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ASEAN Readiness for the Energy Transition: A Baseline Assessment of the Cohesion and Viability of Key ASEAN Energy Planning Documents

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Key messages

Regarding the ASEAN Plan of Action for Energy Cooperation (APAEC) for the period 2026 - 2030:

1). While the APAEC for 2021-2025 with the sub-theme "Accelerating the Energy Transition and Strengthening Energy Resilience through Greater Innovation and Cooperation" reflects the commitment of ASEAN to deepening cooperation on clean and sustainable energy, it does not underline the need for close communication and knowledge-sharing between energy sector leaders and government officials tasked with formulating emissions mitigation policies in the ASEAN Member States. Meanwhile, it is essential to have close communication and knowledge-sharing between both sectors in order to overcome the barriers in the energy-climate nexus. One of the ways to resolve this can be started by highlighting the need for a closer link between energy and climate planning in not only Programme Area 6 (Regional Energy Policy and Planning), but also Programme Area 4 (Energy Efficiency and Conservation (EE&C) and Programme Area 5 (Renewable Energy).
2). This APAEC document also does not include a specific definition of "low carbon economy". To arrive at a common understanding and to organise joint efforts towards a low carbon economy and net zero emissions in ASEAN, a definition of "low carbon economy" should be included in the next phase of the APAEC. Elaboration of more concrete terms such as "net zero" and "carbon neutrality" is also needed.
3). There is no mention in the APAEC document of the need for systematic changes that value inclusion and equality in society. "Gender equality", "gender equity" and "gender inclusion" all need to be defined and discussed

Regarding the 8th ASEAN Energy Outlook (AEO8):

1). The AEO7 report includes several scenarios which project greenhouse gas (GHG) emissions growth. The analysis therein provides a good basis for comparing the potential of various climate change mitigation policies. This use and discussion of scenarios should also be included in the AEO8 report.
2). Net zero modelling should be included in the AEO8 report. Although AEO7 includes a subchapter on GHG emissions in ASEAN, it does not include a net zero- or carbon neutral-related scenario. Such a scenario is important to assess and analyse ASEAN's capacity to develop a low carbon economy and a net zero future.
3). As the AEO7 only briefly explains gender inclusivity in the energy sector, a subchapter on gender equity or gender inclusivity in the energy sector should be included in the AEO8 report.

1. Background

a. Overview of ASEAN Member State Commitments to the Paris Agreement

Upon signing and ratifying the Paris Agreement, it became mandatory for the ten ASEAN Member States (AMS) to communicate their climate action plans in the form of Nationally Determined Contributions (NDCs). Following this, as stated in Article 9 of the Paris Agreement, the NDCs are recommended to update their NDCs every five years, with each new NDC reflecting a stepwise advancement of climate ambitions and measures. As of 2022, all of the AMS had

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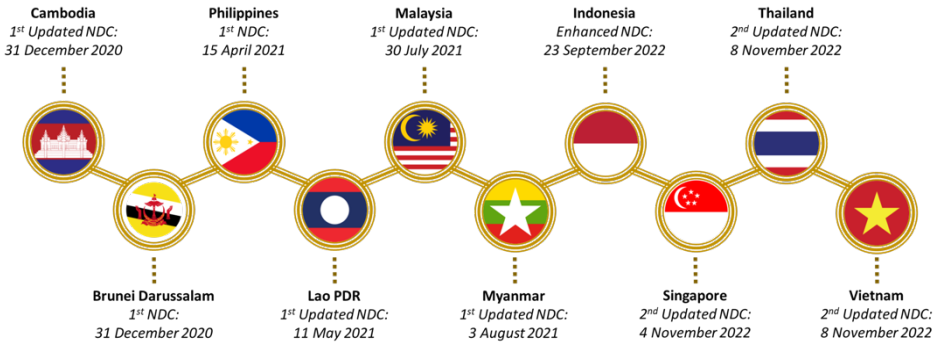
published or even updated their NDCs, demonstrating a commitment to climate change mitigation. Indonesia was the first to make a stronger commitment by raising its NDC targets, relative to those submitted two years earlier, in the cover letter of its updated NDC submitted on 23 September 2022. Shortly thereafter, three other AMS updated their NDCs: Thailand (2 November 2022), Singapore (4 November 2022), and Vietnam (8 November 2022). The other AMS have not as yet updated the targets set in their initial NDCs: Cambodia (31 December 2020), Lao PDR (11 May 2021), Malaysia (30 July 2021), Myanmar (3 August 2021), Brunei Darussalam (31 December 2020), and the Philippines (15 April 2021) (see Figure 1).

Figure 1. Latest NDC updates from the ASEAN member states



Source: UNFCCC, "NDC Registry", 2023. [1]

At COP 27 (held in November 2022), four of the AMS submitted their enhanced NDCs. Indonesia, Singapore, and Thailand plan to reach their emissions reduction targets by scaling up renewable energy shares, while Vietnam is focusing on improving energy efficiency and savings.

Of the various sources of greenhouse gases contributing to climate change, the energy sector is the largest emitter. Thus, focusing on emissions reduction in this sector is imperative for countries to ensure achieving their NDC commitments. However, despite having strong commitments to mitigating climate change, not all of the AMS has set targets specifically for the energy sector. Currently, only Cambodia, Indonesia, Lao PDR, Myanmar, and Vietnam have specified targets for the energy sector in their NDCs (see Table 1). Hence, there is a clear need for much more communication among ASEAN's energy leaders and government officials tasked with formulating emissions mitigation policies. Establishing definitive targets and plans for the energy sector is a good way for the governments to understand the many variables involved in reducing the emissions from this sector and develop strategies to realise large reductions quickly.

Table 1. NDC Targets for Each AMS' Energy Sector

Country	NDC Targets for Each AMS' Energy Sector (from the Business-as-Usual Scenario)
Brunei Darussalam	No specific target
Cambodia	-40% (-13.7 MtCO2e)
Indonesia	-79% (-358 MtCOe) unconditional -98% (-446 $MtCO_2e$) conditional
Lao PDR	-22% (2.9 $MtCO_2e$) unconditional -4% (0.5 $MtCO_2e$) conditional
Malaysia	No specific target
Myanmar	-35% (105,2 $MtCO_2e$) unconditional -48% (144 $MtCO_2e$) conditional
Philippines	No specific target
Singapore	No specific target
Thailand	No specific target
Vietnam	-7% (-64.8 $MtCO_2e$) unconditional -24.4% (-227$MtCO_2e$) conditional

Source: UNFCCC, 'NDC Registry', 2023. [1]

b. The ASEAN Plan of Action for Energy Cooperation (APAEC)

The APAEC is a series of policy documents published every five years that aims to enhance multilateral energy cooperation and integration in accordance with the goals of the ASEAN Economic Community (AEC). The 1st APAEC (1999-2004) was the initial phase of the ASEAN Vision 2020 implementation plan. The 4th APAEC (2016-2025) was launched at the 33rd ASEAN Ministers of Energy Meeting (AMEM) held in Kuala Lumpur, Malaysia on 7 October 2015. The ministers reaffirmed that energy connectivity and market integration play crucial roles in the realisation of the 2025 ASEAN Community Vision, which calls for a well-connected, integrated, competitive, and resilient ASEAN. They agreed that the new ASEAN plan of Action for Energy Cooperation (APAEC 2016-2025) must strategically emphasise energy connectivity and market integration enhancement in ASEAN in order to achieve energy security, accessibility, affordability, and sustainability for all.

Phase I of the 4th APAEC [2] covered the 2016-2020 period and included short- to medium-term measures to enhance energy security cooperation and take further steps towards connectivity and integration. This built on the success of the previous APAECs and outlined the ongoing cooperation in seven programme areas: (i) the ASEAN Power Grid (APG); (ii) the Trans-ASEAN Gas Pipeline (TAGP); (iii) Coal and Clean Coal Technologies (CCT); (iv) Energy Efficiency and Conservation (EE&C); (v) Renewable Energy (RE); (vi) Regional Policy and Planning (REPP); and (vii) Civilian Nuclear Energy (CNE).

Phase II of the 4th APAEC [3] covers the 2021-2025 period. It picks up where Phase I left off, with more ambitious aspirational targets and new initiatives to enhance the energy transition and a resilient, sustainable energy future. With the new subtheme, "Accelerating the Energy Transition and Strengthening Energy Resilience through Greater Innovation and Cooperation," APAEC Phase II frames the region's energy cooperation agenda during the period, as well as the longer-term work towards a sustainable ASEAN energy future. Phase II also considers the impacts of the COVID-19 pandemic and recovery plans, recent global economic and energy trends, climate change and decarbonisation, energy investment and financing projects, inclusion of the private sector through business forums, new and emerging energy technologies, and digitalisation in the energy sector.

c. ASEAN Energy Outlook (AEO)

The ASEAN Centre for Energy (ACE) is an intergovernmental organisation that serves as a catalyst for the economic growth and integration of the ASEAN region by initiating and facilitating multilateral collaboration as well as joint activities in the energy sector. ACE also provides policy advice to ensure that the policies and programmes of the ten AMS harmonise with the region's economic development and environmental sustainability goals. Therefore, ACE is tasked with regularly publishing the ASEAN Energy Outlook (AEO), the flagship ASEAN energy planning document. The AEO analyses whether and how national and regional targets in the energy sector can be met, as well as the required policies, measures, and technologies to help achieve those targets. The latest published AEO was the 7th ASEAN Energy Outlook (AEO7), launched at the 40TH AMEM virtually hosted by Cambodia on 15 September 2022.

AEO7 outlines ASEAN energy prospects by examining four scenarios for the period 2021-2050, based on historical data from 2005 to 2020. Like previous AEOs, AEO7 includes a Baseline Scenario, ASEAN Member State Target Scenario (ATS), APAEC Target Scenario (ATS), as well as a new scenario, the Least-Cost Optimisation (LCO). Each scenario assumes different sets of energy targets and policies, with a gradual increase in the level of effort and commitment, in order to predict the impacts on energy supply and demand, electricity generation, CO_2 emissions growth and other cross-cutting issues. AEO7 also guides the continuing implementation of the APAEC scenarios and potential pathways for achieving the long-term energy security and energy transition agenda envisioned by the Bandar Seri Begawan Joint Declaration[1] of the 39th ASEAN Ministers on Energy Meeting (AMEM).

2. Purpose and Method of the Baseline Assessment

The purpose of this baseline assessment is to establish a reference point for the development of key ASEAN energy planning documents. A qualitative methodology was used to analyse two key documents for ASEAN energy policy and planning, the ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025, Phase II: 2021-2025 and the 7th ASEAN Energy Outlook (AEO7). We formulated three research questions to measure ASEAN's readiness to move towards a low-carbon economy and net zero future:

1). Does the region have adequate knowledge-sharing on the energy-climate nexus?

[1]Joint Declaration of the Priority Economic Deliverable on energy for the 2021 ASEAN Chairmanship of Brunei Darussalam.

2). Is there a common understanding of and joint efforts towards net zero emissions in ASEAN?
3). Does ASEAN have a sufficiently strong regional structure, as well as adequate capacity, equality, and inclusivity to support the energy transition?

First, we analysed the contents of the documents to survey the occurrence of terms related to these research questions. Next, we examined the documents carefully to understand how they reflect the readiness to promote the energy transition.

This assessment provides:

- Baseline information from statements that reflect (i) adequate knowledge-sharing on the energy-climate nexus in ASEAN, (ii) a common understanding and joint efforts to move towards net zero emissions in ASEAN, and (iii) a strong regional structure, as well as sufficient capacity and gender equality on the energy-climate nexus in the APAEC Phase 2 (2021 – 2025) document.
- Baseline information based on statements that reflect (i) adequate knowledge-sharing on the energy-climate nexus in ASEAN, (ii) a common understanding and joint efforts to move towards net zero emissions in ASEAN, and (iii) strong regional structure, as well as sufficient capacity and gender equality on the energy-climate nexus in the 7th ASEAN Energy Outlook (AEO7) document.

The results of the baseline assessment will be used as a basis for the implementation of the ASEAN Climate Change and Energy Project Phase 2 (2022-2026) and as inputs for preparing the APAEC for 2026-2030, which started in 2023, and the 8th ASEAN Energy Outlook (AEO8), which is to be launched in 2024.

3. Results

3.1 The ASEAN Plan of Action for Energy Cooperation (APAEC) for the period 2021–2025

Knowledge-sharing on the energy-climate nexus in ASEAN:

i). The APAEC for period 2021-2025 retains the theme of "Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All" from previous APAECs. This regional energy cooperation plan also has a sub-theme: "Accelerating Energy Transition and Strengthening Energy Resilience through Greater Innovation and Cooperation." This sub-theme reflects the commitment of ASEAN to deepening cooperation to achieve clean and sustainable energy.

ii). The APAEC for period 2021-2025 describes the ASEAN Energy Development Directive and refers to the policy document "ASEAN 2025 Forging Ahead Together" to enhance information-sharing with a mechanism that will strengthen cross-sectoral and cross-pillar coordination in the region. While this means that the APAEC acknowledges the need to enhance information-sharing and cross-sectoral coordination in the region, the document does not explicitly mention support for knowledge-sharing on the energy-climate nexus.

iii). At the programme area level:

- Programme Area 1: ASEAN Power Grid (APG)
  The key strategy is linked to climate change mitigation where the APG aims to promote clean and renewable energy integration. This is also supported in an Outcome-based Strategy (OBS) 4 to explore the integration of renewable energy into the APG.
- Programme Area 2: Trans-ASEAN Gas Pipeline (TAGP)
  The key strategy, the OBS,and action plan for the TAGP are not linked to climate change mitigation.
- Programme Area 3: Coal and Clean Coal Technologies (CCT)
  The key strategy "to optimise the role of clean coal technologies in facilitating the transition towards sustainable and lower emissions development" is linked to climate change. The OBS 1 also outlines the strategy to promote CCTs and Carbon Capture Utilisation and Storage (CCUS) towards the energy transition and low carbon economy.
- Programme Area 4: Energy Efficiency and Conservation (EE&C)
  The key strategies and activities in this programme area are directly related to climate change mitigation.
- Programme Area 5: Renewable Energy
  The key strategies and activities in this programme are directly related to climate change and the low-carbon economy.
- Programme Area 6: Regional Energy Policy and Planning
  The key strategy in this programme area is to advance energy policy and planning to accelerate the energy transition and resilience. The energy transition is linked to climate change mitigation and the low-carbon economy. This programme area also includes OBS 6, which aims to promote information-sharing on the energy-climate nexus.
- Programme Area 7: Civilian Nuclear Energy

Although the use of nuclear energy for power generation is relevant to climate change and low-carbon technologies, the key strategy, OBS, and action plan did not mention climate change or sustainable development.

iv). In general, the APAEC Phase II document contains key strategies, OBS, and action plans that are relevant to climate change mitigation. However, none of the key strategies emphasise the need for knowledge-sharing on the energy-climate nexus in ASEAN, and only OBS 6, on Regional Energy Policy and Planning, includes an action plan to promote information-sharing on the energy-climate nexus. As a result, few policy dialogues, study visits, and regional seminars attended by both ASEAN's energy leaders and government officials tasked with formulating emissions mitigation policies are taking place.

A common understanding and joint efforts towards a low carbon economy and net zero emissions in ASEAN:

i). The previous baseline assessment of APAEC 2016-2020 suggested that the document should include more concrete terms relating to climate change. As a result, the APAEC for 2021-2025 included the terms "Paris Agreement", "climate change", "energy transition", "decarbonisation" and "low-carbon economy" as well as "low-carbon energy system". However, "net zero" and "carbon neutral" are not mentioned in the document.

ii). Although "low-carbon economy" and "low-carbon energy system" were mentioned a few times, there was no explicit definition of either term in the APAEC for period 2021-2025. This means that there is no common understanding of what low-carbon economy is and how to reach it. And as a result, no joint efforts towards a net zero future are articulated in the document.

iii). The APAEC document for 2021-2025 mentions a global energy transition that is gradually shifting the world towards less carbon-intensive energy systems and how ASEAN sees this as shaping regional energy development and balancing the energy trilemma of energy security, energy equity, and environmental sustainability. However, it does not directly address the efforts to move to a low-carbon economy or a net zero future.

Strong regional structure, as well as adequate capacity and gender equality on the energy-climate nexus:

i). The APAEC document outlines comprehensive strategies to meet the challenges of ASEAN's energy transition. However, the approach to the energy-climate nexus in ASEAN still lacks cohesion, durability and structure. This is reflected in the fact that there is no dedicated ASEAN unit responsible for the energy-climate nexus, no dedicated knowledge hub for it and only limited information about it which is tailored to ASEAN audiences.

ii). Despite acknowledging the urgency of the energy transition, the APAEC document for 2021-2025 does not mention the need for systematic changes that value inclusion and equality in society. The terms "gender equity", "gender equality" and "gender inclusion" are not mentioned in the document.

3.2 The 7th ASEAN Energy Outlook (AEO7)

Knowledge-sharing on the energy-climate nexus in ASEAN.

i). AEO7 was created using a bottom-up modelling approach focusing on demand-side management. Improved and more detailed modelling was conducted for the commercial and industrial sector to gain additional insights into how national and regional energy targets can be reached.

ii). AEO7 provides four scenarios, with each assuming different sets of energy targets and policies, to predict the impacts on energy consumption, supply, electricity generation, CO2 emissions and other cross-cutting issues.

iii). AEO7 projects greenhouse gas emissions growth for each scenario. The ATS, APS and LCO Scenario incorporate energy efficiency and conservation (EE&C) and renewable energy (RE) targets that contribute to CO2 emissions reductions. The ATS examines the EE&C and RE targets to achieve a national level target. Meanwhile, the APS and LCO Scenario incorporate the regional commitments of APAEC 2016-2025, namely, to achieve an RE share of 23% in total primary energy supply (TPES) by 2025, and to reduce the energy intensity (TPES/GDP) to 20% by 2020 and 30% by 2025. Both scenarios also include scaled-up targets.

iv). The AEO7 also specifically explains what factors contribute to GHG emissions growth in each scenario. As it directly compares GHG emissions growth in all of the scenarios, the discussion is more comprehensive than in the previous AEO. It shows that collective energy-climate action offers better climate mitigation and promotes improved and synergised regional cooperation on energy, and on curbing GHG emissions.

v). The AEO7 also forecasts the energy access trends, revolving around projected electrification rates and clean cooking access. Ensuring universal access to electricity and clean cooking is a critical Sustainable Development

Goals (SDG). Under the ATS and APS, the universal electrification of ASEAN would meet the SDG 7 target by 2040. Yet, it is critical to address the inadequacy of transmission and distribution lines, mostly in the most remote and difficult-to-reach areas. In addition, under the ATS and APS, ASEAN is not expected to accomplish the SDG7 targets by 2050, primarily due to slow progress on clean cooking access despite significant efforts to improve the situation.

vi). The AEO7 states that the expansion of RE and the provision of a simple, practical, and cost-effective EE&C plan are vital to improving energy security and mitigating climate change simultaneously.

A common understanding and joint efforts towards a low carbon economy and net zero emissions in the AMS:

i). The AEO7 explains the interrelations between energy, economy, and climate by conducting a decomposition analysis using a kaya identity approach. However, AEO7 does not provide any definition or explanation of "low-carbon economy".

ii). The analysis identifies GDP growth as the primary driver of GHG emissions growth in 2050, at approximately 7,101 Mt CO_2eq. The ATS implies that reducing the energy intensity of the economy and the carbon intensity of the energy supply could significantly lower the growth of GHG emissions. It indicates that energy efficiency policies will have a significant effect on GHG emissions reduction and have a robust alignment with the low-carbon economy.

iii). The AEO7 also models potential job creation in the RE sector. In the ATS, the AMS is projected to generate almost 850,000 jobs by 2025, 31% higher than the baseline scenario. An additional 25% of jobs are generated in the APS. In the LCO Scenario, 961,000 jobs are generated in 2025 while optimising the power sector and limiting the newly built power plants. Despite the number being 11% lower than in the APS, it is still a promising result if compared to the ATS

iv). The AEO7 mentions "carbon neutral/net zero emissions" several times, but none of the scenarios analyse when and how the AMS or ASEAN as a whole will reach the carbon neutral/net zero emissions targets.

Strong regional structure, capacity and gender equality on energy-climate nexus:

i). While the AEO7 briefly explains gender inclusivity in the energy sector, it generally remains underexplored.

ii). The words "gender" and "equality" are mentioned several times, but the AEO7 does not explain how the proposed scenarios would improve gender inclusion in the energy sector.

4. Discussion

With the increasing demand for energy and the global aspiration for net zero targets, there is a need for an energy system that is decarbonised, affordable, reliable and sustainable. However, the energy transition is more complex than replacing fossil fuels with renewable energy (RE) due to the numerous technological, economic, social, political and environmental factors at play.

Of the various sources of greenhouse gases contributing to climate change, the energy sector is the largest emitter. As such, ASEAN should focus its climate change mitigation efforts on it. However, there are various barriers faced in fully transitioning to RE, especially in the ASEAN region, where there is still heavy reliance on fossil fuels. The 7th ASEAN Energy Outlook evaluated that about USD 49.6 billion is required by AMS to enhance the power sector by 2050 under the Baseline Scenario. In particular, RE investment will contribute to 37%, or USD 18.5 billion from the total investment cost required by AMS in 2050. The high cost of the energy transition is just one aspect of many barriers. The perceived high risk of clean energy investment is also one of the most pivotal factors leading to the slow pace of clean energy investment in ASEAN [4]. According to a recent World Bank report [5], in many developing countries, risks such as weak governance, poorly targeted subsidies, and inadequate capacity and planning can hinder the energy transition.

Another aspect to note as a barrier is when there is an increase in RE in the power sector, especially the intermittent kind, it can create an issue in the grid stability and resiliency. Therefore, there is a need to shift from traditional to modernized power grids with intelligent monitoring and control-and supply demand optimisation. Meanwhile, pursuing a modern smart grid requires a massive investment and planning [4]. Another option to increase RE in the power sector while addressing the intermittent and grid challenges is the use of hydropower and geothermal for baseload generation. While hydropower has been leading in the RE share in ASEAN, geothermal is still underutilised, especially with the technical, policy, market, and social-acceptance barriers. All these challenges need to be addressed since the electricity transmission networks are highlighted as the main priority regarding the multiplier effect and attaining long-term energy security and sustainability in ASEAN.

Another effort of the energy transition to decarbonise energy systems is by increasing energy efficiency. However, similar to RE deployments, enhancing energy efficiency in the region would require financial drivers and massive investment in clean technologies [4]. In short, financial incentives, policy support, adequate planning, technology advancement, and infrastructural support can be seen as the many pillars needed for countries to achieve climate targets in the energy sector. These aspects and challenges in the energy sector need to be understood by policymakers in the climate sector. Vice versa, it is also important for policymakers in the energy sector to understand how changes in climate may also affect the energy sector. Extreme weather and natural disasters can pose disruptions to energy supply and infrastructure and cause safety risks. Warmer temperatures, wildfires, extreme wind, and flooding can also damage power lines and transmission towers, causing interruptions to electricity transmission. At the same time, extreme changes in temperature can increase the demand for cooling or heating, which in turn, increase the chance of blackouts or other power disruptions due to the strain on the energy system.

Therefore, it is essential to have close communication and knowledge-sharing between the energy sector and government officials tasked with formulating climate change mitigation policies in order to overcome the barriers in the energy-climate nexus. When analysing the two key planning documents, APAEC 2021-2025 and AEO7, we found that the region is still lacking in terms of adequate knowledge-sharing procedures on the energy-climate nexus. The regular collaboration will help synergise energy measures and climate action in the region and identify the enablers of and constraints to decarbonisation.

The need for knowledge-sharing among policymakers should be emphasised in the next phase of the APAEC document, not only in Programme Area 6 but also in other relevant programme areas. Furthermore, net zero scenarios must be included in the 8th ASEAN Energy Outlook, and specified targets for the energy sector should be included in each country's NDC. Such actions will further enhance ASEAN's understanding and capabilities in addressing the climate issues related to energy.

Through our assessment, we found that the key energy planning documents have no specific definition of "low carbon economy". Therefore, to arrive at a common understanding and to organise joint efforts towards a low carbon economy and net zero emissions in ASEAN, a definition of "low carbon economy" should be included in the APAEC document for the next phase. This can also be further enhanced by including more concrete terms such as "net zero" and "carbon neutrality".
We also found that both key planning documents do not mention the need for systematic changes that value gender equality, gender equity, and gender inclusion

5. Conclusion

When the commitments of each AMS under the Paris Agreement are taken together, they represent an emerging vision for the ASEAN region's attainment of net-zero emissions between 2050 and 2065. It is critical to support the AMS in this move towards a low carbon economy and to examine whether these commitments are articulated in the key ASEAN energy planning documents. This baseline assessment has reviewed and analysed the planning documents of the ASEAN Plan of Action for Energy Cooperation (APAEC) for the period 2021-2025 and the 7th ASEAN Energy Outlook (AEO7) and assessed whether they are supporting the efforts of the AMS to develop a low carbon economy and a net zero future.

The assessment found that when drafting the contents of the APAEC for the period 2026-2030 and the AEO8 report, (i) the importance of information-sharing on the energy-climate nexus can be further emphasised, (ii) the definition of low carbon economy needs to be articulated to ensure there is a common understanding and that there are joint efforts towards a low carbon economy and net zero emissions in ASEAN, and finally, (iii) the ASEAN energy planning documents need to acknowledge the need for systematic changes that value inclusion and equality in society.

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