Accelerating the **Indo-Pacific Energy Transition**

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By 2050, the Indo-Pacific will drive most of the new energy demand. Renewables can help the 4.6 billion people of the Indo-Pacific meet 90 per cent of their future power needs. To unlock its potential for clean and affordable energy, the Indo-Pacific needs de-risked and low-cost financial solutions, along with sensitive energy diplomacy to bridge knowledge and technology gaps, and build resilient energy supply chains.

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Executive Summary

The Indo-Pacific[1] contributes to ~40 per cent of global gross domestic product (GDP) and is home to ~60 per cent of the world's population. This Issue Brief focuses on six representative countries – Bangladesh, India, Indonesia, Kenya, Singapore, and Viet Nam –that comprise a quarter of the world's population and 5.6 per cent of global GDP.

The Indo-Pacific is lagging in progress on the Sustainable Development Goals (SDGs) due to a range of geopolitical, economic and physical climate risks. Energy demand in the Indo-Pacific is expected to rise from a quarter to nearly half the global demand by 2050. Reliable, affordable, and sustainable energy access is vital to development and must keep pace with escalating demand. Renewable energy (RE) can serve ~90 per cent of future Indo-Pacific power demand making RE development at scale a key priority.

This Issue Brief aims to use the lens of six selected Indo-Pacific countries to identify some of the challenges, and financial and multilateral mechanisms that can accelerate the Indo-Pacific energy transition.

The analysis in this Issue Brief reveals a need for Indo-Pacific countries to focus on five key areas:

- **Policy:** Four of the six Indo-Pacific countries lack integrated domestic energy transition policy frameworks that address technology, finance, infrastructure, and policy gaps.
- **Technology and resources:** The energy transition of most Indo-Pacific countries is vulnerable to concentrations in technology ownership and critical mineral reserves.
- **Energy transition finance:** Indo-Pacific countries do not have access to adequate levels of finance for their energy transition. While they are using a mix of public, debt, and catalytic concessional finance to attract investment flows towards their energy transition, much more is required to fund this transition for 4.6 billion people.
- **Trade-offs:** A shift away from fossil fuels could lead to a decline in fossil fuel-based revenue, a reduction in primary energy access, loss of jobs in fossil fuel and ancillary sectors, and high expenditure to decommission fossil fuel assets.
- **Multilateral energy cooperation:** Multilateral forums remain under utilised in the Indo-Pacific region.

Addressing these challenges will need concerted action, including agreements to certain trade-offs, by their governments and citizens, domestic and multinational companies, and multilateral financing and developmental institutions. Successful innovations and pilots need to be emulated and scaled up nationally, and adapted to similar situations in other countries. Cooperation must co-exist alongside historic contexts and competition, for the cohesive development of the Indo-Pacific.

[1] Indo-Pacific countries: Bangladesh, India, Indonesia, Kenya, Singapore, Viet Nam, Madagascar, Mauritius, Seychelles, Comoros, South Africa, Mozambique, Tanzania, Somalia, Djibouti, Yemen, Oman, United Arab Emirates (UAE), Qatar, Maldives, Iran, Afghanistan, Pakistan, Nepal, Bhutan, Sri Lanka, China, Myanmar, Thailand, Lao PDR, Cambodia, Malaysia, Brunei, Philippines, Taiwan, Republic of Korea (ROK), Japan, Papua and New Guinea, Australia, New Zealand, Palau, Micronesia, Vanuatu, Nauru, New Caledonia, Tuvalu, Kiribati, and Fiji.

CEOSpeak

"Energy availability must keep pace with rising demand to maintain and grow the Indo-Pacific's share of the global economy."

Dr Arunabha Ghosh
CEO, CEEW

The Indo-Pacific is home to ~60 per cent of the world's population, ~40 per cent of global Gross Domestic Product (GDP), and is vulnerable to climate change, energy insecurity, and economic threats. A majority of the world's ~770 million people without energy access reside in the Indo-Pacific. With a growing population and improved energy access, energy demand in the Indo-Pacific is expected to rise from a quarter, to nearly half of the world's energy demand by 2050. Energy availability must keep pace with this rising demand to maintain - and grow - the Indo-Pacific's share of the global economy. Renewable energy has the potential to help the Indo-Pacific meet 90 per cent of its power demand.

As with any wicked problem, solutions that resolve one set of challenges create policy conundrums elsewhere. Fossil fuels – mainly abundant coal reserves – meet a substantial share of the Indo-Pacific's current energy demand. A phase-out of fossil fuels from Indo-Pacific economies without secured access to affordable and sustainable sources of energy could broaden energy access gaps, create unemployment, and severely dent public spending dependent on revenues from fossil fuel consumption and trade.

This Issue Brief looks at the Indo-Pacific from the lens of six countries – Bangladesh, India, Indonesia, Kenya, Singapore, and Viet Nam – which are geographically, demographically, and economically diverse; and have distinct energy mixes and transition pathways. energy mixes; exposure to climate risks, and geopolitical contexts.

Trillions needed for the Indo-Pacific's clean energy-based development and fossil fuel infrastructure decomissioning are not flowing to where they are needed the most, inadequate technology and resource availability is compounding the transition challenge, and multilateral avenues for energy cooperation remain underutilised.

I congratulate the research teams at CEEW and AFD for taking on this substantial agenda. I hope the partnership between the two institutions will strengthen, with this Issue Brief serving as a first foray into deeper engagement on the Indo-Pacific region to drive a just, secure, and sustainable energy transition for all.

CEOSpeak

> There is a pressing need to recognise that among the challenges the Indo-Pacific is facing, sustainability is as urgent and strategic as the security agenda.

Remy Rioux
CEO, AFD

Strengthening the development agenda in the Indo-Pacific is needed and matters for two reasons.

The first reason is that the Indo-Pacific concept lacks a development lens, as the spotlight is mainly on the strategic and security agenda. There is a pressing need to recognise that among the challenges the Indo-Pacific is facing, sustainability is no less urgent and strategic than the security agenda. The region is at the frontline of climate change impacts, and there is a crucial need to strengthen its ability to adapt to warming temperatures while preserving natural resources.

It is time to recognise that the region's weight in the global economy – 40 per cent of global GDP – and share of world population – 60 per cent – makes it integral to achieving a global green transition. Countries in the region must also simultaneously address the social challenges and the setback that the pandemic has caused to the journey towards the 2030 Agenda for Sustainable Development. The energy transition is the core of this development agenda.

The second reason is that the fate of the global energy transition will be determined more in the Indo-Pacific than anywhere else. The Indo-Pacific produced 16.75 billion tons of carbon dioxide in 2020. Seven of the 10 biggest coal consumers and 6 of the 10 most climate-vulnerable countries are in this area. WWF considers that pollution will have the most impact in the Indo-Pacific region.

By 2040, 88 per cent of growth in electricity demand will come from emerging markets. Among these, the fastest growing economies of the Indo-Pacific are expected to consume 44 per cent of the world's energy by 2050. The imperative of increasing access to clean, affordable, reliable, and secure will underpin a comprehensive energy transition, as solar and wind are the cheapest options for new power facilities in most parts of the world.

I would like to end **on the principle** that I take from this Issue Brief, as a public development bank, which is the need for responsible and coordinated action. We look forward to seeing all parties – banks, financial institutions, think tanks, universities – put this development agenda into action. AFD and the Indian Exim Bank's Sustainable Finance in the Indo-Pacific (SUFIP) event in February 2022 was a first step towards building a common and sustainable agenda for the Indo-Pacific. More than 500 participants from 27 countries attended, which demonstrates the importance of this question for the region. SUFIP has fully recognised the strategic importance of the Indo-Pacific region to deal with global challenges such as global health, climate change, biodiversity, and the protection of oceans. In other platforms we have created, especially Finance in Common Initiative (FICS) and International Development Finance Club (IDFC), public development banks and development financial institutions have committed to play a key role in delivering sustainable and high-quality projects. This takes into account the needs of partner countries and ensures lasting benefits for local communities, in the specific context of Indo-Pacific. I am looking forward to seeing this principle spread in the mind of the enlightened reader, who will find fruitful insights in this Issue Brief.

I would like to take the opportunity to warmly thank CEEW and my dear colleague Dr Arunabha Ghosh for the quality of the Issue Brief, and the many discussions that I am sure will follow.

Indo-Pacific: At the crossroads of energy security and development

The Indo-Pacific's[1] sustainable development relies on affordable and secure clean energy. Home to ~60 per cent of the world's population (UN DESA 2019), the Indo-Pacific contributes ~40 per cent of the global gross domestic product (GDP) (World Bank 2021). The Indo-Pacific also consumes a quarter of the world's energy (BP 2021), which will rise to nearly half by 2050 (Bowen 2022), and it needs to keep pace with this escalating energy demand to keep its economic engine churning. Renewable energy (RE) can serve ~90 per cent of the future power demand in this region (Tong, et al. 2021) , making RE development at scale a key priority.

However, the Indo-Pacific's developmental pathways are fraught with a range of risks. For instance, the COVID-19 pandemic, the Russia-Ukraine conflict, the US and its allies' escalating military deployment in the Indo-Pacific, as well as simmering regional rivalries, are intensifying geopolitical tensions in the area and impacting sovereign choices. The European energy crisis is escalating inflation, creating food and resource insecurity, and widening trade deficits globally. Consequently, even advanced economies are encouraging energy austerity and exploring alternate supply sources, with some, like Japan, reverting to options like nuclear power (Das 2022). At the other end of the spectrum, debt-trapped countries like Sri Lanka are being pushed into default and have been compelled to cut energy subsidies and other welfare measures, eroding hard-earned developmental gains (AFP 2022). The climate crisis is compounding these challenges, as evidenced by the devastating floods in Pakistan that displaced 33 million lives and caused USD 30 billion in damage (World Bank 2022).

Indo-Pacific countries have to navigate complex and competing, and yet, often converging, priorities to realise their transition into a secure, inclusive, and sustainable energy future. Clean energy pathways that leverage the Indo-Pacific's abundant natural resources will play a defining role in securing energy for its 4.6 billion people.

The different growth stages of Indo-Pacific countries also influence their transition choices. The energy transition is likely to greatly benefit developed economies like South Korea, Japan, and Singapore, due to their socioeconomic, financial and technological advantages, boosting green growth, energy security and climate resilience. Developing countries like India and Indonesia face trickier transitions as they must also close energy access gaps, absorb the cost of shifting away from hydrocarbons, and build new clean energy infrastructure. While the energy transition can be extremely challenging for Least Developed Countries (LDCs), they now have the opportunity to leapfrog from fossil fuels to clean energy without incremental interim transitions.

The window of opportunity to achieve the Indo-Pacific energy transition is short and immediate (NBR 2022). Whether the seeds of the energy transition sowed today see fruition in 2050 depends on these countries' responses to some key questions: What is the ideal energy mix for each country's unique endowments and restrictions? Can fossil fuels be phased out without hurting livelihoods, balance sheets, and socioeconomic development? What financing mechanisms can governments deploy to phase in hundreds of gigawatts of clean energy? What Indo-Pacific partnerships and alliances could minimise energy disruptions and maximise energy security?

This Issue Brief aims to map the energy transitions of six representative Indo-Pacific countries to identify some of the challenges, and the financial and multilateral mechanisms that can accelerate the Indo-Pacific energy transition.

[1] Indo-Pacific countries: Bangladesh, India, Indonesia, Kenya, Singapore, Viet Nam, Madagascar, Mauritius, Seychelles, Comoros, South Africa, Mozambique, Tanzania, Somalia, Djibouti, Yemen, Oman, United Arab Emirates (UAE), Qatar, Maldives, Iran, Afghanistan, Pakistan, Nepal, Bhutan, Sri Lanka, China, Myanmar, Thailand, Lao PDR, Cambodia, Malaysia, Brunei, Philippines, Taiwan, Republic of Korea (ROK), Japan, Papua and New Guinea, Australia, New Zealand, Palau, Micronesia, Vanuatu, Nauru, New Caledonia, Tuvalu, Kiribati, and Fiji.

I – The Indo-Pacific development agenda and energy transition

The Indo-Pacific is lagging on key development indicators. Over 820 million people in the Asia-Pacific and Africa subsist on less than USD 1.90 a day (UNESCAP 2023) (Aikins & Mclachlan 2022). Also, 770 million people live without energy access, primarily in Asia and Africa (IEA 2021). Both regions will miss their 2030 Sustainable Development Goals (SDGs) – the Asia-Pacific by 90 per cent, while Africa is unlikely to meet even its SDG 1 goal, to end poverty, until 2043 (ibid). Low social protection spending, a lack of clean cooking fuels and sanitation, and hazardous jobs are some factors contributing to poor development outcomes in these regions (ibid).

Source: AFD Groupe

Physical climate risks compound the development challenge. Indo-Pacific countries will likely face extreme heatwaves, floods, rising sea levels, and intensifying storms that can constrain or reverse development gains (IMCCS 2020).

The Indo-Pacific is also home to 7 of the top 10 global coal-consuming countries (BP 2022), and its major economies like China, India, Indonesia, and Viet Nam, have abundant coal reserves. Fossil fuels are intertwined with Indo-Pacific economies that subsidise energy to close access gaps and generate employment, or rely on fossil fuel consumption or trade for revenue.

Clean energy can advance Indo-Pacific energy security and development. Reliable and affordable energy access is vital to economic development – fuelling industries, productivity and economic growth, and human development (UNCTAD 2023). RE can serve up to 90 per cent of Indo - Pacific power demand (Tong, et al. 2021), and close energy access gaps by leapfrogging from fossil fuel consumption. Indo-Pacific countries can also boost energy security and save billions of dollars in capex by substituting capital-intensive imported fossil fuels like oil and gas with renewables. But Indo-Pacific economies also need to address the energy access and government revenue shortfalls caused by a phase-out of fossil fuels.

The net zero – and related energy transition – commitments made by 36 of the 47 (NewClimate Institute 2023) Indo-Pacific countries studied for this Issue Brief also involve trade-offs.

Net Zero pathways entail building no new coal units and a simultaneous exponential growth in RE to cater to three times more energy demand by 2050 (IRENA 2021). To do this, Indo-Pacific countries will need USD ~390 billion in investment just to build new RE installations (IEA 2022) (AfDB 2019). Additional government funds will be needed to ensure that this new low-carbon infrastructure is affordable, helps create jobs, and crucially, does not reverse hard-earned developmental gains.

To better understand how the Indo-Pacific can achieve its energy transition this Issue Brief focuses on six representative countries which are geographically, demographically, and economically diverse; and have different energy mixes; exposure to climate risks, and geopolitical contexts.

II – Mapping the Indo-Pacific energy transition: Six countries in focus

This Issue Brief focuses on the shift to renewables in six Indo-Pacific countries: **Bangladesh, India, Indonesia, Kenya, Singapore**, and **Viet Nam** (refer **Annexure I).** These six countries comprise 70 per cent of Indo-Pacific and a quarter of the world's population (UN DESA 2019). Yet, they account for just 5.6 per cent of global GDP (World Bank 2021). **Table 1** provides a snapshot of their energy markets.

Table 1: Energy markets overview

Country Unit Year	Electrification % 2020 - 21	Power use per capita kWh 2020	Total power capacity GW 2020	Non-renewable capacity GW 2020	Renewable capacity GW 2020	Share of RE % -	Fossil fuel subsidies million USD 2020	Net energy imports % of supply 2018	Per capita emissions tonnes 2019
Bangladesh	100	489	~24	~23	~0.5	2	1424	17	0.6
India	99	940	~452	318	134	30	23,771	48	1.8
Indonesia	99	939	~70	~60	~10.5	15	6,881	23	2.3
Kenya	72	170	~3	0.8	~2	73	*220 in 2021	26	0.4
Singapore	100	8,900	~13	12	~0.5	4	Not available	680**	8.3
Viet Nam	100	2,200 (in 2010)	~69	~34	~36	51	271	23	3.5

** Singapore is an export hub for refined petroleum

Note: Estimates of renewable power include large hydroelectric sources

Source: CEEW analysis, World Bank

Table 2 shows transition-related commitments of these six countries as defined in their latest Nationally Determined Contributions (NDCs).

Table 2: Nationally Determined Contributions (NDC), COP27

Country	Renewable energy (RE)	Other commitments	Net zero year
Bangladesh	~ 4 GW of RE projects with international support	6.73% emissions reductions below Business as Usual (BAU) by 2030; could rise to 15.12% with international support	—
India	50% of power capacity from non-fossil fuel sources by 2030	45% reduction in carbon intensity from 2005 levels	2070
Indonesia	23% solar by 2025; 66% RE by 2036-40	No additional coal capacity after 2030	2060
Kenya	—	32% emissions reductions by 2030 over BAU of 142 $MtCO_2e$	—
Singapore	~2 GW solar capacity by 2030	Carbon tax to rise to USD 36.90 - 59 per tonne CO_2 by 2030	2050
Viet Nam	—	Coal phase out by 2040	2050

Source: Nationally Determined Contributions (NDC) Registry, UNFCCC

With international support, **Bangladesh** can transition ~19 per cent of its power generation to RE to meet its 2030 targets. **India** will need to notionally install a staggering 10.5 MW of RE capacity every hour to help meet its goal of 500 GW of non-fossil fuel power capacity by 2030, contributing to a 50 per cent share of its power mix. **Indonesia** faces looming deadlines – it needs to double its RE supply by 2025, cut carbon emissions by 29 per cent, and cap new coal capacity by 2030.

In relative terms, **Kenya** is the closest to attaining its promise of net zero by 2030 since RE made up 73 per cent of its power mix in 2020. But with a low electrification rate of 75 per cent compared to the other Indo-Pacific countries in this Issue Brief, and low per capita power consumption, it will need additional RE to provide the advantages of clean energy access and transition its growing population.

Highly developed **Singapore** relies heavily on energy imports as it lacks oil and gas reserves, and does not have enough space to meet its current power demand using renewables. To cover a part of its clean energy imports, Singapore intends to raise its carbon tax from the current USD 5/tCO_2e to USD 50-80/tCO_2e by 2030 (NEA 2022). **Viet Nam** is already halfway to its RE deployment target and aims to phase out coal by 2040, but needs international support to achieve its enhanced emissions reduction target of 27 per cent compared to the Business as Usual (BAU) scenario.

Table 3 showcases the main challenges and dependencies faced by each of the six countries, highlights the most effective RE policies, provides estimates of the finance needed for the energy transition, and how each country is working to raise these funds. It also makes certain policy recommendations based on a detailed analysis of the energy market and transition policies of each country (refer **Annexure I**).

Country	Challenges	Energy dependencies	Key RE policies
Bangladesh	• Only 42 per cent of power generated reaches the intended recipient, rest is lost in transmission and distribution (Nicholas 2022). • Power consumers are vulnerable to spot price-fluctuations. • Low RE potential and land availability.	• LNG imports (mainly from Qatar, Oman and now Russia) help meet 24-26 per cent of gas demand (TBS Report 2022). • Bangladesh imports 1160 MW electricity from India (UNB News, 2021) and aims to import 700 MW from Nepal (SASEC 2021).	• Target of 25 per cent clean energy by 2030 (Nicholas 2022). • The Mujib Climate Prosperity Plan: Decade 2030 lays a pathway for green development (Mujib Plan 2021). • In 2021, a Draft National Solar Energy Action Plan was announced, but has not progressed (Shinde & Skowron 2021).
India	• Overreliance on expensive crude oil and natural gas imports. • The energy transition could leave coal and gas assets stranded. • State distribution companies have outstanding dues of approx. USD 1.1 billion as of March 2023. • India's RE sector depends on 100 per cent imports of critical minerals (Gupta, Biswas, & Ganesan 2016).	• Crude oil imports (mainly from UAE, Saudi Arabia and Iraq) meet 85 per cent of India's demand (Ministry of Commerce 2022). India's crude oil imports from Russia have also grown. • Up to 70 per cent of India's natural gas demand is met mainly via imports from Qatar, UAE, the USA (Sönnichsen 2021).	• Net zero by 2070. • Non-fossil fuel sources to comprise 50 per cent of share of power capacity by 2030. • India has renewables purchase obligation (RPOs) and offtake guarantees (Shah 2022). • Has set up green energy corridors for evacuation and integration RE. • Established Khanij Bidesh India Ltd. (KABIL) in 2022 to secure critical minerals sources globally.
Indonesia	• Installed RE capacity is too less to reach 23 per cent by 2025 (IESR 2021). • Overreliance on hydrocarbon revenues (CNA 2022). • Unstable policy landscape – most recently, banned RE and nickel exports. • Limited indigenous critical minerals processing capacity.	• Imported crude oil from Malaysia, Saudi Arabia and UAE meets 23 per cent of energy demand (Sulaiman & Suroyo 2022). • Budgetary allocation for energy subsidies went up by USD ~29 billion in 2022 due to global price-shocks (ibid).	• Net zero by 2060. • State solar power is 10-15 per cent more expensive than private solar (IESR 2021). • Domestic content requirements will reach 60 per cent for EVs by 2024 and 100 per cent in battery manufacturing. • A carbon tax of USD 2.1/kg CO_2 has had little impact as it applies only to coal and is countered by high fossil fuel subisidies (ibid).

Table 3 continued:

Funding Needs	Raising transition finance	Recommendations
Bangladesh needs USD ~76 billion to achieve its 2030 goals (Mujib Plan, 2021).	The Mujib Plan recommends the following measures to meet transition targets: • Credit enhancement and low-cost refinance. • Ancillary service market for transmission and distribution equipment. • Carbon markets to raise the equivalent of 1 per cent of GDP by 2030. • Phase-out fossil fuel subsidies by 2030 and repurpose the funds for clean energy and climate action.	• Curb transmission losses and improve power utilisation rates. • Power imports from neighbouring countries can be increased since they pose a lower risk of supply and price fluctuations than gas imports. • Invest in maximising RE capacity and storage to improve reliable clean energy access.
India needs up to USD ~10 trillion in aggregated investment to achieve net zero (Singh and Sidhu 2021).	India's public, private and capital market investment in clean energy to achieve net zero could be as follows: • Annual investment of USD 28 billion across power, industry and mobility sectors (Singh & Sidhu 2021). • USD 223 billion in investment needed to build wind and solar capacity additions for India's 2030 targets. • Targeted subsidies and guarantees to scale up clean energy development & deployment (CEEW 2022).	• A comprehensive energy transition strategy can help India achieve net zero. • De-risking mechanisms can help bring down the cost of capital and ease the flow of finance (Ghosh & Harihar 2021). • India needs to invest in higher quality and smart infrastructure (grid, RE production and storage, and green hydrogen) to enable last mile connectivity and curb inefficiencies.
Indonesia needs USD 150-200 billion for its low-carbon development initiatives to achieve net zero by 2060 (Bappenas 2021).	Indonesia is tapping into domestic sources for transition finance (Bappenas 2021) (OECD 2021): • Phase-out fossil fuel subsidies, and phase-in carbon pricing, equivalent of 2 per cent of GDP by 2030. • Expand coverage of interest-free Green Sukuks bonds that helped raise USD 2 billion in 2018. • Provide subsidised interest rates to SMEs for clean energy ventures via instruments like the Kredit Usaha Rakyat – People's Business Credit. • Use the Energy Transition Mechanism (ETM) to collect and disburse internal sources of cliamte finance for specific projects. • Indonesia has signed a USD ~15 billion JETP agreement to decommission coal and transition to clean energy.	• A national transition strategy could provide a clear net zero pathway, clarify the position on RE exports, and signal a stable regulatory environment. • More can be done to channel Indonesia's considerable fossil fuel revenues towards RE infrastructure deployment. • Develop indigenous critical minerals processing capacity to realise trade potential – projected at USD 30 billion by 2060 – to finance Indonesia's transition (IEA, 2022).

Table 3 continued:

Country	Challenges	Energy dependencies	Key RE policies
Kenya	• Energy access inequity, with especially low access in rural areas (MoE 2022). • No available alternate to transition from heavily subsidised transport and cooking fuels (Takase, Kipkoech, & Essandoh 2021). • High risk perceptions deter investment.	• Refined petroleum imports from the UAE, Saudi Arabia, India, Netherlands and Kuwait cost Kenya USD 3.48 billion in 2022 (Kenya National Bureau of Statistics 2022). • Fuel imports made up 20 per cent of Kenya's import bill in 2021(MoE 2022).	• Non-captive RE projects benefit from a 20-year power purchase agreement (Nyabira, Muigai, & Murangi 2021). • No Value Added Tax (VAT) or duties on imported RE, equipment and accessories (ibid). • New target for 100 GW RE power capacity by 2040 (MoE 2022).
Singapore	• Small land-mass restricts installing RE capacity. • Relies almost exclusively on natural gas imports for electricity generation (EMA 2021). • Energy transition plans depend almost entirely on grid interconnection with neighbouring countries; this is in the planning phase and yet untested.	• Nearly 70 per cent of natural gas imports is from Australia and USA, and over two-thirds of crude oil imports come from Kuwait, Qatar, Saudi Arabia and UAE. • Has discussed avenues to import 15 per cent of power demand using an undersea cable from Australia.	• Carbon tax of USD 5/ton CO2 to be hiked to USD 80/ton CO2 by 2030 (Singapore's Enhanced NDC 2020). • Working towards generating half its power from green hydrogen by 2050 (MTI 2022). • Issuing tenders for RE power imports and investing in grid infrastructure (EMA 2021).
Viet Nam	• Relies on coal and oil for 40 per cent of its power needs. • Grid infrastructure is inadequate for Viet Nam's growing power capacity. • Viet Nam's 475 GW offshore wind power potential remains untapped.	• Viet Nam Imports coal from Australia, Russia, Indonesia and Singapore. • Viet Nam is Surrounded by abundant hydroelectric power sources and imports from Lao PDR, Cambodia, and China.	• Robust Feed-in-Tariffs (FiT) helped solar deployment skyrocket from 86 MW in 2018 to 16.5 GW in 2020. • Direct Power Purchase Agreement for projects under 1000 MW. • The latest Power Development Plant (PDP VIII) anticipates RE capacity addition of ~65 GW by 2030.

Table 3 continued:

Financing Needs	Raising transition finance	Recommendations
Kenya Kenya needs USD 65 billion between 2020 – 2030 for its planned climate action. (National Treasury and Planning 2021).	• Kenya's has struggled to generate climate finance, and in 2018, was only able to generate half (USD 2.4 billion) the transition finance needed to meet its NDCs (National Treasury and Planning 2021).	• For a just and equitable energy transition the remaining 60 per cent of the population that uses biomass for cooking must get cost-effective energy access. • Transition plans should factor in growing demand – due to increased access and higher per capita consumption. • Proactive engagement with global partners, multilateral banks and private financiers can curtail risk perceptions.
Singapore needs USD 72 billion in transition finance (Loong 2019).	Singapore aims to raise climate finance for its 2030 goals by: • Gradually raising current carbon tax of USD 5/ton to USD 80/ton CO2 by 2030. • Allowing businesses to use carbon credits to offset up to 5 per cent of emissions (Wong 2022). • Issuing USD 35 billion in green bonds to fund public infrastructure projects (ibid).	• Invest in energy efficiency to reduce per capita power consumption and phase out its reliance on fossil fuels. • Fund the energy transition in neighbouring countries like Indonesia and Myanmar to secure imports to meet domestic power demand.
Viet Nam needs USD 99-115 billion by 2031 to fund its transition needs (Draft PDP VIII).	To attract finance, Viet Nam will need to: • Make power-purchase agreements cost-competitive and reduce the risks from state power generator EVN's arbitrary curtailments (IUCN 2022). • Develop a suitable debt structure, improve credit guarantee schemes, and build appraisal capacity in credit rating agencies (Nguyen, Chuc, & Dang0 2018). • Consider imposing a carbon tax of USD 5 per ton on fossil fuels to generate revenue to invest in RE (ibid).	• Viet Nam needs transmission and distribution infrastructure upgrades to keep up with RE capacity additions. • Grid integration guarantees can mitigate curtailment risk in RE projects. A first-loss guarantee can safeguard investors from curtailment risk and enable low-cost RE capacity additions (Dutt Sidhu and Saxena 2022). • Over-reliance on imported hydroelectric power can be an energy security risk due to climate-related water stress.

Source: CEEW analysis

III – Five challenges to the Indo-Pacific energy transition

The energy transition policies of the six Indo-Pacific countries (refer **Annexure I**) reveal five challenges:

i. Fragmented domestic policymaking

Four Indo-Pacific countries – Bangladesh, India, Indonesia and Viet Nam – lack integrated national energy transition roadmaps or policy frameworks. Four different plans address various elements of **Bangladesh's** energy transition, including a recent Roadmap and Action Plan for Implementing NDCs; the Mujib Climate Prosperity Plan: Decade 2030, which focuses on climate resilient development; a National Solar Energy Action Plan to install 41 GW solar power by 2041; and an Integrated Energy and Power Master Plan Project.

India's energy-related policies, including for coal, petroleum and natural gas, renewable energy, power distribution and transmission, energy access and efficiency, and electric mobility, are sector- and jurisdiction-specific. These are administered by various Union Government ministries, while state governments also have their energy ministries and policies, making the alignment of national and state-level prioritisation, administration, and resource allocation challenging.

Indonesia has published an Energy Sector Roadmap to Net Zero Emissions (IEA 2022), but its policies are still sector-specific. **Viet Nam** is finalising its Power Development Policy (PDP V-III), but is yet to update its *2011* National Climate Change Strategy, and 2012 Green Growth Strategy.

Kenya has a National Energy Policy. Its central Ministry of Energy (MoE) responsible for energy policy (MoE 2018) issued a roadmap targeting 100 GW RE by 2040 (MoE 2022). Kenya's recent decision to end subsidies for fossil fuels to reduce government expenditure will reflect the real cost of fossil fuels and reduce the price gap with renewables (Reuters 2022) . **Singapore** also has a defined, future-ready transition strategy that identifies and attempts to plug technology, finance, infrastructure, and policy gaps.

ii. Trade-offs: Energy transition in the context of government revenue and livelihoods

A shift away from fossil fuels will have significant trade-offs. Fossil fuel revenue contributed to 3.2 per cent of **India's** GDP and 5 per cent of **Indonesia's** GDP in 2019 (Bhandari & Dwivedi 2022) (EITI 2021). Meanwhile, fossil fuel (coal, oil, gas) subsidies cost India USD 40 billion between 2017 and 2019 (IISD 2020), and Indonesia USD 6.8 billion in 2020 (Sumarno & Sanchez 2021).

Millions of people in the Indo-Pacific also rely on government subsidies for primary energy access, which are often cross-subsidised by revenues from fossil fuel consumption and trade. For example, **Indonesia** subsidises palm oil and temporarily banned its export to maintain affordable clean cooking access when prices skyrocketed in the wake of the Russia-Ukraine crisis (Frost 2022).

The energy transition must also be just and inclusive for the millions of people dependent on fossil fuel jobs. In **India** alone, 21.5 million people work in the fossil fuel industry, which provides consistent, long-term employment (Bhushan & Bannerjee 2023) – with many millions more employed in supporting sectors like townships and transportation. There is no direct replacement of these jobs with new ones in the RE sector, in terms of job roles, skills, locations, and incomes.

Decommissioning fossil fuel infrastructure is also expensive. For instance, decommissioning 130 coal-fired power plants in **India** would cost between USD 32 billion and USD 48 billion, including payouts to promoters and creditors (Singh and Sharma 2021). In **Indonesia**, it would cost USD 37 billion to buy all 118 coal units and associated PPAs to retire them before 2040 (Garg 2022).

iii. Limited energy transition finance in the region

The Indo-Pacific energy transition needs substantial investment, but funding is concentrated in the developed world. In 2019-20, energy transition asset finance fell by 10 per cent in Emerging Market Economies (EME) while increasing 34 per cent in developed countries (BNEF, 2022). In Southeast Asia, annual clean energy investment is only a fifth of the amount channelled towards renewables in advanced economies (IEA, 2022).

Three challenges are causing sub-optimal finance flows from the private sector:

- Emerging markets are challenging business environments, with complex regulations, inadequate infrastructure, and political uncertainties, which deter private investors (Table 4).
- Returns on investment in fossil fuels still exceed renewables in emerging markets versus advanced economies (Imperial CCFI, 2021).
- Small businesses and household consumers are also less inclined to commission rooftop solar installations or energy efficiency retrofits due to the high upfront cost of capital, shrinking the market for private players. More concessional lending programmes like Indonesia's *Kredit Usaha Rakyat* (Micro-credit programme for small enterprises), or Brazil's *Minha Casa Minha Vida* for household energy efficiency retrofits are needed.

Table 4: Ease of doing business

Country	Ease of Doing Business Rank (2019)
Bangladesh	168
India	62
Indonesia	73
Kenya	56
Singapore	2
Viet Nam	70

Source: World Bank, 2019

Regional mechanisms for transition finance have proven inadequate. For instance, the African Development Bank's (AfDB) New Deal on Energy for Africa for RE-based universal energy access could raise only USD 12 billion against the USD ~400 billion needed for its 2030 goals (AfDB 2019).

Multilateral and sovereign lending and concessional finance are plugging some finance gaps. G7 countries have launched a USD 600 billion Partnership for Global Infrastructure and Investment for developing countries. Initial investments include a USD 2 billion solar project in Angola, and USD 40 million to develop Southeast Asia's power systems (PGII) (White House 2022).

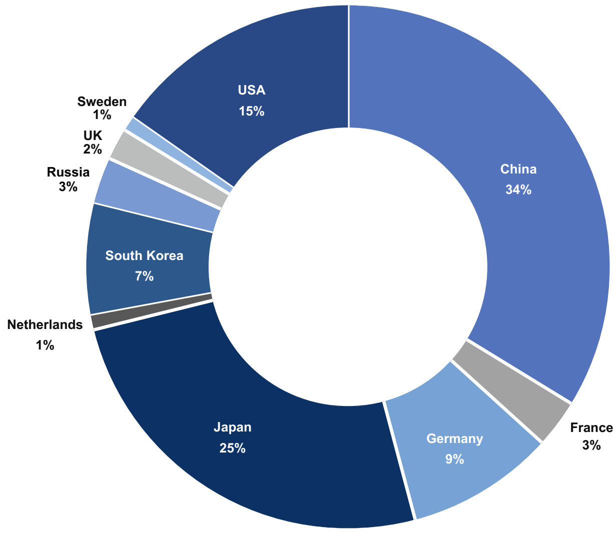
South Africa, **Indonesia**, and **Viet Nam** have signed the *Just Energy Transition Partnership (JETP)*, with the aim to leverage public and private finance of USD 8.5 billion, USD 20 billion, and USD 15.5 billion respectively over the next three to five years, to transition from fossil fuels to clean energy and help meet their 2050 net zero goals.

The JETP provides some concessional finance – Agence Française de Développement (AFD) and Kreditanstalt für Wiederaufbau (KfW) will provide EUR 300 million in concessional finance directly to the **South African** National Treasury – but most of the funds are loans, conditioned upon coal phase-down plans. One challenge for future JETP agreements is that some developing countries that need transition finance may be unwilling to trade sovereignty for conditional loans. On the other hand, JETP may eventually prove to be ineffective since recipients like **Indonesia** has increased coal investment after signing it's JETP (Simon 2023).

iv. **Inaccessible technology**

Technology concentrations (Figure 1) keep RE technologies out of the reach of most new energy demand centres. Analysis of environmental technology (solar, wind, hydro, geothermal, fuel-cell, and waste management) patent applications under the Patent Cooperation Treaty published between 1980 and 2023 reveals that 89 per cent of global patent applications originated from 10 countries (WIPO 2023). Three Indo-Pacific countries – **China**, **Japan**, and **South Korea** – own 63 per cent of these patents (ibid).

Figure 1: Top 10 environmental technology patents published by the PCT by country of origin



Source: CEEW analysis; WIPO IP Statistics

The quest for low-carbon energy security is also a race to domestically manufacture solar panels, wind turbines, electrolysers, batteries, high-voltage transmission lines, electric vehicles, and other components. Technology concentrations, therefore, are hindering the energy transition of most Indo-Pacific countries. For instance, **Bangladesh** and **Kenya** depend on **China**, **India**, **Malaysia**, and **Hong Kong** for solar components (Volza 2021). Similarly, without processing and refining technology, **Indonesia** cannot use its ownership of 22 per cent of global nickel reserves to locally produce batteries (NBR 2022).

v. **Critical mineral dependencies**

Reserves of critical minerals used in clean energy are geographically concentrated, for example, in **Indonesia** (nickel), the Democratic Republic of Congo (cobalt), Chile (copper and lithium), **Australia** (lithium), **South Africa** (manganese), and **China** (graphite and rare earth elements) (CEEW, IEA, UC-DAVIS and WRI 2023). As mineral demand rises, market concentrations and lack of data on critical minerals inventories makes supply chains vulnerable to natural hazards, conflicts, and fragmentation in investments and trade (Boer, Pescatori, & Stuermer 2021).

Consumer countries like **India** and **Japan** are taking policy measures to tackle critical mineral supply chain dependencies but much work still needs to be done in this area (Bowen 2022). Producers like **Indonesia** are exploring the idea of an OPEC-style supply group for critical minerals, while Argentina and Chile are considering a similar idea for lithium.

However, cartelisation of critical minerals could make producer countries vulnerable (Bowen 2022) if they continue to depend on other countries for processing, refining, and manufacturing. They may also struggle to build consensus due to varying domestic priorities and strategic alliances, as not all producers have the same critical minerals. Developing secondary raw-material recycling capability could also reduce the leverage of mineral producers (Tilton, et al. 2018).

[2]The available data on patents granted under the PCT does not include segregation based on the type of environmental technology.

IV – Accelerating the Indo-Pacific energy transition

This section explores financial and multilateral mechanisms that could accelerate the Indo-Pacific energy transition.

i. Finance

Indo-Pacific countries need trillions of dollars for their energy transition. India alone is estimated to need USD ~10 trillion across the power, industry, and mobility sectors to achieve Net Zero. This includes investment support to bridge gaps in banking and capital markets (Singh & Sidhu 2021). Association of Southeast Asian Nations (ASEAN) countries – all in the Indo-Pacific – need USD 290 billion to meet their target of 23 per cent RE by 2025 (Vakulchuk, Overland, and Suryadi 2023).

As noted in Part 3 of Section III, financial flows towards the energy transition in Indo-Pacific countries are inadequate. To attract these vast sums, countries are using a mix of public, debt, and catalytic concessional finance. Government investment in the energy transition extends from sovereign investment in clean energy projects and infrastructure via government agencies, to the public sector, public-private partnerships (PPP), and sovereign wealth and pension funds. Such investments, along with green public procurement to scale clean energy markets, have been instrumental in exponentially growing the RE sectors of **India** and **Viet Nam**.

For example, **India's** state-owned Solar Energy Corporation of India (SECI) has taken innovative measures to promote solar investment: it parcels out GW-scale utility-scale projects to private players via tenders, enables plug-and-play development by removing uncertainties like land acquisition and government permissions; de-risks projects by stepping in as a sovereign guarantor for payments and power offtake via long-term power purchase and sale agreements; distributes subsidy support for rooftop solar installations; provides Viability Gap Funding (VGF) for power projects; and invests in high-value or high-risk projects to demonstrate feasibility (SECI 2023) (SECI 2023b) (SECI 2023c). As of April 2022, SECI had awarded 54 GW of solar capacity – ~88 per cent of India's total solar capacity (SECI 2022), including three wind-solar hybrid projects, and issued tenders for 2.25 GW Round-the-Clock (RTC) power projects. (JMK 2022).

Policy-backed, targeted incentive schemes like production-linked schemes, feed-in-tariffs (FiT), and direct government subsidies also boost private sector participation by indicating government confidence in the sector, and helping lower the cost of capital.

For example, a FiT helped **Viet Nam's** solar deployment skyrocket from just 86 MW in 2018 to 16.5 GW by end-2020 (Do & Burke 2021). **India** has introduced a subsidy for household rooftop solar projects under 10 kilo volts to jumpstart its laggard rooftop solar sector (MNRE 2023), and outlaid USD 2.3 billion in Production-Linked Incentives for 48 GW of high efficiency fully or partially integrated solar modules – ensuring that for the first time, polysilicon and wafers are made domestically.

Some Indo-Pacific countries have also introduced carbon taxes to make fossil fuel consumers shore up a portion of their governments' energy transition funds. However, carbon taxes will have little impact without a parallel phase-down of fossil fuel subsidies that encourage both producers and consumers to continue their dependence on fossil fuels.

For instance, **Singapore's** USD 5/tCO2e carbon tax generated USD 1 billion in five years (Tan 2022), but pales in comparison to the USD ~25 billion spent to subsidise fossil fuels in 2022 alone (IMF 2022).

Debt finance

Indo-Pacific countries are availing debt instruments like loans, including from Multilateral Development Banks (MDBs), and green bonds to encourage and streamline private sector investment, especially in public infrastructure.

Bangladesh recently took a World Bank loan of USD 450 million to improve its grid infrastructure by building new transmission lines and substation capacity (Rose & Joshi 2021). **Indonesia's** state-owned geothermal company has taken a USD 300 million loan from the Asian Development Bank (ADB) to enhance power generation capacity (ADB 2020).

Green bonds are debt securities issued to finance or refinance projects that have a positive environmental benefit (CFI 2023). In 2015, the World Bank's IFC issued an Indian Rupee-based 5-year green 'Masala' bond worth INR 3.15 billion for institutional investors in overseas markets. These bonds were listed on the London Stock Exchange, with proceeds to be invested in a private Indian bank's green bond. This inventive move of strategic investment illustrated how development banks can use their AAA rating to de-risk emerging markets' domestic clean energy projects and channel low-cost institutional capital into these countries (CBI 2015). In 2023, **India** will issue USD 12.2 billion in sovereign green bonds (RBI 2023); in its 2022 Budget, **Singapore** announced USD 35 billion issuance of green bonds by 2030 (MoF 2022).

Catalytic blended and concessional finance

As discussed in Part 3 of Section III, private capital flows to developing countries are constrained by real or even perceived high risks. Capital from MDBs, Development Finance Institutions (DFI), philanthropic organisations, etc., can be strategically blended to attract private capital for the energy transition in developing countries (CEF 2022) (Mutambatsere & de Vautibault 2022).

Blended finance schemes like **Indonesia's** Energy Transition Mechanism (ETM) channel funds towards specific energy transition areas. The ETM's Carbon Reduction Facility (CRF) funds the retirement of coal-fired power plants, and its Clean Energy Facility (CEF) focuses on building new green energy facilities. **South Africa's** Development Bank guarantees RE power purchase up to 75 MW (OECD 2021).

Kenya set up its Geothermal Development Company (GDC) in 2008 to de-risk exploration and drilling via independent power producers (IPPs). The GDC model, aka the Menengai model based on the first major project, routed funds from the AfDB and Climate Investment Fund (CIF) to develop the high-risk exploration stage, after which, three IPPs were selected for power plant construction (Van Den Akker 2018). The GDC also mediated negotiations between the power producers and state-owned off taker KPLC (ibid).

There are multiple benefits of the **Menengai model.** State-owned GDC absorbed the exploration and field development risks, and secured state-led offtake of the produced steam; DFI participation allowed GDC to sell steam to IPPs at low cost; and a partial risk guarantee security package addressed the IPPs' credit risk (ibid). Before Menengai, Kenya only had one privately developed geothermal plant – the 110 MW Olkaria III – which had taken several decades to construct (ibid).

India's National Green Hydrogen Mission (NGHM) has also outlaid USD 2.4 billion to add 125 GW RE capacity to produce 5 MTPA of green hydrogen by 2030 (PIB 2023).

Box Text 1: The role of multilateral and public development banks (MDBs and PDBs) in financing the energy transition

MDBs and PDBs can help create a favourable investment climate by influencing targeted and action-oriented policies, and providing financial instruments to mobilise the private sector. Governments rely on PDBs to tackle persistent economic or social challenges by provisioning long-term and low-cost financing. As per a 2019 estimate, over 500 PDBs in ~150 countries collectively held assets worth USD 23 trillion (AFD 2019).

MDBs and PDBs can:

- **Draft masterplans for cross-border transmission** to resolve bottlenecks and improve cross-border trade. For instance, Japan International Cooperation Agency (JICA) is developing **Bangladesh's** Integrated Energy and Power Master Plan project.
- **Fund strategic projects**, for instance, AFD (via a sovereign concessional loan) and the World Bank co-financed electrical interconnections between **Kenya** and Ethiopia. This project will eventually connect the East Africa Power Pool (EAPP) to the South African Power Pool (SAPP).
- **Improve project facilitation** by intervening in areas that are not typically addressed by commercial financial institutions, and provide technical assistance. PDB contributions can enhance project preparation, business models and market access, and improve their environmental, social and governance practices.

  For example, AFD mobilises the Fund for Technical Expertise and Experience Transfers (FEXTE) which in turn funds technical-cooperation programmes and project-preparation studies in developing countries. ADB also provides technical assistance to its developing member countries (DMCs) to improve capacities and better use resources.
- **Support co-financing and risk pooling.** facilities can increase funding to large-scale projects and bridge financing gaps; delegate roles and responsibilities across financiers to save time and resources; increase access to various grant resources; reinforce each other's sectoral strengths; and provide additional resources to augment the developers' resources to provide auxiliary operational headroom and prevent project overruns.

MDB networks like the International Development Finance Club (IDFC) network, leverage the reach and resources of their members. The IDFC, for example, comprises 27 national, regional and bilateral development banks, including TSKB (Türkiye), PT SMI (Indonesia), CDG (Morocco), Bancoldex (Colombia), CDB (China), KfW (Germany) and JICA (Japan). The IDFC has USD 4 trillion in accumulated assets and more than USD 600 billion in annual financing. Each year, IDFC commits an average of USD 150 billion to 'green' and climate financing, making it the foremost global public donor for the energy and ecological transition.

Source: (AFD 2022)

ii. Indo-Pacific energy cooperation

The Indo-Pacific energy transition needs bilateral, multilateral, and regional cooperation for vital energy and resources trade, supply chain resilience, technology and financing access, and grid interconnectivity. This Issue Brief examines the scope for energy cooperation in existing regional agreements and initiatives. Table 5 provides a snapshot of multilateral energy and trade cooperation avenues among the six representative countries.

Table 5: Multilateral groupings in the Indo-Pacific

Country	ISA	IORA	BIMSTEC	SAARC	IPEF	ASEAN	APEC	CPTPP	RCEP	APTA
Bangladesh	✓	✓	✓	✓	*	*	*	*	*	✓
India	✓	✓	✓	✓	✓	*	*	*	*	✓
Indonesia	*	✓	*	*	✓	✓	✓	✓	*	*
Kenya	*	✓	*	*	*	*	*	*	*	*
Singapore	*	✓	*	*	✓	✓	✓	✓	✓	*
Viet Nam	*	*	*	*	✓	✓	✓	✓	✓	*

Source: CEEW analysis

Multilateral forums categorise the Indo-Pacific into South and Southeast Asia. Indonesia, Singapore and Viet Nam have four common multilaterals that bring countries situated in the Pacific Rim together, while the four common to Bangladesh and India bring together Indian Ocean-based countries. India – via the **Indo-Pacific Economic Framework for Prosperity (IPEF)** and its Free Trade Agreement with ASEAN – bridges the regional divide.

Most South and Southeast Asian multilateral forums have remain underutilised due to the narrow – and often conflicting – priorities of their members. Some prominent ones taking proactive steps to further the energy transition are noted below.

ASEAN's member countries have common energy integration goals undertaken through five-year plans, the latest of which targets 23 per cent RE in **ASEAN's** energy mix and a 32 per cent reduction in energy intensity by 2025 (from 2005 levels) (APAEC Drafting Committee 2020). ASEAN struggles with policy and regulatory incompatibility, compounded by inadequate access to technology and finance (Suwanto, Ienanto, & Suryadi 2021).

The Pacific Rim-centred **Asia-Pacific Economic Cooperation (APEC)** targets doubling RE in the energy mix by 2030 (from 2010 levels) and reducing energy intensity by ~45 per cent by 2035 (from 2005 levels) via uniform building codes for energy efficiency (APEC 2017). While ambitious, there has been little progress since APEC's last Ministerial in 2015.

The **Indian Ocean Rim Association (IORA)**, set up in 1997 for socio-economic cooperation, includes five of the six studied Indo-Pacific countries. The second IORA Ministerial in 2018 in New Delhi called for RE cooperation, regional capacity building, and strengthened partnerships among members (IORA 2022) (MNRE 2018). IORA could boost sub-regional engagement on energy transition and energy and resource supply chains, especially by drawing in East African countries.

Energy cooperation in South Asia has also seen little progress due to longstanding border disputes and a lack of interoperable grids. In 2011, the **Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)** agreed to establish an interconnected grid for its members; this plan was revived in 2021 to includes trade and cooperation on electricity and tariff mechanisms (Saha and Chaudhury 2021).

In 2014, the **South Asian Association for Regional Cooperation (SAARC)** signed a Framework Agreement for Energy Cooperation (FAEC) (SAARC 2014) for cross-border electricity trade and grid interconnections (Acharya, Ray and Dash 2020), which is languishing in the planning stage.

Intensifying competition between the US and China also makes the Indo-Pacific a strategic priority for the Global North. The European Union (EU), Canada, France, and the USA, among others, have their own Indo-Pacific strategy documents, some of which address climate and energy cooperation (Govt. of Canada 2022) (EU 2022) (Govt. of France 2022) (White House 2022).

The USA recently launched the **IPEF** with India, Japan, Australia, Brunei, Indonesia, Republic of Korea, Malaysia, New Zealand, Philippines, Singapore, Thailand, and Viet Nam (MEA 2022). The four-nation (USA, Japan, Australia, and India) **Quad** dialogue is quickly evolving from its security focus to broader economic cooperation, particularly for supply chain resilience (Gateway House 2021). However, both IPEF and Quad lack a clear focus on energy and transition cooperation.

The **Asian and Pacific Energy Forum (APEF)**, a Ministerial platform, includes major and developing economies from three continents and promotes regional and sub-regional cooperation for enhanced energy security and sustainable energy use (UNESCAP 2013). APEF's next Ministerial in 2023 could strive to establish principles for inclusive energy cooperation, and supply chain and grid interconnectivity (IISD 2018).

India and France co-founded the treaty-based **International Solar Alliance (ISA)** at COP21 in 2015. The ISA today has 114 Signatory Countries, and is working on a ©One Sun, One World, One Grid,© a major transcontinental grid interconnection initiative.

A unified and defined narrative for sustainable and secure energy transition is essential for the Indo-Pacific to improve its fractured multilateralism on policies, trade, finance, technology, capacity building, and standards.

V – Conclusion

A unified vision for energy security, cooperation and transition in the Indo-Pacific could help define a new developmental paradigm. The decarbonised future will be very different from today's world. For the 4.6 billion people in the Indo-Pacific the energy transition means more than a shift in energy sources – it means fulfilled aspirations for better quality of life, education, and health, with economic opportunities built on energy access, security, justice and sustainability.

This Issue Brief sought to map the energy transitions of six representative Indo-Pacific countries to identify challenges, and the financial and multilateral mechanisms that can accelerate the Indo-Pacific energy transition. The key learnings are:

- **Policy:** Some Indo-Pacific countries have transition strategies that seek to identify and plug technology, finance, infrastructure, and policy gap; while others still need an integrated domestic energy transition roadmap or policy framework.
- **Trade-offs:** A shift away from fossil fuels also means a decline in fossil fuel revenues, subsidies for primary energy access, jobs in fossil fuel-based and ancillary sectors, and high expenditure to decommission fossil fuel infrastructure.
- **Technology and resources:** Concentrated ownership of solar, wind, hydro, geothermal, fuel-cell, and waste management technology hinders the energy transition of most Indo-Pacific countries. The renewable energy supply chain of Indo-Pacific countries is also vulnerable to concentrations in critical mineral reserves, processing technology, and markets.
- **Energy transition finance:** Current investment flows towards the energy transition in Indo-Pacific countries are inadequate due to high real or perceived risk, low returns, and limited finance and concessional lending. To attract finance, countries are using a mix of public, debt, and catalytic concessional finance which have yielded meaningful progress in some countries.
- **Multilateral energy cooperation:** Bilateral, multilateral, and regional cooperation are needed for vital energy and resources trade, supply chain resilience, finance and technology access, and capacity building. Multilateral forums categorise the Indo-Pacific into South and South-East Asia but most are underutilised due to the narrow and often conflicting priorities of their members.

Addressing these challenges will need concerted action, including agreements to certain trade-offs, by governments and citizens, domestic and multinational industries, and multilateral financing and developmental agencies. Successful innovations and pilots need to be emulated and scaled up nationally, and adapted to similar situations in other countries. Cooperation must co-exist alongside competition and historic contexts, for the cohesive development of the Indo-Pacific.

Annexure I:
Energy transition deep-dive

Bangladesh

Hydrocarbons are the primary power source for Bangladesh's growing economy. Bangladesh has an installed power generation capacity of 25,427 MW. Its power generation depends primarily on natural gas (44.56 per cent) and oil (29.8 per cent), with the remaining 6.95 per cent from coal (SREDA 2022). Of its total power capacity, installed RE amounts to just about 790 MW or ~3 per cent, including off-grid installations (ibid). Solar PV accounts for 59.5 per cent of the country's RE capacity, with small-scale hydropower and biomass-biogas at 39.7 per cent and 0.8 per cent respectively (Tachev 2022).

Bangladesh's gas and oil-dependent power system is vulnerable to fuel price instability and relies on a weak grid. Due to fossil fuel dependence, Bangladesh's energy market and economy is vulnerable to fluctuating global spot prices. Its weak transmission and distribution network leaves 44 per cent of power capacity unutilised (Rose and Joshi 2021). Even though Bangladesh has managed electrification, its power generation challenges forced it to implement rolling blackouts in September 2022, close schools for an additional day per week, and shut down all diesel power generation plants due to the high cost of fuel (Liang 2022).These austerity measures, combined with rising fuel (and thus energy) prices, have sparked widespread protests.

Improved transmission can address some of Bangladesh's challenges. To improve grid infrastructure, Bangladesh recently accepted USD 450 million from the World Bank to build 450 km of transmission lines and 9,040 MVA of substation capacity (Rose and Joshi 2021). In 2019, the Asian Development Bank also approved a USD 300 million loan for an additional 408 km of transmission lines and 7,520 MVA of substation capacity.

Domestic policies show that Bangladesh recognises the need for more RE to boost power capacity. A draft twenty-year National Solar Energy Action Plan envisages the deployment of 40 GW of solar capacity by 2041 (Shinde and Skowron 2021) and seeks to minimise intermittency driven outage risks using storage solutions such as pumped storage and utility scale BESS (Rose and Joshi 2021). The Sustainable and Renewable Energy Development Authority (SREDA) recently proposed a new clean energy target of 25 per cent by 2030 which adds 10 GW, including 5 GW of wind power (Nicholas, 2022). Bangladesh is currently in the final stages of developing an integrated power master plan with the Japanese International Cooperation Agency (JICA), which envisages 40 per cent renewable electricity by 2041 (BSS 2022).

With fuel subsidies costing 0.5 per cent of its GDP, Bangladesh is incentivising the adoption of hybrid and electric vehicles for its mobility sector, responsible for 15 per cent of emissions. There are substantial tax incentives and exemptions for electric two wheelers and three wheelers and the Bangladesh Rural Electrification Board (BREB) is installing solar charging stations (IDCOL 2019). While improved energy efficiency and RE power penetration are key to decarbonising industries, at a cost of USD 1.5 billion, the Ghorashal-Polash Urea Fertiliser plant will be Bangladesh's first green fertiliser factory and will use integrated carbon capture technology (World Bank 2022). Cement and steel are currently tariff subsidised (15 per cent and 15 - 25 per cent respectively) and could benefit from policies to incentivise energy efficiency, green codes and standards for the construction industry; solid waste management to encourage recycling, and reduced import tariffs (ibid).

Resolving energy dependencies

In 2022, high LNG spot prices impacted Bangladesh's economy, exposing the vulnerability of import-driven energy systems. Endowed with the ability to source 80 per cent of its LNG from domestic sources, Bangladesh still needs to import LNG - mainly from Qatar and Oman - to meet power demand (Petrobangla 2021). Bangladesh is vulnerable to LNG spot price fluctuations for 6 per cent of its import demand, which in October 2021 resulted in a 117 per cent jump in the domestic gas bill (TBS Report 2022). To reduce the cost of imports, Petrobangla and its import subsidiary, Pupantarita Prakritik Gas Company Ltd. (RPGCL) want to boost domestic gas production by 5-7 per cent by exploring new reserves with ONGC Videsh Ltd (OVL), and building an LNG terminal to reduce spot price exposure (Petrobangla 2021).

Without new gas discoveries, Bangladesh will have to considerably scale up its RE capacity to meet power demand. Regional players like India, Nepal and Bhutan could export RE to Bangladesh, potentially using old multilateral grid interconnection plans under SAARC, BIMSTEC and ASEAN (Amin, 2020). Bangladesh already imports 1160 MW from India (UNB News, 2021) and recently signed an agreement with Nepal to import 700 MW of hydropower (SASEC, 2021). Bangladesh could seek India and Myanmar's support for imports and interconnectivity but will need to raise domestic capacity to achieve its vision for 2041. A second intervention could be grid investment to improve the low power utilisation rate of just 42 per cent (Nicholas, 2022).

Climate and energy finance

Bangladesh released the Mujib Climate Prosperity Plan: Decade 2030 (Mujib Plan, 2021) during COP26, identifying a financial outlay of USD 76.18 billion for its 2030 goals, which includes:

- Carbon pricing mechanisms (eg. National Carbon Coordination Hub) of up to USD 35 per tonne of CO2 can raise public finance to 0.2 per cent of GDP by 2025 and 1 per cent by 2030.
- Savings of USD 1.7 billion in fossil fuel subsidies by 2030 through a gradual phase-out by 2029. However, Bangladesh spent USD 13 billion on fossil fuel subsidies in 2022 (IMF, 2022).
- Steps towards credit enhancement, low-cost refinance, and labour upskilling with international partners; PPAs to underwrite support; and establishing an ancillary service market for transmission and distribution equipment.
- Funding 25 per cent of the USD 7.2 billion needed to achieve 4 GW of RE capacity by 2030.
- Plans to sources to balance financing, and concessional/de-risking finance of USD 800 million for energy efficiency, from existing partners such as Bangladesh Climate Trust Fund (BCCTF), Global Environmental Facility (GEF) and the Green Climate Fund (GCF).

Observations

- **Bangladesh needs to improve transmission to accelerate its energy transition.** Curbing transmission losses and improving power utilisation rates could transform Bangladesh's economy into one where industries and consumers can trust the grid. Improving RE capacity and storage would help Bangladesh improve clean energy access and economically integrate more of its people without the high cost of subsidies.
- **Power imports are cheaper and more stable than fluctuating gas import prices.** Bangladesh need not be restrained by its low RE potential and needs a proactive foreign policy to leverage the potential of its neighbours such as India, Bhutan, Myanmar and Nepal.
- **Policy certainty will help Bangladesh attract finance to build RE and transmission infrastructure.** Bangladesh's National Solar Energy Action Plan needs to deliver on its policy promises to attract capital for the intended energy transition.

India

India is an energy transition leader, ranked fourth globally for total installed RE capacity (118 GW), and third for wind (~42 GW) and solar energy (~61 GW) capacity (REN21 2022) (MNRE 2022), with another ~15 GW coming from biomass, waste-to-energy and small hydropower (CEA-CEEW 2022). The five-fold increase in installed RE capacity in India since 2010 can be attributed to supportive policies, rapid reduction in technology and implementation costs, and demand-side drivers for energy access, security and efficiency (Singh, Nair, and Raja 2021) (Ghosh 2015). India's installed non-fossil fuel-based power generation capacity, including nuclear, stands at about 42 per cent, with the balance met by hydrocarbons, largely coal (Ministry of Power 2022).

Favourable RE policies are helping India leverage its potential. India has an annual solar insolation of 5,000 TWh, and wind energy potential of 302 GW and 695.50 GW at 100m and 120m hub height respectively (MNRE 2022). Blessed with a long coastline of 7600 km, India also has 70 GW of offshore wind potential, predominantly in the states of Gujarat and Tamil Nadu. To reduce costs, in 2017, India abolished feed-in-tariffs in favour of reverse auctions for the wind sector (similar to solar energy projects), achieving 40 per cent lesser tariffs (Shah 2022). India also has priority sector lending for the RE sector and allows 100 per cent foreign direct investment. Since 2018, there has been a 59 per cent drop in RE subsides (CEEW 2022).

In January 2022, the Government of India launched the second phase of its Green Energy Corridor (GEC) for Intra-State Transmission System (InSTS) to facilitate grid integration and power evacuation of 20 GW of RE from Gujarat, Himachal Pradesh, Karnataka, Kerala, Rajasthan, Tamil Nadu and Uttar Pradesh. Under the scheme, setting up RE power transmission infrastructure will cost USD 1.5 billion. The GEC is crucial to achieving the NDC of 50 per cent non-fossil fuel-based power capacity by 2030.

India is investing in wind-solar hybrid projects (WSH) and storage to address RE power intermittency. The state-owned Solar Energy Corporation of India (SECI) is issuing tenders for round-the-clock power and peak power supply to push for integration of RE power generation and storage solutions and optimise the use of infrastructure, including land and transmission systems (Bridge to India, 2022). SECI has commissioned three WSH projects of 1,440 MW each in the states of Rajasthan, Tamil Nadu and Andhra Pradesh in 2020; overall, India could install up to 5.5 GW of WSH projects by 2025 including investment by the private sector.

India's energy secure low-carbon future focuses on decarbonisation without deindustrialisation. One step is incentivising energy efficiency in industries which consume 50 per cent of India's energy demand (Pal and Hall 2021). India's deployment of green hydrogen can abate 3.6 gigatonnes of CO2 emissions by 2050 (NITI Aayog 2022). In mobility, India is subsidising EV's, implemented 10 per cent ethanol blending in fuel, the Indian Railways aims to be the first Net Zero railway, and the adoption of ZET (Zero Emission Trucks) could cut 838 billion liters in diesel demand by 2050 (NITI Aayog-RMI 2022).

India is also expected to have 140 - 200 GW of battery storage capacity by 2040 (IEA 2021) and will need up to USD 136 billion to finance this potential (CEEW-CEF 2020). In 2020, private players Greenko and ReNew Power were awarded tenders to build 1200 MW of RE capacity using this model with SECI providing a 35 per cent guarantee (Barman 2020). India imposes an 18 per cent GST rate on lithium-ion batteries for storage but only 5 per cent for electric vehicles, and intends to rationalise the tax rate for non-EV batteries to boost the power sector (Baruah 2022).

Resolving energy dependencies

India is diversifying energy sources and suppliers to drive energy security and reduce its fossil fuel subsidy burden. India depends on imports, in particular from the Middle East, for over 85 per cent of its crude oil needs (PPAC 2022). In 2021-2022, the UAE, Saudi Arabia and Iraq provided 53.5 per cent of India's crude oil imports; while Qatar makes up 41 per cent of India's natural gas imports (Ministry of Commerce, 2022). India imports 70 per cent of its natural gas (Sönnichsen 2021) but has diversified its LNG trade mix to reduce one-country dependency, diversifying to include new partners such as the UAE and USA. Pioneering clean fuels, India will spend USD 2.3 billion to build 125 GW additional RE capacity and produce 5 MTPA of green hydrogen by 2030 (PIB 2023).

India has bilateral cross-border power trade with several neighbouring countries including Bangladesh, Bhutan, Myanmar and Nepal (Ministry of Power 2022b). Building cross-border transmission lines is time, labour and capital intensive and includes several years of political understanding and fundraising, followed by a rules-based order for trade across the line (Taylor2021).

The One-Sun-One-World-One-Grid (OSOWOG) initiative could create grid interconnections of 2600 GW by 2050 (ibid). This super-grid could help India reduce its fossil fuel import driven current account while creating a new export market for Indian solar and wind power (Alam and Kumar 2020). India also has the opportunity to collaborate with other regional multilateral groups such as ASEAN whose existing transmission network can provide a crucial link in the OSOWOG chain (Chaudhury 2022).

Climate and energy finance

India attracted USD 14.5 billion in clean energy investments in 2021-22 (ETEnergyWorld 2022). However, it needs USD 10.1 trillion in aggregated investments to achieve its net zero target by 2070 (Singh and Sidhu 2021). Some forms of the required investment could include:

- Financial support of USD 1.4 trillion averaging USD 28 billion annually (Singh and Sidhu 2021).
- Low-cost capital of USD 223 billion to build India's RE infrastructure (BNEF 2022).
- Balanced public and private investment: In 2018, out of USD 21 billion in finance, bilateral and multilateral sources were just 5 and 11 per cent respectively (Macquarie, et al. 2020).
- More transition bonds: Between 2014-2021, USD 11 billion was raised through green bonds in international bond markets by Indian developers, which refinanced 10 GW of RE capacity (Garg, Jain and Sindu 2021).

Observations

- **India needs a comprehensive energy transition strategy to achieve its Net Zero target.** India has made great strides towards the energy transition but needs an overarching global, national and sub-national vision and action plan to set and meet time-bound targets.
- **Infrastructure investments are the key to a successful – and efficient – energy transition.** India needs more and better grid infrastructure, RE production and storage, and hydrogen facilities to enable last-mile connectivity, curb inefficiencies and meet the growing demands.
- **A comprehensive energy strategy showcases market stability and could attract finance towards India's burgeoning RE sector.** India could leverage investment de-risking mechanisms to cut the cost of capital and ease financial flows (Ghosh and Harihar 2021).

Indonesia

One of the top producers and consumers of fossil fuels, Indonesia faces a more complex transition than most Indo-Pacific economies. In 2020, Indonesia's total primary energy supply was hydrocarbon-based, with 37.3 per cent coal, 35 per cent oil and 18.5 per cent natural gas (ADB 2020). The share of RE in the primary power mix is only 11.2 per cent, far behind Indonesia's 2025 goals. Rooftop solar growth remains limited at only 21 MW, with geothermal, hydropower and bioenergy capacities at 55 MW, 291 MW and 19 MW respectively (ibid). To meet its target of 13 GW installed RE capacity, Indonesia will have to dramatically scale up its deployment (IESR 2021).

Replacing revenues generated by fossil fuel production is another transition challenge for Indonesia. In 2021, coal production generated USD 3 billion per month from 600 million tonnes (CNA 2022), surpassing targets under the National Energy General Plan (RUEN) of 400 million tonnes per year (IESR 2021). Indonesia's coal revenues subsidise domestic fossil fuel consumption and are not funding the RE transition. In 2020, energy subsidies cost USD 6.8 billion and focused on coal, LPG and oil. RE received less than 1 per of all subsidy support despite Indonesia's target of achieving 23 per cent RE by 2030 (Sumarno and Sanchez 2021).

New policies are providing incentives to enable Indonesia's energy transition. Competitive tariff structures allow private solar PV developers in Indonesia to utilise solar power with 10-15 per cent lower tariffs than the state electricity company, PT Perusahaan Listrik Negara (Persero) (PLN). A new regulation expands the scope of tariff benefits to commercial and industrial consumers and allows them to claim the benefits of every unit of electricity they produce (IESR 2021). Indonesia has also set up a Net Zero Hub to encourage industrial decarbonisation (Hicks 2022).

Storage solutions and local manufacturing are also in focus. Indonesia has a policy to boost the uptake of storage solutions by mandating that all RE plants generate uninterrupted power (IESR, 2021). For a domestic manufacturing push, Local Sourcing Requirements (LCRs) for electric vehicles have been raised to 35 per cent (two-wheelers) or 40 per cent (four-wheelers). LCR requirements will see a staggered climb to 60 per cent by 2024, with 100 per cent local battery manufacturing. Indonesia's new carbon tax of USD 2.1/kg CO2 and planned coal levy on power plants has seen limited traction.

Indonesia has significant reserves of transition-critical mineral and is taking steps to improve processing capacities. Barring lithium, Indonesia has reserves of the critical minerals necessary for EV batteries such as nickel, laterite and manganese ores (IESR, 2021). However, the country lacks processing and refining facilities and has only one Class 1 nickel producer. To address this challenge, the state-owned Indonesia Battery Corporation (IBC) is building six High-Pressure Acid Leach (HPAL) units. Pumped Hydroelectric Storage Power (PHES) systems are also under construction to address RE's intermittency challenge. Upper Cisokan (~1 GW, 2025) in West Java and Matenggeng (943 MW, 2028) in Central Java are the two first PHES plants in Indonesia (IESR 2021).

Indonesia has laid the policy and planning groundwork to leverage its massive RE potential. Indonesia has the world's highest geothermal potential at 23.9 GW, along with 94 GW hydropower, 208 GW solar, 60.6 GW wind, 17.9 GW ocean and tidal, 32.6 GW biomass, 200,000 barrels per day biogas, and 7.3 GW of PHES potential (ADB 2020). By 2035, PLN wants to increase RE capacity to 20.9 GW and raise the share of RE in power generation from 15 per cent to 23 per cent (IESR 2021). PLN also plans to install at least 4.7 GW of solar PV and 4.2 GW of PHES in the next ten years.

Resolving energy dependencies

Indonesia's energy consumption far exceeds its natural fossil fuel endowment – 23 per cent of energy demand relies on imports. In 2019, Indonesia imported ~113 million barrels of crude oil from Singapore, Malaysia, Saudi Arabia and UAE. Global energy prices forced Indonesia to raise energy subsidies by USD 23 billion and ban palm oil exports to manage inflation (Sulaiman and Suroyo 2022).

For Indonesia, the first task is grid interconnection within the archipelago to improve service quality, and the second is to minimise transmission and power theft-related losses. By 2050, at least 158 GW transmission capacity needs to be built to enable power exchanges between its islands (IESR 2021). ADB and PLN are working on grid interconnections (ADB 2021) and German, Japanese, Taiwan, Korean and Chinese companies are competing to provide smart grid technology (US-ITA 2020).

Also, replacing diesel-driven power in rural areas with RE and third, generating investment to leverage massive geothermal, hydro, wind and solar potential, to potentially become a net exporter of around 6 GW with ASEAN grid interconnections (Jiang, Gao, Xu, & Li 2019). In October 2021, three agreements were made by private companies to export 8.67 GW solar power from Indonesia's Riau Islands to Singapore but their status remains unclear as Indonesia banned RE exports in July 2022.

Climate and energy finance

Indonesia will need USD 150 – 200 billion to fund its Low Carbon Development Initiative (LCDI) and meet its Net Zero targets (Bappenas 2021). However, RE investments are falling short – only USD 2.7 billion between 2015–2020 (SEforALL 2022) whereas fossil fuel power generators received USD 2.5 billion Q3 2021 (IESR 2021). Indonesia recently secured an additional USD 20 billion in loans and concessional finance via the Just Energy Transition Partnership (JETP) investment plan to expand renewable energies and enable the phase down of its coal-fired power systems (EC 2022).

To close the remaining funding gap, Indonesia could: (Bappenas 2021) (OECD 2021)

- Phase-out fossil fuel subsidies, phase-in carbon pricing to raise 2 per cent of GDP by 2030.
- Expand Islamic Finance instruments such as the Green Sukuk that raised USD 2 billion in 2018; or financing products such as Kredit Usaha Rakyat to provide subsidised interest rates.
- Use the SDG Indonesia One Fund to support guarantee schemes aimed at de-risking.
- The Energy Transition Mechanism (ETM) is a disbursal mechanism between internal sources of climate finance for specific projects. The ETM is split into a Carbon Reduction Facility (CRF) to retire coal-fired power plants and create a Clean Energy Facility (CEF) to develop green energy facilities.

Observations

- **Indonesia could use a national transition strategy.** A unified strategy would provide a clear pathway towards Net Zero and a stable regulatory environment in the pathway to Net Zero.
- **Indonesia could boost climate finance using domestic sources.** Already innovating in climate finance and leading a global blended finance initiative that seeks USD 30 billion for its transition goals, Indonesia should explore ways to channel its fossil fuel revenues towards RE infrastructure.

Kenya

Kenya is on an ambitious pathway to a full and just transition to renewable electricity by 2030 (Mbenywe 2021). In 2021, RE accounted for almost 90 per cent of installed power generation capacity (Kenya National Bureau of Statistics 2022). This excludes Kenya's clean cooking access challenge and reliance on wood and biomass for over 68 per cent of overall energy use (Takase, Kipkoech and Essandoh 2021).

Cost-competitive RE is driving high adoption in Kenya, a country with the fourth highest household power tariffs in Africa. Solar is cheaper than grid-supplied power, and household solar systems are cheaper to set up in Kenya than in other parts of Africa. For instance, household solar systems in Kenya cost USD 92.3 compared to USD 400 and more in other parts of rural Africa (Wagner, Rieger, Bedi, Vermeulen, & Demena 2021).

Favourable policy measures such as the removal of Value Added Tax (VAT) and import duties for RE, equipment and accessories have helped reduce the cost of RE systems. Presently, non-captive RE projects benefit from a standardised 20-year Power Purchase Agreement (PPA) (Nyabira, Muigai and Murangi 2021). Kenya's Feed-in Tariff (FiT) policy has been phased out and as of 2021 only benefits small scale biomass, biogas and hydro up to 20 mega-watts (MW). A weak transmission and distribution network has, interestingly, promoted the adoption of RE to cope with regular power outages. Industrial captive power consumers, which make up almost 55 per cent of Kenya Power's revenue, are shifting to off-grid solar power (Okoth 2020).

Table 6: Kenya Installed RE Capacity, June 2020

Source	Installed MW	% Capacity
Hydro	833.9	29.94
Geothermal	811.14	29.12
Biomass	2	0.07
Solar	52.51	1.9
Wind	336.05	12.07
Total	2036	73.1

Source: Kenya Power

Kenya's tremendous RE potential is yet untapped. Geothermal reserves in the Rift Valley and Lake Turkana basin are estimated at 10 GW (Kahlen, Kurdeziel, Day, & Schiefer 2019) and solar potential is 15 GW (EPRA 2022). Ideal wind speeds of 6m/s can be found in 73 per cent of Kenya but it has only installed 336.05 MW of wind power (EPRA 2022). As per the 2018 National Energy Policy, Kenya may shift to open access transmission and distribution, and is also expanding battery storage capacity through its Least Cost Power Development Plan 2021-2030 (LCPDP) to raise capacity to 480 MW (US-ITA 2021).

In 2021, Kenya's fuel imports made up 20 per cent of its import bill, and it faces a weighty subsidy bill for petrol, diesel and kerosene, having spent USD 220 million to stabilise prices in the latter half of 2021 alone (MoE 2022). In a transition scenario, key challenges will include sustainable urban planning and phasing in sustainable fuels (and the allied infrastructure) to replace petrol and diesel for the mobility sector and replacing kerosene. As a starting point, the Ministry of Energy (MoE) issued a roadmap to transform the energy sector, setting an ambitious target of 100 GW RE by 2040 (MoE 2022). Kenya was also one of the countries that launched the African Green Hydrogen Alliance in May 2022, signalling its openness to phasing in new solutions (Race to Zero 2022).

Resolving energy interdependencies

In 2021, **Kenya** generated a weighty import bill, importing 6.149 million litres of refined petroleum worth USD 3.48 billion, mainly from the UAE (USD 1.41 billion) and Saudi Arabia (USD 1.14 billion), apart from India, the Netherlands and Kuwait (Kenya National Bureau of Statistics 2022). Facing political and economic instability due to rising fuel prices, in June 2022, Kenya's treasury announced that it would take steps to progressively eliminate the fuel subsidies for petrol, diesel, and kerosene, which will entail phasing-in alternate and cost-effective energy sources (Kenya News Agency 2022).

Phasing in renewables to cut the subsidy bill will require large investments in infrastructure for RE, particularly for mobility. Leveraging Kenya's geothermal, solar and wind potential will also require new investment. Apart from investment support, Kenya is exploring grid interconnections with neighbours. The national grid already transmission lines to Uganda (132 kV) and Ethiopia (500 kV). Kenya plans to use the Eastern Africa Power Pool (EAPP) to add connections to Rwanda (400 kV), Tanzania (1700 MW) and Zambia (LCPDP 2021).

Source: East Africa Power Pool, 2014

Climate and energy finance

The estimated cost of implementing Kenya's mitigation and adaptation actions is KES 6,775 billion (USD 65 billion) in 2020-2030 (National Treasury and Planning 2021). The status of transition finance in Kenya is:

- In 2018, KES 243.3 billion (USD 2.4 billion) of public and private capital was invested in climate-related activities – only half the financing Kenya needs annually to meet the targets set in its NDC (National Treasury and Planning 2021).
- Overall, public investment (from domestic and international providers) totalled KES 144.3 billion while investment from the private sector totalled KES 98.9 billion.
- The current estimated cost of implementing Kenya's mitigation and adaptation actions stands at USD 65 billion for 2020-2030 (National Treasury and Planning 2021).
- To meet the climate ambitions outlined in the NDC, both public and private climate finance needs to be scaled-up significantly by 2030.

Observations

- **A just and equitable energy transition relies on cost-effective energy access.** For its 2030 targets, Kenya should redouble its efforts towards clean cooking access, use RE to drive down the cost of electricity, and invest in sustainable urban planning to bring energy efficiency.
- **Kenya must account for the challenges that accompany rising demand and access.** Considering its relatively low electrification rate, low per-capita power consumption rate and low access to clean cooking fuels, Kenya's plans ought to factor growing demand as well as transitioning existing power and energy sources to renewables.
- **Proactive engagement with global partners, multilateral and private financiers can drive the transition.** Kenya could meet its considerable transition finance needs by engaging with its allies, multilateral and private financial institutions to generate more access to low-cost transition finance and reduce its risk-perception in capital markets.

Singapore

The smallest of the six countries selected for this Issue Brief, **Singapore has limited capacity for RE deployment.** Almost 95 per cent of Singapore's power mix is natural gas, 3.2 per cent solar and biomass, and the remaining 1.8 per cent petroleum products (EMA 2021). Its main domestic RE resource is solar power. It currently generates 443.6 MW – a fraction of its 12 GW consumption (EMA 2021), but intends to increase its solar capacity to 2 GW by 2030, i.e. 3 per cent of its energy mix. Singapore has brought its signature urban planning innovation to RE deployment to overcome its limited solar potential by utilising every available surface for deployment – from ATM rooftops to vertical panels on buildings, to floating solar. RE power imports and hydrogen are expected to help Singapore deliver on its promise to achieve Net Zero by 2050 (MTI 2022).

Singapore is planning for storage solutions and improving grid resilience. It plans to deploy at least 200 MW of energy storage systems (ESS) by 2025 (ibid). Singapore's ESS National Roadmap envisions using its build-up of storage systems to improve business models and seed new technologies such as solid-state, metal air, and hydrogen storage (Somasundaram, Ugto, and Idg 2020). To achieve these targets and put a price on its emissions by 2030, the country intends to raise its carbon tax to USD 50-80/tCO2e (Singapore's Enhanced NDC 2020). Implementing the carbon tax will be a challenge as it would raise the price of electricity by 8-12 per cent by 2030. The benefits could outweigh the costs if the carbon tax financed solar capacity additions and proposed grid interconnections.

Green hydrogen could be the game changer for the energy transition of the world's biggest container port. Singapore has bet on green hydrogen for industrial decarbonisation and to diversify its fuel mix using marine pipelines for gaseous hydrogen, or carriers such as methanol or ammonia. Potential import partners include Asian Renewable Energy Hub, Yuri, Neoen, Oman and Sarawak Energy. Singapore has the technical potential for 5 per cent hydrogen blending within its existing natural gas infrastructure and anticipates that hydrogen will supply half of its power needs by 2050 (KBR 2021) (MTI 2022). Singapore is partnering with Royal Dutch Shell for hydrogen fuel cells for ships and Engie SA for hydrogen-based energy storage system on Semakau Island. It has an agreement with New Zealand on low-carbon hydrogen cooperation (Rathbone and Wong 2021).

Resolving energy dependencies

Proactive management of Singapore's energy interdependency could enhance energy security. Singapore imports nearly 70 per cent of its LNG from Australia and the US, and over two-thirds of its crude oil requirements from the Middle East viz. Kuwait, Qatar, Saudi Arabia and the United Arab Emirates. Singapore is exploring the option of constructing a 4,200km underwater cable to Australia to procure enough solar power to meet 15 per cent of its energy demand. The Australia-Asia Power Link (AAPL) seeks to transport 100 MW of clean electricity, including a line that could run through Indonesia.

The Energy Market Authority (EMA) plans to issue two Requests for Proposal (RfP) for up to a total of 4 GW of low-carbon electricity imports into Singapore by 2035 to meet 30 per cent of Singapore's electricity demand (EMA 2021). The first RfP to import up to 1.2GW of electricity will be launched in 2022 to commence work by 2027. The second RfP for the remaining 2.8GW is expected to be issued in the second quarter of 2023 and to start by 2035 (Tan, Singapore plans to import 30% of energy from low-carbon sources by 2035, 2021).

Other low-carbon electricity imports include 100 MW of electricity from peninsular Malaysia via an interconnection from 2022; a pilot project to import 100 MW of non-intermittent electricity from a solar farm in Pulau Bulan, Indonesia, by 2024; and 100 MW of power from Laos via the Laos-Thailand-Malaysia-Singapore Power Integration Project, among others (Yep 2021). The largest project includes a 2.2 GW floating solar PV development in Duriangkang reservoir (Batam), and is expected to provide 1 GW of non-intermittent electricity by 2024 (IESR 2021). It is unclear whether Singapore's Indonesia-based grid connectivity projects will materialise since Indonesia's 2022 ban on RE exports.

Climate and energy finance

Singapore will need USD 72 billion in transition finance (Loong 2019). Its 2022 budget included a finance plan for its 2030 climate goals (Wong 2022), covering:

- Gradually raising the current carbon tax from USD 5 per tonne to USD 80 per ton by 2030, but providing a "U-Save" rebate to cushion the impact on household consumption.
- Allowing businesses to use international carbon credits to offset up to 5 per cent of emissions.
- Issuing USD 35 billion in green bonds to fund public infrastructure projects.

Observations

- **Singapore needs to invest in energy efficiency and phase-out its reliance on fossil fuels to become a transition leader.** Singapore's policy experiments and transition efforts are remarkable for their innovative use of urban planning in maximising the use of every surface to generate renewable power, but it still needs to do more.
- **As one of Asia's largest financial hubs, Singapore can do more to fund the energy transition in its neighbourhood.** It has already implemented measures to generate transition finance, and could channel investment towards RE deployment in neighbouring countries to secure its own power via grind interconnections.
- **Singapore is interconnected and interdependent on its neighbours for trade, investment and energy,** and thus has a unique advantage to bridge political differences and steer the Indo-Pacific energy transition.

Viet Nam

Viet Nam has made great strides towards its COP26 targets. In 2020, Viet Nam's power mix comprised 49 per cent hydrocarbons (coal and oil), 30 per cent hydroelectricity, 24 per cent solar power (including rooftop), and 1 per cent wind and biomass; bringing renewables (including large hydro and imports) to 55 per cent of the power mix (US-ITA, 2021) (PDP-VII). Viet Nam has also attracted several new projects – the Trungnam Group recently completed a 152 MW wind farm in Ninh Thuan province, while Denmark-based Orsted has proposed a USD 13.6 billion offshore wind project off the coast of Hai Phong (Samuel 2022).

Viet nam's RE achievements could be attributed to a favourable policy landscape. Till end-2020, Viet Nam had a robust feed-in-tariff policy, providing 9.8 US cent/kilo-watt hour (KWh) for wind, 7.09 U.S. cents/kWh for ground mounted solar, and 7.69 U.S. cents/kWh for floating solar (US-ITA 2021). Favourable tariffs caused Viet Nam's solar deployment to skyrocket from just 86 MW in 2018 to 16.5 GW in 2020 (Do and Burke 2021). To keep pace with consumer demand, EVN, the sole-state owned transmission company, capped the FiT to 2000 MWp for Ninh Thuan province (Hang, et al. 2022).

Viet Nam's transmission and distribution lines, however, are not equipped to handle heavy demand. An excess of solar power is overloading Viet Nam's grid infrastructure, forcing producers to reduce power generation from RE. With battery storage still expensive, a scalable solution would be to expand the transmission grid. A new 461-mile transmission line extension with three 500 KV lines has been initiated to connect nine cities and provinces across Vietnam (Johnson, Chau and Aramayo 2021). It has also launched a Direct Power Purchase Agreement (DPAA) Mechanism between 2021-2023 for projects launched after 2020, with a cap of 1000 MW (Linh Dan 2022).

Viet Nam's RE power capacity could rise by 64.8 GW in 2030 as per the latest Draft Power Development VIII Plan (PDP VIII). TGS Green Hydrogen is building the country's first hydrogen plant for USD 840 million to generate 24,000 tonnes of hydrogen, 150,000 tonnes of ammonia, and 195,000 tonnes of oxygen annually (Medina 2022). However, the 2030 plan does not yet explore Viet Nam's massive potential for 475 GW offshore wind (World Bank 2021), 300 GW solar (Hang, et al. 2022), 2.5 GW biomass, and 340 MW geothermal (US-ITA 2021).

Viet Nam's National Climate Change Strategy to 2050 includes emissions reductions of 91.6 per cent in the energy sector, 84.8 per cent for industries, and its NDC implementation plan targets stopping sales of traditional gasoline to include only 5 per cent ethanol blending by 2030 (Yep 2022). To achieve decarbonisation, Viet Nam intends to invest in carbon capture, utilisation and storage (CCUS) technology. Additionally, ADB has mobilised a USD 135 million loan package for VinFast to manufacture Viet Nam's first fully-electric public transport bus fleet and first national electric vehicle charging network (ETN 2022).

Viet Nam's Battery Energy Storage Solutions (BESS) market is expected to grow from USD 1.53 billion in 2021 to USD 8.62 billion in 2026 (Rangaraju, Isaac, Vo, Ghosh, & Kumaravel 2021). Due to the lack of a regulatory framework to standardise BESS, it has not yet been deployed at scale, leaving the grid vulnerable to intermittency disruptions. In 2021, Viet Nam received a USD 2.96 million grant from the United States for AMI AC Renewables Company to build its first pilot BESS system at the 50 MW Khanh Hoa solar plant (Chandak 2021). Viet Nam has abundant nickel, a key component of lithium-ion (LI) batteries, and PDP VIII includes the development of investment incentive mechanisms for utility scale BESS.

Resolving energy dependencies

Viet Nam relies on fossil fuel and power imports to meet its rapidly growing demand. Coal imports are set to rise from 36 million tonnes in 2021 to 46.5 million tonnes by 2025 (Yang 2022), relying mainly on Australia, Russia, Indonesia, and more recently, South Africa (WITS 2019). Viet Nam relies on Lao PDR and China for electricity imports (EVN 2020), with average daily imports of 853 million kWh in May 2022 (EVN 2022). Historically, Viet Nam has exported over 10 billion kWh to Cambodia through the Chau Doc – Ta Kei 220 kV transmission line (EVN 2019). Viet Nam may also consider power trade via the inter-ASEAN 500kV network in future (EVN 2020). Although existing Chinese electricity imports of 450 MW are a politically sensitive matter, Viet Nam may import up to 4 GW from China by 2030 (The Star 2020).

Hydroelectric power imports may prove to be unsustainable for Viet Nam. It has an agreement with Lao PDR to import power from the 600 MW Monsoon Wind Project and has helped construct Lao PDR's Sekong A dam that generates 86 MW. Lao PDR is the largest electricity exporter in ASEAN and has agreed to supply Viet Nam with 5 GW by 2030 (Do and Burke 2021). However, most of the exports from Lao PDR are thermal and hydropower based, and in the long run, may not be sustainable for the environment and people of the Mekong basin (IUCN 2021). The external cost of the 11 hydropower projects on the Lower Mekong basin from lost fisheries and sediments, biodiversity reduction and social impacts has been estimated at USD 18 billion (Intralawan, Wood, Frankel, Costanza, & Kubiszewski 2018).

Climate and energy finance

Viet Nam needs to invest USD ~13 billion annually between 2021–2030 in the electricity industry and over USD 12 billion between 2031–2045 (Draft PDP VIII). The revised draft plan shows that a total investment of USD 99-115 billion is required between 2021 and 2031, of which ~84 per cent will be invested in power generation and the rest in transmission and distribution. Viet Nam has also agreed to join the JETP, though the specifics of the agreement are yet to be finalised (EC 2022). To attract more transition finance, Viet Nam will need to:

- Make PPAs cost-competitive and reduce the risk of EVN's arbitrary curtailment (IUCN 2022).
- Develop a suitable debt structure, enhance the effectiveness of credit guarantee schemes, and build the capacity of credit rating agencies for appraisals (Nguyen, Chuc, and Dang 2018).
- Consider imposing a carbon tax of USD 5 per tonne on fossil fuels to generate revenue that can be invested into RE (ibid).

Observations

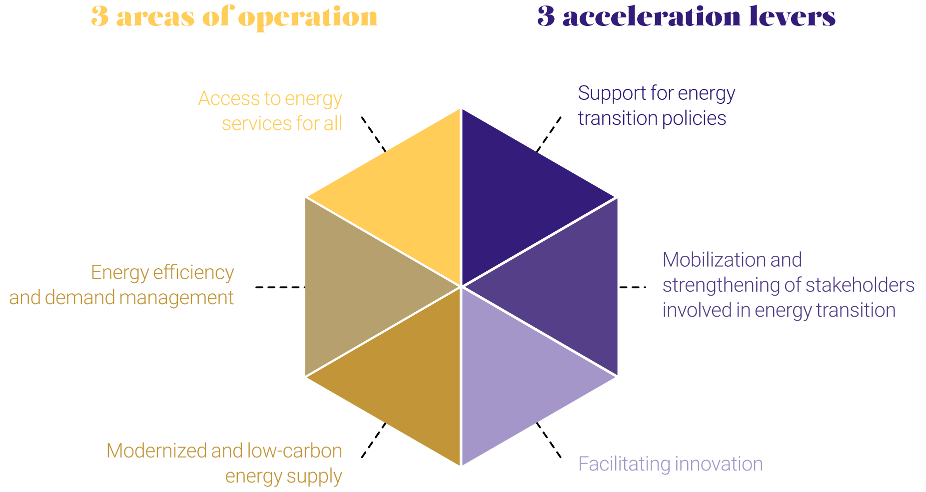
- **Overreliance on hydroelectric power could be unsustainable in the long term.** Beyond biodiversity and ecosystem damage, the climate crisis will cause water stress. Considering Viet Nam's high non-hydroelectric RE power potential, it does not need to expose itself to this water stress-related energy and geopolitical vulnerability.
- **Transmission and distribution infrastructure upgrades are a prerequisite to the expansion of Viet Nam's energy transition.** If existing grid-infrastructure cannot keep up with demand, little would be achieved from RE capacity additions.
- **Grid integration guarantees could mitigate curtailment risk in RE projects in Viet Na.** A first-loss guarantee could safeguard investors from curtailment due to transmission challenges to enable low-cost RE capacity addition (Dutt, Sidhu, and Saxena 2022).

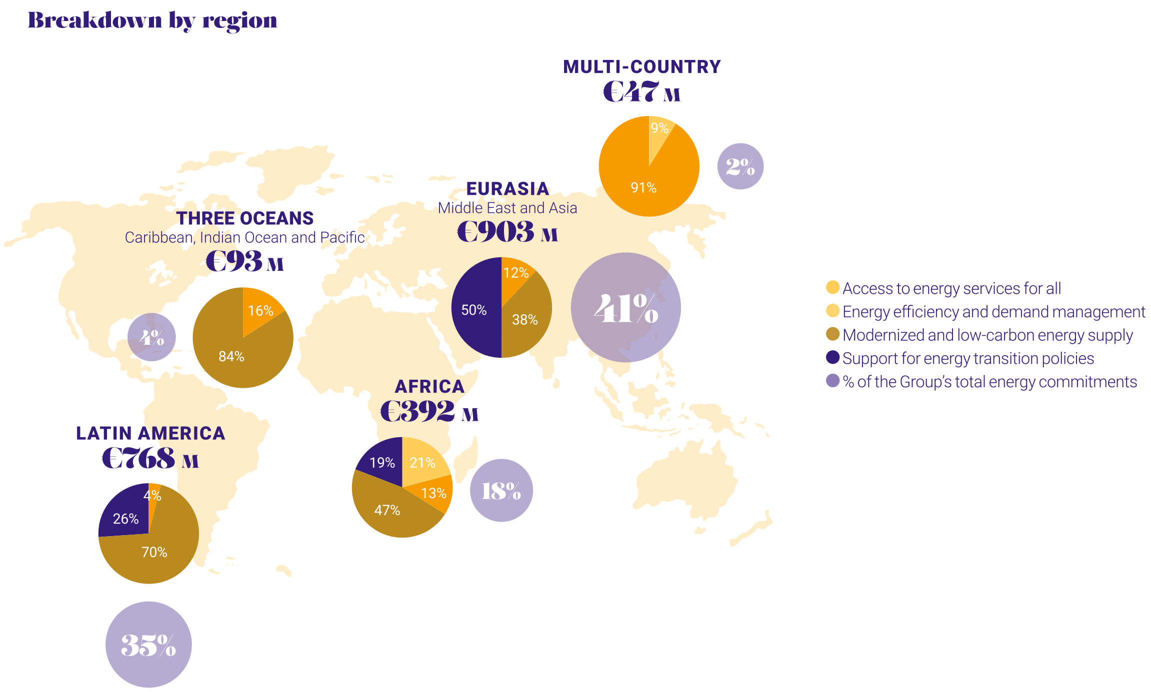
Annexure II:
AFD's projects in the six countries

AFD Group's energy transition strategy is based on three areas of operation, mobilising three intersecting levers. At the crossroads of climate issues and the achievement of SDG 7, AFD Group's activities aim to accelerate the energy transition in its partner countries towards efficient, resilient and low-carbon energy services accessible to all.

To meet these objectives, AFD maintains an ongoing political dialogue with many countries on their low-carbon energy transition trajectories. AFD teams also place a strong emphasis on energy efficiency as key to the transition.

AFD Groups activities.





Source: AFD Groupe

AFD has developed a unique set of development finance tools for the Indo-Pacific region, from project-based loans targeting primarily facilities, to public policy loans targeting structural and sectoral dialogue with counterparts. AFD also provides lines of credit that could foster public investment from banks to beneficiaries involved in renewable energies and energy efficiency. AFD also aims to bring added value to the project by financing feasibility studies and capacity building.

These mechanisms could be used to fund several types of operations: project preparation studies (planning, pre-feasibility, preliminary or detailed design); technical cooperation (resident technical assistance, short term or repeat expertise, high level training actions, strategic partnerships between peer institutions). For example, in India, AFD has financed EUR 750,000 in preparation studies for construction of two Floating Solar PV projects (FSPV) under its technical assistance envelope.

As a transversal objective, AFD also prioritises innovative solutions for RE. One example of financing innovative energy schemes is AFD's financing of the first solar power plant developed by KenGen, Kenya's public power generation company. This 42.5 MW plant and its battery storage facility will be located alongside Kamburu Dam on the Seven Forks Falls. Its "hybrid" operation makes it possible to store water in a reservoir upstream from the waterfall during the day. In the evening, to handle peak demand, this water is run through turbines by power plants installed along the waterfall to reduce the country's dependence on backup thermal energy.

This table showcases AFD's projects in the six main countries selected for this Issue Brief. Most of these projects are enabling the energy transition by investing in RE production, and bringing energy efficiency to distribution grids, the residential sector and industrial units. Although there is only one project (Kenya) that seeks to broaden energy, advancing SDG 7 remains a key priority for AFD.

The AFD Group's efforts to advance SDG 7.

Renewable Energy Development	Energy Efficiency and Demand Management Energy Access	Energy Access
• India - IREDA I and II, HPPCL Hydro • Indonesia- PLN project • Kneya- KENGEN hybrid solar + stroge project • Kneya- KENGEN 80 MW Wind project • Viet Nam- Development or extension of hydroelectric power plans, such as the Huoi Quang plant, layl plant	• Bangladesh- Smart Grid DPDC project • India- EESL supporting UJALA and SLNP, SIDBI, NHB • Kenya: KPCL distribution project • Viet Nam: Southern power distribution grid project	• Kenya- Kentraco Nairobi Project

Source: AFD Group

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Cover image iStock. Developed on a 540ha site in the East Dam region of Bac Lieu province, Viet Nam, the 99.2 MW Bac Lieu near-shore wind farm is Asia's first offshore wind farm in the Mekong Delta region.

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