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CCUS in ASEAN: Viable solution or distant goal?

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Summary

- Southeast Asia has vast potential for carbon capture, utilisation and storage (CCUS) that can play a significant role in meeting climate goals, provided that the appropriate regulatory and cost-reduction enablers are in place.
- Recent CCUS developments in the region reflect a commitment to leverage CCUS as a decarbonisation strategy, with Indonesia taking the lead in policy development.
- Addressing existing barriers to adoption through measures such as supportive policy approaches and cross-border collaboration can pave the way for greater CCUS adoption in Southeast Asia.

CCUS as a decarbonisation lever in ASEAN

As Southeast Asia strives towards a climate-resilient future amid challenges such as rising energy demand and heavy reliance on fossil fuels, carbon capture, utilisation and storage (CCUS) is expected to play an important role in the region's energy transition. CCUS addresses CO_2 emissions by capturing the CO_2 through various technologies to be sequestered underground or be used as feedstock for manufacturing processes. The demand for the nascent low-carbon technology is expected to be driven by hard-to-abate sectors including iron and steel, cement and oil and gas to reduce emissions.

To align with net-zero targets, CCUS technology capacity globally must expand by more than 100 times in the long-term to reach 4 to 6 gigatonnes CO_2 by 2050 and decarbonise about 15% to 20% of today's energy-related emissions, according to the World Economic Forum. Average annual investments in CCUS could reach close to US$175 bn by 2035, expected to be concentrated in hard-to-abate sectors in ASEAN, China, India and North America, according to estimates by McKinsey. While the CCUS market has been expanding, further acceleration would be required to achieve global net-zero commitments.

With Southeast Asian countries setting targets to reduce emissions in their climate action plans, low-carbon technologies such as CCUS are seen as important decarbonisation levers to support the region's energy transition. Southeast Asia is also well placed to develop CCUS hubs due to its high storage capacity potential and the presence of several emissions-intensive clusters, but realising the potential would require a combination regulatory enablers and strategies to reduce high technological costs.

Emerging CCUS hubs in ASEAN

Interest in CCUS in Southeast Asia has been growing, with related cross-border collaborations and regulations announced in recent years. Indonesia was the first Southeast Asian country to adopt a framework to regulate CCS and CCUS activities through the Ministry of Energy and Mineral Resources (MEMR) Regulation No. 2 of 2023.

As part of its energy transition towards its net-zero goal, Indonesia also issued a presidential regulation on CCS in Jan 2024 that allows CCS operators to set aside 30% of their storage capacity for imported CO_2. This allows oil and gas contractors to utilise depleted reservoirs and aquifers in their oil and gas blocks for CCS operations, with the potential to store over 400 bn tonnes of CO_2.

Following which, Singapore signed a letter of intent with Indonesia on cross-border CCS collaboration, as Singapore has committed to boost its research and development in low-carbon technologies such as CCUS to accelerate the country's energy transition. The government is working with industry partners ExxonMobil and Shell to study the feasibility of aggregating CO_2 emissions in Singapore for storage in other countries such as Indonesia. The industry consortium, known as S Hub, plans to develop a CCS project that can sequester at least 2.5 mn tonnes of CO_2 per annum by 2030. In addition, Singapore plans to launch a pilot by 2026 to test the viability of carbon capture and storage technologies at its waste-to-energy plants.

Indonesia launched in 2024 the construction of the country's first CCUS project in West Papua province operated by BP, which has the potential to store up to 1.8 gigatonnes of CO_2. This is one of 15 CCS and CCUS projects in Indonesia that are at different stages of development, with a combined investment of nearly US$8bn. Indonesia has a considerable estimated carbon storage capacity of 8 gigatonnes in depleted oil and gas reservoirs and 400 gigatonnes in saline aquifers, highlighting its significant potential in both the domestic and international CCUS value chain.

Malaysia has also passed the CCUS Bill in Mar 2025 to catalyse the development of CCUS as a green growth sector and to support the country's climate goals. This development aligns with Malaysia's aim to establish three CCUS hubs by 2030 with shared storage capacity of up to 15 mn tonnes per annum, as highlighted in its National Energy Transition Roadmap.

These developments underscore Southeast Asia's growing interest and emerging role as a key player in the CCUS sector, although significant barriers to adoption must be overcome to unlock the region's CCUS potential.

Barriers to CCUS adoption

Despite the high storage potential in Southeast Asia, several factors hinder CCUS adoption in the region such as high costs. Access to funding for CCUS has been limited as the scale of investment required to unlock the potential of CCUS is significant. The cost of CCS in the region would be US$60 to US$120 per tonne of CO_2 stored, which could potentially increase up to US$150 per tonne if not managed effectively, according to estimates from McKinsey. Even if carbon prices in Southeast Asia rise to Singapore's range of S$50 to S$80 per tonne by 2030, a substantial financial gap could still exist that may impede CCUS adoption.

In addition, the region has limited technical and technological proof points, as its carbon capture and storage readiness is still lagging behind that of Europe and the US. Southeast Asia is also still developing carbon pricing mechanisms, regulatory clarity and incentives, as well as access to green financing. Most of the CCUS value-chain activities are familiar to companies in the oil and gas sector, but the level of technical understanding of CCUS in companies outside this sector may be low.

Realising ASEAN's CCUS potential

Despite the challenges, policies and regulations in the CCUS and carbon-related sectors are developing, with Indonesia taking the lead in policy development and Singapore on carbon markets. A comprehensive and supportive policy approach that combines direct financial support with market-driven mechanisms can stimulate investment and innovation in CCUS technologies. Implementing carbon pricing mechanisms or increasing carbon prices can encourage CCUS investments, coupled with the growing role of voluntary carbon markets that can provide revenue streams for CCUS projects.

Strengthening regional partnerships and securing cross-border CCUS agreements can scale up the cross-border CO_2 transport and storage market. In addition, enhancing government support for pilot projects and developing capacity-building initiatives can foster greater technological expertise across various sectors in the region. Implementing CCUS hub projects, where multiple industry players share infrastructure and knowledge, can also reduce individual operational risks and investments. This collaborative approach enables the implementation of cost-effective CCUS applications, as demonstrated by the progress made in several hubs in Australia, Canada, Norway and the UK. CCUS hubs can also be developed in industrial areas in Southeast Asia to foster greater knowledge sharing, leverage existing infrastructure and reduce the high costs associated with CCUS adoption.

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