

Environment

Climate Crisis Is on Track to Push One-Third of Humanity Out of Its Most Livable Environment

As conditions that best support life shift toward the poles, more than 600 million people are already living outside of a crucial “climate niche,” facing more extreme heat, rising food scarcity and higher death rates.



People walk along an almost-dry arm of the Paraná River, where water levels reached a historic low, near Rosario, Argentina, in August 2021. Juan Mabromata/AFP via Getty Images

by **Abrahm Lustgarten**

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Climate change is remapping where humans can exist on the planet. As optimum conditions shift away from the equator and toward the poles, more than 600 million people have already been stranded outside of a crucial environmental niche that scientists say best supports life. By late this century, according to a study published last month in the journal *Nature Sustainability*, 3 to 6 billion people, or between a third and a half of humanity, could be trapped outside of that zone, facing extreme heat, food scarcity and higher death rates, unless emissions are sharply curtailed or mass migration is accommodated.

the largest estimates as enormous segments of the earth's population seek safe havens. It also makes a moral case for immediate and aggressive policies to prevent such a change from occurring, in part by showing how unequal the distribution of pain will be and how great the improvements could be with even small achievements in slowing the pace of warming.

"There are clear, profound ethical consequences in the numbers," Timothy Lenton, one of the study's lead authors and the director of the Global Systems Institute at the University of Exeter in the U.K., said in an interview. "If we can't level with that injustice and be honest about it, then we'll never progress the international action on this issue."

The notion of a climate niche is based on work the researchers first published in the Proceedings of the National Academy of Sciences in 2020, which established that for the past 6,000 years humans have gravitated toward a narrow range of temperatures and precipitation levels that supported agriculture and, later, economic growth. That study warned that warming would make those conditions elusive for growing segments of humankind and found that while just 1% of the earth's surface is now intolerably hot, nearly 20% could be by 2070.

The new study reconsiders population growth and policy options and explores scenarios that dramatically increase earlier estimates, demonstrating that the world's environment has already changed significantly. It focuses more heavily on temperature than precipitation, finding that most people have thrived in mean annual temperatures of 55 degrees Fahrenheit.

Should the world continue on its present pathway — making gestures toward moderate reductions in emissions but not meaningfully reducing global carbon levels (a scenario close to what the United Nations refers to as SSP2-4.5) — the planet will likely surpass the Paris Agreement's goal of limiting average warming to 1.5 degrees Celsius and instead warm approximately 2.7 degrees. That pathway, which accounts for population growth in hot places, could lead to 2 billion people falling outside of the climate niche within just the next eight years, and 3.7 billion doing so by 2090. But the study's authors, who have argued in other papers that the most extreme warming scenarios are well within the realm of possibility, warn that the worst cases should also be considered. With 3.6 degrees of warming and a pessimistic climate scenario that includes ongoing fossil fuel use, resistance to international migration and much more rapid population growth (a scenario referred to by the U.N. as SSP3-7), the shifting climate niche could pose what the authors call "an existential risk," directly affecting half the projected total population, or, in this case, as many as 6.5 billion people.

The data suggests the world is fast approaching a tipping point, after which even small increases in average global temperature will begin to have dramatic effects. The world has already warmed by about 1.2 degree Celsius, pushing 9% of the earth's population out of the climate niche. At 1.3 degrees, the study estimates that the pace would pick up considerably, and for every tenth of a degree of additional warming, according to Lenton, 140 million more people will be pushed outside of the niche. "There's a real nonlinearity lurking in there that we hadn't seen before," he said.

Slowing global emissions would dramatically reduce the number of people

would be left outside of the optimal zone. The population suffering from extreme heat would be reduced fivefold, from 22% to just 5% of the people on the planet.

Climate research often frames the implications of warming in terms of its economic impacts, couching damages in monetary terms that are sometimes used to suggest that small increases in average temperature can be managed. The study disavows this traditional economic framework, which Lenton says is “unethical” because it prioritizes rich people who are alive today, and instead puts the climate crisis in moral terms. The findings show that climate change will pummel poorer parts of the world disproportionately, effectively sentencing the people who live in developing nations and small island states to extreme temperatures, failing crops, conflict, water and food scarcity, and rising mortality. The final option for many people will be migration. The estimated size of the affected populations, whether they’re 2 billion or 6 billion, suggests an era of global upheaval.

According to the study, India will have, by far, the greatest population outside of the climate niche. At current rates of warming, the researchers estimate that more than 600 million Indians will be affected, six times more than if the Paris targets were achieved. In Nigeria, more than 300 million citizens will be exposed, seven times more than if emissions were steeply cut. Indonesia could see 100 million people fall out of a secure and predictable environment, the Philippines and Pakistan 80 million people each, and so on. Brazil, Australia and India would see the greatest area of land become less habitable. But in many smaller countries, all or nearly all the land would become nearly unlivable by traditional measures: Burkina Faso, Mali, Qatar, the United Arab Emirates, Niger. Although facing far more modest impacts, even the United States will see its South and Southwest fall toward the hottest end of the niche, leading to higher mortality and driving internal migration northward.

Throughout the world, the researchers estimate, the average person who is going to be exposed to unprecedented heat comes from a place that emitted roughly half the per capita emissions as those in wealthy countries. American per capita emissions are more than twice those of Europeans, who still live a prosperous and modern existence, the authors point out, so there is ample room for comfortable change short of substantial sacrifice. “The idea that you need the level of wasteful consumption ... that happens on average in the U.S. to be part of a happy, flourishing, rich, democratic society is obviously nonsense,” Lenton said.

Each American today emits nearly enough emissions over their lifetime to push one Indian or Nigerian of the future outside of their climate niche, the study found, showing exactly how much harm Americans’ individual actions can cause (1.2 Americans to 1 future person, to be exact). The lifestyle and policy implications are obvious: Reducing consumption today reduces the number of people elsewhere who will suffer the consequences tomorrow and can prevent much of the instability that would otherwise result. “I can’t — as a citizen of a planet with this level of risk opening up — not also have some kind of human and moral response to the figures,” Lenton said. We’ve all got to deal with that, he added, “in our own way.”

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