

Jonathan Gilligan
Vanderbilt University
Nashville, TN, USA

Employment:

2016-present: Associate Professor of Civil & Environmental Engineering, Vanderbilt University
2009-present: Associate Professor of Earth & Environmental Sciences, Vanderbilt University
2003-2009: Senior Lecturer in Earth & Environmental Sciences, Vanderbilt University
1995-2003: Research Assistant Professor of Physics, Vanderbilt University
1993-1994: Postdoctoral Research Associate, NOAA and University of Colorado
1991-1993: National Research Council Postdoctoral Associate, Nat'l Institute of Standards & Tech.

Education:

1991: Ph.D. (Physics), Yale University.
1982: B.A. (Physics), Swarthmore College

Research Experience:

I did my Ph.D. in atomic, molecular, and optical physics and after a postdoc at NIST, moved into environmental sciences at NOAA, where I led a team building and deploying an airborne gas chromatograph to measure ozone-depleting substances in the stratosphere. After moving to Vanderbilt as a trailing spouse, I worked in biomedical physics for many years until Vanderbilt created a department of Earth & Environmental Sciences, where I launched an interdisciplinary research program to study climate change by connecting social and behavioral sciences with natural science and engineering, both to analyze greenhouse gas mitigation policy and to study impacts, adaptations, and vulnerabilities from a coupled natural-human systems perspective.

I led the quantitative analysis for a paper showing that behavioral interventions could rapidly reduce household greenhouse gas emissions in the US by 20% (reducing national emissions more than 7%). A law-professor colleague and I introduced a three-pronged framework for analyzing climate policy to account for behavioral and political feasibility. We then developed a comprehensive account of non-governmental actors performing environmental regulatory functions traditionally associated with governments. This work was recognized with the 2017 Morrison Prize and our book *Beyond Politics* was included in the Environmental Law Institute's list of the most important books on environmental policy in the last 50 years.

I have collaborated with geoscientists, engineers, and social scientists to study impacts, vulnerabilities, and adaptations to climate change in South Asia, with focus on how land use interacts with climate change to shape vulnerability and resilience, and how environmental shocks affect migration, marriage, and other aspects of human behavior. I was part of an interdisciplinary team that first quantified the contribution of local land-use to relative sea-level rise in Bangladesh, showing that land-use contributes 10 times more than eustatic sea-level rise.

I apply agent-based modeling to understanding impacts and adaptation to extreme weather, including migration, water management, and agriculture. One recent application is a computational test bed for assessing policies to manage the food-energy-water nexus in Western Cape Province, South Africa, in the face of extreme drought.

I have been active in translating my research to benefit society through education and public engagement, which Vanderbilt recognized with its Alexander Heard Distinguished Service Professor award. I volunteer as an adviser on emissions mitigation for the Nashville Mayor's Sustainability Advisory Committee. I organized a workshop for community groups and local government on applying data science to equitable and affordable housing. I have testified about climate change to the state legislature. I worked with Inside Climate News to conduct training

workshops on reporting climate change for journalists in the Southeast and Midwest. I co-chaired the development of a new interdisciplinary Climate Studies major at Vanderbilt that integrates natural and social sciences and humanities.

Selected Publications:

- M.P. Vandenbergh and J.M. Gilligan. 2017. *Beyond Politics: The Private Governance Response to Climate Change*. (Cambridge University Press).
- T. Dietz, G. Gardner, J. Gilligan, P. Stern, and M. Vandenbergh. 2009. Household actions can provide a behavioral wedge to rapidly reduce carbon emissions. *PNAS* **106**, 18452.
- J.M. Gilligan. 2021. Expertise across disciplines: Establishing common ground in interdisciplinary disaster research. *Risk Analysis* **41**, 1171.
- L.W. Auerbach, S.L. Goodbred, D.R. Mondal, C.A. Wilson, K.R. Ahmed, K. Roy, M.S. Steckler, C. Small, J.M. Gilligan, and B.A. Ackerly. 2015. Flood risk of natural and embanked landscapes on the Ganges-Brahmaputra tidal delta plain. *Nature Climate Change* **5**, 152.
- A.R. Carrico, K.M. Donato, K. Best, and J. Gilligan. 2020. Extreme weather and marriage among girls and women in Bangladesh. *Global Environmental Change* **65**, 102160.
- K. Best, J. Gilligan, H. Baroud, A. Carrico, K. Donato, and B. Mallick. 2022. Applying machine learning to social datasets: A study of migration in southwestern Bangladesh. *Regional Environmental Change* **22**, 1.
- S. Elsawah, T. Filatova, A.J. Jakeman, A.J. Kettner, M.L. Zellner, I.N. Athanasiadis, S.H. Hamilton, R.L. Axtell, D.G. Brown, J.M. Gilligan, M.A. Janssen, et al.. 2020. Eight grand challenges in socio-environmental systems modeling. *Socio-Environmental Systems Modeling* **2**, 16226.
- J.M. Gilligan and M.P. Vandenbergh. 2020. A framework for assessing the impact of private climate governance. *Energy Research & Social Science* **60**, 101400.
- K.J. Ding, J.M. Gilligan, Y.C.E. Yang, P. Wolski, and G.M. Hornberger. 2021. Assessing food-energy-water resource management strategies at city scale: An agent-based modeling approach for Cape Town, South Africa. *Resources, Conservation, and Recycling* **170**, 105573.
- K.S. Nielsen, P.C. Stern, T. Dietz, J.M. Gilligan, D.P. van Vuuren, M.J. Figueroa, C. Folke, W. Gwozdz, D. Ivanova, L.A. Reisch, M.P. Vandenbergh, K.S. Wolske, and R. Wood. 2020. Improving climate change mitigation analysis: A framework for examining feasibility. *One Earth* **3**, 325.
- J.M. Gilligan, C.A. Wold, S.C. Worland, J.J. Nay, D.J. Hess, and G.M. Hornberger. 2018. Urban water conservation policies in the United States. *Earth's Future* **6**, 955.
- T. Gunda, G.M. Hornberger, and J.M. Gilligan. 2016. Spatiotemporal patterns of agricultural drought in Sri Lanka: 1881-2010. *International Journal of Climatology* **36**, 563.
- C. Wilson, S. Goodbred, C. Small, J. Gilligan, S. Sams, B. Mallick, and R. Hale. 2017. Widespread infilling of tidal channels and navigable waterways in the human-modified tidal delta plain of southwest Bangladesh. *Elementa: Science of the Anthropocene* **5**, 78.

Honors:

- 2022: Alexander Heard Distinguished Service Professor Award, Vanderbilt University
- 2018: Chancellor's Award for Research, Vanderbilt University
- 2017: The Morrison Prize for the highest impact paper of the year in sustainability law and policy, Sandra Day O'Connor School of Law, Arizona State University
- 1998: Outstanding Scientific Paper Award, Environmental Research Lab, NOAA
- 1995: NASA Group Achievement Award (ASHOE/MAESA campaign)

Professional Society Memberships: American Geophysical Union, American Meteorological Society, American Association for the Advancement of Science (AAAS), American Association of Geographers (AAG), Institute for Operations Research and Management Sciences (INFORMS)