
IASS POLICY BRIEF 5/2022

Institute for Advanced Sustainability Studies (IASS)

Potsdam, October 2022

Unlocking a Low-Carbon Future for Malaysia

How competition, stakeholder participation, and targeted recovery packages can catalyse action for the energy transition



CENTER FOR TECHNOLOGY,
STRATEGY & SUSTAINABILITY

This policy brief was written by Judith Hermann, Esther Schuch, Maria Aperi, Laima Eicke, Andreas Goldthau, Jude Kurniawan, Silvia Weko (all IASS) and Renato Lima-de-Oliveira (Asia School of Business). Research by Judith Hermann, Esther Schuch, Maria Aperi, Laima Eicke, Andreas Goldthau, and Silvia Weko for this policy brief is funded by the Investigating the Systemic Impacts of the Global Energy Transition (ISIGET) project financed by the Federal Ministry of Education and Research (BMBF) under the "Make our Planet Great Again - German Research Initiative"; Grant Nr. 57429628, implemented by the German Academic Exchange Service (DAAD).

This **IASS Policy Brief** should be cited as: Hermann, J., Aperi, M., Eicke, L., Goldthau, A., Kurniawan, J., Lima-de-Oliveira, R., Schuch, E. and Weko, S.: Unlocking a Low-Carbon Future for Malaysia, IASS Policy Brief, October 2022, Potsdam, DOI: 10.48481/iass.2022.041

The policy recommendations presented in this policy brief were developed in cooperation with Malaysian energy experts during two stakeholder workshops held in November 2021 with 22 participants from various sectors, including the finance sector, think-tanks, civil society and NGOs, industry, and academia. The Malaysian energy system was modelled by the ISIGET research team of the IASS Potsdam using stakeholder-driven Cross Impact Balance Analysis to determine factors preventing or facilitating a sustainable energy future. The subsequent succession analysis reveals the factors that need to be addressed in order to trigger changes in the entire modelled system. The recommendations discussed by the Malaysian experts are based on the results of the succession analysis, which suggests that a trajectory change would require action across multiple fields to break up established decision-making patterns, liberalise the energy market, and channel post-pandemic recovery measures and long-term development plans towards green growth. More details on the method will be available in a forthcoming study.

We are very grateful to our Malaysian partners Asia School of Business (ASB) and the Institute of Strategic and International Studies (ISIS) Malaysia for enabling and organising the workshops. A special thanks goes to the Center of Technology, Strategy & Sustainability (CTSS) at the Asia School of Business for hosting and partly funding the workshops.

Malaysia has set ambitious targets to increase the share of renewable energy (RE) in its energy mix.

In 2021, the Ministry of Energy and Natural Resources of Malaysia (KeTSA) established an aspirational target for national installed RE capacity of 31% by 2025.¹ This aspiration was recently reaffirmed by the National Energy Policy 2022–2040², which lays out a long-term plan for Malaysia’s green future. Although the country has abundant solar, biomass, and hydro resources for clean energy production, a number of barriers are slowing the energy transition. With its economy heavily reliant on fossil fuels, Malaysia risks a carbon lock-in that would perpetuate existing path-dependencies, infrastructure, technologies, institutions and behaviours that are embedded in and intertwined with the carbon economy.³

State revenues derive to a large extent from fossil fuels⁴ and previous reforms to support the growth of renewables have been hampered by the fact that the state is both responsible for shaping energy policy and is also the largest stakeholder in Malaysia’s highly centralised fossil-based energy system.⁵ Structural changes in both the energy system and decision-making processes are needed to support a timely transition to a sustainable, low-carbon economy. Post-pandemic recovery packages and policy changes can lend critical momentum to this process if they are properly targeted.

In this policy brief we identify three key opportunities for action to advance the Malaysian energy transition:

■ **Recommendation 1:**
Broaden the range of actors in the electricity sector

Efforts to liberalise Malaysia’s highly concentrated electricity sector, increase competition, and improve market efficiency should be strengthened. Existing reform plans should be extended to the areas of transmission and distribution.

■ **Recommendation 2:**
Involve stakeholders in policy design processes

The government should facilitate the participation of stakeholders in all stages of the policy process by formalising participation processes and establishing permanent, independent bodies to vet government decisions as well as regular forums for stakeholder dialogue. The decentralisation of decision processes should be promoted.

■ **Recommendation 3:**
Prioritise green growth in post-pandemic recovery programmes

Recovery programmes should prioritise investment in sustainable energy infrastructure, clean technology industries, capacity-building, and research and development. Targeted social investment is needed to cushion the social impacts of decarbonisation and harness co-benefits.

Context and background

Malaysia is well positioned to harness the benefits of a green development strategy. With an RE sector that has been growing slowly but steadily since 2001⁶, Malaysia has immense potential for clean energy production.⁷ As an upper-middle income country, with a GDP per capita of just above USD 10k⁸ and a strong manufacturing base, it has a well-educated and skilled workforce and enjoys favourable financing conditions. In 2021, the Malaysian government announced the ambition to achieve net zero emissions by 2050, surpassing the targets of neighbouring countries.⁹ This has been backed by the recently launched National Energy Policy 2022–2040, which aims to position the energy sector as the main driver for Malaysia's socioeconomic development.

Yet, despite this strong potential and long-term pledges, the Malaysian government has so far fallen short of its self-imposed goals.¹⁰ Instead, Malaysia's energy sector continues to rely heavily on fossil fuels. Malaysia is a regional exporter of petroleum products and crude oil, and it also imports natural gas, coal, and petroleum products. Fossil fuels accounted for 84% of total energy production in 2020, and more than 90% of energy consumption. Accounting for only 4% of the total primary energy supply, the share of renewables in Malaysia's energy supply is by far smaller than in many countries in the region. Cambodia, Myanmar, Laos and the Philippines all outperform Malaysia in this respect.^{11,12,13} The country's steady increase in energy consumption and emissions compounds the challenge of reaching emission reduction targets in the near term. Energy consumption per capita increased from 3 900 kWh in 2010 to 4 700 kWh in 2020; CO₂ emissions increased from 6.7 t /capita to 7.67 in the same time.^{14,15} By 2039, Malaysia's electricity demand is expected to grow to between 23 093 and 24 050 MW, from 18 808 MW in 2020.¹⁶ Fossil fuel extraction and refining are an important part of the economy, with oil and gas revenue accounting for 19.2% of total government revenue in 2021. State-owned oil and gas corporation Petronas provides almost 50 000 jobs alone, supplemented by another 59 000 jobs in upstream, midstream and downstream

activities along the oil and gas value chain. Malaysia is the second-largest oil producer in Southeast Asia and the third largest exporter of liquified natural gas globally. There are about 4 000 oil and gas companies operating in the country.¹⁷ When Malaysia was hit hard by the Covid-19 pandemic, fiscal response packages and recovery measures¹⁸ centred on the job-intensive fossil fuel-based sectors – further deepening, rather than challenging, its carbon lock-in.

The Malaysian electricity system

The Malaysian electricity system is highly centralised and consists of vertically integrated, state-owned companies operating what is essentially a single buyer market. Tenaga Nasional Berhad (TNB), Malaysia's largest utility company, has a regulated monopoly position on electricity transmission and distribution in Peninsular Malaysia. In the East Malaysian states of Sabah and Sarawak, Sabah Electricity Supply Sendirian Berhad (SESB) and Sarawak Energy Berhad (SEB) play similar roles in their respective markets. These companies are also the largest stakeholders in power generation, although competition has increased in this sector over the last decade, with new

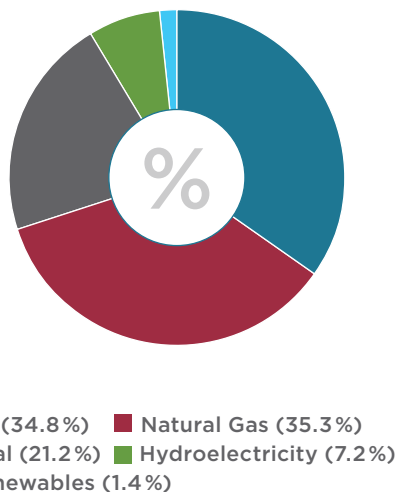


Figure 1: Malaysia's primary energy consumption by fuel type (2021)¹⁹

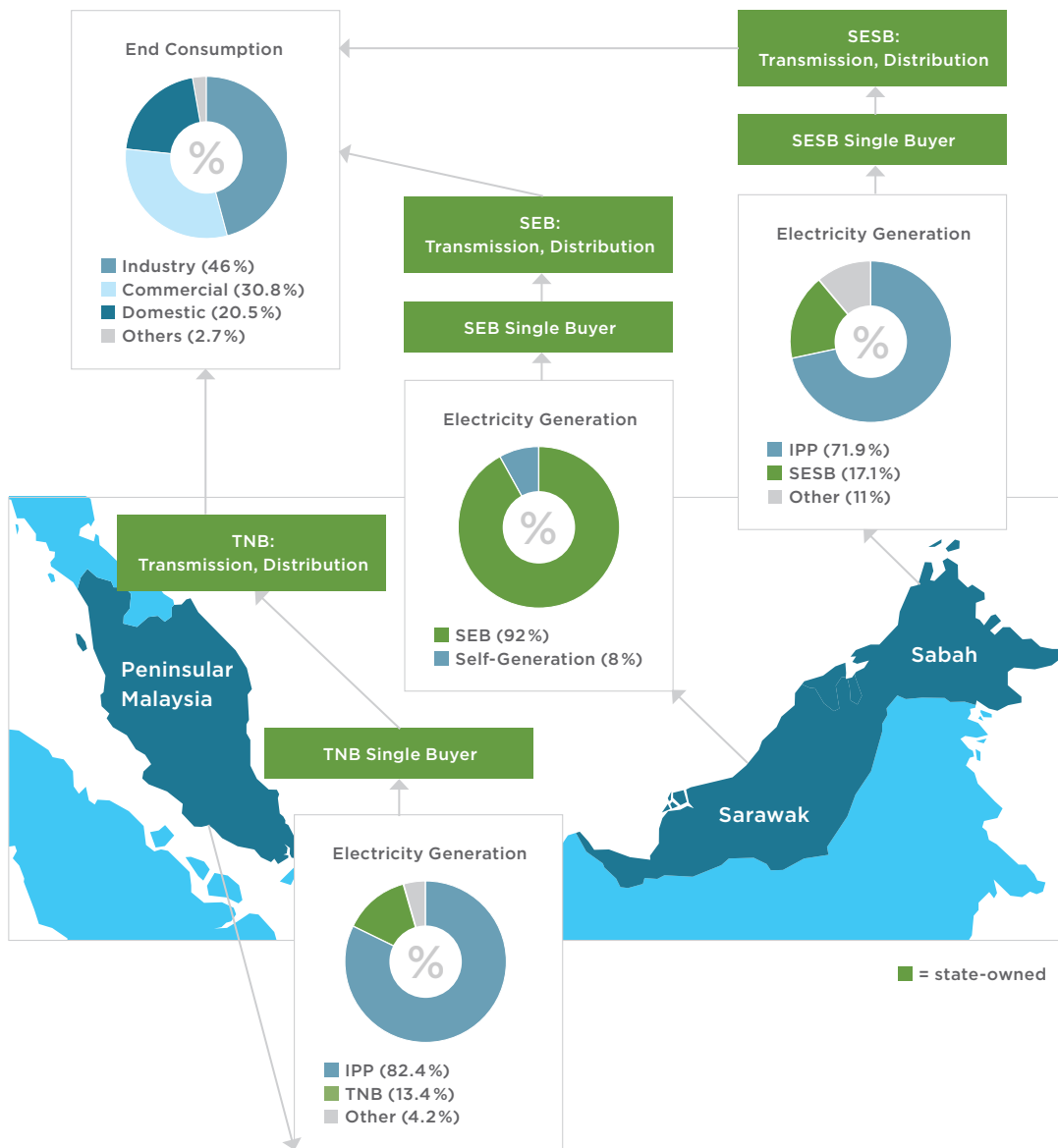


Figure 2: The Malaysian electricity sector: Both state-owned companies and independent energy producers are involved in energy generation. The respective state-owned single buyer purchases the produced electricity and state-owned companies are responsible for transmission and distribution.²¹

players investing in power-generating plants as Independent Power Producers (IPPs).²⁰ Some of these are wholly owned or co-owned by TNB. In the oil and gas sector, the state-owned company Petronas holds exclusive ownership rights to all oil and natural gas exploration and production projects and is responsible for managing all upstream licensing procedures.

It is estimated that Malaysia needs to attract yearly RE investments of over USD 1.3 billion on average from 2019 to 2025 to reach its 2025 RE goals.²² So far investments are well below this number, in 2021 investments in RE totalled just RM 3 billion (around USD 650 million).²³ Malaysia must therefore take quick and decisive action to facilitate more investment and stay on track towards a sustainable low-carbon economy.

1. Broaden the range of actors in the electricity sector

Enhancing competition in the electricity sector will play a crucial role in efforts to increase RE capacity and bring down costs. Allowing more players into the market can mitigate many of the risks that the state-controlled system entails, including regulatory capture, inefficiencies, and a lack of agility.

The Malaysian electricity market is dominated by the state, which holds significant stakes in all of the major players and shapes market developments through its policies. This sets up entry barriers for new competitors and inevitably leads to conflicts of interest. Malaysia's RE policies have so far failed to deliver the gains in installed capacities seen in other countries, largely because too much consideration has been given to the interests of state-owned utility companies and to safeguarding their profitability.²⁴

Refocus and prioritise MESI 2.0

The Malaysian government has recognised the necessity of liberalising the electricity sector and recent policy measures reflect this. Reforms introduced under the Malaysian Electricity Supply Industry 2.0 (MESI 2.0) initiative²⁵ aim at liberalising the electricity retail market, facilitating competitive electricity tariff pricing and promoting the generation of power from renewable sources. However, the near-monopoly of transmission and distribution networks held by TNB and other state-owned enterprises remains untouched by these reforms. The MESI 2.0 reforms were paused in 2020 due to a change of government. They should be renewed and extended to open up the electricity transmission and distribution segments to competition.

Facilitate competition

In order to ensure that the liberalisation of the electricity system delivers the desired effects, new regulatory frameworks must have the explicit goal of building a competitive market and at the same time create a level playing field for all market participants by eliminating subsidies for state-owned enterprises. The effect of new regulations must be regularly reviewed through impact assessments, which should also be accessible to the public.²⁶ In order to achieve these goals, the government should push ahead with the implementation of an electricity market and ensure the creation of fair conditions for market participants by expanding open tendering (which exists on a small scale for large-scale solar projects), allowing the most efficient bids to prevail in the open bidding process.²⁷

Ensure a smooth transition

Interactions in a liberalised electricity market need to be coordinated by a market operator. The aim is to establish an independent market operator in the long run, but the initial transition could be facilitated by a state market operator. Clearly defined stages to hand over responsibility to an independent market operator are necessary. In order to maintain confidence in the electricity supply and foster public acceptance of the sector's restructuring, it is advisable to continue to allow the government to own and operate part of the energy supply. This would provide additional security for challenging times when profit-oriented companies may be unable to maintain an adequate energy supply.²⁸

2. Involve stakeholders in policy design processes

While some progress has been made towards market liberalisation, decision-making is still dominated by state actors. Bringing more actors into policy development and governance processes would help to establish common goals, ensure that policies are pertinent to the needs of all stakeholders and foster public buy-in for the energy transition.

Set up an independent national advisory body for the energy transition

Independent bodies stand outside of regular government institutions and can include independent members of parliament as well as representatives of opposition parties and civil society organisations. National advisory bodies on climate policy and energy transitions have been introduced in a number of countries in recent years and provide a channel for citizens and non-governmental stakeholders to engage in policy processes.²⁹ They take on various functions: vetting, monitoring and evaluating policies, providing reliable and independent information for informed policy choices, and providing the continuity that is needed for efficient climate policy. Evaluations of existing advisory bodies suggest that they can contribute effectively to evidence-based and ambitious policymaking when they are assigned statutory duties and a clear formal mandate with defined tasks and timeframes as well as regular and recurring opportunities to submit input, access to different government branches, and are provided with sufficient financial resources.^{30,31}

Build a consensus for the energy transition

Dialogue platforms should be established that bring together various stakeholders from business, politics, science, and civil society to build a political consen-

sus for the energy transition. These platforms should operate at the national, regional, and local levels and be accessible to all relevant stakeholders. This can be achieved through the adoption of formal rules to govern civil society participation, ensuring access to information and meetings with relevant state actors and decision-makers. Examples of good practice include the Stakeholder Roundtables for the National Climate Agreement in the Netherlands³² and the Indonesian Clean Energy Forum.³³

Improve transparency and foster public participation

Improving the transparency of policy- and decision-making processes would both foster public buy-in and strengthen the basis for decision-making by drawing attention to problems that could otherwise go unnoticed. Involving citizens and communities in consultation and development processes is critical to building coalitions in support of the broader economic transformation that the energy transition requires.

For civil society actors to continue to be a prominent external force, their survival and financial security are key. Public funding should be made available to NGOs so that they have the resources to address current energy policy in a visionary and critical way, to gather and combine different opinions, and to work on improvements and alternatives and support public debate on energy issues independent of economic or business interests. To avoid conflicts of interest, clear guidelines for public funding should be introduced and monitored, which include transparency and fair competition for funds, equal treatment, independence and accountability.³⁴ Information on funding protocols has to be easily accessible to improve and diversify participation by ensuring knowledge access for smaller entities.

Strengthen the role of local government and communities

Living conditions in Malaysia vary widely. Major driving forces shaping these diversities are the intersections of ethnicity and geographical location. Poverty is significantly higher in rural areas and the provinces located in East Malaysia and poverty rates differ between the three main ethnicities (Bumiputera, Chinese, Indian).³⁵ In order to adapt policies to different needs and circumstances and to ensure that benefits gained through RE do not only reach privileged groups, there is a need for political decentralization. Administrative, fiscal, and decision-making competences of local governments should be strengthened whilst being obliged to include local communities (across ethnicities) in their decision-making processes. Protocols for stakeholder inclusion at the national level decision-making should include mechanisms to ensure regional diversity.

3. Prioritise green growth in post-pandemic recovery programmes

The Malaysian government should align its future Covid-19 recovery measures and long-term development plans with its climate goals by prioritising investment in sustainable infrastructure and accelerating decarbonisation efforts.

Introduce measures to increase RE investment

Transforming the Malaysian energy system will require massive investments in the upgrading and renewal of energy infrastructure. Government investment incentives will be vital to achieve this as long as RE is still in the early stages of market entry and its share of total energy production is small. In addition to fiscal incentives, guaranteeing investment security is crucial. Currently, problems often occur during the planning of RE projects because requirements and regulations change during construction or there are delays in getting approval from relevant authorities, resulting in additional costs.³⁶ Priority market entry for RE investors should be organised and uncertainties should be avoided by establishing comprehensive regulatory frameworks for RE. Long-term contracts for energy sellers should help to de-risk RE investment. Support for renewable energy generation must be accompanied by phase-out plans for both coal-fired power plants in Malaysia and coal imports to the country.

Support residential and mid-tier solar energy producers

Malaysia's abundant solar resources make the country an especially favourable location for generating clean energy through solar technologies. In addition to large-scale solar projects, opportunities for small-scale solar arise in the residential, commercial and industrial sectors, for example on building surfaces.

Malaysia's Sustainable Energy Development Authority estimates the total available potential for rooftop solar to be 42 GW – for comparison, the targeted RE capacity in Malaysia in 2035 is 18 GW.³⁷ Previous government projects aimed at increasing small-scale solar (feed-in-tariff for small-scale solar energy generation, net energy metering (NEM), green finance schemes) brought big advances in solar energy generation, but mainly appealed to the commercial and industrial sectors and households with high energy consumption.^{38,39,40} In order to harness the potential for domestic solar PV, it is necessary to ensure financial support tailored to households, create public awareness about existing programmes and provide investment security through a comprehensive legal and regulatory framework and diversified green finance schemes.⁴¹ The limited quota for net energy metering, which is distributed on a first come, first serve basis, also means that not everyone who wants to can benefit from it.⁴² With the ambitious RE targets in mind, quotas must be expanded in the next rounds of the scheme.⁴³

Invest in industrial development

Malaysia is a major international hub for photovoltaics manufacturing.⁴⁴ This creates a range of opportunities for the country's development, including job creation, technology exports, and benefits from knowledge spillovers. By 2030, Malaysia aims to generate revenue of RM 60 Billion (over EUR 13 Billion) through the solar PV industry and an additional 103 000 jobs.⁴⁵ Funds should be channelled towards this aim, in line with the Malaysia Solar Industry Roadmap 2030.⁴⁶ Public investment should target projects and businesses that advance the development and deployment of further clean technologies that address local demand such as green hydrogen, low-carbon industries, energy efficiency, and sustainable agriculture.

Eliminate fossil fuel subsidies

Currently, subsidies are disproportionately allocated in favour of fossil fuel producers.⁴⁷ Subsidies or regulated prices for fossil fuels are a significant hurdle for sustainable energy investments and a burden on public finance. The subsidisation of gasoline is a major obstacle to efforts to decarbonise the transportation sector. Phasing out these subsidies and reallocating finances for the expansion of clean energy technologies would help both the environment and the economy. To cushion the impacts of the energy transition for low-income households, part of the funds currently directed towards subsidies should be channelled back to households as has been successfully practiced in other contexts.

Green jobs and social investment

A rapid carbon phase-out carries risks for people employed in affected sectors and communities dependent on related economic activities. Ensuring a just transition will require substantial efforts to create employment opportunities and mitigate the loss of jobs directly and indirectly linked to fossil fuel industries. Policies that promote the growth of clean technology industries – including energy generation, efficiency, manufacturing, and construction – will be crucial to delivering a just transition and should be flanked by measures to support workforce skill development, including retraining programmes and vocational education opportunities. In addition, social investment in communities and income support programmes will be needed to cushion social impacts in vulnerable communities and low-income households.

Provide incentives to decrease emissions

Investments in greener production technologies should be encouraged through targeted green technology financing schemes and subsidies should be made available for the use of zero-carbon/low-carbon technologies. Tax credits and accelerated depreciation should be awarded to encourage investment in emission-saving technologies. Overall carbon emissions should be further restricted by enforcing stricter regulations and reforming the Environmental Quality (Clean Air) Regulations 2014.⁴⁸ The government should consider introducing a carbon pricing scheme. A carbon tax on the biggest emitting sectors (electricity, transport, oil and gas) would cover 70% of the annual national emissions, incentivising polluters to turn to low-carbon alternatives. This would boost government revenues by as much as RM20 billion (appr. EUR 4.5 billion) annually. Part of this revenue should be used to compensate for any additional burdens caused by priced CO₂ for the poorest parts of the population, the rest should contribute to financing climate adaptation and mitigation measures.⁴⁹ The introduction of a carbon tax would presumably help to lower carbon emissions significantly.⁵⁰ This year, the Malaysian stock exchange, Bursa Malaysia, started a voluntary carbon market.⁵¹ This initiative should be supported and expanded, especially given that other countries such as the EU and China are considering Border Carbon Adjustment Mechanisms which would result in (higher-intensity) Malaysian firms being subject to fees at the border if the country does not introduce own carbon pricing schemes.

Conclusion and outlook

Malaysia is at a crossroads: progress on the energy transition has been hampered by the unwillingness of policymakers to ditch a lowest-cost mindset that ignores environmental impacts and challenge decades-old structures established to protect the country's extractive and carbon industries. With many institutions and decision-making processes intertwined with these structures, successive governments have dragged their feet on necessary reforms that would bring substantial change to the energy system and new players into the market.

Covid-19 recovery measures present an opportunity for the Malaysian government to mitigate the risk of carbon lock-in by adopting ambitious policies that will advance the energy transition and support the growth of clean technology industries. Malaysia is a world leading manufacturer of photovoltaic cells and modules⁵² and has abundant solar resources that could be harnessed to generate revenues by pursuing a rapid expansion of RE generation, storage, and transmission infrastructure, including infrastructure needed to export green energy regionally. These efforts could be flanked by measures to strengthen Malaysia's green technology research and manufacturing bases.

All this will require policy-setting reforms and a willingness to share policy development and decision-making powers. If this succeeds, Malaysia could become a pioneer amongst the ASEAN countries on the path to a carbon neutral future. The ambition is already there – both Petronas and TNB have committed to achieving net zero emissions by 2050⁵³ and the country aims to become carbon neutral as early as 2050. The National Energy Policy launched in September 2022 contains action plans for many of the issues addressed in this policy brief, in particular investment in RE and green growth, strengthening green financial schemes, increasing capital access for rooftop solar, expanding net energy metering programmes, reducing subsidies and a strategic transition of the workforce towards green jobs. The government should pursue these plans with vigour and complement them with the other measures outlined in this policy brief, in particular the liberalisation of the electricity sector and formal involvement of stakeholders in policymaking. Recovery programmes should be carefully crafted to support the transformation of Malaysia's energy system and promote sustainable development on a broader front. ■

About the authors

Dr. Maria Apergi is scientific project leader of the group Investigating Systemic Impacts of the Global Energy Transition at the IASS, which studies the impacts of the clean energy transition on countries of the Global South. Her research focuses on energy access, energy justice, climate finance, and climate policy.

Laima Eicke is a research associate for the project Investigating the Systemic Impacts of the Global Energy Transition at the IASS. Her work focuses on the international political economy of the global energy transition, and she specialises in energy transition finance and the Global South.

Prof. Andreas Goldthau is research group leader of the group Investigating Systemic Impacts of the Global Energy Transition at the IASS, Director of the Willy Brandt School of Public Policy and Franz Haniel Professor for Public Policy at the Faculty of Economics, Law and Social Sciences, University of Erfurt. His academic interests lie in the political economy of the low-carbon transition, energy security, and global energy governance.

Judith Hermann is a research associate for the project Investigating the Systemic Impacts of the Global Energy Transition at the IASS. Her work focuses on climate policy and strategies to achieve a just energy transition.

Dr. Jude Kurniawan is Senior Assistant Director (Complexity Science Research) at the Centre for Liveable Cities, Singapore. Previously, he was a research associate for the project Investigating the Systemic Impacts of the Global Energy Transition at the IASS. His research focuses on scenario methods and modelling for climate change research and sustainability transitions.

Prof. Renato Lima-de-Oliveira is Assistant Professor of Business and Society at the Asia School of Business in Kuala Lumpur, Malaysia, and a research affiliate of the Massachusetts Institute of Technology (MIT). His research interests are the management of natural resources for development, energy transitions, and accountability.

Dr. Esther Schuch is a research associate for the project Investigating Systemic Impacts of the Global Energy Transition at the IASS. Her work focuses on the governance of social-ecological and social-technical systems, sustainable management of natural resources and environmental and energy justice.

Silvia Weko is a research associate for the project Investigating the Systemic Impacts of the Global Energy Transition at the IASS. Her academic interests lie in value creation from the energy transition and how this relates to politics and attitudes.

- 1 Sustainable Energy Development Authority Malaysia. (2021). Malaysia Renewable Energy Roadmap. Pathway towards low carbon energy system. <https://www.seda.gov.my/reportal/myrer/>
- 2 Economic Planning Unit - Prime Minister's Department. (2022). National Energy Policy 2022-2040. https://www.epu.gov.my/sites/default/files/2022-09/National%20Energy%20Policy_2022_2040.pdf
- 3 Seto, K. C., Davis, S. J., Mitchell, R. B., Stokes, E. C., Unruh, G., & Ürge-Vorsatz, D. (2016). Carbon Lock-In: Types, Causes, and Policy Implications. *Annual Review of Environment and Resources*, 41, 425 - 452. <https://doi.org/10.1146/annurev-environ-110615-085934>
- 4 Bhattacharya, P., & Hutchinson, F. E. (2022). Malaysia's Oil and Gas Sector: Constant Expectations despite Diminishing Returns. https://www.iseas.edu.sg/wp-content/uploads/2022/01/ISEAS_Perspective_2022_21.pdf
- 5 Joshi, D. (2018). Evaluating the Performance of the Sustainable Energy Development Authority (SEDA) and Renewable Energy Policy in Malaysia . <https://penanginstitute.org/programmes/penang-institute-in-kuala-lumpur/evaluating-the-performance-of-the-sustainable-energy-development-authority-seda/>
- 6 Oh, T. H., Hasanuzzaman, M., Selvaraj, J., Teo, S. C., & Chua, S. C. (2018). Energy policy and alternative energy in Malaysia: Issues and challenges for sustainable growth - An update. In *Renewable and Sustainable Energy Reviews* (Vol. 81, pp. 3021-3031). <https://doi.org/10.1016/j.rser.2017.06.112>
- 7 Abdullah, W. S. W., Osman, M., Kadir, M. Z. A. A., & Verayiah, R. (2019). The potential and status of renewable energy development in Malaysia. *Energies*, 12(12). <https://doi.org/10.3390/en12122437>
- 8 World Bank. (2021). GDP per capita (current US\$) - Malaysia. <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=MY>
- 9 Nathan, R. (2021, September 28). Malaysia sets 2050 carbon-neutral goal. *Argus*. <https://www.argusmedia.com/en/news/2258221-malaysia-sets-2050-carbonneutral-goal>
- 10 Oh, T. H., Hasanuzzaman, M., Selvaraj, J., Teo, S. C., & Chua, S. C. (2018). Energy policy and alternative energy in Malaysia: Issues and challenges for sustainable growth - An update. In *Renewable and Sustainable Energy Reviews* (Vol. 81, pp. 3021-3031). <https://doi.org/10.1016/j.rser.2017.06.112>
- 11 Suruhanjaya Tenaga (Energy Commission). (2020). Malaysia Energy Statistics Handbook 2020. https://www.st.gov.my/en/contents/files/download/116/Malaysia_Energy_Statistics_Handbook_20201.pdf
- 12 IEA. (2022). Southeast Asia Energy Outlook 2022. <https://www.iea.org/reports/southeast-asia-energy-outlook-2022>
- 13 IRENA. (2022). Energy Profile Malaysia. https://www.irena.org/IRENADocuments/Statistical_Profiles/Asia/Malaysia_Asia_RE_SP.pdf
- 14 Enerdata. (n.d.). Malaysia Energy Information. Retrieved September 12, 2022, from <https://www.enerdata.net/estore/energy-market/malaysia/>
- 15 IEA. (n.d.). Malaysia. Retrieved September 12, 2022, from <https://www.iea.org/countries/malaysia>
- 16 Jawatankuasa Perancangan dan Pelaksanaan Pembekalan Elektrik dan Tarif. (2021). Report on Peninsular Malaysia Generation Development Plan 2020 (2021-2039). [https://www.st.gov.my/en/contents/files/download/169/Report_on_Peninsular_Malaysia_Generation_Development_Plan_2020_\(2021-2039\)-FINAL.pdf](https://www.st.gov.my/en/contents/files/download/169/Report_on_Peninsular_Malaysia_Generation_Development_Plan_2020_(2021-2039)-FINAL.pdf)
- 17 Bhattacharya, P., & Hutchinson, F. E. (2022). Malaysia's Oil and Gas Sector: Constant Expectations despite Diminishing Returns. https://www.iseas.edu.sg/wp-content/uploads/2022/01/ISEAS_Perspective_2022_21.pdf
- 18 International Monetary Fund (IMF). (2021). Policy Responses to Covid-19. Policy Tracker.
- 19 Numbers from: BP. (2022). bp Statistical Review of World Energy 2022. <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2022-full-report.pdf>

- 20 Lima-De-Oliveira, R., & Varming, M. (2020). The Future of Malaysia's Energy Mix (Issue Policy Paper No 64). <https://www.ideas.org.my/publications-item/policy-paper-no-64-the-future-of-malaysias-energy-mix/>
- 21 Numbers from: Suruhanjaya Tenaga (Energy Commission). (2018). Performance & Statistical Information on the Malaysian Electricity Supply Industry 2018. https://www.st.gov.my/en/contents/files/download/99/Performance_Statistical_Information_on_the_Malaysian_Electricity_Supply_Industry_2018.pdf
- 22 Vakulchuk, R., Chan, H.-Y., Rizki Kresnawa, M., Merdekawati, M., Overland, I., Sagbakken, H. F., Suryadi, B., Utama, N. A., & Yurnaidi, Z. (2020). Malaysia: How to Scale Up Investment in Renewable Energy. <https://www.nupi.no/en/publications/cristin-pub/malaysia-how-to-scale-up-investment-in-renewable-energy>. The amount of USD 1.3 billion these investments has been calculated for the aim of 20% of RE in the consumption mix by 2025, so needed investments are likely even significantly higher for the updated goal of 31% RE by 2025.
- 23 MIDA. (2021). Renewable Energy. <https://www.mida.gov.my/industries/services/green-technology/renewable-energy/>
- 24 Joshi, D. (2018). Evaluating the Performance of the Sustainable Energy Development Authority (SEDA) and Renewable Energy Policy in Malaysia . <https://penanginstitute.org/programmes/penang-institute-in-kuala-lumpur/evaluating-the-performance-of-the-sustainable-energy-development-authority-seda/>
- 25 Kumar, M., Poudineh, R., & Shamsuddin, A. (2021). Electricity supply industry reform and design of a competitive electricity market in Malaysia (EL 44; OIES Paper). <https://www.oxfordenergy.org/publications/electricity-supply-industry-reform-and-design-of-a-competitive-electricity-market-in-malaysia/>
- 26 Wisuttisak, P., & Rahman, N. B. A. (2020). Regulatory Frameworks for Reforms of State-Owned Enterprises in Thailand and Malaysia. <https://www.adb.org/publications/regulatory-frameworks-reforms-state-owned-enterprises-thailand-malaysia>
- 27 Sibeperegasam, M., Ramachandaramurthy, V. K., Li, F., & Walker, S. (2020). De-Regulation of Electricity Industry: A Malaysian Perspective. *International Journal of Electronics and Electrical Engineering*, 8(2), 17–23. <https://doi.org/10.18178/ijeee.8.2.17-23>
- 28 Aris, H., Mohd Zawawi, I. S., & Jørgensen, B. N. (2020). The Philippines' and Singapore's Journeys towards Liberalised Electricity Supply Industries—Takeaways for Malaysia. *Energies*, 13(14), 3514. <https://doi.org/10.3390/en13143514>
- 29 Weaver, S., Lötjönen, S., & Ollikainen, M. (2019). Overview of National Climate Change Advisory Councils. <https://www.ilmastopaneeli.fi/wp-content/uploads/2019/05/Overview-of-national-CCCs.pdf>
- 30 Evans, N., & Duwe, M. (2021). Climate governance systems in Europe: the role of national advisory bodies. <https://www.ecologic.eu/sites/default/files/publication/2021/Evans-Duwe-Climate-governance-in-Europe-the-role-of-national-advisory-bodies-2021-Ecologic-Institute.pdf>
- 31 Averchenkova, A., Fankhauser, S., & Finnegan, J. J. (2021). The influence of climate change advisory bodies on political debates: evidence from the UK Committee on Climate Change. *Climate Policy*, 21(9), 1218–1233. <https://doi.org/10.1080/14693062.2021.1878008>
- 32 Donges, L., Stolpe, F., Sperfeld, F., & Kovac, S. (2020). Civic space for participation in climate policies in Colombia, Georgia and Ukraine. https://www.ufu.de/wp-content/uploads/2020/11/Study_CivicSpaceForParticipationInClimatePolicies_final_seperate_online.pdf
- 33 Institute for Essential Services Reform. (n.d.). Indonesia Clean Energy Forum (ICEF). Retrieved August 30, 2022, from <https://iesr.or.id/en/indonesia-clean-energy-forum-icef>
- 34 A detailed presentation of good practices in public funding by CSOs can be found here, for example: Skoric, V. (2020). Standards and Good Practices for Public Funding of Civil Society Organisations. https://ecnl.org/sites/default/files/2020-09/TUSEV%20Public%20Funding%20Report_Final.pdf
- 35 Rongen, G., Ali Ahmad, Z., Lanjouw, P., & Simler, K. (2022). The Interplay of Regional and Ethnic Inequalities in Malaysian Poverty Dynamics (No. 9898; Policy Research Working Paper). <https://openknowledge.worldbank.org/handle/10986/36820>

- 36 Abdullah, W. S. W., Osman, M., Kadir, M. Z. A. A., & Verayiah, R. (2019). The potential and status of renewable energy development in Malaysia. *Energies*, 12(12). <https://doi.org/10.3390/en12122437>
- 37 Sustainable Energy Development Authority Malaysia. (2021). Malaysia Renewable Energy Roadmap. Pathway towards low carbon energy system. <https://www.seda.gov.my/reportal/myrer/>
- 38 Lau, L.-S., Choong, Y.-O., Ching, S.-L., Wei, C.-Y., Senadjki, A., Choong, C.-K., & Seow, A.-N. (2022). Expert insights on Malaysia's residential solar-energy policies: shortcomings and recommendations. *Clean Energy*, 6(4), 619–631. <https://doi.org/10.1093/ce/zkac043>
- 39 Lim Chu Ai, R. (2022). Is the Net Energy Metering 3.0 Program sufficient? In *The Legal 500*. <https://www.legal500.com/developments/thought-leadership/is-the-net-energy-metering-3-0-program-sufficient/>
- 40 Razali, A. H., Abdullah, M. P., Hassan, M. Y., & Hussin, F. (2019). Comparison of New and Previous Net Energy Metering (NEM) Scheme in Malaysia. *ELEKTRIKA- Journal of Electrical Engineering*, 18(1), 36–42. <https://doi.org/10.11113/elektrika.v18n1.141>
- 41 Lau, L.-S., Choong, Y.-O., Ching, S.-L., Wei, C.-Y., Senadjki, A., Choong, C.-K., & Seow, A.-N. (2022). Expert insights on Malaysia's residential solar-energy policies: shortcomings and recommendations. *Clean Energy*, 6(4), 619–631. <https://doi.org/10.1093/ce/zkac043>
- 42 Koerner, S. A., Siew, W. S., Salema, A. A., Balan, P., Mekhilef, S., & Thavamoney, N. (2022). Energy policies shaping the solar photovoltaics business models in Malaysia with some insights on Covid-19 pandemic effect. *Energy Policy*, 164, 112918. <https://doi.org/10.1016/j.enpol.2022.112918>
- 43 Aman, A. S. (2021, July 2). Malaysia needs more NEM, says solar industry body. *New Straits Times*. <https://www.nst.com.my/business/2021/07/704454/malaysia-needs-more-nem-says-solar-industry-body>
- 44 Carroll, D. (2021, June 25). Risen Energy plans 3 GW cell, module factory in Malaysia. *PV Magazine*. <https://www.pv-magazine.com/2021/06/25/risen-energy-plans-3-gw-cell-module-factory-in-malaysia/>
- 45 Malaysian Industry - Government Group For High Technology. (2017). Malaysia Solar Industry Roadmap 2030. Empowering PV Industries. <https://might.org.my/download/malaysia-solar-industry-roadmap-2030-empowering-pv-industries/>
- 46 Ibid.
- 47 Vaka, M., Walvekar, R., Rasheed, A. K., & Khalid, M. (2020). A review on Malaysia's solar energy pathway towards carbon-neutral Malaysia beyond Covid'19 pandemic. *Journal of Cleaner Production*, 273, 122834. <https://doi.org/10.1016/j.jclepro.2020.122834>
- 48 Environmental Quality (Clean Air) Regulations 2014, (2014) (testimony of Minister of Natural Resources and Environment). https://eswis.doe.gov.my/helpDocs/No.5%20-%202014/Peraturan-peraturan_kualiti_alam_sekeliling_udara_bersih_2014_EN.pdf
- 49 Joshi, D. (2019). A Proposal for Carbon Price-and-Rebate (CPR) in Malaysia. <https://penanginstitute.org/publications/issues/a-proposal-for-carbon-price-and-rebate-cpr-in-malaysia/>
- 50 Al-Amin, A. Q., Rasiah, R., & Chenayah, S. (2015). Prioritizing climate change mitigation: An assessment using Malaysia to reduce carbon emissions in future. *Environmental Science & Policy*, 50, 24–33. <https://doi.org/10.1016/j.envsci.2015.02.002>
- 51 Bursa Malaysia. (2022). Bursa Malaysia To Launch Voluntary Carbon Market Exchange By Year-End. https://www.bursamalaysia.com/sites/5bb54be15f36ca0af339077a/content_entry5c11a9db758f8d31544574c6/62f9c18b5b711a43802a7373/files/15_AUGUST_2022_Bursa_Malaysia_To_Launch_Voluntary_Carbon_Market_Exchange_By_Year-End_.pdf?1660535365
- 52 OEC. (n.d.). Photosensitive/photovoltaic/LED semiconductor devices. Retrieved August 30, 2022, from [https://oec.world/en/profile/hs/photosensitivephotovoltaicled-semiconductor-devices#:~:text=Exporters%20and%20Importers&text=In%202020%2C%20the%20top%20exporters,South%20Korea%20\(%243.28B\)](https://oec.world/en/profile/hs/photosensitivephotovoltaicled-semiconductor-devices#:~:text=Exporters%20and%20Importers&text=In%202020%2C%20the%20top%20exporters,South%20Korea%20(%243.28B)).
- 53 Petronas. (2022). PETRONAS, TNB Join Forces to Advance Malaysia's Carbon Neutral Aspirations. <https://www.petronas.com/media/press-release/petronas-tnb-join-forces-advance-malaysia-carbon-neutral-aspirations>



Institute for Advanced Sustainability Studies (IASS) e. V.

The Institute for Advanced Sustainability Studies (IASS) conducts research with the goal of identifying, advancing, and guiding transformation processes towards sustainable societies in Germany and abroad. Its research practice is transdisciplinary, transformative, and co-creative. The institute cooperates with partners in academia, political institutions, administrations, civil society, and the business community to understand sustainability challenges and generate potential solutions. A strong network of national and international partners supports the work of the institute. Among its central research topics are the energy transition, emerging technologies, climate change, air quality, systemic risks, governance and participation, and cultures of transformation. The IASS is funded by the research ministries of the Federal Government of Germany and the State of Brandenburg.

IASS Policy Brief 5/2022 October 2022

Institute for Advanced Sustainability Studies (IASS) e. V.
Berliner Straße 130
14467 Potsdam
Tel: +49 (0) 331-28822-300
Fax: +49 (0) 331-28822-310
E-Mail: media@iass-potsdam.de
www.iass-potsdam.de

Managing Scientific Director:
Prof. Mark Lawrence,
authorised to represent the institute

Editing: Damian Harrison

DOI: 10.48481/iass.2022.041
ISSN: 2196-9221



Das Zeichen für
verantwortungsvolle
Waldwirtschaft

SPONSORED BY THE



Federal Ministry
of Education
and Research

FONA
Research for Sustainability



LAND
BRANDENBURG
Ministerium für Wissenschaft,
Forschung und Kultur

The logo for Land Brandenburg, featuring a stylized red bird in flight above the text 'LAND BRANDENBURG' and 'Ministerium für Wissenschaft, Forschung und Kultur'.