Understanding the Difference Between Weather Modification and Solar Geoengineering

The Alliance for Just Deliberation for Solar Geoengineering
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Despite sharing some similarities in potential outcomes, weather modification and solar geoengineering differ significantly in their objectives, origins, methods, and potential impacts. This fact sheet aims to provide clarity by offering an overview of weather modification and distinguishing it from solar geoengineering. By understanding the nuances between these similar yet distinct approaches, stakeholders can better navigate discussions in these evolving areas.

CATEGORY	WEATHER MODIFICATION	SOLAR GEOENGINEERING (SRM)
AIM	Enhance precipitation, mitigate severe weather, manage water resources	Reduce the temperature increase and some associated impacts caused by climate change
ORIGINS	Mid-20th century with early experiments in cloud seeding to enhance precipitation	Conceptualized in recent decades, techniques mimicking natural phenomena; limited outdoor research
METHODS	Cloud seeding (e.g., silver iodide, salt particles) is used to enhance precipitation, disperse fog or suppress hail	Stratospheric aerosol injection (SAI) and marine cloud brightening (MCB) are the most prevalently researched methods to increase the amount of sunlight reflected back into space
SCALE	Typically localized to regional areas affected by specific atmospheric conditions	While deployment of SAI would inherently be planetary scale and MCB is a more localized approach, both methods could have potential global impacts that require coordinated international efforts
STATUS	Active implementation in over 50 countries; ongoing research and experimentation	Mostly theoretical; limited real-world understanding due to ethical concerns and research limitations
POTENTIAL IMPACTS AND RISKS	Possible unintended consequences include localized environmental impacts (e.g., air quality, ecosystems), disrupting weather patterns, exacerbating extreme weather events	Potential risks include environmental and ecological impacts (e.g., ozone depletion, disruption of precipitation patterns), geopolitical and social impacts
EFFECTIVENESS	While cloud seeding has been used for decades, its effectiveness is difficult to measure, largely depends on atmospheric conditions, type of clouds and techniques used	Efficacy to reduce global temperatures is high; while other impacts have uncertainty, SG could potentially limit some risks of crossing climate 'tipping points' and other climate change harms
EXAMPLES OF FIELDWORK/ DEPLOYMENT	Use of cloud seeding has taken place in Australia, China, United Arab Emirates, United States, and many other countries	No at-scale deployment; proposed research projects and field experiments (e.g.: Make Sunsets, Great Barrier Reef Marine Cloud Brightening and University of Washington MCB experiment)

Existing Governance

International weather modification governance:

Weather modification lacks comprehensive international governance frameworks, leading to a patchwork of regulations and guidelines at the national and regional levels. The World Meteorological Organization (WMO) provides guidance and recommendations on the scientific and technical aspects of weather modification practices. The organization promotes research, collaboration, and the exchange of information among member countries to advance understanding of weather modification techniques, their potential impacts, and best practices for their implementation.

National/state weather modification governance:

Some countries have established regulatory bodies to oversee weather modification activities and ensure adherence to safety and environmental standards. In China, for example, weather modification activities are regulated by the China Meteorological Administration (CMA) Weather Modification Center. In Australia, regulation of weather modification is managed by each state. The State of New South Wales (NSW), for example, Snowy Mountains Cloud Seeding Act of 2004 requires cloud seeding activities to be reported to NSW Environment Protection Authority (EPA) and relevant Ministers. In the United States, the Weather Modification Reporting Act of 1972 "requires that all persons that conduct non-Federal weather modification activities within the United States or its territories report such activities to the U.S. Secretary of Commerce at least 10 days prior to and after undertaking the activities." The weather modification activities to be reported include **cloud seeding** and is now being applied to **solar geoengineering**.

International solar geoengineering governance:

While solar geoengineering remains largely theoretical with limited outdoor experimentation due to its complex and controversial nature and potential risks, research is quickly developing and private initiatives are gaining interest in this field. However, solar geoengineering currently lacks a robust policy framework on national or international scales. There are some existing global treaties or conventions that may apply to some aspects of solar geoengineering, but the lack of comprehensive regulation leaves a significant governance gap that needs to be addressed. Examples of existing governance that could be applied to solar geoengineering include the United Nations Convention on Biological Diversity (CBD) which issued a de facto moratorium on geoengineering activities that may affect biodiversity "(…) until there is an adequate scientific basis on which to justify such activities (…)". Other international legal instruments, such as the United Nations Convention on the Law of the Sea (UNCLOS), only apply to MCB. The Vienna Convention on the Protection of the Ozone Layer and the 1987 Montreal Protocol. on the other hand, could be applicable to SAI because of its potential harm to the ozone layer. Additional international bodies are starting to engage with solar geoengineering in recent years, including the United Nations Environment Program, the UN Human Rights Council and United Nations Educational, Scientific and Cultural Organization (UNESCO).

Conclusion

Given the (often overlapping) risks of both weather modification and solar geoengineering, effective communication and governance is crucial to ensure ethical, transparent, and informed decision-making. As we navigate the complexities of solar geoengineering, understanding the key differences between these approaches will be critical. Efforts around capacity building and science-based communication are paramount to ensure responsible and informed stakeholders as we continue to work towards the well-being of present and future generations and the sustainability of our planet.