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## U.S. National Interest, Climate Engineering, and International Law

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**U.S. NATIONAL INTEREST, CLIMATE ENGINEERING,  
AND INTERNATIONAL LAW**

by

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## Introduction: The Climate Debate & Climate Engineering

Despite the failure of the 2010 greenhouse gas (GHG) cap-and-trade bill, President Obama is plainly resolved to press ahead with new plans to limit emissions. Most Republicans in Congress are equally determined to block this effort. In effect, the United States seems to be locked in the same climate policy stalemate that has prevailed for the last twenty years.

Science offers no escape. Its role, after all, is to find the facts; it does not tell us what to do about them. Science tells us that greenhouse gases in the atmosphere warm the planet. It's less clear how much warming will result from a given increment of GHG; what other effects may ensue is less certain still.<sup>1</sup> As a result, climate policy is doomed to making choices amidst uncertainty, and uncertainty breeds discord.

On both sides of all this strife, those of a more pragmatic cast of mind have reason for dismay. On the one hand, even the most sanguine proponents of GHG controls should, by now, see that China, India, and other fast growing countries will continue building coal fired power plants; therefore, U.S. GHG controls can do little to lower whatever risks climate change poses.

On the other hand, even the most adamant foes of GHG controls must know that majorities of climate scientists and American voters want action to lower the perceived risks of climate change. These demands, in their opponents' eyes, threaten to cause serious net harm to the U.S. economy. To such opponents, it is not climate change, but ill-conceived efforts to halt it, that present the more dire threat. That Obama and his allies pursue GHG controls so doggedly, and with so little regard to costs and benefits, lends credence to these fears.

At least some people from each side of the debate, then, should welcome a way of lessening the perceived risks of both climate change and the measures proposed to counter it. And such an option may, indeed, exist. It is called climate engineering (CE).

GHGs in the atmosphere absorb heat and then radiate some of it back to Earth's surface; hence, higher GHG levels raise surface temperatures. The more promising kinds of CE do not lower GHG concentrations; rather they would reflect back into space a small amount of the incoming sunlight; all else being equal, temperatures fall although GHG levels do not.<sup>2</sup> CE, therefore, may lessen at least some of the risks of global warming.

At least two sunlight based CE concepts may be able to offset all the warming expected in this century.<sup>3</sup> One of them involves lofting a fine seawater mist into low-level marine

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<sup>1</sup> KERRY EMANUEL, WHAT WE KNOW ABOUT CLIMATE CHANGE 62-64 (2007).

<sup>2</sup> Tim M. Lenton & Nem E. Vaughan, *The Radiative Forcing Potential of Different Climate Geoengineering Options*, 9 ATMOSPHERIC CHEMISTRY & PHYSICS DISCUSSIONS 5339, 5539 (2009),

<sup>3</sup> *Id.* at 5553.

clouds. There, the droplets would ‘whiten’ the clouds; *i.e.* they would cause them to reflect more sunlight<sup>4</sup> and perhaps lengthen their lives.<sup>5</sup> One delivery concept would use a fleet of high tech wind powered remote-controlled ships to produce the spray.<sup>6</sup> The clouds that form in the wakes of ships at sea offer a natural analogue to the concept.<sup>7</sup>

The second approach contemplates injecting very fine sulfate particles into the stratosphere.<sup>8</sup> Several delivery methods might serve. After a year or two, particles would fall to the surface as rain or snow; the quantities would be small compared to current sulfate emission levels.<sup>9</sup> The global cooling and other changes that have occurred in the wake of volcanic eruptions are an analogue.<sup>10</sup>

## **A Viable CE Option Would Serve U.S. Interests**

For the United States, having a viable CE option would confer two kinds of potential benefits. First, CE might avoid harm from climate change; second, CE might allow more gradual, and, hence, less costly, GHG controls and adaptation measures. It would, in other words, also lower the costs of the steps designed to limit harm from climate change. Thus, CE might offer gains to both sides of the great climate policy debate.

Globally, those gains could be quite large. A CE system deployed starting in 2055 and lasting for 200 years has been estimated to yield net benefits with a discounted present value (in 2005 dollars) of \$4 to \$10 trillion.<sup>11</sup> The direct engineering costs of such a system are trivial. For marine cloud whitening, the present value of such costs would range (for 200 years) would range from \$300 million to \$1.8 billion.<sup>12</sup> It might also be possible to hold CE in reserve for use should a climate emergency begin to unfold; having a CE option in such a case could easily be worth many trillions of dollars.<sup>13</sup>

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<sup>4</sup> John Latham, et al., *Global Temperature Stabilization via Controlled Albedo Enhancement of Low-Level Maritime Clouds*, PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY 3969 (2008).

<sup>5</sup> Keith Bower, et al., *Computational Assessment of a Proposed Technique for Global Warming Mitigation via Albedo-Enhancement of Marine Stratocumulus Clouds* 82(1-2) ATMOSPHERIC RESEARCH 328, 329 (2006).

<sup>6</sup> Stephen Salter, Graham Sortino, & John Latham, *Sea-Going Hardware for the Cloud Albedo Method of Reversing Global Warming*, 366 PHIL. TRANSACTIONS ROYAL SOC'Y 1 (2008).

<sup>7</sup> *Id.* at 1,2.

<sup>8</sup> Alan Robock, et al., *The Benefits, Risks, and Costs of Stratospheric Geoengineering*, 36 GEOPHYSICAL RESEARCH LETTERS 4-7 (2009).

<sup>9</sup> Paul J. Crutzen, *Albedo Enhancement by Stratospheric Sulfur Injections: A Contribution to Resolve a Policy Dilemma?* 77(3-4) CLIMATIC CHANGE 211, 213 (2006).

<sup>10</sup> THE ROYAL SOCIETY, *supra* note 72, at 31.

<sup>11</sup> Bickel and Lane, *supra*, note 71, Table 1.7 at 40.

<sup>12</sup> *Id.* Table 1.9 at 41.

<sup>13</sup> J. Eric Bickel, *The Climate Engineering Option: Economic and Political Implications* AMERICAN ENTERPRISE INSTITUTE at

<http://www.aei.org/docLib/Bickel%20paper-The%20Climate%20Engineering%20Option.pdf>.

U.S. direct benefits would, of course, be only a fraction of the global totals. Indeed, they might be less than 10% of that amount, but a small fraction of a big number can still matter. Then, too, CE might lessen U.S. spending on foreign ‘humanitarian emergencies’. Also, the United States might reap some indirect gains from CE. These could occur because of greater global prosperity or because strategic allies such as India might avoid harm from climate change.

Against these possible gains, though, U.S. policy makers must weigh the risk that CE might trigger costly side effects. Scientists have raised a number of fears. An R&D effort into CE should thoroughly study these risks, and no doubt, if one takes place, it will do so. Still, it is very doubtful that the costs of the side effects that have been identified so far are as big as CE’s potential benefits, let alone that they are bigger. Thus, important unknowns remain, but, for now, we have no evidence that refutes the judgment that CE might add great value to the United States, and the world’s, climate policy portfolio. The case for an R&D effort seems strong — though only actual research and testing can confirm or falsify CE’s apparent promise.

## **Some CE Options Preferable to Others**

Not all CE systems, though, are likely to serve U.S. national interests equally well. It does appear that different CE systems might have disparate impacts on regional patterns of rain and snowfall.<sup>14</sup> Regional disparities imply that even a CE system that yielded large global net benefits might, like climate change itself, bring net losses to some regions.

In any case, it is most unlikely that all parts of the world would reap equal gains. The regimes that govern radio, TV, and remote sensing are concrete examples of systems that yield very uneven results.<sup>15</sup> CE may be another instance of a regime with global net benefits but unequal distribution of those benefits.

Naturally, each state strives to define the rules of global regimes in ways that maximize its own interests. Those states with the most power and the strongest preferences over a given policy realm tend to play the biggest role in shaping the rules, if any, that govern it. With regard to CE, every world power will try to mold the system to its own benefit. The United States, too, in building regimes has acted in its own enlightened national self-interest. Presumably, it would do so again in the case of CE.

To do so, it should start by building a strong base of knowledge about CE. Its foreign policy should, therefore, seek to quash actions that might impede that learning process. If

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<sup>14</sup> Katharine L. Ricke, M. Granger Morgan & Myles R. Allen, *Regional Climate Response to Solar-Radiation Management*, NATURE GEOSCIENCE LETTERS 2, 2010 at <http://www.nature.com/ngeo/journal/v3/n8/full/ngeo915.html> .

<sup>15</sup> Stephen D. Krasner, *Global Communications and National Power: Life on the Pareto Frontier*, in POWER, THE STATE, AND SOVEREIGNTY: ESSAYS ON INTERNATIONAL RELATIONS 152 (Stephen D. Krasner ed., 2009).

CE proves viable, either the United States or some other power is likely eventually to wish to deploy it. In that case, each world power will need to accommodate to some degree the divergent interests of all the others. Building an international regime to govern, first, large-scale testing and then deployment might be a way to lower the transaction costs of reaching the needed concord.

## **Need to Preserve U.S. Freedom of Action**

Despite CE options' great potential worth, some interests are striving to use international law as a means of blocking its development. Much of this effort starts from the predicate that GHG control is ethically superior to CE.<sup>16</sup> While CE opponents espouse their views quite passionately, the fact remains that the United States has good reasons for wishing to preserve its freedom of action on CE.

First, we lack the knowledge that would be needed to govern CE wisely. CE's regional level effects remain opaque. Then too, new CE concepts may emerge in time, and combined approaches might avoid pitfalls that threaten simple ones. Unknowns abound. The shape of the future bargaining space also remains obscure. What sticks and carrots might states reach for in the face of disputes? We can only guess. What will be Russia's, or China's, or India's preference over global climate in 2050? These states' current rulers may have no more insight into their successors' preferences than we do. In the face of such great uncertainty, rules must either be hopelessly vague, or risk distorting future research and policy choices. The one choice would be a waste of time; the other positively harmful.

Second, there seems little reason for haste. Last year the House Science and Technology Committee found that "There is virtually no federal funding explicitly dedicated to 'climate engineering' or 'geoengineering' research."<sup>17</sup> A few small scattered projects are funded in the private sector or in Europe. Even among these projects some of the 'research' involves speculating about ethics, governance, and law. This work may be more accurately seen as trying to block CE than it is to advance it.

Third, if the US wished to impede other states research into CE, and there is no sign that it does, new formal rules might not add much to its ability to do so. The U.S. government, while relatively less powerful than it once was, still commands a vast array of hard and soft power. It plays a leading role in many global institutions, and its alliance system, though weakened, is still far flung. Thus, the US already wields hefty bargaining power with which it might sway other states conduct on CE. This judgment will be all the stronger if the new anti-CE strictures of the Convention on Biological Diversity, to which the United States is not a party, impede other countries' research in this field.

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<sup>16</sup> DIANA BRONSON, PAT MOONEY, & KATHY JO WETTER, RETOOLING THE PLANET? – CLIMATE CHAOS IN THE GEOENGINEERING AGE 34 (2009).

<sup>17</sup> COMMITTEE ON SCIENCE AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES, 111<sup>TH</sup> CONGRESS SECOND SESSION, *Engineering the Climate: Research Needs and Strategies for International Coordination* p iii (October, 2010).

Fourth, the United States probably also has more to lose from global rules than do other states. United States climate research capacity is the greatest in the world; so with equal restrictions or information sharing the United States may give up more than it gets in return. Also, U.S. civil society is notoriously litigious. Its courts are both independent and powerful. The governments of China and Russia are unencumbered by such restraints. At the same time, the absence of a free press leaves them great latitude to act covertly. Accords with such states are of little value without technical means to ensure compliance. Such means do not exist with regard to the early stages of developing and testing CE; hence, in any early CE agreement with such states, the United States would be trading its own hard-to-evade pledge for one that the other parties might far more readily bend or break.

## **Principles for Future Regime Building**

If the United States, or some other state, someday, decides that it wishes to deploy CE, affairs would alter. Any state or states seeking to deploy CE, or even to test it at large scale, would have a motive for trying to reconcile all bona fide world powers to its actions. To do so, the would-be climate engineers might seek to build a ‘regime’ to govern the CE system. Regimes can sometimes lower the transaction costs of composing states’ conflicts about how a technology or issue should be governed. Regimes consist of accords on common assumptions, principles, rules, and procedures.

At present, only preliminary guesses are possible about the shape of a future CE regime. One thing, though, is clear; all regimes, to be both stable and effective, must be in harmony with the features of the technology that they govern and the major states’ relative power and preferences over those technologies.

About the latter, we can as yet know only a little, but the cost structure of CE allows a few guesses about how it might be governed. For one thing, as mentioned above, the engineering costs of CE are so slight that they create little need to spread costs among many states.

Conversely the transaction costs of governing CE may be high. Operations are likely to give rise to much new knowledge. In response, managers will want to adjust the system. Countries’ expectations and interests, though, may continue to differ; so the bargaining costs could be high. High transaction costs argue for governance by a relatively few powerful states; the more states are involved, the higher such costs are likely to be. And other regimes have tended to evolve toward structures that allow lower transaction costs and less transparency.<sup>18</sup>

Other concerns may, however, suggest adding a small number of mid-sized regional powers. This step might add legitimacy to the regime. Greater legitimacy may in turn

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<sup>18</sup> DANIEL W. DREZNER, *ALL POLITICS IS GLOBAL: EXPLAINING INTERNATIONAL REGULATORY REGIMES*, (2007).

lessen outside resistance and lower transaction costs between regime managers and the rest of the world.

Finally, it should be patent that the UNFCCC is wholly unsuited to governance of CE. It involves far too many states; worse, its membership is rife with corrupt kleptocracies. Such governments have sought to use climate change as a vehicle for extorting added foreign aid, and they use foreign aid largely as a means of cementing their own hold on power. Granting such rulers veto power over CE would serve neither the interests of their own populations nor that of the United States.

One might note in passing that the UN Security Council would be no better. It lacks the needed technical support. Its agenda is packed; its dealings are charged with vitriolic great-power rivalries, and it functions in the limelight. Rising world powers such as India and Brazil are excluded; yet it seats not one, but two, European *ci devant* great powers; neither of which is going to give up its place. Voting is weighted in only a very limited way. All these features are the exact opposite of the ones needed to govern CE.

## **Conclusion**

To sum up, CE may someday be of great use to the US and to the world. For now, conceding any of America's freedom of action to explore the concept would imperil that promise. And it would offer little gain in return. Of course, most of the interests now trying to subject CE research to international control seek not to understand the option — but to bury it. For these interests, UN control of CE would be an ideal outcome. Should they succeed, the U.S. climate policy debate would be condemned to continue what is, for both sides, a needlessly risky policy impasse.

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