



Highlights of [GAO-10-546T](#), a testimony before the Committee on Science and Technology, House of Representatives

Why GAO Did This Study

Key scientific assessments have underscored the urgency of reducing emissions of carbon dioxide to help mitigate potentially negative effects of climate change; however, many countries with significant greenhouse gas emissions, including the United States, China, and India, have not committed to binding limits on emissions to date, and carbon dioxide levels continue to rise.

Recently, some policymakers have raised questions about geoengineering—large-scale deliberate interventions in the earth’s climate system to diminish climate change or its potential impacts—and its role in a broader strategy of mitigating and adapting to climate change.

Most geoengineering proposals fall into two approaches: solar radiation management (SRM), which offset temperature increases by reflecting a small percentage of the sun’s light back into space, and carbon dioxide removal (CDR), which address the root cause of climate change by removing carbon dioxide from the atmosphere.

Today’s testimony focuses on GAO’s preliminary observations on (1) the state of the science regarding geoengineering approaches and their effects, (2) federal involvement in geoengineering activities, and (3) the views of experts and federal officials about the extent to which federal laws and international agreements apply to geoengineering. To address these issues, GAO reviewed scientific literature and interviewed federal officials and scientific and legal experts.

View [GAO-10-546T](#) or [key components](#). For more information, contact Frank Rusco, at (202) 512-3841 or ruscof@gao.gov.

CLIMATE CHANGE

Preliminary Observations on Geoengineering Science, Federal Efforts, and Governance Issues

What GAO Found

Substantial uncertainties remain on the efficacy and potential environmental impacts of proposed geoengineering approaches, because geoengineering research and field experiments to date have been limited. GAO’s review of relevant studies and interviews with experts to date found that relatively few modeling studies for SRM approaches have been published, and only limited small-scale testing—primarily of carbon storage activities relevant to CDR approaches—have been performed. Consequently, the experts GAO spoke with stated that a sustained effort of coordinated and cooperative research would be needed to determine whether proposed geoengineering approaches would be effective at a scale necessary to reduce temperatures and to attempt to anticipate and respond to potential unintended consequences—including the political, ethical, and economic issues surrounding the use of certain approaches. Specifically, just as the effects of climate change in general are expected to vary by region, so would the effects of certain large-scale geoengineering efforts, therefore, potentially creating relative winners and losers and thus sowing the seeds of future conflict.

Federal agencies have funded some research and small demonstration projects of certain technologies related to proposed geoengineering approaches; but these efforts have been limited, fragmented, and not coordinated as part of a federal geoengineering strategy. Officials from interagency bodies coordinating the federal response to climate change stated that their offices (1) have not developed a coordinated research strategy, (2) do not have a position on geoengineering, and (3) do not believe is it necessary to coordinate efforts due to the limited federal investment to date. In the event that the federal government decides to expand geoengineering research, GAO’s interviews with experts suggest that transparency and international cooperation are key factors for any geoengineering research that poses a risk of environmental impacts beyond our borders. Further, GAO’s past work indicates that a comprehensive assessment of costs and benefits that includes all relevant risks and uncertainties is a key component in strategic planning for technology-based research.

According to legal experts and federal agency officials, some existing federal laws and international agreements could apply to geoengineering research and deployment. However, some federal agencies have not yet assessed their authority to regulate geoengineering, and those that have done so have identified regulatory gaps. Although legal experts have identified some relevant international agreements and parties to two agreements have taken actions to address geoengineering, it is not certain whether and how other agreements would apply. Most scientific and legal experts GAO spoke with distinguished the governance of research from governance of deployment and noted that governance of geoengineering research with transboundary impacts, such as SRM approaches, should be addressed at the international level in a transparent manner and in consultation with the scientific community. However, the experts’ views on the details of governance varied.