



Accelerating the energy transition:

how governments and the private sector in Asia-Pacific are driving the shift to a low-carbon future

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About the research

Accelerating the energy transition: how governments and the private sector in Asia-Pacific are driving the shift to a low-carbon future is an Economist Impact report based on research undertaken between March and June 2022, sponsored by Sumitomo Mitsui Banking Corporation (SMBC). The report contains key insights on the transition to clean and renewable energy in nine countries in the Asia-Pacific region, derived from extensive desk research, a primary research survey and expert interviews, produced by a team of Economist Impact researchers and editors including:

Gillian Parker, project director

Ritu Bhandari, project manager

Sakshi Tokas, analyst

Monica Woodley, editor

Economist Impact conducted a survey of 450 executives, who are familiar with their organisation's sustainability initiatives, across nine countries in Asia-Pacific to gather primary insights and perspectives on energy transition in the region, and undertake a comparative analysis of efforts to transition in these countries. Survey questionnaires included five preliminary demographic questions to understand the background of respondents, such as age and gender and 10 content questions to understand the perceptions and individual views of executives.

Countries covered



Australia, India, Indonesia, Japan, Malaysia, Philippines, Singapore, Thailand and Vietnam

Sample size



A total of 450 senior level executives (50 from each country) from 23 industries were surveyed, the **top five sectors** being*:

- Financial services (20%)
- Manufacturing (12%)
- Technology (10%)
- Professional and Business services (8%)
- Construction (6%)

Organisation size



- Less than 250 employees: 25.3%
- More than 250 employees: 74.7%

*Some sectors were not included as random sampling methodology was used.

This research programme benefited from the inputs of industry and academic experts working in the area of the green energy transition, climate change and sustainable finance. We would like to thank the following experts for their time and insights:

- **Allard Nooy**, former chief executive, InfraCo Asia
- **Nikki Kemp**, director, Sustainable Development Investment Partnership Association of South-East Asian Nations (ASEAN) Hub, World Economic Forum
- **Nithi Nesadurai**, director and regional coordinator, Climate Action Network Southeast Asia
- **Pradeep Tharakan**, principal climate change specialist, Asian Development Bank
- **Shruti Sharma**, senior policy advisor, International Institute for Sustainable Development (IISD)

Foreword by Sumitomo Mitsui Banking Corporation

Environmental, social and governance (ESG) considerations have to become ever more prominent in all the business decisions we make. Driven by the global health crisis, geopolitical conflicts, rapid climate change as well as consumer and investor demand, we must prioritise purpose and the greater good alongside profit like never before.

To achieve the objectives as outlined by the United Nations' Sustainable Development Goals (SDGs) and the historic Paris Agreement, a just and urgent energy transition is key. This comprises adequate, clean and affordable energy infrastructure as well as climate aligned finance. The good news is that the push to realise net zero is now at the forefront of most major corporate and government agendas.

As economies across the Asia-Pacific region continue to grow at an exponential rate, so will energy demand from increased urbanisation and industrial transformation. The shift to renewable sources of energy is imperative for these countries to meet growing demand and achieve their decarbonisation goals. With varying degrees of adoption and the amount of effort and investment required to transition to renewable energy, prudent strategies need to be put in place including leveraging new technologies for more affordable and accessible renewable energy sources without disrupting the livelihoods of the many communities across the region.

In commissioning this Economist Impact report, we wanted to dig deeper into the considerations and drivers for the adoption of renewables, common challenges and bottlenecks. The findings of the regional survey shed light on how we may advance this transition by tailoring access to finance, technology innovation and ecosystem collaboration, to name a few.

Sustainability lays the foundation of our business, and we remain committed to engaging and supporting companies and governments in a collective effort to accelerate the Principles for Financing a Just and Urgent Energy Transition, address climate change, and achieve a decarbonised society. As a global financial solutions provider, we have taken steps towards achieving net zero in our group wide operations and our overall investment and loan portfolio. To make sustainability a reality, we will continue to innovate and adapt solutions to meet the evolving needs of our stakeholders and environment.

With best practices in place, abundance of renewable resources, as well as the close partnership between public and private sectors, we are confident this region is well-positioned to become a leader in the production and export of renewables, and we will be able to create a better, greener tomorrow for all.



Yuichi Nishimura

Managing executive officer and co-head
of Asia Pacific Division
Sumitomo Mitsui Banking Corporation



Rajeev Kannan

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Executive summary

“We are on a fast track to climate disaster. Major cities underwater. Unprecedented heat waves. Terrifying storms. Widespread water shortages. The extinction of a million species of plants and animals. This is not fiction or exaggeration. It is what science tells us will result from our current energy policies,”¹ says United Nations’ Secretary-General Antonio Guterres.

His dire warning is backed up by the most recent Intergovernmental Panel on Climate Change (IPCC) report which made clear that aggressive action is needed to drastically cut global carbon emissions over the next few decades and contain the temperature increase to about 1.5C, a vital threshold for limiting the worst effects of global warming on people and ecosystems.² This will require major transitions in the energy sector, including a substantial reduction in fossil fuel use, widespread electrification, improved energy efficiency and the development and adoption of alternative fuels and green technologies.

But the road to clean, green energy is littered with potholes. Russia’s invasion of Ukraine is now pitting energy security against the progress that has been made to pursue the energy transition. The conflict has led to high and volatile prices for fossil fuels and greater near-term competition for non-Russian supplies. Market headwinds have exposed the energy vulnerabilities of countries in Asia-Pacific and the mechanisms in place to weather strained supply. The conflict will likely have major implications for global climate targets, according to Mr Guterres, with some countries ramping up production of fossil fuels in the short term. However, there

also are signs the conflict could help accelerate the transition to renewables, with many countries pledging greater funding for green infrastructure and organisations examining how renewables and greater energy efficiency can help them contain costs.

“We are on a fast track to climate disaster. Major cities underwater. Unprecedented heat waves. Terrifying storms. Widespread water shortages. The extinction of a million species of plants and animals. This is not fiction or exaggeration. It is what science tells us will result from our current energy policies.”¹

Antonio Guterres, United Nations’ Secretary-General

Combining qualitative and quantitative analysis, including a survey of 450 executives across nine countries in Asia-Pacific, our research shows how the public and private sector are driving the transition to a low-carbon future, as well as

detailing the significant challenges facing the energy transition. The key findings of the survey and analysis are:

- **Governments must put their money where their mouths are.** Fossil fuel subsidies discourage the adoption of renewable sources of energy. Moreover, they distort markets, send the wrong price signals to users and widen fiscal deficits in developing economies. Political hesitancy is likely to slow the removal of fossil fuel subsidies, particularly in emerging low-income economies where they cushion the poorest against the impact of rising energy costs.
- **Regulation will enable progress.** Respondents report more comprehensive regulations and policies are needed to support them in achieving energy goals in their sectors in the next five years. Clarity is needed on aspects such as tariffs and renewable purchase obligations (RPOs). Policy should promote grid connectivity and the development of the market. Incentivising investment in renewable energy would also help.
- **Innovative financing needed to bridge the investment gap.** The region will need trillions of dollars to help it reach net zero. Governments need to minimise business risk for companies that are willing to invest but are worried about shifting policies. Multilateral and government backing of long-term clean energy projects will reassure prospective investors.
- **Weaning the Asia-Pacific region off its dependency on fossil fuels will require trillions in investment.** The Asia Investor Group on Climate Change (AIGCC) estimates that the investment opportunity for Asia's energy supply to achieve net-zero is between US\$26 trillion to \$37 trillion cumulatively from 2020 to 2050.³ Most survey respondents believe that government support through subsidies/grants, equity investment and/or debt are useful mechanisms to fund renewable energy projects. According to supporting research and expert interviews, this is particularly the case where a project does not achieve bankability, financial viability or poses risks to investors. Only a quarter of respondents said that they rely on subsidies to fund their companies' energy transitions, using internal funding and corporate social responsibility (CSR) initiatives instead.
- **Market-based instruments have traction, but some mechanisms need more regulatory governance.** Over three quarters of respondents say their organisation invests in market-based instruments such as renewable-energy certificates to offset carbon emissions. The carbon offset market is rapidly growing in Asia-Pacific. An anticipated framework established by the Integrity Council for the Voluntary Carbon Market (ICVCM) should help govern the quality of carbon credits.
- **Technology is critical to fast-track decarbonisation.** Over three quarters of respondents are prioritising the adoption of green technologies to support the energy transition, collaborating with innovative technology partners to accelerate climate awareness and solutions, and investing in the research and development of new energy solutions. Storage technologies, electrification of vehicle fleets, energy efficiency and digital grids were all cited by our experts and respondents as levers to help achieve decarbonisation targets.
- **Clean energy transition is key to future energy security.** Renewable energy has to grow rapidly if it has a chance of displacing fossil fuel energy and to satisfy the demand for energy in regions such as South-East Asia. However, use of hydrogen and carbon capture and sequestration may help support the shift to renewables, balancing the transition with energy security – a priority for many countries in light of the energy crunch triggered by the war in Ukraine.
- **Enabling a just and responsible energy transition.** How the transition to renewable energy remains just, fair and inclusive preoccupies the executives surveyed. Feed-in-tariffs and taxes are considered punitive for consumers already reeling from the impact of the covid-19 pandemic and the energy crunch. These are the least preferred paths to raise cash to enable the energy transition, according to respondents.



Maintaining economic growth in tandem with reducing emissions is a significant challenge for countries in the Asia-Pacific region, not least because the region's energy demand is expected to double by 2030.

Introduction

As the Asia-Pacific region is responsible for more than half of the world’s carbon dioxide (CO₂) emissions⁴, it has a vital role to play in taking decisive steps to cut emissions and contain warming to 1.5C. It also has the most to lose if it does not act. Four of the top ten countries most vulnerable to climate change risks are in the Association of South-East Asian Nations (ASEAN) and it will be the hardest hit region in the world economically, with a projected 37% GDP loss in the worst of the predicted climate scenario models. That is a US\$2.8-4.7 trillion loss in GDP annually – more than two thirds of the global total.⁵

However, maintaining economic growth in tandem with reducing emissions is a significant challenge for countries in this region, not least because Asia-Pacific’s energy demand is expected to double by 2030. There are vast country-by-

“While the investments and targets towards green transition are picking up, different countries are doing it at different speeds.”

Pradeep Tharakan, principal climate change specialist, Asian Development Bank

country variations as they reduce their dependence on fossil fuel energy while trying to cope with growing domestic demand for electricity. “While the investments and targets towards green transition are picking up, different countries are

Table 1: Six out of nine countries in this research have declared a clear deadline for net zero or carbon neutrality commitments

	Net zero or carbon neutrality target	Date to achieve by
Australia		2050
India		2070
Indonesia		2060
Japan		2050
Malaysia		2050
Philippines		Unclear ⁶
Singapore		Unclear ⁷
Thailand		Unclear ⁸
Vietnam		2050



doing it at different speeds. Overall, transition speeds need to accelerate a lot more,” highlights Pradeep Tharakan, principal climate change specialist, Asian Development Bank.

Governments across Asia-Pacific have committed to net zero or carbon neutrality targets (Table 1) and some have laid down plans to reach those goals. Progress will be driven by clean-energy deployment in power generation and end-use sectors. But without a strong effort to accelerate transitions, the region will remain vulnerable to import needs and energy security vulnerabilities.

Success will depend on the region’s ability to transition into diversified and stable renewable energy sources. The Asia-Pacific region possesses abundant, largely unexploited sources of clean energy. It has strong potential for hydropower and solar energy, as well as significant geothermal reserves. The

region also hosts substantial potential for ocean energy.⁹ And although of more modest potential, some nations have sufficient average wind speeds for wind power. Other natural resources in the region, such as nickel, bauxite, copper, lithium and cobalt could make it a key supplier of critical minerals for the manufacture of clean energy products.

Targeted investment is needed to facilitate growth. The energy transition drew a record \$755 bn of global investment in 2021, with almost half the investment occurring in Asia.¹⁰ According to experts interviewed, investment is needed in projects such as renewables storage, charging infrastructure, hydrogen production and carbon capture, utilisation and storage (CCUS) projects to accelerate the clean energy transition and meet rising energy demand.



The path to a low-carbon future in the Asia-Pacific region is not a simple one. Breaking the dependency on fossil fuels, the economic backbone for some economies and the ticket to faster industrialisation, will not only depend on capital but also on political will.

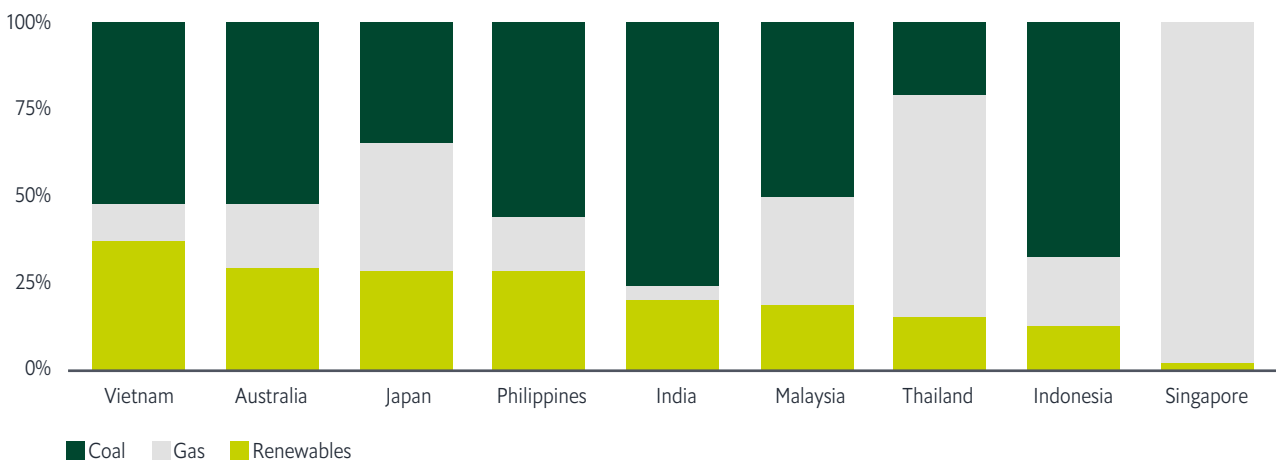
Asia-Pacific snapshot: a winding path to a low-carbon future

While most countries covered in this report have set net zero emissions targets, they continue to rely heavily on fossil fuels, with the region hosting some of the world’s largest emitters. “There is a growing list of ambitions for the energy sector regarding the clean energy transition, but little convergence between them or clarity on how to reach them. A plan for growth in clean energy, alone, is not enough, we also need to see a plan for the decline of fossil fuels,” says Shruti Sharma,

senior policy advisor, International Institute for Sustainable Development (IISD).

While the majority of countries in the Asia-Pacific region have some form of renewable energy national policy, most often for specific renewable energy sources, they largely lack a comprehensive and credible transition plan.

Figure 1: Vietnam leads in adoption of renewables for domestic electricity consumption
% of electricity drawn from coal, gas and renewables, 2021



Source: Our World in Data (2020)¹¹

Net importers: heavily dependent on fossil fuels

India, Japan and Singapore are amongst the top ten importers of fossil fuels globally.¹² Fossil fuels represent about 75% and 94% of energy in the Philippines and Malaysia respectively. The survey finds that a large number of businesses in India and Singapore have set emission reduction targets, although both countries are behind Japan, North America and Europe in setting their net neutrality targets. In the context of their current stated policies and trajectory, both countries are expected to continue relying heavily on fossil fuels, particularly in the short-term, as countries counter an energy crunch triggered by the war in Ukraine.

In **India**, the survey shows that civil society pressure and consumer awareness have a stronger influence than government regulations in driving the green transition of businesses, possibly due to lack of clear government regulations. Half of executives from the country (higher than an overall average of 40% from nine countries surveyed) also indicate the need for a clearer regulatory framework for renewables in the next five years. Already the world's third largest emitter, India's energy demand – driven by an expanding economy, population growth, and rapid

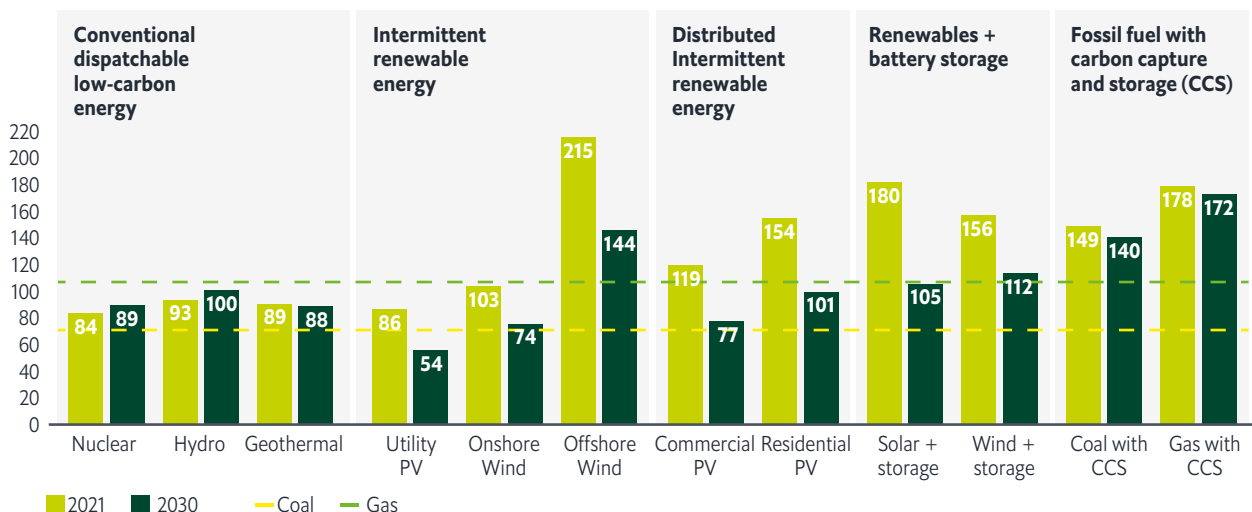
urbanisation and industrialisation – is expected to grow by almost 5% per year to 2040, overtaking the European Union as the world's third-largest energy consumer by 2030.¹³

India has experienced success in connecting millions to the grid and expanding renewable sources of energy and the country is aiming to build enough carbon-free electricity generation capacity to reach 500 gigawatts (GW) by the end of the decade. However, there are pressing problems including a lack of reliable electricity supply, continued reliance on biomass as a cooking fuel, which is harmful to both human health and the environment, and financially hobbled electricity distribution companies.

Despite the country's huge dependence on fossil fuels, businesses in **Singapore** are optimistic about the green transition. Geographically constrained, the city-state draws almost all (98%) of its energy supply from fossil fuels¹⁴ but it has ambitions, set out in the Singapore Green Plan 2030, to halve peak greenhouse gas emissions by 2050 and achieve net zero emissions "as soon as viable" by the second half of this century.¹⁵ Despite its limitations, Singapore is ahead of other countries in the region in creating a carbon tax and common trading platform models, such as Climate Impact X (CIX), an online voluntary carbon market for trading high-quality carbon credits, highlights Allard Nooy, former chief executive at InfraCo Asia.

Figure 2: Green energy costs are expected to fall

Average levelised cost of electricity for low-carbon generating options, US\$MWh (megawatt hour)



Source: Wood Mackenzie (2022)¹⁶



Executives in Singapore are also positive about these models and the majority of respondents (62%) are interested in purchasing carbon offsets in the next five years. Singapore is looking at alternatives for reducing thermal power generation by potentially importing renewables through initiatives like Sun Cable. The development aims to export clean power to Singapore from the Northern Territory in Australia via a 4,200 km high-voltage undersea cable, by 2029.¹⁷ Singapore also started importing renewable energy from Laos through Thailand and Malaysia in June, a first for the city-state.¹⁸ The Lao PDR-Thailand-Malaysia-Singapore Power Integration Project (LTMS-PIP) will import up to 100 MW of renewable hydropower using existing interconnections.

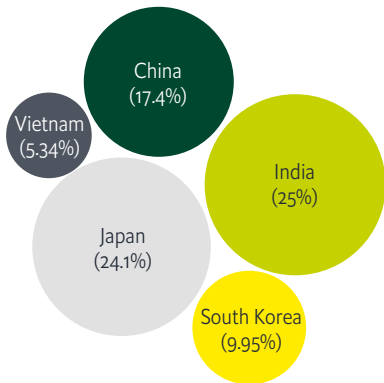
While **Japan** has pledged to reach net zero by 2050, this is not reflected in its public financing of fossil fuels. Asia's second-largest economy is the G7's second-largest funder of fossil fuels.¹⁹ However, last year Japan, along with other G7 countries, agreed to stop international financing of coal projects that have not taken measures to reduce greenhouse gas emissions. The country's net zero commitment is not well reflected in individual companies' targets. It is home to the highest number of survey respondents (30%) who claim that their organisation does not yet have a plan for emissions reduction. A majority (62%, considerably higher than the overall average of 39%) point to high costs of renewable energy as a major bottleneck in the transition. This could be a result of high installation costs which, for example, are considerably higher in Japan than in other markets.²⁰ Japanese respondents expressed more scepticism over the viability of technology than those from elsewhere in the region. Renewable energy developers in Japan face higher risk as they need to factor in "high curtailment rates" in case of grid uncertainties and without any compensation from the government.²¹

Malaysia and the **Philippines** continue to be primarily reliant on coal from Indonesia, Australia and Russia for their electricity generation.^{22,23} While the Malaysian government has announced a 2050 net-neutrality target—and despite having a strong solar potential—over 40% of executives surveyed say that "expensive renewable energy" is a major bottleneck in transition, as the country remains one of the more expensive markets in the Asia-Pacific region.²⁴ Survey respondents in the Philippines also cite cost as the biggest bottleneck, with the country suffering from high up-front costs and little financing support for renewable energy projects from local banks.²⁵

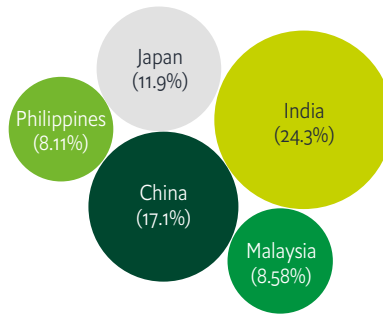
Fossil fuel exporters: cutting domestic emissions

Australia is one of the top exporters of coal worldwide and the seventh largest gas producer. Its liquefied natural gas (LNG) exports have increased significantly over the past decade, according to its government, with export revenue of \$30.5 billion (2020-2021) making it the country's third-largest commodity export by value.²⁶ Coal exports used in power generation are expected to rise 15% in the year to June 2023.²⁷ Despite its vast exports, Australia's reliance on fossil fuels for domestic energy consumption is declining. Renewables accounted for 32.5% of the country's total electricity generation in 2021, an increase of almost five percentage points from 2020. This should accelerate as new Prime Minister Anthony Albanese has vowed to enact a "new era" of climate action and to cut carbon emissions 43% by 2030 from 2005 levels, compared with the previous government's goal of 26% to 28%. It has the potential to generate even more clean energy profitably and has plans to position itself as an exporter of clean energy (through initiatives such as the Sun Cable, green hydrogen and its derivatives).

Figure 3: Top five importers of coal (2020)
from Australia:



from Indonesia:

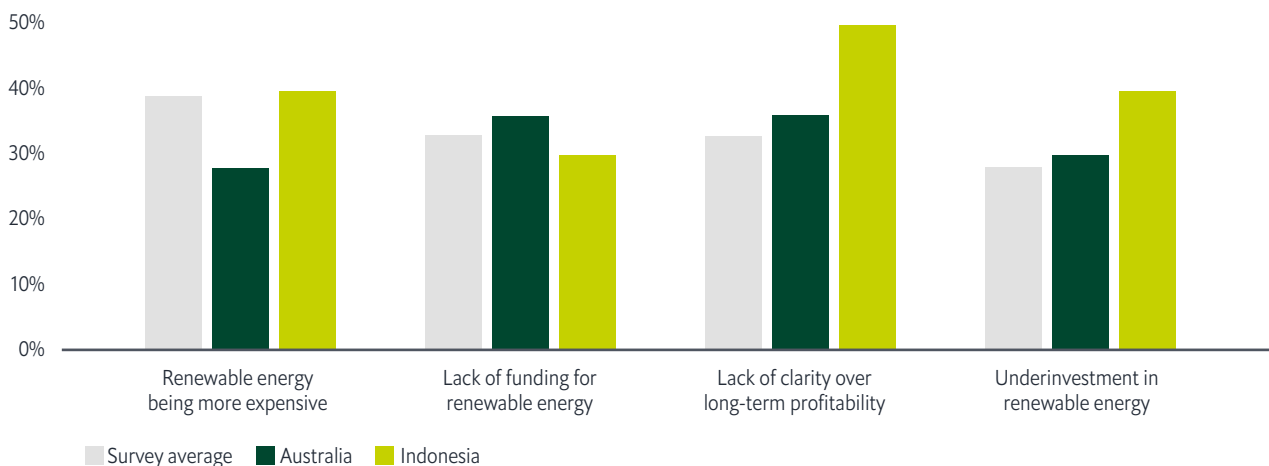


Source: The Observatory of Economic Complexity (2020)

Indonesia is the world’s largest thermal coal exporter. Coal also represents about 60% of the country’s energy mix. Export earnings from coal are roughly \$3 billion a month, contributing to about 5% of the country’s GDP and 12% of all export income. Early retirement of coal-fired plants remains an economic and political dilemma. Survey results show the economic woes that businesses in coal-producing Indonesia face. Half of its executives, much higher than other countries in the survey, highlight long-term profitability of renewable energy as a major bottleneck towards transition, and 40% cite “renewable energy being more expensive” and

“underinvestment in renewable energy” (figure 4). Nikki Kemp, director, Sustainable Development Investment Partnership ASEAN Hub, World Economic Forum, explains: “Indonesia in particular struggles with the fact that it is one of the largest exporters of thermal coal in the world, and that it’s got a cheap resource internally to generate energy.” However, the archipelago has now lost a trio of its top three foreign funders of coal plants in the country—China, Japan and South Korea—and the state-owned electricity utility has committed to stop building new plants.

Figure 4: Survey highlights the economic dilemma of fossil fuel exporters
% of respondents that selected the four bottlenecks around funding and profitability



Source: Economist Impact (2022)

Leading the transition—Vietnam

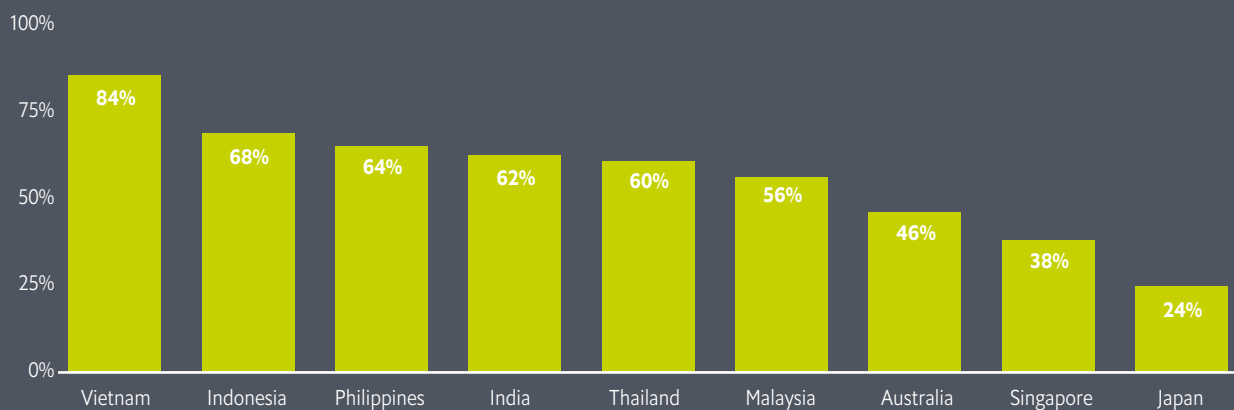
Vietnam is making the shift to renewable energy faster than almost any country in the world, with a focus on electricity generated by solar and wind. In 2014, the share of renewable energy in Vietnam was just 0.32% with only 4 megawatts (MW) of installed solar capacity for power generation available in 2015. In 2021, Vietnam generated 16.5 GW of solar power electricity capacity, penetrating a quarter of the national power system.²⁸ Wind makes up roughly 1% of Vietnam’s electricity production, 597 MW. It aims to produce 11.8 GW of wind power capacity by 2025.²⁹

“Vietnam’s renewable energy success story is in part due to a clear regulatory regime,” according to Allard Nooy, former chief executive at InfraCo Asia. “Foreign direct investors have a clear regulatory regime. There are no restrictions on foreign direct investment, and no caps on local ownership or foreign ownership whatsoever,” says Mr Nooy.

He adds that several years ago Vietnam launched a feed-in tariff structure, which provides a guaranteed, above-market price for producers of renewable energy, for both solar and wind, and prior to that they had avoided costly tariffs for hydropower.

Regulatory clarity is having an impact—survey respondents from Vietnam were much less likely than average to cite a lack of supportive legal and regulatory framework as a bottleneck in transitioning to renewable energy in their sector. And that clarity is represented in the survey results as companies are setting their own transition plans (see Figure 5).

Figure 5: Does your organisation have a plan to achieve net zero emissions or does it have emission reduction targets?
% of respondents who answered yes, there is a well-defined official plan with clear targets, a specific timeline and a roadmap for implementation



Source: Economist Impact (2022)

The path to a low-carbon future in the Asia-Pacific region is not a simple one. Breaking the dependency on fossil fuels, the economic backbone for some economies and the ticket to faster

industrialisation, will not only depend on capital but also on political will. While there are some bright spots in the region, there are systemic issues deterring investment and stalling progress.

Roadblocks to achieving a low-carbon future

Lack of clear regulations is throttling progress

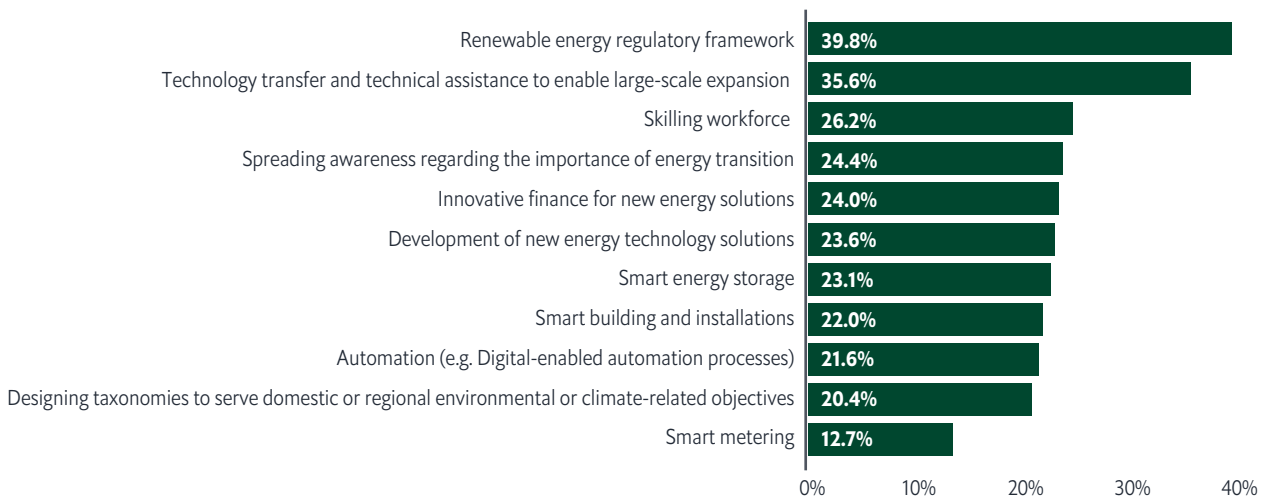
Business risk is deterring the development of low-carbon solutions, according to Ms Kemp. “The private sector doesn’t want to get involved in anything that could become a derailer for them, financially or reputationally,” she says. “It’s important to identify these barriers that are stopping them from coming into the market.”

The early retirement of coal-fired power plants is key to accelerating the shift to clean energy but they usually operate

under long-term power purchase agreements, making it difficult to close them before the contracts expire.

Over a third of executives say that a renewable energy regulatory framework – which provides clarity on aspects such as tariffs and renewable purchase obligations (RPOs), and promotes grid connectivity and the development of the market—is what is most needed to achieve energy goals in their sectors in the next five years (Figure 6).

Figure 6: In the next five years, which of the following areas do you believe will require the highest support in order to achieve energy goals in your sector?



Source: Economist Impact (2022)

Governments are slow to change existing laws to allow the development of renewable energy projects such as solar and wind parks. Over a third of respondents from India and Indonesia point to a “shortage of area for development” as a bottleneck in the transition to renewables. In India, private investors are generally prohibited from acquiring large tracts of land in rural areas due to the existence of state land-ceiling laws.³⁰ Ongoing land conflicts have impacted nearly \$70 billion of power sector investment. In Indonesia, a fragmented regime of national, regional and local government agencies controls land governance, making acquisition for development a protracted and byzantine process.³¹

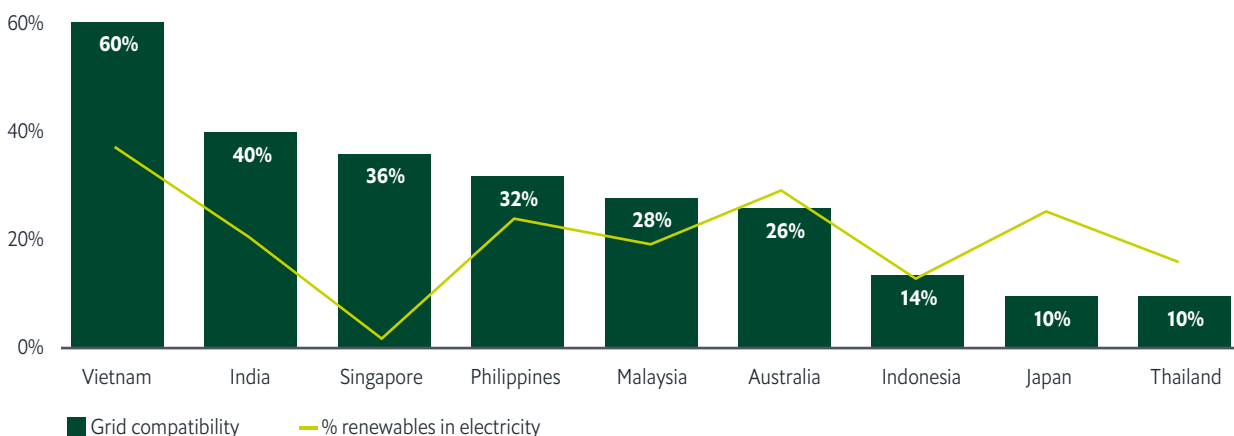
Grids are grinding progress to a halt

Survey respondents highlight grid compatibility and integrating intermittent renewable energy into traditional grid structures as a major bottleneck in the transition to clean energy. For all of its success in increasing renewable energy generation, Vietnam’s weak grid capacity is obstructing the integration of new capacity and inhibiting growth. Citing insufficient input facilities to transfer renewable energy to the grid, Vietnam’s National Load Dispatch Center (NLDC) has stated it will not add more wind and solar power capacity to the national plan in 2022.³²

Mr Tharakan explains: “ In Vietnam you saw what happens when you undertake a very rapid increase in renewable energy deployment without having the necessary grid infrastructure in place. Often, projects were curtailed because there wasn’t enough transmission capacity so power could not be transmitted to places where they needed it. That is a good lesson – expansion of renewable energy needs to be phased in based on effective planning, and it must be done in a systematic way.”

Ageing transmission grids are not designed to accommodate the variability of wind and solar power, which can fluctuate throughout the day and between seasons. Battery storage technology, while improving rapidly, needs to be scaled significantly to meet flexibility needs in a decarbonised electricity system. However, the potential in the region is significant. The Asia-Pacific region is expected to account for 68% of the \$10.84 billion global battery storage market in 2026, with China, Japan, India, South Korea and Australia predicted to drive demand.³³

Figure 7: In your experience, what are some of the biggest bottlenecks in transitioning to renewable energy in your sector?
% of respondents who selected grid compatibility as a bottleneck



Source: Economist Impact (2022)

Innovation in Asia-Pacific: growing pains

Together with cost reductions, firms are banking on advancements in new technologies to help them meet ambitious emissions reduction targets. While over three quarters of survey respondents say that they are collaborating with innovative technology partners, they also highlight the need for more support for technological development. In the next five years, “technological improvements” would need the second highest level of support after regulations for large-scale expansion of renewables. “On the technology side, more funding is required, whether that’s a combination of the private sector and academic institutions, or other government-funded institutions,” according to Mr Nooy.

Funding gap

Many of the bottlenecks to transitioning reported by survey respondents are economic. The Asia Investor Group on Climate Change (AIGCC) estimates that the investment opportunity for Asia’s energy supply to achieve net zero is between US\$26 trillion to \$37 trillion cumulatively from 2020 to 2050.³⁴ In Asia, investments of \$26trn (to maintain temperatures below a 2°C rise) to \$37trn (for a 1.5 degree scenario) are needed.³⁵ International financing is fundamental in helping Asia-Pacific meet its renewable energy goals, but energy projects need to be bankable. A lack of clarity over long-term profitability and the underinvestment in renewable energy and supporting infrastructure is undermining investor confidence.

Green innovation is driving the transition

Carbon capture, utilisation and storage (CCUS) is a crucial emissions-reduction technology that can be applied across an increasingly diverse mix of applications and will play an important role as the region remains heavily dependent on fossil fuels. However, various technical, economic, societal and political challenges—particularly high costs and projects not meeting targets—will have to be addressed before CCUS technologies can be deployed at scale. Nevertheless, more than 100 new facilities were announced in 2021, with at least seven CCUS projects in early development in Asia-Pacific, including in Indonesia and Malaysia.³⁶

Green hydrogen: The demand for hydrogen reached an estimated 87 million metric tons (MT) in 2020 and is expected to grow to 500-680 million MT by 2050.³⁷ However, hydrogen is largely produced from fossil fuels.³⁸ The production of green hydrogen is critical to a low-carbon future, but so far, demand for new applications remains low and is primarily limited to road transportation. Even there, establishing it in the fuel mix has been difficult. Despite the positive growth of fuel cell electric vehicles (FCEVs) – increasing from around 25,000 passenger light-duty vehicles in 2020³⁹ to over 40,000 in 2021⁴⁰, they make up a very small share of the global stock of total vehicles. Green hydrogen has a negligible presence in the power sector, accounting for less than 0.2% of electricity generation globally, according to the International Energy Agency (IEA).⁴¹ Moreover, these green technologies are still on the path to becoming economical. Improvement in technology and falling renewable prices will increase the commercial viability of green hydrogen production.

Sustainable fuels: Sustainable aviation fuel (SAF) is gaining some traction in the region with Singapore receiving its first SAF cargo in July 2022, as part of a one-year pilot to test the new fuel by Singapore Airlines and Scoot flights. The Civil Aviation Authority of Singapore (CAAS), Singapore Airlines (SIA) and Temasek are planning to sell SAF credits. SIA will also partner carbon market exchange, CIX, to introduce a bundled portfolio consisting of SAF credits and carbon credits.⁴² However, SAF remains at a premium compared to conventional jet fuel, challenging its viability as the aviation industry struggles to restore cash flow and flight operations to pre-pandemic levels.

“If we are going to achieve the targets that the IPCC has laid out, this needs a big systemic approach. If we tackle this in the traditional way such as blended finance project by project, we might not be able to get there. We should look at financing from a national level. Looking at the transition plans of the energy sector and the country’s transition plan, assess how the different financial actors can fund a part of the plan, blending different financing at an aggregated plan level,” maintains Ms Kemp.

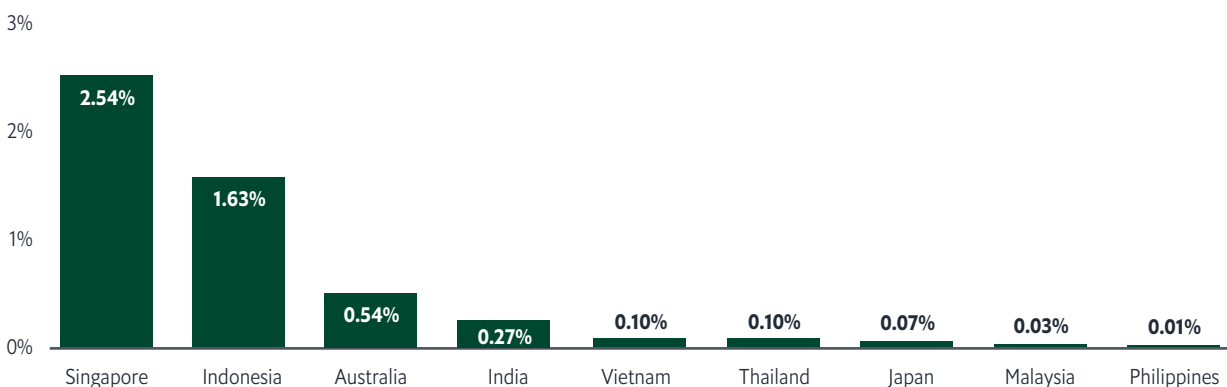
Fossil fuel subsidies discourage the adoption of renewable sources of energy. Moreover, they distort markets, send the wrong price signals to users and widen fiscal deficits in developing economies, states the IEA.⁴³ Reforming fossil fuel consumption subsidies in 32 countries could reduce global greenhouse gas emissions by almost 5.46 billion tonnes of CO₂ by 2030, equivalent to the annual emissions of about 3.8 billion cars, the IISD estimates.⁴⁴ Political hesitancy is likely to slow the removal of fossil fuel subsidies, particularly in emerging low-income economies where they cushion the poorest against the impact of rising energy costs.

“If we are going to achieve the targets that the IPCC has laid out, this needs a big systemic approach. If we tackle this in the traditional way such as blended finance project by project, we might not be able to get there.”

Nikki Kemp, director, Sustainable Development Investment Partnership ASEAN Hub, World Economic Forum

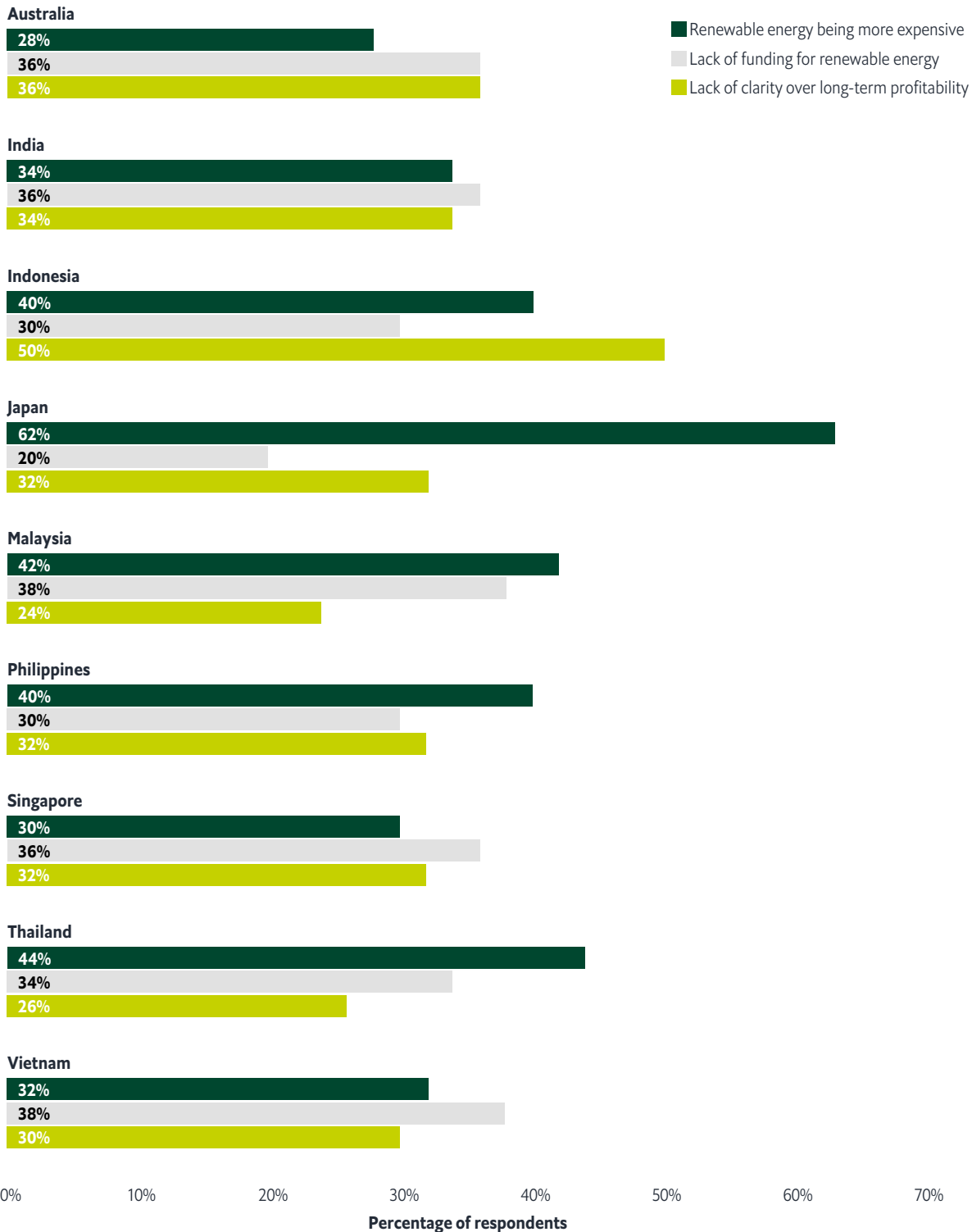
Figure 8: Fossil fuel subsidies as a share of GDP, 2020

Fossil-fuel pre-tax subsidies for both production and consumption shown as a share of total gross domestic product. Production subsidies reduce the cost of producing coal, oil or gas. Consumption subsidies, cut fuel prices for the end user, such as by fixing the price at the petrol pump so that it is less than the market rate.



Source: Our World in Data (2021)⁴⁵

Figure 9: In your experience, what are some of the biggest bottlenecks in transitioning to renewable energy in your sector?
Top three bottlenecks cited by respondents from nine markets interviewed:



Source: Economist Impact (2022)



Emerging economies require significant funding to wean national dependencies on cheap fossil fuels used domestically and exported.

Forging ahead to net zero

Innovative funding will power the drive to net zero

Higher interest rates to tame inflation, supply chain challenges and rising commodity prices may adversely hit the cost-competitiveness of renewables against existing, established fossil fuels. Addressing risks associated with operations, execution of projects and policies can help renewables gain a competitive price edge and assure foreign investors, particularly in the context of emerging markets.

Emerging economies require significant funding to wean national dependencies on cheap fossil fuels used domestically and exported. However, structural challenges could mean that they are losing out on investor climate capital.⁴⁶ More flexible sources of cash are needed for emerging markets as well as a significant overhaul of their debt capital markets to attract climate finance in the sums needed to fund transition efforts. Better data and transparency around how the proceeds from funding instruments are spent would also reassure investors.

Multilateral development banks and sovereign wealth funds could provide long-term capital to improve bankability in the context of emerging markets, where the need is greatest, according to experts interviewed. Blended finance, which combines concessional public funds with commercial funds, can be a powerful means to attract more foreign and domestic capital for renewable energy. Public-private partnerships (PPPs), already well-known in other areas of infrastructure development, are increasingly being deployed in the region. In Indonesia, a public-private initiative, United Nations

Economic and Social Commission for Asia and the Pacific (UNESCAP), is focusing on renewable energy projects for rural communities in the country that targets affordable electricity as well as income and livelihoods.⁴⁷ Some governments, such as Australia, Japan and Malaysia, have chosen to establish green investment banks, which use innovative transaction structures, and risk-reduction and transaction-enabling techniques – such as partial risk guarantee mechanisms, first loss reserves and (re)insurance schemes – to channel private investment into low-carbon, climate-resilient infrastructure.⁴⁸

Other financial mechanisms include green bonds and sustainability-linked loans. Globally, sales of green bonds hit a record \$513 billion last year and could reach between \$900 billion and \$1 trillion by the end of 2022, according to the Climate Bonds Initiative.⁴⁹ Philippine power company, AC Energy, has raised \$1.6 billion in green bonds since 2019. Singapore plans to issue up to \$25.4 billion sovereign green bonds by 2030. The Monetary Authority of Singapore (MAS) issued its inaugural sovereign green bond in August.⁵⁰ Funds will be funnelled towards projects improving energy efficiency, pollution prevention and the management of natural resources.

A clear framework is vital to incentivise private finance as investors always assess risk-return trade-offs. Clear tariffs and renewable purchase obligations (RPOs) reassure investors of their potential returns, as seen with Vietnam's feed-in tariffs for solar and wind power, which have boosted investment.



Innovative funding techniques are also being piloted in the region as a solution to long-term power purchase agreements. For instance, the Asian Development Bank's Energy Transition Mechanism intends to blend equity, debt and concessional finance to buy-out plants and retire them within 15 years, much sooner than their average lifespan. Indonesia, which gets 60% of its electricity from coal, and the Philippines and Vietnam, which get over half, have been chosen for pilot studies.⁵¹

Market-based instruments: establishing carbon markets and carbon taxes

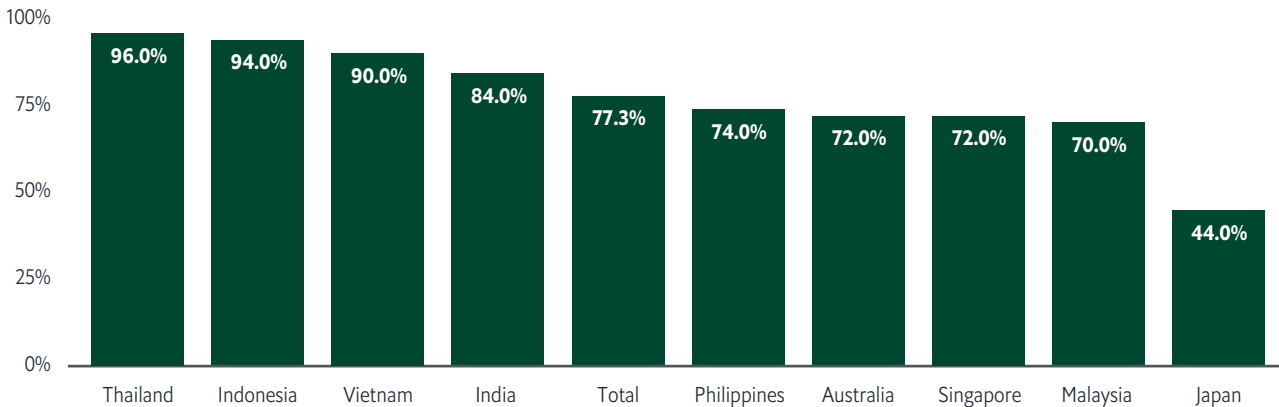
Survey respondents are enthusiastic users of market-based instruments used to neutralise the pollution they cause, with more than 75% of respondents saying their organisation invests in them. That enthusiasm is no doubt due to the recent

boom in a range of initiatives, from both private companies and governments, which is turning the region into a centre of innovation for voluntary carbon markets (VCMs) and nature-based solutions (NBS) to offset emissions.

NBS including growing forests, restoring peatlands and changing farming practices have the potential to trap planet-warming carbon. In theory, such initiatives could help protect biodiversity and guard against its loss. However, there is a long lead time for new NBS offsets to become effective with a lack of expertise to measure the carbon removal potential. While there is some oversight of the quality of NBS, the carbon offset market has been poorly regulated, undermining investor trust. The Integrity Council for the Voluntary Carbon Market (ICVCM) released a draft of its Core Carbon Principles in July in a bid to provide a "credible, rigorous, and readily accessible" global threshold standard for high-quality carbon credits.

Figure 10: Does your organisation invest in market-based instruments such as renewable-energy certificates to reduce carbon emissions?

% respondents who agreed



Source: Economist Impact (2022)

As a global financial hub, Singapore has multiple schemes, including VCMs such as Climate Impact X (CIX), a joint venture led by the Singapore Exchange (SGX), and AirCarbon, the world’s first fully digital carbon exchange. Since it began trading in 2020, AirCarbon has seen more than 10 million carbon credits transacted and it predicts trading volume will triple by the end of 2022, as listed firms across Singapore, Hong Kong and Japan comply with new climate-reporting requirements.⁵²

According to IEA, carbon pricing initiatives have been implemented or are scheduled for implementation in Indonesia, Japan, Philippines, Thailand, Singapore and Vietnam, alongside various subnational jurisdictions.⁵³

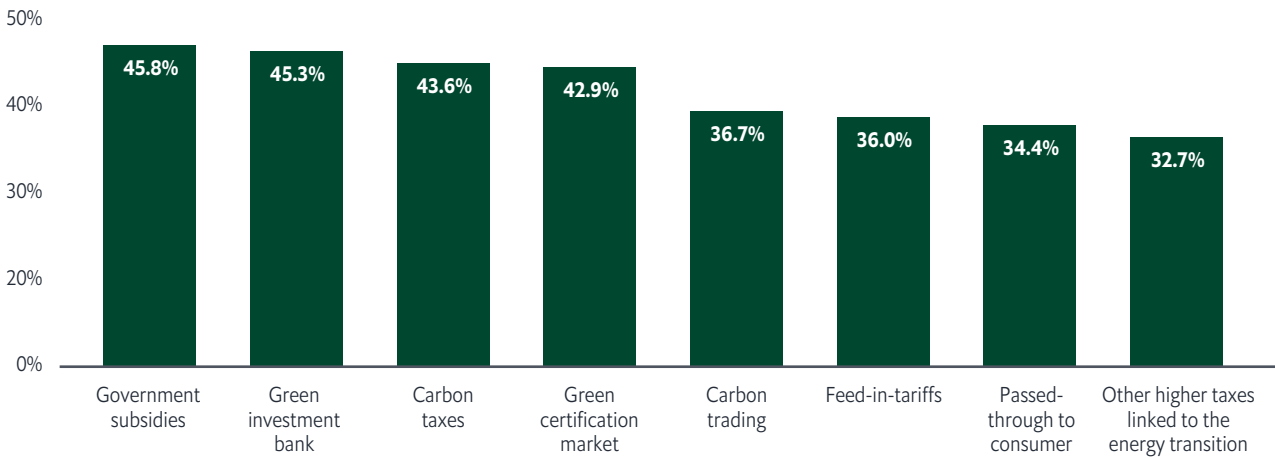
The Indonesian government trialled a voluntary and intensity-based pilot ETS for the power sector from April and August 2021, which allowed participants to trade allowances and offset credits from renewable energy generation. Regulation followed later that year which laid out the framework for a mandatory ETS, which will be phased in by 2024.⁵⁴ Indonesia will have a hybrid cap-trade-and-tax system, with the ETS designed to work alongside a carbon tax. The country’s proposed carbon tax of 30,000 rupiah (\$2.02) per ton of CO₂ equivalent has been criticised as too low but the government has promised to raise the tax to match market prices for carbon once trading is established.⁵⁵

Nithi Nesadurai, director and regional coordinator, Climate Action Network Southeast Asia, warns that countries need to take care with pricing. “It should not create a situation where some companies may find it cheaper to pay to continue polluting instead of transitioning to clean energy,” he says. “The rules on market mechanisms negotiated at the United Nations COP26, while not perfect, will help address previous loopholes and provide guidance.”

Singapore’s carbon tax rate has also been criticised as too low, with the rate of S\$5 (US\$3.60) per tonne of carbon emissions is significantly lower than in other countries such as Sweden (\$133.74) and Switzerland (\$98.90).⁵⁶ However, it will be raised to S\$25 a tonne in 2024, S\$45 in 2026 and 2027, and S\$50 to S\$80 by 2030.⁵⁷ The nation-state first implemented its carbon tax in 2019 – the first carbon pricing scheme in South-East Asia – which now covers facilities producing about 80% of its total carbon emissions.

Low pricing of government schemes together with the infancy of carbon markets and mechanisms may explain why survey respondents are less convinced of the viability of market-based instruments in encouraging the transition to renewables at a country level.

Figure 11: How viable do you think are the following instruments for funding the green energy transition at a country level?
% respondents who selected “very viable” for the different instruments (multiple selections allowed)



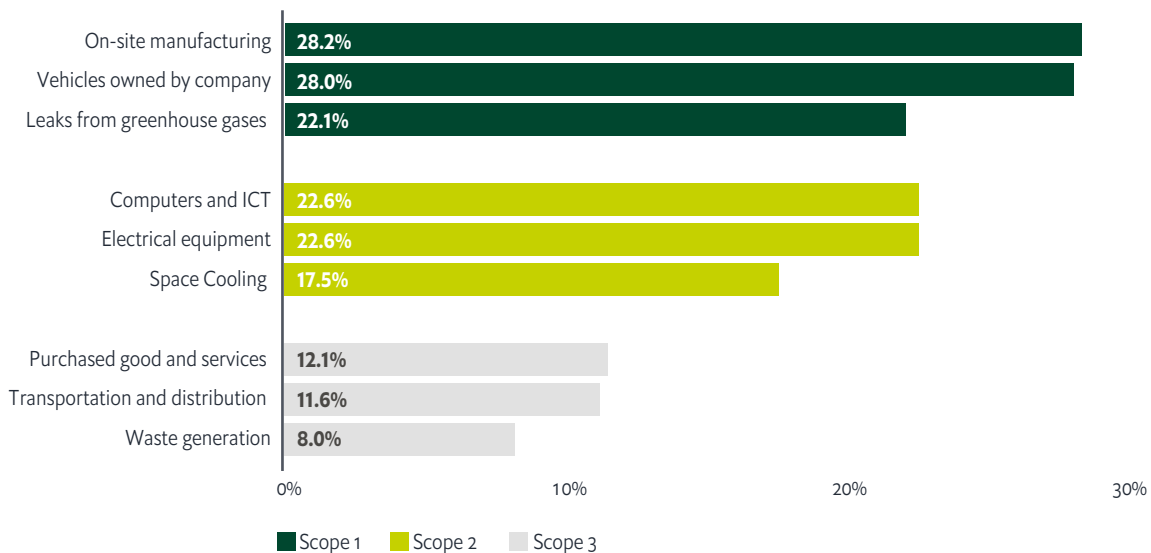
Source: Economist Impact (2022)

Asia at the forefront of electric vehicle growth

Executives in our survey reported that company vehicles are the second largest source of scope 1 emissions with the transportation and distribution of goods a major source of scope 3 emissions. The lowest share of respondents (18%) claim that scope 3 emissions are a primary source of their emissions. Carbon Trust, an advisory, reckons

that for most companies, scope 3 emissions represent 65% to 95% of a company’s carbon footprint. The survey findings point to reporting gaps and the difficulty of measuring scope 3 emissions given that the requirement to do so is largely absent from disclosure frameworks, in their current form.

Figure 12: Which of the following are the main sources of greenhouse-gas (GHG) emissions in your organisation?



Source: Economist Impact (2022)

The overhaul of the transport sector—one of the largest sources of greenhouse gases—is significant in helping the region meet ambitious emissions reduction targets. Road travel (passenger vehicles and trucks carrying freight) accounts for three-quarters of transport emissions.⁵⁸ Countries in Asia-Pacific are adopting EVs at different rates reflecting policy progress. Thailand has set out its 2030 EV Production Policy, which aims to reach 30% of domestic vehicle production by 2030. Indonesia is banning all sales of fossil fuel motorcycles by 2040 and fossil fuel cars by 2050.⁵⁹

Despite ambitions, EVs still have some way to go to match the affordability and performance of conventional vehicles. Official EV targets, restrictions on conventional vehicles and investment in charging infrastructure will underpin the broader roll-out of electric transport. Asia-Pacific requires an estimated 95,000 public alternating current (AC) and 40,000 direct current (DC) charging points to support forecast numbers of registered EVs by 2030—30 times greater than the number today—presenting a large opportunity for investment.⁶⁰

Green gases

According to interviewed experts, continuous innovation is needed to reduce costs and increase the competitiveness of relatively nascent critical technologies. This means larger research and development budgets from both governments and the private sector, as well as greater support for pilot projects such as the Tomakomai carbon capture and storage (CCS) Demonstration Project—Japan’s first full-chain CCS project, which captured and stored CO₂ from a coastal oil

refinery on Hokkaido Island in Japan from 2016-2019⁶¹—to ensure that critical technologies reach commercialisation faster.

“We need to get the finance world up to speed with these new technologies to give them a level of comfort in providing funding to projects, whether pilots or large-scale implementation of renewables,” says Mr Nooy.

Hydrogen is gaining momentum in the region. Recognising the potential of green hydrogen, Japan has ambitious plans to be a major importer and regional market-maker, and Australia, an export superpower. The two countries are collaborating with intergovernmental agreements and commercial projects. India has also announced a national green hydrogen policy, and has plans to become a global green hydrogen production and export hub with goals to produce five million tonnes of green hydrogen by 2030.^{62,63} “In India, the new wave of renewable energy is coming from corporations such as Reliance and Adani, who are betting big on clean energy assets like green hydrogen, but there is a lot of potential for India and other emerging economies to push state-owned enterprises in the same direction,” says Ms Sharma.

There has been some progress on the international trade of hydrogen. The world’s first shipment of liquefied hydrogen from Australia to Japan, originally planned for 2021 but postponed due to the covid-19 pandemic, shipped earlier this year.

The market for fuel cell electric vehicles (FCEV) powered by hydrogen is beginning to take off, catalysed by developments in Asia and the United States. Record monthly sales were recorded in 2021 H1 in Korea, which has eclipsed the US to

Table 2: Cost of different types of hydrogen, 2021

The levelised cost of hydrogen production from natural gas	Using CCUS technologies to reduce the CO ₂ emissions from hydrogen production	Using renewable electricity to produce hydrogen costs
USD 0.5 to USD 1.7 per kilogramme (kg)	USD 1 to USD 2 per kg	USD 3 to USD 8 per kg

Source: International Energy Agency⁶⁴

become the largest stockholder, largely due to aggressive policies for FCEV adoption including subsidies of up to \$30,000.⁶⁵ The region is likely to see an expansion in fuel cell technology beyond light-duty vehicles. However, as with electric vehicles, deployment should be married with the establishment of supporting infrastructure. Japan so far remains the leader with close to 154 refuelling stations.⁶⁶

Large-scale hydrogen deployment will need to be buttressed with cost-efficient methods of storage and transport. National strategies will be critical in building investor confidence. Incentives will be needed to displace 'grey' hydrogen with 'green'. Mr Nooy highlights that "there is a need to put additional renewables on the grid, an opportunity for Asia, and you use that renewable energy solely for the purpose of generating green hydrogen. The cost of producing green hydrogen has already come down and will further come down with improvement of technologies and membranes."

Overhauling the grid to accommodate renewables

Carbon-neutrality commitments, technological advances, and improved cost incentives are accelerating a broad expansion of renewable power generation. However, integrating intermittent renewable energy into traditional grid structures remains a significant challenge. As countries phase out carbon to meet climate goals, they will have to spend at least \$14 trillion to strengthen grids by 2050.⁶⁷ Expanding higher quality transmission and distribution systems is required to improve the efficiency, resilience and reliability of renewable sources. In addition, large-scale adoption of renewable energy sources requires robust infrastructure that can move and transmit decentralised renewable power over long distances to dense population centres.

Decentralised "off-grid" systems that connect independent power generators to a localised distribution network – even allowing households and businesses to feed surplus energy back into the grid – are one solution to the current limited ability to transmit renewable energy long-distance. Another option are smart grids that enable real-time data collection (from line sensors, users and generators) and

analysis, which allows for power load balancing, failure recovery and distribution management. But new grids require significant investment.

"There is going to be a big gap between what the region can provide and what corporations need," says Pradeep Tharakan, principal climate change specialist, Asian Development Bank. "That will push governments to act because these companies either get the green electricity in the region or they are forced to move somewhere else. Green electricity is already becoming an issue of competitiveness."

Creating a just transition

The 2015 Paris Agreement requires that national plans on climate change include just transition measures, with a focus on workers and communities. Survey respondents believe that skilling the workforce to develop and adapt to new energy technology is one of the top three areas that need to be supported in order to achieve energy goals. "Fossil fuel industries have to embark on internal and external stakeholder engagement and company-wide restructuring, supported by national, regional and local Just Transition approaches for re-training, re-skilling and compensation," says Mr Nesadurai.

New Zealand set up a Just Transition unit in 2018 while drafting its first net zero legislation and was successful in including indigenous communities like Maori as full partners in just transition processes.⁶⁸

"Climate finance has an important role in supporting developing countries tackle climate change, while opening up opportunities for an inclusive, just and fair transition to a low-carbon and climate resilient economy," Mr Nesadurai adds.

As with any complex problem, there is no single solution to the clean energy transition and no sole stakeholder can bear the responsibility for change.



A longer and greener road ahead

Worse is to come, faster than expected, even if efforts to curb global warming are stepped up, according to the UN. To limit global warming to 1.5C, global greenhouse gas emissions must peak by 2025 and come down by about 45% by 2030 relative to 2019 levels. And action to arrest the emissions that are driving climate change, has been slow.

In Asia-Pacific, the risks are becoming increasingly complex and difficult to manage. All countries in the region will be impacted by physical climate risks, including dangerously high heat and humidity levels, sea level rise and flooding.⁶⁹ As with any complex problem, there is no single solution to the clean energy transition and no sole stakeholder can bear the responsibility for change. To prevent the temperature increasing over 2C, governments and businesses must step up to swiftly end the release of carbon dioxide and other greenhouse gases, as detailed in this report. Scientists have deemed the pledges made by signatories of the Paris agreement to reduce greenhouse gas emissions as insufficient.⁷⁰ Almost half of companies (45%) surveyed said they do not have a well-defined plan to hit net zero emissions (figure 5).

The war in Ukraine has derailed efforts to transition to clean energy across the globe. For emerging Asia, the additional challenge lies in setting credible transition strategies that do not compromise economic growth and social inclusion. A transition to a low-carbon future must be inclusive. Investments must fairly distribute the gains and losses, while addressing existing economic and social injustices.

“It is important to bear in mind that investment and policy choices made today will lock in economic and climate benefits—or costs—for decades to come,” warns Mr Nesadurai.

Systemic country bottlenecks threaten to stall the clean energy transition. Giving up fossil fuels – the economic backbone for some emerging economies in Asia-Pacific – will be extremely difficult. Fossil fuel subsidies must be removed or phased out to enable a greater uptake of renewables. But policymakers are unlikely to scale these back in the context of wider economic uncertainty. Economies dependent on receipts from the sale of diesel, gasoline and gas pose a policy dilemma, particularly as the energy transition progresses.

Carbon markets—enabled through carbon pricing, carbon taxes, a regulated compliance market and voluntary carbon market platforms—could guide investment decisions. This will help drive the impetus behind decarbonisation technologies such as carbon capture, utilisation and storage (CCUS) and hydrogen—large projects that require long-term commitment.

Investment in green technologies and renewable energy is important but there are regional disparities. Some of the more expensive technological innovations will remain out of reach for many emerging economies. Survey respondents cite technology transfer and technical assistance as one of the top priorities to achieve clean energy ambitions. Businesses also call for urgent attention on the renewable energy regulatory framework (figure 6).

There is sustainable finance to tap but some economies in this region risk missing out. Investors will need assurance around where the proceeds are going and the greener outcomes achieved. Innovative finance mechanisms, blended finance and government subsidies would help capital projects become bankable. Targeted finance could help alleviate infrastructure bottlenecks that survey respondents report as being one of the major challenges to a low carbon future.

The Asia-Pacific region has seen some success in accelerating the energy transition. Vietnam is one such stand out but even there, its weak grid capacity is obstructing the integration of more renewable energy, inhibiting growth. There is great potential to green the transport sector with innovations in sustainable fuels and fuel cell electric vehicles hold promise. But affordability is a challenge with the conventional, fossil fuel option remaining the cheapest one for now.

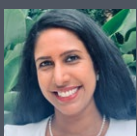
Country leaders must step-up, according to Mr Guterres of the UN. He described the climate crisis as an indictment of a "criminal" "abdication of leadership". It will take political backbone to make difficult choices, including raising the price of carbon so polluters pay and enacting regulations that will mandate the phasing out of dirty sources of energy. The extreme weather conditions we are experiencing this year, affecting communities globally, should trigger the investment needed. Ultimately, our decisions and actions taken today, will shape the road ahead.

"A plan for growth in clean energy, alone, is not enough, we also need to see a plan for the decline of fossil fuels,"

Shruti Sharma, senior policy advisor,
International Institute for Sustainable
Development

SMBC perspective:

The complexity of challenges in tackling a just energy transition across Asia-Pacific requires multiple solutions across public and private sector players. Financing is required on all fronts – from corporate level assessment, reporting and disclosures to large scale infrastructure transformation and scalable technological innovation. SMBC has found that one way companies can proactively navigate and solve the pressing issues to decarbonise our regional economies is for corporates, regulators and industry peers to better engage and partner with each other. Deepening an understanding of the challenges through the diverse viewpoints of the corporates interviewed in this survey is a critical step forward in addressing the financing gap in a targeted, impactful and timely manner and at SMBC, through close engagement with our stakeholders, we are committed to enabling the greener road ahead.



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Footnotes

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