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The Oversimplification of Geoengineering

Clark A. Miller March 17, 2010 Filed under **Geoengineering**

In a recent **Policy Forum** in *Science*, Jason Blackstock and Jane Long summarize the rationale for giving scientific research into geoengineering a serious look:

> *Despite mounting evidence that severe climate change could emerge rapidly, the global reduction of carbon emissions remains alarmingly elusive. As a result, concerned scientists are now asking whether geoengineering—the intentional, large-scale alteration of the climate system—might be able to limit climate change.*

They continue:

> *SRM [solar radiation management] could substantially influence the climate in months, but with much greater uncertainty about the net effects. SRM schemes such as stratospheric aerosols and cloud brightening aim to cool the planet by reflecting a fraction of the incoming sunlight away from Earth.*

Like Blackstock and Long, and many others, I worry a great deal about the uncertainty and risks associated with geoengineering. But here I want to focus on something else: the faulty framing of the problem from the outset.

Those now advocating exploration of large-scale manipulation of the Earth's climate seem most focused on rapid, unexpected climate shifts, which might need to be counteracted by a cooling impulse (See papers by Paul Crutzen and Michael McCracken published in the **August 2006 issue** of *Climatic Change*). But why suppose that such shifts will take the form of simple warming?

What would a climate emergency look like? Consider the following scenario. A rapid climatic shift during January through March gives rise to storms that dump tremendous rainfall over the US Midwest from late spring through mid-summer. Farmers are unable to plant wheat and corn because fields are flooded. Prices on global commodity markets skyrocket. Countries worldwide begin hoarding grain. The world's poor begin to see immediate shortages as a result of rising prices. The threat of malnutrition and hunger emerge as a serious threat in the months to come. Geoengineering advocates begin to lobby the U.S. president to put aerosols into the stratosphere to cool the planet.

Wait. What good will that do? Prevailing models, based on events like the eruption of Mt. Pinatubo, suggest that a release of aerosols could cool the Earth over a period of a few months. In this scenario, however, even if it works perfectly, with no unintended side effects, such a strategy would be useless. Even if the cooling impulse arrives by mid-summer, fields may still not be dry enough to plant. Major agricultural operations run on reasonably tight calendars. Fixing the climate a few months from now is likely to be too late if the climatic shift happens at a critical time of the year. A searing drought a month before harvest could destroy an entire year's crop. In a month, rising floodwaters could overtop dams and destroy communities all along major rivers. A single hurricane, strengthened by high surface ocean temperatures and rising sea level, could wipe out a major city.

A few months may not seem like much time to a climate model. Sure, in a few months, we can reduce the Earth's temperature, such a model might say. But in a few months, it may simply be too late to avoid major climatic disasters.

Indeed, what leads people to think that climatic shifts will be reversible at all? What if they're more like system state shifts, from one meta-stable state to another? Is there really any reason to believe that such a rapid shift would necessarily reverse itself if we pump aerosols into the air? Suppose, for example, a rapid shift to higher Arctic temperatures occurs. Here's a case where rapid cooling might actually counteract the

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general problem over time. But what if, in the meantime, polar sea ice melts much more rapidly than expected or melting tundra outgases enormous quantities of methane. In neither case may subsequent cooling simply return the system to the state it was in beforehand.

For years, climate scientists have complained that public imaginaries of global warming – in which the weather just got a little warmer everywhere – were dangerously misleading. Real climatic change would involve unpredictable shifts in temperature, rainfall, wind, and storm patterns. Indeed, the real impacts would likely come not only from climate changes but also via unpredictable weather variations that cannot be modeled accurately in climate models. Now it's the prospective climate engineers who seem to be following back on the old, over-simplistic logic of global warming.

Policymakers – indeed, the community of scientists looking into climate engineering – should demand realistic assessments of both what real climate emergencies might look like, from a human systems perspective, and whether SRM might even remotely plausibly "fix" such emergencies. And they should demand such assessments before they commit to uncertain field experiments of technologies that even they admit are unpredictable, risky, and potentially highly dangerous.

About the Author: ***Clark Miller*** *is associate director of CSPO and associate professor of science policy and political science.*

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Lori Hidinger (1)
Mary Jane C. Parmentier (1)

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Consortium for Science, Policy & Outcomes
College of Liberal Arts and Sciences
PO Box 875603, Tempe AZ 85287-4401, Phone: 480-727-8787, Fax: 480-727-8791
cspo@asu.edu