

The Need for Geoengineering

Robert Tulip

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A false consensus in the climate policy community holds that the world should decarbonise as fast as possible, with net zero emissions as the main climate priority. This widely held opinion allows the avoidable catastrophic risk of climate collapse, and therefore lacks a sound ethical and empirical basis in science, politics and economics. Reversing global warming in the short term requires the current focus on greenhouse gases to be combined with a focus on increasing planetary brightness to restore lost albedo as the top priority. Direct climate cooling can reflect more sunlight back to space and rebrighten the world, commonly known as solar geoengineering. This need for sunlight reflection methods to restore albedo is a complex and sometimes counter-intuitive argument, but one that needs to be understood and debated in academia, mass media and politics, overturning the current near total absence of public discussion, let alone advocacy.

To change the world requires a robust scientific and political realism. That is largely missing from the climate debate, which operates in a fantasy world. Warming is ignored by denialists and misunderstood by decarbonists. Neither denial nor decarbonisation offers a realistic short-term strategy. Realism is about seeing the desirable in the context of the possible. Advocacy will fail unless its goals are politically and technically possible. The question of what is politically possible has to be grounded in scientific realism, combined with complex social judgement to assess alternative scenarios. This lack of political and economic judgement is where the climate debate is deficient, dominated by impossible goals such as the IPCC call to halve emissions by 2030.

In climate policy, the most desirable goals should be about what sort of world we want to have in the future, allied to a realistic path to achievement. Key objectives should include peace, prosperity, stability, rationality, equality, cooperation and biodiversity. Climate policies should be seen as ways to achieve those ethical goals, which are all made more difficult by the systemic disruption from heating. The problem is that it may turn out that none of these high moral goals are actually helped by efforts to speed up the move away from fossil fuels. Theories of change require practical causal logic, but this is missing in climate policy.

To illustrate the delusional rhetoric of progressive climate consensus, consider this recent typical policy statement from a national climate organisation, the Uniting Climate Action Network in Australia: “the solutions we need to solve climate change are in reach, we just need to build a powerful force to urge the government to implement bold, decisive action to phase out fossil fuels and accelerate the transition to a clean energy future.”

Sadly, while politically attractive for building an oppositional movement, and for mobilising government subsidies for renewable energy, this statement lacks any scientific credibility or practicality. The attractions of fossil fuels are far stronger than any potential “powerful force”. Cutting emissions is not a “solution” in the absence of action to increase planetary albedo. It is not “in reach”, especially as the only thing “we just need”. And the “energy transition” does nothing about the committed warming from past emissions which is the main cause of climate change, or about the rapid physical darkening of the world that is now causing a rapid spike in global warming.

At every point, this statement displays the psychological triumph of hope over observation, generating a tactically and strategically disastrous ideology. This statement is typical of sentiments that are widely endorsed and rarely challenged within progressive echo chambers, with challenge often simply dismissed as denial. But who are the real deniers?

Emission reduction is far too small, slow, contested, difficult and expensive to make any difference to temperature in the short term. And unless we can control temperature rise in the short term, all other political goals are impossible. This is a matter of causal sequence. The systemic disruption of higher temperature, if allowed to occur, will undermine all discussion of critical issues such as justice, ecology, welfare and stability.

The energy shift to renewables is a longer-term problem. Trying to make carbon policy the sole climate policy is causing immense economic, ecological and social disruption, cost and risk, without offering any prospect of actually mitigating climate change. Rejecting efforts to increase albedo simply means that warming will swamp all efforts to cut emissions. And this progressive consensus then has the effrontery to falsely insist that “mitigation” means emissions reduction alone, even though cutting emissions actually can do nothing to mitigate climate change except as part of a systematic scientific long term vision. The IPCC traditional usage of mitigation as a synonym for emission reduction is obsolete and wrong and political, and should be discarded.

Net zero emissions by 2050 as a short-term goal is a fantasy, a dangerous myth, a delusional strategy. Net zero emissions should be abandoned as a short-term goal on the moral grounds that it creates high risk of social and economic and ecological collapse, and that a much better alternative policy is available, focused on rebrightening the planet. Net zero emissions should be replaced by the realistic immediate goal of net zero heating, using geoengineering to cool the planet to balance the warming from greenhouse gases. This argument opens up the moral case for stratospheric aerosol injection (SAI), marine cloud brightening (MCB) and other geoengineering technologies, although it does not prove these technologies are feasible.

In the short term, over the next decade, the most realistic climate policy is to switch the primary focus from carbon to albedo, aiming to reflect more sunlight to space.

The [2009 UK Royal Society report *Geoengineering the Climate*](#) estimated (Table 3.6) that rebrightening the planet using MCB and SAI would have climate impacts that are 1000 times better value for money than decarbonisation. This is an amazing statistic that we should all seek to understand. The extremity of this difference, 1000 to 1, and the fact that so little heed is paid to it, need serious attention. Meanwhile, an academic paper ([AR Harding et al](#), value of information) estimated the cost of a full scientific assessment of geoengineering at 0.02% of the likely economic costs of not conducting such an assessment, a cost benefit ratio of 5000 to 1. The costs of extreme weather, sea level rise, biodiversity loss and systemic disruption without geoengineering will be catastrophic.

IPCC consensus supports action that is one thousand times worse value for money than geoengineering. In view of this shocking discrepancy between reality and their policy, IPCC [failed to mention geoengineering in the AR6 Summary for Policymakers](#). This is very bad. It reflects a pathological mass psychology, an irrational and incoherent belief system. At the heart of this mass delusion is the false hope that reliance on the energy shift can be the primary climate policy. World leaders ignore clear scientific evidence while hypocritically claiming to rely on science. Creating false hope is morally odious.

The argument that albedo cannot substitute for carbon as a climate policy focus serves as a method of political intimidation, with no factual basis. This substitution is urgently needed. Efforts to accelerate decarbonisation cannot help to restore the climate except over the long term, for both political and scientific reasons. A decisive switch away from an emission reduction focus is needed to preserve a liveable climate. Action to cut emissions cannot mitigate the existential risks of catastrophic climate change, whereas the extreme risks of accelerating warming can only be reduced by higher albedo.

This analysis is all acutely embarrassing and unacceptable to the climate establishment, and to its supporting political tribe. They have placed their entire credibility on the claim that cutting

emissions is the only way to mitigate climate risk, and then falsely asserting that this delusional policy is scientific. This consensus mainstream argument is false. The claim that cutting emissions could slow climate change is a myth.

However, decarbonisation has such popular and institutional and political and economic momentum and inertia as a source of tribal hope that people are unwilling to study the simple refutation of its claims. As a result, few public platforms have been available for advocacy of immediate geoengineering deployment, especially in mass media. This situation is now changing under the pressure of the failure of current policy, but misinformation from the IPCC and its supporters continues to deceive the public. Leaving climate policy to the IPCC is a recipe for earth system collapse.

Emission reduction alone has become a sort of religious mantra within mainstream climate policy circles. Any questioning of this dogma is shunned and misrepresented, as we see in the recent baseless criticism of James Hansen by Michael Mann. As Leon Simons observed in conversation with leading climate interviewer Dan Miller, Mann attacked Hansen without engaging on facts. That is unscientific and unscholarly. The climate mainstream arguments presented by Mann treat emission reduction as an article of faith, wrongly alleging that the so-called “zero emission commitment” is scientific consensus. By not applying the required scientific scrutiny to the problem, climate policy is grounded more in emotion than in reason. Part of their mythology is the assertion that emission cuts are mandated by science as the only way to address climate change. This assertion is clearly false.

Increasing albedo is a far faster, cheaper, safer and more effective and acceptable strategy. The only barrier at this point is the false claims that have deceived public opinion. A major international scientific research and governance program is urgently needed to test and deploy climate cooling technologies.

Putting all our climate eggs in the emission reduction basket is leading to economic collapse. The fragility of the world economy means that risks of systemic collapse are high, especially in view of the crazy decision to ban sulphur in shipping fuel by the International Maritime Organisation, removing the masking that shipping aerosols previously provided to slow the rate of warming.

The most urgent need is to restore planetary albedo as fast as possible. The current albedo collapse is nearly 1% per decade, now measured by NASA at 98 w/m² compared to 100 w/m² in 2001. This darkening of the world has the warming effect of five decades of emissions, according to James Hansen.

Restoring albedo is by far the most tractable lever available to cut radiative forcing, acting to reduce the amount of light entering the Earth System rather than to increase the amount of heat leaving.

Few people want to cut emissions as fast as possible if it causes extreme side effects such as war, poverty, extinction, etc. We have to redefine “possible”. Exactly what ‘possible’ means is far from clear. If “possible” meant redirecting public funds from spending that meets objectives to areas that obviously don’t, most people would not agree this is sensible or good. The principle here is that public funds should be allocated on the basis of cost-benefit analysis, against clearly defined objectives.

My simplified understanding is as follows. These are my own calculations so I would appreciate if others could check my numbers. I have not found a source that sets out all these numbers in this simple way. These simple numbers support the argument for scenarios over the next decade to switch focus to albedo. This is my own analysis, as I could not find these facts presented in this clear and simple way in other literature. If I have any mistakes please study it carefully and let me know.

1. Cutting emissions by itself cannot possibly cut temperature, as a simple matter of arithmetic that gets ignored.
2. James Hansen et al have partly explained this problem in the *Global Warming in the Pipeline* article, noting the importance of considering past geological precedent.
3. Humans have added more than 3.2 trillion tonnes of GHGs to the air, about two thirds as CO₂, but also including other GHGs such as methane, based on 100-year CO₂ equivalence, according to <https://worldemissions.io/>.
4. For reference, one gigatonne (Gt) is one cubic kilometre of water.
5. About 30% of anthropogenic CO₂ has dissolved in the oceans so will re-gas when CO₂ is removed from the air.
6. Of the >425 ppm CO₂ in the atmosphere, >145 ppm is anthropogenic.
7. Each ppm weighs 7.72 Gt, so the current atmospheric excess CO₂ weighs about 1150 Gt.
8. To that we have to add the 570 Gt in the ocean, so over 1600 Gt CO₂ would have to be removed to restore the Holocene CO₂ level.
9. As well, methane and other GHGs add 50% to the radiative forcing from CO₂, indicating a total problem of roughly 2400 Gt CO₂ equivalent.
10. Methane radiative forcing is calculated by IPCC on its century-long effect, which is less than one third of its immediate warming effect.
11. The direct radiative forcing from this total excess GHG amount, plus the related loss of planetary albedo, are the main causes of committed warming.
12. Emissions reduction does nothing about committed warming from past emissions.
13. The consensus argument about a Zero Emission Commitment after Net Zero Emissions wrongly claims that this 2400 Gt CO₂ excess would gradually disappear by itself, mainly by photosynthesis.
14. Fully restoring Holocene temperature stability would mean converting about 2400 Gt CO₂e into non-warming form, whether by some sort of CO₂ storage or by finding practical uses such as soil and infrastructure.
15. That will take decades, time that we do not have due to the risk of tipping points.
16. The system disruption from tipping elements would completely swamp all efforts to deal with the carbon problem in the absence of higher albedo.
17. The last time the atmosphere had this much CO₂, the sea was something like 20 metres higher and the world was about four degrees C hotter.
18. Earth System Equilibrium will eventually create similar conditions to these geological precedents unless there is some drastic change.
19. The unprecedented nature of our planetary CO₂ dumping experiment means there is major risk that catastrophic climate change could occur much faster than is generally imagined.
20. The Earth may be more fragile and sensitive than accepted models indicate.
21. Committed warming, together with loss of cooling aerosols, is creating conditions incompatible with human civilization.
22. [Annual CO₂e emissions are 59 billion tonnes](#). Decarbonisation is failing to dent the increase, which has powerful social and economic drivers.
23. For emissions reduction to slow the annual increase by 10% would be hugely expensive, difficult, risky and contested, but would only marginally delay radical climate disruption.
24. If the world managed to cut emissions in half by 2030, emitting only 29.5 Gt CO₂e in 2030, the total difference would be that instead of adding 354 Gt CO₂e between 2024 and 2030, the world would add two thirds as much, 236 Gt CO₂e. That would require annual CO₂ cuts of 4.2 Gt.
25. Slowing the rate of CO₂e increase by 10% (6 Gt per year) would address about 0.3% of the estimated 2400 Gt of remaining anthropogenic GHGs each year.
26. A 1% slowdown in the increase in radiative forcing is functionally less than zero, ie an acceleration, because the remaining 99% of GHGs could prove volatile in ways we cannot

easily predict, such as sudden glacial collapse, methane release, heat waves, extreme weather and slowing of ocean currents.

27. 'Moral hazard' theory, tendentiously called "mitigation deterrence", is that we must do nothing about 99% of the warming problem, because dealing with 1% of the problem is more important, even though dealing with that 1% has proved politically and economically impossible.
28. The concept of mitigation deterrence is incoherent and ideological. Cutting emissions cannot mitigate climate change over relevant timeframe, whereas higher albedo can, so it makes no sense to say that increasing albedo could deter mitigation.
29. When combined with the false theory of moral hazard, efforts to cut emissions are likely to worsen warming by allowing preventable tipping points.
30. As leading climate scientist Thomas Goreau recently commented, we have not yet seen the warming impact of present-day CO₂, due to the delay caused by ocean mixing.
31. The risks of these unpredictable changes can only be mitigated by restoring the temperature that created the previous stability.
32. Cutting emissions can have almost no impact on committed warming, and therefore on temperature.
33. The goal of net zero heating has to replace the false promise of net zero emissions.

Committed warming is just ignored in the fantasy world of emission reduction alone. Unfortunately, the moral principles of efficiency and effectiveness and evidence and ethics are not applied for climate spending, which is largely unfit for purpose. Governments should not spend public funds to subsidise decarbonisation to achieve climate goals, when those goals could be achieved more rapidly, safely and cheaply with solar geoengineering.

Clear distinction is needed between short and medium-term responses to the climate emergency. In the short term, albedo is the main climate impact that could be affected by human action. Albedo is now collapsing by about 1% per decade, a clear indicator of the shutdown of Earth Systems. This emergency could be mitigated with geoengineering.

Cutting GHG levels is something that will take much longer, with the eventual aim of restoring the Holocene atmospheric composition. Cutting emissions cannot cut GHG levels, despite the alleged 'consensus' argument to the contrary made in literature on the Zero Emission Commitment.

Policy discussion in the IPCC and related academic and social organisations has become corrupted by a tribal failure to address scientific evidence about the practical impossibility and high risks of rapid decarbonisation. This triumph of hope over observation is known as greenwashing, which is a bigger political problem than corporate greenwashing. Greenwashing means imagining that a strategy is possible and effective, while ignoring contrary evidence.

Two key points are that possible cuts to emission levels are marginal to the rate of warming, and that efforts to accelerate emission cuts have such high opportunity cost that they are counterproductive.

I don't know anyone else who advocates geoengineering who also doubts the need to accelerate emission cuts, although a few have hinted at that unpopular opinion. Perhaps some keep silent because they are worried about being shunned by the climate tribe as a heretic. That suggests this debate involves religious psychology and community loyalty as much as intellectual coherence. Scientific integrity should be the primary concern in the face of the urgent need to prevent impending system collapse.