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Geo-engineering Oversight Agency for Thermal Stabilization

GOATS

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Document amended in anticipation of presentation of geoengineering responses to global warming on the occasion of [COP 27](#)
-- the 27th Conference of the Parties of the [United Nations Framework Convention on Climate Change](#)
(Egypt, November 2022)

Introduction

An editorial in the journal *New Scientist* (*Time to rank the best ideas to engineer the climate*, 29 October 2008) has just echoed the proposal of Philip W. Boyd (*Ranking Geo-engineering Schemes*, *Nature Geoscience*, 2008, 1, 26 October 2008, pp. 722 - 724) who argues:

Geo-engineering proposals for mitigating climate change continue to proliferate without being tested. It is time to select and assess the most promising ideas according to efficacy, cost, all aspects of risk and, importantly, their rate of mitigation.

The *New Scientist* editorial notes that by coincidence, the UK's Royal Society had just launched such a study. The editorial also cites Boyd to the effect that: "We will reach a tipping point, and none of the schemes will have been tested".

Boyd proposes that an international body, such as the Intergovernmental Panel on Climate Change, rank the schemes according to risk, cost, effectiveness and how quickly they could get off the ground.

Such framings of the challenge imply that the problem has been well analyzed by a selection of natural science disciplines, who are now prepared to assess and recommend solutions supplied by technologists in a period when wider society has every reason to be extremely concerned about the trustworthiness of experts regarding global systems. It implies that, as with the crisis of the financial system, a "tipping point" will provide the political justification to ensure that the best ranked technical solution will be rammed through as a form of technical "bailout". This will presumably be effected by a policy group claiming to act wisely in the best interests of all -- despite views to contrary.

After reviewing a selection of proposals, the following argument focuses on the blinkered perspective which is being brought to the analysis of climate change and actions considered appropriate, especially in the light of the track record of projects of equivalent global scope.

From that perspective the following argument recommends the establishment of a Geo-engineering Oversight Agency for Thermal Stabilization (GOATS) as an appropriately named body within which to focus on such geo-engineering solutions and to be appropriately tracked in turn.

This amendment to the 2008 version of this document is appropriate in the light of recent experience of the pandemic and the disastrous global strategic response to it. Reference to "oversight" is especially appropriate in that it is one of a few key words carefully employed in governance for its "dual use" potential -- like "sanction" and "vice". In the case of "oversight", it is to be expected that the focus of GOATS will enable intentional blindspots to be "overlooked", as has been the case with respect to the [COVID pandemic](#) and its sequels -- and may be expected to be the case with respect to [global warming](#) (*Application of Universal Vaccination Narrative to Climate Change: implications for biodiversity, human equality and anti-otherness*, 2021)

As of 2018 the terms "geoengineering" and "climate engineering" are not used by the Intergovernmental Panel on Climate Change. The term "geoengineering" is deemed by some to be largely an artefact and a result of frequent use of the term in popular discourse, being so vague and all-encompassing as to have lost much meaning. Preference is now accorded to "solar geoengineering" or "solar radiation management". The [Asilomar International Conference on Climate Intervention Technologies](#) has been convened to identify and develop risk reduction guidelines for climate intervention experimentation.

This amendment is limited to the following inclusion of recent references on the range of issues:

- Joseph Versen, Zaruhi Mnatsakanyan and Johannes Urpelainen: *Preparing the United States for security and governance in a geoengineering future* (Brookings, 14 December 2021)
- James Temple: *The US government is developing a solar geoengineering research plan* (MIT Technology Review, 1 July 2022)
- Catherine Clifford: *White House is pushing ahead research to cool Earth by reflecting back sunlight* (CNBC, 13 October 2022)
- Whit Hendersen: *Responsible Research Won't Be Enough to Control Solar Geoengineering* (Wilson Center, 12 July 2022)
- Marshall Brain: *Geoengineering could be key to combating climate change – check out these ideas* (WRAL Tech Wire, 27 May 2022).
- Holly Jean Buck: *We can't afford to stop solar geoengineering research -- it is the wrong time to take this strategy for combating climate change off the table* (MIT Technology Review, 26 January 2022)
- Laura Kuhl: *Dodging silver bullets: how cloud seeding could go wrong* (Bulletin of the Atomic Scientists, 11 August 2022)
- Eoin Redahan: *Incredible ways geoengineering could alleviate climate change* (SCI, 29 July 2022)
- Patrick W. Keys, Curtis Bell, Elizabeth A. Barnes, James W. Hurrell and Noah Diffenbaugh: *Solar geoengineering might work, but local temperatures could keep rising for years* (Phys.org, 28 September 2022)
- Anja Chalmin: *Weather Modification: current developments and lessons learned after 70 years of deployment* (Geoengineering Monitor, 28 April 2022)
- Courtney Johnson and Brian Kennedy: *U.S. adults have mixed views on whether geoengineering would help reduce effects of climate change* (Pew Research Center, 11 June 2021)
- Tracy Raczek: *Geoengineering: Reining in the weather warriors* (Chatham House, 15 February 2022)
- Elil Hoole and Shaun Fitzgerald: *Any plans to dim the Sun and cool the Earth must be led by those most affected by climate change* (World Economic Forum, 8 April 2022)
- Flat White: *Climate scientists have lost their minds* (Spectator Australia, July 2022)
- Jeremy Hance: *Geoengineering Earth's climate future: Straight talk with Wake Smith* (Mongabay, 12 May 2022)
- Patrick Oko Quaye: *Why geoengineering to stay under 2 degrees Celsius should be stopped* (SciencesPo, 11 July 2022)
- Sanjana Kulkarni: *Reversing Climate Change with Geoengineering* (SITN Harvard University, 3 January 2022)
- Ariel Cohen: *Geoengineering: Injecting Aerosols into the Atmosphere is Untested and Dangerous* (Forbes, 12 May 2022)
- David Vetter: *Solar Geoengineering: Why Bill Gates Wants It, But These Experts Want To Stop It* (Forbes, 20 January 2022)
- Douglas MacMartin and Trude Storelvmo: *Processes and Impacts of Radiation Management Approaches to Climate Change* (Gordon Research Conference, June-July 2022)
- Fiona Harvey: *Climate geoengineering must be regulated, says former WTO head* (The Guardian, 17 May 2022)
- Society for Risk Analysis: *Study Weighs the Risks of Climate Geoengineering* (Prevention Web, 4 May 2022)
- Maria Gallucci, *Test of planet-cooling Scheme could start in 2022* (IEEE Spectrum, 19 December 2019)
- *Marine Cloud Brightening: a governance dilemma -- a virtual side event for the UN Ocean Conference* (C2G, 1 July 2022)
- [Geoengineering.global](#): *Advancing the mitigation of Climate Change and Global Warming through Geoengineering education and research*
- [ScientistsWarning.org](#): *Geoengineering: The Good, The MAD, The Sensible, and The Zen* (7 July 2021)
- [GeoengineeringWatch.org](#): *Geoengineering Affects You, Your Environment, and Your Loved Ones*
- VICE: *Geoengineering*:
 - Susmita Baral: *4 Ideas to Save the Planet With Controversial Geoengineering Geoengineering -- a technological approach to tackling climate change -- is either a dangerous distraction or our best hope, depending on whom you ask.* (9 October 2020)
 - Charlotte Nijhuis: *Can Geoengineering Fix the Climate Crisis?* (25 September 2020)
 - Sarah Emerson: *The US Opposed a UN Plan to Study Geoengineering to Combat Climate Change* (18 March 2019)
 - Becky Ferreira: *A 'Geoengineering Cocktail' Is the Latest Last-Ditch Proposal to Reverse Climate Change* (27 September 2017)

The strategic pattern to be anticipated is evident from the recent launching of thousands of communication satellites -- without authorisation by any international body. This has already aroused protest from astronomers -- aside from the other implications separately argued (*Symbolic Disconnection from the Stars and the Universe?* 2019). This can be understood in terms of surreptitious global implementation of full-spectrum dominance and shielding.

Curiously, in systemic terms, the pattern of **inserting** satellites into global orbit can be seen as paralleled by the **inoculation** of the global population -- with the future prospect of systematically **injecting** aerosols into the atmosphere of Earth. These processes are now promoted globally by **indoctrination** via the media. More curious is the fundamental failure to acknowledge how the archetypal variant of the pattern -- **impregnation** -- is exacerbating the crises which governance has proven incapable of addressing effectively. Ironically the consequent increase in widespread social unrest can then be understood as engendering **incarceration**, whether of protestors by society or in the experiential sense of psychological entrapment evident in the crisis of individual mental health -- pathological **introspection**? Do these engender **ingestion**, whether of psychoactive substances or in the form of consumer products?

Geo-engineering remedies for global warming

As [summarized](#) in December 2007, in a BBC interview (Molly Bentley, *Guns and sunshades to rescue climate*, 2 March 2006), the chief scientist for climate change projects at the Climate Institute in Washington DC indicated that:

Humans are changing the Earth, and it's a big effect we're having,... To really stop climate change in its tracks, you have to go to virtually zero emissions in the next two decades..., So the question is, is there a silver bullet that can help us to limit the amount of climate change?

A number of technically radical solutions have been proposed to achieve rapid reduction of such problems as global warming.

- **reflecting solar space shield** (parasol) proposals of various kinds are currently the subject of a NASA study. They include:
 - James T. Early (Lawrence Livermore National Laboratory) proposed siting a 2,000 km-wide glass deflecting panel at the "inner Lagrange point" between the Earth and the sun (*Space-based Solar Shield to Offset Greenhouse Effect*, 1989)
 - the U.S. National Academy of Sciences proposed in 1992 launching 55,000 "solar sails" or "orbiting mirrors" into orbit around the Earth, each with an area of 100 square kilometers, the sails collectively producing the same effect as Early's single glass panel and would together reflect enough sunlight to counter about half the doubling of carbon dioxide; any larger than 100 sq km would need a manufacturing plant on the Moon.
 - creating a cloud of 16 trillion miniature reflective parasols -- each just 60 cms in diameter -- to shade the Earth from the sun, requiring an estimated 20 million separate space missions to get them up into orbit [\[more\]](#).
 - creating an artificial planetary ring around the Earth composed of passive particles -- estimated to cost \$4-6 trillion.
 - Roger Angel, a physicist at the University of Arizona, and others, have proposed using millions of small spacecraft to create a **solar sunshade** or "umbrella" -- a network of tilted mirrors in orbit -- that would deflect about 10 percent of the sun's light from the Earth. It would take 25 years and several trillion dollars to build. [\[more\]](#)
 - the creation of a (less costly) stratospheric solar shield, notably proposed in 2006 by Paul Crutzen (winner of the 1995 Nobel Prize for Chemistry), using sulphur particles -- given the degree of solar reflection following major volcanic eruptions. One of the problems of putting sulphate particles in the stratosphere is that it would destroy the ozone layer; so that solving the global warming problem would probably also destroy the human population. [\[more; more\]](#) .
 - Ken Caldeira (Carnegie Institution Department of Global Ecology at Stanford University in California) has investigated the possibility of moving the Earth itself, cooling the planet by shifting its orbit further from the Sun. He found it would require the energy of five thousand, million, million hydrogen bombs to move Earth's orbit 1.5 million km out, which would compensate for doubling CO2 in the atmosphere.
- **painting all the world's roads white** to reflect sunlight back out into space and so lower the Earth's temperature.
- **creation of artificial "trees"**, as advocated by Klaus Lackner of Columbia University, namely air filters that capture carbon dioxide from the air using chemical absorbers and then compress the carbon dioxide into a liquid or compressed gas that can be shipped elsewhere; they would be some 60 meters high, and some 100,000 might be built near wind turbines.
- **'fertilization' of the world's oceans with iron** so that, as they grow, surface algae would absorb carbon dioxide from the air for photosynthesis, eventually sinking to the ocean floor after they die, thus "sequestering" the carbon on the seabed. Experiments are already under way by a private corporation Planktos Inc [\[more\]](#). At least nine national governments and the European Union (EU) have supported such experiments
- **modification of stratospheric weather**: some dozen countries are involved in such experiments, notably by bombarding clouds with chemicals ("**cloud seeding**") to trigger production of rain [\[more\]](#).
- **introduction of new life forms**: [Craig Venter](#), who mapped the human genome, is committed to creating a new life form -- a synthetic construct based upon simple microorganisms -- that could be designed to clean up pollution, carbon dioxide or other greenhouse gases.
- **genetic engineering**: Australian scientists are exploring the possibility of using genetic engineering to give kangaroo-style stomachs to cattle and sheep in a bid to cut the flatulent emission of greenhouse gases [\[more\]](#)

Such "geo-engineering" and related options -- labelled by some as "wacky ideas" -- are considered to be largely speculative and with the risk of unknown side-effects. Nevertheless the *Technology Quarterly* of the *Economist* (*Plan B for global warming?* 8 March 2007) also presents them as the only alternative to cutting carbon emissions -- without envisaging any other. It notes that

Although most climate scientists do not like to talk about it, cutting greenhouse-gas emissions is not, strictly speaking, the only way to solve the problem of climate change.

As noted with respect to separate discussion of one genetic alternative (*Challenge of Nonviolent Population Decimation: reducing effects of overpopulation on resources and climate change by major reduction in the height of people*, 2007), it is appropriate to compare proposals in terms of technical feasibility, risk, political acceptability and long-term remedial consequences.

Misapplication of complex technology to narrowly defined closed systems

System framing: It is useful to raise the question as to whether each of these is an example of framing the system, whose "pathology" it is considered necessary to address, as simply as is credible -- to those assembled to provide a credible, feasible solution. Within that frame it is then possible to call for, and apply, highly creative thinking that calls upon sophisticated, leading edge technological innovation. Any questions regarding the framing of the system are then framed as irrelevant and an irresponsible waste of time -- especially given the resources available for the preferred solution.

Caricature: The approach might be caricatured as:

- when faced with a complex problem and all you have is a hammer,
- don't hesitate, use it,
- then redefine the problem as a nail,
- but, above all, avoid checking whether there are other tools and considerations from other perspectives

The increasing extent to which the response to climate change is framed as a "fight" or a "war" calling for "mobilization" might be seen as a reflecting just such a strategic understanding. Is it indeed appropriate to undertake a "war" to "combat" climate change? Is this "hammer" the only tool available -- as implied by the many other strategic "wars" undertaken (ineffectually?) in response to global issues (*Review of the Range of Virtual Wars: a strategic comparison with the global war against terrorism*, 2005)?

Current approaches to halting climate change, especially rising sea levels, have already been variously compared to the legendary tale of **King Canute** commanding the seas to go back (*Coastal erosion: the wisdom of Canute*, *The Economist*, 22 May 2008; *Restoring the Wild Coast of King Canute*, *Innovations Report*, 8 October 2007; *Climate Change: we need the 'Canute factor'*, *OneClimate.net*, 11 February 2008; Paul Newby, *Climate change, sea level, King Canute and the sacred flame*, *The Photogrammetric Record*, 22, 2007, 117, pp. 3-9; Paul Brown, *Canute's tidal warning finally sinks in*, *The Guardian*, 25 January 2003).

Is modern global civilization to be remembered as having gone a step beyond the posturing of King Canute before the tide by engaging in a "combat" with the climate? How does such a framing compare with the necessary subtlety of the resilient adaptive response articulated by **Thomas Homer-Dixon** (*The Upside of Down: catastrophe, creativity, and the renewal of civilization*, 2006)?

Asystemic thinking: Such approaches are an exemplification of irresponsible asystemic thinking in the guise of highly responsible systemic thinking -- the best of "thinking small" while claiming to be "thinking big". They are reinforced by the widely recognized aversion of disciplines and their specialists to take into consideration perspectives from disciplines other than their own -- or those within their cognitive comfort zones, however these have been defined.

This irrational aversion is then disguised by application of considerable expertise specific to the disciplines accredited by this process. However it is not the expertise that is taken into consideration that merits attention, it is the disciplines ignored by those process as irrelevant -- and the questions formulated within their frameworks.

The challenge goes to the heart of the failures of interdisciplinarity, carefully disguised by collaborative arrangements between some disciplines to the exclusion of others -- perhaps stigmatized as non-disciplines, pseudo-sciences or otherwise irrelevant. These patterns of behaviour are institutionalized in academies and university faculties so as to preclude a more universal approach to any challenge.

Through careful exclusion of the "soft" (so-called "non-scientific") disciplines, such "serious" hard science approaches avoid any feedback on the unacknowledged agendas associated with such geo-engineering proposals. Excluded therefore is any insight from:

- a political science perspective, namely how such a proposal might be used to advance or reinforce power agendas (or be part of some pork-barrel **boondoggle**)
- a sociological perspective, namely how group dynamics, status and career issues amongst involved parties might affect outcomes
- a psychological perspective, namely the unstated or unconscious needs of those advancing the proposals

Downstream focus: In the analysis of the challenge, geo-engineering exemplifies the focus on "downstream" consequences that can be assiduously treated on the assumption that the **upstream causes**, and their progressive increase, can be ignored -- an approach possibly to be understood as an exemplification of nonscientific causal reasoning (termed **magical thinking**). The case has been strongly argued by the former Permanent Head of the Department of Science of Australia, John L. Farrands (*Don't Panic, Panic: the use and abuse of science to create fear*, 1993). The current volume of remarkable discussion of the technicalities of emissions and carbon trading is then to be seen as a measure of the lack of ability to apply that degree of focus to the engendering process of population growth, for example (cf *Institutionalized Shunning of Overpopulation Challenge: incommunicability of fundamentally inconvenient truth*, 2008).

Much is made of the estimates by economists that economic development will lead to a "peak" and manageable "plateau" of population in decades to come. The proposals of geo-engineering buy into the implication that if global warming can be constrained through that period then all will be well. Unfortunately the majority of the economists associated with those estimates would appear to have been implicated in assumptions about the stability of the financial system -- proven to be seriously ill-founded by the financial crisis of 2008, and to

follow. Should their assumptions regarding population stabilization now be held to be equally questionable?

What disciplinary expertise would usefully explore the degree of [groupthink](#) and [silo thinking](#) associated with the arrogant assertions of the financial community that so effectively denied the vulnerability of the financial system and ensured the complicity of a spectrum of authorities in this belief (cf *Dynamically Gated Conceptual Communities*, 2004)? To what degree might it be assumed that those making geo-engineering proposals are similarly constrained and how might this be determined? Do such proposals exemplify the challenges of tunnel vision syndrome -- described as "Sin #5" by John Collis (*The Seven Fatal Management Sins: understanding and avoiding managerial malpractice*, 1997, pp. 147-158)

Avoidance of intractable problems

Because of the narrow framing of the system and its pathology -- as "global warming" -- the problematic system dynamics of more complex systems are (systematically) avoided. This avoidance is framed as legitimate and appropriate because of the need to gain leverage where this seems possible with current thinking. However:

- careful examination of the thinking applied to the framing indicates that the disciplines from which it emerges are averse to the complexities of the systems (to which they are blinkered) and do not have the methodology to address their pathologies.
- such an approach might be acceptable, as a last resort, if adequate resources had been allocated to analysis of the more complex problems in order to conclude by some rational approach that only a geo-engineering style solution merited consideration, but this is not the case
- it is quite unclear whether those favouring geo-engineering proposals have the inclination or capacity to consider alternatives that do not immediately call upon their skills

It is appropriate to note in this context the awe-inspiring problems to which the technology basic to geo-engineering proudly claims competence in addressing (satellites, aerospace, military, dams, tunnels, surveillance systems, telecommunications, etc) in comparison with the "simple" problems of the planet on which technology has so far proven to be incompetent:

- managing the interface with indigenous populations in developed countries, whether in "settlements" or as "travellers" (gypsies)
- growth and distribution of food, and the consequences of failure in the form of famine and malnutrition
- provision of emergency shelter following natural disaster, whether in developed or developing countries (Hurricane Katrina, etc), and perhaps exemplified by the shelter challenge faced by those evicted from housing as a consequence of the subprime crisis
- managing complex conflicts that destabilize whole regions (Middle East, etc)
- understanding the implications of disappearance of species that may prove vital to agriculture (bees, etc) or ecosystems on which humanity, at least, is in some way dependent
- determining whether personal desire for dignified death in the face of diminishing quality of life is being inappropriately manipulated by external factors (in contrast with the facility with which death-delivering technologies are otherwise designed, marketed and used, irrespective of collateral consequences or ethical considerations)
- ensuring fruitful dialogue between distinct worldviews (whether religions, ideologies, disciplines, language groups, etc) -- notably as it may apply to differences of opinion regarding geo-engineering
- enabling genuinely democratic forms of decision-making in the face of manipulative use of power, knowledge, resources and technology -- notably as it may apply to initiatives proposed by those favouring geo-engineering solutions

Perhaps the most intractable problem is that of the continuing growth of the world population and its effects on climate change. A fruitful outcome to the associated debate is not only beyond the capacity of technologists to facilitate but allows them to assume that its issues can be ignored in the simplistic focus on a "technical" solution which they may be able to implement without wider consultation.

From such a perspective there is a case for recognizing geo-engineering as the epitome of what might be termed "avoidance engineering".

Misapplication of "firefighting" strategy used for financial "meltdown"

Given the framing of global warming as the problem to which an urgent response is required (ignoring upstream challenges), it is useful to examine by what society will be inspired in organizing its response. Examples include:

- intergovernmental programmes as coordinated through UN Specialized Agencies (health for all, food for all, education for all, jobs for all, etc) and the delivery capacity of such initiatives, notably after a number of "[development decades](#)" and the current challenges of fulfillment of the [Millennium Development Goals](#)
- the response to the [Asian Tsunami](#) (2004) and [Hurricane Katrina](#) (2005)
- the response to African famines
- the response to massacres and threats of massacres
- the response to the [subprime mortgage crisis](#) and its worldwide financial aftermath

It is the last which offers an example of a crisis recognized worldwide -- in which economies and societies worldwide had more than a token interest. Given the extent to which this was framed like a natural disaster -- a "financial hurricane" -- and the manner in which remedial measures were consequently initiated, the question is whether the financial disaster itself is now a template through which the response to global warming is likely to be framed, as argued elsewhere (*Systemic Crises as Keys to Systemic Remedies: a metaphorical Rosetta Stone for future strategy?*, 2008).

Specifically:

- are relevant warning signals likely to be ignored, as with the financial crisis
- are simulations of possible crises, and possible responses, to be framed narrowly in support of conventional approaches and

institutional mandates

- is the urgency to be used to ram through proposals and legislation without appropriate debate or consultation, as many have complained in the case of the bailout solutions
- is any geo-engineering solution to be framed as a \$700 billion "bailout" -- a response to global "warming" rather than global financial "freezing"
- are weaknesses in the geo-engineering solution -- discovered too late -- to be comparable to weaknesses in the financial "bailout" to the advantage of those receiving the funds (as with misuse of funds by banks, etc)

Technocratic arrogance and untrustworthiness?

Major learnings of the global financial crisis have included:

- the degree of inappropriate, overconfident arrogance of the banking community over many decades prior to the crisis
- the extent to which agents of the banking community engaged in mis-selling of financial instruments, repackaging the debts in a non-transparent manner, directly resulting in the subprime crisis
- denial by economists, the banking community and other implicated specialists of the dangers of what amounts to hope-mongering (*Credibility Crunch engendered by Hope-mongering: "credit crunch" focus as symptom of a dangerous mindset*, 2008)
- the denial of the relevance of "alternatives" by such informed specialists
- how unworthy of confidence these parties have proven to be, prior to the crisis and subsequent to the bailout

Using the financial crisis response as a template, the question is whether:

- technologists are to be considered similarly arrogant and overconfident of their geo-engineering proposals
- geo-engineering proposals will offer similar opportunities for mis-selling by the institutions that expect to benefit from resources to implement
- the denials of risk by informed specialists regarding geo-engineering proposals are to be considered as credible as those regarding the financial system
- the denials of relevance of "alternatives" to the geo-engineering proposals are to be taken as seriously as those made for alternatives to the financial system
- technologists advocating geo-engineering proposals, and others supporting them, should be considered as unworthy of confidence as has proven to be the case of those implicated in the financial crisis

Is technocratic enthusiasm for geo-engineering to be compared to the promotional activities and shoddy implementation of door-to-door vendors of house maintenance (double-glazing, etc) -- knowing the dependence they create on their skills to remedy inadequate workmanship, which may well have been exacerbated by the skills of their profession when the house was first constructed? Was it not the unchecked and widespread use of technology, following the "industrial revolution", that rapidly accelerated the process of global warming?

Geo-engineering: fallback strategy after failure of 2009 Climate Change Conference?

The failure of the USA to act creatively at the [UN Climate Change Conference](#) is appropriately matched by the creativity in the USA with regard to geo-engineering proposals, notably the organization by the [Climate Institute](#) in the USA of a meeting in 2010 to determine the guidelines for geo-engineering -- presumably a preferred strategy for many. Such an approach will clearly maximize the need for investment in technologies in which US corporations can claim competence, possibly enabling the USA to then require compensation from other countries for its efforts. [\[more\]](#)

Evaluating geo-engineering proposals for vulnerability to past failures

Unforeseen technological disasters: Categories of relevance, typically not mentioned in the enthusiastic promotion of proposals, include:

- [Aircraft accidents](#)
- [Bridge disasters](#)
- Civil engineering disasters (dikes, etc)
- [Dam construction disasters](#) and consequences (*The Social and Environmental Effects of Large Dams* 1984).
- [Environmental disasters](#) (old growth deforestation, oil spills, pollution, loss of topsoil, etc)
- [Industrial accidents](#) (Bhopal, Seveso, etc)
- [Nuclear power station disasters](#) (Three Mile Island, Chernobyl)
- Release of chemicals (lead dust, cyanide, heavy metals, lethal chemicals)
- [Software engineering accidents](#) (including [Mars Climate Orbiter](#) and [Mars Polar Lander](#))
- [Spacecraft accidents](#) (including *Challenger* disaster and collisions with [space debris](#))
- [Collisions between nuclear submarines](#)

Of particular interest is the framing of the construction of the *RMS Titanic*, using some of the most advanced technology available at the time -- leading to the recognition of a spectrum of oversights in that construction following its sinking in 1912. The dangerous level of arrogant over-confidence exhibited by those involved, and its effects on decision-making, has since been highlighted.

White elephants: Of related interest are [mega-projects](#) that have proven to be ill-conceived "white elephants" (or are alleged to be so), including (from *Wikipedia: Examples of notable alleged white elephants*)

- ships: U.S. Navy's *Alaska-class* battlecruiser, *SS Great Eastern*, *HTMS Chakri Naruebet*, [aircraft carrier replacements](#) (UK)

- aircraft: [Bristol Brabazon](#), [Concorde](#), [Hughes H-4 Hercules](#), [Raptor](#) and [Eurofighter](#)
- airports: [Lambert-St. Louis International Airport](#), [Montréal-Mirabel International Airport](#)
- buildings: [Millennium Dome](#) (London), [Olympic Stadium](#) (Montreal), [Ryugyong Hotel](#) (N Korea)
- programming languages: [Ada programming language](#)
- agricultural projects: [groundnut scheme](#) (Tanganyika), [Jari project](#) (Brazil)

A range of examples in Europe have been documented by Konrad Tobler and Christian Helmle (*White Elephants*, 2007). An extensive analysis of "white elephants" is made by James A. Robinson and Ragnar Torvik (*White Elephants*, *Journal of Public Economics*, 2005) who offer the following introduction that is presumably of some relevance to geo-engineering proposals:

Underdevelopment is thought to be about lack of investment, and many political economy theories can account for this. Yet, there has been much investment in developing countries. The problem has been that investment growth has not led to output growth. We therefore need to explain not simply underinvestment, but also the misallocation of investment. The canonical example of this is the construction of *white elephants* -- investment projects with negative social surplus. In this paper we propose a theory of white elephants.

We argue that they are a particular type of inefficient redistribution, which are politically attractive when politicians find it difficult to make credible promises to supporters. We show that it is the very inefficiency of such projects that makes them politically appealing. This is so because it allows only some politicians to credibly promise to build them and thus enter into credible redistribution. The fact that not all politicians can credibly undertake such projects gives those who can a strategic advantage. Socially efficient projects do not have this feature since all politicians can commit to build them and they thus have a symmetric effect on political outcomes. We show that white elephants may be preferred to socially efficient projects if the political benefits are large compared to the surplus generated by efficient projects.

Introduction of species: Of particular interest are the dramatic consequences of the [introduction of species](#) (or their deliberate destruction), typically framed as a well-thought out logical remedy for some other inadequacy. Examples that have engendered disasters include:

- introduction of [rabbits](#), [goats](#) and [cane toads](#) (Australia)
- introduction of [goats](#) (Galapagos)
- [destruction of sparrows](#) (China)

Goats in particular, despite their value to human settlements, are well-recognized as a cause of environmental destruction, especially when inappropriately introduced into fragile, degraded environments, where they are often the main cause of subsequent desertification (itself a major cause of poverty) through their capacity to eat almost anything

As with the banking community, subsequent to the immediate drama of the financial crisis, the question is whether there has been any collective learning or whether such crises are simply seen as an unfortunate anomaly in a continuing cycle of "business as usual".

Coincidence in the Southern Hemisphere as reported on facing editorial pages of one issue of <i>New Scientist</i> , 17 January 2009
Runaway rabbits (p.4): The population of rabbits on Macquarie Island (between Australia and Antarctica) has increased from 4,000 in 2000 to 130,000 as a result of a successful programme to eliminate 160 feral cats. The rabbits have now trashed the population on 40 percent of the island. This outcome resulted from a failure to undertake preliminary quantitative risk assessments.
Iron-seeding ship sets sail (p. 5): Some 20 tonnes of ferrous sulphate are to be dumped in the Southern Ocean off the coast of South Africa by the Alfred Wegner Institute (Bremerhaven) as a geoengineering experiment in triggering a plankton boom to suck carbon out of the air and lock it at the bottom of the ocean. This is seen to be in clear defiance of the UN Convention on Biological Diversity. However in the current legal vacuum, there is concern that such experiments will lead down some slippery slope with such small experiments being subsequently scaled up in the absence of any regulation..

Unforeseen combination effects: The problems which arise from the introduction of species -- whether existing species, genetically modified species or their product analogues -- have been extensively documented. The major difficulty lies in their unforeseen consequences, perhaps with accumulation of effects over time.

Especially relevant, given the probability of unilateral, secretive implementation of geo-engineering remedies, is when two such implemented remedies have combined effects with truly disastrous impacts. This is the principle underlying [binary chemical weapons](#). More probable, however, are the "binary" consequences of lack of coordination as illustrated by the failure of the mission to study the climate on Mars in September 1999 (*Mars Mission's Metric Mixup*, *Wired News Report*, 09.30.99):

"People sometimes make errors," said Dr. Edward Weiler, NASA's associate administrator for space science. NASA officials said a simple miscommunication over different measurement standards -- metric versus US -- by teams controlling its [Mars Climate Orbiter](#) likely caused last week's loss of the spacecraft. "The peer review preliminary findings indicate that one team used English units [inches, feet and pounds] while the other used metric units for a key spacecraft operation," said a statement released Thursday by NASA's Jet Propulsion Laboratory at the California Institute of Technology.

The metric mixup which destroyed the craft was caused by a software error back on Earth. The software was used to control its rate of rotation, but by using the wrong units, the ground station underestimated the effect of the thrusters by a factor of 4.45. The spacecraft thus drifted off course during its voyage and entered a much lower orbit than planned -- to be then destroyed by atmospheric friction on Mars. The problem arose partly because the software had been adapted from use on an earlier Mars Climate Orbiter, without proper testing before launch, and partly because the navigation data provided by this software was not cross-checked while in flight.

To what areas of strategic concern for the future of the planet is the human capacity to "sometimes make errors" currently being assiduously applied? Following the Mars Climate Orbiter failure in 1999, would the Iraq war constitute such an example? What about uncritical complicity in the risk management associated with the derivatives market? What about population overshoot?

Is there a simple geo-engineering solution to climate change?
The capacity to produce technical solutions in response to uncertainty and complex dilemmas is not to be denied. The question is how inappropriately and prematurely. This is best characterized in well-known phrases such as that of Myron Tribus " <i>There is a simple answer to every question and it is usually wrong</i> " or that variously attributed to Will Rogers and H L Mencken " <i>There is a simple solution to every problem - and it is always wrong</i> ". This has in turn been variously paraphrased, for example: " <i>For every human problem there is a solution that is quick, simple, inexpensive -- and wrong</i> ".
Some solutions may well constitute a potential exemplification of the Postcautionary Principle -- as variously evident in the compilation by the Edge Foundation (<i>What Are You Optimistic About?: Today's Leading Thinkers on Why Things Are Good and Getting Better</i> , 2007).

Conclusion: Application of irresponsible science and technology on a planetary scale?

Failure of collective learning: It is most regrettable that the majority of the theoretical and applied sciences spent so many decades denying the relevance of global challenges resulting from human activity. It is even more regrettable that they have ignored the conclusions of systemic studies dating from the 1970s. Especially interesting is the manner in which efforts to analyze the evolution of the world problematique, as pioneered for the Club of Rome in 1972, are themselves undermined in an academic context. As shown by [Graham Turner](#) (*A Comparison of the Limits to Growth with Thirty Years of Reality*, CSIRO 2007), the original study provoked many criticisms which falsely stated its conclusions in order to discredit it. Despite the repeated substantiation of its conclusions, including warnings of overshoot and collapse, recommendations of fundamental changes of policy and behaviour for sustainability have not been taken up. One of its principal areas of focus was population.

The question is whether there has been sufficient collective learning to allow simplistic geo-engineering solutions to be applied on a planetary scale in the light of the track record of the interested parties, their disciplines, the institutions who may claim some mandate in the matter, and the policy-makers responsible in some way for the priorities of governance and resource allocation. It is such issues that are systematically ignored in the sober arguments offered by such as [Thomas Homer-Dixon](#) and [David Keith](#) (*Blocking the Sky to Save the Earth*, *The New York Times*, 20 September 2008) -- despite the former's arguments for an adaptive response (mentioned above).

Is it not appropriate to ask whether "blocking out the sky" is not the ultimate symbol of denial for any civilization -- exemplifying the arguments of [John Ralston Saul](#) (*The Unconscious Civilization*, 1995)?

Arrogation of authority and insight: With unseemly haste, the focus is now on geo-engineering solutions convenient to certain mindsets averse to complexity and the behavioural challenges of society -- of which the haste and blinkered focus is but one striking example.

Who is capable of making such a judgement and with what inputs? What is the probability that a narrow blinkered evaluation of the possibility will lead to the kinds of consequences so well-mapped by the track record of introduction of species -- whether cane toads, rabbits, or goats? Or perhaps by the combustion engine as a form of technological "species"?

Mobilization for war: Already the "fight against climate change" is being framed as a "war" calling for "mobilization" ([Dennis Bartels](#), *Wartime Mobilization to Counter Severe Global Climate Change*, *Human Ecology*, 2001; [David Spratt](#) and [Philip Sutton](#), *Climate Code Red: the case for emergency action*, 2008) -- and the creation of an [international secretariat for civil society mobilization](#) to that end. Is this approach to be compared with the efficacy of the "mobilization for development" promoted by the United Nations over decades?

This follows from the war psychosis that has been used in framing the response to terrorism and other issues (*Review of the Range of Virtual Wars: a strategic comparison with the global war against terrorism*, 2005). It would appear that little has been learnt from those experiences relating to what was then so confidently "known" in relation to one such war -- in which no expense has been subsequently spared -- despite the learnings famously articulated by the US Secretary of Defense, [Donald Rumsfeld](#) (as articulated at a Department of Defense news briefing, 12 February 2002):

The Unknown

As we know,
There are known knowns.
There are things we know we know.
We also know
There are known unknowns.
That is to say
We know there are some things
We do not know.

But there are also unknown unknowns,
The ones we don't know
We don't know.

Systemic neglect: How might such learnings relate to total mobilization in a "war" against climate change and its use of geo-engineering? Was it not the "unknown unknowns" that resulted in the sinking of the *RMS Titanic*? Are the collective learning patterns of past "wars" simply to be repeated despite analyses such as that of Christopher Daase and Oliver Kessler (*Knowns and Unknowns in the 'War on Terror': uncertainty and the political construction of danger*, *Security Dialogue*, 38, 2007, 4, pp. 411-434) or the insights of the former chief defence scientist of Australia, John L. Farrands (*Don't Panic, Panic: the use and abuse of science to create fear*, 1993)?

Geo-engineering could then only too readily be taken up by technocrats of the kind caricatured as the Cold War's secretive "Dr Strangelove" (*Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb*, 1964) -- a term already used in an early assessment of such approaches from an environmentalist perspective (*Dr Strangelove saves the earth*, *The Economist*, 15 January 2007) and in other commentary. As originally highlighted in the exploration of that caricature, reservations are readily set aside in the interests of "security" -- a perverted application of the precautionary principle. Indeed a war footing, as demonstrated in the case of terrorism and the initiatives of Donald Rumsfeld, allows all too many considerations to be set aside.

Resolving the human conflict with climate: Framing the human relationship to climate change in conflictual terms justifying "war" is consistent with current strategic responses to any perceived threat to "business as usual". A more systemic understanding might "recognize" the appropriateness of insights and processes from **conflict resolution**. These have already been considered with respect to the conflicting factional and stakeholder views **about climate** change (International Crisis Group, *Climate Change and Conflict*, 2008; Mark J. Spalding and Charlotte de Fontaubert, *Conflict Resolution for Addressing Climate Change with Ocean-Altering Projects*, Environmental Law Institute, 2007).

But a strong case could be made for applying such understanding (whether through metaphor or otherwise) to humanity's conflictual (and conflicted) relations **with climate** in particular and with the natural environment more generally ("*Human Intercourse*": "*Intercourse with Nature*" and "*Intercourse with the Other*", 2007). This would be especially beneficial in reframing the relationship to enable other possibilities of interaction to emerge -- especially where there is any sensitivity to the need to adapt to changing climate, as with the challenges of reconciliation in any evolving relationship (possibly involving "domestic violence"). The case is perhaps reinforced by the metaphoric recognition, with respect to any form of conflict resolution, of the need to create an appropriate "climate" for it (eg David Strutton, *The Influence of Psychological Climate on Conflict Resolution Strategies in Franchise Relationships*, *Journal of the Academy of Marketing Science*, 1993). Curiously, given the challenge of global warming, conflict resolution normally seeks to address conditions of "overheated" relations between social groups -- and might therefore be said to have expertise with respect to "climate change" amongst groups -- whether expressed as "warming" or "freezing".

Compounding misconception: It is readily assumed that the crisis of global warming is quite unrelated to that of the financial system and the associated implications for the economy and its growth -- and despite the vital learnings from the responses they evoke (*Systemic Crises as Keys to Systemic Remedies: a metaphorical Rosetta Stone for future strategy?*, 2008).

Without mentioning "climate" in any way, Paul Krugman (*What to Do*, *The New York Review of Books*, 55, 20, 20 November 2008) argues that, with respect to the financial system, "what the world needs right now is a rescue operation". He focuses on the merits of a well-trie'd massive programme of public spending to restore confidence in the financial system. **It is not difficult to foresee the creativity and leadership with which "massive public spending" will shortly be framed in terms of a massive geo-engineering project** -- avoiding underlying issues in both cases under the banner of urgency -- and "killing two birds with one stone". As Krugman puts it:

Reform of the weaknesses that made this crisis possible is essential, but it can wait a little while. First, we need to deal with the clear and present danger.

In the arguments he makes for a classic Keynesian approach he however most helpfully notes:

"We have magneto trouble," said John Maynard Keynes at the start of the Great Depression: most of the economic engine was in good shape, but a crucial component, the financial system, wasn't working. He also said this: "We have involved ourselves in a colossal muddle, having blundered in the control of a delicate machine, the working of which we do not understand." Both statements are as true now as they were then.

How did this second great colossal muddle arise? In the aftermath of the Great Depression, we redesigned the machine so that we *did* understand it, well enough at any rate to avoid big disasters.

Unfortunately Krugman only draws a superficial lesson from his Keynesian insights. As a metaphor, the "magneto trouble" is more relevant to the manner in which creative insight is elicited, developed and applied generically to vigilant systems management -- including the ecosystems ignored in his argument. The "blundering" is obvious in the latter respect, for it is indeed a "delicate machine, the working of which we do not understand." However it is Krugman's conclusion that obscures the systemic learning which would enable the "magneto trouble" to be addressed. The environment has indeed been conceptually "redesigned...so that we understand it" -- by oversimplifying it to match the need for "business as usual". Geo-engineering proposals then fit neatly into that framework as a remedy.

Of course, given that the financial system faces a massive crisis of confidence (engendered by conventional conception of a viable economic system), it is unclear why massive confidence should emerge to sustain any geo-engineering proposal (engendered by the

conventional conception of viable use of technology that has contributed so significantly to global warming). The generic challenge for leadership -- business, political, military, academic, technical, religious, media and intelligence services -- is the credibility crunch they have engendered (*Credibility Crunch engendered by Hope-mongering: "credit crunch" focus as symptom of a dangerous mindset*, 2008; *Emergence of a Global Misleadership Council: misleading as vital to governance of the future?* 2007).

Oversight by GOATS: Given the pressures towards an urgent solution to the misconceived challenge of "global warming", and the pressures for an international agency to rank geo-engineering proposals, it would appear that what is required is a **Geo-engineering Oversight Agency for Thermal Stabilization** -- suitably acronymed as **GOATS** -- recognizing that the blindspot of "oversight" is the principal challenge that it faces. This recognizes the merit of concentrating oversight within one agency rather than increasing the risk by depending on oversight within a multiplicity of bodies. Such an agency is appropriately symbolized by a goat, given the propensity (as well-demonstrated by the recent financial crisis) to ram through solutions regardless of other considerations.

Is the [Manhattan Project](#) then likely to be considered the most appropriate model for surreptitious unilateral decision-making regarding development and implementation of a geo-engineering solution (Jay Michaelson, *Geoengineering: a climate change Manhattan Project*, 1998)? Will the execution of such a project then be framed heroically, as with the flight of the *Enola Gay* -- which dropped the bomb on Hiroshima in 1945 (criticized long after in the *Enola Gay* song)? Or will the framing take the form of the urgency and heroism of the response to fictionalized NASA destruction of an asteroid on collision with Earth (*Armageddon*, 1998; *Killer Asteroids and Comets in the Movies*) or that of *Space Cowboys* (2000)? If only global warming could be "nuked" as in such scenarios -- perhaps with a combination of [cold fusion](#) and [nuclear fusion](#) to engender a permanent [nuclear winter](#)?

Suggested logo for Geo-engineering Oversight Agency for Thermal Stabilization



For further information on this topic, follow: [GeoEngineering Watch](#)

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