



Asia CCUS Network Annual Report

2021 - 2022

The Asia CCUS Network provides a platform for policymakers, financial institutions, industry players, and academia to work together to ensure the successful development and deployment of carbon capture, utilisation, and storage.



On the initiative to promote carbon capture, utilisation, and storage (CCUS) and carbon recycling, the ministers noted the importance of CCUS and carbon recycling in supporting the goals of decarbonisation, recovery, and economic growth.





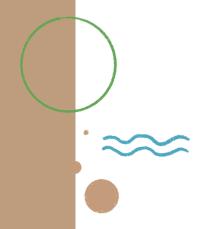
VISION

The Asia CCUS Network provides opportunities for countries in the region to work and collaborate on a low-emission technology partnership. It will eventually help build their capability to lower the cost of carbon capture, utilisation, and storage (CCUS) technology and its deployment through collaboration on research and innovation.

MISSION

The network's mission is to facilitate deployment of CCUS in the East Asia Summit (EAS) through the following activities:

- Promote knowledge sharing by holding an annual forum, conferences, workshops, and meetings.
- Conduct research on technical, economic, and legal standards of CCUS in the EAS.
- Hold capacity-building training workshops to bridge the knowledge gap on CCUS.





1st Asia CCUS Network Forum: First Launch Asia CCUS Network

26 July 2021



Prof Hidetoshi Nishimura, President of the Economic Research Institute for ASEAN and East Asia (ERIA), with Mr Hiroshi Kajiyama, Japan's minister of economy, trade, and industry, attended the 1st Asia CCUS Network Forum with high-level representatives from nine EAS countries and heads of three international energy organisations. They announced the launch of the Asia CCUS Network, an international industry, academia, and government platform to share knowledge and improve the business environment for utilising CCUS. Thirteen EAS member countries and more than 100 companies, research institutions, and international organisations have expressed their intention to participate in the network.

Knowledge-sharing Conferences



1st Conference: International Energy Agency – ASEAN's Energy Challenges: A Boon for Future CCUS Development

26 July 2021



The future of CCUS technologies in Southeast Asia is promising, based on a conference held by the Asia CCUS Network in partnership with the International Energy Agency (IEA). Ms Samantha McCulloch, head of the CCUS Unit at IEA, shared the key findings from the latest IEA report, CCUS: The Opportunity in Southeast Asia, about the trajectory of energy demand and carbon dioxide (CO2) emissions. Amongst the findings is the critical role of CCUS technologies in reaching net-zero targets. Dr Raimund Malischek, energy analyst at IEA, elaborated the role of CCUS technologies in reducing emissions and the CCUS prospects in Southeast Asia. CCUS can massively help reduce emissions: 4 gigatonnes of CO2 need to be captured globally by 2035 and 7.6 gigatonnes by 2050.

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Southeast Asia's industries and policymakers must support CCUS deployment and development given that the region remains heavily reliant on fossil fuels. To achieve netzero emissions, CCUS in Southeast Asia must span the entire energy system, particularly because more than 200 million tonnes of CO2 emissions must be captured by 2050. Dr Twarath Sutabutr, chief inspector general, Ministry of Energy, Thailand, commented on several Association of Southeast Asian Nations (ASEAN)—specific concerns: the readiness of Southeast Asia's financial institutions to finance high-capital projects and the confidence in the availability of safe and secure CO2 storage.

2nd Conference: Department of Energy, United States – The US Department of Energy Welcomes and Supports Asia CCUS Network's Objectives

28 July 2021



The Asia CCUS Network has full support from the United States (US) Department of Energy as Southeast Asia advances in deploying CCUS. Mr Jarad Daniels, director, Office of Strategic Planning, Analysis, and Engagement at the US Department of Energy, mentioned that reaching net-zero targets without innovative technologies such as CCUS would not be feasible; technology should, therefore, be a critical part of the overall climate change strategy. CCUS deployment is a robust part of climate solutions, particularly because a 2050 net-zero goal requires a tremendous CCUS scale-up from today's levels.

The department found that global maximum efforts to be energy efficient will help reach only a third of the carbon emission reduction and mitigation goals by 2050. The US' decadeslong journey in initiating a solution to climate change has resulted in several lessons for Asia. Amongst them is the need for governments to implement strong, transparent environmental regulations to support CCUS because national regulatory complications can limit CCUS deployment. Mr Jesus Tamang, director, Energy Policy and Planning Bureau at the Department of Energy of the Philippines, highlighted how the US' application of CCUS demonstrates that it is a tool for decarbonisation.

However, the Philippines has yet to implement it because it is not economically viable and the country has high levels of emissions. Mr Tamang maintained that CCUS will be included in the Philippines' energy transition strategy, and the government, therefore, is looking forward to assessing the technology's feasibility.





3rd Conference: Oil and Gas Clean Initiative – The Asia CCUS Network and Oil and Gas Climate Initiative on Overcoming CCUS Deployment Challenges

14 October 2021



Governments across Southeast Asia are stepping up decarbonisation, with CCUS technology increasingly becoming a focus in policymaking. Mr Julien Perez, vice president for strategy and policy, Oil and Gas Climate Initiative (OGCI), said that his organisation aims for a carbon-neutral society. OGCI strives to accelerate decarbonisation of the oil and gas industry and to ensure that it offers solutions to the rest of the world. OGCI's members are 12 oil and gas companies, including Chevron and

Shell. Mr Iain Macdonald, OGCI CCUS workstream lead, introduced OGCI, sharing its hubs study to kickstart the CCUS industry.

A key result from the study indicated that Asia has about 60 hubs across 10 countries, emitting nearly three gigatonnes of CO2 annually. Mr Macdonald said the CCUS deployment outlook is positive for Singapore, Japan, and the Republic of Korea. Mr Owain Tucker, OGCI Storage Working Group, presented on CO2 storage, covering topics such as legacy wells, hydrocarbon maturation, aquifers, and CCUS. Safety remains highly important for successful CCUS deployment. CO2 must be contained and stored safely in the CCUS value chain so there is no leakage.

Operators must show governments and stakeholders scientific and practical evidence that CO2 can be properly stored. Mr Tucker underscored the importance of analysing the sites' geological system. Dr Hiroshi Okabe, director, Reservoir Evaluation Team, CCS group, and director, EOR Division, Technology Department, Japan Oil, Gas and Metals National Corporation, commented that, whilst depleted oil and gas fields offer one possible path to launching CCUS projects, he concurred with Mr Tucker on further assessing the geological system to ensure its readiness as a storage site. Ms Noriani Yati Mohamad, head, Resource Development and Management–Sarawak, Malaysia Petroleum Management, Petronas, said that collaboration and innovative technology were important to reduce costs by at least 30% to make the projects economically feasible, and to encourage CCUS deployment.



4th Conference: Clean Energy Ministerial CCUS Initiative and European Commission – European Stakeholders Offer Insights for Successful CCUS Deployment in Asia

17 November 2021



Knowledge sharing and international cooperation between ASEAN and European countries will be central to achieving the collective target of net-zero emissions by 2050. Mr Juho Lipponen, coordinator, <Spell out here> (CEM) CCUS Initiative, explained how CEM's members are spread across North America, Europe, Africa, Asia and the Pacific, and the Middle East, where stakeholders remain dedicated to accelerating CCUS development and deployment. Mr Lipponen said that political support and knowledge sharing are significant for carbon neutrality.

Mr Chris Bolesta, CCUS policy lead at the European Union (EU), presented Learning from Failures – Building on Success: EU Experience on CCUS. In 2007, the EU set a goal of making carbon, capture, and storage (CCS) commercially viable by 2020.

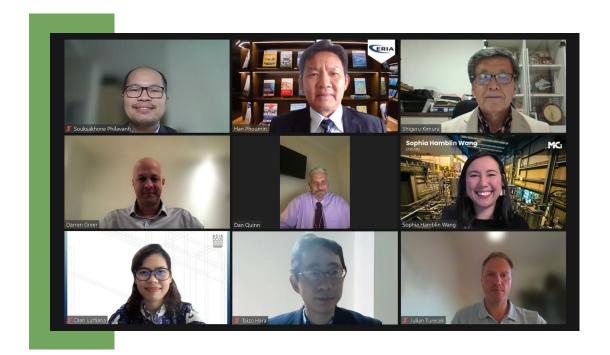
The regional body started by rolling out initiatives on regulatory framework, investment, knowledge sharing, and international cooperation between ASEAN and European countries will be central to achieving the collective target of net-zero emissions by 2050. Mr Juho Lipponen, coordinator, <Spell out here> (CEM) CCUS Initiative, explained how CEM's members are spread across North America, Europe, Africa, Asia and the Pacific, and the Middle East, where stakeholders remain dedicated to accelerating CCUS development and deployment. Mr Lipponen said that political support and knowledge sharing are significant for carbon neutrality. Mr Chris Bolesta, CCUS policy lead at the European Union (EU), presented Learning from Failures – Building on Success: EU Experience on CCUS. In 2007, the EU set a goal of making carbon, capture, and storage (CCS) commercially viable by 2020.

The regional body started by rolling out initiatives on regulatory framework, investment, knowledge sharing, infrastructure, and research. Mr Per-Olof Granström, EU director, Zero-Emissions Platform (ZEP), presented ZEP's View on the EU Experience. He highlighted the European Taxonomy for Sustainable Activities, 'the rulebook for investments in clean technology, which is a good basis for regulation of CCS in Europe, that lays out a clear basis of CCS being an economic activity that can make other activities sustainable'.

Dr Saleh Abdurrahman, member, Committee for Downstream Oil and Gas Regulatory Body Former, and senior advisor, Environment and Spatial Planning Ministry of Energy and Mineral Resources, Indonesia, agreed that CCS is important to reach net-zero targets by 2050 in Europe and 2060 in most ASEAN countries. He acknowledged that ASEAN Member States will require further studies on CCUS implementation and CO2 transport via shipping in addition to drafting of regulations. Mobilising funding remains a top priority 'if we want these technologies to become essential to reaching the goal of net zero by 2050'.

5th Conference: Department of Industry, Science, Energy and Resources, Australia – Australian Stakeholders Showcase CCUS Possibilities in Asia

28 February 2022



Australia's commitment to reaching net-zero emissions and green technology advancements has shown the possibilities for carbon-neutral technologies. In line with Asia and ASEAN's net-zero goals by 2050, CCUS technology is an option of the Australian government's CO2 reduction plan. Mr Dan Quinn, general manager, Resource Strategy, Onshore Resources Division, Department of Industry, Science, Energy and Resources, Australia, shared insights on the Australian government's decarbonisation efforts. He emphasised the value of collaboration for Australia as it strives 'to increase

global cooperation and engagement with like-minded countries and regional partners' to make low-emission technology accessible. Mr Julian Turecek, executive director and project director, Direct Air Capture (DAC) Corporate Carbon, said that the company's AUD4 million grant from the Australian government was 'the first in the world to demonstrate solar power DAC through to geological storage'. Ms Sophia Hamblin Wang, chief operating officer, Mineral Carbonation International (MCI), showcased the remarkable ways that CO2 has been utilised to produce low-emission or negative-emission physical goods. MCI is an Australian government grantee selected for its work on integrated carbon solutions.

Mr Darren Greer, general manager of Carbon Transport and Storage, a Glencore Company, talked about the technical viability, integration, and safe operation of CCS in the Surat Basin in Queensland. Mr Souksakhone Philavanh, director of the Energy Law Division, Department of Law, Ministry of Energy and Mines, Government of the Lao People's Democratic Republic (Lao PDR), praised Australia for making strides in carbon neutrality. Unlike Australia, Lao PDR has found the net-zero transition challenging, which Mr Philavanh attributed to the country being landlocked and mountainous. The terrain has made finding a potential storage area difficult, on top of issues such as poor road conditions and limited transport. He stressed, however, Lao PDR's desire to reduce its annual 40 million tonnes in CO2 emissions by collaborating with Australia and the Asia CCUS Network.

Research Study



Continuous research studies on CCUS are critical to fill the knowledge gap and suggest mechanisms to develop and deploy CCUS.

In 2020–2021, ERIA conducted research with Mitsubishi Research Institute (MRI) to deepen the basic understanding of CCUS technologies, which consist of carbon capture, utilisation, transport, and storage, and polices to deploy CCUS in Asia. ERIA published the study in March 2021.

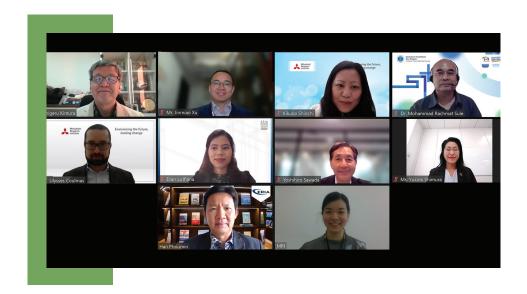
In 2021–2022, ERIA continuously conducted research with MRI on forecasting CCUS cost, assuming a model case and a legal framework to support deployment of CCUS in Asia. ERIA published the study in March 2022. Its introduction is reproduced below.

A Model Case Study by Mitsubishi Research Institute

- A model case study of forecasting CCUS
 cost involving CO2 emissions from a coalfired power plant in ASEAN was conducted.
 The study helped visualise the whole
 value chain of a full-scale CCUS project,
 from capturing CO2 to storing it at its final
 destination.
- Based on public source information, the case study provided a preliminary financial analysis for the main technical segments of a full-scale CCUS project and a legal, institutional, policy, and incentive framework to make the model case study commercially viable.

Workshop on Analysis on CCUS Cost Structure and Legal Framework for Deployment of CCUS Business in Asia

18 January 2022



Crucial to achieving carbon neutrality is understanding the cost structure of CCUS technology. Advancing towards a CCUS value chain will require a collective framework to promote its deployment whilst focusing on cost reduction. The CCUS Model Case Study Workshop, hosted by ERIA in collaboration with MRI, indicated that continuous technological development and scaling-up of CCUS volumes are equally important to make the technology affordable.

Stakeholders discussed the cost structure of ASEAN-wide CCUS deployment and the legal framework to support the initiative. The MRI research findings provided recommendations on common concerns such as the capital-intensive costs of CCUS and CCS and the regulatory requirements to ensure the technologies' feasibility.

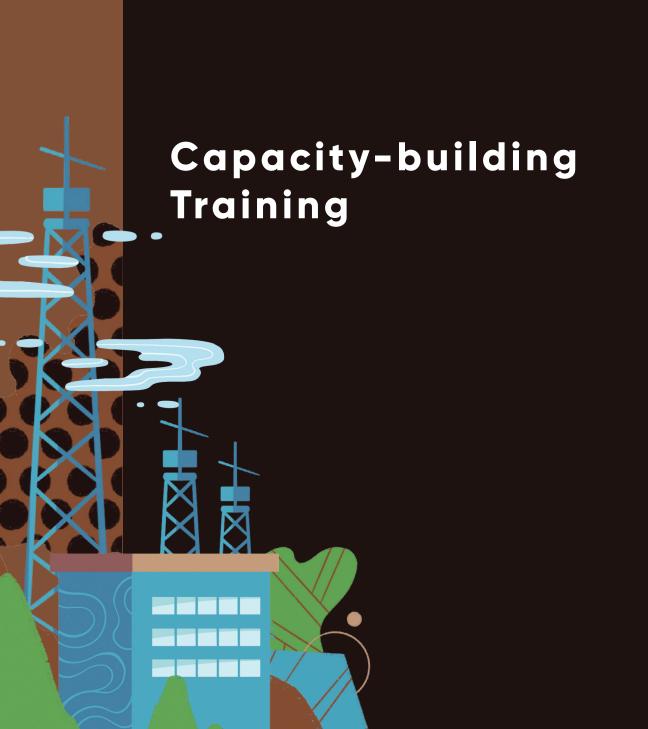
Publications

Kimura, S., K. Shinchi, U. Coulmas, and A. Saimura A. (2021), Study on the Potential for the Promotion of Carbon Dioxide Capture, Utilisation, and Storage in ASEAN Countries Vol. II, ERIA Research Project Report 2021, No. 25.

Kimura, S., K. Shinchi, S. Kawagishi, and U. Coulmas (2020), Study on the Potential for the Promotion of Carbon Dioxide Capture, Utilisation, and Storage in ASEAN Countries: Current Situation and Future Perspectives, ERIA Research Project Report 2020, No. 21.

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The capacity-building training on CCUS was organised by ERIA and the Asia CCUS Network to bridge the knowledge gap in CCUS technology and development. The network strives to help decarbonise emissions through research, training, and knowledge sharing. The event fulfilled one of the network's three core missions.

CCUS Technical Training: Day 1 – Technical Aspect of Carbon Capture Technology

5 October 2021



Southeast Asia's energy demand growth in 2015–2019 ranks second only to China's and is projected to continuously increase. Considering that growth has been and will continue to be driven predominantly by fossil fuels, ASEAN Member States must tackle CO2 emissions from fossil fuel consumption. Dr David Kearns, principal consultant for CCS technology, GCCSI, provided his take on the advantages and disadvantages

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of carbon capture technology. He said that methods such as DAC are important as they can achieve 'negative emissions', given that CO2 will remain even after the world pushes for deep decarbonisation. CCS projects have grown globally at an average of 30% year-on-year since 2017 and especially in 2021. He stressed the importance of achieving economies of scale to push prices and energy costs down, expand technological selection, minimise the full-chain CCS costs of transport, and <verb>quality of storage resources. Mr Takashi Kamijo, chief engineering manager of Mitsubishi Heavy Industry (MHI), introduced MHI's carbon capture business, including the famous carbon-capturing Kansai Mitsubishi Carbon Dioxide Recovery ProcessTM.

CCUS Technical Training: Day 2 – Technical Aspect of Carbon Transport and Storage Technology

6 October 2021



The training focused on carbon transport and carbon storage technologies. Mr Ulysses Coulmas, MRI researcher, said CO2 is transported by pipeline (the most common mode), train, ship, and truck. Thousands of kilometres of pipelines around the world carry oil and natural gas. Pipelines are not only an eminent part of the global energy infrastructure but also the cheapest way to transport large quantities of liquids and gases.

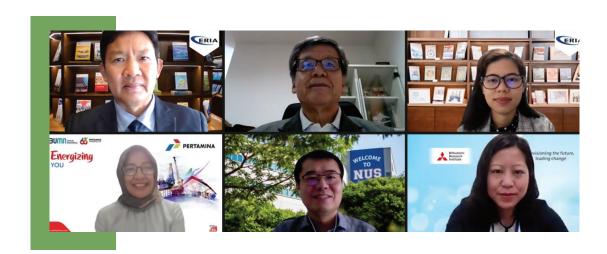
For a CO2 value chain to have a real social and economic impact, building a comprehensive CO2 pipeline network will be integral. Mr Coulmas, therefore, cautioned that developing CO2 transport will require large upfront capital expenditures. Dr Ziqiu Xue, chief researcher of the Research Institute of Innovative Technology for the Earth, and CO2 Storage Research Group leader, explained that about 40%–70% of injected CO2 remains in the reservoir, proving that the subsurface carbon storage method is safe. He stated that continued monitoring will be necessary even after a site is closed to ensure the long-term safety of CO2 storage. He said that risks, however, are inevitable and 'must be reduced to a manageable level for safety'. He explained that whilst the knowledge on carbon storage is abundant, more research and development are needed to create tools that can cope with different geological conditions and challenges.

To deploy the storage technologies on a large scale, he stressed, stakeholders and governments must cooperate and tackle environmental, regulatory, public acceptance, policy, government, and financial issues.

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CCUS Technical Training: Day 3 – Utilisation of CO2

7 October 2021



The speakers lectured on carbon utilisation technologies or EOR and EGR and carbon recycling. Ms Dewi Mersitarini, advisor for CCUS, Pertamina RTC, Indonesia, explained how her company is ensuring environmental sustainability by decarbonisation and reduction of its carbon footprint. Pertamina RTC implements CCUS, which 'is key to sustain energy supply with the current business model'.

A joint crediting mechanism scheme between the governments of Indonesia and Japan, she said, encompasses studying and implementing CCS and CCUS. A core objective is to achieve a circular carbon economy that includes production of valuable products using carbon. She expects that once a circular carbon economy is achieved, technologies such as DAC will be mature enough to further decarbonisation initiatives. Prof Ning Yan, dean's chair associate professor, head of Green Catalysis Lab, National University of Singapore, gave a thorough overview of his various work on CO2 conversion

to fuels and chemicals. Prof Yan is spearheading two projects that convert CO2 into methanol and formic acid and/or formate. He explained that methanol is easy to make and has several advantages, including being the most economically viable hydrogen carrier. Whilst methanol is economically competitive, if it is to compete with other solutions, hydrogen production costs must be significantly reduced.





The advisory group counsels the Asia CCUS Network secretariat, on a voluntary basis, on capacity building, suggestions for CCUS studies, exchange visits to pilot projects, and formulation of the CCUS deployment strategy. The secretariat assigns members of the group as follows:

Group Composition

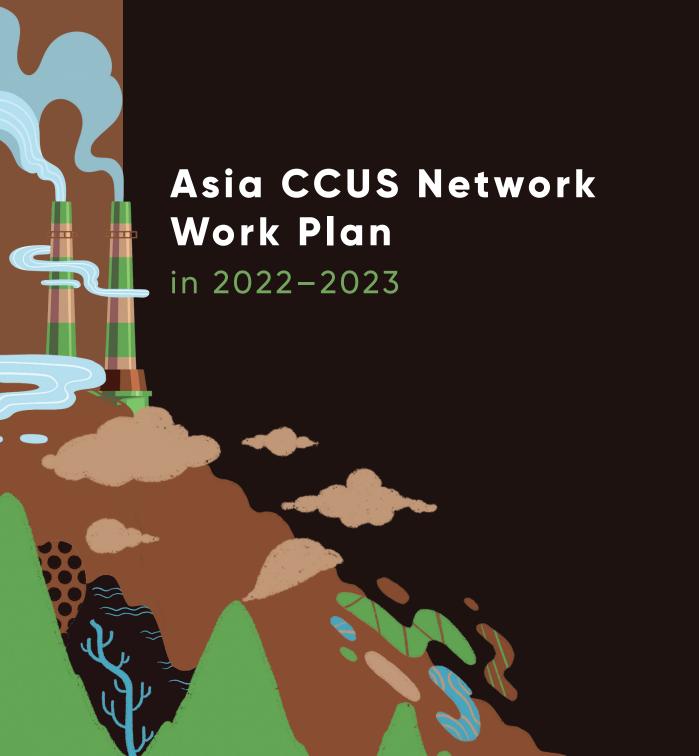
- ASEAN 10 countries and Australia, Japan, and the US to represent the members
- Experts at the request of the secretariat, from India; Japan Oil, Gas and Metals
 National Corporation; and GCCSI
- Any replacement of designated senior officers must be notified to the Asia CCUS Network secretariat through an official letter

Roles

- Substantial support to the secretariat
- Attend regular secretariat meetings (three or four times per year)
- Assessment and approval of the annual activity plan submitted by the Asia CCUS

 Network secretariat
 - Support to prepare the contents of the network's annual forum
 - » Sharing amongst advisory group members of opinions and experiences in developing CCUS in their countries

Advisory group meetings were held in 2021 on 18 February, 18 March, 7–8 June, 4 October, and 15 December. They discussed the network's progress and upcoming knowledge sharing, capacity building, and workshops; website development; and work plans.



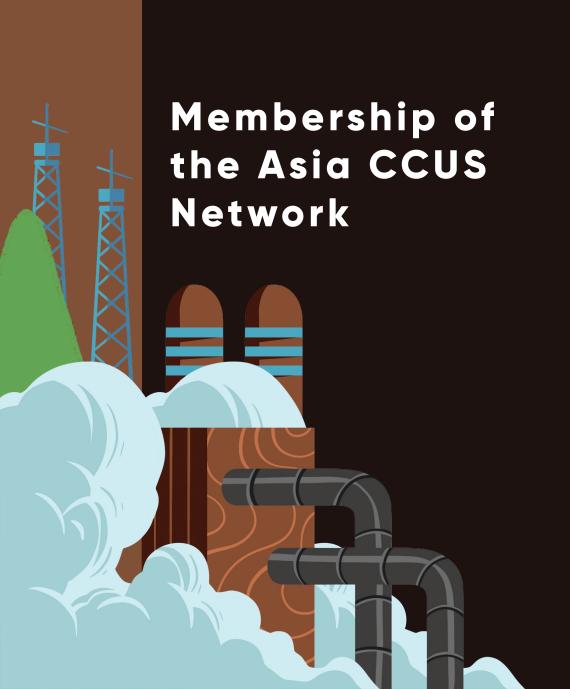
The annual work plan highlights knowledge sharing, research studies, and capacity building. The activities will help formulate policy to support CCUS development and deployment.

Activities 2022-2023

Component 1: Annual Work Plan Forum and Knowledge Sharing		
1.1	2nd Asia CCUS Network Forum to apply hybrid meeting system	Late September
1.2	Six knowledge-sharing conferences: Introduction of existing carbon capture, utilisation, and storage (CCUS) projects around the world	One every 2 months
Cor	nponent 2: Research Studies	
2.1	CO2 storage potential in Asia	Bid amongst supporting members
2.2	Establishment of the Asia carbon, capture, and storage (CCS) value chain	ditto
2.3	Legal and policy framework to deploy CCUS in Asia	ditto
2.4	Financial framework to deploy CCUS in Asia	ditto
2.5	Potential site for initiating a CCS demonstration project in ASEAN	ditto

3.1	Capacity-building training on financial issues to deploy CCUS:	November-December
	Focus on relationship between private and public funds	
3.2	Workshops on introducing results from the research studies	February-March 2023
	mentioned in component 2	
Con	nponent 4: Site Visit	
4.1	Tomokomai CCS project operated by JCCS	Late September
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Con	nponent 5: Advisory Group	
5.1	Advisory group meetings	3-4 times/year
0.1	Marioer, group moonings	
Con	nponent 6: Website	
6.1	Maintenance and update of the Website	At any time
6.2	Release of newsletter	Every quarter

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Members and supporting members of the Asia CCUS Network share its vision and support its mission. Any activities amongst network members and supporting members are to be conducted on a voluntary basis and not obliged.

Members and supporting members are encouraged to share their experience in and knowledge on CCUS development, either policy formulation or practical pilot projects. A network secretariat will conduct research on CCUS with technical assistance from the supporting members.

Advisory Members (13 country members)

- Ms Jocelyn Taylor (Manager, International CCUS Policy), Australian Government Department of Industry, Science, Energy and Resources, Australia
- Mr Takeshi Soda (Director Oil and Natural Gas Division, Agency for Natural Resources and Energy), Ministry of Economy, Trade, and Industry, Japan
- Mr Jesus Tamang (Director of Energy Policy and Planning Bureau), Department of Energy, Philippines
- Mr Hoan Tam (Deputy Head of Climate Change and Green Growth Office), Ministry of Industry and Trade, Viet Nam
- Mr Victor Jona (Director General of Energy)
 Ministry of Mines and Energy, Cambodia
- Mr Souksakhone Philavanh (Director Energy Law Division, Department of Law), Ministry of Energy and Mines, Government of the Lao PDR

- Ms Latha Ganesh (Senior Assistant Director, External Relations) Energy Market Authority, Singapore
- Mr Saleh Abdurrahman (Committee member)
 Downstream Oil and Gas Regulatory Body, Indonesia
- Mr Zaharin Zulkifli (Deputy Director), Energy
 Data and Research Unit, Strategic Planning and
 Communication Department, Energy Commission of Malaysia
- Mr Nopasit Chaiwanakupt (Senior Vice President, New Business Division), PTT Exploration and Production (PTTEP), Thailand
- Dr Ranjith Krishna Pai (Director/ Scientist-E),
 Technology Mission Division (Energy & Water), Ministry of Science and Technology, India
- Ms Soe Soe Nyein (Deputy Director), Oil and Gas Planning Department, Ministry of Electricity and Energy, Myanmar
- Ms Ayaka Jones (International Technical Advisor),
 Office of Fossil Energy and Carbon Management, U.S.
 Department of Energy, United State of America

Supporting Members

- Academia and Research Institutes (50 members)
- Finance Banking (12 members)
- Private Public (158 members)
- Regional and International Organisations (22 members)

Become a Supporting Member

If your organisation or institution is interested in becoming a supporting member of the Asia CCUS Network, please agree to the following conditions:

- You represent
 - » A public or private company
 - » Academia
 - » A financial institution or commercial bank
 - » A regional or international organisation
- Share the vision and support the mission of the Asia CCUS Network

Fill out the form







Asia CCUS Network Secretariat



As the network's secretariat, ERIA prepares and implements an annual activity plan including the following:

- Hold annual the Asia CCUS Network forum and CCUS conferences, workshops, and meetings.
- Select research studies and successful models that can be replicated or expanded to member countries.
- · Conduct capacity-building training sessions.

The secretariat prepares a 3-year rolling plan of activities, which embraces the basic principles of the following:

- Knowledge-sharing technologies, projects, business models, investment incentive options, policies, strategies, amongst others
- Research studies: mapping, feasibility studies, finance, amongst others
- Capacity-building training sessions: technologies, regulations, business models, amongst others
- Establishment of a one-stop knowledge centre in the form of the Asia CCUS
 Network website to provide up-to-date information on CCUS development in
 terms of technologies, business models, development, and deployment of CCUS
- Forming of partnerships with regional and international organisations, and initiatives related to CCUS activities



Contact us

Asia CCUS Network Website

www.asiaccusnetwork-eria.org

Asia CCUS Network Secretariat

Economic Research Institute for ASEAN and East Asia

Sentral Senayan II, 6th Floor, Jl. Asia Afrika No. 8, Jakarta 10270 Phone: (62-21) 57974460 E-mail: energy@eria.org The Association of Southeast Asian Nations (ASEAN) and the East Asia Summit (EAS) region are facing tremendous challenges regarding the future energy landscape and how the energy transition will embrace a new architecture – including sound policies and technologies to ensure energy access with affordability, energy security, and energy sustainability.

The Asia CCUS Network is an initiative based in Jakarta, Indonesia that facilitate the partnership to support knowledge and experience sharing and research activities related to carbon capture, utilisation, and storage (CCUS) and carbon recycling in supporting the goals of decarbonisation and economic growth in the Asia region.

