Three Layers of Energy Law for Examining CO_2 Transport for Carbon-Capture and Storage

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Abstract:

This research is a legal analysis concerning four scenarios for cross-border CO_2 transport that could increase the deployment of CCS deployment in Europe. The legal analysis categorises the law into three levels – international, national and local – and considers the four scenarios in light of these three levels of energy law. Upon reviewing the four scenarios, it is clear that the Rotterdam Nucleus (referred to as the 'Pilot Case') is the leading scenario and as a result it is explored in more detail. The potential Pilot Case is based on the development of Rotterdam (in the Netherlands) as a southern North Sea hub. Under this Rotterdam Nucleus scenario, captured carbon dioxide (CO_2) will be transported through the Port of Rotterdam to depleted gas fields offshore the Netherlands. CO_2 will also be transported through further links using CCS infrastructure to facilitate the processing of undeveloped gas fields offshore UK. The Pilot case contemplates further expansion opportunities, increasing the capture clusters through additional pipelines, expanding to further gas fields and using the port of Rotterdam for CO_2 shipping – hence the analysis of the other scenarios may be invaluable in the future development of CO_2 networks in the EU. Finally, and an original contribution of this paper is that it employs the three lawyers of energy law theoretical framework to an energy problem that was examined by an interdisciplinary research team. Further, this research was developed further through two key industry stakeholder meetings with CCS experts in the EU.

Keywords: CO_2 transport; Carbon-Capture and Storage (CCS); Three layers of energy law; Projects of Common Interest (PCI); London Protocol

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1: Introduction

With the ongoing energy law and policy transition towards contributing to a low-carbon economy, carbon-capture and storage (CCS) technology has a key role to play. Many countries internationally remain reliant on gas and/or coal. Both these energy sources can utilise CCS technology. Progress on CCS has been made in other countries such as Canada, the US and Australia. However, the EU still lacks a credible law and policy agenda on CCS, and in particular, one that will deliver outcomes. CCS has been considered as a CO_2 mitigation strategy for over 30 years now in the EU[1] and it is advanced here, that there has been insufficient research on CCS from a legal perspective in this time period. Further, this research aims to address this gap by also incorporating interdisciplinary analysis of the legal issues alongside industry stakeholder analysis. Hence the research aims to build on the resurgence of legal literature in the area over the last decade.

The original contribution of this paper is that it employs the three lawyers of energy law[2] theoretical framework to an energy problem. Further, it was through this framework that an interdisciplinary research team examined the transboundary-CO_2 transportation aspect of the proposed development cases. And this same research was developed further through two key industry stakeholder meetings with CCS experts in the EU – at each phase the research was revised and aimed therefore to be more robust and reduce potential bias between dominant stakeholders. The methodological process involved the interdisciplinary team of researchers[3] examining and analysing the legal issues for CO_2 transportation at international, national and local level. Then, the legal analysis was also reviewed by CCS experts in Brussels (Belgium) at two stakeholder meetings in November 2015 and September 2016, with a review period between. Feedback from the stakeholders at this meeting was incorporated into the analysis for this paper and the process is further explained in Appendix A. Abbreviations used in this paper are included in Appendix B.

This legal analysis examines four different pilot case scenarios: (1) UK-Norway EOR; (2) German Backbone; (3) Rotterdam Nucleus; and (4) CO_2 Antwerp-Rotterdam (CAR) Pipeline. The paper analyses the legal issues of these scenarios under three main categories – international, national and local levels. Section two presents this legal analytical method. Section three examines in more detail the selected Pilot Case (the Rotterdam Nucleus) and section four explores the three alternate scenarios which demonstrate why the Pilot Case was chosen. With the aim in future being to develop CO_2 transport networks across the EU to enable the development of CCS in Europe, the scenarios not selected now will return to prominence in future years for developing a CO2 network across the European Union (EU). Consequently, the lessons from these scenarios are considered in the penultimate section. Finally, this paper concludes with a brief discussion of future legal and policy activities to consider in the delivery of the recommended pilot case.

2: Analytical Background

[1] De Connick, *et al.* 2006. Acceptability of CO_2 capture and storage. A review of legal, regulatory, economic and social aspects of CO2 capture and storage. Energy Research Centre of the Netherlands ECN, Petten (Netherlands): ACCSEPT project (ECN 7.7714).

[2] Raphael J Heffron & Kim Talus. The development of energy law in the 21st century: a paradigm shift? (2016) Journal of World Energy Law and Business, 9 (3), 189-202.

[3] Financial support for this project from the EU Commission under the H2020 framework programme for research and innovation is highly appreciated.

2.1: Three Layers of Law

The legal issues presented by the development scenarios can be categorized within international, national and local law. In energy legal analysis, this is referred to as the 'three layers of law'.[4]

In energy law, the following issues are of concern at each of the three layers of law. At the international level, energy law is informed by treaties and international organisations.[5] The national level includes the aims of government (energy law and policy) and finance availability (law and economics). Finally, the local level considers local perspectives of individuals and communities, including impacts of infrastructure development.[6] Change at one level, for example, at the international law stage, will generally affect national and local legal issues and vice-versa.[7]

Table 1 below details the legal issues for CO_2 transport in the EU at each level, based on the research analysis completed for this project and these are all explained in more detail later.

Table 1: Issues Within the Legal Layers for CO_2 transport in the EU

Level	Issues
International	• The countries involved having a positive international outlook and/or involvement in CCS and/or CO_2 transport activity. • Ratification of the London Protocol – in particular, agreement with the amended Article 6. (see section 0below for more detail on the London Protocol)
National	• Law and policy – existence of and favourable national policy and legislation • Law and economics – financial commitments, subsidies on offer and research activities • Liability issues – liability regime present
Local	• Planning law and permitting issues – stable application procedures, demonstration projects, past experience • Other issues (e.g., local economy, social issues)

Source: Compiled by Authors (August 2017).

2.2: Selection of Scenarios

2.2.1: The Search for CCS Infrastructure Connectivity: Developing a PCI

Wide-scale transportation of CO_2 for CCS is a planned new activity in the energy sector.[8] Currently, the infrastructure to transport CO_2 in a European network does not exist as planned by the EU and hence in this context it is seen as a 'new technology'. Consequently, as with other new technologies, significant action at policy level is required to drive the development of law at national and local levels in order to encourage industry investment.[9]

[4] *Ibid*, Heffron & Talus (2016); and Heffron, R. J. 2015. *Energy Law: An Introduction*. Springer: Heidelberg, Germany. These layers of law are also used in energy law's sister subject 'environmental law' – see P Sand, 'The Evolution of International Environmental Law' in D Bodansky, J Brunnee and E Hey (eds), The Oxford Handbook of International Environmental Law (OUP 2007).
[5] *Ibid*, Heffron & Talus (2016).
[6] *Ibid*, Heffron & Talus (2016).
[7] *Ibid*, Heffron & Talus (2016).
[8] Joris Morbee, Joana Serpa and Evangelos Tzimas, European Joint Research Commission, *The evolution of the extent and the investment requirements of a trans-European CO2 transport network* (2010 European Union).
[9] Christine Bertram, and others, 'How will Germany's CCS policy affect the development of a European CO2 transport infrastructure?' Kiel Policy Brief Institut für Weltwirtschaft an der Universität Kiel, No. 43.

Despite transposition of the CCS Directive[10] into national law, a lack of consistency remains in the policies and support for CO_2 transportation infrastructure projects across EU Member States (MSs). This could hinder network development, impacting the realization of cross-border projects.[11]

As a means of addressing a lack of infrastructure interconnectivity, CO_2 project development, alongside the development of the CCS industry, has been included among the EU's infrastructure projects available for projects of common interest (PCI) treatment.[12] PCIs are energy infrastructure projects that support the implementation of the TEN-E Regulation's priority corridors and thematic areas, and promote interconnectivity of the EU's energy networks.[13] Cross-border CCS transport and storage projects are included among the thematic areas.[14]

A PCI provides a number of benefits, such as streamlined permitting and access to financial support.[15] In order for a project to qualify for PCI classification, it must achieve general and specific criteria as set out in Article 4 of the TEN-E Regulation.[16] The project must meet both of the following general criteria: 1) It must be necessary for at least one of the energy infrastructure priority corridors and areas; and 2) Following a cost-benefit analysis in accordance with the regulation's criteria, the project's potential overall benefits must outweigh its costs.

Furthermore, the project must achieve at least one of the following criteria: 1) involve at least two Member States by directly crossing the border of two or more Member States; 2) is located on the territory of one Member State and has a significant cross-border impact [as described elsewhere in the regulation]; 3) crosses the border of at least one Member State and a European Economic Area country.[17]

In addition, CCS projects must meet the following specific criteria, and particularly 'contribute significantly' to: 1) the avoidance of carbon dioxide emissions while maintaining security of energy supply; 2) increasing the resilience and security of carbon dioxide transport; 3) the efficient use of resources, by enabling the connection of multiple carbon dioxide sources and storage sites via common infrastructure and minimising environmental burden and risks.[18]

2.2.2: Relevant Countries: Selection of Scenarios

The four alternative development scenarios used to determine the Pilot Case (i.e. the leading scenario) involved the countries of Belgium, Germany, the Netherlands, Norway and the United Kingdom.

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[10] Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (CCS Directive).
[11] Milieu, 'Identification of future CO2 infrastructure networks' (November 2015, Report for the European Commission ENER/B1/FV2014-731/SI2.639451).
[12] Regulation (EU) No 347/2013 of the European Parliament and the Council of 17 April 2013 on guidelines for trans-European energy infrastructure (OJ L 115, 25.4.2013).
[13] Regulation (EU) No 347/2013 of the European Parliament and the Council of 17 April 2013 on guidelines for trans-European energy infrastructure (OJ L 115, 25.4.2013).
[14] European Commission, Commission Staff Working Document, Accompanying the document Commission Delegated Regulation amending Regulation (EU) No 347/2013 of the European Parliament and of the Council as regards the Union list of projects of common interest (SWD(2015) 247 final).
[15] European Commission, 'Projects of Common Interest' (2016) <ec.europea.eu/energy/en/topics/infrastructure/pojects-common-interest>.
[16] Regulation (EU) No 347/2013 of the European Parliament and the Council of 17 April 2013 on guidelines for trans-European energy infrastructure (OJ L 115, 25.4.2013).
[17] Regulation (EU) No 347/2013 of the European Parliament and the Council of 17 April 2013 on guidelines for trans-European energy infrastructure (OJ L 115, 25.4.2013), Article 4, 1(a) – (c).
[18] Regulation (EU) No 347/2013 of the European Parliament and the Council of 17 April 2013 on guidelines for trans-European energy infrastructure (OJ L 115, 25.4.2013), Article 4, 2(e).

A preliminary analysis, and one that provides a lens through which to examine the legal issues, is through the three layers of law.[19] Table 2 below highlights the issues presented within the three layers of energy law across the four potential pilot cases of the GATEWAY project. The 'Legal Issues' column on the right reflects issues within the three layers shown in Table 1 above. The remaining columns are a summary assessment of these issues across the countries involved in the four potential pilot cases (German Backbone, CAR Pipeline, Rotterdam Nucleus and UK-Norway EOR).

It can be seen from this table that all countries in the case studies have an international outlook with regard to CCS development and are participating in international forums concerning CCS development with other countries. This means that across the layers of energy law, Norway, the Netherlands and the UK have the fewest legal hurdles to overcome for realization of cross-border CCS projects. These are just highlighted examples, and the table below indicates where the main legal problems are found. These potentially problematic legal issues are explored in greater detail in the subsequent sections (three and four) of this paper.

Table 2: Legal Assessment Overview of CO_2 Transport Scenarios

Legal Issues	Germany	Belgium	Netherlands	UK	Norway
	German Backbone	CAR Pipeline		UK-Norway EOR	
			Rotterdam Nucleus		
International Legal Issues					
International Participation	☑	☑	☑	☑	☑
London Protocol	☒	☒	☑	☑	☑
National Legal Issues					
National Law & Policy	☑	☒	☑	☑	☑
Law & Economics	☒	☑	☑	☑	☑
Liability Issues	☒	☑	☑	☒	☒
Local Legal Issues					
Planning law and Permitting Issues	☑	☒	☑	☑	☑
Other Issues	☑	☑	☑	☑	☑

Note: Key: ☑ = good legal environment; ☒ = problems in legal environment
Source: Compiled by Authors (August 2017).

3: The Recommended Scenario: The Rotterdam Nucleus (the Pilot Case)

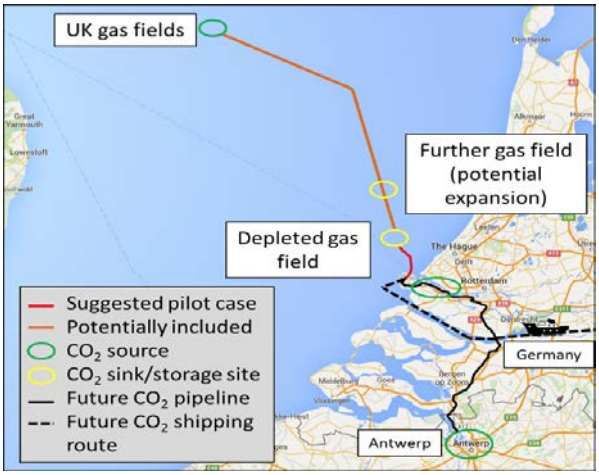
3.1: Case Description

The Rotterdam Nucleus is based on the developing CO_2 capture nucleus of Rotterdam, which includes the Rotterdam Climate Initiative (RCI), ROAD project and potential additional cluster connections (e.g., CAR project—see Case D below). The CO_2 is then transported via a high pressure, medium (100 km), oversized (457 mm) pipeline. The pipeline follows a transboundary offshore route from CO_2 sources in the Netherlands to storage sites offshore Netherlands (P18 and P15), as well as from the Fizzy field offshore UK (and which facilitates a natural gas exploitation opportunity) (See Figure 1 below).

While further extensions are possible, the scope of this analysis focuses on the base pilot case.

Figure 1: The Rotterdam Nucleus

[19] *Ibid*, Heffron & Talus (2016).



3.2: International Legal Issues

3.2.1: Law and Policy

As the Rotterdam Nucleus case includes the transportation of CO_2 from the Fizzy field in the UK to the storage site in the Netherlands, the two countries will need to establish and agree terms for development of the international project. Both the UK and the Netherlands are members of the North Sea Basin Task Force (NSBTF). This could provide an existing cooperate platform to address transboundary transport of CCS, such as that contemplated by the Rotterdam Nucleus scenario.

The establishment of an international agreement will take time. Consider, for example, the UK-Norway Framework Agreement for transboundary hydrocarbon reservoirs and infrastructure. This agreement is considered by some to be a prime example of international cooperation in the North Sea, however, it required three years to be agreed.[20] Yet, it is reasonable to assume that negotiation of a specific, bilateral agreement for a CCS/hydrocarbon production project, following the working relationship under the Framework Agreement, could be a timely and easier process – though this one-off action may not benefit the long-term development of CCS but may be an interim solution. It should be noted that both countries are signatories of the Energy Charter Treaty, which has long been used for transboundary hydrocarbon pipeline projects. The Energy Charter Treaty could also serve as a basis for establishing a transboundary CO_2 project. [21]

3.2.2: Ratification of London Protocol

The London Protocol, which was adopted on 7 November 1996, is an international agreement that prohibits the dumping of wastes at sea, including the export of waste for such disposal.[22] This prohibition applies only to the London Protocol's contracting parties. A map identifying these parties can be found on the IMO's website.[23] The Protocol's terms have implications for transboundary CCS projects.

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[20] Element Energy, 'One North Sea' (2010, Report for The Norwegian Ministry of Petroleum and Energy and The UK Foreign and Commonwealth Office) <www.npd.no/en/publications/reports/one-north-sea/6-legal-and-regulatory-issues/>.

[21] Energy Charter Secretariat, *Investment and Market Development in Carbon Capture and Storage: Role of the Energy Charter Treaty* (2009) <www.energycharter.org/fileadmin/DocumentsMedia/Thematic/CCS_2009_en.pdf>.

[22] International Maritime Organisation (IMO), 'Carbon Capture and Sequestration' (2016), <www.imo.org/en/OurWork/Environment/LCLP/EmergingIssues/CCS/Pages/default.aspx>.

[23] *See* /www.imo.org/en/OurWork/Environment/LCLP/Documents/Parties%20to%20the%20London%20Convention%20and%20Protocol%20March%202016.pdf

Firstly, for context, Annex I of the London Protocol sets out exceptions for the prohibition on dumping of wastes at sea. In 2006, an amendment to Annex I was enacted to allow offshore storage of CO_2 for the purpose of CCS.[24] This amendment entered into force on 10 February 2007.[25] As this change was to an *annex* of the London Protocol, rather than to an *article*, the amendment approval process was passive. That is, the Annex I amendment automatically entered into force for any contracting party that did not lodge an objection to the amendment within the prescribed timeframe in accordance with Article 22 (entitled 'Amendment to the Annexes').[26]

Secondly, Article 6 of the London Protocol currently forbids the Protocol's contracting parties to engage in international transboundary transportation of CO_2 for offshore storage. Specifically, Article 6 states, "Contracting Parties shall not allow the export of wastes or other matter to other countries for dumping or incineration at sea".[27] An amendment to Article 6 was proposed by Norway in 2009 and adopted by the Protocol's parties in accordance with Article 21 (entitled 'Amendment of the Protocol'), however, the amendment comes into force only after ratification by two-thirds of the Protocol's 48 (current) Parties.[28] That is, unlike an amendment to an Annex, the amendment to an Article is an active process, requiring affirmative action by the parties, rather than a deemed approval.

As observed by the IEA, ratification of the amendment is not necessarily a priority for all contracting parties, given not all London Protocol signatories are involved in CCS.[29] This makes ratification a challenge for those parties seeking to deploy transboundary CCS projects. China was the only contracting party to vote against the amendment, raising a concern that it could weaken the Protocol by opening the door for other wastes to be exported, and commenting that the technical and legal issues of CO2 export remained unclear.[30]

It is noted the Rotterdam Nucleus case includes the production of CO_2 from the Fizzy field in the UK central North Sea sector 50 as part of the production of 3.7 bcm of natural gas. The CO_2 is then transported transboundary to the Netherlands' P18 storage site.[31] Unlike the UK-Norway pilot case (explored a subsequent section below), presumably this would not be an enhanced

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[24] International Maritime Organisation (IMO), 'Carbon Capture and Sequestration' (2016), <www.imo.org/en/OurWork/Environment/LCLP/EmergingIssues/CCS/Pages/default.aspx>.

[25] International Energy Agency (IEA), 'Carbon Capture and Storage and the London Protocol: Options for Enabling Transboundary CO2 Transfer' (Working Paper) (Paris: OECD/ IEA 2011) <www.iea.org/publications/freepublications/publication/CCS_London_Protocol.pdf>.

[26] International Energy Agency (IEA), 'Carbon Capture and Storage and the London Protocol: Options for Enabling Transboundary CO2 Transfer' (Working Paper) (Paris: OECD/ IEA 2011) <www.iea.org/publications/freepublications/publication/CCS_London_Protocol.pdf>.

[27] 1996 PROTOCOL TO THE CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER, 1972 (London Protocol) Article 6.

[28] IMO, 'Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter' <www.imo.org/en/OurWork/Environment/LCLP/Pages/default.aspx>; IMO, 'Carbon Capture and Sequestration' (2016), <www.imo.org/en/OurWork/Environment/LCLP/EmergingIssues/CCS/Pages/default.aspx>; IMO, 'Parties to the London Convention and Protocol' (9 December 2016) <www.imo.org/en/OurWork/Environment/LCLP/Documents/Parties%20to%20the%20London%20Convention%20and%20Protocol%20Dec%202016.pdf>; Justine Garrett and John McCoy, 'Carbon capture and storage and the London Protocol: Recent Efforts to Enable Transboundary CO2 Transfer' (2013) 37 Energy Procedia 7747; Chiara Armeni, 'Legal Developments for Carbon Capture and Storage under International and Regional Marine Legislation' in Ian Havercroft, Richard Macrory and Richard B Stewart (eds), *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Hart Publishing 2011) 145.

[29] International Energy Agency (IEA), 'Carbon Capture and Storage and the London Protocol: Options for Enabling Transboundary CO2 Transfer' (Working Paper) (Paris: OECD/ IEA 2011) <www.iea.org/publications/freepublications/publication/CCS_London_Protocol.pdf>.

[30] Chiara Armeni, 'Legal Developments for Carbon Capture and Storage under International and Regional Marine Legislation' in Ian Havercroft, Richard Macrory and Richard B Stewart (eds), *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Hart Publishing 2011) 145, 152 (footnote citation omitted).

hydrocarbon recovery (EHR) scenario, as CO_2 is not being injected and stored into the Fizzy field in order to produce natural gas. Rather, CO_2 is being produced from the Fizzy field (which has a high CO_2 content) and then transported to the Netherlands for storage.

This distinction is relevant, as there is debate in the literature about the meaning of CO_2 when used for EHR with regard to the London Protocol. The London Protocol contemplates the dumping of *waste* at sea, yet EHR presents the question of the point at which the CO_2 transforms from being a commodity to a waste. For example, one view is that EHR CO_2 is not a waste during EHR operations, but it becomes waste upon long term storage, becoming subject to the London Protocol's waste export prohibition under Article 6.[32]

The IEA has suggested possible approaches to address the London Protocol CO_2 export restriction. For example, countries could establish agreements as an alternative to overcome the legal barrier posed as a result of the amendment to the London Protocol not being effective.[33] However, a consensus is lacking on this point. One contrary view is that in the absence of approval of the amendment to Article 6 of the London Protocol, any actions remain 'suspect' under international law.[34] It is assumed here that the Rotterdam Nucleus case would not be classified as an enhanced hydrocarbon recovery activity by the relevant licensing authority, and therefore, it is assumed the London Protocol's CO_2 export restriction would apply.

Both the UK and the Netherlands have signed up to the London Protocol, including the amended Article 6. Although amendment 6 to the London Protocol is not yet in force, the fact that both the Netherlands and the UK have signed the amendment reflects their support for its terms. Thus, it is reasonable to assume the countries could agree terms to overcome the London Protocol obstacle.

3.2.3: Other International Issues*: CCS Directive and Enhanced Hydrocarbon Recovery (EHR)*

Enhanced hydrocarbon recovery (EHR) is the production (recovery) of hydrocarbons (natural gas and oil), through the injection of CO2 into the hydrocarbon formation.[35] The Rotterdam Nucleus case includes the production of CO_2 from the Fizzy field in the UK central North Sea sector 50 as part of the production of 3.7 bcm of natural gas. The CO_2 then would be transported transboundary to the storage location in the Netherlands (at the P18 storage site). Thus, while it has some qualities of EHR, unlike EHR, CO_2 would *not be injected into* the Fizzy field to produce hydrocarbons. Instead, CO_2 *would be produced from* the high CO_2 natural gas reservoir, then transported and stored for the purpose of CCS. Accordingly, it is asserted the production of hydrocarbons in the Rotterdam Nucleus scenario would not be an EHR activity.

The reader may ask why the issue of EHR is noteworthy, given the above position that the Rotterdam Nucleus case is not an EHR activity (or rather perhaps could be described as an EHR activity in reverse). It is because not only does the literature indicate that the application of the CCS Directive to EHR is unclear, but also the meaning of EHR within the CCS Directive is nebulous. With regard to the former, this ambiguity is due to EHR being contemplated by Preamble 20 of the Directive, and as preambles are not binding under EU law, the preamble acts as an interpretative aid for the Directive. As to the latter, arguably, a prima facie reading of the Preamble fails to specify the scope of activities to which the EHR label would apply.

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[33] Justine Garrett & Sean McCoy, 'Carbon capture and storage and the London Protocol: recent efforts to enable transboundary CO2 transfer' (2013) 37 Energy Procedia 7747.

[34] Richard Macrory, and others, UCL Carbon Capture Legal Programme, 'SCCS CO2-EOR JIP Legal Status of CO2 – Enhanced Oil Recovery' (2013) <www.sccs.org.uk/images/expertise/reports/co2-eor-jip/SCCS-CO2-EOR-JIP-WP6-Legal.pdf>.

[35] Philip M Marston and Patricia A. Moore, 'From EOR to CCS: The Evolving Legal and Regulatory Framework for Carbon Capture and Storage' (2008) 29 Energy Law Journal 421.

Preamble 20 of the CCS Directive states:

> "Enhanced Hydrocarbon Recovery (EHR) refers to the recovery of hydrocarbons in addition to those extracted by water injection or other means. EHR is not in itself included in the scope of this Directive. However, where EHR is combined with geological storage of CO_2, the provisions of this Directive for the environmentally safe storage of CO_2 should apply".[36]

With regard to the scope of the Directive, some authors view that the CCS Directive would apply to EHR.[37] However, it has been noted the preamble could be a legacy of the legislative process, when the preamble proposed along with an EHR exclusion in the substantive text.[38] While the exclusion was not included in the final Directive, the non-binding preamble remained.[39]

Regarding the meaning of EHR under Preamble 20 of the CCS Directive, as mentioned above, a prima facie reading of the text suggests the meaning of EHR is not clear and thus the activities that would constitute EHR may not be certain. For the Rotterdam Nucleus case, geological storage of CO_2 would be a product of hydrocarbon exploitation in the Fizzy field, rather than being injected as a means of enhanced hydrocarbon recovery. While it could be argued the consequential CO_2 production and storage in this context reflects the language of the preamble, the result probably does not reflect the preamble's intent. However, even if the production of hydrocarbons from the Fizzy field could be considered EHR, given the EHR aspect of the Fizzy field would be part of a greater CCS project, it would be reasonable to interpret the Directive as applying to the EHR aspects of the Rotterdam Nucleus case (should they be deemed to be EHR).

It is recommended clarity is obtained on these potential ambiguities, such as through an amendment to the CCS Directive or through the permitting process for the Rotterdam Nucleus case.

3.3: National Legal Issues

3.3.1: Law and Policy

The Netherlands

The Netherlands has two CO_2 transportation projects—OCAP and ROAD. The OCAP project entails transportation of CO_2 to greenhouses, whereas ROAD is a CCS project. There is a view that CCS can assist in reaching climate change targets in the Netherlands.[40] Dutch law is generally favourable to enable offshore CCS development and CO_2 storage (noting the Netherlands has banned storage of CO_2 onshore).[41] The CCS Directive has been adopted in the Dutch Mining Act; Dutch Mining Decree; and the Dutch Mining Regulation.

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[36] Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (CCS Directive). (In addition, EHR is not included among the CCS Directive's list of Article 2 exceptions.)

[37] Edwin Woerdman, Martha Roggenkamp and Marijn Holwerda (eds) *Essential EU Climate Law* (Edward Elgar UK 2015) 187.

[38] *Ibid*, Macrory et al. (2013).

[39] *Ibid*, Macrory et al. (2013).

[40] See, e.g., Zero Emissions Resource Organisation, 'The Netherlands' (n.d.) <www.zeroco2.no/projects/countries/the-netherlands>; *Ibid*, Milieu (2015).; Ecofys, http://ccs-roadmap.ecofys.com/index.php/History_of_CCS_in_the_Netherlands#Developing_CCS_regulations

[41] *Ibid*, Milieu (2015).

A 2010 policy document examined large-scale CCS development.[42] The ROAD project has been approved by the European Commission for a CO_2 storage permit (although approval took longer than stated in the Directive).[43]

UK

The UK's CCS policy remains unclear. In recent history, the UK seemed supportive of CCS, as demonstrated in the UK government's CCS commercialization competition, which enabled front end engineering and design (FEED) studies for four CCS projects. This competition was cancelled at an advanced stage in late 2015.

Subsequently, in September 2016, the Parliamentary Advisory Group on CCS issued its 'Lowest Cost Decarbonisation for the UK: The Critical Role of CCS' report (the 'Lord Oxburgh Report'),[44] setting out a roadmap for the commercialization of CCS in the UK. This suggests the UK remains open to the wide-scale CCS deployment.

The UK has transposed the CCS Directive into law under the Energy Act 2008. Operators of offshore CO_2 storage must obtain a Licence under section 18 of the Energy Act 2008, which is issued by the Oil and Gas Authority (OGA). Both CCS and EOR licensing are currently managed by the UK Oil and Gas Authority.[45]

3.3.2: Law and Economics

The Netherlands

In the Netherlands, subsidies have been granted for pilot and demonstration projects.[46] The Netherlands has a significant research agenda through CATO, the Dutch research program for CCS. It is noted the ROAD project received financial support via the Dutch Government and the European Energy Programme for Recovery (EEPR).[47]

UK

The UK government withdrew the £1billion CCS competition in 2015, which would have supported the White Rose and Peterhead projects. However, the UK continues to invest in research of CCS transport and storage projects, such as through the Energy Technologies Institute—a public-private partnership that focuses on research and development for low carbon technologies, including CCS.[48]

3.3.3: Liability

Neither the UK nor the Netherlands have specific provisions on leakage from CO_2 transport pipelines to date (with Norway being the only country among the development cases to do so)[49], however, CO_2 leakages from pipelines are covered by the EU-ETS, should it form part of a CCS project.

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[42] A.J. Seebregts and others, 'Policy instruments for advancing CCS in Dutch power generation' (December 2010) < https://www.ecn.nl/docs/library/report/2010/e10032.pdf>.

[43] Andy Read and others, 'GHGT-12: Update on the ROAD Project and Lessons Learnt' (2014) 63 Energy Procedia 6079.

[44] Lord Oxburgh, 'Lowest Cost Decarbonisation for the UK: The Critical Role of CCS' (2016) (Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage).

[45] UK Oil and Gas Authority 'UK carbon capture and storage' (n.d.) <www.ogauthority.co.uk/licensing-consents/carbon-storage/>;

[46] *Ibid*, Milieu (2015), citing CATO2, 'History of Carbon Capture and Storage in the Netherlands' < http://ccs-roadmap.ecofys.com/index.php/History_of_CCS_in_the_Netherlands>.

[47] *Ibid*, Milieu (2015).

[48] Energy Technologies Institute, (n.d.) www.eti.co.uk/programmes/carbon-capture-storage.

[49] Ibid, Milieu (2015).

The Netherlands

CCS liability provisions have been enacted into legislation in the Netherlands. The ROAD project, which was awarded the first storage permit under the CCS Directive,[50] has published its lessons learned from undergoing the project permitting process in the Netherlands, including an overview of the project's potential liability exposures (but with an emphasis on CO_2 storage).[51] The potential liability exposures common for transport and storage included ETS liability (arising from CO_2 leakage), environmental liability and liability to third parties.[52] (It is noted these same principles would apply to other countries.)

UK

In the UK, CO_2 pipelines will have to comply with the Pipeline Safety Regulations 1996 and the Health and Safety at Work Act 1974. CO_2 is not currently defined as a dangerous fluid nor are CO_2 pipelines classified as Major Accident Hazard Pipelines (which also have relevance for local land use planning).[53]

3.4: Local Legal Issues

3.4.1: Planning Law and Permitting Issues

Planning and permitting procedures are advanced and clear in the Netherlands and the UK.

The Netherlands

It is noted onshore geological storage of CO_2 is not allowed in the Netherlands, following public opposition (and which resulted in cancellation of the Barendrecht project).[54] In the Netherlands, in addition to capture permits, permits are required for CO_2 pipelines and storage. Under certain circumstances, CO_2 pipeline and storage permits are governed by the National Coordination Scheme, under the Spatial Planning Act, which streamlines the application and approval process.[55]

UK

The UK does not have specific permitting procedures for CO_2 pipelines, with permitting being based on the approach used for oil and gas pipelines.[56] As mentioned previously, CO_2 is not defined as a dangerous fluid nor are CO_2 pipelines classified as Major Accident Hazard Pipelines, which have relevance for local land use planning.[57]

In the UK, planning policy supports the development of CO_2 transport infrastructure for CCS (through National Policy Statements and nationally significant infrastructure projects (NSIPs). A licensing procedure exists for offshore CO_2 storage for Scotland and then for England, Wales and Northern Ireland.

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[50] Alla Shogenova and others, 'Implementation of the EU CCS Directive in Europe: results and development in 2013' (2014) 63 Energy Procedia 6662.

[51] ROAD CCS, 'Permitting Process: Special report on getting a CCS project permitted' (January 2013) <http://hub.globalccsinstitute.com/sites/default/files/publications/94946/permitting-process-special-report-getting-ccs-project-permitted.pdf>.

[52] *Ibid*, ROAD CCS (2013)..

[53] *Ibid*, Macrory et al. (2013).

[54] *Ibid*, Shogenova *et al.* (2014).

[55] ROAD CCS, 'Permitting Process: Special report on getting a CCS project permitted' (January 2013) <http://hub.globalccsinstitute.com/sites/default/files/publications/94946/permitting-process-special-report-getting-ccs-project-permitted.pdf>.

[56] *Ibid*, Macrory et al. (2013).

[57] *Ibid*, Macrory et al. (2013).

3.5: Conclusion

At the international level of law, the Rotterdam Nucleus pilot case comprises the Netherlands and the UK – countries that have an existing working relationship in the NSBTF and that have signed the London Protocol amendment, reflecting their support of CO_2 export for CCS.

At the national level of law, both countries have regulatory and permitting regimes in place. However, from a policy perspective, the CCS policy of the Netherlands is more consistent and clearer than that of the UK. The UK's policy seems to be in transition, following the UK's cancellation of the CCS competition, and the subsequent Lord Oxburgh report, setting out a strategy for CCS in the UK.

4: Legal Considerations for Three Alternative Scenarios

4.1: UK-Norway EOR

4.1.1: Case Description

The UK-Norway Enhanced Oil Recovery (EOR) case contemplates a pipeline linking a varied cluster of CO_2 sources in the North East of England to EOR opportunities in the UK and Norwegian sectors of the Central North Sea (CNS). The CO_2 source is the Teesside Collective, a mixed cluster of sources including industry (agriculture), power and gas reformation.

The proposed transport infrastructure is a high pressure, long (500 km), oversized (28 inch) pipeline from the Teesside Collective in northeast England, which runs offshore to storage in the CNS oil fields. A fully scoped route for the pipeline already exists, following existing lines located away from populated areas. The target CNS oil fields are high CO_2 fields, being Brae (100Mt), T block (60Mt) in the UK sector and Jotun, Ula and Oseberg (100s MT) in the Norwegian sector.

4.1.2: International Legal Issues

Ratification of London Protocol

The UK-Norway EOR case entails the capture of CO_2 from sources in the UK with storage in the UK and Norway. The transportation of CO_2 to storage sites offshore Norway thus contemplates the international transboundary transportation of CO_2 between the UK and Norway but for the purpose of EHR, but ultimately for the purpose of storing CO_2 for abatement (i.e., CCS).

As mentioned in the discussion of London Protocol under the Rotterdam Nucleus case, the treatment of CO_2 in an EHR scenario is unclear, as it is questionable whether the CO_2 is a waste (and subject to the Article 6 prohibition on the export of waste) or if it is a commodity (and therefore outside the scope of the London Protocol).[58] There is a lack of consensus in the literature on this point. For example, consider that a 2015 study for the European Commission states:

> "The London Protocol has been interpreted by contracting parties as prohibiting the export of CO2 from a contracting party to other countries for injection into offshore, sub-seabed geological formations. It states that a country can store within its own jurisdiction. The London Protocol was amended in 2009 but this amendment has not yet been ratified to allow trans-boundary transport of CO2. The latest ratified version of the London Protocol allows for offshore EHR but CO2 export is still not allowed".[59]

[58] See discussion at section 3.1.2.1

[59] Triple, Ricardo-IEA and TNO, *Study to support the review and evaluation of Directive 2009/31/EC on the geological storage of carbon dioxide (CCS Directive) (*Contract No 340201/2014/679421/SER/CLIMA.C1) x <http://publications.europa.eu/resource/cellar/3f0867e1-8e88-11e5-b8b7-01aa75ed71a1.0001.01/DOC_1>.

Yet, in comparison Macrory and others observe:

> "CO2 injection associated with EHR operations that falls within the Art 1.4.2 [dumping] exemption will not be caught by the Art 6 prohibition. It will be a matter of fact and degree to determine for any particular operation whether the CO2 storage that occurs is an inevitable result of EHR operations or is conducted for other reasons".[60]

Both the UK and Norway are parties to the London Protocol, and have ratified the amended Article 6. Assuming the London Protocol would apply to the UK-Norway EOR case, although amendment 6 to the London Protocol is not yet in force, the fact that both Norway and the UK have signed the amendment reflects their support for its terms. Thus, it is reasonable to assume the countries could agree terms to overcome the London Protocol obstacle.

Other International Issues

Both countries have implemented the CCS Directive, providing a level of consistency in the national and international legal regimes for the UK-Norway EOR case. (Norway is not an EU Member State, however, it is a member of the European Economic Area, through which the CCS Directive applies.)[61] Similar to the EOR issue under the Rotterdam Nucleus case, the treatment of EOR under the CCS Directive would also apply here. Clarity is required for liability issues under climate change legislation (EU ETS and attribution of credits related to stored CO_2), [62] requiring time for resolution of these issues.

The CCS Directive requires Member States to cooperate with each other with regard to transboundary CCS projects.[63] An agreement would need to be reached between the two nations, governing the arrangements for the international transboundary transportation of CO_2 from UK sources to sinks in Norway.

The UK and Norway have an existing relationship through a cooperative platform governing transboundary petroleum project activities in the North Sea, through the NSBTF. Norway and the UK have cooperated in the past on 1998 and 2005 UK/Norway Framework Agreements concerning cross-border petroleum issues.[64] However, establishment of an agreement governing transboundary CO_2 will take time. (Consider, for example, that the 2005 Framework Agreement entailed a three-year negotiation period.)[65]

Briefly, for completeness, it is noted that the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), to which the United Kingdom and Norway are parties, was amended in 2007 to allow for transboundary CCS. However, the amendment does not explicitly apply to EOR.[66] While the OSPAR convention provides exceptions for dumping, there is ambiguity as to whether EOR meets these exceptions. There is a view that EOR is excepted from OSPAR, as EOR would be a normal operation of an offshore installation.[67]

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[60] *Ibid*, Macrory et al. (2013).
[61] Global CCS Institute, 'Norwegian CCS Legislation' <https://hub.globalccsinstitute.com/publications/dedicated-ccs-legislation-current-and-proposed/norwegian-ccs-legislation>.
[62] Directive 2009/29/EC.
[63] Art. 24, Directive 2009/31/EC.
[64] Element Energy, 'One North Sea' (2010, Report for The Norwegian Ministry of Petroleum and Energy and The UK Foreign and Commonwealth Office) <www.npd.no/Global/Engelsk/3%20%20Publications/Reports/OneNorthSea/OneNortSea_Final.pdf>.
[65] *Ibid*, Element Energy (2010). .
[66] OSPAR Commission, 'Carbon Capture and Storage' (n.d.) <www.ospar.org/work-areas/oic/carbon-capture-and-storage>; and *Ibid*, Macrory et al. (2013)..
[67] *Ibid*, Macrory et al. (2013)., citing Report from the Group of Jurists and Linguists on Placement of Carbon Dioxide in the OSPAR Maritime Area (2004).

4.1.3: National Legal Issues

Law and Policy

Norway

Norway has two decades' experience with CCS. Two commercial CCS projects are in operation in Norway – Sleipner, operational since 1996, and Snohvit, operational since 2008.[68]

Norway's national government has been supportive of CCS. The Norway government is investigating means of proving CCS technology and reducing cost through activities such as feasibility studies.[69] A recent government-funded feasibility study investigated capture project from three different industries: Yara, the world's largest ammonia production company, Norcem, Norway's sole cement producer, and Oslo's waste management and energy recovery CCS project Klemetsrud.[70] The study revealed that all three projects are feasible, and that Norway could implement a full-scale CCS project by 2022 at lower costs than previously considered.[71] This was followed by approximately 40 million Euros in further support in the recent 2017 national budget to move forward with the three capture projects.[72]

Norway, an EEA country, has implemented the EU's CCS Directive. Norway has CCS legislation in place for CO_2 transport pipelines and other CCS-related infrastructure. Approval must be obtained under the Petroleum Act[73] for storage of CO_2 from petroleum activities (including EHR). It should also be noted that Norway has indicated an interest in international CCS collaboration.[74] For example, Norway has provided financial support for the Netherlands' ROAD project. Also, informal discussions have occurred between the UK and Norway, concerning the UK's Peterhead and White Rose projects, which would have provided possible international collaboration opportunities.[75]

UK

Unlike Norway, the UK's CCS policy is unclear. In recent history, the UK seemed supportive of CCS, as demonstrated in the UK government's CCS commercialization competition, which enabled front end engineering and design (FEED) studies for four CCS projects. This competition was cancelled at an advanced stage of detailed design in late 2015.

Subsequently, in September 2016, the Parliamentary Advisory Group on CCS issued the 'Lord Oxburgh Report',[76] setting out a roadmap for the commercialization of CCS in the UK. This suggests the UK remains open to the wide-scale deployment of CCS in the UK.

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[68] *Ibid*, Element Energy (2010).; Statoil, 'Carbon capture and storage' (2014) www.statoil.com/en/TechnologyInnovation/NewEnergy/Co2CaptureStorage/Pages/default.aspx>.

[69] Norwegian Government, Ministry of Petroleum and Energy, www.regjeringen.no/en/topics/energy/carbon-capture-and-storage/id86982/.

[70] Bellona, 'Press Release: Norway breaks vicious cycle of inaction on CCS deployment with concrete plans for industry' (30 September 2016) <http://bellona.org/news/ccs/2016-09-norway-breaks-vicious-cycle-of-inaction-on-ccs-deployment-with-concrete-plans-for-industry>.

[71] Norwegian Government, Ministry of Petroleum and Energy, www.regjeringen.no/en/aktuelt/good-potential-for-succeeding-with-ccs-in-norway/id2506973/.

[72] See, e.g., Gassnova, 'Crucial climate commitment in the 2017 budget' (7 October 2016), <www.gassnova.no/en/crucial-climate-commitment-in-the-2017-budget>.

[73] Act 29 November 1996 No. 72 relating to Petroleum Activities.

[74] *Ibid*, Milieu (2015).

[75] *Ibid*, Milieu (2015).

[76] Lord Oxburgh, 'Lowest Cost Decarbonisation for the UK: The Critical Role of CCS' (2016) (Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage).

In addition, it is noted the UK government recognizes the opportunity presented by EOR; see for example, the UK's EOR Strategy, which recommends the development of strategy and plan for CCS/EOR.[77] The UK has transposed the CCS Directive into law under the Energy Act 2008. Operators of offshore CO_2 storage must obtain a Licence under section 18 of the Energy Act 2008, which is issued by the Oil and Gas Authority (OGA). In the UK, a Seaward Production Licence under the Petroleum Act is required for EOR, whereas CCS storage operators must obtain a CO_2 Storage licence under the Energy Act 2008. An activity could start as pure EOR (Seaward Licence) and later transform into CCS, the latter of which could require CO_2 licence. These licence regimes are not inconsistent, however, it is noted the CO_2 licence has additional requirements – monitoring, etc.[78] Both CCS and EOR licensing are currently managed by the UK Oil and Gas Authority.[79] Clarity on the timing of these dual licensing regimes is required and could be an area for further inquiry and research.

Law and Economics
Norway continues to invest in CO_2 transport and storage projects, such as a financial commitment to the ROAD project.[80] Norway's 2017 budget contemplates expenditures of NOK 1.3 billion for CCS research.[81]

In comparison, the UK government withdrew the £1billion CCS competition in 2015, the UK continues to invest in research into CCS projects, such as through the Energy Technologies Institute, a public-private partnership that focuses on research and development for low carbon technologies, including CCS.[82]

Liability Issues
Both the UK and Norway have implemented the CCS Directive, including its liability regime, mostly through changes to existing legislation. In addition, Norway has regulations for CO_2 pipelines, and imposes strict liability for pollution from CO_2 pipeline leaks.[83] Conversely, in the UK, no specific liability provision has been made for leakages from CO_2 transport pipelines to date.[84]

4.1.4: Local Legal Issues

Planning Law and Permitting Issues
Norway has established planning and permitting procedures for CO_2 pipelines, which are similar to those for oil and gas pipelines.[85] The UK does not have specific permitting procedures for CO_2 pipelines, with permitting being based on the approach used for oil and gas pipelines.[86] However, it is noted that in the UK, CO_2 is not currently defined as a dangerous fluid nor are CO_2 pipelines classified as Major Accident Hazard Pipelines, which has relevance for local land use planning.[87]

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[77] UK Oil and Gas Authority, 'Enhanced Oil Recovery (EOR) Strategy' (2016) <www.ogauthority.co.uk/media/1143/eor_strategy_final-2016.pdf>.
[78] *Ibid*, Macrory et al. (2013).
[79] UK Oil and Gas Authority 'UK carbon capture and storage' (n.d.) <www.ogauthority.co.uk/licensing-consents/carbon-storage/>;
[80] *Ibid*, Milieu (2015).
[81] See, e.g., Global CCS Institute, 'Norwegian state budget confirms 1.3 billion kroner investment in CCS including support for full scale CCS' (11 October 2016) <www.globalccsinstitute.com/news/institute-updates/norwegian-state-budget-confirms-13-billion-kroner-investment-ccs-including-support-full-scale-ccs>.
[82] Energy Technologies Institute, (n.d.) www.eti.co.uk/programmes/carbon-capture-storage.
[83] *Ibid*, Milieu (2015).
[84] *Ibid*, Macrory et al. (2013).
[85] *Ibid*, Milieu (2015).
[86] *Ibid*, Macrory et al. (2013).
[87] *Ibid*, Macrory et al. (2013).; UK Health and Safety Executive, 'About land use planning' <www.hse.gov.uk/landuseplanning/about.htm>.

In the UK, planning policy supports the development of CO_2 transport infrastructure for CCS (through National Policy Statements and NSIPs. A licensing procedure exists for offshore CO_2 storage for Scotland and then for England, Wales and Northern Ireland.

4.1.5: Conclusion

At an international level, the UK-Norway EOR case probably faces the challenge of the London Protocol's Article 6 prohibition on the export of waste. While this is also an issue for the other CCS development scenarios, both the UK and Norway have signed the amendment, which suggests the parties could work to overcome this challenge.

The existing North Sea working relationship between the nations also presents conditions for success of the UK-Norway EOR case. Development of CCS under the UK-Norway case could be aided by the UK/Norway Framework Agreement and its links with nations' decommissioning legislation for oil and gas production facilities.[88]

At the national level, the policy of Norway's government is one that supports CCS. The UK's CCS policy is currently not clear, however, the interest in CCS remains. Both countries have laws in place to enable CCS, having incorporated the CCS Directive into their national law.

4.2: CO_2 Antwerp – Rotterdam (CAR) Pipeline

4.2.1: Case Description

The CAR Pipeline case requires the development of a CO_2 pipeline to transport CO_2: 1) from a centralized location in the Antwerp region of Belgium; then 2) transboundary to the Netherlands at the Port of Rotterdam; and 3) to the P18 block offshore the Netherlands.

The onshore pipeline route involves multiple canal, river, road and rail crossings. It is approximately 80 km long along a pre-zoned pipeline route, which is expected to enable an efficient permitting process.

4.2.2: International Legal Issues

Law and Policy

Belgium has limited CO_2 storage capacity (the extent of which remains uncertain) being limited to the Flemish region and the Walloon region.[89] The immaturity of understanding and restricted regional CO_2 storage potential, means Belgium would be a CO_2 exporter in the near term.[90] This emphasizes the importance of transboundary CO_2 transport and the reliance on international cooperation if Belgian CCS is to be realized in the near term.

The Flemish region is part of the NSBTF, and the Flemish region has considered CCS, particularly in relation to heavy industry in the Port of Antwerp area.[91] The Netherlands is also a member of the NSBTF alongside Flanders. This provides a forum under which the parties could work to

[88] *Ibid*, Milieu (2015).

[89] Heike Rütters, and the CGS Europe partners, 'State of play on CO2 geological storage in 28 European countries' (June 2013) CGS Europe report No. D2.10, 89 <www.cgseurope.net/UserFiles/file/News/CGS%20Europe%20report%20_D2_10_State%20of%20play%20on%20CO2%20storage%20in%2028%20European%20countries(1).pdf>.

[90] Kris Piessens, 'Policy support system for carbon capture and storage (PSS-CCS)' (2009 Final Report Phase 1 Summary) <http://www.belspo.be/belspo/SSD/science/Reports/PSS-CCS%20Summary.pdf>.

[91] Tom Mikunda and Avelien Haan-Kamminga, CATO2, 'Overcoming national and European legal barriers to CO_2 transport and storage in the North Sea' (2013) <www.co2-cato.org/cato-download/2994/20130425_160030_CATO2-WP4.1-D07-v2013.01.25-Legal-barriers_-_pub>.

agree the transboundary requirements for CO_2 export from Belgium to the Netherlands. As noted elsewhere, an agreement would be expected to take time.

In 2013, a group of major emitters in the Netherlands and Belgium formed an emitter Steering Group to address CCS and CO_2 transport challenge, which is coordinated by the RCI and supported by Stichting Borg and the Clinton Climate Initiative (CCI). This further highlights international cooperation between the countries.[92]

In the Netherlands, CCS is considered an option for addressing CO_2 emissions. The Netherlands, which has CO_2 storage capacity, has research and demonstration projects.[93]

Ratification of London Protocol
The Netherlands is party to the London Convention and Protocol, including the amended Article 6 of the London Protocol. Conversely, while Belgium is also a party to the London Convention and Protocol, it has not yet approved Amendment 6 to the London Protocol. This is problematic for cross-border CO_2 transport and storage.

4.2.3: National Legal Issues

Law and Policy

Belgium
Belgium's energy policy is determined at the regional level (Flemish, Walloon and Brussels-Capital).[94] CCS has not been a policy focus, with other low-carbon energy sources being explored.[95] Any CCS development will have to be in conjunction with the federal and regional authorities in Belgium.[96] Overall, problems can arise due to delay from lack of clarity over whether legal issues are federal or regional.[97]

The Flemish region has considered CCS potential and in particular in relation to the use of the Port of Antwerp.[98] From a policy perspective, there is a view CCS could assist the Flemish region in reaching climate change targets.[99]

While there has been a recognition of the potential role of CCS in reducing CO_2 emissions in the Port of Antwerp area, the Flemish CCS policy is not clear, nor is CCS identified as a priority.[100] For example, the Flanders 2014 – 2019 Policy Note advocates new legal instruments to advance

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[92] *Ibid*, Milieu (2015).
[93] Tom Mikunda and Avelien Haan-Kamminga, CATO2, 'Overcoming national and European legal barriers to CO_2 transport and storage in the North Sea' (2013) <www.co2-cato.org/cato-download/2994/20130425_160030_CATO2-WP4.1-D07-v2013.01.25-Legal-barriers_-_pub>.
[94] IEA, *Energy Policies of IEA Countries: Belgium* (2016) <www.iea.org/publications/freepublications/publication/Energy_Policies_of_IEA_Countries_Belgium_2016_Review.pdf>.
[95] Heike Rütters, and the CGS Europe partners, 'State of play on CO2 geological storage in 28 European countries' (June 2013) CGS Europe report No. D2.10, 89 <www.cgseurope.net/UserFiles/file/News/CGS%20Europe%20report%20_D2_10_State%20of%20play%20on%20CO2%20storage%20in%2028%20European%20countries(1).pdf>.
[96] *Ibid*, Milieu (2015).
[97] *Ibid*, Milieu (2015).
[98] Tom Mikunda and Avelien Haan-Kamminga, CATO2, 'Overcoming national and European legal barriers to CO_2 transport and storage in the North Sea' (2013) <www.co2-cato.org/cato-download/2994/20130425_160030_CATO2-WP4.1-D07-v2013.01.25-Legal-barriers_-_pub>;
Ibid, Milieu (2015)..
[99] Rotterdam Climate Initiative, 'Transport and Storage Economics of CCS Networks in the Netherlands' (May 2013) <https://hub.globalccsinstitute.com/sites/default/files/publications/101121/transport-storage-economics-ccs-networks-netherlands.pdf>.
[100] *Ibid*, Milieu (2015).

capture, transportation, storage and use of CO_2. However, the Flemish Climate Mitigation Plan for 2013 – 2020 does not establish a clear CCS policy.[101]

The CCS Directive has not been fully transposed in all regions in Belgium, due to the lack of geological storage. [102] CO_2 storage is prohibited in the Brussels Capital region and off-shore Belgium, except for research activities.[103]

The Netherlands

In contrast, in general, law and policy in the Netherlands are favourable to enabling CCS development. In the Netherlands the law is generally supportive for offshore CCS development and CO_2 storage, (noting that the Netherlands has banned onshore CO_2 storage).[104] The CCS Directive has been adopted in the Dutch Mining Act; Dutch Mining Decree; and the Dutch Mining Regulation.[105]

A 2010 policy document examined large-scale CCS development.[106] The ROAD project has been approved by the European Commission for a CO_2 storage permit (although approval took longer than stated in the Directive).[107]

Law and Economics

The development of Belgium's domestic storage capacity would be a long-term project, as understanding of storage potential and exploration activities has been limited.[108] Cost-effectiveness of CCS projects is needed, with commercial constraints reducing the focus on CCS in Flemish policy.[109]

In the Netherlands, subsidies have been granted for pilot and demonstration projects.[110] The Netherlands has a significant research agenda through CATO, the Dutch research program for CCS. It is noted the ROAD project received financial support via the Dutch Government and the EEPR.[111]

Liability

As mentioned elsewhere, the CCS Directive has been transposed into law in Belgium, with certain regions having prohibited CCS storage. CCS liability provisions have been enacted into legislation in the Netherlands. The ROAD project, which was awarded the first storage permit under the CCS Directive,[112] has published its lessons learned from undergoing the project permitting process in the Netherlands, including an overview of the project's potential liability

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[101] *Ibid*, Milieu (2015).
[102] *Ibid*, Shogenova *et al.* (2014).
[103] *Ibid*, Shogenova *et al.* (2014).
[104] *Ibid*, Milieu (2015).
[105] Global CCS Institute, 'Dutch CCS Legislation' <https://hub.globalccsinstitute.com/publications/dedicated-ccs-legislation-current-and-proposed/dutch-ccs-legislation>.
[106] A.J. Seebregts and others, 'Policy instruments for advancing CCS in Dutch power generation' (December 2010) < https://www.ecn.nl/docs/library/report/2010/e10032.pdf>.
[107] Andy Read and others, 'GHGT-12: Update on the ROAD Project and Lessons Learnt' (2014) 63 Energy Procedia 6079.
[108] Heike Rütters, and the CGS Europe partners, 'State of play on CO2 geological storage in 28 European countries' (June 2013) CGS Europe report No. D2.10, 89 <www.cgseurope.net/UserFiles/file/News/CGS%20Europe%20report%20_D2_10_State%20of%20play%20on%20CO2%20storage%20in%2028%20European%20countries(1).pdf>.
[109] *Ibid*, Milieu (2015).
[110] *Ibid*, Milieu (2015)., citing CATO2, 'History of Carbon Capture and Storage in the Netherlands' < http://ccs-roadmap.ecofys.com/index.php/History_of_CCS_in_the_Netherlands>.
[111] *Ibid*, Milieu (2015)., citing CATO2, 'History of Carbon Capture and Storage in the Netherlands' < http://ccs-roadmap.ecofys.com/index.php/History_of_CCS_in_the_Netherlands>.
[112] *Ibid*, Shogenova *et al.* (2014).

exposures (but with an emphasis on CO_2 storage).[113] The potential liability exposures common for transport and storage included ETS liability, arising from CO_2 leakage, environmental liability and liability to third parties.[114] (It is noted these same principles would apply to other countries.)

4.2.4: Local Legal Issues

Planning Law and Permitting Issues
Time limits of permitting procedures can be lengthy in Belgium. Regional legislation would regulate the permitting procedures for CO_2 pipelines onshore.[115] This increases the legal and regulatory complexity of CCS activities. Evidence indicates the Belgian public have concerns about the safety of CO_2 pipelines.[116] This could also potentially influence the permitting process.

In the Netherlands, in addition to capture permits, permits are required for CO_2 pipelines and storage. Pipeline and storage permits are governed by the National Coordination Scheme under the Spatial Planning Act, which streamlines the application and approval process.[117]

4.2.5: Conclusion
Belgium and the Netherlands are participating in international forums that enable cooperation for CCS activities between the nations, which could provide a foundation for addressing international agreement for transboundary CO_2. However, Belgium has not ratified the London Protocol amendment, which could present an additional legal hurdle at the international level.

CCS does not appear to be an important aspect of policy in Belgium. Although the Flemish region recognizes the potential for CCS to address CO_2 emissions in the Port of Antwerp area, CCS is not a clear policy priority (as compared to, e.g., Norway).

4.3: German Backbone

4.3.1: Case Description
The German Backbone case would link the major concentration of CO_2 emissions in the Ruhr valley in Germany to the main North Sea oil fields in the CNS. The initial CO_2 sources would be the coal/lignite power stations of RWE and EON in the Ruhr valley in Germany.

The proposed transport infrastructure is a high-pressure, long (900 km), oversized (44 inch) pipeline, which includes an onshore component in Germany, and then follows a transboundary, offshore route from Germany to storage in Norway. Specifically, the pipeline would run through western Germany near the Netherlands border to the North Sea coast at Wilhemshaven where it will follow the offshore route of Europipe I to the CNS around the Sleipner area of the Norwegian sector.

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[113] ROAD CCS, 'Permitting Process: Special report on getting a CCS project permitted' (January 2013) <http://hub.globalccsinstitute.com/sites/default/files/publications/94946/permitting-process-special-report-getting-ccs-project-permitted.pdf>.
[114] ROAD CCS, 'Permitting Process: Special report on getting a CCS project permitted' (January 2013) <http://hub.globalccsinstitute.com/sites/default/files/publications/94946/permitting-process-special-report-getting-ccs-project-permitted.pdf>.
[115] *Ibid*, Milieu (2015)., citing CATO2, 'History of Carbon Capture and Storage in the Netherlands' < http://ccs-roadmap.ecofys.com/index.php/History_of_CCS_in_the_Netherlands>.
[116] Paul Upham and Thomas Roberts, 'Public perceptions of CCS in context: results of NearCO_2 focus groups in the UK, Belgium, the Netherlands, Germany, Spain and Poland' (2011) 4 Energy Procedia 6338.
[117] ROAD CCS, 'Permitting Process: Special report on getting a CCS project permitted' (January 2013) <http://hub.globalccsinstitute.com/sites/default/files/publications/94946/permitting-process-special-report-getting-ccs-project-permitted.pdf>.

4.3.2: International Legal Issues

Law and Policy
The capture of CO_2 from sources in Germany, which is then transported transboundary to offshore storage sites in Norway, entails the international transboundary transportation of CO_2. The lack of support for CCS by the German populace has influenced Germany's CCS policies, with domestic CO_2 storage being limited by law.[118] This suggests CO_2 export could be important for German CCS activity and emphasizes the need for international cooperation.[119] Germany is involved and in connection with other Member States about cross-border CCS projects within the NSBTF,[120] of which Norway is also a member.[121]

Germany has ratified the London Convention and Protocol. However, unlike Norway, Germany has not approved the amended Article 6.

4.2.3: National Legal Issues

Law and Policy

Germany
CCS as a means of reducing the nation's CO_2 emissions is not a priority in German energy policy.[122] Implementation of the CCS Directive was met with objections among the German populace, which resulted in a delay in Germany's transposition of the Directive and influenced Germany's CCS policy.[123] After contention, Germany transposed the CCS Directive into German law through the CCS Act. The CCS Directive was not transposed completely, as restrictions were imposed on CO_2 storage, [124] with the amount of CO_2 stored each year be limited per sink and collectively.[125]

Norway
Norway's national government is supportive of CCS. Correspondingly, a recent government-funded feasibility study revealed Norway could implement a full-scale CCS project by 2022.[126] This was followed by further support for CCS in the recent 2017 national budget.[127]

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[118] Global CCS Institute, 'German CCS Legislation'<https://hub.globalccsinstitute.com/publications/dedicated-ccs-legislation-current-and-proposed/german-ccs-legislation>.
[119] Grant Douglas McNicoll, Senergy, 'North Sea CO2 Storage Activity outside the Norwegian Continental Shelf' (June 2012) < www.gassnova.no/no/Documents/10.%20SenergyNorthSeaCO2StorageActivityOutsidetheNorwegianContinentalShelfDraft.pdf>.
[120] *Ibid*, Milieu (2015).
[121] Element Energy, 'One North Sea' (2010, Report for The Norwegian Ministry of Petroleum and Energy and The UK Foreign and Commonwealth Office) <www.npd.no/Global/Engelsk/3%20%20Publications/Reports/OneNorthSea/OneNortSea_Final.pdf>.
[122] John Rhys, Oxford Institute for Energy Studies, 'Current German Energy Policy – the 'Energiewende': A UK climate change perspective' (April 2013) < https://www.oxfordenergy.org/wpcms/wp-content/uploads/2013/04/Current-German-Energy-Policy-A-UK-and-climate-concern-perspective.pdf>.
[123] *Ibid*, Shogenova *et al.* (2014).
[124] See, e.g., Global CCS Institute, 'German CCS Legislation', <https://hub.globalccsinstitute.com/publications/dedicated-ccs-legislation-current-and-proposed/german-ccs-legislation>; *Ibid*, Milieu (2015).
[125] Global CCS Institute, 'German CCS Legislation', <https://hub.globalccsinstitute.com/publications/dedicated-ccs-legislation-current-and-proposed/german-ccs-legislation>.
[126] Norwegian Government, Ministry of Petroleum and Energy, www.regjeringen.no/en/aktuelt/good-potential-for-succeeding-with-ccs-in-norway/id2506973/.
[127] See, e.g., Gassnova, 'Crucial climate commitment in the 2017 budget' (7 October 2016), <www.gassnova.no/en/crucial-climate-commitment-in-the-2017-budget>.

Norway has CCS legislation in place for CO_2 transport pipelines and other CCS-related infrastructure. Approval must be obtained under the Petroleum Act[128] for storage of CO_2 from petroleum activities, including EOR.

Law and Economics
CCS economics (i.e., low ETS price and high storage costs) have also been cited as a reason for CCS receiving little focus in Germany's energy policy.[129] In addition to lack of public support for CCS due to safety concerns, research has revealed a sense of concern among the German public about the cost of CCS, which may also influence public support.[130]

The Norway government is investigating means of proving CCS technology and reducing cost through activities such as feasibility studies.[131] Correspondingly, a recent government-funded feasibility study revealed Norway could implement a full-scale CCS project by 2022.[132] This was followed by further support for CCS in the recent 2017 national budget.[133]

Liability
Germany has implemented the CCS Directive. Germany has extended the storage operator's liability, which continues for 40 years after handover, which is considerably longer than the timeframe in other Member States.[134] Norway has followed the EU CCS Directive[135] and implemented the liability regime, including a twenty-year liability period after handover.[136] The lack of public support for CCS projects could make project implementation difficult, and in fact, contributed to cancellation of the Schwarze Pumpe pilot project.[137]

4.3.4: Local Legal Issues

Planning Law and Permitting Issues
Additional approval may be needed for a CO_2 transport project at the local level in Germany. If there is political will, then it is not envisaged the permit procedure would be problematic. One characteristic of the German permitting process for CO_2 pipelines is the pipeline must be in the public interest (i.e., contribute to CO_2 emissions reduction in Germany).[138] The permitting process includes providing the public with information about activities, and the regulator can impose conditions for public engagement.[139] The strength of political will is considered influential in the development of CO_2 pipeline infrastructure.[140]

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[128] Act 29 November 1996 No. 72 relating to Petroleum Activities.
[129] *Ibid*, Milieu (2015)...
[130] Paul Upham and Thomas Roberts, 'Public perceptions of CCS in context: results of NearCO_2 focus groups in the UK, Belgium, the Netherlands, Germany, Spain and Poland' (2011) 4 Energy Procedia 6338.
[131] Norwegian Government, Ministry of Petroleum and Energy, www.regjeringen.no/en/topics/energy/carbon-capture-and-storage/id86982/.
[132] Norwegian Government, Ministry of Petroleum and Energy, www.regjeringen.no/en/aktuelt/good-potential-for-succeeding-with-ccs-in-norway/id2506973/.
[133] See, e.g., Gassnova, 'Crucial climate commitment in the 2017 budget' (7 October 2016), <www.gassnova.no/en/crucial-climate-commitment-in-the-2017-budget>.
[134] Global CCS Institute, 'German CCS Legislation', <https://hub.globalccsinstitute.com/publications/dedicated-ccs-legislation-current-and-proposed/german-ccs-legislation>.
[135] *Ibid*, Shogenova *et al.* (2014).
[136] Global CCS Institute, 'Norwegian CCS Legislation' <https://hub.globalccsinstitute.com/publications/dedicated-ccs-legislation-current-and-proposed/norwegian-ccs-legislation#liability>.
[137] *Ibid*, Milieu (2015).
[138] Global CCS Institute, 'German CCS Legislation', <https://hub.globalccsinstitute.com/publications/dedicated-ccs-legislation-current-and-proposed/german-ccs-legislation>.
[139] Global CCS Institute, 'German CCS Legislation', <https://hub.globalccsinstitute.com/publications/dedicated-ccs-legislation-current-and-proposed/german-ccs-legislation>.
[140] DNV-GL, 'CO2 Transport Infrastructure in Germany – Necessity and Boundary Conditions up to 2050' (July 2014) <www.iz-klima.de/w/files/veroeffentlichungen/141106-final-report-co2-infrastructure-study-iz-klima_english_with-annex_print-version.pdf>.

In comparison, Norway has established planning and permitting procedures for CO_2 pipelines, which are similar to those for oil and gas pipelines, an area in which Norway has experience.[141]

4.3.5: Conclusion

From a legal perspective, the issues associated with Germany suggest difficulties in delivering the German Backbone case. In particular, Germany's lack of endorsement of the Article 6 amendment to the London Protocol and potential public objection for onshore CCS activities reveal potential challenges for this case.

5: Key Lessons from the Scenarios and International Projects for Future Expansion

5.1: Introduction

Key lessons from the different development scenarios, that are noteworthy items for different countries are presented here. Despite the Rotterdam Nucleus being the scenario that is the most favourable from a legal perspective, the remaining cases provide lessons that will be relevant for future CCS expansion in the EU.

5.2: Norway

Norway had a role in the UK-Norway EOR case and the German Backbone scenario. Norway's international collaboration, such as through the NSBTF and financial support of the Netherlands' ROAD project reflects its willingness to work with other countries to facilitate the establishment of transboundary CCS projects. Norway's ratification of the Article 6 Amendment of the London Protocol further reflects its support for transboundary CCS projects. Norway's position could provide a suitable collaboration for countries who would need to export CO_2, with Norway having the legal/regulatory regime and physical ability to enable transboundary transport and storage.

Norway's experience with commercial CCS and ongoing government support for CCS research further demonstrates a commitment to the development of CCS. Furthermore, the fact that Norway and UK had informal discussions about collaboration in the UK's Peterhead and White Rose CCS projects, could, perhaps, leave the door open for further discussions if the UK pursues development of these projects in the future.

5.3: Germany

Germany was considered in the German Backbone case. Germany's CCS stance is one which is unfavourable for domestic storage of CO_2. This makes Germany suited for CO_2 export. Germany, however, has not ratified the Article 6 amendment to the London Protocol. Its lack of action on the Article 6 Amendment is consistent with the notion that CCS as a means of reducing the nation's CO_2 emissions is not a priority in German energy policy.

Public objections to CCS influenced the nation's implementation of the CCS Directive. Public engagement is required for installation of CCS infrastructure. Information campaigns to educate the public about CCS in an effort to sway public opinion could help with the development of CCS projects in the future.

[141] *Ibid*, Milieu (2015).

5.4: Belgium

Belgium was explored in the context of the CAR Pipeline case. Belgium's physical storage limitations has influenced its domestic CCS policy, making Belgium suited for being a CO_2 exporter. The Flemish region of Belgium has an international outlook for CCS, with CCS being considered for addressing CO_2 emissions in the Antwerp area. However, Belgium has not ratified the Article 6 amendment of the London Protocol, which would need to be addressed to allow CO_2 export. Similar to Germany, this could be a reflection of CCS not being a priority in Belgium's energy policy.

The complexity of the federal/regional system increases permitting times for CO_2 infrastructure. Addressing this, by enabling streamlined approvals, could help implementation of CCS projects in Belgium.

Section 6: Conclusion & Future Outlook

Commercially, there are key criteria that CCS faces in terms of deployment and these are listed below with law being a key issue: (1) volume of CO_2 available to be (readily) captured in a defined area and follow-on projects; (2) absence of legal hurdles; (3) supportive Member State(s) and business partners; (4) plausible route to storage; and (5) viable commercial plan

This paper has examined the law and policy issues for four CO_2 transport scenarios utilising the energy law analysis method of the three layers of law—international, national and local levels. This latter framework, the three lawyers of energy law[142], enhanced the results of this paper as it enabled more integrative and interdisciplinary analysis of these legal issues. It was through the latter framework that an interdisciplinary research team examined the transboundary-CO_2 transportation aspect of the proposed development cases. Further, the research was developed through two key industry stakeholder meetings with CCS experts in the EU – at each phase the research was revised and aimed therefore to be more robust and reduce potential bias between dominant stakeholders. Feedback from the stakeholders at these meetings was incorporated into the analysis for this paper and the process is further explained in Appendix A.

While implementation of the CCS Directive provides a sound basis for delivering transboundary CCS projects in Europe, nuances across countries remain. It is clear from the legal analysis that each of the four cases will have to overcome hurdles, although some cases (i.e., German Backbone and CAR Pipeline) appear to have greater complexities than those of the UK-Norway Pilot and the Rotterdam Nucleus. These greater complexities include:

[142] *Ibid*, Heffron & Talus (2016).

- Germany and Belgium having not ratified the London Protocol amendment, unlike the Netherlands, Norway and the UK;
- Complexities in the permitting processes of Germany and Belgium; and
- CCS not being a priority for CO_2 abatement in the energy policies of Germany and Belgium.

T
he chosen Pilot Case, the Rotterdam Nucleus, has a legal environment favourable for CCS development. The assessment of the Rotterdam Nucleus' legal and policy issues is summarized below in Table 3.

Table 3: Issues Within Legal Layers for CO_2 transport in the EU

Level	Issues	Rotterdam Nucleus (Netherlands/UK)
International	• The countries involved having a positive international outlook and/or involvement in CCS and/or CO_2 transport activity. • Ratification of the London Protocol – in particular, agreement with the amended Article 6.	• Both countries are members of the NSBTF, which provides a working relationship for CCS and an environment for establishing an international agreement for the transboundary project. • The Netherlands' ROAD project has received international support and engagement (e.g., from Norway and Germany). • The UK's experience in establishing and applying the Framework Agreement with Norway could be beneficial. • Both countries have ratified the Article 6 amendment.
National	• Law and policy – existence of and favourable national policy and legislation • Law and economics – financial commitments, subsidies on offer and research activities • Liability issues – liability regime present	• The Netherlands' CCS policy is clearer than the UK's. While the UK's policy experienced a setback in 2015, CCS research continues and government continues to explore the role of CCS (e.g., Lord Oxburgh report). • Both countries have established legislation and have implemented the CCS Directive. • The countries' treatment of CO_2 in the context of EOR should be explored.
Local	• Planning law and permitting issues – stable application procedures, demonstration projects, past experience • Other issues (e.g., local economy, social issues)	• The experience of and lessons gained from the Netherlands' ROAD project's permitting process provides a foundation for the next project. The UK's permitting process will be similar to that of its established oil and gas regime. CO_2 pipelines in the Netherlands are subject to a streamlined approvals process. • Onshore CO_2 storage is prohibited in the Netherlands. The offshore nature of the project is positive here. Offshore CCS projects are consistent with the recommendations of the Lord Oxburgh report.

Both the UK and the Netherlands support the London Protocol amendment. And while the amendment is not in force, the ratification by UK and the Netherlands reflects their intention to address the issue, which, as discussed previously, could possibly be addressed outside the treaty itself. Both countries are members of the NSBTF, which provides an environment for establishing conditions for the transboundary Rotterdam Nucleus project. And, as mentioned, both countries are members of the Energy Charter Treaty, which provides a further framework for establishing a transboundary transport agreement. The Netherlands' CCS policy is clearer than the UK's, but the Lord Oxburgh report provides a strong indication that the UK continues to see a future for CCS in its energy policy, despite cancellation of the CCS competition in 2015. The permitting process is clear for both the Netherlands and the UK, with the Netherlands' permitting experience for the ROAD project providing a foundation and lessons learned.

From a legal perspective, implementation of the Rotterdam Nucleus will require several key actions to be addressed by the nations. Firstly, the London Protocol Article 6 amendment constraint should be addressed by the Netherlands and the UK. This could be explored in the NSBTF forum, which could then include the assistance of Norway, an NSBTF member who is also a supporter of the London Protocol amendment. Secondly, the terms of the agreement to enable the transboundary project to be developed should be agreed. The UK could leverage off the Framework Agreement with Norway to deliver suitable terms with the Netherlands.

Furthermore, technical standards for transboundary CO_2 pipelines need to be agreed. Importantly, given the PCI criteria requirements, where the cost-benefit analysis yields overall project benefits outweigh costs, then the Rotterdam Nucleus case appears to meet the general and specific requirements for a CCS PCI. In particular, the Rotterdam Nucleus meets a key requirement for PCIs: the significant cross-border impact of the project in at least two EU member states.

Finally, it is worth noting that from early 2017, the UK has commenced action to deliver the key recommendations of the Lord Oxburgh report - that in particular emphasized establishment of fiscal structures to encourage investment- and consequently the UK's stance towards CCS will be further clarified. However, this should be tempered by the inaction of energy law and policy development due to the ongoing Brexit negotiations.

Appendix 1: Stakeholder Engagement

There were three points of stakeholder engagement and these are outlined below:

(1) The legal issues at international, national and local level were discussed with Gateway expert project team members at Gateway project meetings over the first 18 months of the project.
(2) Stakeholder Meeting 1 – the initial presentation to stakeholders was held in Brussels in November 2015. The legal analysis was highlighted and was discussed. Feedback from the stakeholders was incorporated into the analysis for this paper.
(3) Having updated the research analysis for this paper as a result of Stakeholder Meeting 1 and subsequent Gateway Project Meetings – a further presentation to stakeholders was made in September 2016 (Stakeholder Meeting 2). Again, the legal analysis was highlighted and discussed. Feedback from the stakeholders at this meeting was incorporated into the analysis for this paper.

Stakeholders who were present at both meetings are listed below:

Stakeholder Meeting 1 – November 2015 (Brussels, Belgium)	**Stakeholder Meeting 2 – September 2016 (Brussels, Belgium)**
AdeB	CCSA
BP International Limited	CCSA / ZEP Secretariat
CCA association	E3G
E3G	EU CCS Network
European Commission, DG Energy	European Commission, DG Energy
Global CCS Institute	Global CCS Institute
Heidelberg Cement	Global CCS Institute
Maasvlakte CCS Project CV	Group Technology BP
National Grid	Maasvlakte CCS Project C.V.
Netherlands Enterprise Agency	Shell
Norwegian Research Council	Statoil
Shell	Sustainable Decisions Ltd
Statoil	TAQA
TAQA	ZEP

The Crown Estate University of Edinburgh ZEP	

Appendix 2

Table of Abbreviations

Abbreviation	Definition
CCS	Carbon Capture and Storage
CAR	CO_2 Antwerp-Rotterdam Pipeline
CCI	Clinton Climate Initiative
CCS	Carbon Capture and Storage
CNS	Central North Sea
CO_2	Carbon Dioxide
EEPR	European Energy Programme for Recovery
EHR	Enhanced Hydrocarbon Recovery
EIA	Environmental Impact Assessment
EOR	Enhanced Oil Recovery
ETS	Emissions Trading Scheme
FEED	Front End Engineering and Design studies
IMO	International Maritime Organisation
MS	Member State
NSBTF	North Sea Basin Task Force
NSIP	Nationally Significant Infrastructure Project
OGA	UK Oil and Gas Authority
PCI	Project of Common Interest
RCI	Rotterdam Climate Initiative
VCLT	Vienna Convention on the Law of Treaties