Harnessing the Ocean to Combat Climate Change: Regulating the Impact of Climate Change Mitigation Activities on Marine Biodiversity

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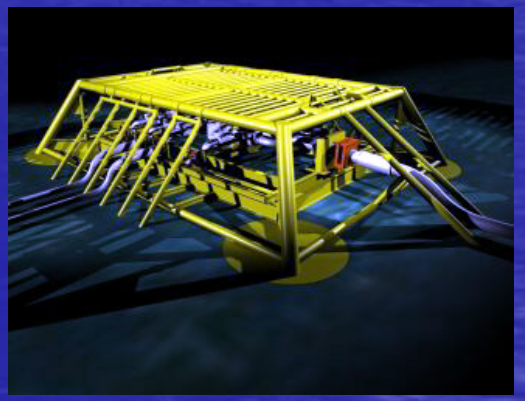


Climate Change Mitigation Activities Based on the Ocean

- The capacity of the ocean to act as a storage receptacle and absorb rising levels of carbon dioxide in the atmosphere has been the focus of a number of activities to mitigate the adverse effects of climate change on the environment.
- These include marine geo engineering schemes involving:
  - The deposit of substances into the ocean; and
  - The deposit of structures or devices into the ocean

Climate Change Mitigation Activities Based on the Ocean

Deposit of substances into the ocean schemes include

- **Offshore carbon capture** involving the sub seabed sequestration of carbon dioxide from fossil fuel fired power stations
- **Ocean fertilization** involving the deposit of iron, nitrogen or phosphorous compounds intended to stimulate primary productivity and thus through the biological pump increase the carbon flux into the deep ocean;
- Depositing crop wastes on the deep seabed
- Increasing the alkalinity of the ocean and thus uptake of CO2 from the atmosphere by adding calcium oxide, calcium hydroxide or calcium carbonate directly to the ocean or enhancing the weathering of silicate rocks on land
- Increasing down welling of carbon through increasing carbon concentrations in the down welling water

Climate Change Mitigation Activities Based on the Ocean

Deposit of structures and devices into the ocean schemes include:

- Using pipes suspended in the ocean that use wave action to pump water from several hundred metres depth up to fertilise surface waters
- Placement of dams across straits either completely or partially reducing the deep outflow of salty water from the Mediterranean Sea to affect the water movements in the North Atlantic so as to avoid a new ice age or damming the Bering Strait with a 300 km dam to reduce the inflow of warm salty water into the Arctic thus deceasing the temperature and salinity of Arctic seawater and helping to cool the Arctic with knock on effects on the cloud reflectivity capacity of the Arctic and the thawing of the permafrost

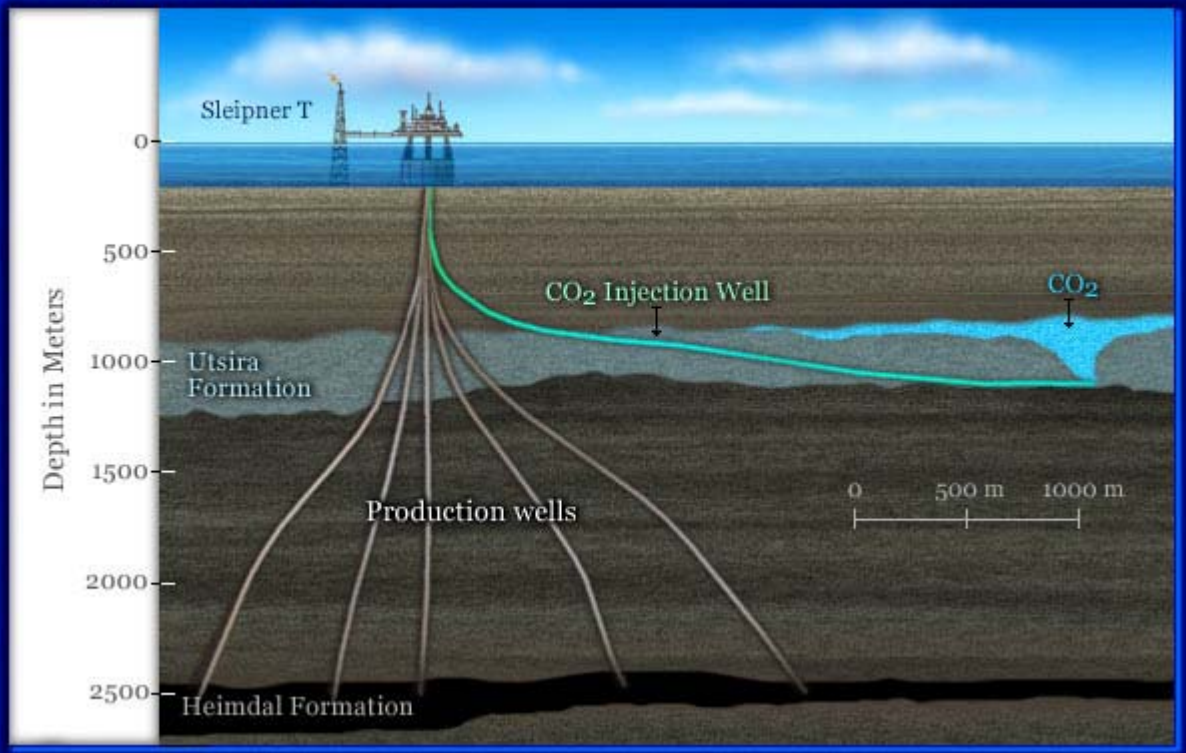
Risks and Likelihood of Ocean Based Climate Change Mitigation Activities

- Used irresponsibly, ocean based climate change mitigation activities or marine geo-engineering activities could have catastrophic consequences similar to climate change itself.
- As the adverse impacts of climate change deepen, States may be left with no alternative but to turn increasingly to marine geo-engineering schemes as part of the solution.
- For this reason environmental impact assessment (EIA) of these types of activity is growing in importance.

Sequestration of Carbon Dioxide in the Seabed or Water Column

- One of the earliest climate change mitigation schemes affecting 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 into sub-seabed geological formations.
- The process involves separating carbon dioxide from flue gases and pressurising it for transport by pipeline or vessel to the sub-seabed storage site eg depleted offshore oil and gas fields

Sleipner Field



Sleipner Field: Norway

Sequestration of Carbon Dioxide in the Seabed

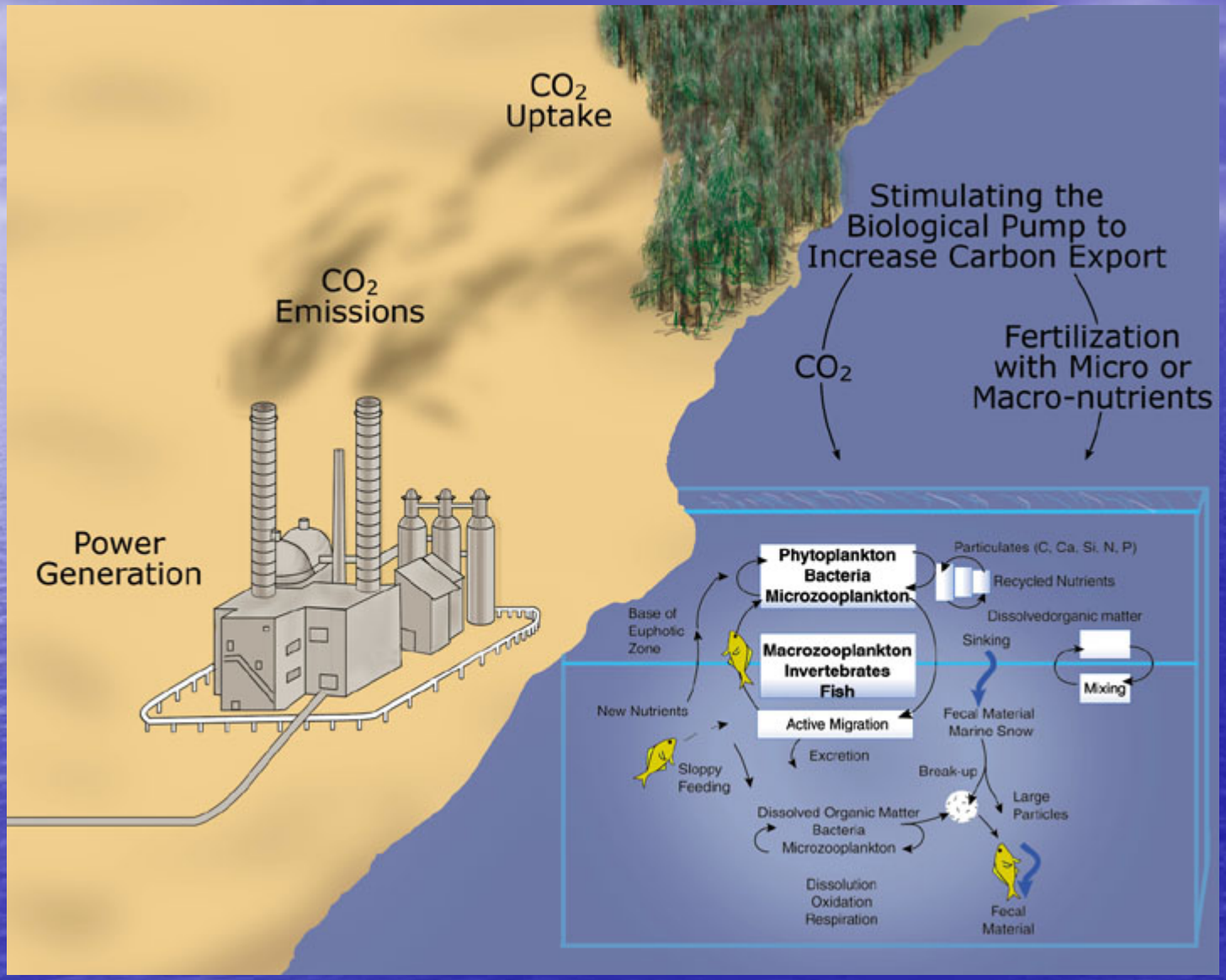
- The principal risk associated with carbon dioxide disposal in the sub-seabed is the potential for leakage of carbon dioxide and any other substances in the carbon dioxide stream such as heavy metals into the marine environment either during transport to a storage site or after storage.
- Considerable research has been undertaken by States and corporations to assess and minimise the risks associated with sub-seabed sequestration of carbon dioxide and this method of disposal is being implemented in a number of projects around the world.

Sequestration of Carbon Dioxide in the Seabed

The effects of leakage of an alien chemical substance such as Co2 into the deep sea on the benthic ecosystems 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.

Open Ocean Fertilisation

- The process of open ocean fertilisation uses iron and other micro nutrients to increase phytoplankton growth in iron and nutrient deficient areas of the ocean in order to promote further draw down of photosynthesised carbon into the deep ocean.
- There are a variety of risks and uncertainties associated with open ocean fertilisation which have excited concern among scientists and environmentalists.


CO_2 Uptake
Stimulating the Biological Pump to Increase Carbon Export
CO_2 Emissions
CO_2
Fertilization with Micro or Macro-nutrients
Power Generation
Phytoplankton
Bacteria
Microzooplankton
Particulates (C, Ca, Si, N, P)
Recycled Nutrients
Dissolvedorganic matter
Base of Euphotic Zone
Macrozooplankton
Invertebrates
Fish
Sinking
Mixing
New Nutrients
Active Migration
Fecal Material
Marine Snow
Excretion
Sloppy Feeding
Break-up
Large Particles
Dissolved Organic Matter
Bacteria
Microzooplankton
Dissolution
Oxidation
Respiration
Fecal Material

Open Ocean Fertilisation

- The effects of stimulating phytoplankton growth on other marine organisms and ecosystems are poorly understood.
- Increased phytoplankton growth may boost the production of other greenhouse gases such as nitrous oxide neutralising the positive effects of carbon dioxide drawdown and the sinking of phytoplankton blooms into the deep ocean may reduce oxygen levels at these depths with adverse consequences for fish and other marine organisms.

Open Ocean Fertilisation

- The sustainability of this activity as a climate change mitigation option has also been called into question on the basis of the lengthy time frames and huge quantities of iron or other nutrients required for the process to have any positive effects.
- 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.

Regulatory Framework for Climate Change Mitigation Activities in Marine Areas

- Part XII of the 1982 UN Convention on the Law of the Sea (LOSC) imposes a general obligation on States Parties to protect and preserve the marine environment (Art. 192).
- States also have a duty to prevent, reduce and control pollution of the marine environment from any source including the release of toxic, harmful or noxious substances....from land based sources, from or through the atmosphere or by dumping (Art.194(3))

Regulatory Framework for Climate Change Mitigation Activities in Marine Areas

- States have a positive duty 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 (Art. 194(5) LOSC)
- 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 of the LOSC which require States 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.

Regulatory Framework for Climate Change Mitigation Activities in Marine Areas

Climate change mitigation activities in marine areas are also subject to international environmental law principles including the precautionary approach (Principle 15 Rio Declaration, Oceans Chapter of Agenda 21), the obligation to conserve marine biodiversity contained in the 1992 Convention on Biological Diversity (CBD) and the duty to prevent transboundary harm caused by activities under States jurisdiction or control (Principle 21 Rio Declaration).

Regulatory Framework for Climate Change Mitigation Activities in Marine Areas

- Where climate mitigation change activities such as offshore carbon capture and ocean fertilization involve the deliberate disposal of waste material at sea they may fall within the scope of the London Convention and its 1996 Protocol.
- The London Convention applies to disposal of waste material in any area of the water column but not to disposal of such material in the seabed.

Regulatory Framework for Climate Change Mitigation Activities in Marine Areas

- The 1996 London Protocol was negotiated to replace the London Convention but the two regimes are still operating in parallel.
- Dumping of waste or other matter at sea is prohibited under the London Protocol except for materials listed in Annex I.

Regulatory Framework for Climate Change Mitigation Activities in Marine Areas

- Amendments to Annex I of the London Protocol permitting storage of carbon dioxide under the seabed were adopted on 2 Nov 2006 at the first meeting of the London Protocol Contracting Parties.
- The amendments have been supplemented by Specific Guidelines for Assessment of Carbon Dioxide Streams for Disposal into Sub-seabed Geological Formations adopted by the Contracting Parties to the London Protocol at their 2nd meeting in November 2007.
- The Specific Guidelines take a precautionary approach to the sub-seabed sequestration process requiring Parties under whose jurisdiction or control such activities are conducted to issue a permit for their disposal subject to stringent conditions.

Australian Regulatory Framework for Sub-seabed CO2 Sequestration

- Offshore Petroleum Greenhouse Gas Storage Act 2006 aims to provide certainty for operators regarding access and title to offshore greenhouse gas storage formations while also ensuring storage is safe and secure.
- Greenhouse gas injection in offshore locations will be regulated through an injection licence requiring a comprehensive site plan.

Australian Regulatory Framework for Sub-seabed Sequestration of CO2

- At the end of an injection site's life, decommissioning reports must be submitted to the appropriate Minister together with suggestions for monitoring, measurement and verification.
- The holder of a licence will not be free of statutory liability until a site closing certificate has been issued.

Australian Regulatory Framework for Sub-Seabed Sequestration of CO2

- Requirement for site closing certificate includes a thorough assessment of the migratory behaviour of the injected greenhouse gas.
- As a result of amendments to the Bill in the Senate, the Act contains a provision on transfer of long term liability from the operator to the Government at the end of a closure assurance period which is to be a minimum of 15 years.
- The Act includes a 20 year sunset period on the proponent's liability for damages.

UK Regulatory Framework for Offshore Carbon Capture and Storage

- The Energy Act (2008) introduces a licensing system for the offshore storage aspect of carbon capture and storage.
- The Act asserts the right of the Crown to an exclusive economic zone for the storing of gas.
- The Government may also designate gas importation and storage zones within the EEZ.
- For operators seeking to undertake CCS activities within the newly designated EEZ, a lease from the Crown estate and rental payment will be required.

UK Regulatory Framework for Offshore Carbon Capture and Storage

- Activities relating to the storage of carbon dioxide with a view to its permanent disposal will require a licence from the Secretary of State or the Scottish Ministers depending upon the location of the proposed activity.
- When granting a licence the issuing authority may attach conditions including financial security in respect of future obligations as well as obligations between the closure of an installation and the termination of a licence.

Emerging Regulatory Framework For Ocean Fertilisation

- The London Protocol Contracting Parties expressed the view at their Second Consultative meeting in November 2007 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 a negative impact on the marine environment and human health.
- They also agreed that open ocean fertilisation falls within their regulatory competence and that they would further study this issue from scientific and legal perspectives.
- CBD COP 9 Decision IX/16 – C para 4 (2008) also called on parties to ensure that ocean fertilization activities don't take place until there is an adequate scientific basis to justify such activities and a global, transparent effective control and regulatory mechanism with the exception of small scale scientific research activities in coastal waters.

Emerging Regulatory Framework for Ocean Fertilisation

- Risk assessment framework for small scale legitimate scientific experiments on ocean fertilization has been developed by the Scientific Groups of the London Convention and Protocol.
- The draft assessment framework for ocean fertilization takes a risk analysis approach to the decision to approve ocean fertilization experiments as legitimate scientific research.
- Likely to be approved at the 2010 meeting of the London Convention and Protocol parties in October 2010.

Emerging Regulatory Framework for Ocean Fertilisation

- The draft assessment framework provides in para 9.1 that a decision to approve ocean fertilization and to determine that it is legitimate scientific research which is not contrary to the aims of the London Convention and Protocol should only be made if all earlier steps of the Framework have been successfully completed.
- The approval should ensure that the scientific objectives of the experiment can be met and that, as far as practicable, environmental disturbance and detriment are minimized and benefits maximised.

Emerging Regulatory Framework for Ocean Fertilisation

- The proponent of an ocean fertilisation experiment must prepare an impact hypothesis which forms the basis for impact monitoring.
- Monitoring programmes are designed to verify that assumptions made during the approval and site selection process were correct and sufficient to protect the environment and human health.

Environmental Regulation of Climate Change Mitigation Activities in Marine Areas Beyond National Jurisdiction

- While ocean based climate change mitigation activities may be subject to national environmental impact assessment processes if carried out in marine areas within national jurisdiction, there are usually no comparable EIA processes for these activities when they are undertaken beyond national jurisdiction.

- In marine areas beyond national jurisdiction (high seas and deep seabed beyond national jurisdiction) the London Protocol Parties decision on sub-seabed sequestration of CO2, the Specific Guidelines on this and the risk assessment framework for ocean fertilization represent the only environmental protection regulations applicable to flag States engaging in climate change mitigation activities in these areas.

Options for Regulating Ocean Based Climate Change Mitigation Activities

- Subjecting all emerging ocean based climate change mitigation activities to a risk assessment process under the London Protocol Annex 2
- This was proposed by Australia/NZ in a submission to the London Convention and Protocol Scientific Groups in 2008.
- The Scientific Groups agreed to explore marine geo engineering activities and their possible impacts on the marine environment. Information on these activities was provided to the April 2010 meeting of the Groups.

Options for Regulating of Climate Change Mitigation Activities in Marine Areas Beyond National Jurisdiction

Discussions in the UN Informal Oceans Process and the UN Working Group on the conservation of high seas biodiversity 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 change mitigation activities

Conclusions

- The urgency and lack of regulation associated with climate change mitigation activities in marine areas poses actual and potential threats to the coastal, open ocean and deep sea environments and the conservation of their 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 within and beyond national jurisdiction.
- Enhanced protection of the marine environment within and beyond national jurisdiction is dependent on the creation of more comprehensive and rigorous EIA and risk assessment processes for proposed activities launched in offshore marine areas with the potential for adverse impacts on the marine environment.