

University of New South Wales
University of New South Wales Faculty of Law Research Series
2008

Year 2008

Paper 37

Iron Ocean Fertilization and International Law

David Freestone*

Rosemary Rayfuse[†]

*General Counsel's Office, The World Bank

[†]University of New South Wales

This working paper is hosted by The Berkeley Electronic Press (bepress) and may not be commercially reproduced without the permission of the copyright holder.

<http://law.bepress.com/unswwps-flrps08/art37>

Copyright ©2008 by the authors.

Iron Ocean Fertilization and International Law

David Freestone and Rosemary Rayfuse

Abstract

Intentional ocean fertilisation and the commercial sale of associated carbon offsets raise a number of issues in international law. On the one hand states are obliged to adopt adaptation and mitigation measures to prevent dangerous climate change. On the other hand, international law obliges states to protect and preserve the marine environment and to act in a precautionary manner in the face of scientific uncertainty. This article examines the application of the international law of the sea to ocean fertilisation, with particular reference to the dumping regime which prohibits the dumping of wastes or other materials from vessels into the ocean. It then examines the application of the international legal regime on climate change to ocean fertilisation and assesses the international legal basis for the sale of carbon offsets or carbon credits associated with ocean fertilisation. It concludes that ocean fertilisation is governed by the dumping regime and that its commercialisation is inconsistent with international law unless and until independent, internationally peer-reviewed scientific research and assessment demonstrates that it is effective and that its benefits outweigh the risks to the marine environment.

Marine Ecology Progress Series

Theme Section on: “Implications of large scale iron fertilization of the oceans“

Draft 8:

Iron Ocean Fertilization and International Law

David Freestone^{1*}, Rosemary Rayfuse²

¹ Senior Adviser, General Counsel’s Office, The World Bank

² Faculty of Law, University of New South Wales, Sydney, NSW 2052, Australia

Email: r.rayfuse@unsw.edu.au

Introduction

Ocean fertilization, whether with iron or other substances, presents something of a dilemma for international law. On the one hand, the international community has accepted that a range of adaptation and mitigation measures is necessary if we are to avoid exceeding the capacity of natural, managed and human systems to adapt to climate change. On the other hand, the international community has long agreed on the obligations of states to protect and preserve the marine environment and to act in a precautionary manner in the face of scientific uncertainty.

Ocean fertilization has been suggested by some as a simple, quick, effective and environmentally friendly fix to the world’s CO₂ emissions problems. Others, however, including the highly regarded Intergovernmental Panel on Climate Change consider ocean fertilization as ‘speculative and unproven, and with risks of unknown side effects’ (IPCC 2007). Nevertheless, despite scientific uncertainty as to its efficacy as well as its environmental safety, a number of commercial operators are preparing to engage in ocean fertilization activities with the intention of reaping financial benefits through the sale of associated carbon credits or offsets.

* The views expressed here are those of the author only and do not reflect the official position of the World Bank

In June 2007 the Scientific Working Groups of the 1972 London (Dumping) Convention (LC) and its 1996 London Protocol (LP) issued a Statement of Concern noting 'the potential for large-scale ocean iron fertilization to have negative impacts on the marine environment and human health' and requesting the 29th Consultative Meeting of the LC and the 2nd Meeting of Contracting Parties to the LP 'to consider the issue ... with a view to ensuring adequate regulation of large scale ocean fertilization operations (IMO, 2007a). At their meeting in November 2007, the contracting parties to the LC and LP endorsed the Statement of Concern, agreeing that ocean fertilization activities fall under the competence of the Convention and the Protocol, in particular in relation to their objectives of protecting the marine environment. It was agreed that planned operations for large-scale fertilizations were not currently justified and that the issue would continue to be studied from both the scientific and legal perspectives, with a view to its regulation (IMO, 2007b).

For any project, including any ocean fertilization project, to generate so-called 'carbon credits' that can be used by states to meet their greenhouse gas (GHG) emission reduction targets it has to meet the rigorous requirements of the 1992 UN Framework Convention on Climate Change (UNFCCC) and its 1997 Kyoto Protocol (KP). The KP envisages industrialised states reducing their GHG emissions by an average of 5.2% from 1990 levels between 2008 and 2012. Although the UNFCCC envisages the use of all types of carbon sinks as well as reductions of GHG emissions in order to achieve 'stabilization' of the earth's climate, this is not reflected in the KP regime. The strict rules established by the KP Parties (the famous 2001 Marrakech Accords) to approve and monitor projects which might generate tradable credits do not accept any form of sink project – except afforestation or reforestation projects. The huge European Emission Trading Scheme (ETS) with carbon trades worth more than US\$24 billion dollars in 2006 (Capoor and Ambrosi, 2007) does not accept any sink projects at all.

Parallel with the official trading schemes there are a number of informal, voluntary schemes. Some of these are industry based, but others rely primarily on a 'feel good' approach of their investors who believe they are financing climate friendly activities to off-set their individual or corporate carbon footprint. These voluntary schemes are currently unregulated at both the national and the international level, although they are subject, like all other commercial activities, to national laws relating to trade practices, securities regulation and consumer protection and there is increasing recognition of

the need to develop national verification mechanisms to ensure the veracity of the carbon reduction claims made.

This article examines the international law issues arising from ocean fertilization activities. These issues relate not only to the regulation of the activity itself, which is governed by the international law of the sea and possibly a range of other sectoral and regional treaties (for example, the Antarctic Treaty System), but also to the way in which such activity might generate carbon credits or off-sets under the international treaty regime established by the UNFCCC and the KP.

Law of the Sea Issues

The basic legal framework for protection and preservation of the marine environment is set out in the 1982 United Nations Convention on the Law of the Sea (LOSC) which gives content to the customary international law obligation binding on all states (including non-parties to the LOSC such as the United States) to ensure that activities under their jurisdiction or control do not cause damage to the environment of other states or to areas beyond national jurisdiction. 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. (LOSC Articles 192-195).

Pollution is defined in Article 1(4) as 'the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the seas, impairment of quality for use of sea water and reduction of amenities'. In other words, it is not the nature of the substance, *per se*, that matters, but rather its potential for deleterious effects.

Pursuant to Article 196, 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'. 'Dumping' is defined in Article 1(5) as 'any deliberate disposal of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea'. Article 210 of the LOSC requires all states to adopt national laws to prevent and regulate dumping which must be no less effective than internationally

agreed global rules and standards. These rules and standards are currently found in the LC (to which the US *is* party) and the LP. 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 Convention. For parties to the latter, dumping of all waste and other matter is prohibited, except for five listed categories of substances (none of which include the 'fertilizers' used in ocean fertilization), the dumping of which is nevertheless subject to the stringent assessment, permitting and on-going monitoring requirements of Annex 2 of the Protocol.

The central issue for ocean fertilization is whether it is exempt from the ban on dumping by virtue of the operation of the exception to the definition of dumping found in the LOSC, LC and LP, all of which state that dumping does not include 'placement of matter for a purpose other than the mere disposal thereof, provided that such placement is not contrary to the aims of' the LOSC or the LC/LP. Iron is clearly 'matter'. However, while iron deposited during fertilization activities is abandoned with no intention of it being recovered, 'mere disposal thereof' is not the objective of the operation. To determine the application of this exception to ocean fertilization activities, it is therefore necessary to consider both the purposes of ocean fertilization and the aims of the LOSC and the LC/LP.

With respect to the former, the purpose of ocean fertilization is to stimulate a phytoplankton bloom. This may be for scientific research, or to draw down CO₂ from the atmosphere for storage in the ocean. While the oceans are a natural sink for CO₂ the point of ocean fertilization is to sequester into the oceans a greater percentage of atmospheric CO₂ than would occur naturally. Ocean fertilization could therefore be viewed as the placement, by indirect means, into the oceans of excess atmospheric CO₂ for the purpose of disposing of that CO₂.

With respect to the latter, marine scientific research (MSR) is one of the 'freedoms' protected by the LOSC. However, the conduct of MSR is subject to the marine environmental protection provisions of the LOSC including the provisions on dumping. In that respect, the aims of the LOSC, LC and LP are 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, as to its efficacy and environmental

safety (see, eg, Buesseler and Boyd (2003), Buesseler (2004), Chisholm (2001), Dalton (2002), Jin and Gruber (2003), Lawrence (2002), Lutz et al (2007), Meskhidze and Nenes (2006)) it is currently not possible to say that ocean fertilization and the placement by indirect means of excess CO₂ 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.

It could therefore be said that ocean fertilization is *prima facie* contrary to the aims of the LOSC, the LC and the LP and is not saved by the exception. If this is the case, for states parties to the LP, ocean fertilization would be prohibited, unless the 'fertilizer' and the CO₂ sequestered fall within the definition of 'inert, inorganic geological material' or 'organic material of natural origin', both of which may be considered for dumping subject to permitting requirements; while for states parties to the LC ocean fertilization would be subject to the permitting requirements set out in the Convention. This is, in fact, the position adopted by the states parties to the LC and LP in their statement in November 2007, 'recognising that it is within the purview of each state to consider proposals (for ocean fertilization) on a case-by-case basis in accordance with the Convention and/or Protocol' (IMO 2007b). In other words, for any ocean fertilization activity conducted under the jurisdiction or control of states parties to the LC or the LP, permits issued by national authorities in accordance with the terms of the Convention or the Protocol (as relevant) will be required.

Admittedly, the characterization of ocean fertilization as within the jurisdiction of the LC/LP does not guarantee its effective regulation and control, particularly where the activities take place on the high seas in areas beyond national jurisdiction. While arguably the provisions of the LC are binding on all states parties to the LOSC as a result of the latter's incorporation of generally agreed international standards (Birnie and Boyle (2002), de la Fayette (1998)), a strict interpretation of the law of treaties holds that the LC and LP are only binding on their parties. Thus while the general prohibitions in the LOSC on pollution of the marine environment, dumping, transfer or transformation of one type of pollution to another, and on technologies which cause significant and harmful changes to the marine environment apply to all LC/LP non-parties who are party to the LOSC, the specific rules on permitting, assessment and monitoring do not.

In addition, state responsibility for protection of the marine environment is allocated on the basis of jurisdictional 'competences to enforce' ascribed to

coastal states, port states and flag states. Coastal states have jurisdiction to enforce their dumping laws within their territorial sea and exclusive economic zone or on their continental shelf. Port states have jurisdiction to enforce in respect of loading of waste or other matter to be dumped within their territory or at their offshore terminals. Nevertheless, where a coastal or port state is unwilling or unable to adopt, implement and enforce at a minimum the internationally agreed rules and standards, the marine environment may suffer. This situation is particularly exacerbated in the case of activities conducted on the high seas where primary jurisdiction to regulate and enforce rests with the flag state which may not be party to the relevant treaties or may otherwise be unable or unwilling to enforce against its vessels.

Reliance on flag state and port state jurisdiction therefore gives rise to the very real threat, common to all areas of the law of sea, of use of 'flags of convenience' and 'ports of convenience'. No matter how strict an approach is taken by the parties to the LC/LP, the very real potential exists for proponents of ocean fertilization to undermine the LC/LP regulatory efforts by simply incorporating their companies, flagging their vessels, and loading their 'fertilizer' in non-LC/LP party states. The standing of other states to bring claims against these recalcitrant states in respect of damage to the formers' interests in the high seas, its resources and amenities as a result of ocean fertilization is still uncertain.

UNFCCC/Kyoto Protocol Issues

The UNFCCC was opened for signature in June 1992 as a part of the UN Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil. It now has near universal membership of 192 states parties. The basic objective of the Convention, set out in Article 2 is to stabilise GHG emissions 'at a level that would prevent dangerous anthropogenic interference with the climate system' and 'within a time frame sufficient to allow eco-systems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.'

The UNFCCC imposes an obligation on its Parties to '...promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases..., including biomass, forests and oceans...' (Article 4(1)(d)). Moreover, parties are urged to take precautionary measures to *inter alia* mitigate the adverse effects of climate change and lack of scientific certainty should not be used as a reason for

postponing such measures (Article 3(3)). However, they are also obliged to use appropriate methods, such as impact assessments, with a view to minimising adverse effects on the quality of the environment of projects designed to mitigate, or adapt to climate change (Article 4(1)(f)).

Neither time frames nor modalities for achieving these objectives are set out in the UNFCCC. Rather, these were negotiated in the context of the KP which was the first of what was envisaged as a series of Protocols that would add substance to the UNFCCC framework. The KP imposes binding obligations on developed countries (set out in its Annex B) to reduce emissions of GHGs by agreed amounts within the 2008-2012 commitment period. The KP also envisages developing countries using the so-called 'flexibility mechanisms' in order to assist them in meeting these targets. The theory behind this approach is that the 'marginal abatement cost', i.e. the cost of financing an emission reduction, will usually be far higher in a relatively fuel efficient industrialised country than in a country such as an economy in transition (EIT) or a developing country which may have less efficient fuel-use technology. As the global climate system benefits from these reductions wherever they are made, then making reductions in an EIT or a developing country as part of a national strategy which also, of course, includes the introduction of domestic 'policies and measures' to reduce emissions at home, will make the cost of reaching these reduction targets cheaper and increase the chances that they will actually be reached.

There are three flexibility mechanisms. The first, carbon trading as between Annex I developed countries, (KP Article 17) does not concern us here. The second is Joint Implementation (JI) whereby two developed countries collaborate in a project to reduce emissions in one country, with investment from the other that can then claim carbon credits for achieved emission reductions (KP Article 6). Most radical, however, is the Clean Development Mechanism (CDM) whereby developed countries invest in GHG emission reduction projects in developing countries. These projects must also contribute to sustainable development in the host country. Once an independent auditor certifies that reductions have actually occurred then the developed country can claim 'certified emission reductions' and set these off against its own GHG reduction targets. In order to prevent abuse of this mechanism a CDM Executive Board oversees these projects and must approve the methodology by which emissions reductions are calculated. The Board also licences the auditors (or certifiers). CDM projects need to meet established criteria: participation must be voluntary; all countries – or entities acting under their authority - must be Parties to the KP; the projects must

manifest real measurable and long-term benefits relating to mitigation of climate change; and a project activity must be 'additional' to that which would have occurred in its absence.

Participation in the CDM is open to the involvement of private as well as public entities, as long as they act under the authority of a KP state party and subject to the guidance of the CDM Executive Board. It is a relatively bureaucratic process which to date has approved more than 800 projects since they opened for business some seven years ago. It is also worth noting that to date only one of these has been a "sink" project. The reason is that carbon sequestration projects have long been controversial in the negotiations of parties to the UNFCCC. In 2001, in Marrakech, it was decided that only reforestation and afforestation projects would qualify for consideration by the CDM. Although the recent Conference of the Parties in Bali in December 2007 decided that any successor to the KP would consider avoided deforestation, these are the only forms of sequestration that are even on the radar screen of the negotiators.

Carbon sequestration in the oceans therefore seems highly unlikely to be eligible for the generation of credits under the KP regime. The UNFCCC parties have never considered how sequestration by ocean fertilization might figure in the national inventories which developed countries are required to submit, nor does it seem likely to be on their agenda given the scepticism of the IPCC regarding fertilization. The situation is very different for CO₂ capture and storage activities which could be part of a national strategy where CO₂ generated in one country might be captured and stored in ocean floor reservoirs in areas under national jurisdiction. Indeed the LP was amended in 2006 specifically to contemplate such activities. Ocean fertilization, by contrast, is very different, particularly where the fertilization activity takes place in areas outside of national jurisdiction so there is no "host" country to certify that this contributes to their sustainable development (a difficult task in any event). Moreover, there is no real evidence that carbon is actually captured and retained in the oceans for a reasonable period, and that there is no leakage of other GHGs, such as nitrous oxide, in the process. Indeed, there are problems with virtually all the other current requirements for CDM and JI project registration.

Outside the ambit of the KP regime, there are few restrictions on the ability of national authorities or the private sector to offer national, or in the case of the private sector voluntary, carbon offset schemes. Voluntary carbon offset schemes do not affect states' commitments under the UNFCCC/KP. These

schemes, and the credit or off-set generating projects included in these schemes, are subject to domestic laws rather than international regulation, although a number of national and international certification programs are being developed to enhance vigilance by national authorities in states where these markets flourish and to ensure these projects offer real environmental benefits in return for the substantial investments that are being made. Nevertheless, under the rules on state responsibility states may still be internationally responsible if projects under their jurisdiction or control cause damage to the rights and interests of other states.

Conclusions

Based on IPCC assessments, the Stern Review (2007) suggests there is a 10-15 year window in which to make major reductions in global GHG concentrations to avoid dangerous climate change. In this environment all the available tools should be on the table. Certainly, the characterization of ocean fertilization as within the competence of the LC/LP does not relieve the international community of the obligation expressed in Article 3 of the UNFCCC to take precautionary measures to mitigate the adverse effects of climate change including through the use and development of greenhouse gas sinks, of which the oceans are by far the largest and most important on earth. Indeed, lack of full scientific certainty is not to be used as a reason for postponing such measures where there are threats of serious or irreversible damage. However, where the mitigation measures themselves may result in serious or irreversible damage, the precautionary principle requires, at the very least, that these need to be subject to proper and rigorous assessment to minimize unwanted adverse impacts on the environment in order to ensure the potential benefits outweigh the potential harms. Indeed, both the LOSC (Article 204) and the UNFCCC (Article 4(1)(f)) mandate prior assessment.

The states parties to the LC and the LP have rightly recognized that ocean fertilization falls under the competence of the LC/LP regime and have agreed to study the need for further regulation. While they do so they have urged states to 'use the utmost caution when considering proposals for large-scale fertilization operations' and have taken the view that, 'given the present state of knowledge ... such large-scale operations are currently not justified' (IMO 2007b). The parties to the LC/LP have therefore recognised that in order to ensure avoidance of conflict and to minimize interference with other legitimate uses of the oceans, with the rights and interests of all states in protection of the marine environment of the high seas, and with the right and

interests of coastal states in areas under national jurisdiction, ocean fertilisation should be subject to internationally agreed regulations and permitting requirements. It goes without saying that these regulations will need to incorporate 'best practice' prior and cumulative environmental assessment (EIA), as well as on-going monitoring and, if necessary, remediation requirements. Given scientific uncertainty as to the possible adverse effects of ocean fertilization, it would also be sensible to require that applicants for permits for ocean fertilization should include research on the broader effects of fertilization on the marine and atmospheric environments. As with all such procedures, where those effects are unknown or likely to be severe, modification to experimental design can be required to minimize possible adverse effects (Verlaan, 2007).

In addition, given the significant practical and technological difficulties have been encountered in previous fertilization experiments in containing and monitoring the algal bloom and in verifying the amount of carbon draw down, consideration could be given to restricting the size and number of future experiments unless and until the process is shown to be effective and that its benefits outweigh the risks involved. Finally, consideration will need to be given to addressing liability issues that may well arise if the rights and interests of other states are adversely affected by ocean fertilization activities.

Regulation by LC/LP does not answer all the questions posed by ocean fertilization. In this respect ocean fertilization highlights the inadequacies inherent in the decentralised and fragmented international legal system which, for effective implementation, requires co-ordination between different international treaty regimes such as the LC/LP and the UNFCCC – no formal mechanism for which exists – and the informed collaboration of national authorities. As has been discussed above, this devolved implementation may present unfortunate opportunities for exploitation. However, it should be borne in mind that *all* states and their nationals are under a legal obligation not to cause damage to the marine environment of other states or to areas beyond national jurisdiction. States not party to the LC/LP could therefore also consider adopting domestic legislation regulating the activity. Other multilateral treaty bodies may also wish to consider its regulation. Climate change institutions such as the UNFCCC and the KP may also need to address the issue of ocean fertilization, particularly as regards its commercialization and the sale of associated credits or off-sets.

In conclusion, the main message seems to be that ocean fertilization has yet to be shown to work as a serious climate change mitigation strategy. Until

such time as independent, internationally peer-reviewed scientific research and assessment has demonstrated that it is effective and that its benefits outweigh the risks to the marine environment, it must be premature for carbon credits or offsets generated by ocean fertilization activities to be offered on either the regulated or the voluntary market.

Literature cited

1972 Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, London, 29 December 1972. Into force 30 August 1975. 1976 UKTS 43 (London Convention)

1982 United Nations Convention on the Law of the Sea, Montego Bay, 10 December 1982. Into force 16 November 1994. 21 International Legal Materials 1245 (1982) (LOSC)

1992 United Nations Framework Convention on Climate Change, New York, 9 May 1992. Into force 21 March 1994. 31 International Legal Materials 851 (1992)

1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, London, 7 November 1996. Into force 24 March 2006. (2006) ATS 11 (London Protocol)

1997 Kyoto Protocol to the Framework Convention on Climate Change, Kyoto, 11 December 1997. Into force 16 February 2005. 37 International Legal Materials 22 (1998) (KP)

Capoor K and Ambrosi P, (2007) State and Trends of the Carbon Market 2006, World Bank Institute & International Emissions Trading Association, Washington DC.

Birnie P, and Boyle A, (2002). International Law and the Environment (2d) 421

Buesseler K, et al, (2004). The Effects of Iron Fertilization on Carbon Sequestration in the Southern Ocean. Science 304: 414-417

Buesseler K, and Boyd PW, (2003). Will Ocean Fertilization Work? Science 300: 67-68

Chisholm SW, Falkowski PG, and Cullen JJ (2001) Dis-crediting Ocean Fertilization. *Science* 294: 309-311

Dalton R, (2002). Ocean Tests raise Doubts Over Use of Algae as Carbon Sink. *Nature* 420: 722

De la Fayette L, (1998). The London Convention 1972:Preparing for the Future. *International Journal of Marine and Coastal Law*:13(4) 515-536

IMO 2007a

IMO 2007b

Intergovernmental Panel on Climate Change (2007), Fourth Assessment Report, Contribution of Working Group III, p 20, para 17

Jin X, and Gruber N, (2003). Offsetting the radiative benefit of ocean iron fertilization by enhancing N₂O emissions. *Geophysical Research Letters* 30: 24

Lawrence MG, (2002). Side Effects of Oceanic Iron Fertilization. *Science* 297: 1993

Lutz MJ, Caldeira K, Dunbar RB, Behrenfeld MJ, (2007). Seasonal rhythms of net primary production and particulate organic carbon flux describe biological pump efficiency in the global ocean. *Journal of Geophysical Research* 112: C10011

Meskhidze N, and Nenes A, (2006). Phytoplankton and cloudiness in the Southern Ocean. *Science* 314: 1419-1423

Stern, N, (2007) *The Economics of Climate Change*, UK

Verlaan P, (2007). Experimental Activities that Intentionally Perturb the Marine Environment: Implications for the marine environmental protection and marine scientific provisions of the 1982 United Nations Convention on the Law of the Sea. *Marine Policy* 31: 210-216