

Global Warming Observations

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<http://ccdatacenter.org/documents/GlobalWarmingObservations.pdf>

My research over the last few years has led me to make the following observations about global warming:

1. There are many significant "climate factors" that are not related directly to anthropogenic emissions of greenhouse gases (surface albedo changes in the Arctic, natural emissions from peat, permafrost, and other "soils", natural emissions from reservoirs, etc.).
2. Other than surface albedo changes (which climate sensitivity likely underestimates), I don't think that any of the "natural emissions" listed in #1 above are taken into account by climate models, and these could easily add the equivalent of about 150 GTC by 2060 (about 70% of the IPCCs carbon budget for 2100), which would eventually raise the global temperature about 0.3° C.
3. Atmospheric aerosols (primarily from the burning of fossil fuels) currently mask about 0.5° C of temperature increase. It is not clear how the various climate models deal with the reduction in aerosols as fossil fuel emissions are reduced.
4. The total "anthropogenic" radiative forcing in 2020 will likely be around 2.7 W m⁻² (2.3 W m⁻² in 2011 and increasing at about 0.4 W m⁻²/decade), which would result in a equilibrium temperature increase of about 2° C for a climate sensitivity of 3° C for doubled CO₂.
5. The cost to sequester one year's worth of CO₂ emissions via direct air capture (DAC) is well over \$2 Trillion (10 GTC/year at much more than \$200/ton carbon), and DAC is needed to compensate for all emissions after 2020 in order to keep the radiative forcing below 2.7 W m⁻².
6. In "Young People's Burden: Requirement of Negative CO₂ Emissions" (2016), James Hansen called for limiting the long-term temperature increase to less 1° C in order to keep the "slow feedbacks" from becoming significant. The likely cost if CO₂ emissions were reduced 3% per year starting in 2020 was \$20-50 Trillion; and if CO₂ emissions remained at the 2015 level through 2100 the likely cost was \$100-200 Trillion. Given a realistic emissions scenario, additional forcing from aerosol reduction (which was apparently not included - see #3 above), and additional forcing from "natural emissions" and surface albedo changes (see #1 and #2 above) then the costs this century for limiting the temperature increase are likely to be in the \$100-200 Trillion range.
7. It is unlikely that large amounts of money will be spent on carbon sequestration unless there is a very good chance that world leaders will be willing to commit the hundreds of trillions of dollars that will be needed to limit the temperature increase to below the point where natural feedbacks become significant.

Give the above, then

1. There is no politically and/or socially acceptable way to limit the temperature increase to 2° C by mitigation and sequestration alone; and even 2° C is likely too high a target.
2. Give the significant radiative forcings from natural causes, we could already be on an un-stoppable path to "run away" global warming (not like Venus, but perhaps enough to raise global temperatures by 8-10° C). If we are not already on an "un-stoppable path", what combination of temperature increase and radiative forcing will likely put us on such a path?
3. Some sort of solar radiation management is required to prevent catastrophic climate change, and it should probably be started sooner rather than later.

If the above is "directionally correct", then

1. Why hasn't the seriousness of our predicament been acknowledged?
2. What should activists like me do in the coming years?