

Preserving a Balanced Ocean: Regulating Climate Change Mitigation Activities in Marine Areas beyond National Jurisdiction

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Abstract

The urgency associated with mitigating the adverse impacts of climate change has spawned a variety of geoengineering schemes designed to promote better absorption of carbon dioxide and other greenhouse gases from the earth's atmosphere by the oceans and forests. This article examines three climate change mitigation activities which employ the ocean as a receptacle for these gases and the international law framework which applies to these activities in marine areas beyond national jurisdiction. It argues that although some guidelines have been developed by the States Parties to the London Convention and the London Protocol to regulate the environmental impact of sub-seabed sequestration of carbon dioxide, the international law framework for such activities in marine areas beyond national jurisdiction is ad hoc and far from comprehensive.

Introduction

The damaging effects of anthropogenically-induced climate change on both the terrestrial and marine environments have been acknowledged by a succession of expert reports commissioned by global and national bodies.¹ This recognition has spawned heightened levels of activity by scientists, engineers and entrepreneurs to mitigate the adverse effects of climate change. Multiple schemes have been suggested to ameliorate the adverse effects of climate change on the environment caused by the burning of fossil fuels and other greenhouse gas emissions, including enhanced schemes to remove carbon dioxide from the atmosphere. The ability of the ocean to absorb rising levels of carbon dioxide in the atmosphere has been the focus of some of these schemes. The ocean is already a major sink for carbon dioxide because of its capacity to readily absorb excess atmospheric carbon and convert it to soluble form. A prominent deep sea

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1 Intergovernmental Panel on Climate Change ('IPCC'), *Fourth Assessment Report* (2007) <www.ipcc.ch/ipccreports/ar4-syr.htm> accessed 29 May 2008 ('IPCC Fourth Report'); HM Treasury, *Stern Review: The Economics of Climate Change* (2006) ('Stern Review'); Benjamin Preston & Roger Jones, *Climate Change Impacts on Australia and the Benefits of Early Action to Reduce Global Greenhouse Gas Emissions. A consultancy report for the Australian Business Roundtable on Climate Change* (February 2006).

scientist, Tony Koslow, estimates that approximately 5.5 billion tonnes (or gigatonnes) of carbon are now released into the atmosphere each year as carbon dioxide from the burning of fossil fuels, and that a third of that is taken up by the oceans.² Augmenting the rate at which the oceans absorb carbon dioxide, or using the oceans as a storage receptacle for excess carbon dioxide, are fundamental objectives of the climate change mitigation activities now being proposed and trialled in marine areas both within and beyond national jurisdiction.³

Less attention has been devoted to the environmental impacts of such climate change mitigation activities particularly where they occur in marine areas beyond national jurisdiction. While climate change mitigation activities conducted in marine areas within national jurisdiction may be subject to coastal State legislation and policy on environmental impact assessment and other environmental protection safeguards, the regulatory framework for such activities beyond national jurisdiction is fragmented and less defined. General obligations to protect the marine environment beyond national jurisdiction are contained in Part XII of the *United Nations Convention on the Law of the Sea* ('1982 LOSC')⁴ but these have not been supplemented in the case of marine areas beyond national jurisdiction with international law instruments applying modern environmental protection principles to the conduct of emerging activities such as climate change mitigation schemes by Flag States, their nationals and corporations. In the absence of systems to monitor and mitigate the adverse impacts of such activities in marine areas beyond national jurisdiction, there is a real risk of irreversible damage to the marine environment of these areas and its biodiversity.⁵

This article will describe three climate change mitigation activities which involve using either the water column or sea-bed: sequestration of carbon dioxide in the water column or sea-bed; fertilisation of the open ocean with iron or other nutrients to stimulate phytoplankton blooms (which may enhance the capacity of the oceans to absorb carbon dioxide); and the use of wave-driven pumps suspended above the ocean floor to bring deeper, more nutrient-rich water closer to the ocean surface, where it may stimulate increased growth of phytoplankton to absorb carbon dioxide more efficiently, and eventually flush more carbon dioxide to the bottom of the ocean. The article will analyse the applicability of the law of the sea and marine environmental law principles to these activities when they occur in marine areas beyond national jurisdiction, whether in the high seas water column or on the deep sea-bed beyond national jurisdiction. The freedom of the seas has been a defining concept of the law of the sea since it was

2 Tony Koslow, *The Silent Deep* (2007) at 156.

3 Karen Scott, 'The Day After Tomorrow: Ocean CO₂ Sequestration and the Future of Climate Change' (2005) 18 *Georgetown International Environmental Law Review* 57.

4 *United Nations Convention on the Law of the Sea*, opened for signature on 10 December 1982, 1833 UNTS 3 (entered into force 16 November 1994) ('1982 LOSC'). The term 'marine areas beyond national jurisdiction' when used in this article refers to all those parts of the sea which are not included in the exclusive economic zone, territorial sea or the internal waters of a State or the archipelagic waters of an archipelagic State and all those parts of the seabed and ocean floor and sub-soil thereof beyond the outer limit of the continental shelf of a State.

5 Koslow, above n2 at 159–160; Scott, above n3 at 58.

advocated by Hugo Grotius in his treatise *Mare Liberum* in 1609.⁶ Grotius' fundamental premise was that the 'outer ocean' may not be subjected to the sovereignty of individual States and that it was open to use by all nations.⁷ This doctrine remains an integral part of the high seas regime and is codified in Part VII of the 1982 LOSC. Juxtaposed with the doctrine of the freedom of the seas is the obligation in Part XII of the 1982 LOSC that States Parties must protect and preserve the whole of the marine environment, including marine areas beyond national jurisdiction. This principle is reinforced in subsequent instruments such as the Oceans Chapter of *Agenda 21*⁸ and the *Convention on Biological Diversity*,⁹ which recognise the obligation to conserve marine biodiversity and require a precautionary and ecosystem-based approach to be taken to activities at sea. The obligation to protect and preserve the marine environment in article 192 of the 1982 LOSC is expressed as applying across all areas of ocean space, although its implementation in marine areas beyond national jurisdiction is far from comprehensive. States have combined to develop international rules and standards on protection of the marine environment beyond national jurisdiction from vessel source discharges in the shipping sector and from the adverse impacts of deep sea-bed mining, through the obligations under Part XI of the 1982 LOSC. For emerging uses of the oceans beyond national jurisdiction, such as climate change mitigation, the environmental regulation canvas remains blank. States and non-State actors are free to engage in these activities on the high seas without prior assessment or monitoring of their impacts on the environment. This article will discuss potential options for strengthening the environmental protection regime which applies to existing and new climate change mitigation activities in marine areas beyond national jurisdiction.

I. Climate Change Mitigation Activities and the Ocean

A. Sequestration of Carbon Dioxide in the Seabed and Water Column

One of the earliest climate change mitigation schemes proposed was carbon sequestration. This involves permanent sequestration of carbon dioxide emissions from large point sources such as fossil fuel-fired power plants, steel works and fuel processing plants, in sub-seabed geological formations.¹⁰ The process involves separating carbon dioxide from flue gases and pressurising it for transport by pipeline or vessel to the sub-seabed storage site. Storage sites envisaged and already being used for sub-seabed carbon dioxide capture include depleted offshore oil and gas fields and deep subterranean and

6 Hugo Grotius, *The Freedom of the Seas of the Right which Belongs to the Dutch to Take Part in the East Indian Trade* (translation and revision of text by Ralph Van Deman Magoffin) (1916).

7 Id at 37.

8 *United Nations Conference on Environment and Development* ('UNCED'), UN Doc. A/CONF.151.26 (1992) ('*Agenda 21*').

9 *Convention on Biological Diversity*, opened for signature on 5 June 1992, 1760 UNTS 79 (entered into force 29 December 1993) ('*CBD*'); 31 ILM 818.

10 Koslow, above n2 at 157; International Maritime Organization Press Briefings, *New International Rules to Allow Storage of CO2 Under the Seabed* (2007) <www.imo.org/Safety/mainframe.asp?topic_id=1472&4doc_id=7772> accessed 30 May 2008.

sub-sea saline aquifers.¹¹ While most sub-seabed sequestration of carbon dioxide has so far occurred in waters within national jurisdiction, there is the potential for future storage in seabed areas beyond national jurisdiction when storage sites within national jurisdiction are exhausted.¹² The principal risk associated with this method of carbon dioxide disposal in the sub-seabed is the potential for leakage of carbon dioxide and any other substances in the carbon dioxide stream, such as heavy metals, into the marine environment, either during transport to a storage site or after storage.¹³ Leakage of these substances into the deep sea environment can alter the marine chemistry of the water column and lead to adverse effects on the interconnected web of marine species, habitats and ecosystems.¹⁴ Considerable research has been undertaken by States, in conjunction with corporations to assess and minimise the environmental risks associated with sub-seabed sequestration of carbon dioxide. The results of this research are being implemented in a number of projects in marine areas within national jurisdiction around the world.¹⁵

A less contained form of disposal of carbon dioxide from fossil fuel emissions associated with the oceans is the injection of carbon dioxide directly into the water column. In most trials performed to date this has involved the introduction of liquid carbon dioxide from ships or pipelines into the sea at depths ranging from 1,000 metres to over 3,000 metres from the surface.¹⁶ Disposal at greater depths is preferred so that mixing of water levels during winter does not return the carbon dioxide to just below the ocean surface, where it would be re-absorbed into the atmosphere.¹⁷ Scientists have identified a range of adverse impacts to the marine environment from this method of disposal. It is predicted that carbon dioxide disposed of in the deep sea at depths below 3,000 metres would form a lake which would freeze over and eventually dissolve.¹⁸ The effects of this introduction of an alien chemical substance into the deep sea on the benthic ecosystems of these areas is expected to include asphyxiation and suppression of the metabolisms of species due to acidification of the surrounding sea water and the inability of deep sea organisms to take up oxygen from sea water with a lower pH level.¹⁹ There is also considerable uncertainty among scientists whether this method of disposal of carbon dioxide in the oceans will lead to effective isolation of carbon dioxide from the atmosphere on a long term basis.²⁰ Although some experiments and proof of concept

11 Scott, above n3 at 60; Ann Brewster Weeks, 'Sub Seabed Carbon Dioxide Sequestration as a Climate Mitigation Option for the Eastern United States: A Preliminary Assessment of Technology and Law' (2007) 12 *Ocean and Coastal Law Journal* 245 at 252.

12 International Maritime Organization, CO₂ Sequestration Frequently Asked Questions (2002) <www.imo.org/environment/mainframe.asp?topic_id=1548> accessed 30 May 2008.

13 Juan Abanades et al, *IPCC Special Report on Carbon Dioxide Capture and Storage* (2005) at 18.

14 Ibid; Koslow, above n2 at 160.

15 Scott, above n3 at 60; Weeks, above n11 at 252–253.

16 Koslow, above n2 at 159–160; Paul Johnston et al, *Ocean Disposal/Sequestration of Carbon Dioxide from Fossil Fuel Production and Use: An Overview of Rationale, Techniques and Implications* (1999) at 7–8.

17 Koslow, above n2 at 159; Johnston et al, above n16 at 7–8.

18 Koslow, above n2 at 160; Johnston et al, above n16 at 8.

19 Koslow, above n2 at 160; Johnston et al, above n16 at 8.

20 Johnston et al, above n16 at 8.

studies have been conducted into this form of carbon dioxide disposal, the associated environmental risks and legal uncertainties have detracted large scale commercial investment, which has gravitated instead towards sub-seabed sequestration projects.²¹

B. Open Ocean Fertilisation

The process of open ocean fertilisation uses iron and other micronutrients to increase phytoplankton primary productivity in iron- and other nutrient- deficient areas of the ocean in order to promote further drawdown of photosynthesised carbon into the deep ocean.²² There are a variety of risks and uncertainties associated with open ocean fertilisation which have prompted concern among scientists and environmentalists. The effects of stimulating phytoplankton productivity on other marine organisms and marine ecosystems generally are poorly understood.²³ Increased productivity of phytoplankton may boost the production of other greenhouse gases, such as nitrous oxide, neutralising the positive effects of enhanced carbon dioxide drawdown, while the sinking of phytoplankton blooms into the deep ocean may reduce oxygen levels at these depths with adverse consequences for fisheries and other marine organisms.²⁴ The sustainability of this activity as a climate change mitigation option has also been called into question on the basis of the timeframes and quantities of iron or other nutrients required for the process to be effective. Results from several iron fertilisation projects in open ocean areas beyond national jurisdiction, including the Southern Ocean, with high dissolved concentrations of nutrients and low photosynthetic biomass have concluded that there is no evidence of increased carbon dioxide drawdown to the deep sea within the timeframe of the experiments.²⁵ One projection quoted in a Greenpeace Technical Report on the Ocean Disposal/Sequestration of Carbon Dioxide estimates that approximately 470,000 tonnes of iron per year, spread over as much as 25 per cent of the ocean surface and repeated for an indefinite period, would be needed for this method of carbon dioxide sequestration to be effective.²⁶ Notwithstanding the uncertainties and environmental risks associated with open ocean fertilisation, some commercial ventures are interested in the process and have attracted investment for their operations.²⁷

C. Biological Sequestration of Carbon Dioxide Using Upwelling Pumps

A further scheme has been developed by a US commercial venture, Atmocean, which uses wave-driven pumps arrayed on the deep ocean floor to bring up large volumes of nutrient rich deep ocean water nearer to the ocean's surface with the object of enhancing

21 Koslow, above n2 at 161; Johnston et al, above n16 at 8.

22 Koslow, above n2 at 157–158; Rosemary Rayfuse, Mark Lawrence & Kristina Gjerde, 'Ocean Fertilisation and Climate Change: The Need to Regulate Emerging High Seas Uses' (2008) 23 *The International Journal of Marine and Coastal Law* 1 at 6–7.

23 Rayfuse et al, above n22 at 8–9; Koslow, above n2 at 159; Scott, above n3 at 87–88.

24 Johnston et al, above n16 at 24–25; Rayfuse et al, above n22 at 10.

25 Koslow, above n2 at 159; Tatjana Rosen, 'Open Ocean Fertilisation' in Cutler Cleveland (ed), *Encyclopaedia of Earth* (2007) <www.eoearth.org/article/Open_ocean_iron.fertilization> accessed 10 June 2008; Rayfuse et al, above n22 at 9.

26 Johnston et al, above n16 at 23–24.

27 Koslow, above n2 at 159; Rayfuse et al, above n22 at 3.

phytoplankton production.²⁸ The scheme projects that the increased numbers of phytoplankton would then absorb more carbon dioxide from the atmosphere and would subsequently be consumed by other marine species, in particular, a zooplankton species, the salp of which makes heavy fast-sinking faecal pellets that efficiently sequester carbon and send it to the bottom of the ocean rapidly and in significant amounts.²⁹ This scheme is based on research by scientists at the Woods Hole Oceanographic Institute which has measured the high degree of carbon sequestration in the excreta of salps over a 100,000 square kilometre region.³⁰ In promotional material for the scheme it is proposed that when fully deployed, the pumps, spaced two kilometres apart, would eventually cover 80 per cent of the world's oceans.³¹ They would be dropped from barges into ocean areas beyond the 200 nautical mile limit.³² Other benefits claimed for the scheme include possible cooling of the upper mixed layer upstream from coral reefs to reduce coral bleaching from ocean hotspots, possible mitigation of climate change effects by enhancing the mixing of Arctic/Greenland melt-water, enhancement of wild fish populations, and reduced hurricane intensity achieved by cooling the upper mixed layer of the oceans upon the approach of a tropical storm in high risk regions such as the Gulf of Mexico.³³ The Atmocean scheme is in the early stages of implementation and has not yet been deployed on a large-scale basis in marine areas beyond national jurisdiction.

2. The Applicability of International Law Principles to Climate Change Mitigation Activities in Marine Areas beyond National Jurisdiction

The regulatory framework for environmental protection in marine areas beyond national jurisdiction resembles an artist's canvas in the preliminary stages of its development. The sketchy outline of broad environmental protection principles, such as those contained in Part XII of the 1982 *LOSC*, is punctuated by denser patches of colour where States have negotiated at the global and regional level on vessel source pollution and dumping at sea, imposing more detailed obligations on States to regulate their flag vessels and activities under their jurisdiction or control. Environmental governance in marine areas beyond national jurisdiction is gradually evolving against a background of vast tracts of ocean where the freedoms of the sea have traditionally held sway. This section will explore some of the general international law principles which apply to the climate change mitigation activities described above in marine areas beyond national jurisdiction, and the development of more detailed regulatory frameworks for such activities.

28 Atmocean, *Biological Ocean Sequestration of CO₂ Using Atmocean Upwelling* <www.atmocean.com/sequestration.htm> accessed 30 May 2008.

29 Ibid.

30 Atmocean, *WHOI Research on Carbon Sequestration – July 5, 2006* <www.atmocean.com/sequestration.htm> accessed 30 May 2008.

31 Atmocean, above n28.

32 Ibid.

33 Philip Kithil, 'Are Salps a Silver Bullet Against Global Warming And Ocean Acidification?' (2006). 87 *Eos, Transactions American Geophysical Union* 52, Fall Meet, Abstract #OS21A-1571

A. 1982 LOSC Provisions

At the zenith of the 1982 LOSC framework for protection and preservation of the marine environment is article 192 in Part XII, which imposes a general obligation on States Parties to protect and preserve the marine environment. The obligation in article 192 is not limited in geographic scope, although in practice its implementation is highly dependent on the regulatory measures in place for different sectors of human activity at sea and the relative strength of enforcement measures within different areas of ocean space.³⁴ Notwithstanding the unqualified nature of the language in article 192, the debates in the Third Committee of the Third United Nations Conference on the Law of the Sea ('UNCLOS III') and other articles in the 1982 LOSC indicate that the general obligation under article 192 must be interpreted consistently with States Parties rights and obligations under other provisions of the 1982 LOSC and related international conventions.³⁵ Article 194(1) of the 1982 LOSC begins the process of giving content to this general obligation by codifying the duty of States Parties to prevent, reduce and control pollution of the marine environment from any source.³⁶ The global scope of this responsibility is manifest in article 194(2) which refers to States Parties' duty 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. An indicative list of the sources of marine pollution is contained in article 194(3) which provides that States Parties shall take measures designed to minimise to the fullest possible extent their effects. The following descriptions of two categories of marine pollution in article 194(3) could apply to some of the impacts of the climate change mitigation activities examined above on the marine environment:

- (a) the release of toxic, harmful or noxious substances, especially those which are persistent from land based sources, from or through the atmosphere or by dumping;
- ...
- (d) pollution from other installations and devices operating in the marine environment...

In addition to these general duties to take measures to prevent, reduce and control marine pollution, article 194(5) imposes a positive duty on States to take measures to protect and preserve rare and fragile ecosystems as well as the habitat of depleted,

34 Myron Nordquist, Shabtai Rosenne & Alexander Yankov (eds), *United Nations Convention on the Law of the Sea 1982. A Commentary, Vol IV* (1991) at 43; Philomene Verlaan, 'Experimental Activities that Intentionally Perturb the Marine Environment: Implications for Marine Environmental Protection and Marine Scientific Research Provisions of the 1982 United Nations Convention on the Law of the Sea' (2007) 31 *Marine Policy* 210 at 210.

35 Commonwealth of Australia, *Report of the Australian Delegation to the Third United Nations Conference on the Law of the Sea, Second Session, Caracas, Venezuela* (1974) Parliamentary Paper 164, Item 12 – Preservation of the Marine Environment at [127]: 'The emphasis on the part of the maritime States was to give the greatest protection possible to freedom of navigation.'

36 Alan Boyle, 'Protecting the Marine Environment: Some Problems and Developments in the Law of the Sea' (1992) 16 *Marine Policy* at 80 describes the general obligation of States to protect the marine environment from all sources of marine pollution as a rule of customary international law.

threatened or endangered species from marine pollution, representing an early recognition of the need for ecosystem-based management of the oceans. The obligation imposed on States Parties in article 195 not to transfer, directly or indirectly, damage or hazards from one area to another has particular relevance to marine areas beyond national jurisdiction, as these areas have often been used as dumping grounds for vessel source and other forms of pollution. The practical issues of environmental impact assessment and monitoring of the risks and effects of marine pollution in all areas of the sea are addressed in articles 204 and 206, which require States Parties to assess, as far as practicable, the potential effects of planned activities under their control which may cause substantial pollution or significant and harmful changes to the marine environment, and to communicate reports of the results of such assessments by publishing them or providing them to the competent international organisations.

Rather than being prescriptive in character, Part XII of the *1982 LOSC* recognises the role of competent international organisations, such as the International Maritime Organisation ('IMO'), and diplomatic conferences in supplementing the *1982 LOSC* framework on marine pollution control with regulatory instruments which address specific forms of marine pollution. Article 197 provides for a duty on the part of States Parties to cooperate on a global and, as appropriate, regional basis in the protection of the marine environment, directly or through competent international organisations, in formulating and elaborating international rules, standards and recommended practices and procedures for the protection and preservation of the marine environment. States must also cooperate directly or through competent international organisations for the purpose of promoting studies, undertaking programmes of scientific research and encouraging the exchange of information and data acquired about pollution of the marine environment and to participate actively in programmes to assess the nature of and extent of marine pollution, exposure to it and its pathways, risks and remedies. The extensive regulatory activity undertaken by the IMO and its member States on vessel source pollution and dumping at sea is a manifestation of this type of cooperation.

Where climate change mitigation activities are experimental in character, the *1982 LOSC* provisions on marine scientific research may apply to their conduct. Article 87 confirms the freedom of scientific research in high seas areas, subject to the provisions of Part VI on the continental shelf and Part XIII on Marine Scientific Research. Articles 256 and 257 in Part XIII reinforce this freedom, providing that all States and competent international organisations have the right in conformity with the *1982 LOSC* to conduct marine scientific research in the Area and the water column beyond the limits of the exclusive economic zone. Marine scientific research activities are, however, expressly subject to the marine environmental protection provisions of the *1982 LOSC* under article 240(d).³⁷ Where climate change mitigation activities, such as the construction of pipelines for carbon dioxide sequestration, are conducted in high seas areas above a continental shelf, States Parties and flag vessels under their jurisdiction or control would also need to have due regard for the sovereign rights of coastal states in relation to the living and non-

³⁷ Verlaan, above n34 at 211.

living resources of the shelf. For example, article 79(2) of the 1982 *LOSC* provides that although a coastal State may not impede the laying or maintenance of pipelines on the continental shelf beyond its territorial sea, it has the right to take reasonable measures for the prevention, reduction and control of pollution from such pipelines.

While some essential principles of environmental protection in the 1982 *LOSC* (which may apply to climate change mitigation activities) extend to marine areas beyond national jurisdiction, these are largely dependent on flag State responsibility for their implementation. Under article 217 of the 1982 *LOSC*, flag States must ensure compliance by vessels flying their flag with applicable international rules and standards established through the competent international organisation and with their own laws and regulations for the prevention, reduction and control of marine pollution from vessels including pollution by dumping.³⁸ Flag States must provide for the effective enforcement of such rules, standards, laws and regulations, irrespective of where a violation occurs. The system of flag State jurisdiction over all forms of vessel source pollution depends on the commitment and resources of States to monitor the compliance of their own fleets and take enforcement measures against delinquent vessels.

B. Complementary Principles for Regulating the Marine Environment beyond National Jurisdiction

Since the 1972 *Stockholm Declaration on the Human Environment*,³⁹ a body of modern conservation principles has emerged that apply to the protection of the marine environment both within and beyond national jurisdiction.⁴⁰ Although these principles have generally been expressed as consistent with the provisions of the 1982 *LOSC*, they have followed a separate development trajectory from the law of the sea. The predominant policy objective in the more recent instruments and soft law declarations on the environment has been the adoption of a more integrated ecosystem-based regime for managing the oceans which promotes sustainable use of marine resources and a precautionary approach to the protection of the marine environment. This objective has usually been qualified with the prescription that marine environmental protection principles and policies must be implemented consistently with the rights and obligations of States under the law of the sea as reflected in the 1982 *LOSC*. Climate change mitigation activities conducted in marine areas beyond national jurisdiction are also subject to this evolving body of marine environmental protection principles.

(i) United Nations Conference on Environment and Development ('UNCED') — Rio Declaration on Environment and Development and Agenda 21 Oceans Chapter

The UNCED process had the effect of catalysing the formation of a whole body of emerging international environmental law principles and demonstrating their application

38 Patricia Birnie & Alan Boyle, *International Law and the Environment* (2nd ed) (2002) at 370; Erik J Molenaar, *Coastal State Jurisdiction over Vessel Source Pollution* (1998) at 99.

39 *Declaration of the United Nations Conference on the Human Environment*, UN Doc A/CONF. 48/1 and Corr. 1 (1972); reprinted in 11 ILM 1416.

40 Verlaan, above n34 at 210–211.

to various components of the environment.⁴¹ Although different versions of the precautionary approach had been contained in other regional and global instruments prior to UNCED, its inclusion in Principle 15 of the *Rio Declaration on Environment and Development*⁴² was a major step in its global maturation as an emerging principle of customary international law.⁴³ The Principle 15 version of the precautionary approach contains a familiar formulation of the concept, specifying that where there are threats of serious or irreversible damage to the environment, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. For marine areas beyond national jurisdiction, the precautionary approach has particular relevance because of the still-developing state of scientific knowledge in relation to most aspects of the deep seas environment and the wide array of new and emerging uses of these areas. The embryonic state of knowledge of the marine environment beyond national jurisdiction arguably imposes an even greater responsibility on the international community to adopt preventive strategies to protect this part of the global environment. The more stringent nature of the obligation imposed by the precautionary approach for areas beyond national jurisdiction is borne out in the content of provisions incorporating the precautionary approach in some of the global instruments which apply to areas beyond national jurisdiction. Birnie & Boyle cite examples of instruments where the burden of proof is reversed in these circumstances, making it impermissible to carry out an activity in areas beyond national jurisdiction unless it can be shown that it will not cause unacceptable harm to the environment.⁴⁴ The use of environmental impact assessment processes for proposed activities that are likely to have a significant adverse impact on the environment is also encouraged in Principle 17 of the *Rio Declaration*. Many of the principles contained in the *Rio Declaration*, including the precautionary approach and the recommendation that States conduct environmental impact assessments for proposed activities, were applied systematically across all programme areas in the UNCED Action Plan, Agenda 21,⁴⁵ including the oceans.

The Introduction to the Oceans Chapter of Agenda 21 recognises the underlying unity of the oceans, describing the oceans and all seas and adjacent coastal areas as ‘an integrated whole that is an essential component of the global life support system.’⁴⁶ The primacy of the 1982 *LOSC* as the governing framework for the protection and sustainable development of the marine and coastal environment and its resources was also acknowledged in the Introduction to the Oceans Chapter, but it also signalled the

41 David Freestone, ‘The Road from Rio: International Environmental Law After the Earth Summit’ (1994) 6 *Journal of Environmental Law* 193 at 216.

42 *Rio Declaration on Environment and Development*, UN Doc A/CONF.151/PC/WG.III/L.33/Rev 1 (1992) (*‘Rio Declaration’*).

43 Birnie & Boyle, above n38 at 116; Patricia Birnie, ‘The Status of Environmental “Soft Law”: Trends and Examples with Special Focus on IMO Norms’ in Henrik Ringbom, *Competing Norms in the Law of Marine Environmental Protection* (1997) at 51; Stuart Kaye, *International Fisheries Management* (2001) at 171–172; Freestone, above n41 at 216.

44 Birnie & Boyle, above n38 at 118.

45 *United Nations Conference on Environment and Development*, above n8.

46 Id at [17.1].

need for fresh approaches to marine and coastal management at the various levels of oceans governance, specifying that such approaches should be 'integrated in content' and 'precautionary and anticipatory' in ambit.⁴⁷ Section B of the Oceans Chapter gave more specific content to the general obligation of States to protect and preserve the marine environment, found in article 192 of the 1982 LOSC, by specifying a set of objectives to guide States' efforts in arresting the degradation of the marine environment. Many of these derive from the principles contained in the *Rio Declaration*. They include the application of preventive, precautionary and anticipatory approaches to reduce the risk of long-term and irreversible damage to the marine environment, the prior assessment of activities that may have significant adverse impacts on the environment, the integration of marine environmental protection considerations into social and economic development policies, incentives such as the polluter pays principle to encourage the application of clean technologies, and other means consistent with the internalisation of environmental costs.⁴⁸

(ii) *1992 Convention on Biological Diversity ('1992 CBD')*

The provisions of the 1992 CBD⁴⁹ are closely linked to the vision expounded in the *Rio Declaration* and Agenda 21 of integrated and ecosystem-based management of the environment including marine areas beyond national jurisdiction.⁵⁰ Biological diversity is an all-encompassing term, defined in article 2 of the 1992 CBD as 'the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part' and including 'diversity within species, between species and ecosystems.' In the context of the marine environment, the concept of biodiversity was allied to the notion of large marine ecosystems forming an interconnecting web of marine living resources and their habitats.⁵¹ This comprehensive approach added new dimensions to the protection of the marine environment which previously had been largely based on pollution control and the protection of single species.⁵² The obligation to conserve biodiversity contained in the 1992 CBD entailed protection of a range of interlinked components in the marine environment, including species, habitats, ecosystems and genetic material, and took into account the social, economic and political factors affecting the various components of marine biodiversity.⁵³ Under article 14 of the 1992 CBD Contracting Parties must introduce environmental impact assessment procedures for proposed projects that are likely to have significant adverse effects on biodiversity in order to avoid or minimise such effects. In the case of biological diversity beyond national jurisdiction, article 5 of the 1992 CBD limited the obligations of Contracting Parties to a duty to cooperate in its

47 Ibid.

48 Id at [17.22(a-d)].

49 *Convention on Biological Diversity*, above n9.

50 Michael Grubb et al, *The 'Earth Summit' Agreements. A Guide and Assessment* (1993) at 75–76.

51 Christopher Joyner, 'Biodiversity in the Marine Environment: Resource Implications for the Law of the Sea' (1995) 28 *Vanderbilt Journal of Transnational Law* 635 at 637.

52 Ibid.

53 Id at 644, 646.

conservation and sustainable use directly or through competent international organisations. Arguably, however, the general obligation of States to protect and preserve the marine environment and their more specific obligations to take measures to protect and preserve rare or fragile ecosystems as well as the habitat of depleted threatened or endangered species must now be interpreted in the light of the provisions of the 1992 CBD.⁵⁴ The framework of the 1992 CBD provides some guidance for States implementing biodiversity protection measures in marine areas within national jurisdiction but their implementation depends on strong policy making institutions and coordinating mechanisms at the national level to develop the measures needed for comprehensive protection of biodiversity. Similar comprehensive protection of marine biodiversity beyond national jurisdiction will require parallel policymaking institutions and coordinating mechanisms at the global and regional level to develop and implement an integrated system of conservation measures.

C. Fitting Climate Change Mitigation Activities at Sea into an Environmental Protection Framework; The Dumping Regime

(i) 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter ('1972 London Convention') and 1996 Protocol to the London Convention ('1996 London Protocol')

Where climate change activities involve the deliberate disposal of waste material at sea they may fall within the regulatory ambit of the 1972 *Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter* ('1972 London Convention')⁵⁵ and 1996 *Protocol to the London Convention* ('1996 London Protocol').⁵⁶ The 1972 *London Convention* applies to disposal of waste material in any area of the water column but not to disposal in the seabed.⁵⁷ Dumping of 'waste materials generated by industrial or processing operations' into the water column has been prohibited under the 1972 *London Convention* since 1996, unless the particular materials appear on a reverse list of industrial wastes that can be dumped.⁵⁸ The reverse list of industrial wastes does not make specific reference to carbon dioxide so unless it can be included in some of the more general definitions of industrial wastes, its disposal into the water column by States Parties to the 1972 *London Convention* is prohibited.⁵⁹ The definition of dumping under the 1972 *London Convention* does not include placement of matter for a purpose other than mere disposal, provided that such placement is not contrary to the aims of the Convention.⁶⁰ This qualification

54 Lee Kimball, 'The Biodiversity Convention: How to Make it Work' (1995) 28 *Vanderbilt Journal of Transnational Law* 763 at 769–771; Patricia Birnie, 'Are Twentieth Century Marine Conservation Conventions Adaptable to Twenty First Century Goals and Principles? Part 1' (1997) 12 *The International Journal of Marine and Coastal Law* 307 at 338.

55 *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter*, opened for signature 29 December 1972, 11 ILM 1294 (entered into force 30 August 1975) ('1972 London Convention').

56 *Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter*, opened for signature 7 November 1996, 36 ILM 1 (entered into force 24 March 2006) ('1996 London Protocol').

57 1972 *London Convention*, above n55 at articles III(1), (3).

58 Id at article IV, Annexes I paragraph 11.

59 Weeks, above n11 at 258–259.

on the definition of dumping may exclude the research and development phase and experimental stages of injection of carbon dioxide into the water column from the general prohibition on dumping of industrial wastes, however in view of its potentially adverse effects on the marine environment, even the experimental phases of such disposal may be regarded as contrary to the aims of the 1972 *London Convention* and contrary to the provisions of Part XII of the 1982 *LOSC* on prevention, reduction and control of pollution.⁶¹

The 1996 *London Protocol* was negotiated to replace the 1972 *London Convention*, and although it has entered into force, it has limited participation and the two regimes are still operating in parallel.⁶² A fundamental premise of the 1996 *London Protocol* is that Contracting Parties should avoid using the sea for the dumping of wastes and that any exceptional dumping of wastes at sea should be subject to rigorous risk assessment and control and scientifically-based procedures for disposal.⁶³ Dumping of waste or other matter is prohibited under the 1996 *London Protocol*, except for those materials specifically listed in Annex I.⁶⁴ Annex I includes 'inert, inorganic geological material' and organic material of natural origin but it is unlikely that carbon dioxide would fall into either category. Direct injection of carbon dioxide into the water column would therefore be prohibited for States Parties of the 1996 *London Protocol*,⁶⁵ however, amendments to Annex I permitting storage of carbon dioxide under the seabed were adopted on 2 November 2006 at the First Meeting of the Contracting Parties to the 1996 *London Protocol*.⁶⁶ The amendments provide a basis for regulating sub-seabed sequestration of carbon dioxide and have been supplemented by Specific Guidelines for Assessment of Carbon Dioxide Streams for Disposal into Sub-seabed Geological Formations (Specific Guidelines) adopted by the Contracting Parties at their Second Consultative Meeting in November 2007.⁶⁷

The Specific Guidelines take a precautionary approach to the process, requiring Contracting Parties, under whose jurisdiction or control such activities are conducted, to issue a permit for the disposal subject to stringent conditions being fulfilled.⁶⁸ The chemical and physical properties of carbon dioxide streams proposed for sub-seabed sequestration must be rigorously analysed and alternative methods of land-based disposal appropriately considered.⁶⁹ In addition, permit applicants must provide a geological assessment of the proposed site which includes information on its long-term

60 1972 *London Convention*, above n55 at article III(1)(b)(ii).

61 Scott, above n3 at 80.

62 The 1996 *London Protocol* has 34 States Parties. See International Maritime Organization, *LC72 News* (2007) <www.imo.org/dynamic/mainframe.asp?topic_id=1509> accessed 10 June 2008.

63 1996 *London Protocol*, above n56 at article 2.

64 *Id* at article 4.

65 Scott, above n3 at 71.

66 International Maritime Organization Press Briefings, above n10.

67 Specific Guidelines for Assessment of Carbon Dioxide Streams for Disposal into Sub-seabed Geological Formations', IMO Doc. LC 29/4 (2007).

68 *Id* at section 9.

69 *Id* at sections 3, 4.

storage integrity, potential migration and leakage pathways over time, potential effects on the marine environment of leakage of carbon dioxide and possibilities for monitoring, mitigation and remediation if leakage occurs.⁷⁰ Permit applicants must also provide information on the biological features and uses of the proposed site, including the presence of vulnerable ecosystems, critical habitats, spawning, nursery and recruitment areas for fish, shipping lanes, migration routes, military exclusion zones and engineering uses of the sea such as undersea cables and energy conversion.⁷¹ Applications for permits are required to evaluate the potential effects of a leakage of the carbon dioxide stream on human health, living resources, amenities and other legitimate uses of the sea.⁷² This evaluation leads to an impact hypothesis forming the basis for a monitoring programme allowing for effective management of the disposal site and triggering mitigation or remediation plans if necessary.⁷³ While these comprehensive Guidelines have been designed to avert the potential risks of this form of waste disposal at sea, they only apply to the limited number of States Parties to the *1996 London Protocol*.⁷⁴ Initially, at least, most proposed carbon sequestration sites will lie within marine areas under national jurisdiction as the main sub sea-bed storage potential is in depleted oil and gas fields and in deep subterranean and sub-sea aquifers.⁷⁵

The applicability of the *1972 London Convention* and the *1996 London Protocol* to other climate change mitigation activities involving the oceans, such as open ocean fertilisation and biological sequestration using upwelling pumps, is still unsettled. It is arguable that both these activities fall outside the definition of dumping under the *1972 London Convention* and the *1996 London Protocol* as the iron, other nutrients and pumps are being placed in the water column and on the seabed for purposes other than mere disposal. However, if adverse impacts to the marine environment ensue as a result of their placement, it could be argued that these activities are not consistent with the aims of the *1972 London Convention* and the *1996 London Protocol*.⁷⁶ At their Second Consultative Meeting in November 2007, the *1996 London Protocol* Contracting Parties considered a report from their Scientific Groups and other submissions concerning open ocean fertilisation and expressed the view that knowledge about the effectiveness and potential environmental impacts of open ocean fertilisation was currently insufficient to justify large scale projects, and that these could have negative impact on the marine environment and human health.⁷⁷ They also agreed that this process falls within their regulatory competence and that they would further study this issue from scientific and legal perspectives.⁷⁸

⁷⁰ Id at section 6.2.

⁷¹ Id at section 6.6.

⁷² Id at section 7.6.

⁷³ Id at section 7.11.

⁷⁴ See International Maritime Organization, above n62.

⁷⁵ International Maritime Organization, above n12.

⁷⁶ Rayfuse et al, above n22 at 16–18.

⁷⁷ International Maritime Organization Press Briefings, *Large-scale fertilization operations not currently justified, says Parties to international treaties* (2007) <www.imo.org/includes/blastDataOnly.asp/data_id%3D20395/Pressbriefing16-11-07.doc> accessed 10 June 2008.

(ii) *Regional Seas Agreements on Dumping at Sea*

In specific regions, dumping at sea is also regulated by protocols to regional seas agreements, some of which apply to marine areas beyond national jurisdiction. These protocols often contain provisions consistent with the 1972 *London Convention* provisions on dumping at sea, but in some instances provide for more stringent regulation of dumping at sea.⁷⁹ Their provisions can apply to climate change mitigation activities which fall within the definition of dumping under the regional agreement. An example of a regional seas agreements which applies to marine areas beyond national jurisdiction within Australia's immediate region is the *Protocol for the Prevention of Pollution of the South Pacific Region by Dumping* ('1986 Noumea Dumping Protocol') to the *Convention for the Protection of the Natural Resources and Environment of the South Pacific Region* ('1986 Noumea Convention').⁸⁰ The 1986 *Noumea Dumping Protocol* applies to the 200 nautical mile zones of Parties and those areas of the high seas which are enclosed from all sides by the Parties' 200 nautical mile zones.⁸¹ The dumping of wastes listed in Annex I to the Protocol is prohibited and the dumping of all other wastes is subject to a special or general permit.⁸² The issue of permits is subject to a range of criteria, including characteristics and composition of the material to be dumped, the characteristics of the dumping site and method of dumping, and the possible effects on human amenities, marine life and other uses of the sea.⁸³ Carbon dioxide is not included in the prohibited wastes listed in Annex I or those subject to a special permit in Annex II, but the dumping of carbon dioxide in high seas areas by a Party to the Protocol would be subject to the issue of a general permit from the Party to its flag vessel.⁸⁴ The implementation of these provisions is devolved to Parties under the Protocol and would, in effect, require Parties

78 Scientists meeting under the auspices of the 1972 *London Convention* and 1996 *London Protocol* from 19 to 23 May 2008 in Guayaquil Ecuador reviewed the evidence on open ocean fertilisation and concluded that 'based on scientific projections, there is the potential for significant risks of harm to the marine environment' even if direct scientific evidence on the environmental impact was still lacking. This decision prompted the Conference of the Parties of the 1992 *CBD* at their 9th meeting from 19 to 30 May 2008 to request Parties and urge other governments 'in accordance with the precautionary approach to ensure that ocean fertilization activities do not take place until there is an adequate scientific basis on which to justify such activities, including assessing associated risks, and a global transparent and effective control and regulatory mechanism is in place for those activities; with the exception of small scale scientific research within national jurisdiction.'; International Union for Conservation of Nature ('IUCN'), *Marine miracles at Convention on Biological Diversity* (2008) <<http://cms.iucn.org/what/species/index.cfm?uNewsID=1063>> accessed 10 June 2008. The final decision will be made available at <www.cbd.int/cop9/>.

79 The applicability of the *Convention for the Protection of the Marine Environment of the North East Atlantic*, opened for signature 22 September 1992, 32 ILM 1069 (entered into force 25 March 1998) ('1992 OSPAR Convention') to climate change mitigation activities involving the ocean including carbon dioxide sequestration in the seabed and water column and open ocean fertilisation is analysed in Scott, above n3.

80 *Convention for the Protection of the Natural Resources and Environment of the South Pacific Region*, opened for signature 24 November 1986, 26 ILM 41 (entered into force 22 August 1990) ('1986 Noumea Convention') and *Protocol for the Prevention of Pollution of the South Pacific Region by Dumping*, opened for signature 25 November 1986, PITSE 16 (entered into force 22 August 1990) ('1986 Noumea Dumping Protocol').

81 1986 *Noumea Dumping Protocol*, above n80 at article 2.

82 Id at articles 4–6.

83 Id at article 7 and Annex III.

84 Id at article 6.

to introduce an environmental impact assessment process before issuing a permit to their nationals and flag vessels engaged in climate change mitigation activities involving the disposal of waste material into the high sea areas covered by the Protocol.

3. Strengthening the Environmental Protection Regime for Climate Change Mitigation Activities in Marine Areas beyond National Jurisdiction

In the sparsely populated regulatory canvas for environmental protection of marine areas beyond national jurisdiction, the *1996 London Protocol* and the Specific Guidelines developed for assessment of sub-seabed sequestration of carbon dioxide represent a welcome burst of colour and detail. The Protocol and Guidelines provide a mechanism for States Parties to apply modern international environmental law principles to at least one climate change mitigation activity which may occur in marine areas beyond national jurisdiction. This mechanism has obvious limitations, however, as it is designed for a specific activity which fits the definition of dumping in the Protocol and will only apply to the relatively small number of Parties under the Protocol, their flag vessels and activities under their jurisdiction and control. Other climate change mitigation activities which impact on the oceans, such as open ocean fertilisation, may be examined by the *1996 London Protocol* Parties on an ad hoc basis in the future to establish whether they fall within their regulatory competence, but there is no overarching global body to assess the environmental impacts of all such activities and to recommend the implementation of relevant environmental safeguards by their proponents. Recent discussions in the international community on the conservation of high seas biodiversity and the protection of the marine environment beyond national jurisdiction have been exploring options for a more integrated and cross sectoral environmental protection regime which would provide principles and mechanisms to assess new and emerging uses of these areas.

A. International Discussions on Protection of the Marine Environment Beyond National Jurisdiction

The main impetus for considering new approaches to strengthen the legal and institutional framework for protection of the marine environment beyond national jurisdiction has emerged from the annual meetings of the United Nations Informal Consultative Process on Oceans and the Law of the Sea ('UNICPOLOS'), which has deliberated on an eclectic mixture of oceans issues since its inception in 1999. The disjunction between the global political forums considering marine environmental protection and the Meeting of the States Parties to the *1982 LOSC* was formally recognised by the Commission for Sustainable Development ('CSD') at its seventh session in 1999.⁸⁵ CSD-7 recognised the need for a more specialised preparation for the United Nations General Assembly ('UNGA') annual debates on the oceans and the law of the sea and the need to reconcile legal issues arising out of the *1982 LOSC* with

⁸⁵ Commission on Sustainable Development, *Report of the Seventh Session of the Commission on Sustainable Development (19-30 April 1999)* UN Doc E/CN.17/1999/20 (1999) at 21, [38].

developing policy aspirations on marine environmental protection and integrated oceans management, and recommended that the UNGA set up a mechanism to achieve this end.⁸⁶ On 17 November 1999, the UNGA passed Resolution 54/33 to establish the UN Open-Ended Informal Consultative Process, which later became known as UNICPOLOS, to facilitate annual review by the UNGA of developments in ocean affairs. While the initial establishment of UNICPOLOS was not without political controversy, its annual meetings have raised the profile of issues associated with protection of the marine environment beyond national jurisdiction and identified a variety of oceans management issues which could benefit from enhanced coordination between UN organisations and national governments. It has also performed an educative function for member states of the United Nations, revealing the diversity of uses which now occur in marine areas beyond national jurisdiction such as climate change mitigation activities and their actual and potential impact on the marine environment.

The fifth meeting of UNICPOLOS in 2004 discussed new and emerging uses of the oceans and the risks such uses posed to the conservation and sustainable use of biodiversity beyond national jurisdiction, in the absence of environmental safeguards agreed and implemented by the international community.⁸⁷ Recommendations from that meeting to the UNGA resulted in the establishment of the Working Group on issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction ('BBNJ Working Group').⁸⁸ In the two BBNJ Working Group meetings held so far, discussions have focused on the need to conserve the environment and biodiversity of these marine areas beyond national jurisdiction and some of the practical measures to achieve that objective. At the first meeting of the BBNJ Working Group in February 2006, participating States agreed on the need for improved implementation of current global and regional agreements relevant to biodiversity beyond national jurisdiction, including the 1982 *LOSC* and the 1992 *CBD*.⁸⁹ The Summary of Trends prepared by the Working Group recognised the fundamental importance of basing decisions on the conservation and sustainable use of marine biodiversity beyond national jurisdiction on precautionary and ecosystem approaches, and using the best available science and prior environmental impact assessment to inform decisions on activities in marine areas beyond national jurisdiction.⁹⁰ The integral role of sectoral and regional organisations was accepted, as was the need to strengthen the management of these bodies and to develop and strengthen mechanisms for their accountability.⁹¹ The second meeting of the Working Group from 28 April to 2 May 2008 emphasised the importance of developing practical measures for the conservation

86 Id at 21, [39].

87 United Nations, *Report on the Work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its Fifth Meeting*, UN Doc A/59/122 (2004) ('UNICPOLOS Fifth Meeting Report').

88 UNGA Resolution 59/24 (2004) at [73].

89 United Nations, *Report of the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction*, UN Doc A/61/65 (2006) ('BBNJ Working Group First Meeting Report') at [50], Annex I [4].

90 Id at Annex I [5].

91 United Nations, above n89 at Annex I [6].

and sustainable use of marine biodiversity in marine areas beyond national jurisdiction, including the development of guidance for the application of environmental impact assessment for existing and new uses of these areas, and the development and use of area based management tools such as marine protected areas.⁹² Neither Working Group meeting reached consensus on any specific legal and institutional changes required to underpin a strengthened environmental protection for marine areas beyond national jurisdiction.

A Workshop on High Seas Governance for the 21st century, sponsored by the World Conservation Union ('IUCN') and other government and non-government organisations in New York in October 2007, has supplemented the deliberations of political forums on protection of the marine environment beyond national jurisdiction by bringing together experts in international marine policy, science, law and economics to discuss policy and regulatory options for improving oceans governance in areas beyond national jurisdiction.⁹³ The discussions at this Workshop identified critical regulatory and governance gaps in the high seas environmental protection framework, as well as a series of short- and medium-term measures that could be taken to achieve more effective protection for the marine environment beyond national jurisdiction from the adverse impact of activities such as climate change mitigation schemes.⁹⁴ Its findings highlighted the lack of any regulatory regime for new and emerging uses of marine areas beyond national jurisdiction, such as bioprospecting and climate change mitigation activities and the absence of modern conservation norms, including requirements for environmental impact assessment of new and ongoing activities in marine areas beyond national jurisdiction, and the application of a precautionary and ecosystem-based approach to such activities in existing instruments such as the 1982 LOSC and the 1992 CBD.⁹⁵

Some participants proposed that a globally effective and transparent system be established, requiring States to notify others of new and intensifying activities on the high seas by vessels and nationals under their control, together with requirements to assess the likely impacts of such activities and monitor their ongoing effects on the marine environment beyond national jurisdiction.⁹⁶ Short- and medium-term measures to achieve this objective included the passing of an UNGA resolution calling on States to regulate the activities of their nationals and vessels under their control in marine areas beyond national jurisdiction by introducing requirements for environmental impact assessments of such activities, and the development of an instrument providing detailed standards and procedures for environmental impact assessment of activities in marine

92 United Nations, *Advanced and unedited Text of the Joint Statement of the Co-Chairpersons of the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction* (2008) < <http://daccessdds.un.org/doc/undoc/gen/N06/277/50/PDF/N0627750.pdf?OpenElement> > accessed 10 June 2008 at [54].

93 International Union for Conservation of Nature, *Workshop on High Seas Governance for the 21st Century, Co-Chairs Summary Report*. (2007) <www.iucn.org/marine/pubs/pubs.htm> accessed 27 August 2008 at 2.

94 Id at 20–24.

95 Id at 3–4.

96 Id at 2–3.

areas beyond national jurisdiction.⁹⁷ It was recommended that these measures be supported by an ongoing global process for scientific assessment and advice, similar to the IPCC, to assist States and global and regional organisations to more effectively apply the precautionary- and ecosystem-based approaches to their activities in marine areas beyond national jurisdiction.⁹⁸

The central theme of enhanced coordination and cooperation among States, as well as relevant intergovernmental organisations and bodies, in regulating human activities in marine areas beyond national jurisdiction featured in the Workshop's second key finding.⁹⁹ At the global level, the expansion of UNICPOLOS to act as an intergovernmental steering body with responsibility for policy direction on activities in marine areas beyond national jurisdiction was suggested.¹⁰⁰ At the regional level, mechanisms proposed for achieving enhanced cooperation and coordination included strengthening existing regional arrangements for marine environmental protection, resource conservation and maritime surveillance and enforcement, and extending their regulatory scope into proximate high seas areas.¹⁰¹ Eventually it was suggested that such organisations might develop into regional oceans management organisations ('ROMOs') forming an underpinning network for a global oceans institution established to review, coordinate and endorse conservation and management measures initiated by the ROMOs and their sectoral counterparts.¹⁰²

The Workshop also developed a toolbox of solutions to address regulatory, governance and implementation gaps in the environmental protection framework for marine areas beyond national jurisdiction. This included developing informal agreements and codes of conduct for unregulated activities, such as bioprospecting and climate change mitigation, establishing an international system to audit and evaluate Flag State activities on the high seas, enhancing compliance and enforcement methods for Flag State activities on the high seas, and establishing default mechanisms for interim regulation of new and emerging activities in marine areas beyond national jurisdiction.¹⁰³ Participants in the Workshop also saw the need for a longer term solution which would provide integrated and environmentally sound conservation and management of the marine environment beyond national jurisdiction.¹⁰⁴ The development of a binding global instrument which would provide overarching guidance for the sustainable use and management of marine areas beyond national jurisdiction was endorsed by the Workshop as having significant advantages.¹⁰⁵

97 Id at 12–13.

98 Ibid.

99 Id at 3, 14.

100 Ibid.

101 Id at 14.

102 Id at 3.

103 Id at 4, 22–24.

104 Id at 4, 24.

105 Ibid.

B. *Soft and Hard Law Options for Strengthening Cross Sectoral and Integrated Protection of the Marine Environment beyond National Jurisdiction*

A wide array of options have been canvassed in global forums for remedying the deficiencies in the current regulatory framework for environmental protection of marine areas beyond national jurisdiction from the adverse impacts of activities such as climate change mitigation schemes. This section will analyse two soft and hard law options for achieving a global instrument which provides strengthened protection for the marine environment beyond national jurisdiction.

(i) *Declaration of Oceans Governance Principles for Marine Areas beyond National Jurisdiction*

A Declaration of Oceans Governance Principles applicable to Marine Areas beyond National Jurisdiction, in the form of an UNGA resolution or as an outcome from an UN-sponsored diplomatic conference, could further galvanise global support for concrete measures to conserve and manage the marine environment beyond national jurisdiction. Such a declaration would raise awareness of the threats to the marine environment beyond national jurisdiction from intensifying human uses, such as climate change mitigation activities, and reiterate the obligation of States to protect and preserve the marine environment including areas beyond national jurisdiction. The related duty to cooperate in protecting the marine biodiversity in areas beyond national jurisdiction could be incorporated, as well as the need to apply modern environmental protection principles such as the precautionary and ecosystem-based approaches and prior and ongoing environmental impact assessment to activities in these areas. The declaration could refer to the common but differentiated responsibilities of developed and developing States in protecting and preserving the marine environment beyond national jurisdiction, and the need to provide technical and capacity building assistance to developing States in fulfilling their responsibilities. It would provide an opportunity to articulate global consensus on the environmental protection principles applicable to marine areas beyond national jurisdiction, and to emphasise the significant responsibilities which accompany the freedoms of the high seas. It could also be an important soft law precursor to binding instruments at the global and regional levels which contain more detailed provisions on the environmental regulation of human activities in marine areas beyond national jurisdiction.

(ii) *Global Binding Instrument on Protection of the Marine Environment beyond National Jurisdiction*

An instrument could be negotiated which implements the obligation of States Parties under articles 192 of the 1982 LOSC to protect and preserve the marine environment beyond national jurisdiction, and their duty to cooperate in formulating and elaborating international rules, standards and recommended practices and procedures for the protection and preservation of the marine environment under article 197 of the 1982 LOSC. An implementing agreement based on these provisions of the 1982 LOSC could

incorporate complementary environmental protection principles, such as the obligation to protect marine biodiversity, requirements to conduct prior and ongoing environmental impact assessments of activities by nationals of States Parties to the *1982 LOSC* and vessels under their control, and to apply a precautionary and ecosystem-based approach to such activities. The agreement could also provide international law authority for the introduction of conservation and management measures, such as bioregional planning and marine protected areas beyond national jurisdiction.

An essential element of the agreement would be the allocation of authority to an existing or new global institution to set minimum standards of compliance with environmental protection principles for States and global, sectoral and regional organisations with regulatory competence over activities in marine areas beyond national jurisdiction. This institution could operate as a global oversight body for the marine environment beyond national jurisdiction and its biodiversity, recommending, reviewing and endorsing conservation and management measures proposed by regional seas organisations, or it could simply act as a standard-setting and advisory body, prescribing best practice guidelines for sustainable conservation and management of marine areas beyond national jurisdiction. It would have consultative links with sectoral organisations at the global and regional level, taking advice from bodies such as the Conference of the Parties of the *1992 CBD* on the protection of marine biodiversity. This overarching environmental protection framework for marine protected areas beyond national jurisdiction would be designed to operate in parallel with regional and sectoral agreements regulating particular activities in marine areas beyond national jurisdiction.

Conclusion

The urgency and lack of regulation associated with climate change mitigation activities involving the oceans beyond national jurisdiction poses actual and potential threats to the physical characteristics and biodiversity of the open ocean and deep sea environments. Arbitrary human intrusions into this largely unexplored marine domain have the potential to harm the intricate links between complex marine ecosystems and to erode components of marine biodiversity. The interdependence of the open ocean and deep sea environments underscores the need for legal and institutional arrangements which allow for integrated protection of the marine environment beyond national jurisdiction and the establishment of linkages between global and regional bodies with regulatory competence in these areas. The attainment of an effective environmental protection regime for marine areas beyond national jurisdiction is frustrated by the global commons status of the high seas, the non-comprehensive and fragmentary nature of the marine environmental protection instruments applicable to activities in these areas of ocean space, and the primary reliance on individual Flag State responsibility for implementation of environmental protection measures. Protection of this vast area of ocean from the adverse impacts of new and emerging uses, such as climate change mitigation activities, requires concentrated global, regional and sectoral investment into coordinating and extending the environmental protection regimes. While some daubs of colour have been splashed onto the broad canvas of environmental protection for

marine areas beyond national jurisdiction, the environmental regulation of activities such as climate change mitigation schemes is, at best, a work in progress waiting for a more integrated system of global, sectoral and regional instruments to provide that protection. Enhancing environmental protection for marine areas beyond national jurisdiction will require concerted action by the international community to put in place best practice guidelines and measures to assess and minimise the adverse impacts of human activities on this vast oceanic domain.