

Four Degrees

Why This Book Is Important

In the introduction to this book I pledged that it would not contain information on the impacts of climate change until its final chapter. Later I discussed how scientists struggled to maintain their composure in the face of the information that they held. In particular I mentioned their anxiety that average global temperatures might rise over the threshold of 4 degrees Celsius (72 degrees Fahrenheit).

For many years their attention was focused on lower outcomes—especially around two degrees, the level that was adopted by policy makers, somewhat arbitrarily, as the boundary level for “dangerous” climate change. In recent years, though, scientists have become far more willing to warn that four degrees is the actual future we face. Professor Robert Watson, the co-chair of the IPCC, was the first to break ranks in 2008 when he publicly warned governments that they needed to develop adaptation plans for four degrees. The following year international experts met for the first time to present detailed scenarios at the “4 Degrees and Beyond” conference at Oxford University. By 2013, there was sufficient agreement that Mark Maslin, professor of climatology at University College London, could tell the Warsaw climate negotiations, “We are already planning for a 4°C world because that is where we are heading. I do not know of any scientists who do not believe that.”

Four degrees is also increasingly on the minds of senior policy makers. The International Energy Agency reports that current emissions figures put us on course for four degrees. In 2012 the World Bank, hardly a radical environmental organization, produced a major report with the title “Why a 4°C Warmer World Must be Avoided.” In his introduction the Bank’s president, Dr. Jim Yong Kim, said that he would ensure that “all our work, all our thinking, is designed with the threat of a 4°C degree world in mind.”

So what does four degrees mean? Scientists, who are, as a group, extremely wary of exaggeration, nonetheless keep using the same word: *catastrophe*. Professor Steven Sherwood, a meteorologist at the University of New South Wales, Australia, says that it would be “catastrophic,” making life “difficult, if not impossible,” in most of the tropics. Professor Kevin Anderson, the former director of the Tyndall Centre for Climate Change Research, says that it is hard to find *any* scientist who considers four degrees “as anything other than catastrophic for both human society and ecosystems.”

I am going to resist the temptation to batter you with statistics—there are some excellent detailed sources available online. Here instead are a few snapshots of the four-degree world.

1. **Heatwaves.** In the words of the World Bank, there would be a “new class of heatwaves of magnitudes never experienced before”—indeed, with temperatures not seen on Earth in the past five million years. Four degrees will be a global average, so temperatures over large land masses will rise far more than this, by six degrees over North Africa, the Middle East, and the contiguous United States. The warmest July in the Mediterranean region could be nine degrees Celsius warmer than today’s warmest July.
2. **Extinctions.** Forty percent of plant and animal species will be at risk of extinction and the regional extinction of entire coral reef ecosystems would happen far earlier. Forests would be particularly vulnerable. A third of the Asian rainforests would be under threat and most of the Amazon would be at high risk of burning down.
3. **Food yields.** A three-degree rise causes all crops to experience a precipitous decline in their current growing regions. Overall yields could fall by a third in Africa. By some estimates temperature rises of over four degrees could reduce U.S. production of corn, soybeans, and cotton by 63 to 82 percent. And there would be other pressures. In Africa and Australia 60 percent of current croplands would also be subject to extreme and recurrent droughts. These problems would be exacerbated by flooding, storms, and increased weed and pest invasions.

Other, equally catastrophic impacts follow close behind. Four degrees guarantees the total melting of the Greenland ice sheet and, most likely, the Western Antarctic ice sheet, raising sea levels by a combined thirty-two or more feet. The timescales are uncertain, but not the outcome: two thirds of the world’s major cities and all of southern Bangladesh and Florida would end up underwater. Nor is there any guarantee that temperatures would level off at four degrees—at this level further powerful feedbacks and tipping points could lead temperatures to keep rising even further, to six and then eight degrees.

The research is developing and is still missing a strong sense of how these changes might interact with one another. What would be the combined effects of repeated droughts *and* storms *and* heatwaves *and* sea level rise? How would a world with nine billion people cope with such dramatic declines in the productivity of its main agricultural regions? What will happen to people in regions that are already marginal for human settlement when they become entirely uninhabitable?

Commenting on such interactions, Dr. Rachel Warren, a climate modeler at the Tyndall Centre for Climate Change Research, writes that “the limits for human and natural adaptation are likely to be exceeded.” The World Bank echoes this when it concludes that there is “no certainty that adaptation might be possible.” It is hard to comprehend what is meant by this abstract language, phrased, as so often, in the passive voice. Professor John Schellnhuber, one of the world’s most influential climate scientists, is more direct: Speaking at a 2013 conference on the risks posed by a four-degree climate to Australia, he said that “the difference between two and four degrees is human civilization.”

So when will we get there? Reviewing the current research, a British research team concluded that we could reach the four-degree point by the 2070s although, it noted, the 2060s are also possible.

However, the science around four degrees keeps moving—usually in the direction of greater pessimism. A recent paper from the University of New South Wales, Australia, argues that a decline of cloud cover in the tropics will accelerate warming so much that global temperatures could reach four degrees by the midcentury and, potentially, eight degrees by the end of the century. So much for climate change being a problem for future generations.

These predictions are couched in caveats and uncertainties, but these are usually a matter of the timeline rather than the outcome. The key variable, on which they all agree, is the level of emissions (especially those from burning fossil fuels), and the speed with which we reduce them.

And so, once again, we return to the overarching influence that our psychological response—our acceptance, avoidance, or denial—has in determining which path we will take. The shifting language of climate science reflects the growing evidence that our collective decision to ignore climate change commits us to a pathway along which we are rapidly losing any future options for control or choice. And this is why the recognition, understanding, and resolution of the questions explored in this book are so critically important.

*Above is the concluding chapter of **Don't Even Think About It: Why Our Brains Are Wired to Ignore Climate Change** by George Marshall (2014).*