Geopolitics of geoengineering

To the Editor — The report on geoengineering the climate by the Royal Society[1] acknowledges that the deleterious impacts of climate change will be unevenly distributed across the planet. Similarly, the beneficial and detrimental effects of geoengineering will not be evenly spread. This raises several key issues for governance. Like climate change, geoengineering might diminish the availability of key resources such as water — needed for human consumption, renewable energy and terrestrial productivity — at the regional scale, thereby increasing the potential for conflict between nations. Specifically, injection of sulphur aerosols into the stratosphere[2] could result in droughts, as seen following volcanic eruptions[3], and sustained fertilization of the oceans with iron could reduce productivity of fisheries[4].

Determining the cause of diminished resources will be difficult and contentious, as multiple factors, including natural climate variability and climate change, could be involved. For instance, the recent and unprecedented onset of upper ocean oxygen deficits within the boundaries of a key fishery — the California current — was attributed to the effects of climate warming[5], but sustained ocean fertilization could have the same effect[6]. Disentangling these effects will become increasingly complex if multiple geoengineering approaches, which operate on different timescales and either reduce incoming solar radiation or capture and store carbon, are adopted[7]. The Royal Society report[1] covers some of these issues, such as the non-uniformity of the side-effects of geoengineering on the climate system, and the legality of geoengineering proposals. But a more in-depth analysis of these broader international issues must be conducted, sooner rather than later, before we can even consider purposefully counteracting climate change.

A key concern is the scale on which geoengineering strategies, both for solar radiation management and carbon removal proposals, are used. Stratospheric sulphur injection and ocean fertilization would need to be adopted on a large scale and sustained over long periods of time if they are to have any globally significant effects[4,6]. But it is the very scale and longevity of these schemes that makes regionally heterogeneous side effects more likely, and the potential for discord between nations more real. The unintended dispersal of geoengineering agents[4] will only exacerbate the problem. For instance, ocean circulation will rapidly disperse modified surface and subsurface waters[4], which may be depleted in both nutrients[4] and oxygen[6] owing to fertilization-driven increases in productivity and carbon export. Such low-quality waters could infiltrate marine exclusive economic zones.

The opportunity for participation is another concern when it comes to the widespread acceptance of individual geoengineering techniques. More replicable schemes, such as atmospheric carbon capture using large numbers of identical artificial trees, can be adopted widely by many nations, whereas other geoengineering schemes, such as the injection of aerosols into the stratosphere, can be implemented by one nation, with global repercussions. Such factors present useful points of difference that, along with a ranking of scientific issues[7], may influence jointly which schemes warrant research investment in the coming decade.

The potential for conflict over the sharing of environmental resources is not new, and there are many instances of international disputes over fishery boundaries or the diversion of major water resources for irrigation. But such conflicts are likely to increase with climate change, as additional environmental issues — such as a reduction in food security and an increase in the frequency of hazards — become more likely. Furthermore, the tone of international disputes could well change if linked to geoengineering — which is essentially aimed at protecting the planet. Nevertheless, minimizing the potential for conflict between nations as a result of geoengineering must be taken into account when considering the focus for future research. ❐

References

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