.5 million customers, a surcharge waiver on late payments, and an extension of supply disconnection suspension.[7] Whilst the immediate response of the TNB is to provide support to the government in cushioning the immediate effect on society, it may also have adverse negative effects on its strategy to move to a greener path. Delays in the implementation of renewable energy initiatives and profiles by TNB could be expected, given that its profits are affected.[8] In addition, tax incentives for passenger car purchases, tourism sector support, incentives for new start-ups, and other business support could also be aligned for the purpose of sustainable consumption and production, leading towards a greener growth path. This requires systemic thinking as to how those industries can be aligned.

4. Designing a Post-crisis Strategy: Building Greener Stimulus Recovery

Malaysia needs to look forward in more strategic ways and tap the new opportunities for economic resilience and inclusivity in the near future. As such, Malaysia needs to align its future recovery plans in low-carbon investments, climate change, and SDGs as the key features in any policy design. Indeed, lessons from the Asian financial crisis show that the banking sector weaknesses have had wider economic implications for all sectors. Similarly, COVID-19 seems to change the global order and standards towards a sustainable path, and it would be wise to prepare Malaysian industries and the public to embrace this new norm. The way forward for future strategy is to align consumption, production, and future industry to embrace sustainability as well as create future green industries. Revisiting the existing initiatives that lead to a low-carbon economy

[6] Electricity in commercial and industrial sectors dropped between 25% and 50%.

[7] Referring to a TNB press release, TNB was affected by the volatile foreign exchange in Q1 2020 and is preparing for prolonged challenges post COVID-19 (https://www.tnb.com.my/assets/quarterly_results/Press_Statement_1QFY20.pdf).

[8] Tenaga Nasional Berhad's group profit after tax declined by 51.6% to RM736.7 million in Q1 2020 due to foreign exchange losses given the global uncertainty.

and complementing them with the recovery plans would be a smart strategy. Table 9.2 shows how those strategies can be operationalised and deployed. Malaysia's current strategy involves six stages – resolve, resilience, restart, recover, revitalise, and reform – which were embarked upon to deal with the unprecedented health, economic, and social impacts. With the announcement of the various stimulus packages, Malaysia has moved into Phase 2 for restart and recovery. Nevertheless, for any future restart and recovery initiatives, the plans could have aligned a sustainable path. Critically, the phase to revitalise and reform should clearly focus on sustainability and low-carbon reforms, which are crucial given the new global order.

For instance, stimulus focusing on people could evolve from just reducing the burden of the people during the pandemic towards creating new employment opportunities in new growth areas related to low-carbon industries. Indeed, it is timely that the consumer focus stimulus packages are aligned with the Malaysia initiative for a greener path. The idea is to promote the consumption of green products and services. Aid and subsidies given to the most vulnerable groups can be targeted at purchasing green products and services. The strategy is to create demand for such products and services so that industry will be driven to make their production greener.

As for the business focus, for instance, Malaysia has already embarked on registering companies providing green products and services via the MyHijau scheme. In this regard, the scheme can be used to further link customers and firms to engage in sustainable consumption and production. Indeed, it is best to view the investments in the post-recovery as a complement to the future sustainability policy. For instance, Malaysian Investment Development Authority (MIDA) investment efforts could further focus on building the competitiveness of green industries. As of July 2020, MIDA has attracted RM35.9 billion in investments, of which 69.3% of the approved investments in the manufacturing sector were new greenfield investments. Given that MIDA has already established its green investment strategies, the green sectors can be further focused on. The focus could be placed on providing incentives and tax breaks for sustainability. For instance, the incentive for the property sector could be well-aligned to green and sustainable practices. Similarly, as illustrated in Table 9.2, technology innovation, financing, efforts for digitalisation, and regional cooperation can all be aligned to achieve more sustainable growth.

5. The Way Forward: Game-changing Plans

Integrating a low-carbon agenda with stimulus investments is one way for Malaysia to make low-carbon economy commitments. Given that Malaysia already has had a strong policy framework with institutional capacity and a legal mandate, making this transformation will prove to be less hurdled compared with countries without such a regulatory framework. However, the challenge is to make this smart policy transition, which requires close coordination within various agencies and smart policymakers.

Table 9.2 Emergency, Exit, and Post-pandemic Strategies and Low-carbon Growth

Areas of recovery	Phase 1 (Emergency)	Phase 2 (Exit)	Phase 3 (Low-carbon growth)
	Resolve and resilience (health and people)	Restart and recover (people, business, and the economy)	Revitalise and reform (new sectors, new growth, new employment generation)
Electricity	Subsidy to society (reducing burden due to job losses)	-	Aid for green practices; renewable energy; green infrastructure, registered green products, and services
Transportation	Travel subsidy	Tourism incentives; tax reductions for car purchases	Public transport subsidy; investment in green transportation; incentives for green transportation; tax exemption for green vehicles
Building	-	Incentives for the property sector	Incentives for the property sector with sustainable concepts; green building initiatives
Fuel	Subsidised public transportation	-	Reduce fuel dependency; alternative energy; improved public transportation, incentives for public transportation
Industry	Wage subsidy (sustain employment)	Buy Malaysia campaign; wage subsidy; reskilling and upskilling; micro credit funds; SME Go scheme for liquidity support	Green tax exemption; investment allowances; R&D incentives; industry incentives for flexible work arrangements (work from home); promotion of green jobs; promote green purchases, wage subsidies for green jobs
Technology Innovation	New start-ups	Technology innovation sandbox	Promote Industry 4.0 technologies; stream R&D budget to green research areas; promote IPR related to green technologies; subsidise knowledge and technical production in low-carbon fields; green start-ups
Digitalisation	Incentives for digital adoption, internet allowances, and aid	Micro and SMEs E-commerce; technical and digital adoption for SMEs; connectivity; digitalisation of government service delivery	Funds and aids can be linked to green and sustainable goals
Finance	Moratorium; micro credit scheme; loan facilities and guarantee schemes	Payment terms for GLCs and large corporates' supply chain	Promote the green sukuk market; place financial institutions to offer green financing; green supply chain financing; micro credit to green practices
Regional cooperation	Relaxation of import regulations for medical devices and equipment; exemptions of import duties	Investment opportunities; market identification; resource mobilisation	Relaxation of import regulations; eliminate non-tariff measures; tariffs, regulatory constraints in green technologies; incentives for R&D collaboration, technology transfer; trade policy for green industry; digital platform

Note: The examples are not mutually exclusive in nature. Policymakers could further add initiatives by tying in their existing plans and programmes to develop the low-carbon path.
Source: Author.

Prioritising a green path requires policymakers to focus on the long-term implications that can be best assessed by asking the following questions:

1. How would intervention support long-term decarbonisation targets and strategies?
2. Does intervention provide and improve the financial market landscape for decarbonisation?
3. Does intervention allow the experimentation of low-carbon technologies?
4. Does intervention support and promote a transition towards green infrastructure?
5. Do intervention support knowledge and technical capabilities in low-carbon fields?

A game-changing plan always requires an effective institutional setting given that market failure is rampant. It requires investment in new growth areas and needs the government to reduce the risk and uncertainty exposures in those areas. Malaysia can do this using different approaches, such as using public financing or its GLCs, or through public-private partnerships, including via international collaboration.

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Chapter 10

COVID-19 Impacts of Low-carbon Green Growth in New Zealand

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Chapter 10: COVID-19 Impacts of Low-carbon Green Growth in New Zealand

1. Introduction

New Zealand is an island nation with a population of 5 million. In the 1970s, trade and tariff barriers protected New Zealand's manufacturers from foreign competition. Electricity was produced and priced by government agencies and subsidies supported primary industry. Faced with oil embargos in the late 1970s and declining gross domestic product (GDP) per capita, the government led investment in energy development and energy-intensive industry. Government investment was directed at hydro development and energy-intensive industry based on the discovery of a large gas field. However, growth initiatives based on centralised planning, subsidies, and poor investment decisions failed to deliver expected economic growth. Following a financial crisis in the early 1980s, New Zealand went through a host of reforms that opened the economy up to competition. Large government agencies were restructured, and some were transformed into state-owned enterprises that have either been partially or fully privatised. New Zealand now has an open economy that works on free market principles, minimal barriers to entry, and light-handed regulation.

Outcomes flowing from the exposure to exogenous forces, such as financial crises and pandemics, are directly connected to the structure of the economy and the fiscal position of government. Markets can adapt to change, and government fiscal initiatives can dampen the impact of a pandemic on both supply and demand, at least in the short run. The trajectory of change in the long run remains uncertain and is conditional on the reset of global markets and international relations.

This chapter is structured as follows. Section 2 provides background information on the economy, which sets the scene for understanding the impact of government actions to control the impact of COVID-19. Section 3 describes the sequence of alert levels implemented by the government and recovery policies directed at supporting business and the community. Initiatives underway to promote the transition to a low-carbon economy are described in Section 4. The chapter concludes with a discussion of the challenges ahead and policy recommendations.

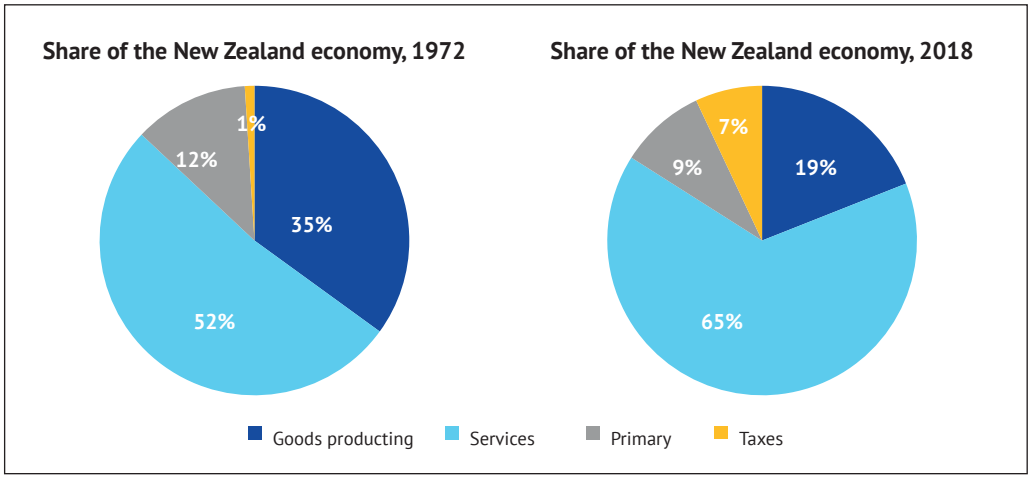
2. The Pre-COVID-19 Economy

Prior to COVID-19, the economic fundamentals had been relatively stable. Beginning in 2015–2019, the government had been running a surplus of 2.5% of GDP in 2019. Government debt was approximately 19% of GDP in 2019. The annual average GDP growth rate per capita was unremarkable, having stabilised at approximately 1.4%, about 25% below the upper half of Organisation for Economic Co-operation and Development (OECD) economies, reflecting declining labour productivity (OECD, 2019). Increased income inequality has increased in recent years, and the government has focused its policies on a broader concept of well-being. Relatively low GDP growth and increased income inequality both work to decrease the resilience of the economy and the workforce to an external shock.

2.1. Economic structure

The likely impacts of COVID-19 are also conditional on economic structure. The evolution of New Zealand's economic structure is evidenced in Figure 10.1. In 1972, the services sector contributed 35% to GDP and the goods producing industry 52%; in 2018, the services sector had increased to 65% and goods producing had declined to 19%. By the very nature of services, the pandemic's impact will be more pronounced relative to other sectors. Contraction in this sector has significant implications for recovery policies.

Figure 10.1 Evolution of the New Zealand Economy



Source: Statistics NZ (2020). http://infoshare.stats.govt.nz/infoshare/

2.2. Trade

The economy is open and faces international markets with few barriers to the flow of goods and services. New Zealand relies on imported goods and commercial tourism. Most imported goods face no tariffs, although minimal tariffs in the order of 5%–10% apply to some goods, such as textiles, machinery, and processed foods. The Comprehensive and Progressive Trans-Pacific Partnership Agreement was implemented in 2018, and preferential tariff rates apply to goods that New Zealand has trade agreements with. In 2019, the total exported goods represented 18.5% of GDP. Approximately 60% of exports by value in 2019 were delivered to Asian countries. Over the period 2000–2020, with few exceptions, the value of imports exceeded exports.

The composition of exports and imports is illustrated in Figure 10.2a and Figure 10.2b, respectively. Primary products, notably dairy and meat products, accounted for between 38% and 44% of the total value over the period 2010–2020. The share of fossil fuel and machinery imports falls within a similar range of 40%–44%. These figures highlight the exposure of New Zealand's trade balance to international prices. Exports of primary products, such as milk powder, face competitive prices. Oil embargoes in the 1970s highlighted

the dependence on the functioning of external oil markets, and this has not changed. The dominance of imported fossil fuels and machinery is particularly relevant to government policy aimed at transitioning to a low-carbon economy.

Figure 10.2a Profile of Main Imports

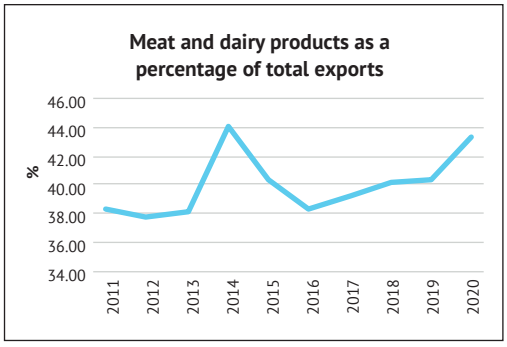
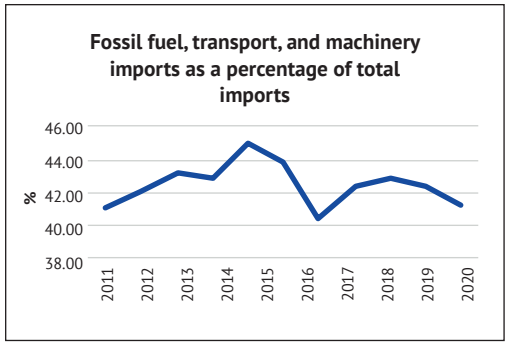


Figure 10.2b Profile of Main Exports

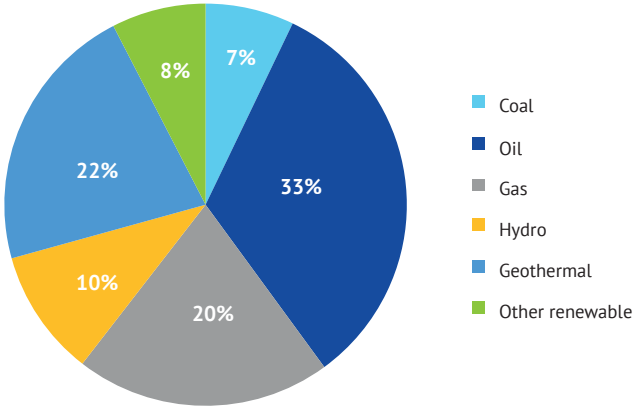


Source: Statistics NZ (2020). http://infoshare.stats.govt.nz/infoshare/

2.3. Energy

In 2019, fossil fuels provided 60% of New Zealand's primary energy, with oil and gas accounting for 53%. The supply of gas is indigenous. Although oil is recovered from local sources, it is primarily exported because the refinery was originally designed to process oil imported from the Middle East. Recent upgrades at the refinery have increased the capacity to process domestic oil.

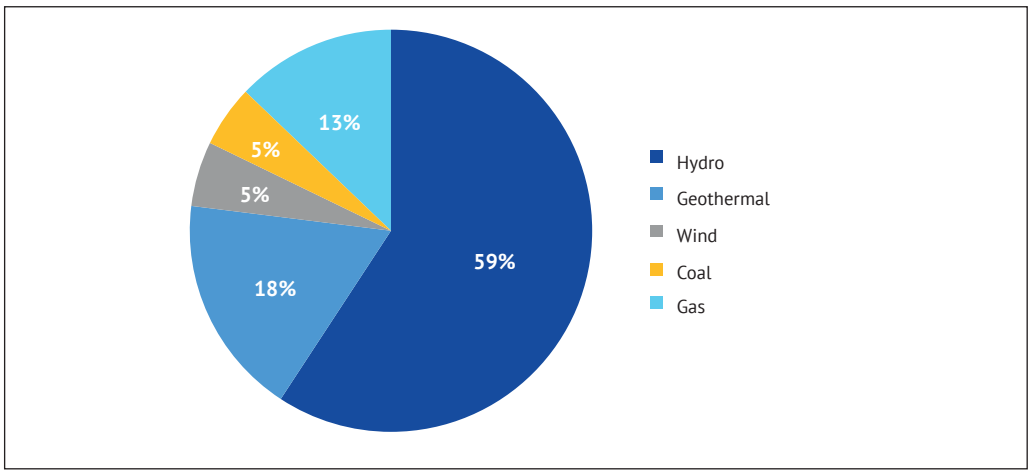
Figure 10.3 Primary Energy Supply, 2019



Source: Ministry of Business Innovation and Employment (2020). https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling

The government has set a target of 90% generation from renewable sources by 2025 (Ministry for the Environment, 2019a). In recent years, over 80% of New Zealand's electricity is generated from renewable sources, depending on the weather. Hydro generation accounts for around 60%, although it can vary according to rainfall patterns and snow melt in the South Island. In recent years, geothermal generation has exceeded gas, but gas remains an important source of generation, particularly with intermittent wind generation. New Zealand has an excellent wind resource, with generation plants running at approximately 45% capacity. Consents have been obtained for a further 2,500 megawatts (MW), and development will proceed with growth in demand (New Zealand Wind Energy Association, n.d.). Integrating more wind generation into supply will increase the need for storage, particularly hydro.

Figure 10.4 Electricity Generation, 2019

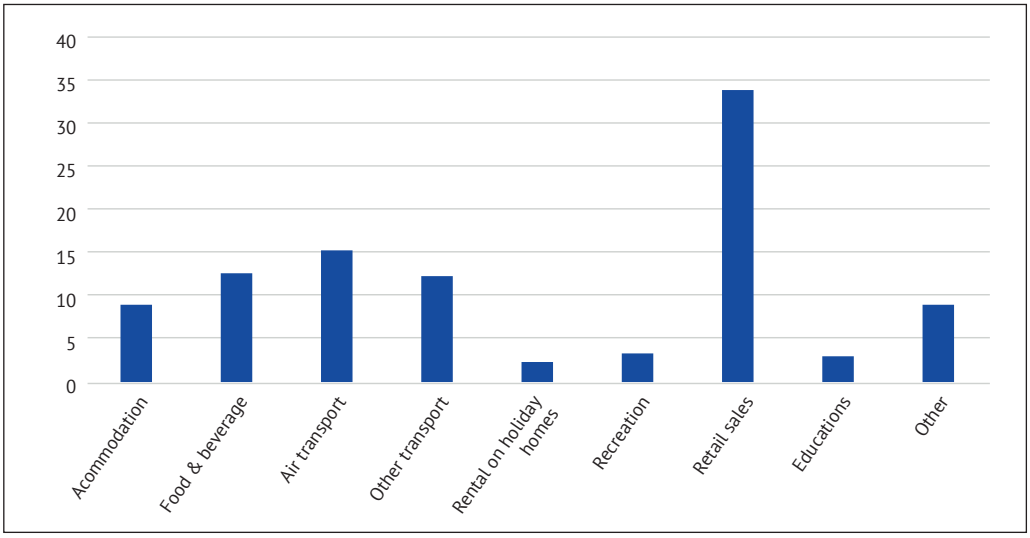


Source: Ministry of Business Innovation and Employment (2020). https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling

2.4. Tourism

Tourism makes a significant contribution to the economy. In 2019, the sector recorded 14% of total employment, direct and indirect. International tourist expenditure in 2019 was NZ$17.1 billion, in contrast to NZ$15.5 billion in dairy products exported that year. Obviously, international tourism relies on open borders, and domestic travel is conditional on rules that apply at various alert levels. Figure 10.5 shows that 34% of tourism expenditure is in retail sales, part of the services sector that contributes 65% of GDP.

Figure 10.5 Tourism Expenditure, 2019 (NZ$ million)



Source: Ministry of Business Innovation and Employment (2020). https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling

3. Economic Impact and Recovery Policy

The impact of COVID-19 on the region's economies will vary according to the robustness of each economy and its structure, trade, energy supply and demand, state of government accounts, and, of course, policies implemented in response to the pandemic. Section 2 highlighted the backdrop of key economic parameters prior to the pandemic. This section outlines the government's policy responses and highlights the outcomes associated with the pandemic.

There were 53 New Zealand residents in Wuhan when the virus was first reported by the World Health Organization in December 2019. On 29 January 2020, the government announced that it was working with Australia to bring these citizens home. The country's first confirmed case of COVID-19 was reported in 2020. Alert level 4, 'eliminate', was implemented on 26 March, requiring residents to stay at home. On 29 March the border was closed to all except New Zealand citizens; the first time this power has been used. The ban did not apply to products entering the country by ship or plane. A phased reduction in alert levels followed, dropping down to alert level 1 on 9 June. However, cases in Auckland increased, leading to the region returning to level 3 on 12 August. In early October, Auckland returned to alert level 1 along with the rest of the country. Testing remains in place, and inbound travellers are required to quarantine in secure facilities for 14 days at their expense. The border remains open to the movement of freight in and out of the country. At the time of returning to alert level 1 in October 2020, there had been 1,912 cases of COVID-19 to date and 25 deaths.

3.1 Fiscal response

In March 2020, the government announced a NZ$12.1 billion public health and economic stimulus package comprising NZ$500 million for health, NZ$8.7 billion in support for businesses and employment, and NZ$2.8 billion for income support and for boosting consumer spending. The package represented 4% of GDP. A wage subsidy scheme was introduced aimed at keeping businesses afloat if they faced laying off staff. Residential rent freeze increases were mandated for a period of 6 months. A finance guarantee was available to businesses with annual revenue between NZ$250,000 and NZ$80 million, with the government guaranteeing 80% of the risk and banks covered the remaining 20%. Retail banks offered to defer repayments for all residential mortgages for up to 6 months for customers financially affected by COVID-19 (Treasury, 2020).

In May 2020, the government announced a NZ$50 billion COVID-19 Response and Recovery Fund (CRRF) as part of its annual budget. As of 14 May 2020, the government had committed NZ$29.8 billion of the CRRF, of which NZ$13.9 billion had been announced prior to Budget Day as part of an ongoing response to COVID-19, leaving NZ$20.2 billion of funding remaining. On 14 May 2020, the CRRF Foundational Package was announced, totalling NZ$12.0 billion in operating expenditure and NZ$3.9 billion in capital expenditure over the forecast period.

In August 2020, the government announced a new 2-week wage subsidy available to businesses that experienced a 40% revenue drop across a 14-day period between 12 August and 10 September when compared to a similar period in the previous year. Businesses could access tailored specialist support, free of charge, for issues such as business continuity planning, finance and cash flow management, human resource issues, and sector-specific issues in some cases. Tax relief was available to businesses making a loss in 2020. Tax incentives were directed at encouraging businesses to retain their research and development capabilities.

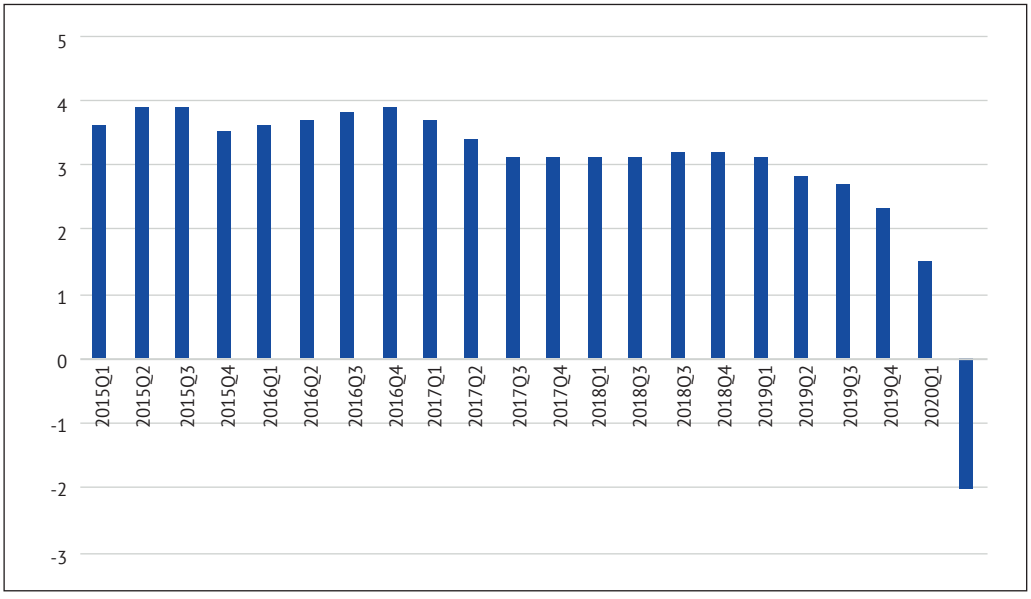
3.2 Monetary policy

New Zealand's monetary policy framework is conventional by current international standards and has a goal of price stability. In carrying out monetary policy, the Reserve Bank is required to keep inflation between 1% and 3% on average over the medium term, with a focus on keeping future average inflation near the 2% target midpoint, and support maximum sustainable employment. The official cash rate (OCR) is reviewed every quarter and was held at 0.25% in May 2020. In August 2020, the OCR remained at 0.25%, and the bank expanded its asset purchase programme to NZ$100 billion so as to further lower retail interest rates and support the smooth functioning of the economy.

3.3. Economic impact

Annualised quarterly growth leading up to Q2 2020 ranged between 1.5% and 3.9%, and retracted by 2% in Q2 after Level 1 was announced by the government. The government announced a lockdown in March 2020, and the borders were closed except for the movement of goods. Figure 10.6 shows the economic contraction in Q2 2020.

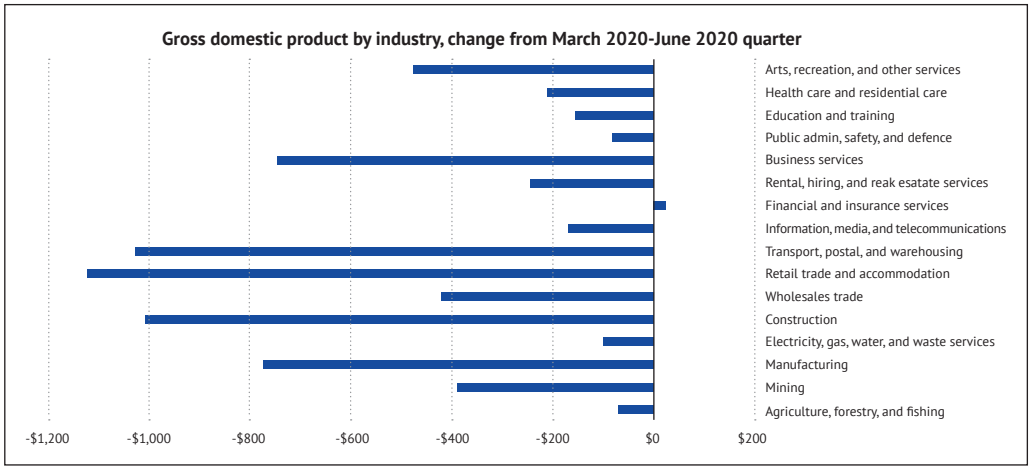
Table 10.6 Quarterly Percentage Change in GDP (%)



Source: Statistics NZ (2020). http://infoshare.stats.govt.nz/infoshare/

Greater insights into the economic contraction are shown in Figure 10.7. As noted earlier, the economy is dominated by the services sector. This sector relies on tourism and consumer spending. The marked decline in retail and services from March to June 2020 is a consequence of the lockdown, as expected.

Table 10.7 Change in GDP by Industry (NZ$ million)

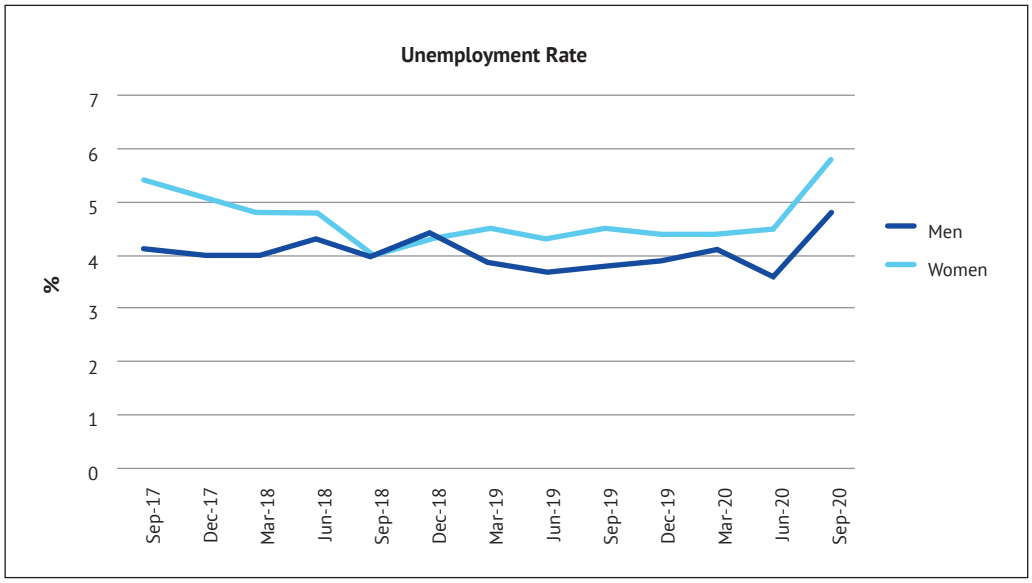


Source: Statistics NZ (2020). http://infoshare.stats.govt.nz/infoshare/

3.4. Employment

Pre-COVID total unemployment was slightly over 4% and remained at 4.2% in March 2020 and 4% in June 2020 (3.6% for men and 4.5% for women), most likely the result of the government's wage subsidy scheme and infrastructure investment prior to the pandemic. Total unemployment increased to 5.3% for the September quarter, 4.8% for men and 5.8% for women.

Table 10.8 Unemployment Rate by Gender, September 2017–September 2020

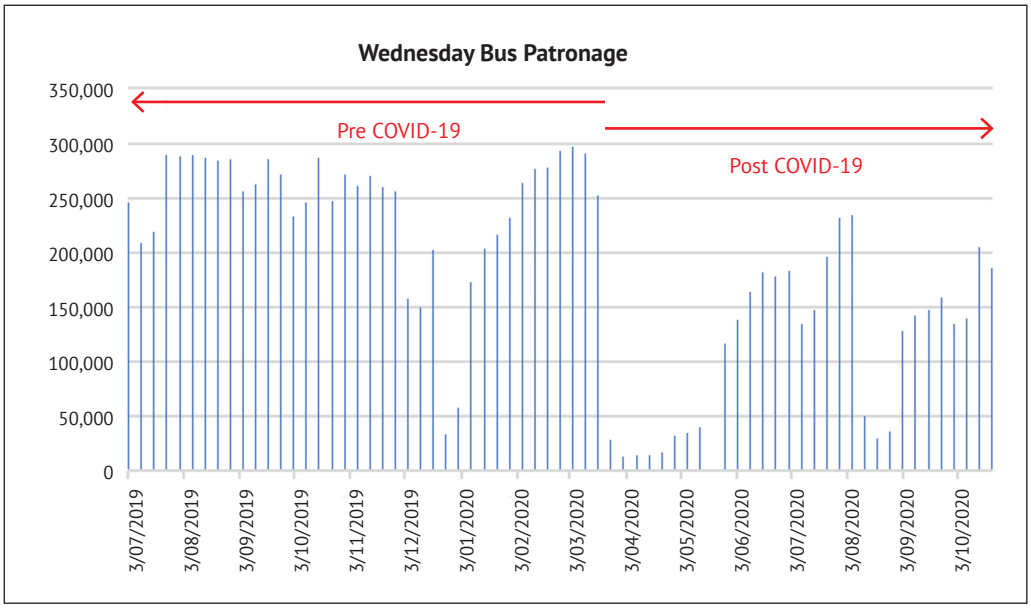


Source: Statistics NZ (2020). http://infoshare.stats.govt.nz/infoshare/

3.5. Transport

Figure 10.9 shows the mid-week bus ridership prior to the March lockdown and the gradual easing of restrictions from June 2020. Investment in dedicated bus lanes, vehicle upgrades, and the increasing state of congestion on arterial routes resulted in increased ridership. Working from home, social distancing, and residual fear over contracting the virus has meant that ridership has yet to return to pre-COVID levels.

Table 10.9 Impact of COVID-19 on Bus Patronage



Source: Statistics NZ (2020). http://infoshare.stats.govt.nz/infoshare/

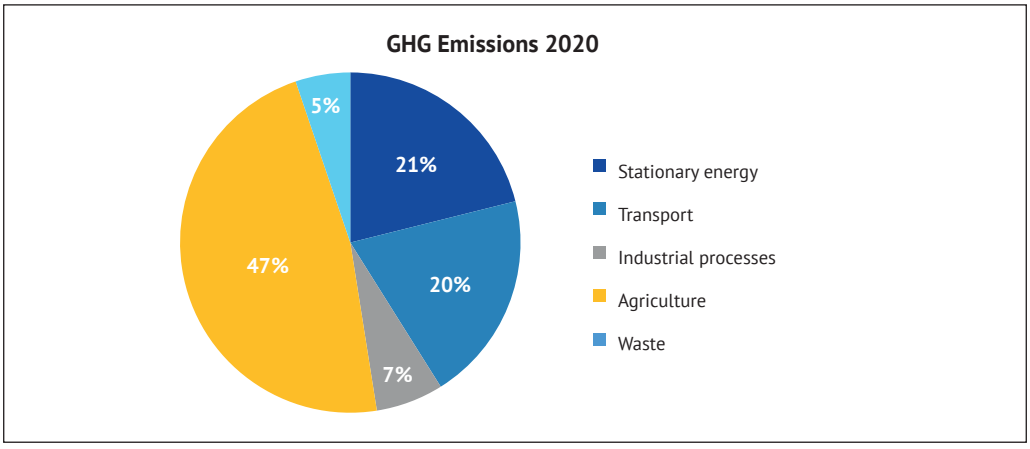
4. Transitioning to a Low-carbon Economy

In order to align with the global ambition set under the Paris Agreement, legislation in 2019 established a target of net zero emissions for all greenhouse gas (GHG) emissions other than biogenic methane by 2050 (Ministry for the Environment, 2019b). The target for biogenic methane reduction is 24%–47% below 2017 emissions. Many initiatives aimed at transitioning to a low-carbon economy were in place before COVID-19.

4.1. Greenhouse gas emissions

The composition of GHG emissions is illustrated in Figure 10.10. New Zealand has a unique emissions profile, with approximately 50% of GHG produced from agriculture. Reducing biogenic methane emissions from pastural agriculture is a major challenge. Approximately NZ$20 million is invested each year into research aimed at reducing biogenic methane emissions.

Figure 10.10 Sectoral Composition of Greenhouse Gas Emissions, 2020



Source: Ministry for the Environment (2019b).

Emissions from transport are mainly produced from road vehicle emissions, which have increased in recent years. Car ownership, at around 0.8 cars per capita, is high by international standards. The average age of cars is 14 years, and the average distance travelled is 30 kilometres per day. In contrast to agricultural emissions, technology offers an available solution to transport emissions. In 2016, the government announced its Electric Vehicle Programme aimed at achieving a goal of 64,000 electric vehicles (EVs) by 2021 (Ministry of Transport, 2020). Government policy aimed at increasing the number of EVs included exemption from road user charges, assistance with the development of charging infrastructure, and a NZ$6 million fund aimed at encouraging innovation to accelerate uptake. A fiscally neutral proposal aimed at reducing the tax on EVs and increasing the tax on large fossil fuelled vehicles was not implemented. In 2020, there were about 20,000 EVs, and it looks as though the target will not be achieved.

4.2. Emissions Trading Scheme

The New Zealand Emissions Trading Scheme (ETS) is a key mechanism for achieving the government's emission reduction targets. Units representing 1 tonne of CO_2-equivalent are traded on the market. The government gives foresters units for CO_2 absorbed by their trees, which can then be sold to emitters requiring units to cover their emissions. In 2020, approximately 50% of New Zealand's emissions were covered by the ETS. The price of units is in the range of NZ$30–NZ$35 per tonne.

4.3. Pumped hydro storage

Variability in weather patterns presents a challenge to the goal of transitioning to 100% renewable electricity. New Zealand's existing hydro catchments sometimes do not receive enough rainfall, and storage levels run low. This, coupled with the inherent intermittent characteristics of wind, presents a challenge. Currently, fossil fuel generation serves to meet demand when lakes are low and the wind is not blowing. In recognition of the dry-period problem, the

government approved funding of NZ$30 million to investigate Lake Onslow as a pumped storage solution. A further NZ$70 million will be invested in design based on the findings of the business case. Bardsley (2005) suggests that the Onslow scheme has a potential of 5 terawatt-hours of storage. Installing 1,200 MW of generating capacity would complement the expansion of wind generation and further advance the likelihood of achieving 100% renewable electricity by 2030.

4.4. Infrastructure upgrades

In January 2020, the government announced NZ$6.8 billion being invested across road, rail, public transport, and walking and cycling infrastructure. Over NZ$1 billion was allocated towards rail upgrades to cope with the expected growth in freight and reduce carbon emissions.

4.5. Hydrogen

In September 2019, the government released its vision for hydrogen as an eco-friendly alternative fuel for vehicles and set aside $10 million to develop a roadmap to invest in green hydrogen and develop strategic partnerships with business. Commercial interest in hydrogen is occurring on multiple fronts. The country's oil refinery, one of New Zealand's largest producers of steam-formed hydrogen, is constructing a 26.7 MW solar farm that will supply 10% of their electricity needs. Hyundai New Zealand has established its hydrogen demonstration project to showcase the NEXO fuel cell electric powertrain. Ports of Auckland has committed to build a hydrogen production and refuelling facility at its Waitematā port. The company and project partners Auckland Council, Auckland Transport, and KiwiRail will invest in hydrogen fuel cell vehicles, including port equipment, buses, and cars as part of the project.

In December 2017, Tuaropaki Trust entered into a Memorandum of Understanding with Obayashi Corporation of Japan to pilot the production of green hydrogen. The plant will use geothermal energy produced at the Trust's geothermal power station at Mokai, 28 km northwest of Taupō. Construction of the 1.5 MW hydrogen plant at Mokai began in 2019, and the plant was scheduled to be operational in 2020. A joint venture between Ballance Agri-Nutrients Limited and Hiringa Energy Limited, with NZ$19.9 million in funding from the Provincial Growth Fund, will see the production of green hydrogen from renewable electricity and water at a facility in Kapuni, South Taranaki. The NZ$50 million project will see the construction of industrial-scale hydrogen from an electrolyser, which will be powered by four large wind turbines close to Ballance Agri-Nutrients' ammonia-urea plant in Kapuni. Installed wind generation capacity of 16 MW will also supply renewable electricity directly to the plant. Green hydrogen will be used as both feedstock into the ammonia-urea plant to reduce the plant's environmental footprint and as a zero-emission transport fuel for local buses, trucks, and cars.

In August 2020, the Infrastructure Reference Group provisionally approved NZ$20 million for Hiringa Energy to establish New Zealand's first nationwide network of hydrogen fuelling stations (New Zealand Government, 2019). The initiative

will involve the installation of eight hydrogen refuelling stations located in Waikato, Bay of Plenty, Taranaki, Manawatu, Auckland, Taupō, Wellington, and Christchurch. These stations will provide refuelling for zero emissions heavy hydrogen-powered fuel cell electric vehicles (FCEVs), such as trucks and buses. This initial network will provide coverage for about 95% of heavy freight routes in the North Island and 82% of the South Island.

4.6. Regional cooperation

New Zealand's Aid Programme budget is NZ$2.2 million spread over 3 years through 2021. The investment priorities emphasise private sector-led growth that supports sustainable development. In addition to well-being and human capital, recent investment priorities have included resilience to climate, natural disasters, and energy. Expertise in renewable energy development and market design has led to investment supporting the upgrade of electricity networks and solar and small-scale hydro development.

5. Future Challenges and Policy

New Zealand faces a dual challenge, one being growth and well-being and the other the transition to a low-carbon economy. Economic growth in the near term will be conditional on the state of global markets. Given that New Zealand markets are open and regulation is light-handed, endogenous innovation and changing patterns of production and employment can be expected in the near term. The economy is dominated by a service sector that relies heavily on tourism and consumer spending. International tourism will only return when the borders are open. Until then, services relying on revenue from international visitors will continue to contract. Opportunities will emerge as residents substitute international travel for domestic travel. However, borders are open, and the flow of imports and exports can be expected to return to pre-COVID-19 levels.

The government introduced a series of innovations aimed at transitioning to a low-carbon economy before the pandemic. The ETS has been strengthened and remains a key tool in achieving net-zero emissions by 2050. Achieving 100% renewable electricity generation by 2030 is feasible. Consents for an additional 2,400 MW of wind generation have been approved, and construction will proceed when financially viable (New Zealand Wind Energy Association, n.d.). However, energy storage will be needed, and currently this is provided by gas. Further conventional hydro development is limited by many sites being located within the conservation estate. Recent interest in pumped hydro storage at Lake Onslow has the potential to provide backup when needed. The government has provided financial support to prepare a business case for development. It is highly likely that private sector investment will be called upon if the project goes ahead. The government's 51% ownership share of four major generating companies could further act as a catalyst for development.

Decarbonising transport is a major challenge. It is unlikely that the target for EV uptake will be met without a comprehensive policy involving price incentives and emission standards. Per capita ownership of cars is high by

international standards, and the light-vehicle fleet is old. A fiscally neutral policy aimed at lowering the relative price of EVs and increasing the price of fossil-fuel-powered vehicles offers an opportunity to grow the EV fleet. The government's support for the hydrogen industry is comprehensive, and commercial partnerships are already emerging. New Zealand has a particular advantage in producing hydrogen from geothermal energy. Hydrogen is well suited to powering heavy vehicles critical to the primary sector.

Finally, it is worth noting the role of government going forward. It is unlikely that government agencies will return to investing in energy projects as was the case prior to the mid-1980s. Transition will proceed based on market principles and commercial return. The role of government is akin to that of a facilitator, providing seed funding for commercial proof of concept, and perhaps providing a nudge with regulations governing vehicle emissions. This approach has served New Zealand well.

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Chapter 11

Transformational Strategies: Progress Made and New Challenges Being Met for the Case of Thailand

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Chapter 11: Transformational Strategies: Progress Made and New Challenges Being Met for the Case of Thailand

1. Introduction

Before the pandemic, Thailand was doing more to implement the Paris Agreement pledge by demonstrating how plans in different sectors would help achieve the agreement's goals and strengthen the implementation of the National Master Plan on Climate Change, the Low Carbon City Initiative, and policies and plans related to climate change.

The pandemic occurred just as Thailand was beginning to reap the rewards of an ambitious national strategy designed to shake off the 'middle-income trap' and propel the economy into high-income status, attracting more than B203.4 billion (US$6 billion) in foreign investment into its target sectors between January and September 2019.

For Thailand, the economic impact of the pandemic has been serious. The current economic downturn has affected the implementation of measures for policies and plans related to climate change. An example is renewable energy, one of the 10 'S-Curve' sectors, which, like many infrastructure-centric industries, is facing an uncertain short, medium, and long-term future.

The government has passed three stimulus packages for pandemic-related relief and efforts and to effectively address and facilitate climate change efforts. To address the COVID-19 pandemic and climate change efforts under the economic crisis, the government has to select and re-prioritise strategies and policies that will be successful in the short term and long term.

The objectives of this study are (1) to review the situation of the implementation of policies and plans for supporting the achievement of the Nationally Determined Contribution (NDC), (2) to ensure that the challenges related to the COVID-19 pandemic are effectively addressed and incorporate climate change efforts, and (3) to study and suggest green initiatives under the stimulus package.

2. Country Strategies for Reducing Emissions Before the Pandemic

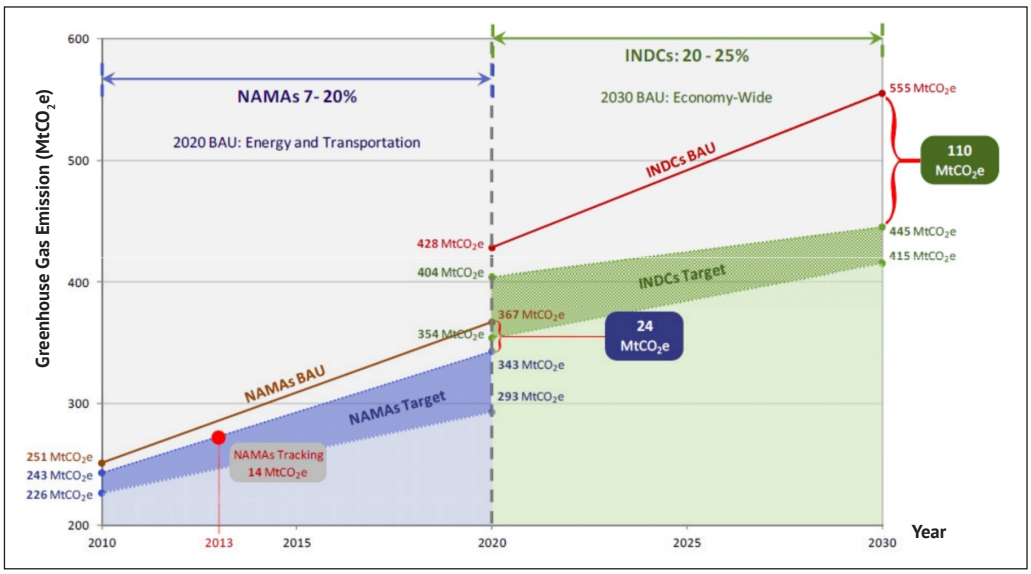
Thailand is one of the top-10 countries in the world facing climate risk and has taken proactive and urgent steps to address climate change. The National Climate Change Master Plan (2015-2050) was planned to help Thailand achieve sustainable low-carbon growth and climate change resilience by 2050.

In December 2014, Thailand submitted its communication on Nationally Appropriate Mitigation Actions (NAMAs) to the United Nations Framework Convention on Climate Change (UNFCCC). Thailand endeavoured, on a voluntary basis, to reduce its greenhouse gases (GHG) emissions in the energy and transport sectors to 7%–20% below the business-as-usual (BAU) case by 2020, subject to the level of international support provided in terms of technology development, finance, and capacity building. Thailand's NAMAs include the following countermeasures: renewable energy – biomass, biogas, hydro, solar, wind, waste-to-energy; and energy efficiency – energy efficiency improvements in industries, buildings and transport, and sustainable transport systems.

The Prime Minister of Thailand announced that Thailand ratified the Paris Agreement on 21 September

2016. Joining the Paris Agreement was an important step to confirm the commitment of Thailand to moving towards a low-carbon and climate-resilient society. Thailand's commitment to a 20.8% reduction in its GHG emissions by 2030 compared to the business-as-usual level was established in its NDC under the Paris Agreement. The business-as-usual level of GHG emissions in 2030 is expected to reach 555 megatonnes of carbon dioxide equivalent (Mt CO2-eq), meaning that the country needs to reduce its emissions by 115.6 Mt CO2-eq. Under its NDC Roadmap, the government has allocated the bulk of the target, 113 Mt CO2-eq, to the power generation, manufacturing, transport and buildings/residential sectors (Figure 11.1 and Table 11.1).

Figure 11.1 Thailand's NAMAs and INDCs Targets



BAU = business as usual, INDCs = Intended Nationally Determined Contributions, NAMAs = Nationally Appropriate Mitigation Actions, Mt CO2-eq = megatonnes of carbon dioxide equivalent.
Source: Author, based on Thailand Greenhouse Gas Management Organisation (2020).

In 2017, Thailand's total primary energy supply was 138 Mtoe and was dominated by fossil fuels: 41% from oil, 26% from natural gas, and 12% from coal. At 19% of the total supply, biofuels and waste were the largest source of low-carbon energy, whilst other renewables only counted for 1%.

The government has allocated emission reduction efforts across the sectors in an imbalanced way – of the 113 Mt CO2-eq reduction target, 74% has to be achieved by manufacturing and transport sector measures. The largest emitter, the power sector, is only required to reduce GHG emissions by 24 Mt CO2-eq, or 20% of the total emission reduction goal, despite being a sub-sector with several low-carbon technologies that are mature, scalable, and competitive.

The power sector was the largest emitter in 2017 at 88 Mt CO2-eq and has the greatest potential for carbon reduction. Electricity

production accounts for 36% of total CO2 emissions from fuel combustion, followed by the transport and industrial sectors at 31% and 20%, respectively. Natural gas has been the dominant source for electricity generation in Thailand since the mid-1980s, with its share peaking in the early 2000s at 70%. That fell slightly to 65% in 2017 with the gradual integration of coal and renewables. Natural gas was responsible for 59% of CO2 emissions from electricity generation. Coal generated less than 20% of total electricity but produced 41% of CO2 emissions from the sector. Generation from renewables accounted for a modest 16% of total generation in 2017 and increased to 20% in 2019.

Table 11.1 GHG Reduction Measures Based on the GHG Reduction Roadmap

Sub-sector	Potential (Mt CO_2 eq)		Under plans
Total potential in 2030 is 115.6 Mt CO_2- eq			
Energy sector	**113**		
Power plant	24		
- Energy efficiency in power plants		6	Power Development Plan 2015 (PDP2015)
- Renewable energy		18	Alternative Energy Development Plan (AEDP2015), PDP2015
Energy use in households	4		
- Increasing efficient use in households			Energy Efficiency Plan (EEP2015)
- Using renewable energy			AEDP2015
Energy use in buildings	1		EEP2015
- Increasing efficient use in buildings		1	
Energy use in industry	43		
- Increasing efficient use in industry		11	EEP2015, Thailand Refrigeration and Air Conditioning Nationally Appropriate Mitigation Action (RAC NAMAs project)
- Using renewable energy		32	AEDP2015
Transport	41		
- Increasing efficient use in transport		31	EEP2015, Master Plan for Transport
- Using biomass fuel in vehicles		10	AEDP 2015
Waste sector	**2.0**		
Solid waste management	1.3		
- Reducing the amount of waste		1.3	Master Plan for Solid Waste Management, Environmental Quality Management Plan
Wastewater management	0.7		
- Increasing biogas production from methane recovery from industrial wastewater			PDP2015, AEDP2015
- Industrial wastewater management			Clean technology mitigation
- Domestic wastewater management			Master Plan for Climate Change, Pollution Management Plan
Industrial process and product use sector	**0.6**		
Adjusting industrial production processes			
- Substituting clinker		0.3	
- Substituting refrigerant		0.3	Montreal Protocol, RAC NAMA

GHG = greenhouse gas, Mt CO2-eq = megatonnes of carbon dioxide equivalent, RAC NAMA = Refrigeration and Air Conditioning Nationally Appropriate Mitigation Action.
Source: Author.

2.1. Energy Efficiency Development Plan (EEDP 2011–2036)

Energy efficiency measures are expected to reduce emissions by around 49 Mt CO_2-eq on average annually by 2030, over 40% of Thailand's emission reduction target. The revised 20-year Energy Efficiency Development Plan (EEDP 2011–2036) was developed with the aim to reduce energy intensity by 30% in 2036, compared with that in 2010, or equivalent to a decrease in final energy consumption by 28% in 2030, or around 57,400 kilotonnes of oil equivalent (ktoe), as shown in Table 11.2. Energy intensity will be reduced from 15.28 ktoe/billion baht in 2010 to 10.7 ktoe/billion baht in 2036. The EEDP targets mainly the transport and industrial sectors, which are responsible for 54% and 26% of the total energy demand reduction target, respectively. The remaining 20% will primarily be covered by the buildings and residential sectors. The main uncertainty for the EEDP is that over 60% of the target is to be met by voluntary programmes. This makes it harder to forecast the carbon reduction achievements.

Table 11.2 Comparison of the Targets of the Previous and Revised 20-year EEDP (kilotonnes of oil equivalent)

Economic sector	Target of 20-year EEDP (2011–2030)	Target of 20-year EEDP (2015–2036)
Industry	16,100	24,000
Transportation	16,800	10,700
Commercial building and residential	5,300	22,700
Total	**38,200**	**57,400**

EEDP = Energy Efficiency Development Plan.
Source: Ministry of Energy (2020).

2.2 Power Development Plan (PDP 2018–2037)

Reflecting the shift in the fuel mix from the 2015 Power Development Plan (PDP), the revised plan reduced Thailand's 2030 power sector emissions projections by 5%, from 100 Mt CO_2-eq to 95 Mt CO_2-eq, whilst meeting a demand forecast up by 4% (Table 11.3). Thailand supports renewables with a feed-in-tariff scheme and has a buy-back policy to support distributed solar generation. In the 2018 Revised PDP, Thailand shifted from a focus on reducing its dependency on natural gas to reducing generation from coal power plants and electricity imports. As for the power sector, the Revised PDP outlines a 4,000 megawatt (MW) potential demand reduction through energy conservation.

Table 11.3 Comparison of the Targets of the Previous and Revised 20-Year PDP

Generation by fuel type	Target of 20-year PDP (2015–2036)	Target of 20-year PDP (2018–2037)
Natural gas	37%	53%
Coal/lignite	23%	11%
Imported hydropower	15%	9%
Other renewables	20%	21%
Nuclear	5%	0%
Energy conservation	0%	6%
CO_2 intensity kg (CO_2/kWh)	**0.319**	**0.271**

CO2 = carbon dioxide, kWh = kilowatt hour, PDP = Power Development Plan.
Source: IEA (2020).

2.3. Alternative Energy Development Plan (AEDP 2015–2036)

The Alternative Energy Development Plan (AEDP 2015–2036) increases the target for installed alternative energy to 19,635 MW in 2036 by promoting the use of non-fossil fuels in power and transport (Table 11.4).

The overall goal is to reduce fossil fuel consumption by 39 Mtoe by 2036, corresponding to 30% non-fossil energy in the total final energy consumption. Addressing GHG emissions is complex because, historically, increased GHG emissions in Thailand were caused by increased energy demand. This in turn stemmed from positive trends, such as economic growth, urbanisation, and a shift in economic structure towards industrial production.

Table 11.4 Comparison of 2014 Capacity and the Target of the 20-year Alternative Energy Development Plan (2015–2036) (megawatts)

	Waste	Biomass	Biogas	Hydro	Wind	Solar	Energy crops	Total
2014 Capacity	48	2,199	226	3,016	220	1,570	-	7,279
Target for 2036	501	5, 570	600	3,282	3,002	6,000	680	19,635

Source: IEA (2015).

2.4. Smart Grid Master Plan (2015–2036)

The Smart Grid Master Plan (2015–2036) was set up to make Thailand the electricity hub in the Association of Southeast Asian Nations (ASEAN) and create new business for energy producers. The Metropolitan Electricity Authority (MEA), Electricity Generating Authority of Thailand (EGAT), and Provincial Electricity Authority (PEA) work together on this megaproject. This project is divided into four phases: preparation (2015–2016), short-term projects (2017–2021), medium-term projects (2022–2031), and long-term projects (2032–2036). The short-term projects will include the development of pilot projects to test the technical suitability and investment feasibility of each technology. This phase will largely cover the expansion of alternative power grids and energy system management, electric vehicles and charging station networks, and power pack projects, and aims to establish portable energy storage systems within users' homes to support the installation of solar rooftops. Projects in the short-term phase are expected to reduce the consumption of electricity from the main facilities by at least 300 MW through the establishment of at least three micro-grids. Other benefits of these projects will be a reduce power outages and malfunctions, as well as an increase in the production of renewable energy by at least 15%.

2.5. Carbon intensity

Oil has always been the largest source of CO_2 emissions from fuel combustion, but emissions from natural gas and coal have grown rapidly since the 1990s, together accounting for around 60% of the total in 2017. The carbon intensity of the energy supply has been consistently declining and decreased from 2.15 t CO_2-eq to 1.77 t CO_2-eq between 2001 and 2017. Thailand's carbon intensity is well below the world average, which has stayed at around 2.38 t CO_2-eq since 1990.

2.6. CO_2 intensity of electricity

Whilst electricity generation continues to grow at about 2% per year, shifts in the generation mix and more efficient fossil fuel plants have led CO_2 emissions from the power sector to plateau since 2013. Improved technology and efficiency have lowered the CO_2 intensity of electricity generation since the 1990s. It fell by 12% between 2013 and 2017 to reach 473 t CO_2/GWh in 2017, just below the world average (485 t CO_2/GWh).

3. The COVID-19 Pandemic and its Effects

In January 2020, Thailand became the second country to confirm a COVID-19 case. As the COVID-19 pandemic continues to escalate around the world, the economic fallout weighs ever deeper on Asia. Throughout the region, tourism has collapsed, and export industries are suffering. Thailand has succeeded in controlling the pandemic by working through a combination of government action, social responsibility and community solidarity. Of course, that success entirely depends on continued vigilance, a whole-of-society approach, and ramped-up testing to prevent a second wave as borders open and full economic activities are resumed.

For Thailand, the economic impact of the pandemic has been serious, with predictions of an

8.1% contraction of the economy in 2020, whilst imports are expected to plunge by nearly 20%. It is estimated that 65% of people have incomes that are totally or very inadequate under the pandemic conditions. The government has passed three stimulus packages for pandemic-related relief and efforts to support sectors across society and business and to promote domestic travel.

Phase 1 was issued on 4 March 2020 and was valued at B100 billion, providing 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 and was valued at B117 billion. The second phase focused 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 and was valued at B1.9 trillion (equivalent to 10% of gross domestic product (GDP)) to mitigate the economic impacts caused by the COVID-19 outbreak. It targets three areas: (1) commercial banks for providing soft loans to SMEs; (2) households, temporary workers, contract workers, and self-employed persons for providing cash handouts; and (3) the financial services sector for ensuring liquidity in the financial sector.

The total budget of the three stimulus packages can be divided for support as follows:

(1) ฿500 billion to lend to SMEs. The package provides ฿500 billion in funding for commercial banks to lend to SMEs. SMEs contribute to some 40% of GDP and employ 80% of the total workforce. This soft loan for SMEs (with an existing credit line of under ฿500 million) will be provided at an annual interest rate of 2%. For the first 6 months, however, the interest rate will be at 0%, which will be absorbed by the government. There will also be a 6-month grace period on debt moratorium for SMEs with credit lines not exceeding ฿100 million. These measures are designed to mitigate the immediate liquidity problems of SMEs so that they are still able to pay employees' salaries.

(2) ฿1 trillion to help farmers and households. The funds go towards farmers, households, community infrastructure programmes, public health services, and job creation schemes. From this total, ฿600 billion was allotted to ramp up financial aid to temporary workers, contract workers, and self-employed persons. This includes providing ฿5,000 (US$154) in monthly handouts for 6 months. This assists some 9 million workers impacted by the pandemic, and 20 million people have applied for the cash handout programmes.

The remaining ฿400 billion goes towards rehabilitating the economy through projects that create jobs, build local infrastructure, and strengthen local communities.

(3) ฿400 billion for stabilising the financial sector. The government has allocated ฿400 billion to establish a Corporate Bond Liquidity Stabilization Fund, a special lending scheme that allows the Bank of Thailand (BOT) to buy corporate bonds through the fund to ensure sufficient liquidity in the market.

(4) Enact legislation to transfer budgets worth ฿80 billion–฿100 billion from ministries to finance measures to handle the COVID-19 outbreak.

Meanwhile, taking into consideration the liquidity concerns of several businesses who have opted to redeem their bond mutual funds, the Ministry of Finance (MOF), the Securities and Exchange Commission (SEC), and the BOT have announced several measures to minimise any subsequent impact on the funds' value:

- Bond mutual funds: A special facility under the BOT's aegis will provide liquidity for mutual funds through commercial banks.
- Corporate bonds: ฿70 billion–฿100 billion has ben earmarked by the Thai Bankers' Association, the Government Savings Bank, Thai insurance providers, and the Government Pension Fund.
- Government bonds: Matters will continue as usual, with the BOT providing liquidity to the government bond market through bond purchasing.

On 20 May 2020, the BOT announced to further cut the policy rate from 0.75% to 0.5%. The BOT expects this to reduce the interest burden on borrowers affected by the pandemic and to alleviate the liquidity strain in financial markets.

The government will also need to closely watch the impact at the household level in the third and fourth quarters and further refine the mix of stimulus measures with sharper targeting. In terms of vulnerabilities, the impact assessment indicates that the youth could potentially lose out the most given rising unemployment and with nearly half a million young people joining the labour force at a time when jobs are difficult to secure. Similarly, women and men are impacted equally, yet differently, which will serve as a drag on the recovery process.

Such measures under three stimulus packages will help in the short term, but long-term resilience for the Thai economy lies in reconciling the country's need for tourist dollars with the need to protect the ecosystem.

4. Integrating the Concept of 'Green Initiatives' into the Economic Stimulus Packages

The COVID-19 crisis opens up opportunities for everyone to rethink and find new ways to enhance cooperation in various areas, such as food and energy security, public health, and the utilisation of digital economy, which will help mitigate the economic effects and the disruptions to supply chains. One of the post-COVID-19 strategies proposed by the Office of National Higher Education Science Research and Innovation Policy Council and Thailand Future Foundation mentions several dimensions related to the Sustainable Development Goals (SDGs), a resilient society, and the present national strategy. However, the ways for implementation, organisation, and budget are not presented. This idea consists of five issues:

Put human security first. Priority is shifted from the economy to human security in four aspects: food, healthcare, energy, and jobs.

Moving beyond GDP. This issue introduces a paradigm shift from GDP growth to balanced growth through

the development and applications of the SDGs, the Bio-Circular-Green economic model, an ecosystem supporting e-commerce, the local economy, and new growth engines.

Reinvention in education and human capital. This issue centres around the improvements in the education system to enhance learning capacity, a hybrid education model for the future incorporation of online and offline education and coop programmes, and reskilling and upskilling programmes for lifelong learning.

Leaving no one behind. This aspect aims at tackling poverty and inequality utilising advanced technology, such as big data analytics, to support the design and implementation of government programmes, such as universal basic income and targeting welfare.

Create an open and resilient society. Technologies and measures are developed and implemented to create transparency in governance and develop an open collaboration platform allowing all stakeholders to participate in national development and strengthen the public-private-people (PPP) collaboration.

The current national strategy addresses long-term climate policies to guide the country towards a more sustainable pathway. The strategy, as noted in the strategy plan, is aimed at cutting carbon emissions and promoting a low-carbon society and climate-friendly infrastructure, as well as introducing climate-proof and mitigation measures against extreme incidents in the future. A number of green initiatives under the national strategy were introduced even before COVID-19 and continued through the crisis, such as the closure of national parks and the setting of carrying capacity for parks nationwide, a ban on single-use plastic bags, and smart farming, etc. To address the COVID-19 pandemic and climate change efforts under the economic crisis, governments should select, re-prioritise, and create strategies and policies that will be successful in the short term and long term. New economic stimulus packages for resilient recovery under the economic crisis will demand sustained economic support, long-term thinking, and policies that include a focus on building back better to jumpstart local economies and enable a green recovery.

Thailand should propose integrating the concept of 'green initiatives' into the economic stimulus packages. Green initiatives are not only are better for the climate, energy, agriculture, natural resources, and the environment but also generate more jobs, delivering higher short-term rates of return and increasing longer-term savings compared to more traditional fiscal stimulus measures. Green initiatives that should be introduced and integrated into the economic stimulus packages apart from the NDC and the National Climate Change Master Plan (2015-2050) are discussed as follows.

4.1 Green initiatives for agriculture

Of Thailand's approximate 127 million acres of land, around 52% is suitable for agriculture. Agriculture in Thailand is a very competitive and diverse subsector. Since agriculture has been a major part of the country's development, the sector has provided many job opportunities for the Thai population. It employs 40%

of the country's labour force, making it part of the backbone of the Thai economy. In terms of the sector's impact on economic growth, the share of GDP from the agricultural sector is the smallest compared to other sectors. It generates 8.4% of the country's GDP by using the country's own technology, and its growth has been relatively slow. For climate change, agriculture is the second-largest GHG emitting sector in Thailand and is at the same time highly vulnerable to adverse climate change effects. More than 90% of agricultural households use machinery (Poapongsakorn and Chokesomritpol, 2020). Farm mechanisation has reached its saturation point where further increases in productivity become difficult. The introduction of technological change also faces difficulties.

The main purpose of the Thailand 4.0 development plan is to eliminate social inequality and pull the country out of the middle-income trap. This would require a seven-fold increase in the average annual income of farmers from B56,450 to B390,000 within the next 20 years – an extreme difficulty. It would require a drastic shift in strategy to encourage the adaptation and adoption of advanced technologies and innovations for farming in order to increase quality, uniformity, and efficiency.

4.1.1. Smart farming

Smart farming is a part of Thailand's 4.0 economic model, aiming to enhance the agricultural production and process with the use of technologies, big data analyses, satellite images, and digital components, such as remote sensing, geo-mapping, and drones. It can improve the entire production process of the agricultural sector from upstream to downstream and help with labour cost-saving for farmers, increasing quality produce, generating more income, reducing operating costs, and elevating the quality of life of people in communities. For farmers, it helps to quickly analyse crop growth and potential diseases and to harvest at the optimal time. It also minimises farming risk costs and, thus, it provides more profitability and cost-effectiveness. The market value of smart farming has been forecast to gradually increase. It amounted to around US$128.7 million in 2018 and was forecast to reach US$269.9 million in 2022 (Statista, 2020). However, before the pandemic, smart farming was gaining traction amongst only larger farming companies, such as the Mitr Phol Group, Betagro Public Company Limited, and Charoen Pokphand Group.

In light of the long-term structural changes in the post-COVID-19 era, one of the long-term strategies is the enhancement of innovation-driven agriculture, which can serve as a new economic engine for local populations. When the agricultural sector is strong, domestic consumption will be robust, sustaining the Thai economy. The government has introduced measures worth around ฿300 billion to help the 300,000 farmers affected by the COVID-19 outbreak (Parpart, 2020). Some of the measures will be allocated for the development of 200,000 new farmers under the government's smart farming policy. People who were let go during the outbreak have decided to return home to their provinces and take up farming. The measures are meant to support them and include the following:

A direct subsidy with a budget of ฿10.7 billion for 300,000 existing farmers and 200,000 new farmers who are looking to invest in the development of their farmland.

A budget of ฿22 billion for 16,000 community enterprises to use for investment in water management, mills, machines, and innovative technologies. The Bank for Agriculture and Agricultural Cooperatives (BAAC) will invest in only 50% of the projects that have been approved with a limit of ฿5 million per enterprise. It will also come with a loan budget worth ฿70 billion.

A budget of ฿21.68 billion for 7,255 farmer institutions to invest in processing and logistics, as well as helping the farmers make valuable market connections. This will also come with a loan budget of ฿20 billion.

However, smart farming still requires a strategic plan, massive subsidies, and technical and digital technology by the government.

4.1.2 Increasing ethanol production from biomass

Before the pandemic, the government wanted Thailand to become an ethanol hub and promote the bioeconomy. During the pandemic, the ethanol industry has also suffered from the economic downfall due to the curfews and urban and provincial shutdowns, as well as social distancing, resulting in a decrease in the use of petrol. During the period when the pandemic was at its peak, the amount of ethanol use decreased from 4.33 million litres in January 2020 to 4.30 million litres, 3.97 million litres, and 2.92 million litres daily in February, March and April, respectively (Sugar Asia Magazine, 2020).

Fortunately, the Thai government responded to the situation quite fast by permitting ethanol manufacturers to change the formula of ethanol used as a fuel to one used as a disinfectant. After the lenient measures were announced, ethanol-based fuel use increased from 2.92 million litres daily in April to 3.49 million litres daily on 17 May 2020. In other words, it was approximately 79% of the average amount used per day before the pandemic.

The Thai government aimed to promote biofuel and boost incomes for farmers who grow energy-based plants by cancelling gasohol 91 production since 1 June 2020 and announcing gasohol E20 as an oil-based benzene so that oil sellers had enough time to prepare for cancelling sales at gas stations. The cancellation was effective from 1 September 2020 onwards. After the effective date, the use of ethanol was expected to reach 7 million litres daily from 4 million–5 million litres per day. The trends in Thailand's ethanol industry after the COVID-19 pandemic seem positive.

4.1.3 Thai Rice NAMA

Rice is cultivated on roughly half of all agricultural land in Thailand and accounts for nearly 55% of emissions from agriculture. Thailand is the world's fourth-largest emitter of rice-related GHG. In irrigated rice production, the flooding of paddy fields leads to significant emissions of methane. Thai Rice NAMA, funded by NAMA Facility in 2018, is a joint project with the Thai government to encourage local small-holder

farmers to implement low-emission rice farming and make mitigation services and technologies accessible to farmers (NAMA Facility, 2020). NAMA Facility provided financial support totalling about ฿530 million (€14.9 million). This project will remain in effect until 2023 and aims to work with 100,000 local rice farmer households to help them shift from conventional to low-emission farming.

As a financial ambition, it expects to generate an additional €21.5 million in direct financial investments from the private sector for the implementation of innovative financial incentives. The government has currently earmarked at least another €25 million annually in agriculture- and mitigation-related areas. Farmers can cover the switching costs through an interest-free loan from the project's revolving fund, which is administered by the BAAC. The project is expected to reduce 1.73 Mt CO_2-eq, reducing baseline emissions from irrigated rice by more than 26%. As a result, farmers will be able to enjoy higher crop yields and reduced farming costs. An implementation strategy and model for four basic mitigation technologies (laser land levelling, alternate wetting and drying, site-specific nutrient management, straw and stubble management) and integrated pest management have been developed.

Although this concept is good and related to GHGs emission from rice farming, it is a joint project during 2018–2023. After 2023, the question is how to incorporate it into policy and implementation. A lack of incentives available to farmers would prevent the transition to low-emission rice production practices.

4.1.4. Bio-Circular-Green economic model

The Bio-Circular-Green (BCG) economic model has been promoted as a new economic model for inclusive and sustainable growth and introduced as the development standard for Thailand in maintaining sustainable development over the next 5 years, especially in coping with the consequences of the COVID-19 pandemic (Office of National Higher Education Science Research and Innovation Policy Council, 2020). The BCG model capitalises on the country's strengths in biological diversity and cultural richness and employs technology and innovation to transform Thailand into a value-based and innovation-driven economy. The model also conforms with the SDGs and is intended to align with the Sufficiency Economy Philosophy, which is also a key principle of Thailand's social and economic development. This model will help promote employment in the farming and food industries, health and medical industries, energy industry, materials and bio-chemical industries, tourism industry, and creative industry. The business sector has expressed support for this economic model, which is expected to help create millions of jobs in the near future.

The BCG model is applied to focus on promoting four industries: agriculture and food; medical and wellness; bioenergy, biomaterials, and biochemicals; and tourism and the creative economy. Science, technology, and innovation will be employed to enhance the capacity and competitiveness of players in

the value chain, both upstream and downstream, in all four industries, coupled with innovative policy and supportive legal and financial measures. At present, these four industries have a combined economic value of ฿3.4 trillion, accounting for 21% of GDP, and represent 16.5 million workers. It is expected that the BCG model can raise this number to ฿4.4 trillion (or 24% of GDP) in the next 5 years.

The Board of Investment (BOI) is offering an exemption for corporate income tax for up to 8 years to a comprehensive range of agricultural biotechnology industries. Eligible sectors under the incentive programme include plant and animal breeding, economic crop plantation, bio-fertiliser production, animal husbandry, food production, and more advanced agricultural biotechnology, such as active ingredient and medical food production. To promote the BCG model, the BOI offers 5-year tax incentives to plant factory projects. The technology is aimed at aiding the steady production of high-quality plants all year round by controlling the cultivation environment. Moreover, the BOI has increased tax incentives to encourage the adoption of environment-friendly technology, innovation, and sustainable development by businesses, including for pet food and animal feed production, grading, and packaging, the storage of farm products, and production from agricultural waste. The BCG model can create value addition as follows:

- Food and agriculture. The goal is to migrate from low-value commodities to value-added and premium products, as well as diversify products.
- Medical and wellness. The goal is to build capacity for drug and biopharmaceutical production, medical devices and implants, and precision medicine and become a hub for healthcare services and clinical research. Platforms to facilitate the utilisation of genetic data as well as clinical research amongst the involved parties, including researchers, industry, and regulatory bodies, will also be established.
- Bioenergy, biomaterials, and biochemicals. The goal is to achieve energy security and convert biomass to high-value commodities. The energy sector can benefit from advanced technology in energy produced from renewables, as well as the establishment of community-based power plants with a distributed energy resources system using renewable energy sources, including biomass and biogas, connected through block chain-enabled smart micro-grids. As for the materials and biochemicals sector, cutting-edge technologies will be developed and employed to convert biomass and agricultural by-products to high-value commodities, such as bioplastics, fibres, and pharmaceuticals.
- Tourism and the creative economy. This sector aims to develop sustainable tourism and the tourism destination management system, conserve the environment, and link tourism with other service industries in order to advance to high-quality tourism, such as wellness tourism, culinary tourism, eco-tourism, cultural tourism, and sports

tourism. The Thai tourism industry can benefit from policies to promote secondary cities and communities as new tourist destinations. Technology and innovation will be applied to create and upgrade infrastructure and a digital platform to improve tourists' convenience and experiences and advance the industry to high-quality tourism. Science and technology will be employed to define national guidelines for tourism, e.g. carrying capacity, support a sustainable tourism standard system, and conserve and rehabilitate the environment. Under the creative economy concept, tourism can be linked to other service industries to target niche markets, such as wellness tourism, culinary tourism, eco-tourism, cultural tourism, and sports tourism.

The BCG model will target the following groups: start-ups, innovation-driven enterprises, smart farmers, high-value service providers, deep technology developers, and creative entrepreneurs. The BCG strategy consists of four drivers and four enablers, involving close collaboration amongst the government, industry, communities, academia, and international organisations. However, the government has to work hard and take time, and the four important enablers for the BCG are:

1. BCG regulatory framework. This enabler aims at reviewing and making amendments to laws and regulations in order to build an innovation ecosystem, support a technology sandbox, and enable product life cycle assessment.
2. BCG infrastructure and facility development. The following facilities will be developed and supported: bio-banks, national quality infrastructure, pilot and demonstration plants, and high-performance computing facilities and high-speed internet.
3. BCG capacity building. This enabler aims at developing manpower in various fields and at all levels, from students to the current workforce. The fields that will be in demand in the BCG model include taxonomy, system biology, bioinformatics, life sciences, computer engineering, and data science.
4. BCG global network. Collaboration with international partners will be developed in the form of research collaboration, technology demonstration, technology localisation, and joint investment.

4.2 Green initiatives for the energy sector

4.2.1 Community-based power plants

To stimulate the grassroots economy and promote the country as a liquefied petroleum gas trading centre, community-based power plants are being promoted. Thailand issued new Community Power Plant Project Procurement Regulations detailing the eligibility criteria and terms and conditions for Power Purchase Agreements for Very Small Power Producers (VSPPs) on 2 April 2020 (Pantumkomon, 2020). The regulation is part of the Electricity Generating Authority of Thailand's (EGAT) Energy Policy for the Local Economy and aims to bring waste-to-power generation

to each local community, turning municipal waste to fuel or utilising local agriculture or forestry-based biomasses. In order to qualify as a VSPP, a power producer must generate no more than 10 MW per project and must comply with the requirements and restrictions. These VSPPs may only use one of the following: biomass; biogas from wastewater or waste; biogas from biofuel; a hybrid of biomass with biogas (from wastewater or waste); or a hybrid of biogas (biofuel) with solar power.

During the pandemic period, community-based power plants and waste-to-energy for local communities have still had heavy support from the government since they can accelerate investment. Investment in community-based power plants will stimulate the grassroots economy. All these projects should commence operation in 2022 using the PPP model. The estimated investment is US$8 million–US$12 million for each project, with most of the funding coming from state enterprise-run investment companies.

An example is biomass community-based power plants, which may help farmers to enjoy the maximum benefit from selling agricultural waste, in particular agricultural-based materials collected from their farms that have not been fully utilised. Th government is also trying to promote the operators of community biomass power plants to bolster income for farmers. The use of biomass from farms alone, however, may create a restriction in terms of the size of a power plant to be invested in. Therefore, using biomass from both farms and agricultural processing plants, plus establishing a joint venture between local residents and the owners of agricultural processing plants, may be a viable guideline to allow operators to meet their business goals whilst responding to the purpose of a community power plant project, i.e. to create wealth for farmers. Operators of hybrid biomass community power plants may enjoy higher annual profits and shorter payback periods. A 3 MW hybrid biomass community power plant generally generates profit of roughly B14.6 million, and its payback period is 8.2 years, whilst a 10 MW power plant generates profit of around B57.1 million, and its payback period of 7 years (KResearch, 2020c).

4.2.2 Promoting B10 biodiesel as the standard biodiesel for domestic consumption

Biodiesel blended with diesel and gasoline fuels will be an important step towards energy stability and sustainability for Thailand. It will generate the following benefits: stabilise the price of palm oil; absorb two-thirds of crude palm oil in domestic stock and reduce the use of petroleum-based diesel; allow people to use higher-quality fuel at a lower price; and reduce the air pollution caused by PM2.5. Demand for biofuel has increased, supported by the pricing mechanism and the increase in the number of biofuel-powered vehicles.

On 1 January, 2020, B10 diesel was adopted as the standard fuel. However, the promotion of E20 gasohol to that status was postponed from September 2020 due to the economic situation resulting from the effects of the pandemic. When the above factor is rectified, biofuel

consumption will likely be sustained in the future. This is because every 1% increase in B10 diesel consumption will bolster its demand by approximately 340 million litres, and every 1% increase in E20 gasohol consumption will push its demand by around 60 million litres. In addition, biofuel should be promoted as helping to reduce the emission of small dust particles by 15% and PM2.5 by 5%. Such efforts should help promote sustainable growth in biofuel going forward.

4.2.3 Continue to support the electric vehicle market

In March 2020, the government announced a policy to make Thailand a regional hub of electric vehicles in 5 years. A roadmap for the production of electric vehicles – to begin within 3 years – will be finalised this year. The strategies include electric vehicle use by governmental organisations and state enterprises and the introduction of electric buses and electric motorcycle taxis. Markets will be built in relation to vehicle demand and charging stations. There will be promotional privileges for both vehicles and batteries. This electric vehicle business expects to employ approximately 890,000 people; the country is gearing up for a national electric policy and for attracting foreign direct investment.

Ultimately, the target is to produce 750,000 electric vehicles out of a total of 2.5 million cars made annually by 2030. The government is already building facilities, such as charging stations, electric systems, and electric vehicle car technology. The government is planning to install about 2,000 charging stations 50 kilometres apart nationwide. The plan for electric cars, motorcycles, and buses is part of the strategy to cut the levels of PM2.5 air pollution that have plagued the country. The government intends to promote the recycling of materials to achieve a systematic vehicle management mechanism.

The goals of the development plan for the electric vehicle industry are, in the short term, to produce more than 60,000-110,000 electric vehicles, including public buses and electric motorcycles, whilst the medium-term goal is to produce about 300,000 electric vehicles and smart city buses.

Some measures are under discussion, such as for encouraging people to exchange their old cars for new ones, offering tax incentives for individuals and companies to exchange their old cars for new cars or electric vehicles, and providing trade-in coupons worth B100,000 each for individual car owners, who can also reduce the taxes from their car expenses. The trade-in coupon scheme will be open to all types of car models, including electric vehicles, and will run for 5 years, which will help restore the Thai automotive industry. This is a quick-win project to help the car manufacturers and related businesses that have been affected by the impacts of COVID-19.

Electric vehicles are expected to become more popular, as the industry is one of the targeted S-curve industries supported by the government. In March 2017, the BOI introduced electric vehicle privileges for car and auto component makers covering three types of electric vehicles, namely hybrid, plug-in hybrid, and battery-powered vehicles.

4.3 Green initiatives for the environment

4.3.1 Banning of seven plastic items and types

From 1 January 2020, Thailand began a campaign to ban single-use plastic bags under the Plastic Waste Management Road Map 2018-2030 of the Pollution Control Department. This will affect the supply chains of the plastic bag industry but create opportunities for other substitute merchandise. Around 45 billion single-use plastic bags were used annually. During the initial stage, the amount of single-use plastic bags will be reduced by at least 29%, or around 13 billion pieces, because they are no longer available in department stores, convenience stores, fresh markets in regional cities, and grocery stores in some locations. By 2022, the amount of single-use plastic bags is set to further drop by at least 64%, or 29 billion pieces, when more businesses in the fresh markets, private sector, street vendors, and grocery stores join the campaign.

The decreasing plastic bag consumption will affect operators in the supply chains for both big operators and SMEs, and they will need to brace for challenges. The government should help them by launching measures to enable them to adapt to the changes during the transition period, especially for SMEs in terms of funding, marketing, and technology. However, since a grocery bag is a necessary item in consumers' daily lives, the economic impact from the reduction of single-use plastic bag consumption will represent a gain of B2.191 billion because it creates business opportunities for eco-friendly substitutes to replace single-use plastic bags, especially thick plastic bags, cloth plastic bags, and cloth bags (KResearch, 2020a). It is expected that the demand for these bags will reach 410 million pieces, translating into a value of around ฿4.63 billion.

In 2022, the overall single-use plastic bag market is expected to fall to negative territory, at ฿295 million, because the eco-friendly substitutes have a longer useful life, hence decreasing the frequency of purchases. Although the net impact of the single-use plastic bag market will contract in the future, the issues related to environmental sustainability are far more important and cannot be evaluated in monetary terms.

This action plan was introduced including measures to crackdown on the use of seven plastic items and types: cap seals, oxo-degradable plastic, microbeads, single-use plastic bags, polystyrene (styrofoam) food containers, plastic cups, and straws. In 2020, the measures only for single-use plastic bags were started and are going well. However, measures for the other six plastic items and types should be introduced as green initiatives because apart from the environmental benefits, they are a good opportunity for establishing new businesses and creating green jobs.

4.3.2 Reducing GHG through e-commerce

Working from home has reduced the need for transportation, cutting both financial and environmental costs. Online shopping cuts investment and transaction expenses, benefiting

both business operators and consumers. Internet banking and e-commerce have also reduced production and labour costs. The 'new normal' has helped to stimulate growth for online retail stores. Even though the COVID-19 pandemic is partially responsible for reinvigorating the growth of the online retail market, it has also triggered a decline in consumers' purchasing power, which is not expected to recover anytime soon. Therefore, KResearch stands by its prior projection that the online retail market – business-to-customer (B2C) e-commerce (for products only) – will expand at approximately 8%–10%, reflecting a slowdown in comparison to the 20% expansion rate of 2019 – or an estimated market value of ฿300 billion–฿320 billion, which would account for a 7.7% share of total retail market (KResearch, 2020b). E-commerce or online retail stores have a high impact on GHG reductions, the people's lifestyles, and employment; however, there are no studies on the details of the impacts.

4.3.3 Promoting eco-friendly food and beverage packaging

The packaging waste crisis has worsened in line with the increase in consumption, growth of convenience food, and massive expansion of food delivery services during the period of semi-lockdown measures to counter the spread of COVID-19. More than half of all packaging waste comes from food and beverages, a majority of which is plastic packaging that is not properly sorted or disposed of. This situation shows that Thailand is in dire need of adjusting its production and encouraging consumers to reduce packaging waste. At the same time, an overhaul of the waste management system would likely help eco-friendly packaging to grab a larger share of the market.

During the pandemic, businesses are facing an economic contraction that has forced many to cut costs by turning to lower-priced conventional packaging. The market value of eco-friendly food and beverage packaging is still projected to grow 25% from last year to around ฿2.1 billion–฿2.4 billion, although the rate is much lower than that of 2019, which saw almost twice as much growth. Nonetheless, its market share for 2020 increased from around 1% to 2% of the total market value of the food and beverage packaging industry.

Over the next 5 years, businesses that produce eco-friendly food and beverage packaging will likely be able to carve out a larger share of the market, benefiting from consumers' environmental awareness and conditions that support production, such as investment promotion measures, the availability of alternative raw materials, and government measures aimed at the creation of an effective packaging waste management system. The market turnover of eco-friendly food and beverage packaging will likely be in the range of B13 billion–฿16 billion in 2025, bringing the market share up to a range of 8%–10% of the total market value in the food and beverage packaging industry.

The adaptation of Thai business operators, particularly manufacturers of plastic packaging (the most used material in packaging), will likely prove beneficial to the eco-friendly packaging market as a whole. It

is expected that there will be a supporting mechanism that will spur the continuous development of Thai business operators in order to achieve the goal of packaging waste reduction and to create a guideline for sustainable consumption. This development will also be in line with changes in the global market, whether it be more stringent packaging standards, a move towards using recycled polyethylene terephthalate (PET) and recycled polypropylene (PP), or an investment in the bioplastic, polylactic acid (PLA), which is more environmentally friendly.

4.3.4 Policy for supporting sustainable business management

Under the economic conditions where the business sector is facing hardships from the COVID-19 pandemic, businesses are compelled to give top priority to their own survival and risk management. Based on the ranking of the Environmental Performance Index (EPI) for 2020, Thailand needs to continually raise its standards of societal and environmental management. Thai businesses and the government should give support together for business survival and improving environmental issues, including PM 2.5, water management, and drought.

Sustainable business management is a mechanism to steer the economy and society towards the future. However, adjustments and improvements may accumulate the incremental costs for businesses. Therefore, to improve the EPI assessment for Thailand, sustainability public policies for supporting sustainable business management should be set to reflect a competitive advantage and comparatively lower financial costs.

Businesses should consider two key factors that could benefit forward-looking businesses, namely (1) marketing opportunities based on next-generation consumers who are willing to pay more to promote environmental protection; and (2) pressures from non-tariff measures that are aimed at raising product quality and protecting consumers. Target businesses that trade in agricultural products, food, energy, logistics, chemicals, and plastics are major players that may need to quickly adjust themselves for long-term sustainability.

4.3.5 Sustainable tourism

A huge challenge awaits Thailand as plans are afoot to open up the country to rescue the tourism industry. The tourism industry is the country's biggest income earner. But the massive influx of tourists far exceeds the carrying capacity, which has had heavy toll on the natural environment. The COVID-19 pandemic has brought the tourism industry to a standstill, destroying businesses and millions of jobs. But the rapid regeneration of nature in just a few months during the lockdown has also shed light on how to strike a balance between the short- and long-term gains towards sustainable tourism when the country is ready to move on again. The drop in tourism may also allow officials an opportunity to assess the hidden costs of mass tourism, including pollution, groundwater contamination, and infrastructure.

In 2021, the Tourism Authority of Thailand (TAT) launched a tourism

recovery strategy aimed at promoting safe and sustainable travel in Thailand's new normal post-COVID-19 era, under the 'SEXY' tourism concept during 2021–2022 (TAT Newsroom, 2021). This concept is in response to the changes in travel behaviour and TAT's goal to restore Thailand's tourism: S – safety and hygiene as a matter of good public health safety; E – environmental sustainability as a sustainable tourism development, X – extra experiences (meaning extra public health safety, reflecting Thailand's ability to control the epidemic), and Y – yield as a high-value form of tourism from the group of people with high-spending potential. This also reflects TAT's existing strategy to move the Thai tourism industry out of mass tourism and towards responsible tourism with an emphasis on revenue-generating quality tourists. Together, TAT and Thai tourism stakeholders will reshape the image of Thailand with core messages highlighting the importance of safe and sustainable travel.

However, the meaning of sustainable tourism is not clear from TAT. It is important for Thailand not to let its natural resources be ruined once again by environmentally destructive mass tourism. The government should create a new normal that prioritises the sustainable use of natural resources. Sustainable tourism is the sustainable use and management of natural resources and tourism not only to serve the national economy but also the local people's way of life whilst preserving the natural resources. Sustainable tourism models cover protecting biodiversity, linking supply chains with markets to strengthen the network of community food management, working with SMEs to support green technology to jumpstart the local economy, and supporting dialogue with youth to showcase innovations that have created jobs.

The quick recovery of natural resources and wildlife following the reduction in tourists and tourist activities after the COVID-19 pandemic shows that sustainable tourism is the way to go. The government needs to speed up sustainable tourism and mete out concrete measures to ensure that the natural resources remain healthy and secure for long-term use. Sustainable tourism can be achieved through various measures to ensure that tourism does not exceed the carrying capacity. For example, by restricting the number of tourists and regulating activities through strict zoning, be it for accommodation, food selling, or tourism activities. The number of hotels and other accommodations must be limited under the carrying capacity. The annual closing of national parks is also necessary to allow nature to recover. All this is to allow tourist locations to generate income for the national economy whilst sustaining the health of natural resources.

4.3.6 Reducing food waste and food loss

Reducing food waste and food loss is the solution with the highest potential impact due to the high GHG intensity and land use emissions in food production and animal agriculture. In 2017, about 64%, or 17.56 tonnes, of total garbage was food waste, and only a tiny amount was recycled. The Bangkok Metropolitan Administration is able

to recycle only 2% of the food waste collected. The rest goes to landfills.

The government needs to set rules and regulations on hygiene standards, such as on temperature during the transport of foodstuffs. Collection, sorting, and treatment systems should be set up in line with the lifestyles of people. Waste collection fees should be adjusted to reflect real costs by charging according to the quantity and weight of each household's trash. Each community should have its own food waste recycling centre to help families and small businesses make organic and biological fertiliser.

4.4 Digital transformation key to improving operational resilience

Private businesses have invested heavily in technology during the lockdown period, and they are betting on major dimensions of digital transformation to make their companies more operationally resilient, agile, and customer-focused. They focus highly on cloud technology, web technology, and mobile applications, which are relatively matured and less complicated compared other technologies. Data analytics is in a unique position and will be increasingly implemented within a year. However, blockchain, artificial intelligence, and Internet of Things are not well-adopted, owing to the investment required and a lack of employee skills. Businesses with high innovative and progressive cultures often subdue the importance of the return on investment by thinking big and bold but starting with smaller initiatives to scale up in the longer term. This is a good opportunity for companies to invest in new technology to increase efficiency and upskill their staff with technology skills. Tax incentives, the easing of regulations, and well-established infrastructure are the most popular demands from the government. Hence, the government should improve the digital business environment in Thailand by focusing on these issues, reforming education systems, and emphasising the importance of data science skills.

The green economy should be a part of recovery packages. Stimulus packages should be directed to businesses or industries that are low-carbon, resource-efficient, and aligned with environmental and climate objectives. They could be used to promote standards and policies that tackle climate change, air and water pollution, and biodiversity loss. Implementing carbon pricing and removing fossil fuel subsidies can unleash low-carbon investment and jobs. Tax incentives and smart de-risking investments should support climate and environmentally friendly technologies, such as renewable energy and energy efficiency.

5. ASEAN Cooperation on Integrating the Concept of 'Green Initiatives'

Biodiversity and climate change are important and related because climate change is one of the main culprits that drive the loss of nature. Without healthy biodiversity, protection against climate change would be an impossible achievement. Biodiversity and its ecosystem services support the principal efforts to tackle climate change and its impacts. Malaysia has prioritised its NDC and has been working towards it through supporting various adaptation measures.

Indonesia is using the knowledge and wisdom of its indigenous peoples and local communities to strengthen climate change adaptation and biodiversity conservation. Therefore, ASEAN could use the recovery opportunity of the pandemic as what has been called 'the great reset or recovery strategy' by pushing for more cross-sectoral and cross-pillar cooperation and moving towards low GHGs emissions; climate-resilient, resource efficient development and a circular economy; enhanced food, energy, and health security; and digital transformation.

Sustainable connectivity, as one example, can mitigate the impact of and support a robust socio-economic recovery from the pandemic, enabling the ability to build back better, greener, and in a more sustainable, inclusive, and resilient manner. ASEAN should welcome the development of quality infrastructure investment and its contribution towards affordable, reliable, and sustainable connectivity in all dimensions, such as energy, transport, and smart cities. To support sustainable connectivity, ASEAN should also welcome the financial resources, investors, and supporters from private sector, the International Monetary Fund, international investors, and multilateral and regional and development banks.

For energy, ASEAN should commit to supporting infrastructure investments and energy innovations, with a view to achieving a safe, sustainable, and affordable energy transition, including renewable energy, and promoting efficient regional energy markets. The energy connectivity includes the interconnected power grids, smart grids, and sustainable cross-border power trade.

For sustainable transport ASEAN needs to continue enhancing sustainable transport connectivity through integrated intermodal and multimodal systems and by strengthening the safety, security, and sustainability of transport, taking into account fiscal and environmental sustainability.

In addition ASEAN has agreed to strengthen cooperation in the development of 'smart cities', including the ASEAN Smart Cities Network, the ASEAN Sustainable Urbanization Strategy, and the Smart Green ASEAN Cities programme. The unity of ASEAN policy on green initiatives and sustainable connectivity such as biodiversity, energy, and climate change, etc. will strengthen the spirit of the ASEAN community and the negotiation power of the group.

6. Conclusions and Recommendations

To ensure that the challenges related to the COVID-19 pandemic are effectively addressed and for incorporating climate change efforts in Thailand, comprehensive reforms should be developed for the addressing health, economic, and environmental issues to recover from the pandemic and to rebuild for a more equitable, just, and resilient society. The reforms should comprise the expansion of welfare and the dispersion of cash in order to address the challenges related to the COVID-19 pandemic, natural resources, and environment problems, including common events such as droughts, air pollution, and forest fires. The relief

package should allocate appropriate budgets for the health sector, the agricultural sector, energy, climate change, and the environment.

A resilient recovery will demand sustained economic support, long-term thinking, and policies that include a focus on building back better to jumpstart local economies and enable a green recovery. Several green initiatives need incentives, subsidies, technical support including digital technology, monitoring and evaluation from the government, and investment from the private sector.

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Chapter 12

Low-carbon Green Recovery from the Pandemic in the United States

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Chapter 12: Low Carbon Green Recovery from the Pandemic in the United States

1. Setting the Scene: From Pandemic Crisis to Systems Change

1.1. Pandemic situation

The United States (US) declared COVID-19 to be a public health emergency on 31 January 2020 (HHS Press Office, 2020). As of 31 December 2021, the country has had nearly 55 million cases, over 450,000 of which were recorded within the preceding 7 days (US CDC, 2022). Roughly 823,000 people have died, with some models estimating that domestic fatalities will surpass 900,000 in early 2022 (US CDC, 2022; Institute for Health Metrics and Evaluation, 2022).

To date, containment measures have varied by state and even by county. In March and April 2020, many places in the country implemented 'stay-at-home' orders, heavily restricting both business and travel activity. However, these orders have subsequently been rolled back and many (but not all) state- and local-level governments have instead turned to more targeted interventions. Such interventions include limiting the size of public gatherings, restricting the operations of certain entities (e.g. restaurants, gyms, and schools), and requiring the use of masks in various situations; the restrictiveness of these interventions is then fine-tuned based on factors such as local outbreak and hospitalisation trends. Although the US Centers for Disease Control and Prevention (US CDC) has offered guidance on how to operationalise these and other related interventions, no nationwide order has been mandated.

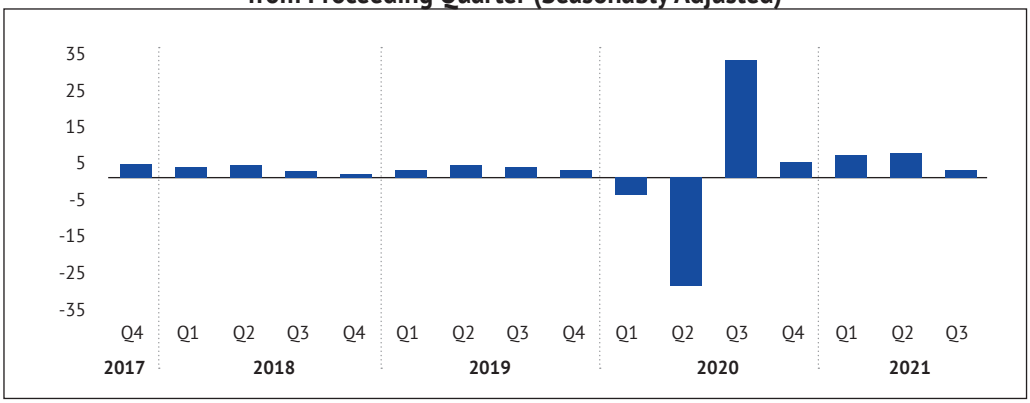
Breakthroughs in the viability and availability of several vaccines have also provided communities with additional tools for combatting the virus' spread. However, vaccination rates continue to vary widely across the country, as does adherence to certain practices, such as social distancing and the use of masks. When coupled with continued (and in some cases, growing) strains on healthcare infrastructure, this suggests that for the US, the pandemic remains a crisis that is both ongoing and likely to result in additional longer-term societal impacts. An essential first-order task for the US thus remains getting the outbreak under control; anything short of this will further exacerbate human suffering and undermine efforts to promote economic recovery.

1.2. Economic situation

COVID-19 has had a profound impact on the US economy. As shown in Figure 12.1, US gross domestic product (GDP) fell at an annualised rate of 31.4% between April and July 2020, in what some analysts have characterised as the 'biggest blow [to the economy] since the Great Depression' (US BEA, 2020a; Mutikani, 2020). Broken down by industry, GDP from private goods-producing industries fell 34.4%, led by decreases in durable goods manufacturing. Contributions from private services-producing industries also fell, by 33.1%, with steep declines in several areas (including accommodation and food services; transportation and warehousing; and entertainment), which were offset somewhat by increases in finance and insurance (US BEA, 2020a).

However, as early as mid-2020, signs of at least a partial economic recovery were already apparent.

Figure 12.1 Real Gross Domestic Product: Percentage Change from Proceeding Quarter (Seasonably Adjusted)



Source: US BEA (2020a).

With the easing of stay-at-home orders, some business activities that had been postponed or restricted began to resume (US BEA, 2020b); the initial COVID-19 stimulus also began to reach impacted businesses and individuals during this period.[1] Subsequently, the US saw a sizeable rebound in its GDP growth in Q3 and higher-than-typical growth rates in each of the next 3 quarters. A return to a pre-pandemic level of real GDP is now anticipated to have occurred in mid-2021 (Wolfram, 2021).

Even so, the US' economic recovery has been uneven and is arguably still incomplete; key evidence here is the state of employment. Roughly 6.5 million people were recorded as unemployed in December 2021 – significantly less than peak unemployment in April 2020 yet still above the levels recorded in February 2020 (US BLS, 2021). As highlighted in Figure 12.2, employment in fields such as leisure and hospitality, government, and even education and health services all remain well-below February 2020 levels – to the extent that despite seeing job growth in some areas (e.g. transportation and warehousing), US nonfarm employment is still down 2.87 million jobs overall since the onset of the pandemic (US BLS, 2022).[2] Meanwhile, although teleworking continues to enable new patterns in and opportunities for work, several studies have cautioned that this trend alone is unlikely to support a full rebound in employment. Amongst other reasons, this is due to modelling suggesting that only one-third of the kinds of jobs typically available within the US can be done remotely (Dingel and Nieman, 2020; Guyot and Sawhill, 2020).

Looking to the energy sector, in particular, disruptions in travel, supply chains, and regular business

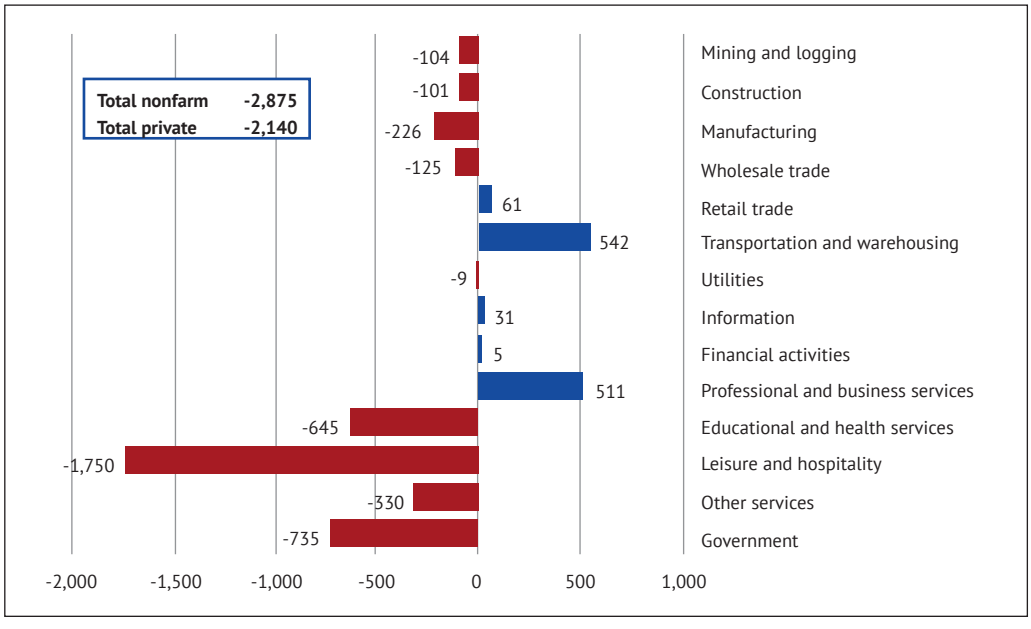
[1] More on US COVID-19 relief is explored in Section 3 of this chapter.

[2] Some of this shortfall likely reflects challenges in filling otherwise available positions (e.g. nursing and elder care have seen an increase in people quitting their jobs to then exit these sub-fields). Even so, given that unemployment overall remains elevated, this suggests a potential mismatch in the labour market that will need to be addressed.

patterns have had a pronounced impact on its employment situation. Prior to the pandemic, this sector was one of the US' fastest growing job markets. Yet, the US Department of Energy (US DOE) estimates that the sector shed roughly 1.4 million jobs in the first half of 2020; even with a notable recovery in the second half of the year, sector employment remained 840,000 jobs below its pre-pandemic peak as of year-end 2020. Of these losses, energy efficiency jobs made up the largest volume (271,700 jobs), followed by those tied to motor vehicles (231,200 jobs) and fuels (211,200 jobs). A similar study for 2021 has yet to be finalised but is expected to show that a full recovery in sector employment remains elusive (US DOE, 2021).

These energy sector trends have important implications for the shape of the US' wider economic recovery. More precisely, studies have argued that 'building back better' from the crisis continues to require policy attention on both improving the resiliency of currently struggling firms and promoting expansion into areas that show strong potential for growth (Baily, 2020). How these considerations apply when thinking about US energy outlooks is thus explored in the next section.

Figure 12.2 Changes in US Nonfarm Employment Between February 2020 and January 2022 (Seasonally Adjusted, in Thousands)



Source: US BLS (2022).

2. Low-carbon Green Growth During the Pandemic

2.1 Energy consumption and CO2 outlooks

Going into 2020, the US Energy Information Administration (US EIA) had projected that US carbon dioxide (CO_2) emissions would decline slightly over the course of the year, even as the country's overall energy consumption increased (US EIA, 2020a).[3] Yet as might be expected, since the onset of the pandemic, US energy demand patterns have undergone a series of dramatic changes; some of which may ultimately prove to be purely near-term phenomena.

Amongst these shifts, the US EIA notes that energy consumption in the transportation sector fell by 15% in 2020 as travel restrictions and avoidance severely curtailed demand. Dampened business activities and the shift towards remote work also drove decreased energy consumption in the commercial and industrial sectors, by 7% and 5%, respectively. Meanwhile, whilst stay-at-home orders led to more people spending more time at home, a relatively warm year encouraged less use of home heating. Residential consumption thus also fell, though by a relatively modest 1% (US EIA, 2021f).

The collective impact of these shifts was that between 2019 and 2020, total US energy consumption fell from 100 to 93 quadrillion British thermal units ('quads'), the largest recorded decrease in the US EIA's 60-year history (US EIA, 2021f). As part of this, consumption of all fossil fuels declined, with especially steep year-on-year declines in petroleum (-13%) and coal (-19%) (US EIA, 2020f).[4] Notably, analysis by the US EIA has suggested that for coal, this level of decline was due to not only a decrease in overall US electricity consumption but also an increase in the rate of switching within the power sector (US EIA, 2021d). Indeed, a key departure from otherwise downward consumption trends in 2020 can be seen in US demand for cleaner power, with both wind and solar consumption ultimately seeing a net increase during this period (US EIA, n.d.).

Correspondingly, US CO_2 emissions decreased in 2020 by 570 million metric tonnes (a roughly 11% year-on-year decrease) (US EIA, 2021h). However, this level of emission reduction is anticipated to be short-lived. To this point, the US EIA estimates that US CO_2 emissions rose by roughly 300 million metric tonnes (or 7%) in 2021 as economic activity continued to recover (US EIA, 2021c). This is not to say that COVID-19 has had no longer-term impact on US energy consumption patterns – indeed, decarbonisation of the power sector appears to have sped up as gains by wind and solar continue to prove resilient. Rather, this level of emissions rebound highlights that in the near term, some sectors (e.g. transportation and industry) have more limited means by which they can pursue

[3] A key assumption here was the role of continued fuel switching in the power sector, based on increasingly favourable economics for wind and solar, as well as the sustained competitiveness of natural gas.

[4] U.S. BEA. Gross Domestic Product, Third Quarter 2020 (Advance Estimate). U.S. Bureau of Economic Analysis (BEA). October 29, 2020. https://www.bea.gov/data/gdp/gross-domestic-product (accessed on November 1, 2020).

radical decarbonisation amidst rising energy demand.

Longer-term, US EIA modelling suggests that under a business-as-usual scenario, US emissions will decline through 2035 but then climb again through 2050. Key to this picture is that as trade and economic activity continue to increase, so will demand for transportation-related uses of energy. Although both efficiency improvements and the greater adoption of electric vehicles are anticipated to play a role in dampening energy demand and CO_2 emission growth, current trends here are assumed to be insufficient to peak oil demand before 2050 (US EIA, 2021a).

2.2. Production trends

US energy production was at an all-time high prior to the onset of the pandemic, reaching 101.4 quads in 2019 (US EIA, 2020d). Oil and natural gas accounted for roughly two-thirds of this total, representing a high degree of overall exposure to the industry in US production patterns. Even so, it is worth noting that production linked to renewable energy also recorded new highs in 2019 (US EIA, 2020a).

Both domestic and international markets are important destinations for US energy supplies. Thus, when global energy demand underwent an unprecedented drop in Q2 2020, many producers felt this shock both immediately and painfully. A particularly steep decline in transportation-linked demand, for example, led to escalating price-driven shut-ins of US oil production over the course of the year, with crude oil production falling 'from a peak of nearly 13 million barrels per day (b/d) in November 2019 to [an] average [of] 11.3 million b/d in 2020 and 11 million b/d in the first 10 months of 2021' (Cahill, 2021). Natural gas production likewise declined in response to market shifts and remains below 2019 levels. Coal production – already expected to decline during this period – also dropped off more than previously anticipated (US EIA, 2021b; US EIA, 2021a).

In contrast with the above, US renewable energy production has continued to hit new highs during the pandemic. Wind and solar have been the primary drivers of this increase, as domestic demand for both sources remained resilient and important new capacity installations came online in 2020 (including 15 GW of new capacity in offshore wind) (US EIA 2021a; IEA, 2021b). In turn, these positive gains meant that some areas of the clean energy sector even added new jobs in 2020, further bolstering outlooks for increasing clean energy production (US DOE, 2021).

Looking ahead, the US EIA anticipates that the current pace of recovery in US and global energy demand will enable US oil and natural gas production to return to their respective 2019 levels by 2023. After this point, production of both fuels is then expected to continue to hit record highs through mid-century. Key to this picture are expectations about robust demand growth in some foreign markets – particularly in parts of Asia – boosting oil and natural gas prices and making a case for increasing US exports (US EIA, 2021a).

Even so, it should be noted that US oil and natural gas players have had to adapt to weather the interim market shock, with 2020 seeing a rash of industry restructuring as a means of reducing operational costs (Cahill, 2021). This suggests that even as oil and natural gas production levels continue to recover, lost jobs in this sub-sector are unlikely to return at a matching pace.

Returning energy demand is also anticipated to support the case for increasing energy production from renewable sources. However, several caveats apply here as well when thinking about US industry futures. Amongst these is that 2020 was an important cut-off for several renewable energy tax credits – and, as such, some developers raced to complete relevant projects during this window (with the pace of new project completions expected to then slow in subsequent years). This suggests that the kinds of growth observed in US renewable energy production during this period may not be fully replicable absent new financial incentives or improvements in market conditions.

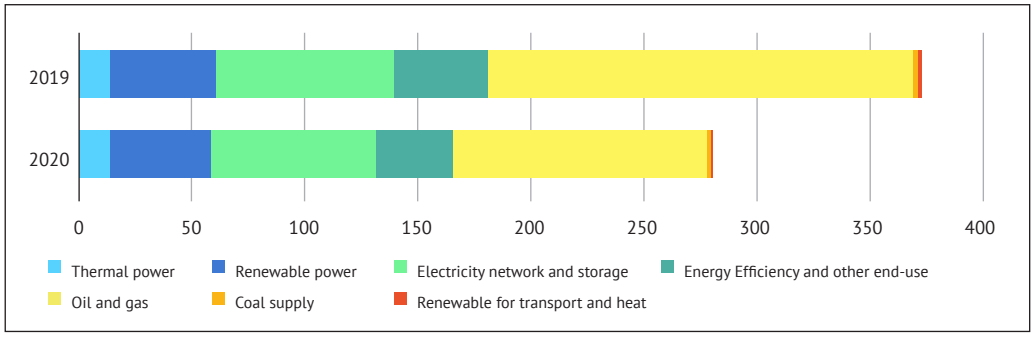
2.3. Investment trends

The International Energy Agency (IEA) estimates that US energy investment declined by 25% in 2020, primarily driven by the US' exposure to the oil and natural gas sector (IEA, 2020a). Investments by US shale companies, for example, underwent a particularly pronounced decline – 45% – driven by supply shut-ins as well as a 50% increase in shale financing costs; two factors which, even with restructuring efforts, still led to a surge of bankruptcies in the industry (IEA, 2020b). Meanwhile, clean energy investment also fell across the board. Energy efficiency investments, for example, declined from US$42 billion in 2019 to US$34 billion 2020, whilst investment in renewable power declined from US$46 billion in 2019 to US$44 billion in 2020 (IEA, 2020c). (See Figure 12.3 for more on US energy investment by sector.)

As of 31 December 2021, US energy investment has yet to return to pre-pandemic levels. However, investment has continued to rebound over the course of the past year as global energy demand outlooks improve and some paused US projects have been able to restart (IEA, 2021b). Encouragingly, some of the fastest recovery appears to be tied to renewable energy investment: solar PV investment, for example, is anticipated to have grown by over 10% in 2021 (IEA, 2021b). Meanwhile, in May 2021 the federal government also greenlit the construction and operation of the 800 MW Vineyard Wind project – the country's first such large-scale offshore wind project – sending a positive signal to investors about the future of offshore wind in the US (IEA, 2021b).

Even so, two concerns stand out when thinking longer term. First, both the US and the wider Asia-Pacific continue to struggle with underinvestment in basic energy infrastructure. If not addressed, this could limit the technical viability of greater utilisation of wind and solar energy – and have knock-on effects for how well US projects focused on new capacity installations at home and abroad are able to sustain their investment momentum. Second, the slower rebound in US oil and natural gas investment does not necessarily mean that US energy investment patterns are becoming

Figure 12.3 US Energy Investment by Sector (US$ billion)



Source: IEA (2020c).

'greener'. Tight operating margins here might ultimately mean, for example, reduced industry spending on researching and deploying clean consumption tools – narrowing the otherwise expected pathways for reaching net-zero emissions by mid-century and raising challenging questions about what recovery really means.

3. Composition of Recovery and Stimulus Packages

3.1 Overview

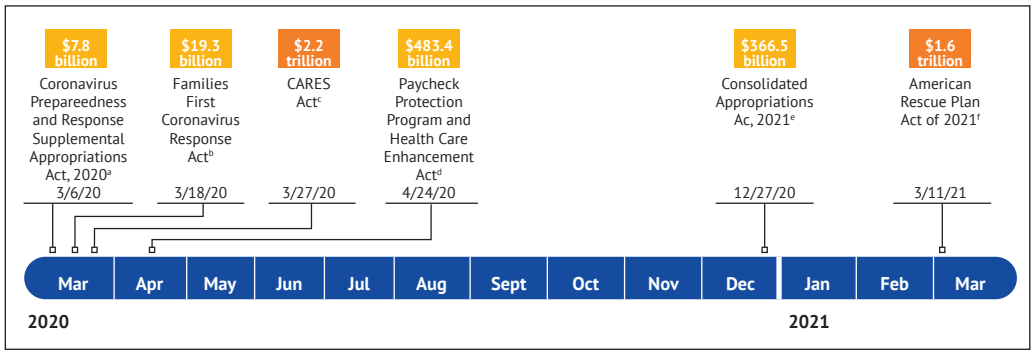
Figure 12.4 shows a timeline of US COVID-19 relief legislation to date. As of 31 August 2021, the US Government Accountability Office estimates that the US Congress had appropriated roughly US$4.8 trillion to COVID-19 relief, of which US$3.9 trillion had been obligated (US GAO, 2021b). Roughly 39% of these obligated funds are tied to unemployment insurance and individual cash payments, whilst business loan programmes operated by the Small Business Administration account for an additional 21%. (See Table 12.2 for a further breakdown of spending.) Although the US Congress is continuing to debate the merits of passing additional recovery legislation – including a proposed Build Back Better Act – the likelihood and specific composition of any next-round stimulus is unclear as of 31 December 2021.

Additional federal action to stimulate economic activity or provide relief has taken several forms. Select actions have included pausing student loan repayments, lowering federal interest rates (to 'support the easier flow of credit'), and approving targeted and blanket regulatory rollbacks (to 'boost the competitiveness of US industry') (IMF, 2020). Numerous state and local governments have also established their own supplemental initiatives, including establishing emergency grants and utility bill forgiveness programmes.

3.2. Energy sector-related COVID-19 relief

Initial rounds of US COVID-19 relief largely touched on energy sector concerns in only a broad sense, via making business loans, tax credits, and other relief available to struggling US firms generally.

Figure 12.4 Timeline of Federal COVID-19 Relief



Source: IEA (2020c).

To that end, several independent assessments have suggested that this approach enabled US oil, natural gas, and coal players to apply for substantial relief at an early date, with just 77 such firms receiving the equivalent of US$8.2 billion in benefits from tax code changes in the CARES Act alone (Butler, Mufson, and MacMillan, 2020; DeConcini Neuberger, 2020; Bailout Watch, 2021). Changes to US federal environmental protection rules (including on methane emissions) also reduced formal regulatory requirements on some domestic producers, although it is unclear whether firms have made noteworthy operational changes on this basis to date.

Clean energy players arguably benefited less from the federal government's initial approach to relief. For example, several notable tax code changes were designed to provide relief to US businesses via allowing them to request refunds on taxes paid in prior years. Such changes enabled sizeable tax credits for some deeply indebted oil and natural gas firms (who had otherwise recorded high profits in recent years) but had more limited relevance to renewable energy and energy efficiency firms (whose revenues saw less-extreme swings) (DeConcini and Neuberger, 2020; Kusnetz, 2021). Meanwhile, in May 2020, the Trump administration announced that it was ending a 2-year rent holiday for wind and solar companies operating on public lands, handing these firms massive retroactive bills (Groom, 2020). As scholars at the World Resources Institute have aptly observed, this occurred during roughly the same period that the federal government approved a dramatic reduction in the royalties required to produce oil and natural gas on public lands, suggesting a lack of parity in early sectoral relief (DeConcini and Neuberger, 2020).

Subsequent federal government efforts have expanded relief available to clean energy projects and firms. The Consolidated Appropriations Act, 2021, for example, provides a 2-year extension of the Solar Investment Tax Credit as well as 'more supportive terms for renewable energy projects to access federal lands' (Runyon, 2021). It also includes targeted stimulus for projects linked to renewable energy – including solar (US$1.5 billion) and wind (US$625 million) – as well as

Table 12.1 Federal COVID-19 Relief Appropriations, Obligations, and Expenditures as of 31 August 2021

Major spending area[a]	Total appropriations[b] ($ in billions)	Total obligations[c] ($ in billions)	Total expenditures[c] ($ in billions)
Unemployment Insurance (Department of Labor)	858.6	660.3	650.2
Economic Impact Payments (Department of the Treasury)	855.3	841.6	841.6
Business Loan Programs (Small Business Administration)	838.0	829.6	827.6[d]
Public Health and Social Services Emergeny Fund (Departmenr of Health and Human Services)	350.1	240.0	172.1
Coronavirus State and Local Fiscal Recovery Funds (Department of the Treasury)	350.0	239.8	239.8
Education Stabilization Funds (Department of Education)	278.6	257.0	51.7
Coronavirus Relief Fund (Department of the Treasury)	150.0	149.9	149.9
Disaster Relief Fund (Department of Homeland Security)[e]	97.0	63.8	9.9
Suplemental Nutrition Assistance Programs (Department of the Agriculture)	91.7	66.1	64.6
Other areas[f]	881.6	532.4	391.9
Total[g]	**4,750.9**	**3,880.1**	**3,399.3**

Source: US GAO (2021a).

other technologies that enable cleaner energy consumption, such as advanced transportation (US$2.6 billion) and energy-grid projects (US$3.44 billion) (Consolidated Appropriations Act, 2021; Shieber, 2020). Even so, this act and other legislation have also continued to provide new support to fossil fuel players and have done so without requiring that recipients subsequently heighten their commitments to cleaner production.

3.3. Implications for a low-carbon growth trajectory, Paris commitments, and the 2030 Agenda

In its original Intended Nationally Determined Contribution (INDC) submission, the US pledged to reduce net greenhouse gas (GHG) emissions by 26%–28% from their 2005 levels by 2025. Although the Trump administration announced that it intended to formally withdraw from the Paris Climate Accord in November 2020, this decision was ultimately reversed by a then-incoming Biden administration.

Subsequently, the US has submitted a revised INDC, committing to reduce its GHG emission levels by 50%-52% from their 2005 levels by 2030, with a further goal of 100% carbon-pollution free power generation by 2035 (since updated to 2030). Meanwhile, an executive order announced in August 2021 sets an additional goal that '50% of all new passenger cars and light trucks sold in 2030 be zero-emission vehicles' (Executive Office of the President of the United States, 2021).

Several studies have found that despite this high degree of policy volatility, the US has made encouraging progress towards realising its Paris commitments. This includes substantial progress over the past decade in accelerating switching to cleaner energy sources in the power sector and in promoting energy efficiency generally (US EIA, 2021a; IEA, 2021a); progress that, as Section 2 noted, has been largely sustained (and in some areas enhanced) during the pandemic. However, modelling efforts by this author and others have nonetheless suggested that more robust action is likely necessary to fully achieve the country's 2025 and 2030 targets (Gillispie and Endo, 2021; Climate Action Tracker, 2021; IEA, 2021a). For example, realising entirely carbon-pollution free power generation in the US is expected to require notable upgrades to existing grid infrastructure and management systems, as alluded to earlier. Recent stimulus packages are expected to have reduced but not eliminated gaps in investment here (American Society of Civil Engineers, 2022).

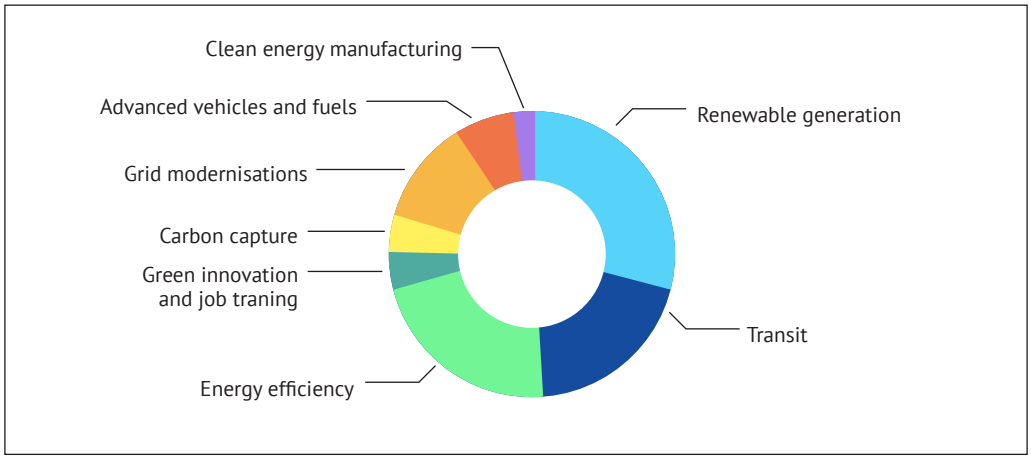
Finally, it should also be noted that some regulatory rollbacks appear to have had a decidedly mixed impact on 'boosting the competitiveness' of the US energy industry. This includes in natural gas, as at least one major export deal appears to have been scuttled based on growing concerns about US shale's level of methane emissions (White and DiSavino, 2020). At a minimum, this suggests that rollbacks are not challenging perceptions in some overseas markets that US firms might be unable or unwilling to meet high standards for environmental protection. If more economies were to adopt this view, the US could find it harder to make a case for the relative merits of its energy exports – much less encourage others to heighten their own climate action.

3.4. Comparisons of the 'green stimulus' to the 2008–2009 global financial crisis

In deciding how to move forward, the US might first consider looking back: reviewing the approach it took to stimulus during the 2008–2009 global financial crisis. Indeed, several assessments have found that the federal government's approach to this earlier crisis produced notable benefits. This includes creating roughly 900,000 jobs in clean energy fields and supporting the leveraging of US$150 billion beyond direct stimulus funds into the US economy (US Council of Economic Advisors, 2016; Varro, Beyer, Journeay-Kaler, and Gaffney, 2020).

The main stimulus measure of the US during this earlier crisis was the American Recovery and Reinvestment Act of 2009 (ARRA). Under this act, the equivalent of around US$90 billion in federal funding was allocated to the clean energy sector via measures such as direct spending and tax code changes (Varro, Beyer, Journeay-Kaler, and Gaffney, 2020). As Figure 12.5 highlights, the majority of these funds were directed to renewable energy and energy efficiency projects, whilst a sizeable share was also directed to advanced vehicles and transit. Resources were also designed to be spent over the course of the subsequent decade (2009–2019) to support a near-term infusion of capital into the sector as well the ramping up of longer-term projects (e.g. infrastructure and technological

Figure 12.5 Clean Energy Budget by Sector in the American Recovery and Reinvestment Act



Source: Varro, Beyer, Journeay-Kaler, and Gaffney (2020).

research and development) (Congressional Budget Office, 2015; Jaeger, Westphal, and Park, 2020). Related to this design aspect, the IEA has noted that the ARRA also helped to enhance the market case for investing in US energy infrastructure projects by guaranteeing a 'long-term, stable, regulated rate of return' on such investments (Varro, Beyer, Journeay-Kaler, and Gaffney, 2020).

Such an approach has several notable divergences from the US approach to the COVID-19 crisis to date. The first – and perhaps most glaring – is the ARRA's greater overall commitment to stimulus that explicitly targeted clean energy projects. In real dollar terms, the White House Council of Economic Advisors estimates that roughly one-eighth of the ARRA's total funds were ultimately directed to clean energy projects (US Council of Economic Advisors, 2016; Office of the Press Secretary, 2016). To put this in perspective: if clean energy projects had received a similar share of US COVID-19 relief spending to date, this amount would exceed US$600 billion.

Less apparent, though no less relevant, is the extent to which the ARRA's stimulus also represented a bold vision for systemic change. For example, whilst both the ARRA and US COVID-19 relief packages have directed support to ongoing national initiatives, the ARRA incorporated more ambitious objectives for supporting new public- and private-sector undertakings that might disrupt energy demand and pricing patterns.

This included projects linked to not-yet-commercially-viable technologies, perhaps most notably several for decarbonising the power sector (Jaeger, Westphal, and Park, 2020). Arguably, the gap between the technologies we need for decarbonising the power sector and the technologies that we already have is significantly smaller than it was in 2008, suggesting that reduced spending on this specific push in COVID-19 relief may simply reflect smaller expected returns-on-investment.

However, the US' COVID-19 response has also yet to incorporate a comparable push focused on a different, still carbon-intensive end-use – raising questions about potential missed opportunities to position the US as a global leader in innovation.

Indeed, when thinking about the way forward, it is worth noting that several key low-carbon technologies – including solar PV and lithium batteries – have seen both their relative capacities and prices improve markedly over the past decade. This suggests that at least some of the conditions necessary for unlocking new energy consumption and production patterns are even more favourable now than they were in 2009, as are opportunities for jumpstarting the rise of new industries (Jaeger, Westphal, and Park, 2020).

Thus, an enhanced US commitment to green growth in the current recovery might yield new – and even surprising – benefits for the US economy, including in job creation. In the context of once again rising global energy demand, such a commitment might also prove critical to helping the country sustain and grow its role as an important energy partner.

4. Recommendations

As the COVID-19 pandemic enters its third year, the US continues to grapple with the need for new and greater policy attention on managing the crisis on several fronts. Perhaps most pressing is the task of getting the domestic outbreak under control. Yet alongside this, decision makers must also confront growing questions about how to address the country's uneven and as-of-yet incomplete economic recovery. This includes questions about the potential merits – and risks – of approving any next-round stimulus.

Sections 2 and 3 noted several ways in which clean energy transitions benefit US recovery from the COVID-19 pandemic. To that end, additional policy support for accelerating such transitions could be a good investment, not just a new expense – if it has the right design. This section makes three recommendations as to what this should look like.

First, policy 'support' does not necessarily mean new spending; it can also mean addressing conditions that undermine the competitiveness of otherwise desired goods and services. US demand for cleaner energy sources has shown remarkable resilience during the pandemic, whilst investment in relevant new domestic capacity – especially wind and solar – appears to be picking up steam. This suggests that, to an extent, the task at hand for the US government is to not undercut already-encouraging sector growth trends. Yet as Sections 2 and 3 suggested, some regulatory changes from the 2020–2021 period risk doing exactly that by favouring 'brown' development strategies. The relatively 'low-hanging fruit' here is restoring earlier US environmental protection rules, strengthening market signals about the advantages of switching to low-carbon technologies.

To take this idea further, the Biden administration should also consider enhancing ongoing energy market and policy reform dialogues with counterparts in Asia. A more explicit

focus on identifying regional best practices in accelerating low-carbon transitions, for example, could help all countries involved to adopter smarter – not just more extensive – regulations around goals such as reducing GHG emissions. In turn, this could also help with growing US-Asia clean energy trade by reducing the prospect that ill-suited or overly byzantine regulations act as barriers to green development.

Second, spending on infrastructure should be regarded as a force multiplier. Current trends in the growth of the US clean energy sector are encouraging but still not enough to deliver on existing US – much less global – decarbonisation plans. 'Building back better' is thus likely to require an additional catalyst, where (as suggested earlier) available infrastructure can shape what is possible.

A targeted push to upgrade power grids and other energy infrastructure would enable fuel inputs to be used more efficiently, address barriers to using wind and solar, and support larger aims for electrifying the economy – outcomes that could help speed up decarbonisation and heighten interests in additional clean consumption tools. Such a push could also create some jobs immediately and generate more new jobs over the long term. Proposed resources for infrastructure projects in pending Congressional legislation could thus have a transformative impact on the US and should be approved in full. Meanwhile, this need for new and more modern infrastructure is not uniquely American. US-backed initiatives, such as Clean EDGE Asia, and organisations, such as USAID and USTDA, are already working with partners in Asia on how to address their own infrastructure gaps; enhanced support here could be invaluable to unlocking new consumption patterns, and in turn, opportunities for increasing US exports to the world's fastest growing region.

Third, a well-placed bet on emerging technologies could yield significant returns. Several sectors of the US economy could benefit from increased support for their cutting-edge projects and tools. Yet, one that seems particularly ripe is transportation, given the twin considerations of robust US and Asian demand growth and several promising technologies for radically decarbonising the sector. Standing in the way of this 'match made in heaven' though are questions about needs for select additional breakthroughs. This includes ongoing challenges in improving battery capacities, as well as making relevant technologies more affordable in general.[5]

Whoever tackles these challenges first could have a golden opportunity to corner a growing market. To that end, the Biden administration should consider making a strategic push to boost relevant US industrial capacities, including via resourcing new public-private partnerships with the expressed aim of advancing breakthroughs in hydrogen and other energy storage technologies.

[5] Establishing the appropriate enabling infrastructure (e.g. charging stations) is of course an additional task here but is not re-raised here to avoid repetition with the preceding point.

Here, closer cooperation with partners in Asia could also prove especially meaningful, as countries such as Australia, the Republic of Korea, and Japan have demonstrated innovative strengths in these fields.

All three of these recommendations envision a high return on investment and are designed to build on both current opportunities and insights from the response to the 2008–2009 financial crisis. Yet, in returning to the example of this past, it also should be kept in mind that not all projects tied to the ARRA ultimately bore fruit. As observed by scholars at the World Resources Institute, the legislation's bet on concentrated solar power projects, for example, was 'not as successful as hoped', whilst US$1.3 billion of the US$3.4 billion that was allocated to carbon capture and storage projects was ultimately returned when projects were unable to meet benchmarks (Jaeger, Westphal, and Park, 2020). Thus, an additional takeaway from the 2008–2009 response for the current crisis is that whilst industrial policy can yield significant net benefits, its specific outcomes are by no means guaranteed. This is something that should encourage decision makers to regularly review key stimulus programmes and adjust focuses as needed – but not necessarily discourage them from betting big on innovation.

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Chapter 13

COVID-19's Impacts on Viet Nam's Economy and the Vietnamese Government's Response Policies

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Chapter 13: COVID'19's Impacts on Viet Nam's Economy and the Vietnamese Government's Response Policies

1. Introduction

The coronavirus disease (COVID-19) pandemic continues to negatively affect the growth and social security of all nations. However, from the perspective of the environment and climate change, COVID-19 is an opportunity to promote sustainable development and green growth. Due to the pandemic, every country has implemented social distancing or even undertaken lockdown of an entire region, a province, or even a whole country, which directly reduces energy demand. In addition, the economic crisis caused by COVID-19 also indirectly affects the demand for energy due to a global value chain breakdown. Moreover, the need for savings and the threat of disease both contribute to the decrease in energy demand and the reduction of greenhouse gas (GHG) emissions (including CO2, CH4, N2O, etc.).

However, the previous global economic crises have shown that, post-crisis, GHG emissions increased quickly because countries often had supportive policies to recover the economy, even 'growth at all costs' in some cases, with little attention to environmental protection and climate change. The 'insecurity' in public transport during COVID-19 has also increased the need to travel by private vehicles, which will also increase GHG emissions pressures.

Therefore, ensuring the growth and recovery of the economy while not increasing GHG emissions requires suitable long-term policies promoting the application of technology, especially information technology, and artificial intelligence in production and consumption.

2. COVID-19 Pandemic and Changing the Systems of Viet Nam

Before COVID-19 entered Viet Nam, the government proactively developed scenarios and measures to limit disease outbreaks, even for worst-case scenarios. As soon as there was a community infection on 23 January 2020, Viet Nam took measures to quarantine, track, and restrict people from epidemic zones, closed borders, implemented medical declarations, and limited many crowd activities, travel, and trade in localities. Some places took body temperature measurements, used antiseptics, gave out masks for free, and tightened controls.

Along with social distancing policies, the government has also issued 'epidemic adaptive' policies to support vulnerable businesses and people. The policies promote innovation, application of information science, and technology in all economic activities. In education and training, the government has recognised the study results from online teaching programmes by providing electricity and transmission lines for training institutions. In the public sector, the government also has policies to promote online services and work from home; meetings and seminars are also conducted online. Regarding production and business, the government has also encouraged advanced technologies to efficiently use natural resources, saving energy, 'going green', sustainable production, and improved labour productivity.

Policies have also been implemented to promote research and application of internet and information technology in online medical examinations (telehealth), health insurance payment

policies, and medical examination fees. In terms of telehealth, patients do not have to travel to major hospital centres but are still able to utilise the medical services from leading health experts. This is truly an 'epidemic adaptive' solution that achieves multiple goals, i.e. social distancing, improving the quality of medical examination and treatment, and creating opportunities for poor patients to access quality medical service. In addition, telehealth helps doctors at lower levels to improve their skills, reduce the need for travel, save money and resources, and contribute to reducing GHG emissions.

With these efforts, Viet Nam is recognised as one of the best COVID-19 control countries and one of the few countries in the world with positive economic growth. Indeed, with two waves of COVID-19 occurring, Viet Nam has effectively controlled both, while the gross domestic product (GDP) growth rate as of September 2020 reached 2.12%. As of 9 October 2020, Viet Nam has confirmed 1,100 cases of COVID-19 infection, with 35 deaths. The rate of infections is 11 per million people, and the number of deaths is 0.4 per million people. These deaths focused only on the second COVID-19 wave occurring in Da Nang hospital, which is treating patients with very severe backgrounds, such as cancer, haemodialysis, etc.

Thus, it can be seen that, although the COVID-19 pandemic has affected health and lives, and strongly affected economic growth, it presents an opportunity for countries to change their growth model and implement economic restructuring for disease adaptation and climate change. Indeed, the above policy changes implemented by the Vietnamese government will help to better adapt to the pandemic, not only today but also for similar pandemics in the future. These policies will contribute to the more efficient use of existing resources, and shift production, business, and people's lives towards sustainable development.

3. The Impacts of the COVID-19 Pandemic on Economic Growth and Emissions in Viet Nam

3.1. Major economic impacts of the COVID-19 pandemic

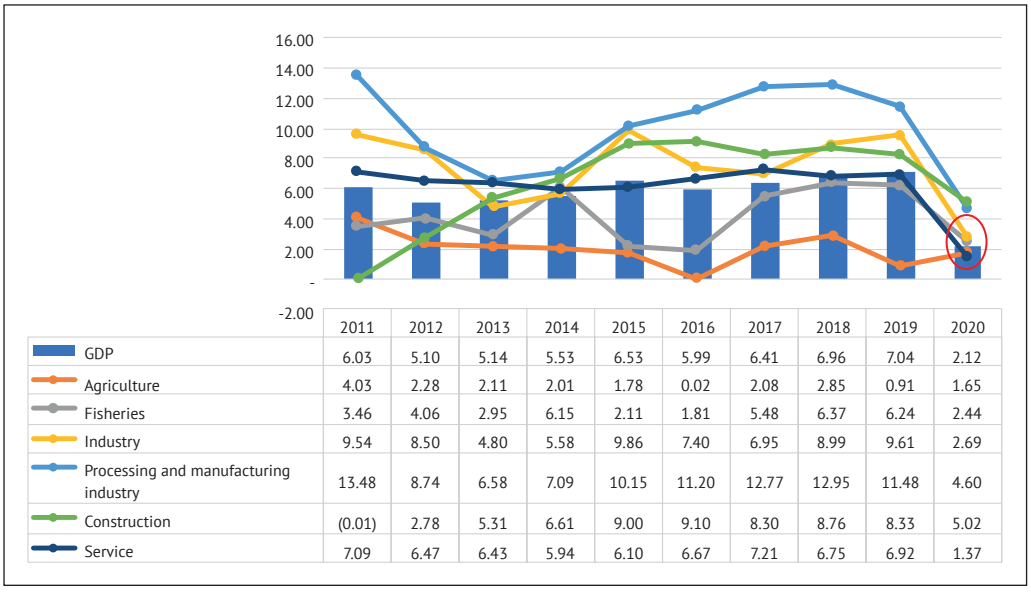
Although Viet Nam has controlled each COVID-19 wave, and limited negative socioeconomic impacts, the pandemic has disrupted international trade, wreaked havoc on production, import, and export activities, and impacted the economy of Viet Nam, especially regarding economic growth, income, and social security. Growth in almost all sectors and fields slowed down, while unemployment and underemployment were high.

Indeed, COVID-19 has made the quarterly GDP growth rate in 2020 reach its lowest rate compared to 2011–2019. The GDP in the first 9 months of 2020 still maintained positive growth but only 2.12%, which is a decrease of about 65% compared to the average growth rate of 5.69% annually for 2011–2019. GDP in the first quarter of 2020 was 3.69%, with that number dropping in the second quarter to 0.39% due to strict social distancing in the whole country. GDP growth in the third quarter is estimated at 2.62% compared to the same period last year. The indicators of labour, employment, and employee income in the quarters of 2020 all decreased compared to the same

period last year, while the number of businesses shutting down and the unemployment rate increased but remained more positive than that of other countries in the region and in the world (GSO, 2020a).

Most affected by the pandemic is the services sector. GDP growth rate in the first 9 months of 2020 reached only 1.37% compared to 6.10% in 2011–2019, which was 79.3% lower. The services sector also only achieved a growth rate of 2.69% compared with 7.39% in 2011–2019, down 66.0%. Of this, the growth rate of the processing and manufacturing industry reached 4.6%, but was still down 56.2% compared to the average rate of 9.9% of the period. The agricultural sector experienced the least impact from the pandemic, maintaining its growth rate in the first 9 months of 2020 of 1.65%, compared with 1.97% in the 2011–2019 period, down only 17.8% (Figure 13.1 below).

Figure 13.1 GDP Growth Rate of 9 Months of 2020 Compared to the Same Period from 2011–19



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GDP	6.03	5.10	5.14	5.53	6.53	5.99	6.41	6.96	7.04	2.12
Agriculture	4.03	2.28	2.11	2.01	1.78	0.02	2.08	2.85	0.91	1.65
Fisheries	3.46	4.06	2.95	6.15	2.11	1.81	5.48	6.37	6.24	2.44
Industry	9.54	8.50	4.80	5.58	9.86	7.40	6.95	8.99	9.61	2.69
Processing and manufacturing industry	13.48	8.74	6.58	7.09	10.15	11.20	12.77	12.95	11.48	4.60
Construction	(0.01)	2.78	5.31	6.61	9.00	9.10	8.30	8.76	8.33	5.02
Service	7.09	6.47	6.43	5.94	6.10	6.67	7.21	6.75	6.92	1.37

GDP = gross domestic product.
Source: Report on the socio-economic situation in quarter III and 9 months of 2020 (GSO, 2020a).

1. The agriculture, forestry, and fishery sector in the 9 months of 2020 had a low increase compared to the same period last year due to the impact of climate change, COVID-19, and African swine fever. Of this, the agricultural sector increased by 1.65%, only higher than the 9 months of 2016 and 2019, which were 0.02% and 0.91%, respectively.

2. The growth rate of the industry sector in 9 months of 2020 increased by 2.69% over the same period last year, much lower than the growth rate of the same period in 2011–2019, contributing 0.91 percentage points to the growth rate of the total added value of the whole economy. The growth rate of the manufacturing sector increased by 4.6%, lower than that of the same period in 2011–2019,

contributing 1.02 percentage points.

3. In the first months of 2020, COVID-19 seriously affected trade, services, and import-export activities.

   - The service sector in 9 months achieved the lowest growth rate in the same period in 2011–19. In the service sector, many industries contributed to the increase in total value added of 9 months as follows: Wholesale and retail increased 4.98% compared to the same period last year, contributing 0.54 percentage points; finance, banking, and insurance increased 6.68%, contributing 0.4 percentage points; transportation and warehousing decreased 4%, a reduction of 0.14 percentage points; and accommodation and catering services decreased by 17.03%, a drop of 0.76 percentage points.

   - Generally, in the first 9 months of 2020, passenger transportation decreased by 29.6% and cargo transportation decreased by 7.3% compared to the same period in 2019; of this, the number of passengers and cargo transported in the third quarter increased in comparison with the second quarter, which still decreased 34%, down 6.4% compared to the same period last year. Aviation was the industry most affected by the pandemic in a 9-month period, with a 45.5% drop in the number of passengers and a 39.4% reduction in freight. International visitors to Viet Nam in the third quarter of 2020 reached 44,000 arrivals, which was only 1% of the amount of the same period last year due to anti-COVID-19 measures. Tourism had not yet opened; hence, the visitors were foreign experts and technical workers working on projects in Viet Nam. In 9 months in 2020, international visitors to Viet Nam reached 3.8 million, down 70.6% over the same period the previous year, of which more than 97% were international visitors in the first quarter of 2018.

   - Viet Nam's merchandise export has retained a positive increase, with the domestic economic sector playing a key role when export and import turnover in 9 months increased over the same period last year. Total export and import turnover in September 2020 was estimated at US$51.5 billion, increasing 15% compared to the same period last year. In 9 months of 2020, the total export and import turnover reached US$388.73 billion, which increased 1.8%, of which exports reached US$202.86 billion, up 4.2%; imports reached US$185.87 billion, down 0.8%. The domestic economic sector has a high increase in export turnover in a 9-month period of 20.2% and a 4.7% increase in imports. The 9-month trade balance continued to trade in surplus, reaching US$16.99 billion (GSO, 2020a).

4. The operation of the credit institution system in the 9 months of 2020 was negatively affected by the COVID-19 pandemic. Credit growth as of 22 September 2020 reached a

low of 5.12%. However, the State Bank of Viet Nam had adjusted the operating rate to stabilise the monetary and foreign exchange markets. The insurance business has grown well, ensuring the interests of insurance participants. Total capital mobilisation on the stock market for the economy in 9 months of 2020 increased by 1.43% over the same period last year.

5. Investment for development: In 9 months of 2020, development investment capital increased by 4.8% compared with the same period in 2019, the lowest increase in the 2016–20 period due to the negative effects of COVID-19 on all production and business activities. However, the rate of capital increase from the State budget in September and 9 months of 2020 both reached the highest level in the period 2016–20. Developmental investment capital in the State sector tended to increase because of accelerated implementation and disbursement of public investment capital as part of Viet Nam's efficient response to COVID-19. Total foreign investment capital in Viet Nam as of 20 September 2020, including newly registered capital, adjusted registered capital, and value of capital contribution and share purchase of foreign investors, reached US$21.2 billion, down 18.9% compared to the same period last year. Of this, 1,947 newly licensed projects with registered capital reached US$10.4 billion, down 29.4% in many projects and 5.6% in registered capital compared to the same period last year; 798 projects licensed from previous years have registered to adjust their investment capital with additional capital of over US$5.1 billion, up 6.8%. Further, there were 5,172 turns of capital contribution and share purchase by foreign investors with the total value of capital contribution reached US$5.7 billion, down 44.9%.

6. The number of newly established enterprises in September 2020 decreased by 12.6% compared to the same period in 2019; moreover, this September coincided with lunar July so people had some hesitancy to start a business as a result of Asian fengshui belief.

7. Negative impacts on labour and employment:

- As of September 2020, Viet Nam has 31.8 million people aged 15 and over that were negatively affected by COVID-19, including those who lost their jobs, had to take leave/alternate leave, reduced working hours, income reduction, etc. Of these, 68.9% have reduced income (with a slight decrease in income), nearly 40.0% must reduce working hours/take time off/take turns off, and about 14.0% were forced to temporarily stop or suspend production and business activities. The service sector was most affected by COVID-19, with 68.9% of workers affected, followed by the industry and construction sectors with 66.4% of workers affected; The rate of affected workers in the agriculture, forestry, and fishery sector is 27.0% (GSO, 2020b).

- Small and medium-sized enterprises cut labour the most, with the average number of employees in 9 months decreasing by 10.0% compared

to the same period last year; meanwhile, the rate of labour cuts in large enterprises was 4.5%.

- In the first 9 months of 2020, industries with a significant decrease in the number of employees such as air transport and tourism[1] by 30.4%; accommodation service industry down 29.9%; sports, entertainment, and entertainment by 17.4%; food and beverage industry decreased by 15.4%; the construction industry[2] decreased by 14.1%.

- Average monthly income of informal employees[3] in 9 months of 2020 was D5.5 million, 1.5 times lower than the monthly average income of formal workers (D8.4 million). Compared to the same period last year, the average monthly income of the formal workers decreased by 1.9%, and the income of the informal workers decreased by 0.8%.

8. The impact on petroleum consumption: oil businesses made big losses, and the production and trading of nitrogenous fertilisers and fibres faced many difficulties. Petrovietnam Oil Corporation's petroleum business output in the first 3 months of the year decreased by about 20%, and retail output decreased by 15% compared to the same period in 2019, with the average cost (D/litre) increasing by about 20% compared to that of 2019 due to a decrease in output. Oil refineries have difficulty when consumption volume drops sharply, and Nghi Son oil refinery alone reduced consumption by 30%–40% in the first quarter of 2020. Petrolimex's petroleum sales volume decreased continuously. The first quarter decreased by 12% compared to the same period in 2019. Aviation fuel demand also decreased sharply (Central Economic Committee, 2020).

9. The impact of COVID-19 on investment in the energy sector (CIEM, 2019): The COVID-19 pandemic had an impact on energy investment in Viet Nam. According to the report of state energy corporations, investment capital for the energy sector has decreased. Specifically, the investment value of Petrovietnam in the first quarter of 2020 only reached D4 trillion, equalling 39% of the plan of the first quarter and 8% of the plan for the year (the annual investment plan is D53.1 trillion). Vietnam Electricity (EVN), the investment value for the first quarter of 2020, only reached D14.463 trillion, equalling 15.5% of the year plan, a decrease of D3.389 trillion compared to the same period in 2019. Vinacomin also invested only D1.778 trillion, equalling 11% compared to the year plan. The situation of investment, production, and business of Petrolimex tended to decrease sharply, with the investment value in the first quarter of 2020 only reaching D212 billion, and the impact is clear in the second quarter of 2020 (Central Economic Committee, 2020).

[1] Operation of travel agents, tour business, and support services, related to tour promotion and organisation.
[2] The construction industry includes housing construction, civil engineering construction, and specialised construction activities.
[3] Excluding people working in households of agriculture, forestry, and fisheries, the average income in the first 9 months of 2020 of this group is D2.9 million/month.

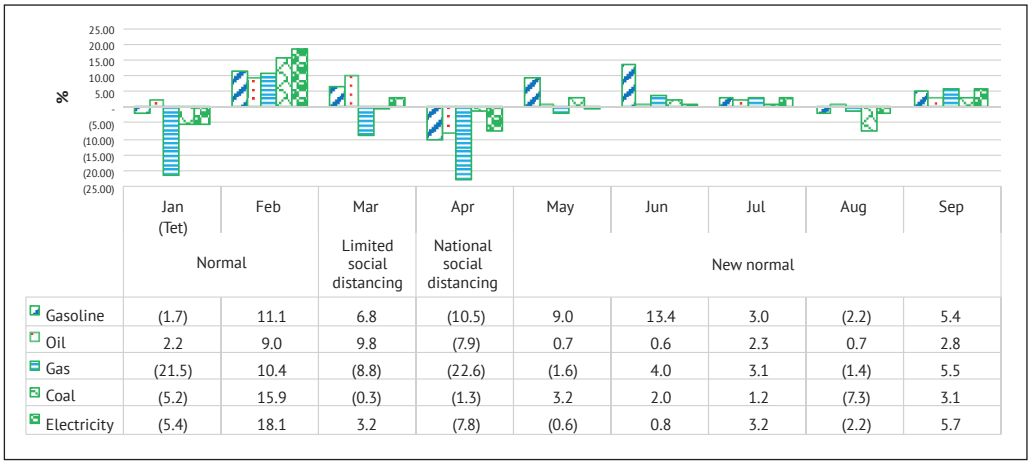
3.2. The Impact of COVID-19 on CO_2 Emissions

Due to the implementation of the social distancing order, energy demand fell sharply in April (equivalent to January, the month when the traditional Tet holiday is held). There was a slight decrease in August compared to the same period in 2019 for all types of energy, and an increase again in the following months. Gasoline and oil are the most visible energy sources directly affected by the social distancing policy because they are the two fuels that are used a lot in traffic (gasoline accounts for 97.3% of the total amount of gasoline and oil accounts for 73% of the total volume of gasoline and oil) (see Figure 13.2). Particularly, coal and gas are not directly affected by social distancing, but indirectly by the economic decline due to the disruption of the global value chain.

1. The impact of social policy on economic sectors is different because of the different structures of fuel use. However, the total GHG emissions of sectors in April were still higher than that in January (Tet holiday). This is because most production and business activities during the Tet holiday were suspended or greatly reduced, while the social distancing in April only limited travel and stopped unnecessary services.

- Energy industry: Coal is the fossil fuel with the largest GHG emission coefficient, and is also the main fuel used in the energy industry, with 65.0% of the total coal consumption in the whole economy. In addition, oil (7.8%) and gas (6.7%) are also used for power generation. In the first 9 months of 2020, total CO_2e of the energy sector was 111.79 million tonnes under the medium scenario, accounting for 51.6% of total CO_2e emissions.
- Industry and construction sector: Fossil fuels are now more diversified, with the structure

Figure 13.2 Comparing the Monthly Energy Consumption Rate in 2020 over the Same Period in 2019 (%)



	Jan (Tet)	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Normal		Limited social distancing	National social distancing	New normal				
Gasoline	(1.7)	11.1	6.8	(10.5)	9.0	13.4	3.0	(2.2)	5.4
Oil	2.2	9.0	9.8	(7.9)	0.7	0.6	2.3	0.7	2.8
Gas	(21.5)	10.4	(8.8)	(22.6)	(1.6)	4.0	3.1	(1.4)	5.5
Coal	(5.2)	15.9	(0.3)	(1.3)	3.2	2.0	1.2	(7.3)	3.1
Electricity	(5.4)	18.1	3.2	(7.8)	(0.6)	0.8	3.2	(2.2)	5.7

Source: Hoa et al., 2020.

of using gas, coal and oil being 62.0%, 29.2%, and 9.1% respectively. As a consequence, the industry and construction sector ranked second in producing GHG emissions after the energy sector. In the first 9 months of 2020, the total CO2e of industry and construction was 57.69 million tonnes under the medium scenario, accounting for 26.8% of the total CO2e emissions.

- Transport sector: The transport sector was directly affected by the social distancing policy. However, this sector uses 97.3% of total gasoline and 73.5% of total oil, so total traffic emissions in the first 9 months of 2020 were only 30.87 million tonnes of CO2e under the average scenario, accounting for 14.3% of total CO2e emissions

- Service sector: This sector does not create much GHG emissions from burning fossil fuel, accounting for 2.3% of total CO2e in the first 9 months of 2020. Therefore, energy used in the services sector accounts for 5.6% of the total oil volume and 0.2% of total gas volume.

- Agriculture sector: The GHG emissions of the agricultural sector were not much, accounting for only 0.7% of the total CO2e in the first 9 months of 2020. This was because the agriculture sector only used 2.7% of total gasoline consumption and 3.7% of total gas.

- Households: GHG emissions in households accounted for 4.4% of total CO2e in the first 9 months of 2020. The reason was that the structure of gas used in the household included 28.5% from gas, 0.2 % from oil, and 3.9% from coal. Due to the implementation of social distancing in April 2020, people stayed at home, meaning the total CO2e from households increased to 1.05 million tonnes compared to 1.03 million tonnes as of 2019, which was 1.4% higher. This is different in comparison with other economic sectors.

2. The results of the CO2e emission calculation by month have shown that 10% of the electricity price support for all subjects and the 30% reduction of the environmental protection tax on the flying fuel for the airlines only helped reducing difficulties for people and businesses. On the other hand, these solutions did not increase the electricity demand because their duration was not long enough to affect energy consumption behaviour. However, these forms of support are contrary to efforts to raise awareness and fulfil the commitment to reduce GHG emissions that Viet Nam has committed to (Hoa et al., 2020).

4. The Policies Adapting COVID-19 Towards Green Growth of Viet Nam

4.1. Efforts to fulfil commitments to reduce GHG emissions in Viet Nam

Before the COVID-19 pandemic, Viet Nam implemented many programmes and solutions to reduce GHG emissions in the energy; transport; agriculture; land use, land-use change and forestry; and waste management sectors and achieved a certain success. Besides, strengthening education and communication on climate change and green consumption behaviours has contributed to reducing GHG emissions in the community.

a) In the energy sector.

In the context of large hydropower sources being fully exploited and other large power sources also needing a lot of time to complete, and before demand continues to increase rapidly, renewable energy sources have important implications in terms of ensuring power supply.

According to Politburo Resolution 55, 'The proportion of renewable energy sources in the total primary energy supply will reach about 15–20% by 2030; 25–30% by 2045' Correspondingly, the proportion of renewable electricity in total electricity production will be about 30% in 2030 and 40% in 2045.

Previously, implementing the National Energy Development Strategy of Viet Nam to 2020, with a vision to 2050, the Prime Minister issued the Renewable Energy Strategy and the Nuclear Power Development Plan, specifically: (i) Viet Nam's Renewable Energy Development Strategy to 2030, with a vision to 2050 (Decision No. 2068/2015QD-TTg); (ii) Orientation of planning for nuclear power development in Viet Nam in the period to 2030 (Decision 906/2010/QD-TTg). The priority view of developing new energy and renewable energy is clearly defined in the Vietnam Industrial Development Strategy to 2025, with a vision to 2035 (Decision 879/QD-TTg dated 9 June 2014), while the master plan for Viet Nam's industrial development to 2020, with a vision to 2030 (Decision 880/QD-TTg dated 9 June 2014). Strategic targets for renewable energy development of Viet Nam to 2030, with a vision to 2050 (Decision 2068/2015/QD-TTg).

i) In 2014, the measures for energy saving and energy efficiency in Viet Nam helped reduce about 7.3 million tonnes of CO2 compared to the previous business-as-usual scenario; and electricity loss decreased by 1.55% (equivalent to about 2.2 billion kWh) compared to 2010, contributing to 1.46 million tonnes of CO2 reduction. From 2015–19, the amount of electricity lost was reduced by about 29.7 billion kWh compared to 2010 and helped reduce emissions by 26.5 million tonnes of CO2 (The Socialist Republic of Viet Nam, 2020).

ii) On renewable energy, the output of renewable energy (excluding hydroelectricity of all kinds) will reach about 0.1 million TOE by 2016, equal to 0.16% of the total primary energy; Electricity from new and renewable energies by 2017 reached a total installed capacity of 380 MW (accounting for 0.83% of total power capacity) and electricity produced 549 million kWh (accounting for 0.3%

of total electricity output). By the end of 2019, the total capacity of small-scale hydropower will reach 3,674 MW, with wind power at 377 MW, biomass power at 325 MW, and solar power at 4,696 MW (The Socialist Republic of Viet Nam, 2020).

- Solar power: As of July 2020, the whole country has 5,053 MW of solar power connected to the grid, while only 429 MW of wind power is connected to the grid; it is likely that by the end of December 2020, about 3,000 MW of solar power continues to be connected to the grid, bringing the total installed solar power capacity to more than 8,000 MW.
- Wind power: As of July 2020, the whole country has only 2,688.68 MW of wind power signed in the power purchase agreement (11,800 MW has been approved for additional planning), in addition to the grid connection and some construction, most are in the stage of investment preparation, expected to be completed by the end of 2021. However, due to the impact of COVID-19, many wind power projects will be behind schedule (Vietnam Clean Energy Association, 2020a).

iii) Regarding investment in developing renewable energy, this field is attracting investors. Viet Nam has mobilised great resources to invest in energy development with the participation of many economic sectors, but the key role is still state-owned enterprises.

- In 2007–17, the total investment in the energy sector reached D2.1 million billion, accounting for 18.4% of the total social investment (about D11.4 million billion), greatly contributing to economic growth and increasingly diversified in terms of institutions and business modes (Central Economic Committee, 2020).
- From 1988 to now, there were 48 foreign direct investment projects registered to invest in the renewable energy sector with a total value of US$3.8 billion. From 2007 to 2017, there were a total of 25 projects with a total capital of about US$2 billion. In this period, the foreign direct investment allocation for each type of renewable energy was unequal, mainly wind power (10 projects) with a total registered capital of US$1.2 billion, accounting for about 61% investment capital in the renewable energy sector, followed by solar power (12 projects) with registered capital of about US$716 million, equivalent to 36% of total registered capital and biomass power (three projects) with only about 3% of the total investment due to the lack of optimal and efficient use of this energy (CIEM, 2019).

It is forecasted that there will be very high demand for investment in renewable energy in Viet Nam, which consisted of D104.476 billion (equivalent to US$4.5 billion) in the period 2016–20, accounting for 19% of the investment capital demand; that number in the period of 2021–25 is D371.531 billion (US$16.2 billion), the proportion increases to 45% of total investment need; investment need in the period of 2026–30 is D608.515 billion (US$26.5 billion), accounting for 69% of the demand; investment need in the period of 2031–45 is D1.968 trillion (US$85.6 billion), accounting for 80% of the investment need for electricity (see Table 13. 1).

The domestic private sector is involved in the development of renewable energy power projects. Currently, the government is giving investment incentives for renewable energy. Specifically, the incentive for hydroelectricity is the avoidable cost of thermal power, which varies by region.

To support the development of renewable energy, the Prime Minister promulgated many policies, such as Decision No. 37/2011/QD-TTg, June 29/2011 on the mechanism to support the development of wind power projects in Viet Nam; Decision No. 24/2014/QD-TTg of the Prime Minister on the mechanism to support the development of biomass power projects in Viet Nam; Decision No. 31/2014/QD-TTg of the Prime Minister on mechanisms to support the development of power generation projects using solid waste in Viet Nam. Accordingly, the current price of wind power is D1,614/kWh (7.8 US cents), with government support for the buyer at D207 /kWh (1 US cent); biomass electricity is D1,220/kWh (5.8 US cents); electromagnet to burn solid waste is D2,114/kWh (10.05 US cents), and magnets to bury solid waste is D1,532/kWh (7.25 US cents) (Hoa, L.T., Hoa, H.C., and Thanh, 2018). The aggregate price of renewables is summarised in Table 13.2 on the following page.

According to the Ministry of Industry and Trade (2017), the scale of subsidies for renewable energy will be US$540 million in 2025, US$2.56 billion in 2030 (assuming the same electricity purchase price as at present) (Table 13.3 on the following page).

Table 13.1 Forecast of Investment Capital Needs for the Electricity Industry in Viet Nam (billion D)

	1,000 billion D[1]				Share (%)			
Component	2016–20	2021–25	2026–30	2032–45	2016–20	2021–25	2026–30	2032–45
Electricity source	**548.8**	**825.2**	**885.9**	**2,467.6**	**100**	**100**	**100**	**100**
Coal thermal power	394.5	210.6	145.0	186.0	72	26	16	8
Hydroelectric	32.2	16.1	23.3	24.1	6	2	3	1
Mixed gas turbines	17.3	227.1	109.1	289.4	3	28	12	12
Renewable energy	104.5	371.5	608.5	1,968.2	19	45	69	80

Source: Calculated from the Central Economic Committee (2020).

Table 13.2 Support Mechanism for Renewable Energy Forms

Type of power source	Technology	Type of tariff	Price of electricity
Small hydropower	Power production	The price is avoided to be announced annually	D598–663/kWh (2.68–2.97 US cents, by time, area, and season), D220–320/kWh (0.99–1.43 US cents, amount of surplus electricity compared to the contract) D2,158/kWh (9.76 US cents, price of capacity)
Wind electricity	Power production	FIT 20 years	8.5 US cents/kWh (on land)
Biomass	Cogeneration	FIT 20 years	5.8 US cents/kWh
	Electricity production	FIT 20 years	7.55 US cents/kWh (north) 7.34 US cents/kWh (central) 7.48 US cents/kWh (south)
Waste	Burning directly	FIT 20 years	10.5 US cents/kWh
	Burial of gas production	FIT 20 years	7.28 US cents/kWh
Solar power	Production of the grid-connected electricity	FIT 20 years	9.35 US cents/kWh

FIT = feed-in tariff.
Source: Ministry of Industry and Trade (2017).

b) Transportation

Responding to climate change and reducing GHG emissions is integrated into the process of updating, adjusting, and formulating sector strategies and planning. The use of renewable energy in public lighting and traffic signals is also increased. The construction activities in the GHG emission reduction scenario in transportation include conversion of using clean energy for motor vehicles (using e5 gasoline, converting to using electric motor vehicles); changing the mode of freight transport from road to mode of transport by rail, inland waterways or sea; mode of passenger transportation from private vehicles to public transports; and efficient energy usage (limiting fuel consumption of motor vehicles, improving the load factor of trucks).

Table 13.3 Estimated Annual Renewable Energy Subsidy Costs (billion US$)

Categories	Type of renewable energy	2020	2025	2030	2035
Electricity production (GWh)	Solar power	3.88	7.62	18.86	24.77
	Wind	4.31	7.97	17.55	55.45
	Biomass	1.67	5.59	15.67	30.54
Subsidy (US$ billion) (the difference between current FIT price and average EVN purchase price in December 2016)	Solar power	0.16	0.31	0.77	1.01
	Wind	0.11	0.20	0.44	1.39
	Biomass	0.01	0.03	0.08	0.16
	Total	**0.28**	**0.54**	**1.29**	**2.56**

EVN = Vietnam Electricity, FIT = feed-in tariff.
Source: The Ministry of Industry and Trade (2017).

c) Agriculture and forestry sector

Many activities to reduce GHG emissions have been implemented. Converting long-term rice varieties to short-term varieties both reduces the risk of storms and the time of GHG emissions; increases the area for application of mid-crop water drain and alternate wet-dry irrigation; reduces the rate of burning straw from 90% to below 30%; improves diets for tens of thousands of dairy cows; allows collection and treatment of millions of tonnes of organic waste in livestock to make organic fertiliser; and applies water-saving irrigation technology for hundreds of hectares of coffee.

Viet Nam has proactively made efforts to reduce emissions, especially within the framework of the REDD + programme. In 2015–20, programmes and projects on REDD + focused on improving policy institutions, building capacity, developing technical guidelines (reference emission curves for REDD +, MRV, and benefit-sharing), and investment in REDD + actions. Several REDD + programmes have considered the potential for reducing emissions and enhancing forest carbon stocks from specific REDD + activities. The North Central region's emissions reduction programme is expected to generate about 25 million tonnes of CO2e from 2018 through 2025. To increase the forest coverage rate, by the end of 2019, the national forest coverage rate is 41.89%.

The Prime Minister signed and approved the project 'Planting One Billion Trees from 2021 to 2025' (Decision No. 524/QD-TTg dated 1 April 2021). Accordingly, by the end of 2025, the whole country will plant 1 billion trees. Of these, 690 million are in urban and rural areas, and 310 million are in protection forests, special-use forests, and new production forests. Funding sources for the project are from mobilising all social resources and diversifying capital sources for planting and protecting trees, as follows:

- Increasing the mobilisation of capital from socialisation, legal contributions from businesses, and funding mobilisation from organisations, households, and individuals participating in afforestation and tree planting through Sponsorship projects or initiatives to establish a tree planting Fund of localities, businesses, associations, and economic groups, which are used to buy materials and seedlings to support tree planting projects.
- Call on donors, international cooperation, effectively implement Official Development Assistance projects to invest in the protection and development of protective forests and tree planting.
- Combining implementation of public investment programmes and projects under the law, such as that for sustainable forestry development in 2021–25; national target programmes; programmes and projects on urban infrastructure development, construction of industrial parks, offices, construction of roads with green tree planting implemented by ministries and localities; and other socio-economic development programmes.
- Mobilising labour resources, volunteering participation of organisations, unions, masses,

households, individuals, and communities to participate in planting, tending, and protecting trees.

d) Waste sector

Many solid waste treatment plants are built and put into operation using innovative technologies in waste treatment and joint production of compost, contributing to minimising waste that must be landfilled and reducing the environmental impacts.

4.2. Policy Responses to the COVID-19 Pandemic

4.2.1. Policies on social distancing

Faced with the complicated situation of the COVID-19 pandemic, Viet Nam promptly issued policies on social distancing. These were implemented on two levels, i.e. limited social distancing, and national social distancing, corresponding to two groups of policies:

- Policy on limited social distancing: Implementing this policy, the Prime Minister of Viet Nam signed Directive No. 15/CT-TTg dated 27 March 2020, on the climax stage of the COVID-19 control effort. The Prime Minister asked the President of the People's Committee of the province to direct the application of measures to limit the crowds of people from 00:00 on March 28 to the end of 15 April 2020. Its main contents included (i) stop meeting activities, events, and religion gathered many people; (ii) suspend the operation of service establishments, except for establishments trading essential goods and services; and (iii) restrict the movement of people.
- Policy on national social distancing: Implementing this policy, the Prime Minister of Viet Nam signed Directive No. 16/CT-TTg dated 31 March 2020, on urgent measures to prevent and control the epidemic COVID-19. Accordingly, the whole country will implement social isolation within 15 days (about 2 weeks) from 0 o'clock on 1 April 2020. Specifically: (i) enforce social isolation, require people to stay at home, except necessary cases; (ii) some social and economic activities continuing to work; and (iii) stop public passenger transportation, except in particular cases, and minimise the operation of private vehicles.

Depending on the actual situation of each zone, the Government of Viet Nam introduced different social distancing policies to better adapt to the pandemic. Specifically, on 15 April 2020, the Prime Minister agreed with the proposal of the Central Steering Committee on the implementation of the social distancing in 3 groups:

(i) High-risk group: continue to implement Directive No. 16/CT-TTg, until 22 April 2020, or 30 April 2020, that is, implementing the policy of social distancing.

(ii) Risk group: implementing a roadmap of Directive 16/CT-TTg and strictly implementing Directive 15 to 22 April 2020, which means implementing a roadmap to loosen the whole social distancing to limited social distancing.

(iii) Low-risk group: continue to strictly comply with the Government's Directive 15, which means limited social distancing until 15 April 2020.

4.2.2. Policies adapting COVID-19 towards green growth

In the face of negative impacts on the economy by social distancing policies, the Government of Viet Nam has issued pandemic adaptation policies towards green growth.

a) Policies adapted to COVID-19 and green growth:

These policies both promote the application of internet technology, information technology in production, business, health, education, and public service provision, etc., in response to COVID-19, and cultivate green and sustainable growth.

- Remote medical examination and treatment policy aims to implement social distancing and promote green growth by limiting people's movement and effectively using resources. According to Directive No. 16/CT-TTg, one of the important preventive measures against the COVID-19 pandemic is that people restrict access to medical facilities if not necessary. Accordingly, the Prime Minister has instructed the Ministry of Information and Communications to coordinate with the Ministry of Health in implementing the remote medical examination and treatment model to households, villages, communes, wards, and districts. On 18 April, the Ministry of Health organised the first pilot place at Hanoi Medical University Hospital. Up to now, many live television stations for medical examination and treatment have been deployed, especially in meeting serious diseases, including patients with COVID-19.

- Policies in education and training: Official Letter No. 1061/BGD Đ T-GDTrH dated 25 March 2020, of the Ministry of Education and Training on the instruction of teaching on the internet, on television for general education institutions for students when students are absent from school because of COVID-19 for the 2019–20 school year, to organise students to study, complete the general education programme for the school year 2019–20.

- Policy on online public service provision: To better adapt to the policy of social distancing, the Government of Viet Nam has issued Decree No. 45/2020/ND-CP dated 8 April 2020, on the implementation of administrative procedures in the electronic environment. To encourage society to use online public services, on 7 February 2020, the Computerization Department of the Ministry of Information and Communications also issued Official Letter 100/THH-TTDVCTT on propagating and encouraging people to increase the use of online public services to limit exposure to crowds.

b) Support policy to people facing difficulties due to the COVID-19 pandemic:

Implementing Resolution No. 42/NQ-CP to directly support people, workers, and business households facing difficulties due to COVID-19 with a total budget of about D62,000 billion, the Prime Minister issued a Decision

No. 15/2020/QD-TTg dated 24 April 2020, on the implementation of policies to support people facing difficulties caused by the COVID-19 pandemic, applied from 1 April 2020. The subjects and levels of entitlement are specified in Table 13. 4 on the following page.

c) Policies to support businesses to respond to the COVID-19 pandemic.

The Prime Minister issued Directive No. 11/CT-TTg on 4 March 2020, on urgent tasks and solutions to remove difficulties for production and business, ensuring social security to cope with the COVID-19 pandemic. The Directive issued seven groups of tasks and solutions, including (i) solving difficulties and facilitating access to capital, credit, finance, tax, commerce, and electronic payment; (ii) reviewing, reducing administrative procedures and costs for businesses; (iii) facilitate production and business, promote import and export; (iv) urgently restore and develop the tourism and aviation industry; (v) accelerate the implementation schedule, disbursement of investment capital and improve the business environment; (vi) focus on handling labour problems; and (vii) promoting communication.

In implementing the Prime Minister's Directive, many important policies have been studied and promulgated by ministries and branches to remove difficulties for production and business, and ensure social security. Specifically:

- Business support through fiscal and credit policies

Directive 11/CT-TTg on urgent tasks and solutions to remove difficulties for production and business, ensuring social security to cope with the COVID-19 pandemic on 4 March 2020, spent D250,000 billion to support businesses affected by COVID-19. In an implementation of the Prime Minister's Directive, the State Bank of Vietnam issued a Circular on 12 March 2020 guiding credit institutions to restructure repayment periods (exempt or reduce loan interests, and keep the whole group of debt); support all borrowers affected by COVID-19; work directly with credit institutions to request a review and assessment of the impact of services on customers; develop bank action programmes and scenarios to remove difficulties for customers; and deploy a loan support package of D250,000 billion, with a preferential interest rate of 0.5%–1.5% compared to ordinary credit.

Credit support policies and exchange rate management: The State Bank of Vietnam issued Circular No. 01/2020/TT-NHNN dated 13 March 2020 on debt rescheduling, exemption, or reduction of interest and fees, retention of debt category to aid borrowers affected by the COVID-19 pandemic.

- Tax and fee support for businesses

Decree No. 41/2020/ND-CP dated 8 April 2020 on tax and land rent deferral is widely applicable to most businesses, organisations, households, and individuals businesses that were directly affected by the COVID-19 pandemic. For value-added tax, the personal income tax of business households and individuals that must be paid in 2020 is extended no later than 31 December 2020.

Table 13.4 The Beneficiaries and the Rate of Support Following the Resolution No. 42/NQ-CP

Beneficiaries	Support	Results in Da Nang
Employees working under labour contracts who have had to agree with their employers (which, due to the COVID-19 pandemic, do not have sources of income to pay salaries) to suspend their contracts or take unpaid leave for 1 month or more.	D1,800,000/person/month (calculated from 1 April 2020, but shall not exceed 3 months).	Employees: 23,598 people have decided to approve the list and the payment is nearly D23.8 billion. In which 18,761 people were paid more than D19 billion, accounting for about 80% of the total number of people and the amount paid.
An employer/entity that (i) is having financial trouble and (ii) has paid at least 50% of suspension salary for its employees under Article 98.3 of the Labour Code from April to June 2020.	The loans will be equivalent to a maximum of 50% of the minimum regional wages applicable to each employee based on the actual time of salary payment, but not exceeding 3 months. The maximum term of the loans is 12 months.	
An individual business household with a tax return of less than D100 million/year suspends its business from 1 April 2020.	D1,000,000/household/ month (not exceeding 3 months).	
An employee is subject to termination of a labour contract but not eligible for an unemployment allowance. The employee who does not have a labour contract will lose his job.	D1,000,000/household/ month (not exceeding 3 months; calculated from April to June 2020).	
People with meritorious services to the revolution.	Supporting amount: D500,000/person/month, not exceeding 3 months from April to June 2020.	Paid 191/191 people with a budget of D289 million.
Subjects of social protection.	Supporting amount: D500,000/person/month, not exceeding 3 months from April to June 2020.	Paid 26,560/26,605 people, with nearly D40 billion. 45 cases have sent notices many times but have not yet received due to leaving the City.
Poor households and near-poor households according to the national poverty line in the list as of 31 December 2019.	Supporting amount: D250,000/person/month, not exceeding 3 months from April to June 2020.	Paid 52,763/52,772 people, with the amount of nearly D 39.6 billion (nine cases left the city).

Source: Compiled from Resolution No. 42/NQ-CP to provide direct support to people, workers, and businesses facing difficulties due to COVID-19.

Besides, the Government also extended the land rent payable for the first period of 2020 by 5 months from 31 May 2020. A 5-month extension shall be given to the value-added tax of the assessment periods of March, April, May, June, the first quarter, and the second quarter.

Air service price support policy: To support aviation businesses that are most affected by social gap policies, the Ministry of Transport issued Circular No. 19/TT-BGTVT dated 1 March 2020, on prescribing price rates and price frames for some specialised aviation services at Viet Nam airports and airfields from 1 March 2020, until the end of 30 September 2020. Accordingly, from 1 March 2020 until 30 September 2020, the price rate of the aircraft take-off and landing service and price of the service of arrival and departure flight administration for domestic flights shall be equal to 50% of the price rate of the aircraft take-off and landing service and price of the service of arrival and departure flight administration prescribed in the Circular No. 53/2019/TT-BGTVT dated 31 December 2019.

Decree No. 114/2020/ND-CP dated 25 September 2020, of the Government detailing the implementation of Resolution No. 116/2020/QH14 of the National Assembly on the reduction of corporate income tax payable by 2020 for businesses, cooperatives, non-business units, and other organisations. Accordingly, a 30% reduction of corporate income tax payable in the tax period of corporate income in 2020 if the enterprise has a total revenue in 2020 not exceeding D200 billion.

Policies to reduce the costs of production, business, and the people of Viet Nam: In Viet Nam's support policies, there are many solutions to promote digital government to reduce travel and reduce costs for businesses. and citizens (such as integrating public services with the National Public Service Portal in the direction of drastically cutting costs to facilitate citizens and businesses) will have a positive impact on GHG emissions reduction. However, in this support group, there are still several policies that can increase GHG emissions and go against the emission reduction policy that the Government of Viet Nam has enacted. Although these supportive policies are only for a short time, they are less likely to change behaviour in electricity and fossil fuel consumption, but they may reduce the effectiveness of propaganda efforts on energy saving and efficient consumption towards reducing GHG emissions.

5. Government Recovery Path Towards Green Growth

Experience in responding to the COVID-19 epidemic in Viet Nam shows that it is necessary to have decisive and drastic policies to limit outbreaks and control epidemics early, to limit the impact on social-economic development and green and sustainable growth goals. Thanks to that approach, Viet Nam has controlled two waves of COVID-19 and is one of the few countries with positive GDP growth in the first 9 months of 2020, although it has been the strongest decline in the past 10 years because of the global value chain, including the value chain in ASEAN + 6.

There are many ways to achieve green and sustainable growth model innovation goals, of which green public procurement is considered one of the important. Especially in the context of a pandemic on a global scale, most governments have their economic recovery packages. How to use the economic recovery packages to ensure both the recovery of the economy and shift toward green growth is important.

The recovery stimulus package for green public procurement and investment in renewable energy will increase the aggregate demand of the market, and stimulate participation in the production and supply of green products to the market. This creates good spillover effects for the environment and climate change, helping to reach climate change agreements of countries around the world, including ASEAN + 6.

As a large part of the shopping market share, public procurement will lead the formation and development of a green market, so it is necessary to step up the government's economic recovery package into green public procurement. The total Vietnamese public procurement package is large. The total state expenditure of Viet Nam for 2009–16 was about 28%–31% of GDP, of which the average development expenditure was about 22.5%–32.3%. Total public procurement accounted for an average of 16.5% of GDP, of which the value of regular purchases using state budget only accounted for an average of 1.9% of GDP and spending for development investment was 13.8% of GDP (Hoa and Phan, 2019). This is appropriate, given that the demand for renewable energy is increasing, while the price of renewable energy tends to drop sharply and is extremely competitive due to the continuous research and technological innovation.

Green recovery packages in the past in the world also showed their key role. Although this economic crisis is different from the previous ones, it created shocks of aggregate demand and supply on a global scale. However, design experience in previous economic recovery packages shows that green stimulus measures often have advantages over traditional fiscal stimulus. This is reflected in both the short and long term, promoting economic growth, creating jobs, and contributing to reducing GHG emissions, towards green and sustainable growth. For example, green recovery packages that focus on supporting investments in renewable energy will have a major impact in the short term and long term, while ensuring the fulfilment of countries' commitments to reduce emissions to the environment and climate change.

In the short term, investing in renewable energy creates more direct jobs in manufacturing, distribution, construction, and installation. As a result, investments in renewable energy drive the spending of goods and services from sectors in the supporting supply chain, and indirect job creation, helping to increase GDP in the short term. Overall, renewable energy requires fewer labourers than fossil fuels, and allows for more efficient use of them in the long term. Experience from the past also shows that investing in health, water, and sanitation infrastructure and services is effective in instant job creation in crises. The case of the US$21

billion green recovery package responding to the global financial crisis of 2008–09 shows that it has created economic value equal to 1.2 to 2.1 times of value in the period 2009–11 (GGGI, 2020).

The case in Viet Nam shows that the price support policies and preferential policies for investment in renewable energy have created waves of investment in renewable energy in Viet Nam. After adopting a mechanism to encourage investment in wind and solar power development, the total planned capacity of renewable electricity in 2025 will rapidly increase. The results of forecasting financial demand for investment in renewable energy in Viet Nam in the period 2016–24 show a breakthrough in investment in renewable energy in Viet Nam. There are many proposals for surveying, project development, and additional planning of wind power projects (on land, nearshore, offshore) up to about 50,000 MW from 2018 up to now. Viet Nam has added to the plan up to 11,800 MWh, with 4,800 MW of wind power being approved by competent authorities before 1 January 2019 (Vietnam Clean Energy Association, 2020b); solar power is 8,935 MWh (with 135 projects). As of the end of June 2019, 4,500 MWh of solar power will be put into commercial operation (Vietnam Clean Energy Association, 2019); and two additional power projects with a total capacity of 30 MWh. Currently, Viet Nam has several waste power plants in operation, such as Go Cat Power Generation Plant with a capacity of 2.43 MWh, Solid Waste Treatment Plant with a capacity of 6 MWh, and House Industrial waste treatment plant generating electricity in the Nam Son garbage treatment area with a capacity of 0.6 MWh (EVN, 2019).

To further promote investment attraction in renewable energy, in addition to green stimulus packages, there should be more favourable mechanisms for investors, especially credit access, thus banks play a key role.

6. Conclusion and Recommendations

In the new context, COVID-19 further affirms the role of the government to lead through solutions to promote the market, while at the same time promoting preferential policies towards green and sustainable growth. Each government needs to make quick, decisive, dynamic, non-rigid, and visionary policy responses in which the role of building the new structure meets the requirements of economic recovery and reduction of GHG emissions after COVID-19 has significance for the sustainable development of the world in general, and for each country in particular.

Thanks to the fast, decisive, and prescient responses of the Vietnamese government, the spread of the disease was prevented, the decline in growth rate was limited, and GHG reduction commitments were ensured.

To ensure sustainable development and adapt to the future risks of natural disasters, epidemics, and unusual impacts of climate change, the Vietnamese government needs to implement the following:

- Prioritise technological innovation to avoid using coal and oil, especially coal-fired thermal power.

Further, there is a need for promoting renewable energy. Hence, it is necessary to integrate the environmental factors and climate change into economic recovery support packages to promote green markets.

- Aim for a longer-term goal towards green and inclusive growth, especially support for the vulnerable, in the event of natural disasters, epidemics, or shocks similar to the COVID-19 pandemic. The government should prioritise economic recovery support packages for renewable energy investment, resilient infrastructure, and energy efficiency promotion. This would both promote the recovery of production and business, boost the consumption of goods and services from sectors of the supply chain, increase short-term GDP, and move towards greener production and consumption, at the same time implementing the commitments to reduce emissions that Viet Nam has signed.
- Accelerate research and application of digital technologies, information technology, big data, and artificial intelligence in service provision in general and public services, in particular, to improve labour productivity, reduce social costs, and ensure social distancing.
- Promote information exchange amongst countries in the region to better respond to crises like COVID-19.

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