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# James Lovelock's plan to pump ocean water to stop climate change

James Lovelock (top) and the sky over the Gulf of Mexico, before a hurricane

By Roger Highfield, Science Editor

6:00PM BST 26 Sep 2007

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A plan to save our world from extreme climate change by pumping cold water from the depths of the oceans is outlined today by James Lovelock, the scientist who inspired the greens.

James Lovelock is best known for his ideas that portray Earth as a living thing, a super-organism - named Gaia, after the ancient Earth goddess - in which creatures, rocks, air and water interact in subtle ways to ensure the environment remains stable.

Today Lovelock, of Green College, Oxford University, outlines an emergency way to stimulate the Earth to cure itself with Chris Rapley, former head of the British Antarctic Survey [who is now the director of the Science Museum, London](#).

They believe the answer lies in the oceans, which transport much more heat than the atmosphere and, covering more than 70 per cent of the Earth's surface.

They propose that vertical pipes some 10 metres across be placed in the ocean, such that wave motion would pump up cool water from 100-200 metres depth to the surface, moving nutrient-rich waters in the depths to mix with the relatively barren warm waters at the ocean surface.

This would fertilise algae in the surface waters and encourage them to bloom, absorbing carbon dioxide greenhouse gas while also releasing a chemical called dimethyl sulphide that is known to seed sunlight reflecting clouds.

"Such an approach may fail, perhaps on engineering or economic grounds", they say, adding that the effects on the acidity of the ocean also have to be factored in.

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None the less, "the removal of 500 gigatons (500 billion tons) of carbon dioxide from the air by human endeavour is beyond our current technological capability. "If we can't 'heal the planet' directly, we may be able to help the planet heal itself."

One version of the scheme sees around 10,000 pipes in the Gulf of Mexico, they told The Daily Telegraph. But until there are some trials, "there is no way one can come up with a figure on atmospheric carbon dioxide reduction per pipe let alone temperature reduction," said Dr Rapley.

"The whole idea is to stimulate some action to find out," he said. "To get an idea of orders of magnitude, the net drawdown of the ocean is estimated to be 2 gigatons per year (compared with human emissions of eight gigatons per year), but only part of that is by the biological pump we are seeking to enhance, and only a fraction of that (maybe as low as 10 per cent) finally sinks to the bottom and is trapped in the sediments (although holding it in the deep ocean helps for a while).

"So one would have to work hard to get a net sequestration of a gigaton a year - but every little helps. "

Lovelock added: "Let's not be pessimistic about the possibilities of the pipes or they might never be tried. Do not forget that they cool the top layer as well as fertilizing it.

"In the Gulf this alone may be important for reducing the severity of hurricanes. It is local self interest such as hurricane prevention and the restoration of fisheries that may pay for the project."

And they conclude in Nature: "The stakes are so high that we must try such schemes, even if they may fail.

"The Earth is fast becoming a hotter planet than anything yet experienced by humans," they write, explaining that natural processes that would normally regulate climate are being driven to amplify warming, so that higher temperatures can, for example, stimulate the release of more methane from wetlands and amplify the warming.

"Such feedbacks, as well as the inertia of the Earth system and that of our response, make it doubtful that any of the well-intentioned technical or social schemes for carbon dieting will restore the status quo.

"We need a fundamental cure for the pathology of global heating. Emergency treatment could come from stimulating the Earth's capacity to cure itself."

Scientists have put forward several proposals to reduce the amount of solar radiation that reaches the planet's surface, including the use of light-reflecting sulphate particles in the atmosphere and installing mirrors in orbit around the planet.

Using radical techniques to "engineer" Earth's climate by blocking sunlight could cool our overheated planet but present great risks that could well worsen global warming should they fail or be discontinued, warned one recent study by Ken Caldeira of the Carnegie Institution's Department of Global Ecology.

"Geoengineering schemes have been proposed as a cheap fix that could let us have our cake and eat it, too. But geoengineering schemes are not well understood. Our study shows that planet-sized geoengineering means planet-sized risks."

However, Dr Rapley said in response: "The attraction of this approach is that the dangers of "unexpected consequences" are low, because we are advocating stimulating and enhancing an entirely natural process."

Prof Sir Brian Hoskins, Professor of Meteorology at University of Reading, commented: "This is the latest in a line of geo-engineering "solutions" or rather "buying time".

"As with some of the others, there is certainly a strong scientific basis for the proposal. Also I agree that the current global political inaction on the climate issue is very serious.

"In my opinion our uncertainties over the likely regional impact of what our greenhouse gas emissions may do is high. The uncertainties over what these "solutions" may do is an order of magnitude higher.

"However we must make sure that our understanding of the climate system and our ability to model it increase as fast as possible so that we can be very confident about the former, the greenhouse gas emissions, and confident about the latter, the "solutions".

"As a different issue the sheer practicality of doing the proposed "solutions" on the required scale to combat greenhouse emissions also has to be considered.

"One of the nightmares is that commercial companies may offer to off-set people's carbon emissions by doing them on a smaller scale, with no real knowledge of the wider implications."

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