

Moral Hazard or Moral Duty? - Repairing the Climate with Greenhouse Gas Removal and Solar Radiation Management

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The IPCC Sixth Assessment Report (AR6)¹ shows human activity warming the climate at a rate unprecedented at least in the last 2,000 years. Each of the last four decades has been successively warmer than any prior decade since 1850, and since 2011, average temperature rise is 1.6°C and 0.9°C over land and ocean respectively. Human-induced climate change is recognised 'with high confidence' as the main cause of the now routine extreme weather events on every continent. Even under low emissions scenarios delivering the target limit of 1.5°C average global warming will be demanding and temperatures may continue rising into the next century. Within the next fifty years sea level is expected to rise about 2 metres if current emissions levels continue. These changes are being driven by radical and rapid increases of the three most important greenhouse gases (GHGs) in our atmosphere. Carbon dioxide (CO₂) concentration is at its highest for two million years, with methane (CH₄) and nitrous oxide (N₂O) at an 800,000 year high. Averting irreversible instabilities in multiple ecosystems and their potentially disastrous effects on humanity requires that the levels of these GHGs be significantly reduced.

The need for deep and rapid emissions reduction, a major issue for COP26, is unarguable. However, the climate has already changed and the evidence is now incontrovertible that emissions reductions alone **cannot** be sufficient to stay within the 1.5°C limit. Additional actions, such as greenhouse gas removal (GGR) and solar radiation management (SRM) that reverse the trends of climate change, are needed.

Some have voiced concerns that GGR and SRM, sometimes referred to collectively as 'geoengineering', might lead to reduced efforts on emissions reduction. This is referred to as the 'Moral Hazard', a term originating in the insurance sector, but latterly applied to a wide range of behaviours where people act more riskily because, if things turn out badly, the negative consequences are borne by others².

Moral hazard became a concern in relation to climate change because fossil fuel producers argued for policymakers to reduce focus on emissions reduction, and instead to shift to hi-tech GGR and SRM approaches (industrial carbon-capture, mirrors in the sky, sulphuric acid in the atmosphere, for example)³⁻⁶. However there is limited evidence of moral hazard in other actor categories. Several studies have indicated a possible 'galvanizing' effect. Participants were generally cautious or hostile towards interventions described as geoengineering, but thought they would be more motivated to reduce their personal carbon footprint if they saw government and industry investing in such research or deployment⁷⁻⁹.

Regardless of progress on emissions reduction many effects of climate change are now locked in. Even the most aggressive emissions reduction scenario considered in AR6 is insufficient on its own to avoid exceeding 1.5°C. Therefore, the unequivocal upshot is that significant SRM and GGR interventions are necessary.

There is an urgent need to extend the scope of existing research on different approaches to GGR and SRM to determine what could safely and beneficially be deployed at scale. SRM techniques, in particular, need careful evaluation for benefits and for any deleterious effects; further studies are essential. There are promising strategies that appear scalable and acceptable. These include cloud brightening over the Arctic ocean to rebuild the increasingly diminished albedo effect from the loss of summer Arctic ice; an example of positive feedback caused by temperature rises in the Arctic Circle being three times higher than the global average,. Broad public engagement is also necessary to determine what constitutes 'acceptable'.

Without appropriate timely research, there is a risk that accelerating climate change, and its unpredictable consequences, will lead to techniques being deployed later, at scale, with a 'hope for

the best' approach. This would be a high-risk strategy to be avoided. From this perspective, Moral Hazard based claims that research on GGR or SRM should not be undertaken for fear of reducing efforts to abate emissions, become a Moral Hazard in themselves; they have the unintended effect of increasing the risks from climate change for present and future generations. If this is the case, rather than downgrading such research for fear of a Moral Hazard impact on emissions reductions, it should be regarded as a Moral Duty, where every available option is explored to avert things turning out badly, with the negative consequences to be borne by others.

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