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A Southeast Asian Perspective on Trade and Climate Change Mitigation and Adaptation

POLICY PAPER

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CUTS International, Geneva is a non-profit NGO that catalyses the pro-trade, pro-equity voices of the Global South in international trade and development debates in Geneva. Through its work, CUTS International links people and issues in the world of multilateral trade with their counterparts in related policy areas. These include regional integration, agriculture, environment, competition, investment and consumer protection among others.

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Preface

Regional Perspectives on Trade, Climate Change, and Sustainable Development

Tackling climate change and accelerating the urgently-needed shift to a low-carbon economy will require a substantial reshaping of global production and consumption patterns. At the same time, countries around the world are struggling to adapt their economies and recover from the impacts of the climate crisis.

Trade and trade policies have an important role to play in climate change mitigation and adaptation efforts, facilitating a fair, inclusive, and sustainable transition to a low-carbon economy and fostering climate-resilient development pathways. Although trade and trade policies can exacerbate the climate impact of unsustainable production and consumption patterns, they can also play a vital role in offsetting climate-induced production shortfalls in parts of the world affected by climate change and scaling up the diffusion, development, and uptake of technologies vital to climate mitigation and adaptation, while increasing their accessibility.

Already, a growing number of countries are exploring how to integrate climate change considerations into their trade policies, such as through new regulations and carbon standards, tariff and non-tariff measures, as well as a wide range of green industrial policies, including policies related to subsidies, government procurement, local content requirements, technology, and intellectual property. Depending on how climate-related policies and measures are designed, however, they can lead to trade tensions with potentially significant consequences for the multilateral trading system, for the cooperation critical to ramp up climate ambition, and for the sustainable development prospects of countries facing an increasingly complex global regulatory context.

In today's highly integrated global economy, achieving climate goals will not only require effective domestic policies, but also concerted and inclusive international collaboration. This implies overcoming traditional silos of policymaking to bring climate and trade policymakers together, and taking into consideration the reality and needs of third countries, including vulnerable economies that are most impacted by the climate crisis and developing countries which need pathways to thrive in the climate-resilient, low-carbon economy.

At the World Trade Organization (WTO), recognition of the trade-related dimension of climate mitigation and adaptation measures has prompted discussions in a number of bodies, starting with the Committee on Trade and Environment as well as in committees on market access, technical barriers to trade, and agriculture. In 2022, in the Ministerial Outcome document of the Twelfth WTO Ministerial Conference, WTO members recognized the importance of global environmental challenges including climate change and natural disasters, noting the importance of the contribution of the multilateral trading system to promote the UN 2030 Agenda and its Sustainable Development Goals in its economic, social, and environmental dimensions. Interest in the climate and trade nexus has also given rise to two climate-related member-led initiatives, namely the Trade and Environmental Sustainability Structured Discussions, co-sponsored by over 70 WTO members, and an initiative on fossil fuel subsidy reform involving nearly 50 members.

While many discussions are now taking place on trade and climate change at the WTO and in a range of other international settings, most are dominated by concerns, policies, and proposals from more advanced economies. By contrast, developing country priorities and perspectives on the nexus of trade, climate, and sustainable development receive relatively little attention.

In an effort to spur a more inclusive dialogue on trade and climate nationally, regionally, and internationally that addresses developing country priorities, TESS has commissioned a series of policy papers with partners highlighting regional perspectives on international cooperation on the nexus of trade, climate, and sustainable development. In a first phase, the series includes papers from experts and institutions in Africa, the Caribbean, South America, South Asia, Southeast Asia, and the broader category of least developed countries.

Each regional paper explores how international cooperation on trade and trade-related policies can support the climate change mitigation and adaptation efforts and priorities of developing countries and foster pathways to climate-resilient sustainable development. To achieve this, the analysis takes a bottom-up approach, starting from priorities reflected in commitments under existing nationally determined contributions, technology needs assessments, or national adaptation plans, and then reviews how cooperation on trade and trade policies can advance those domestic priorities. The papers also reflect on how the growing array of trade-related climate actions by governments, businesses, and consumers around the world is impacting the international policy and market landscape and the implications for the trade, climate, and sustainable development goals and policies of developing countries. Finally, each paper in the series puts forward particular areas of interest, options, and recommendations for international cooperation that could be taken up at the regional and multilateral level.

In each case, the starting point for the analysis is the urgency of climate action to achieve the goals of the Paris Agreement, recognizing the principle of common but differentiated responsibilities, as well as the importance of nationally determined contributions. The analysis does not purport to be exhaustive but rather should be seen as an effort to identify broad priority areas for attention and further investigation. To facilitate feedback on the draft papers and dialogue on priorities and opportunities for action, consultations of stakeholders from each region were convened, involving government officials, trade negotiators, and also regional organizations, academia, and civil society.

Notably, the regional approach to this series was chosen as one way to spur a conversation grounded in the circumstances and priorities of developing countries. This regional approach is not, however, meant to imply that countries in the same geographical region necessarily have similar priorities, nor does it mean to imply that the regional context is the priority setting for tackling climate mitigation and adaptation, though it may be a key strategy for some countries. Taken as a group, the papers highlight the diversity of trade and climate priorities among and within regions while also underlining similarities.

We hope these papers will help support inclusive discussions on trade, climate, and sustainable at the WTO and in other international settings that reflect the priorities and concerns of developing countries on the role of trade and trade policies in supporting climate mitigation and adaptation and climate-resilient sustainable development.

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Executive Summary

Climate change has profound impacts on the environment, livelihoods, and production and trade across all economic sectors. These impacts are expected to worsen over the coming decades. In a world increasingly afflicted by climate change, trade will gain in importance as a mechanism to support mitigation and adaptation efforts and enable recovery from extreme weather events. This paper examines the various adaptation and mitigation efforts of the Association of Southeast Asian Nations (ASEAN) in prioritized sectors (agriculture, energy, and land-use, land-use change, and forestry [LULUCF]). It discusses how international cooperation on trade and trade-related policies could complement or support these efforts and identifies priority areas for action and recommendations at the regional and multilateral level.

Due to its unique geography, combined with underlying factors such as the presence of extreme poverty and high dependence on climate-sensitive sectors such as agriculture and natural resources, the ASEAN region is highly vulnerable to climate change impacts. ASEAN member states have thus undertaken ambitious commitments and implemented several actions on climate change mitigation and adaptation at the national and regional level.

To reduce greenhouse gas (GHG) emissions and achieve the Paris Agreement targets, ASEAN has undertaken to increase the share of renewable energy in the energy mix and enhance the level of energy efficiency for all energy-related sectors and industries, while promoting sink functions through sustainable forest management and afforestation/reforestation, reducing deforestation, and improving forest conservation. In order to adapt to adverse climate change impacts, the region focuses on promoting climate-smart agricultural practices, applying new technologies, and increasing emergency food stockpiles. Several policy measures are mapped out in the nationally determined contributions (NDCs), long-term strategies, national communications, and national adaptation plans submitted by ASEAN member states under the Paris Agreement and the United Nations Framework Convention on Climate Change (UNFCCC). These commitments, however, are unlikely to be achieved with currently stated policies. Advancing sustainable development and the attainment of climate goals in the region will require concerted action and the deployment of multiple technologies and approaches across ASEAN, including through the use of trade and trade policy.

Given the growing recognition worldwide that trade not only contributes to climate change but is also a central part of the solution to ensure a just transition to a low-carbon economy and foster climate-resilient development, it is recommended that ASEAN countries seize the opportunity of using trade and trade-related polices and measures for these purposes more proactively. Specifically, to support climate change adaptation and mitigation efforts vis-à-vis the energy, LULUCF, and agricultural sectors, as well as across their economies, and to achieve the targets set in their NDCs and long-terms startegies, ASEAN member states should consider the following trade-related policy actions:

- *Reduce tariff and non-tariff barriers on environmental goods and agricultural inputs* to enable access and reduce costs for producers and farmers, making it easier for them to change to more sustainable options in the face of increasing GHG emissions and more adverse climate conditions. This could be done unilaterally or through regional, plurilateral, and multilateral cooperation on trade and the environment, for example within the framework of ASEAN, the Asia-Pacific Economic Cooperation, or the WTO.

- *Acquire new climate-friendly technologies* by using the available flexibilities under the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights and support mechanisms under the UNFCCC. New technologies are needed not only to support adaptation and mitigation efforts in the agricultural, LULUCF, and energy sectors, but also to enable cleaner production and consumption patterns in other industries and sectors of the economy.

- *Increase and/or continue to use subsidies* to support climate change mitigation and adaptation options, including vis-à-vis renewable energy and resilient, climate-smart agricultural production, *while reforming and gradually phasing out fossil fuel subsidies*. Domestic support should be used judiciously and not for protectionist purposes in contravention of WTO rules. Future reviews of WTO agreements should recognize climate change as a legitimate cause for using domestic support and provide for the necessary exemptions.

- *Proactively participate in the development and implementation of international sustainability criteria and climate standards*, such as within the framework of the International Organization for Standardization. This would help reflect ASEAN member state positions and practices, create transparency for consumers and producers, and facilitate market access for exporters. The use of such international sustainability standards should also be encouraged in public procurement activities to maximize their climate change mitigation potential.

At the regional level, while climate change is under the purview of the ASEAN Socio-Cultural Community Blueprint, there is also a whole section in the ASEAN Economic Community Blueprint 2025 dedicated to sustainable economic development in which many of the aforementioned issues such as renewable energy promotion, sustainable forest management, and the application of good agricultural practices are included as strategic measures. However, there is no concrete action plan to carry out these strategic measures or sectoral body in ASEAN to oversee implementation of these measures.

The disconnect with other sections of the ASEAN Economic Community Blueprint 2025 (such as those dealing with trade in goods and services) and the ASEAN Socio-Cultural Community Blueprint is quite clear, as illustrated in this paper. Given the urgency of fighting against climate change, which requires concerted action on several fronts with huge resource implications, it is recommended that ASEAN address this gap as soon as possible. This could begin with (greater) cross-sectoral multistakeholder discussion and exchange of ideas at various levels. Such engagement would help ensure that trade is used as a tool to address climate change in ASEAN in the future and that climate change considerations do not hamper trade and negatively affect livelihoods in the region.

At the international level, there are also several cooperation mechanisms related to trade which ASEAN countries could consider using to complement or support their climate change mitigation and adaptation efforts. While the various WTO agreements—such as the Agreement on Trade-Related Aspects of Intellectual Property Rights, Agreement on Agriculture, Agreement on Sanitary and Phytosanitary Measures, and Agreement on Technical Barriers to Trade—are obvious avenues, new mechanisms are now also being forged by members to address the intersection of trade and environmental issues. ASEAN countries could also consider using other finance mechanisms such as the WTO-led Aid for Trade initiative and the Enhanced Integrated Framework for trade-related technical assistance to mobilize further resources for climate change mitigation and adaptation.

ABBREVIATIONS

ADB	Asian Development Bank
AEC	ASEAN Economic Community
AMS	ASEAN Member States
APEC	Asia-Pacific Economic Cooperation
ASCC	ASEAN Socio-Cultural Community
ASEAN	Association of Southeast Asian Nations
ASEAN-CRN	ASEAN Climate Resilience Network
CO2	Carbon Dioxide
ETS	Emissions Trading System
EU	European Union
FLEGT	Forest Law Enforcement, Governance and Trade
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IEA	International Energy Agency
ISO	International Organization for Standardization
LULUCF	Land Use, Land-Use Change, and Forestry
MtCO2e	Metric Tonnes of Carbon Dioxide Equivalent
MW	Megawatt
NDC	Nationally Determined Contribution
NTB	Non-Tariff Barrier
RCP	Representative Concentration Pathway
REDD+	Reducing Emissions from Deforestation and Forest Degradation Plus
TBT	Technical Barriers to Trade
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade Organization

1. Introduction

The Association of Southeast Asian Nations (ASEAN) region is highly vulnerable to climate change impacts. The Global Climate Risk Index 2020 ranked Myanmar, the Philippines, Vietnam, and Thailand among the top 10 countries most affected by extreme weather events in 1999–2018 (Eckstein et al., 2020). In 2015, the Asian Development Bank (ADB) predicted that climate change has the potential to cut the region's gross domestic product (GDP) by 11% by the end of the 21st century (Raitzer et al., 2015). Looking ahead, Southeast Asian countries face the prospect of increasingly severe flooding, more extreme weather events, and large-scale loss of fertile coastal land.

ASEAN's vulnerability to climate change is rooted in its unique geography (Overland et al., 2017). Most of the region's mainland population lives in low-lying plains or coastal river deltas. The major island states, Indonesia and the Philippines, have more than 54,000 and 36,000 kilometres of coastline respectively, and most of their inhabitants live in coastal areas. Sea level rise may therefore have significant consequences for ASEAN. Other underlying factors further exacerbate the region's high vulnerability to climate change including:

- high levels of extreme poverty;
- high dependency of national economies and societies on sectors that are directly affected by climate change (i.e. agriculture and other natural resources);
- pre-existing stress caused by disaster loss and damage, including from droughts, typhoons, and floods;

- high level of interdependence among the regional countries due to economic integration, the existence of regional/global supply chains, and transboundary rivers, resulting in amplification of local risks;
- high propensity of migration in the region; and
- high deforestation in parts of ASEAN, with negative implications for local resilience and positive feedback effects (ASEAN Secretariat, 2021).[1]

As a result, climate change mitigation and adaptation are high on the policy agenda of both ASEAN as the regional bloc and respective member states. To date, all ASEAN member states (AMS) have proactively taken measures to address climate change as parties to the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. A growing number of members have updated their nationally determined contributions (NDCs) and two—Singapore and Indonesia—submitted long-term strategies to the UNFCCC in August 2021. At the national level, all members have also adopted various policies and/or strategies related to climate change, sustainable development, or green growth, which are closely linked to mitigation, and cover adaptation and resilience concerns (Table 1).

At the regional level, climate change comes under the remit of the ASEAN Ministerial Meeting on Environment and the ASEAN Senior Officials Meeting on Environment. The perennial preoccupation of the ministerial meeting has been the transboundary haze pollution caused by forest and peat fires in Indonesia. ASEAN began to pay greater attention to climate change in 2007 with the adoption of the Singapore Declaration on Climate Change, Energy and the Environment (ASEAN, 2007) at the 12th ASEAN Summit. The ASEAN Working Group on Climate Change was formed in 2009 to study climate issues, make policy recommendations, and coordinate positions among AMS.

The ASEAN Socio-Cultural Community (ASCC) Blueprint 2025 frames environmental issues into four key areas: biodiversity and natural resources, environmentally sustainable cities, sustainable climate, and sustainable consumption and production (ASEAN Secretariat, 2016). These four areas are translated into seven strategic priorities for which relevant working groups have been formed to study, make recommendations, and coordinate positions. The ASCC Blueprint specifically calls for enhancing the capacity of sectoral institutions and ASEAN governments to improve greenhouse gas (GHG) inventories, strengthen global partnerships, and advance the implementation of the global framework on climate change, especially the UNFCCC. The ASEAN Working Group on Climate Change was mandated to achieve these targets and to focus on three priorities: (i) enhancing regional cooperation in climate change via its action plan; (ii) promoting collaboration among ASEAN sectoral bodies; and (iii) articulating ASEAN's concerns and priorities at international fora.

Despite these efforts and initiatives, ASEAN countries may not be able to achieve their NDCs with existing policies. In its business-as-usual scenario produced in 2017, the ASEAN Center for Energy (2017) predicted that the region's carbon dioxide (CO2) emissions would increase 2.4 times to reach 3,460 MtCO2e [metric tonnes of CO2 equivalent] in 2040. Meanwhile, the International Energy Agency (IEA) estimated that current policies would lead to the region's CO2 emissions increasing seven times as fast as the global average in 2018–40 (IEA, 2019). This would derail both regional and global climate mitigation efforts. ASEAN must lower its emissions by 11% relative to the current trajectory to meet the goals of its NDCs, according to the Massachusetts Institute of Technology (Paltsev et al., 2018). Moving towards sustainable development and attaining climate goals requires concerted actions and deployment of multiple technologies and approaches throughout ASEAN, among which international trade policy could be a useful tool.

So far, however, the use of trade and trade-related measures has been limited and ASEAN governments have not explicitly acknowledged their role in addressing climate change concerns and priorities. This is despite growing recognition worldwide that trade not only contributes to climate change, but is a vital part of the solution to ensure a just transition to a low-carbon economy and to foster climate-resilient development.

1. Positive feedback effects refer to a situation where an initial change (e.g. an environmental degradation such as deforestation) triggers feedbacks (i.e. leading to other changes such as larger evaporation, loss of soil moisture, drought, etc.) which amplify the initial change (i.e. more deforestation), causing climate change to worsen.

Table 1. Climate Change Mitigation and Adaptation Strategies of ASEAN Member States

Country	Indicative Strategy	Target Year	Source
Brunei Darussalam	Brunei Darussalam National Climate Change Policy	2035	Brunei Climate Change Secretariat (2020)
Cambodia	National Strategic Plan on Green Growth 2013–2030	2030	National Council on Green Growth (2013)
	Cambodia Climate Change Strategic Plan 2014–2023	2023	National Climate Change Committee (2013)
Indonesia	Low Carbon Development Initiative	2045	National Development Planning Agency (2019)
Lao PDR	National Green Growth Strategy of the Lao PDR Till 2030	2030	Secretariat for Formulation of National Green Growth Strategy (2018)
	Agriculture and Development Strategy to 2025 and Vision to the Year 2030	2030	Ministry of Agriculture and Forestry (2015)
Malaysia	National Renewable Energy Policy and Action Plan	2030	Sustainable Energy Development Authority, Malaysia (2009)
	Shared Prosperity Vision 2030	2030	Prime Minister's Office of Malaysia (2019)
	Roadmap for the Water Sector Transformation 2040	2030	Technology University of Malaysia (2020)
Myanmar	Myanmar Climate Change Master Plan (2018–2030) and Myanmar Climate Change Strategy (2018–2030)	2030	Ministry of Natural Resources and Environmental Conservation (2019)
	Myanmar Sustainable Development Plan (2018–2030)	2030	Government of the Republic of the Union of Myanmar (2018)
	Myanmar Climate Change Policy (2019)	2030	Ministry of Natural Resources and Environmental Conservation (2019)
Philippines	National Climate Risk Management Framework	2030/ 2050	Philippine Climate Change Commission (2019)
Singapore	Singapore's Long-Term Low-Emissions Development Strategy	2050	National Climate Change Secretariat (2020)
	Singapore Green Plan 2030	2030	Ministry of Sustainability and the Environment (2021)

Table 1. (Continued)

Country	Indicative Strategy	Target Year	Source
Thailand	Climate Change Master Plan 2015–2050	2050	Office of Natural Resources and Environmental Policy and Planning (2015)
	National Strategy 2018–2037	2037	National Strategy Secretariat Office (2017)
Vietnam	National Climate Change Strategy	2050	Government of Vietnam (2011)
	National Green Growth Strategy for 2021–2030, Vision Towards 2050	2030/ 2050	Government of Vietnam (2012)

Note: The table includes medium- to long-term climate change mitigation and adaptation visions, strategies, and plans (aside from NDCs) outlined by ASEAN member states.

Specifically, trade could shift production to areas with cleaner techniques. It promotes the diffusion and scaling up of key environmental technologies necessary for the transition to low-carbon production. It can also ensure access to and availability of food and deliver critical goods and services to facilitate recovery from extreme weather events (Brenton & Chemutai, 2021).

Research by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) shows that economies in the Asia-Pacific region have considerable room to make their trade and investment more climate-smart. For example, the UNESCAP (2021) study found that barriers to trade in environmental goods are often more prevalent than barriers to trade in carbon-intensive fossil fuels.

This paper aims to provide a regional perspective on how international cooperation on trade and trade-related measures can help Southeast Asian countries reach some of their climate change mitigation and adaptation goals. It further aims to identify priority areas for action and recommendations at the multilateral level. ASEAN's priorities with respect to climate change mitigation, based on an analysis of their NDCs, lie mainly in the promotion of renewable energy and the phasing-out of fossil fuels in the energy sector as well as efforts to expand forest cover in the land use, land-use change, and forestry (LULUCF) sector. This analysis also reveals that developing a climate-resilient agricultural sector to ensure food security cuts across all the climate change adaptation strategies of AMS.

There is, however, very little focus on trade policies. Measures to promote intra- and extra-ASEAN trade seem to exist in a silo in relation to the region's climate change mitigation and adaptation efforts, and vice versa. Hopefully, the insights and recommendations presented in this paper will help bridge this disconnect.

Climate change and international trade are vast policy areas, and this paper does not aim to be exhaustive or cover all the important contemporary issues pertaining to them. This implies that this paper does not address certain issues such as carbon pricing (emission trading), green financing, nature-based solutions, trade facilitation, digitalization, or other relevant industries or sectors which are extremely important in their own right, but are not directly linked to the topic of this paper. Rather, the paper is intended to serve as a conversation starter and only deals with the interlinkages between trade policy and climate change mitigation and adaptation in some prioritized sectors in the ASEAN region. The hope is that more in-depth analysis will follow to shed light on important issues and industries or sectors that could not be discussed here in detail.

2. Overview of Climate Change Mitigation in ASEAN

ASEAN stands at a historical turning point in combatting climate change. Regional GHG emissions have been increasing, primarily due to energy-related CO2 emissions and GHG emissions from LULUCF. Figure 1 shows CO2 emissions from fuel combustion and GHG emissions from LULUCF with the share of GHG emissions by LULUCF category in 2018. The ASEAN region emits more GHG emissions from fossil fuel combustion (1,485 MtCO2) than from LULUCF (965 MtCO2e). Indonesia's deforestation and peatland exploitation are leading ASEAN to become a large net emitter of GHGs from LULUCF, while Vietnam sees net negative GHG emissions from LULUCF.

In terms of CO2 emissions from fuel combustion, Indonesia, Thailand, Malaysia, Vietnam, and the Philippines are the largest emitters in ASEAN. Indonesia and Thailand were among the top global territorial emitters in 2018, with Indonesia being fifth after China, the United States, India, and the Russian Federation. To reach net-zero emissions, it is clear that ASEAN must adopt low- to zero-carbon energy sources in its long-term strategy to enhance energy management and promote the sink functions in land systems, both in forests and cropland.

Sector-wise, most of ASEAN's emissions are from the energy sector, with electricity and heat generation accounting for the bulk of emissions, followed by manufacturing industries and transport (see Figure 2). The power sector is the biggest source of direct CO2 emissions in all AMS except for Cambodia, where the transport sector has larger emissions. Sectoral CO2 emissions in the ASEAN region are similar to the world averages, which means that decarbonization in the power, industry, and transport sectors is a top priority for climate change mitigation.

3. Energy and Land-Use, Land-Use Change, and Forestry as Priority Sectors for Mitigation Efforts

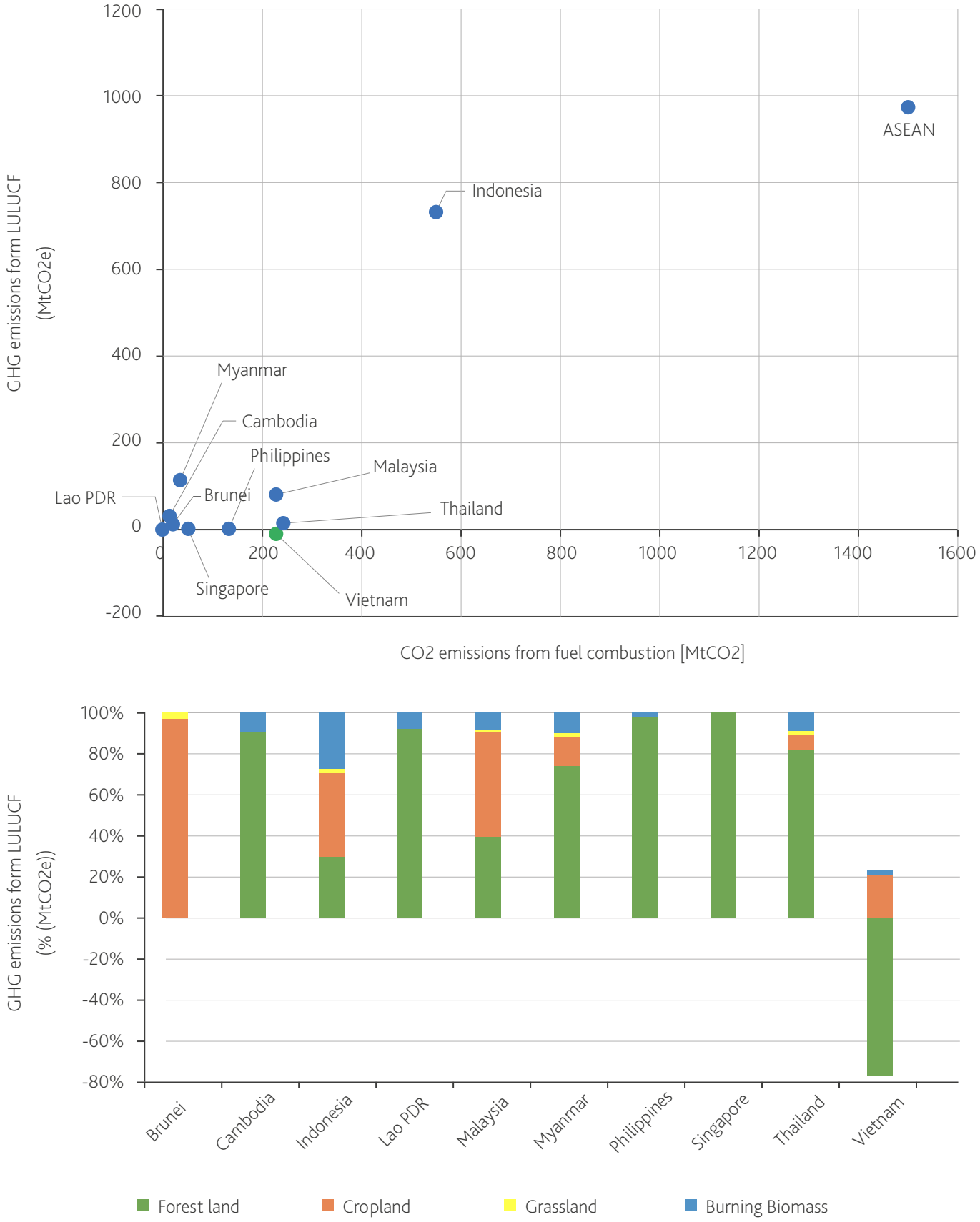
The sectoral policies of each AMS to achieve the mitigation targets in their NDCs are summarized in Annex 1. In the energy sector, policy measures focus on improving energy efficiency and renewable energy diffusion on both the supply and demand sides. With regards to LULUCF, AMS mostly focus on agricultural management, land use, and sustainable forest management through Reducing Emissions from Deforestation and Forest Degradation Plus (REDD+) programmes.[2]

Energy

All AMS identify the energy sector as a priority area for climate change mitigation because it has largest emission share (see Table 2). Basic mitigation measures are to increase the share of renewable energy in the energy mix, enhance the level of energy efficiency for all energy-related sectors and industries, and create the necessary regulatory framework. Specifically, on the supply side, major options include efficiency improvements in power generation, fuel switching from coal to natural gas, and the use of renewable energy, including biomass, solar, wind, hydro, and geothermal resources.

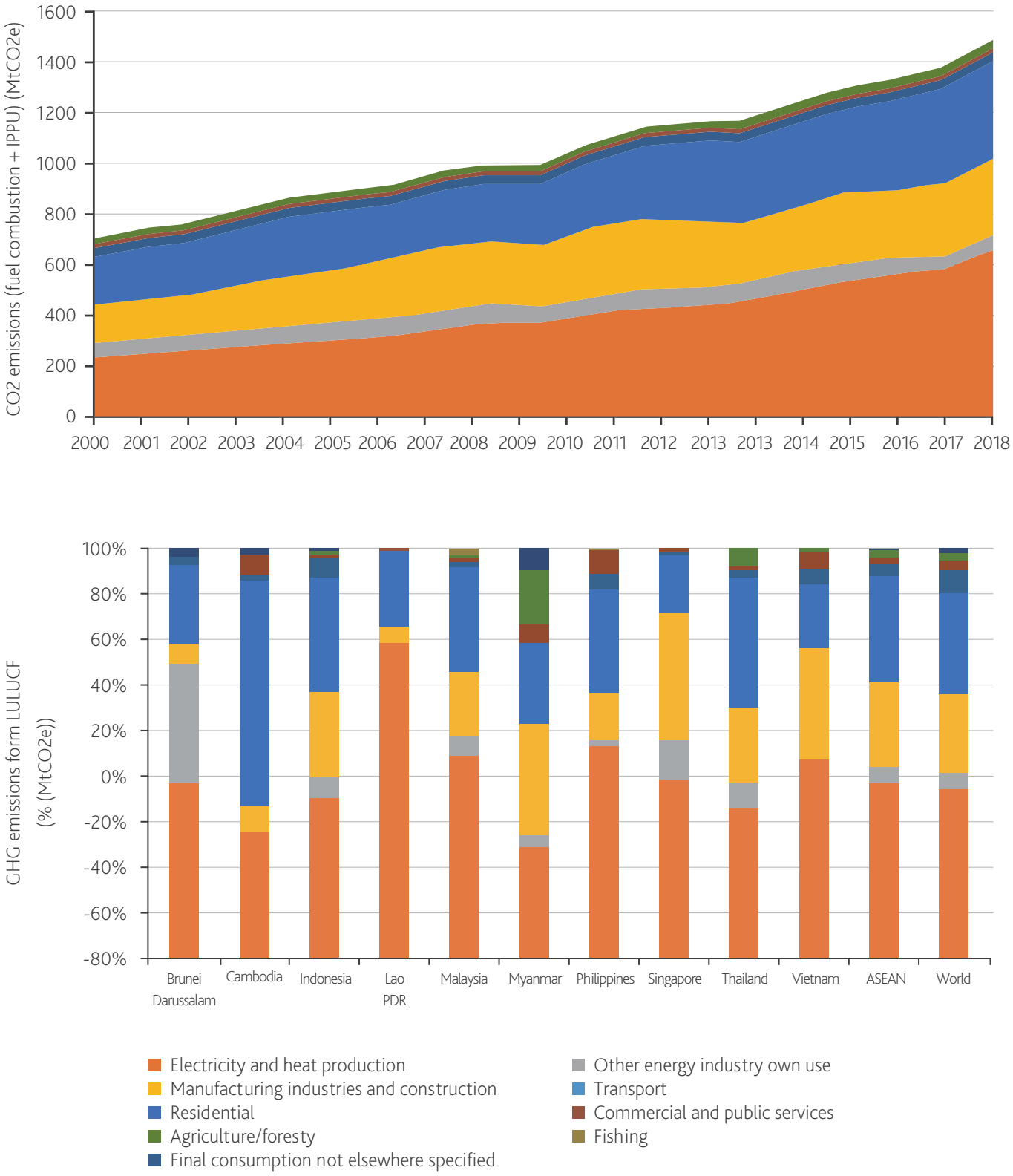
2. REDD was first introduced in the agenda of the Conference of the Parties of the UNFCCC at its 11th session in Montreal (December 2005). Under the UN-sponsored REDD, developed countries' governments and investors would pay developing countries and their forest stakeholders not to cut down forests. REDD would offer an alternative revenue stream to those relying on forests for their livelihood. This proposal received wide support, with agreement on its importance in the context of climate change, particularly of the large contribution of developing countries to global GHG emissions from this activity. REDD was followed by REDD+, with the "plus" referring to the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries.

Figure 1. GHG Emissions From Fuel Combustion and LULUCF in ASEAN (2018)



Note: The top figure shows CO2 emissions from fuel combustion and GHG emissions from LULUCF by country and the ASEAN region (2018). The bottom figure shows the share of GHG emissions of ASEAN countries by LULUCF category (2018).
Source: ASEAN Secretariat (2021, p. 26).

Figure 2. CO2 Emissions From Fuel Combustion in ASEAN by Sector (2000–2018) and Country-Wide Share (2018)



Note: The top figure shows the sectoral CO2 emissions from fuel combustion and industrial processes and product use (IPPU) in ASEAN (2000–2018). The bottom figure shows the country-wide sectoral share of CO2 emissions from fuel combustion (2018).
Source: ASEAN Secretariat (2021, p. 27).

On the demand side, the main sectoral sources of GHG emissions are residential and commercial building, industry, and transport, leading to options such as the following:

- *Residential and commercial building sector*: Use of more efficient lighting and electrical appliances, adoption of energy-efficiency standards and rating programmes, improved insulation, and programmes to drive behavioural change.
- *Industry sector*: Use of more efficient boilers, motors, and furnaces, improved management practices such as energy auditing and benchmarking, heat and power recovery, fuel switching, and material recycling and substitution, particularly in energy-intensive sectors such as iron and steel, cement, paper and pulp, and chemicals.
- *Transport sector*: Switch to cleaner fuels, use of fuel-efficient vehicles, use of hybrid/electric options in road transport, better traffic management, modal shifts from road transport to rail and public transport systems, promotion of non-motorized transport, and land-use and transport planning.

Table 2. Sectors of Mitigation Priority in ASEAN Members States

	Energy	Transport	Industry	Agriculture	LULUCF	Waste
Brunei Darussalam	■	■	■	■	■	■
Cambodia	■	■	■		■	
Indonesia	■	■	■	■	■	■
Lao PDR	■	■			■	
Malaysia	■	■	■	■	■	■
Myanmar	■			■	■	
Philippines	■	■	■	■		■
Singapore	■	■	■	■		
Thailand	■	■	■	■		■
Vietnam	■	■	■	■	■	■

Source: ASEAN Secretariat (2021).

Geographical endowments mean all AMS have room to increase renewable energy in the energy mix, including variable renewable energy such as wind and solar, which would be part of the key decarbonizing technologies going forward to 2050. All AMS except Cambodia describe renewable energy targets and/or policies in their NDC pledges. Six AMS—Cambodia, Indonesia, Malaysia, the Philippines, Thailand and Vietnam—have a feed-in tariff policy, which supports the development of renewable energy sources. Several AMS have also introduced net metering, biofuel blend obligations, and electric utility quota obligations (renewable portfolio standard).

Aside from the national targets of each member state, the ASEAN region has a quantitative target in the energy sector that is closely tied to climate change mitigation. The ASEAN Plan of Action for Energy Cooperation 2016–2025 consists of two phases: Phase I, covering 2016–20 (ASEAN Centre

for Energy, 2015), and Phase II, covering 2021–25 (ASEAN Centre for Energy, 2020a). The action plan sets a target of 32% reduction in energy intensity by 2025 relative to 2005 levels, and a 23% share for renewable energy in the total primary energy supply by 2025. ASEAN is well on track to reach the energy intensity target; the region reduced energy intensity by 24.4% in 2019. Greater efforts will be needed to reach the renewable energy target, however, as the region's share of renewable energy in 2017 was just 14.3% (ASEAN Secretariat, 2021).

A longstanding flagship project of the region is the formation and operationalization of the ASEAN Power Grid. The grid seeks to enable significant power purchasing and develop an integrated power trading market, which in turn is expected to incentivize further deployment of intermittent renewable energy across Southeast Asia. Many AMS have abundant energy resources such as hydropower and solar power. Power grid connectivity can better allocate energy resources and meet energy demand needed for economic development. Nevertheless, the ASEAN Power Grid faces many challenges, particularly high upfront capital investment costs and the need to promote regulatory alignment among trading partners (Shi et al., 2019).

LULUCF

ASEAN states' updated NDCs indicate that aggregated regional GHG emissions are likely to grow until 2030 from 3,294–4,506 MtCO2e, depending on the availability of international support for the energy and LULUCF sectors. While the contribution of the LULUCF sector to total GHG emission reductions varies across countries, its relative contribution is especially large in Cambodia, Lao PDR, and Myanmar (ASEAN Secretariat, 2021). Thus, both the energy and LULUCF sector play key roles in lowering GHG emissions by 2030. This will largely depend on success in avoiding further deforestation and increasing forest cover and carbon sinks, which, in turn, require considerable financial support and appropriate policy measures.

Most AMS therefore include at least one mitigation policy or measure in their NDCs regarding the LULUCF sector (see Annex 1). Most of the countries aim to reduce land-use emissions and/or enhance removals on forest land by reducing degradation and promoting sustainable forest management (82% of countries with mitigation measures in the LULUCF sector), followed by afforestation/reforestation (73%), and reducing deforestation and improving forest conservation (73%) (Crumpler et al., 2020).

Other countries, such as Thailand, have not included forestry in their mitigation targets, but instead added it to their NDC adaptation targets ("increase national forest cover to 40% through local community participation, including in particular headwater and mangrove forests to enhance adaptive capacities of related ecosystem") (see Annex 2). Cambodia, in particular, has emphasized emission reduction from the forest subsector (59.1% of the overall reduction conditional on international support) by improving management and monitoring of forest resources and forest land use, strengthening sustainable forest management and approaches to reduce deforestation, building capacity, and engaging stakeholders.

REDD+ is considered a vital tool that incentivizes actions to prevent deforestation and forest degradation and enhance carbon sinks to reduce airborne CO2 concentration in the ASEAN region. Most AMS are working on REDD+ and have submitted relevant information to the UNFCCC, with the exception of Brunei Darussalam and Singapore, while the Philippines is an observer. While many local voluntary REDD+ programmes have been or are being implemented in several AMS, the respective national governments must incorporate REDD+ programmes in their national development and mitigation strategies and plans, and promote and scale them up in a sustainable manner.

At the regional level, the Vision and Strategic Plan for ASEAN Cooperation in Food, Agriculture and Forestry 2016–2025, adopted in 2015, includes action programmes to facilitate climate-smart/friendly agriculture, land use, and fishery in cooperation with research and development programmes and networks (ASEAN, 2015a). Programmes to reduce GHG emissions involve agroforestry, protecting mangrove forests, establishing regional agreements on timber trade, strengthening forest management by involving local communities and certification, and REDD+.

4. Trade Measures to Support Climate Change Mitigation in ASEAN

LULUCF

Cooperation in international trade could help ASEAN and its member states achieve their climate change mitigation targets in the LULUCF sector. While agriculture and trade in agricultural commodities and forestry products may exacerbate climate change (through deforestation, for instance), trade measures can promote sustainable agricultural management by fostering technological innovations that can drive up yields while lowering the potential for adverse land-use change. Specifically, reducing tariffs on technological goods and liberalizing regulatory policies can facilitate access to agricultural digital technologies and services from advanced economies. Improving digitalization implies that farmers have access to better data, allowing them to make climate-informed decisions, boost yields, reduce waste, and contribute to poverty reduction. Not only would deforestation no longer be necessary, but the total area of land that is currently under cultivation may even be reduced, paving the way for reforestation.

Moreover, large-scale application of climate-smart technologies could enhance food security, because of higher productivity (Brenton & Chemutai, 2021). The issue of technology transfer, however, might be more complex, given the presence of intellectual property rights. The issue is discussed later in this paper, because it is also related to the interlinkages between trade and climate change adaptation.

Several AMS are large exporters of timber and non-timber forestry products. In fact, the timber sector is one of the 12 priority sectors identified for accelerated economic integration under the ASEAN Economic Community Blueprint (ASEAN Secretariat, 2015). Meanwhile, Southeast Asia, despite a crackdown on poachers, remains a hub for the illegal wildlife and timber trade (United Nations Office on Drugs and Crime, 2019). To promote exports while ensuring that doing so does not run counter to the region's climate change mitigation commitments, ASEAN would benefit from entering into mutual recognition arrangements of timber legality with large trading partners such as the European Union (EU) and by developing a common position on timber legality for trade.[3] The adoption of the ASEAN Standard for Legality of Timber in October 2020 by the ASEAN Ministers on Agriculture and Forestry is a move in this direction, expected to promote both intra- and extra-ASEAN timber trade while fighting deforestation and climate change (ASEAN, 2020).

As for non-timber forestry products and agricultural commodities, in a more climate change-conscious world, consumers everywhere are demanding more environmentally sustainable goods. This has implications for exports from developing countries—ASEAN included—which now ought to meet sustainability criteria and standards. Countries that cannot provide traceability in the value chain and the necessary trading infrastructure, such as certification and inspection services, to ensure that their products are genuinely natural and sustainable, may be excluded from many overseas markets.

The International Organization for Standardization (ISO) has numerous standards that help to monitor climate change, quantify GHG emissions, and promote good practice in environmental management. One notable example is the ISO 14000 family of standards for environmental management systems, which details practical tools for organizations to manage the impact of their activities on the environment. This suite of standards, which includes one of ISO's most widely used standard—ISO 14001 on environmental management systems—covers overall frameworks, audits, communications, labelling, life-cycle analysis, and methods to mitigate and adapt to climate change. The ISO 14064 series gives specifications to quantify, monitor, and validate/verify GHG emissions, and the ISO 14067 Technical Specification lays down the

3. The EU's Timber Regulation (No 995/2010) prohibits EU operators from placing illegal timber goods on the EU market. The supply-side measures of the EU Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan include the signing of voluntary partnership agreements with countries outside the bloc that commit to develop a robust timber legality assurance system and export to the EU only verified legal timber products accompanied by FLEGT licences. FLEGT-licensed timber automatically meets the requirements of the EU Timber Regulation and thus can enter EU markets without further checks. Indonesia is the only ASEAN state to have successfully negotiated a partnership agreement with the EU and can now issue FLEGT licences. Lao PDR, Malaysia, Thailand, and Vietnam are in the process of negotiating agreements.

principles, requirements, and guidelines to quantify and report the carbon footprint of products (ISO, n.d.). Six ASEAN countries are full members of ISO, while four—Brunei Darussalam, Cambodia, Lao PDR, and Myanmar—are correspondent members. ASEAN member states therefore should proactively make use of these memberships and participate in the development and implementation of international climate standards so their practices and positions are duly recognized and incorporated. This would improve transparency for consumers and producers alike, and facilitate market access for exporters.

On a related note, such sustainability standards could also be incorporated into technical specifications, requirements for tenderers, award criteria, or the performance of contracts, among others, enabling public authorities to take climate change considerations into account in their purchasing activities. As the largest procurer of goods and services, governments can play an important role in driving further decarbonization by adopting sustainable procurement policies. Using international sustainability standards would ensure that public procurement could contribute to climate change mitigation while still adhering to the principles of non-discrimination and transparency. Several ASEAN countries, such as Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam, are developing their own green public procurement policies (Asia-Pacific Economic Cooperation [APEC], 2013). As a regional bloc, ASEAN is engaged in relevant dialogues and experience exchanges with international institutions and trading partners.[4]

Last but not least, carbon credits earned from mitigation activities in this sector, particularly through the preservation, protection, and expansion of forest coverage, could be traded nationally, regionally, or internationally and bring in much-needed financial flows to the local communities, if given an enabling regulatory framework. A recent study estimated that with a "conservative" carbon price of $5.80 per tonne of CO2, 114 million hectares, or 60% of Southeast Asia's forests, could make for profitable projects to prevent 835 megatonnes of CO2 emissions a year from deforestation. That is equivalent to more than a third of the region's total emissions in 2018 (Sarira et al., 2022).

Several AMS have taken steps to implement both voluntary and compliance carbon markets. Indonesia launched a pilot voluntary emissions trading system (ETS) for the power sector in March 2021 and is planning to start a national compliance system by 2024. Vietnam passed a law in November 2020 to create a national compliance system by 2022. Legislation to establish a national ETS covering large emitting sectors is under consideration in the Philippines. Thailand is also considering establishing a national ETS (Rosales et al., 2021). Meanwhile, there have been calls to introduce an ASEAN-wide carbon tax and create a regional/subregional carbon market/ETS (Nurdianto & Resosudarmo, 2016; Singapore Institute of International Affairs, 2020), which is expected to contribute to the implementation of member states' NDCs under the Paris Agreement (UNFCCC, 2021).

Energy

Several trade and trade-related measures could also be used to support the transformation of the energy sector in ASEAN towards more climate-friendly choices. For example, renewable energy promotion requires the availability of several environmental products such as those needed to generate energy from wind, solar, biomass, biogas, and geothermal sources. Developing countries' access to such goods, as well as their affordability, can be made possible through tariff reductions or the removal of unnecessary non-tariff barriers (NTBs) to facilitate importation. Appropriate tariff reductions could also help to make such goods available and lower their cost, hence diffuse the adoption of cleaner technologies which reduce GHG emissions in residential and commercial buildings, the industry and transport sectors (such as electric vehicles), smart-home devices, or waste management facilities. The following focuses on two main sets of measures that could support climate change mitigation efforts in ASEAN's energy sector: reducing trade barriers on environmental goods and subsidy reform.

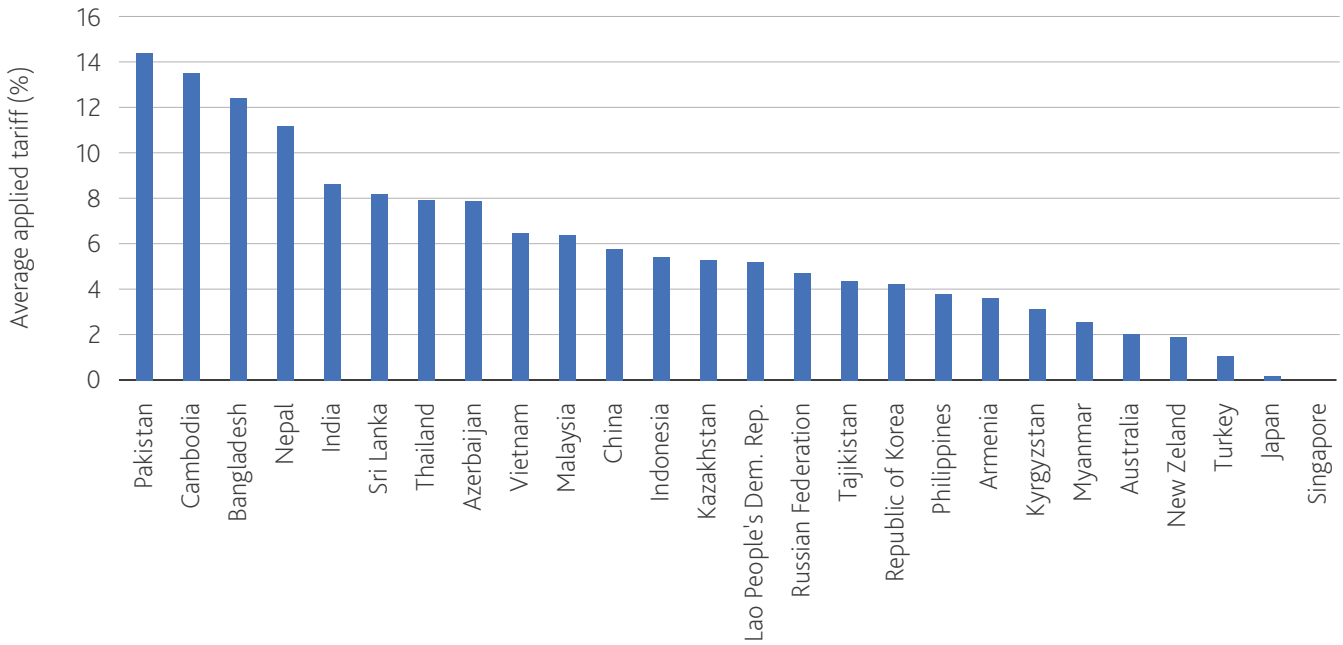
4. See for example SWITCH-Asia (2022) and AANZFTA (2019).

Reducing trade barriers on environmental goods

Trade plays an important role in making mitigation and adaptation technologies available at lower cost and facilitating access to environmental goods. Environmental goods, simply put, are those whose main function is to address or contribute to solving an environmental issue or challenge.[5] In the context of climate change, environmental goods can be implicitly understood as those that contribute positively to climate change mitigation and adaptation.

Generally, tariffs on environmental goods are relatively low, averaging less than 5% in most countries. Such low tariffs are meant to fuel the production, diffusion, and deployment of climate-friendly technologies and stimulate the development of the market for renewable energy and energy-efficient technologies. However, this is not yet the case with ASEAN. UNESCAP research shows that while the average applied tariffs on environmental goods in the Asia-Pacific region was 5.78% in 2019, they exceeded or were close to 6% on average in at least five AMS: Cambodia, Thailand, Vietnam, Malaysia, and Indonesia (see Figure 3). The only exception is Singapore, with an average of 0%, due to its high level of openness to trade.

Figure 3. Average Applied Tariffs on Environmental Goods in ASEAN (2019)



Source: UNESCAP et al. (2021, p. 29).

A closer look reveals that certain ASEAN countries use tariff liberalization quite strategically for renewable energy diffusion by maintaining a high level of protection (i.e. via high tariffs) where they have some local production and/or export capacities while reducing tariffs for those goods to be sourced globally to facilitate access by local businesses. This is found to be the case with Vietnam and the Philippines vis-à-vis solar and wind components. Such an approach would allow them to protect local production, become more competitive over time, and gradually insert themselves in global and regional value chains. Other countries, including Cambodia, consistently maintain tariff protection, probably

5. There is no commonly agreed list of environmental products today. One reference point is the APEC (2012) List of Environmental Goods, athough it is considered to have important omissions. A wider, common list categorizing products as environmental goods is the Organisation for Economic Co-operation and Development (1999) Combined List of Environmental Goods, which is used in this paper. This lack of a commonly agreed list of environmental goods and services is also considered a particular challenge for the promotion of trade in green products and green public procurement.

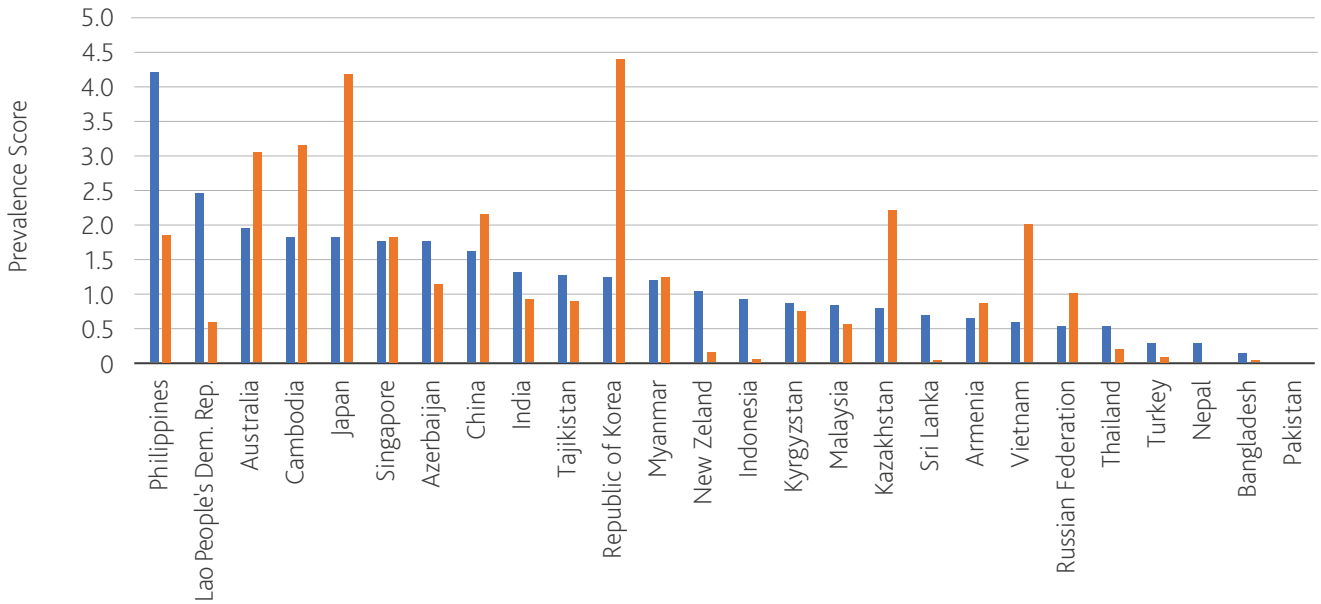
to maximize government revenue, while Lao PDR and Myanmar liberalize "just enough" and maintain their tariffs at more or less average levels (Bridle & Bellmann, 2021).

There are pros and cons to these approaches. However, tariffs generally increase project costs and therefore prices to consumers. ASEAN countries may therefore want to reduce them gradually to lower costs and increase renewable energy deployment. They could do this unilaterally or at the regional level (e.g. via an ASEAN agreement), plurilateral level (e.g. within the APEC framework), or multilateral level (at the World Trade Organization [WTO]).

Another challenge to overcome are NTBs, and eliminating them should be a top priority. NTBs vary from country to country, mostly comprising technical barriers to trade (TBT)—i.e. regulations designed to ensure quality, safety, and environmental protection, among others. However, ambiguity in the application of such regulations can be exploited for trade-restrictive purposes. Other non-technical NTBs are local content requirements, specifically conditions that incentivize the use of locally sourced materials,[6] cumbersome certification and licensing procedures, and price control measures including additional taxes and charges. Addressing these NTBs by monitoring them closely and eliminating unnecessary ones would greatly help facilitate trade in environmental goods, especially clean technologies that could be used to mitigate climate change.

NTBs affecting trade in environmental goods are quite prevalent across ASEAN countries. UNESCAP research shows that, on average, imports and exports of environmental goods in the Asia-Pacific region are subject to 1.18 non-technical NTBs and 1.28 NTBs, respectively. Meanwhile, more than half of all AMS record prevalence scores higher than average on either imports or exports—or both, in the case of the Philippines, Cambodia, and Singapore—as can be seen in Figure 4.

Figure 4. Prevalence Scores of Non-Technical NTBs Affecting Trade in Environmental Goods in ASEAN (2019)



Source: UNESCAP et al. (2021, p. 30).

6. Local content requirements are not very common in ASEAN, and are used only in Indonesia for joint ventures in renewable energy and in Malaysia for feed-in tariff incentives for renewable energy.

Further examination shows that most TBT notifications by ASEAN members to the WTO with climate change mitigation and adaptation objectives are related to energy-efficiency standards, with a few exceptions. In 2009–21, Thailand submitted 11 such TBT notifications, the highest number among all AMS, all of which were related to energy-efficiency standards for various electrical and computer products. Singapore followed with 10 notifications, of which six were related to energy-efficiency standards, one to energy labelling of products, two to both, and one to fuel quality. Other AMS (namely Indonesia, Malaysia, the Philippines, and Vietnam) submitted only one or two TBT notifications during this period, while four (Brunei Darussalam, Cambodia, Lao PDR, and Myanmar) submitted none (WTO, n.d.-b). This points to the need for AMS to consider aligning their national requirements with international standards where possible, as companies may find it difficult to export their products when required to comply with multiple standards to achieve an "energy-efficient" label.

Similarly, ASEAN countries could benefit from entering into mutual recognition arrangements on certain energy-efficient goods, to save costs and reduce product delivery time across borders. ASEAN adopted such an arrangement for electrical and electronic equipment in 2012 (ASEAN, 2012), followed in 2020 by the Guidelines for the Integration of Energy Efficiency into the ASEAN Sectoral Mutual Recognition Arrangement for Electrical and Electronic Equipment (ASEAN Centre for Energy, 2020b). Similar initiatives should be undertaken with external trading partners to jointly facilitate trade and climate change mitigation.

Subsidy Reform

Reducing GHG emissions from the energy sector in ASEAN may require scaling up renewable energy and reducing the region's reliance on fossil fuels at the same time. This could be done by increasing subsidies for renewable energy to support its diffusion, while tackling subsidies for fossil fuels (see Table 3 for a snapshot of examples of types of renewable energy subsidies and incentives available across ASEAN countries).

Table 3. Renewable Energy Subsidies and Incentives in ASEAN

Type	Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
Feed-in tariff/auctions/premium payment		✓	✓		✓		✓		✓	✓
Tax incentives		✓	✓	✓	✓	✓	✓		✓	✓
Public investment/loans/ grants/subsidies/rebates			✓	✓	✓		✓	✓	✓	✓
Reductions in sales, CO2 taxes or value-added tax			✓		✓	✓	✓		✓	✓
Tendering			✓		✓		✓	✓		
Investment or production tax credits		✓					✓			✓
Energy production payment							✓		✓	

Source: ASEAN Secretariat (2021).

Subsidies can help renewable energy firms address market failures and become competitive in a dynamic new market. Such support is therefore crucial in the initial phase to promote the uptake of renewable energy. For example, Vietnam's use of subsidies to support the diffusion of renewable energy could be cited as a success story in this regard. Solar power was at near zero capacity in Vietnam as of 2017. To support the industry, the government introduced a $0.09 per kilowatt-hour subsidy for solar farms on the condition that they start operations within two years. It was expected that 850 megawatts (MW) of capacity would be installed under the scheme. But by the end of 2019, a whopping 5 gigawatts of capacity had been installed (The Economist, 2020).

Vietnam is also a successful case where the use of feed-in tariffs shows a strong positive impact on renewable energy uptake. Thailand and Malaysia began solar photovoltaic feed-in tariffs in 2007 and 2011, respectively—much earlier than Vietnam. But recent feed-in tariffs in these countries have been less generous than those in Vietnam. For example, a rooftop feed-in tariff in Thailand in 2019 was only about $57/MWh. Before ending in 2016, Malaysia's solar feed-in tariffs were subject to strict conditions, including a maximum eligible installed capacity of 30MW and annual reductions in feed-in tariff rates based on a government-set quota. Indonesia's solar feed-in tariffs have recently been capped at 85% of the regional average cost of electricity generation in many regions, which in some areas is quite low and disadvantages solar photovoltaic vis-à-vis generation from fossil fuels. Unlike Indonesia and Malaysia, Vietnam also imposes no local content requirements as a condition for preferential feed-in tariffs. This creates a level playing field for investors and reduces technology costs (Do & Burke, 2021).

In contrast, fossil fuel subsidies tend to distort prices to the detriment of decarbonization, inhibit the spread of climate-friendly technologies, and place a burden on national budgets. The latest modelling exercise by the International Institute for Sustainable Development estimates that fossil fuel subsidy reform by a set of 32 economies—including major developed, emerging, and developing countries—by 2025 would reduce CO2 emissions by an average of 6% in 2030, and in the case of some countries, the emissions can be reduced by up to 35%. The reinvestment of just a third of the savings from such reform into energy efficiency and renewable energy (a "subsidy swap") would add an additional 3% reduction in CO2 emissions by 2030 (Kuehl et al., 2021).

Around 89% of fossil fuel subsidies are intended to further the consumption of fossil fuels by lowering their costs for private households or industrial consumers ("consumption subsidies"), while about 9% go to fossil fuel producers ("production subsidies"), often in countries that produce oil, gas, or coal (International Institute for Sustainable Development, 2022). Many governments offer consumption subsidies. In ASEAN, with oil prices constantly fluctuating, fuel subsidies are seen as a vital policy to help citizens cope with the cost of living (The ASEAN Post, 2018). Subsidies towards coal-powered plants (which are widespread in the region) are considered necessary to increase electrification rates and limit the financial burden on low-income households (Shi, 2016).

Phasing out these subsidies is therefore quite challenging, because doing so could be interpreted as cutting down on the support available to poor consumers. This notion is not necessarily true, however, because fossil fuel subsidies tend to be regressive, meaning that the largest beneficiaries are those who can better afford unsubsidized products. The International Monetary Fund reviewed the estimates of welfare impacts in 32 developing countries in Africa, Asia, the Middle East, and Latin America in 2005–14. Their study shows that 80% of gasoline subsidies go to the wealthiest 40% of households and that the richest 20% of households benefit six times more from the subsidies than the poorest 20% (Coady et al., 2015). Governments therefore should strive to "rationalize inefficient fossil fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities" (United Nations, 2015).

Alarmingly, fossil fuel subsidies in ASEAN amounted to $35 billion in 2018 (IEA, 2019). This contrasts with the region's modest investment in renewable energy in the same year of just over $7 billion (Frankfurt School & United Nations Environment Programme, 2019). Despite improving incentives for renewable energy, fossil fuel subsidies in several ASEAN member states have undermined the competitiveness of renewable energy in electricity generation while putting a burden on national finances (Shi, 2016). Several AMS, such as Malaysia, Thailand, and Indonesia, have thus begun to overhaul their subsidy programmes, albeit with different degrees of success. The Indonesian government, for example, abolished gasoline subsidies in 2015 and fixed subsidies in 2016. These reforms saved the country about $8 billion, which was redirected to infrastructure development and social programmes (The ASEAN Post, 2018). With oil prices rising again, though, Indonesia has decided to reintroduce fuel subsidies.

While the General Agreement on Tariffs and Trade articles VI and XVI include general provisions on subsidies, the WTO Agreement on Subsidies and Countervailing Measures defines subsidies to regulate their use. National climate policies, especially those that strengthen renewable energy development, could contravene international trade law if domestic producers are supported in a protectionist manner that undermines WTO rules. In light of this possible conflict, and as AMS may increase the use of subsidies to promote renewable energy diffusion in the future, ASEAN countries might benefit from proactively participating in the review and reform of WTO subsidy rules, which includes, for example, allowing exemptions to renewable energy subsidies to pursue climate change mitigation objectives.

5. Climate Change Impacts and Adaptation Plans in ASEAN

There is ample literature on climate change impacts and projections for the Southeast Asian region, which can be summarized as follows:

- Projected climate change varies from country to country in the ASEAN region given its wide geographical area, signifying the need to understand the local variations and impacts of climate change.
- The region is highly vulnerable to sea level rise and coastal inundation, due to large populations and economic assets in coastal areas.
- There is an increase in the number of extreme events, such as extreme precipitation, number of hot days, extreme floods, and changes in the behaviour of typhoons and droughts in terms of their severity, duration, and onset.
- There is very little evidence on projected loss and damage. Only a few countries have information on such projections, with more focus on loss and damage related to floods and sea level rise.
- Climate change impacts on crop productivity are significant in the ASEAN region and are especially pronounced in the RCP8.5 scenario.[7] In the case of rice crop, however, the CO2 fertilization effect (increased CO2 leading to reduced fertilization) is prominent.
- The region will face major economic impacts due to sea level rise. Countries such as Indonesia, Thailand, and Vietnam will face more severe damage compared to the other AMS. The number of people affected is also considerably higher in these countries.

7. A representative concentration pathway (RCP) is a greenhouse gas concentration trajectory adopted by the Intergovernmental Panel on Climate Change (IPCC). Four pathways were used for climate modelling and research for the IPCC Fifth Assessment Report in 2014. The pathways describe different climate futures, all of which are considered possible depending on the volume of GHG emitted in the years to come. The RCPs—RCP2.6, RCP4.5, RCP6, and RCP8.5—are labelled after a possible range of climate forcing values in the year 2100 (2.6, 4.5, 6, and 8.5 watts per square metre, respectively).

- Heat stress impacts are markedly higher in countries including Myanmar, the Philippines, Thailand, and Vietnam, and the impacts are much more pronounced in the RCP8.5 scenario. Therefore, adaptation measures are needed to deal with heat stress in the near future due to these impacts (ASEAN Secretariat, 2021).

Although no ASEAN country except Cambodia has submitted a national adaptation plan under the UNFCCC and the Paris Agreement (UNFCCC, n.d.), their adaptation priorities can be found in their NDCs as well as in their national adaptation programmes of action and national communications submitted under the Kyoto Protocol. Countries including Brunei Darussalam, Myanmar, Singapore, and Thailand have made it clear that they intend to safeguard biodiversity resources and invest to conserve them. Forest conservation and enhancing greenery have been identified as important ways to safeguard biodiversity resources.

Flooding is a major hazard for the region, and there are clear commitments to address flooding in the NDCs of some AMS. For example, Brunei Darussalam, Cambodia, Malaysia, and Singapore have prioritized flood protection measures and integrated management of water resources. Agriculture still plays an important role in the region's resilience and, noting this, AMS have identified developing climate-proof and climate-smart agricultural systems especially for adapting to water variability and related uncertainties. Sustainable agriculture and good agricultural practices are among the other means identified to support the agricultural sector.

The region is rapidly urbanizing, and ensuring systematic urbanization in the future is of paramount importance. Cambodia, Indonesia, Lao PDR, and Vietnam have committed to address threats such as sea level rise by strengthening urban infrastructure. Building local capacity, bringing together policy priorities for both adaptation and disaster risk reduction, improving the resilience of public health systems, and understanding climate change vulnerabilities of key sectors can be prominently found in most AMS NDC pledges (see Annex 2 for more information on ASEAN climate adaptation pledges in NDCs).

6. Agriculture as a Key Sector for Climate Change Adaptation

All ASEAN member states have identified several key sectors on which adaptation interventions can be focused. These sectors have been identified in various official communications, including national communications, NDCs, adaptation plans, and adaptation strategies. Although there is no uniform or clearly described method on how these sectors were prioritized, some of the underlying criteria could include their climate change vulnerability to projected impacts, significance to the national economy, significance to societal well-being, and, to some degree, their significance to future development goals, plans, and pathways. Most countries presented these key sectors as a set, without allocating any priority.

From Table 4, it is apparent that food and agriculture, water resources, forest(ry), biodiversity, and health are the most common key sectors for all 10 AMS. These are followed by urban settlements and energy (six countries), coastal and marine (five countries), industry and infrastructure, tourism, and fisheries (three countries), transport (two countries), and livelihood and poverty (one country). Even though the theme of livelihood implications of climate change is important for all countries, only Cambodia identified it as a separate priority, while others integrated the livelihood aspects into other sectoral priorities.

Table 4. Key Sectors Identified by ASEAN Countries in Their National Communications and Other Official Communications

	Food & agriculture	Water resources	Health	Forest(ry) & bio-diversity	Urban	Coastal & marine	Energy	Industry & Infrastructure	Fishery	Livelihoods & poverty	Tourism	Transport
Brunei	■	■	■	■					■			
Cambodia	■	■	■	■	■	■	■	■		■	■	
Indonesia	■	■	■	■	■		■	■	■			
Lao PDR	■	■	■	■	■		■					■
Malaysia	■	■	■	■		■	■	■				
Myanmar	■	■	■	■		■						
Philippines	■	■	■	■		■						
Singapore	■	■	■	■	■		■	■				■
Thailand	■	■	■	■	■	■			■		■	
Vietnam	■	■	■	■	■	■	■		■		■	■

Source: ASEAN Secretariat (2021).

Agriculture is a major economic sector across Southeast Asia, which is undoubtedly why all AMS have identified it as a priority sector for climate change adaptation. ASEAN has about 115 million hectares of agricultural land planted mainly with rice, maize, oil palm, natural rubber, and coconut. The region is a major producer and supplier of grains and the largest producer of palm oil and natural rubber. It also raises a considerable amount of livestock. In recent years, due to climate change coupled with growing populations and emerging industries, the agricultural sector in Southeast Asia has been under considerable environmental pressure.

Rising temperatures amplify the rate of evapotranspiration, which intensifies stress in crops, especially in areas with limited water supply. The combined effect of heat stress and drought reduces crop yields. Erratic precipitation patterns affect land preparation and planting times and alter the life cycle of major pests and diseases affecting agricultural crops. Droughts during the El Niño years cause water stress to crops and increase pest and disease infestation. These insects (also acting as pathogens) feed heavily on major agricultural crops rather than the natural vegetation in the surrounding areas. Heavy rains during La Niña years lead to severe flooding, massive runoff, and soil erosion, reducing

soil fertility and productivity. Rising sea levels amplify soil salinity in many low-lying agricultural areas and even expand the intrusion of seawater into groundwater resources and aquifers. Higher sea levels also cause the loss of arable land in the region (Asian Development Bank, 2009).

Table 5 summarizes key adaptation actions in the agricultural sector in Southeast Asian countries. The region's most commonly used adaptation measures are adjusting cropping calendars and patterns, changing management and farming techniques, using heat-resistant varieties, diversifying farming, intercropping, and crop rotation, among others. Farm-level adaptation practices are helpful to cope with climate variability. Governments need to strengthen local adaptive capacity by providing public goods and services such as better climate information, research and development on heat-resistant crop varieties and other techniques, early warning systems, and water-efficient irrigation systems. Innovative risk-sharing instruments for the agricultural sector such as index-based insurance schemes are also being tried in Southeast Asia, and the experience and expertise of the private sector should be brought in to complement public sector efforts.[8]

Table 5. Key Adaptation Actions in the Agricultural Sector in ASEAN

1. Adoption of stress-tolerant (drought, flood, saline, pests, and diseases) and short- and/or medium-duration varieties of maize.
2. Adoption of stress-tolerant rice cultivars, with greater tolerance to abiotic stresses (i.e. drought, heat, increasing risks from typhoon- and rainfall-induced floods, sea level rise, and saltwaterintrusions) and biotic stresses such as pest infestation problems.
3. Implementation of climate-informed agricultural insurance (including use of weather indices).
4. Alternate wetting and drying (a rice cultivation practice which involves alternate flooding and draining of rice fields during the production cycle).
5. Adjustment of the planting calendar for rice and maize by synchronizing with the occurrence of precipitation.

Source: ASEAN (2014).

In addition to country-level mechanisms to implement these adaptation measures, there are also a range of initiatives at the regional level in ASEAN to support these efforts:

- The ASEAN Climate Resilience Network (ASEAN-CRN) is a platform for regional exchange, particularly for sharing information, experiences, and expertise on climate-smart agriculture. Since its establishment in 2014, the ASEAN-CRN has launched activities that aim to ensure adaptation of the agriculture sector in ASEAN to climate change and to optimize its mitigation potential (ASEAN-CRN, n.d.).
- The ASEAN-CRN, through the ASEAN Technical Working Group on Agriculture Research and Development, developed the ASEAN Guidelines on Promoting Climate Smart Agriculture Practices (ASEAN, 2015b; ASEAN, 2017), which was subsequently endorsed by the 37th ASEAN Ministerial Meeting on Agriculture and Forestry as the guiding framework to promote resiliency of agriculture in the region.

8. Index-based insurance, also known as index-linked insurance or index insurance, is primarily used in agriculture. Because of the high cost of assessing losses, traditional insurance based on paying indemnities for actual losses incurred is usually not viable, especially for smallholders in developing countries. With index-based insurance, payouts are related to an "index" that is closely correlated to agricultural production losses, such as one based on rainfall, yield, or vegetation levels (e.g. pasture for livestock). Payouts are made when the index exceeds a certain threshold, often referred to as a "trigger". Index-based insurance is not therefore designed to protect farmers against every peril, but only where there is a widespread risk that greatly influences a farmer's livelihood.

7. Trade as a Supporting Tool for Climate Change Adaptation

Trade can be an important vehicle to support climate change adaptation. Generally, it offers entry points for developing countries to: i) access goods and services needed to adapt; ii) invest in critical products and services that will reduce climate risks in their own country and abroad; iii) access trade-related financing mechanisms that support climate adaptation; and iv) establish trade-related international collaborative frameworks in support of climate adaptation (Dekens et al., 2021). However, trade policy as a potential tool is not expressly mentioned in ASEAN's adaptation strategies and measures for the agricultural sector. Areas where trade and trade-related measures could support adaptation efforts in the region are identified below.

Tariffs and Non-Tariff Barriers

Trade could be an important conduit for improving access to climate-resilient agricultural inputs such as new seed varieties that are stress-tolerant and could bring better yields, or fertilizers and pesticides for weed control. These inputs are usually not readily available in developing countries such as AMS and must be imported. Tariff reduction would help lower their costs, thus increasing their affordability and fostering access.

Non-tariff barriers such as sanitary and phytosanitary measures, plant quarantine measures, seed certification, and variety release regulations are more problematic because they are often directly related to specific local conditions and procedural traditions, which differ across regions and countries. Such NTBs are also difficult to harmonize, creating barriers to the cross-border movement of seeds. Meanwhile, NTBs such as non-recognition of professional qualifications can impair the movement of agricultural specialists and related professionals, which hampers the exchange of knowledge and capacity building for farmers.[9]

In 2009–21, ASEAN countries notified a total of 69 sanitary and phytosanitary measures and 64 notifications for plant protection to the WTO—far fewer than the total number of their TBT notifications (235 notifications) in the same period (WTO, n.d.-b). The 10 countries are engaged in several activities aimed at aligning their national requirements with internationally recognized standards, ensuring that their sanitary and phytosanitary measures provide an adequate level of protection for consumers while not unduly restricting trade. ASEAN Regional Guidelines for the Implementation of International Standards related to sanitary and phytosanitary measures are thus being drafted and relevant training is offered to member states (AANZFTA, 2021).

Agricultural Subsidies

ASEAN governments undoubtedly are also providing subsidies and other domestic support to help farmers and agri-producers adapt to climate change impacts. Agricultural subsidies fall under Article 6 of the WTO Agreement on Agriculture. Subsidies that are used to support prices, or those directly related to production quantities, are permitted to a limited extent— generally 5% of the product value for developed countries and 10% for developing countries. Article 6, however, gives developing countries flexibilities to provide domestic support for the purposes of their development programmes, designed to encourage agricultural and rural development.

Unfortunately, information on the amount of agricultural subsidies provided by AMS governments is not complete. Information about such subsidies given by AMS including Brunei Darussalam, Cambodia, Malaysia, Myanmar, and Singapore is not available or notified to the WTO at all, while information from the other AMS such as Indonesia, Lao PDR, the Philippines, Thailand, and Vietnam is either

9. Between 2005–2014, AMS signed seven mutual recognition fields of professional and academic qualifications (i.e. tourism, accountancy, architecture, dentistry, engineering, medicine, and nursing), and endorsed an ASEAN Qualifications Reference Framework in 2016. The agricultural sector, however, has not yet been considered for a mutual recognition arrangement.

incomplete or outdated. From the information that can be collected, it seems that domestic support for the agricultural sector in ASEAN mostly comprises "Green Box" items (namely, agricultural research and survey, pest and disease control, training services, extension and advisory services, inspection services, marketing and promotion services, infrastructural services, public stockholding for food security purposes, domestic food aid, payments for relief from natural disasters, environmental programmes, etc.) and "development programmes" (such as investment subsidies generally available to agriculture and input subsidies generally available to low-income and resource-poor producers).[10]

Several AMS are engaged in national stockpiling for food security and emergency purposes, such as in the case of natural disasters due to climate change (which is reflected in their submissions to the WTO). These are Indonesia (rice and frozen beef), the Philippines (rice, corn, and sugar), Malaysia (rice), Thailand (rice), Singapore (rice), and Vietnam (soybean and rice). This is on top of their earmarked stocks for the ASEAN Plus Three Emergency Rice Reserve.[11] Some AMS are also allegedly stockpiling for trade purposes, that is, to guarantee minimum profit margins for farmers and maintain export stability. These include the Philippines (corn), Thailand (rice and cassava), and Vietnam (rice) (Caballero-Anthony et al., 2015).

Looking ahead, AMS could consider offering subsidies for climate change adaptation goods and services (e.g. subsidies that support the adoption of climate-resilient crops, installation of rainwater harvesting tanks, diversification out of monoculture, promotion of sustainable fishing methods, and alternative fisheries-related activities such as sustainable aquaculture in the context of a changing climate). Applying climate change adaptation criteria to the provision of existing green subsidies may be a good first step to ensure that natural resource management considerations account for present and future climate change impacts (Dekens et al., 2021).

Technology Transfer

ASEAN's climate change adaption strategies in agriculture require new technologies such as climate-resilient seeds and water-efficient irrigation technologies for use in drier conditions; desalination technologies to ensure freshwater supplies as rising sea levels lead to saltwater intrusion of aquifers; and early warning systems in the context of more extreme and intense weather events. This technological need also applies in the case of climate change mitigation efforts, for example with regard to solar photovoltaic technology, wind turbines, and electric vehicles.

However, while the need for climate technologies is present worldwide, their ownership (patents and copyrights) is largely concentrated in a small number of developed countries. This means that unless developing countries—AMS included—can gain on reasonable terms timely access to affordable technologies as well as associated know-how for purposes of research and development, especially to adapt these technologies to local conditions and for production, they will not be able to successfully implement their climate change mitigation and adaptation plans.

While Article 10 of the Paris Agreement acknowledges the need for technology transfer, this climate treaty does not stipulate in detail how to transfer climate-friendly technologies to developing countries or how the relevant questions about intellectual property rights should be addressed. Instead, the clarification of these likely controversial issues is postponed to future negotiations. AMS, and other developing countries, should therefore look to the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights and try use the flexibilities it offers, including compulsory licensing, to access climate technologies. There are also other avenues AMS could explore to obtain technological and financial support for climate change mitigation and adaptation projects or activities such as the UN Climate Technology Centre and Network and the Global Environment Facility.[12]

10. See WTO (n.d.-a) for more information on different types of agricultural subsidies and their treatment.
11. See ASEAN Plus Three Emergency Rice Reserve (n.d.) for more information on the rice emergeny reserve.
12. The UN Climate Technology Centre and Network was established in 2013 and the Global Environment Facility in 1991. They are respectively the technology and financial arms of the UNFCCC. For more information see UN Climate Technology Centre and Network (n.d.) and Global Environment Facility (n.d.).

8. Conclusions and Recommendations

Climate change has profound impacts on the environment, livelihoods, production, and trade across all sectors and industries, and these impacts will worsen in the coming decades. This is alarmingly true in the Southeast Asian region, due to its unique geography as well as other characteristics such as the presence of extreme poverty and its high dependence on climate-sensitive sectors like agriculture and natural resources. ASEAN countries have demonstrated high commitment and carried out several actions to mitigate and adapt to climate change impacts, both at the national and regional levels.

To reduce GHG emissions and achieve the Paris Agreement targets, ASEAN has undertaken to increase the share of renewable energy in the energy mix and enhance the level of energy efficiency for all energy-related sectors and industries, while promoting sink functions through sustainable forest management and afforestation/reforestation, reducing deforestation, and improving forest conservation. To adapt to adverse climate change impacts, the region focuses on promoting climate-smart agricultural practices, applying new technologies, and increasing emergency food stockpiles. Several policy measures and positive actions are mapped out in the NDCs, long-term strategies, national communications, and national adaptation plans and strategies submitted by AMS under the Paris Agreement and the UNFCCC. Yet ASEAN member states have not frequently mentioned or adequately acknowledged the role of international trade cooperation in supporting adaptation and mitigation efforts and enabling recovery from extreme weather events.

Given the growing recognition worldwide that trade not only contributes to climate change, but is also a vital part of the solution to ensure a just transition to a low-carbon economy and foster climate-resilient development, AMS should seize the opportunity to use trade and trade-related measures for these purposes more proactively. To support climate change adaptation and mitigation efforts vis-à-vis the energy, LULUCF, and agricultural sectors, as well as across their economies, and to achieve the targets set in their NDCs and long-term strategies, AMS should consider the following trade-related policy actions.

- Reduce tariff and non-tariff barriers on environmental goods and agricultural inputs to enable access and reduce costs for producers and farmers, making it easier for them to change to more sustainable options in the face of increasing GHG emissions and more adverse climate conditions. This could be done unilaterally or through regional, plurilateral, and multilateral cooperation on trade and the environment, for example within the framework of ASEAN, the Asia-Pacific Economic Cooperation, or the WTO.

- Acquire new climate-friendly technologies by using the available flexibilities under the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights and support mechanisms under the UNFCCC. New technologies are needed not only to support adaptation and mitigation efforts in the agricultural, LULUCF, and energy sectors, but also to enable cleaner production and consumption patterns in other industries and sectors of the economy.

- Increase and/or continue to use subsidies to support climate change mitigation and adaptation options, including vis-à-vis renewable energy and resilient, climate-smart agricultural production, while reforming and gradually phasing out fossil fuel subsidies. Domestic support should be used judiciously and not for protectionist purposes in contravention of WTO rules. Future reviews of WTO agreements should recognize climate change as a legitimate cause for using domestic support and provide for the necessary exemptions.

- Proactively participate in the development and implementation of international sustainability criteria and climate standards, such as within the framework of the International Organization for Standardization. This would help reflect ASEAN member state positions and practices, create transparency for consumers and

producers, and facilitate market access for exporters. The use of such international sustainability standards should also be encouraged in public procurement activities to maximize their climate change mitigation potential.

At the regional level, while climate change is under the purview of the ASEAN Socio-Cultural Community Blueprint, there is also a whole section in the ASEAN Economic Community Blueprint 2025 dedicated to sustainable economic development in which many of the aforementioned issues such as renewable energy promotion, sustainable forest management, and the application of good agricultural practices are included as strategic measures. However, there is no concrete action plan to carry out these strategic measures or sectoral body in ASEAN to oversee implementation of these measures.

The disconnect with other sections of the ASEAN Economic Community Blueprint 2025 (such as those dealing with trade in goods and services) and the ASEAN Socio-Cultural Community Blueprint is quite clear, as illustrated in this paper. Given the urgency of fighting against climate change, which requires concerted action on several fronts with huge resource implications, it is recommended that ASEAN address this gap as soon as possible. This could begin with (greater) cross-sectoral multistakeholder discussion and exchange of ideas at various levels. Such engagement would help ensure that trade is used as a tool to address climate change in ASEAN in the future and that climate change considerations do not hamper trade and negatively affect livelihoods in the region.

At the international level, there are several cooperation mechanisms related to trade which ASEAN countries could consider using to complement and support their climate change mitigation and adaptation efforts. While the various WTO agreements mentioned in this paper are obvious avenues, members are forging new mechanisms to address the intersection of trade and environmental issues. These include the launch in 2014 of negotiations for an Environmental Goods Agreement by a subgroup of 46 WTO members,[13] the issuance of a joint Ministerial Statement on Fossil Fuel Subsidy Reform in 2017,[14] the convening of the Trade and Environmental Sustainability Structured Discussions in 2020 by a group of 53 WTO members, and the launch of the Informal Dialogue on Plastics Pollution and Environmentally Sustainable Plastics Trade in 2020 by a group of 16 WTO members. ASEAN countries could further consider using finance mechanisms such as the WTO-led Aid for Trade initiative and the Enhanced Integrated Framework for trade-related technical assistance to mobilize additional resources for climate change mitigation and adaptation.

13. The negotiations have been stalled since 2016 due to disagreement on the definition and scope of environmental goods to be included in the negotiations.
14. To continue building a supportive international setting for a multilateral response, 45 WTO members issued a Ministerial Statement on Fossil Fuel Subsidies in December 2021 in which they committed to improve information-sharing to advance discussions "aimed at achieving ambitious and effective disciplines on inefficient fossil fuel subsidies, […] including through enhanced WTO transparency and reporting" and elaborating concrete options to advance this issue before the Thirteenth WTO Ministerial Conference. See World Trade Organization, Ministerial Statement on Fossil Fuel Subsidies, WTO Doc. WT/MIN(21)/9/Rev.1 (December 14, 2021).

REFERENCES

APEC. (2012). 2012 *Leader's Declaration*. Annex C – APEC List of Environmental Goods. https://www.apec.org/meeting-papers/leaders-declarations/2012/2012_aelm/2012_aelm_annexc

APEC. (2013). *Green public procurement in the Asia Pacific region: Challenges and opportunities for green growth and trade*. APEC Committee on Trade and Investment. https://www.apec.org/docs/default-source/publications/2013/6/green-public-procurement-in-the-asia-pacific-region-challenges-and-opportunities-for-green-growth-an/toc/main-report.pdf?sfvrsn=209ad46d_1

ASEAN. (2007). *Singapore Declaration on Climate Change, Energy and the Environment*. https://asean.org/singapore-declaration-on-climate-change-energy-and-the-environment/

ASEAN. (2012). *ASEAN Sectoral Mutual Recognition Arrangement for Electrical and Electronic Equipment*. https://asean.org/asean-sectoral-mutual-recognition-arrangement-for-electrical-and-electronic-equipment/

ASEAN. (2015a). *Vision and Strategic Plan for ASEAN Cooperation in Food, Agriculture and Forestry (2016–2025)*. https://asean-crn.org/vision-and-strategic-plan-for-asean-cooperation-in-food-agriculture-and-forestry-2016-2025/

ASEAN. (2015b). *ASEAN Regional Guidelines for Promoting Climate Smart Agriculture (CSA) Practices*. Vol. 1. https://asean.org/wp-content/uploads/images/2015/October/ASEAN-Regional-Guidelines-on-Promoting-CSA-Practices/ASEAN%20Regional%20Guidelines%20on%20Promoting%20CSA%20Practices-endorsed%2037th%20AMAF.pdf

ASEAN. (2016). *ASEAN submission to the UNFCCC Subsidiary Body for Scientific and Technological Advice 44 on issues related to agriculture in response to SBSTA decision FCC/SBSTA/2014/L.14*. https://asean-crn.org/wp-content/uploads/2021/10/53_84_131031085300631893-ASEAN-Submission-to-SBSTA-2.pdf

ASEAN. (2017). *ASEAN Regional Guidelines for Promoting Climate Smart Agriculture (CSA) Practices*. Vol. 2. https://asean.org/wp-content/uploads/2012/05/19.-CSA-Guidelines-Vol-2-for-ASEAN-Website.pdf

ASEAN. (2020). *ASEAN Standard for Legality of Timber*. https://asean.org/wp-content/uploads/19.-ASEAN-Standard-for-Legality-of-Timber-Final.pdf

ASEAN-Australia-New Zealand FTA. (AANZFTA). (2019). *Government procurement officials meet to share sustainable procurement experiences*. https://aanzfta.asean.org/media-releases/government-procurement-officials-meet-to-share-sustainable-procurement-experiences

ASEAN-Australia-New Zealand Free Trade Area (AANZFTA). (2021). *AECSP case study: ASEAN regional guidelines on sanitary and phytosanitary measures: Enhancing ASEAN capacities to implement international standards*. https://aanzfta.asean.org/uploads/2021/09/AECSP%20Communications%20Package%202021/2.%20AECSP%20Case%20Study%20-%20ASEAN%20SPS%20Guideline%20-%20Summary%20Report_.pdf

ASEAN Centre for Energy. (2015). *ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025: Phase I: 2016 – 2020*. https://aseanenergy.org/2016-2025-asean-plan-of-action-for-energy-cooperation-apaec/

ASEAN Centre for Energy. (2017). *The 5th ASEAN energy outlook*. https://asean.org/wp-content/uploads/2021/08/5th-ASEAN-Energy-Outlook-AEO5.pdf

ASEAN Centre for Energy. (2020a). *ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025: Phase II: 2021 – 2025*. Jakarta. https://aseanenergy.org/2016-2025-asean-plan-of-action-for-energy-cooperation-apaec/

ASEAN Centre for Energy. (2020b). *Guidelines for the Integration of Energy Efficiency into the ASEAN Sectoral Mutual Recognition Arrangement for Electrical and Electronic Equipment Framework (ASEAN EEE MRA)*. https://aseanenergy.org/guidelines-for-integration-of-energy-efficiency-into-the-asean-sectoral-mutual-recognition-arrangement-for-electrical-and-electronic-equipment-framework-asean-eee-mra/

ASEAN-Climate Resilience Network (ASEAN-CRN). (n.d.). *About us*. https://asean-crn.org/asean-climate-resilience-network-asean-crn-platform-regional-exchange/

ASEAN Plus Three Emergency Rice Reserve. (n.d.). *What is APTERR?* https://www.apterr.org/what-is-apterr

ASEAN Secretariat. (2015). *ASEAN Economic Community Blueprint 2025*. https://asean.org/wp-content/uploads/2021/08/AECBP_2025r_FINAL.pdf

ASEAN Secretariat. (2016). *ASEAN Socio-Cultural Community Blueprint 2025.* https://www.asean.org/wp-content/uploads/2012/05/8.-March-2016-ASCC-Blueprint-2025.pdf

ASEAN Secretariat. (2021). *ASEAN state of climate change report.* https://asean.org/wp-content/uploads/2021/10/ASCCR-e-publication-Correction_8-June.pdf

Asian Development Bank. (2009). *The economics of climate change in Southeast Asia.* https://www.adb.org/publications/economics-climate-change-southeast-asia-regional-review

Brenton, P., & Chemutai, V. (2021). *The trade and climate change nexus: The urgency and opportunities for developing countries.* The World Bank Group. https://elibrary.worldbank.org/doi/abs/10.1596/978-1-4648-1770-0

Bridle, R., & Bellmann, C. (2021). *How can trade policy maximize benefits from clean energy investment?* International Institute for Sustainable Development. https://www.iisd.org/publications/trade-clean-energy-investment

Caballero-Anthony, M., Teng,P., Shrestha, M., Nair, T. & Lassa, J. A. (2015). *Public stockpiling and food security*. https://www.files.ethz.ch/isn/191682/PB150603_Public-Stockpiling.pdf

Coady, D., Flamini, V., & Sears, L. (2015). The unequal benefits of fuel subsidies revisited: Evidence for developing countries. IMF Working Paper WP/15/220. https://www.imf.org/external/pubs/ft/wp/2015/wp15250.pdf

Dekens, J., Hammill, A., Hoffmann, D., & Bellman, C. (2021). *Leveraging trade to support climate adaptation in developing countries*. International Institute for Sustainable Development.

Do, T.N, & Burke, P. J. (2021). *Vietnam's solar power boom: Policy implications for other ASEAN member states*. https://www.iseas.edu.sg/articles-commentaries/iseas-perspective/2021-28-vietnams-solar-power-boom-policy-implications-for-other-asean-member-states-by-thang-nam-do-and-paul-j-burke/

Eckstein, D., Künzel, V., Schäfer, L., & Winges, M. (2020). *Global climate risk index 2020.* Germanwatch. https://www.germanwatch.org/en/17307

Crumpler, K., Dasgupta, S., Federici, S. et al. (2020). Regional analysis of the nationally determined contributions in Asia – Gaps and opportunities in the agriculture and land use sectors. *Environment and Natural Resources Management Working Paper No. 78.* https://doi.org/10.4060/ca7264en

Frankfurt School & United Nations Environmental Programme (2019). *Global trends in renewable energy investment 2019.* https://www.unep.org/resources/report/global-trends-renewable-energy-investment-2019

Global Environment Facility. (n.d.). *Global Environment Facility*. https://www.thegef.org/

Hattori, T., & Takahashi, K. (2022). *IGES NDC database*. Institute for Global Environmental Studies. https://www.iges.or.jp/en/pub/iges-indc-ndc-database/en

International Energy Agency. (2019). *Southeast Asia energy outlook 2019*. OECD/IEA. https://www.iea.org/reports/southeast-asia-energy-outlook-2019

International Institute for Sustainable Development. (2022). *Background note on fossil fuel subsidy reform*. https://www.iisd.org/publications/brief/background-note-fossil-fuel-subsidy-reform

International Organization for Standardization (ISO). (n.d.). Goal 13: *Climate Action: Take urgent action to combat climate change and its impacts*. https://www.iso.org/sdg/SDG13.html

Kuehl, J., Bassi, A., Gass, P., & Pallaske, G. (2021). *Cutting emissions through fossil fuel subsidy reform and taxation*. International Institute for Sustainable Development. https://www.iisd.org/system/files/2021-07/cutting-emissions-fossil-fuel-subsidies-taxation.pdf

Nurdianto, D.A., & Resosudarmo, B.P. (2016). Economy-wide Impact of a Carbon tax in ASEAN. *Journal of Southeast Asian Economies*, 33(1), 1–21.

Organisation for Economic Co-operation and Development. (1999). *The environmental goods & services industry. Manual for data collection and analysis.* https://unstats.un.org/unsd/envaccounting/ceea/archive/EPEA/EnvIndustry_Manual_for_data_collection.PDF

Overland, I. et al. (2017). *Impact of climate change on ASEAN international affairs: Risk and opportunity multiplier*. Norwegian Institute of International Affairs and Myanmar Institute of International and Strategic Studies. https://www.researchgate.net/publication/320622312_Impact_of_Climate_Change_on_ASEAN_International_Affairs_Risk_and_Opportunity_Multiplier

Paltsev, S., Mehling, M., Winchester, N., Morris, J., & Ledvina, K. (2018). *Pathways to Paris: ASEAN*. MIT Joint Program Special Report. http://globalchange.mit.edu/publication/17160

Raitzer, D.A., Bosello, F., Tavoni, M., Orecchia, C., Marangoni, G., & Samson, J.N.G. (2015). *Southeast Asia and the economics of global climate stabilization*. Asian Development Bank. https://www.adb.org/sites/default/files/publication/178615/sea-economics-global-climate-stabilization.pdf

Rosales, R.C. et al. (2021). *Voluntary carbon markets in ASEAN: Challenges and opportunities for Scaling up*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1026880/Green_Finance_COP26_Universities_Network_Policy_Report.pdf

Sarira, T.V., Zeng, Y., Neugarten, R. Chaplin-Kramer, R. & Koh, L.P. (2022). *Co-benefits of forest carbon projects in Southeast Asia. Nature Sustainability 5*, pp. 393–396. https://doi.org/10.1038/s41893-022-00849-0

Shi, X. (2016). The future of ASEAN energy mix: a SWOT analysis. *Renewable and Sustainable Energy Review 53*. https://www.sciencedirect.com/science/article/abs/pii/S1364032115009806?via%3Dihub

Shi, X., Yao, L., & Jiang, H. (2019). Regional power connectivity in Southeast Asia: the role of regional cooperation. *Global Energy Interconnection*, Vol. 2, pp. 444–456. https://www.sciencedirect.com/science/article/pii/S2096511719301112?via%3Dihub

Singapore Institute of International Affairs. (2020). *The price of pollution: Tax as a flexible green policy tool in ASEAN*. http://www.siiaonline.org/the-price-of-pollution-tax-as-a-flexible-green-policy-tool-in-asean/

SWITCH-Asia. (2022). *Enhancing the implementation of Green Public Procurement in the Southeast Asian Region* [Webinar]. https://www.switch-asia.eu/event/enhancing-the-implementation-of-the-green-public-procurement-in-southeast-asian-region/

The ASEAN Post. (2018). *The role of fuel subsidies in Southeast Asia*. https://theaseanpost.com/article/role-fuel-subsidies-southeast-asia

The Economist. (2020). *Vietnam grapples with an unexpected surge in solar power*. (https://www.economist.com/asia/2020/01/25/vietnam-grapples-with-an-unexpected-surge-in-solar-power)

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. (A/RES/70/1) https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E

UN Climate Technology Centre and Network. (n.d.). *UN Climate Technology Centre and Network*. https://www.ctc-n.org/

UNESCAP, United Nations Environment Programme, & United Nations Conference on Trade and Development (2021). *Asia-Pacific trade and investment report 2021: Accelerating climate-smart trade and investment for sustainable development.* https://www.unescap.org/kp/APTIR2021

UNFCCC .(n.d.). *National adaptation plans*. https://www4.unfccc.int/sites/NAPC/Pages/national-adaptation-plans.aspx

UNFCCC. (2021). *28 to 29 September – ASEAN countries meet for the regional dialogue on carbon pricing*. https://unfccc.int/about-us/regional-collaboration-centres/rcc-bangkok/28-to-29-september-asean-countries-meet-for-the-regional-dialogue-on-carbon-pricing

United Nations Office on Drugs and Crime (2019). *Transnational organized crime in Southeast Asia: Evolution, growth and ampact*. https://www.unodc.org/documents/southeastasiaandpacific/Publications/2019/SEA_TOCTA_2019_web.pdf

World Trade Organization. (n.d.-a). *Domestic support in agriculture: The boxes*. https://www.wto.org/english/tratop_e/agric_e/agboxes_e.htm

World Trade Organization. (n.d.-b). *Environmental database*. https://edb.wto.org/charts

World Trade Organization, Ministerial Statement on Fossil Fuel Subsidies, WTO Doc. WT/MIN(21)/9/Rev.1 (December 14, 2021). https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/WT/MIN21/9r1.pdf&Open=True Reference Point

ANNEX 1. ASEAN Climate Change Mitigation Pledges in Nationally Determined Contributions

Country	Mitigation Type	Mitigation Target	Reference Point	Target Year	Detailed Mitigation Pledge	Major Policy
Brunei Darussalam	Relative emission reduction	20%	Business as usual (BAU)	2030	▪ Energy sector: at least 30% renewable energy share of power generation mix by 2035; at least 10% GHG emissions in the power sector through energy efficiency and conservation on both the supply and demand sides ▪ Transport sector: 60% electric vehicle share of total annual vehicle sales by 2035 ▪ Forestry sector: increase forest reserves from 41% to 55% by increasing the carbon sink through reforestation with a target of planting 500,000 trees by 2035	**Energy and industry** 1) Increasing the use of solar power 2) Utilizing the 10-15 MW potential of waste-to-energy resources 3) Energy intensity target: 45% reduction in tonnes of oil equivalent per unit of gross domestic product, using 2005 as a base year 4) Policies and regulatory frameworks for energy efficiency and conservation 5) Land Transport White Paper **LULUCF** 1) National Forestry Policy of Brunei Darussalam 2) Forest Act (Chapter 46) Forest Rules

Country	Mitigation Type	Mitigation Target	Reference Point	Target Year	Detailed Mitigation Pledge	Major Policy
Cambodia	Relative emission reduction	41.7% with forest(ry) and other land-uses	BAU	2030	▪ The emissions reduction of 64.6 Mt CO2e/year is expected by 2030, a 41.7% reduction compared with the BAU case ▪ LULUCF is expected to provide the major share of 59.1% emission reduction by 2030. Other sectors such as energy (21.3%), agriculture (9.6%), industry (9.1%), and waste (0.9%) are also expected to contribute significantly	**Energy and industry** 1) Climate change action plans (2014–18) for manufacturing industry and energy, and transport sectors 2) Renewable energy in power grid and off-grid electricity 3) Promote end-use energy efficiency 4) Promote renewable energy and energy efficiency in manufacturing industries 5) Mass public transport 6) Improve vehicles' energy efficiency through eco-driving and use of hybrid cars, electric vehicles, and bicycles. 7) Promote energy efficiency in buildings and cookstoves 8) Use of biodigesters and water filters to reduce waste emissions 9) Use of renewable energy for irrigation and solar 10) Industrial Development Policy 2015–2025 11) The National Policy, Strategy and Action Plan on Energy Efficiency in Cambodia (MIME 2013) 12) Basic Energy Plan (2019) 13) The national strategy on 3R for waste management in Cambodia 14) Cambodia Climate Change Strategic Plan 2014–2023 **LULUCF** 1) National REDD+ Strategy 2017–2026 2) National REDD+ Action and Investment Plan (2019) 3) National Forest Program 2010–2029 4) National Action Program to combat land degradation 2018–2027 5) Climate Change Priorities Action Plan for Agriculture, Forestry and Fisheries Sector 2016–2020

Country	Mitigation Type	Mitigation Target	Reference Point	Target Year	Detailed Mitigation Pledge	Major Policy
Indonesia	Relative emission reduction	29% unconditional, 41% conditional	BAU	2030	▪ Indonesia has committed to reduce unconditionally 26% of its greenhouse gases against the business as usual scenario by the year 2020 ▪ Indonesia is committed to reducing emissions by 29% compared to the business as usual scenario by 2030 ▪ Indonesia's target should encourage support from international cooperation, which is expected to help Indonesia to increase its contribution up to 41% reduction in emissions by 2030	**Energy and industry** 1) Shares of new and renewable energy in the primary energy supply: at least 23% by 2025 and at least 31% by 2030 2) Mitigation actions and emissions reduction compared to BAU (unconditional; conditional) i) Implementation of clean coal technology in power plants (75%; 100%) ii) Renewable energy in electricity production (7.4GW; 132TWh) iii) Implementation of biofuels in transportation (Mandatory B30) (90%; 100%) iv) Additional gas distribution lines (100%; 100%) v) Additional compressed-natural gas fuel stations (SPBG) (100%; 100%) 3) National Energy Policy (KEN) 2014 4) Electricity Supply Business Plan (RUPTL) 2016-2025 5) National Energy Plan (RUEN) 2016 6) Act No.18 year 2008 regarding Solid Waste Management 7) Government Regulation No. 81 year 2012 regarding Management of Domestic Solid Waste

Country	Mitigation Type	Mitigation Target	Reference Point	Target Year	Detailed Mitigation Pledge	Major Policy
Lao PDR	Relative emission reduction	40% unconditional and 50% conditional (50% is based on the NDC's information on BAU emission in 2020 and 2030 and reduced emissions in 2020–30)	BAU	2030	▪ Forest cover increase to 70% of land area (i.e. to 16.58 million hectares) by 2030 ▪ Increase in the share of renewable energy (13GW total hydropower capacity, 1GW for solar and wind, and 300MW for biomass) by 2030 ▪ 10% reduction of final energy consumption relative to BAU scenario, and introduction of 50,000 energy efficient cook stoves ▪ 30% electric vehicles in national vehicles mix, biofuels to meet 10% of transport fuels, new Bus Rapid Transit system in Vientiane, and Lao-China Railway ▪ 50,000 hectares adjusted water management practices in lowland rice cultivation ▪ Implementation of 500 tonnes/day sustainable municipal solid waste management project	**Energy and industry** 1) Increase the share of renewable energy (<15MW) to 30% of energy consumption by 2025 2) Increase the share of biofuels to meet 10% of the demand for transport fuels by 2025 3) Make grid-based electricity available to 90% of households in rural areas by 2020, thus reducing the consumption of off-grid fossil fuels 4) Implement the findings of the Nationally Appropriate Mitigation Actions feasibility study in transportation 5) Build large-scale (>15 MW) hydropower plants to provide clean electricity to neighbouring countries: approximately 5,500 MW by 2020; 20,000 MW after 2020 6) The Renewable Energy Strategy (2011) 7) National Strategy on Climate Change (2010) 8) Sustainable Transport Development Strategy (2010) 9) Climate Change Action Plan of Lao PDR for 2013–2020 (2013) **LULUCF** 1) Forestry Strategy to the Year 2020 of the Lao PDR (2005) 2) Forest Law Enforcement, Governance and Trade

Country	Mitigation Type	Mitigation Target	Reference Point	Target Year	Detailed Mitigation Pledge	Major Policy
Malaysia	Carbon-intensity reduction	35% unconditional plus 10% conditional	2005	2030	Malaysia intends to reduce its GHG emissions intensity of GDP by 45% by 2030 relative to the emissions intensity of GDP in 2005. This consist of 35% on an unconditional basis and a further 10% is condition upon receipt of climate finance, technology transfer and capacity building from developed countries	**Energy and industry** 1) National Policy on the Environment (2002) 2) National Strategic Plan for Solid Waste Management (2005) 3) National Biofuel Policy (2006) 4) National Energy Policy (2008) 5) National Green Technology Policy (2009) 6) National Policy on Climate Change (2009) 7) New Economic Model, Government Transformation Programme and Economic Transformation Programme (2010) 8) Renewable Energy Policy and Action Plan (2010) 9) National Automotive Policy (2014) **LULUCF** 1) National Forestry Policy (1978, Revised 1992) 2) National Policy on Biological Diversity (1998) 3) National REDD+ Strategy

Country	Mitigation Type	Mitigation Target	Reference Point	Target Year	Detailed Mitigation Pledge	Major Policy
Myanmar	Relative emission reduction	To be updated	BAU	2030	▪ Indicative goal: Hydroelectric generation of 9.4 GW by 2030 ▪ Indicative goal: Rural electrification through the use of at least 30% renewable sources to generate electricity supplies ▪ Indicative goal: To realize a 20% electricity saving potential by 2030 of the total forecast electricity consumption ▪ Indicative goal: To distribute about 260,000 cook stoves in 2016–31	Energy and industry 1) National Energy Policy 2) Draft of the Long-term Energy Master Plan 3) Draft of the National Electrification Master Plan 4) Draft of the Rural Electrification Plan 5) Draft of the National Energy Efficiency and Conservation Policy, Strategy and Roadmap for Myanmar 6) Myanmar Climate Change Strategy (2018–2030) 7) Myanmar Climate Change Master Plan (2018–2030) 8) Myanmar Climate Change Policy (2019) 9) National Transport Master Plan 10) National Waste Management Strategy and Master Action Plans (2020) LULUCF 1) National Forest Policy (1995) 2) National Forest Law (2018) 3) National Land Use Policy (2016) 4) The National Forestry Master Plan (2001-31) 5) Drafted REDD+ Strategy, Myanmar Reforestation and Rehabilitation Programme (2017-2026) 6) REDD+ Safeguard Roadmap

Country	Mitigation Type	Mitigation Target	Reference Point	Target Year	Detailed Mitigation Pledge	Major Policy
Philippines	Relative emission reduction	2.71% unconditional, 75% conditional	BAU (in 2020–30)	2020–30	▪ The Philippines intends to undertake GHG (CO2e) emissions reduction of 2.71-75% in 2020–30 relative to its BAU scenario for the same period ▪ Reduction of CO2e emissions will come from energy, transport, waste, forestry, and industry sectors. Most mitigation contribution is conditioned on the extent of financial resources, including technology development and transfer, and capacity building.	**Energy and industry** 1) National Climate Change Action Plan of 2011 2) Philippine Energy Plan (2016–30, 2018–40) 3) National Energy Efficiency and Conservation Programme 4) Ecological Solid Waste Management Act of 2000 5) Biofuels Act of 2006 6) Renewable Energy Act of 2008 **LULUCF** 1) Philippine National REDD+ Strategy
Singapore	Absolute emission peaking	Peak emissions at no higher than 65 MtCO2e around 2030		2030	Singapore has set a goal of emissions peaking at 65 MtCO2e around 2030	1)The Singapore Green Plan 2030 2)Singapore's Long-Term Low-Emissions Development Strategy (2020) 3)Singapore Energy Story 4)Carbon Tax under Carbon Pricing Act (2018) 5)Promote solar PV deployment which: ▪ facilitates system integration of intermittent sources to ensure grid stability and security ▪ addresses non-market barriers to entry without subsidizing the consumption of any form of energy ▪ supports continued investment in research, development, and demonstration to reduce the cost of solar photovoltaic modules and improve their efficiency 6)By 2030, it is estimated that renewable energy could potentially contribute up to 8% of Singapore's peak electricity demand

Country	Mitigation Type	Mitigation Target	Reference Point	Target Year	Detailed Mitigation Pledge	Major Policy
Thailand	Relative emission reduction	20% unconditional, 25% conditional	BAU	2030	▪ Thailand intends to reduce its GHG emissions by 20% from the projected BAU level by 2030 ▪ The level of contribution could increase up to 25%, subject to adequate and enhanced access to technology development and transfer, financial resources, and capacity-building support	**Energy & Industry** 1) Power Development Plan B.E. 2558–2579 (2015-2036) 2) Thailand Smart Grid Development Master Plan B.E. 2558-2579 (2015-2036) 3) Alternative Energy Development Plan B.E. 2558–2579 (2015-2036) 4) Energy Efficiency Plan B.E. 2558–2579 (2015-2036) 5) Environmentally Sustainable Transport System Plan B.E. 2556–2573 (2013-2030) 6) Climate Change Master Plan B.E. 2558–2593 (2015-2050) 7) National energy targets: (i) Achieve a 20% share of power generation from renewable sources in 2036 (ii) Achieve a 30% share of renewable energy in total final energy consumption in 2036 (iii) Reduce the country's energy intensity by 30% below the 2010 level in 2036 **LULUCF** 1) Agricultural Development Plan (2017–2021) 2) Forest Law (1941)

Country	Mitigation Type	Mitigation Target	Reference Point	Target Year	Detailed Mitigation Pledge	Major Policy
Vietnam	Relative emission reduction	9% unconditional, 27% conditional	BAU	2030	▪ With domestic resources, by 2030, Vietnam will have reduced total GHG emissions by about 9% compared to the BAU scenario, equivalent to 83.9 million tonnes of CO2eq ▪ The above-mentioned 9% contribution can be increased by up to 27% compared to the BAU scenario (equivalent to 250.8 million tonnes of CO2eq) with international support ▪ GHG reduction in energy sector (5.5% or 51.5 million tCO2e), agriculture sector (0.7% or 6.8 million	**Energy and industry** 1) Law on Economical and Efficient use of Energy (6/2010) 2) National Climate Change Strategy (12/2011) 3) National Green Growth Strategy (9/2012) 4) Decision 1775/QD-TTg on "Management of GHG emissions; management of carbon credit trading activities to the world market" (11/2012) 5) Promote effective exploitation and increase the proportion of new and renewable energy sources in energy production and consumption 6) Improve effectiveness and efficiency of energy use, thereby reducing energy consumption 7) Change the fuel structure in industry and transportation **LULUCF** 1) Circular No. 34/2009 / TT-BNNPTNT on the criteria for determining and classifying forests (2009) 2) Decree No. 117/2010/ND-CP on Organization and Management of the Special-use Forest System (2010) 3) Law on Forestry (2017)

Source: ASEAN Secretariat (2021); Hattori & Takahashi (2022).

ANNEX 2. ASEAN Climate Adaptation Pledges in Nationally Determined Contributions

Country	Detailed Adaptation Pledge	Major Policy
Brunei Darussalam	▪ Promote the development of a local biotechnology industry based on the country's forest biodiversity resource ▪ Legislation and regulations in the land use sector, such as restrictions and reduced scale on logging activities ▪ Integrated approach combining flood protection, river quality improvement, and coastal protection	1)Brunei Darussalam National Climate Change Policy 2)National Forestry Policy of Brunei Darussalam 3)Forest Act (Chapter 46) Forest Rules
Cambodia	▪ Promote and improve the adaptive capacity of communities, especially through community-based adaptation actions, and restore the natural ecology system to respond to climate change ▪ Strengthen early-warning systems and climate information dissemination ▪ Develop and rehabilitate the flood protection dykes for agricultural and urban development ▪ Increase the use of mobile pumping stations and permanent stations in response to mini-droughts, and promote groundwater research in response to drought and climate risk ▪ Develop climate-proof agriculture systems for adapting to changes in water variability	1)Cambodia Climate Change Strategic Plan 2014–2023 2)Climate Change Priorities Action Plan for Agriculture, Forestry and Fisheries Sector 2016-2020 3)Strategic National Action Plan for Disaster Risk Reduction in Cambodia 2008–2013 4)National Action Plan for Disaster Risk Reduction 2019–2023 5)2015 Law on Disaster Management 6)National Adaptation Plan 2017

Country	Detailed Adaptation Pledge	Major Policy
Indonesia	▪ Study and map regional vulnerabilities as the basis of adaptation information system ▪ Strengthen institutional capacity and promulgation of climate change-sensitive policies and regulations by 2020 ▪ Reduce risks on all development sectors (agriculture, water, energy security, forestry, maritime and fisheries, health, public service, infrastructure, and urban system) by 2030 through local capacity strengthening, improved knowledge management, convergent policy on climate change adaptation and disaster risks reduction, and application of adaptive technology ▪ Award and encourage adaptation and mitigation actions at the site level (Climate Village Programmes), with a target of 20,000 locations by 2024	1)National Action Plan on Climate Change Adaptation 2)Climate Change Adaptation Programme 3)Proklim (Climate Village Programs)
Lao PDR	▪ Climate resilience in farming systems and agriculture infrastructure ▪ Climate resilience in forestry production and forest ecosystems ▪ Water resource information systems, managing watersheds and wetlands, increasing water resource infrastructure resilience ▪ Increase the resilience of urban development and infrastructure to climate change ▪ Increase the resilience of public health infrastructure and water supply system	1)National Strategy on Climate Change (2010) 2)Forestry Strategy to the Year 2020 of the Lao PDR (2005) 3)Climate Change Action Plan of Lao PDR for 2013–2020 (2013) 4)National adaptation plan for action 5)Strategic Plan on Disaster Risk Management (2020)

Country	Detailed Adaptation Pledge	Major Policy
Malaysia	▪ Flood mitigation programmes and strengthening of disaster risk management and resilience of infrastructure would be further enhanced in the Eleventh Malaysia Plan (Malaysia's five-year development plan towards 2020) and beyond. ▪ Strengthen the regulatory framework (Environmental Quality Act 1974, which has 38 subsidiary environmental regulations and provides a legislative framework to control water pollution) of the water services industry, expand the water supply network and treatment capacity infrastructure, and increase the efficiency of water supply services. ▪ Expand implementation of good agricultural practices and intensify research and development to improve agriculture production. New granary areas and adequate and efficient irrigation and drainage infrastructure will be developed to increase rice production. ▪ A National Coastal Vulnerability Index to sea level rise is being developed.	1)Eleventh Malaysia Plan 2)National Water Resources Policy (2012) 3)Water Services Industry Act 2006(WSIA Act 655) and National Water Services Commission Act (SPAN Act 654) 4)Environmental Quality Act 1974 5)National Agro-food Policy (2011–2020)

Country	Detailed Adaptation Pledge	Major Policy
Myanmar	▪ Resilience in the agriculture sector, developing early-warning systems and forest preservation measures ▪ Public health protection and water resource management ▪ Coastal zone protection ▪ Energy and industry sectors, and biodiversity preservation	1)National Environment Policy (2019) 2)Myanmar Climate Change Policy (2019) 3)Myanmar Climate Change Strategy (2018–2030) 4)Myanmar Climate Change Master Plan (2018–2030) 5)National Waste Management Strategy and Master Action Plans (2020) 6)National Environmental Quality Emission Guidelines (2015) 7)Myanmar National Water Policy (2014) 8)Myanmar Action Plan for Disaster Risk Reduction (2017) 9)The National Forestry Master Plan (2001–31) 10)Community Forestry Instructions (2019) 11)National Adaptation Programme of Action 12)Climate Smart Agriculture Strategy (2015)
Philippines	▪ System strengthening for downscaling climate change models, climate scenario-building, climate monitoring and observation ▪ Science-based climate/disaster risk and vulnerability assessment process ▪ Enhancement of climate and disaster-resilience of key sectors: agriculture, water, and health ▪ Systematic transition to a climate- and disaster-resilient social and economic growth	1)National Disaster Risk Reduction and Management Law of 2010 2)National Climate Change Action Plan of 2011
Singapore	▪ Invest in research ▪ Protect from sea level rise ▪ Manage water, minimize floods ▪ Keep essential services running well ▪ Keep buildings and infrastructure safe ▪ Strengthen resilience in public health and enhance greenery and biodiversity ▪ Ensure resilient food supply	1)National Climate Change Strategy (2012) 2)Singapore's Climate Action Plan: A Climate-Resilient Singapore, For a Sustainable Future (2016) 3)Singapore's Long-Term Low-Emissions Development Strategy (2020) 4)Singapore Green Plan 2030 (2021)

Country	Detailed Adaptation Pledge	Major Policy
Thailand	▪ Promote and strengthen integrated water resources management practices ▪ Safeguard food security through the guidance of sufficiency economy philosophy ▪ Promote sustainable agriculture and good agricultural practices ▪ Increase capacity to manage climate-related health impacts ▪ Increase national forest cover to 40% through local community participation ▪ Safeguard biodiversity and restore ecological integrity in protected areas and important landscapes from the adverse impacts of climate change.	1)National Adaptation Plan 2)2019 Community Forestry Law 3)Climate Change Master Plan 2015-2050
Vietnam	▪ Respond proactively to disasters and improve climate monitoring: modernize the hydro-meteorological observatory and forecasting system; produce socio-economic development plans; implement disaster prevention plans and measures, etc. ▪ Ensure social security: Review, adjust and develop livelihoods and production processes; develop mechanisms, policies, and strengthen the insurance system; improve regulations and technical standards for infrastructure; implement community-based adaptation, etc. ▪ Responding to sea level rise and urban inundation: Implement integrated coastal zone management; use sea level rise scenarios in urban and land-use planning for infrastructure, industrial parks, coastal and island resettlement areas; implement anti-inundation measures for large coastal cities, etc.	1)Law on Natural Disaster Prevention and Control (2013) 2)National Climate Change Strategy (2011) 3)National Target Programme to Respond to Climate Change (2008, 2012)

Source: ASEAN Secretariat (2021).

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