



Strategic Analysis of the Global Status of Carbon Capture and Storage

Report 3: Country Studies
International Policy and Legislation

Final Report



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1. Executive summary

There are a number of international environmental law principles, arising from both customary international law and treaties, that will be relevant to the development and deployment of CCS projects, particularly where those projects have transboundary impacts or occur in the global commons, including in the atmosphere and in maritime areas beyond national jurisdiction. At present, there is no single international convention regulating the conduct of States (and their citizens) participating in CCS activities. Instead, different stages in the CCS project cycle may be regulated by the application of different sources of international environmental law.

As a starting point, the UNFCCC and its Kyoto Protocol have the objective of stabilising CO₂ emissions in the atmosphere to levels that will prevent dangerous anthropogenic interference with the climate system. CCS provides one mechanism which may assist in meeting this objective. However, CCS does not eliminate CO₂ emissions, rather it provides a means of capturing and storing those emissions over a long period of time. If released, those emissions will contribute to atmospheric CO₂ levels. Therefore, consideration must be given to how to minimise and manage the risk of transboundary harm, as a result of the leakage or escape of CO₂ during transportation and from both domestic and international storage sites.

If CCS is to be considered a viable mitigation technology in the context of the UNFCCC, it will be important to provide States with guidance on the most appropriate means to measure, monitor, verify, account for and report on CO₂ sequestration in geological storage sites. These accounting issues have been considered in the 2006 Intergovernmental Panel on Climate Change (IPPC) Guidelines for National Greenhouse Gas Inventories (2006 IPCC Guidelines) which now provide a methodology to account for CCS emissions and sequestration, but which have not been uniformly adopted by Parties to the UNFCCC.

Under the Kyoto Protocol, Parties are also considering whether CCS projects are appropriate project activities in the Clean Development Mechanism (CDM). Whilst the views of Parties are divergent, particularly as to whether the international rules for the CDM allow such projects to take place, the CDM may provide incentives that would make projects in developing countries viable.

When CCS was initially raised as a possible mitigation technology, there were a number of barriers to its deployment as a result of international laws that expressly prohibited stages of the CCS project cycle being conducted in marine areas and in areas beyond national jurisdiction. For example, until recently, the 1996 Protocol to the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* (London Protocol) prohibited the storage of CO₂ in the seabed. These barriers are slowly being overcome, through amendments such as the recent amendment to the London Protocol. However, a number of barriers still exist, in particular when consideration is given to international law principles such as the principle that States must not transfer damage or hazards from one area to another or transform one type of pollution to another.¹

One of the most important issues that arises when considering the application of international law to CCS is how to characterise CO₂. There are a number of international conventions that regulate pollution of the marine and land-based environment² and the treatment or disposal / dumping of waste,

¹ See for example, Art. 195 of UNCLOS and Art. 3.3 of the London Protocol.

² For example the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention), 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention), Convention for the Protection of the Mediterranean Sea against Pollution as amended the Convention for the Protection of the

hazardous waste and harmful substances.³ For the purposes of CCS, if the CO₂ product falls within one of these definitions, dealing with the CO₂ as part of the CCS project cycle may be prohibited under international law, or attract strict regulatory requirements for environmental impact assessment and project management.

To the extent that stages of the CCS project cycle may take place in international waters or involve multiple actors from different States, questions arise as to which State should take responsibility for any leakage of emissions, on-going monitoring and liability for remediation. In the absence of clear guidance on these issues, most States have avoided proposing projects in these areas. Nevertheless, if CCS becomes a viable technological option with potential storage sites in these areas, the international community will need to decide upon appropriate regulatory frameworks.

In this section a number of international legal gaps and barriers arising from these ambiguities are highlighted. The section also canvases the policy positions of key international development organisations regarding the funding of CCS. Clarifying these gaps and barriers will be beneficial to the substantive development of wide spread CCS.

This section does not purport to cover the field of international conventions or regional agreements but rather highlights a select number of key conventions of wide application that raise particular legal issues. In particular, this section focuses on a select number of international conventions of wide application, as a number of the regional conventions largely mirror the international conventions although it is noted that in many instances the regional conventions often impose stricter and more specific regulation.

Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention), 1992 Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention).

³ For example, the 1989 Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention), and the 1999 Protocol on Liability and Compensation for Damage resulting from Transboundary Movements of Hazardous Wastes.

2. Glossary

2006 IPCC Guidelines	<i>Intergovernmental Panel on Climate Change Guidelines for National Greenhouse Gas Inventories</i>
Aarhus Convention	<i>1998 Convention of Access to Information, Public Participation and Decision Making and Access to Justice in Environmental Matters</i>
Basel Convention	<i>1989 Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal</i>
CDM	Clean Development Mechanism
EEZ	Exclusive Economic Zone
Espoo Convention	<i>1991 Convention on Environmental Impact Assessment in a Transboundary Context</i>
HNS	hazardous and noxious substances
HNS Convention	<i>International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea</i>
ICJ	International Court of Justice
IMO	International Maritime Organisation
IPPC	Intergovernmental Panel on Climate Change
ISA	International Seabed Authority
LLMC	<i>1976 Convention on Limitation of Liability for Maritime</i>
London Protocol	<i>1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter</i>
OECD	Organisation for Economic Cooperation and Development
OSPAR Convention	<i>The Convention for the Protection of the Marine Environment of the North-East Atlantic</i>
SBSTA	UNFCCC Subsidiary Body for Scientific and Technological Advice
Synthesis Report	Synthesis Report dated 25 September for the SBSTA
UNCLOS	<i>United Nations Convention on the Law of the Sea 1982</i>
UNFCCC	<i>United Nations Framework Convention on Climate Change</i>

3. Introduction to international law

Public international law is the regime of rules and norms which regulates the relationship between sovereign States. The primary sources of international law include:

- custom (as evidenced by general practice accepted by States);
- treaties;
- general principles of law recognised by civilised nations; and
- judicial decisions and the publications of highly regarded academics (Statute of the International Court of Justice, Article 38).

Of these sources, treaties tend to be the most important sources of international environmental law and will be most relevant to CCS. Treaties are agreements between two or more States and may include Conventions, Charters, Covenants, Protocols and Agreements howsoever described, once they enter into force (usually after ratification by a prescribed number of States).⁴

As will be seen below, existing international treaties were not drafted in contemplation of CCS. To the extent that CCS is or may be addressed under existing treaties, amendments to those treaties may be required, for example, through the adoption of a new Protocol. In order to amend a treaty, further acceptance or ratification of the amendment must be forthcoming from State Parties. This may restrict or delay amendments entering into force, particularly if some countries do not ratify the amendment.

In addition to formal amendments, a number of treaties, particularly those that operate as framework conventions, such as the UNFCCC, regularly meet and adopt decisions which are agreed to by the Parties on a unanimous or majority basis. Whilst those decisions may not strictly be legally binding, the agreement by all States to those decisions supports their application as general principles of law.

Customary international law may also be relevant to CCS, in particular the extent to which custom recognises principles of international environmental law. Whilst some principles of international environmental law have been accepted as custom, for example the principle that States have sovereignty over their natural resources and a responsibility not to cause transboundary environmental damage, many other important principles related to sustainable development, such as the precautionary principle, the polluter pays principle, the principle of inter-generational equity and the principle of common but differentiated responsibility are yet to achieve this status (Sands, 2003: 232). These principles are, nevertheless, included in a number of treaties, such as the UNFCCC, and will apply to States that are Parties to those treaties.

An important aspect of international law is the extent to which it is enforceable by one State against another. This is particularly relevant in the context of the activities of one State having transboundary impacts. In the *Trail Smelter Case* it was held that no state has the right to use its territory in such a manner as to cause injury by transboundary pollution into the territory of another and ordered Canada to pay damages and refrain from activities that would affect the United States (*United States v. Canada*, 16 April 1938, 11 March 1941; 3 U.N. Rep. Int' l Arb. Awards 1907). States may bring actions in the International Court of Justice (ICJ) based upon breaches of custom, treaties or general

⁴ Ratification is the process by which a State (usually through an act of its national parliament) agrees to be bound by the terms of a treaty. The State then deposits the instrument of ratification with the treaty's depositary. Once the minimum number of States required to ratify a treaty do so, the treaty will usually enter into force after a prescribed number of days.

principles of international law or seeking advisory opinions. In addition, most treaties include dispute resolution mechanisms, which often involve the submission of disputes to the ICJ or other international courts or tribunals. However, often the determination of a dispute by such a court or tribunal will require both parties to submit to the courts jurisdiction.

Whilst treaties govern the relationship between States they are not enforceable by or against private citizens under international law. Instead, in order for the terms of a treaty to be given effect at a domestic level, and create obligations that are binding upon citizens, national laws may need to be developed or modified to incorporate the States' international obligations.

Some treaties do, however, establish regimes whereby a State will be responsible for the actions of its citizens. The United Nations Convention on the Law of the Sea 1982 (UNCLOS) provides that State Parties and international organisations have an obligation to ensure that activities in the Area carried out by them or their nationals comply with UNCLOS rules (Sands, 2003: 899). In addition, UNCLOS establishes a regime of "flag" States which requires States to adopt national laws for vessels flying their flag which at least have the same effect as generally accepted international rules and standards (Sands, 2003: 439).

These issues are discussed in further detail with specific reference to CCS below.

3.1 Issues associated with CCS in the global commons

3.1.1 Introduction

The areas outside of the territory of any state are commonly referred to as the "global commons". The global commons includes the "high seas and its seabed and subsoil, outer space and according to a majority of States, the Antarctic. The atmosphere is also sometimes considered to be part of the global commons." (Sands, 2003: 14). Under international law, the global commons are treated as the common heritage of mankind. As such, these areas are vested in the international community as a whole, with no State or person being able to appropriate territory therein, and which are to be preserved and to be freely available for use, for the benefit of present and future generations. The key barriers to CCS in the global commons relate to the ability to undertake offshore CCS activities in the high seas, and in particular, in the seabed and ocean floor and subsoil beyond the limits of national jurisdiction. A further key issue is the ability of States to ensure the protection of areas in the global commons. Although there is no international treaty that specifically addresses the injection and storage of CO₂ in the global commons, the framework provided by UNCLOS provides guidance on how such activities may be regulated by existing laws.

3.1.2 United Nations Convention on the Law of the Sea 1982 (UNCLOS)

The UNCLOS came into force in November 1994 and is largely a codification of the customary international law of the use of the seas.

Relevantly, UNCLOS separates the sea into a number of jurisdictional zones which are measured from the low water mark of the coastal state (Article 5, UNCLOS). These defined areas of states jurisdiction include the territorial sea, archipelagic waters (Article 46-50, UNCLOS) and the continental shelf (Article 76, UNCLOS). UNCLOS also allows States to regulate the contiguous zone (Article 33, UNCLOS) and the exclusive economic zone (Article 55-75, UNCLOS).

TERRITORIAL SEA

Each coastal State may claim a territorial sea that extends seaward up to 12 nautical miles from its baselines (Article 2 and 3 of UNCLOS). This sovereignty over the territorial sea extends to the air space above it, and the seabed and subsoil beneath it (Article 2, UNCLOS). The coastal State may adopt laws and regulations, in conformity with the provisions of this Convention and other rules of international law, relating to innocent passage through the territorial sea, including in respect of the protection of cables and pipelines; the conservation of the living resources of the sea and the preservation of the environment of the coastal State and the prevention, reduction and control of pollution; and marine scientific research and hydrographic surveys (Article 21 UNCLOS). As such, the domestic laws and consequent consents and authorisations of each Coastal State will be required to the undertaking of CCS activities in each territorial sea.

CONTINENTAL SHELF

Under Article 76 of UNCLOS, the continental shelf of a coastal State comprises the seabed and subsoil of the submarine areas that extend beyond its territorial sea throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured where the outer edge of the continental margin does not extend up to that distance.

A coastal State has exclusive sovereign rights over its continental shelf for the purposes of exploration and exploitation of its natural resources. Natural resources are the mineral and other non-living resources of the seabed and subsoil together with living organisms belonging to sedentary species, that is to say, organisms which, at the harvestable stage, either are immobile on or under the seabed or are unable to move except in constant physical contact with the seabed or the subsoil (Article 77, UNCLOS). Arguably geological formations under the seabed are a non-living resource of the seabed and subsoil and as such, the express consent of the coastal State will be required to undertake CCS activities such as injection and storage.

All States are entitled to lay submarine cables and pipelines on the continental shelf. This is subject to the coastal State's right to take reasonable measures for the exploration of the continental shelf, the exploitation of its natural resources and the prevention, reduction and control of pollution from pipelines. The coastal State must also consent to the course for the laying of such cables but the coastal State may not impede the laying or maintenance of such cables (Article 79, UNCLOS).

In relation the CCS, this gives other States a relatively wide discretion to lay pipelines to transport CO₂ over the continental shelf of another.

However, coastal States have the exclusive right to authorise and regulate drilling on the continental shelf for all purposes (Article 81, UNCLOS). As such, a coastal State will be able to control injection and storage activities activates on the continental shelf to the extent that such CCS activities concern drilling.

EXCLUSIVE ECONOMIC ZONE

Each coastal State may claim an Exclusive Economic Zone (EEZ) beyond and adjacent to its territorial sea up to 200 nautical miles from which the breadth of the territorial sea is measured (Article 57, UNCLOS). Although in many situations States will not be able to claim the full 200 nautical miles due to an adjacent State. In situations where there is a dispute between States there is a dispute resolution procedure provided for in Article 74 of UNCLOS. Within its EEZ, a coastal State has:

- sovereign rights for the purpose of exploring, exploiting, conserving and managing natural resources, whether living or nonliving, of the seabed and subsoil and the superjacent waters and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds;
- jurisdiction as provided for in international law with regard to the establishment and use of artificial islands, installations, and structures, marine scientific research, and the protection and preservation of the marine environment; and
- other rights and duties provided for under UNCLOS.

To the extent that the continental shelf and the EEZ cover the same area, a State's right to lay pipelines and conduct other CCS activities such as drilling in the EEZ will largely be the same as discussed above in relation to the continental shelf.

AREAS BEYOND NATIONAL JURISDICTION

The areas beyond national jurisdiction are the global commons, which are separated into two areas – the “high seas” and “the Area”.

HIGH SEAS

The high seas are defined in UNCLOS in the negative, being all parts that are not under national jurisdiction. It is noteworthy that the definition of the high sea refers to the water column and not to the seabed, ocean floor and subsoil underlying high seas (Parts VII and XI, UNCLOS).

States enjoy six freedoms within the high seas. These are set out in Article 87 and include that the high seas are open to all States, whether coastal or land-locked. Freedom of the high seas is exercised under the conditions laid down by this Convention and by other rules of international law. It comprises, *inter alia*, both for coastal and land-locked States:

- freedom of navigation;
- freedom of over flight;
- freedom to lay submarine cables and pipelines, subject to Part VI;
- freedom to construct artificial islands and other installations permitted under international law, subject to Part VI;
- freedom of fishing, subject to the conditions laid down in section 2; and
- freedom of scientific research, subject to Parts VI and XIII.

These freedoms shall be exercised by all States with due regard for the interests of other States in their exercise of the freedom of the high seas, and also with due regard for the rights under this Convention with respect to activities in the Area.

TRANSPORT OF CO₂ IN THE HIGH SEAS

The freedom to lay cables and pipelines and the freedom of scientific research are relevant to CCS activities. Unlike the laying of pipelines in the continental shelf, there is no requirement to obtain the consent of any particular State to conduct such activities, which means that the freedom to lay such pipelines is much wider.

Further, there are no specific environmental assessment requirements relating to the laying of such pipelines in the high seas save for the general provisions in Articles 204-206 of UNCLOS which provide that when States have reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution of, or significant and harmful changes to, the marine environment, they shall, as far as practicable, assess the potential effects of such activities on the marine environment and shall communicate reports of the results of such assessments. States must also “as far as practicable” monitor the effects of any activity they permit or engage in. This gives States a wide discretion to lay such pipelines.

STORAGE IN THE WATER COLUMN IN THE HIGH SEAS

In relation to storage of CO₂ in the water column in the high seas, the OSPAR convention which relates to the North Atlantic was amended in 2007 to specifically prohibit storage of CO₂ in the water column. The London Protocol (discussed below) was also amended to allow storage in geological formations in the sea bed (but not the sea column).

Further, storage in the water column must be considered in light of the general provisions of UNCLOS regarding pollution and harmful changes to the marine environment. In practice, these provisions all serve to limit the ability to undertake storage in the water column in the high seas.

THE AREA

The seabed and ocean floor and subsoil beyond the limits of national jurisdiction form a different geographic zone under UNCLOS defined as the “Area”. The Area is comprised of the seabed and subsoil beyond the limits of national jurisdiction. It does not include superadjacent waters (i.e., the water column) or the air space above those waters. The provisions relating to the Area are directly relevant to the injection and storage of CO₂ in the sea bed.

As the global commons, the Area and its resources are regarded as “the common heritage of mankind”, and no State may claim or exercise sovereignty or sovereign rights over any part of the Area or its resources (UNCLOS, Article 1(1) and Part XI).

Under Article 140 activities in the Area are to be carried out for the benefit of mankind as a whole. The International Seabed Authority (ISA) is the intergovernmental organisation that has authority under UNCLOS to coordinate a limited number activities in the Area including the exploitation of mineral resources and marine scientific research.

In relation to activities involving the exploitation or resources, activities are defined in Article 1(3) of UNCLOS as, “all activities of exploration for, and exploitation of, the resources of the Area”. Resources are then defined as all solid, liquid or gaseous mineral resources *in situ* in the Area at or beneath the seabed, including polymetallic nodules. As such, activities in the Area are limited to those associated with the exploitation of *mineral resources*.

In relation to marine scientific research, such research must be carried out exclusively for peaceful purposes and for the benefit of mankind as a whole (Article 143, UNCLOS). As such, while various forms of scientific research relating to CCS may foreseeable be conducted in the Area these will need to be undertaken with such aims in mind.

In summary, whilst it is arguable that exploration and research may take place in the Area on a temporary basis and in accordance with the requirements noted above, States are not able to assert sovereignty over the Area through the permanent occupation of its territory (including geological storage spaces). This framework may limit the ability to explore for sub-seabed geological storage

sites and, more importantly, prevents the injection of CO₂ into the Area by a State or States and its permanent storage therein for the benefit of the State or States.

For CCS injection and storage to be permissible in the Area, amendments would be required to be made to UNCLOS in accordance with the amendment and ratification procedures described above. In addition, the ISA would need to be given the ability to regulate and set standards in relation to CCS activities, extending its jurisdiction to regulate exploration related to matters other than mineral resources. There does not appear to be any intention to draft amendments to UNCLOS to clarify the ability to undertake CCS activities in the Area. Nor is there apparent, any international will to allow such activities to take place in the Area

From a logistical point of view, the geographic distances involved in constructing infrastructure, monitoring, and enforcing CCS projects in the high seas must be also contemplated.

In relation to liability all States have the responsibility to ensure that activities in the Area are effectively controlled by them and without prejudice to the rules of international law, damage caused by the failure of a State party or international organisation to carry out its responsibilities in relation to the Area shall entail liability. State parties or international organisations acting together shall bear joint and several liability (Article 139, UNCLOS).

3.2 Other issues associated with CCS in the marine environment

3.2.1 Waste dumping and pollution

UNCLOS

Article 192 of UNCLOS places a general responsibility upon States to “protect and preserve the marine environment”.

Article 194 requires States to take individually or jointly as appropriate, all necessary measures to prevent, reduce and control pollution from any source, including land based sources, pollution from or through the atmosphere, pollution from vessels, pollution by dumping and pollution from installations and devices used in exploration or exploitation of the natural resources of the seabed and subsoil and other installations and devices operating in the marine environment.

Pollution is defined in Article 1(4) as:

the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, 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.

The UCL Carbon Capture Legal Program notes that there is no conclusive opinion as to whether CCS would constitute pollution in accordance with this definition (UCL Carbon Capture Legal Program, 2009). As noted above, this definition of pollution may limit the ability to store CO₂ in the sea column and is also relevant to whether CO₂ that seeps from a geological formation will be regarded as pollution.

3.3 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention)

The London Convention was one of the first international conventions regarding the control of marine pollution and dumping of wastes and other matter in the sea and covers all marine areas. In 1996 a Protocol was agreed to update and eventually supersede the London Convention (1996 Protocol to the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter*; London Protocol).

The London Protocol prohibits the dumping of any wastes or other matter with the exception of those listed in an Annex to the Protocol (London Protocol, Article 4 and Annex 1). The dumping of materials listed in Annex I requires a permit. The London Protocol was recently amended in 2007 to make clear that CO₂ could be stored in the sea bed with a permit. The amendment does not extend to the water column.

The amendments state that CO₂ streams may only be considered for dumping, if:

- disposal is into a sub-seabed geological formation;
- they consist overwhelmingly of CO₂ (they may contain incidental associated substances derived from the source material and the capture and sequestration processes used); and
- and no wastes or other matter are added for the purpose of disposing of them (IMO, 2002).

To be provided with a permit a proponent must comply with the requirements of Annex 2 which require, amongst other things that an impact assessment is completed and monitoring requirements are determined. The impact evaluation assessment is required to consider a number of matters including, the expected consequences of the sea or land disposal options, i.e., the "Impact Hypothesis". Other considerations include the potential effects on human health, living resources, amenities and other legitimate uses of the sea. In addition, if the interpretation of the comparative assessment shows the dumping option to be less preferable, a permit for dumping should not be given. Provided that such requirements can be fulfilled the amendment to the London Protocol is a positive move towards the underground storage of CCS in the sea bed.

However, there remain barriers to the transboundary export of CO₂, which is currently prohibited under Article 6 of the London Protocol. This is discussed further below.

THE CONVENTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT OF THE NORTH-EAST ATLANTIC (OSPAR)

The OSPAR convention regulates human activities which can have an adverse effect on the ecosystems and the biodiversity in the North East Atlantic. The contracting parties comprise the fifteen following governments: Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom, together with the European Community (OSPAR, 2009). The OSPAR convention applies to the OSPAR Maritime Area which includes areas under State sovereignty and in the global commons.⁵ The

⁵ Article 1(a) of the OSPAR states that "Convention Maritime area" means the internal waters and the territorial seas of the Contracting Parties, the sea beyond and adjacent to the territorial sea under the jurisdiction of the coastal state to the extent recognised by international law, and the high seas, including the bed of all those waters and its sub-soil, situated within the following limits: (i) those parts of the Atlantic and Arctic Oceans and their dependent seas which lie north of 36° north latitude and between 42° west longitude and 51° east longitude, but excluding: (1) the Baltic Sea and the Belts lying to the south and east of lines drawn from Hasenore Head to Griben Point, from Korshage to Spodsbjerg and from Gilbjerg Head to Kullen, (2)

general obligations of the parties set out in Article 2 include that the contracting parties shall, in accordance with the provisions of the convention, take all possible steps to prevent and eliminate pollution and shall take the necessary measures to protect the maritime area against the adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected.

The key provisions in relation to waste and dumping are set out in the OSPAR Convention's Annexes. Annex II provides that the dumping of all wastes or other matter is prohibited, except for those that are expressly listed as excluded substances. The OSPAR Convention Annexes were amended in 2007 to allow CO₂ to be injected in geological formations under the seabed. However, a decision was made to prohibit the storage of CO₂ in the water column. A press release by the OSPAR Commission noted that "the Commission has also adopted a Decision to legally rule out placement of CO₂ into the water-column of the sea and on the seabed, because of the potential negative effects" (OSPAR Commission, 2007).

3.4 Cross border transportation and storage

3.4.1 London Protocol

As noted above, there remain barriers to the transboundary export of CO₂ under the London Protocol as such transport is currently prohibited under Article 6 of the London Protocol. In a report dated 3 April 2009, an International Maritime Organisation (IMO) working group noted that the majority of states were of the view that transboundary export of CO₂ was prohibited under Article 6 of the London Protocol and the London Protocol would need to be amended to allow export. However, there remain differing views on issues such as whether monitoring and reporting should be the responsibility of the exporting or the receiving State or whether an exporting State should first consider disposing the CO₂ stream in its own territory. The key implication is that until such an amendment is in force it appears that the export of CO₂ for sea disposal is prohibited under the London Protocol.

3.4.2 1989 Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention)

The Basel Convention establishes a global regime for the control of the international trade in hazardous and other wastes. The Convention provides general obligations requiring Parties to ensure the transboundary movement of wastes are reduced to a minimum, consistent with principles of environmentally sound management. Underpinning this approach is the principle that wastes should primarily be disposed of in the jurisdiction in which they are created.⁶ The substantive obligations in the Basel Convention apply to "hazardous wastes".⁷ Hazardous wastes are defined in Articles (1) (a) and (1) (b)) as waste that is:

- within the category of waste substances listed in Annex I of and has one of the hazardous characteristics contained in Annex III (that is it must contain a characteristic such as being explosive, flammable, toxic, or corrosive); or

the Mediterranean Sea and its dependent seas as far as the point of intersection of the parallel of 36° north latitude and the meridian of 5° 36' west longitude; (ii) that part of the Atlantic Ocean north of 59° north latitude and between 44° west longitude and 42° west longitude.

⁶ Article 4, Basel Convention (Sands, 2003: 692).

⁷ The Basel Convention also applies to 'other wastes collected from households' and residues arising from the incinerations of household waste', which are unlikely to be the source of CO₂ for CCS.

- defined to be a hazardous waste in the national legislation of an importing, exporting or transit State.

There is some debate as to whether CO₂ falls within the definition of a hazardous waste for the purposes of transboundary movement.

The same IMO working group (considering amendments to Article 6 of the London Protocol) also considered whether the Basel Convention applies to such CCS activities. While the majority of respondents were of the view that the Basel Convention does not apply to the transboundary movements of CO₂, States such as the Netherlands and groups such as Greenpeace are of the view that the Basel Convention does apply to the transboundary movement of CO₂.

Other States such as Australia and United Kingdom argue that a party to the Basel Convention is able to define CO₂ as a hazardous waste in its domestic legislation and that if this occurred, parties to the Basel Convention would be required to recognise such a decision.

The implications if CO₂ is regarded as a hazardous waste under the Basel Convention include:

- that movement of waste between parties and non-parties is prohibited (Article 4(5)); and
- appropriate insurance, bonds or other guarantees may also need to be in place (Article 6(11)).

Further, in 1995, the parties to the Basel Convention agreed to ban OECD countries from exporting hazardous waste to non-OECD countries for final disposal – the Ban Amendment. (The Ban Amendment has not yet entered into force, however, states such as France, Germany, the United Kingdom and Norway have all ratified the Ban Amendment and national implementing legislation has been implemented in the European Union). If CO₂ is a hazardous waste, the export of CO₂ to non-OECD countries for final disposal will be prohibited.

Until these issues are resolved, CCS activities will likely remain largely confined within national boundaries.

There is no specific international convention applying to the cross border storage of CO₂. Arguably a range of international conventions and customary law would interact. For example, for actions in the marine environment, UNCLOS would determine the State with jurisdiction over particular aspects of the activity for example if a geological formation was located below two or more jurisdictions. If the action was undertaken in the territory of a party to the Espoo convention (discussed below), then there is a possibility that the Espoo convention may require that an environmental impact assessment is undertaken. Under Article 2.1 of the Espoo convention the parties must take all appropriate and effective measures to prevent and reduce and control significant adverse transboundary environmental impacts.

Foreseeably, bilateral agreements could be developed that cover particular situations where a project was located across two or more States or alternatively if there were two or more States involved in a particular project. Customary international law principals will also apply in situations where there may be leakage across State boundaries. The *Trail Smelter Case United states v Canada* 3 RIAA 1907 (1941) is commonly referenced as supporting the international law principle that that no state has the right to use its territory in such a manner as to cause injury by transboundary pollution into the territory of another. This principle will need to be integrated into approaches to the transboundary liability issues raised by CCS projects, if for example, there is leakage of CO₂ that migrates into the jurisdiction of another state and causes harm.

3.5 Environmental impact assessment and public participation in decision-making

There are a number of international conventions which require States to undertake environmental assessment for projects that may have negative environmental impacts and to facilitate in public participation in decisions which affect the environment.

3.5.1 The 1998 Convention of Access to Information, Public Participation and Decision Making and Access to Justice in Environmental Matters

The 1998 Convention of Access to Information, Public Participation and Decision Making and Access to Justice in Environmental Matters (Aarhus Convention) requires that public authorities make environmental information accessible and Article 6 sets out that the public participation requirements in decision making including the provision of public information regarding:

- the proposed activity and the application on which a decision will be taken;
- the nature of possible decisions or the draft decision;
- the public authority responsible for making the decision;
- the envisaged procedure, including, as and when this information can be provided:
 - the commencement of the procedure;
 - the opportunities for the public to participate;
 - the time and venue of any envisaged public hearing;
 - an indication of the public authority from which relevant information can be obtained and where the relevant information has been deposited for examination by the public;
 - an indication of the relevant public authority or any other official body to which comments or questions can be submitted and of the time schedule for transmittal of comments or questions; and
 - an indication of what environmental information relevant to the proposed activity is available; and
- the fact that the activity is subject to a national or transboundary environmental impact assessment procedure.

Under Article 6 of the Aarhus Convention the public participation requirements are triggered if the activity is listed in Annex I or if the activity may have a significant effect on the environment.

3.5.2 The 1991 Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention)

The Espoo convention is a regional convention with parties principally from the European Union. The convention requires parties to assess the environmental impacts of activities during the early stages of planning. Under Article 2.1 the parties must take all appropriate and effective measures to prevent and reduce and control significant adverse transboundary environmental impact. Appendix I of the Espoo convention lists activities that automatically require an environmental impact assessment if significant impacts could cross a border. There is also the possibility for parties to regulate an activity

that may have significant impact that is not listed in Appendix I. Appendix III contains general criterion to determine if an activity is of environmental significance if it is not listed in Appendix I such that it requires an impact assessment.

3.5.3 Other environmental impact assessment

In relation to environmental impact assessment there are also more general provisions in a number of conventions for example, as discussed above, there are requirements for environmental assessment prior to obtaining a permit to the storage of CO₂ under the London Protocol and under Articles 204-206 of UNCLOS also provides that when States have reasonable grounds for believing that planned activities under their jurisdiction or control may cause substantial pollution of or significant and harmful changes to the marine environment, they shall, as far as practicable, assess the potential effects of such activities on the marine environment and shall communicate reports of the results of such assessments.

3.6 Managing liability

3.6.1 Customary international law

Sands notes that there are no agreed international standards which establish a liability threshold for environmental damage which triggers liability and allows claims to be brought (Sands, 2003: 879). It is foreseeable that the development of internationally agreed standards relating to CCS will inform any relevant debate as to the standard of care required and when damage has occurred.

In relation to general damage caused by plume CO₂, the general international law principles relating to state liability will also inform liability. The *Trail Smelter Case United states v Canada* 3 RIAA 1907 (1941) is commonly referenced as supporting the international law principle that that no state has the right to use its territory in such a manner as to cause injury by transboundary pollution into the territory of another. This principle will need to be integrated into approaches to the transboundary liability issues raised by CCS projects, if for example, there is leakage of CO₂ that migrates into the jurisdiction of another state and causes harm. Tortious liability regimes including trespass may also apply to the migration of plume CO₂ many years after initial injection.

However, Sands notes in relation to compliance and enforcement in the global commons that "international law in this respect is still finding its centre of gravity and states have not generally sought to assert a legal right to act on behalf of the whole international community in the protection of the environmental issues on the basis of customary law or international law" (Sands, 2003: 190).

In relation to consequences, the principal is well established that the perpetrator of an internationally wrongful act is under an obligation to make reparation for the consequences of the violation (Sands, 2003: 882). However, there are no established principals in relation to the quantification of environmental damage in economic terms, due to its nature as a resource that often lacks market value. In response, there are a number of international conventions which seek to allocate liability for certain environmental actions, particularly when the risk of damage is high such as oil spills or nuclear accidents.

3.6.2 Activities in the marine environment

In relation to CCS activities in international waters, UNCLOS will be the central regime that addresses liability. Liability may arise as a result of harm caused as a result of pollution associated with the

leakage or escape of CO₂ being transported or stored, damage caused to the marine environment that is associated with the use of CCS infrastructure, or damage to CCS infrastructure itself.

Article 139 of UNCLOS applies to the "Area" and provides that a State is responsible for damage caused by the failure of a State party or international organisation to carry out its responsibility to ensure that activities in the Area carried out by them or by their nationals, or those effectively controlled by them or their nationals, comply with the UNCLOS rules on the Area. If two or more State parties or organisations are acting together such organisations bear joint and several liability. However, Article 139 of UNCLOS also creates a defence that a State Party will not be liable for damage caused by any failure to comply with the UNCLOS rules if the state Party has taken all necessary and appropriate measures to secure effective compliance. In relation to CCS, this may mean that a State will be provided with a defence against the actions of private entities if the State signs off on an environmental assessment or similar process.

Where activities are undertaken in the high seas such as the transport by pipeline, under Article 114 of UNCLOS, every State shall adopt the laws and regulations necessary to provide that, if persons subject to its jurisdiction who are the owners of a submarine cable or pipeline beneath the high seas, in laying or repairing that cable or pipeline, cause a break in or injury to another cable or pipeline, they must bear the cost of the repairs. If pipes are damaged by a vessel of another State, the jurisdiction of the vessel (and consequent liability) is determined by the flag State of the offending vessel. However this can be problematic as the vessel may be flagged in a State with an open registry undermining enforcement action.

Article 286 of UNCLOS establishes a dispute resolution mechanism where any dispute concerning the interpretation or application of UNCLOS shall, where no settlement has been reached, be submitted at the request of any party to the dispute to the court or tribunal having jurisdiction. If two States have both chosen different means of dispute settlement under Article 287, then their dispute may only be submitted to arbitration.

In relation to activities at sea generally, in 1976 the IMO adopted the *Convention on Limitation of Liability for Maritime (LLMC)*, which specifies limits for two types of claim (loss of life or personal injury and property claims).

Compensation for accidents involving hazardous and noxious substances (HNS) is covered by the *International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS Convention)*. HNS are defined "by reference to lists of substances included in various IMO Conventions and Codes. These include oils; other liquid substances defined as noxious or dangerous; liquefied gases; liquid substances with a flashpoint not exceeding 60°C; dangerous, hazardous and harmful materials and substances carried in packaged form; and solid bulk materials defined as possessing chemical hazards."⁸

This convention contains strict liability provisions combined with a liability limit to be paid out to victims of accidents involving hazardous and noxious substances. The HNS Convention was adopted in 1996, however, it has only had limited ratifications and has not yet come into force. Although the convention will not apply to CO₂ as presently drafted it foreseeably could be amended to cover such accidents in the marine environment.

⁸ See the IMO website for a discussion of the convention:
http://www.imo.org/Conventions/mainframe.asp?topic_id=256&doc_id=665 accessed 29 June 2009.

The UNECE *Convention on the transboundary Effects of Industrial Accidents 1992* applies to industrial accidents capable of causing transboundary effects from hazardous substances. Carbon dioxide is not expressly listed as a hazardous substance in Annex I of this convention, although it does create a number of wide categories including “danger to the environment”. The convention on the Transboundary Effects of Industrial Accidents does not cover activities in the marine environment or land based transport accidents.

Another regime that may also relate to CCS in the future is the 1999 Protocol under the Basel Convention relating to liability for transboundary movements of hazardous wastes. Although this protocol is yet to come into force, Article 5 of the Protocol imposes a strict liability regime which is relevant where there is damage as a result of intentional, reckless, or negligent acts. As noted above there is presently debate as to whether the Basel Convention applies to CCS activities.

There have been a number of “strict liability” regimes developed in the international arena in situations where operations are high risk. Examples include nuclear conventions such as the Protocol to amend the *1963 Vienna Convention on Civil Liability for Nuclear Damage* and the *1997 Supplementary Compensation for Nuclear Damage Convention* which deal with oil pollution at sea. Often these conventions provide for liability amounts and require the maintenance of adequate insurance or other financial security. For example, under the 1963 Vienna Convention an operator is liable for nuclear damage but Article V “allows the installation state to limit the operator’s liability, but in no event may it be limited to less than US\$5 million for any nuclear accident. Operators must maintain insurance of other financial security; however, if the security is inadequate to satisfy claims, Article VII provides that the installation state is required to meet any deficiencies up to the limit, if any of the operator’s liability as established under Article V” (Sands, 2003: 908). There is also a protocol under this convention which has not yet come into force which, if it does, will amongst other things amend the liability limit to not less than 300 million SDRs. If a similar regime was developed for CCS, this may provide a method of addressing a number of liability concerns.

3.7 Emissions reductions mechanisms

3.7.1 Treatment under the UNFCCC

The UNFCCC and its Kyoto Protocol have the objective of stabilising CO₂ emissions in the atmosphere to levels that will prevent dangerous anthropogenic interference with the climate system. CCS provides one mechanism which may assist in meeting this objective. However, CCS does not eliminate CO₂ emissions, rather it provides a means of capturing and storing those emissions over a long period of time. If released, those emissions will contribute to atmospheric CO₂ levels. Therefore, consideration must be given to how to minimise and manage the risk of transboundary harm, as a result of the leakage or escape of CO₂ during transportation and from both domestic and international storage sites.

ACCOUNTING

Parties to the UNFCCC are required to report when emissions are released into the atmosphere. If CO₂ is captured and injected before any emissions are released into the atmosphere, then arguably no emission occurs. Yet if CO₂ leaks many years after its original storage, the requirement to report on, and account for, emissions liability for those emissions may not crystallise until many years after injection.

The 2006 IPCC Guidelines for National Greenhouse Gas Inventories are a positive step towards developing rules for accounting of emissions from CCS. A further guidance note produced by States provides that "emissions from plant with CO₂ capture are estimated by subtracting the measured amount captured from the emissions without capture" (Eggleston, 2006). However, this guidance note goes on to state in relation to geological storage that "geological conditions vary widely, and there are currently only a few published studies of monitoring programs that identify and quantify fugitive anthropogenic CO₂ emissions from geological storage operations. Thus, it is not feasible to produce default emission factors that could be applied to leakage from geological storage reservoirs" (Eggleston, 2006). Therefore, a number of recognised ambiguities remain.

Further, the 2006 IPCC Guidelines have not yet been adopted by the UNFCCC COP and Parties are not compelled to use them for reporting national inventories at present, although some parties are doing so. In addition, many developing countries are concerned that the standards in the 2006 IPCC Guidelines are too onerous and therefore should not be mandated to apply in non-Annex I Parties. Consistent international guidelines on monitoring, verification and reporting are needed for both developed and developing countries that are binding under the UNFCCC.

TREATMENT IN THE CDM

There is currently debate as to whether CCS activities should be included within the Clean Development Mechanism (CDM) under the Kyoto Protocol, to provide CCS projects in developing countries with a means to generate Certified Emission Reduction (CERs), which can be traded in the international carbon market.

The UNFCCC's Subsidiary Body for Scientific and Technological Advice (SBSTA) has been considering issues related to the inclusion of CCS in geological formations as CDM project activities since 2006. As a result of these deliberations, a number of issues have been raised about the appropriateness of CCS in the CDM, including:

- long-term physical leakage levels of risks and uncertainty;
- project boundary issues (such as reservoirs in international waters, several projects using one reservoir);
- long-term responsibility for monitoring the reservoir and any remediation measures that may be necessary after the end of the crediting period; and
- other relevant matters, including environmental impacts.

States such as Brazil, acknowledge that CCS is an option for mitigation, particularly for developed Annex I parties in their effort to reduce their emissions, however, are of the view that CCS technologies are not appropriate in the CDM and should not be eligible to generate CERs, as they do not meet obligations to reduce emissions and promote sustainable development. Furthermore, financial arguments against CCS have been raised by some countries suggesting that the inclusion of CCS in the CDM may flood the market with CERs and that CCS will create perverse incentives for more fossil fuel extraction and consumption.

Conversely, States such as Saudi Arabia, Australia, Norway, Canada, and the EU have expressed support for the inclusion of CCS in the CDM on the basis that it has the potential to be an important mitigation technology and can result in real, measurable and long term reductions in GHG emissions.

However, to date parties have not been able agree to the SBSTA conclusions, and have consistently deferred consideration of these issues to the next SBSTA session in June 2009. At its twenty-seventh

session SBSTA invited a number of parties and organisations to submit their views on technological, methodological, legal, policy and financial issues in relation to CCS. A synthesis report dated 25 September was produced for the SBSTA based on submissions received (Synthesis Report).

LEGALITY

The Synthesis Report states that "several submissions referred to the legality of CCS activities under the Kyoto Protocol and the CDM modalities and procedures. Points raised in this context include that CCS is incompatible with Article 12 of the Kyoto Protocol as CCS does not stimulate sustainable development and emission reductions and that CCS is not compatible with the CDM modalities and procedures... which require technologies included in the CDM to be environmentally safe and sound, and project activities to demonstrate achievement of sustainable development as well as emission reductions, and also require equitable geographic distribution of CDM project activities" (Synthesis Report: para 38).

In response submissions from parties and organizations expressed that CCS is recognized under the Kyoto Protocol, in Article 2 as an important GHG mitigation technology that promotes sustainable development (Synthesis Report: para. 39).

3.7.2 Leakage

Under the Kyoto Protocol CDM is a private sector activity. This raises particular issues around the appropriateness of CCS under the CDM given the timelines required for monitoring, reporting and liability for damage and emission units if leakage occurs (particularly if such leakage is into international waters). Such long timelines raise clear insolvency and financing risks. Ultimately, to resolve these issues, risk transfer of liability and monitoring to the State is to be expected. However, as a pre-requisite to the inclusion of CCS in the CDM, rules will need to be developed regarding the distribution of risk between private entities and States including, standard setting, accounting methodologies, verification and monitoring responsibilities and liability provisions. Decisions regarding accounting methodologies are crucial, as ultimately they will determine link between liability and any credits created by a CCS project. The Synthesis Report notes that in this context, the following points included that:

- the economic arrangements to compensate for damage should be addressed via the arrangements by which the storage project has been funded, which could be designed into the requirements for including CCS as a CDM project activity;
- there is a need for clearly defined liability extending beyond the project crediting period. Thus liabilities need to be defined in the short, medium and long term;
- ultimate long-term liability should lie with the host country, the project proponent or the country using the CERs. In the case of the latter two, this should help to ensure close monitoring of the project and offer incentives to use only the safest projects;
- the long-term nature of CCS means that post-project closure monitoring and remediation liability can be practically assumed only by the host country because the storage reservoir lies within its jurisdiction.
- the host country is most able to manage the operating conditions and post-closure controls in the event of any seepage over the long term; and

- the host country must have an appropriate liability regime in place before it can host a CCS project under the CDM (Synthesis Report, para. 44).

Submissions from other parties and organisations suggested different views on these matters in the Synthesis report including that:

- owner liability is only possible for 20–60 years within the current CDM framework, but CCS activities have a time frame of millennia, over which time companies and even States can cease to exist;
- transferring liability for a storage site from the operator to the host country would require the State to finance monitoring and undertake remediation, the costs of which would be unknown. It is also not possible to estimate the potential costs of impacts to the environment and public health, or calculate them in present value terms so as to then include these costs in the CDM project activity" (Synthesis Report, para. 45).

MARKET

Financial arguments against financing CCS projects using the CDM in the Synthesis Report included:

- due to the high costs of CCS projects, they are not a cost-effective mitigation option; and
- CDM revenues should be used to promote clean and renewable technologies; the CDM was not conceived for giving subsidies to oil, gas and coal production with CCS.

One Party suggested that a high carbon price may not necessarily be the trigger for CCS in developing countries, suggesting that CCS could be developed through some other framework using specific financial mechanisms (Synthesis Report, para. 67-68).

POST 2012

The United Nations Climate Change Conference in Copenhagen at the end of 2009 is intended to be the end of a two year commitment to shape an effective international successor agreement to the Kyoto Protocol. This provides an opportunity for CCS's role as a climate change mitigation measure and its role within the CDM to be re-defined. However, notwithstanding general support, States recognise that CDM Rules will need to be developed regarding the distribution of risk between private entities and States including standard setting, accounting methodologies, verification and monitoring responsibilities and liability provisions. There also appears to be general recognition that capacity building is needed in non-Annex I Parties to ensure effective regulation of CCS projects. Decisions regarding accounting methodologies are particularly crucial, as ultimately they will determine the link between liability and any credits created by a CCS project.

3.7.3 Recognition of CCS under emissions trading regimes

There are a number of states such as Australia, America and New Zealand which are presently in the process of developing domestic emissions trading schemes. The European Union Emissions Trading Scheme has been operational since 2005. The concept of "linking" is the acceptance under one scheme of the use of carbon units from other emission reduction schemes to acquit liabilities. It could also include the export of units of one scheme to other schemes. To enable a firm basis for linking with other schemes, it will be important to ensure that one scheme's carbon permits share legal characteristics common to other schemes. The development of diffuse rules regarding the accounting

of CCS activities and the crediting of CCS activities in domestic schemes may present a barrier to the effective linking of schemes.

FUNDING OF PROJECTS BY INTERNATIONAL ORGANISATIONS

It is generally accepted that there is a need for increased funding for CCS to become a viable technology. Funding arrangements through the UN are currently being debated and are under development in the lead up to Copenhagen. While the central driver is likely to be the global price placed on CO₂ emissions through emission caps agreed under a successor to the Kyoto Protocol, there is debate under the UNFCCC regarding the mechanism to provide further funding through measures including technology transfer, adaptation funds and a possible market based mechanism such as the CDM. In general funding for “on-the ground” projects has been left to particular governments while international or bilateral partnerships and institutions such as the IEA, the CSLF and the Global CCS Institute have, to date, have generally focused their significant support to the commissioning studies, public debate and academic research.

Press reports indicate that at the end of May 2009 the World Bank's Vice President Katherine Sierra said that the World Bank seeks to play a bigger role in sustainable energy projects around the globe including experimental CCS research. The World Bank has traditionally not funded "pre-commercialized technology" such as CCS but rather focused on transferring proven green technology to developing States. But the report notes that she said the bank could help fund some CCS projects or studies, including geological surveys, as well as provide clients with know-how on creating renewable energy policies (Moskwa, 2009).

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