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TECHNICAL
REPORT

Governing Geoengineering Research

A Political and Technical Vulnerability Analysis of Potential Near-Term Options

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Summary

Geoengineering—the deliberate altering of the earth's climate—represents a risky and, for many, a frightening proposition. But the concept has attracted increasing interest in recent years because of its potential ability to significantly transform the portfolio of options for limiting the magnitude of future climate change. In contrast to most approaches for reducing greenhouse gas emissions, some geoengineering approaches could prove fast acting and inexpensive and could be deployed by one or a small number of nations without global cooperation. These characteristics present significant challenges for risk management, national security, and international governance that have only just begun to be seriously considered.

This report provides an initial examination and comparison of the risks associated with alternative international approaches the United States might pursue to governing solar radiation management (SRM) geoengineering. To handle the extensive, wide-ranging uncertainties, we employ a vulnerability-and-response-option analysis decision framework. Specifically, we identify scenarios in which alternative U.S. policies toward geoengineering governance might fail to meet their goals and suggest how alternative policies might reduce those vulnerabilities. The report implements this approach using a simple simulation model to conduct the first steps of a robust decisionmaking (RDM) analysis. The analysis identifies some of the risks of three commonly debated near-term approaches to managing geoengineering research: establishing strong norms for research, banning research entirely, or leaving research unregulated.

This report aims to serve three purposes. First, it demonstrates the potential ability for a risk analysis based on a vulnerability-and-response-option analysis framework to inform the debate on geoengineering. Second, it helps define the steps needed to conduct a full RDM analysis to address such governance issues. Third, it provides some intriguing, if only suggestive, policy results.

This analysis compared three alternative policies the U.S. government might pursue regarding near-term geoengineering governance. The report focuses on SRM technologies because these technologies offer the full range of characteristics that make geoengineering both so alluring and dangerous: possibly fast acting, potentially relatively inexpensive, and likely to cause global consequences from even unilateral action.

Under Strong Norms, the U.S. government would encourage the establishment of international norms to govern geoengineering research. Under Ban, the United States would promote a prohibition on any geoengineering research. Under No Norms, the United States would actively discourage the formation of norms governing research. A comparison of the performance of these three strategies across many plausible future states of the world suggests that, if U.S. policymakers believe that some type of SRM technology is possible, they ought to prefer the Strong Norms policy to No Norms or Ban. Under such conditions, this option outper-

forms the alternatives because it increases the likelihood of a successful deployment in those cases in which geoengineering proves useful. It also reduces the likelihood of failed deployments by nations struggling to respond to serious climate impacts.

If U.S. policymakers believe that no SRM geoengineering technology is likely to succeed, they might prefer the Ban or No Norms policy to Strong Norms. The Ban policy appears the better of the two if policymakers believe that climate change is highly unlikely to prove catastrophic. Under such conditions, this option reduces the risks of overconfidence—deploying a geoengineering system that passes its tests but fails in practice. This option also increases the likelihood of reaching an international agreement to reduce greenhouse gas emissions.

In contrast, U.S. policymakers might prefer No Norms to Strong Norms or Ban if they believe that SRM technologies are unlikely to work but that climate change could prove catastrophic. Under such conditions and a Ban policy, some other nation might defy the prohibition, test, and then deploy a SRM system that subsequently fails. The absence of research norms might lead to uncoordinated tests by several nations, undermining the ability to learn from any test. Thus, in this case, the absence of research norms might prove more effective than the Ban at preventing unsuccessful geoengineering deployments under dire circumstances.

Many caveats attend these initial results. The analysis considers only a small set of the options available to the U.S. government. The report focuses only on the decisions of national governments and does not explicitly consider the choices of private firms and other nongovernmental actors that might influence the evolution of geoengineering policies. A more-complete RDM analysis with an enhanced simulation model would likely suggest additional vulnerabilities beyond those identified here and likely identify ways to ameliorate at least some of them. However, this report does demonstrate an approach to risk analysis under conditions of deep uncertainty that, in an expanded form, could help U.S. policymakers develop and evaluate robust policies toward geoengineering governance. The study also offers some initial insights about the future conditions under which alternative approaches for governing geoengineering research might not perform as expected, provides some initial suggestions regarding the trade-offs among such strategies, and describes next steps that could result in a more-complete assessment of the trade-offs among alternative near-term policies for managing the risk and opportunities of geoengineering.