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Should we open this Pandora's box?; Adjusting the Earth's weather systems through geo-engineering raises serious socio-political and moral questions. Tony Carnie identifies issues surrounding climate modification

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IMAGINE a new world where a vast wall of mirrors is erected in outer space to protect the Earth from the heat of the sun.

Imagine using United States Navy warships to blast trillions of tiny particles high up into the sky or deploying a fleet of modern "steam" ships into the seven seas to spray salt water into the air 24 hours a day to create better clouds.

Or how about covering vast stretches of desert with sheets of white plastic to reflect light back to the sun?

What about dumping billions of tons of iron filings into the sea or building millions of chemically coated plastic trees to suck up carbon dioxide from the air?

It's a bit like turning the world into a well-engineered industrial farm, with the sole purpose of controlling the level of carbon in the sky.

This may all sound like preposterous science fiction - yet the debate about "geo-engineering" a way out of catastrophic levels of climate change seems to be gaining credence in several parts of the world.

Earlier this year, President Barack Obama's science adviser John Holdren confirmed that the concept of geo-engineering was being discussed seriously in the White House, and that it should not be ruled out without further investigation.

In the United Kingdom, a House of Commons science advisory committee came to a similar conclusion five months ago and recommended that the British government should start to allocate public money to fund intensive research projects into the pros and cons of geo-engineering.

Several private corporations such as the Ocean Nourishment Corporation, Climos and Atmocean Incorporated have been set up in the United States and Australia to develop geo-engineering technologies and to buy and sell carbon credits.

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While the notion of fiddling with the Earth's climate is not entirely new, geo-engineering is something altogether much grander, and much scarier, because it involves technologies which aim to achieve planetary-scale modification of the world's climate systems.

In the words of Canadian climate and energy researcher Professor David W Keith, geo-engineering signals "a new chapter in humanity's relationship with the Earth".

And it clearly raises some very serious socio-political and moral questions.

For example: Is such large-scale and deliberate modification of the world's weather system akin to opening Pandora's Box?

Who would pay for it? Is it safe? Can the new climate-altering genies ever be put back into their boxes?

And if today's weather boffins are unable to predict the weather in Durban or New York without any certainty five days from now, how can we predict the unexpected effects of "improving" the world's climate patterns?

And, most crucially, is geo-engineering just a new tactic to ensure a world of business-as-usual, which allows the fossil fuel industry and other large corporations to get off the climate change hook?

Dr David Santillo of Greenpeace told the recent House of Commons investigation that climate geo-engineering was a "moral hazard" which could perpetuate a high-carbon economy.

"In the public's mind there is a danger, perhaps, that people will favour what they see to be a solution which does not involve them changing their way of life, and does not involve them having to make difficult choices if they can simply contribute to a scheme which somehow, very distant from them, will engineer the climate back to its normal state."

Some climate change scientists, such as Raymond Pierrehumbert from the University of Chicago, are so worried that they have called for a moratorium on geo-engineering technologies.

But this has not stopped the German government from authorising the Lohafex Expedition to conduct the world's largest "ocean fertilisation" experiments which involved dumping six tons of iron sulphate in the sea off Argentina in an attempt to soak up greenhouse gases by creating a huge plankton bloom.

The Lohafex Expedition left Cape Town aboard the German research vessel Polarstern on January 7, carrying 48 scientists.

Professor David Keith of the University of Calgary has also raised similar concerns about applying expedient "technical fixes", without addressing the root causes of global warming.

He also suggested it would be wise to proceed with great caution - and to follow the money trail.

In a recent essay, "Engineering the Planet", he noted that the US National Academy of Sciences proposed a scheme as far back as 1992 in which millions of tiny metallic aerosol particles would be sent into space via naval guns or high-flying aircraft in order to reduce the level of solar heat entering the Earth's atmosphere.

The study suggested this would cost around $100 billion (R7.8 billion) a year to reduce the level of solar radiation by about one percent.

"While this cost might sound high, it is roughly a factor of 10 lower than the cost to achieve an equivalent reduction in climate change through reductions in CO2 emissions.

"Moreover, later analysis has shown that it is technically possible to design aerosols that are far more effective per unit mass at scattering light which could reduce costs by a factor of 10 to 1 000."

In other words, geo-engineering could turn out to be up to a thousand times cheaper than promoting renewable energy technologies or reducing the carbon emissions from the world's power stations and major industries.

Whose vested interests might this suit?

Nevertheless, Keith argues that the unexpected risks of attempting to geo-engineer the weather are so serious and so controversial that the issue of cost is all but irrelevant.

"As a thought experiment, imagine that alien visitors arrive and give us a technology for climate and weather control.

"For illustration, imagine a box with knobs that allows independent control of global temperature and CO2 concentration.

"Any adjustment of the knobs would inevitably benefit some and harm others," Keith suggested.

"We do not yet possess a system of global governance that would allow a robust, let alone democratic, decision about how to set the knobs.

"One might readily imagine conflict arising from disputes about how the knobs should be set.

"In the absence of a credible system of global governance, perhaps the only robust decision would be to return the knobs to their pre-industrial settings - that is, to minimise human influence rather than actively manipulating the planetary environment."

Keith says that while the alien climate-control box is fiction, the ability to control nature on a planetary scale is not.

"It seems inevitable that we will soon have such abilities (to alter the global climate)... I urge caution. We would be wise to practise walking before we try to run, to learn to minimise impacts before we try our hand at planetary engineering."

Nevertheless, there are other scientists (and several conservative think tanks such as the **Cato Institute** and the American Enterprise Institute) who argue that geo-engineering could turn out to be the salvation of the Earth and humanity. The argument goes that, apart from being cheaper, geo-engineering could turn out to be a form of emergency "Plan B" if politicians fail to reach an agreement very soon to significantly cut global greenhouse gas emissions.

Professor Klaus Lackner of Columbia University told the House of Commons that he was opposed to the idea of a moratorium on geo-engineering experiments.

"There are all sorts of side-effects and I think it is therefore very important that we do basic research... it is important to do that because if there is a crisis we will not have time to do it and we might go down a road which might be potentially far more dangerous because we refused to look at (geo-engineering) earlier."

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Professor Ken Caldeira of the Carnegie Institution argued that geo-engineering might provide some temporary breathing space to address the problem of rapid climate change.

"If we did find that sea ice was melting and threatening polar bears and Arctic ecosystems with extinction and Greenland is sliding into the sea, is it better to say let's have that ecosystem go extinct, let's lose Greenland and that will be a good motivator for people to reduce emissions?

"Or do you say 'no', we actually care about these ecosystems... I do not think the ethical and moral high ground is necessarily to say let's allow environmental destruction to proceed unimpeded while we are trying to reduce emissions."

However, the House of Commons committee chairman, Dr Ian Gibson, expressed "disappointment" that some of the leading proponents of geo-engineering did not appear to be familiar with societal controversies surrounding this technology.

When Gibson asked Professor Brian Launder of the University of Manchester to comment on some of the ethical and moral debates on this technology, Launder responded that he did not think he could, because he had not acquainted himself sufficiently with these debates.

"I just keep my head down like any eager-beaver scientist."

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