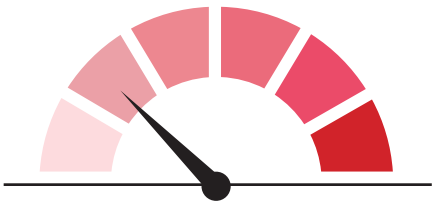
Ocean Fertilization

POINT OF INTERVENTION

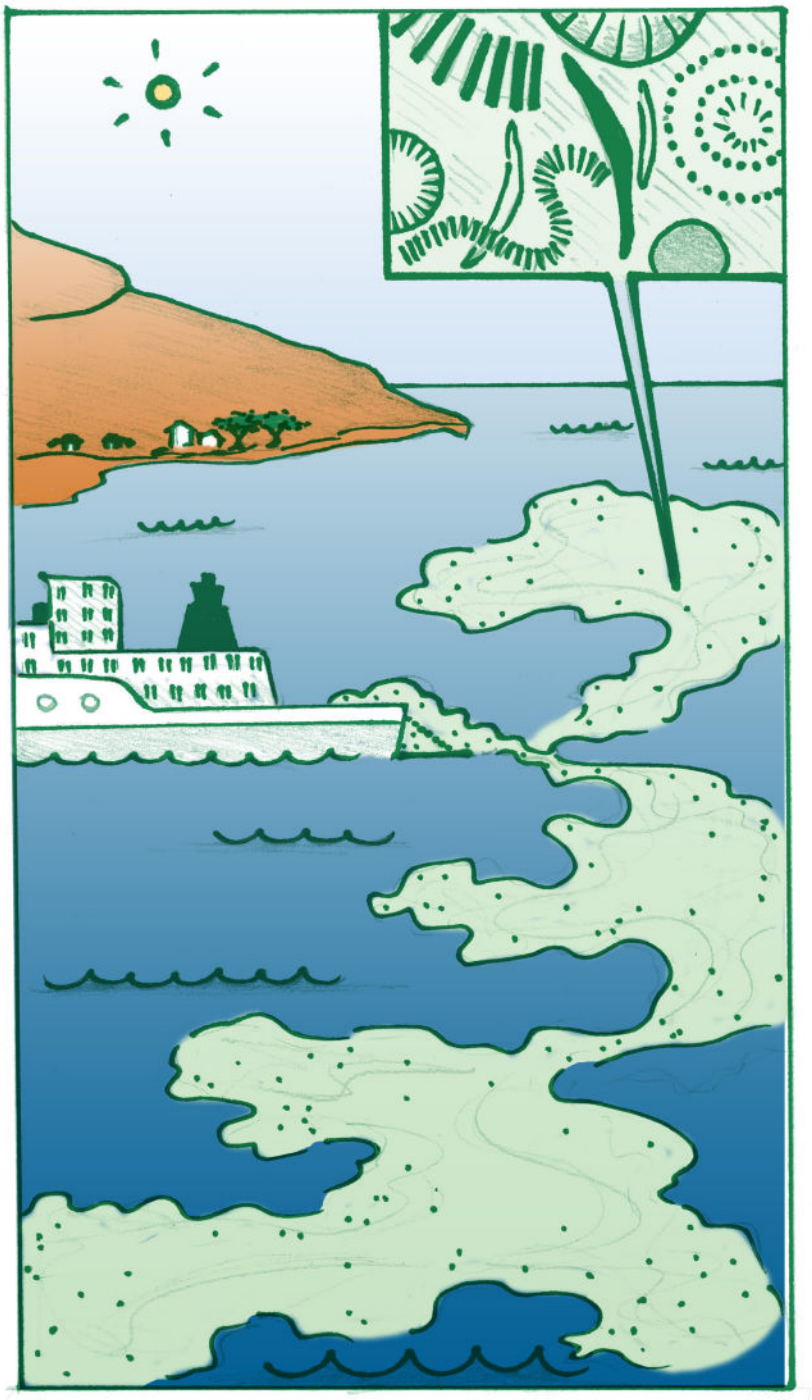
OVERVIEW

Ocean fertilization (OF) is a proposed Carbon Dioxide Removal technique and refers to dumping iron filings or other "nutrients" (e.g., urea) into seawater to stimulate phytoplankton growth in areas that have low photosynthetic production. The idea is that the new phytoplankton will absorb atmospheric CO2 and, when the phytoplankton die, the carbon will be sequestered as they sink to the ocean floor. Over the last 30 years there have been at least 13 ocean iron fertilization experiments. However, scientific studies have shown that the amount of carbon exported to the deep sea is either very low or undetectable because much of the carbon is released again via the food chain.[1]

REALITY CHECK



It's just a theory **It's being implemented**



OF proposes that dumping iron or urea into the ocean will reduce atmospheric CO2.

KEY PLAYER: RUSS GEORGE AND ASSOCIATES

The most persistent OF advocate has been Russ George, who created Planktos, a California-based private research group. George conducted his first OF test off the coast of Hawai'i using singer Neil Young's private yacht. Soon after, Planktos announced plans to dump thousands of kilograms of iron particles over 10,000 km^2 of international waters near the Galapagos Islands, a location chosen because, among other reasons, no government permit or oversight would be required. These plans were postponed indefinitely due to negative publicity.[2]

Russ George reappeared a few years later with the Haida Salmon Restoration Corporation, which pitched OF to boost salmon populations off the Haida Gwaii archipelago. In 2012, they dumped 100 tons of iron sulphate in the Pacific Ocean off the west coast of Canada – the largest-ever OF dump. An international outcry led to an investigation by Environment Canada's enforcement branch, which has yet to conclude its efforts.

Many involved in the Haida project have resurfaced in the Vancouver-based Oceaneos Marine Research Foundation. They are planning an experiment off the coast of Chile, where they say they are seeking permits to release up to ten tonnes of iron particles as early as 2018. The project has been sharply criticised by ocean scientists in Chilean research institutions.[3]

IMPACTS

OF studies show how phytoplankton communities quickly become dominated by larger diatoms, which is very concerning because phytoplankton form the base of the marine food chain. Any changes in the phytoplankton community will have unknown, unpredictable, and potentially highly damaging impacts on marine ecosystems. Phytoplankton blooms also reduce oxygen levels, negatively affecting many marine organisms. A modelling study of large-scale iron fertilization predicted that it would lead to significant deep ocean oxygen depletion in the region studied. Iron fertilization could also lead to harmful algal blooms.[10]

OF also results in other essential nutrients being depleted by the phytoplankton bloom, which could affect down-current phytoplankton and reduce overall biological productivity. This would have a trickle-down negative impact on all other marine life. Modelling studies also predict that commercial-scale iron fertilization of the oceans could have a significant detrimental impact on important fisheries.[11]

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Experiments have shown that a number of greenhouse gases are released through OF, which on a large scale could initiate positive feedback effects on the global climate. For example, one modelling study predicted that any benefits of carbon sequestration by large-scale iron fertilization could be outweighed by nitrous oxide production, a greenhouse gas far more powerful than carbon dioxide.[12]

REALITY CHECK

Numerous outdoor OF experiments have taken place, aided by the fact that such experiments are logistically simple to execute. There are more experiments in the pipeline.

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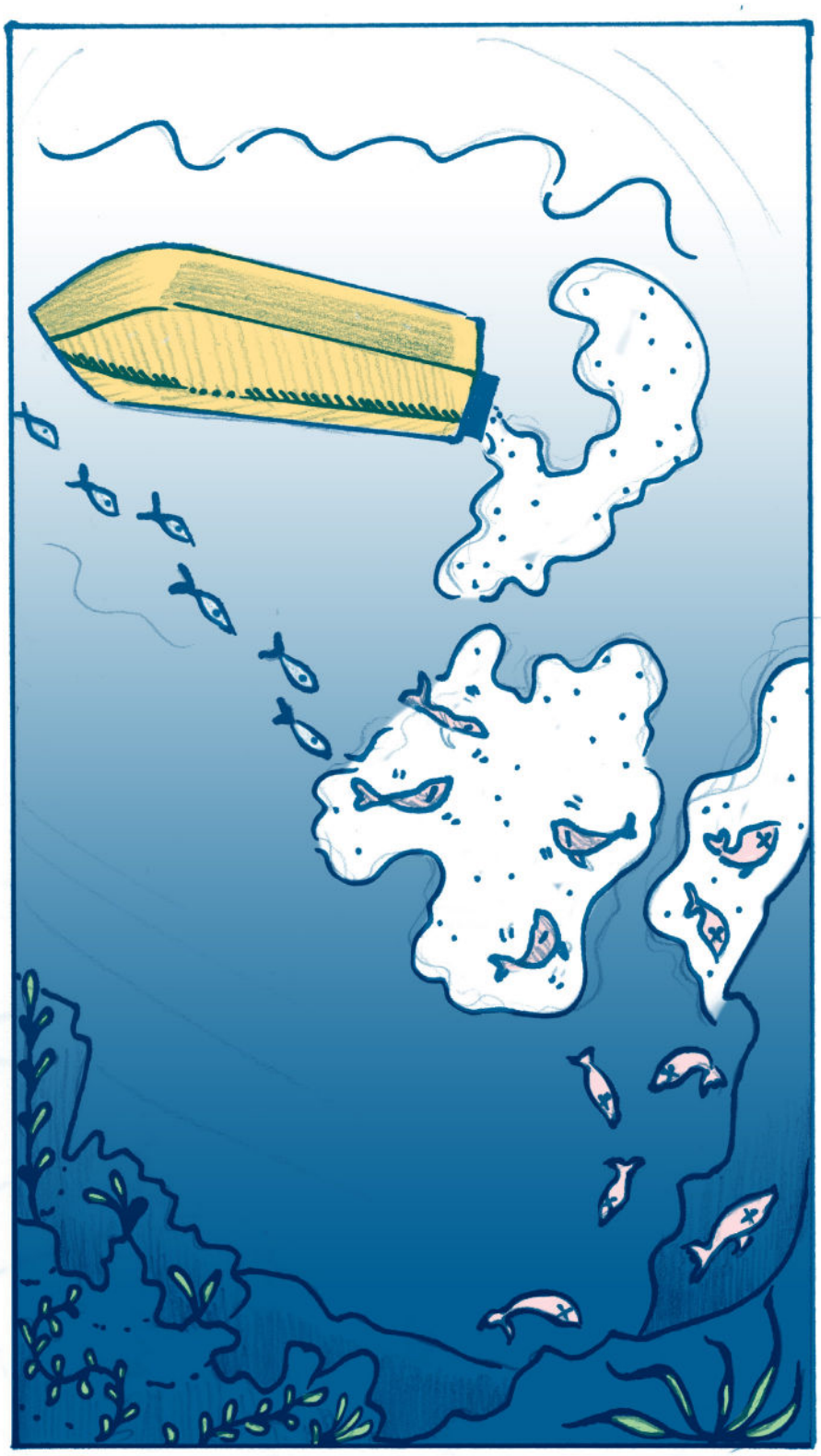

Researchers have suggested that ocean fertilization could have damaging effects, including deep ocean oxygen depletion, harmful algal blooms and disruption of the marine food chain.

KEY PLAYER: KIFES

The KIFES project is a research programme (2016-2020) designed by the Korea Polar Research Institute and funded by the Korean Ministry of Oceans and Fisheries. It aims to carry out "vessel-based research" on iron fertilization experiments in the Southern Ocean.[4] Five Korean universities and several international institutions, including US and Canadian universities, are among the project's "domestic/ international collaborative networks." KIFES has chosen a location in the eastern Bransfield Basin, not far from the Antarctic Peninsula, for its dump and is planning a second stage of the project. KIFES's declared interest is to provide "a clear answer as to whether or not ocean iron fertilization is promising as a geoengineering solution."[5]

KEY PLAYER: LOHAFEX

One of the first large experiments in OF was the 2009 LOHAFEX expedition, in which researchers, co-sponsored by the Indian and German governments, dumped six tons of iron sulphate over 300 km^2 of open ocean east of Argentina.

Most prominent are plans by Oceanos Marine Research Foundation to conduct experiments off the coast of Chile in 2018.

FURTHER READING

ETC Group Case Study: Ocean Fertilization near Haida Gwaii http://www.etcgroup.org/content/case-study-ocean-fertilization-near-haida-gwaii

Greenpeace: A scientific critique of oceanic iron fertilization as a climate change mitigation strategy. http://www.greenpeace.to/publications/iron_fertilisation_critique.pdf

CBD's Scientific Synthesis of the Impacts of Ocean Fertilization on Marine Biodiversity. https://www.cbd.int/doc/publications/cbd-ts-45-en.pdf

ETC Group and Heinrich Böll Foundation, "Geoengineering Map," map.geoengineeringmonitor.org

The Big Bad Fix: The Case Against Climate Geoengineering, http://etcgroup.org/content/big-bad-fix

A red tide off the shore of La Jolla, California. Could Ocean Fertilization lead to toxic plankton blooms? Researchers suggest that the risk is real.

SOURCES

1. Aaron Strong et al., "Ocean fertilization: time to move on," *Nature*, Vol. 461, 2009. See also Secretariat of the CBD, "Scientific Synthesis of the Impacts of Ocean Fertilization on Marine Biodiversity," Montreal, Technical Series No. 45: https://www.cbd.int/doc/publications/cbd-ts-45-en.pdf

2. ETC Group, "Informational Backgrounder on the 2012 Haida Gwaii Iron Dump," 2013, http://www.etcgroup.org/content/informational-backgrounder-2012-haida-gwaii-iron-dump

3. El Mostrador, "Científicos denuncian como "peligroso" proyecto para fertilizar el mar y producir más peces," 2017, http://www.elmostrador.cl/cultura/2017/04/06/cientificos-denuncian-como-peligroso-proyecto-para-fertilizar-el-mar-y-producir-mas-peces/ and *El Mercurio*, "Experimentos en nuestro mar," 2017, http://www.economiaynegocios.cl/noticias/noticias.asp?id=351879

4. Joo-Eun Yoon et al., "Ocean-Iron Fertilization Experiments: Past-Present-Future with Introduction to Korean Iron Fertilization Experiment in the Southern Ocean (KIFES) Project," *Journal of Biogeosciences*, 2016, pp. 15-17

5. Ibid.

6. Ocean Nourishment Corporation, "Ocean Restoration Starts with You," 2017, http://www.oceannourishment.com/

7. Convention on Biological Diversity, "COP 9 Decision IX/16," https://www.cbd.int/decision/cop/?id=11659

8. Convention on Biological Diversity, "COP 10 Decision X/33," https://www.cbd.int/decision/cop/?id=12299

9. National Oceanic and Atmospheric Administration, "London Protocol Resolution LP 4(8)," 2013, http://www.gc.noaa.gov/documents/resolution_lp_48.pdf

10. Greenpeace, "A scientific critique of oceanic iron fertilization as a climate change mitigation strategy," 2007, http://www.greenpeace.to/publications/iron_fertilisation_critique.pdf

11. Ibid.

12. Ibid.