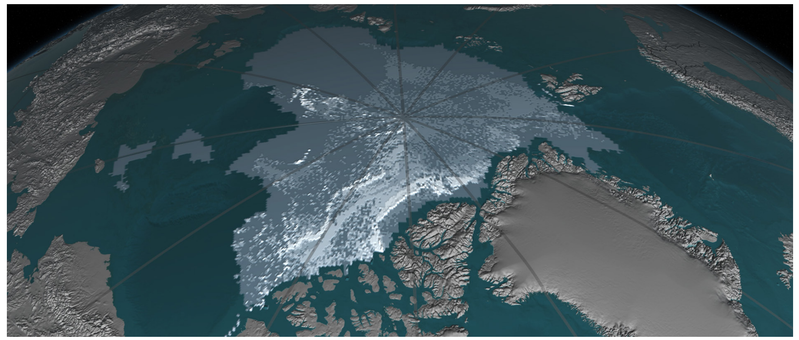
Climate Economics: From Numerical Models to Data-Driven Estimates



Policymakers who drive decisions related to the economics of climate change have traditionally relied upon numerical integrated assessment models, which make assumptions about the relationship between increasing temperatures and economic output to estimate the costs of climate change in each sector of the economy. These estimates are currently the only source of information used in official U.S. regulatory analysis, and are used to inform climate policy like the EPA's Clean Power Plan.

In recent years, however, many economists have started to use empirical, data-driven econometric estimates to measure the impacts of climate change, and in some cases these assessments challenge the previous estimates. The new estimates rely on historical variation in weather to understand how economic processes are affected by changes in climate; they require fewer assumptions and tend to be more transparent than integrated assessment techniques. In most cases, these studies have not been integrated into the regulatory process, and questions remain about how the new estimates should be incorporated into the existing models.

Addressing this question is "of the highest scientific and policy relevance," according to a team of climate economists at UC Berkeley, who are leading a Matrix Theme Team dedicated to this topic. (Matrix Theme Teams are year-long initiatives that relate to the current Matrix theme, "Questioning the Evidence," exploring the changing concepts and practices related to the collection and analysis of data and evidence in the social sciences—and in society at large.)

The research team includes PhD students, post-docs, and faculty from diverse divisions; it is led and coordinated by David Anthoff, from UC Berkeley's Energy and Resources Group, Max Auffhammer, from the Department of Agricultural and Resource Economics & International Area Studies, and Solomon Hsiang, from the Goldman School of Public Policy. These three scholars previously collaborated on the Matrix-sponsored Climate Change Economics Roundtable, which they say "established a robust and vibrant community of researchers on campus that regularly interact" and exposed the model-vs-data analysis question as a "major research gap that this group wants to tackle going forward."

Among the questions the researchers are considering: how do modern, empirical, data-driven, econometric impact estimates compare to older estimates derived from integrated assessment models? How can the new data driven evidence be incorporated into the older analytical tool used in the policy process? And what can the modern econometric studies learn from the approaches taken in the older integrated assessment models?

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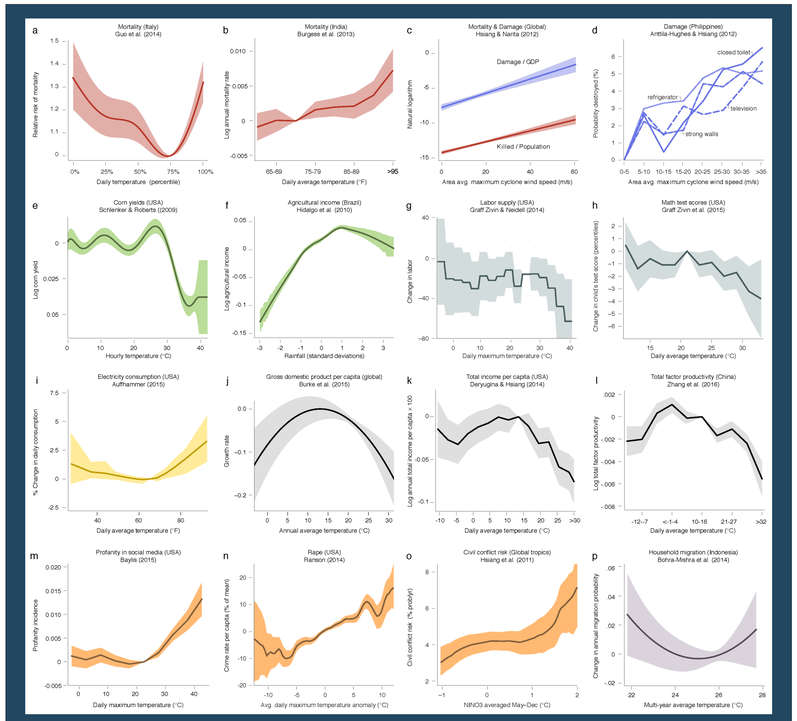
RESEARCH GOALS

- Understand the differences between the models used to inform public policy, and the most recent empirical scientific research.
- Guide new data-driven research so that it can be used in a new generation of numerical models that eventually will be used in policy deliberations.
- Develop robust guidelines on how to incorporate modern empirical impact estimates into quantitative models of climate change that can be used by the wider research community.



Empirical studies demonstrate that climate variables influence social and economic outcomes in many sectors and contexts. From "Social and Economic Impacts of Climate," by Tamma A. Carleton and Solomon M. Hsiang. *Science* 09 Sep 2016: Vol. 353, Issue 6304.

"The specific research question we are tackling will most likely inform any executive branch regulation of carbon emissions in the United States in the future in a most direct way, by changing the way cost benefit analysis is conducted in this important policy area," the proposal explains. "Any attempt to deal with climate economics is inherently interdisciplinary. One needs to combine an understanding of the natural science process of climate change with economic analysis of the consequences of such change."

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Image: "Older, thicker Arctic sea ice declines," NASA Earth Observatory, 2016