

# Geo-Engineering in the Southern Ocean

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## **Ocean Dumping**

Suppose that you set sail from Australia in a research vessel, the Eurostern, with the stated objective of dumping fertilizer across 320 square kilometers of the Mediterranean Sea. I expect that the Europeans may be outraged at such arrogance, and it is a fair guess that you will be in preventative detention before you sail past Gibraltar.

Yet, as I write (February 2009), a German research vessel, the Polarstern, is on a 70 day exercise of dumping 20 tonnes of ferrous sulphate (iron sulphate,  $\text{FeSO}_4$ ) in the Southern Ocean at a latitude of  $46^\circ$  south. That is a latitude just south of Tasmania, in line with Dunedin, New Zealand, and a few degrees north of Santa Cruz, Argentina. During the LOHAFEX experiment, the Alfred Wegner Institute for Polar & Marine Research project will increase the iron level of the treated ocean area by a factor of up to 24 times “the natural iron concentration” (AWI, 2009, p. 7). The target area is 20 kilometres in diameter, i.e. approximately 320 square kilometres - that is an area of more than five times the size of Manhattan which is 59 square kilometres.

It could be argued that the Southern Ocean being far away from sources of pollution, as well as international media, is an ideal place to conduct such a geo-engineering experiment, and that maybe this ocean fertilization experiment will be the seed for a whole new lucrative ocean-dumping industry that might even save the planet.

Alternatively, it could be argued that this is a further exercise in Euro-arrogance, in an expropriation of the commons, and that it is a continuation and extension of the Northern eco-malfeasance that we of the South have witnessed too frequently. Europe has “form” for latitude-shifting its eco-crimes. France travelled half way around the planet to detonate its “safe” nuclear weapons in the otherwise pacific Polynesia.

## **Fertilizer Early Warnings**

The earliest proponents of bio-dynamic and organic agriculture were early voices raised against synthetic fertilizers and artificial fertilization. Rudolf Steiner warned of the enthusiasm for synthetic fertilizers: “No one realizes today that all the

mineral fertilizers are just what are contributing most to the degeneration of the products of agriculture” (Steiner, 1924, p.9).

Lord Northbourne wrote that “If we try to substitute artificial manures ... we only supply certain elements instead of all, and we supply them in a form in which they are undeniably poisonous to certain kinds of life; and though the immediate reactions of plants may appear satisfactory, it is very questionable whether the long-range results are so, especially as regards the quality of the produce” (1940, p. 100).

Dead zones in the world’s oceans have been increasingly reported over the past four decades. A dead zone has been defined as: “A part of a water body so low in oxygen that normal life cannot survive. The low oxygen conditions usually result from eutrophication caused by fertilizer run-off from land.” (UNEP, 2007, p.517).

This collateral ocean fertilization has been an adverse outcome of agricultural fertilizer application and subsequent runoff. “Rivers, lakes and coastal waters receive large amounts of nutrients from the land, and overloading of nutrients often results in algal blooms. If this increases in intensity and frequency, whole ecosystems may be subject to hypoxia (dead zones due to lack of oxygen) as seen already in the Gulf of Mexico” (UNEP 2007, p.111).

The LOHAFEX expedition and ocean fertilization in general, are driven by the potential to sequester carbon in the oceans. This could have substantial commercial value in a carbon-trading world, but at the cost of an ecological make-over of the oceans and the ocean beds.

## **The Science**

The scientific proposition behind ocean fertilization is that:

1. Iron is a bio-limiting factor in the ocean;
2. Artificially dumping iron in the ocean will overcome this bio-constraint, and will lead to a bloom, in particular of phytoplankton;
3. The greater the extent of the bloom, the greater is the capture of carbon dioxide (CO<sub>2</sub>) via photosynthesis; CO<sub>2</sub> is converted to carbohydrates.
4. When this bloom has run its course, and the resultant biomass increase, of phytoplankton and/or of organisms that have fed on it, dies, it may sink to the ocean floor forming a bio-blanket of newly “captured” carbon; and
5. In an oxygen-depleted environment the carbon stored within this dead bio-blanket may remain sequestered since decomposition will be arrested or inhibited.

The current LOHAFEX experiment “is the same as that of previous experiments” according to the organizers, Germany’s Alfred Wegner Institute (Mehrtens, 2009). There have been “five previous experiments carried out in the Southern Ocean” which have “induced phytoplankton blooms of similar size” (Mehrtens, 2009).

The treatment area is the open ocean and there are apparently no perimeter constraints whatsoever. The Alfred Wegner Institute describe the target area as: “a notoriously stormy stretch of ocean” (2009, p.2).

The Alfred Wegner Institute asserts that their artificial fertilization “imitates a natural process which occurs there regularly” (AWI, 2009, p.6). That being the case, there is an argument to be made that the LOHAFEX team ought to be measuring just such natural events rather than creating their own artificial and controversial fertilization events.

## **Dash for Cash**

The commercial proposition behind ocean fertilization is that:

1. Carbon can be sequestered on the ocean floor in dead artificially-bloomed biomass;
2. The sequestered carbon can be measured;
3. The sequestered carbon can be sold within a carbon trading scheme; and
4. The process can be implemented cost effectively, i.e. profitably.

Ocean fertilization exercises should not be confused with curiosity-driven scientific enquiry of the type: “I wonder what would happen if we added x tonnes, of chemical y, to z square kilometres of the ocean”.

Ocean fertilization is driven by cash rather than scientific enquiry. In a carbon-trading world, a scheme to sequester carbon can be a money spinner, especially in a scheme that has the potential to be massively scaled up - remembering that oceans cover in excess of 70% of the Earth’s surface.

## **The Convention**

There are 191 parties to the Convention on Biological Diversity, and the signatories include Germany.

In Bonn, in May 2008, the Conference of the Parties to the Convention specifically addressed the issue of ocean fertilization, and they acknowledged: “the current absence of reliable data covering all relevant aspects of ocean fertilization, without

which there is an inadequate basis on which to assess their potential risks” (CBD, 2008, Decision IX/16).

The 2008 Convention on Biological Diversity decision on ocean fertilization declared that the Conference of Parties:

“Bearing in mind the ongoing scientific and legal analysis occurring under the auspices of the London Convention (1972) and the 1996 London Protocol, requests Parties and urges 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 these activities; with the exception of small scale scientific research studies within coastal waters. Such studies should only be authorized 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” (emphasis added) (CBD, 2008, Decision IX/16).

## **The Issues**

There are at least five issues of concern with the LOHAFEX experiment in particular, and ocean fertilization in general.

Firstly, ocean fertilization is a pollution of the commons without the consent of the commons. It is an example of the invasion of the weak and vulnerable by the strong and well resourced. It is a situation where there are massive financial profits to be made by the few, at the potential expense of the many. How do concerned citizens of the world consent to, or resist, this incursion of their commons?

Secondly, there is the issue of localism and experiment-miles. LOHAFEX is fertilizing remote-from-their-region; it is not fertilizing the Alfred Wegner Institute Lake, nor the mighty Lake Constance (Bodensee) which borders Germany, Switzerland and Austria, or even is it fertilizing the Mediterranean Sea. LOHAFEX is rather travelling far from Europe, far from oversight, and into the pristine waters of the Southern Ocean to conduct its pollution experiment.

Thirdly, the risks are unknown (CBD, 2008). There are opportunities for diverse, adverse and perverse outcomes. The sweeping declaration by the Alfred Wegner Institute that “this experiment will not cause damage to the environment” (Mehrtens, 2009, p.1), would appear to be deceptive and/or delusional. The adoption of the precautionary principle would seem to have much to recommend it as a guide for action and perhaps abstinence, rather than engaging

its antithesis, the post-cautionary principle, as is apparently being embraced by Alfred Wegner as a guide to commission.

Fourthly, it is scientific malfeasance to undermine international agreements that set out to protect the oceans. LOHAFEX contravenes the Convention on Biological Diversity's call for a moratorium on ocean fertilization.

Fifthly, and finally, it is self-serving and disingenuous to claim, as does the Alfred Wegner Institute that their ocean fertilization experiments do "not function as a door opener for commercial iron fertilisation" (AWI, 2009, p.6).

An experiment that should not be done, is in no way redeemed by it being proclaimed "purely scientific" (AWI, 2009, p.1). As the Japanese have shown with their so-called "scientific" whaling, the rubric of science can be employed to cloak ill-conceived and ill-considered programmes with an air of legitimacy.

## **Conclusion**

The eco-credentials of artificial fertilization are poor on both land and sea. Yes we can bloom the ocean, but because we can is not an argument that we ought. Shifting the carbon "problem" from the land to the sea may be just a new version of sweeping the dirt under the mat. In this case, Europe's carbon "dirt" under the Southern Ocean "mat". In any event, if Europe wants to persist with such a clean up strategy, could they please at least find their own mat - rather than using our Southern Ocean.

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