Should We Experiment With Climate Geoengineering?

February 24, 2015

by Rachel Smolker and Almuth Ernsting (Truthout)

(Image: Jared Rodriguez / Truthout)

The US National Academy of Sciences (NAS) announced its long-awaited reports on climate geoengineering in mid-February. The reports intelligently state at the outset that geoengineering is no substitute for reducing emissions. But the call for experimentation and research – and for federal government funding for it – is pervasive, loud and clear. And worrisome. A similar call for research was published as a commentary in Nature, conveniently timed just a few days ahead of the release of the NAS reports.

One approach to climate geoengineering would have us inject large amounts of sulphate aerosols into the stratosphere to reflect a proportion of sunlight – a form of "solar radiation management" (SRM). That could provide some temporary overall global cooling, though not evenly distributed. Models as well as the real world experience of volcanic eruptions show that this would have severe side effects, from disrupting rainfall over large areas of the planet to degrading the ozone layer.

Those who support research into SRM believe that its negative impacts must be seen relative to the disastrous changes, including to global rainfall patterns, which are already unfolding. However, as NASA climate scientist Gavin Schmidt has pointed out, rainfall is much more sensitive to changes in the amount of incoming sunlight (which would be reduced through SRM) than it is to greenhouse gases. Therefore, an earth with high greenhouse gases plus SRM won't be anything like the earth any of us have experienced.

To see more stories like this, visit "Planet or Profit?"

Experimenting with SRM is a bit like experimenting with heroin. You know even before you try it that it's not going to be good for you. Also like experimenting with heroin, it does nothing to address the underlying problems that lead to addiction. Pumping sulphate aerosols into the atmosphere would do nothing to reduce greenhouse gas concentrations. To the contrary, it could be used as an excuse to continue to do so. Nor would it slow or stop ocean acidification, the other disaster caused by carbon dioxide emissions besides climate change. Because SRM fails to address the cause of warming, and instead just temporarily masks some of the symptoms, it becomes an addiction and would have to be maintained and even increased over time. Getting off the SRM drug would be especially problematic. Suddenly halting injection of sulphate particles would result in very abrupt and dramatic heating.

Those who call for research into SRM cite the urgent need to understand more in order to have it as a “tool in the box” in case things get so bad that we need to take dire action. Others support researching it because they fear if “we” (the United States and the United Kingdom) do not take the lead and get up to speed, some unfriendly nation or entity might do so and then use it as a weapon. The weaponization of geoengineering is a particularly troubling concern and in fact, the CIA contributed to funding the NAS reports. One scientist reports being contacted and questioned by CIA officials.

A blanket call for more research on climate geoengineering is especially foolhardy. In 2010, an article by four climate scientists published in Science pointed out that open-air experiments to test the effect that SRM with sulphate aerosols would have on rainfall patterns would need to be so large as to be capable of disrupting global rainfall – and thus food production on a large scale.

Small-scale, open-air SRM experiments could help to develop and test the feasibility of large-scale deployment of such technologies, but they could not tell us more about what the global effects of such deployment would be than modeling studies coupled with observations of climate effects of volcanoes already can tell us. What this existing research shows does not bode well for SRM.

What about other climate geoengineering approaches? Under the heading of “carbon dioxide removal” (CDR) are approaches that use plant or plankton biomass growth to absorb carbon out of the atmosphere, as well as methods that use machinery to filter carbon dioxide out of the ambient air (direct air capture).

Direct air capture of carbon dioxide might seem an attractive prospect, but it is technically challenging and – most importantly – highly energy intensive and extremely costly. Building new power stations to scrub a small fraction of the carbon dioxide emitted by other power stations clearly makes no sense, nor is there any sense in diverting any of the small fraction of lower carbon energy such as wind power to power giant carbon dioxide-sucking fans rather than replace existing fossil fuel use for energy. No proposed direct air capture technique has so far proven feasible at scale.

Plant biomass approaches range from very large-scale afforestation (tree plantations), to stimulating plankton growth with ocean iron fertilization, very large-scale use of biochar, (although the National Academy scientists do not regard biochar as a proven form of carbon dioxide removal) or low-till agriculture (included by the NAS, even though that is mostly a practice for industrial GMO soya and corn producers, and even though several studies have put claims about low-till and no-till sequestering of carbon into serious doubt). They also include most prominently, capturing carbon from industrial bioenergy processes, also known as bioenergy with carbon capture and storage (BECCS).

Ocean fertilization (except for small-scale experiments that have undergone a risk assessment) would contravene an international convention (London Convention and Protocol) as well as a specific moratorium by the UN Convention on Biological Diversity. Its potential to harm marine biodiversity is well established, while several studies have contradicted claims that it could sequester substantial amounts of carbon.

The biomass-based CDR approaches have won favor as more “benign,” and because they involve using plants, they elicit less of the visceral repulsion that most feel toward sulphate particle injection. Proponents claim that these plant-based CDR techniques can provide various auxiliary benefits. For example, the assumption is that BECCS can provide us with alternative renewable energy while simultaneously removing carbon dioxide from the atmosphere. Biochar advocates meanwhile claim it will improve soils, increase agriculture productivity, reduce use of fertilizer, retain moisture, clean toxins from the environment and more, all while simultaneously removing carbon dioxide from the atmosphere – despite the fact that studies do not show that biochar can be relied upon to actually deliver such benefits.

Sound magical? Only if one accepts underlying false assumptions. The first is that there are copious amounts of “sustainable,” available biomass, (and by implication of the land, soils, fertilizers and freshwater required to grow such quantities of biomass) readily available to be burned for bioenergy, or pyrolyzed to produce biochar or refined into biofuels. Those mythological supplies of biomass simply don’t exist. Even with the comparatively small scale of bioenergy production we currently have in place, the impacts on land, food and climate have been hugely problematic and are already well documented. Numerous studies have demonstrated the climate benefits of agroecological farming, protection and restoration of soils, or halting deforestation and allowing natural forests to grow. Establishing huge new demands for wood and crops for CDR achieves just the opposite.

The second false assumption is that large-scale bioenergy is largely “carbon neutral,” based on the absurdly simplistic claim that carbon released from burning a tree for electricity (or refining it into fuel) will be offset when a new tree grows in its place. This “carbon neutral” myth has been debunked in scientific literature repeatedly and yet still remains, a testament to the potency of marketing myths and industry PR messaging.

Those who advocate biomass-based CDR climate geoengineering continue to accept it on face value and assume that when CCS is then applied to a “carbon neutral bioenergy” process, it is rendered “carbon negative” (removing carbon dioxide from the atmosphere, or “net zero emissions”). Since this is simply not true, we already know full well that the impacts of global scale deployment of BECCS would not only fail to reduce atmospheric greenhouse gas concentrations, but would also increase manifold the problems we are already witnessing as a result of bioenergy mandates and subsidies (land grabs, soil and water depletion, biodiversity loss, competition with food production, air pollution and more).

So should we experiment with CDR? Unlike the case for SRM, small-scale “experimentation” is already underway in many locations, though not referred to as “geoengineering.” For example, tree plantations (afforestation) already exist and are expanding. Many different kinds of bioenergy processes are already in practice from ethanol production (which currently consumes nearly 40 percent of the US corn crop) to co-firing of wood with coal for electricity. Capturing carbon from ethanol fermentation and fossil fuel smokestacks has been tested and found to be energy intensive, expensive and risky. Furthermore, to offset the costs, carbon dioxide is often marketed for “enhanced oil recovery” (pumped into depleted oil wells to force remaining oil out). None of these, at the scale currently in place would be considered “climate geoengineering.” But our experiences with them have already flagged up serious limitations and problems. For most biomass-based approaches, the limited availability of biomass, and the land, soils, nutrients and water for growing it, is the key limitation.

Directing science funding toward climate geoengineering raises additional concerns: First of all, public funding for scientific research is limited and spending more of it on geoengineering research will inevitably result in other areas of research being starved of funding. Secondly, once significant funding for geoengineering research becomes available, a bias toward research “results” that reinforce the need for more, similar funding can easily develop. For example, hundreds of studies per year are currently being published about obscure aspects of biochar research, with titles such as “Adsorption of anionic dye on magnesium hydroxide-coated pyrolytic bio-char and reuse by microwave irradiation.” Yet field studies that could reveal to what extent biochar actually does increase soil carbon and what its effects on different crops and soils really are remain few and far between. The National Academy rejected biochar altogether as unworthy of consideration for CDR. Meanwhile, agroecology – one of the most promising ways of reducing greenhouse gas emissions and making agriculture more resilient to the now unavoidable level of climate change – remains starved of funding. A letter signed by more than 200 scientists in 2014 warned: “Public research into agroecology is drastically inadequate . . . And past analyses have found that funding for agroecology is a very small part of the federal research budget.”

Investing in climate geoengineering research creates momentum. Careers are built around it, grants are sought, and institutes and initiatives sprout up as is already clearly underway. These all will seek to perpetuate and advocate the need for more research and investment. That momentum becomes increasingly difficult to stop, even if the ideas have been deemed too risky, too expensive, ineffective or otherwise pointless to further pursue.

Another concern relates to the regulation of activities associated with geoengineering. In the aforementioned Nature article, the authors write: “We argue that governance and experimentation must co-evolve. We call on the US government and others to begin programs to fund small-scale, low-risk outdoor climate-engineering research and develop a framework for governing it.”

The US government? US government “regulation” of GMOs, just as an example, is considered by many to be woefully inadequate and driven more by the interests of Monsanto and their ilk than any interest in protecting public health or the environment. Many people around the globe would likely feel uncomfortable with a US government funded, or governed program on geoengineering. This is especially important given that the negative effects of different types of geoengineering would likely be felt most dramatically in the global South: Sulphate aerosol injections from real-life volcanoes have been linked to major droughts and famines in large parts of Africa, while tropical countries, where trees and crops grow fastest, would be the likely biggest targets for any biomass-based CDR schemes.

The consequences of climate geoengineering are global, so global governance should be considered essential. Yet, realistically, the global community can hardly come to any agreement on climate. How will nations agree on a framework for the governance of geoengineering? Is it possible? Or is climate geoengineering essentially impossible to govern?

Finally, any advancement of climate geoengineering plays directly into the hands of political forces including the oil industry and climate deniers who are pleased to have a “Plan B.” As Pat Mooney from ETC Group points out: “The fossil fuel industry is desperate to protect between $20 and $28 trillion in booked assets that can only be extracted if the corporations are allowed to overshoot GHG-emissions. The theoretical assumption that carbon capture and storage will eventually let them recapture [carbon dioxide] from the atmosphere and bury it in the earth or ocean provides the fossil fuel industry with the best way to avoid popping the ‘carbon bubble’ other than outright climate denial. . . . If the US or other powerful governments accept geoengineering as a plausible ‘Plan B,’ Plan A will evaporate faster than Congressional bipartisanship.”

Pumping funds into geoengineering research seems especially unwise given the political context, and since we already can see clearly enough that these approaches are extremely dangerous, likely won’t work, will have unanticipated negative impacts, are very likely to worsen rather than improve the climate – and with different outcomes for different people in different places – are virtually ungovernable, divert resources from better uses, are a political nightmare, and can potentially be weaponized.

These issues are not all unique to climate geoengineering. Many are common to other kinds of technology developments that pose enormous and potentially global risks. The time is long overdue to recognize that our capacity for developing technologies in many cases poses serious risks to ourselves and the rest of life. When it comes to climate geoengineering, we should not be forced to accept that because we “can,” even though we know we “shouldn’t,” “if we don’t, someone else will” and therefore we “must.” That line of reasoning is no way for an intelligent species to conduct itself.