

# Climate Change: Earth's Unthinkable Future

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Imagine a future where temperatures have increased to the point where as much as half of the earth's landmass has become uninhabitable, where to remain outdoors for several hours would be a sentence of death. Could that be what climate change has in store for our planet thousands of years from now? Not according a recent study. That fate could arrive much sooner.

Climatologists Steven Sherwood and Matthew Huber examined the projected impact of climate-induced heat stress on the human population. Although people can tolerate a wide range of temperatures, this is not the case for peak heat stress. There is a limit to how long one can survive if the body becomes too hot. In order to maintain a normal core body temperature, skin temperature cannot exceed 95°F for longer than a few hours at a time. Sweating brings down skin temperature in a hot climate, but it is much less effective in humid conditions. Temperature, therefore, is insufficient on its own for measuring survivability. That is better determined by "wet bulb temperature," that is, temperature as recorded by a mercury thermometer enveloped in a wet cloth. (1)

Current wet bulb temperatures almost never exceed 86 to 88°F anywhere on the globe. But this is set to change in the decades to come. A skin temperature reaching 99 to 100°F is likely to prove lethal, "even for acclimated and fit individuals," so "sufficiently long periods" with a skin temperature above 95 °F are expected "to be intolerable." (2) And at any temperature above that, remarks Chris Byrne, a specialist in human thermoregulation, "we switch from a state where we're losing heat from the skin to the environment to one where the environment imposes a heat load through the skin. There's no doubt that if those conditions arise, you're probably looking at a lethal situation for the vast majority of the population." (3)

What would it take to bring about such conditions? According to Sherwood and Huber, "a global-mean warming" of around 12°F "would create small zones where metabolic heat dissipation would for the first time become impossible." A shift of around 19 to 21°F, and these zones would expand "to encompass most of today's human population. This likely overestimates what could practically be tolerated: Our limit applies to a person out of the sun, in gale-force winds, doused with water, wearing no clothing, and not working." (4)

Threatening temperatures are likely to arrive surprisingly soon. The Intergovernmental Panel on Climate Change (IPCC) determined that if greenhouse gas emissions were to drop "precipitously" overnight and concentrations remained at current levels, then what is currently in the atmosphere has already committed us to an increase of 4.3°F by the end of the century. (5) The problem, of course, is that greenhouse gas emissions are not going to drop to near zero. Indeed, the rate of emissions continues to escalate. Add to that the fact that the consensus-building structure of the IPCC inherently produces results leaning to the

conservative. Furthermore, the IPCC's estimates are derived from models that are based only on fast feedback processes. Excluded are more gradual processes such as methane emissions from thawing permafrost and oceans shifting from absorbing to releasing carbon dioxide. Nor does it account for feedback effects resulting from the shrinking of the cryosphere and vegetation changes. (6)

The MIT Integrated Global System Model, which is based on more sophisticated parameters, projects median surface temperatures to increase by 7 to 9°F by the year 2100. (7) In some regions, temperatures would range higher. That is only 90 years away. Yet conditions will continue to worsen, and sometime in the 22nd century there may be pockets where wet bulb temperatures start to approach the danger point. In three centuries' time, major areas of the planet may become unlivable.

Potentially, even that estimate may be on the conservative side. Scientists tell us that the more warming that takes place, the more uncertainty there is about its impact. Models can provide projections based on known factors. But it is the uncertain factors that make it more difficult to ascertain how much worse climate can be. "Uncertainty and sensitivity have to go hand in hand. They're inextricable," observes scientist Gerard Roe of the University of Washington. "The kicker is that small uncertainties in the physical processes are amplified into large uncertainties in the climate response, and there is nothing we can do about that." (8)

At some time in the future, climate may reach a tipping point, in which accumulated factors come together to produce a dramatically sharp and rapid change. "The Earth has not had such a high CO<sub>2</sub> content since more than 15 million years ago, when the climate was very warm and alligators lived in England," Peter Ditlevesen, a climatologist at the Niels Bohr Institute, explains. "Climate might not just slowly get warmer over the next 1,000 years," but "major climate changes theoretically could happen within a few decades." (9)

Even in the near term, conditions are set to become more uncomfortable. Climatologists Noah Diffenbaugh and Moetasim Ashfaq ran studies that found that "substantial intensification of hot extremes could occur within the next three decades." By the 2030's the equivalent of the longest historical recorded heat wave will occur five times per decade in the western U.S. and three times in the east. By that time, "we see persistent, drier conditions over most of the U.S.," Diffenbaugh points out. "Not only will the atmosphere heat up from more greenhouse gases, but we also expect changes in the precipitation and soil moisture that are very similar to what we see in hot, dry periods historically." (10)

The rise in temperatures will surely have an impact on work that is performed outdoors. "Periods of net heat storage can be endured, though only for a few hours and with ample time needed for recovery," report Sherwood and Huber. (11) The first regions to be affected are those already facing the highest levels of heat stress today, such as parts of Africa or India. Once wet bulb temperatures surpass the level of lethality, populations could only survive by either migrating to ever fewer regions enjoying more moderate weather, or by ensconcing themselves permanently in air-conditioned surroundings. Nonstop air conditioning, however, would be unaffordable for many. Farm animals, too, would have to be kept in air conditioned buildings. Alarmingly, an extended power outage could result in large scale deaths. (12) In realistic terms, then, migration would be the only viable option. But what would be the effect in livable regions where the resources would be inadequate to support a mass influx of people? This would be all the more problematic in that increasing

temperatures are going to bring frequent drought and drier conditions leading to a reduction in agricultural production.

Sherwood and Huber's study has revealed a "pretty devastating" scenario, says Patrick Kinney, director of the climate and health program at Columbia University. "It's a much more serious and catastrophic outcome than people have identified before in the context of heat-related mortality. It seems to be based on sound reasoning, and good models and data. People have already thought about ill-health effects of climate change, but nobody that I know of has considered there being a threshold above which it basically becomes impossible for people to live." (13)

"We need to think about how to ensure that a large fraction of the fossil fuels are simply left in the ground," urges Sherwood. "That's going to take a change in direction that many people are not yet seriously taking on board." (14)

That change in direction is not likely to come in the foreseeable future; certainly not in time to forestall the outcome projected by Sherwood and Huber. It is the developed capitalist nations that are best positioned economically and technologically to address the issue of climate change, and it is those very same nations that are least inclined to do so. Corporate profit remains sacrosanct in the West, and no policy can be effected which would lead to even a mild reduction in the bottom line. In a social system where consideration of human needs is peripheral, given a choice between serving the wealthy or cherishing the planet, future generations stand no chance. What prospect is there for funding the ambitious research and development programs that are needed to combat climate change when any suggestion of the well-to-do paying more taxes elicits hysterical and well-funded opposition? Contrast the puny amount of attention given in the media to the serious threat posed by climate change with the coverage provided to advocacy for cutting spending and social services, and reducing taxes yet further. In media saturated societies, electorates are easily swayed by the messages they are fed by corporate-friendly media and politicians beholden to their corporate partners. The short term interests of the powerful always prevail. Continue feeding the self-absorbed greed of the wealthy, and it is all of humanity that will ultimately pay the price.

## Notes

(1) Steven C. Sherwood, Matthew Huber, "An Adaptability Limit to Climate Change Due to Heat Stress," *Proceedings of the National Academy of Sciences*, May 25, 2010. Hazel Muir, "Thermogeddon," *New Scientist*, October 23-29, 2010.

(2) Sherwood and Huber.

(3) Muir.

(4) Sherwood and Huber.

(5) Charles H. Greene, D. James Baker, Daniel H. Miller, "A Very Inconvenient Truth," *Oceanography*, March 2010.

(6) Muir.

Greene, Baker, and Miller

(7) A.P. Sokolov, et al, "Probabilistic Forecast for 21st Century Climate Based on Uncertainties in Emissions (Without Policy) and Climate Parameters," MIT Joint Program on the Science and Policy of Global Change, Report # 169, January, 2009.

(8) "Like it or Not, Uncertainty and Climate Change Go Hand-in-Hand," Science Daily, October 27, 2007.

(9) "Dramatic Climate Change is Unpredictable," Science Daily, October 29, 2010.

(10) Noah S. Diffenbaugh, Moetasim Ashfaq, "Intensification of Hot Extremes in the United States," Geophysical Research Letters, vol. 37.

Mark Schwartz, "Heat Waves and Extremely High Temperatures Could be Commonplace in the U.S. by 2039, Stanford Study Shows," Stanford Report, July 8, 2010.

(11) Sherwood and Huber.

(12) Muir.

(13) Muir.

(14) Sherwood and Huber.

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<http://www.amazon.com/Strange-Liberators-Militarism-Mayhem-Pursuit/dp/1595265708>

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