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Geo-engineering: massive potential, or massively implausible?

/bg/feature/2074604/geo-engineering-massive-potential-massively-implausible

06 Jun 2011, Tom Young , BusinessGreen

The head of the UN Climate Change Secretariat this week told the *Guardian* that soaring levels of greenhouse gas emissions meant the world would have to develop "more powerful technologies to capture emissions out of the atmosphere".

But are such carbon capture technologies feasible? Can atmospheric engineering really help curb rising temperatures?

Growing numbers of scientists are investigating so-called "geo-engineering" techniques, exploring how emergency solutions could be deployed to rapidly reduce the amount of carbon dioxide in the atmosphere.

Until recently, conversations around geo-engineering have tended to focus on science fiction-inspired giant mirrors in space, or huge wind-powered ships sailing the oceans to seed clouds.

But there are a number of more practical solutions scientists are considering that could be less risky and less expensive than commonly thought. As a major 2009 report from the Royal Society suggested there are a number of approaches that could prove plausible and are certainly worth further investigation.

Here, *BusinessGreen* runs down five potential geo-engineering techniques – from the most plausible to the least.

1. Improved ecosystem and land-use management
Ecosystems already absorb about 30 per cent of the carbon dioxide we emit and hold twice the amount of CO2 that is in the atmosphere. Simple strategies to protect and enhance key ecosystems such as rainforests are perhaps the most practical and least controversial way to take carbon out of the atmosphere.

As well as reforestation, there are techniques that can be used on soils to ensure they retain carbon stocks more effectively. In one study in Oregon, the carbon storage of an area of land was doubled through changed land use policies.

These can include soil-erosion management, improved land-tilling techniques, crop rotation and better grazing land management. All the techniques are cheap to deploy and have few undesirable side effects. In fact, they have only one drawback – used alone they will not remove enough carbon at sufficient speed to tackle runaway climate change. However, they remain a valuable tool in helping to curb emissions levels.

2. Enhanced weathering
Carbon dioxide is naturally removed from the atmosphere over many thousands of years by weathering processes experienced by silicate rocks. Silicate minerals form the most common rocks on earth and react with CO2 to form solid carbonates that lock in carbon. Accelerating or encouraging this natural weathering process could potentially remove significant amounts of CO2 from the atmosphere.

One option is to mine large quantities of these rocks and then spread them over fields – the greater the surface area exposed, the more CO2 they will remove. It is estimated that mining and spreading 7 km3 of silicate rocks per year – approximately twice the volume of coal mined worldwide – would be enough to absorb all our emissions worldwide in 2010.

It has also been suggested that carbonate rock could be processed and ground, and reacted with CO2 in chemical engineering plants, with the resulting bicarbonate solutions released into the sea. Another approach would be to release the carbonate minerals to the sea directly.

The challenge with nearly all these methods would be managing the extent to which they increase the bicarbonate and calcium concentration (and hence the alkalinity) of sea water. Such an approach could help prevent ocean acidification – another side effect of climate change – but it would have to be closely managed to prevent further disruption to marine environment.

3. Carbon capture from air
Air capture is an industrial process that captures CO2 from ambient air, producing a pure CO2 stream for use or sequestration. There are no question marks over the effectiveness of the technology – it is already used in a number of industrial processes.

One proposal involves absorbing CO2 into a concentrated sodium hydroxide solution. Synthetic catalysts could increase the rate of absorption. However, all air capture technologies will require energy inputs, meaning they would have to be powered by low-carbon sources to be worthwhile. As with carbon capture and storage from power stations, the removed CO2 would also have to be transported for storage in secure underground locations such as oil or gas fields, or combined with hydrogen to make a transport fuel.

Air capture is expected to be effective but costly, with relatively low environmental impacts and low risk of unanticipated consequences, except for those associated with the sequestration of the CO2

captured. The visual impact of a potentially large number of capture installations could be an issue for public acceptance.

4. Ocean iron fertilisation
Ocean fertilisation is the only geo-engineering technique that has been tested at scale and formally analysed by the scientific community.

Carbon dioxide is absorbed by microscopic plants such as algae and phytoplankton. When they die, some of the carbon they take up sinks to the bottom of the ocean in the form of organic matter. This 'biological pump' exerts an important control on the CO2 concentration of surface water, which in turn strongly influences the concentration in the atmosphere. Methods have been proposed to pump nutrients into surface waters to promote algal growth and exaggerate the affect.

The main attraction of this method is that iron and phosphate fertilisation is potentially cheap. But initial trials by a German research team with iron filings saw little evidence of increased CO2 absorption. These results, combined with low levels of public and political acceptance for such a clearly interventionist approach, make the technology an unlikely solution to climate change at present.

5. Ocean upwelling/downwelling
Made popular by the recent book *Superfreakonomics*, this technology involves
installing huge vertical pipes in the ocean to mix cooler, deep water with warmer surface water. Most of the CO2 in the deep sea is transported there by warm water sinking to the bottom of the ocean, and advocates of the technology believe that increasing this circulation will lead to more rapid sequestration.

However, increased ocean downwelling must be compensated by increased upwelling at another location, which may be on the other side of the world and which will also affect atmospheric carbon levels. The technology is unproven and could be expensive.

It is also difficult to guarantee that it would work on an ongoing basis – changes in ocean currents could lead a downwell to become an upwell during another season. One study found that the shifting of huge amounts of water could lead to only minor reductions in atmospheric CO2.

WHAT DO YOU THINK?

Killing hurricanes to reduce global warming

Hurricanes cause massive amounts of deforestation, trees soak-up Carbon Dioxide and in the process give back free Oxygen that we need to breathe.

Atmospheric Oxygen Levels Fall As Carbon Dioxide Rises

According to a study conducted by scientists from the Scripps Institute there is less oxygen in the atmosphere today than there used to be. The ongoing study, which accumulated and interpreted data from NOAA monitoring stations all over the world, has been running from 1989 to the present. It monitored both the rise of carbon dioxide in the atmosphere and the decline in oxygen. The conclusion of that 20 year study is that, as carbon dioxide (produced primarily by burning fossil fuels) accumulates in the atmosphere, available oxygen is decreasing.
Carbon dioxide seems to be almost the total focus of attention in the climate change model as it exists today. After reviewing the results of this study and talking with Dr. Ralph Keeling (one of the lead scientists on the study), it seemed to me that the consequences of atmospheric oxygen depletion should

be included in any discussion of atmospheric change.

At my website http://bsandler.com there is a complete description of a patented machine designed to kill hurricanes.

Posted by brian, 06 Jun 2011

Ocean Acidification

The oceans are absorbing One Million TONS of CO2 PER HOUR from the atmosphere ....

Ocean Acidification combined with worldwide industrial toxic dumping is killing the only Living Oceans in the known universe....

Without Healthy Living Oceans and Earth's Symbiotic Environment... this planet will not have a Life supporting atmosphere... Just talk to any of your friends who have ever maintained a salt water aquarium about how delicate the pH balance is...

Consider the following scenario, and tell me if i am wrong about this...

1) we have no way to stop runaway Ocean Acidification...

2) we will probably continue burning fossil fuels worldwide for about 50 more years...

3) all the kings horses and all the kings scuba divers can not prevent the Oceans from becoming so acidic it will dissolve the coral reefs and impair all marine life, including the phytoplankton ....

4) when that happens... we could loose up to 70% of Earth's oxygen supply...

5) with more CO2 in the atmosphere, even the trees, plants and crops will no longer function...

6) when the methane hydrates melt... and they already are... mega tons of flammable biomass will burn out of control worldwide... releasing additional greenhouse gas, increasing the positive feedback loop....

7) forests will become deserts... further reducing oxygen and increasing CO2...

8) Earth's currently Livable atmosphere will be lost for thousands of years... No blue, No green...

http://EcoDelMar.org/ocean_acidification

Posted by Larry, 06 Jun 2011

death of the human race

, the real inconvenient truth is we are totally dependent on hydrocarbons and when they run out we will die.

Posted by brian, 06 Jun 2011

Clean energy technology 5 times cheaper than coal!

Using LENR, nickel yields gamma rays that deliver 1.7 billion calories per gram. Google the Rossi E-Cat. Geoengineering will still be necessary (especially as coal-fired power plants go belly up). Can you imagine that a super tanker full of oil (2 million barrels) is equivalent to less than a ton of nickel??

Posted by Brad Arnold, 08 Jun 2011

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