

INTERNATIONAL
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Want to cut global warming? Dig into your pockets

By Michael Fitzgerald

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NEW YORK: Global warming is by nature a big-enough problem to create the kind of necessity that could be mother, father and midwife to invention.

And plenty of big ideas are out there to address it, some that may even lead to substantial enterprises, much as our military needs have.

But ideas being backed in the United States are things like biofuels and carbon-emissions trading. These are good approaches, but they may not hold much potential for actually staving off climate change.

James Lovelock, a British scientist whose 2006 book, "The Revenge of Gaia," argued that most of humankind is doomed, does not think much of renewable energy. At a panel on climate change at the University of Cambridge this summer, Lovelock was asked what would be the most effective action people could take.

Because humans and their pets and livestock produce about a quarter of the carbon dioxide in the atmosphere, he said, "just stop breathing."

Now there's a fine idea.

But even a gloom-and-doomer like Lovelock thinks all is not lost.

He supports replacing coal-powered utilities with nuclear power, but he also extols largely untested processes, like shooting particles into the atmosphere to deflect the sun's rays. He also endorses sucking carbon dioxide out of the air and burying it, a process known as carbon sequestration.

These are big ideas, and all of them aim directly at global warming, but they are too costly for individual inventors or even companies to pursue.

Howard Herzog at the Massachusetts Institute of Technology is a proponent of carbon sequestration, which you might call creating carbon landfills.

The basic technologies are already used in the energy business. For example, oil companies pump carbon dioxide into old fields to force out more oil.

But we do not know if it can be done on a scale that will let us keep up with the growth in coal-fired power plants, for instance, or if the carbon dioxide will stay put. Herzog estimates that it will take \$1 billion a year over the next eight to 10 years to build a large test project to find out.

The trouble is that of about \$2 billion the Department of Energy is spending on research into things like cleaner-burning coal, only about \$100 million is available for carbon landfill research.



"I do find it somewhat surprising how little funding sequestration has received," David Reiner, a lecturer on technology policy at the Judge Business School at the University of Cambridge, wrote in an e-mail message.

He noted that the technology had bipartisan support in Congress and could meet multiple needs. It could help alleviate the rapid growth in emissions of carbon dioxide resulting from huge expansion of coal-driven power plants in China and India and could help the coal industry survive in a world that wants to be carbon-free.

If creating carbon landfills is a relative slam dunk but is underfinanced, it is little wonder that more exotic ideas get even less money.

For instance, how about capturing solar power in space and using satellite-based lasers or microwaves to zip it back to Earth?

Martin Hoffert, an emeritus professor of physics at New York University, estimates that it would take \$5 billion to build a plant that would generate enough power for a small city.

J. Roger Angel, a physicist at the University of Arizona, has proposed using millions of small spacecraft to create a solar sunshade 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.

Then there is geo-engineering, which involves shooting particles into the atmosphere to reflect sunlight back into space, creating what is called the parasol effect. This has proponents, partly because it appears to work: Every time a major volcano erupts, producing a similar effect, temperatures decline over large regions.

But John Latham, a senior research associate at the National Center for Atmospheric Research, said there was simply no money for geo-engineering, possibly because there is a counterintuitiveness to shooting particles into the atmosphere.

Robert Metcalfe, the co-inventor of the Ethernet and now a general partner at Polaris Venture Partners, is surprised that the parasol effect is not getting serious research money because it looks like the simplest and easiest way to deal with global warming.

For one, it does not rely on reducing carbon dioxide emissions.

But he called it unfundable: It is barely past the idea phase, and venture capitalists invest in projects that will be commercially viable in three to five years.

"To pursue it is to be seen as a nut," Metcalfe said. It would probably cost a billion dollars to research, and venture capitalists cannot bet that much money on a single project.

Nor can commercial companies or public utilities put that sort of money into something that is for more research than development.

In the United States, that leaves the federal government, which spent \$137 billion on research and development in fiscal 2007. Government money was a prime source for the research that led to the Internet. But even that bumped along for more than 20 years before it became broadly interesting to commercial investors.

And the government does not often put a billion dollars into a specific project, let alone four or five of them. So don't go dashing off to form CarbonCapture Inc. or SunShade Spacecraft Ltd. just yet.

But Reiner at Cambridge expects that climate change will eventually become a research priority, much as the Strategic Defense Initiative, the space program and the Manhattan Project did. The problem will

not go away. Neither will the ideas.

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