

Chapter 11

Transformational Strategies: Progress Made and New Challenges Being Met for the Case of Thailand

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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.

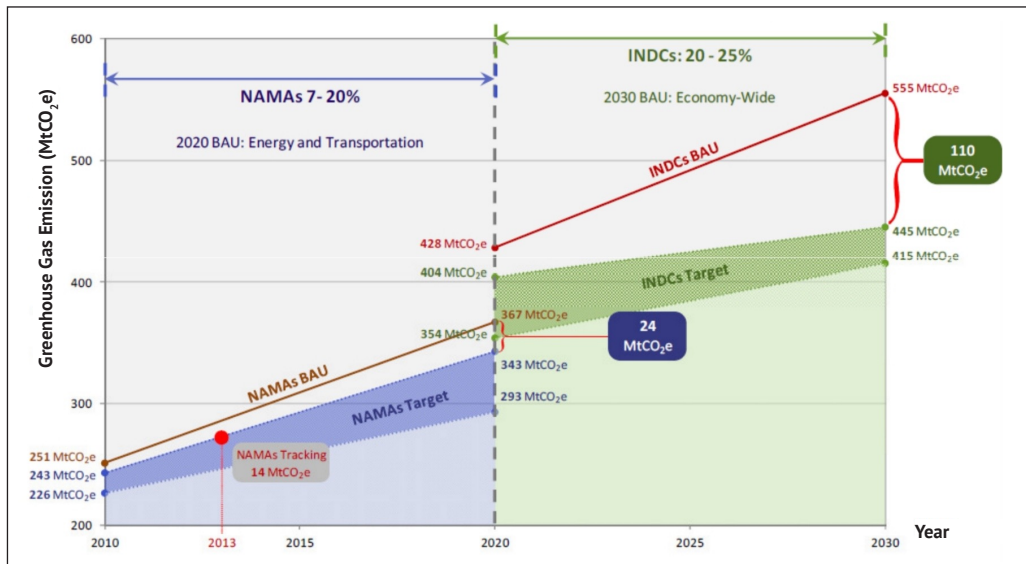
In December 2014, Thailand submitted its communication on Nationally Appropriate Mitigation Actions (NAMAs) to the United Nations Framework Convention on Climate Change (UNFCCC). Thailand endeavoured, on a voluntary basis, to reduce its greenhouse gases (GHG) emissions in the energy and transport sectors 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 CO₂-eq		
Energy sector	113	
<i>Power plant</i>	24	
- Energy efficiency in power plants	6	Power Development Plan 2015 (PDP2015)
- Renewable energy	18	Alternative Energy Development Plan (AEDP2015), PDP2015
<i>Energy use in households</i>	4	
- Increasing efficient use in households		Energy Efficiency Plan (EEP2015)
- Using renewable energy		AEDP2015
<i>Energy use in buildings</i>	1	EEP2015
- Increasing efficient use in buildings	1	
<i>Energy use in industry</i>	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
<i>Transport</i>	41	
- Increasing efficient use in transport	31	EEP2015, Master Plan for Transport
- Using biomass fuel in vehicles	10	AEDP 2015
Waste sector	2.0	
<i>Solid waste management</i>	1.3	
- Reducing the amount of waste	1.3	Master Plan for Solid Waste Management, Environmental Quality Management Plan
<i>Wastewater management</i>	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	
<i>Adjusting industrial production processes</i>		
- 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 CO₂-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 CO₂-eq to 95 Mt CO₂-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%
CO₂ intensity kg (CO₂/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 CO₂ 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 CO₂-eq to 1.77 t CO₂-eq between 2001 and 2017. Thailand's carbon intensity is well below the world average, which has stayed at around 2.38 t CO₂-eq since 1990.

2.6. CO₂ 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 CO₂ emissions from the power sector to plateau since 2013. Improved technology and efficiency have lowered the CO₂ intensity of electricity generation since the 1990s. It fell by 12% between 2013 and 2017 to reach 473 t CO₂/GWh in 2017, just below the world average (485 t CO₂/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) B500 billion to lend to SMEs. The package provides B500 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 B500 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 B100 million. These measures are designed to mitigate the immediate liquidity problems of SMEs so that they are still able to pay employees' salaries.

(2) B1 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, B600 billion was allotted to ramp up financial aid to temporary workers, contract workers, and self-employed persons. This includes providing B5,000 (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 B400 billion goes towards rehabilitating the economy through projects that create jobs, build local infrastructure, and strengthen local communities.

(3) B400 billion for stabilising the financial sector. The government has allocated B400 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 been 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 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 B300 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 CO₂-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 biochemical 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. The 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 PM_{2.5}. 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 B4.63 billion.

In 2022, the overall single-use plastic bag market is expected to fall to negative territory, at B295 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 ฿13 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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