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Lovelock urges ocean climate fix

By **Richard Black**

Environment correspondent, BBC News website

Two of Britain's leading environmental thinkers say it is time to develop a quick technical fix for climate change.



Salps occur in great swarms

Writing in the journal Nature, Science Museum head Chris Rapley and Gaia theorist James Lovelock suggest looking at boosting ocean take-up of CO2.

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Their idea, already being investigated by a US firm, involves huge flotillas of vertical pipes in the tropical seas.

The two scientists say they doubt that existing plans for curbing carbon emissions can work quickly enough.

"We are taking the very strong line that we are not going to save the planet by the regular

approaches like the Kyoto Protocol or renewable energy," Professor Lovelock told

“ **The stakes are terribly high** ”

James Lovelock

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"What we have to do is to look at it in a systems sense, or a Gaian sense, and see if it's curable by direct action."

Natural cycles

Professor Rapley, who has just moved to head up the Science Museum from a similar post at the British Antarctic survey, said the two men developed the ocean pipes concept during country walks in James Lovelock's beloved Devon.

Unbeknown to them, a US company, Atmocean, had already begun trials of a very similar technology.

“ It's worth investigating these kinds of ideas, but premature to start deploying them

Ken Caldeira

[Climate smoke and mirrors](#)

Floating pipes reaching down from the top of the ocean into colder water below move up and down with the swell.

As the pipe moves down, cold water flows up and out onto the ocean surface. A simple valve blocks any downward flow when the pipe is moving upwards.

[See how the pumps would work](#)

Colder water is more "productive" - it contains more life, and so in principle can absorb more carbon.

One of the life-forms that might benefit, Atmocean believes, is the salp, a tiny tube which excretes carbon in its solid faecal pellets, which descend to the ocean floor,

James Lovelock
Science Museum
Atmocean
Carnegie Institution, Stanford

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perhaps storing the carbon away for millennia.

Atmocean CEO Phil Kithil has calculated that deploying about 134 million pipes could potentially sequester about one-third of the carbon dioxide produced by human activities each year. But he acknowledges that research is in the early stages.

"There is much yet to be learned," he told BBC News. "We need not only to move towards the final design and size (of the pipes), but also to characterise the ecological effects.



The scheme could pose problems for marine creatures such as whales

"The problem we would be most concerned about would be acidification. We're bringing up higher levels of CO₂ along with the nutrients, so it all has to be analysed as to the net carbon balance and the net carbon flux."

Atmocean deployed experimental tubes earlier this year and gathered engineering data. The pipes brought cold water to the surface from a depth of 200m, but no research has yet been done on whether this approach has any net impact on greenhouse gas levels.

The company says a further advantage of cooling surface waters in regions such as the Gulf of Mexico could be a reduction in the number of hurricanes, which need warm water in order to form.

And Professors Lovelock and Rapley suggest that the ocean pipes could also stimulate growth of algae that produce dimethyl sulphide (DMS), a chemical which helps clouds form above the ocean, reflecting sunlight away from the Earth's surface and bringing a further cooling.

Ethical fix

In recent years, scientists have developed a wide range of technical "geo-engineering" ideas for curbing global warming.

Seeding the ocean with iron filings to stimulate plankton growth, putting sunshades in space, and firing sulphate aerosols into the atmosphere from a giant cannon have all been proposed; the iron filings idea has been extensively tested.

But the whole idea of pursuing these "technical fixes" is controversial.

"One has to understand what the consequences of doing these things are," commented Ken Caldeira from the Carnegie Institution at Stanford University in California, who has published a number of analyses of geo-engineering technologies.



“ There's evidence that the Earth's response to climate change might be going faster than people have predicted ”

Chris Rapley

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"There are scientific questions of safety and efficacy; then there are the broader ethical,

social and political dimensions, and one of the most disturbing is that if people start getting the idea that technical fixes are available and cheaper than curbing carbon emissions, then people might start relying on them as an alternative to curbing emissions.

"So I think it's worth investigating these kinds of ideas, but premature to start deploying them."

Chris Rapley does not believe ideas like the ocean pipes are complete answers to man-made global warming, but may buy time while society develops a more comprehensive response.

"It's encouraging to see how much serious effort is going into technical attempts to reduce carbon emissions, and the renewed commitment to finding an international agreement," he said.

"But in the meantime, there's evidence that the Earth's response to climate change might be going faster than people have predicted. The dramatic loss of ice in the Arctic, for example, poses a serious concern for the northern hemisphere climate."

High stakes

Professor Rapley said the letter to Nature, one of the world's most prestigious scientific journals, was intended to get people thinking about the concept of technical fixes rather than just to advocate ocean pipes.

"If you think of how the science community

has organised itself," he said, "with the World Climate Research Programme, the International Geosphere-Biosphere Programme, International Polar Year and so on - you've got all this intensive interdisciplinary collaboration figuring out what Earth systems are up to and figuring out how they work, but we don't have a similar network working across the entire piece as to what we can actually do to mitigate and adapt."

He said there was a need for some sort of global collaboration to explore potential climate-fixing technologies.



Salp pellets take carbon to the floor of the ocean

"Geo-engineering is one of the types of thing that are worth investigating," opined Ken Caldeira, "and yes, the amount of effort going into thinking of innovative solutions is far too little.

"If we can generate 100 ideas, and 97 are bad and we land up with 3 good ones, then the whole thing will have been worthwhile; so I applaud Lovelock and Rapley for thinking along these lines."

He observed that human emissions of greenhouse gases are bringing huge changes to natural ecosystems anyway, so there was nothing morally difficult in principle about deliberately altering the same natural ecosystems to curb climatic change.

But changing patterns of ocean life could

potentially have major consequences for marine species. Whales that feed on krill, for example, could find their favourite food displaced by salps.

These would all have to be investigated, James Lovelock acknowledged.

But, he said, it is time to start. "There may be all sorts of ecological consequences, but the stakes are terribly high."

HOW THE PUMPS MIGHT WORK



- 1. Buoy:** Helps hold the pump in position
- 2. Pump:** James Lovelock believes the tubes would be about 100m long to access deep cold water, and 10m wide; Phil Kithil thinks 200m long and 3m wide could be optimum
- 3. Valve:** Could be at the top or bottom of the pipe; top perhaps preferable for maintenance. Water is drawn through the open valve on wave down slopes; no external power needed
- 4. Cold water:** On wave up slopes, cool water spills out of the pump
- 5. Pump sites:** Locations could also be chosen to reduce hurricane risk by cooling surface waters

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