Governance of the Deployment of Solar Geoengineering

Research Workshop Conducted by the Harvard Project on Climate Agreements
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Bios

Scott Barrett is the Lenfest-Earth Institute Professor of Natural Resource Economics at Columbia University. He was a lead author of the second assessment report by the Intergovernmental Panel on Climate Change and was previously a member of the Academic Panel of Environmental Economists to the U.K.'s Department of Environment. Barrett is the author of *Environment and Statecraft: The Strategy of Environmental Treaty-Making*, published in 2005. His most recent book, *Why Cooperate? The Incentive to Supply Global Public Goods*, was published in September 2007. Barrett received his Ph.D. in economics from the London School of Economics (1989); an M.A. in economics from the University of British Columbia, Vancouver; and a B.S., *summa cum laude*, in resource economics from the University of Massachusetts, Amherst (1979).

Daniel Bodansky is Foundation Professor of Law in the Sandra Day O'Connor College of Law. He is also the faculty co-director for the Center for Law and Global Affairs. In addition, he is an affiliate faculty member with the Center for Law, Science and Innovation and the Julie Ann Wrigley Global Institute of Sustainability's School of Sustainability at ASU. Bodansky is a leading authority on international environmental law generally, and global climate change law in particular. He teaches courses in public international law and sustainability and is a key player in the college's Program on Law and Sustainability.

Matthew Bunn is Professor of Practice at the Harvard Kennedy School. His research interests include nuclear theft and terrorism; nuclear proliferation and measures to control it; the future of nuclear energy and its fuel cycle; and policies to promote innovation in energy technologies. Before coming to Harvard, Bunn served as an adviser to the White House Office of Science and Technology Policy, as a study director at the National Academy of Sciences, and as editor of *Arms Control Today*. Bunn is the author or co-author of more than twenty-five books and book-length technical reports (most recently *Insider Threats),* and over 150 articles in publications ranging from *Science* and *Nuclear Technology* to *Foreign Policy* and *The Washington Post*.

Daniel Heyen recently joined ETH Zurich as a postdoctoral researcher after a postdoctoral appointment at the Grantham Research Institute on Climate Change and the Environment at the London School of Economics. He is an applied theorist working at the interface of decision theory and environmental economics. His main research interest is in societal decision-making under uncertainty and learning. Key topics are the description of scientific uncertainty, the value of information and forecasts, and the design of risk regulation and the precautionary principle. A second line of his research focuses on strategic aspects of environmental technologies with geoengineering as an important area of application. Heyen holds a Ph.D. in economics from Heidelberg University.

John P. Holdren is the Teresa and John Heinz Professor of Environmental Policy at the Harvard Kennedy School (HKS); Co-Director of the Program on Science, Technology, and Public Policy in HKS's Belfer Center for Science and International Affairs; and Professor of Environmental Science and Policy in the Department of Earth and Planetary Sciences at Harvard University. He is also Senior Advisor to the Director at the independent, nonprofit Woods Hole Research Center. From January 2009–January 2017, he was President Obama's Science Advisor and the Senate confirmed Director of the White House Office of Science and Technology Policy (OSTP), becoming the longest-serving Science Advisor to the President in the history of the position (dating back to World War II). Holdren earned S.B. and S.M. degrees from M.I.T. and a Ph.D. from Stanford in aerospace engineering and theoretical plasma physics.

Joshua B. Horton is Research Director, Geoengineering at the Harvard John A. Paulson School of Engineering and Applied Sciences and also manages the Weatherhead Center for International Affairs Initiative on Climate Engineering. His research encompasses the politics, policy, and governance of solar geoengineering, with a current focus on compensation for harms arising from possible future deployment of the technology. From 2013–2016, Horton was a Postdoctoral Research Fellow in the Belfer Center's Science, Technology, and Public Policy Program.
Horton obtained a Ph.D. in political science from Johns Hopkins University in 2007, where he specialized in international relations.

Sheila Jasanoff is Pforzheimer Professor of Science and Technology Studies at the Harvard Kennedy School, where she founded and directs the Program on Science, Technology and Society; she also founded and coordinates the Science and Democracy Network. Previously, she was founding chair of Cornell University's Department of Science and Technology Studies. Jasanoff's research centers on the interactions of law, science, and politics in democratic societies. Jasanoff holds an A.B. in mathematics from Harvard College, a Ph.D. in linguistics from Harvard University, and a J.D. from Harvard Law School.

Sikina Jinnah is an associate professor of politics at University of California, Santa Cruz, and a 2017 Andrew Carnegie Fellow. Her research focuses on the shifting locations of power and influence in global environmental governance, in particular in the areas of climate change, climate engineering, and the nexus between international trade and environmental politics. Jinnah is Co-Editor of the journal *Environmental Politics*, is on the editorial board for the journal *Global Environmental Politics*, is a Senior Research Fellow with the Earth System Governance project, and is a member of the Academic Working Group on International Governance of Climate Engineering at the Forum for Climate Engineering Assessment, and serves on that organization's Advisory Board.

David Keith is a professor at the Harvard School of Engineering and Applied Sciences and Harvard Kennedy School, and founder of Carbon Engineering, a company developing technology to capture CO_2 from ambient air. He has worked near the interface between climate science, energy technology, and public policy for twenty-five years. Best known for his work on the science, technology, and public policy of solar geoengineering, he led the development of the Solar Geoengineering Research Program. Keith took first prize in Canada's national physics prize exam, won MIT's prize for excellence in experimental physics, and was one of *TIME* magazine's Heroes of the Environment.

Albert Lin is a professor of law at the University of California, Davis School of Law. His research interests include the relationship between technology, the environment, and law. His writings on geoengineering include: Carbon Dioxide Removal After Paris, __ *Ecology Law Quarterly* __ (2018 forthcoming); The Missing Pieces of Geoengineering Research Governance, 100 *Minnesota Law Review* 2509 (2016); and Does Geoengineering Present a Moral Hazard?, 40 *Ecology Law Quarterly* 673 (2013). Lin received his J.D. from the University of California, Berkeley School of Law and an M.P.P. from the Harvard Kennedy School.

Joseph S. Nye, Jr. is University Distinguished Service Professor, *Emeritus*, and former Dean of the Harvard Kennedy School. He has served as Assistant Secretary of Defense for International Security Affairs, Chair of the National Intelligence Council and a Deputy Under Secretary of State. He is a fellow of the American Academy of Arts and Sciences, the British Academy, and the American Academy of Diplomacy. In a recent survey of international relations scholars, he was rated the fifth most influential over the past 20 years; ranked as the most influential scholar on American foreign policy, and in 2011, *Foreign Policy* named him one of the top 100 Global Thinkers. He is co-chair of the Aspen Strategy Group. Nye received his bachelor's degree, *summa cum laude*, from Princeton University, won a Rhodes Scholarship to Oxford University, and earned a Ph.D. in political science from Harvard University.

Meghan L. O'Sullivan is the Jeane Kirkpatrick Professor of the Practice of International Affairs at the Harvard Kennedy School and the Director of the Belfer Center for Science and International Affairs' Geopolitics of Energy Project. The project brings together experts from the realms of academia, industry, and government to explore the complex interactions between energy markets and international affairs. O'Sullivan's third book, *Windfall: How the New Energy Abundance Upends Global Politics and Strengthens America's Power*, was published by Simon & Schuster in September 2017.

Janos Pasztor is currently Senior Fellow and Executive Director of the Carnegie Climate Geoengineering Governance Initiative (C2G2) at the Carnegie Council for Ethics in International Affairs. He has over thirty-five years of work experience in the areas of energy, environment, climate change, and sustainable development. Before taking up his current assignment, he was UN Assistant Secretary-General for Climate Change in New York under Secretary-General Ban Ki-moon. Pasztor has B.Sc. and M.Sc. degrees from MIT.

Jesse Reynolds is an Emmett/Frankel Fellow in Environmental Law and Policy at the University of California, Los Angeles School of Law. He draws from international law, international relations, and economics to research how society can develop norms, rules, and institutions to manage transboundary environmental problems, particularly those involving new technologies. His book *The Governance of Solar Geoengineering: Managing Climate Change in the Anthropocene* is forthcoming on Cambridge University Press. Reynold's obtained his B.A. in environmental science and chemistry from Hampshire College; his M.S. in environmental science, policy, and management from the University of California, Berkeley (as a Science-to-Achieve-Results Graduate Fellow through the U.S. Environmental Protection Agency); and his Ph.D. in international law from Tilburg University (in part as a Fulbright Fellow through the U.S. Department of State).

Kate Ricke is an Assistant Professor at UC San Diego with joint appointment between the Scripps Institution of Oceanography and the School of Global Policy and Strategy. She is a climate change scientist who combines quantitative modeling and large data set analysis techniques applied to physical and social systems. Her research focuses on how uncertainty and heterogeneity, both in the projected impacts of climate change and in preferences for how to address them, influence strategic incentives in climate policy problems. She has worked on topics ranging from the regional climate effects and international relations implications of solar geo-engineering, to decadal climate variability's influence on international climate agreements to the effect of heterogeneous national climate change impacts on efficient coalition building. She has conducted uncertainty assessments of ocean acidification's effects on coral reefs, marginal carbon dioxide emissions' effects of global and regional warming, and temperature target overshoot scenarios. Prior to UCSD, Ricke was a research associate in the Sibley School of Mechanical and Aerospace Engineering at the Cornell University and a Fellow at the Carnegie Institution for Science. She received her PhD in Engineering & Public Policy at Carnegie Mellon University and her BS in Earth Atmospheric and Planetary Sciences at MIT.

Stefan Schäfer leads a research group at the Institute for Advanced Sustainability Studies in Potsdam, Germany and is a Visiting Fellow in the Science, Technology and Society Program at Harvard University. His research draws on approaches from Science and Technology Studies to examine questions at the intersection of science, technology, democracy, and sustainability, with a focus on the global governance of climate change. He is also an associate fellow of the Institute for Science, Innovation and Society at the University of Oxford, where he was an Oxford Martin Visiting Fellow in 2017.

Daniel Schrag is the Sturgis Hooper Professor of Geology, Professor of Environmental Science and Engineering at Harvard University, and Director of the Harvard University Center for the Environment. His primary appointment is in the Department of Earth and Planetary Sciences in the Faculty of Arts and Sciences. He serves as Area Dean for Environmental Science and Engineering in the Harvard John A. Paulson School of Engineering and Applied Sciences and also co-directs the Program on Science, Technology and Public Policy at the Harvard Kennedy School.

Lucas Stanczyk is an assistant professor of political science and affiliated faculty of philosophy at MIT. In 2017, he joined the philosophy department at Harvard. He works on topics at the intersection of political philosophy and political economy. His current book manuscript develops a theory of justice in production. His other research and teaching is focused on ethical problems in global energy policy and the ethics of growing inequality.

Robert Stavins is the A. J. Meyer Professor of Energy & Economic Development, Harvard Kennedy School; Director, Harvard Environmental Economics Program; and Director, Harvard Project on Climate Agreements. He is a University Fellow, Resources for the Future; Research Associate, National Bureau of Economic Research; elected Fellow, Association of Environmental and Resource Economics; Member, Board of Directors, Resources for the Future; and Editor, Journal of Wine Economics. He was Chairman, Environmental Economics Advisory Board, U.S. Environmental Protection Agency. He was a Lead Author, Second and Third Assessment Reports, Intergovernmental Panel on Climate Change; and Coordinating Lead Author, Fifth Assessment Report. His research has examined diverse areas of environmental economics and policy, and appeared in more than a hundred articles in academic journals and popular periodicals, plus a dozen books. He holds a B.A. in philosophy from Northwestern University, an M.S. in agricultural economics from Cornell, and a Ph.D. in economics from Harvard.

James Stock is the Harold Hitchings Burbank Professor of Political Economy in the Faculty of Arts and Sciences and also a member of the faculty at the Harvard Kennedy School. His research includes energy and environmental economics with a focus on biofuels and on U.S. climate-change policy. He currently is Faculty Associate at the Harvard University Consortium on the Environment, Faculty Fellow with the Harvard Environmental Economics Program, Nonresident Fellow at the Columbia Center for Global Energy Policy, and a member of the scientific advisory board for the Resources for the Future Social Cost of Carbon Initiative. Stock received a M.S. in statistics and a Ph.D. in economics from the University of California, Berkeley.

Robert Stowe is Executive Director of the Harvard Environmental Economics Program and Co-Director of the Harvard Project on Climate Agreements – both University-wide programs based in the Harvard Kennedy School (HKS). He was also an Adjunct Lecturer in Public Policy at HKS, teaching a course on international climate-change policy (2016 – 18). Stowe has been engaged through the Harvard Project in the annual Conferences of the Parties of the U.N. Framework Convention on Climate Change since 2007. He was a Contributing Author to a chapter on international cooperation in the Intergovernmental Panel on Climate Change's Fifth Assessment Report. Stowe has worked in non-profit, academic, and business organizations, including as Vice President of Programs of the Citizens Network for Foreign Affairs, which provides assistance in agriculture and agribusiness to developing countries, and as a consultant to the World Bank and other organizations on agricultural management projects. Stowe holds a Ph.D. in political science from the Massachusetts Institute of Technology and an A.B. in physics from Harvard College.

Dustin Tingley is Professor of Government at Harvard University. His research interests include international relations, international political economy, statistical methodology, and experimental approaches to political science. Recent projects include attitudes towards global climate technologies and policies and the intersection of causal inference and machine learning methods for the social sciences. Tingley received a Ph.D. in Politics from Princeton in 2010 and B.A. from the University of Rochester in 2001.

David Victor is an internationally recognized leader in research on energy and climate change policy, as well as energy markets. His research focuses on regulated industries and how regulation affects the operation of major energy markets. He has a dual understanding of the science behind climate change and how international and domestic public policy work. Victor authored *Global Warming Gridlock*, which explains why the world has not made much diplomatic progress on the problem of climate change, while also exploring new strategies that would be more effective. Victor is a leading contributor to the Intergovernmental Panel on Climate Change (IPCC), a United Nations-sanctioned international body with 195 country members.

Gernot Wagner is a research associate at the Harvard John A. Paulson School of Engineering and Applied Sciences, a lecturer on Environmental Science and Public Policy, the executive director of the Solar Geoengineering Research Program, an associate of the Science, Technology, and Public Policy Program at Harvard Kennedy School's Belfer Center for Science and International Affairs, and an associate at the Harvard University Center for the Environment. Wagner co-authored *Climate Shock* with Professor Martin Weitzman of Harvard University and published by Princeton University Press (2015).

Martin L. Weitzman is a professor of economics at Harvard University. Previously he was on the faculties of MIT and Yale. He has been elected as a fellow of the Econometric Society and the American Academy of Arts and Sciences. He has published widely in many leading economic journals and written three books. His current research is focused on environmental economics, including climate change, the economics of catastrophes, cost-benefit analysis, long-run discounting, green accounting, biodiversity, and comparison of alternative instruments for controlling pollution.

Richard Zeckhauser is the Frank P. Ramsey Professor of Political Economy at the Harvard Kennedy School. He is an elected fellow of the Econometric Society, the Institute of Medicine (National Academy of Sciences), and the American Academy of Arts and Sciences. In 2014, he was named a Distinguished Fellow of the American Economic Association. His contributions to decision theory and behavioral economics include the concepts of quality-adjusted life years (QALYs), status quo bias, betrayal aversion, and ignorance (states of the world unknown) as a complement to the categories of risk and uncertainty. Many of his policy investigations explore ways to promote the health of human beings, to help markets work more effectively, and to foster informed and appropriate choices by individuals and government agencies. He graduated from Harvard College, *summa cum laude*, and also received his Ph.D. from Harvard University.