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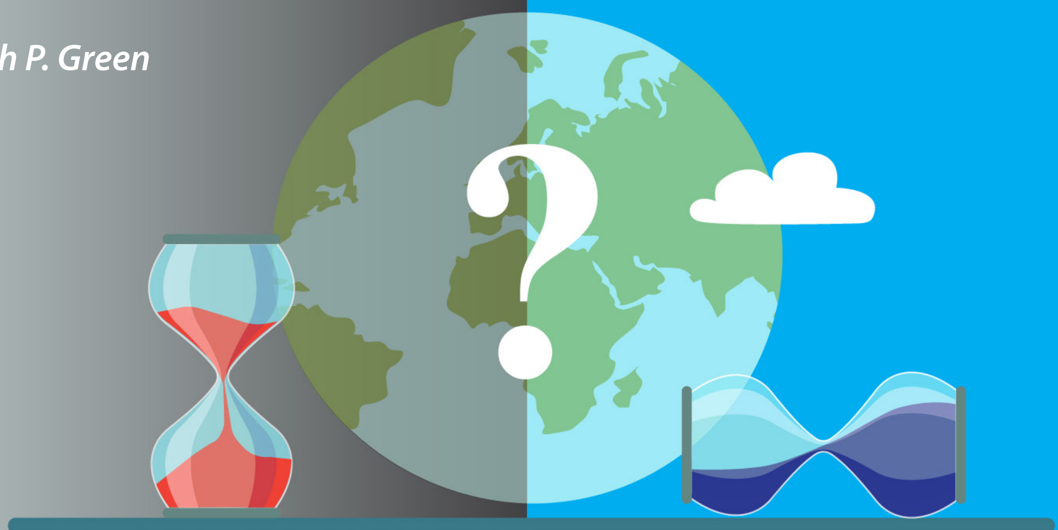
Is Climate Catastrophe Really 10 Years Away?

by Kenneth P. Green



SUMMARY

- The dominant narrative behind the promotion of aggressive climate change policies is that humanity is always about 10 years away from either catastrophic climate change, or some greenhouse gas emission "tipping point" at which such change will become inevitable.

- These "10-years to disaster" scenarios, however, are based on speculative computer models driven primarily by conjecture and assumptions of future events, not merely extrapolations from climate trends, and/or greenhouse gas emission trends that has been observed.

- Comparisons with empirically measured data regarding climate change and greenhouse gas concentrations reveals that the computer forecast models which drive the "10-year" narrative significantly over-predict human-caused warming of the Earth's atmosphere.

- Climate policies based on these 10-year narratives in the past have consistently failed at their stated objectives of either significantly reducing global greenhouse gas emissions, or forestalling expected climate change.

- Longer term, incremental, adaptive control measures are an alternative option that policymakers should consider in the face of repeated "10-year" windows and failed greenhouse gas emission reduction policies.

Introduction

Much of the popular discourse surrounding the risks of human-induced climate change and the requisite timing and stringency of public policies intended to manage those risks is based on the idea that irreversible descent into catastrophic climate degradation is imminent, and therefore must be addressed with all urgency.

Somehow, that narrow window in which we might still avoid catastrophe seems to stay at about ten years long, regardless of the passage of time between periodic assessments of risk by the world's foremost authorities on climate change. Here are a few examples from major media coverage over the years:

- Peter James Spielmann (June 30, 1989), Associated Press: "A senior U.N. environmental official says entire nations could be wiped off the face of the Earth if the global warming trend is not reversed by the year 2000."

- David Adam (May 5, 2007), *The Guardian*: "UN scientists warn time is running out to tackle global warming. Scientists say eight years left to avoid worst effects."

- Sophie Schroder (October 8, 2018), *Greenpeace*: "IPCC climate report gives us 10 years to save the world."

- John Bowden (January 22, 2019), *The Hill*: "Ocasio-Cortez: 'World will end in 12 years' if climate change not addressed."

- Laura Paddison (February 21, 2020), *Huffpost*: "We have 10 years left to save the world, says climate expert."

Computer models of doom

These predictions are naturally quite concerning, but are they real? That is, are they solidly grounded enough in the reality of events in the worlds of physics, chemistry, biology, ecology, and climatology for us to use them as the basis for making large-scale changes to human health, safety, and economic and social systems that proponents of these predictions tell us are required?

Answering that question requires us to understand where this belief that the tipping point into irreversible, catastrophic climate change is just 10 years away originated. Readers may assume that these predictions are extrapolations of carefully measured existing trends such as those regarding greenhouse gas emissions, tightly associated with a rise in rigorously measured atmospheric temperatures, and thence firmly tied to specifically measured and characterized environmental impacts of that warming. However, even a cursory examination of the literature that led to the evolution of the "10 years to save Earth" paradigm would show that this assumption is not correct.

Rather, the ten-year tipping point paradigm comes instead from an interactive set of forward-looking computer models[1] generated by

[1] For the sake of clarity, I will be referring to the climate-related models discussed here as "computer models" to distinguish them from more fundamental models of reality such as quantitative mathematical models of well-understood physical processes that can be observed, measured, tested, and assessed using empirical means. These would be, for example, things like equations predicting future events based on, for example, Newton's Laws of Motion, or Einstein's Theory of Relativity, or Maxwell's equations of electromagnetism. Computer models of the climate are fundamentally different from those empirically tested mechanistic models which normatively define what is or is not "science," in that they draw predictions of future events on assumed and probabilistic understanding of cause and effect relationships, not mechanistic ones. It is not my intention to stigmatize "computer models" in any particular way (I am

a vast network of climate (and related science) researchers, and computer modelers working on the many different elements of climate change understanding, as filtered through the United Nations Intergovernmental Panel on Climate Change (IPCC). The IPCC is considered the "authoritative" body on climate change science and potential impacts of climate change on the Earth and both its human and non-human ecological systems. (Disclaimer: I served as an expert reviewer for one volume of the IPCC's *Third Assessment Report*, and for another on aviation and the climate. I have always felt that the technical volumes of the IPCC represent the best understanding we have of the climate system and human impacts upon the climate. I have not always felt that the technical reports of the IPCC were faithfully represented in either media reports, nor the political aspects of the climate change policy debate.)

The original timeframe of the tipping point started out in 2001 with about 50 years left to save the climate, but that timeframe has been constricted significantly over time. There are three discrete sets of prospective predictive models (created and run by somewhat overlapping environmental computer-modeling communities) that underpin the 10-year tipping point paradigm. Those model sets are:

- *Models of future greenhouse gas* (GHG) *emissions*, which are based on estimates of future population growth, economic growth, technology development, and much more;
- *Models of future atmospheric warming likely to be caused by those GHG emissions*; and
- *Models of future ecological and social impacts*, which estimate what impact a warmer climate will have on a variety of ecosystems (human and non-human).

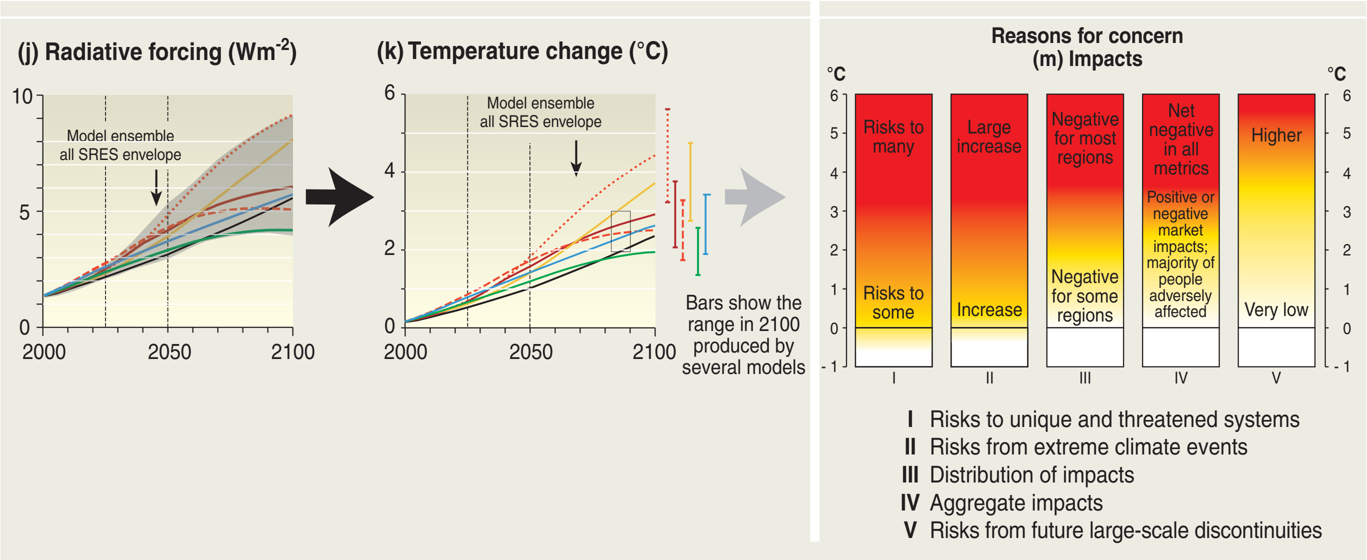
Notice that these models are all *prospective*: that is, they attempt to predict what will happen in the future. This is an important distinction, because beyond extremely limited circumstances (mostly pertaining to the expected manifestations of well-understood equations of mechanistic physical laws), the future is inherently unpredictable, and such predictions are, as a result, highly speculative.

The outputs of these three distinct types of computer modeling (emissions, warming, impacts) have varied over time as they have evolved since they first came to prominence in the Second Assessment Report of the IPCC published in 1995, but it was not until the Third Assessment Report of the IPCC in 2001 (IPCC, 2001) that the full triad of models would be assembled to create the new "tipping point" paradigm.

In the Third Assessment Report (TAR), one key figure composed of three panels shows the evolution of the separate model (see Figure 1). This figure (IPCC, 2001, Figure SPM-3) shows the 2001 estimated range of outputs for the three sets of models. The first graph (labeled j) estimates "radiative forcing," which is basically a technical term for the atmospheric heat-retaining actions of the greenhouse gases under

quite fond of them, in fact, and spend a great deal of time using them), but simply to clarify that they are not, as may be widely understood, simply large ensembles of mathematically encoded "laws" of physics, chemistry, or biology. Rather, the computer models used as the basis for the 10-year paradigm often stray far from those laws into realms that are highly speculative in character. Also note that I am not delving into the computer coding of those models in any way (I am not a coder), nor am I addressing the specific economic models embedded in these ensembles in any particular way (I am also not an economist). Rather, I am trying to illustrate the origins of the greater "10 years to disaster" paradigm across all of the sciences, physical and social.

Figure 1: The Evolution of Climate Models



Source: Figure SPM-3, IPCC, 2001: 11.

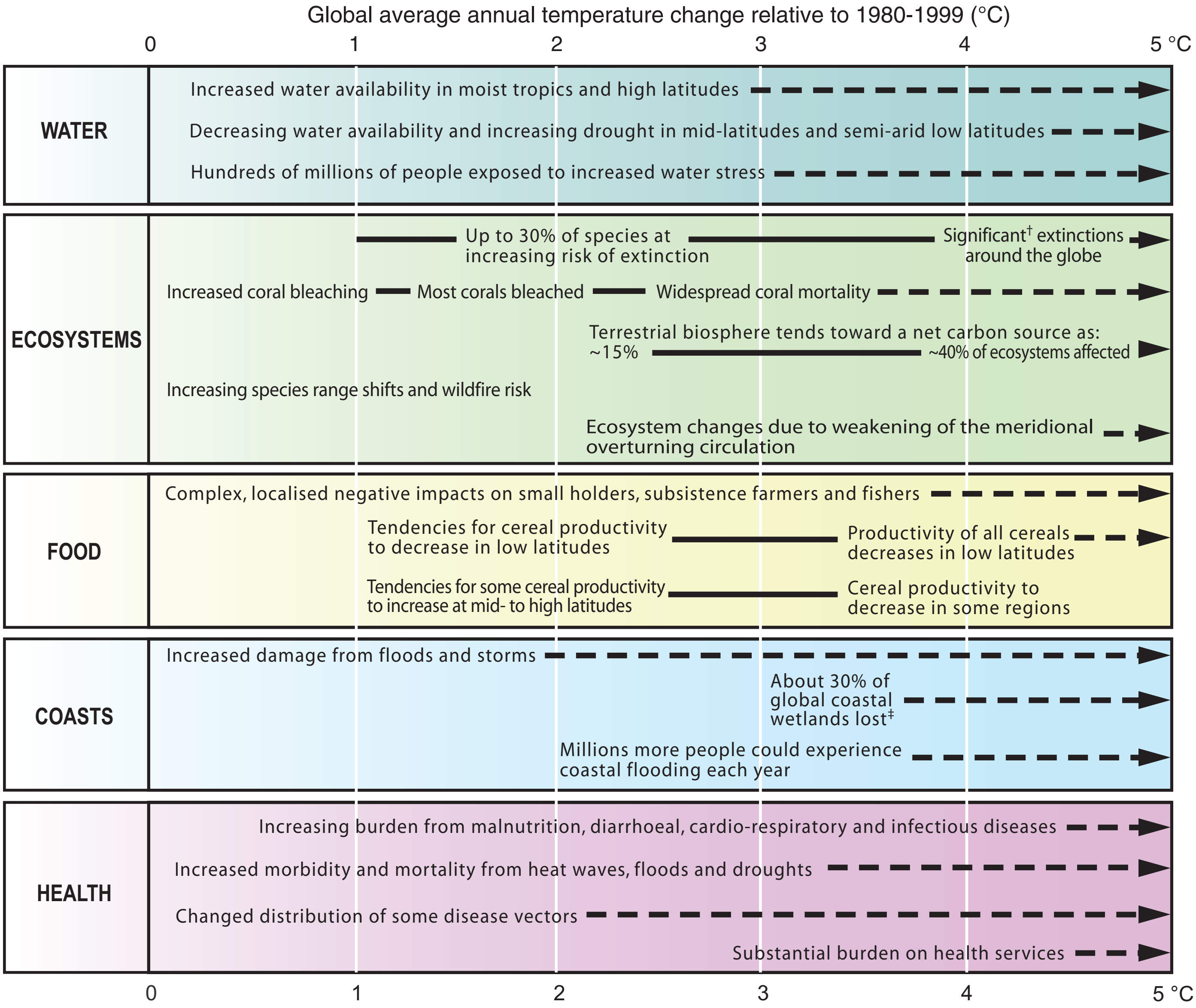
several speculative development scenarios (the colored spaghetti lines in the gray cone). The second graph (labeled k) estimates how much the global atmosphere would be expected to warm under those speculative scenarios of future events (the same coloured lines).

The third panel (panel m) shows how impacts to the Earth's various biologic, ecologic, and social systems would increase as the climate warms. At the time, this figure was called the "burning embers" figure (Zoomers, Marbaix, Fischlin et al., 2020), because above 3°C, well, everything seems to burst into flame-coloured bars rising upwards.

The burning embers panel on the right is essentially the origins of the maximum allowable warming targets that would come to define the goals for global policies to control greenhouse gas emissions. The fourth bar from the left is the most important in this debate because it shows the point at which impacts from climate warming become "net negative in all metrics," which, as you can see in 2001, was not predicted to be reached until the increase in global average temperature reached about 3.5°C. That temperature point, according to chart (k), was not predicted to be breached until around the year 2100, and even then only under extreme scenarios of future greenhouse gas emission levels. However, in panel k the IPCC also gave us a an intersection point at the value of 2°C (the point where things just start bursting into flames according to the flaming-brands chart bar I), scheduled to arrive in 2050.

The equivalent climate-damage model ensembles displayed in the IPCC's Fourth Assessment Report, AR4 Climate Change 2007: Synthesis Report (IPCC, 2007) are somewhat less visually alarming than in the Third Assessment Report as they avoid the color-coding normally asso-

Figure 2: Examples of Impacts Associated with Global Average Temperature Change (Impacts Will Vary by Extent of Adaptation, Rate of Temperature Change, and Socio-Economic Pathway



† Significant is defined here as more than 40%. ‡ Based on average rate of sea level rise of 4.2mm/year from 2000 to 2080.

Source: IPCC, 2007, Figure SPM.7: 10.

ciated with flames and danger, possibly in response to previous observations about "burning embers" (see figure 2).

However, the text accompanying this graphic emphasizes the risks of lower levels of warming even more strongly than did the Third Assessment Report. For example, the description of the ecosystem impacts of climate change state:

> For increases in global average temperature exceeding 1.5 to 2.5°C and in concomitant atmospheric CO_2 concentrations, there are projected to be *major* changes in ecosystem structure and function, species' ecological interactions and shifts in species' geographical ranges, with *predominantly negative consequences* for biodiversity and ecosystem goods and services, e.g. water and food supply. (IPCC, 2007: 48—emphasis by this author)

The 2°C threshold in the Fourth Assessment Report was predicted to be breached in 2020, only some 13 years away at that time. In the IPCC's 2014 Fifth Assessment Report (IPCC, 2014), the net-harm threshold drops to about 1.6°C, to be breached in 2030. In the IPCC's 2018 Special Report: Global Warming of 1.5°C, the critical net-harm threshold drops to 1.5°C, still estimated to be reached by 2030; and this remains the case in the IPCC's most recent draft report, the Sixth Assessment Report (IPCC, Working Group I, 2021).

So, according to the IPCC's evolved model ensembles since 2007, there have been 10 or perhaps 12 or 13 years to save the Earth from a tipping point into net-negative, broadly destructive climate changes caused by greenhouse gas emissions.

But about those scenarios

As mentioned above, all three of the predictive exercises that the IPCC uses in its reports are not simply extrapolations forwarded from observed physical trends in the climate, the environment, the global economy, or global greenhouse gas concentrations. They are predictive models built from sets of *possible* scenarios of the future as developed by special research groups within the IPCC research community. To generate these scenarios, groups of subject specialists in the physical, social, and political sciences join together to speculate about what the world might be like in the future (to about 100 years from now) for just about everything imaginable. What will the global population be? How much energy will humanity consume? How much food? How much water? How much transportation will there be? How will agricultural productivity progress, or fail to progress? How will technology to control greenhouse gas emissions develop? How will lower-greenhouse-gas producing forms of energy come into being? The list of assumptions is quite lengthy (IPCC, 2000). Those assumptions are then mathematized both forward (and in some cases backward) in time and combined to generate the predictive computer models discussed above.

The fullest explication of this whole exercise in predicting the future can be found in the IPCC's *Special Report on Emission Scenarios* (SRES) (IPCC, 2000). Readers who want a detailed understanding of the amazing process that the IPCC goes through to create speculative scenarios and storylines of the future Earth would do well to read this landmark report in the climate change policy canon. At 608 pages, it is actually one of the slimmer technical volumes among the IPCC's climate reports. What is perhaps most important to observe is that the

IPCC itself in the technical narrative that led up to the 10-years-to-disaster paradigm was quite cautious about both the potential accuracy of those narratives, and their potential utility in public policy making.

In the introduction to the SRES volume, the IPCC explains that: "Future greenhouse gas (GHG) emissions are the product of very complex dynamic systems, determined by driving forces such as demographic development, socio-economic development, and technological change. *Their future evolution is highly uncertain*" (IPCC, 2000: 3; emphasis by this author).

The IPPC explains that "A set of scenarios was developed to represent the range of driving forces and emissions in the scenario literature so as to reflect current understanding and knowledge about underlying uncertainties. They exclude only outlying 'surprise' or 'disaster' scenarios in the literature. *Any scenario necessarily includes subjective elements and is open to various interpretations.* Preferences for the scenarios presented here vary among users. No judgment is offered in this report as to the preference for any of the scenarios and they are not assigned probabilities of occurrence, neither must they be interpreted as policy recommendations" (IPCC, 2000: 3; emphasis by this author).

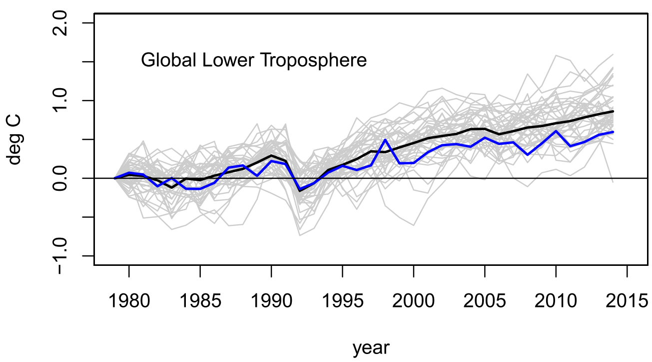
And finally, the authors of the *Special Report on Emission Scenarios* acknowledge that in the future scenario building process, "Four different narrative storylines were developed to describe consistently the relationships between emission driving forces and their evolution and add context for the scenario quantification. *Each storyline represents different demographic, social, economic, technological, and environmental developments, which may be viewed positively by some people and negatively by others*" (IPCC, 2000: 3; emphasis by this author).

The introduction to the *Special Report on Emission Scenarios* concludes that: "By 2100 the world will have changed in ways that are difficult to imagine – as difficult as it would have been at the end of the 19th century to imagine the changes of the 100 years since. Each storyline assumes a distinctly different direction for future developments, such that the four storylines differ in increasingly irreversible ways. Together they describe divergent futures that encompass a significant portion of the underlying uncertainties in the main driving forces. They cover a wide range of key 'future' characteristics such as demographic change, economic development, and technological change. For this reason, their plausibility or feasibility should not be considered solely on the basis of an extrapolation of *current* economic, technological, and social trends." (IPCC, 2000: 4; emphasis in original).

And the IPCC's caveats of caution, in their technical publications at least, were indeed well-placed because there is one rather glaring problem with all of these IPCC and climate activist prognostications of the future: they actually turn out not to represent observed events in reality as it has unfolded. Rather, the IPCC computer modeling enterprise overestimates the extent and timing of warming trends that have been observed. In other words, the 10-years-to-the-climate-tipping-point models have consistently been wrong.

To give but one example, in a research letter published in the journal Earth and Space Science, climate researchers Ross McKitrick and John Christy (co-developer of the Earth's satellite-measured global average temperature set at the University of Alabama, Huntsville) show that virtually all of the models used to project climate warming as a result of increasing greenhouse gas concentrations

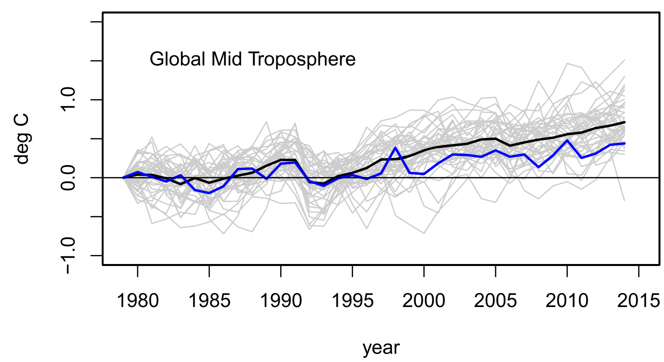
Figure 3: Time series of model and observation temperature anomalies, global lower troposphere



Note: Individual model runs (gray lines), model mean (black line), and observational mean (blue line). All series shifted to begin at 0 in 1979.

Source: McKitrick and Christy, 2020.

Figure 4: Time series of model and observation temperature anomalies, global midtroposphere



Note: Individual model runs (gray lines), model mean (black line), and observational mean (blue line). All series shifted to begin at 0 in 1979.

Source: McKitrick and Christy, 2020.

exceed observations of the actual climate response of the last 35 years (McKitrick and Christy, 2020). Figures 3 and 4 represent different modeled estimates of warming that were expected to occur from 1980 to 2015, with the heavy black line representing the average of the estimated model warming. The blue line shows the actual empirically measured temperature trend over those same years, derived from global satellite measurements of the average temperature in the most sensitive parts of Earth's atmosphere, the global troposphere. The discrepancy between predicted and observed temperatures post 2000 are plain to see. Note that if one were to extrapolate forward from the observed temperature record (the blue line), the thresholds of climate change defined as dangerous—1.5 to 2°C—look considerably further in the future than the next 10 years.

Conclusion

The prevailing wisdom that underpins the sense of climate urgency in today's policy debates—that we have ten years to save the world—stems from three sets of speculative models developed over the last 30 years by scientists working under the umbrella of the United Nations Intergovernmental Panel on Climate Change.

If those models are to be believed, we (as of this writing) have until 2030 to prevent the current trajectory of greenhouse gas emissions from inevitably tipping the world over the critical threshold of 1.5°C, which, we are told, necessitates immediate and sharp reductions in global greenhouse gas emissions.

Yet after some 40 years of alarm, despite little or no progress in reducing global greenhouse gas emissions (which have actually increased steadily), we are still the same 10 or so years from climate catastrophe that we were 20 years ago.

But empirical evidence taken from the real world suggests that the IPCC's estimates of future warming are overstated, and what scientists have seen from looking at actual measurements of increased greenhouse gases in the environment combined with the actual measurements of the recent rise in global average temperatures make it clear that these "ten-years to save the planet" invocations are based more on science-fiction models and less on scientifically determined facts.

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