



Chapter 1

Putting Long-term Sustainable Growth in Perspective

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1	Introduction	3
2	Shifting Developmental Trends, Evolution of Economic Cooperation, and Sustainability Challenges	3
2.1	Economic Landscape of Asia Before the COVID-19 Pandemic	3
2.2	Industrialisation: Competitiveness, Resource Use, and the Technology–Trade Nexus	5
2.3	Poverty, Inequality, and the Middle-Income Trap	8
3	Rethinking Low-Carbon Green Growth and Raising Ambitions for a Net Zero Economy	10
3.1	Climate Change, the Paris Agreement, and Net Zero Emissions	11
3.2	The Impact of COVID-19 on the Low-Carbon Energy Transition	13
3.3	Stimulus Measures and Financing Decarbonisation	16
4	Seizing the Window of Opportunity for Raising the Rate of Low-Carbon Green Growth	17
5	Overview of the Book	20



1. Introduction

A year and a half since the onset of the coronavirus disease (COVID-19) pandemic, the world has witnessed its devastating impacts, with the tragic loss of lives and livelihoods around the globe. The pandemic has caused a severe contraction of the world economy, with effects broader and deeper than those of the 2008 global financial crisis. The COVID-19 pandemic is a distressing reminder of the deep vulnerability of globally integrated economies. It underscores the urgency of building economies that are resilient not only in the face of pandemics, but also of the systemic risks of climate change and inequality that have been the focus of global attention. The pandemic provides opportunities to build back better, in that new development pathways must focus on the agenda of restoring growth, creating employment, and building resilience.

While the pandemic is far from over, and the global economic outlook after COVID-19 remains uncertain, this book argues that it is urgent for countries to adopt and implement policies for sustainable growth. It sets out ideas for achieving this through coherent policy frameworks, institutional strategies, and approaching a well-managed COVID-19 recovery in a regionally coordinated way. The book presents a strong case for Asia, especially the Association of Southeast Asian Nations (ASEAN) economies, to step up efforts to pursue this combined policy approach. This integrated approach sits at the very centre of development pathways that have underpinned economic growth, productivity, and well-being since

the 2008 global financial crisis (ADB, 2013) – and this book will review Asia's experience of the policies and practices for low-carbon green growth in the last decade. At this juncture, however, the agenda has gained greater urgency given the need for the region to move to a post-COVID-19 recovery.

The remainder of this introductory chapter reviews Asia's economic landscape before the COVID-19 pandemic and elaborates on how the pandemic makes the low-carbon resilient development agenda more urgent. It highlights the experience of low-carbon growth implementation in the past decade and, considering the COVID-19 challenges, points out future strategic priorities for the region. The chapter then gives a thematic overview of the ensuing chapters.

2. Shifting Developmental Trends, Evolution of Economic Cooperation, and Sustainability Challenges

2.1 Economic Landscape of Asia Before the COVID-19 Pandemic

Asia's economic performance has been strong since the 1990s. Gross domestic product (GDP) has almost tripled, rising by more than 6%–9% per year to reach US\$65 trillion in 2019. Asia's share in the global economy grew from 21.5% in 1991 to 37.8% in 2019 (World Bank, 2021). The bulk of the growth has come from the developing markets of China, India, and Southeast Asia. Other indicators of economic growth are equally striking. Exports have increased to one-fifth of the world's total, or more than US\$18 trillion per year, making the region one of the most open trading regions in the world (UNTCAD, 2018). The region has been the largest destination for foreign direct

investment for the past 2 decades and has US\$2.0 trillion worth of foreign exchange reserves (UNCTAD, 2020). For the 10 ASEAN Member States (AMS) (Brunei, Cambodia, Indonesia, the Lao People's Democratic Republic (Lao PDR), Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam), China, and India – for which comparable data are available – the share of the population living on less than US\$2 per day, a common measure of extreme poverty, dropped from 70% in 1998 to 30% in 2019, lifting more than 150 million people out of poverty (ADB, 2017; Anbumozhi and Bauer, 2010). A huge educated middle-class population has also emerged during the period, contributing to the skilled labour force.

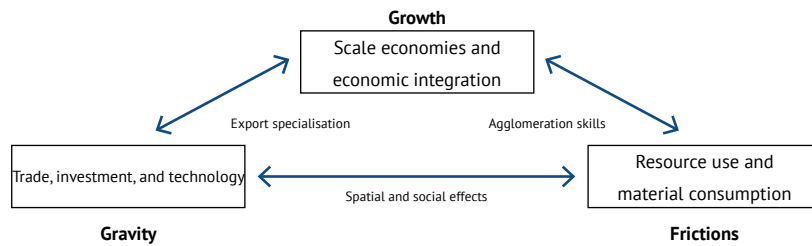
Asian countries have become more integrated with the world economy, which has increased their exposure to international shocks. However, the Asian economic crisis of 1997 and the 2008 global financial crisis have enhanced the resilience capacity of Southeast and East Asian economies. The more open economies – such as Cambodia, Indonesia, Malaysia, and Thailand – were hardest hit in the crises, but were able to bounce back quickly to recover and resume growth.

Structural reforms that were enacted in the aftermath of the crises could be attributed to the enhanced capacity to withstand successive shocks. For instance, the banking sector has become more solid, with capital adequacy ratios strengthened above Basel III levels and non-performing loan ratios and loan-loss provisions comparing favourably with those of many developed countries (Kawai, 2013). Regional cooperation initiatives such as the Chiang Mai Initiative – a multilateral currency swap arrangement amongst the 10 AMS, China, Japan, and the Republic of Korea (henceforth, Korea) – and the ASEAN Free Trade Agreement have their roots in the 1997 Asian financial crisis. That was

a determining moment when many policymakers saw for the first time the risks that came with the benefits of globalisation.

The widely quoted ASEAN Rising of the Economic Research Institute for ASEAN and East Asia (ERIA) (Intal et al., 2014) and ASEAN, PRC, and India: The Great Transformation (ADB, 2014a) explained the superior economic achievements of high-performing economies in the region. They concluded that these economies achieved high growth by getting the basics right. These two books and ASEAN 2030 (ADB, 2014b) went on to claim that fundamental macroeconomic policies were only part of the success story and that, in one form or another, governments had intervened systematically and through multiple channels. Large infrastructure connectivity programmes have boosted growth in several of the countries (Baviera and Maramis, 2017). They have been effective in facilitating investment in energy, transport, and communication connectivity (Kawai and Lee, 2015). Sizeable fiscal stimulus and massive liquidity injections in Japan, Korea, and China immediately after the 2008 financial crisis also contributed to the fast economic recovery. Thus, a willingness to experiment, together with policies adapted to changing circumstances, were the key elements of the sustained and resilient economic growth of ASEAN and East Asia before COVID-19 struck the region.

Another salient feature of the rapid economic growth of AMS during that period was a market-driven process of regional economic integration that has seen the intra-regional acceleration of trade, finance, innovation, and infrastructure investments while globalisation was taking hold.

Figure 1.1 Principal Forces of Economic Development in ASEAN and East Asia

ASEAN = Association of Southeast Asian Nations.

Source: ERIA Study team.

In many respects, the 1997 and 2008 financial crises increased the pace of this regional integration process, as can be seen from the number of international and regional free trade agreements recently concluded (ARIC, 2021).

Figure 1.1 summarises the principal forces that have driven the region's economic development. High growth occurred because of the exploitation of the scale economies that developed through export specialisation. This integration shifted the centre of gravity of global economic growth towards the region. When they are well managed, the resource-use and regional development trends feed back into more scale economies through the agglomeration of production and more rapid skill formation. On the other hand, over-exploitation of resources and unsustainable consumption in some parts of the region led to a reduction in the resources for sustainable growth in the future, resulting in developmental gaps.

This characterisation of the principal forces of economic development in Asia also reflects the fact that this is a region of diversity, with countries encompassing high-income, upper middle-income, lower middle-income, and low-income economies. This diversity creates opportunities for

countries at different stages of development to cooperate for economic complementarity and to develop regional production networks, alongside efforts towards regional infrastructure and trade and investment reforms.

2.2. Industrialisation: Competitiveness, Resource Use, and the Technology–Trade Nexus

Scale economies played an important role in Asia's rapid industrialisation, as they resulted in efficiency gains from large production volumes, which improved competitiveness (ERIA, 2015). The industrial competitiveness utilised the international division of labour and pioneered the formation of international production networks (IPNs). Taking advantage of open trade policies, technology transfer, and knowledge spillovers that reduced service link costs, local firms in Southeast and East Asia quickly became able to participate in the IPNs. Global supply chains (GSCs) originating in the region have expanded at different rates, with the apparel and automobile sectors growing in the 1980s; the electronics industry in the 1990s; and the service sector, especially business process outsourcing, being the most dynamic in the 2000s. In terms of dispersion and complexity, IPNs should be differentiated from GSCs. While GSCs include all sorts of international industrial links, IPNs (e.g. in the automobile and electronics industries) are based on the

task-wise international division of labour connected by tight service links (Kimura, 2020). Because of the interconnectedness of the participating firms and the built-in technical and financial assistance programmes mentored by lead firms, IPNs are known to be more resilient against external shocks.

The extraordinary ramping up of GSCs and IPNs over the past 3 decades has been accompanied by high rates of resource consumption.¹ Natural resources account for an important share of total wealth in the region – on average, more than 20% of total wealth, well above the 2% average in Organisation for Economic Co-operation and Development (OECD) countries (OECD, 2021). Oil, gas, and wood are the most important resources in the region. Resource extraction for economic use increased from 9 billion tons in 1985 to 13 billion tons of resources in 2005 and reached almost 23 billion tons in 2015 (OECD, World Bank, and UN Environment, 2018).

During 1997–2019, the growth of resource extraction in Asia was much faster than the global average. The share of emerging Asian countries, including China, India, and ASEAN, in global resource extraction increased from 22% in 1985 to 31% in 2015 (Anbumozhi et al., 2016). The composition of extracted resources changed considerably over time. While renewable resources such as biomass accounted for almost half of all extraction in 1990, this share diminished to 36% in 2015, as extraction of non-renewable resources increased at a much higher pace (Anbumozhi and Kalirajan, 2017). Large amounts of sand, gravel, and other

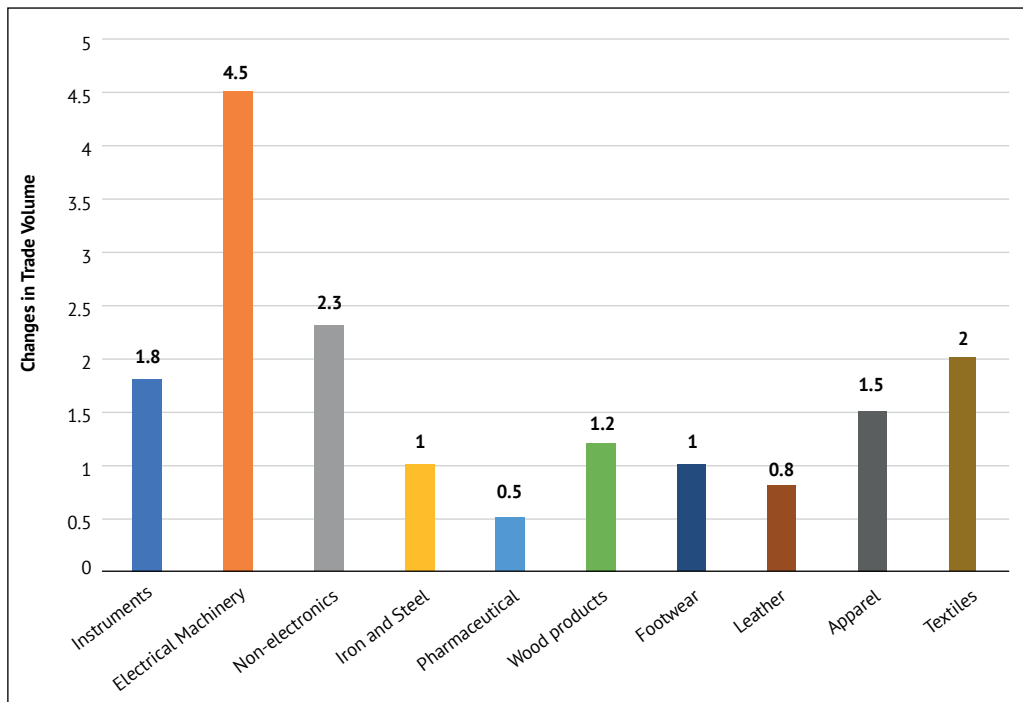
bulk construction materials have been used to build urban infrastructure and manufacturing plants. This growing share of non-renewable resources is one of the main characteristics of the competitive industrialisation process, which has accelerated significantly in many developing AMS since the beginning of the 1990s (Wolf et al., 2016). As a result of this process, the region consumed 20% of world energy in 2000 but 29% in 2019 (IEA, 2020; Kimura and Han, 2021). This poses a serious challenge to sustainable growth, in view of the finite resource base, climate change, and the fragile ecology on which countries of the region depend for economic expansion, social well-being, and human development.

Asia's industrialisation has taken place along with technological improvements in some salient ways (ADB, 2020). Highlighted here is the technology–trade nexus. Over time, exports of modern technology products requiring more highly skilled labour have overtaken exports of products requiring lower skilled labour. Falling under the broader category of 'machinery' in international trade statistics, these goods account for more than half of ASEAN and East Asia's exports, energy use, and embedded carbon emissions.

This trend may best be explained by two related technological developments that have been profoundly affected by goods produced in the developing countries of Asia and sold worldwide. First, scale economies exist in the manufacture of products such as electrical machinery, scientific instruments, iron and steel, and pharmaceuticals (Figure 1.2), which are also energy intensive. On the other hand, products such as wood, leather, apparel, and textiles show no tendency towards scale economies; these industries have seen their exports fall.

¹ In general, four major types of resources are considered: (i) agriculture, forestry and fishery, and biomass products (including textiles and wood products such as paper); (ii) fossil energy carriers (coal, oil, gas, and peat), used for energetic and non-energetic purposes (including chemicals based on fossil materials); (iii) minerals (industrial and construction minerals) and mineral products (such as glass or natural fertilisers); and (iv) metal ores and metal products (including, for example, machinery).

Figure 1.2 Changes in the Export Share of ASEAN and East Asian Economies, 1991–2016 (%)



ASEAN = Association of Southeast Asian Nations.

Source: ERIA Study team.

Second, the evolution of the trade–technology nexus in East Asia also illustrates the shifting location of production and technology transfer, as described by the famous ‘flying geese’ analogy (Akamatsu, 1962). According to this model, a lead economy, such as Japan, develops new technologies and production capabilities, but, as it develops, it shifts these techniques to economies with cheaper labour. In this way, mature industries migrate from more to less developed economies, while the lead economy specialises in more sophisticated technologies and complex industries (Fujita, Krugman, and Venables, 2001).

This resulted in a trend whereby firms in the developing countries of ASEAN relied extensively on technology from the

advanced economies of East Asia, Europe, and the United States, where nearly 80% of relevant global innovations have happened (OECD and ASEAN, 2020). Developing firms have used different mechanisms to acquire technology, depending on the sector and the stage of industrial development. It is a well-known fact that export-oriented firms along the global value chain tend to be more technologically efficient than their non-exporting domestic counterparts. Indeed, technological innovation, transfer, and absorption have stimulated and caused exports (ERIA, 2012). By undertaking original equipment manufacturing production, firms constantly upgrade their technological capabilities with the assistance of foreign buyers (Ando and Kimura, 2003; Kawai, 2013). Once established, they develop their ability to do create their own products, thereby moving up the technology value chain.

This technology–trade nexus has a profound impact on energy consumption and pollution in the developing countries of ASEAN. The total energy supply in the leading ‘goose’, Japan, in 1955 was 64 million tons of oil equivalent. The main energy source at that time was carbon-intensive coal, which accounted for 47% of total energy supply (IEEJ, 2017). The primary energy supply continued to expand in line with economic growth, totalling 385 million tons of energy equivalent in 1973 (IEEJ, 2017), although the pace of the increase slowed because of energy sector regulations and changes in industrial structure. Manufacturing industries have curbed their final energy consumption as the emphasis has moved from materials-based production to other light industries. The iron and steel industry has made remarkable progress in promoting energy conservation.

As a result, the proportion of final energy consumption accounted for by manufacturing industries, which was 36% in 1974, declined to 26% in 2006 (APERC, 2008). The combined share of four energy-intensive industries – steel, paper and pulp, chemicals, and cement – declined from 44.4% in 1974 to 31.0% in 2006 (APERC, 2008).

In many AMS, China, and India, air and water pollution already threaten the well-being of local communities. A sharp rise in industrial production, growing reliance on coal-fired power plants, and increases in the use of motorised vehicles have all contributed to higher air pollution. Concentrations of particulate matter are very high in megacities. The rapid pace of urbanisation and industrialisation in some countries is also contributing to water pollution, adding to pollution coming from agriculture and residential sectors (Limaye and Limaye, 2011). Waste generated from households and industries already represents a serious environmental challenge in many ASEAN

and East Asian countries. While low- and middle-income countries produce considerably less waste than high-income countries in the region, rapid urbanisation, industrialisation, and strong economic growth are likely to see the amount of waste increase rapidly. Open dumps are the most hazardous waste disposal method in several countries, easily polluting air and groundwater.

2.3. Poverty, Inequality, and the Middle-Income Trap

The region's fast and robust growth since the 1990s has moved hundreds of millions of people out of poverty. Table 1.1 catalogues the growth trends of the countries, together with the number of years they have had low and high growth rates. The region's economic growth has remained remarkably strong. Table 1.1 shows that the region's fight against poverty is far from over. Several countries still have a large share of their population living below the income poverty line. Using non-monetary measures, a large section of the population does not have access to necessities such as electricity, safe drinking water, and sanitation. For example, a substantial portion of the population – about 200 million people – does not have access to electricity (Anbumozhi et al., 2017).

The region is also confronted with the challenge of persisting inequality. Measured by the Gini coefficient, income inequality rose by more than 22% between 1990 and 2018 (ERIA, 2020b). The between-country inequality fell thanks to regional economic integration, which seems to have

Table 1.1 Distribution of Economic Development and Income Inequality

Country (ASEAN+6)	Population (2019, People)	Economic growth rate (30 years average)	Number of years			Percentage of population living below poverty line (Data from 2012-2019)	Gini index (data from 2012- 2019)	Percentage of population living without electricity	Energy consumption per capita (2019, in kWh)
			Negative growth rate	Growth rate in range 0-2%	Growth rate above 2%				
Australia	25,365,745	2.99	1	0	29	13.6	34.4	<1	70,644
Brunei Darussalam	433,285	1.12	9	7	14	N/A	-	<1	123,822.666*
Cambodia	16,486,542	7.21	0	2	28	17.7	30.8*	4	2,933.223*
China	1,397,715,000	9.32	0	0	30	0.6	38.5	<1	27,452
India	1,366,417,754	6.55	0	0	30	21.9	35.7	4.76	6,924
Indonesia	270,625,568	5.17	1	1	28	9.4	38.2	2	9,147
Japan	126,264,931	1.07	6	9	15	15.7	32.9	<1	40,889
Republic of Korea	51,709,098	5.18	1	1	28	14.4	31.4	<1	67,083
Lao PDR	7,169,455	6.76	0	0	30	18.3	38.8	2.08	12,009*
Malaysia	31,949,777	5.77	2	1	27	5.6	41.1	<1	37,054
Myanmar	54,045,300	8.43	1	0	29	24.8	30.7	27	-
New Zealand	4,979,300	2.8	3	4	23	N/A	38.5	<1	53,225
Philippines	108,116,615	4.57	2	2	26	16.7	42.3	5.14	5,200
Singapore	5,703,569	5.84	2	3	25	N/A	37.5%**	<1	169,886
Thailand	69,625,582	4.45	3	3	24	9.9	34.9	<1	22,399
Viet Nam	96,462,106	6.92	0	0	30	6.7	35.7	<1	11,862

kWh = kilowatt-hour, N/A = not available.

* 2016 data.

** Singapore: Household income from work per household member (including employer CPF contributions) after accounting for government transfers and taxes.

Sources: World Bank (2019), World Development Indicators, <https://databank.worldbank.org/source/world-development-indicators> (accessed 30 September 2021); IEA (2020); and Our World in Data (2019), <https://ourworldindata.org/> (accessed 30 September 2021).

helped to bring the average living standards closer across countries. However, the inequality within countries widened. An aspect of inequality that is robust across all countries in the region is rural–urban differentials in income, electricity consumption, poverty, education, and emissions. Urban mean electricity consumption levels are 50%–100% higher than rural levels.

During the past 30 years, a number of Asian countries have moved from levels of income associated with abject poverty to levels that have earned them middle-income status. With China, India, Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam having average per capita GDP between US\$1,000

and US\$10,000, about 90 out of every 100 people in the region now live in a middle-income country (IMF, 2021). This region encompasses more middle-income countries than high-income and low-income countries.

It is logical for policymakers in countries that are attaining middle-income status to ask what should be done to ensure that their countries' income levels do not stagnate. While recognising the domestic efforts of these countries towards achieving middle-income status, an important driver in the process was the development of regional production and distribution networks, technological progress, and greater spending on research and development (Ando and Kimura, 2003; Anbumozhi and Kawai, 2015).

Going forward, regional integration and cooperation remains a key driving factor for Asia's middle-income countries to succeed. The necessary institutional infrastructure exists for this continuing cooperative effort. The ASEAN Economic Community was inaugurated in 2016, providing a framework for the free flow of goods, services, investment, capital, and skilled labour. ASEAN+ cooperative platforms are also in place. It is important for countries to work together with these processes.

3. Rethinking Low-Carbon Green Growth and Raising Ambitions for a Net Zero Economy

The rapid growth of the regional economy has provided tremendous growth potential for industry, but as noted earlier, has also brought interlinked environmental and social pressures. ASEAN and East Asian countries are some of the world's most vulnerable to climate-induced natural disasters. From 1990 to 2019, this region accounted for up to 80% of deaths and 38% of global economic losses from natural disasters (Anbumozhi, Breiling, and Reddy, 2019). Disasters such as Cyclone Negrin in Myanmar in 2008, the 2011 floods in Thailand, and the 2013 Typhoon Haiyan in the Philippines are amongst the worst ever recorded in these countries. According to Anbumozhi, Kimura, and Thangavelu (2020) estimates, the damage caused by the 2011 floods in Thailand amounted to around 13% of GDP. To mitigate the risks associated with the increasing likelihood of such disasters, countries in the region will need to improve land use planning and formulate appropriate policies.

Model simulations suggest that Southeast and South Asia will be the regions of the world most negatively affected by climate change in the coming decades. According to several studies (ADB, 2016; Anbumozhi, Breiling, and Reddy, 2019; OECD et al., 2015), climate change could result in GDP loss of 5%–9% in 2050, i.e. above a baseline involving no climate change. A large share of these losses is likely to occur in the agriculture, water, and health sectors, which are important for sustaining economic growth.

The global environmental and local social challenges that accompany rapid economic growth were met in part by the Paris Agreement, the United Nations Sustainable Development Goals, the ASEAN Community Blueprint, and of late the ASEAN Comprehensive Recovery Framework which advocates a low-carbon green growth paradigm. Low-carbon green growth can help countries to meet the challenge of sustaining economic and social development in the short term while safeguarding longer-term economic performance and human well-being.

Rather than replacing the concept of sustainable development, low-carbon green growth encourages pathways to achieving it without neglecting the desire for continuing increases in conventionally measured standards of living. The concept and principles require the decoupling of economic growth from carbon emissions and the recoupling of economic growth with intergenerational social equity and social capital creation. It abandons the conventional linear economic model of development, to explore alternative modes of growth that emphasise the co-benefits or the triple dividends – economic growth, environmental

Table 1.2 Nationally Determined Contributions Set in the Paris Climate Agreement

Target	High-income countries	Upper middle-income countries	Lower middle-income countries
Reduction below BAU	Republic of Korea: 37% Brunei Darussalam: 63%	Thailand: 20%–25%*	Viet Nam: 8%, 25%* Indonesia: 29%, 41%* Cambodia: 27%*
Absolute reductions	Australia: 26%–28% Japan: 26% below 2013 level		
Emissions intensity	Singapore: 36% below 2005 level	China: 60%–65% below 2005 Malaysia: 35%, 45%* below 2005 level	India: 33%–35% below 2005 level

* 2030 nationally determined contributions conditional target emission reduction.

BAU = business as usual.

Source: Compiled by the ERIA Study Team.

preservation, and social equity – of attaining a net zero economy.

3.1. Climate Change, the Paris Agreement, and Net Zero Emissions

Even before the COVID-19 outbreak, the world had already warmed, on average, by just over 1°C since pre-industrial times (IPCC, 2018). When countries struck the landmark Paris Agreement in 2015, they committed to limit global temperature rises to well below 2°C compared with pre-industrial levels. Nations also agreed to strive for an even safer cap on warming of 1.5°C through voluntary emissions-cutting plans, known as Nationally Determined Contributions (NDCs), which would be ratcheted up in scope and ambition every 5 years. Table 1.2 shows the wide variations in the carbon emission reduction targets set by countries in the ASEAN and East Asia region.

To achieve the global goal of net zero emissions established in Article 4 of the Paris Agreement, each country that has signed and ratified the agreement must consider how to contribute to the goal with more ambitious NDCs. Various mitigation pathways are consistent with the 1.5°C target and net zero emissions, all of which would require transformational change in energy and

economic systems across the region. The IPCC (2018) noted that for net carbon emissions to peak by 2030, the following are required: an emphasis on rapid and deep decarbonisation of the global energy supply in the near term; demand-side mitigation efforts across all end-use sectors, such as switching from fossil fuels to electricity in the transportation and residential sectors; and substantial shifts in investment patterns, away from carbon-intensive energy production, energy efficiency improvement demand reduction, and the adoption of carbon capturing and recycling at scale.

Table 1.3 presents the current and projected carbon emission trends for the region until 2040. The region's share in global emissions is expected to surge, driven by rapid economic growth and a rising population. According to Kimura and Han (2021), the energy demand and energy-related carbon emissions of the 16 economies are likely to double between 2020 and 2040. The growth rates of developing ASEAN are well above those observed in the developed countries of Japan, Korea, Australia, and New Zealand over the same period, but are broadly comparable with the large emerging economies of China and India.

Table 1.3 Current and Projected Energy Use and Carbon Emission Trends

Country	Population		CO ₂ Emissions		CO ₂ Emissions per capita		Emission Intensity (tCO ₂ /GDP)	Total Energy Demand*		Electricity Consumption
(ASEAN+6)	2020	2040	2020	2040	2020	2040	2020	2020	2040	2019
Unit	Million		Mt		t/capita		tCO ₂ /GDP	Mtoe		TWh
Australia	25.5	30.6	380.7	358.4	14.9	11.7	246	83.3	89.6	235
Brunei Darussalam	0.4	0.6	1.4	1.8	3.1	3.0	88	2.0	2.8	3
Cambodia	16.7	22.5	3.3	13.9	0.2	0.6	158	4.5	13.1	10
China	1,440.0	1,449.8	9,941.5	9,853.4	6.9	6.8	814	2,163.1	2,338.1	6,510
India	1,380.5	1,593.3	2,545.7	5,355.4	1.8	3.4	778	680.5	1,343.4	1,230
Indonesia	272.1	311.6	142.5	307.2	0.5	1.0	117	180.2	360.8	245
Japan	125.8	112.7	1,058.9	861.0	8.4	7.6	168	286.2	244.6	960
Korea, Republic of.	51.9	52.8	587.8	693.4	11.3	13.1	403	192.9	222.0	553
Lao PDR	7.3	9.8	5.4	9.4	0.7	1.0	372	3.4	7.4	6
Malaysia	32.4	38.9	60.5	120.1	1.9	3.1	151	68.2	137.3	155
Myanmar	55.0	62.7	9.6	21.1	0.2	0.3	99	19.2	35.2	18
New Zealand	5.0	6.0	33.2	30.2	6.6	5.0	169	15.0	14.5	40
Philippines	105.2	141.7	37.4	86.4	0.4	0.6	123	41.5	85.0	106
Singapore	5.8	7.2	19.0	27.2	3.3	3.8	53	25.3	31.4	47
Thailand	69.9	74.4	58.9	114.3	0.8	1.5	127	94.7	176.3	194
Viet Nam	96.6	107.0	64.0	178.4	0.7	1.7	298	70.5	157.8	217

CO₂ = carbon dioxide, GDP = gross domestic product, Mt = million tons, Mtoe = million tons of oil equivalent, t = ton, tCO₂ = ton of carbon dioxide, TWh = terawatt-hour.

* Total energy demand includes total demand on industry, transportation, others, and non-energy sectors.

Sources: Kimura and Han (2021); Enerdata (2020), CO₂ Emissions from Fuel Combustion. <https://yearbook.enerdata.net/co2/emissions-co2-data-from-fuel-combustion.html> (accessed day month year); CEIC Data (2021), <https://insights.ceicdata.com/Untitled-insight/myseries> (accessed 23 April 2021).

The low per capita carbon emissions of most developing countries are largely explained by their lower income, but the carbon intensity of their GDP is close to the average of the advanced countries. On average, AMS perform better in terms of their carbon intensity than China, India, and Korea, which could be explained by the lesser importance of heavy industry. The sooner the region's emission trajectory begins to trend downward towards net zero, the smoother will be the transition to a low-carbon economy at the global level. Improving energy efficiency and achieving net zero emissions will result in a triple dividend: reducing pollution, conserving scarce natural resources, and improving the international competitiveness of the region's export-oriented economies.

The term 'net zero emissions' often refers to achieving an overall balance between greenhouse gas emissions produced and the past emissions taken out of the atmosphere. Getting to net zero means economies can still produce some emissions, if they are offset by processes that reduce greenhouse gases already in the atmosphere. Nineteen countries have already adopted net zero targets, and more than 100 others are considering doing so. Japan and Korea have each announced goals for reaching net zero carbon emissions by 2050, and China by 2060. Indonesia is considering setting a net zero emissions target for 2070 as part of its efforts to update its NDCs, while maintaining the country's previous pledge to reduce emissions by 29% if reliant on its own ability to finance decarbonisation, or by 41%

with international assistance, by 2030 (ACE, 2020). In Thailand, the energy and environmental authorities are together planning to achieve zero net carbon emissions by adjusting the fuel mix in the country's power generation industry.

While countries have made national level pledges of carbon emission reductions in line with the Paris Agreement, detailed plans for how they will get there are largely missing. It is important to have detailed decarbonisation plans carefully developed at the sector, industry, and subnational levels, with financing and implementation arrangements established.

3.2. The Impact of COVID-19 on the Low-Carbon Energy Transition

The economic impact of COVID-19 on export-led Asian economies has been felt predominantly through three channels: disrupted supply chains and decreased manufacturing, a

complete halt in tourism, and changes in patterns of domestic demand. The extent to which these channels affect the economy, change consumption, and reduce carbon emissions very much depends on how strictly and lengthily pandemic containment measures, including social distancing measures and vaccination programmes, are implemented in each country. Nevertheless, the combination of a sharp drop in exports, tourism, and domestic demand led to deep recessions in most of the emerging economies in 2020. Large contractions in GDP growth in the range of -2% to -9% were observed in most of the economies in the region (ADB, 2021). These outcomes have already widened income inequality, disrupted financial markets, and caused deep cuts in planned public spending on infrastructure development (IMF, 2021). The cumulative economic and financial fallout is estimated to be much worse than that of the 1997 Asian economic crisis and the 2008 global financial meltdown (Table 1.4).

Table 1.4 Economic Impact of the COVID-19 Pandemic on the Regional Economy

Country	Economic growth, 2020	'Average economic growth rate (2010-2019)'	Growth forecast					Fiscal balance	Average fiscal balance [pre-pandemic]	Non-performing assets
(ASEAN+6)			2021	2022	2023	2024	2025	Percentage of GDP 2020	Percentage of GDP 2010-2020	Percentage of GDP
Australia	-2.4	2.58	4.5	2.8	2.3	2.3	2.4	-0.7	-2.6	0.961
Brunei Darussalam	1.2	0.51	1.6	2.5	2.3	2.1	2.1	no data	no data	3.899
Cambodia	-3.5	7.03	4.2	6.0	6.3	6.6	6.7	-2.6	-2.5	1.554
China	2.3	7.67	8.4	5.6	5.4	5.3	5.1	-5.5	-2.7	1.862
India	-8.0	6.98	12.5	6.9	6.8	6.7	6.6	-6.6	-7.3	9.234
Indonesia	-2.1	5.44	4.3	5.8	5.7	5.4	5.2	-1.8	-1.9	2.433
Japan	-4.8	1.28	3.3	2.5	1.1	0.7	0.6	-2.1	-5.5	no data
Republic of Korea	-1.0	3.31	3.6	2.8	2.6	2.4	2.3	1.5	1.5	0.254
Lao PDR	-0.4	7.16	4.6	5.6	5.8	5.8	6.1	-5.0	-3.7	no data
Malaysia	-5.6	5.33	6.5	6.0	5.7	5.3	5.0	-2.5	-3.1	1.534
Myanmar	3.2	6.62	-8.9	1.4	4.7	5.0	5.0	-3.8	-2.7	no data
New Zealand	-3.0	2.89	4.0	3.2	2.6	2.5	2.4	0.7	-1.0	no data
Philippines	-9.5	6.38	6.9	6.5	6.5	6.5	6.5	-1.4	-0.5	1.974
Singapore	-5.4	4.96	5.2	3.2	2.7	2.6	2.5	3.1	5.4	1.306
Thailand	-6.1	3.64	2.6	5.6	3.8	3.5	3.6	-0.7	-0.3	3.130
Viet Nam	2.9	6.50	6.5	7.2	6.9	6.8	6.6	-4.3	-4.8	1.501

ASEAN = Association of Southeast Asian Nations, COVID-19 = coronavirus disease, GDP = growth domestic product.

Sources: IMF (2020) <https://www.imf.org/> (accessed 30 September 2021); World Bank (2019) <https://databank.worldbank.org/> (accessed 30 September 2021).

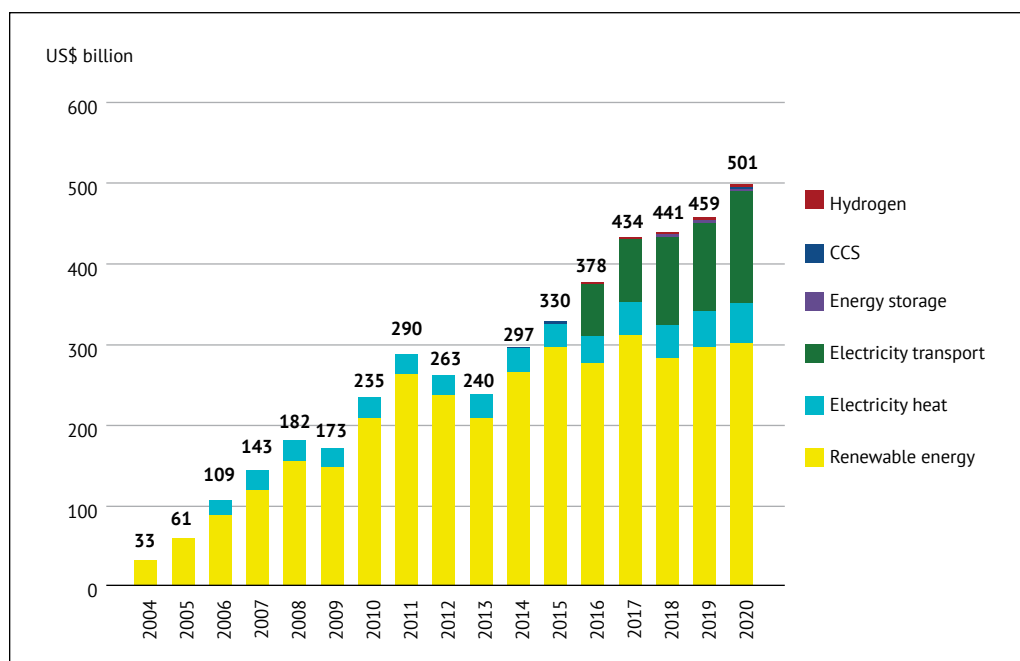
As countries recover from the pandemic, in the short and medium term individual economies are projected to expand by at least 2%–7% every year (World Bank, 2021). The projected growth rates for the next 5 years, however, are based on the assumption of the successful COVID-19 containment measures and pre-pandemic economic structures of countries.

Figure 1.3 shows global trends in energy investment. The energy sector, particularly electricity, has played a critical role in the immediate response to the pandemic. Uninterrupted energy supplies have enabled hospitals to provide healthcare, food, and other essentials to be transported and delivered; and allowed people to study and work from home. However, the pandemic has also slowed down low-carbon energy investment, creating

short-term uncertainties and long-term implications for the financing landscape. The quarantines, industrial lockdowns, and work-from-home arrangements have changed the ways in which energy is consumed and interrupted the supply chains of both fossil fuels and renewable energy, with corresponding lost revenues.

Figure 1.4 shows the changes in energy demand and investment at the global level. Global energy demand is estimated to have fallen by around 5%–9% in the period between the outbreak in March 2020 and December 2020, compared with the same period in 2019 (IEA, 2020). Some countries, including Malaysia and the Philippines, experienced a drop of 30%–45% in electricity demand during the first half of 2020, though this bounced back in the third quarter (ACE, 2020). The oil demand of ASEAN and East Asian

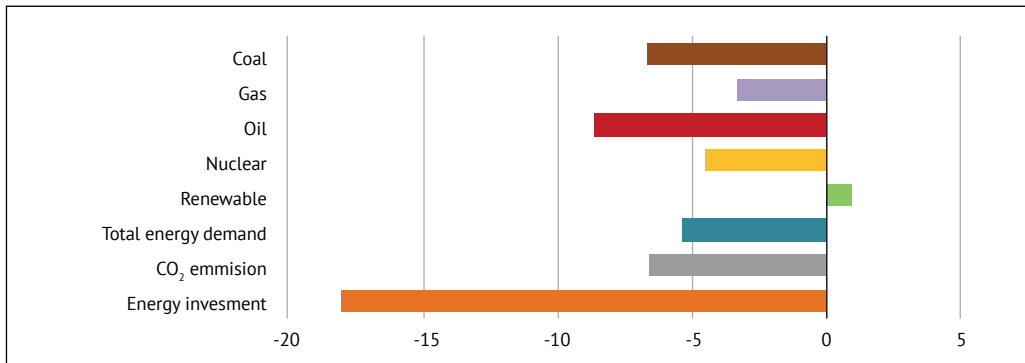
Figure 1.3 Trends in Global Energy Investment



CCS = carbon capture and storage.

Source: BloombergNEF (2021).

Figure 1.4 Changes in Global Energy Demand and Low-Carbon Investment During the COVID-19 Pandemic



CO₂ = carbon dioxide, COVID-19 = coronavirus disease.

Source: IEA (2020).

countries declined by 8% during that period, with transport and aviation fuel demand accounting for the biggest declines. While the renewable energy output was steady at a global level, fossil fuel producers saw a fall in demand, imposing cuts in profitability. Although electricity demand shifted from the industrial and transport sectors to the residential sector, increased household use has been outweighed by a massive reduction in demand from commercial offices and industrial operations (ERIA, 2020a). The experience in 2008 offers potential lessons. The annual carbon dioxide (CO₂) emission growth rate decreased by half in 2008 (to 1.7%, from 3.3% in 2007), mainly driven by the 0.6% drop in oil consumption that resulted from the economic slowdown and high oil and food prices at the time (Hamilton, 2009). However, global emissions rebounded in 2010 due to emissions growth in several developing economies of ASEAN, China, and India; economic stabilisation in developed economies; and an increase in fossil fuel intensity, particularly due to the use of coal and gas (Grossman, 2015). The rebound in energy demand depends on the roll-out of vaccines

and a recovery of the industry and transport sectors.

Relative to 2019, global energy investment contracted by 17%, with a particularly hard impact on energy jobs – although employment more generally also suffered (IEA, 2020). About 8.3 million jobs are estimated to have been lost due to the COVID-19 outbreak in the Philippines. Indonesia's Planning and Development Agency reported that its unemployment rate rose to about 10.0%, or nearly 14 million people, from April to December 2020, a substantial number of whom worked in the energy and manufacturing sector (ILO, 2020a; ILO, 2020b). Ducanes (2020) estimated that up to 2 million jobs may be lost in ASEAN, both directly and indirectly, nearly one-third of which are in the energy sector. Significant efforts should be made for the region to generate more jobs through future low-carbon energy investments. Nevertheless, it should be noted that the recovery may be rapid in 2021, depending on the pandemic response measures implemented as well as new economic and industrial activities supported by special fiscal stimulus packages.

3.3. Stimulus Measures and Financing Decarbonisation

Governments in ASEAN and East Asia are responding to this crisis on a massive scale, producing fiscal stimulus packages to counter the negative economic impacts of COVID-19 totalling 3%–13% of GDP from April to December 2020. The total stimulus of G20 countries up to December 2020 amounts to US\$13.0 trillion, and presents an opportunity to support resource-intensive sectors through the COVID-19 crisis while boosting global resilience to mounting climate and biodiversity risks (Vivid Economics, 2021). The Greenness of Stimulus Index of Vivid Economics shows that the developing and emerging economies which are most dependent on environmentally intensive and high-carbon sectors, and lacking in strong regulatory oversight, have the biggest task in turning their stimulus green, and have so far failed to harness this opportunity, though a few are rising to meet the challenge.

The fiscal interventions made by individual governments in ASEAN can be classified into three categories (ASEAN, 2020). The first is household subsidies, including cash allowances and subsidies for social security contributions, which are crucial for the daily needs of low-income households. Governments have provided tax exemptions, rent moratoriums, and restructuring of bank loans for affected businesses. The combination of fiscal measures and economic contractions is likely to lead to a sizeable increase in public debt across major emerging economies in ASEAN and East Asia. The monetary policy response of most central banks in the region has been

conventional: increased liquidity for banks and lower interest rates to spur lending. The results of the economic and monetary stimuli are not yet clear but may not be sufficient to support several commercial banks with a high proportion of non-performing assets. The region's leading economies – China, Japan, Korea, Indonesia, Malaysia, Singapore, and Thailand – have pumped about US\$2 trillion directly to sectors with relatively high carbon emission intensities: the agriculture, industry, energy, transport, and waste sectors. It is unclear how much of this large amount of investment in high carbon emissions intensity industries was made in accordance with decarbonisation financing standards.

The regional investments needed to implement commitments under NDCs amount to more than US\$30 billion per year until 2030 (ADB, 2016; 2017); and achieving net zero emissions by 2050 will require an estimated US\$50 trillion annually in investments. Public financing will not be sufficient to achieve all the decarbonisation goals, given the limited funds available as well as competing priorities in the health, education, and social services sectors. International finance for climate change mitigation is similarly limited. Private sector investment will be crucial to close the financing gap, by seizing some of the new business opportunities. An ERIA study identified US\$23 trillion of investment opportunities to finance the national climate action commitments of 18 East Asia Summit economies, representing 38% of global greenhouse gas (GHG) emissions (Anbumozhi and Kalirajan, 2017). These investment opportunities include low-carbon buildings, energy efficiency and transport, and clean energy infrastructure. Both

governments and the private sector can play a role in unlocking further investment by enhancing the leverage and multiplier effects of their financing – that is, for every dollar of public funding of low-carbon infrastructure development, an additional US\$2–US\$5 of private investment is mobilised, adding US\$40 billion–US\$100 billion to development flows every year (Anbumozhi, Kimura, and Kalirajan, 2018). It is essential to develop standards for low-carbon and green investment and to enforce implementation through public financial management and banking systems (Anbumozhi and Yao, 2016; Anbumozhi et al., 2020; Durrani, Volz, and Rosmin, 2020). This is to ensure that the financing made can contribute to achieving genuine decarbonisation goals.

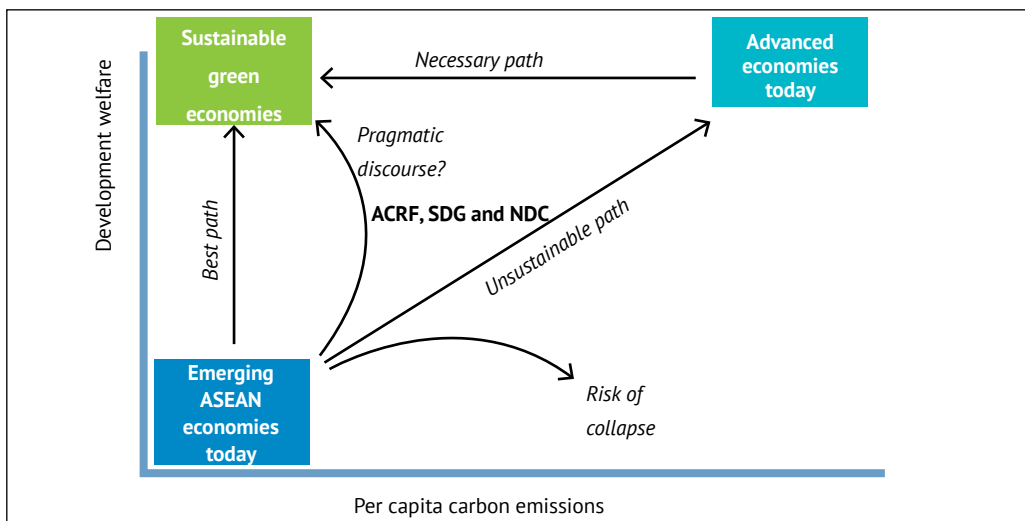
4. Seizing the Window of Opportunity for Raising the Rate of Low-Carbon Green Growth

The COVID-19 pandemic has underlined the fragility and the

dangers of the old economic paradigm. The dangers of ignoring the links between economic growth, natural resources depletion, and climate risk have come to the fore as the pandemic has taken hold. The COVID-19 health crisis has also underscored the importance of technology, social cohesion, and international cooperation. The pandemic also happened at a time when countries witnessed rapid advances in digital technologies, such as artificial intelligence, robotics, and the internet of things, which brought resilience to several supply chains but also disrupted traditional consumer markets. These risks will only heighten as the COVID-19 crisis continues, economies recover, and populations grow.

Figure 1.5 illustrates that now is a critical juncture to make sweeping advances through the low-carbon green growth agenda that will help governments, businesses, and societies achieve global commitments to the Sustainable Development Goals, the

Figure 1.5 Sustainable Development Dilemmas of Emerging Economies of Asia



ACRF = ASEAN Comprehensive Recovery Framework, ASEAN = Association of Southeast Asian Nations, COVID-19 = coronavirus disease, NDC = Nationally Determined Contribution, SDG = Sustainable Development Goal.

Source: ERIA Study Team.

Paris Agreement, and the ASEAN Comprehensive Recovery Framework.

Today's decisions by policymakers will determine the region's development path for decades. There is evidence that decoupling of carbon emissions from economic growth in many developing countries is not only possible but will also improve social inclusion (ERIA, 2020a). Studies (Fulton and Capilno, 2014; Li and Zhang, 2018; Choi, Liu, and Lee, 2017; Mo, Zhai, and Lu, 2017) have also shown that regional economic cooperation through liberalised trade and investment, integration of carbon markets, and increased investment in innovation on low-carbon products and services can contribute both to lower pollution and emissions and to raising long-term economic growth prospects. Other studies (OECD, 2016; Anbumozhi, Kimura, and Kalirajan, 2018) have also found that public finance support to redirect investments towards low-carbon green technologies is imperative and would have long-term benefits, not least by catalysing private financing channels.

Transition from a COVID-19 shock to a more resilient economy: COVID-19 has exposed and exacerbated inequalities between countries just as it has within countries (IMF, 2021). Countries that have practised short-sighted policymaking and suffered more acute inequalities have tended not to manage the health pandemic well (World Bank, 2021). COVID-19 has highlighted the pressing need for better global risk management and more inclusive growth. Health, economic, digital technology, trade, and other systems interwind through complex networks. Over-arching principles are necessary for risk management and for global systemic risks. Through decentralisation, individuals,

businesses, and communities are empowered to make their own quick decisions.

Transition from business as usual to a low-carbon/net zero economy: Whether a clean environment and green infrastructure are to be achieved is being decided now – determining energy consumption, pollution, and natural wealth for decades to come. Developing countries of the region can still leapfrog 20th century technologies and infrastructure investments by adopting low-carbon, viable, and economically viable alternatives. To keep costs and risks low, policymakers need to act now to shape dynamic economies so that they are resource efficient, resilient to climate change, and provide essential services for the socially disadvantaged.

Transition to becoming an innovation hub: The challenge for many of the developing economies that are at middle-income status is to advance to the high-income level. What is needed is innovation and creative industries that increasingly seek green investment opportunities as part of international and domestic trade so that corporate income growth goes hand in hand with low-carbon green growth. The region can lead the global shift, given its production networks and natural resources wealth.

Nevertheless, low-carbon green growth requires a broad range of new strategies involving a mix of policies and instruments, including net zero targets. For example, framework legislation and strategies (e.g. climate laws, renewable energy regulations, and long-term industrial growth strategies); economic instruments (e.g. carbon taxes, subsidy reform, trade policy, and tax incentives for eco-

innovation); regulatory instruments (e.g. regarding energy-related emissions, transport technology, and consumer product standards); and other approaches such as information policies, procurement policies, voluntary agreements for small and medium-sized enterprises, and evaluation and accountability mechanisms, can play important roles in the broader low-carbon green growth policy package.

However, reconciling low-carbon climate-resilient growth and social cohesion while financing the investments necessary for sustainable growth requires a holistic approach, although these objectives have mostly been addressed separately so far by the region's governments. A coherent and comprehensive implementation framework is necessary to reduce the short-term costs of moving towards a net zero economy and to avoid adverse social and competitiveness impacts on sectors, firms, and households.

There is evidence that low-carbon green growth can unlock economic opportunities and create jobs. In mid-

2020, European governments approved a very ambitious low-carbon green growth programme, agreeing to invest more than €500 billion as an economic response to the pandemic, with 25% of the stimulus to be set aside for climate-friendly measures. The European stimulus proposes investments in renewable energy, energy storage, clean hydrogen, batteries, and carbon capture and storage. It proposes to install 1 million electric vehicle charging points. The European Union recovery package is designed to help to achieve the emission reduction targets adopted in the Paris Agreement, and is projected to add 1% of GDP and create 1 million jobs over the next decade, while investing in the circular economy will add another 700,000 jobs (European Commission, 2020).

The stimulus packages implemented in China, Korea, Japan, and Viet Nam in the aftermath of the 2008 crisis typically included government spending on renewable energy development, industrial energy efficiency, climate-resilient infrastructure, and large-scale support for eco-innovations (Table 1.5). A wide range of policy initiatives, incentive

Table 1.5 Share of Low-Carbon Economy Components in the 2008 Green Stimulus

Economies	Low carbon/Green stimulus (US\$ billion)				Share of green stimulus (%)		
	Renewable energy	Energy efficiency	Waste and water	Total	Global total	Fiscal stimulus	GDP
China	1.6	182.4	34.0	218.0	41.8	33.6	3.1
US	39.3	58.3	20.0	117.7	22.5	12.0	0.9
Republic of Korea	30.9	15.2	13.8	59.9	11.5	78.7	5.0
Japan	14.0	29.1	0.2	43.3	8.3	6.1	1.0
EU	13.1	9.6	-	22.8	4.4	58.7	0.2
Germany	-	13.8	-	13.8	2.6	13.2	0.5
France	0.9	5.1	0.2	6.2	1.2	18.2	0.3
UK	0.9	4.9	0.1	5.8	1.1	16.3	0.3
Canada	1.1	1.4	0.3	2.8	0.5	8.7	0.2
Italy	-	1.3	-	1.3	0.3	1.3	0.1
G20 total	105.3	330.1	78.1	513.5	98.3	17.1	0.8
World total	107.6	335.4	79.1	522.1	100.0	15.7	0.7

EU = European Union, GDP = gross domestic product, UK = United Kingdom, US = United States.

Source: Barbier (2010).

mechanisms, and new regulatory frameworks helped to deliver the intended objectives of green stimulus, but to differing extents.

Green stimuli appeared to be most effective in communities which had workers who already possessed the skills required for green jobs (Popp et al., 2020; Chen et al., 2020). The transformation of several strategic sectors within the emerging economies of ASEAN and East Asia is central to stimulating low-carbon green growth. The key challenge is to carefully select the types of technological and infrastructure investments that can bring both jobs in the short run and sustainability benefits in the medium term. Advancing the low-carbon green growth agenda also requires harnessing innovation potential within and across international borders.

5. Overview of the Book

The latest IEA, World Bank, and World Economic Forum joint report (2021) underscored the urgency of speeding up energy transitions and clean energy investments in emerging and developing countries. For developing countries in Asia, the transformation and transition to low-carbon resilient green growth are imperative, feasible, and attractive.

Being heavily dependent on imported resources and energy, the emerging economies of ASEAN and East Asia had already embarked on the application of the new development paradigm before the COVID-19 outbreak. The speed of the transition must rise. Why are perceptions about low-carbon green growth changing and what is the scale of the challenge? What are the

successful transformation strategies, policies, and practices and how has the pandemic changed emission trajectories? How can policymakers align pandemic recovery and stimulus packages with long-term sustainability goals? What are the opportunities for cooperation, collaboration, and coordination? This book aims to answer these questions, reviewing the low-carbon green growth policy initiatives taken by countries at the national, sectoral, and local levels, and assessing the achievements made, while identifying the gaps and examining the new opportunities in the transition to a net zero economy.

Aiming to inform national leaders about low-carbon green growth in the context of COVID-19, the book covers:

- the experience of low-carbon energy transitions during the last decade to identify major trends, performance drivers, and gaps;
- an updated outlook for emission reduction scenarios to achieve sustainability, inclusion, and resilience;
- the economy-wide impact of COVID-19 and the dynamics of structural changes;
- the evolving course of the pandemic recovery and the content of stimulus packages;
- developing new means of financing low-carbon green growth;
- promoting regional cooperation to accelerate the transition; and
- key conclusions and recommendations to help policymakers advance the low-

carbon green growth agenda in the region.

The book takes a practical approach to low-carbon green growth, as applicable to ASEAN and East Asia. It includes contributions about the practical implications of emission reduction policies from a regional perspective and the various ways to incorporate the concept of green growth in day-to-day policymaking. The chapter-by-chapter outlines are narrated below.

Chapter two of the book assesses the evolving global mega trends and converging regional perspectives on low-carbon green growth as an integral part of an inclusive and sustainable development agenda. The megatrend assessment is important to inform countries that design and update their post-recovery package with more ambitious NDC targets. The chapter also highlights a few major takeaways from the megatrend assessment, which will help regional policymakers to track the results of their policies and public investments. Thus, the chapter sets a broad context for country and thematic discussions in the ensuing chapters.

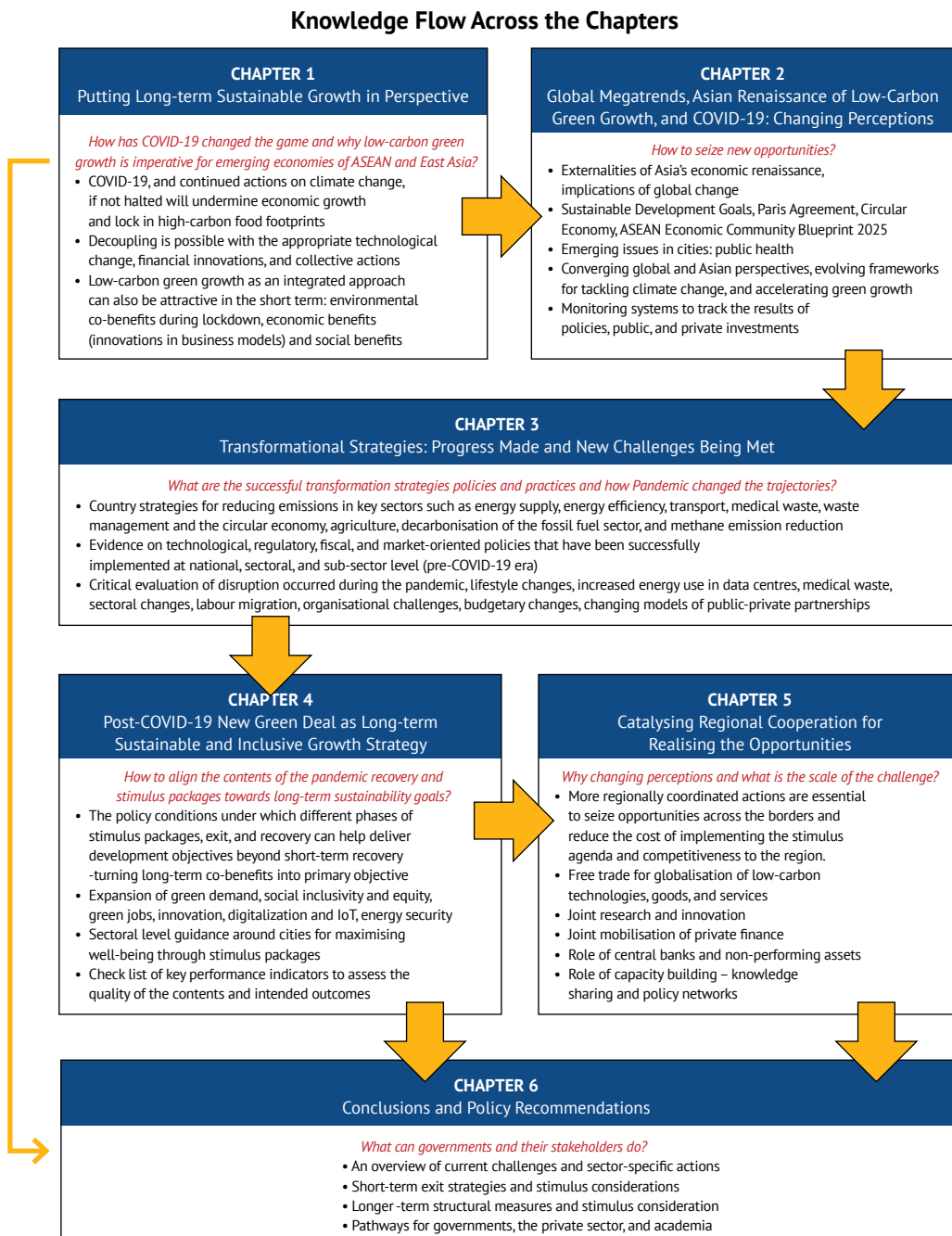
Chapter three reviews the experience of the low-carbon green economy transition in the recent decade. It presents evidence about various country-wide actions to reduce GHG emissions and to promote low-carbon 'circular' economies, with a focus on economic sectors such as the energy supply, energy efficiency, transport, waste management, agriculture, and tourism sectors. These sectors determine the overall trend in emission reductions and whether reducing climate risks can be achieved while increasing people's well-being. This chapter discusses policy reforms and

sectoral case studies to highlight the potential of their replication and scale-up, with the institutional and financing implications for effective implementation. It also reviews policy lessons of public-private partnership models that will be relevant to AMS, China, and India mobilising the efforts of all stakeholders to implement the new net zero economy agenda.

Chapter four presents the most challenging aspects of incorporating a low-carbon development process in Asia, by looking at the impact of COVID-19 on the emission trajectories and the contents of stimulus and economy recovery packages. It compares the lessons learned from examining the business-as-usual and green stimulus development scenarios; and debunks several myths and misconceptions related to the actual costs and benefits of green industries, smart cities, and environment, social, and governance (ESG) investments, providing practical guidance to policymakers on what policy interventions will further unlock the potential of co-benefit approaches and productive employment. It integrates low-carbon choices into broad development strategies, and focuses on the implications of low-carbon green growth choices for employment and social inclusion. In doing so, it gives some guidance about the likelihood of recent fiscal stimuli by ASEAN governments reducing GHG emissions, while continuing to maintain high levels of economic growth and employment. This chapter also analyses how innovation systems are to be developed and strengthened for technology and institutional development, to promote synergies of low-carbon, green, and inclusive measures.

The fifth chapter focuses on how to seize opportunities that lie across national boundaries – both market-based opportunities, such as trade and investment flows in low-carbon green products and services, and non-market opportunities for regional collective action (joint research, finance mobilisation, policy networking, and knowledge sharing). It emphasises the need for a monitoring, reporting, and verification system as a policy management tool for understanding the impact of these strategies. These strategies must be embodied comprehensively in the economic policies, regulations, and new investment programmes of any country. They cannot be an after-thought or a half-baked effort, and must go hand in hand with national development strategies.

The sixth chapter summarises key policy messages, distilling lessons and insights from what has been done to date and what could be done in the future, including picking the ‘low-hanging fruits’ – the easiest options for decarbonisation – over the next 10 years, highlighting those recommended in chapters three, four, and five in matrix form. It is hoped that the policy recommendation matrix serves as a guide for regional policymakers and analysts to monitor and track the progress of low-carbon green growth. Figure 1.6 is the reader’s guide to navigating the chapters.

Figure 1.6 A Reader's Guide to Navigating the Chapters

ASEAN = Association of Southeast Asian Nations, COVID-19 = coronavirus disease, IoT = internet of things.

Source: ERIA Study Team.