DROWNING OUR SORROWS TO SECURE A CARBON FREE FUTURE? SOME INTERNATIONAL LEGAL CONSIDERATIONS RELATING TO SEQUESTERING CARBON BY FERTILISING THE OCEANS

ROSEMARY RAYFUSE*

I INTRODUCTION

It is now generally accepted that drastic reductions in carbon dioxide ('CO_2') emissions are needed if we are to avoid exceeding the capacity of natural, managed and human systems to adapt to climate change. The Intergovernmental Panel on Climate Change ('IPCC') has made clear that a range of mitigation and adaptation measures need to be developed to reduce existing and ongoing CO_2 emissions[1] if we are to achieve the goal, articulated in the *United Nations Framework Convention on Climate Change* of stabilising greenhouse gas concentrations in the atmosphere at a level that will 'prevent dangerous anthropogenic interference with the climate system'.[2] Various climate change mitigation technologies have been suggested including supply side and end use energy efficiency improvements, carbon intensity reduction techniques such as decarbonisation of fossil fuels, renewable energy sources including solar, wind and hydroelectric, and nuclear energy.[3] Suggested as offering the possibility of either a quick fix to excessive atmospheric CO_2 concentrations, or a means to continue our dependence on fossil fuels, among the more controversial suggested mitigation technologies are those involving carbon sequestration.

Carbon sequestration involves either the capture and secure storage of power plant CO_2 emissions in geologic formations (geosequestration) or deep oceans (ocean injection), or the removal of CO_2 from the atmosphere by terrestrial or marine photosynthesis and the subsequent, long-term storage of the carbon rich

* Professor of International Law, Co-Director, Climate Change Law and Policy Initiative, Faculty of Law, University of New South Wales.

1 IPPC, *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Fourth Assessment Report: Working Group II (2007), 19 <http://www.ipcc.ch/ipccreports/ar4-wg2.htm> at 17 August 2008.

2 Opened for signature 4 June 1992, 1771 UNTS 107, art 2 (entered into force 21 March 1994) ('*UNFCCC*').

3 Michael H Huesemann, 'Ocean Fertilisation and Other Climate Change Mitigation Strategies: an Overview' (2008) 364 *Marine Ecology Progress Series* 243.

biomass (biosequestration).[4] Terrestrial biosequestration involves the use of forests and soils as 'sinks'.[5] However, the oceans represent the largest natural carbon sink on earth, capable of absorbing vast quantities of atmospheric CO_2.[6] Attention has therefore become increasingly focused on finding ways to increase the ocean's absorptive capacity, particularly through the practice of ocean fertilisation.

Ocean fertilisation involves the addition of nutrients such as iron, nitrogen or phosphorous, to stimulate the growth of phytoplankton, which converts dissolved CO_2 into organic carbon. While most of the phytoplankton is consumed by larger organisms which respire much of the CO_2 back into the water column, at least some of the dead phytoplankton and other fecal matter sinks before it decays, taking the carbon along with it to the deeper waters and ocean sediments where it then decays, slowly releasing the CO_2 back into the water column over hundreds of years. Thus, once incorporated into the deep ocean sediments the carbon is effectively sequestered for an environmentally relevant time.[7]

It has been estimated that up to three per cent of current annual CO_2 emissions could be sequestered in deep ocean sediments by fertilising an area the size of the entire Southern Ocean each year.[8] However, experiments conducted to date have failed to resolve the serious scientific and technical problems associated with trying to quantify the exact amounts of carbon sequestered. In addition, a whole range of negative consequences for marine ecosystems and biogeochemical cycles has been observed and predicted. These include large scale eutrophication leading to deep ocean anoxia and a shift in the natural species composition of phytoplankton towards organisms that produce methane and nitrous oxide – greenhouse gases far more potent than CO_2. Moreover, changes to ocean ecology and the balance and availability of other nutrients could change primary production patterns globally, resulting in unforeseen, cumulative and long-term

4 IPPC, *Carbon Dioxide Capture and Storage* (2005) <http://www.ipcc.ch/ipccreports/special-reports.htm> at 17 August 2008.

5 See Nicola Durrant, Legal Issues in Biosequestration: Carbon Sinks, Carbon Rights and Carbon Trading' (2008) 31(3) *University of New South Wales Law Journal* 906.

6 The oceans have a storage capacity of several thousand gigatonnes of carbon. The transfer of CO_2 from the atmosphere to the oceans occurs naturally as a rate of 2 gigatonnes of carbon per year, which is equal between 30 and 50 per cent of all anthropogenic emissions. In theory, if the process can be accelerated, atmospheric CO_2 levels can be more rapidly reduced. See, Howard J Herzog, 'What Future for Carbon Capture and Sequestration?' (2001) 35(7) *Environmental Science and Technology* 148A; Huesemann, above n 3, 246. See also, Taro Takahashi et al, 'Global Sea-air CO_2 Flux Based on Climatological Surface Ocean CO_2, and Seasonal Biological and Temperature Effects' (2002) 49(9–10) *Deep-Sea Research Pt. II* 1601; Jagat Adhiya and Sallie W Chisholm, *Is Ocean Fertilisation a Good Carbon Sequestration Option?* (2001).

7 For a more detailed description of the process see 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) *International Journal of Marine and Coastal Law* 297 and the references cited therein.

8 Ken O Buesseler and Phillip W Boyd, 'Will Ocean Fertilisation Work? (2003) 300 *Science* 67; A. Gnanadesikan, J L Sarmiento and J D Slater, 'Effects of Patchy Ocean Fertilization on Atmospheric Carbon Dioxide and Biological Production' (2003) 17(2) *Global Biogeochemical Cycles* 1050; Ken O Buesseler et al 'The Effects of Iron Fertilisation on Carbon Sequestration in the Southern Ocean' (2004) 304 *Science* 414.

disruptions to marine food webs including open water communities and seabed ecosystems.[9]

Considered by the IPCC to be 'speculative, unproven, and with the risk of unknown side effects',[10] ocean fertilisation has raised a storm of controversy between those warning of its potentially disastrous effects on marine ecosystems and those wanting to sell carbon offsets generated by fertilisation activities to a public anxious to assuage its carbon-saturated conscience.[11] In November 2007, the parties to the *Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter*[12] and its *Protocol*[13] agreed that 'knowledge about the effectiveness and potential impacts of ocean fertilisation is currently insufficient to justify large scale operations'.[14] In June 2008, the parties to the *Convention on Biological Diversity*[15] agreed to 'ensure that ocean fertilisation 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 these activities'.[16] An exception was noted in the case of 'small scale scientific research studies within coastal waters', which 'should only be authorised if justified by the need to gather specific scientific data, and should also be subject to a thorough prior assessment of the potential impacts of the research studies on the marine environment, and be strictly controlled, and not be used for generating and selling carbon offsets or any other commercial purposes.'[17]

Nevertheless, a number of companies, including the United States of America based Climos and Planktos Science, and the Australia based Ocean Nourishment Corporation ('ONC'), are proceeding with plans to conduct commercial fertilisation operations. These companies invite investors to finance their

---

9 Rayfuse, Lawrence and Gjerde, above n 7 304–307; see also, Philip W Boyd, et al 'Mesoscale Iron Enrichment Experiments 1993–2005: Synthesis and Future Directions' (2007) 315 *Science* 612; John J Cullen and Philip W Boyd, 'Predicting and Verifying the Intended and Unintended Consequences of Large-scale Ocean Iron Fertilisation' (2008) 364 *Marine Ecology Progress Series* 295.

10 IPPC, *Climate Change 2007: Mitogation of Climate Change*, Fourth Assessment Report: Working Group III (2007), 15 <http://www.ipcc.ch/ipccreports/ar4-wg3.htm> at 17 August 2008.

11 For an overview of the debates see, 'Should we Fertilise the Ocean to Reduce Greenhouse Gases?' 46(1) *Oceanus* (2008). This issue is a special issue containing articles summarising issues raised at the Ocean Iron Fertilisation Symposium held at Woods Hole Oceanographic Institution in September 2007.

12 *Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter*, opened for signature 29 December 1972, 1976 UKTS 43 (entered into force 30 August 1975) ('*London Convention*').

13 *Protocol of 1996 to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter,1972*, opened for signature 7 November 1996, 36 ILM 1 (entered into force 24 March 2006) ('*London Protocol*').

14 International Maritime Organisation, *Report of the 29th Consultative Meeting of Contracting Parties to the Convention on the Prevention of Marine Pollution by Dumping and second meeting of Contracting Parties to the 1996 Protocol thereto*, IMO Doc. LC29/LP2 (2007).

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

16 'COP 9 Decision XI/16 on Biodiversity and Climate Change' (Presented at the Ninth Meeting of the States Parties to the Convention on Biological Diversity (COP 9), Bonn, 19–30 May 2008) Section C, <http://www.cbd.int/decisions/cop9/?m=COP-09&id=11659&lg=0> at 27 August 2008.

17 Ibid.

activities in return for the provision of carbon credits to offset investors' CO_2 emissions. Ultimately the companies intend to sell carbon credits or offsets to the public as an ongoing commercial concern.

While Climos and Planktos have been pursuing ocean iron fertilisation, ONC is focusing on the use of urea, which is produced from ammonia and CO_2 obtained through the burning of natural gas. ONC advertises itself as 'an ethical organisation established with the dual goals of managing planet wide greenhouse gas concentrations and providing protein rich food for malnourished populations'.[18] The company plans to license permanent gas burning factories to produce urea for continuous injection into the ocean via pipelines. In 2007, ONC raised the ire of environmentalists and scientists around the world, as well as that of the Government of the Philippines, when it announced plans to scale up its experiments by injecting hundreds of tonnes of urea into the Sulu Sea off the Philippines.[19] Interestingly, a spokesperson for the Australian Department of the Environment, Water and Heritage was reported in the press as saying that ONC was 'not engaged in any activities that require regulating in Australia', although the spokesperson did note that 'Australian companies wishing to conduct ocean fertilisation experiments will need to take into account the *CBD* decision'.[20]

The activities of ONC do, however, raise a number of issues relevant to Australian regulators and lawmakers. Quite clearly, the activities of ONC are governed by domestic Australian law relating to corporations and securities regulation, trade practices and consumer protection. Beyond this, Australia's obligations under international law must also be considered. Australia is a party to the *London Convention*, the *London Protocol* the *United Nations Convention on the Law of the Sea*,[21] the *UNFCCC* and the *CBD*, all of which are relevant to the issue of ocean fertilisation. This article examines the international law issues arising from ocean fertilisation activities and their interaction with Australian law.

---

18 See Ocean Nourishment Corporation <http://www.oceannourishment.com> at 24 August 2008.

19 See, eg, Jerome Aning, *Green Groups Nix Fertilizing Sulu Sea to Boost Fish Stocks* (2007) Inquirer.net <http://newsinfo.inquirer.net/breakingnews/regions/view_article.php?article_id=99703> at 27 August 2008; Amy R Remo and Jerome Aning, *Eco Groups Protest Sulu Sea Experiment* (2007) Inquirer.net <http://newsinfo.inquirer.net/inquirerheadlines/nation/view_article.php?article_id=100182> at 27 August 2008; Anna Salleh, *Urea 'Climate Solution' May Backfire* (2007) ABC Science Online, <http://www.abc.net.au/news/stories/2007/11/09/2087099.htm> at 27 August 2008; Jerome Aning, *DENR Stops 'Ocean Fertilisation' Project* (2007) Inquirer.net <http://newsinfo.inquirer.net/breakingnews/nation/view_article.php?article_id=102353 > at 27 August 2008; Katherine Adraneda, *No ECC for Sulu Sea Project – DENR*, (2007) ABS–CBN News Online <http://www.abs-cbnnews.com/storypage.aspx?StoryId=99974> at 27 August 2008.

20 Anna Salleh, *Storm Brewing Over Ocean Fertilization* (2008) ABC Science Online <http://www.abc.net.au/science/articles/2008/06/05/2265635.htm> at 27 August 2007.

21 *United Nations Convention on the Law of the Sea*, opened for signature 10 December 1982, 1833 UNTS 3 (entered into force 16 November 1994) ('*LOSC*'). As of 7 August 2007, there are 155 parties to the *LOSC*.

II OCEAN FERTILISATION AND THE LAW OF THE SEA

Protection and preservation of the marine environment is a fundamental obligation, incumbent on all nation States. The *LOSC* gives content to this customary obligation, articulated in Principle 21 of the Stockholm Declaration,[22] by requiring states to ensure that activities under their jurisdiction or control do not cause harm to the environment of other states or to areas beyond national jurisdiction.[23] To that end, all states are obliged to take individually and jointly all measures necessary to prevent, reduce and control pollution of the marine environment, to prohibit the transfer, either directly or indirectly, of damage or hazards from one area to another, and to prohibit the transformation of one type of pollution to another.[24] Pollution is defined as:

> the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the seas, impairment of quality for use of sea water and reduction of amenities.[25]

In other words, it is not the nature of the substance, per se, that matters, but rather its potential for deleterious effects. Neither is the nature or purpose of the polluting activity relevant. States are to prevent, reduce and control pollution from all sources, whether generated from scientific research or from commercial operations, including from land based sources, through the atmosphere, and from vessels, including from 'dumping'.[26]

'Dumping' is defined as 'any deliberate disposal of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea'.[27] All states are required to adopt national laws to prevent and regulate dumping which must be no less effective than internationally agreed global rules and standards.[28] These rules and standards are found in the *London Convention* and the *London Protocol*. For States parties to the former, dumping of non-prohibited substances is only allowed subject to the requirements of prior environmental impact assessment, permitting and ongoing monitoring set out in Annex III of the

---

22 Adopted by the United Nations Conference on the Human Environment, 'Final Documents' (Papers presented at the United Nations Conference on the Human Environment, Stockholm, 5–16 June 1972): 'Declaration of Principles: Other Documents' (1972) 11 ILM 1416.

23 *LOSC*, opened for signature 10 December 1982, 1833 UNTS 3, art 192 (entered into force 16 November 1994).

24 *LOSC*, opened for signature 10 December 1982, 1833 UNTS 3, arts 192–196 (entered into force 16 November 1994).

25 *LOSC*, opened for signature 10 December 1982, 1833 UNTS 3, art 1(4) (entered into force 16 November 1994).

26 *LOSC*, opened for signature 10 December 1982, 1833 UNTS 3, art 196 (entered into force 16 November 1994).

27 *LOSC*, opened for signature 10 December 1982, 1833 UNTS 3, art 1(5) (entered into force 16 November 1994); *London Convention*, opened for signature 29 December 1972, 1976 UKTS 43, art 1 (entered into force 30 August 1975); *London Protocol* opened for signature 7 November 1996, 36 ILM 1, art 1 (entered into force 24 March 2006).

28 *LOSC*, opened for signature 10 December 1982, 1833 UNTS 3, art 210 (entered into force 16 November 1994).

London Convention. For parties to the latter, including Australia, dumping of all waste and other matter is prohibited, except for five listed categories of substances, including 'inert, inorganic geological material' or 'organic material of natural origin', the dumping of which may be permitted but is nevertheless subject to the stringent assessment, permitting and ongoing monitoring requirements of Annex 2 of the *London Protocol*. However, none of the 'fertilisers' proposed for use in ocean fertilisation fall into any of these categories.[29] In other words, the use of these 'fertilisers' is prima facie banned.

It is arguable that ocean fertilisation may fall under the exception to the definition of dumping found in the *LOSC*, the *London Convention* and the *London Protocol*.[30] Stated in the same terms in each convention, dumping is defined as *not* including 'placement of matter for a purpose other than the mere disposal thereof, provided that such placement is not contrary to the aims of' the relevant convention. While the concepts of 'placement' and 'matter' may be self-explanatory (although their definitions are not free from doubt), the issues of the purpose and intention of such placement are not.

With respect to the purpose of ocean fertilsation, its proponents characterise it as intended for climate change mitigation and for other commercial and environmental purposes such as fisheries enhancement rather than disposal of the fertiliser. However, the real purpose of producing the phytoplankton bloom, at least insofar as those seeking to sell carbon credits from the exercise are concerned, is to sequester into the oceans a greater percentage of atmospheric CO_2 than would occur naturally. In other words, the purpose of ocean fertilisation is the deliberate placement into the oceans of excess atmospheric CO_2 for the purpose of disposing of that CO_2.

With respect to the aims of the *LOSC*, *London Convention* and *London Protocol*, these are stated to be to prevent, reduce and eliminate pollution that is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea. Given the range of observed and predicted adverse side effects and the concerns expressed by many scientists, including the IPCC and the Scientific Working Groups of the *London Convention* and *London Protocol* as to its efficacy and environmental safety,[31] it is currently not possible to say that ocean fertilisation and the placement by indirect means of excess CO_2 into the ocean will not result in increased harm to living resources and marine life, potential harm to humans or interference with other legitimate uses such as fishing, bio-prospecting, marine scientific research and navigation. Ocean fertilisation therefore appears to be

29 Rayfuse, Lawrence and Gjerde, above n 7, 316.

30 For a comprehensive discussion of the issue see ibid, 307–317 and the ongoing discussions in the Scientific Working Groups of the London Convention and London Protocol. Reports of their deliberations are available at <http://www.imo.org/dynamic/mainframe.asp?topic_id=1683> at 17 August 2008.

31 See, eg, 'Statement of Concern regarding iron fertilization of the oceans to sequester CO2'. Report of the Joint Meeting of the Scientific Groups of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 and 1996 Protocol, IMO Doc LC-LP.1/Circ.14, 13 July 2007

contrary to the aims of the *LOSC*, the *London Convention* and the *London Protocol* and is not saved by the exception.

If this is the case then, for States parties to the *London Convention*, ocean fertilisation activities will be subject to the permitting requirements set out in the Convention. However, for States parties to the more stringent *London Protocol*, ocean fertilisation is prohibited. This is, in fact, the position adopted by the States parties to the *London Convention* and the *London Protocol* at their meeting in November 2007, where it was agreed 'that it is within the purview of each state to consider proposals [for ocean fertilisation] on a case by case basis in accordance with the Convention and/or Protocol'.[32] As a party to the *London Protocol*, Australia is therefore under an obligation to ensure that ocean fertilisation activities carried out in areas, or by entities, under its jurisdiction or control are prohibited, at least until such time as independent, internationally peer reviewed scientific research and assessment has demonstrated that ocean fertilisation is effective and that its benefits outweigh the risks to the marine environment so that it cannot be said to be inconsistent with the aims of the *LOSC* and the *London Protocol*. Indeed, this appears to be precisely the position taken by Australia in the Legal and Inter-Sessional Correspondence Group on Ocean Fertilisation of the Scientific Groups of the *London Convention* and *London Protocol*.[33]

It is acknowledged that Australian companies may attempt to circumvent a prohibition on commercial ocean fertilisation activities by utilising vessels flagged in States that are not party to the *London Protocol* or the *London Convention* and by operating only on the high seas beyond national jurisdiction or through non-Australian registered subsidiaries. In this case, the Australian pubic should, at the very least, be made aware of the dangers and uncertainties of investing in or purchasing products, including carbon credits or offsets, produced by such companies.

However, it is also arguable that the particular activities proposed by ONC do not constitute dumping because of the manner in which ONC proposes to carry out the fertilisation. The urea–producing plants that ONC currently plans to license will be positioned onshore. The definition of dumping requires 'placement' from 'vessels, aircraft, platforms, or other man-made structures at sea'. It is unclear whether it is the 'placement' that is to be at sea or the 'vessels, aircraft, platforms or other man made structures' but the LOSC does distinguish between land based sources of pollution and pollution by dumping. If the former interpretation is correct then ONC's proposed operations still constitute dumping. If the latter interpretation is correct then, by virtue of its proposal to inject the

32 International Maritime Organisation, *Report of the 29th Consultative Meeting of the Contracting Parties to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 and 2nd Meeting of the Contracting Parties to the 1996 Protocol thereto*, IMO Doc. LC29/LP2 (2007).

33 'Australian Government Response to Legal Issues Questionnaire' in International Maritime Organisation, *Report of the Legal and Inter-Sessional Correspondence Group on Ocean Fertilisation* (2008) <http://www.imo.org/includes/blastDataOnly.asp/data_id%3D22766/INF.3-LCweb.doc> at 30 August 2008.

fertiliser into the ocean through pipes extending miles into the water column from onshore, it is arguable that it may constitute land–based pollution. States are obliged to adopt laws and regulations and take all measures necessary to prevent, reduce and control pollution of the marine environment from land–based sources, including rivers, estuaries, pipelines and outfall structures that are consistent with internationally agreed rules, standards and recommended practices and procedures.[34] However, this obligation, together with enforcement of the laws and regulations so adopted is the responsibility of the State on whose territory the plant is located and into whose waters the urea is pumped.[35]

Australia will therefore be responsible for regulating the activity should the 'placement' originate from and occur within Australia and Australian waters. Where, however, the activity occurs elsewhere, it will be subject to regulation by the relevant coastal State. Australian companies could thus choose to engage in fertilisation activities of the type envisaged by ONC originating from the territory and occurring within the waters of other coastal States, which will then be responsible for regulation of the activity. If carried out in States which, for whatever reason, are either unable or unwilling to control such operations this could lead to adverse impacts on the marine environment and hazards to or interference with other legitimate uses of the ocean contrary to international law. Should that harm cause adverse transboundary effects in Australia, Australia would have a cause of action against the State from whose territory the damage eventuated, although this may be of little benefit. Nevertheless, where Australian companies are involved, Australian laws pertaining to corporate social responsibility, including corporate disclosures, trade practices and consumer protection will still apply to the company per se.

III OCEAN FERTILISATION AND THE INTERNATIONAL CLIMATE CHANGE REGIME

There is no doubt that ocean fertilisation experiments may provide much needed information about marine and atmospheric environmental processes and their interaction, which may be of use in understanding both the processes and effects of climate change. For this reason, the scientific community is currently investigating the possible *modus operandi* for a new generation of fertilisation experiments.[36] While some of the push for new generation, larger and more numerous experiments come from scientists not wishing to see their research agenda interrupted, the primary driver of the push for expanded experimentation comes from the new breed of climate entrepreneurs hoping to profit from the sale of carbon credits or offsets on the regulated and voluntary markets.

---

34 *LOSC*, opened for signature 10 December 1982, 1833 UNTS 3, art 207 (entered into force 16 November 1994).

35 *LOSC*, opened for signature 10 December 1982, 1833 UNTS 3, art 213 (entered into force 16 November 1994), opened for signature 7 November 1996, 36 ILM 1 (entered into force 24 March 2006).

36 Andrew J Watson, et al, 'Designing the next generation of ocean iron fertilisation experiments' (2008) 364 *Marine Ecology Progress Series* 303.

The international regulated market for carbon credits is currently that established by the *Kyoto Protocol to the United Nations Framework Convention on Climate Change*[37] and its Clean Development Mechanism ('CDM').[38] The Executive Board of the CDM can issue 'certified emissions reduction' credits for sequestered carbon, but only in respect of CDM approved and accredited projects for which reductions have been verified according to strict criteria. The Executive Board has not yet approved any ocean fertilisation or related activities.[39] Indeed, pursuant to the 2001 Marrakesh Accords,[40] the only 'sink' projects that qualify for consideration under the CDM are reforestation and afforestation projects. Currently no internationally agreed mechanism exists to assess and verify the efficacy of ocean fertilisation as a sequestration technique. Thus, the Bali Action Plan, adopted by the Conference of the Parties to the UNFCCC in November 2007, refers only to avoided deforestation as another possible 'sink' to be considered in the current negotiations on the post-2012 international climate regime. Carbon sequestration by ocean fertilisation therefore seems highly unlikely to be eligible for the generation of credits under the Kyoto Protocol and the post-2012 regime.[41]

Similarly, ocean fertilisation seems unlikely to qualify for the generation of credits under the proposed Australian Carbon Pollution Reduction Scheme ('CPRS').[42] According to the recently released Green Paper, the CPRS will account for greenhouse gas reductions from carbon capture and storage ('CCS') projects. To that end it proposes an Electricity Sector Adjustment Scheme to support the development of CCS technology, which is currently commercially uncompetitive and expected to remain so until at least 2025.[43] However, the technology envisaged here is that of pre-release capture and direct geosequestration of emissions from power stations into sub-seabed offshore formations (ie, exhausted oil and gas wells). At one time also prohibited by the *London Protocol*, in 2005 Australia and Norway succeeded in having an amendment to the *London Protocol* adopted allowing for sub-seabed

37 *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, opened for signature 16 March 1998, 37 ILM 22 (entered into force 16 February 2005) ('*Kyoto Protocol*').

38 *Kyoto Protocol*, opened for signature 16 March 1998, 37 ILM 22, art 12 (entered into force 16 February 2005).

39 See *UNFCCC* Secretariat, 'Further guidance relating to the clean development mechanism' (Decision 1/CMP.2) in *Report of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol on its second session, held at Nairobi from 6 to 17 November 2006. Addendum. Part Two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol at its second session*, 3, UN Doc FCCC/KP/CMP/2006/10/Add.1 (2006).

40 Adopted at the seventh meeting of the States parties to the *Kyoto Protocol*. See *UNFCCC* Secretariat, *Report of the Conference of the Parties on its Seventh Session held at Marrakesh from 20 October to 10 November 2001*: *Part II*, UN Doc FCCC/CP/2001/13/Add.1/Corr.1 (2002).

41 David Freestone and Rosemary Rayfuse, 'Ocean Iron Fertilisation and International Law' (2008) 364 *Marine Ecology Progress Series* 227.

42 Australian Government Department of Climate Change, *Carbon Pollution Reduction Scheme Green Paper* (2008), 247. <http://www.climatechange.gov.au/greenpaper/report/pubs/greenpaper.pdf> at 30 August 2008.

43 Ibid ch 9, 291–340.

sequestration of CO_2 in certain circumstances.[44] Although still controversial in its own right, this mitigation strategy appears to hold much promise for Australia, which has submitted a proposal to the CDM requesting that CCS be included under the mechanism.[45] Generation of credits from biosequestration activities like ocean fertilisation is not, however, envisaged under the CPRS.

Given the foregoing, for the foreseeable future, credits or offsets generated by ocean fertilisation activities will only be available through voluntary offset schemes, subject only to domestic, not international law. Although a number of national and international certification schemes are being developed, such as the Australian Greenhouse Friendly Standard and the WWF Gold Standard, these generally relate to projects for the generation of credits under the CDM. The sale of unverified and unverifiable carbon credits or offsets associated with ocean fertilisation projects on the voluntary market is therefore wholly unregulated and appears likely to remain so for the foreseeable future. Recognising the propensity for and dangers of 'green-washing' by companies seeking either to sell offsets to the public or to claim carbon neutrality on the basis of the purchase of offsets, the Australian Competition and Consumer Commission has recently issued guidelines to inform businesses of their trade practice obligations in connection with carbon offset and neutrality claims[46] and has also published advice for consumers relating to corporate carbon claims.[47] Whether this satisfies the obligation on Australia, as a state party to the *CBD*, to ensure that until such time as an effective global regulatory mechanism is in place to regulate ocean fertilisation such activities not be used for generating and selling carbon offsets or for other commercial purposes, is an open question.

IV CONCLUSION

Article 3 of the *UNFCCC* places an obligation on all states to take precautionary measures to mitigate the adverse effects of climate change, including through the use and development of greenhouse gas sinks, of which, as

---

44 See International Maritime Organization, *Notification of Entry into Force, of the "CO_2 Sequestration" Amendments to Annex 1 of the London Protocol 1996* <http://www.imo.org/includes/blastDataOnly.asp/data_id%3D18192/11.pdf> at 27 August 2008. With the new amendment to the Protocol, 'carbon dioxide streams from carbon dioxide capture processes for sequestration' can be stored if they meet three criteria: (1) disposal is into a sub-seabed geological formation; (2) the carbon dioxide stream is of high purity containing only incidental amounts of associated substances; and (3) no wastes or other matter are added for the purpose of disposing of those wastes or other matter.

45 *UNFCCC* Secretariat, 'Consideration of Carbon Capture and Storage as Clean Development Mechanism Project Activities: Submissions from Parties', *Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol, Second Session, Nairobi, 6–17 November 2006*, UN Doc FCCC/KP/CMP/2006/MISC.2 (2006).

46 Australian Competition and Consumer Commission, *Carbon claims and the Trade Practices Act* (2008) <http://www.accc.gov.au/content/item.phtml?itemId=833279&nodeId=14e6d4cd90c85705b681de797365c53d&fn=Carbon+claims+and+the+Trade+Practices+A> at 27 August 2008.

47 Australian Competition and Consumer Commission, *Your Consumer Rights: Environmental Claims* (2008) <http://www.pacia.org.au/_uploaditems/docs/9.accc08.pdf> at 27 August 2008.

noted at the outset, the oceans are by far the largest and most important. Lack of full scientific uncertainty is not to be used as a reason for postponing such measures where there are threats of serious or irreversible damage.[48] However, where the mitigation measures may themselves result in serious or irreversible damage, the precautionary principle requires considerable scientific certainty that the potential benefits outweigh the potential harm. In the case of ocean fertilisation, no such scientific certainty exists. Indeed, scientific opinion currently suggests that the consequences of ongoing and/or large scale ocean fertilisations may be equally if not more serious than the consequences of climate change itself, which are defined in the *UNFCCC* to mean

> changes in the physical environmental or biota resulting from climate change which have significant deleterious effects on the consumption, resilience or productivity of natural and managed ecosystems or in the operation of socio-economic systems or on human health and welfare.[49]

It is perhaps worth noting that the use of environmental modification techniques involving the deliberate manipulation of natural processes for human advantage is prohibited under the 1976 *United Nations Convention on the Prohibition of Military or Any Hostile Use of Environmental Modification Techniques*[50] and the 1977 *Additional Protocol I to the 1949 Geneva Convention on the Laws of Armed Conflict*.[51] Not only manifestations of the obligation not to cause harm to the environment, these prohibitions are also manifestations of the recognition that these types of responses generally do not provide the simple solutions sought.[52] In this respect it is also worth remembering that ocean fertilisation, at best, can only address the symptoms rather than the underlying causes of climate change – the profligate human use and misuse of the earth's natural resources and our dependence on fossil fuels.

The international community, including Australia, has agreed that until such time as independent, internationally peer–reviewed scientific research and assessment has demonstrated that ocean fertilisation is effective and effectively verifiable, and that its benefits outweigh the risks to the marine environment, it is premature to consider commercialisation of ocean fertilisation activities or the sale on either regulated or voluntary markets of carbon credits or offsets generated by ocean fertilisation activities. Australian companies are proposing to engage in ocean fertilisation activities and their commercialisation. Contrary to the assertion of the spokesperson for the Department of the Environment, Water and Heritage, these companies are engaging in, or proposing to engage in, activities which *do* require regulation in Australia.

---

48 *UNFCCC*, opened for signature 4 June 1992, 1771 UNTS 107, art 3(3) (entered into force 21 March 1994).

49 *UNFCCC,* opened for signature 4 June 1992, 1771 UNTS 107, art 1(1) (entered into force 21 March 1994).

50 Opened for signature 18 May 1977, 1108 UNTS 151 (entered into force 5 October 1978).

51 Opened for signature 8 June 1977, 1125 UNTS 3 (entered into force 7 December 1978).

52 James R Fleming, 'The Pathological History of Weather and Climate Modification: Three Cycles of Promise and Hype' (2006) 37(1) *Historical Studies in the Physical and Biological Sciences* 3.

Of course, ocean fertilisation is not the only activity being proposed as a means of increasing the oceans' capacity to absorb excessive amounts of atmospheric CO_2. All such proposals are subject to the international legal regime relating to protection and preservation of the marine environment and relevant domestic laws and each must be carefully considered in accordance with the requirements of precaution. While it may be tempting to use the oceans as a quick fix to drown our CO_2 sorrows in the short term it will not solve the problem in the long term. And, as anyone who has had one will know, the hangover will not be worth it.