

# Mapping Research and Literature on the Energy Transition in Southeast Asia

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## SYNOPSIS

In order to drive change in Southeast Asia's power sector, a systematic literature review to map all existing research publications was conducted. In total, 177 documents/papers were selected, and a summary of the gaps was identified in the context of the keywords used. Under 5 identified sub-themes: 1) policy planning and alignment; 2) investment challenges; 3) grid and market integration; 4) fossil fuels and 5) capacity building and knowledge sharing, these sub-themes are used to elaborate on the research and assessment framework, namely, "challenges" and "stakeholders" using keywords to analyse relevant literature at bilateral, multilateral, and regional levels.

## KEY POINTS

- In the Policy Planning and Alignment sub-theme, a few of the notable research works describe the readiness of current infrastructures for more renewable energy into the energy mix, the adoption of CCS, nuclear energy, electric vehicles, smart grid solutions.
- As for the Investment Challenges, while there is a significant decline in renewable energy technology costs over the years, Southeast Asian governments are increasingly subsidising the fossil fuel industry.
- As for the Grid and Market Integration, Southeast Asia is still focused more on scaling up the adoption of renewable energy technology at the national level.
- Most of the literature gathered for review under the Fossil Fuels subtheme foregrounded the prospects of a coal phase-out in the region as part of the energy transition strategy.
- Very little publicly available academic and grey literature on the topic of capacity building or knowledge sharing on the energy transition in the power sector in Southeast Asia.

## INTRODUCTION

To drive change in Southeast Asia's power sector, as part of efforts to help the region achieve its climate change goals, an evidence-based solution is developed to support decision-makers tackling the challenges of designing and implementing sound policies and activities, enabling sustainable energy transition in the long-term and help the region achieve its climate change goals, including the societal acceptance of such interventions. Thus, a systematic literature review was used as the framework to identify the most recent developments in Southeast Asia and to map relevant literature and stakeholders on the energy transition during the review process.

One of the outputs is the provision of relevant and credible evidence to support the power sector transition aligned with the region's goals under the Paris Agreement. Systematically mapping, capturing, and reviewing existing literature can help provide informed and evidence-based solutions to key stakeholders and decision-makers. A critical and continuous systematic review of existing literature can also help identify research opportunities and gaps that can be taken forward as the next steps of the initiative.

Using the systematic review approach, the reviews were focused on 1) identifying relevant literature from 2018; 2) summarizing the available empirical evidence guided by the

dimensions outlined in the Research and Assessment Framework; 3) identifying gaps in current research and literature on the region's power sector to suggest ways of addressing these; and finally, 4) providing a baseline approach to systematically map out research areas and stakeholders.

To operationalise the systematic review, a review protocol that specifies the steps and methods is used. This protocol provides rigour to the review and reduces the possibility of selection bias. There are three main phases in the protocol with specific steps for each, consisting of 1) planning, 2) conducting the review, and 3) reporting phases.

The research questions guide the systematic review process by providing elaboration on the research and assessment framework, namely, "challenges" and "stakeholders", using keywords to analyse relevant literature at bilateral, multilateral, and regional levels.

## **ANALYSIS**

In total, 177 relevant articles were selected in the review process and analysis. The sections below present the general overview of each subtheme through the lens of literature gathered and a summary of the gaps identified in the context of the keywords used.

### ***Policy Planning and Alignment***

The existing literature highlights the importance of renewable energy adoption as a pathway to fully decarbonise and achieve a sustainable energy transition, specifically in the power sector. A few of the notable research works are those that describe the readiness of current infrastructures for more renewable energy into the energy mix, the adoption of CCS, nuclear energy, electric vehicles, and smart grid solutions.

As for the gaps, there is a need for consistent implementing rules and regulations (IRRs) that can drive investments towards renewable energy technologies and the main actor in the power sector transition remains the countries/states.

The results of the review reveal that the current literature on policy planning and alignment is more focused on the supply side. There are fewer studies on the demand side or

at least, a holistic value chain analysis of the power sector transition from the supply side. Availability and affordability remain to be the main concerns in the literature.

More studies could be done from the perspective of accessibility of power infrastructures and acceptability from various stakeholders in policy planning and alignment. Literature on power market structures remains at national or bilateral levels.

### ***Investment Challenges***

Indeed, the literature selected in this review indicated a high level of interest and awareness among key stakeholders regarding the challenges to invest in renewable energy technologies in a region that continues to heavily rely on fossil fuels for power. At the regional level, investments are expected to primarily come from the international community, be it from donor countries and international development organizations or the international private sector.

Experts also recognise the significant decline in renewable energy technology costs over the years, while noting broader rising expenditure on fossil fuel subsidies and its repercussions for the region. However, they also point out that Southeast Asian governments are continuing to subsidise the fossil fuel industry. However, heightened interest from key stakeholders to pursue emerging technologies may postpone fossil fuels transition rather than replace them.

However, there is no clarity as to how to bridge the gap between regional decarbonisation goals and Southeast Asia's coal economy, whether in terms of compelling political arguments or practical recommendations. Moreover, there also seems to be a lack of awareness and analysis of trade-offs governments must make in deciding to invest in these sophisticated, complex and costly technologies versus readily available renewable energy technologies.

Additionally, there is very little literature that articulates the position of donor organizations on investing in Southeast Asia's energy transition and a lack of practical recommendations as to how the region would successfully pursue decarbonisation

investment opportunities and implement identified solutions and instruments at regional or national levels. Furthermore, literature has yet to uncover more systematic efforts to map green financing flows at the regional level.

### ***Grid and Market Integration***

Most of the present scholarship on grid and market integration focuses more on the technological solutions for power sector transition. The challenges to fully integrating renewables into the grid are 1) continuous support and insulation of the coal industry; 2) lack of long-term mandatory, binding climate and renewable energy targets and policies; 3) lack of iterative and adaptive resilience-focused power system planning, and 4) absence of holistic approach towards renewable energy integration e.g. financing structures, new business models to encourage more renewable investments, and buy-in from end-users.

The results of the review reflect the gaps in the literature and the needed analysis for the regional grid and market integration. Most of the countries in Southeast Asia are still focused more on scaling up the adoption of renewable energy technology at the national level. Specifically, the scholarship on grid integration looks at on-grid renewable energy electrification and less on off-grid. This reflects that at the national level, the priority is a large-scale power supply to address the lack of affordable electricity access and less on environmentally-friendly electricity sources.

Analyses on bilateral, multilateral, and regional renewable energy integration are few and far between. Present studies on importing and exporting renewable energy electricity are more on technical and technological perspectives and less on political and social aspects. While hydropower is popular, policy planning for other renewables such as solar and wind remains less examined.

Few studies reviewed the end-of-life of these renewable energy power plants. While renewable energy integration is important to drive sustainable power sector transition, more studies should also look into the environmental impacts of decommissioning or recycling the parts.

One major gap in the grid and market integration literature is the “market” part of it such as how the ASEAN Power Grid (APG) can bring about a sustainable energy transition through an increase in regional connectivity via the import and export of renewables. Another gap is the focus on the role each Southeast Asian country could play in terms of further developing the power market integration at the regional level, the lessons learned from implementing regional power market trade from other regions and the possibilities of implementing policies that integrate nuclear and other energy technologies, such as green hydrogen at the regional level.

### ***Fossil Fuels***

Most of the literature gathered for review under this subtheme foregrounded the prospects of a coal phase-out in the region as part of the energy transition strategy. The Asian Development Bank (ADB) is perhaps the international development partner that is most active in promoting the coal phase-out, specifically through its Energy Transition Mechanism (ETM) retirement scheme. Other possible retirement schemes have not received as much attention as ETM in the literature, thus making it difficult to compare. More work is needed to analyse the possibility of implementing policies that integrate nuclear and other energy technologies (e.g. green hydrogen) at the regional level.

Furthermore, whilst there is a lot of discussion in the literature on most of the keywords included for this subtheme, the analysis does not seem to offer a way forward that is politically feasible for Southeast Asian countries, particularly those that are highly reliant on coal, and therefore have many actors with a stake in the industry, from local governments, marginalised communities to the industry players themselves.

### ***Capacity Building and Knowledge Sharing***

There was surprisingly very little publicly available academic and grey literature on the topic of capacity building or knowledge sharing on the energy transition in the power sector in the region, let alone on best practices and lessons learned, existing networks or database platforms.

International development and energy organizations have a wealth of analysis on capacity-building needs in the energy transition, though not necessarily focused on the region. However, they are not publicly available. Publicly available project documents produced by international donor organizations do offer some practical value in the context of capacity building. However, they are specific to the project, with little broader relevance. Considering the real need for capacity building and knowledge sharing on the energy transition in the region, the dearth of literature on this topic is alarming.

Policy diffusion or policy adoption was not a term that was used in the context of capacity building for the energy transition in the power sector. This is perhaps a reflection of how policymaking in Southeast Asian countries is still largely undertaken within silos in each sector, and independently in each member state. Thus, in the context of the energy transition, capacity-building and knowledge-sharing policies in the one-member state could result in policy diffusion or the adoption of similar policies in other member states, resulting in regional capacity building, which is not explicitly discussed in the literature.

## CONCLUSION

As with any study, the undertaking of this literature review was hampered by certain limitations, some inherent, some anticipated, and some retrospectively identified.

Firstly, for the types of literature analysed, the limitation of the review process to only include publicly available academic and grey literature was a serious limitation of the project. The focus of the exercise on gaps in the literature would have benefitted from a crosscheck against other publications to provide a better understanding of the current thinking of both technical and regional experts.

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<sup>1</sup> This project is the outcome of an ESI research collaboration with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on Clean, Affordable and Sustainable Energy (CASE) for Southeast Asia, a program implemented to drive change in Southeast Asia's power sector to help the region achieve

Secondly, the process of using keywords helped in noting key gaps in the literature that might be out of scope like the impact of geopolitics towards the power sector transition. It also introduced a selection bias that has resulted in the inclusion or exclusion of certain publications in the final selection.

Lastly, the use of the regional lens in searching of keywords is also a major limitation. At the regional level, many issues that have been identified across the keywords are only discussed as an inflated or aggregated version of national-level analysis, leading to difficulty in identifying real gaps at the regional level.<sup>1</sup>

## WHAT TO LOOK OUT FOR

- Systematic review as a framework to map relevant literature and stakeholders.
- Overview of sub-themes and summary of gaps identified in the context of keywords.
- Limitations in the types of literature analysed use of keywords and regional lenses which would introduce bias.

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climate change goals. As further clarification, GIZ is a German development agency headquartered in Bonn and Eschborn that provides services in international development cooperation and international education work.