Regional Spotlight

APAC and India

Critical role of CCS creating both opportunities and challenges

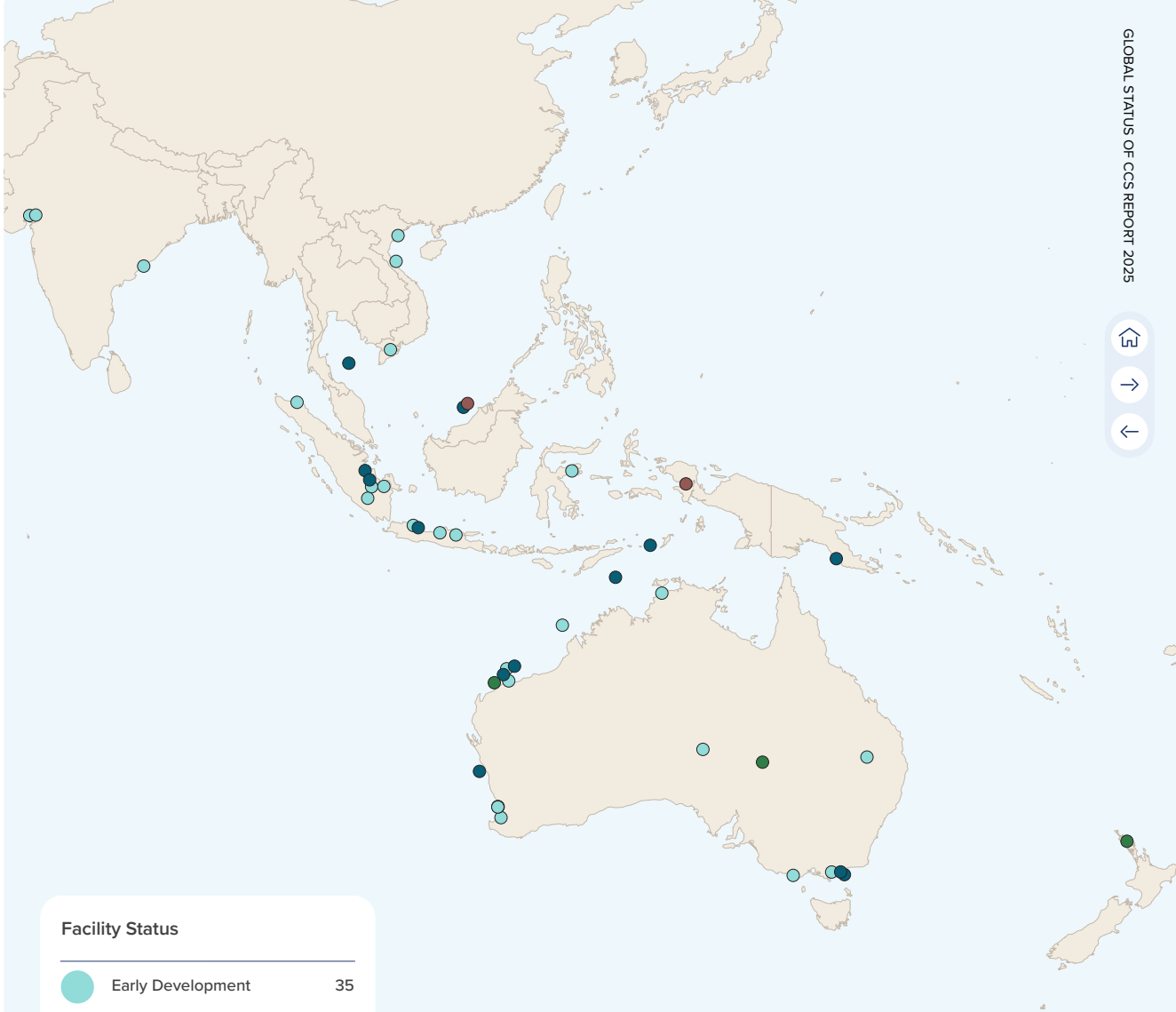
Rapid economic growth in the emerging economies of the Asia Pacific region is driving demand for energy to power industry and cities. Collaboration across the private and public sectors is ramping up to find ways to make CCS more investable. Governments are developing regulations, supporting studies and discussing cross-border CO_2 transport for permanent storage. Companies are forming joint ventures, developing projects and turning the key on the region's first commercial CCS facilities. But progress is uneven and the business case for CCS remains challenged, putting net zero commitments at risk.

Progress – 2024/2025 was a significant year for CCS in the APAC region, with the region's third CCS facility commencing operation, two more in construction and significant positive regulatory developments in Australia, Indonesia and Malaysia.

Collaboration – Cross-border transport and storage of CO_2 will be key to the successful deployment of CCS, necessary to achieve net zero commitments. Governments have begun negotiating agreements to allow this trade, and companies are forming joint ventures and executing MoUs with the intent of participating in this value chain.

Challenge – The first tranche of lowest-cost CCS facilities associated with gas production is being developed; however, policy support is not yet sufficient to drive investment in the next tranche of higher-cost applications.

Momentum – Despite the challenges, new CCS projects, studies and related initiatives continue to be announced as governments and companies improve their understanding of the economic and environmental opportunities of carbon capture and storage.



Facility Status	
Early Development	35
Advanced Development	14
In Construction	2
In Operation	3

* PTTEP reached FID for the Arthit CCS project after the cut-off date for this report. Arthit is In Construction as of October, however facility statistics in this report record Arthit as Advanced Development as of July.

Efforts to create cross-border CCS value chains in the Asia Pacific region have continued over the past 12 months. Governments and industries from countries with limited storage capacity – Japan, South Korea, Singapore – are progressing with feasibility studies and cooperation agreements with neighbouring countries. Potential regional storage providers – Indonesia, Malaysia, Thailand and Australia – continue to position themselves as storage hubs, with regulatory frameworks, licensing regimes, and commercial models in place or beginning to take shape. As legal, logistic, and financial frameworks evolve, the region is rapidly laying the foundations for cross-border CO_2 transport and storage.

The first movers in the region are oil and gas companies, and a geothermal power company. In Australia, Chevron's Gorgon and Santos' Moomba CCS facilities collectively store 3.3 Mtpa of CO_2. The Ngawha Geothermal Power Station is reinjecting up to 120 ktpa of CO_2 in New Zealand. Petronas, bp and PTTEP have CCS facilities in construction; Kasawari in Malaysia, Tangguh in Indonesia, and Arthit in Thailand, respectively. There are an additional 54[1] facilities in earlier stages of development across the Asia Pacific[2] excluding Japanese domestic facilities and China, which are covered in other sections of this report. Momentum continues to grow with increasing recognition of the necessity of CCS to achieve net zero emission targets as demonstrated through CCS' inclusion in national policies, plans and regulations. However, the most difficult challenge yet to be overcome is making more CCS projects investable.

Challenges

Perhaps the most pressing issue facing CCS in the region is that policy incentives are currently insufficient to create a business case for investment. The specific circumstances that enabled investment in the facilities that are operating or in construction are not broadly applicable. Without stronger policy, few additional positive financial investment decisions in the region are likely, putting net zero commitments out of reach.

Whilst there has been rapid development of CCS regulation in Indonesia and Malaysia, which is a prerequisite for investment, beyond Australia, CCS regulation is incomplete or absent and the geological storage of CO_2 outside of oil or gas tenements is generally not able to be authorised.

Relatively few South-East Asian government officials understand CCS, which could slow policy and regulatory development. Community and environmental groups that do not understand the stringent regulatory requirements that will apply to transboundary CO_2 transport and geological storage are concerned that the import of CO_2 is a form of waste dumping, similar to the dumping of other foreign wastes, which has been problematic in the past. There is an urgent need to engage these stakeholders and provide information that addresses their concerns.

Finally, bilateral agreements between CO_2 exporting and importing nations, essential to enable cross-border transport and storage of CO_2, have not yet been negotiated.

Sustainability

CCS is essential to achieve global net zero emissions and has a more prominent role in rapidly growing economies such as those of South-East Asia and India. Approximately two-thirds of the CO_2 required to be captured and stored to 2050 is in emerging and developing economies (IEA, 2023). These nations are characterised by strong energy demand growth and growing consumption of fossil energy.

CCS reduces the cost of achieving net zero commitments by several trillion dollars[3] across Asia Pacific countries whilst maintaining energy security and continued economic growth.

It enables a just transition for communities that rely on heavy industry by mitigating their emissions and facilitates the creation of new low-emission industries such as carbon transport and storage services, low-carbon hydrogen, ammonia and fertiliser production.

Once established, CCS hubs are expected to attract further investment in the decades ahead from industries such as cement, steel, and power generation that require CO_2 management services. These economic, social and sustainability benefits are why the governments of Malaysia, Indonesia and Thailand are supporting CCS developments.

Policy

The Indonesian and Malaysian governments are promulgating legislation to enable the storage of domestic and imported CO_2. Similarly, the Australian Government has taken several steps since 2023 to establish cross-border transport and storage of CO_2, including the declaration of provisional application of the 2009 amendment to the London Protocol on 7 November 2024 (GCCSI, 2024).

The Indonesian Ministry of Energy and Mineral Resources issued Regulation No. 16 of 2024 on the Organization of Carbon Storage in Carbon Storage Permit Areas (Wilayah Izin Penyimpanan Karbon or WIPK) on 24 December 2024. The regulation provides for the authorisation of geological storage resource exploration, and CO_2 storage and transport, independent of hydrocarbon exploration/production activities (Draps & Ibnuaji, 2025).

On 25 March 2025, the upper house of the Malaysian Parliament passed the Carbon Capture Utilisation and Storage (CCUS) Act, which establishes a framework for comprehensive regulation of all stages of the CCS life cycle as well as the transport and importation of CO_2 (Choong & Thani, 2025). This Act does not apply to the states of Sabah or Sarawak. Sabah has not promulgated CCS regulations whilst Sarawak has regulations in place. Regulations under the CCUS Act are being prepared by the Malaysian Government.

In September 2024, India's Bureau of Energy Efficiency included Carbon Capture Use and Storage within the scope of India's Carbon Credit Trading Scheme (CCTS) (Bureau of Energy Efficiency, 2024). Once a methodology has been published, abatement delivered by CCUS in India will be recognised by the CCTS. This follows an announcement by the Indian Government in August 2024 of its intent to develop a CCUS Mission to drive research, development and commercial deployment of CCUS. The mission is expected to include a range of supportive policies to enable the application of CCS across key sectors, including steel, cement, oil and gas, petrochemicals and fertilisers (Climate Change Newse, 2024).

In May 2025, New Zealand released a new policy framework, the Enabling CCUS package, introducing regulatory guidance and incentives for investment in carbon capture technology and aiming to include CCS in the domestic emissions trading scheme (George, 2025).

International collaboration to create cross-border CCS value chains in South-East Asia continued in 2025 with discussions between the governments of Australia, Indonesia, Japan, Malaysia, Singapore and South Korea. Petronas has signed memoranda of understanding with nine countries – among them Japan and South Korea – to store their excess CO_2 emissions in depleted fossil fuel sites off the coast of peninsular Malaysia and Sarawak (Budgen, 2025).

In Australia, Royal Vopak signed an MOU with the Northern Territory Government in August to construct a CO_2 import terminal at the Port of Darwin, with the aim of beginning operations in 2030 (ABC News, n.d.). In January, Indonesia's Coordinating Ministry for Economic Affairs and ExxonMobil signed an MoU to advance the petrochemical sector and develop CCS technology with an estimated investment of US$10 billion.

[1] Excludes projects that have been announced but for which feasibility studies have not yet commenced.

[2] Includes India.

[3] GCCSI Analysis using the Global Economic Net Zero Optimisation Model (GENZO): Present Value to 2065.

Gorgon CO_2 injection and monitoring wells, Western Australia, courtesy of Chevron.

Finance

CCS facilities are capital-intensive, typically costing hundreds of millions to over a billion dollars, depending on their scale, and therefore must make a positive return for the investor. There are six CCS facilities that have reached a positive financial investment decision in Australia and South-East Asia and all are associated with gas re-injection. Gorgon, Moomba and Ngawha Geothermal are operating. Kasawari, Tangguh and Arthit are in construction. Both Gorgon and Kasawari, primarily LNG projects, were required to use CCS to capture and store reservoir CO_2 as a condition of their project approvals. After the additional capex and opex arising from the requirement to use CCS to reduce CO_2 emissions were considered, investment in these LNG projects and their associated CCS infrastructure was able to proceed.

Investment in Tangguh and Moomba was enabled by additional value drivers. At Tangguh, injected CO_2 will produce additional gas for sale through enhanced gas recovery. At Moomba, the capture and storage of CO_2 creates Australian Carbon Credit Units, which may be sold or used to offset Santos' emissions at other facilities, subject to monitoring and verification of CO_2 storage. In both cases, these additional value drivers provided a sufficient return to enable investment in the CCS facility.

Storage project developers in the region are planning to generate revenue by providing CO_2 storage services for a fee. The most advanced projects, such as Kasawari and Moomba, will initially store their own CO_2 but intend to utilise excess capacity to store third-party CO_2.

Technology

The transport of CO_2 by ship from capture hubs to storage operators is critical to the optimum deployment of CCS in the Asia Pacific region. Larger ships better suited to longer shipping distances, with capacities of up to 80,000 cubic meters, are being designed by various shipbuilders for the Asia Pacific Market.

In June 2025, Mitsui OSK Lines (MOL) and Mitsubishi Shipbuilding received approval from the ship classification society ClassNK to develop the world's first liquefied CO_2 and methanol combination carrier. The vessel will transport captured CO_2 to a synthetic methanol production plant on its outward journey and then carry synthetic methanol on the return voyage (Savvides, 2025). This dual-cargo approach eliminates empty return trips, significantly increasing transport efficiency compared to using dedicated vessels for a single cargo type.

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Moomba CCS Project

Santos' and Beach Energy's Moomba CCS project in Australia's Cooper basin commenced capturing and storing 1.7 Mtpa CO_2 from the Moomba Gas Plant in October 2024. With a total cost of less than US$30/tonne, Moomba stands out as a low-cost project and a clear example of how CCS can be delivered within a commercial model when supported by strong policy frameworks (Moomba CCS, n.d.).

Carbon dioxide is separated from methane using conventional Benfield Acid Gas Removal units. This CO_2 would normally be vented to atmosphere, but at Moomba it is captured. Water is removed from the CO_2 stream before it is compressed to approximately 14 Mpa (approximately 140 times atmospheric pressure) in a four-stage compressor. Waste heat from the compressor is used to generate steam that powers a turbine generating electricity that is used at Moomba. The compressed CO_2 is transported by a 50 km pipeline to the injection wells where it is injected into the Strzelecki-Marabooka depleted gas reservoir for permanent geological storage, 1.8 km below the surface.

Santos has a 66.7% interest in the Moomba CCS project with the remaining equity being held by Beach Energy. The total project capital cost was approximately US$250 million. Moomba CCS is registered with the Australian Clean Energy Regulator (CER) and is applying the CER's CCS Methodology to generate Australian Carbon Credit Units (ACCUs), which it can do for up to 25 years. As of July 2025, ACCUs were trading at AU$35 (Carbon and Environmental Price Updates, n.d.).

Moomba CCS is critical to Santos' and Beach Energy's plans to reduce emissions and meet their obligations under Australia's Safeguard Mechanism. This requires companies that emit more than 100,000 tCO_2e per year to reduce their emissions below their baseline by 4.9% per year, each year, between 2023 and 2030.

Emission reduction rates for 2030-2035 had not been announced by the Australian Government at the time of writing. These factors combined to create a business case for the project, demonstrating how government policy and regulation can deliver material emissions abatement through private sector investment in CCS.

700,000

That's the emissions reduction equivalent of taking 700,000 petrol cars off the road a year[1].

28%

Equivalent to around 28% of total emissions reduction across Australia's electricity sector in 2023.

1.7 Mtpa

Moomba CCS phase 1 has the capacity to store 1.7 Mtpa of CO_2.

Moomba CCS Project, Australia. Image Courtesy of Santos.

[1] Based on a blended emissions factor considering both light and heavy passenger vehicles, calculated per statistics for distance travelled each year (ABS - Survey Motor Vehicle Use Australia 2020).