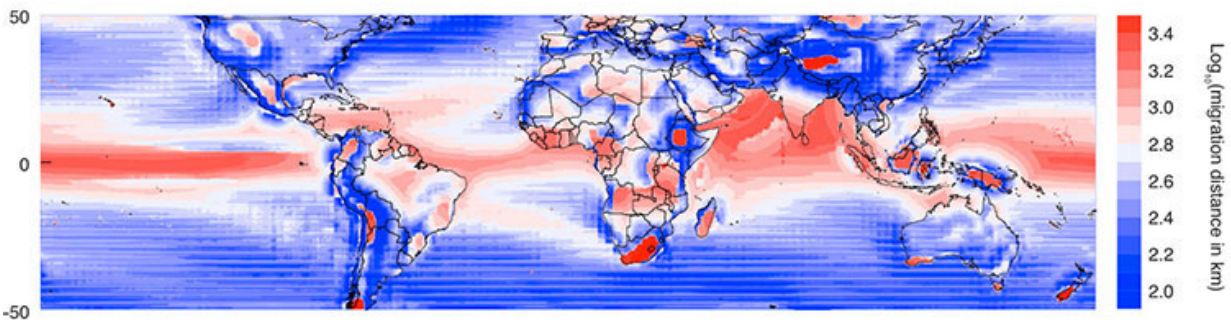


# Climate change could trigger tropical evacuations, researchers advise

June 10 2016, by Kathleen Maclay

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The map above, contained in the Hsiang-Sobel paper, reflects a logarithm calculating the minimum distance an organism must travel to maintain the average temperature of its original tropical location. Credit: University of California - Berkeley

Global warming by just 2 degrees Celsius is likely to force some tropical plant, animal and human populations to relocate hundreds of miles from their current homes this century, according to research published today in the journal *Scientific Reports*.

Solomon Hsiang, Chancellor's Associate Professor of Public Policy at the University of California, Berkeley, and Adam Sobel, a professor of applied physics and math at Columbia University, foresee dramatic population declines in Mexico, Central America, Africa, India and other

tropical locales if ecosystems or humans move due to [climate change](#).

In their analysis, the pair used a model to demonstrate how [climate](#) dynamics in the tropics can dramatically magnify the consequences of climate change as it is experienced on the ground. This means even small climate changes can have dramatic impacts.

## **The equator's limited options**

"We're not making specific predictions about migration patterns of individual species, but the geophysical constraint is that, as the tropics get hotter, you'll have to go far, essentially leaving the tropics, to cool off," said Sobel.

Because the tropics are uniformly hot, when things get hotter by just a small amount, populations will have to move far to find relief.

Hsiang explains it with an analogy: "Imagine you have a fixed budget you can spend on your apartment and rents are the same throughout your entire neighborhood. If all the rents go up, even by just a little bit, you might have to move very far to find a new place you can afford."



Credit: AI-generated image ([disclaimer](#))

Hsiang and Sobel describe climate-related displacements in the tropics as "an almost complete evacuation of the equatorial band" that could impact ecosystems as well as human well-being.

## **A 'temperature budget'**

The researchers report that some oceanic and continental populations would have to move as far as 1,000 miles or more to stay within their "temperature budget." Where do those populations end up? Simulations by the authors suggest the cooler edges of the tropics could get crowded, where populations might theoretically climb by 300 percent or higher. At those densities, disease and conflict over resources, among other issues, would bring their own complications.

"We know that people and species of all kinds move for all kinds of reasons, not just to stay at the same temperature," said Sobel. "At the same time, the uniformity of [tropical](#) temperatures is a basic fact about the temperature structure of Earth, and still will be as the climate changes. It seems like a very basic constraint that ought to be understood as we think about populations."



Professor Solomon Hsiang, director of UC Berkeley's Global Policy Lab. Credit: Brittany Murphy

## Problems with staying put

"Another real problem arises when populations can't move, but instead

have to stay put and suffer the consequences of a new climate," Hsiang said. "This can happen when human migrants run into political borders or when species physically can't move fast enough." The recent catastrophic bleaching of the Great Barrier Reef is an example of the latter.

To arrive at their findings, Hsiang and Sobel compared today's temperatures with climate model projections where Earth's average temperature rose by 2 degrees Celsius this century. Even under these modest climate changes, considered "optimistic" compared to business-as-usual forecasts, the authors found that [population](#) movements could be dramatic. The tropics, they said, are unique in this extreme response to limited warming.

The authors are cautious in applying their findings to [human populations](#), since moving is only one of many strategies humans will use to cope with warming. Nonetheless, they note that extraordinary human migrations cannot be ruled out, pointing to the American Dust Bowl as a familiar and dramatic recent experience.

**More information:** Solomon M. Hsiang et al. Potentially Extreme Population Displacement and Concentration in the Tropics Under Non-Extreme Warming, *Scientific Reports* (2016). [DOI: 10.1038/srep25697](https://doi.org/10.1038/srep25697)

Provided by University of California - Berkeley

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