Exploring China's Role in Southeast Asia's Energy Transition

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Key Takeaways

- Southeast Asia has become a key target for China's engagement in the energy transition, particularly under its South–South cooperation framework.
- China employs different investment and partnership models across countries, each resulting in varying degrees of involvement and influence.
- China's participation offers Southeast Asian countries a comprehensive package of support combining finance, technology, and knowledge sharing to accelerate their clean energy transition.
- However, heavy reliance on China poses dependency risks, including potential debt traps and concentration within supply chains.
- Southeast Asian countries must adopt a balanced approach, strengthening cooperation with China while mitigating associated risks.

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Executive Summary

Energy demand in Southeast Asia continues to rise rapidly. However, under the region's collective commitment to meet climate goals, attention has increasingly shifted from fossil fuels to clean energy sources. While countries across the region are striving to advance their energy transitions, a persistent challenge remains: financing. Limited funding has created a significant gap that has allowed China to emerge as a key supporter of energy transition efforts across many Southeast Asian economies.

Domestically, China has made strong progress in addressing carbon emissions through policies such as the "1+N" framework. Building on this foundation, China has extended its focus beyond its borders, positioning itself as a leading advocate for global climate action. The Belt and Road Initiative (BRI) has become a core strategy for deepening China's engagement in energy development abroad, particularly following its rebranding as the "Green BRI." Within this framework, Southeast Asia has been identified as a key region, viewed as a group of "countries with a shared future" under China's South–South cooperation vision.

China is now one of the largest investors in Southeast Asia. While some of its investments remain in energy-intensive or high-emission sectors, the global emphasis on green growth has prompted China to decarbonise its manufacturing processes, indirectly fostering greener investments. At the same time, China has also made substantial direct investments in renewable energy projects through several distinct models: Majority Chinese-Funded Model, EPC Contractor Model, and Direct Investment Model.

These models reflect China's multifaceted approach to strengthening its influence in the region's energy landscape through shared vision, financial support, technology transfer, and institutional partnerships. As a result, China's role in Southeast Asia's energy transition has become increasingly significant.

Nevertheless, the scale and nature of China's engagement differ across countries. Lower-income economies such as Laos and Cambodia rely heavily on Chinese funding for hydropower and grid infrastructure, giving China substantial influence over their energy systems. In Indonesia and Vietnam, China's involvement is also extensive but more sector-specific—centred on nickel mining and EV manufacturing in Indonesia, and wind and solar projects in Vietnam. By contrast, Malaysia and Thailand have adopted a more cautious approach: while welcoming Chinese investment, they maintain diversified partnerships and rely less on China as a primary financier. Malaysia's engagement focuses on high-value industrial investment, while Thailand collaborates with multiple international partners to ensure balance.

The differing levels of engagement reflect both opportunities and risks associated with China's expanding presence. On one hand, Chinese investment brings critical finance, technology, and knowledge that help countries meet rising energy demand while progressing toward their climate targets. It also facilitates cross-border energy integration through shared technical standards. On the other hand, growing dependence on Chinese finance and technology raises concerns about "debt traps," supply-chain concentration, and potential risks to national sovereignty. Moreover, questions over governance, transparency, and environmental and social safeguards persist in several projects.

While China's engagement undeniably benefits Southeast Asia's energy transition, the key challenge for regional policymakers is to strike a balance—leveraging partnership opportunities while mitigating risks. To achieve this, ASEAN countries should consider the following actions:

- Strengthen ASEAN Unity and Negotiating Power: Collective regional action can enhance bargaining leverage, promote shared priorities, and enable more balanced cooperation with external partners.
- Balance Energy Sovereignty with Regional Security: Treat energy sovereignty as a regional concept rather than a purely national one, while diversifying suppliers and developing safeguard mechanisms.
- Diversify International Finance and Partnerships: Expand funding sources, adopt blended financing models, and use regional cooperation to attract greater trust from global donors.
- Insist on Transparency, Governance, and Standards: Uphold strong governance frameworks and environmental and social safeguards, ideally harmonised at the ASEAN level.
- Enhance Local Capacity and Supply Chains: Build domestic industries, strengthen technical expertise, and develop resilient regional clean-energy supply chains.

In short, China has become indispensable to Southeast Asia's energy transition. However, the region's long-term resilience depends on how well it balances cooperation with diversification, leveraging China's strengths while safeguarding transparency, sustainability, and regional autonomy.

Introduction: Context and Change

Southeast Asian countries are facing an acute energy trilemma: balancing the fundamental needs of energy security and affordability with the global imperative of sustainability. The region holds significance as the world's fourth-largest energy consumer, with demand growing at around 3% annually1. This rapid growth, driven by sustained economic expansion and urbanization, places immense pressure on existing infrastructure and resource management systems.

Although eight of the ten ASEAN member states have announced carbon neutrality targets, generally between 2050 and 2065[2], around 80% of Southeast Asia's total energy demand and 72% of its electricity generation remain dependent on fossil fuels.[3] Achieving carbon neutrality goals will require a substantial transition to renewable or low-carbon energy sources, involving a fundamental and costly transformation of the region's energy system.

Recognising this challenge, ASEAN is pursuing a regional action plan which aims to raise the share of renewable electricity to 45% of total installed power capacity within the next five years. The plan also seeks to increase renewables' contribution to 30% of the region's total primary energy supply and improve energy efficiency by reducing energy intensity (defined as energy use per unit of economic output) by 40% compared with 2005 levels.[4]

To align Southeast Asia's development pathway with the Paris Agreement's temperature goals, analysts estimate that at least USD 200 billion in annual energy investments will be required by 2030[5]. This financial requirement far exceeds the level of support currently available from traditional donors and investors. While major donors have launched clean energy initiatives in the region, such as the U.S. Asia EDGE program, Japan's Asia Energy Transition Initiative (AETI), and the G7 climate pledge, the scale and pace of these efforts have been relatively modest. Similarly, while multilateral development banks like the World Bank and the Asian Development Bank have expanded their green funding, they continue to operate under strict lending conditions and modest disbursement timelines.

Consequently, a gap has emerged between Southeast Asia's urgent energy transition needs and the level of support provided by Western and allied partners. In this context, China has increasingly stepped in to fill the void. Over the past decade, it has become the single largest source of foreign investment in Southeast Asia's energy infrastructure, particularly in the clean energy sector.[6]

1. China's Global Climate & Energy Ambitions

China as a global leader in renewable energy

China is the world's largest source of carbon emissions (by country), accounting for roughly 30% of global totals. Its decades of rapid economic growth have intensified environmental pressures, and its earlier, reactive approach to pollution control contributed to delayed action to address these challenges. Over the past decade, however, China's domestic and international stance on climate change has shifted markedly. Today, the country seeks to project itself as a global leader in renewable energy and green development. It is the world's largest producer of solar panels, wind turbines, and batteries, and has installed renewable power capacity on an unprecedented scale at home.

In September 2020, President Xi Jinping announced China's landmark pledges to peak carbon emissions before 2030 and achieve carbon neutrality by 2060, signalling a strong commitment to align with global climate objectives. Although these targets are set later than those of many Western countries, they are regarded as a major step forward given China's position as the world's largest emitter.

To meet these goals, China introduced the "1+N" policy framework, where "1" refers to the overarching Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality, and "N" represents a suite of sector-specific action plans and policies. The 14th Five-Year Plan reinforces this agenda by prioritising green development, expanding green manufacturing, and accelerating the transition to cleaner energy. Complementary policies, such as the Energy Development Plan and the Action Plan for Carbon Dioxide Peaking Before 2030, aim to curb coal consumption and increase the share of clean energy in the national energy mix.

These frameworks have driven significant investment in renewable energy, expanding the share of non-fossil fuels in China's overall energy consumption. The government has implemented robust domestic measures, including large-scale investments in wind and solar farms, the development of ultra-high-voltage transmission lines to integrate renewable power, the expansion of nuclear energy, and the establishment of pilot carbon trading schemes.

Building on this domestic momentum, China has increasingly sought to export its model of green development abroad. Chinese enterprises, often supported by state policy banks, now play a dominant role in global clean energy supply chains. For example, they produce more than 80% of the world's solar photovoltaic (PV) modules and a substantial share of

lithium-ion batteries and EV components[7]. This manufacturing strength enables China to supply renewable energy technologies to developing countries at relatively low cost.

In parallel, China has actively positioned itself in international forums as a leading advocate for climate action in the Global South, using its renewable energy success and financing capacity to enhance its influence in global sustainability governance.

International outreach

China's international climate engagement is most visibly embodied in the Belt and Road Initiative (BRI), a vast overseas investment programme spanning infrastructure, energy, transport, and telecommunications across dozens of countries. As of mid-2025, the cumulative value of China's BRI engagement is estimated at approximately USD 1.3 trillion, covering projects in more than 140 countries since its launch in 2013.

The BRI encompasses a wide range of projects, including large-scale energy developments. In its early years (2013–2017), however, the initiative faced criticism for supporting carbon-intensive projects, particularly coal-fired power plants in countries including Indonesia, Vietnam, and Pakistan. Responding to growing global concern and host-country feedback, China announced at the United Nations General Assembly in September 2021 that it would cease building new coal-fired power plants abroad.[8]

This announcement marked a pivotal shift in the BRI's energy strategy. Since then, China has sought to rebrand the initiative as a "Green BRI," encouraging greater investment in renewable energy, energy efficiency, and environmental protection. Chinese officials have promoted this transformation as part of the country's broader vision of an "ecological civilisation" and have introduced stricter sustainability guidelines for overseas projects[9]. The Belt and Road Green Development Coalition, a China-led network, has published green investment principles and documented case studies showcasing cleaner BRI projects.

Over the past decade, the BRI has expanded its footprint across Asia, Europe, Africa, and parts of South America. Within this global framework, Southeast Asia stands at the geopolitical and economic centre of the initiative. China frequently frames its engagement with the region through the lens of "South–South cooperation," portraying it as a mutually beneficial partnership among developing nations rather than a traditional donor–recipient relationship[10].

Southeast Asia has become an important testing ground for this greener approach. Energy infrastructure projects, ranging from power plants and transmission lines to pipelines, form a central pillar of the Green BRI in the region. Supporting Southeast Asia's energy transition

represents both a strategic opportunity and a logical extension of China's own development philosophy, reflecting its vision of a "shared future" with neighbouring countries while simultaneously expanding its influence across the region.

Role of China in Southeast Asia

Southeast Asia holds a distinctive position in China's climate and energy engagement. Owing to their geographical proximity and deep economic interconnections, many projects in the region function as extensions of China's domestic energy network. For instance, hydropower dams in Lao PDR export electricity to China's grid, while solar panel factories in Vietnam rely on Chinese machinery and inputs.

Chinese leaders frequently underscore that Southeast Asia's development and stability are closely linked with China's own, encapsulated in the notion of a "community of common destiny." In practice, China's role in the region extends far beyond individual infrastructure or investment projects. Its activities increasingly influence Southeast Asia's broader energy strategy, shaping how countries plan, produce, and manage energy within the framework of regional cooperation.

China's Efforts to Decarbonise Industrial Investments in Southeast Asia

While Chinese companies continue to expand their industrial footprint across Southeast Asia, many are now incorporating carbon reduction measures to address the environmental impacts of their operations. Chinese outbound investment often targets energy-intensive sectors such as mining, metal processing, and manufacturing. In 2024, about 77% of China's outbound investment went to the automotive, materials, and energy sectors[11]. Projects ranging from nickel processing plants in Indonesia to rare earth mining in Myanmar have drawn scrutiny from environmental groups concerned about their long-term effects on air quality, water resources, and local communities. However, recent years have seen a gradual shift towards cleaner and more energy-efficient practices, driven by growing regulatory pressure, international expectations, and China's own commitment to green development.

A notable example is Indonesia's Morowali Industrial Park, a Chinese-led nickel processing hub that plays a crucial role in the global EV battery supply chain. In its early stages, the park relied heavily on captive coal-fired power plants operating outside national grids, leading to high carbon emissions and local air pollution. This situation conflicted with both Indonesia's and China's net-zero ambitions and prompted environmental concerns from local and international observers.

In response, the Indonesian government introduced the Nickel Industry Decarbonisation Roadmap (2025), which aims to cut emissions from the sector by 81% by 2045. Following this policy shift, Chinese investors have begun adapting their operations to align with Indonesia's decarbonisation goals. Leveraging China's technological leadership in ultra-high-voltage transmission systems and smart grid platforms, Chinese companies are contributing to modernising energy infrastructure in Indonesia—an important step given the country's geographically fragmented grid system.

At Morowali, Chinese enterprises are now developing renewable energy facilities, including large-scale solar farms and energy storage systems, to provide cleaner electricity and reduce emissions from production. Although coal remains a significant energy source for the park, these investments signal meaningful progress towards integrating green technologies and supporting Indonesia's broader energy transition.

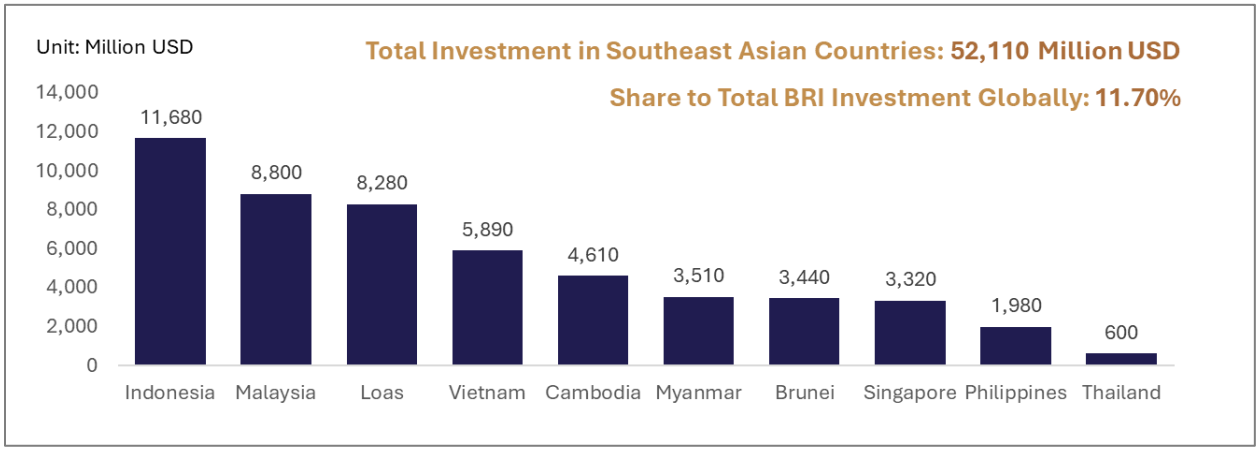
China's approach in Indonesia reflects a broader pattern across the region: its industrial investments are gradually evolving from high-emission operations to more sustainable models. This transformation highlights China's growing recognition that its overseas projects must align not only with local development priorities but also with global climate commitments.

Direct Investment in the Renewable Energy Sector

In Southeast Asia, China has emerged as the largest public financier in the energy sector, with investments in the region's energy projects under the Belt and Road Initiative (BRI) totalling approximately USD 52 billion. Of this, nearly USD 3 billion has been channelled directly into renewable energy projects such as solar, wind, hydropower, and transmission networks—earning China recognition as "the region's largest clean energy financier[12]."

Chinese renewable energy projects can now be found throughout Southeast Asia, with the highest concentrations in Indonesia, Vietnam, Lao PDR, Malaysia, Thailand, and Cambodia. Each country plays a distinct strategic role: Lao PDR and Cambodia serve as regional power exporters, Vietnam and Thailand have become major hubs for renewable installations and manufacturing, while Indonesia represents a key frontier for integrating renewable power with its expanding EV and nickel processing industries.

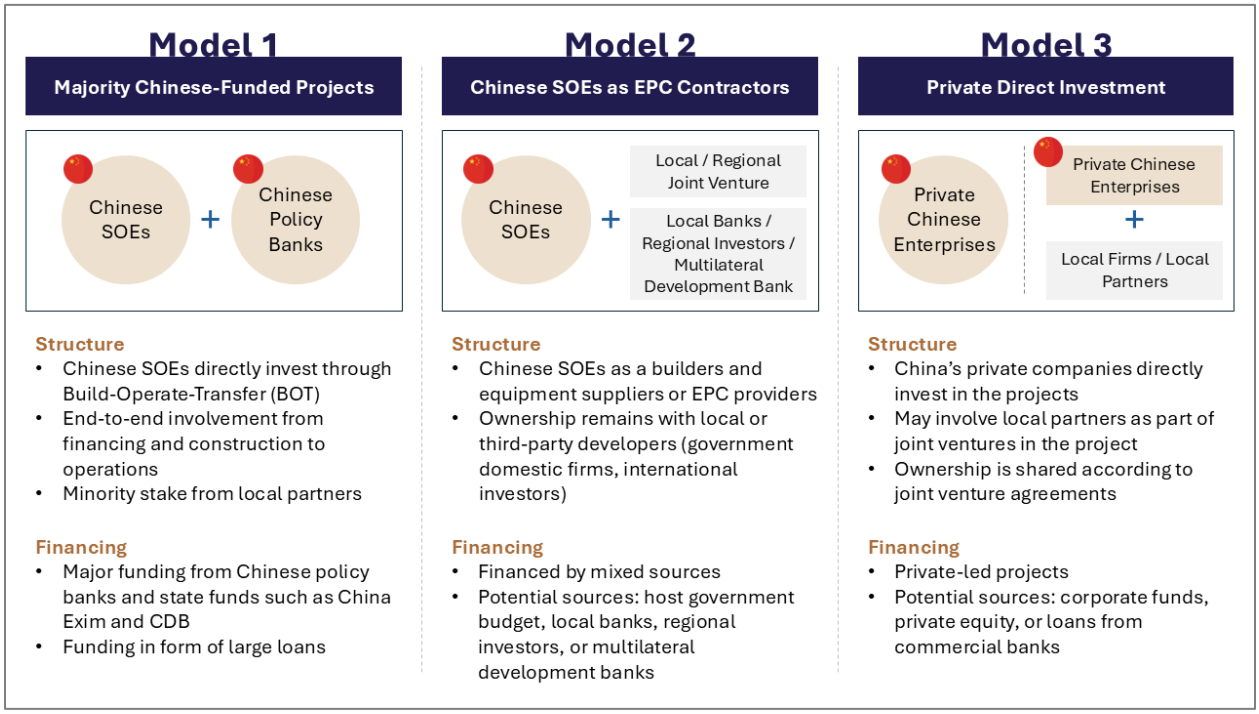
Chinese BRI Investment in Energy Sector in Southeast Asian Country 2005-2025
(as of 1 October 2025)



Source: China Global Investment Tracker

Across the projects discussed above, Chinese participation takes several distinct investment models, each characterised by different ownership structures, financing sources, partner arrangements, and strategic objectives.

China's Investment Models in Renewable and Clean Energy in Southeast Asia



The most prominent model, accounting for a significant share of projects in countries such as Lao PDR and Cambodia, is the **Majority Chinese-Funded Model**. Under this model, Chinese state-owned enterprises (SOEs) such as PowerChina, China Southern Power Grid (CSG), China General Nuclear (CGN), and Hydrolancang International directly invest in and develop renewable energy projects, typically through Build-Operate-Transfer (BOT) or Independent Power Producer (IPP) arrangements that last between 25 and 40 years before assets are transferred back to the host government. Project companies are usually wholly or majority-owned by Chinese entities, sometimes with local partners holding minority shares. Financing is primarily sourced from Chinese policy banks and state funds, notably the Export–Import Bank of China (China Exim) and the China Development Bank (CDB), making China's involvement effectively end-to-end, from funding and construction to operation and maintenance. Examples of this model include the Lower Sesan II Hydropower Project in Cambodia and the Nam Ou Cascade Hydropower Project in Lao PDR.

A closely related model also centres on Chinese SOEs but differs in their role. In this **EPC Contractor Model**, Chinese companies participate mainly as builders and equipment suppliers rather than equity investors. In this arrangement, SOEs act as Engineering, Procurement, and Construction (EPC) contractors, while ownership remains with local or third-party developers. Financing may come from various sources, including host government budgets, domestic banks, regional investors, or multilateral development banks. In some instances, the Chinese contractor may assist in securing a loan from a Chinese bank, but its involvement in financing is generally limited. Representative examples of this model include the Cirata Floating Solar Plant in Indonesia and the Ca Mau Offshore Wind Project in Vietnam.

Beyond these state-led megaprojects, a third model, driven by **Direct Investment** from Private Chinese Enterprises, has become increasingly visible. In this case, privately owned or publicly listed Chinese firms make direct equity investments or form joint ventures with local partners. Motivated by commercial opportunities rather than state directives, these companies typically focus on solar photovoltaic (PV) farms, wind farms, and small hydropower projects that offer strong growth potential. This approach reflects the expanding role of China's private sector in Southeast Asia's clean energy landscape, complementing the activities of state-backed enterprises.

The solar PV industry has witnessed a rapid expansion of Chinese-owned production facilities in Vietnam, Malaysia, Thailand, and Cambodia. Leading companies such as LONGi Green Energy, Trina Solar, JA Solar, and Jinko Solar have established extensive manufacturing operations in the region to serve global markets. This expansion is partly driven by ongoing trade tensions and tariffs on Chinese solar exports to the United States

and Europe, which have encouraged firms to diversify production and strengthen their presence in Southeast Asia.

Chinese entities now dominate the global renewable energy supply chain, holding over 80 percent of the market share across all stages of solar photovoltaic (PV) production, from polysilicon and wafers to cells and modules. In the EV sector, Chinese entities control nearly 90 percent of global cathode manufacturing capacity[13] and almost all anode capacity, both of which are critical components for EV batteries. China also produces around 80 percent of the world's battery cells and over half of total global EV output[14].

Taken together, these developments show that Chinese engagement in Southeast Asia's renewable energy sector extends well beyond the provision of finance. It is actively shaping the region's energy policies, strengthening cross-border infrastructure connectivity, and fostering new industrial ecosystems that underpin Southeast Asia's transition toward a low-carbon future.

2. China's Engagement Strategy in Southeast Asia's Energy Transition

China's engagement in Southeast Asia's energy transition follows a deliberate and structured approach rather than a series of isolated actions. Its strategy integrates multiple dimensions—diplomatic, financial, technological, and institutional—to strengthen its influence in the region's energy landscape. In practice, China combines high-level diplomacy, regional cooperation frameworks, diverse financial instruments, and extensive project-level implementation to advance its role in ASEAN's energy sector and support the region's shift toward cleaner and more sustainable energy systems.

Policy Framing

From official statements to bilateral agreements, China consistently presents its engagement with Southeast Asia as an expression of solidarity among developing countries. This narrative of "South–South cooperation" emphasises a partnership of equals built on mutual benefit, distinguishing it from the traditional "North–South" aid model.

In the energy sector, China frames its cooperation in terms of shared development experience. It offers funding, technology, and expertise based on the premise that it has undergone a similar transition at home and therefore understands the challenges faced by fellow developing nations. This framing not only helps China foster goodwill and trust but also positions its assistance as more pragmatic and less conditional than that of Western

donors, which some Southeast Asian leaders have criticised for their stringent requirements.

An illustrative example is the Vientiane Saysettha Low-Carbon Demonstration Zone in Lao PDR, a flagship project under China's initiative to establish "ten low-carbon demonstration zones" in developing countries. The project aims to create a low-carbon, eco-friendly model for sustainable urban development and is explicitly identified as part of China's broader South–South climate cooperation effort[15].

However, critics note that this framing can obscure underlying power asymmetries. China's economic size and financial capacity far exceed those of any individual ASEAN member, meaning the partnerships are not entirely equal. Nevertheless, the South–South cooperation narrative has proven effective in making Chinese engagement more politically acceptable and appealing across the region, reinforcing its role as a trusted partner in Southeast Asia's energy transition.

Regional initiatives

China engages with Southeast Asia not only through bilateral partnerships but also via regional and subregional platforms that institutionalise its cooperation with ASEAN member states. One of the most prominent mechanisms is the ASEAN-China Energy Cooperation Framework, established under the ASEAN Plan of Action for Energy Cooperation (APAEC). Since the mid-2000s, China and ASEAN have held regular energy dialogues covering a wide range of issues, from power connectivity and grid integration to renewable energy policy and technology transfer. A major milestone in this collaboration was the establishment of the ASEAN-China Clean Energy Cooperation Centre (ACCECC) in August 2023, supported by the Chinese government. The Centre aims to strengthen joint efforts in clean energy development, focusing on policy dialogue, technology exchange, and project implementation between China and ASEAN[16].

In addition, China actively participates in the ASEAN Ministers on Energy Meeting Plus Three (involving China, Japan, and South Korea), where it frequently introduces new programmes such as grants for energy efficiency, grid studies, and renewable technology demonstrations. At the October 2025 meeting,[17] China reaffirmed its commitment to cooperation under the ACCECC framework, proposing continued collaboration on clean energy technology transfer, renewable energy research and development, and pilot projects in energy storage and renewable deployment.

At the subregional level, the Lancang–Mekong Cooperation (LMC) framework serves as another important channel for China's engagement. The LMC brings together Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and China, with energy identified as one of its core cooperation areas. Through this mechanism, China has funded numerous small-scale projects, including rural solar electrification in Myanmar and biogas development initiatives in Cambodia, as well as facilitated coordination of hydropower operations along the Lancang–Mekong River.

Under the Five-Year Plan of Action on Lancang–Mekong Cooperation (2023–2027), energy cooperation remains a top priority. The plan encompasses policy exchanges, joint research and development, renewable energy integration, and enhanced communication among member countries[18]. China also provides significant financial and human resource support to the Mekong Institute, contributing to capacity-building and regional cooperation programmes, further reinforcing its role as a constructive regional partner.

Although other powers, such as the United States and Japan, have established similar frameworks—including the Mekong–U.S. Partnership and the Mekong–Japan Cooperation—China's engagement stands out for its scale, financial commitment, and geographical centrality. The key challenge, however, lies in ensuring that these projects uphold international environmental and social standards, particularly with regard to issues such as the downstream ecological impacts from hydropower development.

Financial and Investment Channels

A central pillar of China's engagement strategy in Southeast Asia's energy sector is the mobilisation of substantial financial resources to support infrastructure and industrial development. Chinese financing flows through multiple channels, encompassing both state-backed lending and private investment mechanisms that together underpin the region's growing dependence on Chinese capital and technology.

BRI Projects Funded by Policy Banks

Under the Belt and Road Initiative (BRI), China's policy banks, principally the China Development Bank (CDB) and the Export-Import Bank of China (China Exim Bank), provide concessional loans and export credits to energy infrastructure projects. These loans typically feature low interest rates and long repayment periods, making them especially attractive to Southeast Asian countries facing fiscal constraints. BRI energy projects are often arranged through government-to-government or government-backed deals, which can accelerate approval processes but sometimes bypass open bidding. By 2025, policy

bank financing in the region had begun shifting decisively toward clean energy, with new Chinese power investments primarily directed at renewables, even as earlier projects left a legacy of coal-fired plants.

Asian Infrastructure Investment Bank (AIIB)

Established in January 2016, the Asian Infrastructure Investment Bank (AIIB) represents another key vehicle for China's regional financing strategy. Although the AIIB is a multilateral institution with broad membership, China remains its largest shareholder, and many of its investments align closely with BRI objectives. The AIIB frequently co-finances projects alongside the World Bank and Asian Development Bank, applying similar environmental and social safeguards. Its involvement lends additional legitimacy and financial strength to regional projects while indirectly extending China's influence under a multilateral framework that Southeast Asian countries generally perceive as more neutral and reliable.

Foreign Direct Investment and Corporate Financing

Beyond sovereign lending, China's energy engagement in Southeast Asia is increasingly driven by foreign direct investment (FDI) and corporate financing. Chinese companies, both state-owned and private, are establishing joint ventures and wholly owned subsidiaries throughout the region. Solar manufacturers such as JA Solar and Trina Solar have set up assembly and component plants in several ASEAN countries, while large state-owned enterprises including PowerChina, China Energy Engineering Group, and Sinohydro both construct and take equity stakes in energy projects. This equity-based investment model aligns the long-term interests of Chinese investors with project success and reduces the debt burden on host governments, though it also results in partial Chinese ownership of strategic energy assets.

In essence, China employs a flexible blend of state and market financing, tailored to the needs and capacities of each host country. For lower-income economies such as Cambodia, soft loans are often favoured for state-led projects, whereas in middle-income countries like Malaysia, joint ventures and private investments are more common. The sheer scale and speed of Chinese financing gives it a comparative advantage over Western and Japanese sources, which tend to have stricter lending conditions and longer approval timelines.

While these investments bring vital capital, technology, and expertise to Southeast Asia's fast-growing energy sector, they also raise important concerns about market concentration and economic dependency. The dominance of Chinese firms in supply chains and project ownership could potentially crowd out local enterprises and deepen the region's reliance on China-centric energy systems.

Technology Transfer and Project Development

A central feature of China's engagement in Southeast Asia's energy transition is its dual provision of financial support and technology transfer. Chinese projects are often backed by concessional financing or investment capital, while simultaneously introducing advanced technologies such as high-efficiency solar photovoltaic (PV) modules and ultra-supercritical turbine systems for geothermal and thermal power generation. Alongside technology deployment, Chinese companies also train local workforces during project construction, helping to build technical capacity in areas such as project management, engineering design, and grid integration. For instance, in Indonesia, Chinese firms developing hydropower dams in Sumatra have provided training programmes for local dam operators and engineers as part of the project handover.

China also actively promotes technologies in which it has developed strong competitive advantages. One such area is ultra-high-voltage (UHV) power transmission, where China has built the world's longest and most advanced UHV networks domestically. It is now exploring transboundary applications, including proposed projects to transmit clean electricity from the Yarlung Zangbo River Hydropower Project through interconnected grids in Yunnan and Guangxi to meet growing demand in South and Southeast Asia[19].

Another key area is nuclear energy, where China is rapidly becoming a global leader. With nearly as many reactors under construction as the rest of the world combined, China's nuclear capacity is projected to surpass that of the United States by 2030[20]. Its long-term objective is to become a major supplier of nuclear technology worldwide, including to Southeast Asian countries. Although no ASEAN state currently operates a nuclear power programme, China has offered proposals for its Small Modular Reactors (SMRs) to several governments. By engaging early in this emerging field, China seeks to establish enduring partnerships and potentially position its technology as a standard for the region's future adoption.

Complementing these technological and financial initiatives are capacity-building programmes that deepen China's technical engagement in the region. Each year, Chinese ministries, universities, and enterprises host hundreds of ASEAN officials, engineers, and energy professionals for training and exchange. These include workshops on solar policy for regulators, postgraduate scholarships in power engineering, and technician training through the Lancang–Mekong Cooperation framework. While often low-profile, such programmes steadily cultivate a network of Southeast Asian energy experts familiar with Chinese technologies and practices—forming an important foundation of China's long-term soft power in the region's energy sector.

Diplomacy and Soft Power

Beyond financial and technological engagement, China also leverages diplomacy and soft power to advance its energy interests in Southeast Asia. High-level state visits often serve as platforms for launching or formalising energy cooperation, with Chinese leaders inaugurating power plants, signing memoranda of understanding on renewable development, or announcing new investment packages during regional tours. These symbolic gestures reinforce China's visibility and commitment to supporting the region's energy transition.

Chinese state media, published in local languages across Southeast Asia, play a complementary role by highlighting positive narratives about Belt and Road Initiative (BRI) energy projects—emphasising how they bring electricity to rural communities, create jobs, and contribute to sustainable growth. Such storytelling aims to shape public perceptions of China as a constructive and benevolent development partner.

At the institutional level, China also promotes greater representation for developing countries, including those in Southeast Asia, within global green finance governance. Through platforms such as the Asian Infrastructure Investment Bank (AIIB) and the New Development Bank (NDB China advocates for a financial system that better reflects the priorities of emerging economies.

Together, these diplomatic and soft influence strategies strengthen China's image as a reliable and forward-looking partner in regional development.

3. Case studies

China's engagement in Southeast Asia's energy transition

This section presents concise overviews of China's role in advancing energy transition efforts across six Southeast Asian countries including Cambodia, Lao PDR, Indonesia, Malaysia, Thailand and Vietnam. Each case highlights major projects or initiatives involving Chinese participation, showcasing the scope of China's contributions as well as the challenges and vulnerabilities that accompany them. Taken together, these case studies illustrate the depth and diversity of China's involvement in shaping the region's evolving energy landscape.

Lao PDR

Lao PDR, a small, landlocked country, has embraced China as a linchpin of its strategy to become the "Battery of Southeast Asia." Over the past two decades, the country has constructed dozens of hydropower dams along smaller rivers and tributaries of the Mekong, with roughly half of these projects substantially financed by China[21]. Major Chinese-backed developments include the Pak Beng Dam, the seven-dam cascade on the Nam Ou River, the Nam Khan 3 Hydropower Project, and the Nam Beng Dam, among others. The electricity generated by these projects is primarily exported to neighbouring countries such as Thailand, Vietnam, and Cambodia—and, in some cases, transmitted back to China—helping to address regional electricity shortages.

More recently, bilateral cooperation has expanded beyond hydropower into new forms of renewable energy and sustainable development. A key milestone is the Monsoon Wind Power Project in southern Lao PDR, the largest onshore wind farm in Southeast Asia and the first cross-border renewable energy project in the region. Developed by PowerChina, the 600 MW wind farm, consisting of 133 turbines across the highlands of Sekong and Attapeu provinces, became fully operational in August 2025. Its electricity is primarily exported to Vietnam under a 25-year Power Purchase Agreement with EVN and a 28-year Concession Agreement with the Lao government[22].

The project is expected to generate 1.72 billion kWh of electricity annually, reducing an estimated 35 million tonnes of carbon emissions.

Financed by the Asian Infrastructure Investment Bank (AIIB), the Asian Development Bank (ADB)23, and likely several Chinese banks, the project is widely viewed as a turning point in Lao PDR's transition from hydropower dependency toward more diversified renewable

energy. The Lao government has praised the project as a model of green partnership, while PowerChina's ability to overcome difficult terrain and logistical challenges highlights the value of Chinese technical expertise in unlocking new renewable resources previously untapped within the country.

Beyond energy generation, China and Lao PDR have deepened cooperation in sustainable urban development through the Vientiane Saysettha Development Zone (SDZ), a joint venture industrial park established under the Belt and Road Initiative (BRI). The SDZ is being transformed into a Low-Carbon Demonstration Zone, covering 11.5 km^2 in the Lao capital, with total planned investment of around USD 5 billion. Under this initiative, China has provided green infrastructure such as solar-powered street lighting and EVs, while introducing climate-friendly urban design features including energy-efficient buildings, smart grids, waste-to-energy systems, and extensive tree planting.

By 2025, the zone had begun attracting clean-technology manufacturers, such as a Chinese solar panel assembly facility, and had implemented a low-carbon management plan developed jointly with Chinese experts. Expected to be fully completed by 2030, the project aims to enhance urban sustainability in Vientiane and serves as a showcase of China's "green city" model abroad. The SDZ was hailed as a model of bilateral cooperation on climate change, China's use of integrated development assistance—combining infrastructure investment, technology transfer, and policy support with renewable and green energy integration—to promote low-carbon growth in a partner country.

Cambodia

Cambodia's energy sector has undergone a profound transformation over the past decade, with China serving as the principal driver of that change. To achieve its national goal of universal electricity access by 2030, Cambodia has relied heavily on Chinese investment to expand both traditional and renewable energy infrastructure. In the early stages of development, the Cambodian government welcomed all forms of energy investment, whether fossil fuel or renewable, aimed at alleviating nationwide power shortages. Beginning in 2010, China financed several major coal-fired power plants, primarily located in Sihanoukville and Oddar Meanchey provinces. Among these, the Sihanoukville CIIDG Power Plant and the CIIDG Erdos Hongjun Sihanoukville Plant remain Cambodia's two largest coal facilities by capacity and continue to operate today.

In recent years, however, China's role in Cambodia's energy sector has evolved in response to growing international pressure to address climate change and to align with Beijing's broader commitment to supporting developing countries in pursuing cleaner growth.

Several planned coal projects, such as the Botum Sakor Power Station, have been shelved, while both governments have shifted their focus toward renewable energy development under the Belt and Road Initiative (BRI). Within this framework, China has sought to enhance Cambodia's energy security and expand access to reliable, clean electricity through large-scale projects financed by Chinese banks and implemented by state-owned and private Chinese companies.

Historically, Chinese investment in Cambodia's renewable energy sector has centred on hydropower, which remains the backbone of the country's electricity generation. The two largest operational hydropower stations, Lower Sesan II (400 MW) and Stung Tatay (246 MW), were both financed and built by Chinese entities. Lower Sesan II, located on a tributary of the Mekong River in Stung Treng Province, began full operations in 2018 and now supplies roughly one-fifth of Cambodia's domestically generated electricity[24]. The Stung Tatay Dam, located on the Tatai River in Koh Kong Province, contributes approximately 24 percent of national hydropower generation, equivalent to around 10 percent of Cambodia's total electricity supply[25]. Other notable projects include the Kamchay Dam (194 MW), developed by Sinohydro, and the Russei Chrum Dam (338 MW), built by China Huadian Corporation. In total, Chinese-built hydropower projects now account for more than 1,300 MW of Cambodia's generating capacity, meeting the majority of national grid demand. Overall, Chinese-funded hydropower and coal-fired projects together provide roughly 73 percent of Cambodia's domestically generated electricity[26], underscoring the country's deep dependence on Chinese investment.

Looking ahead, China's involvement in Cambodia continues to expand through a growing portfolio of renewable projects. The two countries have signed multiple memoranda of understanding for new initiatives in solar, wind, and bioenergy. A notable example is the 150 MW wind power project in Mondulkiri Province, developed under a cooperation agreement signed in April 2025 between China Energy Engineering Group and several Chinese partners. Scheduled to launch in 2026, the project marks Cambodia's entry into utility-scale wind energy[27].

Collectively, these developments illustrate Cambodia's continued reliance on Chinese partners to expand its energy capacity and diversify its power mix. Given that many Western financiers avoid large-scale hydropower projects due to environmental and social concerns, China remains the most willing and capable partner to deliver the infrastructure needed for Cambodia's growing energy demand, making it central to the country's ongoing energy transition.

Indonesia

Indonesia, Southeast Asia's largest economy, demonstrates the full spectrum of China's influence in the region's energy and industrial transformation. With its vast mineral resources, growing domestic market, and strategic geopolitical position, Indonesia has become a key focal point for China's engagement. From nickel mining and EV production to solar power development and industrial park construction, Chinese state-owned enterprises, private firms, and financiers play a major role in reshaping Indonesia's energy and manufacturing landscape.

Home to some of the world's largest nickel reserves, a critical raw material for lithium-ion batteries, Indonesia has become central to the global EV supply chain. Following the government's ban on raw nickel ore exports to promote domestic processing, Chinese companies rapidly expanded their investments in nickel smelters and downstream industries. The most prominent example is the Morowali Industrial Park (IMIP) in Central Sulawesi, developed by China's Tsingshan Group in partnership with Indonesian firms. Spanning over 5,500 hectares, IMIP is now recognised as the world's largest vertically integrated stainless-steel and nickel processing complex, anchoring Indonesia's ambitions to become a global hub for EV battery production[28].

IMIP and other Chinese-backed smelters are now transitioning from stainless steel to battery-grade nickel chemicals to support Indonesia's growing EV industry. However, these operations have also raised environmental concerns due to their heavy reliance on coal-based power generation. In response, the Indonesian government launched the Nickel Industry Decarbonisation Roadmap in 2025, aligned with Law No. 59/2024, setting an ambitious target to reduce carbon emissions from the nickel sector by 81 percent by 2045. This has prompted Chinese investors to explore cleaner alternatives. At IMIP, Tsingshan is testing gas or solar hybrid systems to replace coal-fired power, aligning its operations with Indonesia's broader goal of developing a "green" EV supply chain.

Beyond industrial energy needs, Indonesia's vast archipelagic geography creates strong demand for decentralised renewable energy to expand electrification in remote areas. The country's equatorial location offers abundant solar radiation year-round, making solar photovoltaic (PV) energy particularly viable. Although Indonesia has identified at least 16.5 GW of prospective solar projects[29], its installed capacity remains below 1 GW[30]—well short of its long-term goal of 100 GW by 2060. Despite this gap, deployment is accelerating, and Chinese firms are playing a key role. A flagship example is the 192 MW Cirata Floating Solar Plant operated in November 2023 in West Java, the largest of its kind in Southeast Asia. Developed as a joint venture between Indonesia's state-owned utility PLN and Masdar (Abu

Dhabi Future Energy Company)[31], the project features PowerChina as the constructor responsible for PV installation.

Like other countries, China has also contributed financially to Indonesia's renewable expansion. For example, the China Development Bank provided a USD 100 million loan to support the Cirata project's construction[32]. Nevertheless, Indonesia's exposure to debt risk from Chinese financing remains lower than that of some regional peers, largely because projects are commonly structured as joint ventures involving state-owned enterprises rather than direct sovereign borrowing.

Malaysia

Malaysia's engagement with China in the energy sector differs markedly from that of most other Southeast Asian countries. While many of its neighbours have relied heavily on Chinese financing for large, state-led infrastructure projects under the Belt and Road Initiative (BRI), Malaysia's approach has been more selective and partnership-oriented. As a relatively advanced economy with strong domestic capabilities and access to capital, Malaysia focuses its collaboration with China on mutual technological advancement and industrial upgrading. In this context, China's role has evolved from that of a state financier to that of an investor and technology provider, helping to catalyse new green industries and scale up advanced renewable technologies.

Unlike some regional peers, Malaysia is less vulnerable to debt exposure or single-source dependency, given its diversified network of energy and investment partners from Japan and Europe. Moreover, major Chinese BRI projects in Malaysia, such as the East Coast Rail Link, were subject to review and renegotiation following corruption allegations and concerns over financial terms.[33] This prompted a more cautious policy stance and a slowdown in new official development finance (ODF) projects involving Chinese state-backed loans.

Consequently, much of China's recent financial involvement in Malaysia has shifted toward private and corporate investment rather than sovereign lending. Chinese renewable energy firms such as LONGi Green Energy and Jinko Solar have established manufacturing and assembly facilities for photovoltaic (PV) technologies in Malaysia, enabling the country to host substantial PV cell and module production capacity. These facilities have created local employment, built technical expertise, and integrated Malaysia more deeply into global clean energy supply chains.

A major new collaboration was announced in May 2024, with the launch of a 40-acre Renewable Energy Industrial Park in Iskandar Puteri, Johor—a key economic hub adjacent to Singapore. The project involves UEM Sunrise (a Malaysian property developer under the sovereign wealth fund Khazanah Nasional), ITRAMAS Corporation (Malaysia's leading solar energy company), and China Machinery Engineering Corporation (CMEC). The partners plan to attract Chinese manufacturers, suppliers, and research firms across the renewable energy and EV value chains[34]. For Malaysia, which aspires to become a regional hub for renewable technology manufacturing, this initiative represents a strategic partnership to accelerate the development of a complete green industry ecosystem.

China still also remains involved in selected large-scale renewable infrastructure projects in Malaysia. In April 2025, InvestSarawak (the state investment arm of Sarawak, on Borneo Island) signed an MoU with China Energy Engineering Investment Corporation (CEEIC) to develop 2 GW of renewable energy projects in the state. The planned investments, valued at approximately USD 1.35 billion, include large-scale solar farms—potentially including floating solar installations on existing hydro reservoirs—and energy storage systems to stabilise the grid[35]. This partnership seeks to position Sarawak as a preferred destination for green investment by attracting co-developers and international financiers, rather than relying exclusively on Chinese capital.

Taken together, these developments demonstrate Malaysia's pragmatic and higher-value approach to cooperation with China. Rather than focusing merely on power generation, Malaysia leverages Chinese partnerships to enhance its industrial competitiveness and innovation capacity. This reflects a more advanced form of collaboration—one that integrates manufacturing, research, and technology development—marking Malaysia's evolution from an energy importer to a regional hub for green industry.

Thailand

Thailand has taken a proactive approach to energy transition, with a particular emphasis on expanding solar energy while diversifying into other renewable sources. Compared with many of its neighbours, China's role in Thailand's energy transformation is moderate, as Thailand possesses strong domestic capabilities and maintains partnerships with a wide range of foreign investors, including those from Japan, South Korea, and the European Union. Nonetheless, Chinese participation remains significant in key areas, particularly in solar energy, EVs, and emerging nuclear technology.

Thailand's renewable energy drive is largely motivated by its national commitment to achieving net-zero greenhouse gas emissions, a target that has been accelerated under the

current administration from 2065 to 2050. In response, the new Power Development Plan (PDP) aims to increase the share of renewable energy in total fuel consumption to 51 percent by 2037, up from the 22 percent target in the previous plan.

Another key driver of Thailand's energy transition is the rapid growth of its EV industry. Long known as Southeast Asia's automotive hub, Thailand is now attracting substantial investment from leading Chinese EV manufacturers such as BYD, Great Wall Motor (GWM), Changan, GAC, and Chery. These companies are establishing large-scale production facilities to manufacture right-hand-drive EVs for both domestic sales and export to global markets. However, the expansion of EV manufacturing has also exposed a key challenge: Thailand's electricity supply remains heavily dependent on fossil fuels, particularly natural gas. This dependency highlights the urgency of expanding renewable energy generation to ensure the EV transition contributes to actual emissions reduction.

Among renewable sources, solar energy stands out as Thailand's most mature and promising option. The country was one of the first in ASEAN to develop large-scale solar farms, with the Lopburi Solar Farm, initially commissioned in 2012 at 55 MW, marking a milestone in its clean energy history[36]. Since then, Thailand's solar ecosystem has evolved significantly, with Chinese companies playing an integral role. Most solar panels deployed nationwide are Chinese-made, benefiting from their cost competitiveness. Firms such as JA Solar, Huawei, and Sofar Solar not only supply solar equipment but have also established local production facilities in Thailand to circumvent U.S. and EU trade tariffs, mirroring similar trends seen in Malaysia. Additionally, Chinese state-owned conglomerate Energy China has strengthened its presence through joint ventures with local firms such as B. Grimm Power, contributing engineering expertise to Thailand's solar plant development.

Another emerging area of cooperation lies in nuclear energy. Although Thailand does not currently operate any nuclear power plants, it continues to explore nuclear technology as part of its long-term clean energy strategy. In February 2025, Thailand's Ministry of Higher Education, Science, Research and Innovation (MHESI) signed a Memorandum of Understanding (MoU) with the China Atomic Energy Authority to collaborate on nuclear technology development[37]. This was followed by an agreement to establish a Joint Laboratory for Small Modular Reactors (SMRs), a milestone that positions China as an early partner and potential technology supplier should Thailand move forward with nuclear power deployment.

As a key node in the ASEAN Power Grid, Thailand also imports electricity from neighbouring countries such as Lao PDR, Malaysia, and Cambodia. Given that many Lao hydropower projects are financed and constructed by Chinese firms, Thailand's energy security is indirectly linked to Chinese investments across the Mekong region. While this

interdependence has not posed major challenges, it underscores how Chinese involvement in neighbouring energy infrastructure contributes albeit indirectly, to Thailand's own energy resilience.

Vietnam

Vietnam's Power Development Plan VIII (PDP8) sets an ambitious course for the country's energy transition, targeting 30.9–39.2 percent of its energy mix from renewables by 2030 and 67.7–71.5 percent by 2050[38]. These targets open substantial opportunities for foreign investment and technical collaboration, particularly in renewable energy development. China has emerged as one of Vietnam's key partners in this effort, engaging both as a supplier of technology and a project developer, especially in the solar and wind power sectors. Although Vietnam remains cautious about overreliance on its northern neighbour, China's role in renewable energy projects has grown steadily in recent years.

In the wind energy sector, Chinese enterprises, ranging from state-owned giants such as PowerChina to private manufacturers like Envision Energy and MingYang Smart Energy, have become active contributors. Among their notable projects are the Huong Linh 3 and Huong Linh 4 wind farms in Quang Trị Province, each with a capacity of 30 MW. These projects, developed by PowerChina, were fully operational by April 2025 and now supply approximately 165 GWh of clean electricity annually, enough to power 48,000 households while reducing carbon emissions by around 132,000 tonnes per year[39]. Though relatively modest in scale, these projects mark important milestones in connecting Chinese-built renewable infrastructure to Vietnam's national grid.

PowerChina is also leading the Ca Mau Offshore Wind Project, comprising four offshore wind farms with a total installed capacity of 350 MW, one of the largest offshore wind developments in Southeast Asia. The first phase was completed in late 2022, with the second expected to finish by 2026. Once fully operational, the project is projected to generate 1.1 billion kWh of electricity annually, equivalent to powering roughly 200,000 households[40]. Meanwhile, Envision Energy has advanced its presence in northern Vietnam through the Envision Nam Po Wind Power Plant in Dien Bien Province. The 300 MW project began construction in June 2025 and is expected to commence operations by late 2026[41], reinforcing Vietnam's growing capacity in onshore wind energy.

China has also played a crucial role in Vietnam's solar energy boom, which began around 2019. One of the early large-scale projects was the Hoa Hoi Solar Farm in Phu Yen Province, where Chinese firms contributed major engineering and construction work. The China Energy Engineering Corporation (CEEC) served as the general contractor, while Shanxi

Electric Power Engineering provided engineering, procurement, and construction (EPC) services. Another landmark project is the Dau Tieng Solar Power Project, developed by Sinohydro Corporation Limited and PowerChina Huadong Engineering Corporation Limited, both subsidiaries of PowerChina. Officially inaugurated in September 2019, the 500 MW installation remains one of the largest solar farms in Southeast Asia.

Beyond solar and wind, Chinese companies are expanding into Vietnam's broader clean energy and environmental infrastructure. PowerChina, for instance, is constructing the Sóc Sơn Waste-to-Energy Plant near Hanoi, which processes 4,000 tonnes of municipal waste daily and generates approximately 30 million kWh of electricity annually. This project demonstrates the diversification of Chinese investment into circular economy initiatives that complement Vietnam's low-carbon development objectives.

Collectively, these projects illustrate China's growing footprint in Vietnam's renewable energy and environmental sectors. While concerns about strategic dependence persist, the scale and technical sophistication of Chinese participation continue to make Beijing a vital partner in Vietnam's energy transition journey.

4. Challenges and Opportunities

Looking across these case studies, a central question emerges: does China's expanding role enhance Southeast Asia's energy security, or does it risk deepening the region's vulnerabilities?

With the largest volume of renewable energy investment in Southeast Asia,[42] China's involvement has undeniably contributed to strengthening energy security in tangible ways. Countries once affected by severe electricity shortages, such as Cambodia and Lao PDR, now enjoy more stable power supplies, while those with ambitious renewable energy goals, such as Vietnam, are progressing closer to their targets with Chinese support. Meanwhile, new investments in green industries, including EVs and battery manufacturing, are helping countries like Indonesia, Malaysia, and Thailand to build clean-energy ecosystems aligned with their climate commitments. These developments enhance not only national energy security but also economic resilience through increased generation capacity, a more diversified energy mix, and strengthened local clean-tech industries. Put simply, without Chinese engagement, Southeast Asia's energy transition would likely be slower, as Western-led initiatives often face longer implementation timelines and stricter financing conditions.

More specifically, China's engagement in renewable energy brings a comprehensive package that addresses multiple aspects of the transition: accessible financing, affordable technology, and experience sharing. Beyond country-level outcomes, these contributions generate regional spillover effects. In many cases, Chinese projects' most significant contribution lies not only in energy generation but also in the construction of critical infrastructure that connects national grids and supports cross-border renewable integration. A notable example is Lao PDR, where Chinese-backed transmission lines and hydropower projects have strengthened the country's role as the "Battery of Southeast Asia." The Laos–Thailand–Malaysia–Singapore Power Integration Project (LTMS-PIP), supported under the BRI, represents the first multilateral clean-energy trading framework in the region. It serves as a prototype for the broader ASEAN Power Grid, which aims to connect all ASEAN member states through an integrated electricity network.

Through these initiatives, China is effectively building a regional clean energy ecosystem—developing hydropower, solar, and wind projects in countries such as Cambodia, Lao PDR, and Vietnam, and interlinking them with cross-border transmission networks. The widespread adoption of Chinese technology has also led to the emergence of shared technical standards, which in turn facilitate smoother regional grid integration and energy trade.

However, these benefits come with growing debate and caution. As China's role deepens, concerns have arisen over Southeast Asia's increasing dependence on Chinese financing, technology, and expertise. This dependence introduces potential vulnerabilities across different dimensions: financial, through debt accumulation or equity control; technological, through over-reliance on Chinese-manufactured equipment; and human resource, through the reliance on Chinese engineers and technical workers in project operations.

The first and most discussed concern is financial vulnerability, often referred to as the risk of "debt-trap diplomacy." If countries accumulate unsustainable debts for projects that fail to deliver expected returns, their fiscal stability and, in some cases, policy autonomy may be jeopardised. Lao PDR provides a striking example of this risk[43]. Most of its dam projects were financed through loans from Chinese policy banks such as the Export–Import Bank of China and the China Development Bank. By 2023, Lao PDR' total public debt had reached the equivalent of its entire GDP (USD 13.8 billion), with roughly half owed to China. Yet the country earns limited revenue from its hydropower assets, as many are built and operated by foreign developers under long-term concession agreements of 20–25 years. Consequently, while substantial revenues may accrue in the distant future, Lao PDR remains fiscally constrained in the near term, a reminder of how even beneficial infrastructure can carry long-term financial risks when dependent on external funding.

This brings forward a deeper concern about sovereignty and security: if national grids or major power plants are built, financed, and possibly operated by Chinese entities, it could create vulnerabilities in times of political tension or conflict? The issue is that hidden technical dependencies, or even Beijing's influence over key contractors, could undermine the reliability of critical infrastructure. In response, countries such as Malaysia and Thailand have adopted strategies that prioritise local participation and tighter regulatory control in joint projects, rather than relying exclusively on Chinese funding, to mitigate these potential risks.

The second major risk stems from technological dependence and supply chain concentration. While China's low-cost renewable technology has accelerated Southeast Asia's clean energy deployment, it also exposes the region to strategic vulnerabilities. Southeast Asia's solar industry, for example, relies heavily on Chinese inputs—including polysilicon, wafers, and solar cells—while the majority of wind turbines and battery components are likewise sourced from China. Excessive concentration of supply in a single country heightens exposure to geopolitical tensions and trade disruptions.

This vulnerability became evident in April 2025, when the United States imposed tariffs of up to 3,500 percent on solar panels imported from certain ASEAN countries, alleging that they contained Chinese components used to circumvent trade rules[44]. The abrupt tariff hike disrupted solar exports from the region and underscored how deeply ASEAN's renewable manufacturing base depends on Chinese materials and technologies. Any future geopolitical rift or export restriction could similarly stall Southeast Asia's clean energy transition and undermine investor confidence.

A third risk relates to governance and transparency. Without strong oversight, large-scale projects financed or constructed by Chinese companies can generate environmental and social challenges that erode public trust. The earlier example of the Morowali Industrial Park (IMIP) in Indonesia illustrates this concern. While the park has been pivotal for industrial growth, its operations have led to significant ecological impacts, including toxic waste discharge, air pollution, deforestation, and water contamination. Such incidents highlight the importance of enforcing stringent environmental safeguards and transparent governance frameworks to ensure that investment-driven growth remains sustainable.

Taken together, these opportunities and risks reflect the dual nature of China's role in Southeast Asia's energy transformation. For many ASEAN countries, China represents an indispensable partner—providing vital capital, technology, and expertise at a time when other sources of financing are limited. Its contributions have accelerated renewable energy deployment and regional connectivity, positioning China as a central actor in Southeast Asia's low-carbon development.

Yet, this partnership is not without complications. The same channels that bring economic and technological benefits also raise concerns about strategic leverage, financial dependency, and long-term autonomy. As a result, Southeast Asian governments are adopting a more pragmatic and cautious approach—welcoming Chinese investment while actively diversifying partnerships to preserve balance. The goal is not to reject China's engagement but to manage it wisely: maximising its benefits for green development while safeguarding national interests and regional resilience.

5. Recommendations for Southeast Asia and ASEAN

Drawing on the analysis above, the following policy recommendations are proposed for Southeast Asian nations and ASEAN collectively to strengthen their energy transition strategies in the context of China's expanding role. These measures aim to maximise the opportunities presented by Chinese partnership while mitigating associated risks, ensuring a balanced, secure, and sustainable path forward.

1. Strengthening ASEAN Unity and Negotiating Power

Southeast Asian countries should use ASEAN as a collective platform to negotiate with external partners, including China, on energy cooperation. A coordinated ASEAN position, channelled through mechanisms such as the ASEAN-China Energy Cooperation Framework or the ASEAN Ministers on Energy Meeting Plus Three (AMEM+3), would enhance the region's bargaining power and enable members to secure more favourable and transparent terms of engagement.

By attracting Chinese investment under ASEAN-defined conditions rather than through fragmented bilateral deals, member states can avoid competitive dynamics that lead to excessive concessions or unbalanced contracts. ASEAN could establish regional baseline standards for key aspects such as loan terms, local content requirements, environmental safeguards, and technology transfer commitments. Collective negotiation would also allow ASEAN to align incoming projects with existing regional frameworks such as the ASEAN Power Grid (APG), preventing duplication, inefficiency, and overcapacity.

Furthermore, ASEAN can reinforce South-South cooperation by positioning China as a partner within ASEAN-led initiatives rather than as the sole driver of regional programmes. Maintaining ASEAN centrality in agenda-setting and project design will ensure that the region's long-term energy transition aligns with its own priorities, while still benefiting from China's financing capacity, technological expertise, and implementation experience.

2. Balancing Energy Sovereignty with Regional Security

ASEAN member states should reconceptualise "energy sovereignty" not as complete self-sufficiency but as secure interdependence. In practice, this means recognising that cross-border energy trade and foreign investment, including from China, are essential

components of the region's energy mix, while ensuring that such engagement does not result in overdependence on a single source or technology provider.

To achieve this balance, countries should actively pursue diversification of both energy sources and partners. For critical technologies such as power grid control systems, solar panel supply, and battery storage, maintaining a diverse pool of reliable suppliers—from China as well as Japan, South Korea, the European Union, and the United States—will enhance system resilience. Governments can incorporate procurement safeguards, such as requiring that a proportion of project equipment be sourced from non-Chinese suppliers when Chinese firms act as engineering, procurement, and construction (EPC) contractors. This approach helps ensure technological interoperability, alternative maintenance options, and supply continuity in times of disruption.

In addition, countries should embed contractual safeguards such as exit clauses or diversification provisions that allow for withdrawal, renegotiation, or the introduction of third-party investors under specified conditions. These mechanisms can mitigate long-term dependency risks and protect national interests without deterring foreign participation.

Ultimately, energy sovereignty should be understood not in purely national terms but as a collective ASEAN objective—a form of regional sovereignty where interconnected energy systems are governed by shared principles of transparency, diversification, and mutual security. Such an approach would enable ASEAN to manage interdependence strategically and strengthen the region's overall resilience against geopolitical and supply chain risks.

3. Diversifying International Finance and Partnerships

While Chinese financing has played a crucial role in bridging Southeast Asia's infrastructure funding gap, the region should actively seek a broader mix of donors, investors, and development partners to reduce dependency risks and enhance competitiveness. Expanding engagement with partners such as the United States, European Union, Japan, South Korea, India, Gulf states, and multilateral development banks can provide both financial diversity and access to advanced technologies and governance standards.

To attract such financing, Southeast Asian governments should focus on strengthening transparency, regulatory certainty, and investment climate stability, as these factors are often prerequisites for Western and Japanese investors. Countries should also make fuller use of international initiatives such as the G7-led Just Energy Transition Partnerships (JETPs), which offer multilateral platforms for mobilising climate finance and supporting developing nations in their shift away from fossil fuels. In parallel, engagement with Gulf

sovereign wealth funds, many of which prioritise renewable energy, technology, and innovation investments, could provide an additional and complementary source of capital.

A practical strategy is to adopt blended financing models, combining Chinese state-backed funding with concessional loans or grants from multilateral institutions. This approach leverages the speed and scale of Chinese finance while balancing it with the standards and safeguards of international institutions.

Moreover, coordinated ASEAN-level projects could enhance the region's collective credibility and bargaining power when securing funding for large-scale initiatives. Regional cooperation not only improves access to concessional financing and grants but also offers an alternative to sole reliance on Chinese banks, which have traditionally been the fastest or only lenders for major infrastructure ventures.

Having multiple financiers at the table enables Southeast Asian countries to negotiate more favourable terms, such as lower interest rates and improved risk-sharing, and to benefit from a wider pool of technical expertise.

4. Insisting on Transparency, Governance, and Standards

Southeast Asian governments must collectively ensure that all energy investments, regardless of origin, adhere to high standards of transparency, accountability, and sustainability. This is essential to prevent the recurrence of negative outcomes that have sometimes accompanied large-scale infrastructure projects, including opaque financing arrangements, corruption risks, and environmental degradation.

To achieve this, governments should implement open and competitive bidding processes for all major projects, ensuring that proposals are evaluated on their technical and financial merit rather than through closed-door negotiations. Where direct government-to-government MoUs are deemed necessary for expediency, the resulting contracts should still be made publicly available or, at minimum, subject to review by independent oversight bodies.

Environmental and social safeguards must also be strengthened. Governments should mandate rigorous Environmental and Social Impact Assessments (ESIAs) for all energy and industrial projects, conducted by independent and credible experts. No project—whether a hydropower dam, industrial park, or power plant—should be exempt from this requirement. Enforcing such assessments will help ensure that infrastructure development does not come at the expense of ecosystems or local communities.

At the regional level, ASEAN could take the lead in institutionalising these standards by developing a unified "Green Guideline for Southeast Asia", aligned with ASEAN's existing sustainability frameworks. The bloc could then negotiate with China to adopt these guidelines for all BRI projects within the region, enhancing accountability and long-term environmental integrity.

By promoting strong governance and transparency, Southeast Asian nations would not only safeguard public interests but also raise the overall quality of investment in the region. Such efforts would encourage all partners, not only China, to adhere to best practices, ensuring that projects deliver genuine, lasting benefits for citizens and remain sustainable well beyond the involvement of foreign investors.

5. Enhancing Local Capacity and Supply Chains

To avoid remaining passive consumers of imported technology, Southeast Asian countries should aim to capture greater domestic value from the ongoing clean energy transformation. This requires a deliberate focus on developing local industries, strengthening human capital, and building resilient regional supply chains that can support renewable energy deployment and electrification.

Governments should prioritise education, skills development, and technology transfer through structured policies and partnerships. Investment incentives and industrial agreements with foreign investors can incorporate local content requirements or mandates for joint ventures with domestic firms to ensure meaningful technology diffusion. Skills training programmes should be expanded to equip engineers, technicians, and researchers with expertise in renewable energy, grid management, battery storage, and emerging clean technologies. Collaboration with universities and private-sector partners can help tailor these programmes to local contexts and long-term development needs.

In parallel, governments should allocate funding for local R&D, enabling Southeast Asia to contribute not only to the assembly and installation stages of the value chain but also to innovation and product development. Strengthening domestic capacity in these areas will transform the energy transition into a broader industrialisation opportunity.

Building regional supply chains for renewable energy components—such as solar panels, batteries, and grid equipment—will further enhance resilience, reduce logistics and currency-related costs, and generate employment. It will also protect the region from external shocks, such as export restrictions or price fluctuations in key supplier countries.

Encouraging intra-regional trade and production of energy-related goods can collectively reduce dependence on imports from outside the region and bolster energy sovereignty.

Conclusion

By implementing these measures, Southeast Asian nations can more effectively manage their complex yet potentially rewarding partnerships with external actors, including China. The overarching goal should be to achieve a secure, affordable, and sustainable energy system in which external partners contribute positively under fair, transparent, and well-governed conditions.

To reach this goal, however, ASEAN must act proactively and collectively. Only through unified regional coordination can Southeast Asia leverage its collective strengths, shape equitable partnerships, and build an integrated ecosystem that benefits all member states in the long term.

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