A Climate Science Textbook

Dessler, Andrew E. *Introduction to Modern Climate Change*, third edition

I decided to look through a textbook on climate science to see if it provided support for my view of the current orthodoxy and what was wrong with it. In Chapter 9, "Impacts of Climate Change," I found:

> Scientists predict that sea level will rise 47 to 73 cm (19 to 29 inches) above 1995–2014 levels by 2100. This may not sound like a significant challenge, but it is much larger than the 18 cm of sea level experienced over the twentieth century, which is already challenging for many who live near sea level. Like temperature, these predictions of sea-level rise might sound small but, also like temperature, they are not. In Florida, for example, a sea-level rise in the middle of the projected range would inundate 9 percent of Florida's current land area at high tide.[6] This includes virtually all of the Florida Keys as well as 70 percent of Miami-Dade County. Almost one-tenth of Florida's current population, or nearly 2 million people, live in this vulnerable zone, and it includes residential real estate valued at hundreds of billions of dollars. It also includes important infrastructure, such as two nuclear reactors, three prisons, and 68 hospitals.[1]

That struck me as implausible, given what else I have seen on the effect of sea level rise. The footnote was to Stanton and Ackerman (2007), which turned out to be not a peer reviewed journal article but a report commissioned by the Environmental Defense fund, an environmentalist group. It includes the same claims, but for 27 inches of Sea-level rise not the 24 inches that is Dessler's "middle of the projected range." It refers the reader to Appendix C for "detailed sources and methodology." Going there, I find:

> To estimate the impact of sea-level rise on land area, populations, and public and private assets and infrastructure, we began with a 1:250,000 Digital Elevation Model (DEM) map of the State of Florida, and divided the state into "vulnerable" and "not vulnerable" zones demarcated by 1.5 meters of elevation and other factors described by Titus and Richman (2000) as corresponding to 27 inches of sea-level rise.

So what they are showing as the vulnerable area is not the 27 inch or 24 inch contour but the 1.5 meter (5 feet) contour. The explanation, from Titus, J. G. and C. Richman (2001). "Maps of lands vulnerable to sea level rise: modeled elevations along the US Atlantic and Gulf coasts." Climate Research 18: 205–228, a journal article written by two EPA people and presumably peer reviewed:

> Thus, at a typical site, the 1.5-meter contour would be flooded by spring high tides (i.e., high tides during new and full moons) when sea level rises 80 cm

Figure 1 below (Titus and Richman Figure 4) is a map of Florida with the region within the 1.5 meter contour colored red, the region between 1.5 and 3.5 blue. Dessler's middle of the projected range is 60 cm. The map shows what its authors claim would be flooded at 80cm.

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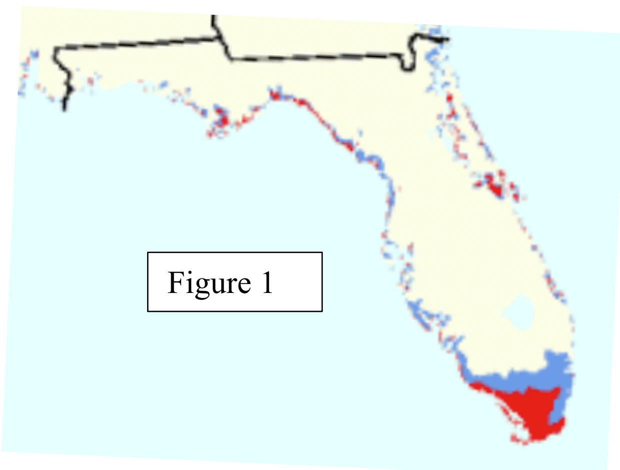
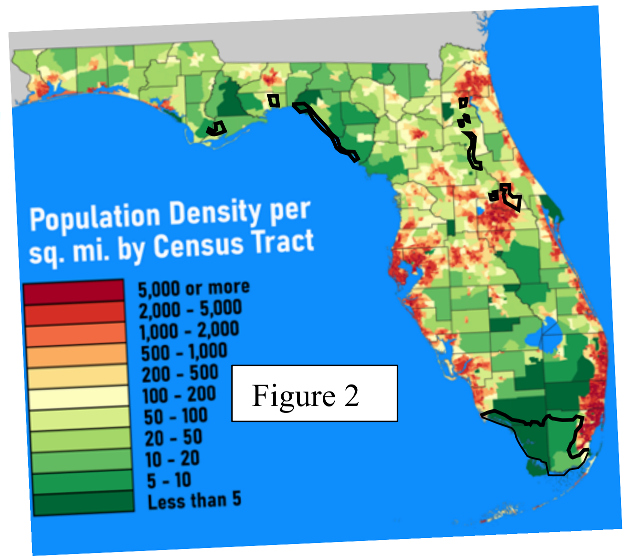
[1] Essentially the same claim appears in the 2011 paperback (1st?) edition, except that it says 1.5 million instead of nearly 2 million.

From 60 cm of sea level rise to 80 cm is a significant difference, but I do not think it is the most serious problem with Dessler's claim. Figure 2 below is a population density map of Florida from Wikipedia to which I have added the 1.5m contours from Figure 1. The large flooded area on the southern tip of Florida includes none of the densely populated area around Miami; only one of the tiny areas farther north appears to be in part on a populated area. That isn't surprising — areas very close to sea level are likely to be marsh, in this case the everglades, and poor places to build on.





Stanton and Ackerman claim that their own calculations, using data bases of elevation and population, produce a total population in the at risk area of 1.5 million. That was the figure Dessler gave in his first edition, presumably increased to almost 2 million in the third edition to reflect the increase in Florida's population. I cannot readily reproduce their calculations, but I don't believe it; Figure 2 shows why. The flooded areas are in places almost all of which have very low population density, so I do not see how flooding nine percent of the land area, most of it in the everglades, can flood almost ten percent of the population.

That problem is in addition to the fact that Dessler's claim is for 60 cm of sea level rise, Stanton and Ackerman's, from which Dessler got his figure for how many people are flooded, is for 68.6 cm (27 inches), and Titus and Richman get the 1.5 m contour that Stanton and Ackerman say they are using, by assuming 80cm of sea level rise. Further reasons for suspicion are that Stanton and Ackerman give figures for sea level rise substantially higher than either the IPCC figure at the time or the current IPCC figure, which suggests that they are trying to make the consequences of climate change look as scary as possible, and that they write "1.5 meters of elevation and other factors described by Titus and Richman (2000) as corresponding to 27 inches of sea-level rise" when Titus and Richman actually describe 1.5 meters as corresponding to 80 cm (31.5 inches) of sea level rise.

I can see three possible explanations:

1. I have made a mistake in my calculations and Dessler's claim is true. After discovering the apparent error I emailed Dessler describing it. He replied and we had a couple of rounds of

exchanges. He appeared to concede that his 60 cm might be wrong, said he would have someone look into the other part of my criticism.

2. His statement is a noble lie, a deliberate falsehood told to produce good consequences, in this case to persuade students that climate change is a terrible threat. He denied that and, after interacting with him, I think it unlikely.

3. Having found a claim he liked, Dessler never bothered to check whether it was true, although an hour reading his source and its source would have found the first error (60 cm vs 80 cm) and comparing Titus and Richman Figure 4 with a population density map of Florida, findable on Wikipedia, would have strongly suggested that their numbers were much too high. I consider that the most likely explanation.

It is also the most interesting because it helps answer the question of how it is possible for an orthodoxy, a scientific claim supported by most professionals in the field, to be wrong. Dessler made his claim about Florida in the first edition of his book more than ten years ago.[2] The book was widely used as a textbook. Either nobody in the field bothered to check the claim or those who discovered it was false never told Dessler or Dessler was told, ignored the information, and continued to make the false claim in later editions. So far as I can tell those are the only alternatives.

The way science is supposed to work is that individual scientists try to make sure what they publish is true, some make mistakes, a few may commit deliberate frauds, but both mistakes and frauds are controlled by the willingness of others in the field to spot errors and correct them. That does not work if the attitude of people in the field is that there is no need to check claims that support a conclusion they agree with.

When I pointed out the problem to Dessler and, in the ensuing exchange, pointed him at my analysis of Cook's 97% claim (Chapter XXX),[3] his initial response was disinterest. He believed the conclusions being argued for, his and Cook's, were true; that was what mattered. In later correspondence he insisted that he believed scientists should tell the truth, that when they didn't it should be pointed out, but that that he had never seen any examples of that being necessary. Given his reaction to my offering him evidence of one case of error (his) and one of deliberate fraud, that is not surprising.

What conclusion is true is what matters — the problem is how you find out. In a field where researchers are not concerned with whether what they or others write is true as long as it leads to the right conclusion you can not. If everyone is doing that none of them can be sure it is the right conclusion, since each is relying on the others for much of the evidence on which the conclusion depends. That is why, in the climate context, I do not find "all the experts agree" a compelling argument.

Another Example: Temperature-related Mortality

One issue in evaluating the effect of global warming is the tradeoff between more deaths from heat and fewer from cold. Dessler writes in Chapter 1:

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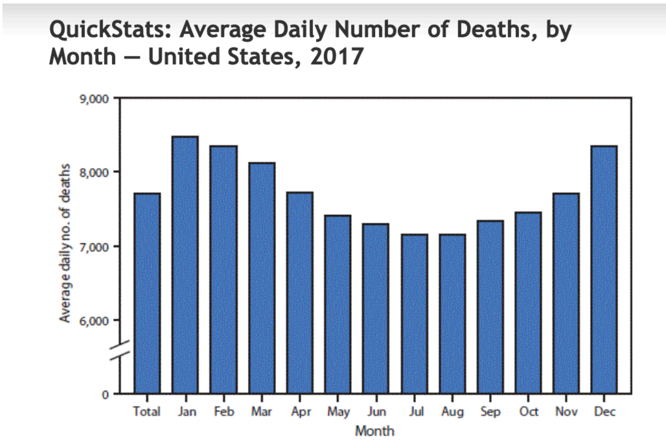
[2] With 1.5 million instead of almost 2 million people flooded.

[3] Add a cite to the chapter that discusses it, which should probably be before this one

> In fact, heat-related mortality is the leading cause of weather related death in the United States, killing many more people than cold temperatures do.

He cites no source for the claim and as best I can tell it is not true. According to a published article by four authors from the CDC,[4] cold kills about twice as many people in the U.S. as heat. That is supported by the pattern of mortality over the year:[5]



The fact that Dessler could confidently assert a relevant fact that is at least debatable and probably false in a book that has been in print for more than a decade, apparently with nobody ever pointing out the problem, is again evidence that the climate field lacks mechanisms for active error correction, making it possible for false claims to become accepted facts of the field.

What is Wrong with Dessler's Book

Dessler's dismissal of the issue of reduced deaths from cold is one example of the most serious thing wrong with the book. In order to evaluate the consequences of climate change, one has to look at both positive and negative effects. Chapter 9 of Dessler's book, which deals with consequences of climate change, does not mention a single positive consequence.

Here is a list of facts a student will not learn from this book:

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[4] Deaths attributed to heat, cold, and other weather events in the United States, 2006-2010

Jeffrey Berko [1], Deborah D Ingram [1], Shubhayu Saha [2], Jennifer D Parker [1]

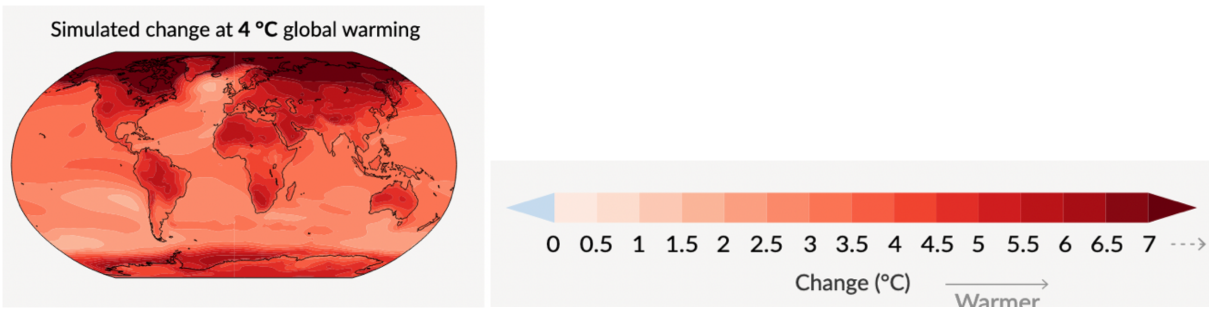
The CDC, counting death certificates classified by cause of death, finds about 670 heat-related deaths a year, 1300 cold-related. The NOAA estimate, in which Dessler may be relying, finds about 134 heat-related and 30 cold-related deaths a year.

"According to a 2005 paper in the Bulletin of the American Meteorological Society, Heat Mortality Versus Cold Mortality: A Study of Conflicting Databases in the United States, *Storm Data* is often based on media reports, and tends to be biased towards media/public awareness of an event." (Jeff Masters, "Which Kills More People: Extreme Heat or Extreme Cold?")

[5] Figure from the NCHS.

1. Many more people die from cold than from heat, about fifteen times as many, globally, according to an old article[6] in Lancet, so raising global temperatures can be expected to reduce total temperature-related deaths.

2. Warming due to the greenhouse effect tends to be greater in colder places and colder seasons, the former obvious in IPCC maps of projected temperature change, due to the interaction between CO2 and water vapor, both greenhouse gases.[7] Temperature increase is usually a good thing when it is cold, a bad thing when it is hot, so the pattern is biased in our favor, which strengthens the conclusion from point 1.



3. CO2 is an input to photosynthesis, so increasing its concentration in the atmosphere increases plant growth and yield. Doubling CO_2 concentration, about what the IPCC projects for the end of this century, substantially increases the yield of most crops.[8] It also reduces the need of plants for water, since they do not have to pass as much air through the leaves in order to get the carbon they need for growth. The effect is well established experimentally and depends on only the first step, increased CO2 concentration, in the causal chain that leads to climate change.[9]

4. Human land use at present is limited almost entirely by cold, not heat — the equator is populated, the polar regions are not. As global temperatures increase, temperature contours in the arctic shift north, greatly increasing the amount of land warm enough for human use.[10] Land that was previously too cold for human use is now warm enough, even if barely, land south of that that was barely warm enough is now warmer. It is not a small effect; in Chapter XXX I estimate that the net effect of three degrees of additional warming, about what the IPCC projects for the end of the

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[6] 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.

[7] As was pointed out by Freeman Dyson in *The Scientist as Rebel*, published in 2006. The map is from IPCC

[8] The exceptions are C4 crops, of which the important ones are Maise, Sugar cane, millet and sorghum. Increased CO_2 reduces their need for water but has little effect on yield when water is adequate.

[9] Taub, D. (2010) Effects of Rising Atmospheric Concentrations of Carbon Dioxide on Plants. *Nature Education Knowledge* 3(10):21

Nereu Augusto Streck "Climate change and agroecosystems: the effect of elevated atmospheric CO2 and temperature on crop growth, development, and yield," *Ciência Rural*, Santa Maria, v.35, n.3, p.730-740, mai-jun, 2005, contains an extensive review of the literature up to that date. Table 1 shows experimental results on the increase in marketable yield of a wide variety of crops in response to a doubling of CO2 concentration.

[10] Calculated from the IPCC 6 figure on temperature change in polar regions, Figure 11.11 e and f, and the IPCC 5 map of annual mean temperatures. Should be a chapter that shows the calculation.

century, is to increase usable land by over ten million square kilometers, more than twice the area of the U.S.

What about land lost through making it too warm for habitability? Comparing temperature maps, both average and maximum, to a population density map, there is no obvious pattern — some of the hottest regions are densely populated.

It follows that a student who has learned about climate change from this book will end up with a badly distorted view of its effects. If the book reflects the beliefs of its author, as I think likely from corresponding with him, it follows that an active professional in the field can have a badly distorted view of the effects of climate change.

“Extreme heat and extreme cold both kill hundreds of people each year in the U.S., but determining a death toll for each is a process subject to large errors. In fact, two major U.S. government agencies that track heat and cold deaths--NOAA and the CDC--differ sharply in their answer to the question of which is the bigger killer. One reasonable take on the literature is that extreme heat and extreme cold are both likely responsible for at least 1300 deaths per year in the U.S. “

Deaths attributed to heat, cold, and other weather events in the United States, 2006-2010

Jeffrey Berko [1], Deborah D Ingram [1], Shubhayu Saha [2], Jennifer D Parker [1]

During 2006-2010, about 2,000 U.S. residents died each year from weather-related causes of death. About 31% of these deaths were attributed to exposure to excessive natural heat, heat stroke, sun stroke, or all; 63% were attributed to exposure to excessive natural cold, hypothermia, or both; and the remaining 6% were attributed to floods, storms, or lightning.

[all authors from the CDC]

NCHS

an old Lancet article found that, globally, cold killed about fifteen times as many people as heat.

“Photons have a characteristic size, referred to as the wavelength,” chapter 3.2

and rebuild the infrastructure in whatever region becomes conducive to farming. Not every single change in every region will be negative. Reductions in extreme cold events will have benefits: less cold-weather mortality, fewer freezing events (which can destroy some crops). Plant growth may well be enhanced in some regions. But these positive effects are expected to be outweighed by the more pervasive negative effects. The upshot of this discussion is that, when it comes to climate, change is bad.

Dessler, Andrew E.. Introduction to Modern Climate Change (p. 148). Cambridge University Press. Kindle Edition.