

Chapter 1

Achieving Climate Goals: The Intersection of Policy, Finance, and Innovation

Fukunari Kimura, Fauziah Zen, Alloysius Joko Purwanto, and Denisa Athallia

1. Introduction

The increasing threats from climate change have become a major global concern. Nations have sought to mitigate these threats through international agreements such as the Paris Agreement, Conference of the Parties (COP) meetings, and nationally determined contributions (NDCs). There is a widespread consensus that addressing climate change requires a collective effort, however, there are two main reasons why market mechanisms alone are insufficient to solve climate change issues. First, everyone is affected by the climate. It is not limited by territorial boundaries and it generates both positive and negative externalities. Second, the adverse impacts of climate change are delayed and widespread, and there are no clear economic incentives for private individuals or entities to take responsibility for them.

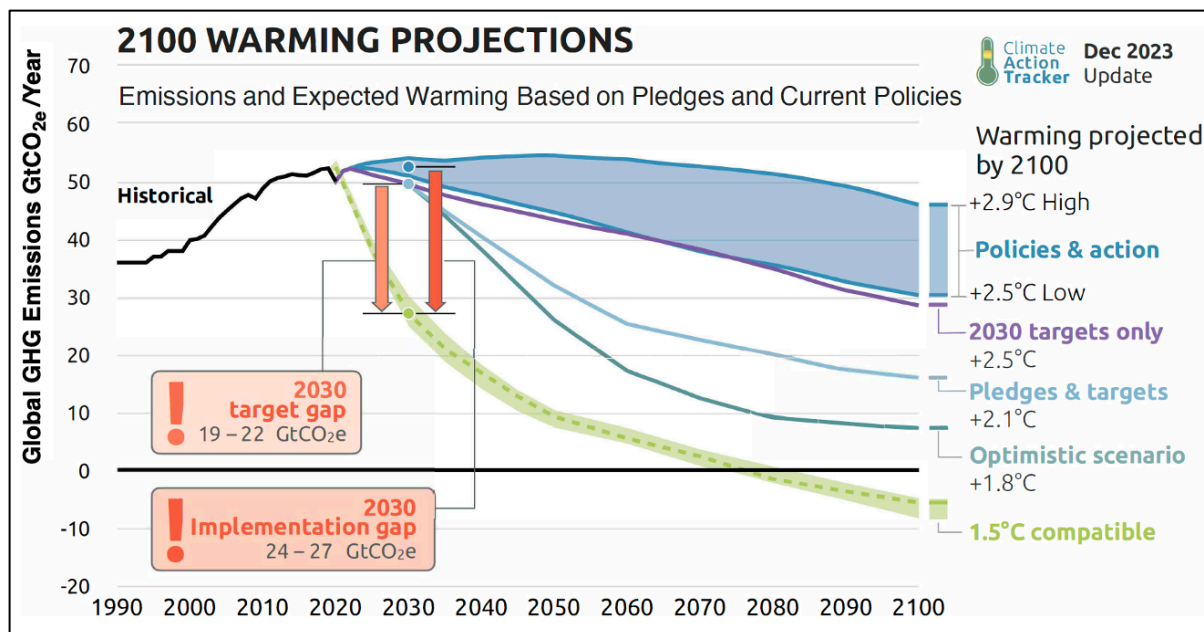
In the public sector, fiscal policy and budgeting are crucial tools to enable governments to lead, influence, and shape the green transition. Budgetary policies are essential to demonstrate the consistency of government action on climate change by linking revenue and expenditure strategies to climate objectives. Fiscal policy also plays a key role in shaping and influencing private sector behaviour towards more sustainable practices. Common policy instruments include command-and-control measures, taxation, incentives and disincentives, market creation, and regulatory frameworks.

Recognising the pivotal role of the public sector in promoting a green economy, this study examines examples from three developing Association of Southeast Asian Nation (ASEAN) Member States – Indonesia, Malaysia, and Thailand – and two advanced economies – the European Union (EU) and Japan. The analysis focuses on their respective green policies in selected sectors. The need for decarbonisation is urgent, as there is a significant gap between climate pledges and actual progress, exacerbated by ongoing global conflicts and crises, such as wars and the impact of the coronavirus disease (COVID-19) pandemic, which have distracted from efforts to combat global warming (Figure 1.1).

The study highlights the critical importance of strategic planning, robust fiscal policies, and innovative solutions to drive the green transition. The experiences of the countries and economies studied provide valuable lessons for developing tailored approaches to

effectively address climate change and promote sustainable development on a global scale.

Figure 1.1. Paths of the Pledges for Several Scenarios and the Gaps with Current Policies



°C = degrees Celsius, GHG = greenhouse gas, GtCO_{2e} = gigatons of carbon dioxide warming equivalent.

Source: Climate Analytics (2024).

While economies have differing capacities to decarbonise, all actions and efforts are counted if they produce net benefits. There are also arguments over which policies and actions are more efficient and effective; and it has been suggested that we must focus on high impact policies. Focusing only on high impact policies, however, is not the only path to take, because limited capacity in many countries may make these policies undeliverable. This is one of the benefits of allowing countries to define their own NDCs.

Private financing for the transition is crucial, since public capacity is limited. Decarbonisation requires strong complementarity between public and private partnerships not only for financing but also for setting and implementing standards, actions, mitigation, and adaptation efforts.

The fiscal role in promoting decarbonisation includes the use of taxes and subsidies to influence behaviour. Implementation of carbon taxes for fossil fuels and providing subsidies for renewable energy projects can incentivise reductions in greenhouse gas (GHG) emissions and encourage the adoption of cleaner technologies. Direct and indirect green public investment and fiscal policy can play a significant role in funding essential green infrastructure projects, such as the development of electric vehicle (EV)

ecosystems and renewable energy installations. Such investments would not only reduce emissions but should also stimulate green job creation and economic growth.

Support for green facilitations, including infrastructure for the EV ecosystem, tax allowances, and subsidies for renewable energy projects, is essential for accelerating the green transition. Governments can provide tax incentives and allowances to reduce the financial burden on companies and individuals investing in green technologies. These measures can drive innovation, lower costs, and increase the adoption of environmentally friendly practices across various sectors.

Green bonds have emerged as a powerful tool for financing sustainable projects in Asia. These bonds provide a way for governments and corporations to raise capital specifically earmarked for green initiatives, such as renewable energy, energy efficiency, and sustainable infrastructure projects. The growing market for green bonds in Asia reflects the region's commitment to integrating sustainability into financial practices and attracting investment for climate action.

Other innovative green finance mechanisms, such as climate funds, carbon markets, green credit lines, and sustainability-linked loans, offer additional avenues for mobilising resources for environmental projects. These innovative financial instruments can attract private sector participation and create new opportunities for collaboration between public and private entities. By leveraging these tools, countries can enhance their capacity to fund and implement effective climate change mitigation and adaptation strategies.

2. Financing for a Green and Just Transition

The concept of a just energy transition emphasises the importance of ensuring that the shift to a low-carbon economy is both equitable and inclusive. This involves considering the rights and needs of all stakeholders, particularly those most vulnerable to the impacts of climate change and the transition itself.

In developing and emerging economies, affordable energy prices are especially critical. A significant portion of the population remains vulnerable and relies on low energy costs not only for essential needs such as cooking and household lighting but also for everyday activities such as powering small fishing boats, preparing and selling food, and commuting to work or school.

In countries with heavily subsidised fuel prices, reducing subsidies with each price adjustment often leads to higher-than-expected rises in inflation. This creates a stronger link between energy and other sectors than previously observed. To mitigate the impact, governments typically provide additional welfare support through cash transfers or in-kind benefits. There is also price discrimination (subsidised prices) for energy consumed by specific groups in many developing economies, including low-income households, farmers and fishermen, public transportation operators, small businesses, religious organisations, and charitable groups. While this policy aims to protect these vulnerable

groups from high inflationary commodity prices, it often results in misallocation due to errors in inclusion and exclusion. This challenge is particularly significant in nations with outdated socio-economic databases, numerous remote regions, and limited implementation capacities.

The massive shift from fossil fuels to renewable energy sources will significantly disrupt industries such as coal, oil, and gas, destabilising regional economies heavily dependent on these sectors. This challenge is particularly serious in countries with unequal resource distribution, such as Indonesia, where a substantial portion of subnational revenue comes from natural resources shared with the national government.

While the renewable energy sector has the potential to create millions of new jobs, it also poses a significant risk of job losses in traditional fossil fuel industries. The new jobs often require retraining and relocation, as they demand different skills and may not be available in the same locations as the displaced jobs. Hence, a framework for a just transition is vital, to maximise the potential gains while reducing the negative impacts or compensating for them.

International climate funds are primarily allocated to developed markets at the implementation level, leading to a lack of funding for emerging and developing markets, which face the most severe impacts. The implementation of COP targets generally depends on aggregate funding data, creating significant barriers for developing economies to access these funds. During the application stage, the standards and mandated obligations necessary to access funds can result in the exclusion of developing economies.

It is also crucial to manage the phase-out of fossil fuels responsibly to avoid simply shifting emissions to alternative fossil-based sources. For example, promoting EVs in countries reliant on fossil fuels for electricity generation requires complementary policies to reduce dependence on fossil fuels for electricity. Although EVs can potentially reduce overall net carbon emissions compared to combustion engine vehicles, these efforts must be paired with initiatives to increase the share of renewable energy in the electricity mix.

Achieving net zero emissions will require substantial growth in renewable energy capacity, necessitating increased funding and international cooperation. It is essential to ensure that decarbonisation efforts do not exacerbate existing inequalities or create new forms of climate or environmental injustice. By integrating equity into the transition process, we can foster a more inclusive and sustainable future for all.

Green finance is a crucial component of sustainable finance, encompassing instruments aimed at achieving social, economic, and other Sustainable Development Goals (SDGs). Specifically, green finance targets climate change mitigation and adaptation, and addresses various environmental issues. The transition towards a green economy is heavily influenced by government policies, which are crucial in shaping and driving the development of green finance systems.

To achieve the ambitious targets set by the Paris Agreement and the United Nations 2030 Agenda for Sustainable Development, substantial investments are necessary. The Intergovernmental Panel on Climate Change (IPCC) estimates that global annual investment needs to range from \$1.6 trillion¹ to \$3.8 trillion from 2020 to 2050 to maintain global warming within a 1.5°C scenario (Masson-Delmotte et. al, 2018). Public finance alone is insufficient; thus, leveraging private sector investments is crucial. Blended finance that combines concessional funds from public sources with private capital can help reduce investment risks and attract private investors (Climate Policy Initiative, 2018).

Green bonds have emerged as a vital tool for raising capital for environmentally friendly projects. The development of green bond markets, supported by clear standards and taxonomies, can channel investments into renewable energy, energy efficiency, and sustainable infrastructure. For instance, the EU's Green Bond Standard (GBS) aims to enhance transparency and credibility in the green bond market, ensuring that funds are used for genuinely sustainable projects (European Commission, 2019b).

The size of the green bond market has seen significant growth in recent years (Table 1.1). The global sustainable bond market has expanded by more than 20% annually, with the ASEAN region experiencing even more rapid growth – almost 50% in 2022 and 28% in 2023. Green bonds now constitute nearly half of the total outstanding sustainable bonds in ASEAN. Notably, both the public and private sectors contributed almost equally to the issuance of sustainable bonds in 2023.

Table 1.1. Market Size of Sustainable Bond Markets

Region	2021	2022	2023	2024 Q1
Global				
Outstanding stock (\$ mn)	2,594,000	3,306,000	4,000,000	4,264,000
% YoY growth		27.2%	21.0%	17.7%
EU-20				
Outstanding stock (\$ mn)	1,157,000	1,246,000	1,508,000	1,603,000
% YoY growth		7.7%	21.0%	20.4%
Japan				
Outstanding stock (\$ mn)	79,069	115,982	163,337	
% YoY growth	64.9%	46.7%	40.8%	

¹ In this chapter, \$ refers to United States dollars.

Region	2021	2022	2023	2024 Q1
% issued by public sector	29.6%	28.3%	31.6%	
% green bonds	46.7%	45.8%	43.9%	
ASEAN				
Outstanding stock (\$ mn)	37,929	56,725	72,687	73,000
% YoY growth	92.9%	49.6%	28.1%	16.6%
% issued by public sector	32.3%	43.9%	49.1%	
% green bonds	48.4%	47.0%	46.8%	
Indonesia				
Outstanding stock (\$ mn)	7,079	9,871	11,959	11,800
% YoY growth	39.6%	39.4%	21.2%	26.0%
% issued by public sector	57.5%	63.0%	63.7%	66.0%
% green bonds	73.6%	79.2%	78.4%	81.7%
Malaysia				
Outstanding stock (\$ mn)	6,276	10,353	13,198	13,100
% YoY growth	118.9%	65.0%	27.5%	5.3%
% issued by public sector	20.7%	22.4%	26.3%	26.1%
% green bonds	30.5%	19.6%	19.3%	18.8%
Thailand				
Outstanding stock (\$ mn)	10,719	14,803	19,774	19,400
% YoY growth	134.2%	38.1%	33.6%	17.07%
% issued by public sector	64.2%	62.2%	68.3%	68.9%
% green bonds	28.7%	26.1%	22.7%	21.7%

% = percent, \$ = United States dollar, ASEAN = Association of Southeast Asian Nations, mn = million, YoY = year on year,
Source: Asian Bonds Online (2024).

Quarter 1 (Q1) of 2024 was particularly prolific, with a total of \$276 billion (54.6% Q on Q) in global issuance of sustainable bonds. The share of the global sustainable bond market in the general bond market increased to 15% in 2023, up from 14% in 2022 and 12% in 2021. The market for sustainable bonds, especially green bonds, is set to continue growing. According to Environmental Finance's forecast, green bond issuance is expected to reach \$600 billion in 2024, \$700 billion in 2025, and \$850 billion in 2026.

In Q1 of 2024, the total issuance of green finance instruments amounted to \$4,264 million, representing 17.7% of the total issuance of sustainable finance instruments. Of this, green bonds accounted for a significant portion, with \$1,603 million issued, making up 20.4% of the green finance market.

However, the distribution of green bonds between public and private sectors varies across countries. In Indonesia and Thailand, the public sector dominates by issuing more than 60% of the sustainable bonds. Conversely, Malaysia's market is largely driven by the private sector, with only 26% of the bonds issued by the government.

Table 1. also highlights the regional differences in green finance adoption. ASEAN's robust growth in green bonds is notable, reflecting the region's commitment to transitioning towards a greener economy. The data also shows that within ASEAN, public sector involvement is substantial in countries such as Indonesia and Thailand, which contrasts with Malaysia's private sector-led market.

Several key market drivers are fuelling this growth. Lower interest rates are creating more favourable market conditions for green projects such as EVs and renewable energy to expand and for bonds to be issued. Additionally, there is a push for more diverse energy stacks, including renewables, hydrogen, ammonia, sustainable bioenergy, synthetic fuels, nuclear, and oil and gas with both carbon capture, utilisation, and storage (CCUS) and carbon capture and storage. The use of proceeds structure, defined by new standards and regulations such as the EU GBS, helps 'ring-fence' capital specifically for green projects.

Europe continues to lead the sustainable bond market, accounting for 37.6% of global sustainable bond stock and 55% of global issuance. Major issuances in 2023 included Italy's sovereign green bonds, as well as bonds from Germany and the UK.. Europe's regulatory framework has seen significant developments, such as the EU GBS, which aims to improve transparency and credibility in the green bond market.

Japan has introduced the Green Transformation (GX) Policy, aiming for ¥150 trillion (~\$1 trillion) in private-public investment over 10 years. This includes the world's first sovereign climate transition bonds and the implementation of carbon taxes and emissions trading systems.

The ASEAN+3 region² has shown significant growth in sustainable bond issuance, with a 21.4% year on year increase in Q1 2024, outpacing both the EU and global averages.

² ASEAN+3 consists of ten ASEAN Member States plus China, Japan, and the Republic of Korea, henceforth Korea.

Efforts include the development of regional taxonomies and frameworks, such as the ASEAN Taxonomy for Sustainable Finance v3, and initiatives such as the Energy Transition Mechanism and Just Energy Transition Partnership to finance early coal retirement and decarbonise energy sectors.

While the green bond market is experiencing significant growth, the green loan market lags by \$30 billion per year globally. To address this gap, recent initiatives have been introduced, such as the establishment of discounted lending facilities for green projects by central banks, including the Bank of China and the Bank of Japan.

These trends underscore the importance of tailored government policies and incentives to stimulate both public and private sector participation in green finance. The rapid growth of green bonds in ASEAN, driven by strategic policies and strong market demand, illustrates the potential for significant environmental and economic benefits through well-coordinated green finance initiatives.

Overall, the development of green finance is pivotal to achieve global sustainability targets. The varying levels of public and private sector involvement across regions highlight the need for adaptive policy frameworks that can effectively harness the strengths of both sectors to drive the green transition.

One of the efforts to achieve both emission reduction and mobilisation of funds is implementing carbon markets and pricing mechanisms, such as carbon taxes and cap-and-trade systems. This will incentivise the reduction of GHG emissions by putting a price on carbon. These mechanisms encourage businesses to invest in low-carbon technologies and practices. Revenue generated from carbon pricing can be reinvested in green projects and used to support communities affected by the transition (UNFCCC, 2015).

Globally, developed countries committed to mobilising \$100 billion annually by 2020 to support climate action in developing countries. This finance is crucial for enabling developing nations to invest in green technologies and build resilience to climate impacts. However, the actual disbursement has been far lower than the pledge. Initiatives such as the Green Climate Fund and the Adaptation Fund play a significant role in channelling these resources to where they are most needed (UNFCCC, 2018).

Strong institutional frameworks and supportive policies are essential for scaling up green finance. Governments can create enabling environments through regulatory measures, such as mandatory environmental, social, and governance disclosures, green finance taxonomies, and incentives for sustainable investments. Central banks and financial regulators can also play a pivotal role by integrating climate risks into financial supervision and promoting green lending practices (Schumacher, Chenet, and Voltz, 2020).

All these financing mobilisation efforts should work under the principle of just transition. The shift to a low-carbon economy is fair and inclusive, particularly for workers and

communities dependent on fossil fuel industries. Just Transition Funds can provide financial support for retraining and reskilling workers, developing new economic opportunities, and ensuring social protection for vulnerable groups. The EU's Just Transition Mechanism, for example, includes a dedicated fund to support regions most affected by the transition (European Commission, 2018).

Engaging local communities and stakeholders in the planning and implementation of green projects is vital to ensure that the benefits of the transition are widely shared. Transparent and inclusive decision-making processes can help build trust and support for green initiatives, while also addressing potential social and economic impacts (UNEP, 2019).

Financing a green and just transition requires a concerted effort from both public and private sectors, supported by robust policies and regulatory frameworks. By mobilising the necessary financial resources and ensuring that the transition is equitable, we can achieve SDGs and mitigate the adverse effects of climate change. The integration of environmental, social, and governance considerations into financial decision-making will be key to driving this transformation and building a resilient, low-carbon future. The following section of this chapter summarises key messages from the scoping countries and offers suggestions for moving forward.

3. Countries' Experiences

3.1. Indonesia

Indonesia has taken a remarkable step in implementing a strategic plan to combat climate change. With the signing of the Global Coal to Clean Power Transition Statement at COP26, the country is exploring the early retirement of coal-fired power plants (CFPPs), known as the 'coal phase-out' plan, with estimated funding of up to \$48 billion. The plan aims to close CFPPs by 2050 while promoting the development of renewable energy. In addition, the national government in Indonesia is developing an energy transition strategy that aims to reduce dependence on fossil fuels, increase renewable energy capacity, and maximise energy efficiency, making renewable energy the primary option.

The Economic Research Institute for ASEAN and East Asia (ERIA)'s Energy Outlook and Energy Saving Potential in East Asia 2023 (Kimura, Phoumin, and Purwanto, 2023) shows that even with Indonesia's carbon neutrality target year of 2060, by 2050 power generated by coal must be reduced to only 178 terawatt-hours (TWh) compared to the estimated 650 TWh in the business-as-usual scenario. The 179 TWh of electricity should be delivered with the most advanced clean coal technology and around 42% of it must be combined with carbon capture and storage.

The coal phase-out plan is, however, economically costly as it may require Indonesia to sacrifice an opportunity to achieve the Golden Indonesia 2045 Vision. Implementation of the coal phase-out plan means that Indonesia cannot make optimal

use of all available resources, including abundant and comparatively low-cost fossil energy sources. The plan is also financially costly, requiring significant funding from various parties. The government has predicted that by 2030, early retirement of CFPPs will have cost \$25–\$30 billion. Investing in renewable energy will cost \$20–\$25 billion per year, increasing the cost burden for coal phase-out and renewable energy development.

The empirical findings of this study show that the presence of CFPPs significantly influenced Indonesia's well-being at both macro and micro levels. At the macro level, the presence of CFPPs significantly and adversely affects Indonesia's economic development as measured by gross domestic product (GDP) and its growth rate. The results of the analysis indicate that the total annual economic cost of CFPPs is an estimated \$92.88 billion. At the micro level, the presence of CFPPs is associated with an increase in monthly electricity spending by an average of about \$48.24 per household per year, an increase of about 6.1%, or a total annual value of \$15.5 billion at the national level. Regarding the manufacturing business sector, the presence of CFPP operations has a positive impact on the return on capital of companies, with the effect quantified as an increase of 0.16 percentage points, or equal to a change of 3.1%. The results also suggest that, on average, the positive impact on return on investment is estimated at \$7.87 million per company per year, equating to a total annual value of \$43.6 billion nationally.

Summarising the overall effects of CFPPs at the macro and micro levels, it appears that the presence of CFPPs results in a potential annual net economic loss. The simulation model shows how important it is to consider the financial impact of implementing the coal phase-out plan. CCUS is the most practical option amongst scenarios to help Indonesia achieve its net carbon emissions target by 2060.

3.2. Malaysia

Malaysia has abundant resources capable of producing renewable energy for electricity generation. The introduction of renewable energy as the fifth fuel in 2001 is one of Malaysia's initiatives to ensure sustainable energy supplies and to meet the country's energy demand growth. Since then, the legal, regulatory, and financial framework was set up to realise the planned renewable electricity generation targets.

At present, the share of renewable energy in the national energy mix is about 2%, and the Government of Malaysia plans to raise it to 20% by 2025. ERIA's Energy Outlook and Energy Saving Potential in East Asia 2023 (Kimura, Phoumin, and Purwanto, 2023) suggests increasing this share target to at least 28% by 2030 and to maintain that share level to reach carbon neutrality by 2050. The main goal is to turn the current national energy mix into more renewable energy sources, not just for the sake of continuity of supply but also for the pressing environmental issues that arise from the use of fossil fuels. In this regard, the government has developed the energy policy over the years to ensure the electricity supply supports the rapid growth of the country's energy demand and efficiently utilises domestic natural resources. The energy transition in Malaysia

became more environmentally friendly when, from 2000, there was a need to diversify energy supplies. The energy policy and strategies evolved gradually to solve climate change issues through the development of renewable energy. The mid-term review of the 11th Malaysian Plan 2016–2020 stated that the current priority of the energy policy was to match its strategic priorities outlined in the SDGs of the United Nations Development Programme.

Various policy instruments have been developed and used to promote the adoption of renewable energy technology in the power generation sector. Researchers in Malaysia have undertaken studies to analyse the effectiveness of green policy implementation to achieve the country's objectives and to meet the target of increasing the adoption of renewable energy. However, there has been insufficient research into the environmental factors that impact the effectiveness of implementing these policies. When formulating the current policy portfolio, it is, therefore, important to identify these environmental factors and study how they may contribute to the effectiveness of the policy implementation. This can also offer guidance on what needs to be done. With various renewable energy policies already adopted and others still under discussion, this publication offers information and feedback about the environmental factors that affect policy effectiveness. Decision makers can use it to implement, or possibly redesign policies.

In this study, the environmental factors affecting the technical efficiency scores of renewable energy development in Malaysia are determined by using a two-stage analysis. In the first stage, Malaysian renewable energy development efficiency scores are calculated using the data envelopment analysis method with three inputs: the number of employments, electricity consumption, and licensed renewable energy capacity, and two outputs: renewable energy generation and GDP. The second stage uses the Tobit regression analysis to investigate the relationship between the efficiency scores and environmental variables beyond renewable energy development control.

3.3. Thailand

The study on Thailand's EV policy in this report focused on its economic and GHG emission impacts. The authors employed a computable general equilibrium model to simulate the impact of the domestic expansion of EV production, reaching the proportion of 30% in the year 2030 and continuously growing in the later years. This scheme is a replication of the national EV promotion policy (the '30@30 plan'). The model includes 47 production sectors and 53 commodities. It also incorporates the representative of aggregate household, government, and the rest of the world. The details of fiscal structure comprise the main sources of fiscal income, which are direct tax, tariff, value-added tax, excise tax, and other indirect taxes. The fiscal revenue includes dividends earned from state-owned enterprises and other capital incomes. The mechanism of the recursive dynamic of this model is based on the capital accumulation process, enabling the inter-temporal

relationship between investment and capital stock. The production and utilisation of EVs have been included in the constructed computable general equilibrium model.

The simulation results indicate that the 30@30 plan will boost real GDP and investment, while slightly increasing inflation and inducing a trade deficit. In particular, the substitution between internal combustion engine cars and EVs will initiate a change in household consumption patterns, allowing more consumption due to less expenditure on transportation. This change will subsequently create economy-wide impacts and will eventually lead to higher household income. This simulation outcome also indicates that GHG emissions will be reduced by approximately 8% during the period 2035–2040. However, the 30@30 plan will continuously incur a budget deficit because the lowered demand for internal combustion engine vehicles will decrease government revenue from excise tax, tariffs, and other indirect taxes. Notably, the simulation result identifies that the reduction of GHG emissions created by this EV policy is equivalent to the fiscal burden of \$55.2–\$82.6 per tonne of CO₂. This cost-benefit ratio would be the criterion for comparing with other GHG reduction policies.

3.4. European Union

According to the EU Climate Law, Europe needs to achieve climate neutrality by 2050. For transport the EU's Sustainable and Smart Mobility Strategy aims to deliver a 90 % reduction in emissions from the transport sector by 2050. In recent years, with the Fit for 55 package and other policy initiatives, the EU has made substantial efforts to improve its existing legislation as well as to introduce new legislation for the decarbonisation of transport.

The chapter on the EU first presents a general overview of EU policies for the decarbonisation of transport. It then takes a deeper dive into the following pieces of legislation, discussing the main changes they entail for the future: (i) The EU Emission Trading System and its future extension to road transport, buildings, and additional industrial sectors, (ii) the related Social Climate Fund, (iii) the CO₂ emission performance standards for cars, vans, and heavy duty vehicles and finally (iii) the Renewable Energy Directive and the new regulation for sustainable fuels in aviation. Based on the impact assessments they are expected to have a profound effect on the future environmental performance of the transport sector in the EU. In the future it will be important to regularly assess the progress and the economic and social impacts of the policies, to see whether they remain in line with the objectives.

3.5. Japan

Japan's energy transition, based on the latest GX policy, is analysed from an economic perspective taking as a case study, the carbon capture, CCUS technology for methanol production in Japan. The study for the Basic Guidelines on Climate Transition Finance was launched in 2021 to finance the GX Transition in Japan (METI, 2023).

The economic analysis reveals Japan's challenges with sustainable energy and regulations. In comparison to its Group of Seven (G7) counterparts, Japan faces hurdles to boost renewable energy adoption, improve energy efficiency, and reduce fossil fuel subsidies and this is hindering its transition to a sustainable, green economy. While all G7 countries ensure universal access to modern energy services, Japan exhibits higher energy intensity in its economy, pointing to potential inefficiencies in consumption and lower use of energy-saving technology. Japan's lag in renewable energy is striking. Despite supply growth, its total energy supply and consumption share remains below 10%, contrasting with its 2030 target of 36%–38%. Regulatory indicators show that Japan's renewable energy and energy efficiency policies are weaker than other G7 members, especially in network connections, incentives, and financing mechanisms. In addition, fiscal trends are worrisome. Government subsidies for fossil fuels, initially affected by the coronavirus disease (COVID-19), surged after 2021, reaching about 3.5% of GDP, the highest amongst G7 nations. This rise may hinder the shift to renewables and the green economy, potentially causing inefficient use of resources and environmental issues. Moreover, Japan's low government spending on research and development for environmental protection and taxes signals challenges in adopting renewable energy technologies and transitioning to a greener economy. These trends align with Japan's relatively lower share of renewable energy in its primary energy supply.

4. Lessons Learned: Insights from Global Climate Action with a Focus on the Association of Southeast Asian Nations

Global efforts to fulfil the commitment to the Paris Agreement have provided invaluable lessons in the fight against climate change. These lessons highlight the importance of international collaboration, flexibility, regular reviews, economic transformation, climate finance, and the science–policy interface. Here, we delve into these key areas, emphasising their relevance to the ASEAN region.

- **The importance of strategic planning and policy frameworks.** The experiences of ASEAN countries such as Indonesia, Malaysia, and Thailand underscore the critical role of strategic planning and robust policy frameworks to drive the green transition. Indonesia's coal phase-out plan and Malaysia's renewable energy policies exemplify the need for comprehensive energy transition strategies to set clear targets and pathways for decarbonisation (Kutani, Namba, and Phoumin, 2024).
- **Economic transformation is possible:** The growth of renewable energy and the implementation of carbon pricing in many countries demonstrate that economic systems can adapt to align with climate goals. These changes show that economic transformation towards sustainability is achievable, and that climate action can be integrated into economic development strategies. In ASEAN, countries such as Indonesia and Malaysia are already making strides in renewable energy adoption and sustainable finance.

- **Economic and social impacts of energy transition and the need for inclusive and just transition.** The transition to renewable energy and the phase-out of fossil fuels have significant economic and social implications. Indonesia's early retirement of CFPPs presents both economic costs and opportunities for economic restructuring. Similarly, Thailand's EV policy demonstrates the potential for economic growth and GHG emission reductions, while also highlighting the fiscal challenges associated with reduced government revenue from traditional energy sources. Indonesia's approach to providing welfare support during the coal phase-out and Thailand's focus on household consumption patterns in its EV policy are examples of efforts to achieve a just transition (Kutani, Namba, and Phoumin, 2024).
- **Global cooperation is essential:** The Paris Agreement has underscored the critical importance of international collaboration to tackle climate change. The near-universal participation of countries highlights a collective recognition of the global nature of this challenge. This cooperation is vital for sharing knowledge, resources, and technologies that can drive global climate action. For ASEAN, regional cooperation through initiatives such as the ASEAN Alliance on Carbon Market is crucial to leverage collective strengths and address shared challenges.
- **Role of public and private sector collaboration:** Effective collaboration between the public and private sectors is crucial to mobilise the necessary financial resources and expertise for the green transition. The growth of green bonds in ASEAN, driven by both public and private sector participation, underscores the importance of leveraging private investments to complement public funding. Malaysia's private sector-led green bond market exemplifies how private investments can drive sustainable finance (Kutani, Namba, and Phoumin, 2024).
- **Flexibility enhances participation:** The Paris Agreement has encouraged widespread participation by allowing countries to set their own targets through NDCs. This flexible approach accommodates countries' diverse national circumstances and capabilities, making it possible for all nations to contribute to global climate goals in a manner that aligns with their unique contexts. ASEAN countries, with their varying levels of development and economic structures, benefit from this flexibility, enabling tailored climate strategies.
- **Climate finance is a key enabler:** The emphasis on climate finance within the Paris Agreement has highlighted its crucial role in supporting developing countries' transitions to low-carbon economies. Adequate financial resources are essential for these countries to implement effective climate actions, and the mobilisation of climate finance has been a significant driver of progress. ASEAN countries, with their significant financing gaps, can benefit from innovative financial mechanisms and international support.
- **Challenges of implementing carbon pricing and market mechanisms:** There are challenges to implementing carbon pricing mechanisms, such as carbon taxes and cap-and-trade systems in ASEAN due to varying levels of economic development and

institutional capacity. However, these mechanisms are essential for incentivising low-carbon investments and generating revenue for green projects. The experiences of developed markets, such as the EU's Emission Trading System, provide valuable insights for ASEAN countries in designing effective carbon pricing policies (European Commission, 2019a).

- **Science–policy interface is crucial:** The Paris Agreement's reliance on scientific assessments, particularly from the IPCC, underscores the importance of basing climate action on the best available science. This science–policy interface ensures that climate strategies are informed by robust and up-to-date scientific knowledge, enhancing their effectiveness and credibility. ASEAN countries can leverage regional scientific collaborations to inform their policies.

These lessons from the Paris Agreement provide a roadmap for future climate action, particularly for the ASEAN region. By embracing these insights, ASEAN countries can enhance their climate strategies, foster regional cooperation, and make significant strides towards a sustainable and resilient future.

5. Future Strategic Priorities in Climate Action for the Association of Southeast Asian Nations: Strengthening Policy and Regulatory Frameworks and Implementing Effective Climate Policies

ASEAN Member States must continue to bolster their policy and regulatory frameworks to support the green transition. While setting targets is important, the emphasis must now shift towards the concrete implementation of climate policies and measures at both national and local levels. Effective action on the ground is essential to achieve the desired climate outcomes. This includes developing robust implementation plans, building institutional capacities, and ensuring that policies are effectively enforced across ASEAN. Research from ERIA shows that setting clear and ambitious renewable energy targets, developing comprehensive energy transition plans, and implementing supportive policies such as subsidies for renewable energy projects and tax incentives for green investments is crucial (Kutani, Namba, and Phoumin, 2024).

- **Promoting regional cooperation and knowledge sharing:** Regional cooperation and knowledge sharing amongst ASEAN countries can accelerate the green transition by facilitating the exchange of best practices and lessons learned. Initiatives such as the ASEAN Plan of Action for Energy Cooperation and regional taxonomies for sustainable finance can help harmonise policies and standards, creating a more conducive environment for green investments (ASEAN, 2020).
- **Enhancing public–private partnerships:** Building on the success of green bonds and other sustainable finance instruments, ASEAN Member States should enhance public–private partnerships to mobilise additional financial resources for green projects. Governments can play a key role in de-risking investments through

blended finance mechanisms and by providing guarantees for private sector investments in renewable energy and other green technologies (Climate Policy Initiative, 2018).

- **Fostering innovation and technology development:** Investing in research and development for green technologies is essential for driving innovation and reducing the costs of renewable energy and other low-carbon solutions. ASEAN countries should prioritise funding for clean energy research and support the development of local green technology industries to enhance their competitiveness in the global market (Kutani, Namba, and Phoumin, 2024).
- **Ensuring a just and inclusive transition:** Policies and programmes aimed at ensuring a just and inclusive transition should be integral to the green transition strategies of ASEAN countries. This includes providing support for retraining and reskilling workers affected by the shift away from fossil fuels, developing social protection measures for vulnerable populations, and engaging local communities in the planning and implementation of green projects (UNEP, 2019).
- **Leveraging international support and climate finance:** ASEAN countries should actively seek international support and climate finance to complement domestic efforts to achieve their green transition goals. Engaging with multilateral development banks, international climate funds, and bilateral partners can provide access to additional financial resources and technical assistance for implementing ambitious climate policies (UNFCCC, 2018). The current programme of the Just Energy Transition Partnership in Indonesia, for example, is important to open wider international support for developing economies. Developed countries must fulfil and exceed their commitment to mobilise \$100 billion annually for developing nations. Exploring innovative financing mechanisms will be essential to support the global transition to a low-carbon economy. Enhanced climate finance will enable ASEAN countries to implement ambitious climate actions and build resilience to climate impacts.
- **Strengthening adaptation efforts:** As climate impacts intensify, there needs to be a greater focus on adaptation strategies, particularly for vulnerable communities and ecosystems. Enhancing resilience to climate change is as important as mitigating its causes. Strengthening adaptation efforts will help ASEAN communities cope with the impacts of climate change and protect livelihoods and ecosystems.
- **Investing in clean energy technologies:** Continued investment in clean energy technologies, energy storage, and negative emissions technologies will be vital for meeting long-term climate goals. Innovation in these areas can drive significant progress in reducing emissions and enhancing energy efficiency. ASEAN countries can benefit from regional technology transfer and innovation hubs.
- **Integrating climate goals with sustainable development:** Future efforts should align climate goals with broader sustainable development objectives. This integration can create co-benefits for health, equity, and economic growth, ensuring

that climate action contributes to overall societal well-being. Integrating climate action with sustainable development will help ASEAN achieve multiple global goals simultaneously.

- **Improving monitoring, reporting, and verification mechanisms:** Improving mechanisms for monitoring, reporting, and verifying emissions reductions and climate finance will build trust and drive progress. Transparency and accountability are key to ensuring that commitments are met, and that progress is accurately tracked. Enhancing these mechanisms will strengthen the credibility and effectiveness of climate actions in ASEAN.
- **Engaging non-state actors:** Encouraging and recognising the contributions of cities, businesses, and civil society organisations can complement national efforts and drive bottom-up change. Non-state actors play a crucial role in advancing climate action at various levels. Engaging these actors will enhance the overall impact of climate initiatives and foster a more inclusive approach to climate action in ASEAN.
- **Addressing loss and damage:** As climate impacts worsen, increased attention and resources need to be devoted to addressing loss and damage in vulnerable countries. Providing support for these countries is essential for equitable climate action. Addressing loss and damage will help ensure that the most affected communities in ASEAN receive the assistance they need to recover and rebuild.

By learning from past experiences and adopting a forward-looking approach, ASEAN countries can effectively navigate the challenges of the green transition and build a sustainable, low-carbon future that benefits all segments of society.

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