Grounds for Skepticism

Someone offers you evidence you have not seen before against your view on a controversial issue. If you conclude that the evidence is true, you have two reasons to reduce your confidence in your prior view. One is that you now have additional evidence that goes against what you believed. The other is that its existence suggests that your previous view was formed on an incomplete, possibly biased, basis.

Here are some positive effects of climate change of which most people with views on the issue are unaware.

Things You Probably Didn't Know

CO_2 is an input to photosynthesis. There are two different mechanisms used by different plants for photosynthesis, C3 and C4. Most crop plants, including rice and wheat, are C3; maize, sugar cane, sorghum and millet are C4. Doubling CO_2 concentration in the atmosphere increases the yield of C3 plants by something like 30% and substantially reduces water requirements for both C3 and C4 plants; it has less effect, possibly none, on the yield of C4 plants provided with adequate water. It follows that two effects of increased CO_2 usually ignored in discussions of climate change are a substantial increase in crop yields and a decrease in drought.[1] For details, see Chapter XXX.

A second positive effect is the subject of Chapter XXX. Global warming due to the greenhouse effect is larger in cold places than in hot, a pattern clearly visible on the maps of projected warming in the IPCC reports. Combine that fact with the observation that human land use is restricted almost entirely by cold not heat — the equator is inhabited, the poles are not — and it follows that climate change, by shifting climate contours in the northern hemisphere towards the North Pole, substantially increases the amount of land warm enough for human habitation. It makes land too cold for humans barely warm enough and land barely warm enough comfortably habitable. I offer an approximate calculation of the size of the effect in Chapter XXX for three degrees of global warming relative to current temperature. The conclusion is an increase in the amount of usable land by more than twice the area of the United States, about five hundred times my estimate of the amount of land lost to sea level rise, a negative effect everyone is aware of.

A third effect is the change in temperature-related mortality. Accounts of the consequences of global arming routinely, and correctly, include an increase in heat-related mortality. They usually ignore the associated, probably much larger, reduction in cold-related mortality.

There are two reasons why the reduction is probably larger than the increase. One is that, according to the IPCC projections, minimum temperatures in cold places increase with climate change by much more than maximum temperatures in hot places. The other is that deaths from cold are more common than from heat, about twice as common in the U.S. according to an article from the CDC and about fifteen times as common globally according to an article in *Lancet*.[2] With much more

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[1] Defined not by the amount of water in the soil but by the effect on plants. If the available water decreases by ten percent and the amount needed by plants decreases by twenty percent the net effect is a reduction in drought, a point discussed in Chapter XXX.

[2] Jeffrey Berko [1], Deborah D Ingram [1], Shubhayu Saha [2], Jennifer D Parker [1], Deaths attributed to heat, cold, and other weather events in the United States, 2006-2010

warming at the cold end than the hot and many more people currently dying of cold than of heat, the reduction in mortality from the former is almost certainly larger, probably much larger, than the increase from the latter. Hence it is almost certain that climate change will reduce temperature-associated mortality. That is the opposite of the impression given by almost everything one sees on the subject.

There may be other positive effects that usually get ignored but those are three big ones that I know of. A fourth and smaller effect is a reduction in the number of tropical cyclones, typhoons and hurricanes. Another but very uncertain positive effect is the greening of the Sahara and Sahel, discussed in the IPCC report as a possible consequence of climate change.

Evidence of Bias

The previous section describes positive effects that most people with opinions about climate change are unaware of. That is evidence that their beliefs on the subject are based on a biased selection of evidence. In this section I offer some specific examples of such bias.

The elementary climate science textbook that I discuss in Chapter XXX contains at least two factual claims that I believe I show to be false. In each case, as best I can tell, the author came across claims that fitted his beliefs and accepted them without any serious effort to determine if they were true. The book's chapter on effects of climate change contains not a single positive effect. I have just described three big ones, none of which is mentioned.[3]

The textbook was first published in 2012 and is now in its third edition. Over the years since, either no professor using it pointed out any of the errors, errors I was able to spot with a few hours spent reading the book and checking its claims, or professors who spotted errors never mentioned them to the author, or the author chose to ignore them. I take that as evidence that college students who take a basic course in climate science are likely to get a badly biased account. It is also evidence that the field of climate science does a poor job of correcting errors that support the current orthodoxy.

My next example is the latest IPCC report. So far as I know it contains no false statements. It does, however, contain a biased selection of true statements. Here are three examples:

The Summary for Policy Makers, which is all most people will read, correctly reports that climate change is projected to increase the proportion of high-end tropical cyclones (categories 4 and 5). You have to look at the body of the report to discover that the increase in the proportion of high-end cyclones is due not to a projected increase in their number but to a projected decrease in the number of low-end cyclones, with the number of high end cyclones staying about the same. You also have to look there to discover that the total number of cyclones is projected to decrease.

All four authors are from the CDC. Antonio Gasparrini et al. Mortality risk attributable to high and low ambient temperature: a multicountry observational study, *Lancet* Volume 386, ISSUE 9991, P369-375, July 25, 2015.

[3] Earlier in the book the author mentions the reduction in cold-related mortality, asserting without evidence that cold-related mortality in the U.S. is much lower than heat-related.

The Summary for Policy Makers shows a map of the Earth with drought increasing in twelve regions, decreasing in one. It does not mention, although the body of the report does, that overall the Earth is greening.[4]

> SRCCL subsequently concluded that greening had increased globally over the past 2–3 decades (high confidence).
>
> The increased greening is largely consistent with CO2 fertilization at the global scale,

The body of the report repeatedly notes that warming both increases hot extremes and reduces cold extremes but pays much more attention to the former. Many examples can be offered but the simplest is a count of words. There are six pages with the words "extreme cold", a hundred and twenty with "extreme heat."[5]

Dishonesty

My examples so far are of bias, either selective reporting of evidence or willingness to believe claims in support of the current orthodoxy that are not true. There are also examples in the literature of deliberate dishonesty.

Possibly the most quoted factoid about climate science is the claim that 97% of climate scientists agree that humans are responsible for global warming. It is usually based on Cook et. al. 2013, an article that looked at the abstracts for a large number of articles and classified them by what they said or implied about the cause of warming. A later article, co-authored by Cook, contains the sentence: "Cook et al. (2013) found that over 97% endorsed the view that the Earth is warming up and human emissions of greenhouse gases are the main cause."

The first article sorted abstracts into seven categories, of which category 4 consisted of articles that said nothing about the causes of warming. The 97% figure was the ratio of the sum of categories 1-3 to the total of 1-3 plus 5-7.

Category 1 contained abstracts saying humans are the primary cause of warming, category 2 that they are a cause of warming; the quote used as an example is "Emissions of a broad range of greenhouse gases of varying lifetimes contribute to global climate change." Category 3 abstracts say implicitly what Category 2 say explicitly.

The paper gives the sum of Categories 1-3 but does not give values for the individual categories; to get those you have to go to the webbed data and count the abstracts in each category. Having done so, you discover that of the 97%, Category 1, the only category that implies humans are the main cause, is 1.6%. The authors have lumped together one very small number with two much larger numbers and reported only the sum.

I go over this case in more detail in Chapter XXX. A reader can check that the much-quoted claim is a lie using only information webbed by the authors of the two articles — the articles themselves

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[4] One of the articles they cite, Zhu, Z., Piao, S., Myneni, R. *et al.* Greening of the Earth and its drivers. *Nature Clim Change* **6,** 791–795 (2016), finds "a persistent and widespread increase of growing season integrated LAI (greening) over 25% to 50% of the global vegetated area, whereas less than 4% of the globe shows decreasing LAI (browning)." The explanation for the conflict between that and their conclusion that drought is increasing may be that they are defining drought by soil moisture, ignoring the decreased need for water due to the increase in CO_2 concentration.

[5] IPCC_AR6_WGI_Full_Report.pdf.

and the webbed data from the first. Yet the claim was widely repeated — by, among others, President Obama — without, so far as I can tell, any of the people who used it checking to see if it was true. That is bias on the part of the people who quoted it but deliberate dishonesty on the part of John Cook.

Conclusion

In the course of this chapter I have offered evidence of several large positive effects of climate change that are rarely mentioned, of bias in the presentation of the effects of climate change, and and an example of published work frequently quoted in support of the current orthodoxy that is deliberately dishonest. That does not prove that climate change is not a problem but it is evidence that most people with views on the subject have formed them on the basis of a badly biased selection of the relevant information, hence should reduce their confidence in those views.