

Transboundary Chains for CO₂ Enhanced Oil Recovery

Legal Contexts for CO₂ Injection in the North Sea

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Caveat

The views and opinions expressed by authors in this publication are those of the authors and do not necessarily reflect those of the project sponsors.

This report is intended to give an overview of legal issues surrounding transboundary chains in the North Sea region, and is not a comprehensive review of all EOR and CCS legal issues and developments in the relevant areas of law and practice. Therefore, the intention of this report is for general information purposes and should not be construed as legal advice. The author expressly disclaims any and all liability in respect of actions taken or not taken based on the content of the report.

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Executive Summary

CO₂ storage is regulated by EU States within their exclusive economic zone (EEZ), of up to 200 nautical miles. Transboundary issues are twofold: firstly CO₂ may originate in a different member state, to be injected beneath waters of a different state; secondly fluid movement after injection may physically relocate CO₂ into pore space beneath the waters of an adjacent member state. The issue of transboundary pressure interference is not considered. Evidence was gained from reviewed publications, and grey reports, together with interviews with experts from seven stakeholder groups

The two most relevant treaties are 1) OSPAR, to which a modification was ratified in 2007 and “formally enables” cross-border transport for the purposes of CO₂ storage, including CO₂-EOR; 2) the London Protocol has enabled CO₂ storage from 2007. However, transboundary movement of CO₂ under Article 6 has still to be ratified and requires agreement by 2/3 (i.e., 27 of 40) signatories to the Protocol. However CO₂ used for EOR will be exempt, as it is related to the exploitation of seabed mineral resources, including hydrocarbons. A second method to enable transboundary CO₂ movement is that two states can bilaterally agree the export of CO₂ for storage.

Small quantities of CO₂ for food and drink are already moved as commodities by ship between North Sea states, and provide a precedent, although scaling this up 1,000x may require diplomatic support. It is unclear within the CCS Directive, if transport of CO₂ by ship removes liability to purchase EU-ETS certificates, even if CO₂ is later securely disposed by EOR, because ships are outwith the EU-ETS. A solution is for the State receiving CO₂, to opt-in those ships as EU-ETS facilities. Licensing and standards (IGC code) for larger CO₂ ships need to be adapted, but multiple small vessels can already work. The design concepts for larger vessels are completed. Shipping is seen as simpler, with fewer and smaller liability and legacy problems, than modifying or constructing pipelines.

For transboundary chains of CO₂ pipeline transport, and storage sites which straddle licence boundaries, or straddle international boundaries, the existing hydrocarbons legal approach to unitisation and cost sharing is likely to be adaptable. To enable conversion of oilfields to EOR, suitable fiscal incentives are needed. For these EOR purposes, CO₂ should be legally defined as a commodity, not a waste. However if an EOR project transitions into being pure CO₂ storage, then definition of CO₂ as a waste triggers greater difficulties in transport, monitoring, and certification of storage – including difficulty of export from one State to another under the London Protocol.

Liability concerns can be at state level, usually undertaken by negotiation, and at civil level. EU liability law is not harmonious between states. Diligence during normal project evaluation by legal firms, can make multilateral private contract consortium agreements. Bilateral state agreements may be useful to define the physical location of shipping under the CCS Directive, or to allocate regulatory responsibility and leakage liability for cross-border pipelines or storage sites. Private commercial contracts, adapted from hydrocarbons, will need to consider liability more closely than the existing “loss of income” approaches currently taken.

In summary, CO₂-EOR project chains face no special legal challenges around the North Sea, provided that CO₂ is defined as a commodity not a waste. CO₂ shipping implies less cost and liability, but may lose EU-ETS exemption if bilateral agreements are not made. EU Commission needs to provide Directive guidance to include CO₂ shipping within EU-ETS. Pipeline transport of CO₂ for EOR has no legal impediment. Successful EOR projects could provide exemplars to establish pragmatic ratification of London Protocol article 6, which currently prohibits transboundary CO₂ transfer. Fiscal incentives are needed to stimulate CO₂-EOR investment, rather than decommissioning. Liability frameworks already exist in private contract law, but need adaptation from hydrocarbons to specific CO₂-EOR risks.

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1. Introduction

1.1 Background

The Central North Sea (CNS) has been identified as a location with good potential for CO₂ Enhanced Oil Recovery (EOR) from depleting oil and gas fields. EOR is considered to be an essential driver for CCS demonstration and commercialization¹. Hydrocarbon fields in the CNS are also linked to a wider aquifer storage capacity. The CNS region could therefore provide a CO₂ storage facility for EU Carbon Capture & Storage (CCS) projects. It is envisioned that the CNS region could progressively be developed into a fully functioning storage hub for Europe's industrial CO₂ emissions by 2050, offering a range of CO₂ storage sites and CO₂ pipeline and shipping infrastructure².

However, the Central North Sea is a shared resource between many countries, including Denmark, Germany, The Netherlands, Norway and the UK (see Figure 1). Each of these countries may use the geological formations in the CNS for CCS-EOR. However, political boundaries of nation states are not the same as those of geological formations. These boundaries are prescribed by the United Nations Convention on the Law of the Sea³ in the form of exclusive economic zones (EEZ), which are areas of the sea where a state has the rights over exploration and use of marine resources. The EEZ can stretch up to 200 nautical miles from the coast of a state and includes rights for hydrocarbon exploration and production, which are illustrated in Figure 1. For example, the Utsira rock formation, a CO₂ storage reservoir in the North Sea, is predominantly in Norwegian territory but a small part is situated on the British continental shelf and therefore British owned. Similarly, depleted hydrocarbon fields or saline formations attractive for CO₂ EOR or CCS respectively may cross several territorial bounds. In addition, the North Sea may also be used in the future as an offshore storage facility by countries with limited storage capacity.

With such potential for projects with transboundary elements to be developed in the CNS region, it is pertinent to assess the legislative implications for CO₂ EOR. It is also important to distinguish here that initial CO₂ EOR projects could progress into EOR with permanent CO₂ storage, which may entail a different set of legal ramifications. This scoping study seeks to address some of these issues through a stakeholder analysis and review of the most recent literature.

¹ See: Schlumberger SBC Energy Institute (June 2012): 'Leading the Energy Transition: Bringing Carbon Capture & Storage to Market.' Available at: <http://www.sbc.slb.com/SBCInstitute/Publications/CCS.aspx>

² See: 'Central North Sea – CO₂ Storage Hub: Enabling CCS deployment in the UK and Europe': <http://www.sccs.org.uk/features/cns>

³ See Articles 56 & 57, Part V, *United Nations Convention on the Law of the Sea 1982*: https://www.un.org/depts/los/convention_agreements/texts/unclos/part5.htm

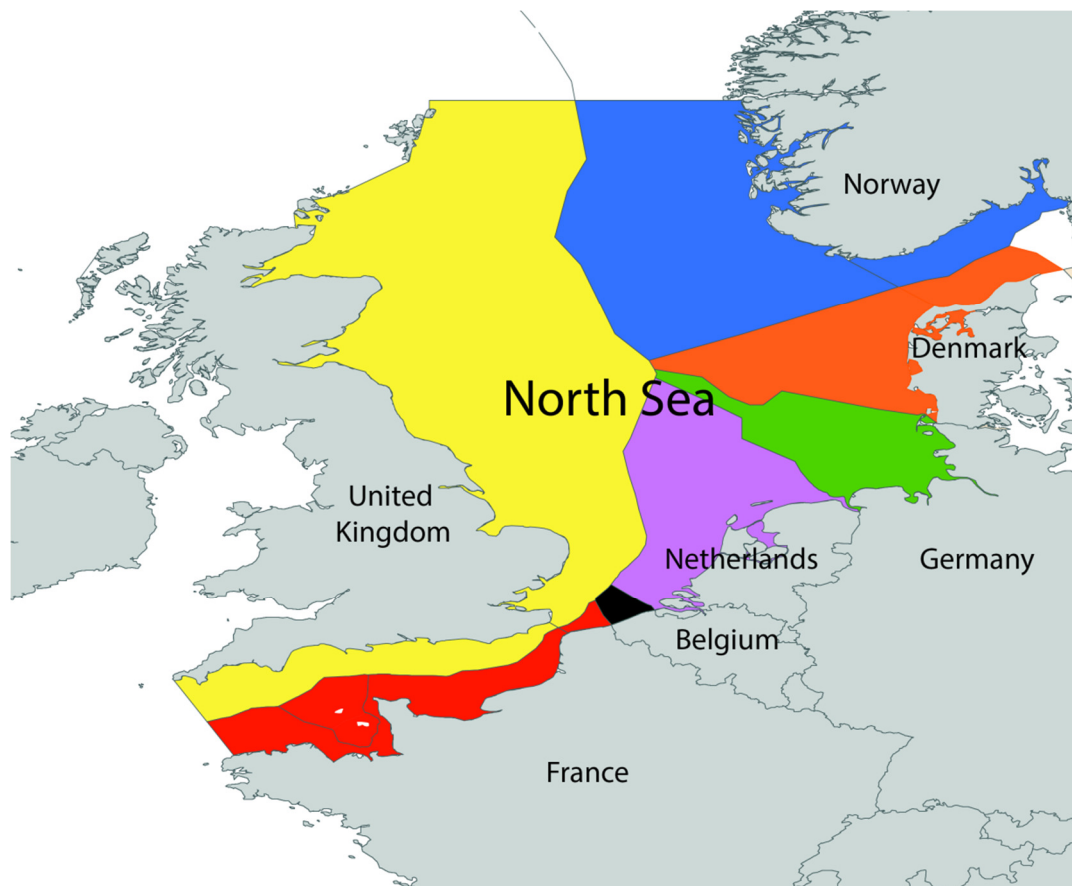


Figure 1. Map of the North Sea region, depicting the different jurisdictional boundaries (EEZs) of coastal states (source: Wiki Commons).

Defining ‘Transboundary’

The transboundary aspects of potential CCS-EOR projects are twofold:

1. The *pre-injection* transboundary element, involves the physical transportation of CO₂ streams for CCS and/or EOR. For example, in theory CO₂ could source from a CO₂ capture site in Germany, be shipped or piped through the Netherlands, and then injected into rocks in UK territory (see Figure 1).
2. The *post-injection* transboundary element refers to the potential for the physical migration, or seabed leakage⁴, of injected CO₂ within a transboundary storage complex. If there is migration of CO₂ then this has implications for monitoring and verification in another jurisdiction. In the previous example, the CO₂ injected in rock formations in UK territory could migrate in the subsurface into Norway (even though it may still be contained within the same geological structure) (see Figure 2).

There are likely to be different legal requirements and liability rules that apply to the several parties involved in the project, depending on which country they are based in, in which country the project activities take place and if there is subsequent leakage into another territory. Bugge (2011) highlights that legalities in transboundary chains are further complicated by the *number* of actors involved, both private parties and states, which will be responsible for the CO₂ in the

⁴ Leakage in this context is defined in the same way as in the EU CCS Directive, i.e. CO₂ leaks out of the storage complex into the water column. See: <http://www.globalccsinstitute.com/networks/cclp/legal-resources/liability/europe>

transport chain and in the reservoir⁵. Consequently, if migration or leakage were to occur, then this “may also raise several issues of public international law”⁶.

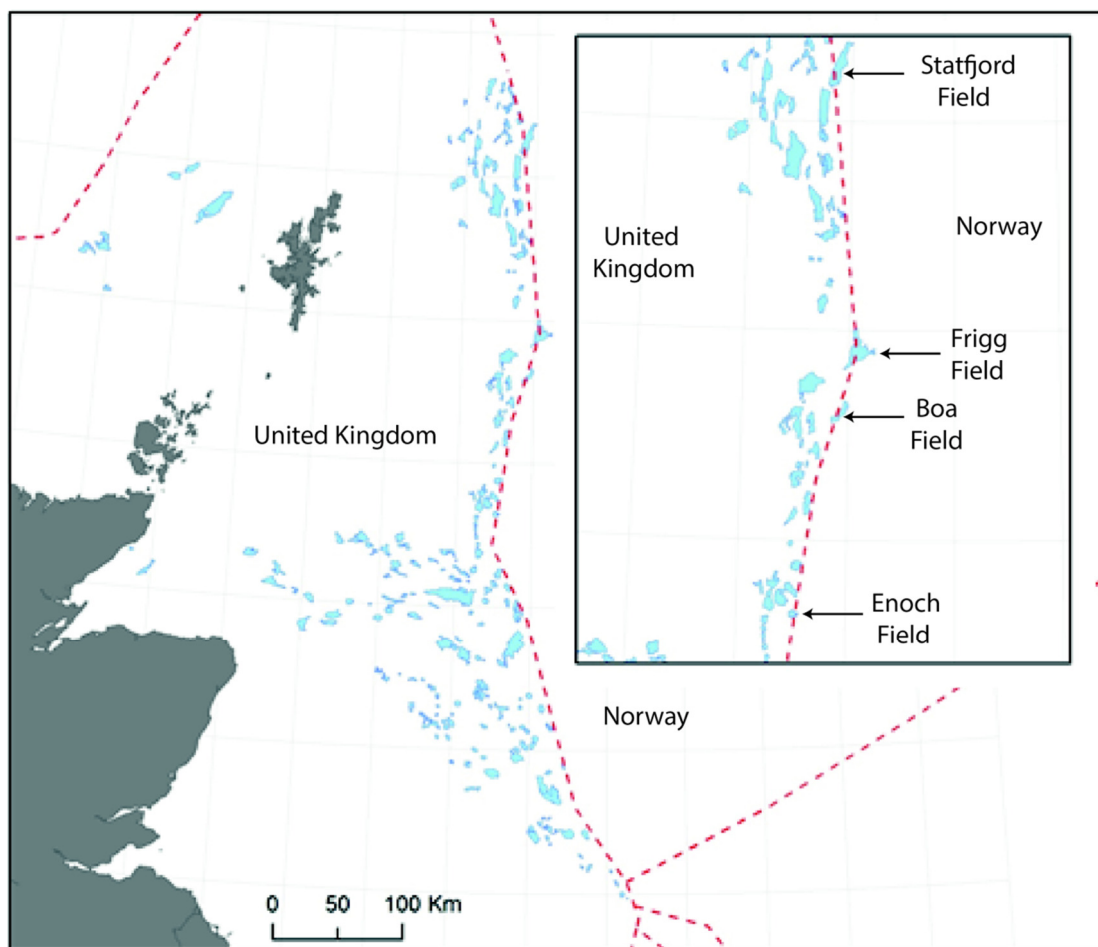


Figure 2. Map showing oil and gas fields (in light blue), or potential transboundary storage complexes in the North Sea in relation to jurisdictional boundaries.

1.2 Scope of the Report

The scope of this report is primarily based on transboundary chains for CO₂ EOR in the Central North Sea. The objective of this report is to identify the relevant legal conditions that could enable such projects and also highlight areas that may need to be further adapted. The focus is on hydrocarbon fields mainly, though the potential of CCS EOR is also discussed and the relevant legal issues for CO₂ storage. The study also investigates current thinking and strategies within the EU regarding offshore EOR practices, supplemented by interviews with public and private parties of the transboundary chain. The transportation of CO₂ is a key aspect of the transboundary chain. As such, the movement of CO₂ across borders by different shipping and pipeline options will also be considered here. In addition, current legal practices for handling cross-border oil and gas production are also reviewed.

⁵ See Bugge, H. C. (2011) ‘Transboundary Chains for Carbon Capture and Storage: Allocation under the Climate Regime between the States Parties of Emissions due to Leakage’. In Havercroft, I., Macrory, R. & Stewart, R. B. (Eds.) *Carbon Capture and Storage - Emerging Legal and Regulatory Issues*. Oxford, Hart Publishing Ltd.

⁶ *Ibid.*, p. 124

Key Research Questions

The potential for CO₂ EOR development in the North Sea raises a number of legal questions regarding how existing EU legislation can be adapted to accommodate CO₂ EOR and also regarding liability for transboundary leakage. This study centres on the following key research questions:

- ♦ What are the relevant international legal instruments and EU directives that could influence transboundary CO₂ EOR projects in the North Sea?
- ♦ How do existing legal arrangements within Europe's current energy system enable or impede the movement of CO₂ across borders?
- ♦ What are the different liability rules if there is transboundary CO₂ leakage?

1.3 Research Methods

Stakeholder Analysis

The stakeholder analysis draws upon a series of research interviews that were conducted by telephone, predominantly during January 2013⁷. In total, seven interviews were conducted and the full list of participating organizations is included in Appendix A.

The stakeholders interviewed for this study include:

- i) Representatives from private companies who are experts in the legalities associated with hydrocarbon exploration and production in the North Sea; herein referred to as *hydrocarbon expert*.
- ii) Representatives from the shipping industry who have experience of shipping CO₂; herein referred to as *shipping expert*.
- iii) Individual consultants and law academics working with governments on potential transboundary CCS-EOR projects; herein referred to as *legal expert*.

Unfortunately not all stakeholders of a transboundary chain could be consulted, notably, governments and potential CO₂ suppliers, e.g. power stations.

Initial contact with most participants was made at CCS related conferences and workshops. These participants can therefore be considered as well informed on CCS-EOR and transboundary issues. Some participants assisted further by suggesting other potential interviewees.

The research interviews were semi-structured and generally lasted between 30 to 90 minutes. Each interviewee, depending on their expertise or background, was provided with a set of questions in the pre-interview e-mail exchange. These questions were used to guide the telephone discussion, and not to restrict the conversation in any way. The interview guides are provided in Appendix B. All the interviews were transcribed, primarily by note-taking, or from a digital voice recorder where permission was granted. When possible, interviewees were asked to repeat themselves in order to obtain the most accurate quotes.

Once the data was collated, key themes and issues were drawn out, and relevant insights or

⁷ Some interviews were initiated towards the end of 2012, but since relevant, legal developments and negotiations were ongoing at this time, follow-up interviews were conducted in January 2013. This ensured that the most current information could be obtained.

opinions were categorized according to these themes, with quotations used to illustrate the main issues. It should be noted that for confidentiality purposes, no names of interviewees are provided, nor are any of the quotes attributed to any specific organization within the text. Quotations used are not necessarily verbatim, as some were adapted from notes but do represent the essence of the comments made.

Documental Analysis

The qualitative data provided by the stakeholder analysis is further corroborated by the analyses from published documents. These include peer-reviewed papers and books, legal texts, industry reports and government-commissioned publications. References are provided in the footnotes, and the key documents used to support this research are listed at end of this report. Also, the key legal documents referred to in this report are briefly explained and listed for reference in Appendix C, based primarily on the online legal resource provided by the Global CCS Institute.

1.4 Structure of Report

The key legal issues and crosscutting themes that emerged from the research are presented and discussed in Section Two. Along with the main conclusions, suggested strategies and recommendations for dealing with these issues are proposed and discussed in Section Three. References and Appendices are found at the end of this report, after Section Three.

2. Key Issues & Insights

This section presents the results of the study, which includes qualitative data from the research interviews supported by official documents and published material. The data from all the interviews was collated and then organized according to the key areas and themes that relate to transboundary chains for CO₂ EOR. These are presented in this section in the following order:

Key areas/legal contexts:

- International Law
- EU Law
- UK Law

Crosscutting themes:

- Defining CO₂ usage
- Liabilities

How these areas and themes interact is illustrated in Figure 3 below.

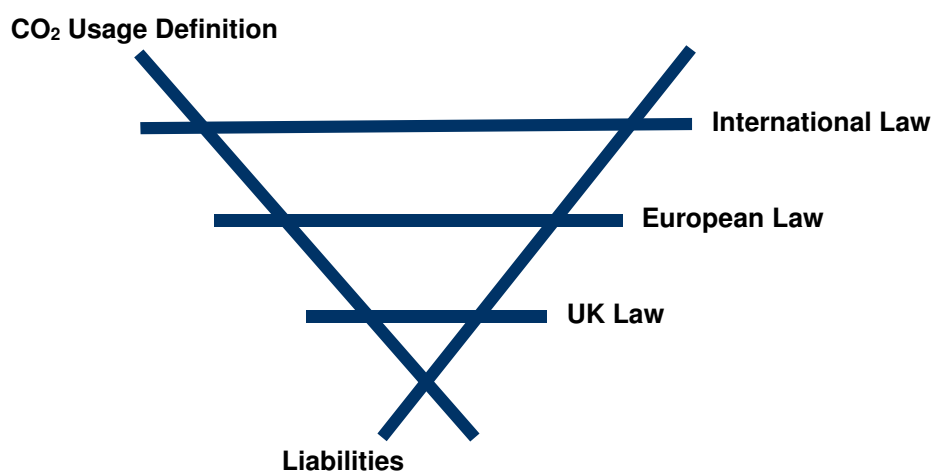


Figure 3. Visualization of key jurisdictional areas and crosscutting themes that were highlighted by this study.

The legalities surrounding CO₂ transport will be a crucial element of any potential transboundary chain in the North Sea and is therefore, consistently discussed in the results sections below. Each of the following sections also offers a vignette of the crucial issues, revealing some of the predominant political and economic factors at play.

2.1 International Law & Transboundary Chains

Two key marine treaties that provide international legal context to transboundary CO₂ injection

in the North Sea are the OSPAR Convention⁸ and the London Convention and its Protocol⁹. These treaties do not secure the interest of any specific state, rather, they are designed to secure the interest of the general community of states, which is in preserving the environment of the seas, including the seabed and subsoil¹⁰.

Sub-seabed CO₂ injection for CO₂ storage was considered the disposal of waste products by these treaties, and was consequently prohibited. However, amendments that would accommodate offshore CO₂ injection, particularly in terms of risk assessment and management for permanent storage for CCS activities¹¹, have been proposed and deliberated for both treaties:

- *OSPAR*: Amendments were proposed by the contracting parties in 2006 and the latest legal and regulatory review by the International Energy Agency (IEA) (2012) states that CO₂ storage via sub-seabed injection is now “formally enabled” for all those countries that have ratified the 2007 OSPAR Convention amendment¹². It is also interpreted that the OSPAR treaty does not prohibit CO₂ injection or export for EOR and CCS EOR projects, regardless of the source of CO₂¹³.
- *London Protocol*: Amendments proposed in 2006 to enable sub-seabed CO₂ storage that came into force by 2007. Amendments proposed in 2009 to enable the transboundary export of CO₂ streams has yet to be ratified by the contracting parties, in order for it to enter into force¹⁴.

The latter proposed amendment to the London Protocol has a major bearing on potential transboundary chains for CCS projects and any long-term plans to create a storage hub in the North Sea. The following vignette presents the specifics of this issue, drawing upon insights from stakeholders to highlight the political factors at play.

Vignette: London Protocol

The problem:

⁸ This OSPAR treaty is the Convention for the Protection of the Marine Environment of the North East Atlantic, 1992, available at: http://www.ospar.org/html_documents/ospar/html/ospar_convention_e_updated_text_2007.pdf

⁹ This is the Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter, 1972 and its Protocol, 1996. The full text is available at: <http://www.imo.org/Pages/home.aspx>

¹⁰ Article I of the London Protocol defines ‘sea’ as the “marine waters other than the internal waters of States, as well as the seabed and the subsoil thereof.”

¹¹ See Purdy, R. (2006). ‘Geological Carbon Dioxide Storage and the Law,’ in Gough, C. & Shackley, S. (eds.) in *Capturing Carbon: The Prospects for Carbon Dioxide Capture and Storage in the UK*, pp87-139, Ashgate.

¹² The 2007 amendment to the OSPAR convention came into force in July 2011 following the ratification by Denmark. See page 24 in IEA (July 2012): ‘Carbon Capture and Storage: Legal and Regulatory Review (Third Edition)’. Available at: <http://www.iea.org/publications/freepublications/publication/name,28506,en.html>

¹³ See p. 31 in Bech-Bruun (2013) ‘EOR/CCS 360-Degree Legal Review’. Available at: <http://www.globalccsinstitute.com/publications/eorccs-360-degree-legal-review>

¹⁴ See Dixon, T. Greaves A., Christophersen, O., Vivian, C. and Thomson, J., *International marine regulation of CO₂ geological storage. Developments and implications of London and OSPAR*, Energy Procedia 1 (2009), 4503-4510

In international law, the London Protocol is the primary hurdle for potential CO₂ transboundary chains. Specifically, Article 6 of the Protocol prohibits the export of wastes or other matter to other countries for 'dumping' at sea, where CO₂ is considered a waste, and the term 'export' is not defined¹⁵. An amendment was proposed and adopted in 2009 to Article 6, which would enable the export, or transboundary transfer, of CO₂ streams for geological storage.

In order for this to come into force, twenty-seven out of the current forty contracting parties must show their acceptance of the amendment through ratification¹⁶. This is challenging because not all contracting parties are interested in CCS activities that require transboundary movement of CO₂. Currently, out of the required twenty-seven, only Norway and the UK have ratified the amendment¹⁷, which, notably, border the North Sea and both have an active interest in CCS activities. Ratification is low priority for other countries in the Protocol and acquiring the required number of ratifications will need a "concerted international effort" if the 2009 amendment is to come into force¹⁸. The IEA notes that the challenge will be greater if more countries ratify the Protocol. This is because the required number of ratifications to the amendment from contracting parties will also increase¹⁹. It is therefore likely that, for several years, the difficulty accepting the 2009 amendment will continue to be a barrier to transboundary CO₂ chains for CCS activities.

The definition of CO₂ as a waste or commodity for industrial use is crucial to the above debate. According to the legal experts interviewed, if the transported CO₂ is only used for EOR and, *not* for disposal and storage purposes, then the Protocol will not present any legal barriers. Currently, there is an exemption for EOR²⁰ under the Protocol, stating that the "disposal or storage of wastes or other matter directly arising from, or related to the exploration, exploitation and associated off-shore processing of seabed mineral resources is not covered by the provisions of this Protocol." It should also be noted that the exceptions to the definition of 'dumping' include:

- "disposal of wastes or other matter incidental to, or derived from the normal operations of platforms or other manmade structures at sea²¹"
- "placement of matter for a purpose other than the mere disposal thereof²²"
- "disposal and storage of waste and other matter related to seabed mineral resource activity²³"

Therefore, a recent study by Bech-Bruun (2013) concludes that:

"In a combined EOR and CCS project where the exported volumes of CO₂ are determined by what is needed for EOR, the London Protocol will most likely be interpreted as not prohibiting the use and export of CO₂, as the use of CO₂ for EOR is

¹⁵ See page 11 in IEA (2011): 'Carbon Capture and Storage and the London Protocol: Options for Enabling Transboundary CO₂ Transfer'. Available at: <http://www.iea.org/publications/freepublications/publication/name,4008.en.html>

¹⁶ This is in accordance with Article 21 of the Protocol and is essentially "two-thirds of the Contracting Parties".

¹⁷ *Ibid*, 18, p. 12 Norway was the first to ratify, followed by the UK, ratifying the London Protocol amendment in November 2011.

¹⁸ *Ibid*.

¹⁹ *Ibid*.

²⁰ See Article 1, paragraph 4.1.3 of the London Protocol

²¹ *Ibid*, Art. 1, paragraph 4.2.1

²² *Ibid*, Art. 1, paragraph 4.2.2

²³ *Ibid*, Art. 1, paragraph 4.2.3; where "seabed mineral resource activity" includes hydrocarbon exploration and production.

most likely covered by the exemptions in the protocol.”²⁴

Strategy:

International law has no central authority enforcing the treaty, it is expected the member states will do so themselves. If no other party to the protocol were to object to transboundary transport of CO₂ with intent to store, then in theory, this would become a non-issue.

A possible solution, as suggested by one of the shipping expert interviewees, may be to form a bi-lateral agreement between respective governments. For example, if the UK and Norway decide to go ahead with a project that had transboundary elements, then the two countries could simply arrange an agreement regarding the Protocol. This is supported by the work of the IEA in 2011, which highlighted the option for two contracting parties to negotiate the export of CO₂ for storage between themselves. This would not affect the rights of other contracting parties unless the CO₂ streams were to be “transported through their territory (in which case an agreement would need to be reached with that particular state)”²⁵.

However, this is proposed with caution since such agreements could be viewed to “be incompatible with the object and purpose of the London Protocol”²⁶. A legal expert interviewee pointed out that a few developing countries have raised objections to the 2009 amendment, notably China, and that the support for export of CO₂ streams mainly comes from OECD²⁷ countries. Consequently, there might be significant political ramifications if there were to be a breach of this obligation:

“The Chinese, for example, have been very reluctant to accept these proposed amendments. Therefore, it is not unlikely that the Chinese, and perhaps other developing countries also, could use this, or would seize this opportunity to accuse the Norwegians and the British for double standards, for breaching international law while on the other hand going around the world and preaching human rights etc. So it could be politically controversial and challenging.”

It was also stressed that in order to understand these political ramifications, this issue of exporting CO₂ cannot be viewed in isolation:

“This is not purely a matter of what to do with CO₂ in the North Sea, it is a matter of international foreign policy, and it could be used for driving home some very political points in the international debate.”

Therefore, if the UK and Norway, or any other country bordering the North Sea, were to enter into a bi-lateral agreement, then the political challenge would be how to, on the one hand keep the principle stand that they are firm believers in multilateral solutions and the role of international law, while on the other hand they are then clearly breaching the substantial obligations of an agreement that they have entered into. They would have to come up with some kind of diplomatic strategy of how they would present this globally. Therefore the best course of action suggested was:

“[The] concerned member states of the EU need to persuade enough contracting

²⁴ *Ibid*, 16, p. 30

²⁵ *Ibid*, 18, p. 19.

²⁶ *Ibid*.

²⁷ Organisation for Economic Co-operation and Development

parties to the London protocol to actually ratify it, so that the amendment enters into force and then changes the state of the law. That would be the proper way to do it.”

Summary:

The London Protocol is a key piece of international legislation that provides a framework for dealing with CO₂ injection offshore for CCS related activities. Currently, the export of CO₂ streams for offshore storage is prohibited, and therefore would impact any projects with transboundary elements. However, an amendment was proposed in 2009 to accommodate this, and is still waiting to be ratified by two-thirds of the contracting parties to the Protocol. The delay in ratifying the transboundary amendment presents a legal barrier for CCS projects and any long-term plans to create a storage hub in the CNS. However, CO₂ EOR and CCS EOR would be exempt from the London Protocol prohibition, provided that the CO₂ is not specifically for disposal or ‘dumping’ purposes.

2.2 EU Law & Transboundary Chains

The previous section illustrates how the definition of CO₂ can have legal implications for transboundary chains for CO₂ EOR, and for the North Sea region in particular, European Law will take legal precedent over international law (which regarded as more of a general framework). The key piece of legislation for CO₂ injection is the EU Directive on the geological storage of carbon dioxide²⁸. The CCS Directive came into force in 2009, and member states were required to transpose the Directive into their respective national laws by 25 June 2011. Out of the coastal states²⁹ of the North Sea region, so far the UK, Denmark, Belgium and France are advanced in this process³⁰. Germany and the Netherlands have been slower to transpose the Directive due to public opposition to CO₂ storage³¹.

In the context of CO₂ transport, there are a certain aspects of the CCS Directive that may influence transboundary EOR chains, particularly when selecting the mode of transportation i.e., pipeline or ship. A recent legal assessment by researchers for a potential transboundary CCS project in the Skagerrak/Kattegat region³² found that “shipments of CO₂ are not covered by the EU regulations on shipments of waste as long as they are carried out for the purposes of geological storage in accordance with the CCS Directive.”³³ Their work implies that the way the CCS chain is currently described or defined, both in the CCS Directive and also with references to the Directive setting up the EU ETS³⁴, only authorizes the use of pipelines. This has implications for any transboundary project that wishes to include a shipping element in its chain. The following vignette discusses this situation in further detail.

²⁸ Directive 2009/31/EC on the geological storage of carbon dioxide is available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0114:0135:EN:PDF>

²⁹ It should be noted that Norway is not a member of the EU, however it is a contracting party to the OSPAR convention, and therefore the definition of CO₂ for storage will be consistent with the Directive.

³⁰ The latest status of Directive transpositions of member states is provided by the Global CCS Institute here: <http://www.globalccsinstitute.com/networks/cclp/legal-resources/dedicated-ccs-legislation/europe/transposition-status>

³¹ *Ibid.*

³² Scandinavian waters between Norway, Sweden and Denmark.

³³ See p. 13 in Langlet, D. & C. Olsen-Lundh (2012). ‘Carbon Capture and Storage in the Skagerrak/Kattegat Region – Legal Issues’. Available at: <http://www.ccs-skagerrakkattegat.eu/Project/Project3/tabid/96/Default.aspx>

³⁴ EU Emissions Trading Scheme

Vignette: EU Directives & CO₂ Shipping

Problem (i):

Even though the CCS Directive primarily deals with the geological storage of CO₂, its adoption has triggered a series of amendments to several other pieces of EU legislation. These amendments aimed to harmonize other EU legal acts, so that they may also accommodate the different aspects of potential CCS projects. Notably, Langlet & Olsen-Lundh (2012) highlight the fact that:

“In a separate but coordinated process, amendments were made to the Emissions Trading Directive 2003/87/EC [the ETS Directive] with the effect that CO₂ captured for geological storage in accordance with the CCS Directive is not to be considered as emitted under the cap and trade system. Any subsequent emission from any part of the CCS chain must instead be covered by emission allowances.”³⁵

When examining CO₂ transport regulations they found that emissions from CO₂ shipping for storage would not be considered under the ETS Directive. For example, if an operator wanted to use ships, then they would have to include any associated emissions within the chain and therefore be subject to monitoring, verification and reporting requirements of the ETS Directive. Each member state involved in the project would be required to do this, alongside consent from the EU commission. Crucially however, CO₂ transported by ships is not included in the EU ETS³⁶.

If CO₂ transported by ships must be included in the EU ETS, but this legislation does not consider this method of transport, none of the operators gain emission credits, or rather, no one is spared the financial burden of buying or getting emission allowances. Therefore, under current legislation, if a transboundary CCS-EOR project were to be established, the Directive would only recognize transportation via pipelines under the cap and trade system.

Strategy (i):

One way to overcome the emissions recognition problem from shipping CO₂ is the ‘opt in’ procedure, proposed by Langlet & Olsen-Lundh (2012). In short, under Article 24 of the ETS Directive each member state can, choose to unilaterally include additional pollution sources or installations, which in this case would be ships for transporting CO₂. This would require a robust monitoring and verification system by the state, and consent from the EU Commission. A legal expert interviewee pointed out that in the context of a transboundary CCS EOR project in the North Sea, where several countries were involved in the chain and the regional infrastructure, it is likely that all of those states would have to use this ‘opt in’ procedure. However, Bech-Bruun (2013) highlight the fact that:

“Where a Member State, with the Commission’s approval, includes ship transportation in the EU ETS, it is questionable whether this inclusion would be binding on other Member States where the ship transports CO₂ to or from another Member State or where the ship sails under the flag on another Member State.”³⁷

In addition, another legal expert interviewee was of the opinion that the “monitoring and reporting regulations were not flexible enough to accommodate shipping as the opt-in installation” and that potential CCS EOR projects would be “narrowly limited to transportation

³⁵ *Ibid.*, 36, p. 4.

³⁶ *Ibid.*, 36, p. 23. This is “simply because it is not mentioned in the Trading Directive’s Annex I. Consequently, there are no European guidelines for the transportation of CO₂ via shipping.”

³⁷ *Ibid.*, 16, p. 25

by pipeline.” Bech-Bruun (2013) explain the technical issues further:

“If the monitoring and reporting principles applicable to pipelines are applied where ship transportation is included in the EU ETS, it is questionable whether any ancillary plants functionally connected to the ship would be encompassed by the boundaries of the monitoring and reporting obligations with respect to the ship. If that is the case, the ship would also include intermediate compressor stations, intermediate storage facilities, liquefaction facilities as well as onloading facilities.”³⁸

Problem (ii):

There are also technical problems regarding jurisdictional control of ships. Ships are, by definition movable objects, whereas the ETS Directive mainly considers stationary installations:

“You don’t have the same kind of control, it’s not as easy to allocate responsibility to individual states as it is with a pipeline. This may be resolved in a few years time, however further research is required [on this aspect].”

Strategy (ii):

One method for resolving this issue is discussed by Bugge (2011). He recommends ships to be treated under ‘flag state jurisdiction’; described as the situation when “a state has personal jurisdiction over a ship which is registered in the shipping register of the state, regardless of where the ship is located at any given time”.³⁹ Crucially, in the context of a transboundary CO₂ EOR chain, Langlet & Olsen-Lundh (2012) highlight the complications that can arise when it comes to allocating emissions:

“A ship might originate from one country (the Flag State), be loaded with the captured CO₂ in another State (the Port State, if the vessel is loaded within a port or off-shore terminal of a State) and then move across the border to a third State (Coastal State, if in its territorial sea; 12 nautical miles from the so called baseline). Which of these States is to be responsible for potential emissions? The current [ETS] Directive cannot handle such a situation.”⁴⁰

However, a legal expert interviewee was of the opinion that this should be dealt with at the EU Commission level, and this was not seen as a major hurdle to shipping CO₂ in terms of time and legal procedure:

“If you get industry or government determined to carry out a CCS project, then this could be definitely be dealt with. I think that the most efficient or appropriate way to deal with [this] would be to have the EU legislator amend the directive, and put in place a proper regime for [dealing] with CO₂ ship transport, so that you don’t need individual solutions for each country. [By] integrating it into the general frameworks that you have, you get consistent rules that apply to all states. And that could be done. I think the main hurdle here is to muster sufficient political backing for amending the directive. Technically it can be done. It’s the political will that [will be] the main hurdle.”

Most importantly, similar to the previous vignette’s arguments, if CO₂ in the transboundary chain

³⁸ *Ibid*, 16 p. 26

³⁹ *Ibid.*, 8, p. 127

⁴⁰ *Ibid.*, 36, p. 24

is defined as a commercial gas for EOR purposes, then it should not be subject to any restrictions or requirements under both the CCS Directive and the ETS Directive:

“If [the operator] can let go of the EU ETS, if they can dispense with the need for emission allowances then of course there wouldn’t be a problem. If [they] are not after the emission reduction aspect in the legal sense, [even if in practice] there will be some emission reduction as long as the CO₂ remains in the ground, [and they] don’t claim any of the financial benefits under the EU ETS, then it’s much easier to carry out legally. However, it may be very hard to get a business case if you can’t claim it as CCS under EU law.”

Summary:

The key legal hurdle for transboundary chains within the EU legislation is to do with transportation of CO₂. Currently, the ETS Directive does not accommodate shipping transport of CO₂, and in terms of emission allowances, only pipelines are recognized. This affects any CCS EOR project and future storage facility that wishes to use a shipping element within its transboundary chain. Although, there is an opt-in procedure that will allow Member States to voluntarily include ships as installations, there is skepticism amongst interviewees and the literature on whether it would work in practice. Therefore, Member States approaching the EU Commission to amend the ETS Directive and integrate a proper regime for shipping may be a good strategy to address this particular issue. This may prove to be more of a political hurdle than a legal one. Also, this issue is more relevant for EOR projects that wish to claim allowances under the EU ETS.

2.3 UK Energy Law & Transboundary Chains

Presently there are no CO₂ based EOR operations in the North Sea, primarily due to the lack of a reliable CO₂ source. However there is an extensive amount of experience in the North Sea for other forms of EOR, such as involving hydrocarbon gas injection⁴¹. Therefore several transboundary aspects for CO₂ EOR would be analogous to current operations in the North Sea. However, for CCS EOR, there would be further monitoring and verification requirements for storing CO₂, which have been transposed into UK law. Regardless, the seabed or sub-seabed transboundary issues, for either CO₂ EOR or CCS EOR, include license boundaries within the territory of one state or boundaries between two or more territories (see Figure 2). Transboundary chains also imply multiple parties, and this could include multiple operators. The following vignette reviews current North Sea operations in the context of UK private contract law and how it deals with transboundary offshore operations between multiple operators.

Vignette: North Sea Operations

Operators in the North Sea have over thirty years of EOR experience. Hydrocarbon exploration here is mature, and oil industry experts describe the North Sea as a “crowded area”, where there are many facilities and pipelines located close to each other. Agreements are put in place when these pipelines were constructed to determine which operator or service provider is liable for each part of the chain. There are also industry standards in place for the zones in which you can’t build or construct. The majority of guidelines, standards and contracts are provided by the trade association Oil & Gas UK⁴², which supports the oil industry operating in the UK.

⁴¹ See Arwan, A. R., Teigland, R. & J. Kleppe (2008). ‘A Survey of North Sea Enhanced-Oil-Recovery Projects Initiated During the Years 1975 to 2005.’ June 2008 SPE Reservoir Evaluation & Engineering, Society of Petroleum Engineers.

⁴² See Oil & Gas UK website: <http://www.oilandgasuk.co.uk/>

UK licensing and legislation overview:

All North Sea subsurface operations require a license to explore and produce. Each country divides their North Sea territory into licensing areas, which are subdivided into blocks. For the countries bordering the North Sea, operators tend to apply to their respective Governments for a license to explore and extract hydrocarbons in a particular block⁴³. The Governments impose a fixed royalty and taxation regime rather than by taking a share of the extracted hydrocarbons. Each of the coastal states in the North Sea region has its own regime for hydrocarbon exploration. Some regimes are similar; for example, Norway and Denmark grant licenses by a similar process to the UK⁴⁴ regime. In the UK, licenses for these blocks are awarded by the Department of Energy and Climate Change (DECC).

Outside the annual DECC licensing rounds, operators can acquire a percentage interest in a license from an existing licensee, but the Government has to approve the acquisition and will only do so if it is confident that the acquiring party has the necessary finances and technical expertise to discharge its obligations under the license.

Where operators wish to share a license (as is the norm for UK offshore licenses) the parties enter into a joint operating agreement (JOA). This governs how the parties conduct joint operations such as how decisions are made, how expenditure is approved etc⁴⁵. However, the JOA only deals with a single licensed block between operators, not two state territories.

Situations can arise where two different operators have licenses to explore two neighboring blocks that are part of the same hydrocarbon reservoir structure. In this case, it is economically most reasonable to develop the field together, rather than have two separate developments in the same reservoir. For these scenarios a 'unitization agreement' is required.

Both the JOA and unitization agreements deal with indemnities⁴⁶ and liabilities between operators. This includes situations where pipelines and other infrastructure are to be built through another party's field of operations. Due to the fact that this situation is so common in the North Sea, producing appropriate legal contracts and agreements is a standardized practice.

Application to transboundary issues with CCS-EOR:

The JOA and unitization agreements address transboundary licensing issues. These are analogous to the type of arrangements that may be required to deal with the large number of actors (both private parties and states) normally associated with CCS-EOR transboundary

⁴³ The Petroleum Act 1998, along with different pieces of subsidiary legislation, contain terms that apply to oil & gas licenses. Essentially, there are a number of different pieces of law interacting in different ways to create this kind of codified regime. See: <https://www.gov.uk/oil-and-gas-petroleum-licensing-guidance>

⁴⁴ This involves a royalty or tax system; where the Government grants a licence for exploration and then takes money back via royalties or tax payments. See: Johnston, D. (1994). *International Petroleum Fiscal Systems and Production Sharing Contracts*. Tulsa, OK, USA, PennWell Books.

⁴⁵ *Ibid.*

⁴⁶ An indemnity is when you agree to pay somebody for a loss. In this context, it is beneficial to companies if it means that when they have to prove in court if anything goes wrong, they don't have to establish certain aspects of the scenario, or how their loss was incurred, or what their loss equates to. An indemnity is quite a powerful type of guarantee, and it is something oil companies typically give to other oil companies, in order for them to be able to carry out certain activities together.

chains⁴⁷. These standard agreements could be adapted for CCS-EOR operations. In this context, an expert from the oil industry commented:

“You’re likely to be looking at a relatively mature field if you’re contemplating EOR, so there’s a likelihood that your block neighbour will also be wanting to carry out EOR on wells because some of them will be at the same level of depletion as yours. Therefore, in terms of a transboundary EOR project where it potentially crosses blocks, then that would definitely involve a unitization agreement, which would set out the relationship between the two operators and the liability for losses.”

Another hydrocarbon expert interviewee explained that, for the North Sea region in particular, having multiple owners for pipelines is the norm, and:

“... Even though a pipeline operator that has to act for all of these owners, and looking at the liability and indemnity arrangements between them can be quite a challenge⁴⁸, still, it’s just a reality of pipelines, and it shouldn’t be any different with CO₂. The fact that different governments have different regimes probably isn’t as much a difficulty as the political one – the fact that there might be a political issue of a pipeline going from one country into another. For example, in the Mediterranean, there are real problems associated with how Cyprus would pipeline its oil, and where they could sell it. Such issues would apply whether it’s CO₂ or whether it’s crude oil.”

The Problem:

Interviewed experts stressed that for the North Sea region, the hurdles for transboundary EOR infrastructure and operations were not necessarily legal, but rather due to the fact CO₂ is a different product, and it’s got a different value, or perceived value than oil. A hydrocarbon expert commented:

“There is a lot of value in using analogous contracts from the [oil and gas] industry, the basic fundamentals are the same in terms of transporting a gas, though you’re transporting things in pipelines in the opposite direction so to speak. What skews the analogy is the value proposition. In oil & gas, the purpose of the contract is to re-align a very valuable commodity, whereas in this context, aside from the EOR, the purpose of the contract is essentially to dispose of a low-value waste, which has a very low price in the EU ETS.”

Most interviewees were of the opinion that the biggest challenge to such projects was actually providing the sustainable long-term supplies of CO₂ on a reliable basis, and that perhaps the carbon capture had to come first, and then once that is proven and established, CO₂ EOR and CCS EOR projects should hopefully follow on swiftly thereafter. A legal expert interviewee from the hydrocarbon industry added that:

“If you were investing in a CCS project today in the UK, then you probably don’t have firm commitments from oil and gas operators to off-take your CO₂. I think that’s the next step. So, from a sponsor’s perspective if you’re investing in the development of these projects then, the potential upside from EOR, at a future point in time, is probably a fundamental driver to your strategic decision to spend lots of cash on CCS... Until

⁴⁷ *Ibid.*, 8, p. 124

⁴⁸ The companies involved would have to apply to every government concerned and every government whose territory the pipeline crosses. Each state would need to give their consent and impose their conditions – it is a complex area.

you're at a point where you've got demonstrable commercial means to develop the project, and the oil and gas operators are satisfied on the deliverability of that project, then it's unlikely you're going to progress detailed commercial terms on EOR to a point of binding contractual agreement."

Strategy/solution:

Hydrocarbon experts indicated that many operators in the North Sea are considering, and consulting on, the options for handling mature fields. Interestingly, due to certain tax benefits offered for decommissioning, it is sometimes more cost effective for operators to decommission a field rather than apply non-CO₂ EOR methods. It was suggested that to encourage more CO₂ EOR or CCS EOR operations, the Government could provide fiscal incentives and support for operators developing their fields through tertiary recovery methods.

Incentivising is not a new concept; DECC has awarded projects in the past to encourage small companies to explore areas of poor invested interest. For example, the Frontier and Promote Licenses encourage operators to explore 'fallow fields' and maximize recovery⁴⁹. However, an interviewee pointed out that for any kind of EOR project, initiatives that will benefit operators, rather than the actual means they use, would be more effective. The incentive needn't depend on the type of license granted by the Government:

"... Because if it's EOR then it is probably an old field that has a license already in place. So more than likely a fiscal benefit would be more appropriate – where the Government could maybe reduce the tax or the royalty or have some kind of rebate. It always comes down to money."

Summary:

All interviewees were of the opinion that there were not many challenges to CO₂ EOR and CCS EOR projects from a regulatory or policy perspective. Current licensing regimes for North Sea offshore operations are well established, where contractual agreements are already in place to support transboundary offshore operations. In the UK, this can be in the form of a JOA or unitizing agreement, which are used when dealing with multiple operators. Some aspects of such contractual agreements could be transferable for potential transboundary CO₂ chains that involve multiple parties. However, interviewees stressed that the barriers were more due to uncertainties surrounding the current carbon price and security of CO₂ supply. It was suggested that fiscal incentives in the form of tax breaks might be a way to encourage operators to take on CO₂ EOR or CCS EOR projects.

2.4 Crosscutting theme: Defining CO₂

The definition of CO₂ in terms of its usage is critical, and will determine the degree of legal ramifications, if any, for potential transboundary chains for CO₂ EOR. All interviewees were of the opinion that if CO₂ were considered as a commodity for EOR operations, then the legal problems surrounding transboundary transfer of CO₂ become less severe. A hydrocarbon expert interviewee explained:

"I think it is critical that if you use CO₂ as part of an EOR operation, then it would not be likely to be considered as dumping, because then you're not primarily aiming to get rid of the CO₂ but you're utilising it in the extraction purpose. In fact, [with EOR operations] you actually get some of the CO₂ back with the oil. So, you're not in fact primarily interested in making the CO₂ stick into the ground, but rather you have it

⁴⁹ *Ibid.*, 46.

integrated in the industrial process.”

However, when the aim and use of the CO₂ stream changes from EOR to permanent storage in a geological formation, then the CO₂ is considered a waste product. This triggers a series of legal ramifications, which have been discussed in detail in the previous sections according to the relevant legal contexts. This includes the prohibition of export of CO₂ streams under the London Protocol (section 2.1) and further requirements under EU Directives (section 2.2). How CO₂ is defined also has implications for dealing with liabilities, the other crosscutting theme, which is discussed in the following section.

The vignette below offers insights from shipping and hydrocarbon experts, highlighting the importance of the CO₂ definition and other issues affecting the transboundary transfer of CO₂ streams for EOR.

Vignette: CO₂ Transport – Shipping v Pipelines

Interviewees from both the oil and shipping sectors consider CO₂ transport to be a mature technology suite that can be scaled and adapted for potential transboundary CO₂ EOR chains. For example, there is extensive experience in North America, where CO₂ has been transported via pipelines for cross-border EOR operations. However, given the scope of this study, the report does not explore existing US legislation for CO₂ transportation⁵⁰. This vignette has a European focus, with emphasis on offshore CO₂ injection in the North Sea region.

Current shipping scene:

Shipping expert interviewees pointed out that there is currently a separate market for CO₂ as a commodity for the food and drink industry. However, a larger volume of CO₂ will be required for EOR operations compared with current CO₂ shipping quotas. This calls for a larger, more sophisticated vessel design. A shipping expert interviewee indicated that an extensive amount of time and funding has already gone into the engineering and development of conceptual designs for CO₂ tankers as part of potential transboundary projects. The impression was given that, from the shipping point of view, they were ready to be part of a transboundary chain:

“Basically we are ready to go, [all] we need is a solid project. Essentially it’s old technologies re-applied to something new. Offshore discharge could be a challenge [because] that’s something new, but then again, not really because [both] LNG⁵¹ and LPG⁵² are being discharged offshore⁵³. I think that for the North Sea, there is quite a good opportunity to perform EOR there.”

Further to the issue of physically scaling up ships, transportation laws & standards will also need to be adjusted. This includes the International Code for the Construction and Equipment

⁵⁰ For a more comprehensive overview of CO₂ transport regulation in the US see Odeh & Haydock (2009). ‘International CCS Policies and Regulations’, NZEC WP5.1a/WP5.4 Report. Available at: <http://www.nzec.info/en/assets/Reports/International-Policies-Regulations-English.pdf>

⁵¹ Liquefied Natural Gas

⁵² Liquefied Petroleum Gas

⁵³ Research has also been conducted for developing a combined gas carrier and an integrated receiving terminal, so that LNG can be transported outbound, and CO₂ inbound. See: Aspelund, A., Tveit, S. P. & Gundersen, T. (2009) ‘A liquefied energy chain for transport and utilization of natural gas for power production with CO₂ capture and storage - Part 3: The combined carrier and onshore storage.’ *Applied Energy*, **86**, 805-814.

of Ships Carrying Liquefied Gases in Bulk (IGC Code), which covers design rules and safety issues and provides an international standard for the safe transport of liquefied gases and other substances in bulk by sea⁵⁴.

Shipping expert interviewees were primarily of the opinion that amending the IGC to accommodate CO₂ shipping would not be a showstopper for transboundary chains for either CO₂ EOR or CCS projects. An interviewee did point out that making such adjustments could take some time, however, “once the necessity is there, [time] will go very swiftly”.

Non-legal factors:

Shipping expert interviewees anticipated that if CO₂ were classed as a ‘waste’, then it would have to be traded on the EU carbon market. With a current price of roughly €5 per tonne (in 2013), most interviewees felt that this would not encourage general investment in CO₂ capture and transport for CCS EOR projects, let alone those with transboundary CO₂ chains. A price of at least €30-40 per tonne was thought to be more suitable for making a viable business case for shipping CO₂ and CCS.

In terms of CO₂ transportation, hydrocarbon expert interviewees implied that presently there was some hesitancy from the oil industry towards transport of CO₂ for EOR due to the uncertainty around securing a reliable and large source of CO₂. Furthermore, the corrosive nature of transporting CO₂ via pipeline was highlighted as a potential technical barrier for developing extensive pipeline networks. This was presented as a significant issue in terms of making investment decisions, particularly if it required upgrading and adjusting existing infrastructure offshore. When comparing pipelines with shipping for transboundary chains, a legal expert from the oil industry commented that shipping was “definitely the more straightforward option” because CO₂ is already being shipped commercially, whereas:

“... Constructing a pipeline, well, there will be liability issues related to the actual construction of the pipeline, the fact that you’re leaving infrastructure, you’re doing something potentially damaging in somebody else’s territory – shipping takes away a lot of those issues.”

Summary:

Shipping of CO₂ is currently happening in Europe for the food and drink industry, and shipping experts believe they have the technical capability to scale up vessels for potential transboundary CO₂ streams that would be used for EOR and CCS projects. Industry experts also believe that required amendments to shipping standards such as the IGC should not prove to be a major legal barrier. The main challenges were considered to be non-legal, specifically, more to do with the low price of carbon preventing a viable business case for CO₂ shipping as part of a CCS EOR chain. Hydrocarbon experts expressed a preference for shipping over pipelines in the context of potential transboundary projects and related liability issues regarding leakage.

2.5 Crosscutting theme: Liabilities

For the purposes of this study, the type of liability discussed in this section refers to any potential harm to human health or the environment through operations. In the context of transboundary

⁵⁴ This is the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), see: <http://www.imo.org/ourwork/environment/pollutionprevention/chemicalpollution/pages/igccode.aspx>

CO₂ streams injected offshore, liability can be considered in two ways: either as *State liability* (where a State can be liable under the rules of international law), or as *civil liability* (where the liability of States and other actors, such as operators, can be liable under national laws)⁵⁵. In the context of international law and State liability, Langlet (p. 294, 2009) points out that:

“With respect to CCS, it is conceivable that a State would be liable for transboundary damage or damage caused by sea-based activities if it had failed to carry out a proper risk assessment or permit procedure as required by an applicable agreement, or if it had otherwise failed to exercise due diligence in controlling hazardous activities under its control.”⁵⁶

However, it is further noted, “the practical effects of State liability are limited” and, rather than bringing claims against each other, States “prefer to address environmental harm through diplomatic channels.” Given the scope of this study, this section focuses more on the civil liability issues that could potentially arise with transboundary chains. The following vignette how to deal with different responsibilities and liabilities in a transboundary chain at the EU level.

Vignette: Transboundary chains & Civil liabilities

EU Level

A legal expert commented that currently harmonization of liability laws at the EU level is incomplete. Therefore, there may be differences in dealing with liability, e.g. between Norway and the UK, if there were to be an accident occurring in the North Sea, affecting both countries or their interests. However, in their opinion, this kind of situation should be managed by skilled private law experts, that already have a great deal of experience in such matters relating to offshore operations:

“Once the industry gets going, [then] with the scale of operations, one could form agreements between the different stakeholders, which would basically reduce responsibility on the CO₂ financial cost. There might be ways for diminishing the responsibility for each stakeholder or each company, but that would require a significant number of actors etc. If all those people agree to work together under some sort of regime, then documenting it would not be the difficult bit. Getting them to agree would be a different matter but actually, putting a legal framework round that should not be an obstacle.”

This situation can be examined further to establish whether a bi-lateral liability agreement between nations would be useful for transboundary EOR. When it comes to transboundary CCS EOR projects, the CCS Directive bases the competency of the authority, or the jurisdiction of the national regulatory authority, on the physical location of the installation. In the context of transboundary transport or storage, under Article 24 of the CCS Directive, Member States are obliged to co-operate with each other, implying that there is a joint responsibility between Member states to comply with the Directive⁵⁷. A legal expert interviewee was of the opinion that bi-lateral treaties would be particularly of use when dealing with leakage liability from pipelines:

⁵⁵ See p. 294 in Langlet, D. (2009) Safe Return to the Underground? The Role of International Law in Subsurface Storage of Carbon Dioxide. *Review of European Community & International Environmental Law*, 18, 286-303.

⁵⁶ *Ibid.*

⁵⁷ See Doppelhammer, M. (2011) ‘The CCS Directive, its Implementation and the Co-financing of CCS and RES Demonstration Projects under the Emissions Trading System (NER 300 Process)’. In Havercroft, I., Macrory, R. & Stewart, R. B. (Eds.) *Carbon Capture and Storage - Emerging Legal and Regulatory Issues*. Oxford, Hart Publishing Ltd.

“Where I can see a bi-lateral treaty functioning within the EU is [when] there is a storage site that straddles international boundaries. [One] could envisage an agreement of understanding between two Member states [where] one regulation authority will essentially take the lead on regulating that installation in its entirety. But, with that comes responsibility obviously in terms of any non-compliance with the directive, [which] would be dealt with between the Member states. [One] can effectively sub-contract [one’s] obligation under the directive to another Member state for co-ordination and efficiency purposes. [Nevertheless], you still remain primarily liable under the directive on a joint basis with your fellow neighbor.”

Leakage:

In a transboundary CCS-EOR chain there is a responsibility for CO₂ to be retained underground. In the case of leakage from a storage site:

- (a) The EU ETS requires that emissions allowances corresponding to the volume of leaked CO₂ must be surrendered.
- (b) The CCS directive provides that permit holders have an obligation to provide financial security in order to cover liability and responsibility for leaked CO₂⁵⁸.

Despite these arrangements, legal experts highlighted that it is difficult to generalize these procedures. This is because the type of liability and the costs incurred is dependent on the specific characteristics of the storage site. The EU commission has issued guidelines to alleviate this issue. These guidelines suggest alternative methods of measuring or calculating this risk, but still there remain significant concerns and this could potentially become a major obstacle for CCS projects in the North Sea⁵⁹.

However, with CO₂ EOR projects, the CCS and ETS Directives become inapplicable (because you are not storing CO₂, nor are you claiming emissions credits), and therefore dealing with leakage liabilities becomes a matter of private contract law (see section 2.3).

As highlighted in the previous section, hydrocarbon experts view CO₂ as a difficult substance to transport and inject. In this regard it is expected that quite a strict liability would be imposed on the operator because of the perceived risks. A legal expert from the hydrocarbon industry explained:

“The transportation of CO₂ offshore is less mature and I don’t think that those contracts for oil would be appropriate. A lot of those contracts are more for ‘what would happen if I burst your pipeline while I was building my pipeline’ rather than ‘what happens if there was leakage from my pipeline’. Present agreements governing liability [between operators] probably don’t contemplate CO₂ EOR, and are probably limited to the state-of-the-art technology when the agreements were formed. [Also], if CO₂ has a more corrosive quality, or needs specific conditions to be transported⁶⁰, [then] I would expect there to be a different liability arrangement to take those factors into consideration.”

A separate consent would be required from DECC for the construction of any CO₂ pipelines

⁵⁸ *Ibid.*

⁵⁹ See Clarke, C. (2011) ‘Long-term Liability for CCS: Some Thoughts about Specific Risks, Multiple Regimes and the EU Directive’. In Havercroft, I., Macrory, R. & Stewart, R. B. (Eds.) *Carbon Capture and Storage - Emerging Legal and Regulatory Issues*. Oxford, Hart Publishing Ltd.

⁶⁰ For economic and technical reasons, CO₂ is more likely to be handled as a supercritical fluid, or at high pressures as a dense phase.

crossing borders. It is therefore unlikely that neighbouring operators would be involved in this process. Any leakage from the CO₂ pipeline would incur indemnity or liability towards the Government, and this is where a bilateral treaty between two states may prove useful.

Summary:

The EU legislation implies that Member states should jointly share responsibilities when it comes to transboundary CCS EOR projects. However, not all liability regimes are harmonized at the national level, therefore private contract lawyers would be needed to sort out any inconsistencies. However, for transboundary installations, such as a pipeline or storage complex, then bi-lateral treaties may prove to be quite useful for ironing out liability issues associated with leakage. For CO₂ EOR projects, any indemnities or liabilities would need to be sorted out through private contract law, as the issues relating to the EU directives are not applicable.

3. Conclusions, Recommendations & Further Research

“Transboundary issues, yes they could be seen as a nuisance or a kind of irritation today, but they should certainly be possible to resolve.”

CO₂ injection for offshore EOR, particularly linked with long-term CO₂ storage for CCS, is gaining a lot of interest in Europe. The previous section presents and discusses some of the key issues in various legal contexts related to transboundary CO₂ streams for offshore injection in the North Sea region. The overall view amongst stakeholders was that there are not that many challenges from a legal and regulatory perspective. Rather, the main barriers for setting up transboundary projects are to do with political will and cost. From the analysis in the previous section, the relevant legal instruments discussed, and that could influence transboundary chains for CO₂ EOR projects, are presented in Table 1 below. How these existing legal arrangements effect transboundary CO₂ chains is indicated by a ‘green light’ for those that enable (green circle), and a ‘red light’ for those that impede (red circle).

Table 1. Summary of legal enablers or barriers to projects with transboundary CO₂ chains.

Legislation/legal context	Transboundary CO ₂ Chains				
	CO ₂ EOR	CCS EOR		CCS	
		Pipeline	Ship	Pipeline	Ship
OSPAR	●	●	●	●	●
London Protocol	●	●	●	●	●
EU CCS/ETS Directives	N/A	●	●	●	●
UK Energy Law ⁶¹	●	●	●	●	●

Table 1 highlights the fact that currently there are no legal impediments for transboundary CO₂ EOR projects in the North Sea region. If the project were to combine CCS with EOR, then currently there should not be any major legal impediment, provided that pipelines are used for CO₂ transport, otherwise carbon allowances would not be recognised by the EU ETS Directive. For CCS projects, where the aim is purely to do with the permanent disposal of CO₂, then a few legal hurdles remain for transboundary chains, notably, the London Protocol.

In terms of time scales, the information in Table 1 can be interpreted as follows:

- ♦ **Next year (2014):** initiate CO₂ EOR or CCS EOR project with transboundary elements, where *only pipelines* recognised *if* claiming allowances.
- ♦ **10-30 years (2020-2050):** CO₂ aquifer storage for CCS projects with transboundary elements, *provided that* London Protocol is ratified *and* a new regime that accommodates shipping within existing EU legislation is in place.

Further conclusions from the discussions of the previous section, and the relevant

⁶¹ This includes the Energy Act 2008, the Petroleum Act 1998 and all other related subsidiary legislation.

recommendations are presented below.

- ♦ In an international legal context, the London Protocol prohibits the export of CO₂ streams for permanent storage. However, the 2009 amendment to Article 6, which accommodates transboundary CO₂ transfer for CCS, has been adopted but still awaits ratification by two-thirds of the contracting parties in order to come into force. The ratification process could take a very long time, and requires extensive negotiations through high-level international diplomatic channels. Nevertheless, currently there is no prohibition under the Protocol for transboundary CO₂ streams for the purposes of hydrocarbon recovery.
 - **Strategy/solution:** *Allow the Protocol negotiations to take their course, where interested parties should remain engaged with the international dialogue and, a concerted diplomatic effort is maintained in order to progress the ratification process. Meanwhile, a few CO₂ EOR and CCS EOR demonstration projects could be started, provided that the CO₂ stream is genuinely used to facilitate and improve the production of hydrocarbon resources.*

- ♦ In the European context, there are various Directives in place, notably the CCS Directive and the ETS Directive, which are harmonized and provide a legal framework that would support combined CCS and EOR projects. However, for the transboundary transport of CO₂ streams, the Directives are quite prescriptive and currently only recognize pipelines as valid installations for calculating emissions allowances. Furthermore, the current price of Carbon in the EU market was highlighted as a major barrier to incentivise carbon capture projects, which would be key for ensuring secure supplies of CO₂.
 - **Strategy/solution:** *If a CO₂ EOR project decides to use ships for the transboundary transfer of its CO₂ streams, then this is possible as long as no attempt is made to claim emission allowances. However, this may not be a commercially attractive strategy, and if this route were taken, then the first CO₂ EOR projects may have to source their CO₂ as a commodity, similar to the food and drink industry presently does. However, the first CCS EOR projects could be designed to use pipelines, rather than shipping. This would give time for high-level negotiations within the EU community, notably between the main legislator (Commission) and Member States, in order to make the necessary amendments to existing Directives that could provide a regime supporting CO₂ transportation by ship. It is envisioned that the fixed carbon price floor, soon to be initiated in the UK, will encourage investment in carbon capture projects, which could secure CO₂ supplies.*

- ♦ The review of current UK regulation indicates that legislation of offshore operations is fairly robust. There are no major legal hurdles to speak of, as procedures for drawing up agreements between multiple parties is common practice, and may be transferable for transboundary projects. However, currently there are no CO₂ EOR operations in the UK, or the North Sea region. Stakeholders were of the view that the main challenge is in securing sustainable supplies of CO₂. Hydrocarbon and legal experts also indicated a preference for shipping CO₂ rather than pipelines, mainly for the added flexibility to transboundary chains, plus reducing the volume of contractual agreements required for dealing with liability issues associated with pipeline construction.
 - **Strategy/solution:** *DECC to provide fiscal incentives to encourage operators to use CO₂ streams for EOR and CCS EOR projects. UK Government should also stress the importance of shipping at the EU Commission level, so that a suitable regime can be put in place to support the hydrocarbon industry's preference for using ships for CO₂ transportation. In parallel, there should be a push to get the required adjustments to the IGC Code to allow safe and standardized shipment of CO₂.*

- ♦ In terms of liability, at the EU level it is implied in the legislation that Member states must share responsibility. Therefore, the focus of liabilities may come down to private contract law, dealt with on a case-by-case basis. In the context of transboundary chains, bi-lateral treaties between Member states may prove useful for installations such as pipelines, or shared storage complexes. At the UK level, industry already has procedures in place for dealing with indemnities and liabilities from offshore operations, which may provide a basis for both CO₂ EOR and CCS EOR projects.

Further Research

There are other issues related to potential transboundary chains that are not covered in this report and require further research. These include:

- ♦ Transboundary chains for CO₂ EOR and CCS EOR projects where the CO₂ stream is being imported into the North Sea region from countries *outside* the EU. This would involve reviewing the developments under the United Nations Framework Convention on Climate Change (UNFCCC).
- ♦ Bilateral treaties are routinely used for transporting natural gas across national borders in the shipping industry. A more detailed study of these types of legal procedures and contractual arrangements may provide insights that could be analogous for transboundary CO₂ shipping elements in future EOR projects.
- ♦ CO₂ is currently transported from the US to Canada for EOR purposes through pipelines. Therefore, a comprehensive review of the relevant legal arrangements presently used to transport CO₂ within North American legislation may highlight suitable methods for transporting CO₂ for European transboundary projects.

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Appendix A

The interviewees were lawyers, consultants and industry specialists, and they represented the following organizations:

List of participating organizations

- **Anthony Veder Group N.V.**
- **Bernhard Schulte Shipmanagement Limited**
- **Cairn Energy**
- **Maersk Oil & Maersk Tankers**
- **Panaware Ab**
- **Pinsent Masons**
- **Statoil**
- **Stockholm University**

Appendix B

The interview guides were designed specifically for the interviewee, depending on, for example, whether they were legal experts or business developers in industry. The following list questions were generally used to start a discussion, as the interviews were designed not to restrict conversation, but rather to be more exploratory in nature. This form of interviewing is generally used when the interviewee is a specialist or expert in a given field and has extensive knowledge of a particular area that cannot be gleaned from documents alone, e.g. how the shipping industry works, or how multilateral treaties are negotiated. Therefore, the interviews are also a way to gain factual knowledge as well as opinions of stakeholders.

Questions:

- ♦ Do you think there has been much progress in [insert industry sector/specific area] since we last met?
- ♦ Other than the [insert project name], have there been any other such initiatives involving offshore EOR?
- ♦ In your opinion, what are the key reasons for delays or lack of progress for moving CO₂ shipping/ CO₂ EOR forward?
- ♦ Are you aware of any legal or regulatory issues that restrict CO₂ shipping across national borders for offshore EOR?
- ♦ Are there pre-existing legal arrangements for setting up CO₂ transport/CCS-EOR projects?
- ♦ Do you think there is a big enough market for CO₂ in the North Sea area to make CO₂ EOR a viable business venture for [insert company name]?
- ♦ In your opinion, what do you think needs to be changed or adapted in the regulations and/or EU law to enable transboundary CCS-EOR projects?

Let's say Country A wanted to do some offshore CO₂ EOR, but it needed to source its CO₂ from Country B.

- ♦ How would Country A go about importing this gas?
- ♦ Would this be dealt by a legal contract with specific terms and conditions? E.g. if a production sharing contract by an oil company listed CO₂ as an industrial gas, then would this operation be subject to any restrictions from the London Protocol?
- ♦ And/or would there also be a need for a bi-lateral agreement between the two countries?
- ♦ How would you imagine the liabilities would be shared between these two countries for any environmental damages? E.g. if CO₂ were to leak or migrate into Country C's waters (which is geographically located next to Country A).

- ♦ Are liability issues dealt with on a case-by-case basis? Or is there some general rule that countries follow? E.g. would this be the point where the EU CCS directive would come into play?

Appendix C

Below is a list of the key pieces of legislation that are referred to throughout the main body of the report. The Global CCS Institute provides a useful analysis of a range of CCS (and EOR) related legal issues, and the relevant resource links are provided.

International Marine Legislation:

London Protocol

Full name: Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1996)

Brief description: “The Protocol aims to create a more modern and comprehensive waste management system for the seas than the one established under the 1972 London Convention, with a heightened emphasis upon the protection of the environment.”

EOR Exemption: Article 1, paragraph 4.1.3, provides that the “disposal or storage of wastes or other matter directly arising from, or related to the exploration, exploitation and associated off-shore processing of seabed mineral resources is not covered by the provisions of this Protocol.”

Resource link: <http://www.globalccsinstitute.com/networks/cclp/legal-resources/offshore-co2-storage/international-marine-legislation/london-protocol>

OSPAR

Full name: Convention for the Protection of the Marine Environment of the North East Atlantic (1992)

Brief Description: “The Convention applies to the 'maritime area', which is defined as the 'internal waters and the territorial seas of the Contracting Parties', the adjacent areas of sea under the jurisdiction of the coastal state and certain parts of the Arctic and Atlantic Oceans defined in Article 1. This Article also states that the maritime area includes 'the bed of all those waters and its sub-soil'. The primary aim of the Parties is to prevent and eliminate 'pollution', defined by the Convention as:

“the introduction by man, directly or indirectly, of substances or energy into the maritime area which results, or is likely to result, in hazards to human health, harm to living resources and marine ecosystems, damage to amenities or interference with other legitimate uses of the sea” (Article 1).”

Resource link: <http://www.globalccsinstitute.com/networks/cclp/legal-resources/offshore-co2-storage/europe/ospar>

EU Law

CCS Directive

Full name: Directive 2009/31/EC on the geological storage of carbon dioxide

Brief description: “The Directive applies to both offshore and onshore geological storage of CO₂. It establishes a comprehensive regulatory framework for geological storage and associated capture and transport activities.”

Resource link: <http://www.globalccsinstitute.com/networks/cclp/legal-resources/offshore-co2-storage/europe/ec-directive-on-the-geological-storage-of-co2>

ETS Directive

Full name: EU Emission Trading Directive (Directive 2003/87/EC) & Revised EU Emission Trading Directive (Directive 2009/29/EC)

Brief description: “The 2003 EU Emission Trading Directive establishes a scheme for greenhouse gas emission allowance trading within the EU, which is intended to 'promote

reductions of greenhouse gas emissions in a cost-effective and economically efficient manner' (Article 1). The Directive requires the government of each Member State to set a cap on the amount of greenhouse gases to be emitted annually by various installations covered by the scheme."

Resource link: <http://www.globalccsinstitute.com/networks/ccip/legal-resources/emission-trading/eu-emission-trading/eu-directive>

UK Law

Energy Act 2008

Brief description: "The Act asserts the rights of the Crown to an Exclusive Economic Zone (EEZ) (200 nautical miles), in accordance with Part V of the United Nations Convention on the Law of the Sea (UNCLOS) 1982, for the 'storing of gas' (whether or not with a view to its being recovered). The government may also designate 'Gas Importation and Storage Zones' within the EEZ. For operators seeking to undertake CCS activities within the newly designated EEZ, a lease will be required from the Crown Estate."

Resource link: <http://www.globalccsinstitute.com/networks/ccip/legal-resources/offshore-co2-storage/uk>