# Chapter 3

# Regulatory and Policy Study

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# Chapter 3

# Regulatory and Policy Study

## 1. Background and Introduction

The main barrier inhibiting investment in CCS projects is the uncertainty of the scope of responsibility and risks that CCS operators need to undertake. Ensuring a legal and regulatory framework covering the entire life cycle from the planning to post-closure and clarifying processes and responsibilities is an important step to remove those barriers and advance CCS deployment in ASEAN countries. This section examines approaches to formulate the CCS legal framework in ASEAN countries by investigating (i) the general outline of CCS legal frameworks, (ii) the status of CCS legal frameworks in ASEAN countries, (iii) a global case study in CCS regulatory frameworks of CCS-leading countries, and (iv) possible solutions that ASEAN countries can adopt. This section also covers the policy incentives introduced for CCS/CCU in various countries.

## 2. General Outline of CCS Regulatory Framework

A legal and regulatory framework for CCS addressing the entire life cycle of CCS projects and clearly defining the steps and responsibilities of each participating party is a crucial part of improving the chances of large-scale CCS deployment. In considering the framework, the following items are generally recommended to be examined to establish a high-level outline of the CCS legal and regulatory framework. Each item is elaborated in the following section.

**Table 3.1: Summary of the General Outline of CCS Legal and Regulatory Frameworks**

| Theme | Contents |
|---|---|
| Coverage | A CCS legal and regulatory framework covering a whole CCS project life cycle and aligning with the project life cycle is desirable to clarify roles and responsibilities for each participating party in each step of a CCS project. |
| Issues | Barrier issues specific to CCS projects should be addressed in legal and regulatory frameworks. Some barriers will be addressed in coordination with existing rules where appropriate. |
| Scope | The legal and regulatory frameworks for CO2-EOR and CO2-CCS operations offer different models as the objectives of each operation differ. |
| Approach | Developing a CCS legal and regulatory framework varies from country to country. These include utilising the existing regulations that govern the oil and gas sector, developing stand-alone CCS-specific regulations, or developing project-specific CCS regulations. |

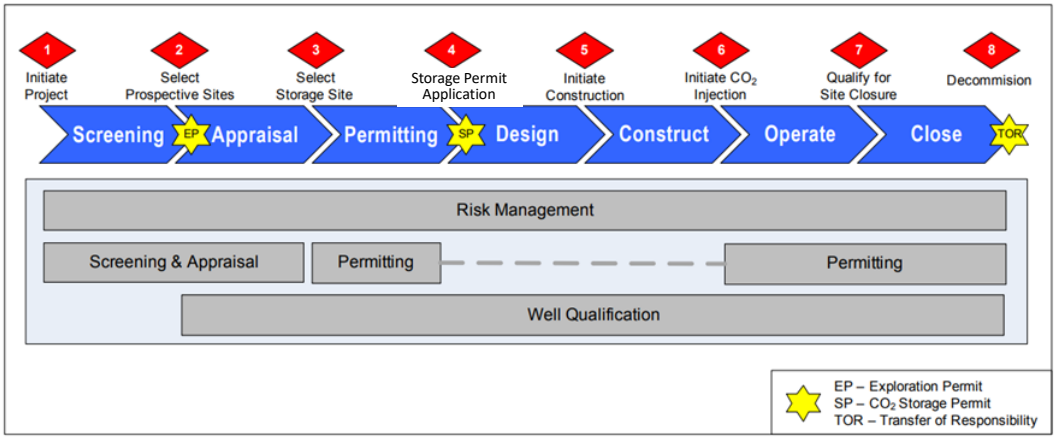
CCS = carbon capture and storage, EOR = enhanced oil recovery.

Source: Created by the Author (2021).

## 2.1. Coverage: Life cycle diagram for a CCS project

Figure 3.1 shows the life cycle diagram of a CO2 geological storage project. The decision gates for a CCS project include (i) initiating the project; (ii) selecting prospective sites; (iii) selecting storage sites; (iv) storage permit application; (v) initiating construction; (vi) initiating CO2 injection; (vii) qualifying for site closure; (viii) decommissioning; and (ix) a responsible agency granting permits to a CCS operator for exploration, CO2 storage, transfer of responsibility, or their equivalent during the life cycle of a CCS project. In clarifying each participating party's roles and responsibilities in a CCS project, it is necessary to consider the legal and regulatory framework that covers the whole project life cycle.

**Figure 3.1: Life Cycle Diagram of a CO2 Geological Storage Project**




Note: Well qualification - the process of providing the evidence that a given well will function within specific limits with an acceptable level of confidence.
Source: DNV (2013).

## 2.2. Issues: CCS-specific barrier issues

Table 3.2 summarises barrier issues specific to the CCS planning phase thru the post-closure phase. In developing and deploying CCS, legal and regulatory frameworks should address these barrier issues and clarify operators' processes, responsibilities, and roles in implementing CCS. Some barriers, such as pipeline access and environmental requirements, should be addressed in coordination with existing rules where appropriate. On the other hand, other issues, such as long-term liability, stewardship, and public acceptance, are anticipated to be handled with specific provisions for CCS.

**Table 3.2: Barrier Issues for CCS Projects**

| Item | Barrier Issue |
|---|---|
| Pore space and storage site access | • CCS projects must have access to geological pore space for CO2 storage and/or access to storage sites.<br>• In some jurisdictions, pore space and/or storage sites are privately owned or owned by the national, provincial, or state government. |
| Pipeline access | • CCS projects must have access to pipelines and pipeline routes to transport $CO_2$ from source to storage facility.<br>• Some jurisdictions have existing rules for CO2 pipelines or other pipeline rules that may be used or modified. |
| Rules for geological storage | • Some jurisdictions have no rules for geological storage facilities.<br>• Establish rules for permanent storage that address site selection; suitability of storage formations; environmental requirements; purity of stream requirements; ownership of injected CO2; MRV requirements; storage operator financial responsibility and financial security; site closure, certification, and abandonment; and harmonisation with hazardous waste rules |
| Long-term liability and stewardship | • $CO_2$ must be stored indefinitely. However, indefinite responsibility and liability for storage facility operators are neither practical nor conducive to CCS deployment.<br>• Assumption of liability and long-term stewardship by government bodies, trusts, or other entities with perpetual existence after completion of the post-injection monitoring period |
| Public acceptance | • Public acceptance is essential to CCS deployment because of concerns about CCS effectiveness and risk associated with transport and underground storage of large quantities of material. |

MRV = measurement, reporting, and verification.
Source: Created by MRI based on Russial (2011).

## 2.3. Scope: CO2-EOR and CO2-CCS operations

The legal and regulatory frameworks for CO2-EOR and CO2-CCS operations offer different models (Table 3.3). For CO2-EOR, hydrocarbon recovery is the primary objective, and CO2 storage is incidental so that the regulatory model could be built on the existing law governing oil and gas and related activities. In contrast, CO2 reduction is the primary objective for CO2 storage, so a more detailed definition is required to ensure that CO2 is injected for permanent storage.

**Table 3.3: Legal and Regulatory Frameworks for CO2-EOR and CO2-CCS**

| Topic | CO2–based EOR | CCS–based CO2 Injections and Storage |
|---|---|---|
| Overview | In the CO2-EOR model, geologic storage of the injected CO2 is a necessary incident of hydrocarbon recovery operations but is not itself an objective. | In CO2–CCS operations, the objective is to ensure reductions of anthropogenic CO2 emitted into the atmosphere. |
| Legal and regulatory framework | The regulatory model is built on a foundation of the commercial law governing oil and gas and related activities. | The principal components are based, to a significant degree, on pre-existing waste disposal regulations, especially for the CCS Directive of the European Union. |
| Feature | There has traditionally been no need to develop standards for measuring, verifying, or monitoring the CO2 injections or reporting such data on a standardised basis to verify permanence. | The standards being considered for adoption may be considerably more prescriptive and extensive than those applied to otherwise comparable CO2 injections in EOR operations. |

EOR = enhanced oil recovery.
Source: Created by MRI based on GCCSI (2013).

### 2.4. Approach: examples for developing legal and regulatory frameworks

Approaches to developing CCS-specific legal and regulatory frameworks vary from region to region and country to country. The United States (US) has enhanced the existing legal framework by adding CCS-specific provisions. On the other hand, the European Union (EU) has opted to develop a stand-alone CCS-specific legal framework. Some regional governments in Australia have opted for a stand-alone CCS legal framework. In contrast, other regional governments have introduced CCS regulations for a specific project, such as The Barrow Island Act in Australia.

**Table 3.4: Different Approaches for CCS-specific Legislation**

| Approach | Description | Examples |
|---|---|---|
| 1. Enhance existing legal frameworks with CCS-specific provisions | • A method that builds on existing laws and regulations governing oil and gas and related activities and adds CCS-specific laws and regulations<br>• The resulting legal framework includes requirements for permitting exploration and storage activities, monitoring and reporting obligations, liability and financial security provisions, as well as a process to enable the eventual closure and long-term stewardship of storage sites. | • United States |
| 2. Stand-alone CCS-specific legal frameworks | • Legal frameworks that include coherent processes for selecting underground storage sites, permitting exploration and storage activities, monitoring and reporting, liability and financial security provisions, and closure and long-term stewardship of storage sites | • European Union<br>• Australia |
| 3. CCS project–specific legislation | • CCS project-specific legislation regulates the operations of a single project. An example may be found in The Barrow Island Act regulating Western Australia's Gorgon CO2 injection project. | • The Barrow Island Act in Australia |

Source: Created by MRI based on GCCSI (2021a).

### 3. Status of CCS Legal and Regulatory Framework in ASEAN

As illustrated in Table 3.5, the Asian Development Bank (ADB) and others investigated the legal and regulatory frameworks for CCS in Indonesia, the Philippines, Thailand, and Viet Nam. These studies mentioned that CCS legal and regulatory frameworks are not yet in place in these four countries, except for some provisions for CO2-EOR. On the other hand, Indonesia developed a draft of a CCS-specific legal framework (draft CCUS presidential decree) with ADB's support in 2019. The contents of the regulations are based on existing Indonesian regulations for the upstream oil and gas sector, with additional content specific to CCS. Given the similarities between regulations governing oil and gas and legal and regulatory frameworks for CCS, the studies indicate that utilising existing oil and gas laws is a possible step to be taken to develop legal and regulatory frameworks for CCS in these four countries.

**Table 3.5: Status of Regulatory Framework in Some ASEAN Countries**

| Issue | | Indonesia | Philippines | Thailand | Viet Nam |
|---|---|---|---|---|---|
| Surface and subsurface rights for CO2 transport and storage | Status | No laws exist for CCS ownership, grant, or lease of surface or subsurface pore space. Only the government has the power to grant mineral rights (including oil and gas), which are typically provided through production-sharing contracts. | | | |
| | Required for CCS | CCS will require long-term access through ownership, grant, lease, or contract to surface and subsurface rights, including access to pore space for storage. | | | |
| CO2 transport | Status | No existing regulator for CO2 pipeline. | | | |
| | Required for CCS | Clear regulatory and legal framework defining who can build, own, and operate pipelines (or other means) used to transport CO2 for CCS. | | | |
| Legal liability of CCS operations and for stored CO2 | Status | No current framework for legal liability exists for CCS. | | | |
| | Required for CCS | Short-term and long-term liabilities can arise. Short-term liability relates to operations (environment, health, safety). Long-term liability relates to environmental and health risks from leakage, contamination, or migration. CCS liability can be addressed by adapting existing liability rules for minerals. | | | |
| Environmental protection | Current status | No environmental protection rules exist for the CO2 capture process, transport, injection, or storage. | | | |
| Health and safety | Status | Standards for general occupational health and safety, as well as health and safety specific to oil and gas, are available. No CCS-specific standards currently exist. | | | |
| | Required for CCS | A clear definition of health and safety for workers and for CCS operations will be required; some will be adapted from existing rules. | | | |
| Enhanced oil recovery (EOR) | Status | Limited regulations for CO2-EOR are available in some countries. | | | |
| | Required for CCS | A clear approach to how CO2-EOR will be integrated into the production-sharing arrangement and built into oil-gas field development programmes will be required. | | | |

Source: Created by MRI based on ADB (2013).

## 4. Global Case Study in Legal and Regulatory Framework for CCS

Table 3.6 shows the regulatory framework in CCS-leading countries, including the EU, Australia, the US, and Norway. Out of leading countries in CCS, the EU has introduced a comprehensive regulation while the US has developed CCS regulations based on existing environmental legal frameworks. Australia has developed stand-alone CCS legislation for federal, state, and project levels. In many EU and European Economic Area countries, the CCS Directive was later incorporated into the existing legal frameworks of each country. For example, some existing regulations were used in Norway or amended, while some were newly created to implement the EU CCS Directive.

ASEAN can also adopt a similar pattern, where basic principles are set for the region while each country develops its regulations either by amending existing ones or creating new ones.

**Table 3.6: Regulatory Framework in CCS-leading Countries**

| Regulatory Type | Region/ Country | Main Regulation | Major Projects |
|---|---|---|---|
| Comprehensive/ stand-alone CCS regulation | European Union | CCS Directive | CarbFix, Acorn, etc. |
| | Australia | Federal Level:<br>・ Offshore Petroleum and Greenhouse Gas Storage Act<br>State Level:<br>・ e.g. Victoria's Greenhouse Gas Geological Sequestration Act 2008<br>Project Level :<br>・ e.g. Barrow Island Act 2003 applied to Gorgon Project (for onshore and offshore within 3 nautical miles) | Gorgon Project |
| Using existing environmental regulation | United States | 'UIC Program' based on Safe Drinking Water Act | Various |
| Comprehensive regulation is incorporated into existing regulations | Norway | **[Existing]**<br>・ 1963 Act on Research, Exploration and Exploitation of Other Natural Resources than Petroleum on the Ocean Floor<br>・ 1996 Act Relating to Petroleum Activities<br>・ 1981 Act Concerning Protection Against Pollution and Concerning Waste<br>**[Amended or developed based on CCS Directive]**<br>・ 1997 Regulations to Act Relating to Petroleum Activities | Longship/ Northern Lights |

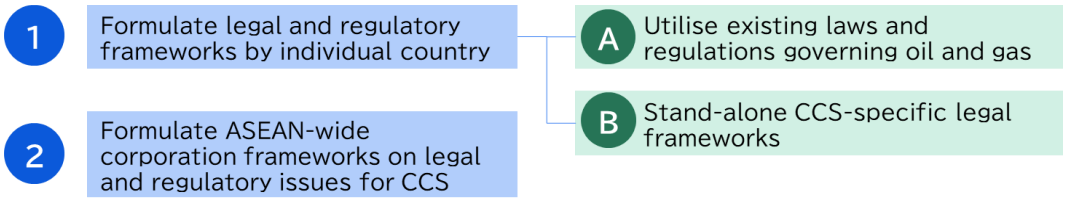
| | | | |
|---|---|---|---|
| | | ・2014 Regulations Relating to Exploitation of Subsea Reservoirs on the Continental Shelf for Storage of CO2 and Relating to Transportation of CO2 on the Continental Shelf<br>・2017 Regulations Relating to Material and Documentation in Connection with Exploration for and Exploitation of Subsea Reservoirs on the Continental Shelf for Storage of CO2 | |

Source: Created by MRI based on METI (2020).

## 5. Desired Regulatory Framework for ASEAN

As mentioned in the previous section, there are several approaches to develop legal and regulatory frameworks for CCS, including enhancing existing legal frameworks with CCS-specific provisions, stand-alone CCS-specific legal frameworks, and CCS project–specific legislation (Figure 3.2). Whichever approach is adopted, CCS-specific issues – pore space and storage site access, pipeline access, rules for geological storage, long-term liability/stewardship, public acceptance, etc. – must be addressed to clarify the processes, responsibilities, and roles of each participating party. Based on the CCS regulatory frameworks of CCS-leading countries, the following three optional approaches can be adopted in the ASEAN region, where legal and regulatory frameworks for CCS will be newly developed as CCS projects gain importance in the context of emission reductions.

**Figure 3.2: Possible Approaches for Developing a Regulatory Framework in ASEAN**




ASEAN = Association of Southeast Asian Nations; CCS = carbon capture and storage.
Source: Created by MRI (2021).

Out of three options, option 1A – formulating legal and regulatory frameworks by individual country or utilising existing laws and regulations governing oil and gas – may be the first step in developing a CCS-specific legal and regulatory framework since it can be considered in a single country and can use existing regulations as a fundamental basis. Option 1B – formulating legal and regulatory frameworks by individual country/stand-alone CCS-specific legal frameworks – would be another option for a single country to develop and use as a comprehensive legal framework. On the other hand, option 2 –

formulating ASEAN-wide corporation frameworks on legal and regulatory issues for CCS – may be a desirable approach for the ASEAN region in the long run for the following reasons:

- Large-scale emission reductions, including hard-to-abate sectors, will be required to achieve net-zero emissions in the future, and robust legal and regulatory issues for CCS will play a significant role in the ASEAN region.
- Multiple issues are specific to CCS, and it will take time to examine the legal and regulatory issues for CCS in individual countries.
- Emission sources and possible storage sites may be located far away from each other, so cooperation amongst multiple countries may be necessary to develop regional hub-and-cluster projects in the ASEAN region in the future.

The delay in the development of CCS laws and regulations that clarify the scope of risks and responsibilities will cause a delay in securing financing, ending up hindering the scalability of CCS projects. An ASEAN-wide cooperation framework on legal and regulatory issues for CCS, which serves as a common guideline for CCUS in the ASEAN region that breaks through the limitations of individual legal systems, will potentially advance CCUS development in the region.

## 6. Policy Incentives for CCUS

This section covers the policy incentives for CCS, CCUS, and CCU projects. The scale of CCUS projects is relatively large compared to other emission reduction measures. It requires long-term risk management; therefore, CCUS faces specific challenges, especially in the initial scaling-up phase. In developing CCUS projects as profitable business cases, policy incentives can accelerate the smooth transition from the R&D phase to the demonstration phase and the demonstration phase to the commercial phase. Policy measures for CCUS include direct capital grants, tax credits, carbon pricing mechanisms, operational subsidies, etc. Continuous support for innovation is also needed to drive down costs and develop and commercialise new technologies. Table 3.7 shows representative policy instruments adopted in various counties to promote CCUS.

**Table 3.7: Main Policy Instruments for CCUS Development and Deployment**

| Category | Types | Examples |
|---|---|---|
| Grant support | • Capital funding provided directly to targeted projects or through competitive programmes to overcome high upfront costs | • UK CCUS Infrastructure Fund<br>• EU Innovation Fund |
| Operational subsidies | • Tax credits based on CO2 captured/stored/used<br>• Contracts-for-difference (CfD) mechanisms covering the cost differentials between production costs and a market price<br>• Feed-in tariff mechanisms with long-term contracts with low-carbon electricity producers<br>• Cost-plus open book mechanisms in which governments reimburse some costs as they are incurred, reducing risk for the contractor | • US 45Q and 48A tax credits<br>• Netherlands' SDE++ scheme<br>• UK power sector<br>• CfD arrangements |
| Carbon pricing | • Carbon taxes, which impose a financial penalty on emissions<br>• Emission trading schemes (ETSs) involving a cap on emissions from large stationary sources and trading of emissions certificates | • Norway carbon tax on offshore oil and gas<br>• European ETS<br>• China ETS<br>• Canada federal Output-based Pricing System |
| Demand-side Measures | • Public procurement of low-CO2 building materials, transport fuels, and power, including those produced with CCUS<br>• Border adjustments, adding a carbon tariff on imported goods to prevent competition from those with higher CO2 and a lower price | • Canada's and The Netherlands's rules favouring low-CO2 material inputs for construction projects, etc. |
| CCUS-specific market mechanisms | • Tradable certificates or obligations, such as fuel standards favouring low-carbon fuels for transport or stationary applications<br>• Carbon storage units based on a verified | • Carbon sequestration units of Saudi Arabia<br>• C-capsule, tradable |

| | | |
|---|---|---|
| | record of CO2 securely stored, which could be purchased by emitters from those storing carbon (proposed). | carbon removal certificate (private initiative) |
| Regulatory standards and obligations | · Mandates on manufacturers to meet emissions criteria or oblige firms to purchase a minimum share of products with low life-cycle CO2 emissions<br>· Regulated asset base, a model for investment recovery through a regulated product price passed on to consumers<br>· Emissions standards establishing limits on unabated CO2 emissions | · EU Renewable Energy Directive II<br>· Australia–Gorgon LNG project CCS requirement<br>· UK energy and infrastructure markets employ a regulated asset base model, etc. |
| Risk mitigation measures | · Loan guarantees covering project developers' debt should they default on loans<br>· Pain-gain risk-sharing mechanisms whereby partners share some projects risks<br>· CO2 liability ownership, in which governments take a share of liability for stored CO2, particularly after project closure | · Australian legislation allowing the transfer of CO2 liability to the state |
| Innovation and research and development (R&D) | · Funding for R&D, either directly in state-run research institutions or indirectly through grants and other types of subsidy for private activities<br>· Competitive approaches to support R&D for low-carbon technology | · Canada/US Carbon XPRIZE<br>· EU Horizon 2020<br>· US Department of Energy CCUS R&D programmes |

Source: Created by MRI based on IEA (2020).

The UK CCUS Infrastructure Fund and US 45Q tax credits are summarised as examples of policy instruments for CCUS development and deployment.

**Example #1: Grant Support: UK CCUS Infrastructure Fund**

The UK government has committed to deploying CCUS in two industrial clusters by the mid-2020s and four industrial clusters by 2030. The CCS Infrastructure Fund (CIF) supports capital expenditure on transport and storage networks and industrial carbon capture projects (Table 3.8).

**Table 3.8: Summary of UK CCUS Infrastructure Fund**

| Item | Description |
|---|---|
| General information | The CIF is expected to primarily contribute to the capital costs of establishing transport and storage (T&S) infrastructure and early industrial capture projects. The CIF will support in delivering the following:<br>• Establishing a new CCUS sector<br>• Enabling low-cost decarbonisation in multiple sectors<br>• Developing a market for carbon capture |
| Phase | The CIF will be allocated to projects via the two-phase cluster sequencing process.<br>• Phase 1: the government will provisionally sequence those that are most suited to deployment in the mid-2020s onto Track 1<br>• Phase 2: the government will receive applications from individual projects across capture applications to connect to the Track 1 clusters |
| Budget | The allocation of £1 billion was confirmed in November 2020. |
| Allocation | The CIF is expected to be allocated to clusters through the proposed cluster sequencing process, along with:<br>• Business models for T&S, power, industrial carbon capture (ICC), low-carbon hydrogen, and potentially bioenergy with carbon capture and storage, which include:<br>➢ a revenue mechanism to bring through private sector investment into ICC and hydrogen projects;<br>➢ an economic licence that grants the licensee a regulated revenue stream facilitated by the right to charge a regulated fee (the 'T&S fee') from completion of construction; and<br>• capital expenditure for CCUS-enabled 'blue' hydrogen projects from the £240 million net-zero hydrogen fund. Funding for electrolytic 'green' hydrogen projects will be allocated separately. |

Source: Created by MRI based on BEIS (2021).

**Example #2: Operational subsidies: US 45Q Tax Credit**

The carbon oxide sequestration credit – 45Q – named after the relevant section in the US Tax Code, applies to carbon dioxide (CO2) and other carbon oxides (e.g. carbon monoxide). It provides a certain amount of monetary credit for carbon oxide permanently stored via usage, tertiary oil injection, or in geologic formations, as described in Table 3.9.

**Table 3.9: Summary of US 45Q Tax Credit**

| Item | Description |
|---|---|
| Credit amount (per metric tonne of CO2) | • Geologically sequestered CO2: US$31.77 in 2020. Increasing to US$50 by 2026, then inflation-adjusted<br>• Geologically sequestered CO2 with EOR: US$20.22 in 2020. Increasing to US$35 by 2026, then inflation-adjusted<br>• Other qualified use of CO2: US$20.22 in 2020. Increasing to US$35 by 2026, then inflation-adjusted |
| Claim period | • 12-year period once the facility is placed in service. |
| Claim period | • Begin construction before 1 January 2026 |
| Annual capture requirements | • Power plants: capture at least 500,000 t.<br>• Facilities that emit no more than 500,000 t/year: capture at least 25,000 t<br>• Direct Air Capture (DAC) and other capture facilities: capture at least 100,000 metric tonnes |
| Eligibility to claim credit | • The person who owns the capture equipment and physically or contractually ensures the disposal, utilisation, or use as a tertiary injectant of the CO2. |

Note: Different elements are applied for the equipment placed in service before 9 February 2018.
Source: Created by Author based on Congressional Research Service (2021).