Chapter 3

Business Models

March 2021

This chapter should be cited as

ERIA (2021), 'Business Models', in Kimura, S., K. Shinchi, S. Kawagishi, and U. Coulmas (eds.), *Study on the Potential for the Promotion of Carbon Dioxide Capture, Utilisation, and Storage in ASEAN Countries.* ERIA Research Project Report FY2020 no.21, Jakarta: ERIA, pp.28-33.

Chapter 3

Business Models

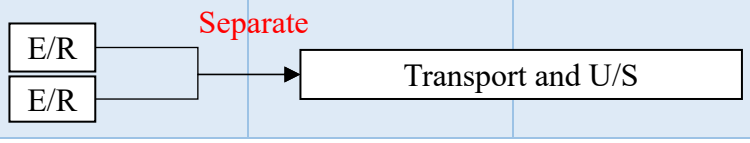
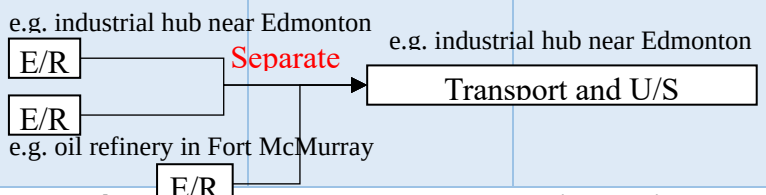
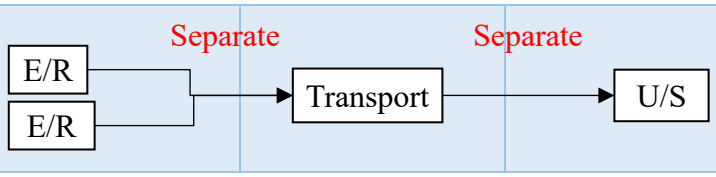
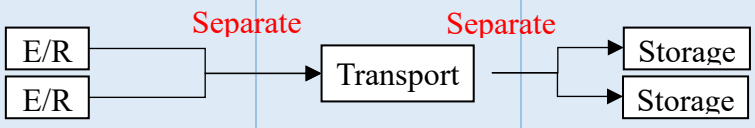
1. Case studies

As mentioned in the previous chapter, to ensure the longevity of carbon capture, utilisation, and storage (CCUS) projects, it is important to create financially healthy schemes covering each stage of the CCUS process. The financial hurdles already start at the beginning in capturing the carbon dioxide (CO_2). CCUS requires the emitters to install carbon capture equipment, which is still high in cost. There also needs to be feasible solutions to transport the captured CO_2. Then, the captured CO_2 has to be sequestrated at a safe location, if not used for other purposes. Finally, the sequestrated CO_2 is subject to monitoring over a year-long, or even decade-long, period of time to make sure there are no unforeseen or unwanted side effects or leakages. Each of these steps needs investment, and at a stage where there is no realistic chance for short-term profitability, private companies cannot cover all the investments on their own nor can financial institutions provide loans. Therefore, CCUS strongly relies on public funding.

The medium-term target should be to build up a new value chain for CO_2. This can only be realised by making CO_2 a marketable resource on a wider scale. Giving CO_2 a value and trading it like oil or other resources would make CCUS an autonomous scheme, reducing greenhouse gases in the atmosphere without being an economic burden. Although carbon trading schemes in Europe and carbon-based tax incentives in the United States give some incentives, we are not yet at the stage where financial institutions and the private sector see it as a promising business opportunity despite the existence of some encouraging projects. CCUS projects need to be not only ecologically but also economically attractive for widespread deployment.

A promising business structure that reduces both cost and risks whilst striving for economy of scale is a model that involves multiple stakeholders, such as CO_2 emitters and those involved in transport and storage. Such a business model would not only reduce costs by sharing some of the infrastructure, including CO_2 pipelines and storage sites, but also enable risk- and responsibility-sharing amongst the stakeholders. Several types of these so-called ‘hub and cluster’ models are shown in Figure 3.1. There are some promising projects taking place, as explored in detail in the subsequent sections.

Figure 3.1. Examples of Various Hub and Cluster models of CCUS

No.	Type	Emission/Recovery (E/R)	Transport	Utilisation/Storage (U/S)
1	Neighbouring emitters share transport/storage facility			
		[Comment] A typical hub and cluster model. Reduces risk/cost by separating E/R and U/S.		
2	Variation of Type 1 that includes distant emitter			
		[Example] Heartland Area Redwater Storage PJ (Canada) [Comment] Sharing of storage facility, high transport cost.		
3	Different ownership for transport and storage			
		[Example] Peterhead PJ (United Kingdom) [Comment] Improved flexibility of transport and storage facilities		
4	Multiple storage sites			
		[Example] Teesside Low Carbon PJ (United Kingdom) [Comment] Improved flexibility of transport and storage facilities. Possibility of improved profitability when tax rates differ based on storage type (enhanced oil recovery, storage).		

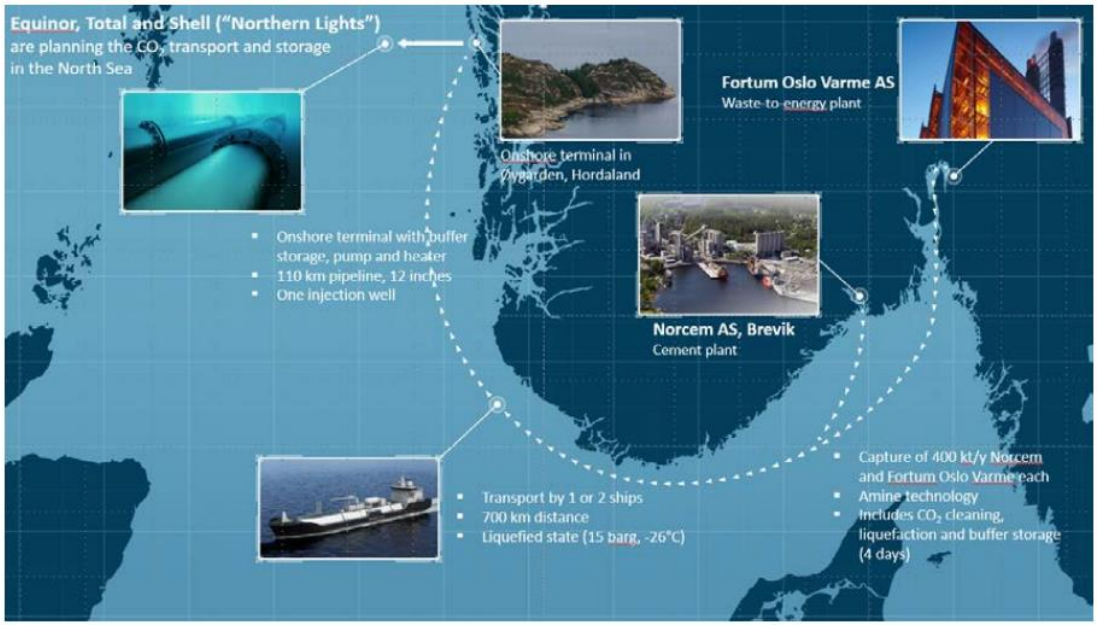
Source: Created by project members based on METI (2020).

1.1. CO_2 transport and storage service: Longship (Norway)

Norway is one of the most ambitious countries in the field of carbon capture and storage (CCS). It already recognised the necessity of capturing and permanently storing CO_2 in the early 1990s and has been actively engaged in CCS since that time. Norway has been attracting attention as one of the most ambitious countries in the field in recent years as a CCS pioneer. Norway's government is promoting the research and development of CCS technologies and large-scale demonstration projects towards commercial CCS as a national agenda.

'Longship', or 'Langskip' in the native language, is Norway's most recent and most ambitious initiative aiming to build up the first commercial CCS infrastructure. An important characteristic of Longship, and Norway's approach towards CCS, is its two-pillar structure. As demonstrated in Figure 3.2, the initiative contains three projects. Two of these projects, a cement plant and a waste treatment plant, are focusing mainly on the capturing process. The other one, Northern Lights, is responsible for the transport and storage. Each project is implemented individually by the responsible companies. Longship's main target is to prove the feasibility of full-scale CCS to show that the capture and storage of CO_2 can be executed on a large scale and pave the way for a wider contribution in the future. The two-pillar structure, which promotes the capturing sites and the transport-to-storage service individually, is a realistic approach for a potential business model. In future, CO_2 transport and storage companies could offer a similar service like conventional waste management companies, but for CO_2 emitters. Each emitter will only have to bring its 'CO_2 garbage bin' to a collecting hub like a harbour or train station. Separating the CO_2 transport and storage infrastructure from the CO_2 capture projects reduces the overall commercial risk and cost of the CCUS value chain.

Figure 3.2. Overview of the Longship Project



Source: Gassnova (2019).

1.2. Hub and cluster CCUS for the community: Net Zero Teesside and Zero Carbon Humber (United Kingdom)

The United Kingdom (UK) is promoting another approach to implementing CCUS. In 2018, the government announced an action plan for the social implementation of CCUS, which targets deploying CCUS at scale and in an economically feasible way by the 2030s. The government has made close cooperation between the public and private sectors a top priority in promoting CCUS (HM Government, 2018).

A decisive strategy is to facilitate CCUS deployment through the utilisation of existing infrastructure. Developing a viable business model, sharing transport and storage infrastructure, and strategically reusing existing oil and gas industry assets (pipelines and depleted oil fields, etc.) can significantly reduce the initial costs of building up a CCUS value chain.

A second important strategy is to develop clusters as a regional group in which multiple CCUS facilities share information and infrastructure. This will lead to the promotion of CCUS cost reductions and is expected to enhance the regional economy. Revitalisation of the regional economy would again promote continuous technological innovation and create a virtuous cycle that accelerates innovation in the CCUS field. To promote and accelerate innovation that leads to cost savings across the sector, the UK is planning to develop at least two CCUS clusters that can be operated from the mid-2020s. These two projects are Net Zero Teesside and Zero Carbon Humber, as described in Figure 3.3. They are located in industrial areas off the North Sea in the north-eastern part of England, which have been a high-emission industrial cluster for many years with the steel and chemical industries. The projects were launched with the aim of completely decarbonising the region by 2030. Both projects will start the decarbonisation in stages from 2026. The concept combines CCUS with the utilisation of low-carbon hydrogen by large-scale offshore wind farms that will supply renewable energy to the clusters. The two industrial clusters will build up a CO_2 and hydrogen transportation network and share storage facilities. In future, they can become hubs for an international CO_2 and hydrogen transportation network. Sharing the North Sea with Norway and other nations, there is a possibility of bilateral or multilateral cooperation to form a North Sea CCS network. This would offer northern European countries an ideal platform for CO_2 trading and CCS-related services, stimulating the marketability of CO_2.

Figure 3.3. Overview of Net Zero Teesside and Zero Carbon Humber

Source: Net Zero Teesside (2020).

2. Ramifications for ASEAN and East Asia

The perceptions and acceptance of CCUS amongst ASEAN Member States and countries in East Asia countries are quite diverse. Some countries are already actively funding and promoting CCUS projects, from basic research projects to large-scale testing sites. Other countries are still observing the concept of CCUS and the related technology with caution. However, most of them agree that CCUS can play a vital role in the fight against climate change. It is, therefore, important to maintain close multilateral collaboration between the nations. CCUS is still a field where a lot of research and development happens. This includes technological achievements, geological requirements, risk assessment, law-making, and considerations about carbon pricing. The concept of CCUS aims to create a new economic structure for CO_2 by making it a marketable resource. Cautious observations from nations, companies, and individual experts are targeted at the environmental, geological, technological, and financial feasibility. So, sharing information about the newest achievements with a wide audience will be essential for including as many players as possible.

Even though the economic and environmental situation, as well as the industrial structure of each country, shows big differences, there are some key components that might help to paint a hypothetical picture of what a multilateral CCUS collaboration could look like. Countries like Norway, the Netherlands, and the UK are already taking the first steps towards building a CO_2 transportation network, and in future surely also a trading network. From these countries, the Netherlands and the UK are trying to restructure existing industrial clusters that are traditionally high-emitting areas into large-scale, low-carbon CCUS clusters. Those clusters have an oil or gas industry background with refineries, access to pipelines, and exploited gas fields. These are characteristics that many industrial port cities in the ASEAN region fulfil. Industrial port cities are, without exception, carbon-

intensive areas and account for a big part of each country's carbon footprint. At the same time, they are well-connected locations with maritime access to other countries. Most of the ASEAN Member States and countries in East Asia depend heavily on maritime traffic and, therefore, have relatively sophisticated ports. This offers the ideal requirements to strive for a CCUS hub and cluster network. Singapore, Japan, and the Port of Rotterdam Authority recently signed a memorandum of cooperation, seeking to collaborate for the development of a clean maritime fuels network. In future, this kind of network could be extended towards CO_2 and hydrogen trading. Countries with underground storage potential could offer storage services such as Northern Lights in Norway, offering high-emitting countries carbon solutions for reasonable prices. Costs for individual projects are still high and, as stated above, there is no existing CO_2 market yet that can immediately attract private companies to offer low-cost, low-carbon solutions. Therefore, it is vital for the further development of CCUS in the ASEAN region to further encourage information and knowledge sharing. Developing a model CCUS cluster as a multilateral joint project would not only help to collect essential experience but would also initiate participating countries to promote common regulations and standards for a regional CCUS network.