Preserving a Balanced Ocean: Environmental Regulation of Climate Change Mitigation Activities in the Offshore Marine Areas of Developing Countries

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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 capacity 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 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. 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 but this is not always the case in developing countries. In marine areas beyond national jurisdiction the regulatory framework for such activities is even more fragmentary 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

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[1] Intergovernmental Panel on Climate Change (IPCC), *Fourth Assessment Report* (2007) (‘IPCC Fourth Report’) <http:www.ipcc.ch/ipccreports/ar4-syr.htm> accessed 29 May 2008; Nicholas Stern et al, *Stern Review: The Economics of Climate Change* (HM Treasury, London, 2006); BL Preston & RN 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* (CSIRO Canberra, Canberra ACT, 2006).

[2] Tony Koslow, *The Silent Deep* (UNSW Press, University of New South Wales, Sydney, Australia, 2007) at 156.

[3] Karen N Scott, ‘The Day After Tomorrow: Ocean CO2 Sequestration and the Future of Climate Change’ (2005) 18 *Georgetown International Environmental Law Review* at 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

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. Climate change mitigation activities with major impacts on the marine environment beyond national jurisdiction may be launched and supported from developing countries. Proposed ocean fertilization projects in the Asia Pacific region in marine areas within and beyond national jurisdiction have attracted criticism from local communities concerned about the adverse impacts of such activities on local marine resources and the marine environment. In the absence of systems to monitor and mitigate the adverse impacts of such activities, there is a real risk of irreversible damage to the marine environment of these areas and its biodiversity.[5]

This article describes two climate change mitigation activities which involve using either the water column or sea bed: sequestration of carbon dioxide in the water column or seabed and fertilization 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. Some trials involving open ocean fertilization activities in marine areas off the coast of developing countries in the Asia Pacific area are also discussed. The article will analyse the applicability of international law principles on marine environmental protection to these activities and the regulatory gaps and ambiguities in the existing environmental protection framework. Finally it will examine options for strengthening the environmental protection framework for such activities whether they occur within marine areas under the national jurisdiction of developing countries or are launched from such countries into marine areas beyond national jurisdiction.

1. 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 for the ocean 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.[6] 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 sub-sea saline aquifers.[7] While most sub-seabed sequestration of carbon dioxide has occurred in waters within national jurisdiction so far, there is the potential for future storage in seabed areas beyond national jurisdiction when storage sites within national

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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.

[6] Koslow, above n2 at 157; IMO Press Briefing 5, 9 February 2007 <http://www.imo.org/Safety/mainframe.asp?topic_id=1472&4doc_id=7772> accessed 30 May 2008.

[7] 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(2) *Ocean and Coastal Law Journal* 245 at 252.

jurisdiction are exhausted.[8] 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.[9] 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.[10] 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 and the results of this research are being implemented in a number of projects in marine areas within national jurisdiction around the world.[11]

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 involves the introduction of liquid carbon dioxide from ships or pipelines into the sea at depths ranging from 1000 metres to over 3000 metres from the surface.[12] 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.[13] 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 3000 metres would form a lake which would freeze over and eventually dissolve.[14] 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.[15] There is also considerable uncertainty among scientists that 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.[16] Although some experiments and proof of concept studies have been conducted into this form of carbon dioxide disposal in the ocean, the associated environmental risks and legal uncertainties have detracted large scale commercial investment which has gravitated instead towards sub seabed sequestration projects.[17]

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[8] IMO, CO2 Sequestration Frequently Asked Questions <http://www.imo.org/environment/mainframe.asp?topic_id=1548> accessed 30 May 2008.
[9] Juan C Abanedes et al, *IPCC Special Report on Carbon Dioxide Capture and Storage* (Cambridge University Press, Cambridge, 2005) at 18.
[10] Abanedes et al, above n9; Koslow, above n2 at 160.
[11] Scott, above n3 at 60; Weeks, above n7 at 252-253.
[12] Koslow, above n2 at 159-160; Paul Johnston et al, *Ocean Disposal/Sequestration of Carbon Dioxide form Fossil Fuel Production and Use: An Overview of Rationale, Techniques and Implications* (Greenpeace Research Laboratories, Technical Note 01/99, March 4th 1999) at 7-8.
[13] Koslow, above n2 at 159; Johnston et al, above n12 at 7-8.
[14] Koslow, above n2 at 160; Johnston et al, above n12 at 8.
[15] Koslow, above n2 at 160; Johnston et al, above n12 at 8.
[16] Johnston et al, above n12 at 8.
[17] Koslow, above n2 at 161; Johnston et al, above n12 at 8.

B. Open Ocean Fertilisation

The process of open ocean fertilisation uses iron and other micro nutrients to increase phytoplankton primary productivity in iron and other nutrient deficient areas of the ocean in order to promote further draw down of photosynthesised carbon into the deep ocean.[18] There are 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, is poorly understood.[19] 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 and 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.[20] The sustainability of this activity as a climate change mitigation option has also been called into question on the basis of the time frames 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 draw down to the deep sea within the time frame of the experiments.[21] 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 percent of the ocean surface and repeated for an indefinite period would be needed for this method of carbon dioxide sequestration to be effective.[22] 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.[23]

C. Climate Change Mitigation Activities in Offshore Areas of Developing Countries

Actual and proposed ocean fertilisation experiments in offshore areas of developing countries in the Asia Pacific region have attracted criticism from local communities and regional and global environmental organisations concerned that adequate assessment of their impacts on the marine environment and its biodiversity have not been undertaken. One particularly egregious example involves launching ocean fertilisation experiments from

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[18] Koslow, above n2 at 157-158; Rosemary Rayfuse, Mark G. Lawrence and Kristina M. Gjerde, 'Ocean Fertilisation and Climate Change: The Need to Regulate Emerging High Seas Uses' (2008) 23(2) *The International Journal of Marine and Coastal Law* 1 at 6-7.
[19] Rayfuse et al, above n18 at 8-9; Koslow, above n2 at 159; Scott, above n3 at 87-88.
[20] Johnston et al, above n12 at 24-25; Rayfuse et al, above n18 at 10.
[21] Koslow, above n2 at 159; Tatjana Rosen, 'Open Ocean Fertilisation' in Cutler J. Cleveland (ed.), *Encyclopaedia of Earth* (Environmental Information Coalition, National Council for Science and the Environment, Washington D.C., 2007) http://www.eoearth.org/article/Open_ocean_iron.fertilization accessed 10 June 2008; Rayfuse et al, above n18 at 9.
[22] Johnston et al, above n 12 at 23-24.
[23] Koslow, above 2 at 159; Rayfuse et al, above n18 at 3.

plants in the Philippines and Malaysia and taking advantage of their less stringent environmental assessment processes to undertake activities which may have adverse impacts on the marine environment just beyond the continental shelf of these countries.[24] Ocean Nourishment Corporation (ONC), an Australian based company, has developed technology which involves the injection of urea, a nitrogen compound, into areas of the world's oceans considered to be nitrogen deficient.[25] The liquid urea is mixed with other nutrients, diluted in sea water and transported via marine pipeline to deep waters off the continental shelf where it is injected into the sunlit layer of the ocean 50 metres below the ocean's surface.[26] ONC claims that the nutrient mix stimulates further growth of existing stocks of phytoplankton through photosynthesis which after a short life cycle of approximately 5 days die increasing the flux of carbon dioxide locked in their plant tissues to the deep ocean floor.[27] ONC asserts that a further benefit of this process would be increased fish stocks as phytoplankton are at the base of the aquatic food chain and in essence would fertilise the ocean, fuelling the production of more fish.[28] ONC claims that one of their plants could remove approximately 5-8 million tonnes of carbon dioxide from the atmosphere every year and that this is equivalent to offsetting annual emissions from a typical 1200 mega watt coal fired power station or the short term sequestration from one million hectares of new growth forest.[29] ONC also states that their technology is only applicable to deep ocean sites and is not suitable for shallow bays or coastal waters, however the transport of nutrients to these sites does involve the establishment of an ONC Plant on shore and the use of a deep ocean pipeline to transport the nutrient mix to deep waters off the continental shelf.[30]

In 2007, reports emerged of ONC's first large scale field trial which would involve the release of 500 tonnes of urea into the Sulu Sea between the Philippines and Borneo through a pipeline from the Philippines coast.[31] This trial was to be undertaken by ONC in conjunction with two Philippines institutions, the University of the Philippines and the University of San Carlos and the Bureau of Fisheries and Aquatic Resources in the Philippines had issued a permit for the activity to take place without any prior environmental impact assessment or consultation with relevant stakeholders in the local coastal communities, fishing industry or other sectors of civil society.[32] Concerns were raised by local fishing communities, civil society groups in the

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[24] ETC Group (Canada)/SEARICE (Philippines)/Third World Network (Malaysia)/Corporate Watch (UK), *Ocean Nourishment Corporation plans imminent urea dumping experiment in Southeast Asian seas. Civil Society groups call on London Convention to halt marine dumping geo-engineering experiments*, 5 November 2007, http://www.etcgroup.org/en/materials/publications.html?pub_id=660 at 31 August 2008; Rayfuse et al, above n. 18, at 3.
[25] Ocean Nourishment Corporation, Technology, <http://www.oceannourishment .com/technology.asp> at 31 August 2008.
[26] Ibid.
[27] Ocean Nourishment Corporation, Information Brochure, http://www.oceannourishmentcorporation/files/ONC_exhibition_brochure_small.pdf at 31 August 2008.
[28] Ibid.
[29] Ibid.
[30] Ibid.
[31] ETC Group et al, above n.24 at 1-2.
[32] Ibid, 2-3.

Philippines and environmental non governmental organisations (NGOs) about the potential threats to the marine environment and its biodiversity posed by the ONC trial.[33] These included the creation of toxic algal blooms and dead zones in the ocean from oxygen depletion.[34] The civil society groups noted that the Scientific Councils of the London Convention and Protocol Parties had also raised concerns that open ocean fertilisation schemes would result in adverse impacts to marine ecosystems caused by large scale artificial algal blooms and called on the 29th Consultative Meeting of the London Convention and the second Meeting of the Contracting Parties to the London Protocol to consider the threats of large scale nitrogen addition projects such as the ONC proposed trials.[35] In addition to the Philippines based trial, it was also reported that ONC planned to conduct a trial in 2008 involving the release of 1000 tonnes of dissolved urea off Malaysia under similar conditions to the Philippines trial and that ONC had approached Chile and Morocco to conduct trials off both these countries.[36] It appears that a principal reason these developing countries are being targeted as conduits for the ocean fertilisation trials may be their less rigorous environmental impact assessment systems, an issue which is discussed below.

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

Part XII of the 1982 LOSC provides framework principles for protection and preservation of the marine environment which have been implemented by coastal States within marine areas under national jurisdiction according to their differing capacities. The regulatory framework for environmental protection of marine areas beyond national jurisdiction is gradually evolving against a background of vast tracts of ocean where the freedoms of the sea and the exclusivity of flag State jurisdiction have traditionally held sway States have also negotiated instruments 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. This section will explore some of the general international law principles which apply to the climate change mitigation activities described above in marine areas within and beyond national jurisdiction and the potential for development of more detailed regulatory frameworks for such activities.

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

[33] Ibid, 1.
[34] Ibid, 3.
[35] Ibid, 1.
[36] Ibid, 2-3.

space.[37] 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.[38] Article 194(1) of the 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.[39] 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, 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 Article 204 and 206 which require

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[37] Myron Nordquist, Shabtai Rosenne and Alexander Yankov (eds.), *United Nations Convention on the Law of the Sea 1982. A Commentary Vol. IV* (Martinus Nijhoff, Dordrecht, 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.

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

[39] Alan Boyle, 'Protecting the Marine Environment: Some Problems and Developments in the Law of the Sea' (1992) 16(2) *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.

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 LOSC recognises the role of competent international organisations such as the International Maritime Organisation 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 International Maritime Organisation (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).[40] 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 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.

[40] Verlaan, above n.37 at 211.

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.[41] 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

Since the 1972 Stockholm Declaration on the Human Environment, a body of modern conservation principles has emerged which apply to the protection of the marine environment both within and beyond national jurisdiction.[42] 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 this evolving body of marine environmental protection principles.

(i) United Nations Conference on Environment and Development (UNCED) – Rio Declaration 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 to various components of the environment.[43] 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[44]

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[41] Patricia Birnie & Alan Boyle, *International Law and the Environment* (2nd Ed.) (Oxford University Press, Oxford, 2002) at 370; Erik J. Molenaar, *Coastal State Jurisdiction over Vessel Source Pollution* (Kluwer Law International, The Hague, 1998) at 99.
[42] Verlaan, above n.37 at 210-211.
[43] David Freestone, 'The Road from Rio: International Environmental Law After the Earth Summit' (1994) 6 *Journal of Environmental Law* 193 at 216.
[44] UNCED, *Rio Declaration*, UN Doc A/CONF.151/PC/WG.III/L.33/Rev 1.

was a major step in its global maturation as an emerging principle of customary international law.[45] 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 and 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.[46] 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[47], including the oceans.

The Introduction to the Oceans Chapter of Agenda 21 recognised 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.'[48] 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 need for fresh approaches to marine and coastal management at the various levels of oceans governance, specifying that such approaches should be

[45] Birnie & Boyle, above n.41 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* (Kluwer Law International, London, 1997) at 51; Stuart B. Kaye, *International Fisheries Management* (Kluwer Law International, The Hague, 2001) at 171-172; Freestone, above n.43 at 216.
[46] Birnie & Boyle, above n.41 at 118.
[47] UNCED, UN Doc A/CONF.151/26 (1992) (*Agenda 21*).
[48] Agenda 21, Chapter 17, para 17.1.

'integrated in content' and 'precautionary and anticipatory' in ambit.[49] Section B of the Oceans Chapter gave more specific content to the general obligation of States to protect and preserve the marine environment 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 are derived 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.[50]

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

The provisions of the *1992 CBD*[51] 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.[52] 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.[53] 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.[54] 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.[55] 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

[49] Ibid.
[50] Id at para 17.22(a-d).
[51] *Convention on Biological Diversity*, opened for signature on 22 May 1992, 31 ILM 822 (entered into force 29 December 1993) ('*1992 CBD*').
[52] Michael Grubb, Matthias Koch, Koy Thomson, Abby Munson & Francis Sullivan, *The 'Earth Summit' Agreements. A Guide and Assessment* (Earthscan Publications Ltd, London, 1993) at 75-76.
[53] Christopher C. Joyner, 'Biodiversity in the Marine Environment: Resource Implications for the Law of the Sea' (1995) 28 *Vanderbilt Journal of Transnational Law* at 637.
[54] Ibid.
[55] Id at 644 and 646.

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 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.[56] 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 policy making 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'*) [57] and 1996 *Protocol to the London Convention* (*'1996 London Protocol'*).[58] The 1972 London Convention applies to disposal of waste material in any area of the water column but not to disposal in the seabed.[59] 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.[60] The reverse list of industrial wastes does not make specific

[56] Lee A. Kimball, 'The Biodiversity Convention: How to Make it Work' (1995) 28 *Vanderbilt Journal of Transnational Law* 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* at 338.

[57] *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'*).

[58] *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'*).

[59] 1972 London Convention, Article III(1) and (3).

[60] Id at Article IV, Annexes I paragraph 11.

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.[61] 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.[62] This qualification 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.[63]

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.[64] 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.[65] Dumping of waste or other matter is prohibited under the 1996 London Protocol except for those materials specifically listed in Annex I.[66] 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,[67] 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 London Protocol.[68] 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.[69]

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[61] Weeks, above n.7, at 258-259.
[62] 1972 London Convention, Article III(1)(b)(ii).
[63] Scott, above n.3, at 80.
[64] The London Protocol has 34 States Parties, http://www.imo.org/dynamic/mainframe.asp?topic_id=1509 accessed 10 June 2008.
[65] 1996 London Protocol, Article 2.
[66] Id, Article 4.
[67] Scott, above n.3 at 71.
[68] IMO Press Briefing 5, 9 February 2007, http://www.imo.org/Safety/mainframe.asp?topic_id=1472&4doc_id=7772 accessed 10 June 2008.
[69] IMO Doc. I:\LC\29\4.doc.

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.[70] 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.[71] In addition, permit applicants must provide a geological assessment of the proposed site which includes information on its long term 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.[72] 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.[73] 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.[74] 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.[75] 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.[76] 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.[77]

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 is still unsettled. It is arguable that both these activities fall outside the definition of dumping under the Convention and 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 can also be argued that these activities are not consistent with the aims of the Convention and Protocol.[78] At their Second Consultative Meeting in

[70] Id, Section 9.
[71] Id, Sections 3 and 4.
[72] Id, Section 6.2.
[73] Id. Section 6.6.
[74] Id, Section 7.6.
[75] Id, Section 7.11.
[76] See above n57.
[77] IMO, CO2 Frequently Asked Questions,
,http://www.imo.org/environment/mainframe.asp?topic_id=1548> accessed 10 June 2008.
[78] Rayfuse et al, above n.18 at 16-18.

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.[79] They also agreed that this process falls within their regulatory competence and that they would further study this issue from scientific and legal perspectives.[80]

(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.[81] 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'*).[82] 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 200 nautical mile

[79] IMO Press Briefing 40, 16 November 2007 http://www.imo.org/includes/blastDataOnly.asp/data_id%3D20395/Pressbriefing16-11-07.doc accessed 10 June 2008.

[80] Scientists meeting under the auspices of the 1972 London Convention and 1996 London Protocol from 19 to 23 May 2008 in Guayaquil Ecuador reviewing the evidence on open ocean fertilisation 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.', IUCN, *Marine Miracles at Convention on Biological Diversity* http://www.iucn.org.law accessed 10 June 2008. The final decision will be made available soon on the CBD COP 9 website http://www.cbd.int/cop9/.

[81] 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 n.3.

[82] *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'*).

zones of the Parties.[83] 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.[84] 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.[85] 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.[86] The implementation of these provisions is devolved to Parties under the Protocol and would in effect require Parties 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 Offshore Marine Areas.

In marine areas within national jurisdiction, the environmental regulation of climate change mitigation activities and the prevention of adverse impacts on the marine environment will depend largely on the strength and scope of national environmental impact assessment processes. In marine areas beyond national jurisdiction, the 1996 London Protocol and the Specific Guidelines developed for assessment of sub-seabed sequestration of carbon dioxide represent the only environmental protection principles applicable to flag States engaging in these types of activity. 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 offshore marine areas. 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 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 also 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 such as climate mitigation activities.

[83] 1986 Noumea Dumping Protocol, Article 2.
[84] Id, Articles 4-6.
[85] Id, Article 7 and Annex III.
[86] Id, Article 6.

A. Strengthening Environmental Protection Frameworks for Marine Areas within the National Jurisdiction of Developing Countries

In developing countries, implementation of regulatory frameworks for environmental protection of marine areas within national jurisdiction which reflect international law principles and modern conservation norms has been variable.[87] UNEP and other commentators estimate that approximately two thirds of the 110 developing countries identified by the World Bank had enacted environmental impact assessment legislation by the mid 1990s.[88] The creation of environmental impact assessment systems in developing countries has been heavily influenced by external development assistance agencies such as the World Bank and the Asian Development Bank.[89] Craik notes a number of factors that militate against the development of comprehensive and rigorous environmental impact assessment systems in developing countries. These include the narrow scope of projects to which environmental impact assessment applies, the lack of experts trained in environmental impact assessment and related scientific techniques, the paucity of financial resources devoted to implementing environmental impact assessments and the scarcity of environmental baseline data on which to make decisions.[90] There are also difficulties in consulting with affected sectors of the community such as the fishing communities in the Ocean Nourishment Corporation case in the Philippines and an absence of transparency in government decision making processes permitting activities to proceed without prior and ongoing environmental impact assessment.[91]

In an overview of environmental impact assessment processes in developing countries, Wood identifies a group of urgent generic issues which need to be addressed to improve the effectiveness of such processes in developing countries. He highlights localised training in the practical and operational aspects of environmental impact assessment which focuses on the national legislation and conditions applicable in the relevant country and the diffusion of environmental impact assessment experience among developing countries within particular regions.[92] The need for greater opportunities for public participation in environmental impact assessment processes, awareness raising of the activities which should be subjected to such processes and increased political understanding of the links between rational management of the environment and long term economic development are also emphasised.[93]

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[87] Neil Craik, *The International Law of Environmental Impact Assessment. Process, Substance and Integration* (2008) 42.
[88] Ibid; Christopher Wood, 'Environmental Impact Assessment in Developing Countries: An Overview' (Paper presented at Conference on New Directions in Impact Assessment for Development: Methods and Practice, 24-25 November 2003), 3, http://www.enterprise-impacct.org.uk/pdf/Wood.pdf at 30 August 2008; Kees Bastmeijer and Timo Koivurova, 'Conclusions: Globalisation of Transboundary Environmental Impact Assessment' in Kees Bastmeijer and Timo Koivurova, *Theory and Practice of Transboundary Environmental Impact Assessment* (2008) 348.
[89] Craik, above n. 87 at 42; Wood, above n.88 at 9; 'The World Bank and Environmental Impact Assessment'in Bastmeijer et al, above n.88 at 291.
[90] Craik, above n.87 at 43.
[91] Craik, above n.87 at 44; Wood, above n.88 at 17-18.
[92] Wood, above n.88 at 21-22.
[93] Ibid, 22-23.

As well as these generic issues, the inclusion of activities which have transboundary impacts in marine areas beyond national jurisdiction within the scope of the environmental impact processes of developing countries is clearly a regulatory gap which needs to be addressed in many countries.[94]

B. 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 LOSC was formally recognised by the Commission for Sustainable Development (CSD) at its seventh session in 1999.[95] 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 LOSC with developing policy aspirations on marine environmental protection and integrated oceans management and recommended that the UNGA set up a mechanism to achieve this end.[96] 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.[97] 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

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[94] Bastmeijer et al, above n. 88 at 348-349.
[95] 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 at 21, paragraph 38.
[96] Id at 21, paragraph 39.
[97] UN, *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. 1 July 2004 (*UNICPOLOS Fifth Meeting Report*).

jurisdiction (BBNJ Working Group).[98] 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.[99] 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.[100] 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.[101] The second meeting of the Working Group from 28 April to 2 May 2008 emphasised the importance of developing practical measures for the conservation 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.[102] 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.[103] The discussions at this Workshop identified critical regulatory and governance gaps in the high seas environmental protection framework and a series of short and medium term measures that could be taken to achieve

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[98] UN, *UN General Assembly Resolution on Oceans and the Law of the Sea*, UN Doc A/Res/59/24, paragraph 73 (4 February 2005).
[99] UN, *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, 20 March 2006 (*BBNJ Working Group First Meeting Report*) at paragraph 50 and Annex I, paragraph 4.
[100] Id at Annex I, paragraph 5.
[101] Id at Annex I, paragraph 6.
[102] UN, *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* <http://www.un.org/Depts/los > accessed 10 June 2008, paragraph 54.
[103] IUCN, *Workshop on High Seas Governance for the 21st Century, Co-Chairs Summary Report.* (December 2007) http://www.iucn.org/marine/pubs/pubs.htm at 2.

more effective protection for the marine environment beyond national jurisdiction from the adverse impact of activities such as climate change mitigation schemes.[104] 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.[105]

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.[106] 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 areas beyond national jurisdiction.[107] It was recommended that these measures be supported by an ongoing global process for scientific assessment and advice, similar to the Intergovernmental Panel on Climate Change, 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.[108]

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.[109] 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.[110] 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.[111] Eventually it was suggested that such organisations might develop into regional oceans management organisations (ROMOs) forming an underpinning network for a

[104] Id at 20-24.
[105] Id at 3-4
[106] Id at 2-3.
[107] Id at 12-13.
[108] Ibid.
[109] Id at 3 and 14.
[110] Ibid.
[111] Id at 14.

global oceans institution established to review, coordinate and endorse conservation and management measures initiated by the ROMOs and their sectoral counterparts.[112]

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.[113] 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.[114] 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.[115]

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 coastal, open ocean and deep sea environments. Arbitrary human intrusions into these marine domains have the potential to harm the intricate links between complex marine ecosystems and to erode components of marine biodiversity. The interdependence of these components of the marine environment underscores the need for legal and institutional arrangements which allow for integrated protection of the marine environment both within and beyond national jurisdiction and the establishment of linkages between national, regional and global bodies with regulatory competence in these areas. Improving environmental protection for marine areas within the national jurisdiction of developing countries is dependent on the creation of more comprehensive and rigorous environmental impact assessment systems for proposed activities affecting these areas at the national level. Enhancing protection of the marine environment of developing countries will also require concerted action by the international community in partnership with individual and regional groupings of developing States to put in place best practice guidelines and measures to assess and minimise the adverse impacts of human activities on these marine areas. The attainment of an effective environmental protection regime for marine areas beyond national jurisdiction faces more daunting challenges. It 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

[112] Id at 3.
[113] Id at 4 and 22-24.
[114] Id at 4 and 24.
[115] Ibid.

implementation of environmental protection measures. Protection of all areas of the marine environment from the adverse impacts of new human uses such as climate change mitigation activities requires concentrated global, regional and national investment into coordinating and extending environmental protection regimes.