CORRESPONDENCE:

Field tests of solar climate engineering

To the Editor — The international community has declared climate change a 'common concern of humankind'[1,2]. Therefore, the development of 'climate engineering' (also known as geoengineering) techniques that aim to modify the global climate requires international cooperation on their governance. Some CO_2 removal technologies — such as ocean fertilization, which aims to stimulate primary production by adding iron or other nutrients to surface waters to draw down additional CO_2 — have already moved to the field-test stage and are being addressed under international law. However, governance for possible future testing of solar climate engineering technologies that attempt to block incoming sunlight is inadequate at present. Nonetheless, several proposals have recently been put forward that call for field testing of these technologies soon[3–5]. All of these proposals acknowledge a need for some form of governance, such as national oversight by funding bodies, but they also share a common supposition that small-scale testing should proceed even in the absence of further international agreement. However, there are strong reasons to refrain from such testing until some form of international cooperation on climate engineering has been established.

There is no urgent need to explore the feasibility and risks of solar climate engineering technologies through field tests now, as there is still much to learn from modelling, imperfect natural analogues and laboratory work. Contrary to what Victor *et al.*[5] argue, proponents have failed to provide clear and cogent evidence for their claim that it is particularly imperative for research to move on to the next stages, including field trials in the upper atmosphere. Such trials are particularly controversial and unprecedented. Moving on to outdoor experimentation in a still nascent and contentious debate without a clearly identifiable immediate need for such knowledge means risking unnecessary confrontation and polarization.

Advocates of field testing point to the negligible effects that a small-scale experiment would have on the physical environment[4]. However, the limited physical risks are not the central concern with small-scale field tests. This is what sets climate engineering apart from the historical case of developing governance for recombinant DNA (rDNA) technology during the 1970s in the USA, which is sometimes cited as an analogous debate. Here, scientists developed a system of self-governance with laboratory precautions and safety standards, successfully avoiding the imposition of external rules (between 1976 and 1979, the US Congress failed to pass 12 bills for transitioning the system of self-governance to one that included elements of external regulation). However, this was only possible because the risks of rDNA technology were framed as being purely technical and, as a consequence, entirely amenable to management by technical experts. In stark contrast to this, adequate governance for climate engineering research needs to be developed primarily to address societal concerns, which have figured prominently from the start of the debate. As Parson and Keith[4] note, these concerns cannot be addressed legitimately through self-governance by the scientific community.

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Adequate governance for climate engineering research would include, as rightly pointed out by Parson and Keith[4], transparency, a registry of projects with advance notice, compliance with relevant regulations, public consultation and public disclosure of results. But developing these norms in a national context — as suggested by Morgan *et al.*[3] — is not sufficient. Given that there is no such thing as 'local climate', there is a strong common interest in fostering a culture of international cooperation and transparency in the understanding of these technologies from the outset. As a starting point, this could be achieved through the establishment of an international voluntary code of conduct, which could cover some of the issues and gaps in climate engineering governance that cannot be addressed solely at the national level, and that would bestow legitimacy for research through state backing.

Finally, there is no deadlock on climate engineering governance and no evidence of a "widespread but quietly expressed" wish within the larger scientific community "to reject any new controls on research"[2]. Quite the contrary, given the near-universal agreement within the Convention on Biological Diversity[6] on climate engineering as well as the existing resolutions and further negotiations within the London Convention and Protocol[7]— there is a good chance that further progress on solar climate engineering governance can be made in the next few years. Parson and Keith[4] already point to the current window of opportunity for international cooperation. However, such collaboration should be in place before field tests commence.

For these reasons, it is responsible and prudent that scientists voluntarily refrain from conducting field tests of solar climate engineering until their need is clearly established, and until an international code of conduct or similar cooperation between governments is in place. Without sufficient public trust in its governance, rushing ahead now, even with conducting environmentally benign field tests, could cause a regulatory backlash — not only against future climate engineering research, but also against atmospheric experiments more broadly. ❐

References

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