

## Climate Change - Where We Are Now

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

Climate scientists use "Representative Concentration Pathways" (RCPs) and "Shared Socio-Economic Pathways" (SSPs) to develop narratives outlining broad characteristics of the global future and country-level population, GDP, and urbanization projections. The projections are then "fed into" climate models to estimate likely temperature increases. Unfortunately, there seems to be a big disconnect between how the results of the climate models are being interpreted and what they actually imply.

We are currently on a greenhouse gas emissions pathway that will result in a temperature increase by 2100 of at least 4°C over preindustrial times. Since the current global climate models show that there are many pathways in which it is theoretically possible to limit the temperature increase to 1.5-2.0°C (primarily by extracting lots of carbon dioxide from the atmosphere), the general assumption seems to be that we can continue the current path for another 10 years or so while we work on reducing the extraction costs. We would then start "decarbonization" in earnest, with the goal of becoming "carbon neutral" by around 2060. But there are two major problems:

1. The climate models have done a relatively good job of forecasting the current temperature increase, but many of the "natural feedbacks" which they have been able to ignore in the past are likely to be of significant importance now that the temperature increase has exceeded 1° C since preindustrial times (and will very likely exceed 1.5° C within 10 years) . These feedbacks include both albedo changes in the Arctic region (which are underestimated in the models) and greenhouse gas emissions from soils, peat, permafrost, and surface waters (which are primarily dependent on temperature and are not included in most models). Thus the models are very conservative and very likely to underestimate the future temperature increase, perhaps by as much as 0.5-1.0°C in 2100.
2. The climate models do not include estimates of either the dollar costs associated with limiting the temperature increase or the likelihood that our society will be willing to make the changes that the various RCPs and SSPs require. E.g., will society be willing to pay a trillion dollars a year for carbon capture if there is no "direct return investment" ? Or if there is only a 25% chance that doing so would prevent catastrophic climate change? Will any politician force people to pay significantly more for energy by requiring a switch from natural gas to electricity? Are we likely to cut meat consumption by 80% as global GDP rises? How much will "vested interests" slow the inevitable switch to renewable energy?

My guess is that we will continue along our current "do very little other than let the free market reduce emissions" path until it becomes obvious that the costs of the necessary CO<sub>2</sub> removal will be more than our society will be willing to pay. Until then most people will continue to hope both that we will be able to "innovate" our way out of catastrophic climate change and also that they will not be required to make any significant sacrifices.