Assessing ASEAN Youth's Perception on Clean Energy Transition:

ASEANS's Readiness for Clean Energy

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Assessing ASEAN Youth's Perception on Clean Energy Transition: ASEANS's Readiness for Clean Energy.

Competence, Equity, and Opportunity

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1.0

EXECUTIVE SUMMARY

The findings from our comprehensive survey paint a detailed picture of the Clean Energy Transition landscape among ASEAN youth, providing concrete evidence at various levels—regional, country-specific, and individual.

At the regional level, a significant majority (70%) of youths emphasise the importance of regional cooperation in advancing clean energy adoption. However, only 38% feel that ASEAN is adequately prepared for this transition. This sentiment is reinforced by the fact that merely 41% of youths perceive ASEAN as having a clear vision and goals in addressing climate change.
Furthermore, key barriers identified include a lack of government political will, regulatory gaps, and limited inter-governmental cooperation.

The commitment to Sustainable Development Goals (SDGs) is evident, with SDG7 (Affordable and Clean Energy) identified by a substantial 86% of respondents as crucial. Similarly, there is recognition of the importance of SDG13 (Climate Action) and SDG11 (Sustainable Cities and Communities). However, SDG5 (Gender Equality) lags in priority, despite its significance in fostering inclusive transitions as noted by one respondent;

"...encouraging women's involvement in sustainable energy transition in rural areas..."

Delving into country-level insights, a resounding 80% of youths believe that their country must have decarbonization targets and act upon them immediately. However, challenges abound, with 87% identifying government political will, economic constraints, and facilitative policies as the top three barriers hindering sustainable energy transition. Moreover, concerns about insufficient investment in energy infrastructure (80%) and lack of emphasis on education (79%) are prevalent among respondents. Similarly, 84% of youths express concerns about the scarcity of industry-relevant skills training.

Individual-level intentions and actions demonstrate a strong willingness among youths to embrace clean energy practices. For instance, 92% intend to change their habits and adopt a sustainable lifestyle, while 84% aspire for their future vehicles to be electric. Additionally, 77% express a willingness to transition fully to public transportation to spur clean energy transition. Interest in energy-related volunteerism is also evident, with 53% of youths indicating their desire to pursue such activities and one highlighted for a better future;

"...clean energy transition involves shifting from traditional, fossil-fuel-based energy sources to cleaner and more sustainable alternatives, with the aim of reducing carbon emissions and mitigating the impacts of climate change..."

Despite these positive intentions, various challenges hinder effective contribution to the clean energy transition. Financial constraints emerge as a significant barrier, with respondents citing limitations in financial resources to invest in clean energy solutions. Limited knowledge and awareness, infrastructure and policy constraints, and cultural factors also pose challenges to progress.

In conclusion, addressing these challenges requires a multi-faceted approach involving stakeholders at all levels. Strengthening policy frameworks, enhancing education and skill development, fostering regional cooperation, and raising awareness are critical steps toward accelerating the clean energy transition and achieving sustainable development goals.

2.0

INTRODUCTION

Navigate the intricate tapestry of the energy trilemma, where there is a shift towards a cleaner energy economy and infrastructure.

Our global perspective has irrevocably shifted in the aftermath of a year dominated by the profound and tragic consequences of the conflicts in Russia-Ukraine and Israel-Palestine . The human cost and community devastation remain at the forefront of our thoughts, yet the energy landscape has also undergone a significant shift that will echo for years to come. As we reflect on these events' implications for the world's energy system, the disruptions to Russian energy supplies and the resulting global energy shortages are stark reminders of how integrated and interconnected the global energy infrastructure is and the delicate balance it treads.

In recent years, global energy policies and discussions have emphasised the importance of decarbonising the energy system, propelling us toward a net-zero future. However, the events of the past year highlight that the journey towards sustainable energy transformation must not only encompass decarbonisation but also take into account energy security and affordability. These three dimensions, security, affordability, and sustainability are essentially what we refer to as the energy trilemma which shapes the future of our global energy landscape. To ensure a successful and sustainable energy transition, it is imperative that we address the challenges posed by all three facets of the trilemma. The global energy system is very uncertain, and the decisions taken will carry immense ramifications for our future

Despite the numerous pledges from governments and major organisations worldwide to reduce greenhouse gas emissions, the status quo remains a conscious choice made by global governments, continuing their reliance on conventional energy sources. While policymakers, civil society, and business leaders have planted the seeds of the energy transition, it is vital to start nurturing these seeds to fruition with unprecedented scale and speed. As we delve into this exploration, our focus shifts to the perceptions of an often overlooked yet influential group: the youth. In their eyes, the future beckons, and their perspectives on the readiness of the ASEAN region for a clean energy transformation hold invaluable insights into the path we must tread. It is with this vantage point in mind that we embark on our journey to assess youth perceptions towards ASEAN's readiness for clean energy, recognizing that their voices may well guide us through the complex nexus of security, affordability, and sustainability in the energy trilemma.

3.0

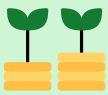
SETTING THE LANDSCAPE

Embarking on the energy transition journey by delving into the challenges, commitments, and potential pathways forward, setting the stage for the ASEAN Youth Energy Outlook

3.1 Overview

Climate change affects every aspect of human life. Throughout all the essential sectors that support us, such as agriculture, energy, and health, climate change has had nothing but adverse impacts. Thus, avoiding the most negative consequences is crucial by limiting warming and lowering emissions in a timely manner. To make a collective movement across all nations for climate change, the Paris Agreement was adopted. Nationally Determined Contributions (NDCs) are one of the main instruments of the Paris Agreement to achieve its goals. NDCs represent the national climate commitments of each participating country to develop actions and strategies to decrease greenhouse gas (GHG) emissions and adjust to the effects of climate change (UNDP, 2023). However, the source of around 75% of GHG emissions comes from the energy sector. Therefore, it is more urgent than ever to replace polluting energy sources like coal, gas, and oil with cleaner alternatives, such as wind or solar (UN, n.d.)

The energy transition, crucial for limiting global warming to 1.5°C as per the Paris Agreement, is inseparable from the energy trilemma - energy equity, energy security, and environmental sustainability (World Energy Council, n.d.).



Energy Equity: The ability of a country to provide reliable and affordable energy

Energy Security: The resilience and reliability of a country's energy infrastructure to meet current and future energy needs

Environmental Sustainability: The transformation of energy systems for improved air quality and efficient energy generation, transmission, and distribution

Moreover, energy justice is essential in the energy transition, introducing a human-centered perspective to the traditionally technological and economic approaches. It advocates for those affected by the energy sector's injustices and inequalities, promoting social, economic, and political participation in the energy system for a more ethical energy system (University of Sussex, 2023; Lim Z.W. and Goh K.L., 2019)

3.2 Global Energy Outlook

The global energy landscape is currently in a state of flux, grappling with a series of crises that have complicated the transition towards cleaner and more sustainable energy systems. The COVID-19 pandemic has had a profound impact on the energy sector, causing significant disruptions and accelerating the shift towards renewable energy. Concurrently, the Ukraine crisis has reshaped the energy world, leading to price volatility, supply shortages, and economic uncertainty. To align with the Paris Agreement's target of limiting global warming to 1.5°C, it is estimated that an annual deployment of approximately 1,000 GW of renewable power is necessary. However, in 2022, the global addition of renewable capacity fell short, with only about 300 GW added, representing 83% of new capacity. The remaining 17% was accounted for by fossil fuels and nuclear energy. Despite the technical feasibility and economic viability of significantly increasing both the scale and share of renewables in the energy mix, there is a misalignment between policies and investments and these objectives. In 2022, while there were record additions of renewable power capacity, fossil fuel subsidies also reached record-high levels, with global subsidies amounting to $7 trillion. These subsidies, which keep fossil fuels artificially competitive with low-emission alternatives, pose a significant barrier to the energy transition (IRENA, 2022). Therefore, addressing these policy and investment challenges is crucial to navigate these crises and accelerate the global energy transition.

Some of the observable trends moving forward are mainly:

1. The global energy landscape is witnessing a **significant shift towards renewable energy integration.** This trend is driven by the increasing deployment of renewable energy technologies. Concurrently, advancements in transmission line technology are improving the efficiency and reliability of power distribution, facilitating the integration of electricity generated from renewable sources.

2. As the energy sector evolves, **enhancing the resilience of the power grid is key** to withstand various challenges, such as extreme weather events and cyber threats whilst managing the rise in global energy consumption, largely driven by strong demand in Asia.

3. Despite high prices and supply chain disruptions, the demand for renewable energy is expected to rise. However, the **continued use of fossil fuels,** with demand expected to reach record levels, poses a significant challenge to the energy transition. Furthermore, this is exacerbated by the misalignment between policies and investments, highlighting the need for coordinated efforts across policy, investment, and technology to achieve a sustainable energy future.

3.3 ASEAN Energy Outlook

Due to the projection of robust economic and population growth in the coming decades, Southeast Asia is expected to have soaring energy demand. This is already evident based on the trend of total final energy demand in the region over the period 1971–2015, which indicates that energy demand has significantly increased by 4.5 times. This growing energy demand can be addressed efficiently by enhancing energy accessibility, primarily through energy efficiency measures (Asian Development Bank, 2020)

Energy Landscape

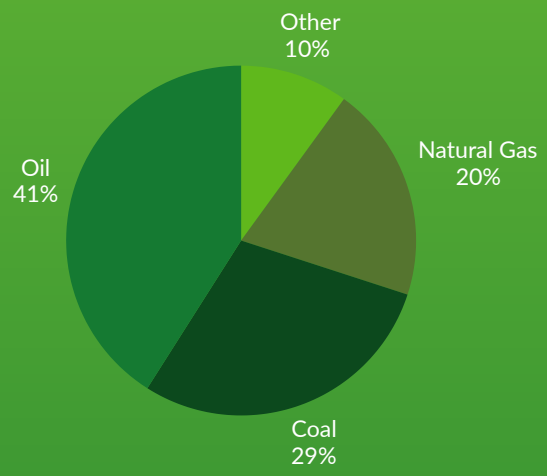


***Fig 1**. The energy landscape in Southeast Asia (McKinsey, 2022)*

Southeast Asia also heavily relies on fossil fuels, which constitute more than 85% of its primary energy sources. Thus, the region faces a crucial dilemma between two options. Southeast Asia can persist with its reliance on fossil fuels and expose itself to an increasingly costly and volatile market as it is mostly not indigenous to the region. On the other hand, the region can utilise its abundant, cost-effective, and locally available renewable energy resources (IRENA, 2022). Therefore, the report will lay out the current situation and commitments in the region on two aspects, namely renewable energy and energy efficiency.

Southeast Asia has relatively slow renewable energy development rates, except Vietnam, which has made significant strides by adding 16 GW of solar power from 2018 (86 megawatts) to 2020 (16.5 gigawatts). The ambition to achieve climate commitment is expected to require a remarkable increase in renewable capacity across the region by 2030. However, the heavy reliance on fossil fuels in the region has hindered the progress of renewable energy sources. Across Southeast Asia, only approximately 40 percent of the region's energy investment has been allocated to renewables. Consequently, the installed renewables capacity varies widely within the region, with examples including 27 percent for Vietnam, 23 percent for Thailand, and 12 percent for Indonesia (McKinsey, 2022).

Power Generation

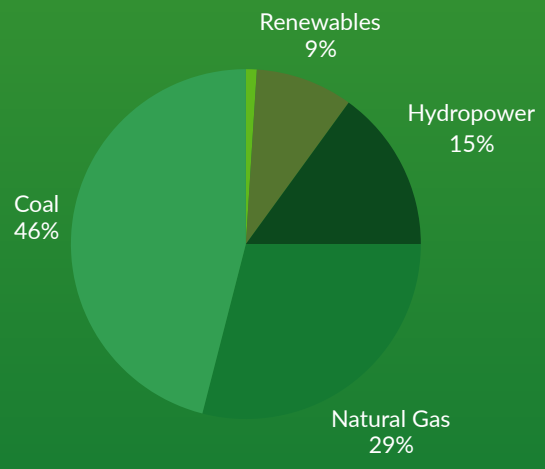


***Fig 2.** The power generation in Southeast Asia (McKinsey, 2022)*

Energy Consumption

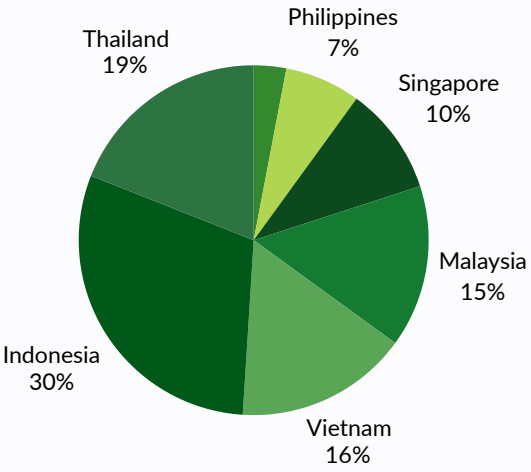


***Fig. 3** Energy consumption in Southeast Asia (McKinsey, 2022).*

Southeast Asia experienced significant growth in per capita Total Final Energy Consumption (TFC), surging from 530.9 Kilotonne of Oil Equivalent (ktoe) in 2000 to 721.7 ktoe in 2016. Despite the fact that 6 out of 10 ASEAN states do not export energy, many of them are anticipated to struggle with maintaining self-sufficiency in the coming years. This challenge arises due to the rapid growth in energy demand and consumption, which is surpassing domestic production and supply capabilities. Consequently, effective management and sustainable control of energy demand growth become imperative to ensure energy security and sustainable development. The region's robust economic expansion has led to a 70% increase in energy demand compared to the levels seen in 2000. Currently, the ASEAN region accounts for 5% of the total global energy demand. However, it's vital to efficiently govern and utilise finite energy resources to address the seemingly boundless energy demand and to sustain continued economic development (McKinsey, 2022).

3.4 ASEAN and Energy Transition

ASEAN Member States are vulnerable to climate change risks from several reasons, including geography. With its complex landscape of archipelagos and forests, ASEAN faces various effects of climate change, such as rising sea levels, escalating temperatures, and increasingly frequent extreme weather events. For instance, Cambodia and Myanmar have the highest vulnerabilities to climate change globally, which is exacerbated by their limited readiness to enhance resilience. As climate change also alters the weather, it has caused the displacement of 65.2 million people in the region (IRENA, 2023).

Furthermore, the ASEAN region grapples with a significant deficit in access to sustainable energy sources, further impeding its capacity to adapt to the challenges posed by climate change. An estimated 45 million individuals lack access to electricity, while a staggering 250 million people do not have access to clean cooking fuels, according to data from IRENA in 2021. This energy accessibility gap compounds the region's vulnerability and underscores the urgent need for measures to address these critical issues (IRENA, 2023).

In Southeast Asia, there exists a collective commitment among countries to achieve a regional target of sourcing 23 percent of their total primary energy supply from renewable energy sources by 2025. Among the 11 nations within the region, a significant majority, specifically nine of them, have made pledges towards achieving net-zero emissions or carbon neutrality by the year 2050. However, it's important to note that the Philippines does not currently possess a net-zero emissions target (McKinsey, 2022).

The transition to clean energy holds significant potential for generating substantial socio-economic advantages in Southeast Asia. Based on IRENA's 1.5˚C Scenario, Southeast Asia stands to benefit from an annual average of 3.4% higher GDP growth in comparison to the Planned Energy Scenario (PES), which indicates the current policy settings. This improvement is projected to occur over the period spanning from 2021 to 2050. In cumulative terms, this region would witness an addition of approximately USD 13.1 trillion (in 2019 dollars) to its GDP, beyond what was originally expected in the Planned Energy Scenario (IRENA, 2023).

Aside from the notable economic gains, the energy transition carries the significant potential to enhance the overall well-being of Southeast Asia. This enhancement is driven by considerations of both social and environmental dimensions. Under the 1.5°C Scenario, relative to the Planned Energy Scenario (PES), the welfare improvement in Southeast Asia is projected to increase by 10.9% by the year 2050. Notably, the energy transition plays a pivotal role in enhancing public health by leading to a substantial reduction in both indoor and outdoor air pollution. Additionally, it contributes to improvements in the energy access dimension across the ASEAN region (IRENA, 2023).

***Table 1**. Cross-cutting policies in energy and NDCs (IEA, 2023).*

Country	Policy, Pledge or Measure
Cross-Cutting	
Indonesia	Net zero emissions by 2060 or before
Malaysia	Carbon neutrality target by 2050
Thailand	Net zero GHG emissions target by 2065
Vietnam	Carbon neutrality target by 2050
Indonesia, Malaysia, Philippines and VietNam	Commitment to the Global Methane Pledge
Nationally determined contribution (NDC)	
Brunei Darussalam	Reduction in GHG emissions by 20% relative to business-as-usual (BAU) Brunei Darussalam levels by 2030
Cambodia	Emissions reduction target of 41.7% (64.6 MI CO_2eq) by 2030
Indonesia	Emissions reduction target of 31.89% (29% in first NDC) unconditionally and 43.2% (41% in first NDC) conditionally by 2030
Lao People's Democratic Republic (Lao PDR)	Unconditional reduction in GHG in 2030 by 60% compared to a BAU scenario

Malaysia	Reduction in economy-wide carbon intensity (against GDP) of 45% (unconditional) in 2030 compared to 2005 level
Myanmar	Total emissions reductions contributions as a part of its NDC are 244.52 million t CO_2e unconditionally, and a total of 414.75 million t CO_2e conditionally by 2030
Philippines	GHG emissions reduction and avoidance of 75%, of which 2.71% is unconditional and 72.29% is conditional, for 2020 to 2030
Singapore	Emissions reduction target of around 60 Mt COze in 2030 after peaking its emissions earlier
Thailand	Reduction in GHG by 30% from the projected BAU level by 2030. The level of contribution could increase up to 40 percent, subject to adequate and enhanced access to technology development and transfer, financial resources and capacity building support
Vietnam	GHG emissions reduction target of 15.8% (from 9%) unconditionally and 43.5% (from 27%) conditionally, compared to BAU by 2030

To meet these established targets, nations within the region have collectively worked towards constructing effective policy frameworks and establishing strong institutions. They have also initiated measures to promote competition within their energy sectors by opening up thei energy markets to liberalisation. Most of these countries have implemented some type of national policy or legislation specifically directed at renewable energy, primarily focusing on distinctrenewable energy sources. However, even though laws oriented towards renewable energy-based power generation are widespread, most nations still lack comprehensive legal structures or mandates that encompass renewable energy applications in transportation or heating and cooling sectors (IRENA, 2018). Thus, ASEAN countries need a set of enabling policies to support the energy transition in the region (IRENA, 2023).

Table 2. Renewable energy policies across ASEAN member states (IRENA, 2018).

	Nationaly Policy							Fiscal Insentives						Grid Access			Regulatory Instruments				Others	
	Renewable energy target	Renewable energy law/strategy	Solar heating law/programme	Solar power law/programme	Wind power law/programme	Geothermal law/programme	Biofuels law/programme	Vat exemption	Income tax exemption	Import/export fiscal benefit	Carbon tax	Accelerated Depreciation	Other fiscal benefit	Priority/dedicated transmission	Grid access	Preferential dispatch	Guaranteed offtake via feed-in tariff or auctions	Quota (e.g. renewable portfolio standards)	Renewable energy certificate system	Net metering	Renewable energy in rural access programmes	Local content requirements for equipment
Brunei Darussalam																	*	*	*	*		
Cambodia																	*					
Indonesia																						
Laos PDR																	*		C			
Malaysia																			C			
Myanmar																						
Phillippines																						
Singapore																						
Thailand																						
Vietnam																			C			

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4.0

ASEAN YOUTH PERSPECTIVE AND THE ENERGY TRANSITION

Thought-provoking exploration of the role of youths in the ASEAN region's shift towards sustainable energy, delving into the unique insights, innovative ideas, and their crucial role in shaping the future of energy

4.1 The transition towards net-zero

The journey of the Association of Southeast Asian Nations (ASEAN) towards a net-zero transition is a testament to the region's commitment to addressing the pressing challenges posed by climate change. With the region being highly susceptible to the adverse effects of global warming, ASEAN member states have taken proactive steps to mitigate these risks. The road to decarbonization is paved with ambitious goals, as ASEAN aims to transform its energy landscape amidst rapid economic and demographic growth. The anticipated surge in energy demand by 2050 necessitates a strategic approach to curb the associated CO2 emissions. This endeavour is underpinned by the region's nationally determined contributions (NDCs), which outline the commitment of ASEAN member states to reduce their carbon footprint.

The urgency of ASEAN's net-zero targets is underscored by the region's escalating greenhouse gas emissions, which have reached significant levels in recent years. The energy sector, transportation, and industrial activities are the primary contributors to these emissions, accounting for the majority of the region's energy-related carbon output. To alter this trajectory, ASEAN is exploring a range of strategies and technologies tailored to the unique circumstances of each member state.

A comprehensive analysis indicates that achieving net-zero emissions will necessitate a drastic departure from historical energy consumption and emission patterns. The envisioned net-zero pathway would see a dramatic reduction in ASEAN's greenhouse gas emissions, with a marked decrease in the reliance on fossil fuels. This transformative journey is not only crucial for the environment but also for the long-term economic stability and health of the region's population.

As ASEAN stands as a significant energy consumer on the global stage, the challenge of balancing growth with environmental stewardship becomes increasingly apparent. The region's energy consumption has been on an upward trend, contributing to a rise in carbon emissions that surpasses global averages. However, the ASEAN member states are acutely aware of their vulnerability to climate change, particularly due to their geographic and economic characteristics.

Conference of the parties 28th

United Arab Emirates

The recent COP28 summit has been a defining moment for the ASEAN bloc, emphasizing its dedication to sustainable energy and climate resilience. The ASEAN Climate and Energy Insight series post-COP28 highlights the region's progress in clean energy, with the ASEAN Joint Statement on COP28 advocating for ambitious climate actions and increased support for developing countries, in alignment with the Paris Agreement.

Looking forward, ASEAN faces a dual challenge and opportunity in the climate and energy domain. The commitments established at COP28 are foundational, yet their true impact hinges on their implementation and expansion. A comprehensive approach is essential for a successful transition to sustainability. Enhanced regional cooperation is crucial. ASEAN Member States stand to gain from shared resources, knowledge, and technologies. An integrated energy market and cross-border renewable energy projects can significantly boost the region's capacity to achieve its energy and climate goals. Investing in innovation and technology is equally critical. Embracing renewable energy technologies and investing in research for sustainable practices across various sectors are key.

Partnerships with international entities and the private sector can hasten technological advancements and attract investments. Capacity building and public awareness are also key. Governments must invest in education and training for a low-carbon economy and conduct public awareness campaigns to shift consumer behaviour and garner support for climate policies.

In a nutshell, ASEAN's journey towards a net-zero future is a complex yet vital endeavour that requires a collective effort from all member states. It is a journey that demands innovation, collaboration, and a steadfast commitment to creating a resilient and sustainable future for the region and its inhabitants. An inclusive and just transition is imperative. This involves considering the socio-economic impacts of climate policies and supporting vulnerable communities through the transition. Policies must be equitable, offering opportunities and minimizing hardships for all. ASEAN must capitalize on the momentum from COP28 and turn its pledges into tangible actions. The ASEAN Climate Change and Energy Project (ACCEPT) promotes climate-friendly energy development in the AMS, aiming to harmonize energy and climate policies. By focusing on cooperation, innovation, capacity building, and inclusive policies, ASEAN can exemplify global efforts to combat climate change and move towards a net-zero future.

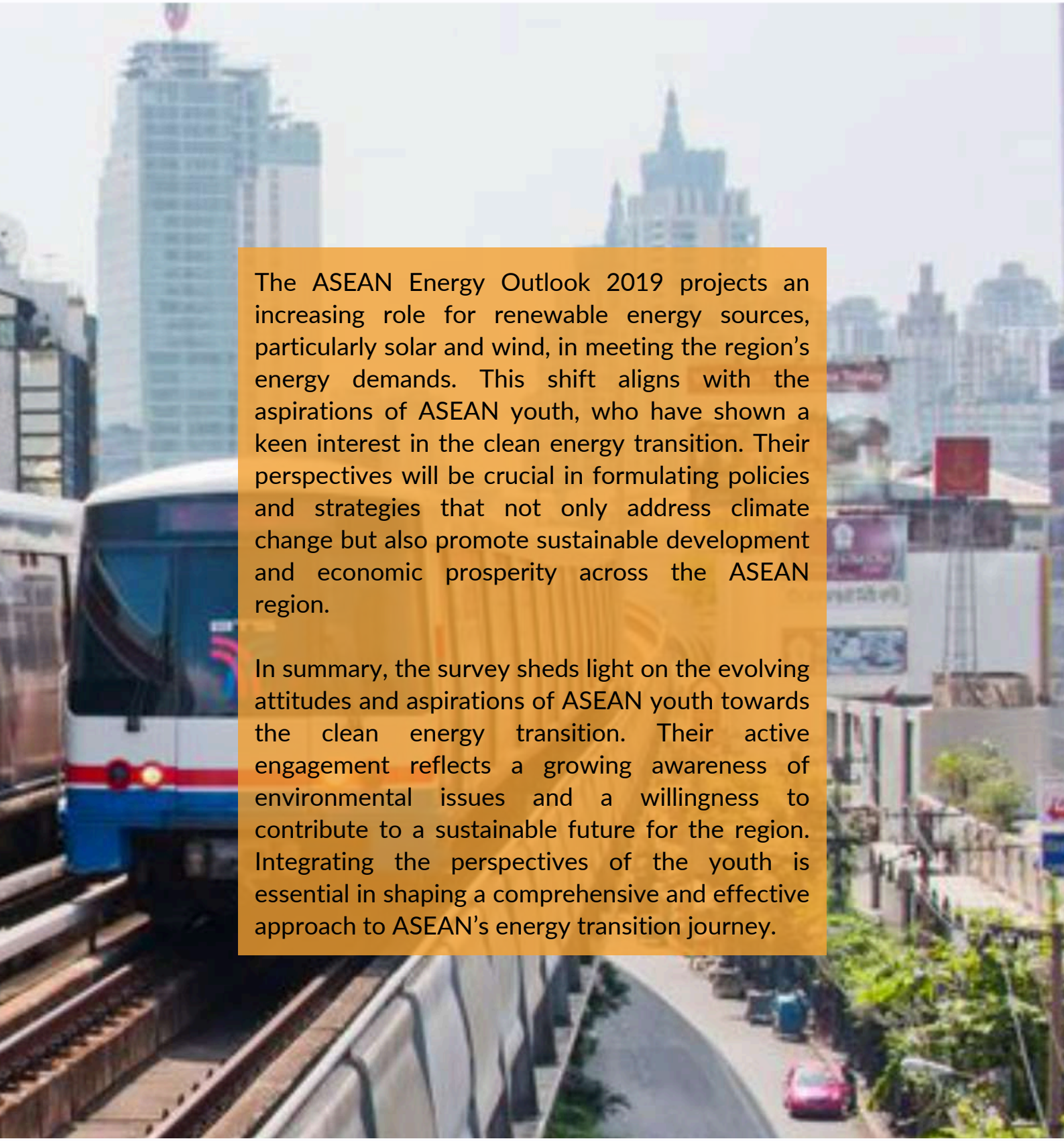
4.2 A perspective from the ASEAN youths

The ASEAN region's energy transition journey is being shaped by a multitude of key actors, each playing a pivotal role in steering the community towards a cleaner, more sustainable future. A comprehensive study, inclusive of Timor-Leste, has recently cast light on the youth's perspective on this critical shift to renewable energy sources. This survey, reflective of the latest advancements and in-depth reports on the energy transition landscape, drew participation from a diverse demographic, predominantly from urban and suburban areas, indicative of the varied levels of infrastructure and connectivity.

Gender representation within the survey was balanced, with a slight majority of male participants, followed closely by females, and a small percentage identifying as non-binary or preferring not to disclose their gender identity. Targeting individuals aged 18 to 35, the survey captured the sentiments of a demographic crucial for understanding the evolving attitudes towards the clean energy transition. Notably, a significant portion of respondents were part-time employees, actively contributing to the workforce, and half of them held undergraduate degrees, highlighting a strong commitment to education among the youth.

Interestingly, over 31% of respondents had only completed high school, which emphasizes the widespread access to information and the eagerness of ASEAN youth to engage with topics like clean energy transition. Their active involvement in the survey signals a proactive stance in shaping their future and holding governments accountable for environmental stewardship. The socioeconomic backgrounds of the respondents, mainly from lower-middle to higher-middle income families, reflect their anticipation for enhanced opportunities within ASEAN, underscoring the importance of sustainable development and equitable resource access for regional growth.

The ASEAN Clean Energy Transition's recent developments underscore the urgency of incorporating the youth perspective from the survey. ASEAN member states have been actively pursuing initiatives to transition towards cleaner energy sources, as highlighted by the ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025, which focuses on promoting renewable energy and enhancing energy efficiency. Additionally, projects like the ASEAN Power Grid (APG) and the ASEAN Renewable Energy Market Integration have been instrumental in adopting renewable energy technologies and promoting cross-border energy trade.



The ASEAN Energy Outlook 2019 projects an increasing role for renewable energy sources, particularly solar and wind, in meeting the region's energy demands. This shift aligns with the aspirations of ASEAN youth, who have shown a keen interest in the clean energy transition. Their perspectives will be crucial in formulating policies and strategies that not only address climate change but also promote sustainable development and economic prosperity across the ASEAN region.

In summary, the survey sheds light on the evolving attitudes and aspirations of ASEAN youth towards the clean energy transition. Their active engagement reflects a growing awareness of environmental issues and a willingness to contribute to a sustainable future for the region. Integrating the perspectives of the youth is essential in shaping a comprehensive and effective approach to ASEAN's energy transition journey.

4.3 Project Clean Future – ASEAN youths' perception towards energy transition

The energy transition in ASEAN is a critical issue that has garnered the attention of the region's youth, who are increasingly concerned about the future of their environment and the sustainability of their energy sources. This essay will dissect their perceptions into three key areas:

ENERGY TRANSITION

Firstly, the outcome of the youths' perception on ASEAN-wide initiatives and journey towards energy transition are presented. On a regional level, ASEAN youths are acutely aware of the collective efforts required to facilitate a smooth transition to clean energy. They recognise the importance of regional cooperation and shared strategies to overcome the barriers to sustainable energy adoption. The ASEAN Plan of Action for Energy Cooperation (APAEC) is one such initiative that aims to enhance energy connectivity and market integration in the region to ensure energy security and sustainability. However, there are challenges that held them back on the belief.

Secondly, the focus shifts to the perception of youth on their respective countries especiallt on the specific challenges and opportunities each ASEAN member state faces in its energy transition journey and in terms of the readiness for their countries.. The overwhelming majority of youth are troubled by the perceived inadequate investment in their respective countries' energy infrastructure, with a particular focus on the scarcity of renewable energy and energy conservation initiatives. Furthermore, many felt that there is not enough being done to educate and raise awareness about climate change, and express concerns on the lack of industry-relevant training for the energy transition.

Lastly, the limelight will be on the youths, as the leaders of tomorrow, with their fresh perspectives and adaptability to new technologies, can actively participate in the energy transition. ASEAN youths reflect on their personal responsibilities and the role they can play in supporting the energy transition. They are increasingly becoming aware of the importance of sustainable energy and are showing a willingness to participate in the energy transition. Young people are particularly engaged on climate change, with 65% of those in the age group 18-35 considering climate change to be a global emergency. They are primed to be a critical force for the energy transition, bringing new ideas and pursuing careers aimed at decarbonising the sector.

In the following sections, we will delve deeper into the perspectives of youths on the three areas outlined above.

4.3.1 Country-level analysis and insights

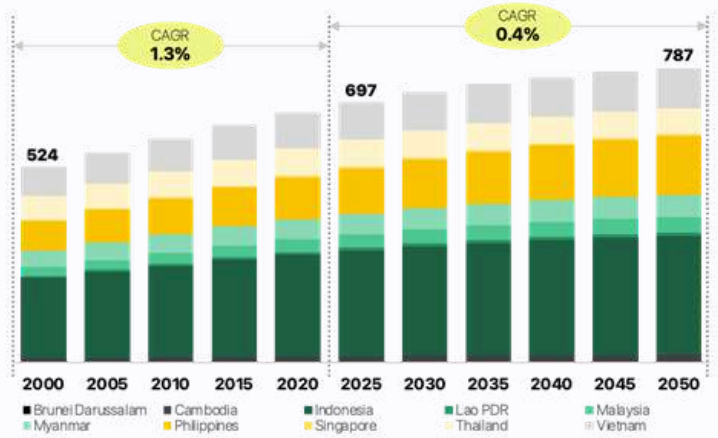
Regional cooperation among ASEAN member states is lacking?

The region is on the cusp of a significant demographic transformation. With a projected population of 0.8 billion by 2050, of which half are expected to be youths, ASEAN is presented with an unprecedented opportunity to harness this demographic dividend for sustainable development. The youth population, representing innovation, energy, and dynamism, are the key growth drivers who can propel ASEAN nations into an era of increased productivity and prosperity. However, this potential boon also presents challenges that require strategic planning and execution.

With the rise in population, energy demand is expected to triple, while energy supply-needs to quadruple by 2050. ASEAN nations must focus on sustainable energy solutions to meet this demand.. Investments in renewable energy sources, enhancing energy efficiency, and conservation should be prioritised. This approach will not only ensure a steady supply of energy but also contribute to the global effort in mitigating climate change. While the burgeoning youth population in ASEAN countries offers a golden opportunity for economic upliftment, it also necessitates comprehensive planning in education, employment generation, and sustainable development practices. Ensuring that this demographic dividend is fully realised for regional prosperity requires a concerted effort from all stakeholders, including governments, private sector, and civil society. With strategic planning and execution, ASEAN can indeed harness its demographic dividend towards achieving sustainable development.

Total Population of ASEAN, 2000 – 2050f [1]

Million

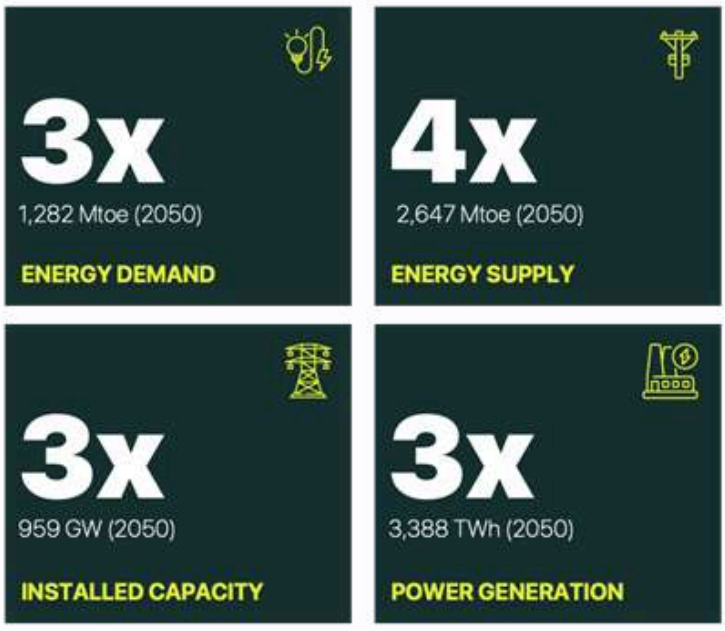


Youths are expected to be the key growth driver, making up half of the population in ASEAN by 2050

The potential of ASEAN's young population should excite everyone. The demographic dividend of ASEAN is not just a numerical entity but a potent force that can drive significant changes. A striking statistic reveals that 70% of youths believe that regional cooperation in the ASEAN region is crucial to advance clean energy adoption. This belief underscores the importance of collective action and international collaboration in addressing environmental challenges.

Youths recognise the importance of sustainable practices, policies, and innovations. In the ASEAN region, this translates into active participation in dialogues, initiatives, and projects aimed at promoting clean energy. The youths' perspective is shaped by an understanding that environmental issues transcend national borders and necessitate regional solutions. They advocate for policies that promote renewable energy sources, energy efficiency, and innovations that reduce carbon footprints.

ASEAN Energy Outlook, 2050f [2]



70%

of youths believe that **regional cooperation in ASEAN region is important** to advance clean energy adoption

The youths are ready to spark a clean energy revolution, but it seems like they are held back by legacy structures. This young generation wants action, and they understand the importance of working together. However, there's a concerning gap between aspiration and reality. Less than half of young respondents believe ASEAN is adequately prepared for the clean energy transition. This gap, between the potential of clean energy and the perceived readiness of ASEAN to harness it, presents both a challenge and an opportunity. The perception gap could be attributed to several factors. It could stem from a lack of awareness about the initiatives already underway in the region or a sense of urgency given the scale of the climate crisis. It could also reflect concerns about the pace of transition and whether it can keep up with the growing energy demand.

Only

38%

of youths feel that ASEAN is adequately prepared to embrace the transition towards clean energy

Clear goals are crucial in addressing climate change as they provide a roadmap for action. They set the direction, define the scope of efforts, and serve as a benchmark against which progress can be measured. Without clear goals, efforts can become fragmented, resources can be wasted, and the urgency of action can be lost. 41% of youths feel that ASEAN has clearly defined vision and goals in addressing climate change is a significant concern. This perception indicates a need for ASEAN to articulate its climate change mitigation strategies more effectively.

Only

41%

of youths feel that ASEAN has a clearly defined vision and goals in addressing climate change

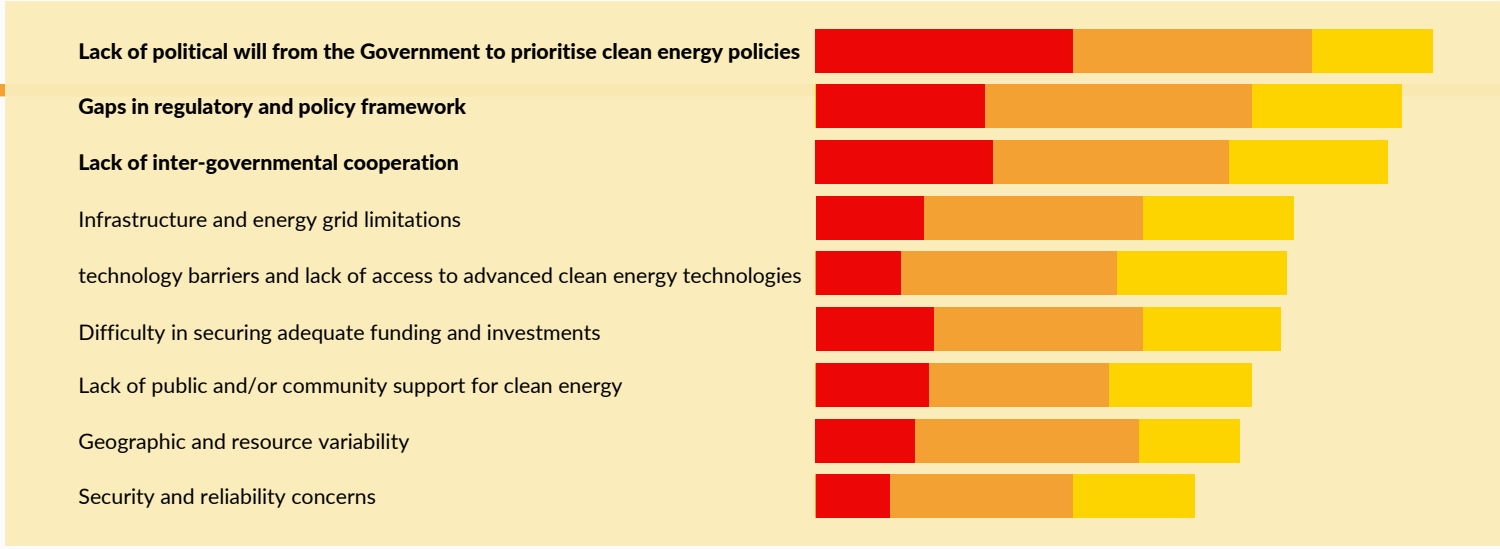


Fig 4. *Top three ranking of the biggest barriers to achieve clean energy transition ASEAN-wide*

In their pursuit of an ASEAN-wide clean energy transition, youths have identified three significant barriers. These include a lack of political will within governments, gaps in the regulatory and policy framework, and a lack of inter-governmental cooperation.

Illustrating these challenges is the slow progress of the Trans-ASEAN Power Grid Project (APG). This ambitious project, aiming to interconnect the power grids of all ASEAN countries, has been hindered by bureaucratic hurdles and disagreements over technical standards and grid access fees. This case underscores the need for enhanced cooperation and streamlined regulations.

Another persistent issue complicating the clean energy transition is the cross-border haze in Southeast Asia, primarily originating from open burning and forest fires in Indonesia. This environmental challenge underscores the need for enhanced regional cooperation and poses significant health and economic risks.

The youths' perception of the barriers to achieving clean energy transition reveals a divergence of opinions regarding ASEAN-wide clear goals and vision. A substantial number of respondents identified the lack of political will from governments to prioritise clean energy policies as a significant impediment. This highlights the critical role of political leadership in driving the clean energy agenda forward across ASEAN countries.

Indonesia's National Energy Policy, which targets a 23% renewable energy mix by 2025, is a prime example of how political will can facilitate clean energy transition. Moreover,

respondents highlighted gaps in policy frameworks and the lack of inter-governmental cooperation as additional hurdles, underscoring the need for enhanced policy coherence and regional cooperation.

Interestingly, security and reliability concerns were not ranked as the most critical barrier, suggesting a greater focus on addressing governance and policy challenges as immediate priorities. However, efforts to enhance energy security and reliability remain integral to ensuring the resilience of clean energy systems and fostering public confidence in renewable energy technologies. This comprehensive understanding of the barriers and potential solutions can guide ASEAN towards a successful clean energy transition.

Despite the formidable barriers identified, a resilient spirit and collective belief in the region's potential for progress shine through among ASEAN youths. Approximately 40% remain optimistic about the prospects for a clean energy transition. This optimism is facilitated by perceived capabilities, with accessibility emerging as a primary factor. Around 40% of respondents highlight factors such as the availability of transitioning to better technologies,-

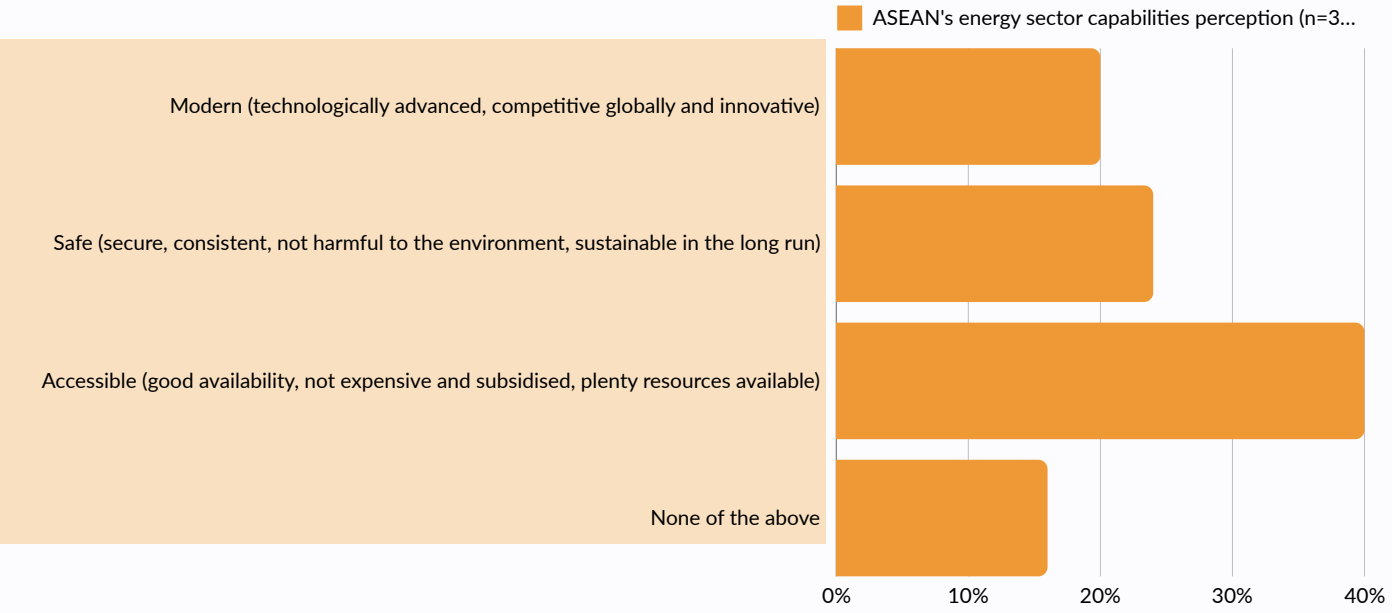


Fig 5. *ASEAN's energy sector capabilities perception*

Country-level analysis and insights

-affordability, and ample subsidisation of resources. This aligns with ongoing efforts in ASEAN countries to improve access to clean energy technologies. For instance, Thailand's Solar Rooftop Program provides financial incentives for households and businesses to invest in solar energy systems, enhancing both accessibility and affordability.

Safety considerations also feature prominently among youth concerns. About 24% express apprehensions regarding the safety of clean energy technologies. This underscores the importance of stringent safety standards and regulatory frameworks to address potential risks associated with the deployment of renewable energy infrastructure. For example, initiatives such as the ASEAN Renewable Energy Standards and Certification Scheme aim to establish harmonised safety standards across ASEAN countries, bolstering confidence in clean energy technologies and fostering greater public acceptance.

Youths also express a desire for continued innovation and advancement in clean energy technologies. About 20% highlight the importance of ongoing research and development efforts. This sentiment aligns with global trends in clean energy innovation, where advancements in areas such as battery storage, hydrogen fuel cells, and smart grid technologies hold promise for enhancing the efficiency and reliability of renewable energy systems. Initiatives such as the ASEAN Energy Research and Development Network facilitate collaborative research projects and knowledge exchange, driving innovation and technological progress in the region.

However, despite these optimistic sentiments, a significant proportion of youth (16%) harbour doubts about the region's capacity to evolve in the clean energy transition journey. This scepticism is reflected in survey findings indicating that only 41% of respondents perceive the ASEAN region as having a clear goal and vision regarding clean energy. This highlights the need for concerted efforts to enhance policy coherence, stakeholder engagement, and strategic planning to address uncertainties and build momentum towards a sustainable energy future.

In essence, the ASEAN youth are ready to ignite a clean energy revolution, yet they face significant systemic barriers. This generation is eager for action and understands the importance of collective effort. However, there's a palpable disconnect between their aspirations and the current reality, with less than half believing that ASEAN is ready for the clean energy transition. This gap highlights the challenges and opportunities that lie ahead. The youth are calling for clear goals to provide a roadmap for climate action. Despite these challenges, the ASEAN youth remain resilient and believe in the potential for a successful clean energy transition. Their collective voice is a call to action for ASEAN governments to prioritise and address the climate crisis with the urgency and commitment it demands.

4.3.2 Country-level analysis and insights

Government is key in driving energy transition, but do they have the political will?

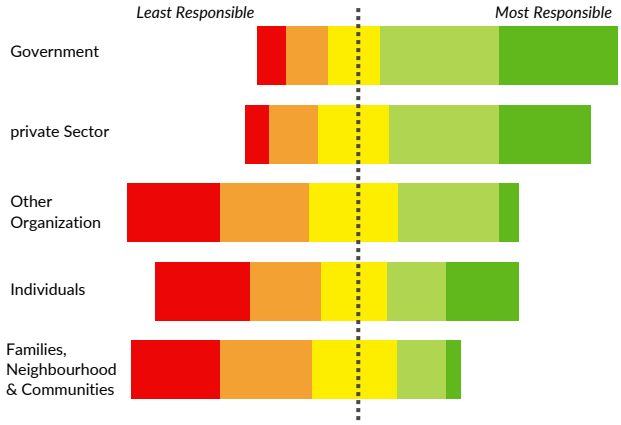
As we delve deeper at the country level, the demand for climate action from Southeast Asian youth is loud and clear. However, the question that looms large is whether their governments will heed this call. The message from the youth is unambiguous: a staggering 80% believe that their countries need to set decarbonisation targets immediately. Their concern transcends mere worry; they are demanding swift and decisive action. The youth in the region are deeply troubled by climate change. They firmly believe that a collaborative effort between the government and the private sector is imperative to reduce emissions effectively. This sentiment is echoed in the survey findings, where a significant 87% of respondents express concern about pollution and emissions caused by the current global energy system.

Furthermore, the youth believe that the primary responsibility for reducing greenhouse gas emissions rests with the government and the private sector. This belief underscores the need for these entities to take the lead in driving the clean energy transition and addressing the climate crisis. It is apparent that the youths are not just passive observers of the unfolding climate crisis. They are active participants demanding change, advocating for clear decarbonisation targets, and calling for greater collaboration between the government and the private sector to mitigate emissions. Their voices represent a clarion call for action that ASEAN governments cannot afford to ignore.

87%

Youths are concerned about the pollution and emissions caused by the current global energy system

Youths believe that the primary responsibility for reducing greenhouse gas emissions rests with the Government and Private Sector



The youth in ASEAN countries perceive the lack of political will, economic and financial constraints, and insufficient facilitative policies as the primary barriers to achieving a sustainable energy transition. A significant majority cite the absence of government initiative in prioritising clean energy policies as a major hurdle and a critical issue. This reflects the broader political landscape in the region, where political agendas often overshadow the need for comprehensive clean energy policies. Despite the potential for renewable energy, the lack of explicit policy frameworks and incentives has been a stumbling block in the shift towards sustainable energy sources.

Global Youth Energy Outlook; Youth for Energy, Southeast Asia analysis

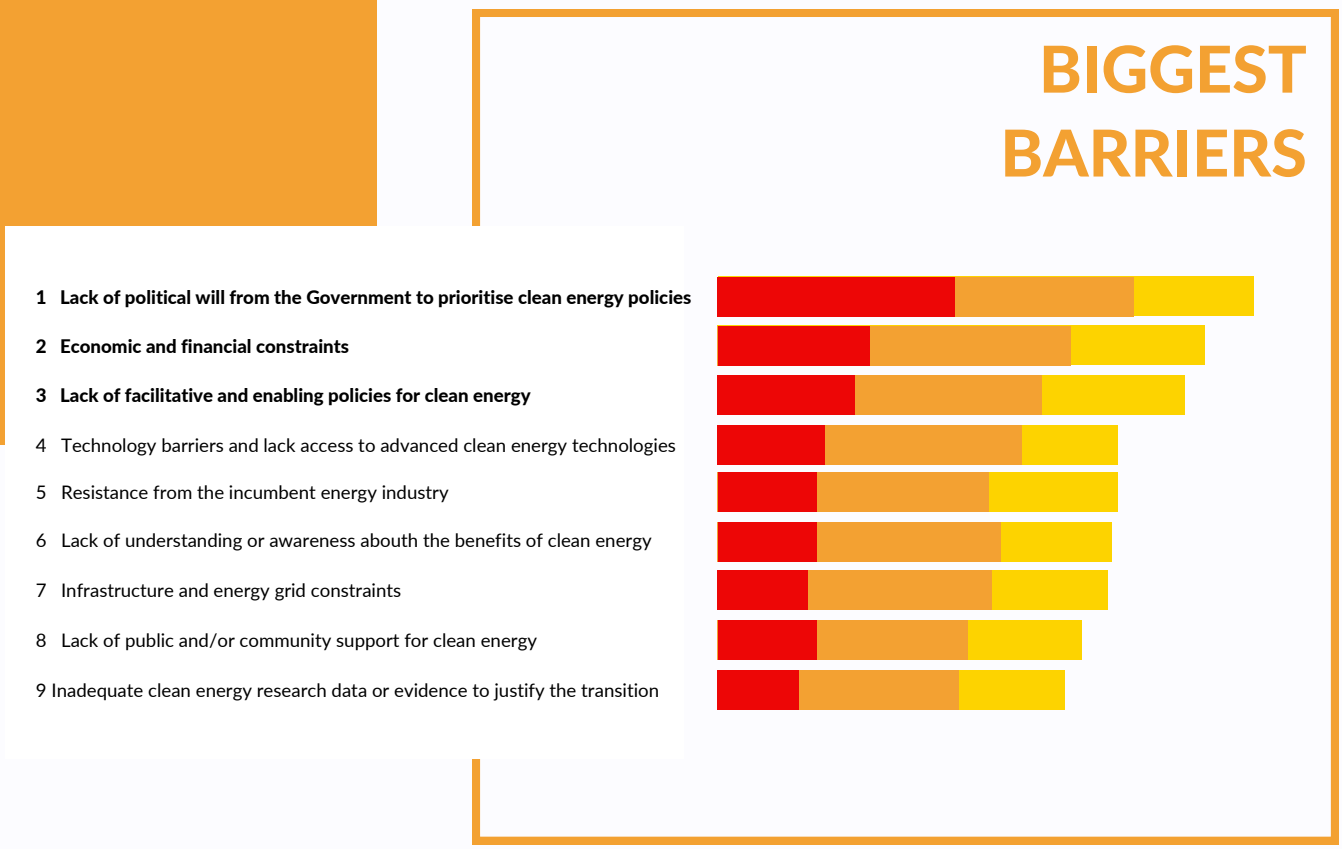


Fig 6. *Top three ranking of the biggest barriers to achieve clean energy transition in the respective country*

Economic and financial limitations are also prominent concerns, with 63% of the youth identifying them as barriers, and 20% deeming them the principal obstacle. The ASEAN nations face fiscal challenges and competing priorities that hinder investments in clean energy infrastructure and technology. The experiences of countries like Cambodia and Laos highlight the necessity for innovative financing and international cooperation to overcome these economic hurdles and harness the region's renewable energy capabilities. The youth's perception of government performance in allocating budgets for clean energy aligns with these concerns, as only a minority agree with the current financial commitments. While the absence of facilitative policies is acknowledged as a barrier, the youth least likely view the lack of clean energy research data as the biggest obstacle. This indicates an awareness of the necessity for evidence-based policymaking and the availability of reliable data to guide decisions. Initiatives like the ASEAN Energy Outlook and regional research collaborations are instrumental in providing the necessary data and analysis to support clean energy strategies.

ACHIEVING CLEAN ENERGY TRANSITION

Moreover, the concerns of the ASEAN youths extend beyond policy and financial barriers. A staggering 80% express apprehension over their nations' underinvestment in energy infrastructure, particularly in renewable energy and energy conservation initiatives. This sentiment is further echoed in their views on educational and awareness efforts by governments:

- 79% of young people feel that there is insufficient government action in educating and raising awareness about climate change.
- An even higher 84% perceive a gap in industry-relevant skills training for energy transition, underscoring the urgency to empower the youth with the necessary knowledge and competencies to drive a sustainable future.

ASEAN Youth Dialogue on Development for Sustainable Development Goals

These findings highlight a critical call to action for ASEAN governments to not only invest in physical infrastructure but also in the intellectual and social capital that will enable young people to actively participate in and shape a sustainable energy landscape.

In summary, the ASEAN youth are not only cognizant of the environmental challenges ahead but are also actively seeking to influence the trajectory towards a sustainable future. The survey findings reveal that the youth perceive political will, economic constraints, and the lack of facilitative policies as significant barriers to achieving a sustainable energy transition. They are particularly critical of the absence of government initiative in prioritizing clean energy policies and the underinvestment in energy infrastructure. The youth's concerns extend to the need for educational and awareness efforts, with a majority feeling that there is insufficient government action in this regard. The ASEAN youth's apprehensions and demands underscore the need for ASEAN governments to take heed of their call. It is a clarion call for action that cannot be ignored. The youth are not passive observers but active participants in the climate crisis, and their voices represent a demand for change that must be addressed with urgency and commitment.

2023

4.3.3 Individual-level analysis and insights

The youth of ASEAN are the inheritors of tomorrow. Youth see the climate crisis looming large and refuse to be silent bystanders.

The ASEAN youth, as the leaders of tomorrow, are acutely aware of the looming climate crisis and are determined not to remain silent bystanders. They are vocal in their demands for a clean energy future and are committed to turning this vision into a reality. They are ready to act, but the path is not straightforward. The outcome of this study on the youths is a testament to their determination. It is a call to action for the youth of ASEAN to lead the way towards a sustainable future. They understand the urgency of the situation and are eager to contribute meaningfully.

The ASEAN youth are poised to embrace eco-conscious habits and lifestyles, with a staggering 92% ready to make the shift towards sustainability. They are not just interested in living sustainably; they are eager to do so. However, there is a gap between their intentions and their ability to act, as many find themselves lacking the necessary knowledge and resources to implement these changes effectively. This readiness to adopt eco-conscious habits reflects a broader commitment to environmental stewardship and a desire to contribute to a sustainable future. The youth are aware of the impact their choices have on the planet and are willing to make personal changes that align with their values. Yet, the challenge lies in translating this willingness into practical, everyday actions.

ELECTRIC VEHICLES

Electric Vehicles

Electric vehicles (EVs) are rapidly becoming the preferred choice for the next generation of drivers, with an impressive 84% of youths indicating their intention to choose an EV as their future mode of transportation. These youths envision a fleet of clean, efficient vehicles that allow them to travel without leaving a carbon footprint. However, despite their enthusiasm, they recognize the current barriers to widespread EV adoption: the high cost of electric vehicles and the limited availability of charging infrastructure. The dream of driving an electric vehicle is fuelled by the desire for a more sustainable and environmentally friendly transportation option. The youth are drawn to the promise of EVs to reduce emissions and dependence on fossil fuels. Yet, the perceived roadblocks of cost and infrastructure highlight the need for systemic changes to support this transition.

The majority of youths are showing a strong commitment to adopting public transportation as their primary mode of travel, recognizing its potential to foster a cleaner and more sustainable future. A significant 77% of youths are willing to forgo private cars in favour of public transportation, understanding the benefits it can bring in terms of cleaner air and reduced emissions. However, they are also aware of the challenges that come with this choice, such as the lack of first-mile and last-mile connectivity and the overall inconvenience that can make relying on public transportation a difficult decision.

This willingness to embrace public transportation is indicative of a broader environmental consciousness among the youth. They are ready to make personal sacrifices for the greater good, but the current state of public transportation systems often does not meet their needs or expectations. To truly encourage this shift, there must be improvements in the public transportation infrastructure to address these concerns. Enhancing first-mile and last-mile connectivity, ensuring timely and efficient services, and providing a safe and comfortable experience are essential steps to make public transportation a more attractive option. Additionally, integrating technology such as mobile apps for real-time tracking and payment can greatly improve the convenience factor.

ENERGY-RELATED VOLUNTEER

The energy and enthusiasm of the youth are vital resources that can significantly contribute to clean energy initiatives. With 53% of young individuals eager to volunteer their time and energy, there is a substantial force ready to be harnessed for the cause. These youths are not content with being mere spectators; they want to be active participants in the journey towards a greener future. They are looking for opportunities and platforms that allow them to engage in meaningful volunteerism and apply their talents to support environmental causes.

However, the challenge lies in capturing this eagerness and translating it into effective action. There is a need for structured programs and initiatives that can channel the youth's passion into productive volunteerism. Organizations, both governmental and non-governmental, can play a pivotal role in creating these opportunities. By establishing clear pathways for involvement, they can tap into the youth's potential and empower them to make a tangible impact. The call for engagement goes beyond mere participation; it is about providing the youth with the chance to lead and innovate within the realm of clean energy. Mentorship programs, internships, and community projects are just a few examples of how the youth can contribute their skills and ideas. These platforms not only allow them to contribute but also help them to grow and learn, fostering a generation of environmentally conscious leaders.

In conclusion, the ASEAN youth stand at the forefront of a pivotal movement towards a sustainable future. Their collective voice echoes a deep-seated concern for the environment and a resolute determination to be part of the solution. This study has illuminated their readiness to adopt eco-conscious habits, their preference for electric vehicles, their commitment to public transportation, and their willingness to volunteer for clean energy initiatives. It is a clarion call for action, urging the youth to harness their passion and lead the charge towards a greener tomorrow. The findings underscore the urgency of the climate crisis and the eagerness of the youth to contribute meaningfully. The ASEAN youth are not just the inheritors of tomorrow but the architects of a cleaner, more responsible world. Their actions and choices today will shape the environmental legacy of the ASEAN region, making it imperative to support and empower them in their quest for a sustainable future.

4.4 Case for Change

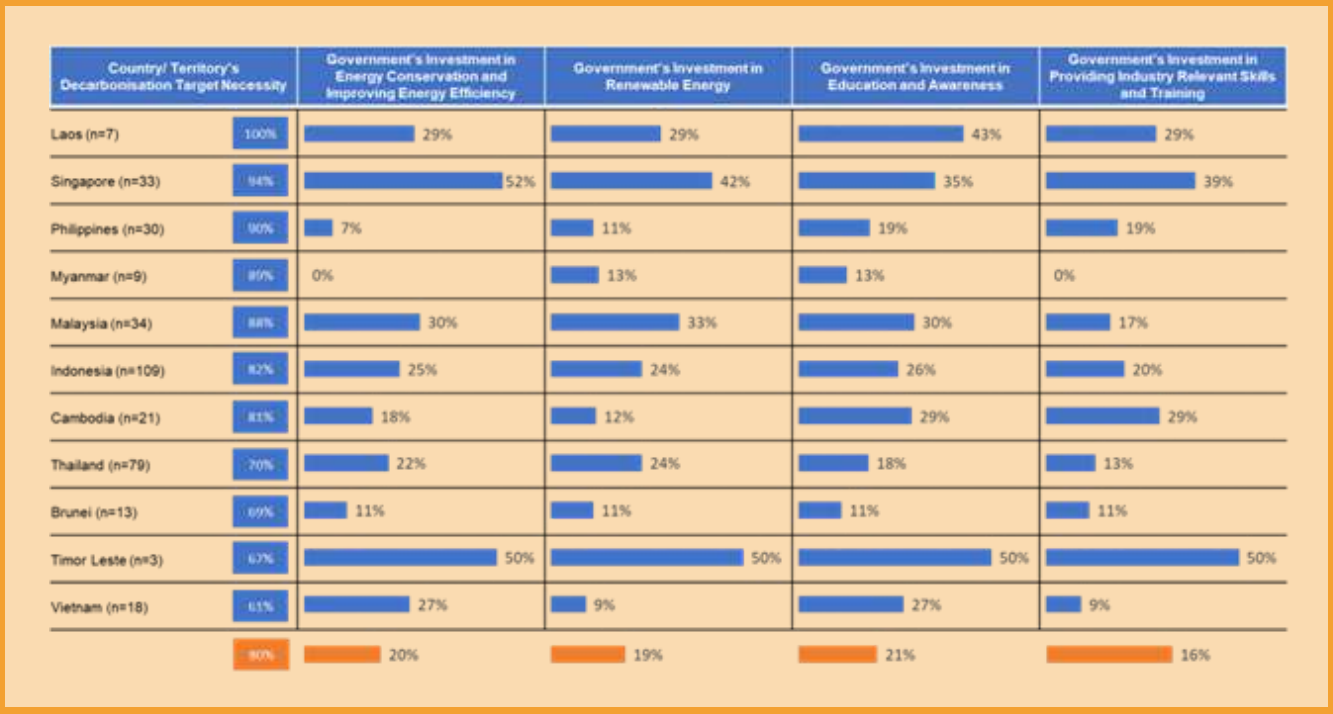


Fig 7. *Youths' perception on the government's importance to energy transition in the ASEAN region*

The ASEAN youth's call for proactive government involvement in the clean energy transition reflects their keen awareness of the environmental challenges facing their region. The overwhelming majority, 80%, are advocating for robust policymaking that supports decarbonisation targets, a sentiment that is in line with the active role youth are taking in pushing for policy changes that favour clean energy goals.

From the outcome of the survey, the key gaps and challenges identified can be categorised and structured into three key themes mainly,

- There is a perception that the governments in the region are not investing enough in key energy infrastructure to spur energy conservation, renewable energy and improving energy efficiency
- There is a lack of awareness and understanding on clean energy transition where many respondents feel there is not enough awareness or understanding of the benefits of clean energy, which hampers public support and engagement. Education and knowledge-sharing are crucial in bridging this gap, as one respondent emphasised the need for greater understanding through education
- There is also a lack of industry relevant skills and training which is a recurring theme of limited awareness and understanding points to a significant challenge. Statements from respondents such as "...knowledge and exposure..." and "...no clear concern or commitment from the policymaker in my sector..." underscore the need for more information and accessibility regarding clean energy transition opportunities

To address these challenges, it is imperative that ASEAN governments, along with educational institutions and industry stakeholders, collaborate to create comprehensive educational programs and policies that not only raise awareness but also equip the youth with the necessary skills to participate in and drive the clean energy transition. This collaborative effort should also aim to address gender disparities, ensuring inclusive and equitable access to clean energy opportunities for all. In the following sections, we will go through these key themes and analyse the perceived gaps and challenges.

4.4.1 Lack of enabling energy policies to facilitate investments

There are several factors contributing to this. One of the important things would be lack of political will from governments to prioritise clean energy policies. This sentiment underscores the need for stronger policy frameworks and government commitment to drive the transition towards cleaner energy sources. This will indirectly contribute to the resistance from the incumbent energy industry as a significant impediment to clean energy transition efforts, aligned with respondents who also highlighted this through the survey. Overcoming entrenched interests and fostering collaboration between traditional and renewable energy sectors is crucial for advancing sustainable energy agendas.

Consequent from lack of political will to drive the narrative and steer the direction of the country would be an inadequate energy infrastructure in the region. This presents a hurdle to the adoption of renewable energy sources like solar and wind power. The existing power grid structures are ill-equipped to handle the-intermittent nature of renewables, posing potential issues for national power grids. For instance, Vietnam witnessed a surge in solar energy in recent years, expanding its solar capacity from 85 MW in 2017 to nearly 17,000 MW in 2021. However, its current grid infrastructure struggled to manage the fluctuations in supply, leading to restrictions on renewable energy farms. Therefore, apart from the cost challenges associated with renewable energy technologies, the capacity of national power grids to support renewables emerges as a significant obstacle to decarbonization (ISEAS-Yusof Ishak Institute, 2023).

In addition, the development of renewable power in the region lags due to insufficient policy and investment frameworks. Regulatory obstacles, entrenched interests, and rigid commercial arrangements have favoured fossil fuel generation over renewables. Despite global decreases in renewable technology costs, Southeast Asia sees relatively high costs for solar and wind projects due to limited deployment scale and underdeveloped supply chains. Securing affordable financing remains a significant challenge. With ongoing development, operational complexities, and economic risks, financing solar PV and wind projects remains relatively costly in many ASEAN Member States, making the financial appeal for private sector investment less clear than in advanced economies (IEA, 2023).

MODERN BIOENERGY
HYDROGEN-BASED FUELS
CARBON CAPTURE TECH.

To fulfil sustainability objectives, Southeast Asian countries will need substantial energy sector investments, estimated at least USD 200 billion by 2030, with over three-quarters directed towards clean energy. These clean energy investments encompass extensive renewables deployment, enhanced energy efficiency, electrification of end-use sectors, and the implementation of low-emission fuels like modern bioenergy, hydrogen-based fuels, and carbon capture technology. Attracting this level of capital necessitates improved policy design and regulatory enhancements to support the implementation of energy transition plans and ambitions across the region. For example, in Vietnam, supportive policy incentives have spurred significant growth in solar and wind energy over the past five years. Nevertheless, this process has been marked by cycles of rapid expansion and significant grid congestion (IEA, 2023).

4.4.2 Lack of awareness and understanding on clean energy transition

In delving into the intricacies of each nation's initiatives and policy landscapes, our survey reveals a rather sobering reality: a mere 31% of respondents feel adequately informed about the ongoing efforts within their respective countries. Even in nations traditionally perceived as more proactive in sustainable development, such as Malaysia, Indonesia, Singapore, and Thailand, awareness levels remain alarmingly low, hovering around 41%, 39%, 22%, and 22%, respectively. Despite this modest level of awareness, there's a notable degree of familiarity with national clean energy targets. However, there exists a palpable scepticism regarding the efficacy of current measures in catalysing widespread adoption of clean energy technologies. This scepticism is reflected in the responses garnered, hinting at a disconnect between governmental objectives and public perception of their attainability and impact. This shows the divergent trajectories of clean energy development across ASEAN member states. While some countries exhibit promising progress, others, like Cambodia and Myanmar, face formidable hurdles in this arena, likely stemming from unique socio-economic and infrastructural challenges inherent to their contexts.

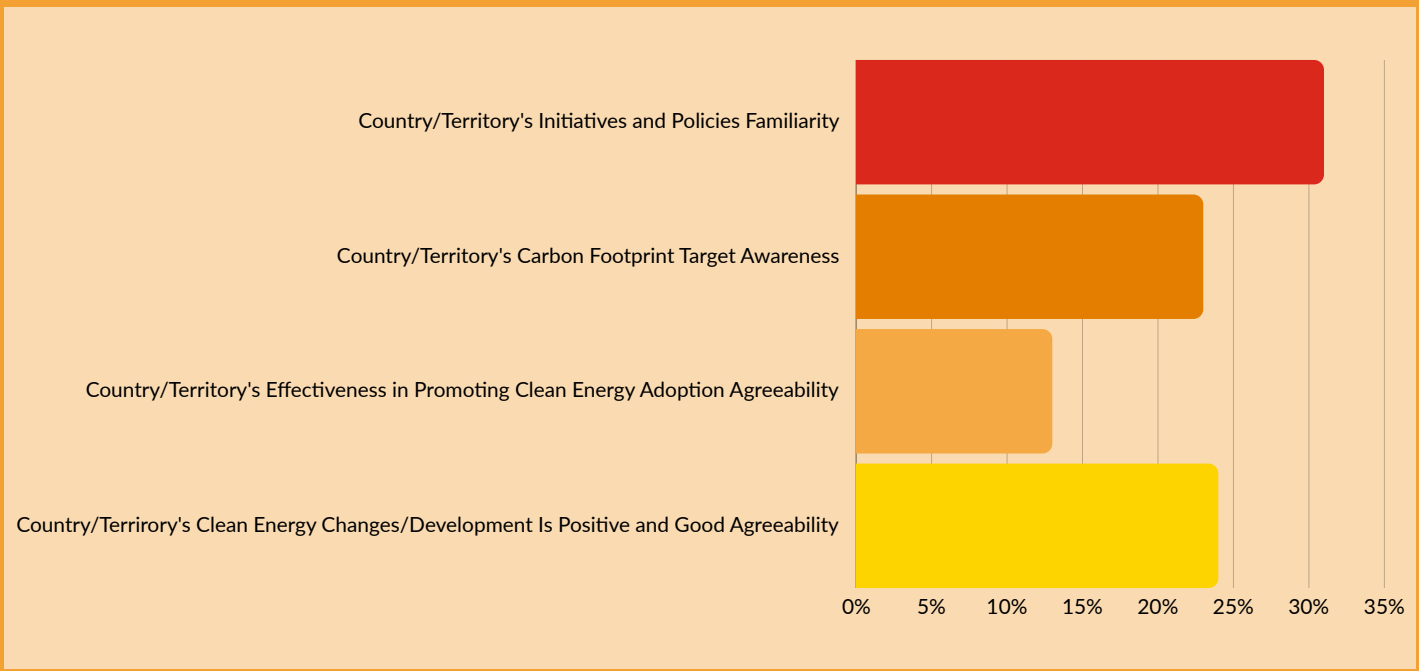


Fig 19. *Youths' perception on their country's performance in adopting clean energy initiatives*

A recurring sentiment among respondents is the dearth of awareness or understanding regarding the advantages of clean energy. This gap in knowledge inhibits public support and engagement with clean energy initiatives.

To illustrate, let's consider the case of Singapore. Despite its reputation as a regional leader in clean energy initiatives, recent years have seen increasing public scrutiny over the pace and effectiveness of its transition. The city-state's ambitious target of achieving 2 gigawatts peak of solar deployment by 2030, while commendable, has been met with scepticism regarding its feasibility given the constraints of land scarcity and regulatory complexities. Similarly, Indonesia, with its vast renewable energy potential, has struggled to translate policy objectives into tangible outcomes. Despite government pledges to increase the share of renewable energy in the national energy mix, bureaucratic bottlenecks, inadequate infrastructure, and an overreliance on fossil fuels continue to impede progress, leaving many youths disillusioned about the prospects of a truly sustainable energy future.

Meanwhile, Thailand's journey towards clean energy has been marked by a mix of successes and setbacks. While the country boasts significant investments in renewable energy projects, including solar and wind, bureaucratic red tape and inconsistent policy frameworks have hindered the sector's full potential. Moreover, recent controversies surrounding the environmental and social impacts of large-scale hydropower projects have ignited public debate and underscored the complexities inherent in navigating the transition towards clean energy. In contrast, Malaysia has made notable strides in renewable energy deployment, particularly in the solar sector. The government's efforts to incentivize private investment in solar photovoltaic installations have borne fruit, with Malaysia emerging as a regional leader in solar energy production. However, challenges persist, including grid integration issues and the need for more comprehensive policy support to sustain momentum in the long term.

Considering these diverse trajectories and challenges, it becomes evident that fostering a successful clean energy transition within ASEAN requires a nuanced understanding of local contexts, coupled with robust policy frameworks, technological innovation, and active engagement from all stakeholders, including the youth. With the growing youth population, there is immense potential to drive meaningful change and accelerate progress towards a sustainable future for all.

4.4.3 Insufficient industry-relevant skillsets and human capital development

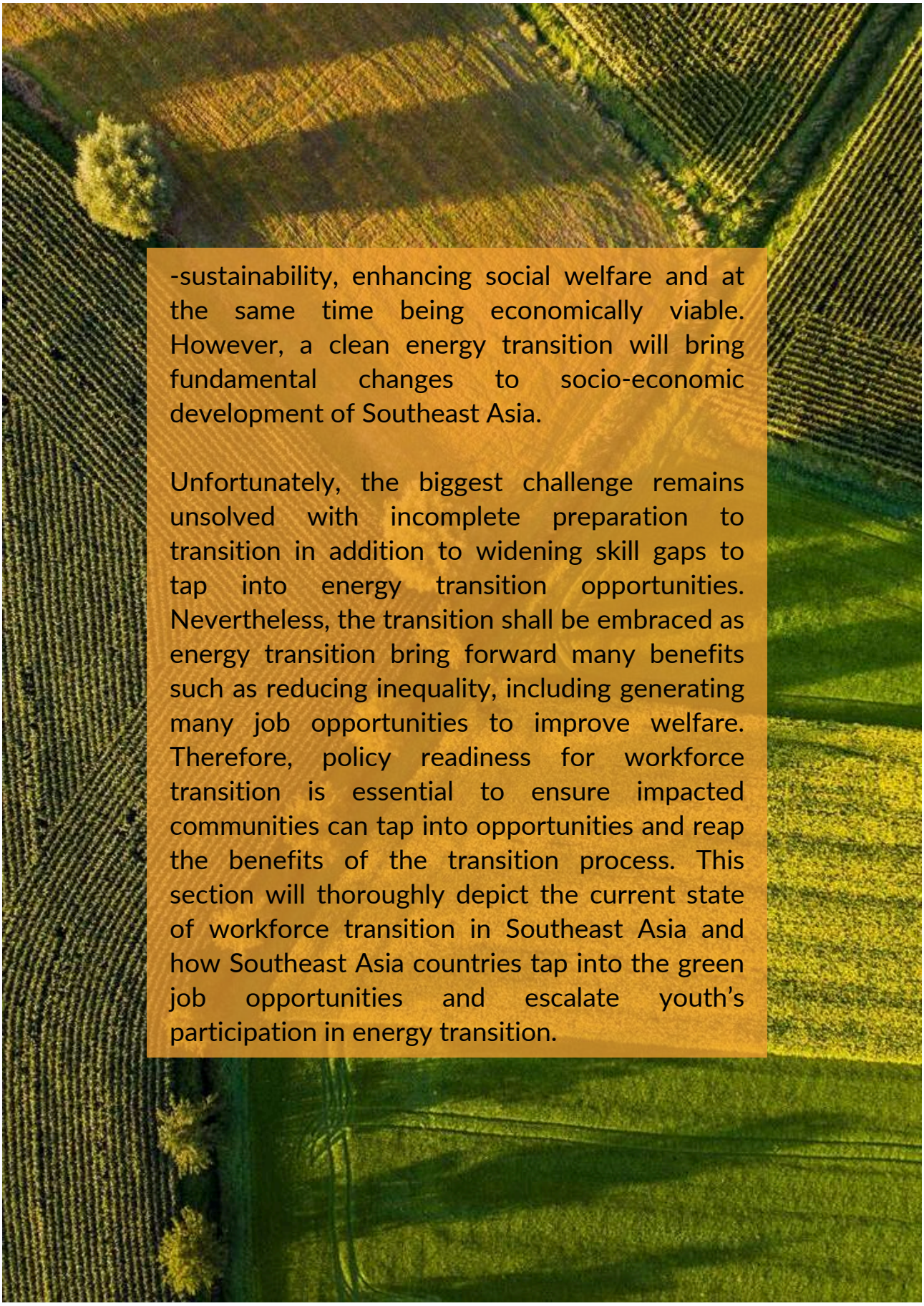
Energy has been the key driver of growth for the economy globally and specifically in the Southeast Asia region. The energy-growth nexus has been prevalent in the context of Southeast Asia, as the increase in energy consumption positively and directly contributes to economic growth by boosting economic outputs with every 1% increase in energy consumption driving 0.11% economic growth (Rahman, et.al., 2022). Energy consumption in Southeast Asia has been increasing rapidly since the last two decades, experiencing a total 70% increase compared to early 2000s (IEA, 2022) and is projected to rise over 50% in the coming decades (IRENA & ACE, 2022). To meet the growing energy demand, energy supply in Southeast Asia has expanded by 80% between 2000 and 2020 (IEA, 2022).

Historically, the demand has been met with fossil fuels as shown by the substantial growth of fossil fuel in energy supply over the last two decades, accounting for nearly 85% of the region's total primary energy supply (ACE, 2022). Compiled data have also shown that for the last two decades, the number of coal consumption has expanded by sixfold in electricity generation following many coal-fired power plants that were put into operation. By 2020, coal accounts for more than 40% share of the region's electricity generation compared to-

-renewable energy, which contributes only nearly a quarter of the region's electricity. The power sector now accounts for more than 40% of Southeast Asia's energy related emission, coal specifically contributing to 30% of total energy's emission (IEA, 2022).

Despite fossil fuel reliance, the region's abundant solar irradiance, wind resources, and hydroelectric potential are increasingly being recognized as valuable assets in the transition to a cleaner energy. Renewable energy sources accounted for approximately 23.3% of Southeast Asia's electricity generation. It is projected that Southeast Asia's electricity generation will be dominated by renewable energy accounting for 60% to 100% share (ACE, 2022), presenting a massive opportunity for job creation in the sector. Employment in Southeast Asia's renewable energy is predicted to reach 850.000 by 2025 (ACE, 2022) and 1.7 million by 2030 (IRENA, 2023).

The urgency to decarbonise the energy sector heightens with the increasing impacts of climate change manifested in Southeast Asia, one of the most vulnerable against climate impacts, completing the region to rapidly start deploying renewable energy sources. To avoid aggravating impacts, the transition must be conducted in a timely manner, while ensuring environmental-



-sustainability, enhancing social welfare and at the same time being economically viable. However, a clean energy transition will bring fundamental changes to socio-economic development of Southeast Asia.

Unfortunately, the biggest challenge remains unsolved with incomplete preparation to transition in addition to widening skill gaps to tap into energy transition opportunities. Nevertheless, the transition shall be embraced as energy transition bring forward many benefits such as reducing inequality, including generating many job opportunities to improve welfare. Therefore, policy readiness for workforce transition is essential to ensure impacted communities can tap into opportunities and reap the benefits of the transition process. This section will thoroughly depict the current state of workforce transition in Southeast Asia and how Southeast Asia countries tap into the green job opportunities and escalate youth's participation in energy transition.

4.5 Key actors in the energy transition journey

KEY ACTORS IN THE ENERGY TRANSITION JOURNEY

The journey towards energy transition is a complex and multifaceted process, involving a diverse range of key actors, each playing a crucial role in shaping the future of our energy systems. These actors include the youth, the private sector, and the government, all of whom have unique roles and responsibilities in this transition.

Firstly, governments play a crucial role in driving the energy transition. They set the policy framework and create an enabling environment for the transition through legislation, incentives, and regulations. For instance, the government of Malaysia recently launched the National Energy Transition Roadmap (NETR), outlining efforts towards achieving a sustainable and inclusive energy system. Governments can also rally their ministers of energy, climate, transport, health, and other portfolios around the same goal: zero-carbon energy.

Secondly, the private sector has a leading role in driving the energy transition. From energy producers to technology developers, their investments, innovations, and business models can significantly accelerate the shift towards cleaner and more efficient energy systems. For example, in Malaysia, the private sector is being encouraged to drive climate action forward into the future. The success of the energy transition hinges on the availability of affordable capital to fund clean energy projects.

Lastly, the youth, as the leaders of tomorrow, with their fresh perspectives and adaptability to new technologies, can actively participate in the energy transition. They are increasingly becoming aware of the importance of sustainable energy and are showing a willingness to participate in the energy transition. Young people are particularly engaged on climate change, with 65% of those in the age group 18-35 considering climate change to be a global emergency. They are primed to be a critical force for the energy transition, bringing new ideas and pursuing careers aimed at decarbonizing the sector.

In conclusion, the energy transition is a collective effort that requires the active participation of all sectors of society, including the government, the private sector, and the youth. Each actor plays a unique and crucial role in shaping the future of our energy systems. By working together, we can accelerate the shift towards a more sustainable and resilient energy future. In the following sections, we will delve deeper into the perspectives of youths on the roles and contributions of these key actors in the energy transition journey.

4.5.1 Governments' role in driving clean energy transition

As we explored the primary focus areas for advancing clean energy transition efforts in the nation and country, youths are of the opinion that governmental and policymaking entities are key actors in providing the steer for the nation and region towards clean energy transition. Among them, a significant 26% emphasised the critical need for clear and well-defined regulations crafted by governmental bodies. This resonates deeply with the contemporary challenges prevailing in the ASEAN region, where uncertainties in regulations and policy discrepancies often impede investments in clean energy projects. For instance, the absence of standardised renewable energy tariffs across ASEAN nations hinders private sector engagement in renewable energy ventures. Initiatives such as the ASEAN Energy Regulatory Network (AERN) strive to address this, advocating for regulatory harmonisation and capacity building among regulatory bodies to pave the way for a more conducive environment for clean energy investment.

Following closely at 25%, our youth highlighted the paramount importance of education and human capital development in driving forward the clean energy agenda. This reflects a profound understanding of the indispensable role skilled manpower plays in catalysing technological innovation, executing projects, and advocating for policy reforms within the clean-

-energy domain. Efforts to bolster human capital development in ASEAN countries are underway, with initiatives such as the ASEAN Centre for Energy's capacity-building programs and the Clean Energy Education and Empowerment (C3E) Program aimed at equipping our youth with the necessary knowledge and skills to navigate the clean energy landscape adeptly.

Additionally, our youth emphasised the critical role of financial support from governments in propelling forward new clean energy technologies and initiatives. Funding considerations emerged as a central priority, reflecting regional trends where governments are increasingly rolling out incentives and subsidies to spur investments in renewable energy ventures. For instance, Thailand's Feed-in Tariff (FiT) scheme guarantees payments for electricity generated from renewable sources, incentivizing private sector engagement in solar and wind energy projects. Similarly, initiatives like the ASEAN Catalytic Green Finance Facility (ACGF) aim to mobilise financing for sustainable infrastructure projects, including clean energy initiatives, through innovative financing mechanisms and public-private partnerships.

Furthermore, the overwhelming sentiment among our youth, with 79% stressing the significance of clean energy, underscores its pivotal role in addressing pressing societal challenges. Despite competing public concerns such as healthcare, employment, access to education, and gender equality, clean energy emerges as a resolute priority, underscoring its centrality to sustainable development agendas.

In addition, an overwhelming 87% of our youth expressed deep concern about the pollution and emissions stemming from the current global energy system. This reflects a heightened awareness of the environmental impacts associated with conventional energy sources, such as fossil fuels, and underscores the urgent need for transitioning towards cleaner and more sustainable energy alternatives. Initiatives such as the ASEAN Clean Air Initiative and the ASEAN Greenhouse Gas Emissions Reduction Program epitomise regional efforts to combat air pollution and mitigate greenhouse gas emissions, aligning with our youth's aspirations for a cleaner and healthier environment.

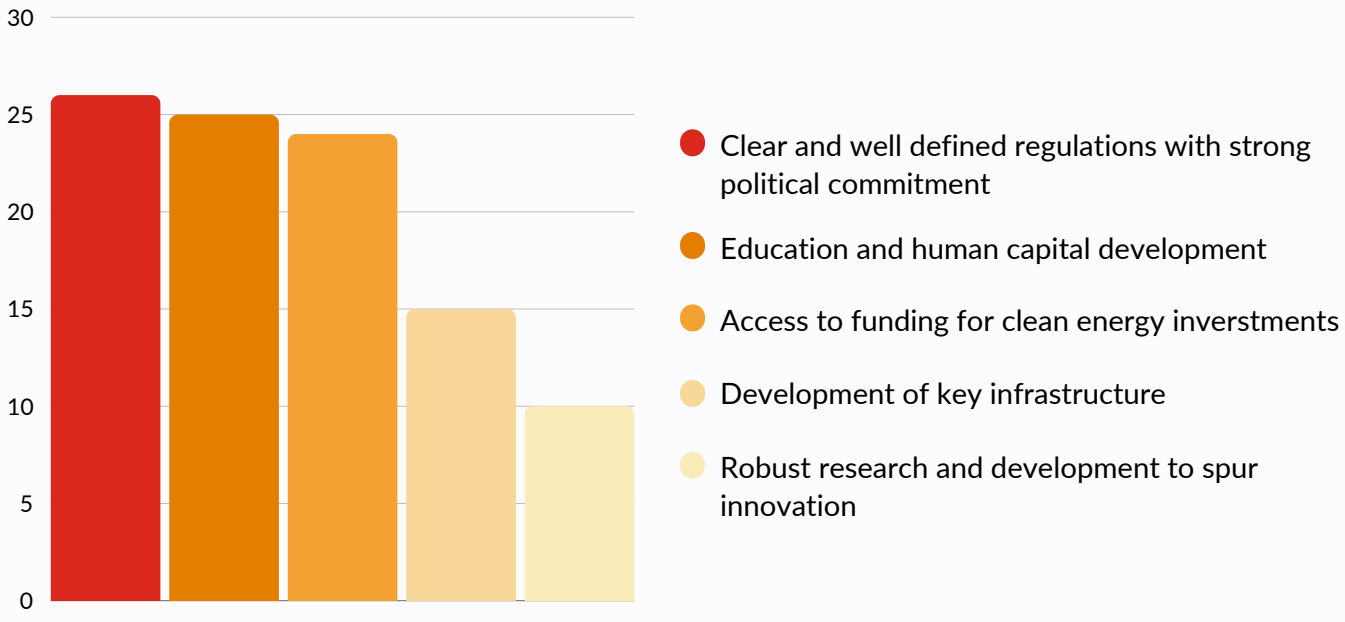


Fig 18. *Youth's primary focus areas for advancing clean energy transition efforts.*

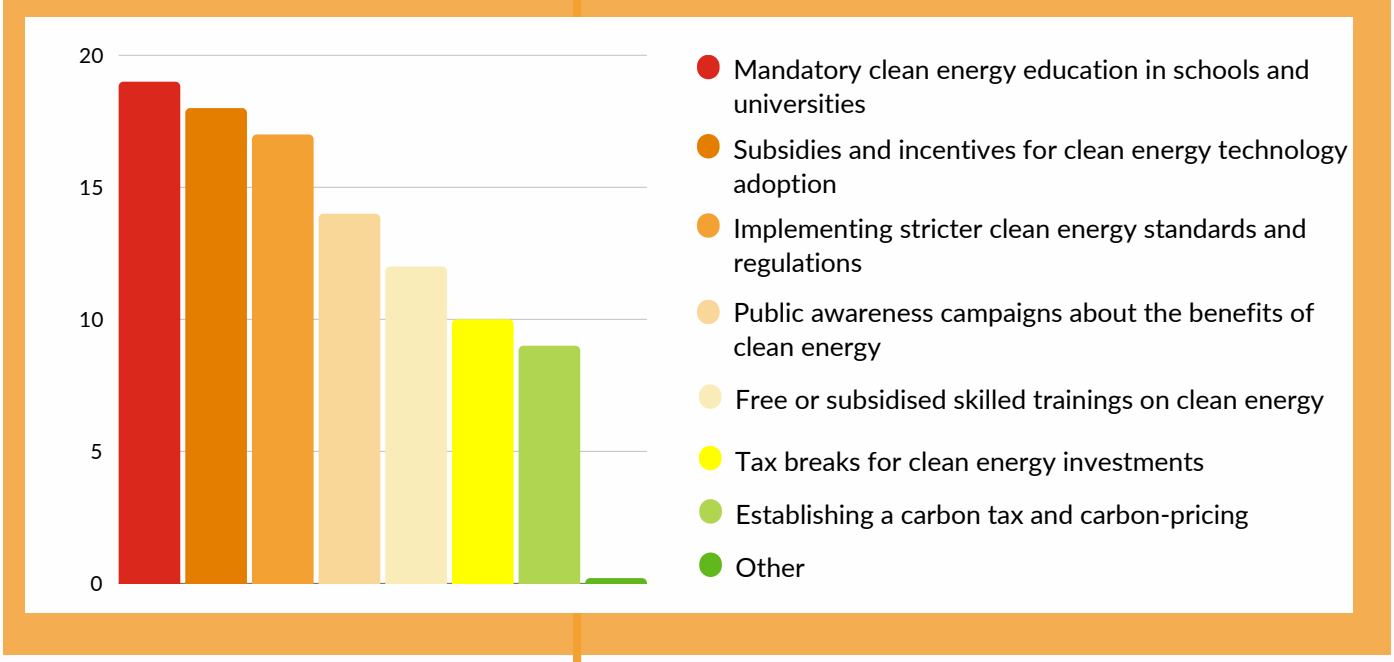


Fig 12. *Top three things that the government should do to educate, spread awareness or provide training to adopt clean energy based on youths' perception.*

As we try to understand what is expected of the government to do, it becomes evident that ASEAN youth are not merely passive observers but active proponents of clean energy transition initiatives. As we delve deeper into the nuances of their perspectives, Fig 12 offers compelling insights into the expectations placed on governmental and institutional stakeholders in fostering clean energy education, awareness, and training. A striking 19% of youth advocate for the establishment of mandatory clean energy education within schools and universities, underscoring the pivotal role of formal education in nurturing a generation of environmentally conscious individuals. This sentiment resonates with ongoing efforts in ASEAN countries to integrate sustainability principles into educational curricula. For instance, Thailand's Ministry of Education has introduced initiatives to incorporate renewable energy and environmental conservation topics into school syllabi, aligning with youth expectations for comprehensive clean energy education.

Additionally, youth express a keen interest in industry-led training and certification programs for clean energy jobs, recognizing the importance of practical skill development in navigating the evolving clean energy landscape. Initiatives such as the ASEAN Centre for Energy's capacity building programs and industry partnerships exemplify collaborative efforts aimed at equipping youth with the requisite skills to thrive in the clean energy sector. Amidst the rising business opportunities, youth advocate for governmental incentives and subsidies to incentivise the adoption of clean energy technologies by companies and private sectors. This aligns with regional trends where governments are increasingly rolling out incentives to spur investment in renewable energy projects. For instance, Vietnam offers feed-in tariffs and tax-

-incentives to promote solar and wind energy development, reflecting a proactive approach towards incentivizing clean energy adoption.

Moreover, the implementation of stricter standards and regulations to prevent mismanagement of funds is highlighted as a priority by youth, particularly considering the political dynamics prevalent across ASEAN countries. This underscores the importance of transparent governance frameworks and accountability mechanisms to foster investor confidence and ensure the effective allocation of resources towards clean energy initiatives. Countries like Singapore, with robust regulatory frameworks and governance structures, serve as exemplars in this regard, attracting significant investments in clean energy projects.

In addition to these discussions, the pivotal role of educational institutions in shaping the clean energy landscape cannot be overstated. An overwhelming 87% of youth emphasise the indispensable contribution of educational institutions in fostering awareness, knowledge dissemination, and skill development relevant to clean energy transition. This underscores the need for concerted efforts to empower educational institutions to serve as incubators of sustainability-conscious individuals, equipped to drive positive change in the clean energy sector.

4.5.2 Private sector's role as a catalyst to clean energy transition

The strategic advancement of innovation requires collaboration between public and private sectors. In the pursuit of economic growth and policy evolution, the region has primarily focused its innovation efforts on research, leveraging partnerships among research institutes, universities, and governments both within and outside the region. Notable instances of technological research and development (R&D) and innovation initiatives, such as Singapore's EcoLabs Centre of Innovation for Energy, have emerged. However, challenges remain, particularly in bridging the gap between technological innovation and market implementation due to financial constraints.

The private sector, while possessing its own R&D capabilities, stands to benefit significantly from fostering open innovation and deeper collaboration with the public sector. This symbiotic relationship can enhance and expedite the innovation process, leading to more efficient and effective solutions. To foster an environment that is conducive to innovation, the implementation of various policies and measures is recommended. These may encompass tax incentives, initiatives that promote free trade, and reforms related to intellectual property rights. Such strategies serve to attract ideas, talent, and investments, hence facilitating the transition of innovations from the research and development stage to practical application.

In the context of energy infrastructure investments, the importance of public-private partnerships (PPPs) cannot be overstated. PPPs can provide a platform for risk sharing and resource pooling, enabling the mobilization of private sector expertise and capital for public infrastructure projects. This can lead to improved efficiency, cost-effectiveness, and innovation in the development and operation of energy infrastructure. Moreover, PPPs can play a pivotal role in addressing the financing barriers that often hinder the transition from technological innovation to market implementation. By leveraging the strengths of both the public and private sectors, PPPs can help bridge this gap, accelerating the deployment of innovative energy solutions and contributing to sustainable economic development. Therefore, fostering and strengthening PPPs should be a strategic priority in promoting innovation and investment in energy infrastructure.

In parallel with governmental and institutional efforts, the private sector and community engagement emerge as pivotal drivers of clean energy transition initiatives, underscoring the multifaceted nature of sustainable development agendas. As we delve deeper into the nuances of youth perspectives, it becomes evident that collaborative partnerships between corporations, communities, and educational institutions are instrumental in advancing clean energy education,-

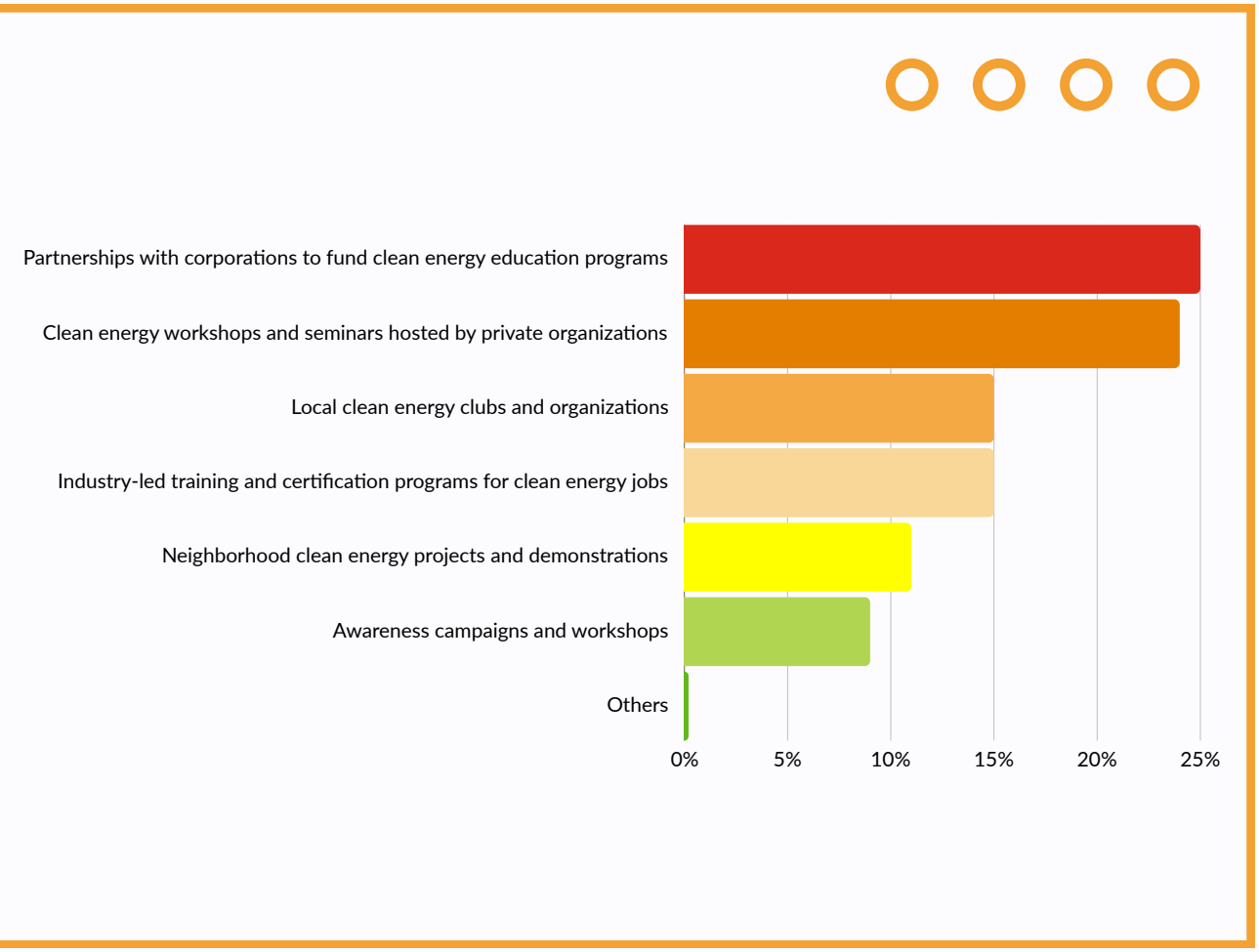


Fig 13. *Top three things that the private sector and community should do to educate, spread awareness or provide training to adopt clean energy based on youths' perception.*

- awareness, and implementation. Notably, 25% of youth identify partnerships with corporations to fund energy education programs as the top priority, highlighting the role of corporate social responsibility (CSR) initiatives in supporting educational endeavours. This aligns with contemporary examples from the ASEAN region, where corporate entities are increasingly investing in clean energy education and skill development programs. For instance, partnerships between multinational corporations and local educational institutions in countries like Thailand and Indonesia have resulted in the establishment of clean energy research centres and scholarship programs, aimed at nurturing a talent pool equipped to drive clean energy innovation.

Furthermore, the imperative for preparing the workforce for emerging clean energy technologies is underscored by the youth's recognition of the need for managerial positions, young engineers, and technician's adept in clean energy solutions. This aligns with regional efforts to bridge the clean energy skills gap through targeted capacity building initiatives and vocational training programs. For instance, initiatives such as the ASEAN Skills Competition and the Clean Energy Education and Empowerment (C3E) Program facilitate the development of specialised skills required for clean energy jobs, ensuring that ASEAN countries are well-positioned to harness the benefits of clean energy transition.

In addition to formal education and corporate partnerships, youth express a keen interest in participatory learning experiences such as clean energy workshops, seminars, and neighbourhood projects. These hands-on initiatives not only foster community engagement but also serve as platforms for knowledge exchange and skill development at the grassroots level. Examples from ASEAN countries such as Malaysia and Vietnam showcase the effectiveness of such community-driven projects in raising awareness and fostering a culture of sustainability within local communities.

4.5.3 Youths should be in the center of future policy making

The youth of today are the leaders of tomorrow. This statement holds particularly true when it comes to the transition towards clean energy. As the world grapples with the challenges of climate change and environmental degradation, the role of youth in driving the conversation and advocating for clean energy transition cannot be overstated. In our survey, ASEAN youths were not only queried about their awareness and perceptions of clean energy initiatives but also probed on their willingness to actively participate in the transition towards a more sustainable future. The results unveiled a spectrum of attitudes and intentions, shedding light on both the enthusiasm and challenges inherent in mobilising youth engagement.

Approximately 37% of respondents expressed a commendable willingness to embrace transformative actions such as opting for public transport, adopting electric vehicles, and cultivating sustainable lifestyle habits. This segment of the youth population demonstrates a proactive stance towards catalysing the clean energy transition, recognizing the pivotal role individual behaviours play in mitigating environmental impact and advancing sustainability agendas. However, it's imperative to acknowledge the significant proportion – around 47% – who perceive these behavioural changes as challenging, albeit with a positive inclination towards improvement. This group acknowledges the importance of transitioning towards cleaner alternatives but may encounter barriers such as infrastructural limitations, affordability concerns, or entrenched habits that resist change. Their willingness to confront these challenges signals a latent potential for mobilisation and underscores the importance of targeted interventions and support mechanisms to facilitate transition pathways.

Youth, with their dynamism, creativity, and passion, are uniquely positioned to advocate for clean energy. They are not only the most affected by the decisions made today but also the ones who will live with the consequences of these decisions. Therefore, they have a vested interest in ensuring a sustainable future. Youth can leverage their digital savviness to raise awareness about the importance of clean energy. Through social media platforms, they can reach a global audience, share information, mobilize support, and pressure policymakers to prioritize clean energy transition. Youth are also instrumental in driving the conversation on clean energy. They bring fresh perspectives and innovative ideas to the table, challenging the status quo and pushing for change. They question existing energy practices, propose sustainable alternatives, and work towards making these alternatives a reality. Youth-led initiatives, such as school strikes for climate and various other youth-led organizations, have already shown the power of-

PIVOTAL ROLE OF THE YOUTH

-youth in driving the conversation on clean energy. These movements have succeeded in bringing the issue of clean energy transition to the forefront of global discourse.

The future of clean energy transition lies in the hands of the youth. As they step into leadership roles, they carry with them the responsibility of steering the world towards a sustainable future. They will be the ones to implement clean energy policies, manage renewable energy projects, and ensure the equitable distribution of clean energy resources. Moreover, youth will also play a crucial role in the innovation and development of clean energy technologies. Their curiosity and eagerness to learn will drive advancements in renewable energy, energy efficiency, and other clean energy solutions.

In conclusion, youth play a pivotal role in the clean energy transition. Their role in advocacy and driving the conversation on clean energy is crucial for a sustainable future. As they step into the shoes of tomorrow's leaders, their actions and decisions will shape the course of clean energy transition. Therefore, it is imperative to empower youth, provide them with the necessary knowledge and skills, and involve them in decision-making processes related to clean energy. After all, the future belongs to them.

5.0

POLICY IMPLICATIONS AND RECOMMENDATION

Considering the identified case for change, which highlights critical issues such as the lack of enabling energy policies that facilitate investments, the insufficient industry-relevant skillsets and human capital development, and a deficit in awareness and understanding of the clean energy transition, it is imperative to delve into the subsequent policy implications and recommendations. These considerations are pivotal for crafting a strategic framework that not only addresses these gaps but also propels the industry forward. By exploring comprehensive policy measures, we can ensure a more robust and sustainable energy sector that is well-equipped to meet the demands of the future, fostering an environment conducive to growth, innovation, and a smoother transition to clean energy solutions.

5.1.1 Facilitative and enabling policy framework to spur clean energy investments

The ASEAN region has a history of extensive fossil fuel subsidies, and these subsidies experienced a significant surge in 2022. While the complete phase-out of these subsidies is not an immediate prospect, there have been some notable subsidy reforms aimed at transitioning to cleaner fuels and targeting specific demographic groups, such as the shift from kerosene to liquefied petroleum gas for lower-income individuals. These reforms offer substantial health benefits, promote energ efficiency, reduce greenhouse gas emissions, and generate savings in subsidy costs.

Firstly, there is a need to relook at allocation of resources for energy infrastructure investments. This is prevalent where there is regional commitment to phase out coal and deploy renewable energy. Every Member State has consolidated their commitments within the ASEAN Plan of Action for Energy Cooperation (APAEC), with the ASEAN Centre for Energy (ACE) playing a central role in facilitating regional cooperation. It's noteworthy that even though APAEC Phase II: 2021-2025 has elevated its energy efficiency objectives and introduced more specific renewable energy targets, the plan still emphasises the optimization of clean coal technology (CCTs) as one of its program areas, rather than considering its discontinuation. An alternative approach could involve a shift away from coal, along with efforts to reduce its role, by placing more emphasis on repurposing coal assets or phasing out coal usage entirely. Instead, a stronger direction could be set by introducing clean energy technologies like renewable gases (e.g., green hydrogen and biogas) and biomass. Such a shift would send a more potent signal in favour of the clean energy pathway within the region.

The prioritisation of investment funds should then be channelled to ensure that there is access to financing for renewable energy projects. To achieve ASEAN's renewable energy and energy efficiency targets by 2025, the region will require approximately USD 300 billion in investments. There is a noticeable disparity in raising investments between medium-to-large-scale projects and higher-risk projects, particularly smaller projects in rural off-grid areas and research and development initiatives. Some programs and mechanisms led by international development banks, in collaboration with the local public sector, have shown ways to bridge this investment gap. For instance, the energy transition mechanism (ETM), formed through a partnership between ADB, the Philippines, and Indonesia, allocates funds for research and development aimed at retiring or repurposing existing coal-fired power plants and developing new clean energy technologies. However, achieving the necessary scale of investments will require more extensive intervention and cooperation beyond the scope of these existing prgrams. This could involve promoting the success of these programs to attract additional support, sharing knowledge, and replicating successful models across a wider range of countries inthe region. Furthermore, certain countries in the region have introduced mechanisms like carbon pricing and carbon taxes, aimed at discouraging investments in fossil fuels. Vietnam stands out as a leader in implementing an Environmental Protection Tax (EPT), with the revenue generated contributing to programs with environmental advantages. However, it's important to note that the region has yet to establish a carbon market. Additionally, all ASEAN countries have re-evaluated their investments in fossil fuels and have raised the proportion of renewable energy in their targets

However, these efforts appear to represent a moderate step, primarily focusing on substituting fossil fuels (e.g., transitioning from coal to gas) rather than comprehensive transformation.

With the growing demand, investments should also be prioritised for energy efficiency projects. Energy efficiency is known as the “fifth” fuel, and it is imperative to promote and improve energy efficiency across the region. All member states have introduced various energy efficiency initiatives spanning the power, transportation, and heating/cooling domains. However, it's worth noting that only three countries — Brunei Darussalam, Singapore, and Thailand have established comprehensive targets encompassing all these sectors. Thailand serves as an illustrative example, as it outlines its strategies and measures that encompass both mandatory and promotional approaches, clearly demonstrating how these efforts will contribute to the established energy efficiency goals. Besides, there are regional-level targets for energy efficiency, ongoing initiatives to standardise energy-efficient appliances, and a certification program for energy management. To ensure the effective implementation of energy efficiency measures, there's a pressing need for well-defined targets that span various sectors, a coordinated set of measures, and enhanced collaboration among ASEAN nations at the regional level. Such coordinated efforts are essential for realising the full potential of energy efficiency in advancing the clean energy transition and reducing greenhouse gas emissions across the ASEAN region.

Table 3. *Examples of energy efficiency policies across member states (Rosalia & Nasution, 2023).*

Theme	Country	Policy
Energy conservation and utility reduction	Philippines	Implement energy conservation practices, targeting a minimum of 10% savings in electricity and fuel consumption.
	Thailand	Electricity-saving campaign for households and businesses.
Facilitation of efficient energy use	Indonesia	Regulations for energy management and conservation.
	Cambodia	National Energy Efficiency Policy to reduce carbon emissions and enhance energy sector resilience.
	Singapore	Energy Efficiency Grant, offering funding support of up to 70% for adopting energy-efficient equipment.
	Thailand	Vietnam Scaling Up Energy Efficiency Project (VSUEE), has announced a 50% credit guarantee to increase participation in energy-efficiency sub-projects.

To put it simply, it is never a zero-sum game. ASEAN member states should work collaboratively to expand necessary energy infrastructures beyond borders. The ASEAN Power Grid (APG) program is a significant initiative for promoting multilateral power trading in the region. It represents the first multilateral trade agreement involving four ASEAN Member States. Recent research has underscored the economic viability of this program and highlighted the necessity for integrating 19,918 MW of renewable energy from cross-border trade to help ASEAN meet its renewable energy target by 2025. At the national level, many ASEAN countries have integrated grid modernisation or smart grids into their Power Development Plans (PDPs). In addition to physical infrastructure development, organisational reforms play a crucial role in expediting the deployment of renewable energy. For instance, Thailand is in the process of implementing organisational and procedural reforms to streamline permitting and approval processes, enabling a faster and more effective rollout of renewable energy projects. Similarly, Lao PDR and Myanmar emphasise the importance of energy infrastructure to support their rural electrification programs.

In a nutshell, ASEAN's path to a sustainable energy future is fraught with the legacy of fossil fuel dependency but is also ripe with reformative potential. The shift from traditional subsidies to cleaner fuel alternatives, the reallocation of resources towards energy infrastructure, and the prioritisation of investments in renewable energy and energy efficiency are pivotal steps forward. The ASEAN Plan of Action for Energy Cooperation (APAEC) and the ASEAN Centre for Energy (ACE) play crucial roles, yet a more decisive move away from coal towards renewables is necessary. Bridging the investment gap for smaller, riskier projects and R&D is essential, as is the promotion of energy efficiency across the region. Collaborative efforts like the ASEAN Power Grid (APG) program are key to a cohesive energy strategy. Empowering the youth with the awareness, knowledge, and skills to drive this transition is critical, and with strategic investment and collective action, ASEAN can lead in the global clean energy shift.

5.1.2 Ensuring access by removing gender disparities in energy transition

A lesson learned from the past, the social impact of the transition process is carefully considered, especially on gender disparities, in which both women and men are unequally benefited and affected by limited access to energy services both in society and household scale and the health risk that comes with it (Feenstra & Özerol, 2021). For example, in the fossil fuel industries, the ASEAN statistic shows that 92% of the workers in the fossil fuel production sector are men (Fig 1). A similar proportion is also seen in industries highly dependent on fossil fuels. Interestingly, more women involvement can be seen in manufacturing-related products but still represent less than half of those employed (Duerto-Valero et al., 2021

Hence, in the Sustainable Development Goal (SDG7) context, universal access to affordable, reliable, and modern energy services is explicitly linked with SDG5, gender equality targets. In fact, according to the UNWOMEN, the SDG5 is the only goal that "sits at the intersection of economic and environmental issues" where gender equality is recognised as a commitment within a commitment (UNWOMEN, 2023). Therefore, addressing gender biases is an essential aspect of the energy transition and it is required to achieve the target of modern energy for all. This was further emphasised in the UN General Assembly, where Parties were called to put more effort into increasing opportunities for women in the energy sector and the need for equal access to clean energy for enhanced economic and social empowerment (UN, 2019).

Although closing the gender gap has been one of the main goals for SDG, a notable gender gap persists in the renewable energy sector, a sector dominated by male (IRENA, 2019). Existing gender and energy literatures has highlighted three main issues with gender disparities in energy transition, which are;

1. Women's access to energy (de Groot et al., 2017; Dutta et al., 2017; Johnson et al., 2019; Pueyo & Maestre, 2019; Winther et al., 2018);
2. Women's representation in the energy workforce and in decision-making (Emmons Allison et al., 2019; Fraune, 2015); and
3. disproportionate harm that women experience from environmental degradation (Bell et al., 2020).

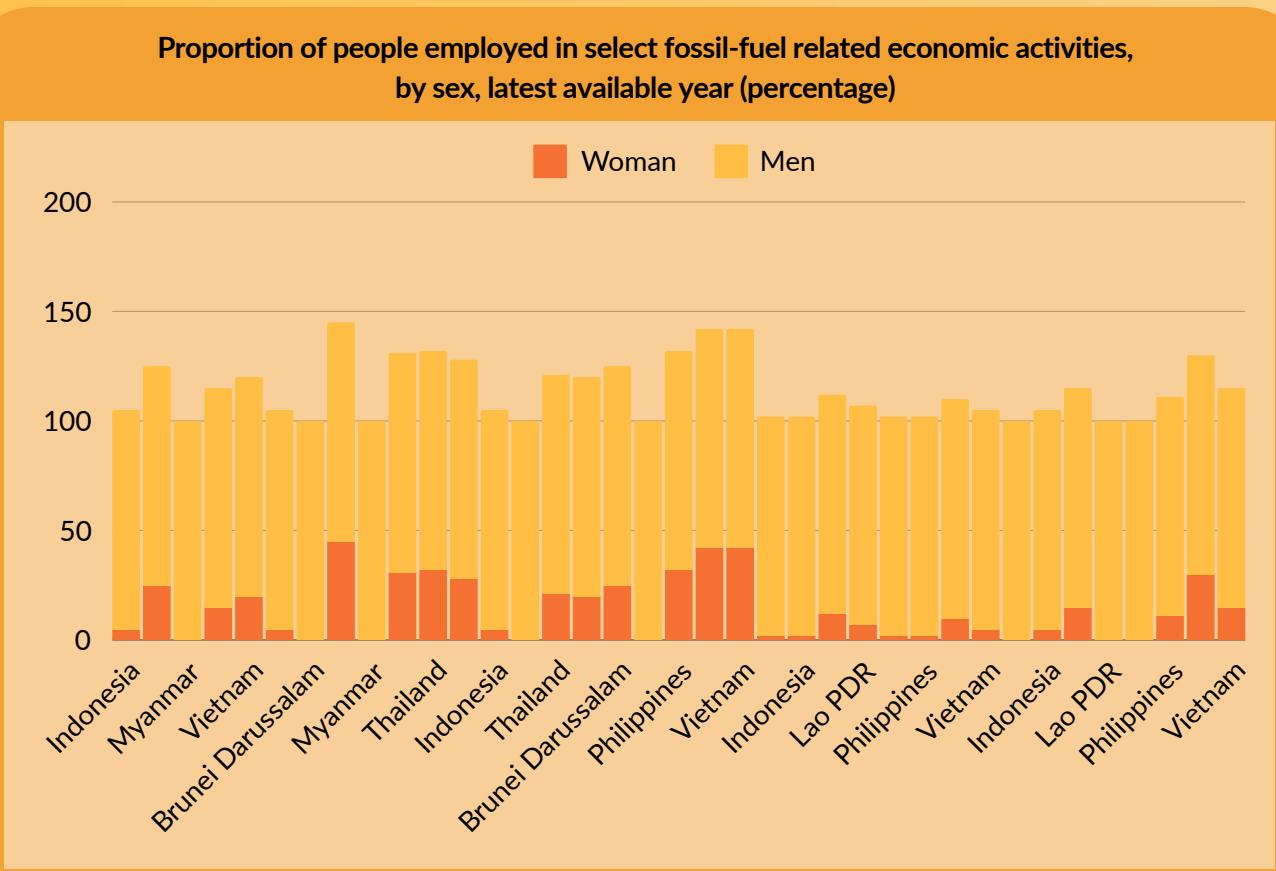


Fig 4. *Proportion of people employed in select fossil-fuel-related economic activities by sex (Duerto-Valero et al., 2021)*

Approaching the energy transition process with a gender-neutral point of view will result in a gender-blind and insensitive to women's special needs policies, yielding a multifaceted and highly context-dependent electrification. Some of the examples are; hampers a fair energy distribution between women and men, denies the gendered energy needs, and contributes to unequal participation of women and men in the energy sector (Feenstra & Özerol, 2021). For instance, in obtaining subsidised connection or liquefied petroleum gas (LPG), registration may require a bank account and extensive paperwork, which places women and their enterprises (which are mostly informal) at a disadvantage (Dutta et al., 2017). To further exacerbate the conditions, a gender-blind approach to the energy transition, policymakers could deprive half of the potential workforce of its benefits, and electricity suppliers could be missing half of their productive consumers which are closely linked to poverty and economic instability (Pueyo & Maestre, 2019).

Highlighted by Wilhite (2016), women play a central role in society especially across the Global South bearing far greater responsibility for the role of caregiver. It is often involved in producing essential home energy services, such as light and heat, cooking, laundry, hygiene activities and schoolwork. Therefore, limited access to energy means hindering efficient performance for women in doing daily household chores. Denoting that, women are spending more time doing chores, making it impossible to get educated and have a career outside their family unit, affecting the overall economic productivity. Addressing the gender inequalities in the clean energy sector, will result in a multiplier effect in supporting the involvement of women's role from consumers to entrepreneurs and later becoming leaders. Hence, energy access for all serves as key in poverty reduction and economic advancement enablers (Merdekawati et al., 2022).

Energy access increases productivity and enables new industries to thrive, ultimately contributing to improved social and economic outcomes for individuals. Energy access definition by the IEA, modern energy access to clean cooking facilities, a first connection to electricity, and then an increasing level of electricity consumption over time to reach the regional average. Figure 3 shows the current and 2030 projection of energy access in the Southeast Asia region based on the currently implemented policies scenario and sustainable development scenario. The data shows an estimation of about 5% of the population in Southeast Asia (around 33 million people) are currently living without electricity. Based on the data, the region has improved its access to clean cooking with the share of the population using clean fuels and technologies rises from 45% in 2010 to nearly 70% in 2019.

It is well established by the scientific communities that energy access limitations are inextricably intertwined with economic, social and health issues (Nguyen & Su, 2021). **Table 4** showcases the current status of each ASEAN member state for energy access, electricity access policy, gender gap index and the nation's poverty rate. From **Table 4,** among the ASEAN member states, Myanmar has the lowest percentage of electricity and clean cooking access, about 51.6% and 9% respectively. Myanmar has the lowest energy access due to 70% of its population being located in the rural areas where it is difficult to connect with the national grid because of a very remote location and entails exorbitant costs (DoP, 2015; EuroCharm, 2019). However, Myanmar's electricity access policy and regulations received an average score of 60 in the Regulatory Indicators for Sustainable Energy (RISE) assessment. The country's comprehensive national electrification plan and affordable electricity prices are the primary factors contributing to this average score. The gender gap index for the country is the second lowest, with an index of 0.691. In terms of the poverty rate, about 1.99% of Myanmar's population are below the 2017 international poverty line, household income of $2.15 a day.

Table 4. *Current status of energy access, electricity access policy score, 2023 gender gap index and the latest available poverty rate for ASEAN Member States.*

Country	Electricity Access	Clean Cooking	Score on Electricity Access Policy and Regulations	Gender GAP Index	Proverty Rate (International Line)
Brunei Darussalam	100%	100%	NA	0.693	NA
Cambodia	82.5%	44.5%	60	0.695	NA
Indonesia	99.21%	86.9%	71	0.697	2.47%, 2022
Laos	100%	9.3%	44	0.733	7.14%, 2018
Malaysia	100%	93.8%	NA	0.682	0.01%, 2018
Myanmar	72.47%	9%	60	0.691	1.99%, 2017
Philippines	97.49%	48%	71	0.791	NA
Singapore	100%	100%	NA	0.739	NA
Thailand	100%	85.1%	NA	0.711	0.01%, 2021
Timor Leste	100%	NA	NA	0.693	24.4%, 2014
Vietnam	100%	96.1%	NA	0.711	0.65%, 2020

*Electricity access data source, 2022 (ACE, 2022a); Clean cooking data source, 2021 World Data (**https://tradingeconomics.com/**); Score on electricity access policies and regulation source, 2021 RISE (**https://rise.esmap.org/scores**); Gender gap index source, (WEF, 2023); Poverty rate source, based on 2017 PPP rates International Poverty line (**https://pip.worldbank.org/country-profiles/**)

The consequences of dependencies on traditional biofuels are health problems (i.e., indoor air pollution, physical injuries during fuelwood collection, lack of refrigeration and medical care (Sovacool et al., 2012)) and income degradation (Sarkodie & Adams, 2020). However, due to the gender divisions of roles, the consequences of limited energy access differs between women and men, as women are the one taking care of cooking and other household chores (Moniruzzaman & Day, 2020; Rodriguez-Alvarez et al., 2019).

As a result, women are more affected by the limited energy access than men. Highlighted by Zhu and Chang (2020) availability of resources can be associated with lower gender inequality, henceforth, limited energy access may be the cause of gender inequalities. The gender disparities in energy access are globally discussed in two different women's roles: (1) the household realm and (2) economic empowerment.

In the household realm, there is strong evidence of the link between limited energy access in the household realm, it is impacting the women's health burdens, use of time, and access to information (Pueyo & Maestre, 2019). In terms of health burdens, in addition to the indoor air pollution exposure, women are also exposed to the musculoskeletal disorder, safety and mental health issues through drudgery work done when collecting the energy sources (Seedat & Rondon, 2021) The women suffer heavily from limited energy access as women spend more time obtaining and using cooking fuels in addition to performing other household chores (Krishnapriya et al., 2021).

Case Studies: Women in rural areas of Myanmar

In Myanmar, the women located in rural areas are the most impacted group as they are the ones who are responsible for household chores and cooking. The primary sources for lighting are wood, kerosene, candles and diesel generators, while fuelwood is used for cooking and heating. Under the patriarchal structure of Myanmar, the responsibilities of collecting fuel woods for the household are automatically borne by the women. Therefore, a large portion of the women's time and effort are spent in collecting fuelwood for cooking and heating. The interviewed women in rural areas of Myanmar mentioned the need of spending time in front of the open-fire cooking as to control the flame by putting extra firewood or blowing air onto a fire, if not the rice will burn easily. Women spend their time in front of an open flame three times a day: breakfast, lunch and dinner. Limited access to energy does not only force the women to spend their time inefficiently, but also exposes them to high health risk. (ADB, 2017; UNDP, 2013)

Global data suggested that gender inequality is strongly correlated with national poverty levels, as measured by the proportion living under $1.25 a day, in which tackling the former means mitigating the latter. Energy access programs that are coupled with meaningful income-generating activities can play a critical role on both fronts. Analysis of country-level data shows that the greater the proportion of a country's population that has access to electricity, the greater its gender equality – regardless of the proportion of its population living under $1.25 a day. Evidence from Brazil, one of the top 20 "fast-moving" countries in terms of electrification, is consistent and compelling, where girls in rural areas with access to electricity are 59% more likely to complete primary education at the time they are 18 years old than those without (Fig 7.).

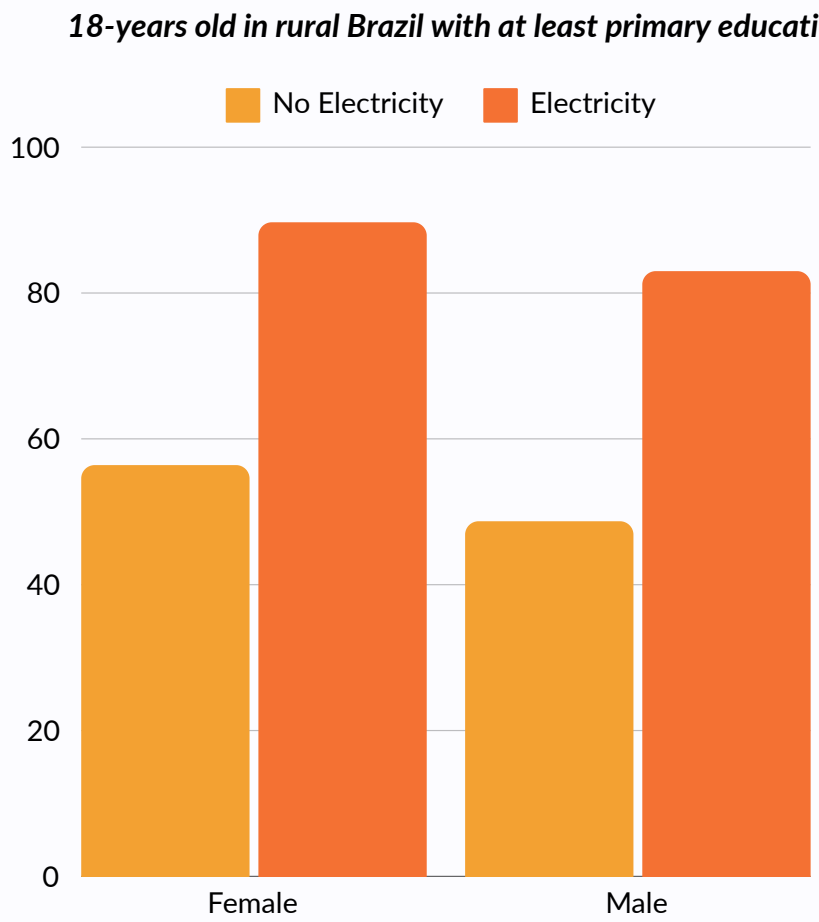


***Fig 7**. Energy access and education in Brazil.*

In terms of their productive role, women entrepreneurs and employees face different challenges than men to use and derive benefits from electricity mainly because women and men operate in different types of productive activities at different locations and have different access to the previously identified key enablers- assets, finance, markets, infrastructure, and skills (Feenstra & Özerol, 2021). The gender gap is driven by unequal access to education, limited access for women to technical skills and training opportunities as well as unfair company policies (IRENA, 2019).

Case Study: Impact of limited energy access on health, education and earning opportunities of a Cambodian household

A study has been conducted in Cambodia to understand the impact of limited energy access on the health, education and earning opportunities of a household. The limited access to energy affects the school attendance, especially the child. The first reason would be the involvement of the children in collecting firewood or doing other household chores. Resulting in a higher school dropout rate for the household without energy access. As the result shows, the rural households with limited energy access are spending a significant amount of their income on healthcare costs, especially respiratory problems, suggesting that the use of firewood and kerosene affects the health of those with limited energy access. The study also found an increase in school dropout rate, increase in respiratory diseases would reduce the earning ability of energy poor households by 48% compared to the non-energy-poor group (Phoumin & Kimura, 2019).

On the global front, the United Nations launched its Sustainable Energy for All (SEforAll) initiative and declared 2014-2024 the Sustainable Energy for All Decade. One of the objectives of SEforAll is to address gender equality in to meet the SDG7, the critical role of women and youth in the energy transition is acknowledged but often they are left out in the decision-making process and have limited access to energy technologies, employment opportunities and finances (SEforALL, 2021a). In terms of a gender-balanced workforce, be it the conventional fossil-fuel energy or the clean energy sector, both are behind others as women in the sector are lacking in support systems, role models and enabling environment such as public and company policies to aid their career advancement.

The main program instigated by SEforAll in reducing the gender gap is the Women and Youth at the Forefront programme. Several core activities have been conducted through this program, for instance, internship, mentorship and technical training opportunities for women in the energy sector, and elevating women as visible leaders of SDG7 through sponsorship to attend and speak at key industry events (SEforALL, 2021b). The activities conducted involve several countries in Asia, Africa and Haiti.

The Asian Development Bank launched the Energy for All Partnership, which aims to provide access to safe, affordable modern energy for an additional 100 million people in the region by 2015. Based on the report produced by the World Economic Forum (WEF), as an effort in narrowing the existing workplace gender gap, the private sector has implemented a Diversity, Equity and Inclusion programme (DEI) (WEF, 2023). Figure 3 shows the share of organisations surveyed in the Gender Gap Report 2023, that select women as the priority of their DEI program.

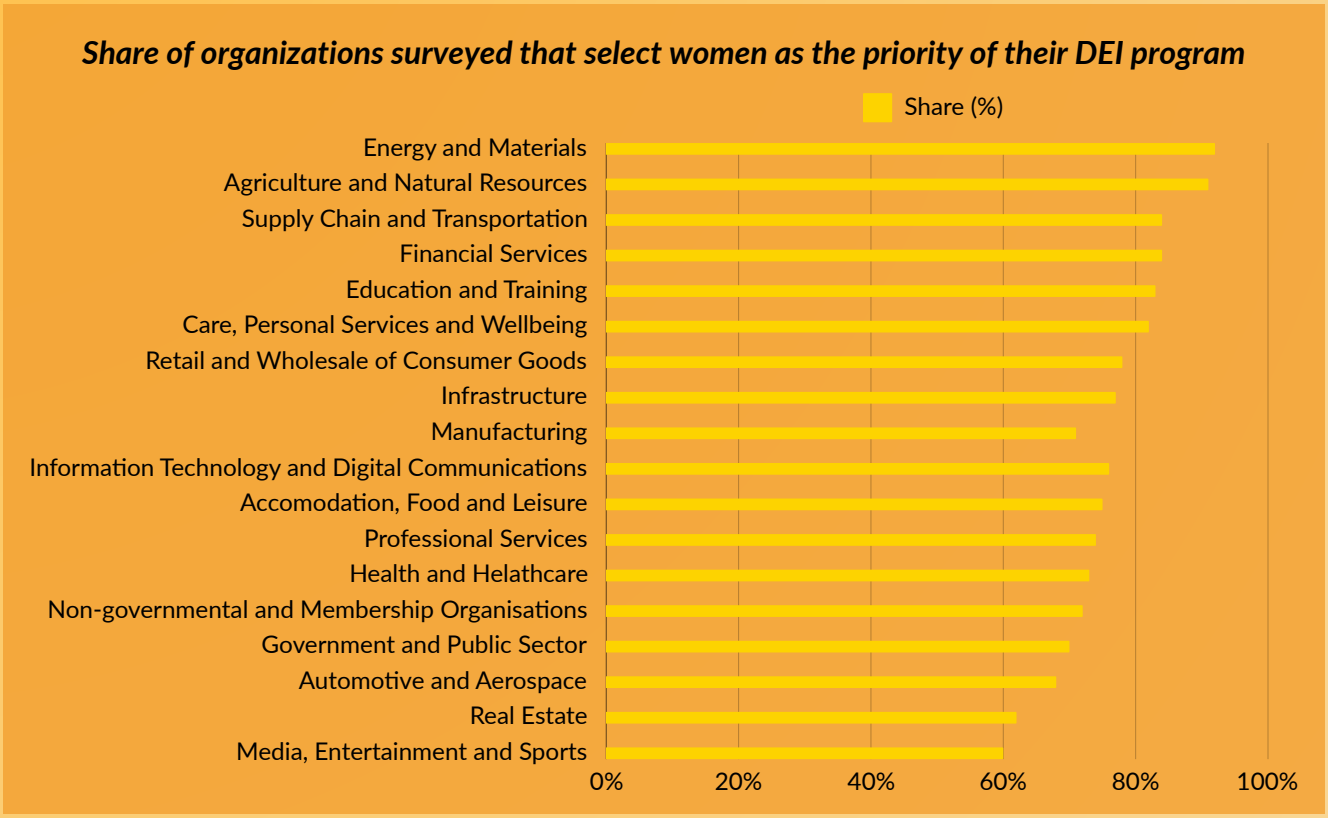


Fig 8. *Share of organisations surveyed that select women as the priority of their DEI program (WEF, 2023).*

On the regional front, there are several programmes which are in-flight (shown in Table 6), conducted by some ASEAN member states in closing the gender gap for efficient energy access and improved energy sources. The first example is ICoProDAC with the objective to introduce an efficient improved cookstoves (ICS) by establishing the manufacturing and distribution network for ICS in Kampong Cham Province, Cambodia (ADB, 2019). The program includes a gender action plan to address the needs of women and the poor in access to energy and reported to achieve key gender equity results, including increasing efficiency in the use of time for women, economic empowerment, and human capacity development. Indonesia has several programs conducted with different objectives respective with issues to be addressed and project implementation locations. The wonder women program aims to make clean energy technologies available to people residing in remote locations through a structured and strategic distribution network of primarily female sales agents that sells solar lights, water filters and cookstoves (Kopernik, 2018).

The Yayasan Rumah Energi has executed the program BIRU to provide alternative and clean energy sources (i.e., biogas) for cooking while solving the issues of domestic organic waste generation (YRE, 2021). The program was implemented since 2009 and is still actively disseminating renewable energy through small-scale household biodigester systems, where up-until 2021, 26,828 units of BIRU has been constructed in 19 different provinces in Indonesia. A non-profit organisation in Indonesia, Institut Bisnis dan Ekonomi Kerakyatan (IBEKA) plans to empower the rural community through the installation of a community owned small-scale hydro power plant (both off-grid and grid connected) (Parry, 2020). The method used by IBEKA requires high local community involvement as they become the owners of the energy systems, making decisions for its design and operation, and are able to sell energy to the national grid supplier.

BIRU Program

BIRU Program Operation Map

SCALE (Strengthening Access to Improved Cookstoves in Myanmar)

Apart from Cambodia, Geres, a development NGO is also facilitating wide scale access to cleaner energy and more efficient cookstoves in Myanmar. Programs SCALE (Strengthening Access to Improved Cookstoves in Myanmar) and REACH (Rural Energy Access for Communities and Household) does not only provide solutions for limited energy access, but to address the gender disparities issues as well. The project planning involves women as important stakeholders to obtain their perceptions and understand their barriers in participating in the program as stove producers and entrepreneurs (GERES, 2015).

Table 6. Energy and gender access programmes in ASEAN and Timor-Leste.

No.	Country	Programme	Project Objectives	Developer	Financier
1	Cambodia	ICoProDAC, (Improved Cookstove Producers and Distributors Association of Cambodia). Promotion of Improved Cookstoves in Kampong Cham (ADB, 2019)	Biomass energy and improved cookstoves	Geres	Undisclosed
2	Indonesia Nusa Tenggara	Wonder Women (Kopernik, 2018)	Solar lights, clean cookstoves	Kopernik, ENERGIA	Philanthropic funds from individual donors and corporate grants
3	Indonesia Java, Nusa Tenggara, South Sulawesi	BIRU (Indonesia Domestic Biogas Programme) (YRE, 2021)	Biogas	Yayasan Rumah Energi	Blended finance from private sector
4	Indonesia	Multiple energy access programmes (IBEKA, 2022)	Micro hydro power plant	IBEKA	Multiple governments and multilateral agencies
5	Myanmar	SCALE (GERES, 2019b)	Fuel-efficient cookstoves	Geres	Agence Française de Děveloppement (AFD)
6	Myanmar	REACH (GERES, 2019a)	Solar home systems in off grid villages, energy efficient appliances in on-grid system, improved cookstoves	Geres	Agence Française de Děveloppement (AFD)
7	Philippines	33 kW micro hydropower in Tinglayan	Community-based renewable energy	SIBAT	Government of United Kingdom
8	Vietnam	Multiple rooftop solar projects	Solar PV power plant	GreenID	European Union, United Nation Development Programme (UNDP)
9	Timor-Leste	Lampu Diak	Solar lighting		
10	Timor-Leste	Access	Solar home systems and solar-powered water pumps	Ministry of States Administration, Timor-Leste	United Nations Development Program (UNDP) and Korea International Cooperation Agency (KOICA)

5.1.3 Addressing the industry-relevant skillset and ensuring green job readiness

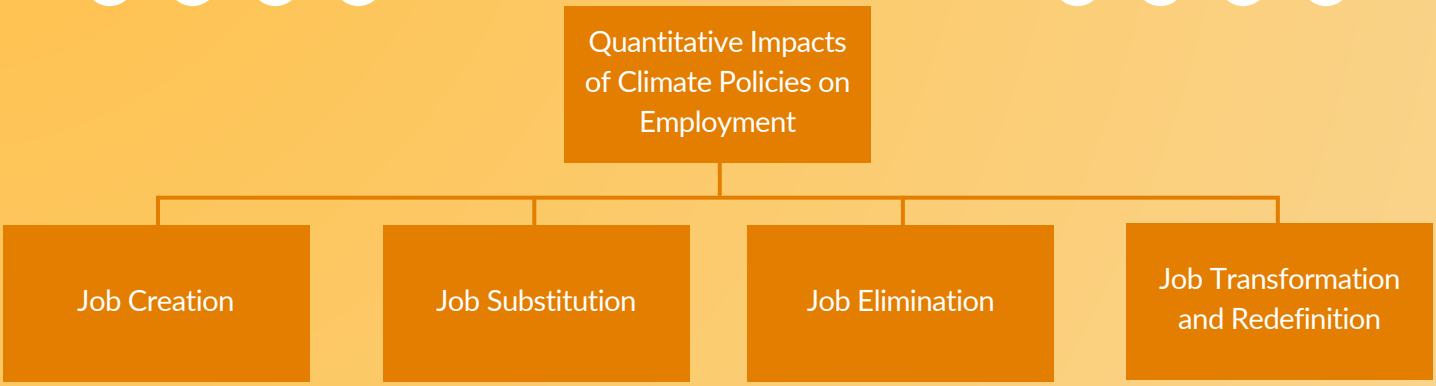


***Fig 9**. Quantitative Impacts of Climate Policies on Employment (UNFCCC, 2020)*

Transitioning to clean and sustainable energy requires fundamental restructuring of the energy supply sector that depends mainly on fossil fuel. Consequently, climate policies aimed to advance global transition to a low carbon economy surely have profound impacts to communities and will potentially disrupt the lives of the affected communities. In Southeast Asia, the number of workers affected by mitigation policies is expected to be large, reflecting from its fossil-fuel based energy system. Several countries in ASEAN are also the largest global coal producers like Indonesia and Vietnam, while Malaysia and Brunei are leading in the global oil production market. Thus, fossil energy provides many jobs. Despite the potential offset by jobs generated through renewable energy dispatchment, the potential job losses from fossil fuel phase out is projected to reach 1.7 million by 2050, with 4.4 million jobs will be declined following the decline in fuel extraction activities (IRENA, 2023).

From a conceptual perspective, there are four ways the number of jobs in the energy sector will be affected by climate mitigation policies as the world swivels towards greater sustainability. Firstly, climate mitigation policies will create new types of jobs and open opportunities for further employment in the renewable energy sector. As the need for low carbon intensive products increases, services and infrastructure will translate to higher labour demand related to-renewable energy production across many sectors of the economy. The employment doesn't only consist of direct jobs but also jobs along the supply chain. Secondly, some existing jobs will be substituted because of shifts in the economy to cleaner and more efficient sources, using low carbon and less polluting technologies in the process. Thirdly, certain jobs will either be phased out or massively reduced in numbers without direct replacement or substitution. As the world achieves net zero in the energy sector, some jobs related to high carbon sources production,-

-manufacturing, and services will be phased out entirely. This will cause substantial job losses both in primary and secondary sectors. Indirect job losses are inevitable due to the closing of the primary producing sector. Lastly, many existing lines of work will have their work practices, skillset, and methods transformed to cater to the established sustainability practices (UNFCCC, 2020). Despite the enormous job creation potential derived from energy transition, green jobs creation may not happen at the same time or at the same pace as job losses occur. To prevent the imposition of a large burden on affected workers and communities during the transition process, mitigation policies need to be carefully planned and implemented as soon as-possible. There is a need to focus on skills and education policies to facilitate workforce transition and improve employability. This is paramount because without skilled workers, the shift to a low carbon economy will be neither technically feasible nor economically viable. Studies have shown that the pursuit of climate policies have resulted in meaningful employment gains and creation of many jobs. Hence, the longer the mitigation action is delayed, the more change will need to happen in a compressed timescale and the more pressing the need to quickly adapt will be. Planning and implementing policies in a timely manner can avoid creating more pronounced and widespread employment impacts.

Policy Instruments to Support Green Jobs Readiness

ATTAIN NET ZERO FUTURE

Just Transition is a precondition to attain the net zero future. As Southeast Asia paves its way to clean energy, green jobs since then have become a high priority in the Southeast Asia region. Countries in Southeast Asia have shown commitment in promoting green employment in clean energy and developing policies to support a low carbon economy. These commitments are bringing attention to the human capital required to achieve net zero that faces hurdles catering to the needs of clean energy transition. The lack of skilled professionals to help accelerate the transition poses a major challenge for the achievement of common renewable energy advancement of 23% by 2030. Although discourse on green jobs also involves decent work conditions, this section will only specifically discuss the topic of green jobs creation and employment, further elaborating the policy implications to promote green employment in the Southeast Asia region.

To encourage the increased number of green employment, there are three policy areas that act as pillars for building enabling conditions and supporting the environment, namely:

- Demand-creation for green jobs;
- Green jobs supply enhancement; and
- Stakeholders involvement

The policy areas can be broken down into specific action topics related to green employment, as seen on the graphic below.

Table 7. *Green Jobs Creation Policy Readiness Assessment among ASEAN Member States (ILO, 2021).*

Policy Area	Brunei	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
Development policies establishing the green agenda										
Industrial and sector policies for greening										
Enterprise policies and initiatives for greening										
Skills development for green skills										
Active labour market for greening										
Cross-cutting issues - Labour rights, standards & social dialogue processes in greening										

Green: Significant Policy Elements in Place | **Yellow:** Some Policy Elements in Place | **Red:** Limited/No Policy in Place

Among Southeast Asia countries, there have been discrepancies between some of the policy areas related to green employment. All ASEAN Member States (AMS) currently has green policies in place, in hope to generate demand for clean energy and therefore the demand for green skills, including promoting green initiatives by enterprises. However, this policy is not in parallel with policies enacted to expedite labour supply to the green jobs market. Only three to four countries among AMS have skill development and green labour market related policies.

Despite the lack of strong framework for green skill development and education structures, between these two policies areas that directly influence green skills supply in the market and employment, substantial gap has been shown in establishing active labour market for green skills with 5 out of 11 AMS have limited or no policy in place to connect supply with demand. This finding highlights the importance of establishing significant policies related to capacity building and labour infrastructure that support green jobs. Furthermore, although the mapping of social dialogue in this context specifically relates to employment decision-making, only a handful of countries have already established robust social dialogue processes in transition to green jobs.

This finding can serve as a reflection that there are still limited platforms available for stakeholders to participate in driving green job creation and green employment, including youth.

To overcome these barriers, robust policy instruments should be established to support green jobs readiness. Some of the policies that can be enacted include creating enabling conditions for clean energy deployment, bridging the skill gaps and providing link to connect labour supply and demand as well as increasing stakeholder participation in advancing workforce transition to cleaner energy and greener industry. Some efforts that can be carried out are;

Creating Supporting Condition for Clean Energy Deployment

Green and low-carbon policies are closely interlinked with the growing demand for green skills. In fact, strong climate policy is a key driver of green jobs creation. This is due to a strong signal for the market to favour low-carbon products and services is influencing more businesses and services to centre their activities in low-carbon products, services, or technology. Thereby, increasing the demand for people working in low-carbon fields (green jobs). Some key policies that are affecting greening of the labour market are climate policy such as the plan to achieve the climate goals through the Nationally Determined Contributions (NDC), energy policy for example coal phase-out policy and renewable acceleration, the implementation of carbon pricing, and the pivoting of public investments into green infrastructure, research and development, and green procurement. The stronger the commitment and policy are for renewable energy adoption, the bigger green jobs potential a country can generate. It has already shown that countries in Southeast Asia who are advancing renewable energy sources such as Vietnam have been creating numerous job opportunities.

Another important intervention that might be necessary to drive support for the clean energy transition is the approach for the private sector. As the private sector is one of the key actors in driving green jobs, promoting enterprises' involvement in clean energy transition is critical. Therefore, policies and mechanisms to encourage low-carbon activities from the private sector remain pivotal. As shown in Table 2, some countries in Southeast Asia are still lacking adequate policies to facilitate enterprises to take part in the transition. Subsidies and access to finance for greening production and employment, support for commercialisation and green entrepreneurship, and the creation of new,

-green markets are some of the policies that can be established to encourage private sector activities in the green economy (Sharpe and Martinez-Fernandez, 2021). Sustainable enterprise development and green jobs creation can be uplifted by the enactment of a clear and supportive regulatory framework that mainstreams clean energy transition across all areas, fostering cooperation and coordination between various actors and providing channels to stimulate demand and market for green goods and services. To assess clean energy policy readiness and its employment implication, policymakers can refer to policy mix elements in developing supporting policy and framework, as follows:

Table 8. *Policy Framework to Promote Green Jobs and Clean Energy (Sharpe and Martinez-Fernandez, 2021, Curated by Authors)*

Category	Policy Mix Elements
Policies assessing and responding to employment implications of greening	**National Development Framework** • Strong and ambitious NDC that is mainstreamed across levels and sectors. • Harmonised and strong regulatory framework on climate and clean energy transition • Green agenda established in National Development Framework/Plan. • Climate Change Impact and Assessment Plans. • Links to International Agreements and standards.
	Macroeconomic Policies • Specific fiscal, monetary and trade policies to promote clean energy transition and environmentally sound practices. • Fossil fuel pricing, carbon taxes, or energy subsidy reform.
	Public Investment Leveraged for Green Jobs • Infrastructure investments that include climate and green jobs. • Green procurement policies. • Green innovation/R&D support
	Industrial and Sector Policies • Targeted sectors for green employment acceleration. • Sector-specific policies to improve clean energy adoption.
	Enterprise Policies • Information, assistance, and financial incentives for greening the private sector. • Green entrepreneurship support, including support for women and youth. • Business resilience programme in particular MSMEs, to avoid disruption of economic activity and loss of assets, jobs, and incomes. • Assistance programme to support transition to cleaner energy from high-carbon and resource-intensive operations.

Bridging Skill Gaps and Establishing Active Labour Market

GREEN SKILLS

As discussed in the previous section, most Southeast Asian countries have a green economy and/or clean energy strategies integrated into their policies. However, gaps exist in providing skill development and establishing an active labour market. Only a limited number of countries have the strategies embedded and implemented. Enhancing the capacities of people through the acquisition of green skills is critical to the broad promotion and creation of green jobs in the economy. The gap presents in knowledge and data sources of green jobs and employment hence limiting understanding on country and sectoral level supply and demand drivers for green jobs. The gap is also shown in education structures, particularly TVET systems (ILO, 2021). For green skills to adequately diffuse within the workforce, there needs to be deeper understanding about-

-types of green skills needed and how they are different to the skills that are already in the market and workforce, to help craft the reskilling or upskilling needs for clean energy transition. Understanding this information can help government, enterprises, and the public to better navigate the complexities of energy transition while reaping the most benefit and minimising unproportionate burden to those most affected by the transition. Bridging the skill gaps and connecting supply with demand will need structural reforms.

First, there needs to be a dataset identifying the skills needed or required for clean energy transition. To do that, a common definition for green jobs is essential to allow knowledge sharing of green jobs analysis across regions and to help create accessible job platforms across countries-

-in Southeast Asia. The dataset then highlights potential green jobs generated, what are the skill needs, where the energy transition hotspots are located, how many employment opportunities are made, also the occupiers of green jobs by age, gender, and location. The information then can be used to design skill development/education policies and programmes, create a green labour market and mechanism that drives green employment, and eliminate barriers to participate in opportunities from clean energy transition. Training should be designed to match supply and demand and anticipate evolving skill needs in accordance with skill needs assessment and labour market information. Information from assessment can also be developed into a taxonomy of green skills.

For example, The European Commission has published a taxonomy mapping and identifying skills needed for green transition. The taxonomy will act as a guideline that provides common understanding of which skills are needed for a fruitful and fair green transition in the labour market. Thus, helping decision-making and private actors include essential green elements in crafting and designing vocational education and training (VET) or in-house training (European Commission, 2023). Some of the most in-demand high-skilled occupations in low-carbon activities are business specialists, architects, engineers, technicians, and physical scientists with five broad skill groups, different from its generic jobs counterpart are expected to be acquired by the labour force: cognitive, IT, management, social, and technical skills.

The gap is particularly pronounced for technical, managerial, and to a lesser extent, social skills. Specifically, a lot of green job vacancies ask for a more complex skill portfolio than high-carbon jobs for engineers (GRI, 2021). This finding shows the importance of equipping the workforce with skills that match both the demand and the requirement to actually implement clean energy deployment.

These market-driven skills need to be mainstreamed into training systems and education curricula, both in vocational and technical education. Skills for low emission jobs should have specific competency standards to encourage worker participation as well as integration into the TVET system. Furthermore, mainstreaming the teaching of skills required for clean energy also needs to be taught to transitioning industrial workers, both through reskilling training programs and in course curricula at fossil energy-focused faculties such as petroleum mining, machinery, and industrial engineering. This can be done in collaboration with the private sector, including on-the-job training. In addition, the government can encourage the acquisition of both generic skills and skills in science, technology, engineering, and mathematics by incorporating them in curricula for basic training and lifelong learning (ILO, 2015a).

More importantly, there also needs to be a push to increase the participation and quality of STEM education among Southeast Asian countries. As Southeast Asia is struggling with a limited number of STEM graduates and low-quality STEM education, Southeast Asian countries need to undertake education system-

- reforms to encourage enrollment in STEM fields and foster innovation and development of new technologies while at the same time addressing the lack of teachers and trainers in new green areas. This also includes improving Technical and Vocational Education and Training (TVET) focusing on green skills with improved curricula and quality assurance systems.

Second, women's participation in green jobs also needs to be of closer focus in designing development policy, as women often face systematic barriers to enter the workforce in the energy sector, let alone clean energy. Women also have less access to resources to adapt to climate change. Hence, gender-responsive and gender-specific policies for green jobs and skills are paramount to ensure women have equal access to jobs, opportunities, and access to improve women's participation in clean energy transition particularly green employment. Existing gender inequality in accessing STEM education and training, discrimination in the STEM field, and limited access to work experience will affect women's access to green jobs in the same way they already impact access to existing jobs (Sharpe and Martinez-Fernandez, 2021).

The clean energy transition then must become a pivotal moment to address these barriers. Ensuring equal access to opportunities for skills acquisition and job opportunities such as career development and leadership promotion as well as recognizing a range of green jobs that women have already being a part and will be a part of such as forest stewards, farmers, green entrepreneurs in ecotourism and waste management and engineer will diminish the barriers to encourage women's participation in education and workforce (ILO, 2015b; Power for All, 2020).

Active policy engagement to create conditions and structures necessary for gender equality in green jobs such as raising awareness on women's barriers, providing safe environment and support for women in STEM to develop their capability and skill, also redistribution of unpaid care work are also required as catalysts for better involvement and participation of women in green energy workforce.

Finally, an establishment of an active green labour market that is reaching regional level through regional cooperation remains important. The government should encourage sound labour market policies that help enterprises and workers anticipate the changing market demands by facilitating access to jobs, strengthening employability and training. Another policy package that might be considered to push an active labour market is to introduce active employment policies including, among others, subsidies that allow workers to access education and acquire skills that improve their employability (e.g., on-the-job training or work experience). To assess policy readiness in skill development, policymakers can refer to policy mix elements:

Table 9. *Policy Framework to Promote Green Jobs and Clean Energy (Sharpe and Martinez-Fernandez, 2021; Curated by Authors)*

Category	Policy Mix Elements
Policies developing skills and labour market interventions for greening	**Skills development** • Common definition of green jobs, particularly at the regional level. • Identification of skills needs, including for target groups such as women and youth to develop training and education that cater to the skill needs. • Assessment of adequacy, access to, and availability of green skills training and plans for enhancement. • Integration of on-the-job training into formal training and accreditation system. • Re-training and transition programmes for affected workers.
	Active labour market policies • Easily accessible green jobs and green skills labour market information available by demographics and geography. • Just transition plans and social dialogue in impacted industries. • Labour market policies linked to infrastructure and industry development policies.

Stakeholders Engagement

Green transition including workforce transition depends on active stakeholder engagement and the flow of information among stakeholders and decision-makers. Listening and considering interests of each party enable effective design of transition policies and programmes that cater to the actual needs and gaps. Considering the complexities of energy sector planning, stakeholders' engagement will create benefit and support for the policy and program from greater communication, collaboration, and knowledge sharing. Successful stakeholders' engagement requires active participation of relevant stakeholders. To enable and achieve this, decision makers and private actors should first identify relevant parties to engage through stakeholder identification. Some guiding questions that can help identifying relevant stakeholders are:

1. Who may benefit from the project, both in near and long term?
2. Who may contribute to the project, including through technical knowledge? and
3. Who may be impacted by the project, both in near and long term? (Heagney, 2016).

Once the stakeholders have been identified, they can be engaged to gather and share relevant information and data, consult on key questions, provide feedback on potential obstacles, offer insight on context-appropriate approaches, and disseminate findings.

6.0

CONCLUSION

Our finding underscores the pivotal role of formal education in driving ASEAN youth's receptivity to clean energy transition, with policymakers recognizing the need for educational initiatives. Proactive engagement is evident among youth pursuing energy-related studies, alligning their skill sets with emerging opportunities in the clean energy sector. Furthermore, involvement in volunteerism showcases a broader commitment to environmental stewardship and community engagement, presenting opportunities for stakeholder collaboration. Collaborative efforts between educational institutions, policymakers, and industry stakeholders are imperative for advancing clea energy transition agendas, as highlighted by initiatives such as APAEC 2016-2025. Disparities in educational attainment and awareness levels underscore the need for targeted interventions and effective policy making

The readiness of these young individuals to ignite a revolution in clean energy is palpable, yet they find themselves constrained by entrenched legacy structures. A staggering 70% of ASEAN youths underscore the significance of regional cooperation for the adoption of clean energy. This generation is not just eager for action but also recognizes the necessity of collective efforts. Despite this, a disconcerting disconnect exists between their aspirations and the current state of affairs, with less than half of the young respondents convinced of ASEAN's preparedness for the clean energy transition. They perceive a lack of clear goals and vision as major impediments to addressing climate change effectively. The youth hav pinpointed three principal obstacles to an ASEAN-wide clean energy transition:

1. The absence of political will from governments,
2. Deficiencies in the regulatory and policy framework,
3. The shortfall in inter-governmental cooperation.

These barriers prompt critical questions: How can ASEAN member countries transcend beyond periodic high-level meetings to actual collaborative action? Is genuine cooperation feasible given the diversity in demographics, economic conditions, and policy objectives amongthe member states? The discourse must continue, but with a sense of urgency, as the time for action is now.

Youth also stress the importance of clear regulations, education, and governmental financial support as critical factors in advancing clean energy transition efforts. The consensus mong the youth is unequivocal: 8 out of 10 believe that setting a decarbonisation target for their country is imperative, and they demand it be established without delay. Their concern transcends mere awareness; they are calling for tangible action. The youth firmly believe in the necessity for a synergistic approach between governments and businesses to reduce emissions. They are cognizant of the complexities involved and understand that a multi-stakeholder strategy is essential to surmount this challenge. While recognising the role of governments and businesses, they also acknowledge the existence of significant barriers that impede progress. The top three concerns they have identified are:

A lack of political will from governments, which necessitates a robust commitment to prioritise climate action.

Economic and financial constraints that make it challenging to align climate objectives with economic imperatives.

The need for facilitative and enabling policies that are essential to incentivize green investments and steer the transition.

A significant 92% of youths are prepared to adopt eco-conscious habits and lifestyles, aspiring to live sustainably, yet many are hampered by a lack of knowledge and resources. While 84% envision a future with electric vehicles (EVs) as clean, efficient transportation options, the prohibitive costs and inadequate charging infrastructure present daunting obstacles. Furthermore, 77% are willing to forgo private cars in favour of public transportation, recognizing its potential to mitigate air pollution and emissions, but are deterred by the inconvenience and lack of connectivity. Additionally, 53% express eagerness to volunteer for clean energy initiatives, yearning to contribute to a greener future, yet they seek opportunities and platforms for meaningful engagement.

The youth of ASEAN are not mere consumers; they are the changemakers, the generation poised to inherit the consequences of our collective actions. They refuse to accept a legacy of a planet suffocated by pollution and devastated by climate change.

ASSESSING YOUTH PERCEPTIONS TOWARDS ASEAN'S READINESS FOR CLEAN ENERGY

Research Survey

Section 1

Dear Participant,

We invite you to take part in our research survey, which aims to bridge knowledge gaps and develop a comprehensive ASEAN-wide perspective on how young people perceive the energy transition.

This collaborative effort between ASEAN Youth Organisation (AYO) Research Centre (RECENT) and Youth for Energy Southeast Asia (Y4E-SEA) aims to provide valuable insights that can inform energy policies, empower youth engagement, and drive sustainable energy transitions in the ASEAN region.

With your help, we are creating an extensive report to represent young people's opinions, priorities, and timelines for the clean energy transition. By working across the ASEAN region, the report will develop the region's comprehensive policy recommendation by engaging with young people in the energy transition, understanding that the energy system presents unique challenges and opportunities in the region.

You do not need in-depth knowledge of energy issues to participate in this questionnaire. You must be between the ages of 18-35 years old and come from the ten (10) ASEAN member states and the observer member, Timor Leste to participate. (ASEAN region from here henceforth will include the 11 states)

This questionnaire contains questions related to clean energy and should take approximately 10 minutes to complete. You can answer the questionnaire in different times as it is automatically saved and you can continue where you left off, however please complete the questionnaire by 5th November 2023 11:59 GMT+7.

7.0 OTHERS

Information Regarding Data Collection

Your participation will inform our study on youth perceptions on ASEAN's readiness for clean energy transition leading to 2050. The data set from this questionnaire may be used in additional reports, presentations, or publications at our discretion.

Your participation in this questionnaire is **voluntary**. Your responses will be **anonymous** and you may stop participating at any time without penalty. Incomplete questionnaires will be deleted.

Upon completion, all questionnaire data will be downloaded and retained by Y4E-SEA and AYO for analysis and potential future use. If you have any questions or concerns related to this questionnaire and privacy, please contact : youthenergysea@gmail.com

Section 2

Introductory Demographic

The following consists of questions pertaining to your background (but non-identifying) information which will give an insight on clean energy perceptions based on different demographic in ASEAN region including your:

- Racial or ethnic identity
- Indigenous identity
- Gender
- Employment status
- Living situation

We are asking these questions to ensure that we reach a diverse group of participants. Your responses will guide how we engage in outreach, and will help us to include the perspectives of young people across economic, educational, and geographic backgrounds.

Section 3

Demographic Background

In this section we are asking some questions about your background to determine and classify your responses accordingly. It will help provide context and perspective based on various economic, social and cultural backgrounds and therefore make the analysis more representative and inclusive.

7.0 OTHERS

Section 5

Youth Perception for the Local Community, Territory and Country

This section contains a series of questions about your understanding, knowledge, awareness or opinion (not in particular order) regarding the topic of **Clean Energy within your COUNTRY, TERRITORY and COMMUNITY**. This will help us gain insight into youth's perceptions related to ASEAN's readiness to change or adapting Clean Energy.

1 Do you think your **country or territory** should have a **decarbonisation target** for its energy system?

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

2 Do you agree that your **country or territory's government** is investing enough in **ENERGY CONSERVATION and IMPROVING ENERGY EFFICIENCY?** This includes direct investment in technologies, production methods, distribution, and usage through grants and subsidies, loans, and tax incentives among other means.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

3 Do you agree that your **country or territory's government** is **investing enough in RENEWABLE ENERGY?** This includes direct investment in technologies, production methods, distribution, and usage through grants and subsidies, loans, and tax incentives among other means.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

4 Do you agree that your **country or territory's government** is **investing enough effort in EDUCATION AND AWARENESS** to spur clean energy transition?

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

5 Do you agree that your **country or territory's government** is **investing enough in PROVIDING INDUSTRY RELEVANT SKILLS AND TRAINING** to spur clean energy transition?

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

7.0 OTHERS

6 Of the given options, what do you think are the **TOP THREE (3) things that the Private Sector or the Community should do to educate, spread awareness or provide training** to adopt for clean energy?

- [ ] Subsidies and incentives for clean energy technology adoption
- [ ] Mandatory clean energy education in schools and universities
- [ ] Public awareness campaigns about the benefits of clean energy
- [ ] Tax breaks for clean energy investments
- [ ] Free or subsidised skilled trainings on clean energy
- [ ] Implementing stricter clean energy standards and regulations
- [ ] Establishing a carbon tax and carbon-pricing
- [ ] Other

7 How **important** do you think **educational institutions contribute** to the clean energy transition?

	1	2	3	4	5	
Not important	○	○	○	○	○	Very important

8 Of the given options, what do you think are the **TOP THREE (3) things that the government should do to educate, spread awareness or provide training** to adopt for clean energy?

- [ ] Partnerships with corporations to fund clean energy education programs.
- [ ] Industry-led training and certification programs for clean energy jobs
- [ ] Clean energy workshops and seminars hosted by private organizations
- [ ] Local clean energy clubs and organizations
- [ ] Neighborhood clean energy projects and demonstrations
- [ ] Awareness campaigns and workshops
- [ ] Other

7.0 OTHERS

9 What is the **biggest barrier** to achieving clean energy transition in **your country or territory?** Please **RANK UP TO THREE (3) OPTIONS ONLY**, with one (1) being your top choice.

If you do not think that any of the barriers options would be a challenge in achieving a clean energy transition in your country or territory, please submit that as your first and only response.

If you are unsure, please submit that as your first.

		1	2	3
1	Lack of political will from the Government to prioritise clean energy policies	O	O	O
2	Resistance from the incumbent energy industry	O	O	O
3	Economic and financial constraints	O	O	O
4	Lack of understanding or awareness about the benefits of clean energy	O	O	O
5	Lack of facilitative and enabling policies for clean energy (i.e., incentive, remuneration or tax relief)	O	O	O
6	Lack of public and/or community support for clean energy	O	O	O
7	Infrastructure and energy grid constraints	O	O	O
8	Technology barriers and lack of access to advanced clean energy technologies	O	O	O
9	Inadequate clean energy research, data, or evidence to justify the transition	O	O	O
10	Unsure	O	O	O

7.0 OTHERS

Section 6

Youth Perception for the ASEAN Region

This section contains a series of questions about your understanding, knowledge, awareness or opinion (not in particular order) regarding the topic of **Clean Energy within the ASEAN REGION.** This will help us gain insight into youth's perceptions related to ASEAN's readiness to change or adapting Clean Energy.

1 Choose the option you believe best describe **ASEAN's energy sector capabilities** right now.

- ☐ Modern (technologically advanced, competitive globally and innovative)
- ☐ Safe (secure, consistent, not harmful to the environment, sustainable in the long run)
- ☐ Accessible (good availability, not expensive and subsidised, plenty resources available)
- ☐ None of the above

2 Do you agree that **ASEAN region** has a **clear goal and vision** with regards to clean energy?

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

7.0 OTHERS

3 What is the **biggest barrier** to achieving an **ASEAN-wide** clean energy transition? Please **RANK UP TO THREE (3) OPTIONS ONLY,** with one (1) being your top choice.

If you do not think that any of the barriers options would be a challenge in achieving a clean energy transition in ASEAN region, please submit that as your first and only response.

If you are unsure, please submit that as your first.

		1	2	3
1	Lack of political will from the Government to prioritise clean energy policies	O	O	O
2	Gaps in regulatory and policy framework	O	O	O
3	Lack of inter-governmental cooperation	O	O	O
4	Geographic and resource variability	O	O	O
5	Difficulty in securing adequate funding and investments	O	O	O
6	Infrastructure and energy grid limitations	O	O	O
7	Lack of public and/or community support for clean energy	O	O	O
8	Technology barriers and lack of access to advanced clean energy technologies	O	O	O
9	Security and reliability concerns	O	O	O
10	Unsure	O	O	O

7.0 OTHERS

Section 7

General Perception

1 Please identify all **Sustainable Development Goals** that you believe **are related to the energy sector**. Choose one or more options:

If you intend to choose 'None of the preceding' or 'Unsure' please make sure you do not select the other options and vice-versa.

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 

- ☐ 
- ☐ 

2 What do you think are the **TOP THREE (3) most essential focus areas for you** to spur clean energy transition?

- ☐ Clear and well defined regulations with strong political commitment
- ☐ Access to funding for clean energy investments
- ☐ Education and human capital development
- ☐ Development of key infrastructure
- ☐ Robust research and development to spur innovation

7.0 OTHERS

3 How **important** do you think **clean energy** is when **compared to public concerns including healthcare, employment, access to education, cost of living, gender equality,** and others?

	1	2	3	4	5	
Unimportant	○	○	○	○	○	Very important

4 Are you **concerned about** about the **pollution and emissions** caused by the **current global energy system?**

	1	2	3	4	5	
Unconcerned	○	○	○	○	○	Very concerned

5 How **familiar are you with the clean energy policies** and **initiatives** in your **country or territory**?

	1	2	3	4	5	
Not familiar at all	○	○	○	○	○	Very familiar

6 Are you aware of **the targets your country or territory** has set to **reduce carbon footprint?** e.g., Nationally Determined Contributions (NDC)

	1	2	3	4	5	
Not aware at all	○	○	○	○	○	Very aware

7 Do you agree that the current clean energy policies in **your country or territory** are **effective in promoting the adoption** of clean energy technologies?

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

8 Do you agree that **changes or development** brought to in **country or territory** by clean energy is positive and good for the future?

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

9 Are you willing to **transition fully to public transportation** in your **country or territory** to spur clean energy transition?

- ☐ I am willing and I am doing so now
- ☐ I am willing but it is difficult to find / no public transport near where I live
- ☐ I am not willing because I find public transports unsafe
- ☐ I am not willing because public transportation is inconvenient for me (i.e., lack of first and last mile connectivity)

7.0 OTHERS

10 Are you willing to **have an electric vehicle** in **your country or territory** to spur clean energy transition?

- ☐ I am willing and I am doing so now
- ☐ I am willing but I can't afford an electric vehicle now
- ☐ I am willing but there's not much option for me now
- ☐ I am not willing because I have range anxiety (i.e., not enough charging infrastructure)
- ☐ I am not willing because I don't think the technology is mature

11 Are you willing to **change your habits and adopt a sustainable lifestyle**?

- ☐ I am willing to make the change and I know where I can improve and change my habits
- ☐ I am willing to make the change but I have no idea what should I do
- ☐ I am not willing to because of my current economic situation
- ☐ I am not willing to because I think it is only a gimmick

12 In your opinion is **ASEAN adequately prepared** to **address the challenges** associated with a clean energy transition in the region?

	1	2	3	4	5	
Very unprepared	○	○	○	○	○	Very prepared

13 How **important is regional cooperation in ASEAN region** to advance clean energy adoption?

	1	2	3	4	5	
Unimportant	○	○	○	○	○	Very important

14 Are you **satisfied with the level of youth engagement in discussions and decision-making processes** related to clean energy policies in **your country or territory?**

	1	2	3	4	5	
Very unsatisfied	○	○	○	○	○	Very satisfied

15 Are there **enough jobs or career opportunities** in the clean energy sector in **your country or territory?**

	1	2	3	4	5	
Not at all	○	○	○	○	○	A lot

7.0 OTHERS

16 How satisfied are you with your **current contributions towards clean energy transition?**

	1	2	3	4	5	
Not satisfied at all	○	○	○	○	○	Very satisfied

17 In what way are you **currently or in the future planning to contribute towards clean energy transition?**

18 What are the **challenges that stop you** from contributing towards clean energy transition?

Section 8

End of Questionnaire

We have reached the end of our study. On behalf of Y4E-SEA and AYO, we thank you for your time and effort in answering all the questions. The final report will be published on our respective websites and shared across our social media.

To learn more about AYO Recent Research Center please visit: https://ayorecent.com/
To learn more about Youth For Energy, South East Asia please visit: https://www.youthenergysea.com/

We hope you continue to contribute to clean energy in the future!

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