Last month's report on solar geoengineering research from the White House Office of Science and Technology Policy (OSTP) consolidated a shift in the discourse on this controversial technology. Over recent years advocates for more research have increasingly adopted a 'risk-risk' framing. As Gernot Wagner puts it in 'Geoengineering: the Gamble': "The decision is all about risk-risk tradeoffs". He urges us to put the risks of potentially pursuing solar geoengineering against "the risks of unmitigated climate change."

The National Academy of Sciences adopted a 'risk-risk' framing in its 2021 report. So too did the UN Environment Programme earlier this year. And the same framing now features centrally in the OSTP report. Here it is often linked to a concern that continued climate change might trigger irreversible tipping points in the climate system. In the abstract, one might think it simple common sense to assess a poorly understood and potentially risky technology in the context of the risks it hopes to mitigate. But the risk-risk framing forms part of an increasingly polarised solar geoengineering debate. A proposal for a non-use agreement has provided a lightning rod for dispute. Advocates of research and opponents of deployment each accuse the other of bad faith interventions.

Contending over geoengineering risks

In this setting advocates arguing for more research use the risk-risk framing much more than opponents. Intentionally or not, this move rejects concerns that the risks of solar geoengineering might be so great as to remove it from consideration. Moreover, emphasizing 'risk-risk' tradeoffs implies that opponents either overestimate the risks of geoengineering or underestimate the risks of climate change, or both.

At an extreme, invoking existential risks from climate change, and a possibility to mitigate them with solar geoengineering, such advocacy implies only one conclusion. Considering, or even actively pursuing, geoengineering might seem especially reasonable if the climate risks in the 'risk-risk' tradeoff include tipping point concerns (as in the OSTP report). But it remains hugely uncertain whether tipping points could really be avoided through geoengineering. Moreover there are also plausible scenarios in which pursuit of geoengineering itself could underlie catastrophic risks, for instance as a trigger for nuclear conflict. This makes such a conclusion much less clear cut.

Give the polarised nature of geoengineering debate, we should carefully interrogate the adoption of a 'risk-risk' assessment approach using a climate change context. A more conventional 'risk-benefit' analysis of geoengineering – such as that by the Royal Society back in 2009 – already attends to climate risks, insofar as they are affected by

geoengineering. So what's new? The risk-risk framing perhaps helpfully emphasizes climate change risks, which have long seemed under-estimated in policy responses. But what more does the move from risk-benefit to risk-risk do? And does that make it a positive shift, or raise different concerns?

Balancing risks is tricky

Implications of the new 'risk-risk' framing

I see two particularly worrying implications. First the risk-risk frame tends to imply that the *only alternative* to climate harms is solar geoengineering. This would be a false duality, despite the rapidly depleting carbon budget for 1.5°C. Some advocates argue that solar geoengineering is essential to hold temperature rises to 1.5°C. But such a conclusion depends on debatable presumptions about the feasibility of rapid social change, carbon removal techniques and the acceptability of temporary temperature overshoot. We should not exclude alternative pathways to 1.5°C from assessment, even if they might involve other risks and harms. Worse, some but not all of the risk-risk framings (like Wagner's) suggest

(perhaps unintentionally) that the alternative to solar geoengineering is *unmitigated* climate change, as if no further emissions reduction or adaptation can be foreseen.

Second, the risk-risk framing, setting assessment in terms of climate risks, *excludes other logics for geoengineering*. In other words it ignores the prospect that countries might deploy or avoid solar geoengineering for reasons other than seeking to reduce climate change. To research advocates, steeped in climate science, it might appear obvious that climate change would be the logic.

But to security experts, and students of political science, geoengineering appears as a hybrid, dual-use security technology. Its deployment might involve *climate-related* goals, but that could merely mean masking impacts enough to justify continued exploitation of fossil fuels for geopolitical reasons. The risk equation in a world of high continued emissions, masked by solar geoengineering, could look very different from one where an idealized intervention helps 'shave the peak' of emissions related temperature rises. The implications of geoengineering initiated, or manipulated as a security intervention for relative national advantage might look very different again

Broader concerns about 'risk' as a key measure

The risk-risk framing further consolidates a discourse that presumes the key is 'risk' rather than 'uncertainty'. This too can be problematic. 'Risk' is understood as exposure to danger or loss – an inherently undesirable thing. But it also implies a level of knowability and calculability that might simply not exist in this space. Conventional approaches calculate *risk* as the product of *likelihood*, *exposure* and *impact*, but for many climate and geoengineering outcomes, all of these factors can be deeply uncertain. The dangers inherent in treating something as a *calculable* risk can fall in either direction. Analysts might overlook entirely plausible, yet unquantifiable impacts. Or false confidence in the scale of the threat might justify undemocratic, and inequitable responses, as seen in many national responses to threats of terrorism.

Risk framings also suggest particular approaches to climate justice. They demand consideration of exposure, and often also vulnerability. But they focus on the aggregate numbers exposed to the hazard, and tend to treat these conditions as natural circumstances rather than a consequence of social or economic factors. Thus a risk framing can help policy makers better consider who is exposed and vulnerable to climate impacts. But it might also distract their attention away from the processes by which vulnerability and exposure are generated – for example through building on floodplains, or through economic processes

generating precarity.

Making “risk-risk” useful

Given these problems, and the polarised context, can we rescue risk-risk analysis and make it productive for climate policy? Or should we be objecting to its dominance in the debate? The answer will probably depend on whether advocates for risk-risk analysis can separate themselves from deliberate efforts to distort debate, and recognise and correct the possible unintended distortions arising in the risk-risk framing.

If we assume good faith desire to avoid dangerous climate change in line with social justice (claims seen on both sides of the debate), then there is no inherent reason why a risk-risk analysis would be inappropriate. But it would have to address the problems described above.

The analysis should start from a clear definition, and identify exactly which additional climate risks might be plausibly averted by geoengineering. It should consider the risk that attention given to geoengineering might itself distract from effective timely mitigation. It would need to consider a broad range of risks, including geopolitical ones. And an equally broad range of scenarios including competing deployments, not just idealised (and impractical) designs that minimise the impacts of climate change.

In this context the analysis would need to examine the distribution of the risks on both sides of the ledger. It should take account of whether those facing the worst of the risks have most say in whether those risks are acceptable. And it should consider the extent to which the scenarios involved might increase vulnerability, or build resilience.

Risk-risk in the OSTP report

How does the OSTP report stand in relation to these challenges? It puts environmental justice to the fore, with reference to both domestic and international distribution of risks and benefits. However it does rather falls into the trap of treating vulnerability as an exogenous factor. Similarly it emphasizes the need for a broad range of scenarios. But it puts more emphasis on diverse climate responses than on the social and political context. Nonetheless it includes more than climate risks, stressing the moral and ethical dimensions of decision making on solar geoengineering. But despite highlighting geopolitical risks it merely encourages, rather than demanding international cooperation and suitable research governance.

The report avoids the worst of the false duality, urging comparison of risks and benefits in "scenarios involving the use of SRM" with those "associated with plausible trajectories of ongoing climate change not involving SRM." Unfortunately, it doesn't specify those 'plausible trajectories' at this point. Although it asserts the primacy of emissions reduction, it fails to address the risks of mitigation deterrence in any detail. In discussing environmental justice the report mentions a concern that "the potential benefits to frontline communities of SRM could be reduced if it is used as a substitute for, or reduces, mitigation through emission reductions," but not the need for risk assessment and scenarios to include the possibility of such substitution.

Conclusions

I could say much more about the challenges of designing a just and meaningful risk-risk assessment. But in conclusion I want to note some contrasts between the OSTP report and another recent government announcement. In a statement on climate security the European Commission highlights the risks of geoengineering. It indicates a need for international assessment of the possible implications for security. But the Commission does not deploy 'risk-risk' language. Its approach rather reflects the European risk culture and its often precautionary stance. The context of climate security brings its own problems, but to support wise judgement, such an assessment would need to address a broad range of risks and scenarios. The US helped defeat proposals for an inclusive and collaborative assessment of geoengineering at the UN Environment Assembly in 2019. It would be a shame if differences in framing led to an another such failure today.