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Environmental Liability from Offshore Carbon Dioxide Sequestration in the European Union

by

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ABSTRACT

The case of European offshore carbon dioxide sequestration informs us that the international and European environmental liability frameworks for the protection of the marine environment are developed but several issues remain to be addressed and that they are still not completely ready to accommodate this technology. A detailed look is taken at the status of offshore CCS under public international law: the United Nations Convention on the Law of the Sea, the London Convention, the London Protocol, and the OSPAR Convention. Subsequently, European law is analysed, the CCS Directive and the Environmental Liability Directive in particular. Finally, the liability related to carbon dioxide transport by pipelines is examined.

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Viktor Weber

Table of Contents

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Introduction

What is carbon dioxide?

The best way to describe carbon dioxide is by immediately quoting from authors with a background in the natural sciences:

> "Carbon dioxide [is a gas which is] ubiquitous in the natural world. It undergoes an endless cycle of exchange among the atmosphere, living systems, soil, rocks, and water. Volcanic outgassing, the respiration of living things from humans to microbes, mineral weathering, and the combustion or decomposition of organic materials all release CO_2 into the atmosphere. Atmospheric CO_2 is then cycled back into plants, the oceans, and minerals through photosynthesis, dissolution, precipitation, and other chemical processes. Biotic and abiotic processes of the carbon cycle on land, in the atmosphere, and in the sea are connected through the atmospheric reservoir of CO_2."[1]

> "Carbon dioxide is an important biological compound because it is the ultimate source of carbon for all life."[2]

> "Ambient air typically contains 21% oxygen and [0.040]%[3] carbon dioxide ([402.80][4] parts per million). CO_2 is inert and it is non-toxic at low concentrations. It is not explosive, carcinogenic, or mutagenic."[5]

Carbon dioxide is also the by-product of combustion processes, the burning of fossil fuels. The energy and heat producing sector, the manufacturing of certain materials[6], and transport are the biggest sources of anthropogenic carbon dioxide emissions.[7]

While carbon dioxide is present in the atmosphere, and it is harmless to life in low concentrations[8], it is a so-called greenhouse gas. It causes the heat energy arriving from the

[1] Benson et al.; Lessons Learned from Natural and Industrial Analogues for Storage of Carbon Dioxide in Deep Geological Formations; Lawrence Berkeley National Laboratory, 2002; p.13
[2] Ibid., p.17
[3] Value updated according to http://www.esrl.noaa.gov/gmd/ccgg/trends/ on 26 July 2015
[4] Value updated according to http://www.esrl.noaa.gov/gmd/ccgg/trends/ on 26 July 2015
[5] E J Wilson; Managing the Risks of Geologic Carbon Sequestration: A Regulatory and Legal Analysis, PhD thesis; Carnegie Mellon University, Carnegie Institute of Technology, 2004; p.18
[6] E.g. hydrogen, ammonia, iron and steel, and cement; IPCC 2005, p.54, section 1.1.1
[7] IPCC 2005, p.56
[8] E J Wilson; Managing the Risks of Geologic Carbon Sequestration: A Regulatory and Legal Analysis, PhD thesis; Carnegie Mellon University, Carnegie Institute of Technology, 2004; p.18

sun to be trapped in the Earth's atmosphere.[9] It is understood that if the amount of carbon dioxide in the atmosphere is excessive, the greenhouse effect manifests itself at a larger scale referred to as global warming, and it initiates a series of complex chain reactions with undesirable effects which is often referred to by the umbrella term 'climate change'.[10]

One of the effects of excess carbon dioxide in the atmosphere is that carbon dioxide is taken up in excess quantities by the seas and it leads to a chain of physical and chemical changes[11] including acidification.[12]

Since most scientific research on ocean acidification has been done in the context of the effects of atmospheric carbon dioxide,[13] partly but not wholly such research is referred to below to contemplate the type of impact escaping carbon dioxide from geological formations may have. In case carbon dioxide leakage from a reservoir leads to the same or a higher pCO_2 in the area of the leakage than the increase of pCO_2 resulting from the excess uptake from the atmosphere, the same or more drastic effects (especially if combined) can be expected in the area of leakage than those resulting from atmospheric

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[9] For an early analysis see: J Hansen et al.; Climate Impact of Increasing Atmospheric Carbon Dioxide; Science, New Series, Vol. 213, No. 4511 (Aug. 28, 1981), pp. 957-966

[10] See: IPCC, 2007 ('hereafter IPCC 2007'): Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.; IPCC Climate Change 2007 – Impacts, Adaptation and Vulnerability Contribution of Working Group II to the Fourth Assessment Report of the IPCC (978 0521 88010-7 Hardback; 978 0521 70597-4 Paperback); IPCC, 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.; Especially pp.13-4, 17-9.

[11] "Changes in temperature and salinity affect the solubility and chemical equilibration of gases. Changes in circulation affect the supply of carbon and nutrients from below, the ventilation of oxygen-depleted waters and the downward penetration of anthropogenic carbon. The combined physical and biogeochemical changes also affect biological activity, with further consequences for the biogeochemical cycles." – IPCC 2007, p.403

[12] "As CO_2 increases, pH decreases, that is, the ocean becomes more acidic." IPCC 2007, p.405; ... A decrease in surface pH of 0.1 (The pH scale is logarithmic. "A decrease in ocean pH of 0.1 units corresponds to a 30% increase in the concentration of H^+ [ions] in seawater, assuming that alkalinity and temperature remain constant." (IPCC 2007, p.405) over the global ocean was calculated from the estimated uptake of anthropogenic carbon between 1750 and 1994..." (IPCC 2007, p.405) "As atmospheric concentrations of carbon dioxide increase, the drop in ocean pH is expected to accelerate. [S]urface ocean pH is already 0.1 unit[s] lower than preindustrial values. By the end of the century, it will become another 0.3-0.4 units lower..." (D Brian; Regulating Carbon Dioxide Under the Clean Air Act as a Hazardous Air Pollutant; 33 Colum. J. Envtl. L. 369 2008 ; p.400-1; relying on James C. Orr et al.; Anthropogenic Ocean Acidification Over the Twenty-first Century and its Impact on Calcifying Organisms; 437 NATURE 681, 681 (2005); internal citation marks omitted)

[13] Atmospheric carbon dioxide is taken up by the oceanwaters. (IPCC 2007, para 7.3.4.1) While oceanwaters naturally contain carbon dioxide as part of the above-mentioned carbon cycle, the more carbon dioxide there is in the atmosphere, the more carbon dioxide is taken up by the oceans. "In the past few decades, only half of the CO_2 released by human activity has remained in the atmosphere; of the remainder, about 30% has been taken up by the ocean…" (R A Feely et al., Impact of Anthropogenic CO_2 on the $CaCO_3$ System in the Oceans; Science 305, 362 (2004

uptake alone.[14] However, the purpose of this section is merely to see in general what type of effects elevated carbon dioxide levels may have. Brian's account gives a short overview:

> "As ocean pH decreases, it becomes harder for organisms that use calcium carbonate to construct cell walls or skeletons – including snails, oysters, clams, lobsters, and other crustaceans and mollusks – to survive.[15] Indeed, [e]ven small changes in [carbon dioxide] concentrations in surface waters may have large negative impacts on marine calcifiers and natural biogeochemical cycles of the ocean.[16] Coral, some species of plankton, shellfish, and other microscopic organisms are among those for whom ocean acidification may be fatal.[17] Several aquatic organisms already have been affected to such a substantial extent that they now hover on the brink of extinction. For example, two species of coral-Elkhorn and Staghorn-were added to the Endangered Species Act's list of threatened species in May 2006.[18],,[19]

The Royal Society[20] found that as a result of ocean acidification "the biological production of corals as well as calcifying phytoplankton and zooplankton within the water column may be inhibited or slowed down".[21] The impact on certain species may also affect other

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[14] Similarly to this assumption, in the onshore-offshore context West et al. (Fn.341; p.85-6) considered that "[i]n contrast to studies of the effects of elevated atmospheric CO_2 concentrations (say, a rise from current levels to 550 ppm), levels of CO_2 in soils resulting from leaks from engineered storage sites underground could be enhanced by several orders of magnitude above atmospheric levels, causing damage or, in the worst case, serious damage to an ecosystem. Organisms close to a leakage could be exposed to acute and perhaps lethal concentrations whilst those at increasing distances from the leakage could be exposed to firstly acute and then to chronic concentrations."

[15] J A Kleypas et al., Impacts of Ocean Acidification on Coral Reefs and Other Marine Calcifiers: A guide for future research 3 (2006); p.3; Available at: http://www.ucar.edu/communications/Final_acidification.pdf

[16] Ibid.; p.5

[17] J P Gattuso et al.; Effect of Calcium Carbonate Saturation of Seawater on Coral Calcification; 18 GLOBAL PLANETARY CHANGE 37 (1998); see U Riebesell et al.; Reduced Calcification of Marine Plankton in Response to Increased Atmospheric CO_2, 407 NATURE 364 (2000); F Gazeau et al.; Impact of Elevated CO_2 on Shellfish Calcification; 34 GEOPHYSICAL RESEARCH LETTERS, April 2007, at L07603, 1

[18] Endangered and Threatened Species: Final Listing Determinations for Elkhorn Coral and Staghorn Coral, 71 Fed Reg. 26, 852 (May 9, 2006).

[19] Brian, p.401; internal citation marks omitted

[20] "The Royal Society is a self-governing Fellowship of many of the world's most distinguished scientists drawn from all areas of science, engineering, and medicine. The Society's fundamental purpose, reflected in its founding Charters of the 1660s, is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity. … The Society facilitates interaction and communication among scientists via its discussion meetings, and disseminates scientific advances through its journals. The Society also engages beyond the research community, through independent policy work, the promotion of high quality science education, and communication with the public." Source: http://royalsociety.org/about-us/

[21] IPCC 2007, p.529 referring to Royal Society, 2005: Ocean Acidification Due to Increasing Atmospheric Carbon Dioxide. Policy document 12/05, June 2005, The Royal Society, London, 60 pp., Now available at: http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/2005/9634.pdf; See Chapter 3 in general

species of the ecosystem.[22] Fish species may be affected.[23] Some of the affected species may be protected species[24]. The research conducted under the European Union's ECO_2 project[25] specifically in relation to offshore CCS also indicates that *in certain circumstances* escaping carbon dioxide *may* affect the living organisms of the sea.[26] Should therefore carbon dioxide be classified as a pollutant? Chapman's assessment from a scientific perspective will give guidance in the section 1.1.1 below on how to resolve this dilemma.

What is CCS?

The abbreviation 'CCS' stands for 'carbon capture and storage' in the popular language. This is a process whereby carbon dioxide is captured at fossil fuel burning or manufacturing[27] sources and it is injected into deep onshore or offshore geological formations. These formations are typically depleted oil or gas fields and saline

[22] Cardinale et al.; Effects of biodiversity on the functioning of trophic groups and ecosystems; NATURE, Vol 443, 26 October 2006; Cooley et al.; Ocean Acidification's Potential to Alter Global Marine Ecosystem Services; Oceanography Vol.22, No.4, p.172; The Royal Society, Ocean acidification due to increasing atmospheric carbon dioxide, June 2005, Chapter 4

[23] See: Ishimatsu et al.; Effects of CO_2 on Marine Fish: Larvae and Adults; Journal of Oceanography, Vol. 60, pp. 731 to 741, 2004; and Langenbuch and Pörtner; Energy budget of hepatocytes from Antarctic fish (Pachycara brachycephalum and Lepidonotothen kempi) as a function of ambient CO_2: pH-dependent limitations of cellular protein biosynthesis?; The Journal of Experimental Biology 206, 3895-3903; The Royal Society, Ocean acidification due to increasing atmospheric carbon dioxide, June 2005, Section 6.3

[24] See in particular the Habitats Directive, Directive 92/43/EEC.

[25] The European Commission's Framework Seven Programme; Topic OCEAN.2010.3; Offshore carbon storage and the marine environment, project number 265847

[26] Dupont et al. found that despite the expectations the photosymbiotic, non-calcifying and pure autotrophic acoel worm (Symsagittifera roscoffensis) is extremely resistant to ocean acidification up to the point of saturation at which sub-lethal bleaching occurs. However, the reasons for this resistance are not known. (Sam Dupont et al., Stable Photosymbiotic Relationship under CO_2-Induced Acidification in the Acoel Worm Symsagittifera Roscoffensis; PLoS ONE 1 January 2012 | Volume 7 | Issue 1 | e29568) Stumpp et al. examined the resistance of the green sea urchin (Strongylocentrotus droebachiensis). The study found that sea urchins are able to maintain fully compensated pH_e (extracellular pH) for 45 days at intermediate pCO_2 (partial pressure of CO_2). However, at partially high and high pCO_2 levels, 71% of the urchins could not compensate and 29% could compensate only partially. There was no difference in mortality between the pCO_2 treatments. It must be noted that compensation is a burden. The urchins had a shift in their energy budget, showed reduced somatic and reproductive growth, and probably, enhanced protein metabolism to support ion homeostasis. Strongly reduced feeding activity; and abnormality and mortality among the larvae were also observed. (M Stumpp et al., Resource allocation and extracellular acid–base status in the sea urchin Strongylocentrotus droebachiensis in response to CO_2 induced seawater acidification; Aquatic Toxicology 110– 111 (2012) 194– 207)
There is current research taking place on the sensitivity of sandy infauna bivalve communities. "First results indicate that at pCO2 of 10-20,000 µatm high bivalve mortality is coupled to intensive shell dissolution." Infaunal brittlestar exposed to elevated pCO2 reacted with "reduced metabolic rate and scope for regeneration and enhanced protein metabolism." (Reitz, Investigating the impact of offshore CO_2 storage on marine ecosystems, The Marine Scientist No.40 August 2012 p.19)

[27] E.g. hydrogen, ammonia, iron and steel, and cement – IPCC 2005, p.54, section 1.1.1

formations.[28] The purpose of CCS is to reduce the amount of carbon dioxide emitted into the atmosphere and thereby to contribute to a set of measures undertaken to reduce the greenhouse gas effect and avoid climate change.

The common denomination of this technology is imprecise because carbon is a solid element and it is a distinct material from the gaseous molecule of carbon dioxide. It will be shown in Chapter 3 that the use of the word 'storage' is also not appropriate. However, as it will be explained, the abbreviation 'CCS' can be resolved in a more appropriate form, and the use of the expressions 'CCS' and 'storage' have become customary; therefore, these also will be used in the followings.

The technology used for CCS is based on the same principles as the ones used for natural gas storage and enhanced oil or gas recovery (EOR, EGR). The former technology is in use for almost a hundred years now[29]; the latter technology was first used in the 1970s in Texas[30]. Commercial scale offshore CCS is also in operation since 1996 at Sleipner in the North Sea and since 2008 at Snøhvit in the Barents Sea injecting 0.9 Mt/yr and 0.7 Mt/yr respectively.[31] Although the Dutch K12-B project is currently listed as dormant[32], it injected carbon dioxide into depleted gas fields from 2004[33] at least until March 2015[34]. In 2011 it has been found that the injection and the well have worked according to the expectations.[35]

International and European effort to reduce greenhouse gas emissions

On the international level it is the 1992 United Nations Framework Convention on Climate Change[36] (the UNFCCC) and its related legal instruments which seek the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous

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[28] "Saline formations are sedimentary rocks saturated with formation waters containing high concentrations of dissolved salts." - IPCC 2005, p.3, fn.3;
E.g. Statoil, Sleipner project, North Sea; IPCC p.202; See also: Statoil, Snøhvit project, Barents Sea; See: http://www.statoil.com/en/technologyinnovation/protectingtheenvironment/carboncaptureandstorage/pages/captureandstoragesnohvit.aspx last accessed 31 07 2013
[29] IPCC, p.211
[30] IPCC, p.199
[31] CCS Project database at http://sequestration.mit.edu/tools/projects/index.html last accessed 02 May 2013
[32] http://sequestration.mit.edu/tools/projects/index_cancelled.html last accessed 02 May 2013
[33] Ibid.
[34] The latest information on the project's website (http://www.k12-b.info/) was from March 2015.
[35] Presentation by Vincent Vandeweijer, Bert van der Meer, Cor Hofstee from TNO and Frans Mulders, Hilbrand Graven, Daan D'Hoore from GDF Suez, Monitoring CO_2 injection at K12-B, Current status, 10 May 2011; See also: Vandeweijer, Vincent, Bert van der Meer, Cor Hofstee, Frans Mulders, Daan D'Hoore, and Hilbrand Graven. "Monitoring the CO_2 injection site: K12-B." Energy Procedia 4 (2011): 5471-5478.
[36] 1771 UNTS 107

anthropogenic interference with the climate system".[37] The 1997 Kyoto Protocol[38] to this Convention provides that

> "[t]he Parties included in Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts … with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012."[39]

The Doha Amendment[40] updated the assigned amounts in the Kyoto Protocol[41] and the obligation to reduce greenhouse gas emission to be "with a view to reducing [the] overall emissions of such gases by at least 18 per cent below 1990 levels in the commitment period 2013 to 2020".[42] The European Union is party both to the UNFCCC and the Kyoto Protocol.[43] Although the Doha Amendment is not yet in force, the commitments of the Amendment already form part of the EU's 2009 Climate and Energy Package[44].

Since 2010, the main responsible entity for greenhouse gas reduction strategies in the European Union is the Directorate-General for Climate Action (DG Clima). It is one of the policies of DG Clima to promote the capture and geological storage of carbon dioxide. As the European Commission explained, the target of reducing carbon dioxide emissions by 50% by 2050 cannot be achieved without this technology in a cost efficient manner.[45]

The themes of the present thesis

Legality

The first obvious question in case of any activity under environmental law is whether the activity is legal. No state is expected to engage in an activity which is prohibited under

[37] Article 2
[38] 2303 UNTS 148
[39] Article 3, para.1
[40] Accessible from https://unfccc.int/kyoto_protocol/doha_amendment/items/7362.php ; last accessed 30 08 2013
[41] Article 1, para. A
[42] Article 1, para. C
[43] See the first annexes of the two treaties.
[44] Press release IP/13/1035, 6 Nov 2013; Parliamentary Questions, answer to question P-006836-13; 11 July 2013; available at: http://www.europarl.europa.eu/sides/getAllAnswers.do?reference=P-2013-006836&language=EN ; last accessed 30 08 2013
[45] Commission staff working document - Accompanying document to the Proposal for a Directive of the European Parliament and of the Council on the geological storage of carbon dioxide - Impact assessment {COM(2008) 18 final} {SEC(2008) 55}; See also: Kulovesi, p.867, fn.223

international law. The status of offshore CCS should be clarified under the United Nations Convention on the Law of the Sea[46] (UNCLOS). Although the London Protocol[47] and the OSPAR Convention[48] have been amended[49] to accommodate offshore CCS, the London Convention[50] should still be amended. Also, the amendment[51] to Article 6 of the London Protocol should be ratified by the sufficient number of states so that it can come into force and clearly legalise the transboundary transport of carbon dioxide for the purposes of CCS. These issues have been widely discussed both in academic papers and the publications of various organisations.[52] The regulation of CCS and certain related forms of environmental liability are mainly governed by two directives in the EU. Thus, the analysis of these instruments forms the core of the second part of this thesis.

Liability

Liability is an aspect of an activity which accompanies it throughout its lifespan and in the present case even beyond. It is in the nature of liability that it may arise at any time and the questions which arise are important for all. They are important for operators to know for what, to what extent and how long they may be held liable. This issue is equally important for those carrying out work on behalf of the operator. The guarantee providing sector also has to be aware of the nature and the size of the risk in order to make the activity insurable and to be able to set a price for the guarantee. As it will be seen, the long-term liability attaching to CCS also involves the state and therefore the public as taxpayer. Finally – and equally importantly – the question is important to those whose interests have been compromised. The obvious such entities may be states which suffer environmental damage and certain private entities who exploit the resources of the sea or its subsoil. The present thesis examines the former of these groups.

[46] United Nations Convention on the Law of the Sea of 10 December 1982, Montego Bay; 1833 UNTS 397; available at http://treaties.un.org/; last consulted on 05 09 2013
[47] 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 29 December 1972, 36 ILM 7
[48] 2354 UNTS 67
[49] IMO Resolution LP.1(1), LC 28/15, Annex 6 and OSPAR Decision 2007/2, OSPAR Commission, OSPAR 07/24/1-E, Annex 6 respectively
[50] 1972 International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1046 UNTS 120
[51] IMO Resolution LP.3(4)
[52] See for example: Purdy, R, Macrory, R, 2004; Scott, K, 2005; Figueiredo, 2005; Figueiredo 2007; Weeks A B, 2007; Raine, A, 2008 in the context of transporting the carbon dioxide; Carr, Y, 2007

The European Union, on the basis of the principle of subsidiarity[53], has decided to regulate CCS at the EU level through Directive 2009/31/EC[54] (the CCS Directive).[55] According to the CCS Directive

> "…the establishment of a legal framework for the environmentally safe storage of CO_2, cannot be sufficiently achieved by the Member States acting individually, and can therefore, by reason of its scale and effects, be better achieved at Community level…"[56]

This is the essence of the subsidiarity principle. The reasoning of the European Commission for justifying legislation in this domain is, amongst others, to ensure a comparably high level of environmental integrity (also important for avoiding the distortion of the Emissions Trading Scheme), to regulate the permitting procedure of transboundary storage sites, to ensure equal access to the transport and the storage network across Europe, and to make sure that different permit conditions and the conditions for the transfer of responsibility do not distort competition.[57] Thus, there is a European framework for the regulation of this activity and it is expectable that states will endeavour to share geological storage space to benefit from the economy of scale. Indeed, some states have no geological storage space[58] but may still wish to reduce their carbon dioxide emission through CCS. It follows from these considerations that as far as European states are concerned this technology should be examined from a European perspective.

Since the provisions of the CCS Directive also regulate the question of liability to a certain extent, and since these provisions had to be transposed into national legislation,[59] this approach fundamentally affects the regulation of liability for the Member States of the EU. CCS also falls under other European legislation, such as the Environmental Liability Directive[60] (ELD).

Although the present discussion has a European focus, considering all Member States and all possible European offshore locations would be beyond its scope. In the North Sea, the

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[53] See Article 5 of the Treaty on the European Union; OJ C 326, 26.10.2012
[54] OJ L 140, 5.6.2009, p. 114–135
[55] Recital (49) of the CCS Directive; see ibid.
[56] See fn.55
[57] Proposal for a Directive of the European Parliament and of the Council on the geological storage of carbon dioxide, C6-0040/08; p.6
[58] Finland; IEA 2011, p.13
[59] See Article 39
[60] Directive 2004/35/CE on environmental liability with regard to the prevention and remedying of environmental damage; OJ L 143, 30.4.2004, p. 56–75

United Kingdom is expected to exploit this technology first among the member states of the EU. Therefore, mainly the UK's approach will be considered, and it will be compared to other states where appropriate.

Currently only Norway has CCS operating in the North Sea. The EEA Joint Committee by Decision No 115/2012[61] amended the EEA Agreement[62] to include the CCS Directive, making it applicable to Norway as well. The decision entered into force on the 16 June 2012. The amendment is actually in force since 1 June 2013.[63] Also, Norway used to be in cooperation with the United Kingdom, the Netherlands, and Germany[64] through the North Sea Basin Task Force. However, it appears that this group is currently dormant.[65]

Since the entry into force of the CCS Directive there has been some commentary on it in varying detail. The discussions by Bergsten[66], Bradshaw[67], Lee[68], Macrory[69], and Srivastava[70] can be mentioned as examples of considering the Directive in general. These articles raise pertinent questions. For example, Bergsten asks what happens if the operator becomes insolvent and why Article 18, para.7 of the CCS Directive (competent authority not to be liable even after the transfer of responsibility if the operator was at fault) does not provide a minimum time period. Bradshaw points out, amongst others, that there is no guidance on the expression 'all available evidence', and that there is no limitation period in the CCS Directive, while the 30 year limitation period of the ELD is still in place. Macrory considers the 'all available evidence' standard in the Directive to be very high and suggests purposive interpretation.[71] Srivastava questions the adequacy of the European CCS legal framework in general.

In the United States there has been substantial research on the theory of regulating liability connected to CCS. It has been asked at which level (federal or state) liability should be regulated; which common law and regulatory mechanisms should be used; how subsurface

[61] OJ L 270, 4.10.2012, p. 38.
[62] OJ L 1, 3.1.1994, p. 3; unconsolidated
[63] http://decarboni.se/publications/dedicated-ccs-legislation-current-and-proposed/norwegian-ccs-legislation; last accessed 11 05 2015.
[64] HM Government, p.20, para.1.40
[65] The group's website is not available at the time of writing. Also see: SCCS, Unlocking North Sea CO_2 Storage for Europe: Practical actions for the next five years, SCCS Recommendations and Conference 2013 Report, 2013; pp.20, 35 – This reports recommends the revitalisation and empowerment of the North Sea Basin Task Force.
[66] Bergsten, 2011
[67] Bradshaw, 2009
[68] Lee, 2009
[69] Macrory, 2009
[70] Srivastava, 2011
[71] Macrory, p.47

property rights should be allocated as well as what compensation scheme should be established.[72] These sources bear limited relevance to the current discussion because they are mainly in the onshore context and the questions of liability mainly consider private interests. Offshore CCS has a fundamentally different legal context. It takes place in an area where most legal devices are not available (e.g. negligence, nuisance, trespass).

The development of CCS is also followed by several organisations. Their publications are mostly descriptive and have a general scope. Four publications[73] from the International Energy Agency[74] should be noted here because these track the implementation of the CCS Directive in the Member States of the EU and examine other jurisdictions as well. The CO_2 Capture Project's[75] 2010 publication[76] can also be mentioned because it addresses the question of liability in more detail than similar publications. An important undertaking is the UCL Carbon Capture Legal Programme[77] (CCLP) which has described, amongst others, the implementation of the CCS Directive in the Member States[78]. Other issues discussed include: CO_2 transport for storage, international climate change legislation, emissions trading, financing, and property rights.

A project of close relevance to this discourse is the study on the "Implementation challenges and obstacles of the Environmental Liability Directive (ELD)"[79] which provides considerations for the analysis of the ELD in the general context. In relation to the present context, attention has been given to the ELD in a report by Havercroft and Macrory.[80]

[72] See: Adelman, Duncan; Flatt, V. B.; Klass, A, Wilson, E; Glaser et al.; Weeks, A. B.; Wilson, E. J.; Zadick; Figueiredo 2005; Figueiredo 2007
[73] IEA 2010, IEA 2011, IEA 2012, IEA 2014
[74] "The International Energy Agency (IEA) is an autonomous organisation which works to ensure reliable, affordable and clean energy for its 28 member countries and beyond. … It is at the heart of global dialogue on energy, providing authoritative and unbiased research, statistics, analysis and recommendations." Source: http://www.iea.org/aboutus/whatwedo/ ; last accessed 08 09 2013
[75] "The CO_2 Capture Project (CCP) is a partnership of several major energy companies working together to advance the technologies that will underpin the deployment of industrial-scale CO_2 capture and storage (CCS)." Source: http://www.co2captureproject.org/ ; last accessed 08 09 2013
[76] CO_2 Capture Project
[77] "The CCLP was set up by the University College London (UCL) in June 2007. It aims to provide a dedicated, up-to-date, open-access and independent resource for the analysis of legal aspects of CCS. The programme covers legal and policy developments in various jurisdictions, with a view to promoting informed discussion and analysis by decision makers in government, industry and the wider community." Source: http://decarboni.se/category/organisation/carbon-capture-legal-programme-cclp, last accessed 11 05 2015
[78] *Idem.*
[79] This project was carried out for the European Commission (DG ENV), contract number: 07.0307/2012/623289/ETU/A1, May 2013. See: http://ec.europa.eu/environment/archives/liability/eld/eldimplement/index.html, last accessed: 29 July 2015
[80] I Havercroft, R Macrory; Legal Liability and Carbon Capture and Storage, A comparative perspective; Global CCS Institute, October 2014

Chapter 5[81] will complement the findings of this publication by a detailed analysis of the application of the Environmental Liability Directive.

The last chapter of this thesis is to consider the liability that may arise in connection with the transport of carbon dioxide by pipelines. On the planned scales, pipelines are the cheapest way of carbon dioxide transport. Also, the CCS Directive defines 'transport network' in Article 3, para.22 as a network of pipelines.[82] Since there is no particular regulatory guidance at EU level, most legal issues have to be solved at the international and national level.[83] It should be noted that transport by vessels may also be possible.[84]

The sources identified in this section are the pool of legal literature on the subject of CCS in general. Where relevant, these sources will reappear in this discussion for analysis, and for support and evaluation of the thesis made.

The outline of the thesis

The present thesis, the fact that international and European environmental law are not ready yet to accommodate offshore CCS, is set out through six chapters.

The first chapter seeks to lay down the theoretical foundations of the thesis. It seeks to expressly distinguish offshore CCS from pollution. Although, this idea may have appeared before, the present thesis is the first work which uses this distinction for a systematic analysis of the relevant instruments and provisions. From this chapter we learn what CCS really is when international regulation is considered.

The second chapter examines how CCS fits into the highest legal order of the seas, the United Nations Convention on the Law of the Sea 1982 (UNCLOS), and it finds that this convention is not an obstacle to CCS as long as State Parties endeavour to avoid pollution. Thus, UNCLOS is largely ready to accommodate offshore CCS. However, an authoritative statement on the precise scope of Article 195 would be a saluted development. Further, it is

[81] The source idea for this chapter has been the research conducted by the author in the frame of the ECO2 project on the safety of offshore CCS in the North Sea (see acknowledgements). The legal tasks examined, amongst others, the potential environmental liability arising from offshore CCS that operators and the licensing state may face in the European Union.
[82] See also Roggenkamp, Haan-Kamminga, p.2; Srivastava, p.191-2
[83] See: European Commission, DG Environment, Assessing the case for EU legislation on the safety of pipelines and the possible impacts of such an initiative, Fina report, ENV.G.1/FRA/2006/0073, December 2011; see also: Roggenkamp, Haan-Kamminga, p.3.
[84] See for example IPCC 2005, p.30

not possible to state with certainty whether CCS would come under Article 210 (dumping) of UNCLOS.

Chapter 3 considers CCS specifically in the context of dumping. It is found that there is no authoritative opinion which would classify CCS as dumping either under the London Convention and the London Protocol. Pragmatically, the fact that the London Protocol and the OSPAR Convention have been amended can be taken to indicate that the contracting parties understand offshore CCS to be dumping under these instruments. However, this is an unsatisfactory solution because this understanding is not based on the legal source itself. Furthermore, it is shown for the first time that under the OSPAR Convention it is uncertain which of the annexes would be applicable to certain forms of CCS.

Chapter 4 analyses the EU's CCS Directive. After a general description, the discussion addresses specific questions on the entrapment criterion before transferring responsibility, and on the financial security and financial contribution of the operator. In light of the ECO2 project certain terms would benefit from refinement and ascertainment.

In chapter 5 attention is given to the Environmental Liability Directive. The main outstanding issue under this instrument is terminological uncertainty in relation to which exact head of damage would be applicable in different leakage scenarios. In addition, it should be noted that while under the CCS Directive the operator is strictly liable for corrective measures until the transfer of responsibility, under the ELD the operator may enjoy certain exemptions, and whether this is so varies from state to state.

Chapter 6 examines the liability framework related to the transport of carbon dioxide by pipelines. Considering that pipelnies are essential for taking carbon dioxide to the injection site, the size of such infrastructure, and the risks associated with pipelines, transport liability should be seen as an integral part of the broader CCS liability question. It is found that although the ELD would be applicable, there is no specific international regime applicable to environmental damage from pipelines. On the other hand, there are examples of national legislation governing pipelines with a combination of strict liability, limits on liability, and liability fund. The adoption of a similar approach in the EU would be a welcome development.

The ECN[85] has noted:

[85] Energy research Centre of the Netherlands

> "…analysis is required of the extent to which current EU and national legislation regarding property rights and liability might apply to CCS activities. … Guidance is also required regarding aspects of CCS under the international climate change regime."[86]

In light of the outline above, the thesis partially addresses this note with regard to European environmental liability.

[86] ECN, p.33

Chapter 1: The legal nature of offshore CCS

The purpose of this chapter is to define precisely the activity of offshore CCS by delineating it from the related but distinct concept of pollution. This distinction is essential for conceptual clarity and the correct interpretation of the relevant legal instruments. It will be seen in Chapter II that authors who do not make this distinction arrive at a different interpretation of the law than the one reached in this thesis. The present research has found that one author has come close to making this distinction. However, the idea has not been stated and the author's actual argument does not take account of this distinction; indeed, it is contrary to it. Therefore, this chapter shall expressly distinguish between offshore CCS and pollution in itself. This will provide the conceptual foundation of this thesis.

1.1 Is carbon dioxide a pollutant?

1.1.1 The relativity of pollution

Chapman's assessment of pollution reveals that the concept of a 'pollutant' is a relative one:

> "Contamination is simply the presence of a substance where it should not be or at concentrations above background. Pollution is contamination that results in or can result in adverse biological effects to resident communities. ... All pollutants are contaminants, but not all contaminants are pollutants because substances introduced into the environment may be more or less bioavailable to organisms depending on their chemical form, modifying factors in the environment, the environmental compartment they occupy, and the reactions (behavioural and physiological) of exposed biota (Chapman et al., 2003)[87]. … "[88]

It follows so far that under historical concentrations carbon dioxide is not a pollutant but a fundamental building block of life. On the other hand, the presence of carbon dioxide in

[87] Chapman PM et al.; Conducting ecological risk assessments of inorganic metals and metalloids — current status.; Hum Ecol Risk Assess 2003;9:641–97
[88] P M Chapman; Determining when contamination is pollution — Weight of evidence determinations for sediments and effluents; Environment International 33 (2007) 492–501 at p.492

quantities higher than that would result from the natural carbon cycle may result in adverse effects. In such case the excess carbon dioxide under Chapman's definition would be seen as a contaminant because its 'concentration would be higher than the background' and as a pollutant because this higher concentration could 'result in adverse biological effects'.

1.1.2 The legal position

Although international law seeks to regulate carbon dioxide emissions through the Kyoto Protocol to the United Nations Framework Convention on Climate Change[89], it does not classify carbon dioxide as a pollutant.

At national level, the United States has a legal statement to the effect that carbon dioxide is a pollutant. In the context of atmospheric carbon dioxide and climate change the US Supreme Court held (JJ Stevens, Kennedy, Souter, Ginsburg, and Breyer) in the case of *Massachusetts et al., petitioners v. Environmental Protection Agency et al.*[90] that carbon dioxide is an 'air pollutant' within the meaning of § 7602(g) of the Clean Air Act[91]. Justice Scalia dissented partly on the point of classifying CO_2 as pollutant[92]; he was joined by Chief Justice Roberts, and JJ Thomas and Alito. The case was an action against the US Environmental Protection Agency (EPA) after it denied a petition for rule making to regulate greenhouse gas emissions under the Clean Air Act with regard to new motor vehicles[93] because it took the view that 1) it had no authority to do so under the Clean Air Act, and that 2) such regulation would interfere with the fuel economy standards, and that 3) it was not a mandatory duty under the Clean Air Act to regulate motor vehicle emissions; and that 4) a different policy would be more favourable.[94] After the judgment, EPA promulgated a series of greenhouse gas-related rules:[95] it issued an Endangerment Finding[96], in which it determined that greenhouse gases may reasonably be anticipated to

[89] 2303 UNTS 148
[90] 549 U.S. 497 (2007); 127 S.Ct. 1438 (2007), see p.1460
[91] 42 USC Chapter 85
[92] 127 S.Ct. 1438 (2007), p.1475-6 (or 1474-7 more broadly)
[93] Ibid., p.1438
[94] Ibid., p.1450; also see: 68 Fed.Reg. 52922-52933
[95] This series of rules was challenged in the case of Coalition for Responsible Regulation Inc. et al. v. Environmental Protection Agency. (684 Federal Reporter, 3d Series; p.102) The Court of Appeals for the District of Columbia unanimously dismissed the applicants' claims. This judgment was challenged in two petitions (Coalition for Responsible Regulation, Inc. v. E.P.A. (Unreported; See: 2012 WL 6621785) and Coalition for Responsible Regulation, Inc. v. E.P.A.[95] (Unreported; See: 2012 WL 6681996)) which were both denied.
[96] Federal Register / Vol. 74, No. 239 / Tuesday, December 15, 2009 / Rules and Regulations; p.66496; In fact, the EPA issued two findings: an Endangerment Finding and a Cause or Contribute Finding (the latter one is also prescribed under 42 U.S.C. § 7521(a)(1)). See title and http://www.epa.gov/climatechange/endangerment/ (Last accessed on 24 05 2013)

endanger public health or welfare (as prescribed in 42 U.S.C. § 7521(a)(1)); it issued the Tailpipe Rule[97], which set emission standards for cars and light trucks; and it determined that the Clean Air Act requires major stationary sources of greenhouse gases to obtain construction and operating permits.[98] The above sections and Chapman's analysis indicate that the judgment in *Massachusetts v EPA* must be read to apply to excess carbon dioxide. Categorising carbon dioxide either as an 'air pollutant' under the Clean Air Act or as a harmless material without recognising that its effects depend on its quantity inevitably leads to criticism and political commentary from either side.[99] It is suggested here that legal acts referring to carbon dioxide as a pollutant should be read as applicable to excess quantities.[100]

As regards the law of the European Union, there is no European legislation or judgment from the European Court of Justice which states that carbon dioxide is a pollutant. The legislation which can be seen in Europe as the equivalent of the US Tailpipe Rule[101] is EC Regulation No 715/2007[102] (the Euro 5 and Euro 6 emission standards). Article 3, paragraph 4 does not include carbon dioxide in the definition of 'gaseous pollutant'. EC Regulation No 443/2009[103] is concerned with setting emission performance standards for new passenger cars with respect to carbon dioxide. However, this instrument does not classify carbon dioxide as a pollutant either. On the other hand, the motivation behind the Regulation is the EU's commitment under the UNFCCC[104] and the Kyoto Protocol[105], and the fact that standards are set means that the amount of emitted carbon dioxide is sought to be reduced. Although, not defined as a pollutant, it seems safe to find that the EU considers

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[97] Federal Register / Vol. 75, No. 88 / Friday, May 7, 2010 / Rules and Regulations; p.25324
[98] 684 Federal Reporter, 3d Series; p.113
[99] The Science magazine noted about Coalition for Responsible Regulation Inc. et al. v. Environmental Protection Agency: "Reaction to the decision has split along predictable lines. The Obama Administration, environmentalists and many Democrats in Congress celebrated, with Representative Henry Waxman (D-CA) calling the ruling a "resounding victory for science." In contrast, many industry groups and Republican political figures have vowed to reverse the decision, either in Congress or the courts. "The debate to address climate change should take place in the U.S. Congress and … not impose additional burdens on businesses," Jay Timmons, president of the National Association of Manufacturers, said in a statement." – Malakoff; posted to http://news.sciencemag.org/scienceinsider/2012/06/climate-science-gets-a-hug-in-us.html?ref=hp; 26 June 2012
[100] Admittedly, this approach immediately leads to the question: how much carbon dioxide in the atmosphere is an excess amount?
[101] See below.
[102] Regulation (EC) No 715/2007 of the European Parliament and of the Council of 20 June 2007 on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information; OJ L 171, 29.6.2007, p. 1
[103] Regulation (EC) no 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO2 emissions from light-duty vehicles; OJ L 140, 5.6.2009, p. 1–15
[104] United Nations Framework Convention on Climate Change, 1771 UNTS 107; See Recital (2)
[105] See Recital (10)

carbon dioxide as a contaminant in the context of atmospheric emissions. In the context of major stationary sources, the large combustion plants directive[106] and the industrial emissions or 'IPPC' (integrated pollution prevention and control) directive[107] provide the framework in the EU. These directives are repealed by the Industrial Emissions Directive (EID)[108] from 1 January 2016 and 7 January 2014 respectively.[109] This later directive also does not define carbon dioxide as a pollutant. In legal terms, carbon dioxide is not a pollutant under European law.

1.2 Is offshore CCS pollution of the marine environment?

This question has to be answered in two parts. First it has to be asked what comes under the definition of the marine environment. Once it is known what the marine environment is, it can be asked whether offshore CCS constitutes its pollution.

1.2.1 What is the marine environment? Does the subsoil of the seas form part of the marine environment?

Different views exist as to whether offshore geological formations form part of the marine environment. Earlier, legal support for the view that offshore geological formations do not form part of the marine environment could be drawn from the debate[110] regarding offshore radioactive waste disposal under the 1972 London Convention[111]. In relation to this debate Kaplan commented in 1991:

> "The meaning of 'sea' is set out in the [London Convention], and is not a matter of contention. ["all marine waters other than the internal waters of States"] *Wastes stored in the seabed in isolation from ocean waters quite clearly are not in the "sea."* A different result would obtain for any SSD [sub-seabed disposal] method that

[106] Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants; OJ L 309, 27.11.2001, p. 1
[107] Directive 2008/1/EC concerning integrated pollution prevention and control; OJ L 24, 29.1.2008, p. 8–29
[108] Directive 2010/75/EU; OJ L 334, 17.12.2010, p. 17–119
[109] Ibid., Article 81
[110] See in more detail from p.62
[111] International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1046 UNTS 120; See in more detail below.

> depended on dilution and dispersion in ocean waters[112] once the primary sediment barrier is breached."[113]

Thus, if something is kept in the seabed in isolation from the ocean waters is not in the sea, then it seems to follow that offshore geological formations do not form part of the marine environment. On the other hand, Scott argued in 2005 in relation to the London Convention that "the term 'marine environment is broad enough to encompass the sea floor and subsoil thereof".[114] This latter view can be supported by the fact that the 1996 London Protocol[115] – the successor of the London Convention[116] – defines the 'sea' to include the subsoil. Equally well, the OSPAR Convention[117] includes in its definition of the 'maritime area' the seabed and its sub-soil. Purdy and Macrory noted in relation to the London Protocol that "it is arguable that the "subsoil" could just be the layer of rock and soil immediately under the seabed, not the geological formations underneath."[118] On the other hand, later Friedrich noted in relation to the OSPAR Convention[119] that "[a]rguments ... which rely on a distinction between the sub-soil and sub-seabed are hardly convincing".[120] There is no conclusive legal opinion under the London Convention as to whether offshore geological formations form part of the marine environment. However, the fact that two major treaties[121] following the London Convention extended their scope to the subsoil seems to indicate that in legal terms the sub-soil of the seas may have become part of the marine environment.

1.2.2 Is offshore CCS pollution?

If the subsoil of the seas is not considered to be part of the marine environment then of course offshore CCS cannot be seen as marine pollution. However, even if the subsoil of the seas *is* considered to be part of the marine environment, offshore CCS in itself is not

[112] This method has been outlawed for CCS by the OSPAR Commission. See: Summary Record OSPAR 2007, OSPAR 07/24/1-E, Annex 5; (Ref. §2.10b)
[113] Kaplan, p.778, fn.47; Italics by the present author.
[114] Scott, p.75
[115] 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 29 December 1972, 36 ILM 7; see in more detail below.
[116] See: Article 23
[117] 2354 UNTS 67, see in more detail below
[118] Purdy, Macrory, p.20
[119] See below.
[120] Friedrich, p.223
[121] The London Protocol and the OSPAR Convention; discussed in detail below.

pollution because in normal circumstances it does not cause harm to living or non-living[122] resources. In the words of UNCLOS[123], it is not the introduction of a substance which

> "results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities".[124]

Chapman's formulation corresponds to this. Even though the amount of carbon dioxide is increased[125] in the subsoil geological formations, it does not result in 'adverse biological effects to resident communities'. In this case carbon dioxide is not a pollutant.

1.2.3 Offshore CCS and the risk of pollution

Offshore CCS as an activity is merely the injection of carbon dioxide into offshore geological formations where the detrimental effects mentioned above do not arise. Nonetheless, this does not mean that this is an activity free from risk. In 2005 the International Panel on Climate Change (IPCC)[126] reported:

> "For large-scale operational CO_2 storage projects, assuming that sites are well selected, designed, operated and appropriately monitored, the balance of available evidence suggests the following:
>
> • It is very likely the fraction of stored CO_2 retained is more than 99% over the first 100 years.
>
> • It is likely the fraction of stored CO_2 retained is more than 99% over the first 1000 years"[127]

The ECO2 project could model and simulate scenarios of leakages. However, it was also found that such leakages are unlikely, and even if they occur, the effects are expected to be minor, confined to an area of a couple of tens of meters with no perceivable effect on the

[122] As a contingency, CCS may cause damage to adjacent resources in the subsoil such as trapping exploitable hydrocarbons.
[123] United Nations Convention on the Law of the Sea 1982, see Chapter II
[124] Article 1(4) UNCLOS.
[125] Or even, carbon dioxide is introduced
[126] "The IPCC is a scientific body under the auspices of the United Nations (UN). It reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It does not conduct any research nor does it monitor climate related data or parameters." Source: http://www.ipcc.ch/organization/organization.shtml last accessed 29 April 2013
[127] IPCC, 2005; p.246, section 5.7.3.5

environment. Such leakage would amount to contamination as opposed to pollution. Leakage on this scale could be defined as *de minimis* and be acceptable. However, any leakage which passes this threshold and causes harm or significantly increases the risk of harm should amount to pollution and require remediation and possibly compensation. Thus, the approach would be similar to the MARPOL regime[128] whereby some emissions are tolerated. However, once the leakage rate is higher than the accepted level, there must be a legal mechanism to ensure remediation and possibly compensation. However, an event like this must be distinguished from offshore CCS in itself. Carr made a similar distinction earlier in relation to UNCLOS[129]:

> "…offshore sequestration is not, of itself, 'pollution of the marine environment'. While it involves 'the introduction by man, directly...of substances...into the marine environment'[130], it does not *necessarily* result in the adverse consequences contained in the definition and the IPCC's statistics presented above suggest that it is not likely to, either. However, *leakage*[131] from a storage reservoir would amount to 'the introduction by man ... indirectly, of substances ... into the marine environment' and result in harm to living marine resources, thereby falling within the definition of 'pollution of the marine environment'.[132,,133]

Carr observes that should a leakage occur which causes harm, it would amount to pollution of the marine environment. In this case carbon dioxide would be both a contaminant and a pollutant. However, this contingency must not be confused with the activity itself. Harm causing leakage must not be attributed to offshore CCS as a descriptive feature of it but merely as an unlikely possibility.

In light of the ECO_2 findings discussed above this interpretation has to be modified to consider some leakage which would amount to contamination inevitable but to equate to pollution only such leakage which harms the marine environment. Nevertheless, the quote still conveys the idea that offshore CCS is not pollution in itself. It is submitted in this

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[128] International Convention for the Prevention of Pollution from Ships
[129] However, as it will be seen below, Carr does not make this distinction in relation to Article 195 of UNCLOS.
[130] Note that Carr understands the subsoil to form part of the marine environment.
[131] Leakage is not the only way through which off-shore sequestration may cause damage. Although unlikely, seismic events are also contemplated. See for example: Wilson at p.33, IPCC 2005 at p.249
[132] Ian Havercroft and Ray Purdy, Carbon Capture and Storage - A Legal Perspective (2007) 18 United Nations <www.un.org/esa/sustdev/sdissues/energy/op/ccs-egm/presentationspapers/havercroft paper legal.pdf> accessed 30 September 2007
[133] Carr, p.142; NB. The source Carr refers to did not make the distinction Carr made; it stated that: "[i]t seems that there is no conclusive opinion as to whether CCS would constitute pollution under current definitions..." at p.3

thesis and it will be shown in Chapter II that failure to make this distinction leads to an incorrect interpretation of the international framework.

1.3 Conclusion

This chapter intended to clarify what offshore CCS is and to show how it relates to the concept of pollution in general and under UNCLOS. Although leakage is not a completely excludable occurrence, offshore CCS in itself is a harmless activity. Should a substantial leakage take place, this contingency would amount to marine pollution in a legal sense and carbon dioxide in this case would be a pollutant. When the law discusses the pollution of the marine environment, it should be seen to apply to this contingency as opposed to offshore CCS in itself.

Chapter 2: The status of offshore CCS under the United Nations Convention on the Law of Sea

The purpose of this chapter is to evaluate the Member States' general environmental obligations under the United Nations Convention on the Law of the Sea 1982[134] (hereafter 'UNCLOS' or 'LOSC') in light of the conclusion of the previous chapter. It will be seen that authors who did not distinguish offshore CCS from the pollution it may cause ask whether UNCLOS is permissive. This chapter will show that in fact UNCLOS is regulatory and that offshore CCS is a legal activity under this treaty as long as the criteria therein are complied with. It will also be argued that, on close analysis, Article 195 is not applicable to the technology in question.

2.1 The United Nations Convention on the Law of the Sea 1982 and its status

Under treaty based international law the main international instrument regulating the law of the seas and oceans is UNCLOS. It has been referred to by T. T. B. Koh, President of the Third United Nations Conference on the Law of the Sea, as the 'constitution for the oceans'.[135] UNCLOS is a treaty with 167 parties who either formally confirmed, acceded, succeeded, or ratified it.[136] These parties are bound by the provisions of UNCLOS.[137] UNCLOS has further 10 parties who signed it or succeeded to its signature. These signatories, although not bound, are expected to recognise the rights and obligations in UNCLOS.[138] Thus, in total there are 179 parties who are expected to follow the provisions of UNCLOS. It entered into force on 16 November 1994.[139]

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[134] United Nations Convention on the Law of the Sea of 10 December 1982, Montego Bay; 1833 UNTS 397; available at http://treaties.un.org/; last consulted on 15 November 2012

[135] Nordquist, United Nations Convention on the Law of the Sea 1982, A Commentary; Martinus Nijhoff Publishers (1985), p.11 referring to statement by President Koh on 6 and 11 December 1982 at the final session of the Conference of Montego Bay reprinted in The Law of the Sea: United Nations Convention on the Law of the Sea; United Nations, 1983 No. E.83.V.5

[136] United Nations Treaty Collection, available at: https://treaties.un.org/home.aspx, last accessed: 23 07 2015

[137] See Articles 11 - 15 of the Vienna Convention on the Law of Treaties 1969; United Nations, Treaty Series, vol. 1155, p. 331

[138] See Ibid., Article 18

[139] United Nations Treaty Collection, available at http://treaties.un.org/; last consulted on 15 November 2012; See also Article 308 of UNCLOS

All Member States[140] of the European Union are parties to UNCLOS either through ratification, accession or succession.[141] The European Union itself is also a party by formal confirmation on 1 April 1998.[142] The European Court of Justice stated in the *MOX plant* case[143] that

> "[t]he Convention was signed by the Community and subsequently approved by Decision 98/392[144]. It follows that, according to settled case-law, the provisions of that convention now form an integral part of the Community legal order (see, inter alia, Case C-344/04 IATA and ELFAA [2006] ECR I-00403, paragraph 36)."[145]

This judgment was later evoked in the *Intertanko* case[146]. Thus, it is confirmed by European case law that the provisions of UNCLOS are directly relevant both to the European Union and its Member States. Indeed, the *MOX plant* case held that "the Member States fulfil, within the Community system, an obligation in relation to the Community, which has assumed responsibility for the due performance of [UNCLOS]."[147]

2.2 The geographical applicability of UNCLOS to European offshore CCS projects

Para.3 read together with para.1 of Article 2 of EC Directive 2009/31/EC[148] ('the CCS Directive') limits the geographical scope of European offshore CCS projects to the continental shelf – which comprises both the seabed and the subsoil[149] – the territorial sea[150], and the exclusive economic zone of the Member States as defined by UNCLOS. Within the meaning of para.3, sequestration may not take place not only beyond these areas but also in these areas if the storage complex extends beyond them. All three of the

[140] Also parties: Iceland (EEA), Norway (EEA, EFTA), Switzerland (EFTA)
[141] United Nations Treaty Collection, available at http://treaties.un.org/; last consulted on 15 November 2012
[142] Ibid.
[143] Case C-459/03, European Court reports 2006 Page I-04635
[144] 98/392/EC: Council Decision of 23 March 1998 concerning the conclusion by the European Community of the United Nations Convention of 10 December 1982 on the Law of the Sea and the Agreement of 28 July 1994 relating to the implementation of Part XI thereof; Official Journal L 179, 23/06/1998 P. 0001 - 0002
[145] Case C-459/03, European Court Reports 2006 Page I-04635 at para.82
[146] Case C-308/06, European Court Reports 2008 Page I-04057 at para.53
[147] Case C-459/03, para.85
[148] OJ L 140, 5.6.2009, p. 114–135; last consolidated in 2012
[149] Article 76, para.1 of UNCLOS
[150] Although it was not expressly confirmed by the Court, in case C-308/06 Advocate General Kokott considered in paragraphs 26 and 123 that the territorial sea forms part of the Member State's territory. See: [2008] ECR I-4057

areas that are referred to here are defined[151] and regulated by UNCLOS. The coastal State is sovereign in its territorial sea, and it has certain sovereign rights in its exclusive economic zone[152] and on its continental shelf.[153] In the exclusive economic zone it is stated by UNCLOS that the sovereign rights are granted "for the purpose of exploring and exploiting, conserving and managing the natural resources ... of the waters [, and the] ... seabed and its subsoil..."[154] Similarly, on the continental shelf the sovereign rights are provided for the purpose of exploring and exploiting natural resources.[155]

Paras.1 and 3 of Article 2 are ambiguous because the continental shelf may be shorter or longer than the 200 nautical miles of the exclusive economic zone.[156] Which concept should provide the definitive limit? In the absence of a provision, it cannot be known whether it is the one which is closer or the one which is further away having its border from the coastal baseline.

Para.3 in the European Commission's legislative proposal[157] for the CCS Directive stated:

> "The storage of CO_2 in geological formations extending beyond the area referred to in paragraph 1 shall not be permitted."[158]

This has been amended by the European Parliament at the first reading[159] to state:

> "The storage of CO_2 in a storage site with a storage complex extending beyond the area referred to in paragraph 1 shall not be permitted. This shall not apply where a level of protection comparable to that provided by this Directive is guaranteed for the entire storage complex."[160]

The justification given was the following:

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[151] Including their extent, the territorial sea is defined in Articles 2 and 3, the exclusive economic zone is defined in Articles 55 and 57 and the continental shelf is defined in Article 76.
[152] On the continental shelf the Coastal States exercises exclusive sovereign rights. See Article 77, para.2 of UNCLOS.
[153] Articles 2, 56 and 77 of UNCLOS
[154] Article 56, para.1 of UNCLOS
[155] Article 77, para.1 of UNCLOS
[156] The continental shelf may be narrower than the 200 nautical miles of the EEZ. In such case the continental shelf is legally deemed to be 200 nautical miles wide as well (Article 76, para.1). The continental shelf may also extend beyond the EEZ. However, the legal continental shelf cannot be longer than 350 nautical miles or "shall not exceed 100 nautical miles from the 2,500 metre isobath" (Article 76, paras.4, 5).
[157] Proposal for a Directive of the European Parliament and of the Council on the Geological Storage of Carbon Dioxide, C6-0040/08
[158] Ibid., p.17
[159] Report on the proposal for a directive of the European Parliament and of the Council on the geological storage of carbon dioxide; A6-0414/2008
[160] Ibid., p.24

> "Geological formations may extend for thousands of km. Consequently a ban on storage in a geological formation extending beyond the borders of the EU would not be helpful. However, where CO_2 is stored on a site with a storage complex extending beyond the borders of the EU, it needs to be ensured that the stored CO_2 cannot escape on the other side of the border with impunity."[161]

The justification reveals that that the intention behind the provision is to avoid a situation whereby leakage (and assumedly harm) occurs in a place where the Member States of the EU have no jurisdiction. This corresponds to the obligation in the second clause of para.2 of Article 192 of UNCLOS.[162] In this case, the end of the continental shelf must be the ultimate limit because the real or deemed continental shelf is always at least as long or longer than the exclusive economic zone[163] and because in the Area (the seabed and its subsoil beyond the continental shelf[164]) States have no jurisdiction.[165]

2.3 The basic environmental obligations under UNCLOS and their applicability and effect in the context of offshore CCS

2.3.1 The applicability of the basic environmental obligations

Part XII of UNCLOS regulates the protection and preservation of the marine environment. Section 1 of Part XII combined with the definition of "pollution of the marine environment" in Article 1(4) (in Part I) set out the States'[166] general environmental obligations.

Does Section 1 of Part XII apply to any form of pollution or does it apply to forms of pollution which are referred to in the Convention only? Nordquist comments that Article 192 "announces the broad obligation to protect and preserve the marine environment".[167] It

[161] Ibid.
[162] "States shall take all measures necessary to ensure that … pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention."
[163] See fn.156
[164] See Article 1, para.1(1) and Part XI of UNCLOS
[165] See Article 137, para.1 of UNCLOS
[166] It has to be noted that the provisions of Part XII refer to States in general as opposed to State Parties. See : Nordquist at paras.192.2 and 192.8
[167] Nordquist, para.192.2

is an expression of the IWGMP principles[168] and the principles agreed in the Stockholm Declaration.[169, 170]

An obligation as broad as the above paragraph standing alone would suggest is nonsensical because it is indefinite: it is impossible to know what measures would discharge it and which states would be concerned. Therefore, it is suggested here that although the obligation adopted in Article 192 is general, it must be limited to States which engage in activities which pollute or may result in pollution and to pollution or risk arising from their own activities only – subject to the obligation of cooperation in Article 199.

The Convention also attempts to give some guidance on the content of the laws and regulations that has to be adopted by making reference to international rules and standards.[171] In the context of seabed activities the laws, regulations and measures adopted "shall be no less effective than international rules, standards and recommended practices and procedures"[172]. There is a substantial difference between this approach and the approach adopted for atmospheric pollution and land-based pollution where State Parties merely have to "take account of the international rules"[173] but do not need to adopt them.[174] This differentiation is a compromise between the interests of developed and developing countries.[175]

This line of observations enables the argument that only those activities come under the scope of UNCLOS which are regulated under international law; otherwise there is no standard which could be at least taken into account by the State Parties and it is not possible to know whether the standard has only to be taken into account or adopted as a minimum rule. Nordquist notes that the expression 'individually or jointly as appropriate' "seems to imply that the decision does not rest exclusively with the coastal State or other State concerned".[176] This observation would strengthen the argument made in this paragraph. However, in the present author's view the expression still assumes independence to regulate an activity if it is sufficient to do so.

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[168] The principles agreed at the Intergovernmental Working Group on Marine Pollution, Second Session, 1971, Ottawa as referred to by Nordquist at para.192.2
[169] Declaration of the United Nations Conference on the Human Environment, 16 June 1972, Stockholm as referred to by Nordquist at para.192.2
[170] Nordquist, para.192.3
[171] Also see: Boyle; Marine Pollution under the Law of the Sea Convention; The American Journal of International Law , Vol. 79, No. 2 (Apr., 1985), pp. 347-372; from p.353
[172] Article 208, para.3
[173] Articles 207, para.1 and 212, para.1
[174] Fn.171, p.354
[175] Ibid., p.354-5
[176] Nordquist, para.194.10(b)

On the other hand, it is also arguable that the environmental obligations under UNCLOS apply to any activity, and where there are international rules in place, those rules have to be at least considered as the smallest common denominator. The use of the expressions "all measures", "activities" (without article), "all sources of pollution" bolster this argument.

At the 1973 session of the Sea-Bed Committee the predecessor of Article 192 stated:

> "States have the obligation to protect and preserve the marine environment, in accordance with the provisions of these articles."[177]

Nordquist clarifies that the "reference to 'the provisions of these articles' is intended to reflect the fact that the Working Group will wish to specify in subsequent articles the scope, qualifications and limitation of this general obligation"[178]. This expression was abandoned as it can be seen from the finalised version of UNCLOS[179], and Nordquist considered that the inclusion of the phrase 'in accordance with the provisions of these articles' would have been redundant because according to his interpretation "[i]t is clear from the Convention as a whole (and not merely from Part XII), that the obligation of article 192 (and with it the right of article 193) is always subject to the specific rights and duties laid down in the Convention".[180] This statement is not the same as saying that Section 1 applies only to pollution which follows from activities the State parties engage in and only to those States as suggested above. Also, the rights and duties mentioned mainly concerned the freedom of navigation.[181] Nevertheless, it can be seen from this that although the obligation in Article 192 is general, it is not absolute.

The general phrasing of the environmental provisions means that offshore CCS, as an activity with a risk of polluting the marine environment, is also covered by them. On Article 194, para.3 Nordquist commented that it "specifies some measures which the state may take in order to discharge their obligations, not only under [Article 194] but under the

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[177] Nordquist, para.192.5
[178] Nordquist, para.192.5
[179] See also: Nordquist, para.192.7
[180] Nordquist, para.192.11(c)
[181] See also: R Warner (Protecting the Oceans Beyond National Jurisdiction: Strengthening the International Law Framework; BRILL, 2009) at p.48: "Notwithstanding the unqualified nature of the language in Article 192, the debates in the Third Committee of UNCLOS III and other articles of the LOSC indicate that the general obligation under Article 192 is circumscribed to a large extent by States rights and obligation under the LOSC and other conventions.[105]," [105]: "Commonwealth of Australia, Report of the Australian Delegation to the Third United Nations Conference on the Law of the Sea. Second Session, Caracas, Venezuela, Parliamentary Paper 164 (AGPS, Canberra, 1974), Item 12 – Preservation of the Marine Environment, para.127: "The emphasis on the part of the maritime states was to give the greatest protection possible to freedom of navigation."

whole of Part XII."[182] In fact, Article 194, paragraph 3 does not specify measures which the state may take but tells what sort of pollution the measures taken pursuant to Part XII have to minimise. Nevertheless, the use of the word 'some' by Nordquist indicates an understanding according to which the forms of pollution considered in paragraph 3 is not a conclusive list. This means in turn that the obligations in Part XII are not limited to forms of pollution evoked in the Convention. This conclusion is supported by other authors. Warner considers that "Article 194(1) of the LOSC begins the process of giving content to and defining the scope of States general obligation to protect and preserve the marine environment"[183] and that Article 194(3) contains an indicative list of the sources of marine pollution[184]. McConnell and Gold emphasised that Part XII is expressly concerned with pollution from any source and all sources and stated that Articles 194, 195 and 196 provide a non-exhaustive list of examples of the measures to be taken.[185] It follows from this line of commentary that although CCS and the type of damage which may arise from it is not referred to at any point in UNCLOS, these do come under Part XII of the Convention due to its design.[186]

Article 194, para.1 requires

> "…all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at [the States'] disposal and in accordance with their capabilities…".

The scope of Part XII is wide; the meaning of the word 'necessary' is not explained in the Convention.[187] The expression to 'prevent, reduce and control pollution' makes Article 194 particularly wide. The word 'prevent' has a certain meaning inasmuch as it is known what amounts to pollution as opposed to contamination. However, the word 'reduce' allows a certain amount of pollution. 'Control' seems to be similar in meaning to 'reduce'. The

[182] Nordquist, para.194.10(h)
[183] R Warner, Protecting the Oceans Beyond National Jurisdiction: Strengthening the International Law Framework, (Brill, 2009); p.48
[184] Ibid., p.49
[185] M L McConnell, E Gold, The Modern Law of the Sea: Framework for the Protection and Preservation of the Marine Environment, 23 Case W. Res. J. Int'l L. 83 (1991); p.90
[186] Boyle's discussion is tangent on this line because he notes in a broader context that, the terms of the Convention are not static and subject to the evolution of international law. See: A Boyle, Further development of the Law of the Sea Convention: mechanisms for change, 2005 ICLQ 54(3) 563-584
[187] Nordquist, para.194.10(b)

Vienna Convention on the Law of Treaties[188] (VCLT) provides in Article 31 that a "treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose." The general object and purpose of Part XII seems to be the elimination of pollution of the marine environment. The requirement of using the best practical means at the disposal of the State Parties supports this view. The use of the words 'reduce' and 'control' seem to allow measures less than a total ban or complete elimination. Reading these two considerations together means that States must strive for complete prevention while it is recognised that in some areas complete prevention may not be possible immediately. The MARPOL Convention[189] against ship-source pollution is an example of a such set of measures. Equally well, the words 'reduce' and 'control' are necessary for the limitation of 'acting according to the States' capabilities'[190]; if a State does not have the capacity for complete prevention, no more than reduction or control can be expected.

Regarding the particular thresholds of pollution which may be allowable in certain circumstances, it emerges from the provisions of Part XII[191] that the limits are to be established on the basis of scientific research. In this connection the work of the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) has to be mentioned at the international level. Boehmer-Christiansen's account of GESAMP's early work shows that the definition of what 'pollution' is, the elaboration of scientific criteria, and the establishment of thresholds or safe values is a particularly difficult task, which is further complicated by socio-economic considerations.[192] In the European Union the above mentioned ECO_2 programme represents a regional scientific effort for investigating the possible consequences of offshore CCS and to establish guidelines of good industrial practice. Other research projects related to the North Sea include the Scottish Carbon Capture & Storage project (SCCS)[193] and the work of the UK Carbon Capture and Storage

[188] 1155 UNTS 331; N.B. The European Union is not party to this treaty.
[189] 1340 UNTS 184 for the 1973 Convention and 1340 UNTS 61 for the 1978 Protocol; "It may be noted that the Marine Environmental Protection Committee (MEPC), at its fifty-sixth session, decided that, when referring to the Convention and its six Annexes as a whole, the term "MARPOL" should be preferred to "MARPOL 73/78", as the latter would leave Annex VI on Prevention of air pollution from ships, which had been adopted by the 1997 Protocol, outside its scope." MARPOL Consolidated Edition 2011, (IMO, London, 2011); p.1
[190] See below at p.39
[191] See Article 201 in particular
[192] Boehmer-Christiansen, S; The Scientific Basis of Marine Pollution; Marine Policy, Volume 6, Issue 1, January 1982, Pages 2-10
[193] "SCCS is the largest carbon capture and storage research group in the UK. Our internationally renowned researchers provide connected strength across the full CCS chain. With our unique position SCCS is able to

Research Centre (UKCCSRC)[194]. The CO2MultiStore project should also be mentioned which is a collaboration between SCCS, the Scottish Government, The Crown Estate, Scottish Enterprise and Shell.[195]

Despite the uncertainties, three considerations can be added which make Part XII more defined. First, it has to be remembered that UNCLOS is subject to the precautionary principle, therefore when State Parties consider the status or regulation of an activity they have to take it into account. Second, since the limitation of 'acting according to capabilities' reflects an economic concern, where no economic considerations are present it is arguable that no compromise should be made between the protection of the marine environment and other interests. This interpretation is bolstered by the fact that both the first and the second paragraph of Article 194 and Article 196 refer to "*all* measures necessary". With respect to these arguments, as regards legality, offshore CCS stands in the middle. On the one hand, this activity carries a risk of pollution and it is not an economic necessity[196]; on the other hand, it is a measure for the protection of the environment, including the marine environment; the very thing which Part XII of UNCLOS seeks to achieve. Para.2 of Article 194 proclaims the same requirement as the first paragraph with an emphasis on the environment of other States as opposed to the environment in general. These two obligations allow less freedom than Article 193 because para.1 of Article 194 refers to the states' 'capabilities' and 'best practicable means at their disposal' as opposed to their 'environmental policies'. Third, the measures must be consistent with the Convention as regards the different passage rights accorded by the Convention.[197]

Article 196 needs a brief discussion as well at this point. It provides that:

"States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control…"

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act as the conduit between academia, industry and government." Source: http://www.sccs.org.uk/about ; last accessed 07 10 2013

[194] "The UK Carbon Capture and Storage Research Centre (UKCCSRC) is supported by the Engineering and Physical Sciences Research Council (EPSRC) as part of the Research Councils UK Energy Programme, with additional funding from the Department of Energy and Climate Change (DECC)." Source: http://www.ukccsrc.ac.uk/about-centre ; last accessed 07 10 2013

[195] Source: http://www.sccs.org.uk/news/2013/27May-CO2MultiStore.html ; last accessed 07 10 2013

[196] Unless it is argued that offshore CCS is an economic necessity because the phasing out fossil fuel based energy production is not economically viable.

[197] See Nordquist, para.194.10(c)

The observations made above in relation to Part XII are equally valid in this case. Applying the above suggested interpretation, this article should not be seen as impeding offshore CCS as long as it is assured that there is no leakage from reservoirs or that it remains under a safe threshold. Nordquist considers that the phrase 'jurisdiction or control' in this article refers to jurisdiction *ratione loci*, that is, the location of the use of the technology rather than the area where the harm may occur.[198]

2.3.2 The effect of the basic environmental obligations of UNCLOS in the context of offshore CCS

2.3.2.1 Articles 192 and 194

In the previous chapter offshore CCS has been distinguished from the pollution which may arise from this activity and in this chapter it has been established so far that the environmental obligations of UNCLOS are also applicable to the pollution which may result from this activity. What do these findings mean in the context of Articles 192 and 194?

They mean that Articles 192 and 194 are not prohibitive or permissive but regulatory. Offshore CCS is a permitted activity but no harm to the marine environment must follow from it. Member States comply with these provisions if they regulate offshore CCS in order to prevent and minimise[199] the pollution which may arise in connection with it.

Not making the distinction advocated here leads authors to question whether offshore CCS is pollution in itself. Finding that it is, leads to the conclusion that the environmental provisions UNCLOS prohibit offshore CCS. Contemplating the opposite means for them that the environmental provisions of UNCLOS are not applicable. Authors who do not distinguish vary in the formulation of their argument. Three commentaries are discussed below as examples of this approach.

Purdy and Macrory[200] argued that

> "...it seems the provisions in Article 194 will apply if the proposed activity [(CCS)] is determined to be 'pollution'."[201]

[198] Nordquist, para.196.6
[199] Fn.185
[200] Purdy, Macrory, Geological carbon sequestration: critical legal issues, Tyndall Centre for Climate Change Research, Working Paper 45, 2004; p.18
[201] Ibid.

This clause reveals that the authors do not make the distinction discussed above, and they see Article 194 applicable only if CCS is classified as pollution. After citing the definition of pollution in Article 1.1(4) of UNCLOS they continue:

> "[i]t is not clear from [the definition of pollution of the marine environment] whether CO_2 is pollution. Some commentators have argued that it probably is not a pollutant, although if large quantities of CO_2 are stored then this could cause pollution if it resulted in harm to living marine resources.[202]"

The first thing to note is that carbon dioxide is a material. Even if it is classified as a pollutant, it does not make sense to refer to it as 'pollution'. The second sentence uses the correct term 'pollutant'. It seems that the authors argue that if carbon dioxide is classified as a pollutant, then CCS falls under the definition of pollution and therefore Article 194 is applicable and prohibitive. The consequence of this approach would be absurd. It would mean that if CCS was not considered to be pollution, then Article 194 would not be considered to be applicable, and consequently Article 194 would not request States to regulate CCS. It shows the absurdity of this conclusion further that if this idea was extended to other activities which are not pollution in themselves (e.g. the transport of oil), Article 194 would not be applicable to those activities either.

Friedrich was inquiring "[w]hether CCS constitutes pollution".[203] This phrasing tells that Friedrich did not distinguish between the activity and the harm either. He found:

> "The applicability [in the sense of prohibition] of all of these norms [Articles 192, 194 and 195] thus depends on the harmful effects of CCS on the marine environment and the living resources that are part thereof."[204]

After discussing the applicability of the precautionary principle[205] to UNCLOS Friedrich concluded:

"If – despite a growing tendency towards reaching the opposite conclusion – the precautionary principle is thus not considered applicable to UNCLOS obligations,[206] CCS

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[202] McCullagh, International Legal Control over Accelerating Ocean Storage of Carbon Dioxide, in Ocean Storage of CO_2, Workshop 3, International Links and Concerns, pp.85-115, IEA Greenhouse Gas R&D Programme, December, 1996
[203] Friedrich, p.217
[204] Ibid.
[205] See Box 2.1 below
[206] Purdy, Macrory, Geological Carbon Sequestration: Critical Legal Issues, Tyndall Centre for Climate Change Research, Working Paper 45, January 2004, p.18

could not be considered an illegal activity *per se*, but CCS activities would still have to refrain from harming the environment."[207]

Thus, Friedrich did contemplate a conclusion similar to Carr's, but in his case it would follow from the hypothesis of the non-applicability of the precautionary principle under UNCLOS and not an initial distinction between activity and harm. Also, this was merely a contemplated conclusion. The argument actually made by Friedrich was that, despite no express reference, the precautionary principle seems to apply to UNCLOS and therefore the risk associated with offshore CCS triggers the application of UNCLOS. This reasoning reveals further Friedrich's viewpoint. For establishing whether it is pollution, Friedrich does not consider whether CCS *causes* or *is* any harm but the fact that there is a *risk* of causing harm. Thus, Friedrich unwarrantedly equated the risk of harm to actual harm.

> The precautionary principle in its legal form can be traced back to the *Vorsorgeprinzip* in German environmental policy in the 1970s (**Adams**, **MD**; 2011). In the 1980s the concept appeared in international soft law instruments. See: the World Charter for Nature, the ministerial declarations at the 1984, 1987, and 1990 North Sea Conferences, and the Governing Council of the United Nations Environmental Programme (UNEP 1989) (**Sand**, **PH**; 2000; **McIntyre**, **O**, **Mosedale**, **T**; 1997). Since then the principle appeared in at least fourteen multilateral agreements. (**Sand**, **PH**; 2000) In 1996 the Indian Supreme Court held that the precautionary principle forms part of customary international law and this judgment has been confirmed by the same court in five subsequent judgments. (**Sand**, **PH**; 2000) In the European Union para.2 of Article 191 TFEU expressly refers to the precautionary principle as one of the principles on which the Union's environmental policy should be based.[208] As to what exactly the precautionary principle states, several answers may be given. "Definitions vary widely, from the general notion that it is desirable to prevent pollution, to the requirement that polluters establish by some appropriate burden of proof that that their activities are not releasing potentially eco-reactive substances into the environment and thereby causing damage." (**Cameron**, **J**, **Abouchar**, **J**; 1991) Perhaps the most widely accepted formulation is in Principle 15 of the Rio Declaration on Environment and Development: "In order to protect the environment, the precautionary approach

[207] Friedrich, p.218
[208] See also: Commission of the European Communities, Communication from the Commission on the Precautionary Principle, COM/2000/0001 final

shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."

It can be seen from this description that the precautionary principle is not a feature of particular international legal instruments but a feature of international environmental law in general, and thus it is part of the background to Part XII of UNCLOS.

It should be noted that the precautionary principle does not apply to contaminants or pollutants only, but it applies more generally to activities that may cause harm. For example, trawling does not involve the introduction of (or the risk of the introduction) any material into the marine environment, yet international action has been taken, on the basis of the precautionary principle to halt trawling in certain areas.[209] Similarly, the ECJ has ruled in Case 127/02 on the application Article 6(2) and (3) of the Habitats Directive[210] and the precautionary principle in the context of mechanical cockle fishing. Article 6(3) of the Habitats Directive provides that if there is a 'likelihood of significant effect', then an appropriate assessment has to be carried out. The 'likelihood of significant effect' in Article 6(3) exists "if it cannot be excluded on the basis of objective information that the plan or project will have significant effects on the site concerned".[211] Once the assessment is made "the plan or project in question may be granted authorisation only on the condition that the competent national authorities are convinced that it will not adversely affect the integrity of the site concerned. … [W]here doubt remains as to the absence of adverse effects on the integrity of the site linked to the plan or project being considered, the competent authority will have to refuse authorisation".[212]

The requirement of 'impossibility of excluding on the basis of objective information that the plan or project will have significant effects' for the purposes of demanding an assessment places the threshold very low. Since in reality it is hard to exclude the possibility of significant effects of any activity, this

[209] UN General Assembly Resolution, A/RES/61/105 paras. 82-87; See: Trouwborst, A. (2007), The Precautionary Principle in General International Law: Combating the Babylonian Confusion; Review of European Community & International Environmental Law, 16: 185–195; p.192-3
[210] Directive 92/43/EEC; OJ L 206, 22.7.1992, p. 7–50; last consolidated in 2007
[211] Para.44 of the case
[212] Paras.56-7

formulation in practice, seems to prescribe a mandatory assessment. Once the assessment has taken place, where doubt remains as to whether the activity leads to adverse effects, authorisation must be refused. In other words, there must be certainty that no adverse effects will result from the activity.

With strict interpretation these two requirements seem to be almost impossible to satisfy. If it cannot be excluded with certainty before the assessment that an activity may lead to significant effects, it is difficult to imagine that after the assessment it can be concluded with certainty that it does not lead to significant or adverse effects.

The European system is more demanding than Principle 15 of the Rio Declaration. The threshold of 'significant effect' seems to be stricter than the notion of 'threats of serious or irreversible damage' because an effect can be significant but not yet serious. The Principle also seems to be more lenient because it foresees an activity whereby there is no full scientific certainty, and the relevant measure taken may be a ban but it need not be.

Box 2.1

Scott's view is demonstrated best by the following passage:

> "The application [in the sense of prohibition] of Part XII of UNCLOS to sequestration activities depends not just on whether its obligations are precautionary as opposed to merely preemptive, but also on whether they may be categorized as activities that pollute the marine environment. Unlike direct ocean injection and ocean fertilization strategies, the geological sequestration of CO_2 is unlikely to impact negatively on the marine environment unless there is leakage. However, the fact that CO_2 itself can harm marine life and also be hazardous to human health strongly suggests that it should be classed as a pollutant, thereby triggering the application of obligations imposed on states by Part XII of UNCLOS."

On the one hand, Scott finds that 'the geological sequestration of CO_2 is unlikely to impact negatively on the marine environment unless there is leakage'. On the other hand, he contemplates that offshore CCS may be classified as an activity that pollutes the marine environment and he suggests this to be the case based on the fact that CO_2 can harm the marine environment and that it can be hazardous to human health. She finds that if CCS is

so classified and the obligations of UNCLOS are precautionary, then UNCLOS is applicable to CCS and prohibitive.

Six points have to be made about this view. 1) It has been argued above that the precautionary principle is part of the background to UNCLOS, therefore the obligations of UNCLOS should be seen as precautionary.[213] 2) However, as it is argued here, UNCLOS applies to offshore CCS regardless of the fact that the obligations in UNCLOS are precautionary. Therefore, it is not a requirement. 3) Even if the applicability of the precautionary principle was a factor in determining whether UNCLOS applies to CCS, once if it were established that CCS is marine pollution in itself, the precautionary principle would lose its relevance, therefore it does not make sense to have the applicability of the precautionary principle and the qualification of CCS as pollution as joint requirements for the application of UNCLOS. 4) Of course, in line with the argument made here, an activity does not have to be pollution in itself for the environmental provisions to apply. The provisions can refer to the regulation of the activity to assure its safety. 5) Similarly to Friedrich, Scott suggests that offshore CCS should be seen as pollution on the basis that carbon dioxide may harm the marine environment. This merger – apart from being unwarranted – underlines the third observation because this way Scott, in fact, considers the precautionary principle only. Equally well, the fact that carbon dioxide in itself may be hazardous to human health in certain circumstances seems to bear little relevance to an activity which may cause pollution in the marine environment. 6) Scott herself found that negative impact is unlikely from CCS unless there is a leakage. If so, pollution and CCS are clearly distinct.[214] However, as it can be seen from the quote and the commentary above (and also below[215]), such distinction does not form part of Scott's argument; indeed it would be incompatible with her reasoning. In the present discussion the distinction in question is made expressly and applied methodologically, thereby consitituing one of the cores of the thesis.

The three accounts above show how easy it is to confuse CCS with pollution on the conceptual level. The current thesis has the benefit of relying on recent scientific research. In the light of the results, offshore CCS has a small risk of minor leakage.[216] Even if the risk materialises, the extent of such leakage and its effect is not foreseen to fall under the category of pollution. Otherwise, CCS would be pollution in itself and it would be

[213] See fn.205.
[214] Indeed, see the paragraph below.
[215] See p.52.
[216] See section 5.1.

contentious to commence this activity against the general object and purpose of Part XII, even if the words 'reduce' and 'control' seem to allow measures less than a total ban.

2.3.2.2 Article 195

2.3.2.2.1 General interpretation

The complexity of Article 195 demands separate discussion. It provides that

> "[i]n taking measures to prevent, reduce and control pollution of the marine environment, States shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another or transform one type of pollution into another."

With the VCLT[217] in mind, it has to be noted that the roots of Article 195 lie in the refusal of entry into port of vessels in distress.[218] However, Article 195 is phrased in general terms and therefore it must be examined what impact, if any, it has on CCS.

For precise interpretation, the present discussion considers Article 195 to have two separate parts. The first is "States shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another"; the second is "States shall act so as not to ... transform one type of pollution into another."

Since, as it has been shown in Chapter I, offshore CCS in itself is not pollution or damage to the marine environment, it is also not the transfer of damage from one area to another or the transformation of one type of pollution into another. Should leakage occur and cause damage, that damage may be seen as transferred damage or as atmospheric pollution transformed into marine pollution. However, Article 195 applies to 'measures'. If it is applicable at all, it must relate to 'CCS as a measure to indirectly protect the marine environment' as opposed to a contingency which may arise from it. This interpretation is reinforced by the fact that, if Article 195 applied to particular types of pollution, its effect

[217] See fn.188 above.

[218] See: 15th Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean and its Protocols, Draft Decisions for the 15th Meeting of the Contracting Parties, UNEP(DEPI)/MED IG.17/5, p.247; Tanaka, The international law of the sea, (Cambridge University Press 2012), p.82); Constantinou, Places of Refuge – a Myth or a Reality?; p.12 Available at: http://www.martrans.org:8093/symposium/papers/Track%20A/A42%20constantinou.pdf last accessed 18 04 2013
On the other hand, the Scandinavian Institute of Maritime Law's final report on Liability and Compensation with Regard to Places of Refuge, (Scandinavian Institute of Maritime Law, Liability and Compensation with Regard to Places of Refuge, STUDY No. EMSA/RES/001-2004) prepared for the European Maritime Safety Agency, reached the opposite conclusion at p.55.

would not be more than that of Articles 192, 194 and 196[219]. Furthermore, Article 195 also applies to 'hazards' in the first part. Once pollution materialises, it cannot be referred to as 'hazard' anymore. It would be an internal conflict in the article. Can CCS be classified as a transfer of hazard? On the one hand, it can be said that it is not a hazard since the possibility of harm caused by it is minimal.[220] On the other hand, on a strict interpretation, the mere possibility of leakage and harm qualify offshore CCS as 'hazard'.[221] Secondly, it has to be asked whether offshore CCS would be a '*transfer* of hazard'. On the one hand, it may be argued that it is not a transfer since excess carbon dioxide in the atmosphere, if not sequestered, indirectly damages the marine environment with certainty. That is, it is the transformation of certain damage into a hazard – if it is considered to be a hazard under the previous question. On the other hand, it may be put forward that such reliance on the word 'transfer' is overly technical and the mere relevant fact is that a hazard is created to prevent other pollution. If the two latter interpretations were adopted from this paragraph, then Article 195 could be interpreted to apply to offshore CCS and prohibit it.[222]

Two remarks can be made. First, it is suggested here that the size of the risk that CCS causes harm is so small that compliance with the precautionary principle should be sufficient to address it and that the prohibitive effect of Article 195 applies to more serious hazards. Second, since concerning the '*transfer* of hazard' it is a literal interpretation which would mean that Article 195 is not applicable, the argument can be made with more confidence that Article 195 is also not applicable to offshore CCS as a hazard.

Similarly to Articles 192 and 194, authors who do not distinguish CCS from pollution arrive at incorrect conclusions in relation to Article 195 too. Friedrich found:

> "Whether CCS constitutes pollution would also be decisive for the applicability of the obligation of Article 195 whereby oblige[d] states must refrain from merely transferring one type of pollution to another area."[223]

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[219] See below from p.39.
[220] See: IPCC 2005, from p.212, section 5.2.5 and paragraph 5.7.3.5 in particular; also see section 5.1 below in relation to the findings of the ECO2 project.
[221] This minimal hazard must not be confused with minimal leakage or harm. Although, the question of de minimis thresholds received considerable attention in relation to radioactive waste (see: IAEA; Considerations Concerning "De Minimis" Quantities of Radioactive Waste Suitable for Dumping at Sea Under a General Permit, IAEA-TECDOC-244), no such limit has been defined for carbon dioxide.
[222] In order to avoid confusion, it must be noted at this point that even if this interpretation is adopted, offshore CCS would still not be 'damage' or 'pollution', it would not be more than a 'transfer of hazard'. Therefore, in a technical sense, even this interpretation could not justify Friedrich's and Scott's view whereby they contemplate offshore CCS to be pollution based on the fact that it carries a risk.
[223] Friedrich, p.217

There are three observations to be made in relation to this comment. First, Friedrich does not distinguish between the first and the second part of Article 195.[224] He refers to 'transfer' and 'another area', which are in the first part, together with 'type of pollution' which is in the second. Since this is not pointed out and justified, it is uncertain whether this merger is intentional. The way Friedrich formulates his argument under Article 195 is, in fact, not provided for by the article. Second, since Friedrich did not distinguish between the activity and the harm it may cause, in his reading if offshore CCS leads to leakage and harm then the activity itself is a 'transfer of one type of pollution to another area' and therefore prohibited under Article 195. Third, the footnote of the above passage states:

> "Article 195, UNCLOS, could only apply if widely interpreted in a purposive manner. Although CCS does not constitute a transfer of a pollutant from one area in the sea to another, it could apply if it is taken into consideration that the emission of carbon dioxide into the atmosphere would indirectly, through global warming and ocean acidification, contribute to pollution of the marine environment."[225]

Although Friedrich did not delineate the two parts of Article 195, this comment can be interpreted to refer to the first part of Article 195 only. If this interpretation is adopted, Friedrich is right in finding that the expression 'from one area to another' refers to the marine environment only.[226] If Article 195 applied to leakage as opposed to CCS, Friedrich would also be right to find that, a leakage causing harm would be a transfer of indirect damage to the sea caused by the pollution of the atmosphere into another area of the sea. It would also be arguable that the indirectness of the transferred damage is not important because the atmosphere has already been seen as part of the marine environment.[227]

Figueiredo commented on Article 195:

> "Under one reading of this provision, CO_2 storage could be seen as transforming pollution related to climate change into potential pollution of the marine environment (due to the risk of CO_2 being emitted from the geological formation into the waters) …"[228]

[224] The first part concerns the prevention of transfer, directly or indirectly, damage or hazards from one area to another. The second part concerns the prevention of transformation one type of pollution into another. Friedrich refers to the transfer of one type of pollution to another area.
[225] Friedrich, p.217, fn.28
[226] See also Nordquist at para.195.1.
[227] Nordquist, para.194.10(k)
[228] Figueiredo 2007, p.107

Figueiredo too blends the first part of Article 195 with the second. What he phrases as 'potential pollution' seems to correspond to the term 'hazard' in the article. This is in the first part whereas the transformation of (one type of pollution into another type of) pollution is in the second. Consequently, this interpretation is also not provided for by the article. Similarly to Friedrich's and Scott's view, the reading Figueiredo contemplates would classify CCS as pollution because of the risk it carries. Figueiredo finds as counter-argument that if carbon dioxide is not sequestered under the seabed, it will get into the marine environment through the atmosphere and therefore offshore CCS is in fact the prevention of pollution. While it does not follow as a matter of logic from the fact that carbon dioxide in the atmosphere pollutes the marine environment that offshore CCS is not pollution because the latter could be pollution as well if it caused harm, this argument distinguishes impliedly offshore CCS in itself from pollution. The second counter-argument given was that CCS carries very little risk. Similarly to Friedrich's account (which equated CCS with pollution because of the risk it carries), the proposition here is that if the risk is very small then CCS should not be seen as pollution.

Finally, Carr argued that

> "…art 195 could be interpreted in a way that would prohibit offshore sequestration under the LOSC. First, sequestration may involve the transformation of gaseous CO_2 to liquid CO_2. Gaseous CO_2 produced from power plants is undoubtedly 'pollution'; if CO_2 introduced into the marine environment was also so classified, offshore sequestration would involve transforming one 'type' of pollution (gaseous CO_2) into another (liquid CO_2). Secondly, sequestration involves transferring CO_2 from land-based sources to the offshore, which could be interpreted as transferring 'damage or hazards' from one place to another. Accordingly, offshore sequestration is arguably prohibited under the LOSC by reason of art 195."[229]

Similarly to Purdy and Macrory, Carr is not precise as to the words 'pollutant' and 'pollution'. Inasmuch as the quote refers to anthropogenic, surplus emissions, it would have been more precise to claim that 'the emission of CO_2 into the atmosphere from power plants is undoubtedly pollution'. It is also questionable to what extent the word 'type' is applicable to the physical state of the disposed material as opposed to the medium whose pollution is envisaged in Article 195. A much more important difficulty with the above

[229] Y Carr, p.142

passage is that the author herself distinguished offshore CCS in itself from pollution.[230] Asking whether CCS should be classified as pollution contradicts her earlier view.

2.3.2.2.2 A different interpretation for Article 195

Article 195 may have another façade whereby it does not apply to actions but to decisions. Teclaff and Teclaff's[231] analysis of the legal background of transferred pollution explains this idea. In relation to Principle 13[232] the Inter-Governmental Working Group on Marine Pollution for the U.N. Conference on the Human Environment, held at Stockholm in 1972 they commented:

> "This guideline explicitly recognized that regulatory measures *per se* (such as "black" lists and standards) can cause pollutants to be shifted around…"[233]

At an earlier point, in the context of noting the lack of provisions like Article 195 in other treaties, the authors describe the *Zuid-Chemie* case[234] concerning the discharge of gypsum waste into the Scheldt and the situation which has arisen under Council Directive 78/176/EEC[235] on the disposal of titanium dioxide as "situation[s] in which measures specifically devised for environmental protection result in a transfer of damage or hazard form place to place and medium to medium."[236]

In the present discourse this interpretation is merely a difference in phrasing. Under this interpretation it would be the legislation enabling CCS for the purpose of mitigating climate change[237] to what Article 195 would apply as opposed to CCS itself but the same considerations would be relevant as above.

2.3.2.2.3 Further interpretations

Raine proposes further interpretations:

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[230] See text related to fn.129 at p.28
[231] L A Teclaff, E Teclaff, Transfers of Pollution and the Marine Environment Conventions; (1991) 31 Natural Resources Journal 187
[232] "Action to prevent and control marine pollution (particularly direct prohibitions and specific release limits) must guard against the effect of simply transferring damage or hazard from one part of the environment to another" as quoted in ibid. at p.196.
[233] L A Teclaff, E Teclaff, p.196
[234] Werkgroep Water van de Vereniging Milieu Defensie v. Hoofdingenieur-Directeur van de Rijkswaterstat in de Directie Zeeland, Royal Decree (administrative decision of the Crown), 26 June 1984, No. 23, Institute's Collection No. 2311, as reported in part in Netherlands Judicial Decisions, 16 Netherlands Y.B. Int'l L. 519-21 (1985); footnote reproduced from L A Teclaff and E Teclaff, p.189
[235] OJ L 54, 25.2.1978, p. 19–24
[236] L A Teclaff and E Teclaff, p.190
[237] In the European context the CCS Directive for example.

> "Although [Article 195] does not specifically refer to "transboundary" transportation (referring more broadly to movement from "one area to another"), Guruswamy notes that the article institutionalises a prohibition on transfers or exports of hazardous materials – the underlying rationale being that the producer of waste should deal with and neutralise it at the source rather than transporting it to other areas.[238] This is an early reflection of the proximity principle which was further developed in transboundary movement of waste instruments."[239]

Guruswamy's point links UNCLOS and transboundary movement of waste instruments such as the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal[240]. This way Article 195 is a preliminary hurdle for waste transport that would come under the Basel Convention. Raine's own interpretation is:

> "One argument could be that CO_2 is a potentially hazardous substance … and when interpreted in light of one of the key objectives of UNCLOS – to prevent, reduce and control marine pollution – it could be considered a "hazard" under the Convention."[241]

This interpretation would correspond to one of the possible combinations developed above, that is, even minimal leakage is not accepted and the word 'transfer' construed in a less strict manner.

2.3.2.3 Articles 207 and 208

Article 207 addresses pollution from land-based sources, Article 208 applies to pollution from seabed activities subject to national jurisdiction. It is prudent to consider both of these articles here because it is arguable for both that offshore CCS should come under it. This issue is discussed in more detail in the next chapter in the more specific context of the amended OSPAR Convention – a regional agreement for the protection of the North-East Atlantic. At the moment, it is sufficient to note four points. First, currently CO_2 is either locally present or transported by pipelines from shore and the injection may take place either from an offshore platform or through a so-called subsea injection template. Second,

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[238] Guruswamy, "Environment and Trade: Competing Paradigms in International Law", in Weeramantry/Anghie/Sturgess, Legal Visions of the 21st Century: Essays in Honour of Judge Christopher Weeramantry, (The Hague 1998); at p.568 as referred to in infra.
[239] Raine, p.361
[240] 1673 UNTS 57
[241] Raine, p.361

Nordquist notes in relation to Article 214 (Enforcement with respect to pollution from seabed activities) that "[p]ollution of the marine environment from seabed activities addressed by article 214 is likely also to include land-based pollution (e.g. from onshore processing)…"[242] Third, Article 208 refers to pollution "arising from *or in connection with* seabed activities".[243] Finally, the expression 'land-based' is not defined in UNCLOS.[244]

The role of these articles in UNCLOS need a brief, separate explanation. While "Article 194 establishes the framework for the development and adoption of national legislative measures to prevent, reduce, and control pollution"[245], Section 5 – including Articles 207 and 208 –

> "defines the relations of the international 'rules, standards and recommended practices and procedures', with the national legislative measures and (laws and regulations) to give effect to or to be in conformity with the international measures. … Section 5 is primarily concerned with establishing the manner in which international and national measures for the protection and preservation of the marine environment are to be correlated in the different maritime zones…"[246]

Thus, Article 207 (as well as Article 208) is open to two ways of interpretation. If CCS is not distinguished from pollution we arrive at Scott's view:

> "Article 207, in conjunction with Article 194(3)(a), stipulates that states shall adopt laws and regulations to prevent, reduce, and control pollution from land-based source, such as CO_2 piped from land into deep saline aquifers under the seabed. Moreover, paragraph 5 of Article 207 exhorts states to adopt measures designed to minimize to the fullest extent possible the release of toxic, harmful, and noxious substances into the marine environment, such as CO_2."[247]

By contrast if we adopt the argument made in relation to Section 1 that its provisions are not prohibitive but prescriptive, then Section 5 must also not be read to require measures which prohibit CCS but to take measures which assure its safe deployment. The CCS

[242] Nordquist, para.214.7(b)
[243] See also: Nordquist, para.208.7
[244] See also: Nordquist, para.207.7(a)
[245] Nordquist, para.207.1
[246] Ibid.
[247] Scott, p.72-3

Directive, the Environmental Liability Directive[248] and their transposing measures would be examples of such legislation.

2.4 Conclusions

This has been the first analysis which applied consistently the first chapter's activity-pollution distinction to the general environmental obligations of UNCLOS, including Article 195, and this is the first attempt to argue that offshore CCS is compatible with all general environmental provisions of UNCLOS.

It has been found that UNCLOS is not permissive or prohibitive but regulatory on two grounds. 1) First, this follows from the fact that the subject of the environmental provisions is the measures which states must take in order to protect the marine environment and not particular activities. Although the Convention gives examples as to what measures State Parties must take, these are merely examples and it does not refer to any activity in particular. 2) Second, the Convention's language is embracing in order to cover any potentially polluting activity.[249] 3) Third, the goal is not necessarily the complete elimination of pollution. The reduction and control of pollution is just as much the aim of the Convention as the prevention of pollution.[250] Therefore, state measures which address pollution but do not prevent them completely are also acceptable; an example of such measures is the MARPOL Convention.

As long as an activity does not cause pollution whether due to the measure which UNCLOS prescribes or due its inherent nature, the Convention is not contravened. Accordingly, offshore CCS is a legitimate activity under this treaty as long as the conditions therein are complied with, including the precautionary principle.

[248] Directive 2004/35/
[249] As it has been noted above, the expressions "all measures", "activities" (without article), "all sources of pollution" seem to cover all activities which may harm the marine environment.
[250] See Articles 194, 195, 196.

Chapter 3: Is offshore CCS dumping?

Due to its similarity to dumping, it is invariably considered by the relevant literature whether offshore CCS is compatible with the international legal framework on dumping. Recital (12) of the CCS Directive[251] states that "[a]t the international level, legal barriers to the geological storage of CO_2 in geological formations under the seabed have been removed …" while referring to the London Convention[252], the London Protocol[253] and the OSPAR Convention[254] which all seek to regulate and eliminate dumping. It will be seen below that Recital (12) would need qualification. Under the London Convention there is no agreement as to the meaning of two terms and it is arguable that it is prohibitive. As regards the London Protocol, its Article 6 restricts this activity to carbon dioxide captured within the territory of the sequestering state. In the European context it seems that these difficulties can be overcome by the way European law functions with respect to international instruments. In relation to the OSPAR Convention it will be shown for the first time that although the amendments to the Convention permit offshore CCS, it is not completely certain which of the amending annexes apply to certain sequestration scenarios.

3.1 The definition of dumping in the net of four conventions

Article 210, paragraph 1 of UNCLOS provides:

> "States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment by dumping."

Dumping is defined in Article 1.1(5)(a)(i) of UNCLOS:

> "any deliberate disposal of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea"

On reading this definition four questions arise in order to know whether offshore CCS falls under this formulation.

Is offshore CCS a form of disposal?

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[251] Directive 2009/31/EC; OJ L 140, 5.6.2009, p. 114–135
[252] 1046 UNTS 138
[253] 36 ILM 7
[254] 2354 UNTS 67

Is carbon dioxide 'waste or other matter'?

What does 'at sea' exactly mean?

If carbon dioxide is conducted through pipelines, does the expression 'man-made structures' include pipelines on the seabed?

There is little literature answering these questions directly under UNCLOS. Instead, authors consider the wording and proceedings of the London Convention and the London Protocol.[255] The OSPAR Convention also regulates dumping in the North-East Atlantic. The rationale behind this approach is that UNCLOS is a general treaty which does not provide further guidance on the relevant terms while the London Convention and the London Protocol are seen as the specific instruments on the subject of dumping which UNCLOS requests in Article 210, paragraph 4.[256] In fact, the drafters of UNCLOS took over the definition of the London Convention. At the fourth session of the Sea-bed Committee in 1976 Article 20, para.1 read:[257]

> "States shall establish national laws and regulations to prevent, reduce and control pollution of the marine environment from dumping of wastes and other matter.*"

The footnote marked by the '*' provided:

> "The following article will be included at the appropriate place to be decided on by the Drafting Committee: "For the purposes of this Convention, the term 'dumping' is construed in the context of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter, done at London on 29 December 1972."

Nordquist notes that "[t]his indicates that agreement had been reached on the material scope of the concept of "dumping"."[258] Indeed, later he states:

> "The principal issue raised in the negotiation of article 210 related to the definition of "dumping", which determines the real scope of the article. By article 194, the control of dumping relates to substances which are toxic, harmful or noxious. With that point

[255] See for example: Figueiredo (2007), p.109; Purdy and Macrory p.17, N.B. The authors state wrongly at p.17 that the definition of dumping is the same under the London Convention and under UNCLOS but it is correct that the 1996 London Protocol applies the same definition as the one in UNCLOS
[256] Figueiredo (2005), p.14; Figueiredo (2007), p.108-9; A B Weeks, p.257, Weeks links this agreement to Article 197 and Section 5 of UNCLOS
[257] Nordquist, para.210.6 referring to A/CONF.62/WP.8/Rev.1/Part III (RSNT, 1976), article 20, V Off. Rec.173, (Chairman, Third Committee); p.176
[258] Nordquist, para.210.6

> of departure, the legislative history demonstrates the intention to follow the definition contained in the London Dumping Convention."[259]

Having said that, it must be noted that the definition under UNCLOS is different. The expression 'at sea' appears only once as opposed to twice in the definition under the London Convention. It is uncertain to what extent this difference is important. As it will be seen below, Kaplan relied on it to justify his interpretation of Article 210, while Nordquist attributed no significance to this difference.

3.1.1 Is offshore CCS a form of 'disposal'?

The exact form in which this question appears in the literature is whether offshore CCS is 'disposal' as opposed to 'placement of matter for a purpose other than mere disposal'. This is important because Article 1, para.1(5)(b)(ii) of UNCLOS provides that "placement of matter for a purpose other than the mere disposal thereof, provided that such placement is not contrary to the aims of [the] Convention" is not dumping. The same is the case under the London Convention and Protocol and the OSPAR Convention.[260]

Figueiredo argues that "CO_2 storage for the purpose of climate change mitigation would likely not qualify as 'placement' because operations are not planned with the intent of recovering the stored CO_2; the purpose of CO_2 storage is to keep CO_2 in the ground."[261] Figueiredo mentions the theory according to which if operators who own the carbon permits retain ownership over the injected carbon dioxide, then offshore CCS could be classified as 'placement' as opposed to disposal.[262] However, as Figueiredo himself finds, the Secretariat to the London Convention considers that this would be too broad an interpretation of the word 'placement'.[263] Although the Oxford English Dictionary[264] does not define 'placement' to have an element of retrieval[265] while it does define storage to imply retrieval[266] the point made by Figueiredo can still be understood: if the carbon dioxide is not placed with the intent to recover, than it is not placed for a purpose other

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[259] Nordquist, para.210.11(a)
[260] Article III.1(b)(ii); Article 1.2.2 and Article 1(g)(ii) respectively
[261] The argument was made in relation to the London Convention. However, as stated above, Figueiredo applies it to UNCLOS as well.
[262] Figueiredo, p.114; relying on René Coenen's address at the International Energy Agency/Carbon Sequestration Leadership Forum Workshop on Legal Aspects of Storing CO_2 (Jul. 13, 2004)
[263] Ibid.
[264] Accessed online at http://www.oed.com/
[265] "placement, n.". OED Online. March 2013. Oxford University Press http://www.oed.com/view/Entry/144879?redirectedFrom=placement (accessed May 25, 2013)
[266] See below.

than mere disposal. The joint study[267] of Ecofys[268] and FIELD[269] considered that carbon dioxide injected into a geological storage from a vessel or platform would not be 'placed' for a purpose other than disposal.[270] The Group of Jurists and Linguists[271] of the OSPAR Convention[272] considered[273] in relation to the OSPAR Convention that

> "[t]here seems no doubt that the placement of CO_2 in the maritime area for the purposes of mitigating its effects on climate change is a deliberate disposal."[274]

Would it make a difference if we referred to offshore CCS as 'storage'? Weeks argued in relation to UNCLOS that the word 'disposal' reflects the idea of permanent, unrecoverable placement, as opposed to placement with the intention of short-term or long-term storage.[275] In this view, 'storage' is a form of placement but it is not 'disposal'. It does not describe offshore CCS because of the lack of intention to recover the sequestered carbon dioxide.

The Oxford English Dictionary defines the noun 'disposal', amongst others, as "[t]he action of disposing of, putting away, getting rid of, settling, or definitely dealing with."[276] Apart from the expression of 'putting away' all explanations imply permanence which does describe appropriately the future of the injected carbon dioxide. Therefore 'disposal' is an appropriate word to use albeit it has a negative connotation. In legal terms, both the London Protocol and the OSPAR Convention define 'dumping' as 'disposal'. Those who considered this technology to be dumping and that amendment is necessary also had to consider at least indirectly that it is disposal. However, in the present context this would be a circular argument because the very question is whether the technology in question comes under the definition of dumping. On the European legal scene the CCS Directive refers to the 'geological *storage* of carbon dioxide'.

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[267] Ecofys and FIELD; 'Impacts of EU and International Law on the Implementation of Carbon Capture and Geological Storage in the European Union, a study by order of the European Commission, Directorate General Environment; ECS04057, June 2005

[268] Ecofys is a private consultancy in renewable energy, energy and carbon efficiency, energy systems and markets, and energy and climate policy. Source: http://www.ecofys.com/en/info//about/ ; last accessed 24 06 2013

[269] Foundation for International Environmental Law and Development; www.field.org.uk last accessed 24 06 2013

[270] See fn.267, p.90

[271] See fn.388

[272] See below.

[273] Report From the Group of Jurists and Linguists on Placement of Carbon Dioxide in the OSPAR Maritime Area; OSPAR 04/23/1-E, Annex 12

[274] Fn.273, see therein fn.47 and para.20

[275] Weeks, p.256-7

[276] "disposal, n.". OED Online. March 2013. Oxford University Press. http://www.oed.com/view/Entry/55111?redirectedFrom=disposal (accessed May 22, 2013)

'Storage' is defined in the Oxford English Dictionary, amongst others, as "[t]he action of storing or laying up in reserve; the condition or fact of being stored."[277] The verb 'store' is defined in turn, amongst others, as "[t]o furnish, supply, stock (a person, place, etc.) with something"[278] and as "[t]o keep in store for future use; to collect and keep in reserve; to form a store, stock or supply of; to accumulate, hoard"[279]. The word 'storage' implies that the injected carbon dioxide is to be retrieved for a certain use. Therefore, considering carbon dioxide injection under the seabed to be 'storage' would not reflect the purpose of this activity. For this reason, the most commonly used name for this technology – 'CCS', standing for carbon capture and storage – is not an appropriate name.

As it can be seen from the sources referred to in this discussion 'sequestration' is a term which is often used by the related literature. According to the Oxford English Dictionary it denotes 'separation' or 'disjunction'[280]. Although the use of this word avoids both the negative connotation of 'disposal' and the inaptness of 'storage', it describes the technology in question only figuratively and vaguely. Nonetheless, the use of this word is not wrong.

The use of the abbreviation CCS is acceptable because it can be resolved to 'carbon dioxide capture and sequestration'. For this reason and the already widespread use of the abbreviation 'CCS', the present thesis considers it convenient to use the word 'CCS'.

3.1.2 Is carbon dioxide 'waste or other matter'?

UNCLOS does not define the expression 'waste or other matter'. Scott in the context of UNCLOS opined that

> "[a]s an unwanted by-product of manufacturing or energy generating processes, CO_2 clearly constitutes waste when it is disposed of for sequestration purposes alone."[281]

[277] "storage, n.". OED Online. March 2013. Oxford University Press. http://www.oed.com/view/Entry/190925?redirectedFrom=storage (accessed May 22, 2013)
[278] "store, v.". OED Online. March 2013. Oxford University Press. http://www.oed.com/view/Entry/190929?rskey=4Tr9fv&result=2&isAdvanced=false (accessed May 22, 2013)
[279] Ibid.
[280] "sequestration, n.". OED Online. March 2013. Oxford University Press. http://www.oed.com/view/Entry/176315?redirectedFrom=sequestration (accessed May 22, 2013)
[281] Scott, p.73-4

The London Convention uses the same wording, and it defines waste in Article III, para.4 as "material and substance of any kind, form or description". Scott considered that carbon dioxide falls under this definition both under the London Convention and the 1996 Protocol.[282] However, carbon dioxide is neither in Annex I nor in Annex II of the London Convention as 'waste or other matter'. This is important because in the meaning of Article IV only the dumping of matter listed in Annex I is prohibited. IMO Resolution LC.49(16) amended Annex I of the London Convention to include "industrial waste" in new para.11. The Resolution defines industrial waste as

> "waste materials generated by manufacturing or processing operations and does not apply to: ...
>
> (e) uncontaminated inert geological materials the chemical constituents of which are unlikely to be released into the marine environment;
>
> (f) uncontaminated organic materials of natural origin"

The OSPAR Secretariat examined this definition of industrial waste and considered that it is unclear whether the generation of electricity is covered by either 'manufacturing' or 'processing'.[283] The United Kingdom considered that carbon dioxide falls under the definition of 'industrial waste'.[284] The London Convention's Scientific Group's 22nd meeting in 1999 found carbon dioxide to be industrial waste.[285] However, the scientific group can only provide advice, and on the twenty-first consultative meeting[286] of all the parties no consensus was reached as to whether carbon dioxide is 'industrial waste'.[287]

The political nature of this question is apparent from the report of the twenty-first consultative meeting.[288] "Several delegations, including those of Denmark and Germany, supported by the observer from Greenpeace International, agreed with the conclusion of the Scientific Group that fossil fuel derived CO_2 was an "industrial waste"."[289] Other delegations disagreed, other delegations still considered that it was too early to decide this

[282] Scott, p.77
[283] Purdy, Macrory p.21; relying on: OSPAR Secretariat, Compatibility with the OSPAR Convention of Possible Placements of Carbon Dioxide in the Sea or the Sea-Bed, 2003
[284] Ibid., relying on DEFRA Legal Services, CO_2 Sequestration and Storage – Legal Issues, August 2002; See also: LC 22/6; The Interpretation of "Industrial Waste" (Annex I(11) to the Convention), London Convention: Interpretation of industrial waste, Submitted by the United Kingdom
[285] Ibid.
[286] LC 21/13; see paras. 5.17-5.27
[287] Ibid.
[288] LC 21/13
[289] Para.5.20

question.[290] Norway – a stakeholder in offshore CCS in 1999 already – considered that the London Convention does not cover all types of CCS.[291] Some delegations "stressed the value of being kept informed of results of research on technical and scientific aspects of CO_2 disposal at sea, irrespective of its current legal status."[292] France and the IUCN [International Union for Conservation of Nature and Natural Resources], supported by Greenpeace, "expressed their concern that research related to CO_2 disposal at sea should not deflect attention and resources from the need to prevent and reduce CO_2 emissions in the first place."[293] There has been no consensus on whether carbon dioxide should be classified as industrial waste.[294] CCS in offshore geological structures[295] returned to the agenda at the twenty-sixth meeting consultative meeting.[296] However, the particular issue of classification of carbon dioxide as industrial waste was not discussed. During the twenty-seventh meeting no substantial progress has been made in this respect.[297] However, it has become clear that there was no consensus among the parties whether offshore CCS is a legal activity under the Convention and the Protocol.[298] During the twenty-eighth meeting[299] the parties adopted the draft criteria[300] for use under the London Convention regarding the eligibility criteria of inert, inorganic geological material as elaborated by the Scientific Group.[301] These criteria were also adopted for the London Protocol.[302] However, the criteria were not established in the specific context of carbon dioxide but in general, and there has been no subsequent discussion as to whether carbon dioxide would meet these conditions. It must be noted though that it seems impossible that carbon dioxide would be understood to be a "material from the solid mineral portion of the Earth" and 'inert'.[303] Thus, amending paragraph 11(e) seems to be inapplicable to carbon dioxide. However, the possibility remains to consider carbon dioxide to be covered by paragraph

[290] Ibid.
[291] Para.5.21; N.B. This view can be challenged; see this discussion from the section 'What does 'at sea' exactly mean?' at p.62. On the other hand, with respect to the London Protocol, the observation would be correct. The type of CCS at the Sleipner and Snøhvit fields would not fall under the Protocol because both of these fields store CO_2 obtained from offshore production and Article 1.4.2.4 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".
[292] Para.5.22
[293] Para.5.23
[294] Para.5.26
[295] LC 26/15; Para.6.35
[296] LC 26/15
[297] LC 27/16, paras.7.1 – 7.4
[298] Ibid., paras.6.18 – 6.30
[299] LC 28/15
[300] LC/SG 29/15; Annex III
[301] Fn.299, para.143
[302] Fn.299, para.144
[303] See: fn.300, paras.9-14

11(f). Subsequently, the London Protocol has been amended[304], and on the Twenty-ninth Meeting[305] the focus shifted to Article 6 of London Protocol.[306] The question of carbon dioxide as industrial waste under the London Convention remained a loose end. If it was considered to be industrial waste (and subsoil formations would come under the Convention's scope[307]), the Convention is prohibitive. The implications of this in the European context will be discussed from p.80.

The London Protocol operates in the opposite way of the London Convention. In the meaning of Article 4, all materials are prevented from dumping, except those which are listed in Annexes 1 and 2. In this case, and also in the case of the OSPAR Convention, Scott's view seems to be valid. Apart from the particularity of the London Convention, even if carbon dioxide is not considered to be 'waste', the expression 'other matter' seems to encompass it. It can be observed that the fact that the London Protocol and the OSPAR Convention have been amended indicates that the Contracting Parties to those treaties understand carbon dioxide to be either 'waste' or 'other matter'.[308]

3.1.3 What does 'at sea' exactly mean?

Does 'at sea' mean the place where the disposing activity takes place or the place where the disposed material arrives or both? This question arose first under the London Convention 1972 under which the definition of dumping is

> "any deliberate disposal *at sea* of wastes or other matter from vessels, aircraft, platforms or other man-made structures *at sea*"[309]

The London Convention defines 'sea' as: "all marine waters other than the internal waters of States".[310] In the context of nuclear waste disposal[311], Contracting Parties to the London Convention raised the question whether the phrase 'at sea' denotes the place of the dumping mechanism or the final resting place of the dumped matter.[312] However, it was not a matter of contention that "wastes stored in the seabed in isolation from ocean waters

[304] 10 February 2007, see in more detail below.
[305] LC 29/17
[306] See below.
[307] See the next section.
[308] See in detail at p.73
[309] Italics by the present author.
[310] Article III, para.3
[311] It will be shown below that the exact context has little relevance.
[312] For a detailed discussion of the debate see Kaplan, pp.778-783.

quite clearly are not in the "sea." "[313] This means that if the former interpretation is followed then all forms of disposal are prohibited. This would even include incineration at ships and thereby the pollution of the atmosphere. However, this was not the case at the time when the debate arose. Incineration at sea was banned later by one of the 1993 amendments to the London Convention[314], and amendments to the OSPAR Convention[315], and the London Protocol[316]. Welsch observed that on this reading even launching waste into space from a ship would be dumping.[317] On the other hand, if the latter interpretation is followed then the definition is not prohibitive for offshore CCS because the resting place of the material is not understood to be a part of the sea under the Convention.

At the Thirteenth Consultative Meeting the Parties adopted Resolution LDC.41(13)[318]. It states in para.2 that

> "[d]isposal of low-level radioactive wastes into the sub-sea-bed repositories accessed from the sea constitutes a form of disposal subject to resolution LDC.21(9), and is therefore suspended at present."

It shows well the political nature of the debate that "the major nuclear nations – the United States, Britain, France, and the Soviet Union – voted against the proposal; Japan and three other nations abstained.[319] The nuclear powers consider the Resolution non-binding, but indicated that they would comply voluntarily.[320],[321]

Kaplan argued that this resolution clearly endorses the interpretation according to which 'at sea' refers to the place of the dumping mechanism. In other words, when a material is disposed of the disposing mechanism is at sea, the activity constitutes dumping even though the resting place of the disposed material is not at sea. Following Kaplan's view

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[313] Kaplan; p.778, fn.47
[314] Resolution LC.50(16)
[315] Article 4 and Annex II
[316] Article 5
[317] Kaplan, p.778, fn.48 referring to Welsch, The London Dumping Convention and Offshore Disposal of Radioactive Waste, 28 GERMAN Y.B. OF INT'L L. 322, 326 (1985); Kaplan adds: "Of course, wastes delivered to the seabed via a land-based tunnel should not fall within this interpretation of dumping. Sweden has implemented such a plan. See [Welsch] at p.327"
[318] Resolution LDC.41(13), Disposal of Radioactive Wastes into Sub-Sea-Bed Repositories Accessed From the Sea
[319] See Rubin, Industrial Powers Agree To Ban Ocean Dumping of Wastes, Associated Press Wire Service, Nov. 2, 1990.
[320] "A British delegate to the Meeting made a statement after the vote that typified nuclear nation reaction to the voluntary moratorium: [Y]ou just can't wish it away, we have to put [the radioactive waste] somewhere. We have no plans to dump radioactive waste, but we are not prepared to eliminate options that we may later regret." Internal quotation marks omitted.
[321] Kaplan, p.788

means that any offshore CCS project would be considered to be 'at sea'. Although Kaplan did not provide further explanation, it seems that the word 'from' in the Resolution was what led him to this interpretation. The definition of dumping under UNCLOS contains only the second 'at sea'. Kaplan argued that

> "the language [in UNCLOS] leaves no doubt that the definition of dumping depends not on the final resting place of the wastes, but rather the location of the dumping vehicle. SSD [sub-seabed disposal] would clearly be considered dumping under UNCLOS...".[322]

Here Kaplan did not provide further explanation either and it is questionable whether the deletion of the first 'at sea' should be heavily relied on. Nordquist notes that the change to this expression is 'merely a drafting change'.[323] More importantly, Kaplan's view can be doubted due to Resolution LC 51.(16)[324] (concerning disposal at sea of radioactive wastes) in which the Contracting Parties "declined to affirm[[325]] that such disposal would constitute dumping within the meaning of the 1972 Convention".[326]

Figueiredo argued that it is likely that the London Convention is not applicable to offshore CCS.[327] His argument was based on the fact that the definition of dumping provides that it is a deliberate disposal 'at sea' whereas the definition of 'sea' does not cover the seabed and the subsoil. In other words, in Figueiredo's reading, the phrase 'at sea' refers to the resting place of the disposed material. Figueiredo supported his view by submitting that Resolution LDC.41(13) is applicable to radioactive waste disposal only. He added that the Secretariat of the London Convention[328] is on record that the storage of carbon dioxide in geological structures under the seabed is not covered under the London Convention.[329]

The present author submits that the difficulty with this argument is that although Resolution LDC.41(13) was agreed in the context of radioactive waste disposal, its object was a general, linguistic question which is not related to radioactive waste in particular.

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[322] Kaplan, p.788
[323] Nordquist at paras.1.23 and 1.24; However, it is questionable to what extent can any change in the wording of a legal document be argued to have little importance.
[324] IMO Resolution LC.51(16), LC 16/14, Annex 5; p.2, para.6
[325] The actual wording was that the Contracting Parties 'agreed that it is under consideration whether such disposal is dumping within the meaning of the London Convention'.
[326] Scott, p.76
[327] Figueiredo, p.112
[328] The Secretariat of the London Convention is an institution under the auspices of the International Maritime Organisation which is an agency of the United Nations.
[329] However, Figueiredo does not state that the Secretariat of the London Convention holds this stance for the same reason which he has given and provides no reference.

Considering otherwise would mean that the meaning of 'at sea' and thus the definition of dumping changes according to the disposed material in question.

Figueiredo offered two counter-arguments to his view. The first is the interconnected nature of the marine environment.[330] Second, since the London Convention in its preamble mentions Resolution 2749(XXV) of the United Nations General Assembly which declares the principles governing the seabed, ocean floor and subsoil beyond the limits of national jurisdiction, the London Convention can be seen broad enough to cover offshore CCS.[331]

Much followed a teleological interpretation:

> "…[T]he location in which a substance is disposed of is not necessarily the decisive factor, but rather whether it has the potential to cause harm to the marine environment. … Therefore, the exclusion of the seabed and its subsoil from the Convention's scope of application would not be consistent with [this] approach."[332]

Much has further supported her argument by also evoking Resolution 2749 (XXV) as mentioned in the London Convention's Preamble and by pointing to the debate discussed above in relation to radioactive waste.[333]

In the light of this debate, although the scope of the London Protocol and the OSPAR Convention comprise the sub-seabed, it seems that in formal terms the subsoil falls outside of the scope of the London Convention. By evolutive or teleological interpretation, on the other hand, it is possible to argue that the subsoil has become part of the definition of 'sea'. A further argument can be made for this view by the following. In the particular context of disposal through pipelines Purdy and Macrory considered:

> "The Convention and Protocol only applies to activities using ships or platforms to inject CO_2 into the marine environment and there are no controls governing pipeline discharges from land based sources. This can be supported by the provision in the Protocol stating that its remit does not extend to sub-seabed repositories accessed

[330] Figueiredo, p.113 referring to Kaplan at p.779, fn.51; Kaplan in turn relied on Curtis, Legality of Seabed Disposal of High-Level Radioactive Wastes Under the London Dumping Convention, 14 OCEAN DEV. & INT'L L. 383, (1985); at p.398

[331] Figueiredo, p.113 referring to Scott at p.75; In fact, Figueiredo refers to Resolution 2740(XXV) by a typographical mistake.
Also see: fn.332, p.267-8

[332] Much, The Emerging International Regulation of Carbon Storage in Offshore Geological Formations, Chapter 11 in Caddel, Thomas eds., Shipping, Law and the Marine Environment in the 21st Century; (Lawtext Publishing Limited, Oxon, 2013), p.267

[333] Ibid.

> only from land[334]. This was confirmed at the thirteenth meeting of the consultative parties to the London Convention in 1990 (Snelders, 2002). The use of pipelines from land based sources to transport CO_2 direct to off-shore repositories is therefore a legitimate activity under the Convention and Protocol."[335]

In this view, regardless which position is taken as to what 'at sea' and 'industrial waste' mean, the London Convention and the London Protocol would not apply to disposal through pipelines. However, this view is fragile. Purdy and Macrory used the Contracting Parties' decision to equate disposal from land with disposal through pipelines into any subsoil space. It is true that the London Protocol does not apply to sub-seabed repositories accessed only from land and it is also true that the thirteenth consultative meeting of the contracting parties to the London Convention has found the same in relation to the Convention.[336] However, the meeting in question considered "low-level radioactive wastes [disposed of] into a repository, constructed in bedrock either totally or partially beneath the sea and accessed from the shore"[337]. The emphasis in this formulation seems to be on the 'repository beneath the sea' and not on the method of conveying the disposed material. The word 'constructed' implies an artificial storage space rather than natural geological formations. This difference is of substance because it may have implications on the safety of the disposal project and it limits significantly the volume of the material that can be planned to be disposed. Further, pipelines are not mentioned while such repositories may also be accessed by tunnel. What the Contracting Parties seem to have decided is that repositories constructed offshore are not part of the sea as opposed to the rest of the subsoil regardless of the method of disposal as long as it is conducted only from the shore. This interpretation is supported by the fact that the exclusion is in the definition of the 'sea' under the Protocol and not in the definition of 'dumping'[338] or in 'what dumping does not include'[339]. Thus, it seems unlikely that the Contracting Parties' decision can be understood to mean that the Convention does not apply to disposal through pipelines into any subsoil space. Indeed, the fact that this agreement was seen to be necessary seems to mean that – contrarily to the above agreement that the subsoil does not form part of the sea

[334] 1996 Protocol, Article 1(5)(7)
[335] Purdy and Macrory, pp.20-1
[336] It should also be noted that the phrasing of the above quote is unfortunate in that it states that an earlier instrument confirmed the scope of a later instrument.
[337] LDC 13/15, para.6.40
[338] Art.1.4
[339] Art.1.4.2

– here the parties did see the subsoil to be part of the sea. Equally well, it should follow from this that 'at sea' refers at least to the resting place of the disposed material.

Evolutive or teleological interpretation and/or the acceptance of the above argument and the treatment of carbon dioxide as 'industrial waste' would mean that the London Convention is prohibitive for offshore CCS. The implications of such scenario in the European Union will be analysed at later point below.[340]

Here it should be noted that if offshore CCS was formally regarded to be allowed under the London Convention, then this would mean that the sub-seabed disposal of radioactive waste is treated differently from the disposal of carbon dioxide. To answer whether such distinction would be a justifiable policy, it is appropriate to compare the size of the risk and the possible consequences. CCS (in a general context) and the disposal of radioactive waste have been compared in 2011 including these aspects.[341] It emerges from the comparison that although both activities are the disposal of waste into the subsoil and that both carry risks, they are fundamentally different.[342] In summary,[343] the volume of CO_2 which is sought to be disposed is on the scale of gigatonnes while the amount of radioactive waste to date is a few hundred thousand tonnes. CCS relies on natural, geological barriers[344] while radioactive waste disposal relies both on engineered barriers (the disposing repository) and natural barriers. Both risks neutralise themselves over time. CCS sites are expected to become safe on the scale of centuries to millennia. For radioactive waste, on the other hand, it may take even a hundred thousand years before it becomes harmless. Thus, a brief comparison does not give an answer. It is a political question about what risk society is willing to tolerate in its fight against climate change. A further consideration may be that, in contrast to nuclear power generation[345], the UNFCCC recognises[346] CCS as a Clean Development Mechanism (CDM)[347]).

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[340] See the section 'The impact of the London Convention and Article 6 of the London Protocol' at p.80.
[341] Toth, FL (ed.); Geological Disposal of Carbon Dioxide and Radioactive Waste: A Comparative Assessment; Springer, 2011
[342] Ibid.; See in particular pp.56-70; 83-98; 114-119
[343] Ibid.; p.9
[344] However, the well closure may be seen as an artificial barrier.
[345] FCCC/CP/2001/13/Add.2, Preamble, para.4; confirmed at FCCC/KP/CMP/2005/8/Add.1; See also: http://cdmrulebook.org/348 ; last accessed 03 10 2013
[346] FCCC/KP/CMP/2010/12/Add.2; p.27-29; Also see: FCCC/KP/CMP/2011/10/Add.2, p.13-30
[347] "The Clean Development Mechanism (CDM), defined in Article 12 of the [Kyoto] Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO_2, which can be counted towards meeting Kyoto targets" source:

In conclusion to this section, there is no authoritative opinion for the meaning of ‘at sea’ under the London Convention. Even if there was one, it would still be questionable to what extent it is relevant to UNCLOS because – as it was mentioned above – even though the intention was to accord the same meaning to ‘dumping’, in fact, the phrase ‘at sea’ appears only once in the definition under UNCLOS. Equally well, there has been no consensus under this instrument whether carbon dioxide is industrial waste. The table below summarises the position under the London Convention and its potential effect on UNCLOS.

http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php ; last accessed 03 10 2013

The meaning of 'at sea' and 'industrial waste'		The status of offshore CCS
'At sea' refers to the resting place of the disposed material	CO_2 is industrial waste	Allowed
	CO_2 is not industrial waste	Allowed
'At sea' refers to the location of the dumping mechanism	CO_2 is industrial waste	Prohibited
	CO_2 is not industrial waste	Allowed
'At sea' includes the subsoil of the sea.	CO_2 is industrial waste	Prohibited
	CO_2 is not industrial waste	Allowed
	CO_2 is industrial waste	Prohibited
	CO_2 is not industrial waste	Allowed

Table 1.1

The applicability of the London Convention to offshore CCS

3.1.4 Does the expression 'man-made structures' include pipelines?

Pipelines are referred to as man-made structures in scientific and engineering contexts.[348] It is also intuitive to the common sense. However, in the legal context there is no clear answer to this effect. UNCLOS, the London Convention and the London Protocol do not define man-made structure. Peters, Soons and Zima[349] argued in the in relation to the removal of installations from the EEZ under UNCLOS that whether pipelines come under the different terms of the Convention is context dependent and that the terminology used

[348] See for example: Blondel, The handbook of sidescan sonar, (Springer, Berlin, 2009); p.201
[349] Paul Peters, Alfred H.A. Soons and Lucie A. Zima (1984). Removal of installations in the Exclusive Economic Zone. Netherlands Yearbook of International Law, 15, pp 167207 doi:10.1017/S0167676800003329

by UNCLOS is inconsistent[350] due to the negotiating method whereby it was concluded.[351] They found in particular that

> "In the definition of "dumping" in Article 1.5 reference is made to "platforms or other man-made structures". From the context it would seem likely that pipelines are meant to be included in such other structures."[352]

> "Article 194.3(c) and (d) in Part XII on the marine environment deals with pollution from "installation and devices", while Articles 208 and 214 refer to "artificial islands, installations and structures" and Article 209 refers to "installations, structures and other devices". In all these cases it would be rational to assume that pipelines were meant to be included, since they are not mentioned separately (pipelines are only mentioned in this Part in Article 207.1, in the context of land-based sources of pollution)."[353]

If these consideration are followed under Article III.1(a)(ii) of the London Convention (dumping is "any deliberate disposal at sea of vessels, aircraft, platforms or other man-made structures at sea.") pipelines would come under the definition of man-made structures. Assuming consistency, 'man-made structures' comprises pipelines in Article III.1(a)(i), that is in the context of using those structures for disposal, as well.

More importantly, if 'man-made structures' did not cover pipelines, the Convention would be deprived from most of its *raison d'être*. It would be sufficient to set up a pipeline to dump any waste into the sea. Even the agreement discussed in the previous section made during the thirteenth meeting of the Contracting Parties would not be necessary.

Thus, as far as UNCLOS and the London Convention are concerned pipelines fall under the regulation of dumping and it is argued here that the agreement on the thirteenth meeting of the Contracting Parties does not bear effect on the legality subsoil disposal of carbon dioxide through pipelines into natural geological formations.

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[350] English and Australian law shows that national law is not consistent either. In the laws of the United Kingdom in the context of abandoning the man-made structures themselves pipelines do not seem to come under the definition of man-made structure. Section 5(a)(i) of the Food and Environment Protection Act 1985 provides that licence is needed for the deposit of marine structures in the sea or under the seabed within the Scottish inshore region but in Section 24(1) of the same act the term 'marine structures' does not include pipelines. However, according to s.44 of the Energy Act 1998 a pipeline is an 'offshore installation'. Under sub-para. (qa) of para.1, s.4 of the Australian Sea Installations Act 1987 , pipelines are not 'sea installations' if they require a licence to be issued under the Offshore Petroleum and Greenhouse Gas Storage Act 2006 and under the latter act pipelines are subject to such licence.

[351] Ibid. from p.189; in particular: p.189, para. b and p. 190, para. f

[352] p.190

[353] Ibid.

Since the London Protocol and the OSPAR Convention has been amended, under these instruments the question is of no practical importance. However, it has to be noted that if the argument made here in relation to offshore repositories is accepted then storage projects from the shore via pipeline would not be legal under the London Protocol by virtue of its Article 1.5.7 but by virtue of the amendment.

Under the OSPAR Convention 'offshore pipeline' to pipelines related to the "exploration, appraisal or exploitation of liquid and gaseous hydrocarbons".[354] Therefore, pipelines for the purposes of CCS fall outside the scope of this definition. However, they may fall under the definition of 'vessel'. This will be referred to again below.

3.2 The International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (the London Convention)

The London Convention[355] has 87 parties. While the European Union itself is not a party, it has seven parties from the EU.[356] The London Convention is in force since 30 August 1975; its backbone is Article IV, and Annexes I and II. Article IV, paragraph 1 provides:

> "In accordance with the provisions of this Convention Contracting Parties shall prohibit the dumping of any wastes or other matter in whatever form or condition except as otherwise specified below:
>
> (a) the dumping of wastes or other matter listed in Annex I is prohibited;
>
> (b) the dumping of wastes or other matter listed in Annex II requires a prior special permit;
>
> (c) the dumping of all other wastes or matter requires a prior general permit."

It is sufficient to recall at this point that the applicability of the London Convention to ships or platforms depends on how the phrases 'waste or other matter' and 'at sea' are interpreted. If 'at sea' refers to the resting place of the dumped material and sub-soil geological formations are not considered to be part of the marine environment, the

[354] See together Article 1, para. (m) with para. (j)
[355] 1046 UNTS 138
[356] Croatia, Finland, Greece, Hungary, Malta, Poland, Portugal

Convention is permissive. On the other hand, if 'at sea' is interpreted to refer to the place of the dumping mechanism, then depending on whether carbon dioxide is classified as industrial waste, the Convention is either prohibitive by paragraph (a) or it subjects offshore CCS to permit pursuant to paragraph (c). This conclusion seems to apply to disposal through pipelines as well. What impact would classifying carbon dioxide as industrial waste have on the Member States of the European Union which are parties to the London Convention? This will be answered from p.80.

3.3 The 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (the London Protocol)

The London Protocol[357] was drafted to be the successor of the London Convention. Article 23 provides that the "[p]rotocol … supersedes the Convention as between Contracting Parties to [the] Protocol which are also Parties to the Convention". While the European Union is not a party to the Protocol, fourteen Member States[358] are. It is in force since the 24 March 2006. The 1996 Protocol operates through a mechanism which is the reverse of the one in the London Convention. That is, nothing can be dumped unless it is present in Annex 1 of the Protocol. In 2006 the Contracting Parties agreed to amend Annex 1 of the Protocol.[359] The amendment provided an express permission for CCS under international law for the fourteen EU Member States which were parties to the amendment. Since there were no declarations made to the contrary within the 100 days provided, the amendment entered into force for all Contracting Parties to the London Protocol in accordance with Article 22, para.4, on the 10 February 2007. The amending resolution inserted into Article 1 of Annex 1 (the list of materials that may be considered for dumping), a new paragraph to the effect of permitting the sequestration of carbon dioxide streams.[360] The Resolution also introduced another paragraph stipulating the conditions for such disposal. The disposal

[357] 36 ILM 7
[358] Denmark, Germany, United Kingdom, Spain, Sweden, Ireland, France, Luxembourg, Bulgaria, Belgium, Slovenia, Italy, the Netherlands, Finland; Also parties: Iceland (EEA), Norway (EEA, EFTA), Switzerland (EFTA)
[359] IMO Resolution LP.1(1), LC 28/15, Annex 6
[360] They inserted into Annex 1: "1.8 Carbon dioxide streams from carbon dioxide capture processes for sequestration"

must take place in a subsoil geological formation; the material disposed must be overwhelmingly carbon dioxide which may contain incidental associated substances derived from the source material and the capture and sequestration processes used; and it must have no wastes or other matter added for the purpose of disposing of those wastes or other matter. Thus, the London Protocol expressly allows CCS subject to the conditions specified therein. However, this amendment is merely a half-success. Article 6 of the 1996 Protocol provides:

> "Contracting Parties shall not allow the export of wastes or other matter to other countries for dumping or incineration at sea."

This article is the direct result of the intention of the contracting parties to the London Convention to bring the Convention in line with the Basel Convention.[361] It was not foreseen at the time of drafting that this article will create an obstacle to the transport of carbon dioxide for the purposes of CCS.

The Legal and Technical Working Group on Transboundary CO_2 Sequestration Issues set up at the second meeting of the contracting parties[362] took the view that

> "Article 6 prohibits the export of CO_2 streams from the jurisdiction of one Contracting Party to any other country, whether that is another Contracting Party or a non-Contracting Party. It was also felt that "export" would include any movement from one Contracting Party to another country for disposal in that other country regardless of any commercial basis for that transfer. Consequently, it was felt that an amendment to Article 6 was required in order to permit such movements."[363]

On the third meeting of the contracting parties[364] all the recommendations of the Working Group have been endorsed and its report was adopted,[365] but there was no agreement on whether Article 6 should be amended.[366] The Working Group has also suggested the

[361] See: IMO Resolution LDC.42(13); This resolution "[c]alled for the prevention of export of wastes for dumping at sea containing substances listed in annexes I and II and resulted in Article 6 of the London Protocol." Source: http://www.imo.org/KnowledgeCentre/IndexofIMOResolutions/Pages/London-Convention-(LDC,-LC)-and-London-Protocol-(LP).aspx last accessed at 13 07 2013
[362] LC 29/17, Report of the Twenty-ninth Consultative Meeting and the Second Meeting of Contracting Parties, paras.4.7-4.9
[363] Report of the 1st Meeting of the Legal and Technical Working Group on Transboundary CO_2 Sequestration Issues; LP/CO2 1/8; para.3.9
[364] IMO LC 30/16, Report of the Thirtieth Consultative Meeting and the Third Meeting of Contracting Parties
[365] Ibid., 5.24
[366] Ibid., 5.17, 5.18, 5.20

setting up of an intersessional correspondence group[367] to consider, amongst others, the option of an amendment to Article 6.[368] Crucially, according to the replies given to the intersessional correspondence group, the Basel Convention is not applicable to this issue.[369] However, it has to be remembered that this is not an authoritative opinion. The findings of this group were taken into consideration at the fourth meeting.[370] The same meeting established the Working Group on an Amendment to Article 6.[371] There was no consensus among the parties to the meeting about the amendment proposed by the Working Group.[372] Finally, after modifications[373], Resolution LP.3(4) on the amendment of Article 6 was put to a vote and it has been adopted.[374]

The amendment introduced a new paragraph under Article 6 to the effect of allowing the export of carbon dioxide subject to certain conditions. There must be an agreement between the countries concerned with a "confirmation and allocation of permitting responsibilities between the exporting and receiving countries, consistent with the provisions of the Protocol and other applicable international law", and "[i]n the case of export to non-Contracting Parties, provisions at a minimum equivalent to those contained in [the] Protocol…" Such agreements must be notified to the International Maritime Organisation.

Since this amendment affects the main text as opposed to an annex, different provisions apply to its coming into force. According to Article 21 of the London Protocol, two-thirds of the Contracting Parties have to accept the amendment before it can come into force. Today, twenty-eight ratifications would be necessary. This number may increase anytime when a State accedes to the Protocol. The International Maritime Organisation[375] noted in 2010:

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[367] The report of this group is in LC 31/5
[368] Ibid., 5.23.1
[369] LC 31/5, paras. 15, 20, 26, 27 and 30; In relation to transport for injection to a London Protocol country, the Group also reported that some parties would like to discuss this issue under the Basel Convention itself.
[370] LC 31/15, para.5.9
[371] LC 31/15, para.5.12; the report of this Working Group can be found in LC 31/WP.2 However, a search in the IMODOCS database on 16 07 2013 did not provide any result for this symbol.
[372] LC 31/15, para.5.14
[373] Ibid., para.5.15
[374] Ibid., paras.5.16, 5.17; China voted against the Resolution and expressed its fear that the amendment may "open a door for export of other wastes, which is in contradiction with the objective of the Protocol.", paras.5.16, 5.18; Kenya, the Marshall Islands, Mexico, Saudi Arabia, South Africa and Vanuatu abstained. para.5.16
[375] "IMO – the International Maritime Organization – is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships."; Source: http://www.imo.org/About/Pages/Default.aspx; last accessed 25 06 2013

> "This amendment will take some years before entry into force, but the potential it offers might be of interest to countries sharing marine resources (e.g., the North Sea, the Persian Gulf, etc)."

The University College London Carbon Capture Legal Programme[376] commented:

> "Despite its importance for the development of CCS, the amendment to Article 6 has not yet entered into force and there is currently little indication that a sufficient number of Contracting Parties will ratify it in the near future. ... This means that, until the ratification and entry into force of such an amendment, transboundary transport of CO_2 for the purpose of geological disposal will still be prohibited under the Protocol. This situation has a direct impact upon the future development of CCS transboundary activities."[377]

In 2011 the International Energy Agency published a working paper[378] dedicated to this issue and proposed five plus one way to overcome this impasse:

> "1. an interpretative resolution based on the general rule of interpretation[[379]];
>
> 2. resolving to provisionally apply the 2009 amendment;
>
> 3. subsequent agreement between contracting parties (bilateral or multilateral);
>
> 4. modification of the operation of relevant aspects of the London Protocol as between two or more contracting parties; and
>
> 5. suspension of the operation of relevant aspects of the London Protocol as between two or more contracting parties.
>
> A sixth option, of conducting CCS through non-contracting parties, [was] also considered.[380],,381

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[376] "Set up in June 2007, the UCL Carbon Capture Legal Programme (CCLP) analyses legal developments relating to Carbon Capture and Storage (CCS) and coordinates discussion between policy-makers, industry and other interested parties." Source: http://blogs.ucl.ac.uk/law-environment/2012/09/24/carbon-capture-legal-programme/ (last accessed: 17 January 2013)

[377] Available at: http://www.globalccsinstitute.com/networks/cclp/legal-resources/offshore-co2-storage/international-marine-legislation/london-protocol (last accessed: 17 January 2013)

[378] International Energy Agency, Carbon Capture and Storage and the London Protocol; Options for Enabling Transboundary CO_2 Transfer, 2011

[379] Based on Article 31 of the Vienna Convention on the Law of Treaties, 1155 UNTS 331

[380] However, in light of the February 2008 meeting of the IMO working group this approach is not viable because export even to non-contracting parties for the purposes of offshore injection would be prohibited. This conclusion was adopted by the Contracting Parties. See pp.20-1 of fn.378

[381] Ibid., p.14

The working paper concluded that the most desirable option would be the second one.[382] It also mentioned the possibility of a clarifying resolution to the effect that Article 6 should not be interpreted to prevent the transboundary movement of carbon dioxide. However, as it was pointed out by the paper itself, this would be a derogation from the already initiated formal amendment procedure. Those parties wishing to engage in the transboundary transport of carbon dioxide could enter into bilateral or multilateral agreements, or modify or suspend the application of Article 6. However, all these options are less desirable for the time and effort they may require and the political impact of a suspension.[383]

As it has been seen above, the Contracting Parties understand offshore CCS to be dumping under the London Protocol.[384] Today, the strict interpretation of the London Protocol means that Member States can dispose of carbon dioxide only which was captured in their own territory. In order to enable the transboundary transport of carbon dioxide, the amendment to Article 6 has to come into force. The implications of this in the European context will be discussed from p.80 together with the possible implications of the London Convention.

3.4 The Convention for the Protection of the marine Environment of the North-East Atlantic of 1992 (the OSPAR Convention)

The OSPAR Convention[385] is a regional agreement devised to protect the North-East Atlantic, or the OSPAR maritime area as it is also referred to. This convention entered into force on the 25 March 1998, and it has sixteen contracting parties; twelve EU Member States[386], three cooperating states[387] and the European Union itself. The Convention is built up of a main text and five annexes. The relevant annexes are: Annex I (Prevention and elimination of pollution from land-based sources), Annex II (Prevention and elimination of pollution by dumping or incineration), and Annex III (Prevention and elimination of pollution from offshore sources). The Group of Jurist and Linguists is a subsidiary body of

[382] Ibid., p.23
[383] See Ibid.
[384] See p.73
[385] 2354 UNTS 67
[386] Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, the Netherlands, Portugal, Spain, Sweden, United Kingdom
[387] Iceland (EEA), Norway (EEA, EFTA), Switzerland (EFTA)

the OSPAR Commission with an advisory function.[388] When it examined the status of offshore CCS under these annexes, it drafted a legal opinion and accompanied it by a table which is reproduced below in Annex I.[389]

The Group made its findings in four contexts: 1) scientific experiment 2) facilitating or improving the production of oil or gas 3) placement for the purposes of mitigation the effects of climate change. 4) placement for the purposes of mere disposal. The present text disregards the first two purposes because neither of them is CCS in the ordinary meaning of the term. As regards the third and the fourth aims, it is considered here that they represent the two sides of the same coin. It has been discussed above that CCS is a form of disposal which is undertaken in order to prevent the negative consequences of climate change. The present discussion is in this context.

The first scenario to consider is where an oil rig – an 'offshore installation' in the Convention's language[390] – has an added device which permits the injection of carbon dioxide. In the Opinion such device is treated as a man-made structure. The first fork is to ask whether the injection from such man-made structure is still considered to be done from an offshore installation. If so, the injection comes under Annex III as dumping from offshore installation. Otherwise, this form of placement may come under Annex I as pollution from land-based source or Annex II as dumping from a vessel depending on whether it is necessary for the offshore installation to have a physical link with the land in order to qualify the source as land-based. This is the second fork. If no such link is necessary, the placement will (or may[391]) come under Annex I as pollution from a land-based source regardless of the method of delivery of the carbon dioxide. That is, it would include delivery by ships to the offshore installation. On the other hand, if such link is necessary and there is no such link, the source will be considered as a 'vessel' for the purposes of the Convention and the placement will come under Annex II as dumping from a vessel. This is possible due to the very broad definition of the term 'vessel'. In fact the definition is so wide that every man-made structure can be considered as a vessel and therefore even where CCS comes under land-based pollution (being connected to land or not), it could also come under the definition of dumping from a vessel. This was partly

[388] Rules of Procedure of the OSPAR Commission as revised at OSPAR 2001 (Annex 29), OSPAR 2002 (Annex 10), OSPAR 2005 (Annex 25). Editorial amendments made at OSPAR 2012 (see OSPAR 12/22/1, (12.6-12.5§§; p.4-5, 6-7; Available at: http://www.ospar.org/documents/dbase/decrecs/agreements/05-17e_rules%20of%20procedure.doc
[389] OSPAR Commission, Summary Record OSPAR 2004, OSPAR 04/23/1-E, Annex 12 (Ref. §11.7a),
[390] See Article 1, para. (l)
[391] See below.

pointed out by the Group. A more important observation is that the Group phrased the possibility of this scenario of coming under Annex I as "*in some circumstances* an installation without such a physical link *might* be within the definition of a land-based source."[392] It is not told what those circumstances are. Also, it is not certain what the word 'might' refers to. It may reinforce the words 'in some circumstances' or it may mean that even within those not specified circumstances it is not certain that the setting would come under Annex I. In either case, this clause indicates that this interpretation is merely a limited possibility. It is a hint that where there is no physical link with the land, the placement will almost certainly be seen as dumping from a vessel and come under Annex II. That is, at the second fork it is the latter option which is likely to be adopted. Crucially, it also has to be noted that in its first clause paragraph 18 (c) uses the term 'installation' which suggests that it refers to 'offshore installations'. Thus the subject ('it') of the second clause is also offshore installations. However, the second clause refers to paragraph 16 (b) which clearly does not cover offshore installations but man-made structures for the purposes of carbon dioxide injection. It seems that this is a drafting mistake. The meaningful interpretation which stays closest to the text of the Opinion is to question whether the offshore installation has to be connected to land in order to the carbon dioxide injecting man-made structure on it qualify as a land-based source. This is what has been assumed so far. However, this formulation does not apply to the scenario where merely a man-made structure is placed in the marine environment with the sole purpose of CCS (or where an offshore installation is converted into such device – if deemed possible[393]) because such structure would not be an offshore installation in the meaning of the Convention. However, in this case questioning the need for a physical link would be equally valid. Therefore it is unlikely that this interpretation was intended. Rather, paragraph 18 (c) should have asked whether the man-made structure source has to be attached to land (regardless whether it is on an offshore installation or a converted offshore installation or an independent structure).

The second scenario to examine is where an offshore installation is converted into a man-made structure with the sole purpose of CCS. The Group has asked whether it is possible for an installation which was originally placed in the maritime area as an offshore installation for the purposes of the offshore activities to be converted into a structure of the kind described in paragraph 16(b). It is submitted here that this should not be a legal

[392] Para.18(c); Italics by the present author.
[393] See below.

question. It is question about engineering offshore devices. Nevertheless, the presence of the question in the legal context demands a legal examination. If such change is considered to be legally possible, then the same considerations apply to the offshore installation converted into the man-made structure as the ones above apart from the first fork since such structure would not come under the definition of offshore installation. Should such change be considered legally impossible, then the device in question would remain an offshore installation and Annex III would apply.

The third scenario is where a new man-made structure is placed in the maritime area with the sole purpose of CCS. In this case again the same considerations would apply as the ones to the first scenario with the exception of asking whether the new device is an offshore installation. The fourth scenario is where only pipelines are used which are running from land. In this case Annex I would apply.

Through OSPAR Decision 2007/2[394] the Contracting Parties amended the Convention to expressly provide for offshore CCS and to make it legal. In Annex II the Parties added sub-paragraph '(f)' to para.2, Article 3 to the effect of allowing the dumping of carbon dioxide streams from carbon dioxide capture processes for storage with three conditions mirroring those of the amendment to the London Protocol and the additional criterion that the carbon dioxide is to be intended to be retained permanently without significant adverse consequences for the marine environment, human health and other legitimate uses of the maritime area.[395] Annex III has been amended to the same effect by added paras.3 and 4 to Article 3, with identical conditions and the additional requirement that "[t]he Contracting Parties shall ensure that no [carbon dioxide] streams […] shall be disposed of in sub-soil geological formations without authorisation or regulation by their competent authorities. Such authorisation or regulation shall, in particular, implement the relevant applicable decisions, recommendations and all other agreements adopted under the Convention."[396] Annex I was not amended because, although Article 2 prescribes authorisation or regulation by a competent authority, it is not prohibitive.

The amendment to the OSPAR Convention does not discuss in detail the findings of the Group of Jurists and Linguists. It does not comment on to what extent the Group's opinion has been accepted. Therefore, although not binding, it has to be assumed that every finding of the Group is at least a possible interpretation of the Convention.

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[394] OSPAR Commission, OSPAR 07/24/1-E, Annex 6
[395] The words 'dumping' and 'store' are the expressions used by the amendment.
[396] OSPAR Commission, Summary Record OSPAR 2004, OSPAR 07/24/1-E, Annex 4 (Ref. §2.10a)

The OSPAR Convention has also been amended with respect to the right of placement in the water column. By Decision 2007/1 the Contracting Parties agree that

> "[t]he placement[397] of carbon dioxide streams in the water column or on the seabed is prohibited..."

Due to the environmental concerns expressed in the decision, CCS can take place in the sub-soil only. This is a policy setting decision because earlier literature did contemplate the disposal of carbon dioxide on the seabed or in the water column.[398]

It can be concluded that under the OSPAR Convention offshore CCS is permitted now in all forms as long as the resting place of the carbon dioxide is not on the seabed or in the water column. However, it is unfortunate that three different annexes may apply to what is the same activity and that and the exact circumstances in which Annexes II and III apply are not certain enough.

3.5 The impact of the London Convention and Article 6 of the London Protocol

3.5.1 Jurisdiction

It has been asked above what impact the London Convention may have on the seven Member States parties to it. If carbon dioxide is considered to be 'industrial waste' and the subsoil of the seas to be part of the definition of 'sea' then the Convention is prohibitive. How could such interpretation be reconciled for the seven Member States with the European policy?[399]

In order to answer this question it is advisable to ask first who is competent to answer it. This leads to the *MOX Plant* case[400] before the European Court of Justice. The United Kingdom had planned to construct a so-called 'MOX' or mixed oxide fuel plant on the

[397] For the purpose of this Decision, the term "placement" encompasses the term "disposal".
[398] See for example: IPCC 2005; Chapter 6 - Ocean storage
[399] The CCS Directive has no provision which expressly allows offshore carbon dioxide storage. However, it does encourage this activity. This is a possible conflict has been identified by the IEA Report as well (see fn.378). Furthermore, the OSPAR Convention after the amendment permits offshore CCS, and since to European Union is a member to this Convention it can be submitted that - similarly to UNCLOS in the MOX plant case (para.82, C-459/03) - it forms integral part of the Union's legal order.
[400] Case C-459/03; European Court reports 2006 Page I-04635

western English coast at Sellafield.[401] Such plants recycle plutonium from spent nuclear fuel by mixing plutonium dioxide with depleted uranium dioxide.[402] Ireland brought its concerns before an ad hoc tribunal set up under the OSPAR Convention and it applied for interim measures before the International Tribunal for the Law of the Sea (ITLOS)[403]. Ireland's contentions relied on UNCLOS, the OSPAR Convention as well as on Community law.

The case concerned, *inter alia*, whether Ireland's original contentions fell under the Community's competence because in this case, the Court was to have exclusive jurisdiction over the issues in the meaning of ex Article 292 of the EC Treaty (now Article 344 TFEU).

As regards the particular provisions in question, the Court held that the Community had a legal basis to enter into agreements concerning the protection of the marine environment under ex Article 175(1) EC (now Article 192(1) TFEU), if read together with ex Article 174(1) EC[404] (now Article 191(1) with the last point expressly mentioning climate change) and that the Community's external competence in environmental matters is shared on the basis of ex Article 176 EC[405] (now Article 193 TFEU).

In general circumstances this would be sufficient to find that in the matters concerned competence has been transferred to the Community.[406] However, in this particular case (due to the provisions on which Ireland relied in the main dispute and the wording of the Community's Declaration of Competence[407]) prior Community legislation was necessary on the matters concerned to establish that the Community was competent. Ireland's contentions related to matters which were governed by Community law, indeed some of the contentions relied on Community law.[408] Therefore, the Court had an exclusive jurisdiction in the meaning of ex Article 292 EC.

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[401] The project was carried out but the plant was closed in 2011. See: The Independent, Revealed: £2bn cost of failed Sellafield plant, 09 June 2013; and The Guardian, Sellafield Mox nuclear fuel plant to close, 03 August 2011
[402] Para.21
[403] The ITLOS is a judicial body established by the United Nations Convention on the Law of the Sea 1982. See: Annex VI, Art 1 of UNCLOS
[404] Paras.90-1
[405] Para.92
[406] See also: Case 22/70 Commission v Council; ('the AETR judgment'), [1971] ECR 263, para.17
[407] Declaration concerning the competence of the European Community with regard to matters governed by the United Nations Convention on the Law of the Sea of 10 December 1982 and the Agreement of 28 July 1994 relating to the implementation of Part XI of the Convention; Section 2, para.2; See: para.8 of the judgment
[408] Paras.110-120

Before continuing it has to be noted that Article 292 EC merely refers to the 'disputes concerning the interpretation or application of this Treaty', that is, the EC Treaty. By contrast, the proceedings brought by Ireland did not rely on the EC Treaty. So how could the ECJ reach the conclusion it reached? The Court accepted the formulation of the Commission which made a link between the EC Treaty and the obligations assumed by the Community:

> "It is necessary to specify at the outset that, by its first head of complaint, the Commission is criticising Ireland for failing to respect the exclusive jurisdiction of the Court by bringing before the Arbitral Tribunal a dispute between it and another Member State concerning the interpretation and application of provisions of the Convention involving obligations assumed by the Community in the exercise of its external competence in regard to protection of the environment, and for thereby breaching Article 292 EC. The articles of the EAEC Treaty to which the Commission refers in its submissions relate to the second and third heads of complaint."[409]

This is an expansion of the original wording of the EC Treaty. Even though the protection of the marine environment falls under the shared competence of the Community, and even though the competences of the Community were allocated by the EC Treaty, these facts should be clearly distinguished from the submissions Ireland made in its original proceedings which did not rely on the provisions of the EC Treaty. On the other hand, Ireland did rely on Community rules, and it is understandable that the Community wished to grant exclusive jurisdiction to itself in matters which concern its own legislation. However, this should have been reflected by the formulation of the Court's argument. The exclusiveness of the jurisdiction should not have been linked to the presence of a competence but to the fact that Community law was in question.

A question regarding the hierarchy between the London Convention and the European position would certainly involve the interpretation of EU law. This could be either the CCS Directive or it could be the amended OSPAR Convention.[410] Once the *MOX Plant* case has affirmed that the Community exercises shared competence in the field of the protection of the marine environment by referring to Part XII of UNCLOS, which also discusses dumping, the argument can be made that the Union exercises shared competence in the field of dumping as well. More directly, the European Union is party to the OSPAR

[409] Para.80
[410] See fn.399

Convention whose purpose is the elimination of dumping and pollution from land-based sources. It must also not be forgotten that the CCS Directive was enacted on the basis of Article 175(1) EC.[411] Thus, regardless whether the emphasis is placed on the existence of a competence or (as here suggested) the invocation of European legislation, the ECJ can argue that it has an exclusive jurisdiction in the question discussed here. In para.123 of the *MOX Plant* case the Court stated:

> "… an international agreement cannot affect the allocation of responsibilities defined in the Treaties and, consequently, the autonomy of the Community legal system, compliance with which the Court ensures under Article 220 EC [now see Article 19 TEU[412]]. That exclusive jurisdiction of the Court is confirmed by Article 292 EC, by which Member States undertake not to submit a dispute concerning the interpretation or application of the EC Treaty to any method of settlement other than those provided for therein (see, to that effect, Opinion 1/91 [1991] ECR I-6079, paragraph 35, and Opinion 1/00 [2002] ECR I-3493, paragraphs 11 and 12)."

When the Union's jurisdiction is in question the text of the European treaties prevails over international provisions. However, it is crucial to note that, as the Court said itself in paras.124-5, Article 282 of UNCLOS (Obligations under general, regional or bilateral agreements) foresees exactly this scenario. Therefore, regarding UNCLOS, the case is not really an example of the above statement. On the other hand, ex Article 292 EC certainly prevailed over Article 32, para.1 of the OSPAR Convention which prescribes arbitration.

3.5.2 Substantive provisions

The question of jurisdiction is a specific, procedural matter and it can be distinguished from provisions of substance. Even if the ECJ is the sole competent authority in a legal question concerning the Member States when competence is transferred, it is not necessarily the case that substantive European legislation prevails over conflicting international law.[413] Indeed, in light of Article 351 TFEU the first assumption should be to the contrary.

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[411] See Directive 2009/31/EC, preamble

[412] Also see: Foreign and Commonwealth Office, London; A Comparative Table of the Current EC and EU Treaties as Amended by the Treaty of Lisbon, p.3; Available at http://www.official-documents.gov.uk/document/cm73/7311/7311.pdf; last accessed: 17 07 2013

[413] This statement is made on the assumption that the validity of European law in light of the international provision is not questioned. For the scenario where the validity of European provisions was questioned see: International Association of Independent Tanker Owners (Intertanko) and Others v Secretary of State for Transport; Case C-308/06; European Court reports 2008 Page I-04057

Article 351 TFEU before the Treaty of Lisbon (2009) was Article 307 EC (or TEC) and before the Treaty of Amsterdam (1997) it was Article 234 EC. This may be confusing because after the Treaty of Amsterdam Article 234 EC was the ground for bringing a case before the ECJ for a preliminary ruling; before it was Article 177 and under the TFEU it is now Article 267. The table below gives an overview of this note.

	before Amsterdam	after Amsterdam	after Lisbon
Status of anterior treaties	Article 234 EC	Article 307 EC	Article 351 TFEU
Preliminary rulings procedure	Article 177 EC	Article 234 EC	Article 267 TFEU

Box 3.1

The first two paragraphs of Article 351 TFEU provide:

"The rights and obligations arising from agreements concluded before 1 January 1958 or, for acceding States, before the date of their accession, between one or more Member States on the one hand, and one or more third countries on the other, shall not be affected by the provisions of the Treaties.

To the extent that such agreements are not compatible with the Treaties, the Member State or States concerned shall take all appropriate steps to eliminate the incompatibilities established. Member States shall, where necessary, assist each other to this end and shall, where appropriate, adopt a common attitude."

As it is clear from the wording, Article 351 applies to anterior treaties only and there is no equivalent provision in the Treaty with respect to posterior agreements. With the exception of Greece[414], the London Convention is an anterior treaty for the states here discussed; therefore the position of anterior treaties is considered first and Greece's case will be considered separately.

[414] Greece became a member of the European Community on the 1st of January 1981, and it ratified the London Convention on the 10th of August of the same year.

At first sight it would seem that, albeit for the protection of third parties, Article 351 would give way to the London Convention over European law. However, in the ECJ's practice the predecessors of Article 351 were not always a successful ground to rely on.[415]

The first case to consider in this context is the case of *Levy*[416] which concerned a conflict between Directive 76/207/EEC[417] on the equal treatment of women and French legislation based on the 1948 ILO Convention on night work for women in industry[418]. The judgment of the Court was ambivalent. Reading the final conclusion[419] – and strictly speaking this is the *ratio* of the judgment – ex Article 234 would uphold the provisions emanating from the ILO Convention. However, the reasoning of the Court strongly suggested that the national court should reconsider the binding nature of the rights and obligations arising under the 1948 ILO Convention in the light of the subsequent developments in international law.[420]

On the other hand, the Court respects the procedural provisions of international treaties.[421] In the case of *Commission v Austria*[422] the 1935 ILO Convention on the employment of women on underground work in mines was found to be in conflict with the above mentioned directive[423].However, the Court has also acknowledged that the only way to denounce the Convention was through its Article 7(2).[424] According to this provision the first occasion to denounce was in 1997 but, as the court found, at that time the incompatibility was not sufficiently clear and therefore the first real occasion to denounce was to come in 2007.[425] It followed that Austria had not failed to fulfil its obligations under Community law.[426]

These two cases suggest that the Court could in the context of the London Convention find that as far as offshore CCS is concerned, international law has progressed and the Member States concerned should re-examine whether their London Convention obligations should be applied to CCS. The Court could invoke directly Recital (12) of the CCS Directive for this argument. More drastically, it is not excludable that that Court could direct the

[415] See Klabbers, chapters 6, 8 and 9
[416] Case C-158/91
[417] OJ L 39, 14.2.1976, p. 40–42; repealed by Directive 2006/54/EC, OJ L 204, 26.7.2006, p. 23–36
[418] Convention No 89 of 9 July 1948 of the International Labour Organization on Night Work for Women in Industry; 81 UNTS 147
[419] Fn.416, para.22
[420] Ibid., paras.18-21
[421] Also see: Klabbers, p.139
[422] Case C-203/03
[423] Paras.42-50
[424] Para.62
[425] Paras.62-3
[426] Para.64

Member States to withdraw from the London Convention under its Article XXI to eliminate the incompatibility.

However, it may also happen that reference to Article 351 would not be made at all due to the seeming confusion at the Court as to the exact role of Article 351 which is apparent from the case of *Commission v Portugal*[427]. In this case Portugal had an international agreement concerning merchant shipping with Angola which conflicted with Regulation No 4055/86[428]. Portugal defended its position on the substance of the debate by relying on ex Article 234 and also in terms of procedure it pointed out that the Commission did not refer to this provision when it brought its claim.[429] The Court stated in response that the Commission brought its claim on the basis of the Regulation itself as opposed to ex Article 234[430] and that the obligation to denounce the earlier treaty (the substance) stemmed from the Regulation[431].

In the present author's view there is a conceptual difficulty with this line of argument on both procedural or functional and substantive grounds. From a procedural point of view, the Regulation is a piece of specific Community legislation which the member states must observe. By contrast, the purpose of ex Article 234 is to provide for the relationship between any Community legislation and international law. If there were non-compliance with Community legislation at international level it would have been ex Article 234 which should have been invoked with regard to the particular Community legislation in question. Apart from the fact that such by-passing was certainly not the drafting states' intention, in terms of the substance of the article, it carries the risk of rendering the now Article 351 meaningless. Klabbers notes the same from a constitutional perspective:

> "To suggest [, as the Court does,] that the obligation to denounce follows from the regulation, is to place the regulation above article 307. This is unsatisfactory from the point of view of systematics of EU law (which would normally do the opposite: treaty provisions prevail over secondary legislation, *lex specialis* considerations notwithstanding), and undermines the protection offered by Article 307: surely, if Article 307 can be trumped by a regulation, then the protection of the interests of third states runs the risk of being rendered nugatory."[432]

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[427] Case C-62/98
[428] OJ L 378, 31.12.1986; last consolidated in 1990
[429] Paras.23, 40
[430] Para.51
[431] Para.48
[432] Klabbers, p.139

Although Klabbers is right in that this way Article 351 risks losing its meaning, the problem is not really constitutional. Relying on the regulation was a functional mistake whose consequence is that the substance of Article 351 is not being applied and this mistake also happens to be constitutionally questionable because of the primary and secondary legislation division between the two grounds in question.

This is the strict interpretation of the Court's approach. It follows from this approach that Portugal's substantive defence based on ex Article 234 could have been dismissed without analysis. However, the Court did analyse Portugal's claim under ex Article 234 and thereby its judgment became inconsistent. The only way to avoid this conclusion is to say that although the actual obligation to denounce came from the regulation, the criteria for establishing the existence of the obligation were in ex Article 234. Although this is an absurd argument, this is exactly what the Court did in effect.

Nevertheless, the argument provided by the Court is interesting. First, the Court held that within the meaning of ex Article 234 Portugal must respect its anterior international commitment.[433] However, immediately after this the Court found that the treaty in question has a denunciation clause and therefore Angola's rights would not be encroached upon denunciation.[434]

Commission v Portugal can be contrasted to the BLEU[435] cases[436]. In these cases the Court also relied on the directives only. However, in all these cases the regulation in question had its own provisions for the case of incompatibility.[437] This confirms the argument above that the Court's approach in *Commission v Portugal* is questionable on a functional ground rather than on a constitutional one. Of course the regulation may be unconstitutional but this issue is a distinct question.

In *Burgoa*[438] although the court held that ex Article 234 was applicable[439], on the Court's interpretation of the legal background this had no relevance because it considered that Spain's later negotiations with the Community[440] "superimposed on the régime which

[433] Para.45
[434] Para.46
[435] Belgium-Luxembourg Economic Union
[436] Joined cases C-171/98, C-201/98 and C-202/98, Commission v Belgium and Luxembourg; and C-176/97 and C-177/97, Commission v Belgium and Luxembourg; See Klabbers, p.136
[437] Article 5(1) of Regulation No 4055/86; OJ L 378, 31.12.1986
[438] C-812/79
[439] See paras.6-10, 11(c)
[440] Klabbers commented at p.128: "One may entertain serious doubts about the Court's reasoning. Surely, to consider an agreement in force to be abrogated by what is at best an example of informal cooperation

previously applied".[441] The case concerned Spain's (not a member state at the time) rights under the 1964 London Fisheries Convention[442] in Irish waters and Irish legislation originating from[443] Community law.

It should be noted that Articles 5 and 10 of the London Fisheries Convention provide that Member States can take conservation measures and special regimes in matters of fisheries as between States Members and Associated States of the European Economic Community. The term 'associated state' is not defined in the Convention. It seems that Spain could be seen as an associated state due to its negotiations with the Community. If so, it is arguable that Community law did not really prevail but was in line with the London Convention. This can be countered by the fact that the Court did not mention Article 10 in the judgment. However, Article 5 was evoked, and it is a general provision; Spain did not have to be an associated state for it to apply. A similar approach was taken in *Procureur Général v José Arbelaiz-Emazabel*[444], where the Court evoked both Article 5 and 10 of the Convention[445], and in the joined cases of *José Crujeiras Tome v Procureur de la République* Case[446] and *Procureur de la République v Anton Yurrita*[447], where the two articles did not appear in the Court's judgment. Thus, despite an initial resemblance neither this line of cases nor the BLEU cases should be relevant in this context.

Both *Commission v Austria* and *Commission v Portugal* seems to suggest withdrawal from the Convention under its Article XXI. Since being party at least to the London Convention is generally desirable, perhaps a middle-ground could be found by giving a wider interpretation to *Levy* meaning that Member States should be able to consider the validity of obligations arising under a treaty with respect to particular parts of a convention or activities as opposed to the treaty as a whole.

Similarly to the status of the London Convention, the above case law may be seen as guiding on Article 6 of the London Protocol inasmuch as it concerns the intra-Community movement of carbon dioxide. However, suggesting renunciation in this case would be even less satisfactory than in the case of the original convention. On the other hand, disregarding

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preceding any expressions of consent to be bound runs the risk both of not taking the sanctity of existing treaties too seriously, as well as making mockery of such acts a s signature and ratification."

[441] See paras.24-25
[442] 581 UNTS 57
[443] para.18
[444] C-181/80
[445] Paras.12-3
[446] C-180/80
[447] C-266/80

Article 6 for the purposes of CCS seems to be a viable solution. Norway – the largest current stakeholder in the European region – not being a member of the European Union, cannot rely on this argument. The European Union may consider a bilateral agreement with Norway as to the provisional application of the amendment as suggested by EIA Report above.

3.5.3 The particular case of Greece

In formal terms the London Convention is a posterior treaty for Greece. Article 351 TFEU is not applicable in this case and there is no equivalent provision in the Treaty for posterior agreements. As it was seen above, the court did not always refer to the predecessors of Article 351. This seems to indicate that in practice the lack of such provision would not be fatal for the overriding of the London Convention even if it is a posterior treaty.

It is arguable that the Court could rely on para.3 of Article 4 of the Treaty on the European Union[448] asking Member States to cooperate with the Union in order to attain the Union's objectives. Perhaps this provision is the reason why there is no equivalent to Article 351 with respect to posterior agreements: it goes without saying that a Member State should not enter into agreements which go against the Union's objectives. This observation in the present case immediately highlights the limitation of the distinction between anterior and posterior treaties. Although Greece became member to the London Convention after it became a Member State of the EC, the relevant European legislation and policy dates from after Greece ratified the London Convention. From this perspective, although not in the language of the treaty, Greece's ratification still could be seen as anterior.

3.6 Conclusions

The current position regarding dumping can be summarised as follows. It is not certain whether CCS falls under the London Convention because there is no legal consensus or authority on what 'at sea' refers to and whether carbon dioxide constitutes 'industrial waste'. If the London Convention was understood in the future to be a barrier to CCS, it would become in conflict with European policy. The second part of this chapter has shown that under the current European jurisprudence the ECJ would have an exclusive competence to discuss this matter in relation to the Member States. In light of the

[448] Consolidated version of the Treaty on European Union, OJ C 326, 26.10.2012, p.13–390; last consolidated in 2012

preceding case law on conflicting international law, it is a possibility that the Member States parties to the London Convention would have to disregard the Convention to the extent of offshore CCS or even to renounce their membership. By contrast, the London Protocol and the OSPAR Convention are certainly applicable to CCS and have been amended to expressly permit this technology. However, two problems remain. First, the amendment to Article 6 of the Protocol should come into force to allow CCS in the whole of the European region. Second, there is no clarity as to which annex of the OSPAR Convention would be applicable in certain sequestration scenarios. This is a shortcoming of the Convention which will have to be addressed in the future.

Chapter 4: The CCS Directive

In 2009 the European Union has promulgated the so-called CCS Directive[449] which had to be implemented into the national laws of the Member States by 25 June 2011.[450] The primary objective of the CCS Directive is to establish a "legal framework for the environmentally safe geological storage of carbon dioxide (CO_2) to contribute to the fight against climate change."[451] Having CCS is only considered as a 'bridging technology'; it is to be deployed temporarily until other means of mitigating climate change do not become more widespread.[452]

The CCS Directive is a response by the EU to two policy streams. On the one hand, the EU pledged to reduce its greenhouse gas emissions under the United Nations Framework Convention on Climate Change[453]. The EU's current commitment under this framework is in the Doha Agreement of 2012 which initiated a second Kyoto Protocol period running to 2020[454]. The EU has agreed to reduce its emissions by 20% until 2020 in comparison to 1990.[455] This may be increased to 30% if

> "other developed countries commit themselves to comparable emission reductions and developing countries contribute adequately according to their responsibilities and respective capabilities."[456]

These commitments necessitate the reduction of fossil fuels in the Member States' energy portfolios. However, the Member States still rely on fossil fuels to a large extent. On the other hand, the EU strives for energy security.[457] The use of CCS seeks to allow the continued use of fossil fuels while minimising carbon dioxide emissions from coal and gas.

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[449] Directive 2009/31/EC, OJ L 140, 05.06.2009, p. 114–135, (latest consolidated version: 17.02.2012)
[450] Art.39; CCS Dir.
[451] Art.1, para.1; CCS Dir.; Also see: Recitals (6) – (9), Preamble; CCS Dir.
[452] Recital (4), Preamble, CCS Dir.; "This technology should not serve as an incentive to increase the share of fossil fuel power plants. Its development should not lead to a reduction of efforts to support energy saving policies, renewable energies and other safe and sustainable low carbon technologies, both in research and financial terms."
[453] 1771 UNTS 107
[454] http://ec.europa.eu/clima/policies/international/negotiations/index_en.htm; last accessed: 24 01 2015
[455] Doha amendment to Kyoto Protocol, Article 1 A
[456] Ibid., Article 1 A, fn.7
[457] See: Accompanying document to the Proposal for a Directive of the European Parliament and of the Council on the geological storage of carbon dioxide - Impact assessment, COM(2008) XXX, 23.1.2008, p.13; Bradshaw at p.196-7

The provisions of the CCS Directive have been examined in a general context[458] and they have been considered in more specific discussions[459] as well as it has been discussed how they have been implemented into national law.[460] Therefore, it is sufficient in this chapter to provide a brief overview on the general aspects of the CCS Directive. On the other hand, some issues remain where the present author considers that further discussion is necessary. This stems partly from the findings of the ECO2 research consortium, which inform us about the appropriateness of the current legal arrangement, partly from the further analysis of certain provisions. This chapter wishes to cast light on these issues and to suggest to Member States which promote this technology to take a common position. A common position is advised partly because of the European ethos and – more pragmatically – because unified rules are expected to facilitate the deployment of CCS. The points discussed can be divided into two major categories. The first category is technical questions related to the entrapment of carbon dioxide. It will be found that the requirement of complete and permanent containment is in need of an official re-statement or re-interpretation. However, as it will be explained, in light of the ECO2 project a mere re-statement would probably create an obstacle for CCS. The second category is questions related to the financial security and financial contribution the operator has to provide. In the final part of this chapter comparison will be made with jurisdictions outside the EU. This will serve as indication as to what other solutions may be available. However, it is not possible evaluate these on an empiric basis in comparison to the European approach due to the relative novelty and slow deployment of this technology.

[458] For a general discussion see for example: C Bradshaw; 'The new Directive on the geological storage of carbon dioxide'; 2009 Env. L. Rev. 196; M Bergsten, 'Environmental Liability Regarding Carbon Capture and Storage (CCS) Operations in the EU' (2011) 20 European Energy and Environmental Law Review, Issue 3, pp. 108–115

[459]; Specific discussions include: M M Roggenkamp, A Haan-Kamminga, CO_2 Transportation in the European Union: Can the Regulation of CO_2 Pipelines Benefit from the Experiences of the Energy Sector? in I Havercroft, R B Macrory, R B Stewart (eds.), Carbon Capture and Storage: Emerging Legal and Regulatory Issues (Bloomsbury, 2011); UKERC, The Economic and Financial Viability of Landfill in the UK – A regulatory analogue to carbon storage, November 2011, UKERC/RS/CCS/2012/002

[460] For the UK implementation see: Ch Armeni, Case Studies on the Implementation of the Directive 2009/31/EC on the geological storage of carbon dioxide'; Carbon Capture Legal Programme Report, UCL; November 2011; For a discussion on the Dutch implementation see: A Haan-Kamminga M M Roggenkamp, E Woerdman, Legal Uncertainties of Carbon Capture and Storage in the EU: The Netherlands as an Example, 2010 3 CCLR 240; The University College London Carbon Capture Legal Programme has elaborated a number of discussions on the relevant national legislation of the Member States. Currently these discussions are available through the website: www.decarboni.se.

4.1 Overview of the CCS Directive

The CCS Directive has two key elements. First, it prescribes a permit regime.[461] This regime contains rights and obligations for the permit holder. The obligations apply during the period of operation of the CCS facility and even after its closure. Second, the Directive also provides that these obligations are transferred to the State after the passage of a certain amount of time and upon the satisfaction of certain conditions.[462] Both of these elements concern the storage of CO_2. The capture and transport phases of CCS are considered only tangentially by the Directive.[463]

The CCS Directive has to be read together with five other European instruments. First, the capture, transport and storage sites are subject to the codified Environmental Impact Assessment (EIA) Directive.[464] Second, environmental damage that may arise from the storage of carbon dioxide comes under the strict liability regime of the Environmental Liability Directive.[465] Third, storage sites come under the European Emissions Trading Scheme (ETS) Directive.[466] Fourth, Directive 2001/80/EC prescribes for new combustion plants to set aside space for carbon dioxide capturing equipment.[467] Finally, a provision is created in the Large Combustion Plant Emissions Directive[468] to make all future combustion plants CCS ready if the necessary conditions are met. The CCS Directive also mentions the Directive on waste and the Regulation on shipments of waste in order to exclude CCS from the scope of these instruments. CCS is also excluded from the Water Framework Directive but only as an activity; the environmental effects that may arise from CCS are covered by this Directive as the Environmental Liability Directive relies on it as the benchmark for environmental damage to waters.[469] The diagram below illustrates the preceding.

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[461] Arts.5-11, CCS Dir.
[462] Art.18; CCS Dir.
[463] See for example: Art.21, CCS Dir.
[464] Directive 85/337/EEC as amended by Directive 97/11/EC, Directive 2003/35/EC, and Directive 2009/31/EC; and codified in Directive 2011/92/EC; OJ L 26, 28.1.2012, p. 1–21; See in particular: Recitals (17), (27), (45) and Art.7, para.9.; CCS Dir.
[465] This directive is discussed in more detail below.
[466] 2003/87/EC; OJ L 275, 25.10.2003, p. 32; See in particular: Art.12, para.3a of the ETS Directive and Recitals (20) and (30) of the CCS Directive.
[467] Art.33 of the CCS Dir. amending Directive 2001/80/EC (OJ L 309, 27.11.2001, p. 1–21), which will be replaced by Art.36, Directive 2010/75/EU (OJ L 334, 17.12.2010, p. 17–119) from 1 January 2016.
[468] Directive 2001/80/EC, OJ L 309, 27.11.2001
[469] The detail of the relationship between the Water Framework Directive and the Environmental Liability Directive is discussed in section 5.3.2 below.

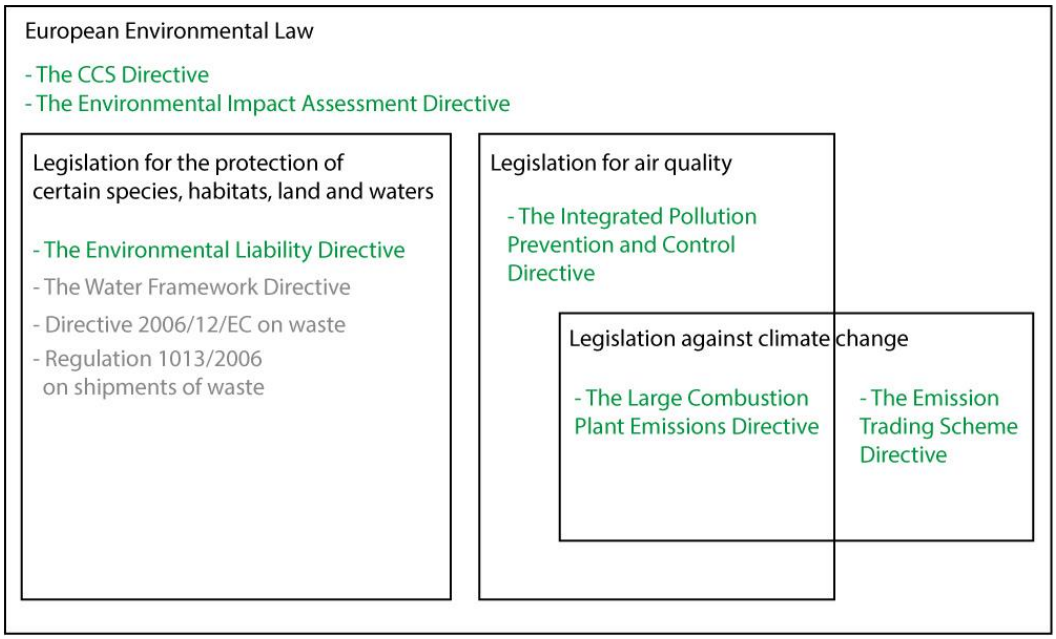

Diagram 4.1 The interaction of the CCS Directive with other European environmental legislation

The provisions of the CCS Directive address CCS operations in four stages which can be termed as preparation[470], operation[471], closure[472], and post-closure[473]. The last stage can be further divided into pre-transfer and post-transfer of responsibility[474]. The following diagram illustrates these stages and outlines their main features.

[470] Arts.4-10, 19; CCS Dir.
[471] Arts.11-16; CCS Dir.
[472] Art.17; CCS Dir.
[473] Arts.17, 18; CCS Dir.
[474] The CCS Dir. defines 'post-closure' in Art.3, para.21 as "the period after the closure of a storage site, including the period after the transfer of responsibility to the competent authority."

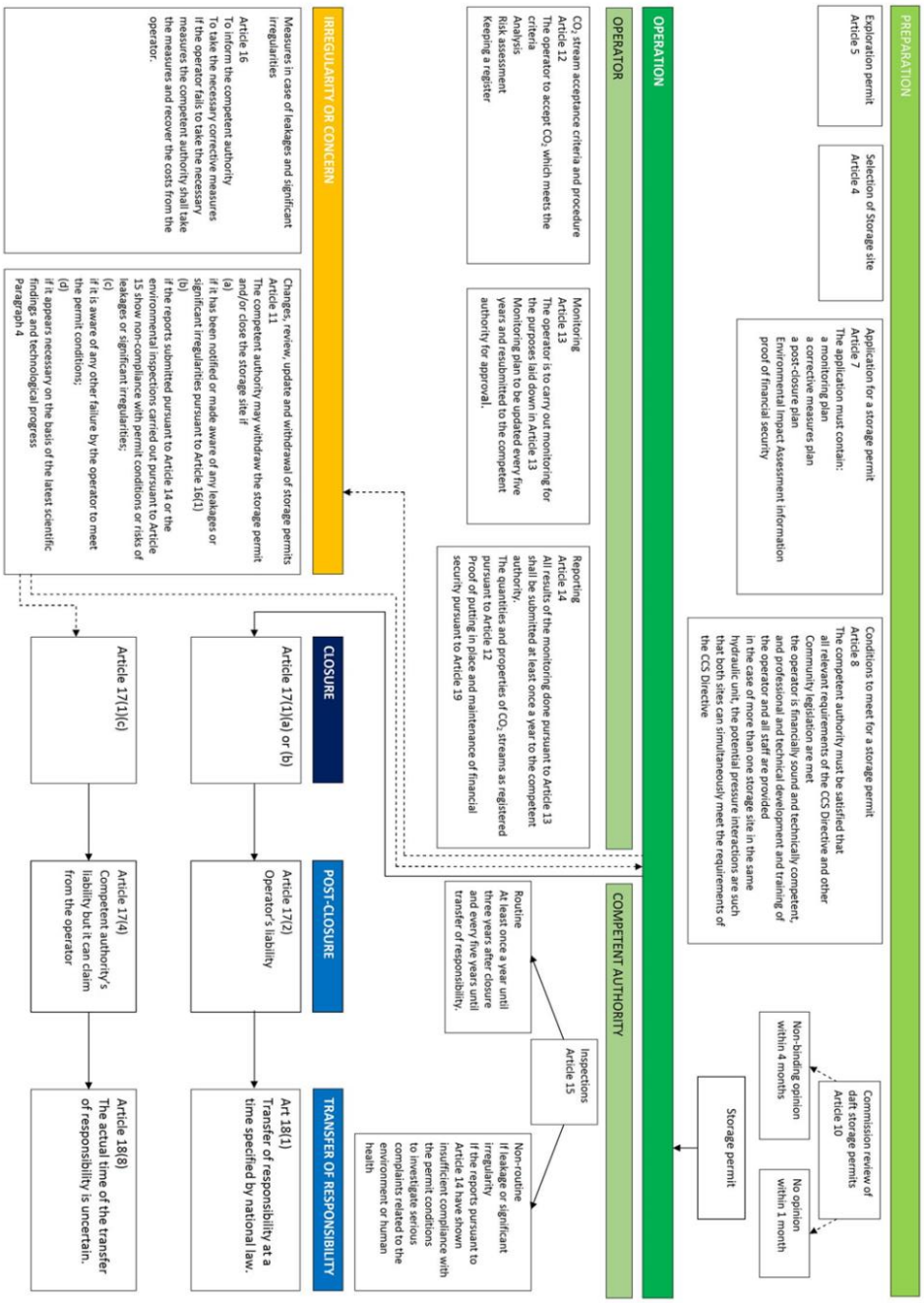

Diagram 4.2 An outline of the operation of the CCS Directive

The preparation phase is unlikely to cause environmental damage although mistakes by either the CCS operator or the licensing authority at this stage can be the reason for environmental damage later on.

During the operation phase if a concern or irregularity arises, the operation may resume or the storage site may need to be closed.[475] During this phase the operator has a set of

[475] Art.11, paras.3, 4; CCS Dir.

obligations: the analysis, risk assessment, and recording of the accepted CO_2 streams[476]; the monitoring of the injection facilities, the storage complex (including where possible the CO_2 plume), and where appropriate, the surrounding environment[477]; and reporting to the licensing authority[478]. The report has to contain the results of the monitoring[479], the details of the injected CO_2[480], proof of the putting in place and maintenance of the financial security required by the CCS Directive[481], and any other relevant information[482]. The competent authority is to carry out routine inspections during the operation phase at least once a year, and non-routine inspections if necessary.[483]

Once the storage complex is closed, the CCS project enters the after-closure period. During this time, initially the operator is still responsible for monitoring, reporting, corrective measures, and liabilities arising under the ETS Directive and the ELD.[484]

Finally, the responsibility for the storage site is transferred to the competent authority provided a number of conditions are satisfied.[485]

Regarding the requirements for the transfer of responsibility NIVA[486] has identified a number of points of concern in its report prepared to support the review of the CCS Directive.[487] The most important criticism is related to the 20 year pre-transfer period. It is considered to be too long and arbitrary in nature. It is argued by the responding parties that it should be replaced by performance based indicators, taking into account the geological conditions, the technologies used and the predictions of the models. The responders also consider that the transfer mechanism is not described with sufficient precision; the conditions under which the competent authority will take over the responsibility for the storage site are not certain. It has also been noted that the risk of policy change and liability for seepage may deter investment. The report seems to imply that the uncertainties linked to the transfer of responsibility may have been at least partly addressed by the CO2CARE project.

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[476] Art.12, para.3(a), (b); CCS Dir.
[477] Art.13; CCS Dir.
[478] Art.14; CCS Dir.
[479] Art.14, para.1; CCS Dir.
[480] Art.14, para.2; CCS Dir.
[481] Art.14, para.3; CCS Dir.
[482] Art.14, para.4; CCS Dir.
[483] Art.15; CCS Dir.
[484] Art.17, para.2; CCS Dir.
[485] Art.18; CCS Dir.
[486] The Norwegian Institute for Water Research
[487] NIVA, Support to the review of Directive 2009/ 31/EC on the geological storage of carbon dioxide (CCS Directive), December 2014, Publications Office of the European Union

4.2 Liabilities under the CCS Directive

The CCS Directive distinguishes three types of liability:

- liability for corrective measures in case of significant irregularities or leakage,
- liability for environmental damage (dealt with under the ELD),
- liability for climate damage arising from leakage (dealt with through the surrender of emission allowances under Directive 2003/87/EC as amended by Directive 2009/29/EC).

'Corrective measures' under the CCS Directive are "any measures taken to correct significant irregularities or to close leakages in order to prevent or stop the release of CO_2 from the storage complex".[488] The CCS Directive defines leakage as "any release of CO_2 from the storage complex".[489] 'Storage complex' in turn is defined as "the storage site and surrounding geological domain which can have an effect on overall storage integrity and security; that is, secondary containment formations".[490] Further elaboration on these terms is given by Commission Guidance Document 2 on the implementation of the CCS Directive.[491, 492] For the present purposes it is sufficient to note that the precise shape and size of the storage formation cannot be known until the injection starts and the results of the monitoring are compared to the earlier models predicting the behaviour of the injected CO_2.

Bradshaw considers that the taking of corrective measures if needed is a compliance issue because it is part of the storage permit while preventive and remediation action under the ELD are a liability issue.[493] The practical implication of this is that "the authority is compelled under Article 16(4) of the CCS Directive to carry out corrective measures if the operator fails to do so, but through reliance on the ELD for preventing environmental

[488] Art.3, para.19; CCS Dir.
[489] Art.3, para.5; CCS Dir.
[490] Art.3, para.6; CCS Dir.
[491] European Commission; Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide, Guidance Document 2, Characterisation of the Storage Complex, CO2 Stream Composition, Monitoring, and Corrective Measures; 2011
[492] The Guidance Document provides that the term 'storage complex' certainly includes the immediate surface and sub-surface facilities at the storage site; the targeted seal(s) and reservoir(s) where the CO_2 is physically injected into and is expected to migrate and be stored, i.e. the geological formations which comprise the physically invaded rock volume from the CO_2 plume migration; and secondary seal(s) and reservoirs(s) that may contain the CO_2 in case the CO_2 plume migrates beyond the primary seal. However, the definition of storage complex remains uncertain with respect to changes in time and effects distant from the injected CO_2's location. (See pp.25-7 of the Guidance.)
[493] Bradshaw, p.201-2

damage, the corresponding preventative duty on the authority does not apply."[494] Bradshaw seems to base her opinion on the permissive language of Article 5.4 of the ELD, that is, 'the competent authority *may* take the measures itself'. More generally, the ELD Training Handbook applies this interpretation.[495, 496] However, there are two points to note which may lessen the practical implications of this observation.

First, it must be noted that this observation is relevant where there is a significant irregularity or leakage, the operator does not act on it, and the storage permit has not been withdrawn. It is not applicable after the transfer of responsibility, or whenever the storage permit has been withdrawn and no new permit has been issued. This is because under the CCS Directive the competent authority 'takes over' all legal obligations relating to preventive and remedial action from the operator in case of a withdrawn permit[497], and 'remains responsible' for preventive and remedial actions upon transfer of responsibility[498]. In other words, in these cases the competent authority does not act under the ELD *instead of* the operator but *as an operator*. That is, in these cases the obligation of the competent authority for preventive and remedial action arises from Articles 5 and 6 of the ELD in general as directed from the CCS Directive and not from paras.4 and 3 of Articles 5 and 6 respectively.

This interpretation is further supported by the English implementation of the CCS Directive. Regulation 12(4)(e) of the Licensing Regulations[499] provides that after the revocation of the storage permit "[u]ntil the storage site is closed, or the new storage permit is granted, the authority is deemed to be the operator of the site for the purposes of the following obligations… *under legislation implementing Articles 5(1) and 6(1) of the Environmental Liability Directive.*"

It is assumed here that in case there is a significant irregularity or leakage and the operator fails to act, the competent authority withdraws the storage permit and becomes liable for both corrective and preventive measures. The operator does not escape liability this way

[494] Ibid., p.202
[495] Eftec, Stratus Consulting; Environmental Liability Directive: Training Handbook and Accompanying Slides, For the European Commission DG Environment; Contract Reference No. 070307/2012/621542/SER/A1, February 2013; pp.14, 31-2
[496] However, it must be noted that if the competent authority does not take action, it cannot recover the costs from the operator. This turns partly against the polluter-pays principle because the operator is not subjected to the financial consequences which would normally follow from the pollution it has caused.
[497] Art.11, para.4; CCS Dir.
[498] Art.18, para.2; CCS Dir.
[499] See fn.573.

because Article 16(5) of the CCS Directive instructs the competent authority to recover from the operator or by drawing on the financial security.

The second point to note is that corrective measures and preventive action under the ELD are foreseen to potentially overlap.[500] Thus, even if the above was incorrect, it can be expected that once corrective measures are being taken by the competent authority (the threshold is *any*[501] environmental damage), those measures would at least partly also be to the effect of possible preventive action under the ELD.

If the corrective measures are to no avail or if there are no possible corrective measures and environmental damage occurs, remedial action has to be taken under the ELD as it will be discussed in more detail in the chapter on the ELD.

Liability for climate change is addressed through the inclusion of storage sites into the emissions trading system. Directive 2003/87/EC[502] establishes a scheme for greenhouse gas emission allowance trading within the EU. In this system, the entities which fall under the Directive can emit only as much greenhouse gas as much allowance they have. Since the amendment by Directive 2009/29/EC[503], no allowances have to be surrendered under the ETS Directive for carbon dioxide captured and stored.[504] On the other hand, if the stored carbon dioxide leaks, the CCS Directive and the amended ETS Directive require the surrender of allowances.[505]

Recital (30) of the CCS Directive states that "...[l]iability for climate damage as a result of leakages is covered by the inclusion of storage sites in Directive 2003/87/EC, which requires surrender of emissions trading allowances for any leaked emissions. ..." The term

[500] Bergsten at p.110; See also the relevant section in Chapter 5:
[501] Art.3, para.19 defines 'corrective measures' as "any measures taken to correct significant irregularities or to close leakages in order to prevent or stop the release of CO_2 from the storage complex". In turn, para.17 of the same article defines 'significant irregularities' as "any irregularity in the injection or storage operations or in the condition of the storage complex itself, which implies the risk of a leakage or risk to the environment or human health". The CCS Directive refers to the 'risk to the environment' without any qualification. Consequently, the potential scope of corrective measures under the CCS Directive is at least as broad as the scope of preventive action under the Environmental Liability Directive, which is limited by the way the forms of environmental damage are defined under it.
[502] OJ L 275, 25.10.2003, p. 32; latest consolidated version: 01.07.2013
[503] Art.1, para.15(b), Directive 2009/29/EC; OJ L 140, 05/06/2009, p. 63–87
[504] Art.12, para.3a; ETS Directive
[505] At the time of writing the ETS is in its third trading period (2013-2020). For an overview with emphasis on the current phase see: World Bank Group, State and Trends of Carbon Pricing, Washington DC, May 2014; pp.54-56, 106-113. The news coverage of the system indicates that the price of emission allowances is too low to create an efficient mitigation incentive and the elaboration of the system is heavily influenced by political considerations. The EUA price at the time of writing is €6.81/t (Intercontinental Exchange).

'storage site' is broader here than in its definition[506] and includes the injecting facilities because the corresponding provision in Directive 2003/87/EC refers to "[g]eological *storage* of greenhouse gases in a storage site permitted under Directive 2009/31/EC".[507] Since its amendment, the ETS Directive also applies to the capture and the transport of carbon dioxide.[508]

Of course, surrender for leaking sites only deals with the lost benefit of storing carbon dioxide. The additional emissions caused by the installation and operation of the CCS process come under the normal mechanism of the ETS.[509]

The CCS operator is expected to have operational CO_2 emissions.[510] A substantial leakage from a storage complex is a contingency as opposed to certain emissions. The financial significance of the surrender will depend on the pricing of the emission allowances and the timing the surrender should take place.

This liability is strict because the operator is held to account regardless of his conduct. This falls in line with the operator's potential liability to take corrective measures under the CCS Directive in any case if necessary and to prevent and remediate environmental damage under the Environmental Liability Directive's strict liability regime.[511] It is possible to align this policy with public international law where there is an observable but not generally established practice that certain hazardous activities (or ultra-hazardous activities) attract strict liability.[512] Two particular sectors where the imposition of strict liability *vis-á-vis* the owner or the operator of the activity is well established through treaty law are the maritime industry[513] and nuclear power generation.[514] However, there is a

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[506] Art.3, para.3; CCS Dir.
[507] Article 2 and Annex I, ETS Directive; See also fn.509 and related text.
[508] Article 2 and Annex I; ETS Directive
[509] See: Decision 2007/589/EC (OJ L 229, 31.8.2007, p. 1–85), Annex XVIII; This Decision has been repealed by Commission Regulation No 601/2012 (OJ L 181, 12.7.2012, p. 30–104). However, Recital (19) and Article 76 of the Regulation provide that the Decision is to continue to apply with respect to monitoring, reporting, (the annexes of the Decision) verification, and certain activity data. Also see: Annex IV, para.23.A of the Regulation
[510] Ibid.
[511] See Chapter 4.
[512] See for example: G Handl, State Liability for Accidental Transnational Environmental Damage by Private Persons, 74 Am. J. Int'l L. 525 1980; J Brunnée, Of Sense and Sensibility: Reflections on International Liability Regimes as Tools for Environmental Protection, 2004 53 ICLQ, p.531; E Reid, Liability for Dangerous Activities: a Comparative Analysis, 1999 48(4) ICLQ, p.731; A E Boyle, Globalising Environmental Liability: the Interplay of National and International Law, Journal of Environmental Law (2005) Vol 17 No 1, 3–26
[513] See: A Mandaraka-Shepard, Modern Maritime Law: Managing Risks and Liabilities, (Vol.2, 3rd ed., 2013), Chapter 16
[514] For a brief discussion of this point see: M Lee, Civil Liability of the Nuclear Industry, J Environmental Law (2000) 12 (3): 317-332, p.320.

crucial difference between these cases and CCS. Both the maritime industry and the operators of nuclear power plants can limit their liability. From a historic perspective, "[t]he limitation system [for the maritime industry] … appears to have been developed as a means to encourage the investment of risk capital in maritime adventures by limiting the personal liability of the investor."[515] Anderson commented in relation to the International Convention on Civil Liability for Oil Pollution regime[516]:

> "[The] position of strict liability was in fact accepted by the shipping industry. This was considered the most expedient way of dealing with pollution incidents, for if an incident happens then time is of the essence, that is not the time to start arguing or discussing who is to blame and consequently considering what steps should be taken to contain and minimise the pollution, and more specifically who is going to pay at the end of the day. In return for accepting this strict liability position the shipowners received a right to limit their financial liability at a level which would usually be more favourable than the normal [1976 Convention on Liability for Maritime Claims[517]] tonnage limitation figures."[518]

In the context of nuclear liability Pelzer pointed to the *Exposé des Motifs* to the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy[519] which states that[520]

> "[i]n the absence of a limitation of liability, the risks could in the worst possible circumstances involve financial liabilities greater than any hitherto encountered and it would be very difficult for operators to find the necessary financial security to meet the risks."[521]

Pelzer commented further:

> "Some people also take the view that limiting liability in amount is a necessary counterbalance to the severe strict liability of the operator. It is true that both elements are sometimes linked in legislations. But such linkage is surely no dogmatic

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[515] J J Donovan, Origins and Development of Limitation of Shipowners' Liability Admiralty Law Institute Symposium on Limitation of Liability, p.1002
[516] International Convention on Civil Liability for Oil Pollution 1969, 973 UNTS 3 as amended by the 1992 Protocol, 1956 UNTS 255
[517] 1456 UNTS 221
[518] P Anderson, ISM Code: A practical Guide to the Legal and Insurance Implications, (2nd ed., 2005), Chapter 3, Section 'A strict liability regime—the CLC'
[519] Paris Convention on Third Party Nuclear Liability in the Field of Nuclear Energy 1960, 956 UNTS 263
[520] N Pelzer, Focus on the Future of Nuclear Liability Law, 17 J. Energy & Nat. Resources L. (1999), p. 338
[521] Para.43 of the Exposé des Motifs

> or systematic corollary of strict liability. … Consequently, from a legal point of view, strict liability does not require the limitation of that liability."[522]

Once it is certain that it is the operator who has to cover the consequences of an accident and the extent of their maximal liability is known, it is easier to provide insurance or other forms of financial guarantee for it. In the case of CCS, it is known that it is the operator who is to bear the burden of liability, it is also known that they must provide a financial security and a financial contribution. However, in the absence of a limitation regime, it is not possible to tell with sufficient certainty how big the operator's financial exposure may be.

Being a directive, the Member States exercise liberty in the implementation of the CCS Directive as long as its original goal is achieved. Member States wishing to promote CCS may elaborate laws on the national level regarding limitation of liability arising from CCS activities paying attention to not to set the limits too low and thereby hinder the aims of the Directive.

Bradshaw notes that the "relatively low carbon price may fail to address any financial gain which could be garnered from a failure to remedy leakages."[523] However, as long as the price of carbon credits is low the technology is not financially viable in the first place. Furthermore, the competent authority can intervene by taking corrective measures and recover the costs. Most importantly, as Bradshaw notes herself, the transfer of responsibility cannot take place under Article 18 as long as there is leakage.

4.3 Further considerations

Article 21 of the CCS Directive provides for third party access to transport networks and storage sites. This must be read together with Article 6 which provides that "there shall be only one operator for each storage site."[524] An entity may need to access a CO_2 transport network and/or an injection facility. Such arrangement does not complicate the issue of public liability further because it remains with the permit holding operator.

[522] See fn.520
[523] Bradshaw at p.202
[524] Art.6, para.1; CCS Dir.

In the meaning of Article 18, para.1 of the CCS Directive the responsibility transferred concerns monitoring and corrective measures, emissions liability, and preventive and remedial action under the Environmental Liability Directive. This approach covers public liability as far as far as European public law is concerned. Equally importantly, the CCS Directive expressly provides for emissions liability. However, Member States may have other public liability provisions which do not originate from European law. Equally well, the CCS Directive is not concerned with civil liability, or tort law more generally. It is in the Member States' discretion whether any civil or tort liability is transferred to the State.

The use of a fund to cover environmental liability could be an alternative or it could supplement the current system. The International Oil Pollution Compensation Fund 1992 (IOPCF)[525] and the Oil Spill Liability Trust Fund under the United States Oil Pollution Act 1990[526] are examples of two such working regimes.[527] During the first reading of the proposal for the CCS Directive the European Parliament suggested that, in addition to the financial security, the financial mechanism was to be established through a contribution to a fund.[528] This fund would have first of all covered monitoring, oversight and remediation after the transfer of responsibility. However, the justification also states that it would have provided "a supplementary revenue source for Member States in instances of financial insolvency on the part of operators". The word 'supplementary' has to be emphasised because along this option the original financial security provision would also have been in force. The precise amount of contribution to the fund would have been calculated in a highly technical manner. However, this amendment has not been taken into the final version of the Directive. Instead, the currently known financial security (Art.19) and financial contribution (Art.20) provisions have been adopted. Thus, the CCS Directive does not prescribe the establishment of a fund, nor does the ELD. Indeed, industries in the

[525] The current regime consists of three instruments: 1) Protocol of 1992 to amend the International Convention on Civil Liability for Oil Pollution Damage, 1969 referred to as the 'the 1992 Civil Liability Convention', 1956 UNTS 255; 2) Protocol of 1992 to amend the International Convention on the establishment of an international fund for compensation for oil pollution damage referred to as 'the 1992 Fund Convention', 1953 UNTS 330; 3) Protocol of 2003 to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992 referred to as 'the 2003 Supplementary Fund Protocol', IMO Document LEG/CONF.14/20, 27 May 2003.

[526] Public Law 101-380, 33 U.S.C. Chapter 40, § 2701 -

[527] On the functioning of the IOPCF see: Gauci, G. M. (1999), Protection of the Marine Environment through the International Ship-Source Oil Pollution Compensation Regimes. Review of European Community & International Environmental Law, 8: 29–36. doi: 10.1111/1467-9388.00175; Ibrahima, D. (2005), Recovering Damage to the Environment per se Following an Oil Spill: The Shadows and Lights of the Civil Liability and Fund Conventions of 1992. Review of European Community & International Environmental Law, 14: 63–72. doi: 10.1111/j.1467-9388.2005.00424.x

[528] European Parliament, Session Document, A6-0414/2008, 16.10.2008, p.61

EU show little interest in the establishment of funds for environmental liability.[529] This way, the current system relies on the contribution of individual operators and the general revenues of the undertaking state. At the early stages of development this approach provides an incentive to operators because it avoids subsidising other operators. On the other hand, a fund which is designed for CCS activities and includes ELD liability could be a more efficient option than the current system. It could make entry easier for operators joining at a later stage because the individual contribution would be smaller, and the state would have to cover only liability that goes beyond the fund's capacity.

4.4 Certain technical aspects of CCS in light of the ECO2 project

As it has been discussed above, the long-term liability of the CCS operator is transferred to the state if the operator can demonstrate that the storage complex complies with the prescribed criteria. The two central technical expressions in relation to these conditions are 'leakage' and 'complete and permanent containment' which shall be considered below in order.

4.4.1 What is a leakage under the CCS Directive?

The concept of leakage is much broader than the escape of carbon dioxide into the water-column. The CCS Directive defines leakage in terms of release of CO_2 from the 'storage complex'. The 'storage complex' in turn comprises the 'storage site' and the 'secondary containment formations'. Once carbon dioxide leaves the secondary containment formations, the definition of leakage is met.[530]

Consequently, by the time the carbon dioxide reaches even the seafloor sediments, the fact of leakage is established.

The first obvious implication is that sub-soil monitoring will be more important than the monitoring of CO_2 concentration in the water column.[531] Secondly, if a leakage of this type occurs and the corrective action under the CCS Directive succeeds, the likelihood of a

[529] These considerations are discussed in more detail in the chapter on the ELD.
[530] See also Bradshaw at p.200
[531] Water monitoring and the general CO_2 baseline of the superjacent water-column gains importance in relation to the monitoring of the effectiveness of the remediation action (under the ELD) in case the CO_2 reaches the water-column.

large amount of CO_2 reaching the sediments or the water-column, and the consequential environmental damage, is significantly reduced.

It follows that it has to be known what exactly a secondary containment formation is. It emerges from the CCS Directive that it is the surrounding geological domain of the storage site which can have effect on overall storage integrity and security.[532] Guidance Document 2 states further that "it is expected that [the] operator will provide the CA with the specific vertical and areal extent of the geological formation(s) into which injection will take place, as well as defined boundaries of the storage complex".[533] It is also recognised that the precise size of the complex may vary in light of the actual behaviour of the injected CO_2.[534] Guidance Document 3 states: "the definition of leakage is contingent on the geological strata that are considered to be part of the storage complex".[535] This document also recognises in relation to models in general that they operate with certain error bars,[536] and states in relation to 'evolution towards long term stability' that "[f]or model scenarios that show leakage, the value of the parameters (or combination of parameters) that may cause a leak should be far (e.g. two standard deviations) from expected values."[537]

4.4.2 The complete and permanent containment of the injected carbon dioxide

The CCS Directive requires 'all available evidence [to] indicate that the stored CO_2 will be completely permanently contained'.[538] This means that even the slightest indication[539] of leakage will be an impediment to the transfer of responsibility. It has been questioned already during the legislative procedure of the CCS Directive whether commercially this can support the development of CCS.[540] Bradshaw noted that 'complete containment' may be impossible to show and that the expression 'all available evidence indicates' is more lenient than for example 'proof of'.[541, 542] Macrory understood the test to be a 'particularly

[532] Art.3, para.6
[533] European Commission; Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide, Guidance Document 2, Characterisation of the Storage Complex, CO_2 Stream Composition, Monitoring and Corrective Measures, 2011; p.25
[534] Ibid., pp.26-7
[535] Fn.543 at p.8
[536] Ibid., pp.4-6
[537] Ibid., pp.10
[538] Art.18, para.1(a); CCS Dir.
[539] In relation to this term see the section 'Should there be a minimum threshold for leakage?' below.
[540] See further: Opinion of the European Economic and Social Committee on the 'Proposal for a Directive of the European Parliament and of the Council on the geological storage of carbon dioxide and amending Council Directives 85/337/EEC, 96/61/EC, Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC and Regulation (EC) No 1013/2006', OJ C 27, 3.2.2009, p. 75–80, paras.: 5.7.3, 5.7.4, 5.14, 5.14.1, 5.14.2
[541] C Bradshaw; 'The new Directive on the geological storage of carbon dioxide'; 2009 Env. L. Rev. 196; pp.202-3 referring to Client Earth, 'Laying the Regulatory Foundations for Carbon Capture and Storage in

tough' one and noted that the wording of the condition "may require some common sense rather than literal interpretation if it is ever to be exercised".

Nonetheless, the Commission's Guidance Document 3 as published in 2011 maintained the language of the CCS Directive without adding any margin of appreciation.[543] It confirms that operators can demonstrate permanent containment by meeting at least the three conditions listed in Article 18(2) (conformity with the models, no detectable leakage, and storage site evolution towards stability).[544] Having said that, Guidance Document 3 also states:

> "A key aspect of containment is that there are no detectable leaks from the *storage complex*, including leakage through geological or man-made structure (see GD1). There should be no observed[545] leakages from any *existing or abandoned wells*. This may be assessed by the operator demonstrating that the there are no leakages for a continuous 10 year period immediately before the time of transfer. If a successful corrective measure has taken place (as result of leakage), the 'clock' for the ten year time period would start over from the point in time when the corrective measure has been proven successful. This would allow the CA to have sufficient confidence that the *site* would not leak again."[546]

Two interpretations of this guidance are possible. Emphasis may be placed on the expression 'existing or abandoned wells'. In this case, it would be applicable only to wells and the term 'site' in the final sentence would have to be read as 'the site through a well'. Alternatively, since the first sentence refers to the storage complex, the second to wells, and the last to the storage site, all in the same context; it can be submitted that the guidance

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the EU: A Legal Review of the Draft European Directive on Geological Storage of Carbon Dioxide'; (October 2008) at p.17

[542] It is apposite to mention here the French version of the CCS Directive and its implementation. The Directive requires "tous les éléments disponibles tendent à prouver que le CO_2 stocké restera confiné parfaitement et en permanence". 'Tendre à prouver' corresponds to 'indicate', 'parfaitment' to 'completely' (as opposed to 'perfectly') and 'en permanence' to 'permanently'. The implementation varies from this. The operator is required to prepare a report with "tous les éléments disponibles tendant à prouver que le dioxyde de carbone stocké restera parfaitement confiné de façon permanente et sûre" (L229-47, al.I.(c); Code de l'Environnement). Thus, here there are three elements. The containment must be complete, permanent and 'sûre' which probably translates in this case as 'safe' as opposed to 'certain'. The implementation retains the expression 'tendre à prouver', i.e. 'tends to prove', which seems to be a more lenient phrasing than 'indicates'.

[543] European Commission; Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide, Guidance Document 3, Criteria for Transfer of Responsibility to the Competent Authority, 2011; pp.4-11

[544] Ibid., especially at p.4

[545] In relation to this term see section 3.3.4 below.

[546] Fn.543, p.8; Italics by the present author.

is general and the exact choice of words is not important here. In the latter case, this guidance is potentially of great significance as it would mean that even in the default 20 year minimum period only during the second ten years there must be no leakage from the storage complex.

The report compiled by NIVA[547] on the topic of permanent containment reveal the following findings. There is a lack of consensus on the definition of permanent containment. The general opinion seems to be that 100% containment cannot be guaranteed.[548] However, Member States should pay attention to minimise the risk of leakage through the site selection procedure, operation, and monitoring.[549] It has also been raised whether the term permanent should be replaced by a number of years. The majority of respondents would avoid this solution.[550] Further, it has been asked whether the CCS Directive should make a distinction between the risk of minor leakage and major leakage. The answers to this question were varied. Those being against relied on the comprehensiveness of the risk management systems, or on the belief that we should strive for zero leakage.[551] It has also been suggested that this decision should be decided at the Member State level as well as the view that the CCS Directive should better reflect current knowledge and risks (environmental and seismic risks in particular) associated with CCS.[552] The interviews conducted by NIVA indicate first of all that the industry wants a flexible definition to reflect reality and variance between sites.[553] This is also recognised by NGOs.[554] NGOs and public actors also consider that the term 'permanent' should be retained for public confidence and credibility.[555] The stakeholder meeting confirmed the theoretical concerns.[556] However, it was considered that these issues do not halt projects as they can be resolved through practical discussions during implementation.[557] Finally, the report discussed in this part that both the Ketzin storage site and the Lacq project show no leakage.[558]

[547] See fn.487.
[548] Ibid., p.31
[549] Ibid.
[550] Ibid.
[551] Ibid.
[552] Ibid.
[553] Ibid., p.31-2
[554] Ibid., p.32
[555] Ibid.
[556] Ibid.
[557] Ibid.
[558] Ibid.

4.4.3 The practical perspective of the CCS Directive's requirements

How do these requirements fare in light of the findings of the ECO2 project? It is important to state that the two storage sites taken as templates – Sleipner and Snøhvit – did not leak to date (operating from 1996 and 2008 respectively). However, it is possible to run simulations on the geological models of these areas which demonstrate leakage scenarios. Consequently, in scientific terms the possibility of leakage cannot be excluded. It must be added immediately that the likelihood of such leakages is very small.

Is this finding fatal to future CCS projects? Can this finding be relied on to say that not all available evidence indicates complete and permanent containment for these sites (and presumably other sites)?

If the word 'evidence' is understood to mean 'ascertain', that is, 'gives a certain answer', then this result does not evidence either that the injected CO_2 will leak or that it will remain permanently contained. It does the opposite. It gives a probability that the likelihood of leakage is very small. It is a consequence of this that it is not possible to evidence or give certainty that the injected CO_2 will be completely and permanently contained.

Does this mean that the requirement in Article 18, para.1(a) can never be satisfied *because no such evidence can be given*? If the requirement is taken strictly, then this is the case.

However, it is arguable that this requirement was not meant to be interpreted with absolute strictness. The more lenient (or the correct) interpretation is supported by the Directive itself. Article 4, para.4 (selection of storage sites) provides:

> "A geological formation shall only be selected as a storage site, if under the proposed conditions of use there is *no significant risk of leakage*, and if no significant environmental or health risks exist."

It is clear from this paragraph that some risk of leakage is contemplated at the site selection stage. If so, it is reasonable to expect the same risk on site closure and later on. In effect, the requirement in Article 18(2) would become *all available evidence indicating no significant risk that the stored CO_2 will not be completely and permanently contained.* The findings of the ECO2 project would be a favourable answer to such requirement. In addition, it may be noted that if certainty was required and possible to show in relation to complete and permanent containment, the provisions on financial contribution and monitoring would be unnecessary.

The operator must also show the absence of any detectable leakage in the meaning of para.2(b) of Article 18 at the time of the transfer of responsibility. If the above interpretation is accepted, this provision has to be read to mean that the risk of small leakage must not materialise itself at the time of the transfer of responsibility. In other words, the operator cannot hand over a leaking site; it must correct the leakage first.

The suggested interpretation can be countered by the consideration that the risk of leakage is expected to decrease over time as trapping mechanisms additional to the stratigraphic and structural trapping activate, so it is conceivable that a higher standard is required at a later point in time. However, this approach is not without difficulties. Regarding additional trapping mechanisms; the two-phase, two-component modelling carried out for the Sleipner field in the ECO2 project accounted for the dissolution of the CO_2 in the surrounding brine. This shows that even by including additional trapping mechanisms it is still possible to simulate scenarios other than complete and permanent containment. Second, assuming a decreasing risk and imposing a higher standard before the transfer, Article 18, para.2(b) would be merely a reassurance for the competent authority in addition to para.1(a).

4.4.4 Should there be a minimum threshold for leakage?

It appears from the above that the law must recognise that some minimal risk of leakage is attached to this technology. The law does recognise this risk by providing for corrective measures and, more broadly, liability.[559] The exact size of the risk depends on the technical conditions the competent authority accepts when the operator applies for a storage permit.

If some risk is accepted, the question may also arise whether some leakage could be allowed – an amount of leakage which does not have an impact on the environment and therefore does not attract liability.

It may be noted that Article 18, para.(2)(b) refers to *detectable* leakage. It is obvious that what cannot be detected that cannot be confirmed as leaked CO_2, a *de minimis* threshold in effect. Detectability varies as a function of depth.[560] Currently, at shallow depth (less than

[559] As it is discussed above (section 3.3.2), the storage complex must not leak for at least ten years before the transfer of responsibility and at the time of the transfer (Guidance Documents 3, and Article 18, para.(2)(b)); and after the transfer it is the competent authority who is responsible for correcting leakages (Article 18, para.1).

[560] ECO2, WP1 result summary report relevant for "Environmental Best Practice", Deliverable 1.2, 05.11.2014, p.20

500 m) amounts as small as 300 tonnes of gaseous CO_2 may already be detectable.[561] However, two points have to be made. First, detecting technology may improve. Secondly, and more importantly, this threshold is not a real allowance but a temporary one because once there is even a minimal escape of CO_2 from a secondary containment formation, in time it accumulates by definition and reaches a detectable threshold whether at that point it burdens the operator or the competent authority. As monitoring technology develops, ever smaller quantities become detectable and intervention becomes possible sooner.

Although the CCS Directive in its current form does not provide for this possibility, the Member States may agree in the future that a certain *de minimis* leakage speed can be accepted. A further question in this case would be whether such leakage has to be accounted for under the Emissions Trading System.[562]

This and the two sections above have found that 1) a storage complex cannot be outlined with absolute precision before the injection begins, 2) a not leaking storage complex cannot be guaranteed with absolute certainty but it is possible to show that the risk is very small, 3) it is possible to interpret the CCS Directive to accommodate this position, and that 4), if there is any amount of leakage, the CCS Directive is strict and corrective measures must be taken.

4.5 Financial security and financial contribution

Article 19 of the CCS Directive demands the operator to provide financial security in order to cover "all obligations arising under the permit issued pursuant to [the] Directive, including closure and post-closure requirements, as well as any obligations arising from inclusion of the storage site under Directive 2003/87/EC". Under Article 20 of the CCS Directive, the operator is also to provide the competent authority with a financial contribution before the transfer of responsibility.

The NIVA report identified several issues surrounding the practical implementation of the CCS Directive's finance provisions. *Inter alia*: the true amount of exposure is uncertain, there is no cap on potential liability, the long-term price evolution of the ETS market adds further uncertainty, uncertainty as to when the handover of responsibility takes place[563],

[561] Ibid., p.22
[562] See further discussion of the emission trading scheme on p.99.
[563] See the discussion on p.96.

Guidance Document 4[564] is considered to be too rigid and demanding, and ETS liability for seepage may be particularly large.

The present author considers that the amount of exposure can be determined to some extent through negotiation with the competent authority. In other words, the broad wording of the Directive should be seen as leaving space for particular agreements, rather than a lack of precision. Indeed, the report notes that although developers have serious concerns about the financial security provisions, both the Directive and Guidance Document 4 have sufficient flexibility in them to accommodate investment.

The ROAD project[565] is an example of such negotiations. The main concerns of the ROAD project are: what are the activities that must be covered by the financial security, what is the amount of money that should guarantee these activities, and what kind of financial instruments are accepted. In line with the above argument, perhaps the last of these concerns illustrates the best that some issues have been left to be decided at Member State level. The solution arrived at in the ROAD project may provide a sample for future projects. The financial security has to cover: monitoring, contingency monitoring, abandonment, the financial contribution, and EU emission allowances in case of leakage. The breakdown of the budget is hereby included in Annex I. The financial contribution is only to cover monitoring costs. As regards the types of financial instruments, currently the Dutch government accepts balance sheets. However, bank or parental guarantees will be preferred.

CCS activities are subject to the ELD.[566] However, the CCS Directive does not include the obligations arising under the ELD in the contents of the storage permit.[567] The relevant recital[568] does not mention ELD liability either, nor does, in the context of Article 19, the European Commission's Guidance Document on Articles 19 and 20.[569] This guidance document gives potential ELD obligations as an example for what *may* be required by the competent authority to be included in the financial contribution before the transfer of

[564] Discussed below.
[565] "The Rotterdam Capture and Storage Demonstration Project (ROAD) is an initative of E.ON Benelux and GDF SUEZ Energie Nederland. As of 2015, ROAD plans to capture 1.1 million tonnes of CO_2 per year from a new power plant at the Maasvlakte and will store the captured CO_2 in a depleted gas reservoir under the North Sea." Source: http://road2020.nl/en/, last accessed: 13 March 2015.
[566] Art.34, CCS Dir.
[567] Art.9, CCS Dir.
[568] Recital (36); CCS Dir.
[569] European Commission; Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide, Guidance Document 4, Article 19 Financial Security and Article 20 Financial Mechanism, 2011

responsibility from the operator.[570] The Guidance Document provides that the financial security has to be able to cover the financial contribution.[571] It follows that in case the competent authority requires the financial contribution to cover potential ELD costs, the financial security has to be big enough to cover ELD liability too.

Thus, *as far as European law is concerned*, it seems that ELD liability does not have to be catered for by the financial security but Member States are free to include it.[572] For example, in England under para.7(1)(a) with (5)(b) in Schedule 2 of the Storage of Carbon Dioxide (Licensing etc.) Regulations 2010[573] the financial security must cover costs arising "under legislation implementing Articles 5(1) and 6(1) of the Environmental Liability Directive".[574, 575] The financial contribution too has to cover ELD expenses. According to Regulation 10(1) of the Storage of Carbon Dioxide (Termination of Licences) Regulations 2011[576] the financial contribution has to be sufficient to cover the expected post-transfer costs. Regulation 3(3) of the same instrument defines post-transfer costs as "the costs for which the authority will be liable as a result of the transfer of obligations and liabilities to the authority pursuant to regulations 14 and 15". Regulation 14(d) prescribes expressly the transfer of "preventive and remedial action under legislation implementing Articles 5(1) and 6(1) of Directive 2004/35/EC". Similarly to England, in Poland both the financial security and the financial contribution has to cover the costs that may arise under the ELD.[577] In France, the implementation does not refer to ELD liability in relation to the financial security and contribution.[578] However, it is possible to know that the costs of the actions to be taken according to the post-closure plan, especially the closure of the storage site and the monitoring of the storage site for a minimum of thirty years, have to be covered by the financial security; and that the amount of these items are to constitute the minimum amount for the financial contribution.[579, 580]

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[570] Fn.569, pp.42-3
[571] Ibid., pp.8-9
[572] Also see: C Armeni, Case studies on the implementation of Directive 2009/31/EC on the geological storage of carbon dioxide, UCL Carbon Capture Legal Programme, November 2011
[573] Storage of Carbon Dioxide (Licensing etc.) Regulations 2010/2221
[574] Ibid., Regulation 12(4)(e)
[575] This is the effect of Schedule 2, para.7(5)(b) pointing to Regulation 12(6) pointing to paras.(4) and (5) of the same provision.
[576] Storage of Carbon Dioxide (Termination of Licences) Regulations 2011/1483
[577] Dz.U. 2011 Nr 163 poz. 981, 9 June 2011 as amended by Dz.U. 2013 poz. 1238, 27 Sept 2013; Art.28a, paras.3-4
[578] See: Article R516 – 2, IV, 4°, b) and Article L229 – 47, I, d); Code de l'environnement
[579] Article R516 – 2, IV, 4°, a); Code de l'environnement
[580] The amount for thirty years monitoring etc. under Article R516 – 2 (see fn.578) is not to be confused with the separate amount for thirty years of monitoring etc. after the transfer of responsibility under Article L229 – 47 (see fn.578).

The ELD by itself also does not provide for mandatory financial guarantee. It merely requests Member States to "take measures to encourage the development of financial security instruments and markets."[581] This solution is the result of deliberate policy[582] which in turn may explain why the CCS Directive does not require mandatory guarantee for this type of liability either.

By reading the two directives together, it may be put forward that since the permit makes the permit holder an operator under the ELD, and thus liable under the ELD, the ELD liability arises 'under the permit issued'. On the other hand, this is an uneasy interpretation because even if the permit holder is an operator under the ELD, the only source of the ELD liability will still be the ELD itself as opposed to the permit. If nonetheless this argument was considered to be persuasive by decision makers, more clarity would be necessary because the amount of financial security may be significantly different if, even partly, ELD liability is to be covered by it.

As mentioned above, under Article 20 the operator is to provide financial contribution before handing over the responsibility. The amount of this contribution is defined by the CCS Directive in general terms: "[t]he contribution from the operator shall take into account those criteria referred to in Annex I[583] and elements relating to the history of storing CO_2 relevant to determining the post-transfer obligations, and cover at least the anticipated cost of monitoring for a period of 30 years". The above mentioned Guidance Document 4 provides further detail on how the financial contribution can be established. On the basis of this guidance, Bergsten considered that Article 20 "may cover not only the monitoring costs, but also those of corrective measures, preventive and remedial actions and other costs provided for by CCS Dir."[584]

Bergsten considers that the financial contribution may also be used to recover costs arising from the fault of the operator (Article 18, para.7) if the operator becomes insolvent or incurs financial difficulties after the transfer of responsibility.[585]

Bergsten also discusses the insolvency of the operator after the withdrawal of the permit in relation to when the financial security should be established and whether the financial

[581] Art.14, para.1; ELD
[582] COM(2010) 581, at para.4.2
[583] Criteria for the Characterisation and Assessment of the Potential Storage Complex and Surrounding Area referred to in Article 4(3)
[584] Bergsten, p.113
[585] Ibid.

security can be used in such case as the financial contribution. In Bergsten's opinion the financial security may take into account the possibility of insolvency from the beginning or the company's financial situation may be assessed every time the financial security is adjusted. Although it is argued that the latter option is better for the operator, it is submitted here that considering the possibility of insolvency from the beginning is the appropriate solution for two reasons. First, the very reason for the requirement of financial security is the risk that the operator may become insolvent. Second, it seems to make little commercial sense to require the operator to increase its financial security when it is in hardship and thus to weaken its position further.

In relation to the financial contribution Bergsten argues that, although it is not stated expressly in the Directive, the financial security is transformed into the financial contribution. The present author agrees with this view but for a different reason than what Bergsten gives. Article 19 provides:

> "…
>
> 3. The financial security or any other equivalent referred to in paragraph 1 shall remain valid and effective:
>
> …
>
> (b) after the withdrawal of a storage permit pursuant to Article 11(3):
>
> …
>
> (ii) where the site is closed pursuant to Article 17(1)(c), until the transfer of responsibility pursuant to Article 18(8), provided the financial obligations referred to in Article 20 have been fulfilled."

Bergsten considers that under Article 19, para.3(b)(ii) the transfer of responsibility as prescribed under Article 18, para.8 cannot take place until the financial contribution is made available, and an insolvent operator could not fulfil the obligations remaining with it in any case. Therefore, the financial security must turn into the financial contribution if the transfer of responsibility is to take place.

In the present author's view Article 19, para.3(b)(ii) does not make the provision of financial contribution a condition for the transfer of responsibility. Rather, it contemplates

that the transfer certainly takes place at some point[586] under Article 18, para.8 and that an operator in financial difficulty is not likely to be able to make such contribution (this is why in this case there is no separate requirement for financial contribution) or to reimburse the competent authority for action taken by it before the transfer of responsibility. Therefore, it deliberately does not release the financial security unless the financial contribution is provided. Thus, the financial security remains valid until the transfer of responsibility and, as the last step, the competent authority can attribute it or a part of it to the financial contribution requirement and release any remaining amount.

Bergsten also notes that corrective measures under the CCS Directive and preventive action under the Environmental Liability Directive (ELD) may overlap which may lead to the double recovery of costs in Member States where financial security is prescribed under the ELD or the hindrance of recovery.[587] This issue will be considered in more detail in the chapter on the Environmental Liability Directive.

4.6 The minimum period in case of closure by the competent authority

The CCS Directive indicates that the transfer of responsibility will not take place before at least 20 years have passed from closure.[588] However, earlier transfer may be possible where the competent authority is satisfied regarding the complete and permanent containment of the carbon dioxide.[589]

The CCS Directive provides that "[l]iabilities other than those covered by [it], [and] Directive 2003/87/EC and Directive 2004/35/EC, in particular concerning the injection phase, the closure of the storage site and the period after transfer of legal obligations to the competent authority, should be dealt with at national level."[590] This means that the detail of broader regulation depends on the willingness of each Member State to encourage CCS operations.

Bergsten points out that no minimum time is specified to pass before the transfer of responsibility in case it is the competent authority who closes the storage site after the

[586] See section 3.4.2 below.
[587] M Bergsten, 'Environmental Liability Regarding Carbon Capture and Storage (CCS) Operations in the EU' (2011) 20 European Energy and Environmental Law Review, Issue 3, pp. 108–115; p.115
[588] Art.18, para.1(b); CCS Dir.
[589] Ibid.
[590] Recital (34); CCS Dir.

withdrawal of the storage permit. Bergsten considers that this is so because in this case the competent authority also performs the duties of the operator and therefore the competent authority decides when it wants to transfer the responsibility – when the risk of CO_2 leakage is as low as possible. Therefore, it is not necessary to stipulate a minimum time period in the Directive.

In the present author's view this explanation is not correct. First, as it may be expected, it is the competent authority to whom the minimum period provision is addressed as the institution which prescribes it for the operator even where it is not assuming the responsibilities of the operator. Thus, it is always the competent authority who decides when the transfer should take place, and it is not a consequence of the fact that it has assumed the responsibilities of the operator. Second, it does not follow from the fact that the competent authority decides on the minimum time, that no minimum time provision is necessary. The normal closure scenario is the illustration of exactly this. Otherwise, even in the normal closure scenario no minimum time provision would be necessary.

With these considerations in mind it is surprising rather than consequential that in this case the same 20 year period with the competent authority's discretion is not prescribed expressly. It is assumed here that if the storage complex is closed by the competent authority, it is likely that the operator cannot do so because it is in financial difficulty or insolvent.[591] Therefore, the above discussion concerns, first of all, the financial security rather than the operator. The financial security has to be in place until the transfer of responsibility. If there is no minimum period before the transfer, it is not certain for how long the financial security has to remain available, that is, for how long the State can claim against it. This is of concern to finance institutions who may back the financial security and an insolvent operator's creditors who could recover from the financial security when it is released. Depending on the financial mechanism, it may be more expensive (insurance) or even impossible (mechanisms requiring the tying of capital) to find institutions which provide such security. A fund could be a solution to this problem.[592]

In this light, the lack of minimum period in case the competent authority closes the storage site is an omission. This gap can be bridged by purposive interpretation. The passage of a certain amount of time without leak or irregularity is part of ascertaining that the CO_2 has

[591] See the section above.
[592] See the discussion above in section 3.2.3.

been completely and permanently contained.[593] It is arguable that the suggested 20 year period should be applicable in this case too. Equally well, just like in the cases of normal closure, the competent authority should be allowed to require a shorter time period if it is satisfied about the safety of the storage complex.

4.7 Financial contribution and minimum period as implemented by the Member States

In England, the Termination Regulations[594] adopt the approach which Bergsten considered. The Explanatory Note to the Regulations state:

> "If a storage site is closed by the authority acting as operator after the relevant storage permit has been revoked under the licensing regulations, then the applicable licence will be terminated when the conditions set out in regulation 12 are met. In this case, there is no obligation for a financial contribution to be made under regulation 10 and it is not necessary for the minimum period determined under regulation 7 to have elapsed."

Although the Termination Regulations do not demand a financial contribution where the competent authority closes the storage site after the revocation of the licence, this does not exclude the possibility of using part of the financial security as financial contribution as suggested in section 3.4.1 above. However, absent any express provision to this effect, it seems to the present author that such interpretation of the Termination Regulations would be unlikely. The French implementation can be interpreted in the manner suggested above both regarding the minimum period and the financial contribution. In relation to the latter, additional support can be taken for such interpretation from the fact that, as it has been discussed above[595], the minimum amount of the financial contribution is defined through elements of the financial security.[596] The Polish implementation can also be interpreted this way. However, in the Polish case the purpose of the financial security does not mention the financial contribution.

[593] Guidance Document 3, p.8
[594] See fn.576.
[595] See section 3.4.1
[596] See footnotes 578, 579, 580 and the related text.

4.8 Other CCS legislation

How does the CCS Directive compare to jurisdictions and solutions outside the European Union? A report prepared at the University of Calgary[597] compared fourteen jurisdictions (including the UK, Germany, and Poland[598] from the EU, as well as the CCS Directive itself) and three legislation models. The twelve questions asked in the report were the following:

1. Does the jurisdiction have special rules to deal with CCS or do the default rules apply (either the default rules for the oil and gas sector or common law default rules)?
2. Does the jurisdiction leave liability with the operator/licensee during the active injection phase?
3. Does the jurisdiction require the operator/licensee to post security? How is the amount of that security assessed?
4. Does the jurisdiction transfer long-term liability for the storage operation to the state, or some other entity?
5. If liability is transferred what is the trigger to the transfer of liability? Is there any discretion as to the transfer of liability?
6. Is there any indication that the transfer of liability is confined to early actors?
7. Which of the following are transferred?
8. Are there any exceptions to the transfer of liability?
9. How is the transfer funded? An industry levy? General revenues?
10. If the transfer is funded by a levy, what is it and who pays?
11. How does the jurisdiction effect the transfer?
12. Does the jurisdiction change the default tort liability rules in any way other than the transfer of liability?

In relation to the first question the report has found that most jurisdictions in question developed special rules for CCS. Norway, the only jurisdiction which has substantial experience with CCS in the European region, used to have *ad hoc* rules based on already existing legislation. It can be seen from the report that the original Norwegian approach is compatible with the main principles of the CCS Directive because it requires the licensee to provide security for its obligations and liabilities, and long-term liability can be taken

[597] S Ransom, N. Bankes, 'A Comparative Review of Long Term Liability Rules for Carbon Capture and Storage' (October, 2011)
[598] At the time of the preparation of the report only these states have implemented the CCS Directive.

over by the state based on an agreed financial compensation as part of the decommissioning plan.[599] The detail of the transfer is to be agreed between the licensees and owners and the State.[600] Since the CCS Directive is a text with so-called EEA relevance[601], Norway must give effect to its provisions either under existing or new legislation. Since the report, Norway has made progress on this but as of December 2014 some issues remained outstanding.[602]

The only point of the study which did not find variance was that the operator is liable during injection.[603] This reflects the fact that during injection CCS is just like any other industrial activity; its special nature comes from the fact that undesired consequences may appear in the future at unusually long timescales. On the other hand, it is pointed out in the report that whether liability is fault-based or strict varies between jurisdictions, and that the Jacobs and Stump proposal[604] provides for capping of liability.[605]

Security is required in virtually all jurisdictions.[606] The report distinguishes between three approaches. The Minister or regulator may have a broad discretionary authority to obtain security; or security may be required which is sufficient to carry out abandonment or reclamation operations; or regulation may set the level of security and the Minister may be allowed to require additional security.[607] The report identifies generally the EU's approach as the second one, and gives Poland as an example for the third one.[608] This is possible because Article 19 (Financial security) states that the amount has to cover the obligations arising under the storage permit and the greenhouse gas emission allowance trading scheme, and that the security shall be periodically adjusted, but the further rules of implementation are decided by the Member States. Accordingly, in Poland Article 28b,

[599] Fn.597, p.25
[600] Ibid.
[601] See: EEA Joint Committee Decision No.115/2012 (OJ L 270, 4.10.2012, p. 38) amending the EEA Agreement (OJ L 1, 3.1.1994, p. 3; unconsolidated)
[602] For an overview of the implementation process in Norway until November 2014 see: T Jevnaker, Norway's Implementation of the EU Climate and Energy Package, Europeanization or cherry-picking?, (Fridtjof Hansen Institute, December 2014), pp.32-7
[603] Fn.597, p.4
[604] See: Jacobs, Wendy B. and Stump, Debra L., "Proposed Liability Framework for Geological Sequestration of Carbon Dioxide" Harvard Law School, Emmett Environmental Law & Policy Clinic, Cambridge, Mass.: October 2010.; Available at: http://blogs.law.harvard.edu/environmentallawprogram/files/2013/01/proposed-liability-framework-for-geological-sequestration-of-carbon-dioxide.pdf
[605] Fn.597, p.4
[606] Ibid.
[607] Ibid.
[608] Ibid.

para.1 of the Geological and Mining Law[609] gives power to the competent authority to increase the size of the financial security in case there is an increase in the risk of storage operations or decommissioning.[610] The amount of the financial security is prescribed by the competent authority.[611] The method of establishing the amount (and other matters) is prescribed by the Minister for the Environment.[612] In England it is the competent authority who can prescribe a new amount for financial security.[613] In France the amount of the financial security requested is in the authorising order as well as the modalities of updating that amount.[614]

Liability may be transferred to the state or a fund may cover it to a certain extent.[615] As it has been discussed above, under the CCS Directive the liability is transferred to the state.[616]

The particular sets of criteria enabling the transfer of liability vary across the examined jurisdictions.[617] In general, similarly to the CCS Directive, the transfer is connected to the passage of a certain amount of time and demonstration that the reservoir is reasonably expected to maintain mechanical integrity.[618] The relevant tests introduce a measure of discretion which must be exercised in accordance with the law.[619]

Where there is a transfer of liability, it applies both to early projects and later undertakings.[620] Exception to this is the 2010 Rockefeller/Voinovich Bill (abandoned proposal for federal legislation in the United States) which gave full indemnity to first movers while later entrants could be liable for claims above the Fund limit.[621]

The report distinguishes between four types of liability. MMV costs (monitoring, measurement, and validation), general tort liability, statutory liability for re-abandonment etc., and emissions liability.[622]

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[609] Dz.U. 2011 Nr 163 poz. 981, 9 June 2011 as amended by Dz.U. 2013 poz. 1238, 27 Sept 2013
[610] The same power is given with respect to financial contribution under Article 28f, para.1
[611] Article 28e, para.8
[612] Article 28h
[613] Licensing Regulations, Sch.2, para.7(4)
[614] Article R516 – 2, II; Code de l'environnement
[615] Fn.597, p.4
[616] Art.18, CCS Dir.; Also see the discussion in section 3.2.3
[617] Fn.597, p.5
[618] Ibid.
[619] Ibid.
[620] Ibid.
[621] Ibid.
[622] Fn.597, pp.3, 5

The CCS Directive in its Article 18 provides for the transfer of responsibility for monitoring, corrective measures, the surrender of emission allowances, and preventive and remedial action pursuant to the ELD. The report does not attempt to align these forms of responsibility with its own categories. It merely concludes that the liability is transferred.[623] Monitoring clearly corresponds to MMV costs as well as emissions liability to the surrender of allowances. General tort liability may apply to certain forms of damage under the ELD depending on the law of the Member State in question. However, similarly to the ELD, the CCS Directive is a public law instrument and it does not transfer civil liability in a direct[624] manner. Statutory liability is most likely to correspond to corrective measures, and preventive and remedial action under the ELD (both categories as stem from the implementation of the two directives). The report also states that the ownership of the project, including the injected CO_2, is transferred as well.[625] However, there is no statement to this effect in the CCS Directive.

It is also found in the report that several jurisdictions do not state expressly which forms of liability are transferred; especially emissions liability.[626] Such approach is broader than the CCS Directive because it probably includes civil liability and forms of environmental liability which would not be covered by the ELD. A disadvantage of this method is that it may invite litigation on the exact scope of the liability transferred and it hinders the calculation of the necessary financial security.

The report has found that most jurisdictions do not address exceptions to the transfer of liability.[627] EU Member States must have exceptions in case the operator has been at fault because the CCS Directive provides for this scenario as it has been discussed above.[628] This solution is a counterbalance to the complete transfer of responsibility. It seeks to assure that the operator remains diligent throughout the operation and the post-closure period and that the competent authority does not take over the responsibility with a hidden defect in the storage complex.

[623] Fn.597, p.20
[624] Indirect transfer could be where environmental damage has to be remediated as matter of public law which also affects the interests of private entities or individuals.
[625] Fn.597, p.20
[626] Fn.597, p.5
[627] Fn.597, p.6
[628] Art.18, para.7; CCS Dir.

As to the funding of the liability after the transfer there are three main approaches.[629] There may be no particular provision; this implies that the liability is covered from the general revenues of the State.[630] Other jurisdictions charge an injection fee to pay for the liabilities that have been transferred.[631] Finally, the operator may be required to provide financial assurance in advance for MMV costs.[632]

In Article 20 the CCS Directive prescribes a financial contribution to be made by the operator before the transfer of responsibility. The contribution is to take into account the criteria used for the characterisation and assessment of the storage complex and 'elements relating to the history of storing CO_2 relevant to determining the post-transfer obligations', and it is to cover the costs of monitoring for at least 30 years. The contribution "may be used to cover the costs borne by the competent authority after the transfer of responsibility to ensure that the CO_2 is completely and permanently contained".[633] Costs going beyond the financial contribution are borne by the state.

Where the contribution is not by a single sum, the liability may be funded through the collection of a levy that may be a tax or a fee, which may be charged on a 'per ton injected' basis.[634]

The means of effecting the transfer of liability may take several forms. The operator may be released from liability as in the case of the CCS Directive.[635] In the Canadian Alberta province, the operator receives statutory indemnity and the Crown becomes the licensee and the operator of the project; it also becomes the owner of the injected CO_2.[636] Under the 2010 Rockefeller/Voinovich Bill the transfer was suggested to take place by giving immunity to the operator.[637] The report mentions funds as another alternative.[638] However, even where there is a liability fund, a clear transferring or indemnity provision should be present.[639]

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[629] Ibid.
[630] Ibid.
[631] Ibid.
[632] Ibid.
[633] Art.20, ELD
[634] Fn.597, p.6
[635] Fn.597, pp.6, 20
[636] Fn.597, pp.6, 11
[637] Fn. 597, pp.6, 15
[638] Fn. 597, p.6
[639] The examples given by the report are not real illustrations of transferring liability by a fund: In British Columbia a claim can be made in relation to acid gas disposal wells against the Orphan Site Reclamation Fund when a working interest owner is defunct. (p.12) This is not a transfer of responsibility because the operator is liable until it is capable to pay. The example of Saskatchewan in relation to conventional oil and

Lastly, the report has asked whether there is any change to the default tort rules. In relation to the CCS Directive it was found that the default tort rules continued to apply. It would be more precise to state that the CCS Directive does not address tort liability in particular. In order to know whether the default tort rules have been changed in the EU, the law of the Member States has to be examined. As the report itself indicates, Germany has introduced a number of changes with respect to the position of a person suffering harm.[640] However, change to default tort rules is not typical; apart from Germany only Queensland is listed amongst the jurisdictions which introduced change.[641]

4.9 Conclusions

In conclusion the CCS Directive sets out a basic liability framework for the Member States to implement. It complements the Environmental Liability Directive with a focus on storage. The Directive has four linchpins. First, the operator is to prevent or to stop leakage. Second, liability is transferred to the state on the satisfaction of certain conditions which are fine-tuned by the Member States. Member States must take care to formulate the conditions for the transfer in a manner which reassures the industry and investors that the liability will certainly be taken over. It is foreseeable that under Article 18, para.1(b) the requirement of 20 years before transfer will be abandoned in practice to reflect the scientific understanding of CCS and to promote investment. Third, the operator must leave financial contribution for the licensing state to cover the management of the storage complex after the transfer of responsibility for at least thirty years. The exact amount of the financial contribution depends on how the licensing state determines it. Member States must strive for as much certainty as possible to encourage the development of CCS. This may even mean a regime limited to monitoring costs as in the case of the ROAD project. Potential liability from seepage both pre- and post-transfer may easily undermine the business case for CCS; therefore, this question needs particular attention from the Member States. The fourth linchpin is the requirement of permanent and complete containment. In this analysis, on strict interpretation this requirement at least reduces the number of formations suitable for CCS operations if not halts the development of CCS. However, both this analysis and the NIVA report indicate that a strict interpretation is not the only possible one.

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gas recovery / enhanced oil recovery is similar; the report itself states: "[t]here is no transfer or indemnity as such". (p.13)

[640] Fn. 597, p.6

[641] Ibid.

Annex I

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10 - 29
Monitoring	12	10	9	8	7	6	5	4	3	0,1
Contingency monitoring	10	10	10	10	10	10	10	10	10	10
Abandonment	15,5	15,5	15,5	15,5	15,5	15,5	15,5	15,5	15,5	0
FC	2	2	2	2	2	2	2	2	2	2
EU-ETS	0	1	2	3	4	5	6	7	8	8
Sub Total	***47***	***46***	***46***	***46***	***46***	***46***	***46***	***46***	***46***	***39,5***
Contingency 20%	9,4	9,2	9,2	9,2	9,2	9,2	9,2	9,2	9,2	7,9
Total	**56,4**	**55,2**	**55,2**	**55,2**	**55,2**	**55,2**	**55,2**	**55,2**	**55,2**	**47,4**

Table 3.1 The breakdown of the ROAD project's budget[642]

[642] Fn.487, p.72

Chapter 5: Potential Environmental Liability in the EU and the UK arising from Offshore CCS

The sections below on policy and choice of law considerations have been contributed to by Professor Michael Tsimplis.

5.1 Introduction

The ECO2 project has examined two real CO_2 storage reservoirs – Sleipner and Snøhvit – in the North Sea. These two sites did not leak to date (operating from 1996 and 2008 respectively). However, it is possible to run simulations on the geological models of these areas which demonstrate leakage scenarios.[643] In scientific terms the possibility of leakage cannot be excluded.[644] However, leakages are unlikely.[645] Even if a leak occurs, the footprint of the leak is expected to be localised in the vicinity of the leak.[646] Nevertheless, it has also been shown during the project that elevated CO_2 levels in the seawater due to a leakage may have an impact on living organisms.[647] Indeed, not only acidified seawater may affect the local biota but also exposure to high salinity and low oxygen formation water[648] which may be driven up by leaking carbon dioxide. With these points in mind and considering that the science of CCS is still in its understanding phase, it is reasonable to examine the environmental liability an operator or state may face in case of a contingency.

The centre of the European environmental protection framework is the Environmental Liability Directive (ELD) [649]. The CCS Directive is part of this framework, and it expressly brings CCS into the ELD's scope. While the CCS Directive prescribes corrective measures in case of a leakage or significant irregularity, it is the ELD under which environmental liability arises at the European level. Therefore, it is reasonable to consider the ELD immediately after the CCS Directive, and it is essential to examine it in order to see how it can respond to the specificities of offshore CCS.

[643] See the results of Work Package 1 of the ECO2 project.
[644] Personal comm. with Prof. Dr. Christian Berndt (GEOMAR, ECO2), 01 Feb 2015
[645] *Ibid.*
[646] ECO2, Deliverable 3.4, p.5
[647] ECO2, Deliverables 4.1, 4.2
[648] ECO2, Deliverable 4.1
[649] Directive 2004/35/EC; OJ L 143, 30.04.2004, p. 56–75

The ELD aims to establish a public liability liability framework for environmental damage based on the *polluter-pays* principle to prevent and remediate environmental damage[650] in line with the principle of sustainable development.[651] Diagram 4.1 below illustrates the ambit of the ELD and its place in the offshore CCS liability framework. The ELD covers:

- Damage to protected species and natural habitats
- Damage to waters
- Damage to land

The standard for the liability imposed depends on whether the activity undertaken is listed in Annex III of the ELD or not. The CCS Directive modified Annex III by including in the list the "…operation of storage sites pursuant to Directive 2009/31/EC."[652] Thus, the liability of a CCS operator is strict. This means that the CCS operator is responsible for the three aforementioned categories of damage irrespective of fault. However, note that causality must always be proven.

In the *ERG* case[653] the European Court of Justice interpreted the ELD and held that in order to impose remedial measures the competent authority of the Member State must establish a causal link between the polluter and the environmental damage.[654] The method used for proving causation is in the discretion of the Member State.[655] The causal link may even be presumed on the basis of the proximity of the operator's installation to the pollution.[656] However, in order to presume such causal link, "the competent authority must have plausible evidence capable of justifying its presumption, such as the fact that the operator's installation is located close to the pollution found and that there is a correlation between the pollutants identified and the substances used by the operator in connection with his activities."[657] This seems to be a high standard which is almost equivalent to proving causation. It must be noted that this interpretation is relevant to the applicability of the ELD only. Member States may

[650] Art.1, ELD
[651] Paragraph (2), Preamble; ELD
[652] Art.34, ELD
[653] Case C-378/08; European Court Reports 2010 I-01919
[654] Paras.52–54
[655] Para.55
[656] Para.56
[657] Paras.57–8

have national provisions on liability which may be applicable in cases where the pollution is of a diffuse character and the ELD is not applicable.[658]

Seven key questions arise in relation to the ELD as applied to offshore CCS:

1) Who is liable under the ELD as a CCS operator?

2) Which heads of damage in the ELD would be applicable to offshore CCS?

3) To which jurisdictional areas environmental damage is covered under the ELD?

4) What is the liability of the CCS operator?

5) What are the limits on the CCS operator's liability?

6) What are the exceptions and defences available to the CCS operator?

7) The effect of non-compliance with national provisions stemming from the ELD

8) Choice of law rules

[658] Para.59

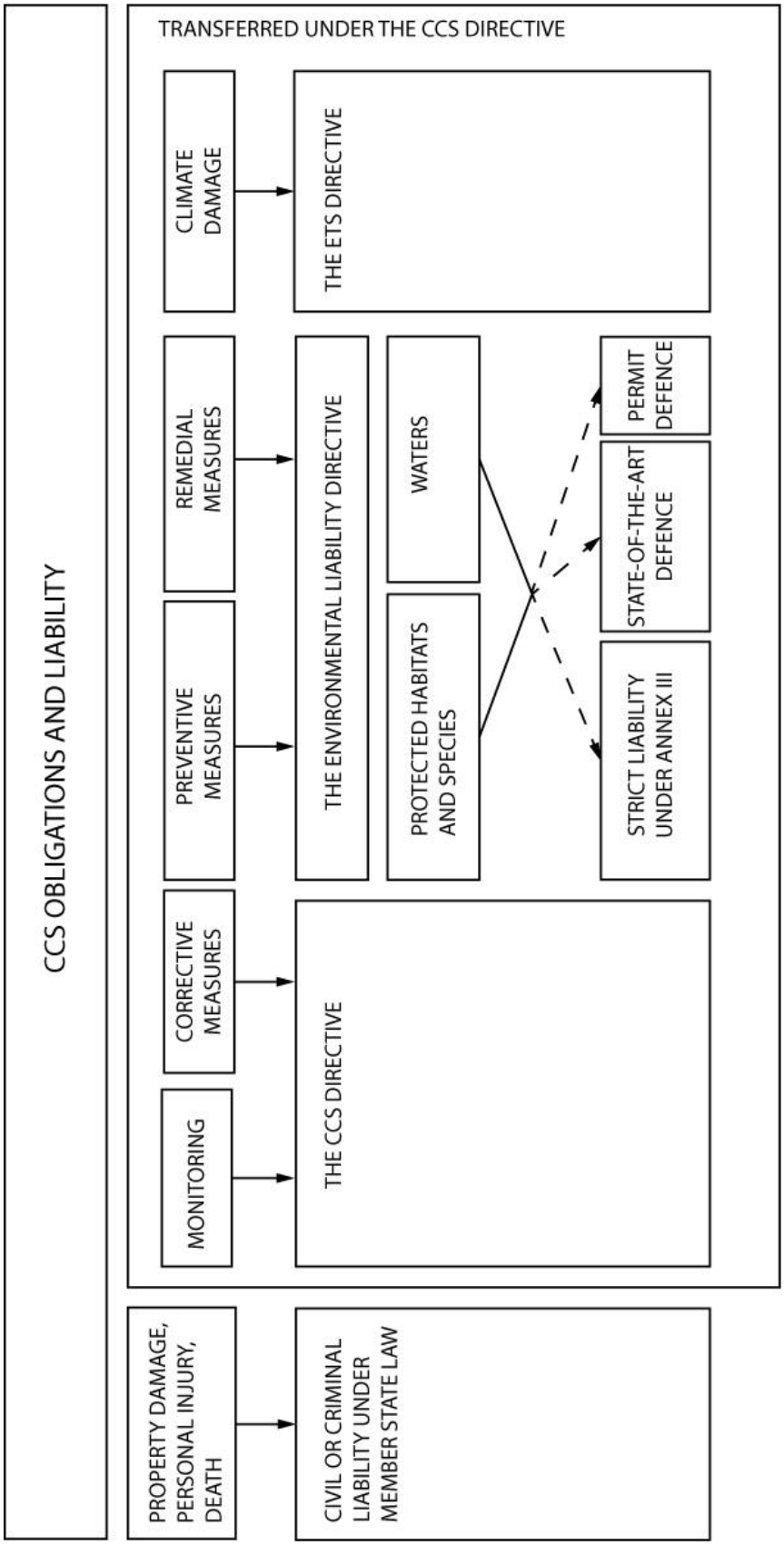

Diagram 4.1 The allocation of liability which may arise from CCS activities

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5.2 Who is liable under the ELD as a CCS 'operator'?

The ELD defines operators as

> "any natural or legal, private or public person who operates or controls the occupational activity or, where this is provided for in national legislation, to whom decisive economic power over the technical functioning of such an activity has been delegated, including the holder of a permit or authorisation for such an activity or the person registering or notifying such an activity".[659]

Operators under the CCS Directive are

> "any natural or legal, private or public person who operates or controls the storage site or to whom decisive economic power over the technical functioning of the storage site has been delegated according to national legislation".[660]

The two definitions are very similar. The CCS Directive does not include the "holder of a permit or authorisation for such an activity or the person registering or notifying such an activity". Since the CCS Directive establishes a permit procedure, the inclusion of these possibilities would be redundant. Most Member States bordering the North Sea have followed the definition provided in the ELD. However, there are variances as it is shown in Table 4.1.[661]

[659] Article 2, para.6; ELD
[660] Article 3, para.10; CCS Directive
[661] For the summary, this analysis relies on the ELD Implementation Study's Legal Analysis: BIO Intelligence Service (2013), Implementation challenges and obstacles of the Environmental Liability Directive, Annex — Part A: Legal analysis of the national transposing legislation prepared for European Commission — DG Environment. In collaboration with Stevens & Bolton LLP.

	The definition of an operator	**Whether the law provides for secondary liability**	**Whether the law provides for the death or dissolution of the operator**	**Whether persons other than the operator may be liable**
United Kingdom	"The definition of an operator is essentially the same as in the ELD."	"No secondary liability is specified."	"The transposing legislation does not mention the death or dissolution of a responsible operator."	"An operator is the only person who may be liable under the Regulations." [662] Scotland: "The transposing legislation provides that an operator may recover its costs from a third party."
France	"[The] definition is materially the same as that in the ELD."[663]	"The transposing legislation does not mention the secondary liability of a parent company or other person."[664]	"The transposing legislation does not mention the effect of the death or dissolution of a responsible operator."	"The transposing legislation does not impose liability on any person other than an operator."
Belgium	Federal State: "There is no definition of an operator in the Marine Order." However, implementing legislation concerning the protection of the marine environment defines 'operator' in terms similar to the one in the ELD.	All jurisdictions: "The transposing legislation does not mention the secondary liability of a parent company or other person."	All jurisdictions: "The transposing legislation does not mention the effect of the death or dissolution of a responsible operator."	Federal State: "The transposing legislation does not impose liability on any person other than an operator, with the exception of the Marine Order, pursuant to which the owner of the ship may also be liable." All Regions: "The transposing

[662] "The transposing legislation, however, states that "An operator who incurs liability to the [competent] authority under these Regulations (whether in carrying out work or in payment to the [competent] authority) may recover all or some of those costs from any other person who caused the damage"."

[663] "[A]ny natural or legal, private or public person operating or controlling effectively an activity irrespective of its profit or non-profit character. Persons who are the *de facto* operators of an activity are also deemed to be operators."
"Although it is not specified by the Law, the holder of a permit or authorisation, or a person who registers or notifies an activity, may also be an operator because that person is operating or controlling an occupational activity by following those procedures."

[664] However, has found at an earlier point that "[u]nder the so-called Grenelle 2 law, article L. 512-17 of the Environmental Code provides that the parent company of the last operator may be liable for remediating contamination at a Classified Installation if the last operator (the subsidiary) has entered into liquidation proceedings and the parent company acted negligently and, as a consequence, contributed to the subsidiary's loss of assets. Article L. 512-17 further extends such liability to include the "grandparent company" or "great grandparent company.""

	All regions: "The definition of an operator is the same as in the ELD."			legislation does not impose liability on any person other than an operator."
the Netherlands	The definition of 'operator' is the same as in the ELD.	"[The relevant legislation] does not mention secondary liability. However, case law under the General Administrative Law Act … may apply to this issue."	"[The relevant legislation] does not mention the death or dissolution of a responsible operator."	"Only the operator may be liable under [the relevant legislation]. However, case law under the General Administrative Law Act indicates that, under certain conditions, persons other than the operator may be held liable."
Germany	"The definition of an operator is the same as that under the ELD, including the holder of a permit or authorisation."	"The EDA does not mention secondary liability."	"The EDA does not mention the effect of the death or dissolution of a responsible operator."	"The EDA does not impose liability on any person other than an operator."
Denmark	"[T]he person responsible for operating a ship, an aircraft, a platform or a pipe, provided this is an occupational activity"[665]	"The legislation does not mention secondary liability."	"The legislation does not mention the effect of the death or dissolution of a responsible operator."	"The owner of a ship may be liable in certain circumstances; see Marine Environment Protection Act."
Sweden	"[p]ersons who pursue or have pursued an activity or taken a measure that has	"The transposing legislation does not provide for secondary liability"	"The transposing legislation does not mention the death or dissolution of a	"The owner of the land on which environmental damage has occurred may

[665] This definition is from the Marine Environment Protection Act. See also the definition of 'operator' in the EDA: "the person who carries on or controls the occupational activity".

	contributed to pollution damage or serious environmental damage"[666]		responsible operator."	be liable for its remediation..."[667]

Table 4.1 The concept of 'operator' under the ELD in the Member States under consideration

[666] "The above definition of an operator is particularly broad because it includes owners of land on which there is ongoing pollution from landfills, oil tanks, barrels, etc. Such landowners are liable for removing the waste or other polluting substances, investigating the pollution, carrying out preventive measures and remediating pollution that has occurred during their ownership of the land. This is the most common situation in which a landowner is liable under chapter 10. In addition, landowners become liable for investigating, preventing and remediating pollution if they develop, dig or otherwise exploit land that has been contaminated by historic pollution."

[667] This happens if "the liable operator is unable to carry out or pay for the remediation, provided that the landowner knew or should have known of the environmental damage when it acquired the land (keeping in mind the prospective only nature of the ELD)."

5.3 Which heads of damage in the ELD would be applicable to offshore CCS?

The ELD defines 'damage' in general as "a measurable adverse change in a natural resource[668] or measurable impairment of a natural resource service[669] which may occur directly or indirectly."[670] There are three heads of damage under the ELD. The ELD defines 'damage' further for these heads and also delimits their scope.

5.3.1 Damage to protected species and natural habitats

Protected species and natural habitats for the purposes of the ELD are those identified in the relevant parts of the Birds Directive[671] and the Habitats Directive[672] (the two together are referred to as 'the Nature Directives').[673] In turn, these instruments refer to species and sites submitted to the European Commission by the Member States.[674]

Damage to protected species and habitats is referred to under the ELD as 'environmental damage'. It is "any damage that has significant adverse effects on reaching or maintaining the favourable conservation status of such habitats or species. The significance of such effects is to be assessed with reference to the baseline condition, taking account of the criteria set out in Annex I…"[675] 'Damage' is defined in Article 2, para.2 as a "measurable adverse change in a natural resource or measurable impairment of a natural resource service which may occur directly or indirectly". The meaning of 'conservation status' and the requirements for a 'favourable conservation status' are given in Article 2, para.4 and Annex I of the ELD respectively. Annex I provides guidance on what amounts to 'significant': "Damage with a

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[668] See p.150
[669] *Ibid.*
[670] Art.2, para.2; ELD
[671] Directive 79/409/EEC (OJ L 103, 25/04/1979, p. 1–18) as codified in Directive 2009/147/EC (OJ L 20, 26/01/2010, p. 7–25); 'Codified' in this context means a new, legally binding directive which consolidates the amendments to an earlier directive.
[672] Directive 92/43/EEC; OJ L 206, 22/07/1992, p. 7–50; latest consolidated version: 1992L0043 — EN — 01.07.2013 — 006.001
[673] Art.2, para.3; ELD
[674] When an area is included in a national catalogue but not yet declared as an area of special concern Member States should not authorise interventions which incur the risk of seriously compromising the ecological characteristics of those sites. Member States must take all the measures necessary, in accordance with the provisions of national law, to avoid interventions which incur the risk of seriously compromising the ecological characteristics of the sites which appear on the national list transmitted to the Commission (ECJ C-244/05, preliminary ruling in case "*Bund Naturschutz*", Germany).
[675] Art.2, para.1(a); ELD

proven effect on human health must be classified as significant damage."[676] However, variations smaller than natural fluctuations; or variations due to natural causes or resulting from intervention relating normal management of sites; or if recovery takes place in a short time, without intervention, then the damage is not 'significant'. Some Member States provide additional evaluation factors in their guidance to the ELD on what is significant.[677] For example, the Dutch guidance provides that no values can be set in advance because the threshold depends on the particular case.[678, 679]

The terms 'species' and 'habitats' are interrelated. In respect of both 'favourable conservation status' is required. The favourable conservation status of habitats includes the favourable conservation status of its typical species (Article 2, para.4(a) referring to para.4(b)). The favourable conservation status of typical species in turn seems to presuppose the lack of influences that may negatively affect the typical species' long-term survival (part of the definition of conservation status in respect of natural habitats in Article 2, para.4(a)).

The concept of favourable conservation status of habitats is broader than the welfare of its species. Damage to habitats may be found if its natural range and areas it covers within that range are not stable or increasing, or if the specific structure and functions which are necessary for its long-term maintenance do not exist or are not likely to continue to exist in the foreseeable future (Article 2, para.4(a)). Such occurrences may affect the species typical to the habitat, or they may be a consequence of species being affected.

Species may be affected beyond protected or in non-protected habitats as well. The ELD Training Handbook considers that in such cases "it might be appropriate to compensate for the loss of, or damage to, an area of habitat used by protected species as if it were a protected habitat".[680] Indeed, remediation or compensation may take place in a habitat distant from the

[676] This may be relevant with respect to released heavy metals which may enter the food chain.
[677] Eftec, Stratus Consulting; *Environmental Liability Directive: Training Handbook and Accompanying Slides*, For the European Commission DG Environment; Contract Reference No. 070307/2012/621542/SER/A1, February 2013; p.25
[678] Fn.677, p.25
[679] The Finnish guidance provides factors similar to those found in Annex I. (Fn.123, p.25) The Irish guidance (Environmental Liability Regulations Guidance Document, 2011) provides a table compiled on the basis of the European Commission publication Assessment, Monitoring and Reporting under Article 17 of the Habitats Directive: Explanatory Notes and Guidelines (2006). This document has since been updated in 2011 with identical title.
[680] Fn.677, p.81-2

affected habitat if it is shown that the improvement of the distant habitat is more beneficial for the affected species due to its lifecycle.[681]

This head of damage is not limited to the sea and aquatic organisms even in the present context. For example, coastal bird species may be affected in case certain fish populations decrease.

5.3.2 Water damage

This head of damage under the ELD covers two major groups of waters[682] which are referred to here as non-marine[683] and marine[684].

5.3.2.1 Non-marine waters

With respect to non-marine waters the ELD defines 'water damage' as "any damage that significantly adversely affects the ecological, chemical or quantitative status or the ecological potential, as defined in Directive 2000/60/EC[685] [the Water Framework Directive or 'WFD'], of the waters concerned."[686] Although this definition refers to the WFD, it does not correspond exactly to the terms defined in the WFD. The WFD defines in its Article 2, as aligned with the ELD's definition:

- 'ecological status',
- 'good ecological status' (this has to be read together with 'surface water status' and 'good surface water status'),
- 'good surface water chemical status',
- 'good ecological potential' (applies to artificial or heavily modified (surface) water bodies),
- 'good groundwater chemical status',
- 'quantitative status' (applies to groundwater abstraction and thus not relevant), and
- 'good quantitative status' (applies to groundwater abstraction and thus not relevant).

[681] Fn.677, p.82
[682] The definition of 'waters' in Art.2, para.5 of the ELD mentions only the waters covered by Directive 2000/60/EC (see *infra*). However, in light of Art.38 of Directive 2013/30/EU (OJ L 178, 28/06/2013, p. 66–106) replacing Art.2(1)(b) of the ELD, this definition is outdated; its amendment has been omitted.
[683] Art.2, para.1(b)(i); ELD
[684] Art.2, para.1(b)(ii); ELD
[685] OJ L 327, 22/12/2000, p. 1–73
[686] Art.2, para.1(b); ELD

The desired parameters for these terms are provided by the WFD and related instruments. The WFD includes various types of waters in its scope as illustrated by the diagram below.

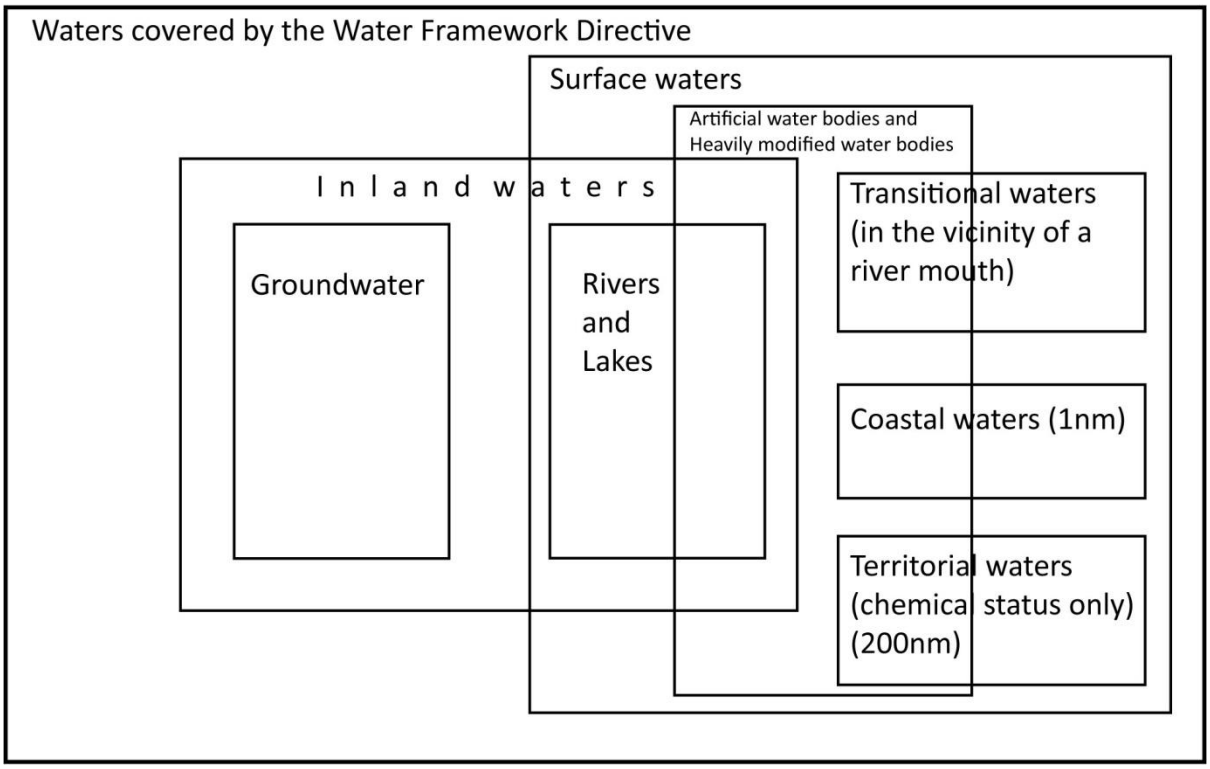

Diagram 5.1: The waters covered by the Water Framework Directive
Viktor Weber

In the case of offshore CCS, territorial waters (with respect to their 'chemical status' only[687]), coastal waters, transitional waters, and artificial or heavily modified water bodies on the seaward side of the baseline from which territorial waters are measured are the obvious waters that may be affected. However, depending on the location of the storage site, it is possible to imagine a scenario where inland waters, or inland artificial or heavily modified water bodies, or groundwater can be affected.[688]

The two main possible adverse consequences a leakage scenario is foreseen to have in the marine environment are the acidification of the surrounding waters (including groundwater) and the release of heavy metals from the seabed. In extreme cases acidification may disrupt ecosystems; released heavy metals may lead to bioaccumulation and enter the food-chain,

[687] See p.140.
[688] This could happen if the storage site was located both under onshore and offshore areas or in the case of offshore groundwater. Regarding the latter possibility see: V E A Post *et al*., '*Offshore fresh groundwater reserves as a global phenomenon*', Nature 504, 71–78 (05 December 2013)

including food for human consumption. Heavy metals may also disrupt ecosystems if their concentration is high enough. In the meaning of the definition of 'water damage' under the ELD, these phenomena have to come under the terms listed in the ELD definition as they are defined in the WFD.

5.3.2.1.1 Acidification

The quality elements for the classification of 'ecological status' for each type of surface water, are listed in Annex V of the WFD. These lists provide the headings 'biological elements', 'chemical and physico-chemical elements supporting the biological elements', 'general', and 'specific pollutants'.[689] The first of these headings is specified further by various elements for each type of surface water. The heading second here is not specified in more detail for any of the surface waters. The heading 'general' is specified further and provides, amongst others, 'acidification status' as a quality element for rivers and lakes but not for 'transitional waters' and 'coastal waters'. The heading 'specific pollutants' distinguishes between priority substances and other substances.

Since the acidity value of waters is a physico-chemical element, it is arguable that in the case of 'transitional waters' and 'coastal waters' the corresponding heading above may provide the basis for assessing acidification in case it affects biological elements.[690] If acidification is so severe that it significantly adversely affects any of the first three headings above, it will amount to water damage under the ELD (based on impact to ecological status).

'Territorial waters' do not form part of 'surface waters' except with respect to their 'chemical status'. However, 'chemical status' is not the same as the heading 'chemical and physico-chemical elements supporting the biological elements'. These two terms are at a different level in the hierarchy of the terms used by the WFD and have different meanings. 'Chemical status' – it is understood here that the corresponding definition in the WFD is 'good surface water chemical status' in Article 2, para.24 – refers to specific environmental quality standards which are not directly relevant to acidification.[691] On the other hand, 'chemical and physico-chemical elements supporting the biological elements' is a heading for quality elements of surface waters in Annex V of the WFD as stated above. 'Territorial waters' are

[689] The heading 'hydromorphological elements supporting the biological elements' is also part of these lists.
[690] This argument could be defeated by arguing that no overlaps were intended in the WFD. However, this cannot be shown. Indeed, for the opposite stance see fn.692 below.
[691] For the current standards see the paragraph below.

not listed in Annex V even with respect to 'chemical and physico-chemical elements supporting the biological elements'. Under this interpretation, should acidification take place in territorial waters, it cannot be addressed under Article 2, para.1(b)(i) of the ELD as damage to ecological or chemical status under the WFD. However, as it will be seen below, Article 2, para.1(b)(ii) of the ELD can cover such scenario.

However, 'chemical status' can be interpreted as a more general expression which includes 'chemical and physico-chemical elements supporting the biological elements', 'specific pollutants' as well as any other relevant element. This would mean that 'chemical status' and 'ecological status' overlap to a certain extent – not necessarily an indication that such interpretation is incorrect.[692] This interpretation would include acidification of territorial waters as changes in the 'chemical status'. The diagram below is a simplified scheme of the WFD to illustrate the above discussion.

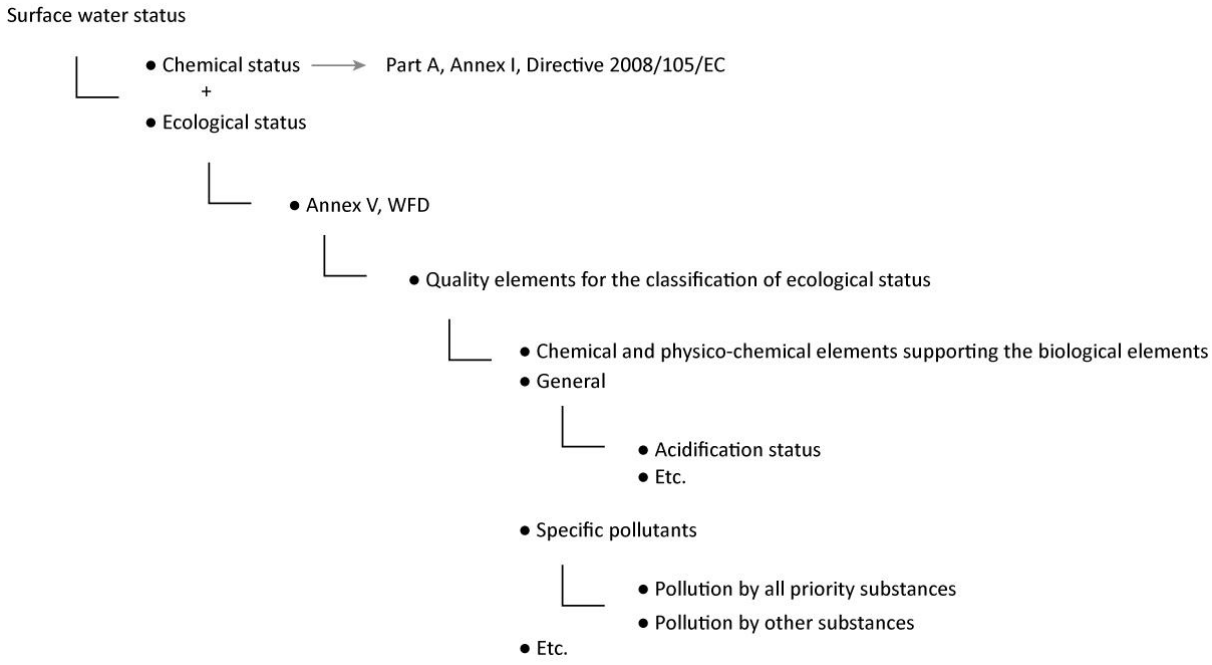

Diagram 5.2: A simplified scheme of the concepts appearing in the Water Framework Directive Viktor Weber

If leakage occurs, the acidified seawater is likely to be driven away and diluted by the oceanic circulation. Therefore the impact on the 'biological elements' will be more important

[692] 'Ecological status' and 'chemical status' certainly overlap at another point. The quality elements for the classification of 'ecological status' also include a heading 'specific pollutants' which include 'pollution by all priority substances' and the list of these substances (Annex X of the WFD) is to a large extent the same as the list applicable to 'chemical status' (Directive 2008/105/EC as explained below).

for determining whether there has been environmental damage, rather than measurements of local acidification which will be variable at very short time scales.

5.3.2.1.2 The release of heavy metals and formation waters

Similarly to acidification, with respect to heavy metals both the 'biological' and the 'chemical and physico-chemical' elements – that is, significant adverse effect on the 'ecological status' – may be evoked if a release is of such severity that these elements are affected. However, in this case two further elements provide grounds for assessment: 'chemical status' (even on its narrow interpretation as discussed above) and 'specific pollutants'. The definition of 'good surface water chemical status' in the WFD directs to Annex IX with respect to certain heavy metals and dangerous substances.[693] Today the relevant list is in Part A (Environmental Quality Standards or 'EQS') of Annex I of Directive 2008/105/EC.[694] This list prescribes limits for, amongst others, cadmium and its compounds, lead and its compounds, mercury and its compounds, and nickel and its compounds. This head of assessment under the WFD, and thus Art.2, para.1(b)(i) of the ELD, is also certainly applicable to the territorial waters of the Member States regardless whether the narrow or broad interpretation of 'chemical status' is followed. Otherwise, the exception made for territorial waters would lose its meaning under the narrow interpretation of 'chemical status'. The heading 'specific pollutants' may also be the ground to rely on in this case.[695] However, with respect to territorial waters it could only be relied on under the broad interpretation.

Groundwaters are treated separately in the WFD. The only relevant term for the present purposes is 'good groundwater chemical status'.[696] Should carbon dioxide intrude a groundwater body, it would fall under Table 2.3.2 of Annex V of the WFD.

It is the competent authority who decides under the ELD whether the damage is sufficiently adverse for action to be taken.[697] The ELD Training Handbook provides that "[w]hether or not damage to water is significant should be judged against the WFD status of water. If the

[693] Annex IX of the WFD referred to the daughter directives of Directive 76/464/EEC. The standards in the daughter directives were deleted by Art.11 of Directive 2008/105/EC (reference at fn.694).
[694] OJ L 348, 24.12.2008, p.84; latest consolidated version: 13.09.2013; See Art.3
[695] See fn.692.
[696] Art.2, para.25; WFD
[697] Art.11, para.2; ELD

good status of water is adversely affected, damage should be deemed to be significant. For indicators of good status, readers are referred to Annex V of the WFD."[698, 699]

5.3.2.2 Marine waters

For marine waters the applicable standard for water damage as prescribed by the ELD is a significant adverse effect on the "environmental status of the marine waters concerned, as defined in Directive 2008/56/EC[700] [the Marine Strategy Framework Directive or 'MSFD']."[701, 702] 'Environmental status' is defined in the MSFD as "the overall state of the environment in marine waters, taking into account the structure, function and processes of the constituent marine ecosystems together with natural physiographic, geographic, biological, geological and climatic factors, as well as physical, acoustic and chemical conditions, including those resulting from human activities inside or outside the area concerned."[703]

This is a very broad definition. If a leakage either through acidification or the release of heavy metals significantly adversely affects any of the elements listed, the change will amount to water damage under Article 2, para.1(b)(ii) of the ELD.

What constitutes good environmental status is a matter for Member State legislation.[704] For example, in the United Kingdom CEFAS[705] has provided expert advice[706] to support the development of proposals for UK targets and indicators of good environmental status for the Marine Strategy Framework Directive. The standards established by the Member State may provide the ground for the competent authority to evaluate the significance of the damage.

Despite the different standards for protected species and natural habitats, non-marine waters and marine waters; from a regulatory perspective there is a connection between the Nature

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[698] Fn.677, p.27
[699] The ELD Training Handbook also refers to the Dutch guidance on this issue which poses three questions: What was the ecological, chemical and/or quantitative status of the water (before the damage occurred)? Is there an adverse effect on this status? If so, is it significant?
[700] OJ L 164, 25/06/2008, p. 19–40
[701] Art.2, para.1(b)(ii); ELD
[702] Similarly to non-marine waters, this definition relies on 'environmental status' as opposed to 'good environmental status' which is also defined in the MSFD in Art.3, para.5
[703] Art.3, para.4; MSFD
[704] See in particular: Art.9, MSFD.
[705] Centre for Environment, Fisheries and Aquaculture Science
[706] CEFAS, *Proposed UK Targets for achieving GES and Cost-Benefit Analysis for the MSFD: Final Report*; February 2012; available at: http://randd.defra.gov.uk/Document.aspx?Document=9890_FinalReportME5405.pdf

Directives, the Water Framework Directive, and the Marine Strategy Framework Directive.[707] The relationship between these directives may be relevant for the design of remediation measures.

5.3.3 Damage to land

The third category of damage is "land contamination that creates a significant risk of human health being adversely affected as a result of the direct or indirect introduction, in, on or under land, of substances, preparations, organisms or micro-organisms"[708] If CCS poses a risk to human health, then the costs of safely removing the stored CO_2 will burden the CCS operator. Where a storage site is located partly under onshore areas, a significant onshore carbon dioxide leakage scenario may involve the threat of health effects on humans in a similar manner to the Lake Nyos Disaster.[709] As far as the seabed and its subsoil are concerned, threat to human health in these cases is unlikely. Furthermore, the seabed and its subsoil are not land in this[710] legal sense; they are part of the definition of 'marine waters' and 'coastal waters'.[711]

[707] The European Commission has published a paper on the relationship between the WFD and the Nature Directives, and another paper on the relationship between the MSFD and the Nature Directives: European Commission, *Links between the Water Framework Directive and Nature Directives*, December 2011; available at: http://ec.europa.eu/environment/nature/natura2000/management/docs/FAQ-WFD%20final.pdf
Links between the Marine Strategy Framework Directive (MSFD 2008/56/EC) and the Nature Directives (Birds Directive 2009/147/EEC (BD) and Habitats Directive 92/43/EEC (HD)), 27 July 2012; available at: http://ec.europa.eu/environment/nature/natura2000/marine/docs/FAQ%20final%202012-07-27.pdf
See also: HM Government, *Links between the Marine Strategy Framework and Water Framework Directives*, Factsheet 1, December 2012; available at: http://archive.defra.gov.uk/environment/marine/documents/legislation/msfd-factsheet1-waterdirective.pdf
[708] Art.2, para.1(c); ELD
[709] Although the Lake Nyos disaster was not the result of CCS, it shows that a substantial leakage from a partly onshore site may affect human health.
[710] The seabed and its subsoil may be treated as land for the purposes of licensing the activities on or in them.
[711] See fn.731 below.

5.4 To which jurisdictional areas environmental damage is covered under the ELD?

There is no doubt that the ELD covers damage on the land and in the internal waters of the Member States. However, it has to be asked whether liability under the ELD extends to the territorial sea and the Exclusive Economic Zone (EEZ)[712] of the Member States. Each head of damage should be considered separately.

5.4.1 Damage to protected species and natural habitats

The ELD Implementation Study[713] found that "[s]ome Member States such as Denmark, Germany, Spain, and the UK, which have a maritime border, provide that the ELD regime applies to biodiversity in the exclusive economic zone. Other Member States are silent on the issue."[714]

Even where the legislation of the Member States is silent, it is arguable that the ELD is applicable with respect to protected species and natural habitats not only in territorial waters but also in the Exclusive Economic Zone and even at the High Seas. For making the argument, it is necessary to look at the application of the Habitats Directive first.

Advocate General Kokott at the ECJ[715] considered that the Habitats Directive was applicable outside the UK territorial waters if the UK had extended sovereign rights to the area outside territorial waters and the legislation in question "must require to be interpreted as extending to that area".[716] The first requirement was not contested; the latter requirement was fulfilled by the Habitats Directive through the following reasoning:

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[712] United Nations Convention on the Law of the Sea of 10 December 1982, Montego Bay, 1833 UNTS 397 (UNCLOS), Article 55: "The exclusive economic zone is an area beyond and adjacent to the territorial sea, subject to the specific legal regime established in this Part, under which the rights and jurisdiction of the coastal State and the rights and freedoms of other States are governed by the relevant provisions of this Convention." See also UNCLOS, Article 57; Note that the United Kingdom does not have an exclusive economic zone. Note further that in the North Sea, with the exception of Norway, none of the States has an exclusive economic zone reaching to 200 nautical miles.

[713] BIO Intelligence Service (2013), Implementation challenges and obstacles of the Environmental Liability Directive, Final report prepared for European Commission — DG Environment. In collaboration with Stevens & Bolton LLP

[714] Fn.713, p.71, footnote omitted.

[715] Case C-6/04 *Commission of the European Communities v United Kingdom of Great Britain and Northern Ireland*, Opinion of Advocate General Kokott delivered on 9 June 2005; paras.128-135

[716] See fn.715 at para.130

> "[The Habitats Directive] is meant to contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States to which the Treaty[717] applies. This objective supports the conclusion that the area within which the directive applies coincides with that of the Treaty. In accordance with the aforementioned case-law, the area within which the Treaty applies is not limited to the territorial waters."[718]

One of the cases to which the Advocate General refers is the *Kramer* case[719] where the ECJ held that the EU has competence to legislate beyond the territory of the Member States inasmuch as the Member States themselves have certain rights and duties in such areas. It should be noted that this case concerned fisheries on the High Seas. (The *Kramer* case has been later confirmed in the *Drift-Net* case.[720, 721]) The Court agreed with the Advocate General's opinion.[722]

The Queen's Bench Division of the English High Court held in the case of *R v Secretary of State for Trade and Industry ex parte Greenpeace*[723] (the second case to which AG Kokott referred) that the Habitats Directive was applicable beyond the territorial seas of the United Kingdom and it extended to the continental shelf and the superjacent waters.[724] The Court relied on, amongst others, the purpose and object of the Habitats Directive and the closely linked 'very nature of things' argument coined in *Kramer*.[725]

Following the above reasoning of AG Kokott and considering that the ELD has the similar purpose of preventing and remedying environmental damage and that it is also based on the EC Treaty[726, 727], it can be assumed that the reasoning in the above case law is also applicable to the ELD.

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[717] 'Treaty' refers to the 'EEC Treaty'.
[718] Fn.715, para.132
[719] Joint cases C-3/76, C-4/76 and C-6/76 *Kramer*; [1976] ECR 1279
[720] Case C-405/92 *Etablissements Armand Mondiet SA v Armement Islais SARL*; [1993] ECR I-6133
[721] See in particular para.30/33 in the former case and paras.11-15 in the latter case. See also J.H. Hans, *Case law analysis. The Habitats Directive*, J Environmental Law (2000) 12 (3): 385-390; p.386
[722] Case C-6/04 *Commission of the European Communities v United Kingdom of Great Britain and Northern Ireland*, Judgment of the Court (Second Chamber) of 20 October 2005; para.117
[723] [2000] 2 C.M.L.R. 94
[724] See in particular para.79.
[725] See paras.14-15.
[726] The EC Treaty as it stood after the Treaty of Amsterdam and the Treaty of Nice
[727] Today Art.192 of the Treaty on the Functioning of the European Union serves the same purpose.

5.4.2 Damage to water

Although it follows from the previous section that in constitutional terms the ELD applies to the coastal State's waters including the territorial waters and the EEZ, 'water damage' had been defined under the ELD in a way which necessitates qualification for this observation.

Originally, the ELD included in the term 'water damage' only waters which are regulated by the WFD. That is, inland waters, groundwater, coastal waters, and with respect to chemical status only, territorial waters. Territorial waters (apart from chemical status) and the EEZ fell outside the scope of the ELD.

This ELD definition has been amended by Article 38 of the Offshore Oil and Gas Operations Safety Directive[728] to include 'marine waters' as defined in the MSFD. After the transposition of this amendment into national legislation[729], 'water damage' in 'marine waters' will be covered by the ELD.[730] The MSFD defines 'marine waters' as "waters, the seabed and subsoil on the seaward side of the baseline from which the extent of territorial waters is measured extending to the outmost reach of the area where a Member State has and/or exercises jurisdictional rights [... and] coastal waters as defined [in the WFD], their seabed and their subsoil, in so far as particular aspects of the environmental status of the marine environment are not already addressed through that Directive or other Community legislation."[731] The outmost reach of the area where a Member State has and/or exercises jurisdictional rights is typically the seaward edge of the Exclusive Economic Zone. Beyond this area lies the High Seas[732] where CCS is prohibited in the European Union by the CCS Directive.[733] However, in case environmental damage occurred at the High Seas, theoretically the ELD could be applicable in the same way as to protected species and habitats as explained above. It must be noted that the amendment mentioned applies only "in so far as particular aspects of the environmental status of the marine environment are not already

[728] 2013/30/EU; OJ L 178, 28/06/2013, p. 66–106; The language of the amendment is general and not limited to the subject of offshore oil and gas operations safety.
[729] The deadline is 19 July 2015; Art.38, para.2; Directive 2013/30/EU
[730] In terms of jurisdictional rights and enforcement, Article 56(1)(b)(iii) of UNCLOS has to be considered which provides that "[i]n the Exclusive Economic Zone, the coastal State has: … jurisdiction as provided for in the relevant provisions of [UNCLOS] with regard to: … the protection and preservation of the marine environment".
[731] Art.3, para.1; MSFD
[732] See: UNCLOS, Part VII
[733] Art.2, paras.1, 3; CCS Directive

addressed through [the WFD].” Consequently, coastal waters and territorial waters concerning their ‘chemical status’[734] remain non-marine waters for the purposes of the ELD.

5.4.3 Damage to land

With regard to land damage, the ELD is applicable throughout the onshore territory of the coastal State in case relevant damage arose.

The diagram below illustrates the findings of the current section, excluding groundwater. (Note that the applicability of European law regarding the High Seas is only to the extent that the argument outlined above permits.)

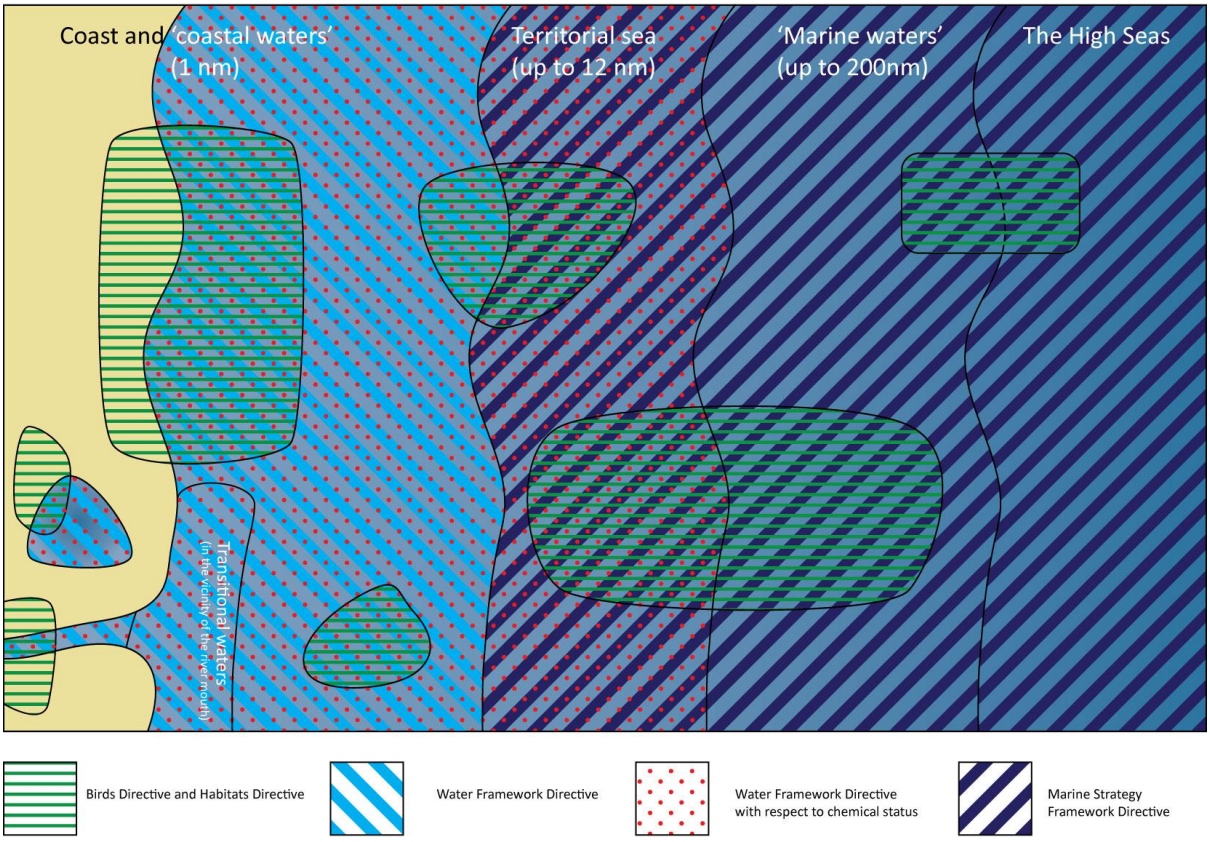

Diagram 4.3: The potential applicability of European environmental legislation to offshore activities Viktor Weber

[734] Both under the narrow and the broad interpretation.

5.4.4 A tailor-made regime?

From the current and the preceding section it emerges that while it is possible to accommodate offshore CCS in the current European environmental liability framework, some issues may require further consideration. In particular: the way the terms describing environmental damage may apply to offshore CCS, the financial security is not defined in exact terms, there is a possible overlap between corrective measures and preventive action which may affect the availability of the financial security, and the liability of the operator is not limited. These issues may be addressed either by amending the current European framework or by a tailor-made European or international regime.

5.5 What is the liability of the CCS operator?

Two themes are addressed in this section: the liability obligations and the transfer of liability.

5.5.1 The liability obligations

The ELD provides for an obligation on the competent authority to intervene and either force the operator to undertake reparation or it may undertake the reparation itself. The liability of the CCS operator under the ELD is triggered when there is an imminent threat of damage, in which case the operator shall take the necessary preventive measures without any delay and inform the competent authority. The ELD defines imminent threat of damage as "a sufficient likelihood that environmental damage will occur in the near future".[735] Where damage has already occurred, the operator must:

- inform the competent authority
- take all practicable steps to immediately control, contain, remove or otherwise manage the environmental damage
- take the necessary remedial measures on the basis of Annex II of the ELD

The ELD aims to remove threats to human health and to restore the environment to its baseline condition. Baseline condition is defined in the ELD as "the condition at the time of the damage of the natural resources and services that would have existed had the environmental damage not occurred, estimated on the basis of the best information available".[736] 'Natural resources' is an umbrella term for "protected species and natural habitats, water and land"[737]; in turn, 'services and natural resource services' means "the functions performed by a natural resource for the benefit of another natural resource or the public"[738]. The ELD distinguishes between three types of remediation:

- primary remediation
- complementary remediation
- compensatory remediation

[735] Art.2, para.9; ELD
[736] Art.2, para.14; ELD
[737] Art.2, para.12; ELD
[738] Art.2, para.13; ELD

Primary remediation is defined in the ELD as "any remedial measure which returns the damaged natural resources and/or impaired services to, or towards, baseline condition… The purpose of primary remediation is to restore the damaged natural resources and/or services to, or towards, baseline condition."[739] Primary remediation can be specified further as "[i]mmediate actions designed to stop the incident, minimise, contain, and prevent further damage and clean-up the damage[,] [t]hese may also be called emergency remedial measures (Article 6.1.(a) of the ELD)[;] and [m]ore medium to long-term remediation actions on the damaged site that are designed to return the damaged resource and/or services to their baseline conditions (for water and nature damage[740])."[741] Thus, for example, the actions of an operator to stop a leakage (which causes environmental harm) would amount to primary remediation.

What can the operator do to stop a leakage?[742, 743]

In case a storage site starts to leak, the operator has a number of choices as to what to do. There is no universal best method. The appropriate solution depends on which brings the least disadvantages, that is, the result of the risk assessment.

In cases where the net balance of carbon dioxide remains negative and there are no environmental concerns, it may be better to leave the site to leak. In the meaning of the CCS Directive, this solution is not acceptable in the EU. A leak must be stopped even if it has no further consequences.

Thus the operator may stop the injection and reduce the bottom-hole pressure. Faster solutions are venting (releasing CO_2 to the atmosphere) or, preferably, diverting the CO_2 to another site. It is standard practice for sites to have redundant injection wells which allow diversion into other areas.

[739] Para.1(a) and para.1.1.1, Annex II; ELD
[740] As opposed to land damage.
[741] See fn.677, p.11
[742] This box is based on pers. comm. from Prof. Andrew Garnett, University of Queensland, Australia; 07 Apr 2015
[743] Also see for further detail: European Commission, *Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide, Guidance Document 2, Characterisation of the Storage Complex, CO_2 Stream Composition, Monitoring and Corrective Measures*, 2011; para.4.4. and DNV, *CO_2 Storage - Is it safe?, Towards large scale implementation of CCS*, Research and Innovation, Position Paper 06 – 2010, pp.17-8

If it is a well that is leaking, it may be cement squeezed or plugged and abandoned. If the leak happens through a geological fault, a relief well can be drilled to drive the pressure away or a barrier substance may be injected (this latter method works with less certainty). If the leak is diffuse, i.e. it takes place over a wider area, venting or diverting may be a possibility. In theory, it could also be possible to inject an appropriate substance above the cap rock to increase the over-burden pressure. However, leaks from fault and diffuse leaks are the results of poor site selection.

Box 5.1

The purpose of complementary and compensatory remediation is revealed by their definitions.[744] Complementary measures are defined as "any remedial measure taken in relation to natural resources and/or services to compensate for the fact that primary remediation does not result in fully restoring the damaged natural resources and/or services… Where the damaged natural resources and/or services do not return to their baseline condition, then complementary remediation will be undertaken. The purpose of complementary remediation is to provide a similar level of natural resources and/or services, including, as appropriate, at an alternative site, as would have been provided if the damaged site had been returned to its baseline condition. Where possible and appropriate the alternative site should be geographically linked to the damaged site, taking into account the interests of the affected population."[745]

Compensatory remediation in turn is "any action taken to compensate for interim losses of natural resources and/or services that occur from the date of damage occurring until primary remediation has achieved its full effect… Compensatory remediation shall be undertaken to compensate for the interim loss of natural resources and services pending recovery. This compensation consists of additional improvements to protected natural habitats and species or water at either the damaged site or at an alternative site. It does not consist of financial compensation to members of the public."[746]

Interim losses are "losses which result from the fact that the damaged natural resources and/or services are not able to perform their ecological functions or provide services to other

[744] Para.1, Annex II, ELD
[745] Para.1(b) and para.1.1.2, Annex II; ELD
[746] Para.1(c) and para.1.1.3, Annex II; ELD

natural resources or to the public until the primary or complementary measures have taken effect. It does not consist of financial compensation to members of the public"[747]

It must be noted that "the distinction between complementary and compensatory remediation is very fine – both refer to actions designed to compensate for resource or service loss that is not fully compensated through primary remediation. As a practical matter, therefore, complementary and compensatory remediation measures are generally combined for purposes of scaling [748] remediation to offset interim loss."[749]

"In cases of damage to protected species and natural habitats, primary remediation refers to measures that restore the damaged habitat of a protected species or a damaged natural habitat, the most important of which include supporting natural recovery by means such as … measures to prevent further chemical damage…"[750] Types of primary remediation may include the acceleration of recovery to baseline condition by the re-establishment of baseline vegetation community composition and structure, components of the food web that support fish and wildlife, and the physical habitat.[751] Stocking may also be required.[752] In other cases natural recovery may be sufficient supported by monitoring and limitation on the use of the affected area.[753] Primary remediation actions may also need to address damage that has arisen from the remediation itself.[754]

Where the competent authority undertakes the reparation, it must claim against the operator within five years from the time the measures have been completed or the responsible party has been identified, whichever is later. The ELD does not grant compensation rights to individuals or legal persons.

Article 12 of the ELD grants the right to certain third parties to submit observations related to environmental damage or the imminent threat of such damage to the competent authority and to request the competent authority to take action under the ELD.[755] This provision corresponds with the public participation objective of the Aarhus Convention on Access to

[747] Para.1(d), Annex II; ELD
[748] See Section 7.
[749] Fn.677, p.12
[750] Fn.677 ,pp.45-6
[751] Fn.677 ,p.46
[752] Fn.677 ,pp.45
[753] *Ibid.*
[754] Fn.677, pp.46-7
[755] Art.12; ELD

Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.[756] (Access to information is provided for today by Directive 2003/4/EC[757], and access to justice in the ELD's context is covered by Article 13 of the ELD.) The ELD recognises that environmental protection is a diffuse interest and that individuals may not act or may not be in the position to act.[758] Therefore, to broaden the scope of potential applicants, non-governmental organisations promoting environmental protection are also allowed to submit observations and to request the competent authority to act in case they fulfil the necessary requirements under national law.[759] In particular, the terms 'sufficient interest' and 'impairment of a right' are determined by the Member States.[760] Article 13 of the ELD grants a right of review to persons and entities which were given rights under Article 12.

The ELD requires EU Member States to encourage the development financial instruments covering environmental liability[761], so that compensation from operators is not dependent on their financial status alone. Art.14, para.2 of the ELD foresees the possibility of creating a harmonised mandatory financial security. In 2010 the European Commission has found that it was too early to propose mandatory financial security at EU level.[762] The 2014 Report on the ELD has not been published at the time of writing. Independently from this provision, it has been investigated whether it would be feasible to create a fund to cover environmental liability and losses occurring from industrial accidents.[763] The study summarised that the creation of such fund would have benefits. However, several questions would need to be clarified, and the industry is opposed to the creation of such fund.[764]

The ELD permits EU member states to apply more stringent rules. Thus the ELD only describes the minimum liability provisions. This freedom together with the optional implementation of the permit exception and state-of-the-art exception[765] can be the basis for substantially different environmental liability regimes for CCS.

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[756] 2161 UNTS 447
[757] OJ L 41, 14.2.2003, p. 26–32
[758] Recital (25) of the ELD's Preamble
[759] Art.12, para.1; ELD
[760] *Ibid.*
[761] Art.14, para.1; ELD
[762] COM(2010) 581, 12.10.2010, para.4.2
[763] BIO Intelligence Service et al. (2012) Study to explore the feasibility of creating a fund to cover environmental liability and losses occurring from industrial accidents, Final report prepared for European Commission, DG ENV
[764] *Ibid.*, pp.5-14
[765] These exceptions are discussed below.

5.5.2 The link between the CCS Directive and the ELD

First, measures have to be in place under the CCS Directive which prevent significant irregularities. A significant irregularity is an irregularity or condition which implies the risk of leakage, damage to the environment, or to human health.[766] Measures to prevent significant irregularities should not be confused with preventive measures under the ELD. The former is understood here to be taken in advance, as part of the CCS operation. In other words, these are safety measures. The latter, on the other hand, are in response to an imminent threat of environmental damage.[767] In case a significant irregularity arises or if there is a leakage[768] despite measures in place to prevent these, corrective measures have to be taken (CCS Directive).[769] If the significant irregularity in question is a risk of damage to the environment and it is imminent, preventive action has to be taken under the ELD.[770] In this case corrective measures and preventive action may overlap. Remedial action under the ELD covers the restoration of the affected resources or services as close to baseline condition as possible.[771, 772] Thus, stopping a leakage may be a corrective measure if it is not severe enough to cause environmental harm (CCS Directive), or it may be a preventive measure if it is serious enough to pose an imminent threat of damage (ELD), or it may be a form of primary remediation if environmental damage has already occurred (ELD).

5.5.3 The transfer of liability

The CCS Directive provides for the post-closure transfer of liability from the CCS operator to the national authority in its Article 18. The relevant requirements are:

> "(a) all available evidence indicates that the stored CO2 will be completely and permanently contained;

[766] Art.3, para.17; CCS Directive
[767] Art.2, para.10; ELD
[768] N.B. The definition of significant irregularities in the CCS Directive lists the risks of leakage, damage to the environment, or human health. On the other hand, the definition of corrective measures splits these concepts; it refers to leakage and significant irregularities.
[769] Art.3, para.19; CCS Directive
[770] See Art.5, para.1, ELD
[771] See the section above.
[772] If the ELD Training Handbook's interpretation of primary remediation is accepted (see fn.749 and related text), then the halting of leakage may be seen as a form of primary remediation in case the leakage causes environmental damage.

(b) a minimum period, to be determined by the competent authority has elapsed. This minimum period shall be no shorter than 20 years, unless the competent authority is convinced that the criterion referred to in point (a) is complied with before the end of that period;

(c) the financial obligations referred to in Article 20 have been fulfilled;

(d) the site has been sealed and the injection facilities have been removed."

It is clear that requirements (b) to (d) can be practically assessed. The passage of a specific period of time, the discharge of financial obligations, the sealing of the site and the removal of injection facilities are clear points to test. However, the first requirement of completely and permanently contained CO_2 is arguably too strict as any indication of leakage, even at small amounts, will make it impossible to satisfy it. In such case the post-closure transfer of liability cannot take place, and the CCS operator will remain liable until all conditions are satisfied. It may not be possible to meet this requirement unless the CCS Directive is interpreted in a particular way.[773] It is certain on the other hand that at the time of the transfer there must be no leakage at all.[774]

In Article 18 the 20 year minimum period is a condition to be met after the storage site has been closed. Article 2, para.20 defines 'closure' as "the definitive cessation of CO_2 injection into that storage site". The sealing of the storage site and the removal of the injection facilities is the operator's obligation.[775] On strict reading, Article 17, para.2 means that the sealing of the storage site and the removal of the injection facilities comes, or may come, after the closure of the storage site and thus distinct from 'closure'. This leads to the conclusion that the 20 year minimum period runs from the time the storage site has been closed by the definite cessation of the injection regardless whether the storage site has been sealed and the injection facilities removed. During the drafting procedure the European Parliament has suggested on its first reading[776] an amendment to Article 17, para.2 to state that "[c]losure shall not be complete until the operator has sealed the storage site and removed the injection facilities." However this amendment has not been adopted in the final version of the CCS Directive. The CCS Directive does not detail what is comprised in the

[773] For further elaboration on this see Appendix B.
[774] Art.18, CCS Directive and ibid.
[775] Article 17, para.2; CCS Directive
[776] Report A6-0414/2008, 16.10.2008

'removal of injection facilities'. However, other binding international agreements and guidelines indicate that, subject to exceptions, complete removal is necessary.[777, 778]

5.5.4 Policy considerations[779]

The problem of environmental liability for substances stored within the ground for a long period of time imposes several issues. Legal arrangements already exist in relation to contamination of land. In such cases the policy objective of cleaning up the area without burdening the tax payer overtakes issues of fault and causality. Thus, in most cases liability for the remediation of hazardous lands is on the person who caused the contamination or environmental damage and in certain circumstances the owner, occupier or lessee of the land.[780] For example, in the UK, Belgium, the Netherlands, Germany and Sweden the owner of the land can be liable as well as the operator, whereas in Denmark the owner of the land cannot be liable.[781] In France the owner or occupier of the site is not liable unless it is a *de jure* or *de facto* operator.[782] In Norway the law does not state that the owner of the land may be liable.[783] The applicable rules on when the owner of the land is liable are highly specific for each Member State.[784]

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[777] See: OSPAR Decision 98/3 on the Disposal of Disused Offshore Installations, para.2, and Communication from the Commission to the Council and the European Parliament on Removal and Disposal of Disused Offshore Oil and Gas Installations, COM(1998) 49 final, 18.02.1998
Also see: IMO Resolution A.672(16), Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone; UNCLOS, Article 60, para.3; 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter of 29 December 1972, Article 1, para.4(2) and Article 4, para.1; 1972 International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Article III, para.1(a)(ii) and Article IV

[778] In the UK the relevant provisions can be found in s.30 of the Energy Act 2008 pointing to Part IV of the Petroleum Act 1998. In France, Art.14 of the law n° 68-1181 of 30 December 1968 prescribes complete removal.

[779] This section has been contributed by Professor Michael Tsimplis (University of Southampton) with additions and changes by the present author.

[780] It has not been argued that CCS will require the transfer of the ownership of the ground or sea bed although separation of the ownership of the ground / sea bed surface and the pores where storage takes place is an issue that has been discussed. The ownership of the stored CO_2 is another subject that may be of concern when liability is discussed.

[781] See: ELD Implementation Study, Legal Analysis: BIO Intelligence Service (2013), Implementation challenges and obstacles of the Environmental Liability Directive, Annex — Part A: Legal analysis of the national transposing legislation prepared for European Commission — DG Environment. In collaboration with Stevens & Bolton LLP.

[782] *Ibid.*, p.90

[783] H C Bugge, *Environmental Law in Norway*, (Kluwer Law International, 2011), p.152, paras.373-4

[784] For example: In the UK the owner or the occupier of the contaminated land is liable if the person causing or knowingly permitting the contamination cannot be found (fn.781, p.359; Environmental Protection Act 1990, Part IIA, s.78F). By contrast, in the Netherlands "[t]he owner or lessee of contaminated land may also be liable for investigating and remediating contamination that occurred on or after 1 January 1987. That is, if the polluter cannot be identified, no longer exists or is not financially viable, the owner or lessee must remediate the

As far as the seabed is concerned, the ownership is typically with the coastal state. For example, in the UK the seabed (and the relevant rights beyond the territorial sea) is owned by the Crown Estate[785], in France the seabed is in public ownership.[786]

Whether private entities can obtain ownership of the seabed is a question of national law but it is not a common position across the Member States. Thus post-closure, either the CCS operator would remain liable for a limited or unlimited period or environmental liability must shift to the state. While this general principle is easy to identify there are many alternative ways of applying it. The appropriate balance between the interests of the operator and society can only be found if the risks associated with CCS are understood and there will be a long learning curve for this. The present legal situation includes a wide variety of international examples. Within the USA different states have adopted different liability models. In most cases transfer of responsibility for monitoring is coupled with transfer of liability for damage. Such transfer will occur between 0-30 years from closure and is supported by different combinations of funding arrangements some of which specify a fee per ton of CO_2 stored while others leave this issue for future determination.[787, 788] Another example can be drawn from the nuclear industry. Nuclear wastes are managed in different ways by each state. Some states permit private entities to be responsible, others create public bodies or transfer the responsibility for the long-term management to existing public bodies.[789]

The uncertainty in terms of the risks involved with CCS make the identification of optimum legal arrangements difficult. Thus, if the transfer of liability for the CCS operators can never be effected due to, for example, some leakage occurring, then the financial costs of CCS operations and their viability against renewables will become doubtful. This issue is not

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contamination if the contamination poses a risk to human health and the environment. The order requiring the owner or lessee to remediate the contamination cannot, however, be served if it proves that: it did not have a permanent legal relationship with the polluter when the contamination was caused; it was not directly or indirectly involved in the activity that caused the contamination; and when it acquired the freehold or leasehold interest in the land, it did not know or should not have known of the contamination, or on 1 January 1987, the owner or lessee and its successors in title satisfied the first two conditions. [Under the last preceding point,] if a long-term legal relationship existed at the time of the contamination, the owner or lessee must prove that it was not involved in the contamination and the contamination was not unlawful. If the owner or lessee is liable (as set out above), the liability continues after it disposes of its interest in the land." (fn.781, pp.216-7)

[785] Territorial Sea Act 1987 and Continental Shelf Act 1964, s.1

[786] Code général de la propriété des personnes publiques, Article L2111-4

[787] Javedan, H., "Regulation for Underground Storage of CO2 Passed by U.S. States", Working Paper, September (2013)

[788] See also section 4.8 above.

[789] EDRAM Report on Radioactive Waste Ownership and Management of Long-term Liabilities in EDRAM Member Countries, June 2005
http://www.edram.info/fileadmin/edram/pdf/EDRAMWGonWOwnershipFinal_271005.pdf

presently satisfactorily resolved. Note though that leakage, especially at low rates, will not necessarily cause environmental damage under the ELD and therefore, while liability would not be transferred under the CCS Directive, liability for remediation would not arise. However, liability under the CCS Directive for corrective measures and the Emission Trading System would arise. While the CCS Directive provides for transferring liability under the ELD from the operator to the state, additional liabilities such as other forms of environmental damage, property damage, and loss of life or personal injury will depend on the applicable laws of each state and need to be taken into account.

5.6 What are the limits on the CCS operator's liability?

5.6.1 Time bar

The ELD contains two articles which influence its temporal scope. As it has been referred to above, Article 10 limits the competent authority's power to recover from the liable operator or third party to five years counted from the time the competent authority's measures have been completed or from when the liable party has been identified, whichever is the later.

Article 17 states that the Directive does not apply to "damage, if more than 30 years have passed since the emission, event or incident, resulting in the damage, occurred." Where damage is caused by prolonged leakage of a CCS storage site there is no event or incident. It could thus be argued that the time bar may not be relevant, or if relevant, it will only apply 30 years after the emission (leakage) has stopped.

It must be noted that Article 17 of the ELD refers to 'damage' only and does not include the monitoring and corrective measures under the CCS Directive. The monitoring obligation and the obligation to take corrective measures as transferred to the competent authority under the CCS Directive extend into perpetuity.

5.6.2 Financial limits

There is no limitation of liability in the ELD, nor is there limitation in relation to the kind and extent of environmental damage to be remediated other than that inferred from the definition of environmental damage. The ELD demands remediation which restores the damaged environment to its baseline level. However, this requirement is subject to Article 1.3.3 of Annex II which provides that

> "… the competent authority is entitled to decide that no further remedial measures should be taken if:
>
> (a) the remedial measures already taken secure that there is no longer any significant risk of adversely affecting human health, water or protected species and natural habitats, and

(b) the cost of the remedial measures that should be taken to reach baseline condition or similar level would be disproportionate to the environmental benefits to be obtained."

It follows that the size of the liability which an operator has to be able to cover depends on the damage caused and on the discretion of the competent authority.

Regarding civil claims, it is provided in the particular provisions of the Member States whether there is a limit on the kind and the extent of the recoverable damage. As it has been discussed above, such limits exist under international regimes relating to various forms of pollution.

5.7 What are the exceptions and defences available to the CCS operator?

The operator avoids liability where the damage or the imminent threat of damage is caused by: a) armed conflict, hostilities, civil war or insurrection, or b) a natural phenomenon of exceptional, inevitable and irresistible character.[790] The ELD seeks to exclude from its scope damage which arises due to pollution of a diffuse character;[791] where environmental damage is caused by diffuse pollution, the ELD imposes liability only where causality can be determined with respect to individual operators.[792] Under the ELD it is for the competent authority to determine which operator has caused the damage or threat of damage.[793] It seems therefore that the burden of proof rests with the competent authority in the case of diffuse pollution too. The particular requirements for establishing causation are in the domain of national law.[794] For offshore CCS this means that where there are multiple storage sites in the same region and there is environmental damage or an imminent threat of environmental damage, then liability will only be imposed if the damage or the imminent threat of it can be attributed to specific storage sites.

The operator is not to bear the cost of preventive or remedial measures if the environmental damage or the imminent threat of it was caused by a third party or it resulted from

[790] Art.4., para.1; ELD
[791] Recital (13); ELD
[792] Art.4, para.5; ELD
[793] Art.11, para.2; ELD
[794] See also: L Bergkamp, B Goldsmith, '*The EU Environmental Liability Directive: A Commentary*', (Oxford University Press, 2013); p.70, para.3.55

compliance with a compulsory order or instruction emanating from a public authority.[795] In the former case, it also has to be shown that appropriate safety measures were in place; in the latter case the order or instruction has to be not consequent upon an emission or incident caused by the operator's own activities.[796] These two requirements imply to a high degree no fault or negligence on the operator's part. The burden of proof is on the operator in these cases.[797]

A member state has the option to provide that the operator need not to pay for remedial actions where the operator was not at fault or negligent and the environmental damage was caused either by an expressly authorised emission or event (the permit defence), or by an emission or activity or any manner of using a product in the course of an activity which according to the state of scientific and technical knowledge at the time when the emission was released or the activity took place was not considered likely to cause environmental damage (the state-of-the-art defence).[798] The burden of proof is on the operator in these cases as well.[799] If implemented, the latter defence is of particular importance to operators. Since currently the CCS Directive requires that there be no leakage, the importance of the former defence is merely theoretical. The pertinent points regarding the exceptions to liability are summarised in the table below.[800]

Whether these exemptions apply to costs only and not also to taking preventive or remedial action has been debated; it is considered here that they apply to costs only.[801] The summary report from the 2nd ELD stakeholder conference[802] notes that "[i]t was clarified that from a legal point of view ['state-of-the-art' and the 'permit' defence] relate only to the costs of remediation but not to the application of the ELD as such – the scope of the ELD stays

[795] Art.8, para.3; ELD
[796] *Ibid.*
[797] *Ibid.*
[798] Art.8, para.4; ELD
[799] *Ibid.*
[800] This table relies on: ELD Implementation Study's Legal Analysis: BIO Intelligence Service (2013), Implementation challenges and obstacles of the Environmental Liability Directive, Annex — Part A: Legal analysis of the national transposing legislation prepared for European Commission — DG Environment. In collaboration with Stevens & Bolton LLP.
[801] See: BIO Intelligence Service (2013), Implementation challenges and obstacles of the Environmental Liability Directive, Final report prepared for the European Commission – DG Environment. In collaboration with Stevens & Bolton LLP., pp.61-62 in particular; In relation to the United Kingdom see: BIO Intelligence Service (2013), Implementation challenges and obstacles of the Environmental Liability Directive, Annex — Part A: Legal analysis of the national transposing legislation prepared for European Commission — DG Environment. In collaboration with Stevens & Bolton LLP., pp.369-370
[802] 2nd ELD Stakeholder Conference, 'Evaluating the experience gained in the ELD Implementation', Summary Report, 11 June 2013, p.11

untouched." A 2014 study on the effectiveness of the ELD understood this to be a clarification from the Commission. However, there is no statement to this effect in the summary report. As it appears in the report, it is merely a stakeholder opinion.[803] Lee has suggested a third view on the basis of the English implementation of the ELD[804].[805] With respect to remediation the exemptions also apply to taking measures. In relation to prevention, the first two exemptions (Art.8.(3)) apply to costs only. However, this interpretation is very specific to the English implementation of the ELD and accepting it assumes that the English implementation is correct. In the present author's view this is not the case. The wording of the ELD instructs for legislation which requires operators to take preventive and remedial action whose costs can be recovered. Art.5, para.4 states that "[if] the operator … is not required to bear the costs under the Directive, the competent authority may take these [preventive] measures itself" and Art.6, para.3 provides for the same with respect to remedial actions as a means of last resort. This indicates that even though the operator is exempted from the costs of the measures, the obligation to act stays with them with respect to both preventive and remedial measures. The language of the exemptions themselves also supports this view: "[a]n operator shall not be required to bear the cost…", "[t]he Member States may allow the operator not to bear the cost…", that is, the operator is not to bear the cost but it is still required to take action in both cases. Further, Art.8, para.3 of the ELD expressly applies both to preventive and remedial action, and it provides in its final sentence that "Member States shall take the appropriate measures to enable the operator to recover the costs incurred."

It must be noted at this point that contrarily to the ELD, the CCS Directive imposes absolute liability for corrective measures in case of leakage or significant irregularities. Therefore, even where a defence or exemption under the ELD applies, the operator will still liable to take corrective action and to surrender emission trading credits at their own expense.

[803] BIO Intelligence Service (2014), ELD Effectiveness: Scope and Exceptions, Final Report prepared for European Commission – DG Environment, p.151
[804] Today it is in the Environmental Damage (Prevention and Remediation) (England) Regulations 2015, SI 2015/810.
[805] M Lee, '"New" environmental liabilities: the purpose and scope of the contaminated land regime and the Environmental Liability Directive', Env. L. Rev. 2009, 11(4), 264-278, pp.273 -274

	Diffuse pollution exception	**Multiple operators**	**Limitation period**	**Defences to cost or to liability?**	**If defences to liability; suspension … during appeal?**	**Permit defence**	**State-of-the-art defence**
United Kingdom	✔	England: Joint and several Scotland: Joint and several if cannot apportion	30 years	Liability [806]	✔ [807]	✔	✔
France	✔	Proportionate	30 years	Costs	Not applicable	✘	✔
Belgium	✔ [808]	Joint and several	The Marine Order does not specify a limitation period.	"The Marine Order does not refer to any defences."	"All jurisdictions: the legislation does not provide for a suspension of a remediation notice during an appeal."	"None of the Orders adopted the permit defence."	"None of the Orders adopted the state-of-the-art defence."
the Netherlands	✘	"The rules and case law do not rule out joint and several liability. The key issue is the identity of the administrative	30 years	Third party fault and compliance with compulsory order: costs Permit defence and	No mention of suspension in the relevant Act. Summary proceedings may be	✔ but only to a limited extent "in so far as [the costs] cannot in whole or in part, be	✔ but only to a limited extent "in so far as [the costs] cannot in whole or in part, be

[806] England: not real defences, grounds of appeal; "The "defences" do not apply to preventive actions and emergency remedial actions, against which there is no appeal."; Scotland: "The defences" do not apply to emergency remedial actions…"
[807] England: "The remediation notice is suspended during an appeal unless the person hearing the appeal directs otherwise." Scotland: "The remediation notice is suspended unless there is an imminent risk to human health or an imminent threat of environmental damage and the competent authority notified the operator of this opinion when imposing the requirement in question."
[808] "Federal State: The diffuse pollution exceptions are a copy out of the ELD except that the exception in the Marine Order applies to actual damage to the marine environment provided there is a cause-and-effect relation between the damage and the activities of the ship owner or the operator."

		offenders."		state-of-the-art defence: costs after passing a reasonability check	suspended under certain circumstances.	reasonably attributed to the operator"[809]	reasonably attributed to the operator"
Germany	✔	Joint and several	30 years	Costs	"A remediation notice is not suspended during appeal."	✕	✕
Denmark	✔	Modified proportionate liability	30 years	Liability	✔	✔	✕
Sweden	✕	Joint and several but *de minimis* threshold applies to individual operators under national law.	30 years	Liability	"Orders are … suspended until the appeal process … has been completed."	✕ but used as mitigating factors	✕ but used as mitigating factors

Table 4.2 Key variations in the implementation of the ELD in the Member States under consideration

[809] "That is, the competent authority may decide not to recover part or all of the costs of the remedial measures from an operator when the authority concludes that it would be unreasonable to do so." This applies only to the costs of remedial measures.

In the meaning of the CCS Directive, the operator's responsibility under the ELD is transferred to the state after the closure of the storage site provided the operator complies with the requirements in Article 18 of the CCS Directive. The time of transfer is determined individually by each state. In some cases liability will remain with the operator for costs if the operator has been at fault.[810] Where the transfer of responsibility has been effected and there has been no fault on the part of the operator, then the competent authority takes over the responsibility for the monitoring of the storage site and remediation. Any criminal liability for environmental damage and any civil liability for damage to property or loss of life and personal injury will be subject to the relevant provisions of the national law of each Member State.

5.8 The effect of non-compliance

The measures available against non-compliant operators depend on the applicable legislation of the Member States.[811] Table 4.4 below summarises some of the key differences between states.[812]

[810] Art.18, para.7; CCS Directive: "In cases where there has been fault on the part of the operator, including cases of deficient data, concealment of relevant information, negligence, wilful deceit or a failure to exercise due diligence, the competent authority shall recover from the former operator the costs incurred after the transfer of responsibility has taken place."

[811] The ELD requires from the Member States under Article 19, para.1 to "bring into force the laws, regulations and administrative provisions necessary to comply with this Directive".

[812] This table relies on: ELD Implementation Study's Legal Analysis: BIO Intelligence Service (2013), Implementation challenges and obstacles of the Environmental Liability Directive, Annex — Part A: Legal analysis of the national transposing legislation prepared for European Commission — DG Environment. In collaboration with Stevens & Bolton LLP.

	Delay in complying with preventive or remediation order	Offences and sanctions
United Kingdom	"A delay in complying with a remediation order equates to a failure to comply with a remediation notice." Sanctions apply. Scotland: "It is an offence for a responsible operator not to comply with a request from a competent authority to take necessary remedial measures."	All UK: "A breach of transposing legislation is a criminal offence." Summary conviction: fine £5,000 max., imprisonment 3 months max. (in Scotland 1 year max.) or both Conviction on indictment: unlimited fine, imprisonment 2 years max. or both All UK :"Directors, officers and managers may be convicted if the company's offence is committed with their consent or connivance or is attributable to their neglect." Scotland: "The secretary or other similar officers of a company can be convicted if the company's offence is committed with their consent or connivance or is attributable to their neglect. In addition, the partner of a Scottish partnership may be convicted if the partnership's offence was committed with their consent or connivance or is attributable to their neglect. Equivalent provisions apply to the member, or a person purporting to act as a member, of a Scottish limited liability partnership." There is no provision for the publication of penalties.
France	Fine, max. €7,500 for a legal person and a fine of max. €3,000 for a second offence	Various criminal offences and sanctions. "The legislation does not specify any specific penalties for directors and officers if they breach the transposing legislation." The publication of penalties may be ordered.
Belgium	All regions: "The transposing legislation does not specify any particular sanctions for a delay in complying with a preventive or remediation order."	Federal State: no sanctions in the ELD transposing legislation. However, there are sanctions in the Law of 20 January 1999 concerning the protection of the marine environment (articles 49-60) There is no mention of directors' and officers' liability in the transposing legislation. There is no mention of publication of penalties in the transposing legislation.
the Netherlands	"There are no specific sanctions for failing to comply with a preventive or remediation order. However, these are included in the General Administrative Law Act."	The Economic Offences Act with the Environmental Management Act, the Guidelines for Title 17.2 of the Environmental Management Act and the General Administrative Law Act establish various misdemeanours and crimes. It is not specified whether directors and officers may be liable for

		breaching the ELD regime. There is no mention of the publication of penalties.
Germany	"The EDA does not mention sanctions."	"Sanctions are provided for in the German Criminal Act which contains provisions on environmental crimes, in general legislation on administrative sanctions, etc." "The EDA does not mention directors and officers liability for breaching the EDA." "The EDA does not mention the publication of penalties."
Denmark	"The transposing legislation does have specific sanctions for a delay in complying with an order requiring remediation."	"Unless a more severe penalty is available under other legislation, a fine shall be imposed on any person who: fails to comply with decisions under EDA; … fails to take measures to prevent or limit the worsening of environmental damage or the increase in the damage …" The penalty may be increased to imprisonment in certain circumstances. Companies may be held criminally liable. "The transposing legislation does not indicate whether directors and officers may be liable." "The transposing legislation does not require the publication of penalties."
Sweden	"The administrative sanction charges under the Environmental Code apply; criminal law does not apply." "[T]he competent authority combines the order with an administrative fee (astreinte) which the recipient of the order must pay (in addition to the costs of complying with the order) if it fails to comply with it."	Administrative fees as explained to the left. The liability is strict. The charge ranges SEK 1,000 to 1,000,000. "The transposing legislation does not mention directors' and officers' liability for breaching the transposing legislation." "The transposing legislation does not mention the publication of penalties."

Table 4.3 The effect of non-compliance with the ELD in the Member States under consideration

5.9 Choice of law rules[813]

The question of choice of law arises when transboundary environmental damage occurs and it has to be decided which State's law is applicable to the incident. The question also arises when the environmental damage occurs within one jurisdiction but the legal remedy is sought in a foreign court, for example, the court where the defendant operator has his principal place of business. In the European Union the question of the law applicable to non-contractual obligations is resolved by the application of the ROME II Regulation.[814] This instrument is directly binding on all Member States of the EU thus there is no issue of non-uniformity in its implementation though there may be differences when the Regulation refers to national laws.

The pertinent rules here are as follows. For damages arising from non-contractual liability in general, including environmental damage, "the law of the country in which the damage occurs" will apply and this is "irrespective of the country in which the event giving rise to the damage occurred and irrespective of the country or countries in which the indirect consequences of that event occur."[815] For environmental damage and damage to property from environmental damage the aforementioned rule applies "unless the person seeking compensation for damage chooses to base his or her claim on the law of the country in which the event giving rise to the damage occurred."[816]

There is no definition of environmental damage within the main text of the ROME II Regulation. However, in its preamble it is stated that

> "*'Environmental damage' should be understood as meaning adverse change in a natural resource, such as water, land or air, impairment of a function performed by that resource for the benefit of another natural resource or the public, or impairment of the variability among living organisms.'*"[817]

[813] This section has been written with the contribution of Professor Michael Tsimplis (University of Southampton).
[814] Regulation (EC) No 864/2007 on the law applicable to non-contractual obligations (ROME II); OJ L 199, 31.7.2007, p.40
[815] Art.4; ROME II
[816] Art.7; ROME II
[817] Recital (24), Preamble; Rome II

This definition is wide enough to cover damage under the ELD. However, only "civil and commercial matters" are covered under the scope of ROME II. The term "civil and commercial matters" has been interpreted by the European Court of Justice and has been held not to include claims which can only be exercised by statutory authorities in their capacity as such.[818] Liability under the ELD can only be imposed by the competent authority. Being a statutory authority, its claims do not fall under the scope of ROME II. Notably though, any other liability rules for environmental damage which can be exercised more generally, for example damages arising in tort, would be subject to ROME II.

It also has to be asked whether ROME II applies to non-contractual liability outside the territorial areas of the Member States. If the answer to this is no, then the individual conflicts of laws rules of the Member States will apply. Since Member States have some jurisdictional rights and responsibilities in relation to the marine environment of their EEZ, it is assumed that the intention is to apply ROME II to such conflicts to the extent that only environmental damage is concerned.

Considering that the implementation of the ELD differs in the Member States, the best solution seems to be to apply the law of the state where the activity has been licensed and to co-operate with other affected states for the purposes of remediation under Article 15 of the ELD. This solution allows the operator to be judged according to the laws of the licensing state and permits remediation and/or compensation of expenses for other states by the licensing state.

[818] See Case 814/79 and in the context of Brussels I (EC Regulation 44/2001): ECJ Case C-645/11, paras.32-33

Chapter 6: The liability framework in the UK for using ships and pipelines for offshore CCS operations

The transport of carbon dioxide for the purposes of CCS has received little attention to date both from academia and law makers. It is planned to be based on new and existing pipeline networks with some modifications. For countries and power plants where no such networks exist the use of ships is a feasible option.[819] This chapter will focus on the existing environmental liability systems in the UK for transport by pipelines.

The role of the common law for pipeline liability is limited.[820] It is not an adequate ground to address environmental damage beyond the territorial sea due to lack of ownership and interest in land. In the territorial sea, the tort of negligence may play a role. However, this demands proving by the claimant that the defendant owed a duty of care, that the defendant breached this duty, that the breach has caused the damage, and that the damage was foreseeable in type.[821] Proving fault by the pipeline operator or its contractors may be a disproportionate burden on the claimant. For pipeline transport, there is no specific liability system in the UK. The applicable liability law is in various regulations. This is unsatisfactory. Pipeline transport should receive a regime similar to the international shipping liability system as in certain jurisdictions this has already happened.

6.1 The environmental liability regime for transport by pipelines

Even though pipelines are a safe mode of carrying substances if maintained with diligence, pipeline leaks are not uncommon. The recent pipeline burst on the California coast is an example of such accidents.[822] 21 000 US gallons (79 494 litres) of crude oil has been spilled into the Pacific Ocean affecting marine life and coastal birds.[823] About five times of

[819] Yoo B-Y et al (2013), A feasibility study on CO_2 marine transport in South Korea. Energy Procedia, 37, 3199-3211.

[820] For a discussion of this issue in the context of offshore petroleum operations see: G Gordon, Oil, water and law don't mix: environmental liability for offshore oil and gas operations in the UK, Part 1: Liability in the law of tort/delict and under the petroleum licence, (2013) 25 ELM 3 (Gordon 1); G Gordon, Oil, water and law don't mix: environmental liability for offshore oil and gas operations in the UK, Part 2: Regulatory law, the Environmental Liability Directive and OPOL, (2013) 25 ELM 121 (Gordon 2)

[821]

[822] For the news coverage see: http://edition.cnn.com/2015/05/20/us/california-oil-spill/; http://www.latimes.com/local/california/la-me-oil-spill-plains-20150605-story.html#page=1;

[823] Ibid.

this amount has been spilled onshore. CO_2 pipelines also carry certain risks[824], and the question of environmental liability is equally relevant. Just like CCS itself, subsea CO_2 pipelines are also an already existing solution. Hammerfest in Norway is connected to the Snøhvit oil field in the Barents Sea by a 160 km offshore pipeline.[825] As UK projects also opt for this form of transport[826], it is apposite to investigate what liabilities operators may bear should environmental damage occur.

As it has been said above, there is no international liability regime applicable to damages caused by pipelines and the common law rules are of little significance. In case of environmental damage, certain UK regulations, including the implementation of the ELD,[827] and perhaps the licensing regime may be applicable.

6.1.1 The licensing system

Gordon has argued in relation to petroleum licences granted under the Petroleum Act 1998 (applying specifically to the 'searching for, boring and getting of' petroleum) that it may be possible to establish environmental liability on the basis of the model clauses[828] which it contains. The legal nature of the petroleum licence is both regulatory and contractual[829], and licences contain a model clause on the 'avoidance of harmful methods of working'.[830] It provides in relevant part that

"The Licensee shall maintain all apparatus and appliances and all Wells in the Licensed Area which have not been abandoned and plugged as provided by clause 19 of this licence in good repair and condition and shall execute all operations in or in connection with the Licensed Area in a proper and workmanlike manner in accordance with methods and practice customarily used in good oilfield practice and without prejudice to the generality of the foregoing provision the Licensee shall take all steps practicable in order — (a) to control the flow and to prevent the escape or waste of Petroleum discovered in or obtained

[824] See: Polytec; A. Oosterkamp, J. Ramsen; State-of-the-Art Overview of CO_2 Pipeline Transport with relevance to offshore Pipelines, Report number: POL-O-2007-138-A; 8 January 2008; Chapter 18
[825] Parliamentary Office of Science and Technology; Postnote, CO_2 Capture, Transport and Storage; June 2009, No.335
[826] See: Yorkshire and Humber CCS Project (http://www.ccshumber.co.uk/the-project.aspx last accessed: 24 April 2015), Peterhead CCS project (http://www.shell.co.uk/energy-and-innovation/the-energy-future/peterhead-ccs-project.html last accessed: 24 April 2015)
[827] OJ L 143, 30/04/2004, p. 56–75; latest consolidated version: 02004L0035-20130718
[828] Model clauses are predefined standard terms which are to be incorporated into the petroleum licence. The Secretary of State may modify or exclude these if he thinks it to fit. See: s.4(1)(e), PA 1998.
[829] See Gordon at p.10.
[830] Clause 23, Sch.1, Petroleum Licensing (Production) (Seaward Areas) Regulations, SI 2008/225

from the Licensed Area … (e) to prevent the escape of Petroleum into any waters in or in the vicinity of the Licensed Area."

Gordon finds that this clause has bearing on environmental damage.[831] If the operator does not comply with it, he is in breach of contract and the losses arising from the breach may be claimed by the Minister. Similarly to common law, liability through this way of recovery is not strict. If the operator can demonstrate that he acted according to the 'methods and practices customarily used in good oilfield practice' he will not be in breach of his licence.[832] As Gordon notes himself in relation to his argument, it has not been much discussed and contemplates the existence of the OPOL scheme[833] as a reason for this.[834] An additional consideration may be that as long as the territorial sea is concerned the Crown may have a claim for the loss of or damage to or the remediation of property as its owner. However, in the EEZ the questions may arise to what extent the State is obliged to remediate environmental damage and whether the State can recover if it incurs losses without being legally obliged to remediate.[835] More importantly, it appears that the clause in question is not geared specifically towards environmental liability, and the method suggested is an indirect solution.

Nevertheless, it should be asked whether the licensing regime could be used in a similar way to establish liability in case of environmental damage to UK waters from a CO_2 pipeline. Pipelines are subject to a separate authorisation regime under the Petroleum Act 1998, the so-called Pipeline Works Authorisation or 'PWA'. This is under Part III, which is also applicable to CO_2 pipelines because s.26 defines 'pipeline' as "a pipe or system of pipes (excluding a drain or sewer) for the conveyance of any thing, together with all apparatus, works and services associated with the operation of such a pipe or system"; indeed, s.28 defines 'controlled carbon dioxide pipelines' specifically. Unlike for

[831] Gordon, pp.10-1.
[832] See also: Gordon, p.11
[833] OPOL stands for 'Offshore Pollution Liability Agreement'. It is a voluntary (In the UK, statutory regulation makes it in effect compulsory. See: Gordon, p.126) contractual agreement between offshore operators engaged in the production of oil. It prescribes compensation for remedial measures and for pollution damage resulting from oil pollution. The former can be claimed by public authorities, the latter can be claimed by anyone affected. The liability is strict but limited to $ 250m. For a description and analysis see: http://www.opol.org.uk/index.htm, and Gordon 2, pp.126-9
[834] Ibid.
[835] In light of R v Secretary of State for Trade and Industry ex parte Greenpeace (see fn.870) European environmental legislation may have relevance beyond the territorial sea. However, the Environmental Liability Directive does not oblige Member States to remediate environmental damage. (V Fogleman, Enforcing the Environmental Liability Directive: Duties, Powers and Self-Executing Provisions, [2006] 4 Env. Liability 127; p.132) Thus, at the European level an obligation can be established only indirectly through the Water Framework Directive and the Marine Strategy Framework Directive.

petroleum licences, there are no model clauses provided for PWAs. It depends on the particular terms of the PWA granted whether an argument which is similar to Gordon's would be available in the case of pipelines. Since there is no sample PWA available to the public the followings are contemplations of the present author and depend on the PWA having a contractual nature as well. Section 15(3) of the Petroleum Act prescribes in indent (h) that any authorisation may contain terms as to "the operation of the pipeline, including the methods by which it is to be operated and the persons by whom it may be operated." A term as to the diligent operation of the pipeline could be introduced under this heading, and such a term could be a ground for establishing indirect liability for environmental damage in a similar manner to the above. Indent (j) provides that the authorisation may have terms as to "the giving by the Secretary of State, with respect to matters specified in the authorisation, of directions which shall have effect as terms of the authorisation." If such terms are introduced into the PWA in relation to an inserted environmental term; the Secretary of State can intervene, and thereby to impose environmental liability. Apart from these considerations, indent (e) of the section in question provides for "the steps to be taken to ensure that funds are available to discharge any liability for damage attributable to the release or escape of any thing from the pipeline." A term like this could clearly cover environmental damage.

6.1.2 The regulatory framework

Gordon has identified three instruments which may impose some form of environmental liability on the operator. Two of these regulations[836] are not applicable in the present context. However, one necessitates separate discussion in this setting too, as well as other regulations.

6.1.2.1 Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005

Although the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005[837] have been devised for oil pollution cases from offshore installations, tracing its amendments necessitates some discussion in this context. Reg.4(d) of the Offshore Petroleum Activities (Oil Pollution Prevention and Control) (Amendment)

[836] Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation Convention) Regulations 1998, SI 1998/1056; Offshore Installations (Emergency Pollution Control) Regulations 2002, SI 2002/1861
[837] SI 2005/2055

Regulations 2011[838] amends reg.2 of the 2005 Regulations to include pipelines which are "used for the purposes of, or in connection with, *any activity* in respect of which the Secretary of State exercises functions under the Petroleum Act 1998". As it has been discussed above, the Petroleum Act 1998 governs the authorisation of laying and using offshore pipelines, including pipelines for the purposes of CCS. Thus, formally, the 2011 amending regulations make the 2005 Regulations applicable to offshore CCS pipelines.[839] However, the gist of the instrument, regulations 3, 3A, and 14 on tying discharges to permits, prohibiting releases, and prohibition notices in case of an 'imminent risk of serious pollution' refer to oil only.[840] The two regulations leave the impression that although the broad wording of 'any activity' in reg.4(d) of the 2011 Regulations includes the use of CCS pipelines as well as pipelines "for the conveyance of any thing…"[841], the 2011 Regulations did not intend to include CCS pipelines in the amendment of the 2005 Regulations; indeed, it seems that the 2005 Regulations are to apply only to pipelines conveying oil.

6.1.2.2 Pipelines Safety Regulations 1996

The Pipelines Safety Regulations 1996[842] prescribe rules for the design, construction, operation, maintenance, and decommissioning of onshore and offshore pipelines.[843] Liability arising under this instrument is not environmental in the strict sense. Contravening these regulations is an offence[844] which is subject to a narrow exception.[845] The PSR apply in all areas where the pipeline runs.[846] The regulations distinguish between pipelines in general and so-called 'major accident hazard pipelines' or MAHPs, which are also subject to Part III of the Regulations. A pipeline falls under the latter category if it

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[838] SI 2011/983

[839] It may be also considered that in reg.23, the Offshore Petroleum Activities (Oil Pollution Prevention and Control) (Amendment) Regulations 2011, SI 2011/983 amend art.9 of the Energy Act 2008 (Consequential Modifications) (Offshore Environmental Protection) Order 2010, SI 2010/1513 to state that the 2005 Regulations apply to "an installation or pipeline established or maintained for the purpose of an activity within section 2(3) or section 17(2) [of the Energy Act 2008] as they apply to an offshore installation as defined in regulation 2." Section 17(2) of the Energy Act prescribes a licence requirement for CCS activities. This does not include the transport of carbon dioxide by pipelines.

[840] Contravening regs.3 or 3A or failing to comply with the terms of a prohibition notice is an offence in the meaning of reg.16.

[841] s.26, PA 1998

[842] SI 1996/825

[843] Also see: http://decarboni.se/publications/legislation-relating-co2-transport-storage/uk-laws-regulating-co2-transport-storage

[844] Health and Safety at Work etc. Act 1974, s.33(1)(c)

[845] Reg.28 of the PSR 1996;The offence has to be due to the act or default of a person other than the operator or one of his employees and the operator had to take all reasonable precautions and exercise all due diligence to avoid the commission of the offence.

[846] See: reg.4 of the PSR 1996; regs.4 and 6 of the Health and Safety at Work etc. Act 1974 (Application outside Great Britain) Order 2013, SI 2013/240; s.1(7) of the Continental Shelf Act 1964

carries a 'dangerous fluid' as it is defined in Schedule 2. The UK Health and Safety Executive have organised a consultation in 2010 on, amongst others, whether CO_2 should be regarded as dangerous fluid.[847] Although industry was generally in favour of this approach, HSE has decided to postpone this amendment until the science and evidence base develops.[848] Updates to this consultation in 2011[849] and 2012[850] have maintained this position. HSE in its own 2009 assessment of onshore pipelines recommended that CO_2 for the purposes of CCS should be classified as dangerous fluid.[851] Thus, in legal terms, CO_2 is not a dangerous liquid at the moment. However, in the 2007 UK competition for demonstration project funding, HSE required developers to consider carbon dioxide as a dangerous liquid.[852] Since 2012 several projects have considered the safety of CO_2 pipelines which may help HSE to reach a definite position.[853] It is arguable that CO_2 should be classified as a dangerous liquid on the basis of the Regulations themselves.[854]

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[847] HSE, Consultation on Amendments to the Pipeline Safety Regulations 1996 and the Health and Safety (Fees) Regulations, Consultative Document CD228

[848] HSE, Analysis of responses to the consultation on proposed amendments to the pipelines Safety Regulations 1996 and the Health And Safety (Fees) Regulations, 7 December to 1 March 2010, p.3; available at http://www.hse.gov.uk/consult/condocs/cd228-analysis.pdf

[849] HSE, Update on the proposed amendments to the Pipelines Safety Regulations 1996 following further consultation with stakeholders; Available at: http://www.hse.gov.uk/consult/condocs/proposed-amendments-Pipelines-Safety-Regulations-1996.pdf

[850] HSE, Update on the Proposed Amendments to the Pipelines Safety Regulations (PSR) 1996 - Following Further Stakeholder Consultation and Research, Annex I, paras.2-4, paper no.: HSE/12/10; Available at: http://www.hse.gov.uk/aboutus/meetings/hseboard/2012/250112/pjanb1210.pdf

[851] HSE, Comparison of risks from carbon dioxide and natural gas pipelines, Research Report RR749, 2009; pp.3, 20

[852] HSE, Amendments to the Pipeline Safety Regulations (PSR) 1996 and the Health and Safety (Fees) Regulations, paper no.: HSE/09/103, p.16; Dentons for the Global CCS Institute, The experience of CCS demonstration projects in the European Union with the transposition of the CCS Directive, October, 2013; p.9-10

[853] The CO_2PipeHaz project run until 2013 under the European Commission's Framework Seven programme (Project: Quantitative Failure Consequence Hazard Assessment for Next Generation CO_2 Pipelines: The Missing Link, Project reference: 241346, http://cordis.europa.eu/project/rcn/92935_en.html, http://www.co2pipehaz.eu/index.php; The resulting good practice guide can be accessed at http://www.hsl.gov.uk/media/396859/co2pipehaz_goodpracticeguidelines.pdf; Websites last accessed: 6 June 2015). In the onshore and offshore context the CO2PIPETRANS[853] (https://www.dnvgl.com/oilgas/innovation-development/joint-industry-projects/co2pipetrans.html, last accessed: 7 June 2015; For the results see: DNV-RP-J202) and CO2RISKMAN[853] (https://www.dnvgl.com/oilgas/innovation-development/joint-industry-projects/co2riskman.html, last accessed: 7 June 2015) joint industry projects led by DNV should be mentioned and the specifically offshore SUB-C-O2 project[853] (http://www.offshoreenergytoday.com/dnv-gl-launches-jip-to-address-risk-from-offshore-co2-releases/, last accessed: 7 June 2015; http://www.arcweb.com/Blog/Post/37/DNV-GL-Cooperates-With-Industry-to-Address-Risks-from-Offshore-CO2-Pipelines, last accessed: 7 June 2015; Brown, H Holt, K Helle, Large Scale CO_2 Releases for Dispersion Model and Safety Study Validation, Energy Procedia 63 (2014) 2542 – 2546) also led by DNV.

[854] Paragraph 3 of Schedule 2 defines a liquid "which has a vapour pressure greater than 1.5 bar absolute when in equilibrium with its vapour at either the actual temperature of the liquid or at 20°C" as a dangerous fluid. Carbon dioxide exercises a pressure of around 60 bars in such conditions (http://encyclopedia.airliquide.com/encyclopedia.asp?GasID=26#VaporPressureGraph last accessed 24 April 2015). Indeed, the offshore leg of the Yorkshire and Humber pipeline is planned to transport CO_2 at 200 bar pressure (http://www.ccshumber.co.uk/the-project.aspx last accessed 24 April 2015).

6.1.2.3 Environmental Permitting (England and Wales) Regulations 2010

The 2010 Regulations have been made under the powers conferred by the Pollution Prevention and Control Act 1999[855] which has been enacted "to make provision for implementing [the Integrated Pollution Prevention and Control Directive or IPPC Directive[856]] and for otherwise preventing and controlling pollution; to make provision about certain expired or expiring disposal or waste management licences; and for connected purposes"[857] However, pipelines are not a regulated facility in the meaning of regs.8, 2; and para.1 of Pt.1, and Pt.2 of Sch.1.

Discharge of CO_2 from a pipeline, even if accidental, may come under the Environmental Permitting (England and Wales) Regulations 2010.[858] In the meaning of reg.12 "[a] person must not, except under and to the extent authorised by an environmental permit … (b) cause or knowingly permit a water discharge activity or groundwater activity."[859] 'Water discharge activity' is defined as the "discharge or entry to inland freshwaters, coastal waters or relevant territorial waters of any … (i) poisonous, noxious or polluting matter…"[860] The case law related to the predecessor of reg.12 (s.85 of the Water Resources Act 1991[861]) indicates that the scope of this provision is much wider than discharges tied to authorisations and encompasses discharges which were not meant to occur in any circumstances. *Environment Agency v Empress Car Co*[862] concerned a diesel tank which although had a spillage containing bund, it was overridden by a pipe connecting it to a drum. An unknown person opened the tank's tap and it was drained into the adjacent river. On the facts of the case the defendants were found to have contravened s.85 of the WRA 1991 and thereby committed an offence. In *Alphacell v Woodward* [863] a pump which was meant to transfer wash water from a paper mill's settling tank has been clogged by leaves which resulted in polluted water overflowing into the adjacent river. The defendants were

[855] Preamble to the 2010 Regulations
[856] Today it is codified in Directive 2008/1/EC, OJ L 24, 29.1.2008, p. 8–29.
[857] Preamble of the Pollution Prevention and Control Act 1999
[858] SI 2010/675
[859] The provision to the same effect for Scotland can be found in Para.4 of Schedule 23 to the Water Act 1989.
[860] Reg.2(1) pointing to sch.21, para.3 of the 2010 Regulations
[861] This can be inferred from the Explanatory note to the 2010 Regulations.
[862] [1999] 2 A.C. 22
[863] [1972] A.C. 824

found to have committed an offence under the s.2(1) of the Rivers (Prevention of Pollutions) Act 1951 which has been the predecessor to s.85 of the WRA.[864]

Both cases revolved around the question of causation. It can be noted that although the liability for pollution by a water discharge activity is not strict, the courts interpret the relevant provisions with a high threshold. As under the earlier legislation, not complying with reg.12 under the 2010 Regulations is an offence in the meaning of reg.38. Under reg.57 the regulator may 'arrange for steps to be taken to remedy the effects of pollution' and recover from the operator the costs so incurred.[865]

The territorial scope of reg.12 requires a note. 'Relevant territorial waters' is defined by reference to s.104 of the WRA 1991.[866] This provision defines relevant territorial waters as "the waters which extend seaward for three miles from the baselines from which the breadth of the territorial sea adjacent to England and Wales is measured". Therefore, the relevant territorial waters extend merely to three miles[867] as opposed to the territorial waters in general, which extend to twelve nautical miles in the United Kingdom.[868] (The 2010 Regulations as a whole apply up to the seaward boundary of the territorial sea.[869])

Since *R v Secretary of State for Trade and Industry ex parte Greenpeace*[870], depending on the circumstances, European environmental law is to have effect in the EEZ as well. However, this argument is not available in this case. The IPPC Directive applies to activities listed in its Annex I which does not refer to pipeline transport of any form. Consequently, the applicability of the 2010 Regulations to pipelines would come under the terms 'otherwise preventing and controlling pollution' and the applicability of the 2010 Regulations to a potential pipeline accident would not stem from European law.

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[864] J Attwood for Westlaw Insight, Water quality, para.15, 6 May 2014
[865] This regulation seems to overlap with ss.161A-D of the WRA 1991. See: fn.864, paras.26-30
[866] reg.2(1), 2010 Regulations
[867] The 2010 Regulations do not refer to nautical miles. The question may arise whether this is intentional.
[868] The UK has extended its original 3 nm territorial sea to 12 nm by s.1(1) of the Territorial Sea Act 1987. Subsection (5) in the same section provides that a reference to the territorial sea in any enactment or instrument shall be construed by giving effect to subsection (1). However, this provision is not applicable with respect to the distance of the territorial sea. Subsection (6) states that "nothing in [subsection (5)] shall require any reference in any enactment or instrument to a specified distance to be construed as a reference to a distance equal to the breadth of that territorial sea ." Thus, even if reg.12 referred to the territorial sea in general as opposed to the relevant territorial sea, its application would extend to three miles only.
[869] Reg.1(2), 2010 Regulations
[870] [2000] 2 C.M.L.R. 94

6.1.2.4 The Environmental Liability Directive

Environmental liability has to be addressed through the legislation implementing[871] the Environmental Liability Directive when relevant. However, unlike storage, the pipeline transport of CO_2 is not included in Annex III[872] of the Directive or Schedule 2 of the implementation; therefore, the operator's liability would not be strict but fault based. In the UK implementation the relevant standard is either intent or negligence.[873] It follows from the nature of a seabed pipeline that proving either of these may be a significant burden. Furthermore, in this case the applicability of the Directive is limited to cases of significant adverse effect to protected species or natural habitats or a site of special scientific interest.[874]

Outside Annex III the exceptions and exemptions offered by the ELD are of little importance. Since neither of the exceptions in Article 4, para.1 implies fault on the part of the operator, the ELD would be inapplicable in the first place. Equally well, the exemptions in Article 8, imply or require no fault on the part of the operator to be applicable.

6.1.2.5 The European Emissions Trading Scheme

Under the European Emissions Trading Scheme Directive (2003/87/EC)[875] certain operators must purchase or surrender allowances for the greenhouse gas emissions they make. The current UK implementation of the ETS Directive is in the Greenhouse Gas Emissions Trading Scheme Regulations 2012.[876] Directive 2009/29/EC[877] has amended the ETS Directive in order to include, amongst others, the 'transport of greenhouse gases by pipelines for geological storage in a storage site permitted under Directive 2009/31/EC'. In the meaning of Regulation 2012/601[878] on the monitoring and reporting of greenhouse gas emissions pursuant to the ETS Directive, the calculation is to include at least the "combustion and other processes at installations functionally connected to the transport network including booster stations; fugitive emissions from the transport network; vented

[871] Environmental Damage (Prevention and Remediation) (England) Regulations 2015, SI 2015/810
[872] In light of the relevant European legislation (see: Recital (46) of Directive 2009/31/EC), the pipeline transport of carbon dioxide would not be considered as transboundary shipment of waste which would bring it under the strict liability regime of Annex III of the ELD (para.12) and Schedule 2 of the 2009 Regulations (para.10).
[873] Reg.5
[874] Art.3, para.1(b), ELD and ibid.
[875] OJ L 275, 25.10.2003, p. 32–46
[876] SI 2012/3038
[877] OJ L 140, 5.6.2009, p. 63–87
[878] OJ L 181, 12.7.2012, p.30

emissions from the transport network; and emissions from leakage incidents in the transport network." In other words, in case of a carbon dioxide leak from a pipeline the operator will have to surrender emission allowances corresponding to the leaked amount CO_2. This form of liability is not dependent on the fault of the operator and thus strict.

6.1.3 The main features of pipeline liability

The potential liability for a pipeline accident is in various regulations and possibly the licensing regime. Although this system does provide for the remediation of environmental damage, it faces several difficulties. If the operator is at fault, he may be held liable for remediation of damage to specific protected areas and species or the costs of such remediation under the regulations implementing the ELD. The liability arising this way is not limited; nonetheless, the competent authority *may* decide that the costs of further remediation would be disproportionate to the benefits once any significant risk has been removed.[879] No financial security is prescribed, and there is no fund to address pipeline liability or ELD liability. On the other hand, the Emission Trading System and the Pipelines Safety Regulations 1996 impose liability of a different character and they are appropriate for that purpose. Both are a form of penalising the operator, and the limitation and inclusion of such liability into a fund would be counter-productive. In practical terms, liability is strict under both of these regulations.

The shortcomings of the present regime could be avoided by a system similar to the one in the shipping industry. The adoption of this solution in the UK would not be unique. In the United States the Trans-Alaska Pipeline Authorisation Act[880] establishes a similar system.[881] The holder of the pipeline right-of-way is strictly liable for all injuries and damages up to the limit of $50 m per incident. Above this amount the ordinary rules of negligence apply. The owners and operators of vessels carrying oil transported through the pipeline are strictly liable too up to $14 m. The regime is strict but not absolute. An act of war, the negligence of a governmental unit, or causation by the damaged party would be exemptions to it. However, on the basis of US common law and the relevant environmental impact statements, acts of God as earthquakes and tidal waves would not be exemptions from liability in Alaska and the Arctic. Another example is the Canadian Pipeline Safety

[879] ELD, Ax.II, para.1.3.3; Reg.8(3)
[880] 43 U.S.C. §§ 1651-55 (Supp. III, 1973).
[881] For a detailed analysis see: Alan G. Stone, The Trans-Alaska Pipeline and Strict Liability for Oil Pollution Damage, 9 Urb. L. Ann. 179 (1975); Available at: http://openscholarship.wustl.edu/law_urbanlaw/vol9/iss1/8

Act.[882] The operator's liability is unlimited when he is at fault or negligent. Otherwise, he is absolutely liable (i.e. no defences are available) up to CAD 1 bn. In addition, pipeline operators must maintain financial security corresponding to their size. Major pipeline operators are to make CAD 1 bn. available. It must be kept in mind that although these rules are similar to shipping liability, it is domestic law. For international pipelines, a unified regime would be a more appropriate solution.

6.1.4 Final conclusions

There are no international conventions in place for regulating liability for environmental damage from pipelines. The domestic law of the state determines this issue. In the UK, tort law may offer relief in case damage is caused to owned property or interest in land. The implementation of the Environmental Liability Directive may also be available. If an accidental discharge from a pipeline is found to be linked to the contravention of a provision in the Pipelines Safety Regulations 1996, that contravention will amount to an offence. The Emission Trading Scheme would always be applicable in connection to a discharge, even without fault on the part of the operator. Finally, it may be possible to submit a contractual claim on the basis of the authorisation.

In terms of environmental damage, this liability regime is lenient for the operator because it is fault based and the lack of limitation may be mitigated through reg.8(3) of the ELD's implementation. However, this is not a sufficiently certain solution and it exposes the operator's insurers to an uncertain financial risk. Equally well, considering the risks and the difficulties of proof, strict liability would be justified in this case too as well as the requirement for financial security. The solution has already been developed in the United States and Canada. It is suggested here to at least adopt a similar system in the UK, or to draft an international agreement with the same effect. The latter option would also bring about the advantage of legal certainty across jurisdictions and the promotion of investment.

[882] An Act to amend the National Energy Board Act and the Canada Oil and Gas Operations Act (Short title: Pipeline Safety Act), Bill C-46; Also see: http://news.gc.ca/web/article-en.do?nid=912989; Natural Resources Canada, Pipeline Safety, Canada's World-class Safety System, September 2014, available at http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/files/pdf/14-0278-%20PS_canada_world-class_safety_e.pdf

Conclusions

The findings of this discourse have broader implications than the regulation of- and liability from offshore CCS. Addressing the issues raised here would lead to a logical and more coherent international and European legal framework for the protection of the marine environment. While this is a goal in itself, the obvious advantage of this would be the easier accommodation of novel technologies deployed at sea, be it for mitigating climate change, the protection of the environment more generally, or for the responsible extraction of resources.

The first major conclusion is that conceptual clarity is essential for the interpretation of the international legal framework. The distinction offered in this thesis allows precise interpretation and it finds that CCS is compatible with UNCLOS. Once it is certain how an activity or concept fits into the existing regime, policymakers can evaluate whether the law serves the policy sought to be implemented and to adjust the law if necessary.

Apart from the concept of pollution, an activity may be allowed or hindered on the basis of highly technical considerations as the international dumping regime indicates. Both under the London Protocol and the OSPAR Convention the status of CCS has been resolved by express amendment. While the use of express amendments is not a wrong technique in itself, in the present case this is not a satisfactory solution because – as the debates between the State Parties shows – no agreement has been reached on the meaning of these instruments in the context of CCS. This is the reverse of the problem in the paragraph above. First there should be an agreement as to the meaning of the relevant laws, only then it can be known whether an activity or concept comes under them; finally a separate agreement can be made if necessary to mirror policy.

Aside from not being logical to put policy ahead of interpretation, it also has two major pitfalls. The first is exemplified with the OSPAR Convention. Although CCS is permitted now under this treaty, due to lack of agreement on relevant concepts, it is not possible to know under which of its annexes would different types of offshore CCS fall.

The more important problem is best illustrated by the debates surrounding the London Convention. The State Parties wish to follow different interpretations according to their policies. Logic and language becomes subjected to policy instead of policy using logic and language to describe its aim. To date, there is no authoritative, express opinion on whether offshore CCS is permitted under this treaty and on what ‘at sea’ means. This is not

satisfactory not only from the standpoint of CCS but any other activity that may fall under this Convention.

An illustration of the contrary is the interpretation Article 6 of the London Protocol. In this case the State Parties interpreted the law first and found it prohibitive. Since this was contrary the general policy direction, an amendment has been drafted. Since 2009 the amendment has not been ratified by the sufficient number of states to come into force. It may be fair to remark in this light that this methodology may be less efficient in some cases or uncertain. However, this does not refute the correctness of the principle; the current obstruction for the amendment to Article 6 is procedural (this varies from instrument to instrument) and not a consequence of the methodology of revising Article 6.

In the EU, CCS comes under a specifically designed Directive, the ELD, and the European Emission Trading Scheme. This forms a hybrid regime. Under the CCS Directive and the ETS, liability is absolute and financial security is required to cover such contingency. The unlimited emission trading liability is a particular concern for industry. Under the ELD, although the liability is strict, some exceptions and defences may apply and the competent authority may request a lesser degree of remediation than complete restoration if the costs would be disproportionate in comparison with the obtainable benefits. Although ELD liability is subject to the competent authority's discretion of proportionality, this is not comparable to the system developed for various forms of shipping. The obvious advantage of a limitation regime would be the encouragement of investment in activities which are useful for society, including CCS. Meanwhile, a set maximum amount of liability may encourage industries to provide financial security voluntarily (as it happened in the case of certain shipping conventions) even for ELD liability.

In relation to the defences it has been argued above that they apply only to the costs of the required measures and therefore the implementation of the ELD in England is in error. The ELD also does not prescribe mandatory financial security. Industrial stakeholders in general are opposed to such proposition. Nonetheless, Member States can require the CCS Directive's financial security to cover ELD liability as this is the case in England.

It has been discovered that the terminology of European legislation protecting marine and non-marine waters is not systematic. Certain terms do not cover each other with precision across the instruments and the relationship between certain concepts may be interpreted in more ways. This is unfortunate not only for CCS but any activity that affects or may affect marine or non-marine waters in the EU. It is a source of legal uncertainty and may invite

litigation in the future. It is suggested therefore that European legislation concerning the protection of waters should be amended so that the same terms are used in the ELD, the Water Framework Directive, and the Marine Strategy Framework Directive, with identical meaning. Also, overlap between different terms should be avoided to the extent possible.

With regard to protected species and habitats, it can be submitted on the basis of ECJ jurisprudence that the ELD is applicable at least to the outer border of the Member State's Exclusive Economic Zone. Indeed, also on the basis of European case law, it is possible to envisage the argument whereby certain species are protected in the High Seas.

Concerning water damage, it is a welcome development that the ELD's scope has been extended to marine waters. This provides a head of claim where there are no protected species or habitats in the vicinity of a pollution incident.

The CCS Directive addresses the pipeline transport of carbon dioxide only tangentially. Liability rules are prescribed at state level. Ship transport is not provided for in the CCS Directive at all.

It is not resolved clearly which state's provisions should apply if transboundary damage occurred, and the applicable liability laws differ in the licensing state and the other affected state. The general practice of the conflicts of laws would indicate the law of the other affected state. However, this may be seen as contrary to justice if, for example, the operator enjoys certain defences in its licensing state while those defences are not applicable in the other state. Similarly, if a state suffers damage which would have prescribed financial security for ELD liability whereas the licensing state does not, the former state may find its interest compromised. These problems can be overcome by considering the substantive part of the ELD to be applicable in the licensing state only, whereas action and compensation for transboundary damage is to be agreed through co-operation between the states concerned. Subsequently, the licensing state could recover from the operator where appropriate. However, this interpretation is not obvious and an express authoritative statement to this effect would be a welcome development.

The two above considerations point to an overarching problem: Although there are two key instruments at the European level which are applicable to CCS, their implementation varies and therefore there is no real legal uniformity across the jurisdictions of the different Member States.

It has also been shown, that the time bar in the ELD, may not be adequate for certain activities where damage arises through accumulation over a long period of time and there is no identifiable single event of pollution.

Appendices

Appendix A

Methods of placement in the maritime area	Purposes of placement*	Applicable OSPAR Annex	CONCLUSION
By pipeline pure and simple	(a) Experiment (c) Mitigating climate change (d) Other mere disposal	Annex I	Placements for purposes (a), (c) and (d) are not prohibited but are strictly subject to authorisation or regulation.
By pipeline working with an structure in the maritime area that is not an offshore installation	(a) Experiment (c) Mitigating climate change (d) Other mere disposal	Annex I	Placements for purposes (a), (c) and (d) are not prohibited but are strictly subject to authorisation or regulation.
By shipment in a vessel for placement from the vessel	(a) Experiment (c) Mitigating climate change (d) Other mere disposal	Annex II	Placements for purpose (a) are not prohibited, provided that they are in accordance with relevant provisions of the Convention. Placements for purposes (c) and (d) are prohibited.
By placement from a structure in the maritime area that is neither part of a pipeline system nor an offshore installation	(a) Experiment (c) Mitigating climate change (d) Other mere disposal	Annex II	Placements for purpose (a) are not prohibited, provided that they are in accordance with relevant provisions of the Convention. Placements for purposes (c) and (d) are prohibited.

By placement from an offshore installation	(a) Experiment (b) Improving hydrocarbon production (c) Mitigating climate change (d) Other mere disposal	Annex III	In respect of CO_2 arising from offshore activities: Placements for purpose (a) are not prohibited, provided placement is in accordance with relevant provisions of the Convention. Placements for purposes (b), (c) or (d) are not prohibited, but are strictly subject to authorisation or regulation. In respect of CO2 arising from activities other than offshore activities: Placements for purpose (a) are not prohibited, provided placement is in accordance with relevant provisions of the Convention. Placements for purpose (b) are not prohibited, but are strictly subject to authorisation or regulation. Placements for purposes (c) or (d) are prohibited.

883

[883] Reproduced from OSPAR Commission; Summary Record OSPAR 2004, OSPAR 04/23/1-E, Annex 12; (Ref. §11.7a), p.7

* The purposes of placement considered in this table are those set out in paragraph 14:

a. placement for the purposes of scientific experiment ("experiment");

b. placement for the purposes of facilitating or improving the production of oil or gas ("improving hydrocarbon production").

c. placement for the purposes of mitigating the effects on climate change ("mitigating climate change");

d. placement for the purposes of mere disposal, other than placement covered by sub-paragraph (c) ("other mere disposal").

Appendix B

If the word ‘evidence’ is understood to mean ‘ascertain’, that is, ‘gives a certain answer’, then the results of the ECO2 project do not evidence either that the injected CO_2 will leak or that it will remain permanently contained. It does the opposite. It gives a probability that the likelihood of leakage is very small. It is a consequence of this that it is not possible to evidence or give certainty that the injected CO_2 will be completely and permanently contained. Does this mean that the requirement in Article 18, para.1(a) can never be satisfied? If the requirement is taken strictly, then this is the case.

However, it is arguable that this requirement was not meant to be interpreted with absolute strictness. The more lenient (or the correct) interpretation is supported by the Directive itself. Article 4, para.4 (selection of storage sites) provides:

“A geological formation shall only be selected as a storage site, if under the proposed conditions of use there is *no significant risk of leakage*, and if no significant environmental or health risks exist.”

It is clear from this paragraph that some risk of leakage is contemplated at the site selection stage. If so, it is reasonable to expect the same risk on site closure and later on. In effect, the requirement in Article 18(2) would become *all available evidence indicating no significant risk that the stored CO_2 will not be completely and permanently contained.* The findings of the ECO2 project would be a favourable answer to such requirement. In addition, it may be noted that if certainty was required and possible to show in relation to complete and permanent containment, the provisions on financial contribution and monitoring would be unnecessary.

The operator must also show the absence of any detectable leakage in the meaning of para.2(b) of Article 18 at the time of the transfer of responsibility. If the above interpretation is accepted, this provision has to be read to mean that the risk of small leakage must not materialise itself at the time of the transfer of responsibility. In other words, the operator cannot hand over a leaking site; it must correct the leakage first.

The suggested interpretation can be countered by the consideration that the risk of leakage is expected to decrease over time as trapping mechanisms additional to the stratigraphic and structural trapping activate, so it is conceivable that a higher standard is required at a later point in time. However, this approach is not without difficulties. Regarding additional

trapping mechanisms; the two-phase, two-component modelling carried out for the Sleipner field in the ECO2 project accounted for the dissolution of the CO_2 in the surrounding brine. This shows that even by including additional trapping mechanisms it is still possible to simulate scenarios other than complete and permanent containment. Second, assuming a decreasing risk and imposing a higher standard before the transfer, Article 18, para.2(b) would be merely a reassurance for the competent authority in addition to para.1(a).

Corrigendum

1) The title of Chapter 6 at p.168 and the corresponding entry in the table of contents should be: ‘The liability framework in the UK for using pipelines for offshore CCS operations’.
2) The acknowledgements on p.vii should state that the research behind this thesis has been funded by the ECO2 project (no^{o} 265847) under the European Union’s Seventh Framework Programme for research, technological development and demonstration.
3) In fn.350 the first words should be ‘The law of the United Kingdom’; ‘English and’ should be disregarded.
4) In fn.350, ‘Energy Act 1998’ should be ‘Petroleum Act 1998’.
5) At fn.664 ‘the analysis’ should be inserted after ‘However,’.
6) It should be noted at fn.674 that this footnote has been contributed by Prof. Michael Tsimplis.
7) The statement in fn.712 regarding the UK’s Exclusive Economic Zone has become incorrect since the time of writing. See: Exclusive Economic Zone Order 2013 SI 2013/3161
8) Fn.872 should state: ‘Ibid.’
9) In fn.210, the latest consolidation for Directive 92/43/EEC should be 2013.
10) The reference in fn.45 should be {COM(2008) 18 final} {SEC(2008) 54} /* SEC/2008/0055 final */ and the word ‘Summary’ should be inserted before ‘impact assessment’.
11) The date in fn.132 should be ignored. The web address is not live anymore.
12) The cross-reference in fn.14 should be ‘in fn.341’.
13) The date of the question in fn.44 should be 9 July 2013
14) In fn.112, ‘(Ref. §2.10b)’ should be ‘(Ref. §2.9b)’
15) The second sentence of fn.388 should be: Editorial amendments made at OSPAR 2012)see OSPAR 12/22/1, §§12.5-12.6(. The web address is not live anymore.
16) The 2006 document mentioned in fn.679 has been amended in 2011 with the title ‘Assessment and reporting under Article 17 of the Habitats Directive Explanatory Notes & Guidelines for the period 2007-2012’.

17) From the third sentence of the second paragraph of section 6.1.3 the text should be: "In the United States the Trans-Alaska Pipeline Authorisation Act[884] establishes a system similar to the one in the shipping industry. The holder of the pipeline right-of-way is strictly liable to "all damaged parties, public or private, without regard to fault for such damages, and without regard to ownership of any affected lands, structures, fish, wildlife, or biotic or other natural resources relied upon by Alaska Natives, Native organizations, or others for subsistence or economic purposes" up to the limit of $350 m for any one incident; above this amount the ordinary rules of negligence apply.[885] The regime is strict but not absolute. An act of war, negligence of the United States, other government entity, or the damaged party provide exceptions; the burden of proof is on the operator.[886] However, on the basis of US common law and the relevant environmental impact statements, acts of God as earthquakes and tidal waves would not be exemptions from liability in Alaska and the Arctic.[887] The fund connected to the Act has been consolidated[888] by the Oil Pollution Act 1990[889] into the Oil Spill Liability Trust Fund established under the Internal Revenue Code of 1986[890]. Another example is the Canadian Pipeline Safety Act.[891] The operator's liability is unlimited when he is at fault or negligent.[892] Otherwise, he is absolutely liable (i.e. no defences are available) up to a defined limit. If "he operates one or more pipelines that individually or in the aggregate have the capacity to transport at least 250,000 barrels of oil per day" the limit is C$1 bn.[893] Further, pipeline operators must maintain financial security corresponding to their limit of liability.[894] It must be kept in mind that although these rules are similar to shipping liability, it is domestic law. For international pipelines, a unified regime would be a more appropriate solution."

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[884] 43 U.S.C. §§ 1651-56 (Supp. III, 1973).
[885] 43 U.S. Code § 1653, (a)(2)
[886] 43 U.S. Code § 1653, (a)(1)
[887] See the early analysis: Alan G. Stone, *The Trans-Alaska Pipeline and Strict Liability for Oil Pollution Damage*, 9 Urb. L. Ann. 179 (1975); Available at: http://openscholarship.wustl.edu/law_urbanlaw/vol9/iss1/8
[888] L I Kiern, *The Oil Pollution Act of 1990 and the National Pollution Funds Center*, 25 J. Mar. L. & Com. 487 1994; Also see: http://www.uscg.mil/npfc/About_NPFC/osltf.asp, last accessed 4 Jan 2016.
[889] Sec.8102, 33 U.S.C. 2701
[890] Sec.9509, 26 U.S.C. 9509
[891] An Act to amend the National Energy Board Act and the Canada Oil and Gas Operations Act (Short title: Pipeline Safety Act), Bill C-46; Also see: http://news.gc.ca/web/article-en.do?nid=912989; Natural Resources Canada, *Pipeline Safety, Canada's World-class Safety System*, September 2014, available at http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/files/pdf/14-0278-%20PS_canada_world-class_safety_e.pdf
[892] 48.12(1), PSA
[893] 48.12(4), (5); PSA
[894] 48.13(1), PSA

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