Geoengineering by coalition

February 21 2013

Solar geoengineering is a proposed approach to reduce the effects of climate change due to greenhouse gasses by deflecting some of the sun's incoming radiation. This type of proposed solution carries with it a number of uncertainties, however, including geopolitical questions about who would be in charge of the activity and its goals.

New modeling work from Carnegie's Katharine Ricke and Ken Caldeira shows that if a powerful coalition ever decided to deploy a geoengineering system, they would have incentive to exclude other countries from participating in the decision-making process. Their work is published by *Environmental Research Letters* and is available online.

Carbon dioxide emissions from the burning of coal, oil, and gas have been increasing over the past decades, causing the Earth to get hotter and hotter. Large volcanic eruptions cool the planet by creating lots of small particles in the stratosphere, but the particles fall out within a couple of years and the planet heats upagain. The idea behind solar geoengineering is to constantly replenish a layer of small particles in the stratosphere, mimicking this volcanic aftermath and scattering sunlight back to space.

"Attempts to form coalitions to reduce greenhouse gas emissions have repeatedly hit the wall, because it's difficult to get everybody to participate in a substantive and meaningful way," Ricke said. "Members of coalitions to reduce emissions have incentives to include more countries, but countries have incentives not to participate, so as to avoid costs associated with emission reduction while benefiting from reductions made elsewhere."

But a game-theoretic model developed by Ricke, Caldeira, and their colleague Juan Moreno-Cruz from the Georgia Institute of Technology showed that when it comes to geoengineering, the opposite is true.

Smaller coalitions would be more desirable to the participants, not less, because those members could set the target temperature to their liking without having to please as many parties. Likewise, countries that aren't included in the coalition would actually want to join so that they could move the thermostat, so to speak, in the direction that better suits their interests. Since the costs of geoengineering are so much lower than mitigation, once a coalition has formed and has successfully implemented geoengineering, it would have an incentive to exclude permanently other willing participants.

"My view, aside from any technical result, is that it should remain a central goal to maintain openness and inclusiveness in geoengineering coalitions, so that all people who want a voice in the decision-making process are able to have that voice," Caldeira said.

Provided by Carnegie Institution for Science