Geo Engineering Baseball

IRON POWDER CORE

Iron fertilization is the intentional introduction of iron to the upper ocean to stimulate a phytoplankton bloom. This is intended to enhance biological productivity, which can benefit the marine food chain and is under investigation with regards to being a successful means of facilitating increased carbon dioxide removal from the atmosphere. Iron is a trace element necessary for photosynthesis in all plants. It is highly insoluble in sea water and is often the limiting nutrient for phytoplankton growth. Large phytoplankton blooms can be created by supplying iron to iron-deficient ocean waters. A number of ocean labs, scientists and businesses are exploring fertilization as a means to sequester atmospheric carbon dioxide in the deep ocean, and to increase marine biological productivity which is likely in decline as a result of climate change.

Fertilization occurs naturally when upwellings bring nutrient-rich water to the surface, as occurs when ocean currents meet an ocean bank or a sea mount. This form of fertilization produces the world's largest marine habitats.

Fertilization can also occur when weather carries wind blown dust long distances over the ocean, or iron-rich minerals are carried into the ocean by glaciers, rivers and icebergs.

CRUSHED LIMESTONE

Acid Neutralization: Carbon dioxide forms carbonic acid when dissolved in water, so ocean acidification is a significant consequence of elevated carbon dioxide levels, and limits the rate at which it can be absorbed into the ocean. A variety of different bases have been suggested that could neutralize the acid and thus increase CO2 absorption. For example, adding crushed limestone to oceans enhances the absorption of carbon dioxide.

"It is impossible to isolate and objectively assess the contribution each [football] team member makes to the outcome of the play.... Every basketball player is interacting with all of his teammates all the time. In baseball, by contrast, every player is more or less on his own.... Baseball is therefore a realm of complete transparency and total responsibility. A baseball player lives in a glass house, and in a stark moral universe.... Everything that every player does is accounted for and everything accounted for is either good or bad, right or wrong."

Michael Mandelbaum

GEO ENGINEERING (Climate engineering, an application of geoengineering), is the deliberate and large-scale intervention in the Earth's climatic system with the aim of reducing global warming. Carbon dioxide removal (one such intervention) addresses a cause of climate change by removing one of the greenhouse gases from the atmosphere. Geoengineering has been proposed as a potential third option for tackling global warming, alongside mitigation and adaptation. Scientists do not typically suggest geoengineering the climate as an alternative to emissions control, but rather an accompanying strategy. Reviews of geoengineering techniques for climate control have emphasised that they are not substitutes for emission controls and have identified potentially stronger and weaker schemes. The Intergovernmental Panel on Climate Change (IPCC) concluded in 2007 that geoengineering options for climate change "remained largely speculative and unproven." The costs, benefits, and risks of many geoengineering approaches to climate change are not well understood.There are (very few) large-scale climate engineering projects. Almost all research has consisted of computer modeling or laboratory tests, and attempts to move to real-world experimentation have proven controversial. Voices of caution against viewing geoengineered interventions as a simple solution to climate change are largely due to the risks and partially unknown side-effects of the technologies in question. Given the vastly insufficient action on emissions reductions in climate policy to date some have argued though that the risks of such interventions are to be seen in the context of risks of dangerous climate change. As a rule of thumb it would appear that the scale of risks and costs of each climate engineering option appear to be somewhat inverse: The lower the costs, the greater the risks. Some have suggested that the concept of geoengineering the climate presents a moral hazard because it could reduce political and public pressure for emissions reduction. Groups such as ETC Group and individuals such as Raymond Pierrehumbert have called for a moratorium on deployment and out-of-doors testing of geoengineering techniques for climate control. In October 2011, a Bipartisan Policy Center panel issued a report urging immediate researching and testing in case "the climate system reaches a 'tipping point' and swift remedial action is required". The National Academy of Sciences is running 21-month project which will study how humans might influence weather patterns, assess dangers and investigate possible national security implications of geoengineering attempts. The project will be funded by the CIA, the National Oceanic and Atmospheric Administration, and NASA.]

It is argued that climate change may cross tipping points where elements of the climate system may 'tip' from one stable state to another stable state, much like a glass tipping over. When the new state is reached, further warming may be caused by positive feedback effects. An example of a proposed causal chain leading to runaway global warming is the collapse of Arctic sea ice triggering subsequent release of methane. The precise identity of such "tipping points" is not clear, with scientists taking differing views on whether specific systems are capable of "tipping" and the point at which this "tipping" will occur. An example of a previous tipping point is that which preceded the rapid warming leading up to the Paleocene–Eocene Thermal Maximum. Once a tipping point is crossed, cuts in anthropogenic greenhouse gas emissions will not be able to reverse the change. Conservation of resources and reduction of greenhouse emissions, used in conjunction with geoengineering, are therefore considered a viable option by some commentators. Geoengineering offers the hope of temporarily reversing some aspects of climate change and allowing the natural climate to be substantially preserved whilst greenhouse gas emissions are brought under control and removed from the atmosphere by natural or artificial processes.

The full effects of various geoengineering schemes are not well understood. In a paper written for *Environmental Research Papers* in 2009, H. Matthews and Sara Turner compared geoengineering to a number of previous environmental interventions and concluded that "Given our current level of understanding of the climate system, it is likely that the result of at least some geoengineering efforts would follow previous ecological examples where increased human intervention has led to an overall increase in negative environmental consequences."
Performance of the systems may become ineffective, unpredictable or unstable as a result of external events, such as volcanic eruptions, phytoplankton blooms, El Niño, solar flares, etc., potentially leading to profound and unpredictable disruption to the climate system.

It may be difficult to predict the effectiveness of projects,with models of techniques giving widely varying results. In the instances of systems which involve tipping points, this may result in irreversible effects. Climate modelling is far from an exact science even when applied to comparatively well-understood natural climate systems, and it is made more complex by the need to understand novel and unnatural processes which by definition lack relevant observation data.

The techniques themselves may cause significant foreseen or unforeseen harm. There may be unintended climatic consequences, such as changes to the hydrological cycle including droughts or floods, caused by the geoengineering techniques, but possibly not predicted by the models used to plan them. Such effects may be cumulative or chaotic in nature, making prediction and control very difficult.

The existence of such techniques may reduce the political and social impetus to reduce carbon emissions. This issue has been researched in an in-depth study by Ipsos MORI (a UK based market research firm) for NERC (Britain's National Environmental Research Council) The issue of moral hazard means that many environmental groups and campaigners are reluctant to advocate geoengineering for fear of reducing the imperative to cut greenhouse gas emissions. Other criticism comes from those who see geoengineering projects as reacting to the symptoms of global warming rather than addressing the real causes of climate change. Because geoengineering is a form of controlling the risks associated with global warming, it leads to a moral hazard problem. The problem is that knowledge that geoengineering is possible could lead to climate impacts seeming less fearsome, which could in turn lead to an even weaker commitment to reducing greenhouse gas emissions.

information sourced from Wikipedia