

MIT Joint Program on the Science and Policy of Global Change

XLIV GLOBAL CHANGE FORUM

23–24 March, 2022 MIT Samberg Conference Center

50 Memorial Drive, 7th Floor, Building E52 The Morris and Sophie Chang Building Sloan School of Management, Cambridge, MA USA

SAVE THE DATE: 23–24 MARCH, 2023

GLOBAL CHANGE FORUM XLV

Location: MIT Samberg Conference Center 50 Memorial Drive, Cambridge MA

A word from the Director:

Much has changed in the world since the start of the Covid-19 pandemic in 2019. And that includes how conferences are run. As you know, public health constraints compelled us to move our Global Change Forum online so we could continue our annual, substantive conversations about the latest developments in global and regional change. We are delighted that with this Forum we can meet both in person and online.

For those of you who are joining us in person, we greatly appreciate your efforts to navigate multiple Covid-19 restrictions on travel and social gatherings in order to be here. For those of you joining us online, we have taken great measures to ensure that your virtual experience of the Forum will be as smooth as possible, and that you will have ample opportunity to interact with presenters and other participants.

I look forward to a vigorous discussion of this year's theme—Global Net Zero Emissions Goals: Challenges and Opportunities. And I hope that next year public health conditions will make it possible for more of you to join us on campus.

-Ronald G. Prinn, MIT Joint Program Director

Agenda

Wednesday 23 March 2022

8:00 REGISTRATION AND LIGHT BREAKFAST

8:45 Opening Remarks Prof. Ronald G. Prinn • MIT Joint Program • Director

9:00 Session 1: Carbon Budgets

Moderator: Anne Slinn • MIT Joint Program • Executive Director for Research Adam Schlosser • MIT Joint Program • Deputy Director and Senior Research Scientist Joeri Rogelj • Imperial College London • Director of Research, Grantham Institute

10:30 COFFEE BREAK

11:00 Session 2: Decarbonizing Energy & Industry

Moderator: Jennifer Morris • MIT Joint Program • Research Scientist

Sergey Paltsev • MIT Joint Program • Deputy Director and Senior Research Scientist Peter Levi • International Energy Agency • Industry Lead, Energy Technology Policy Division

12:30 LUNCH

14:00 Session 3: Nature-Based Solutions

Moderator: Horacio Caperan • MIT Joint Program • Executive Director of External Affairs Angelo Gurgel • MIT Joint Program • Research Scientist

Suzi Kerr • Environmental Defense Fund • Chief Economist

15:30 COFFEE BREAK

16:00 Session 4: Climate and Health

Moderator: Adam Schlosser • MIT Joint Program • Sr. Research Scientist; Deputy Director

Noelle Selin • MIT Institute for Data, Systems and Society (IDSS), and MIT Department of Earth, Atmospheric and Planetary Sciences (EAPS) • *Professor*

Pallavi Pant • Health Effects Institute • Senior Staff Scientist

17:45 RECEPTION

18:30 Dinner and Keynote Address

Richard Lester • Massachusetts Institute of Technology • Professor & Associate Provost

Thursday 24 March 2022

8:00 REGISTRATION AND LIGHT BREAKFAST

8:30 Session 5: Negative Emission Technologies

Moderator: Sergey Paltsev • MIT Joint Program • *Deputy Director and Senior Research Scientist*

Jennifer Morris • MIT Joint Program • Research Scientist

Niall Mac Dowell • Imperial College London • Professor, Centre for Environmental Policy

10:00 COFFEE BREAK

10:30 Session 6: PANEL: Policy Session on the Path Forward

Moderator: Henry Jacoby • MIT Joint Program • Professor Emeritus; Co-Director Emeritus

John Reilly • MIT Joint Program • Co-Director Emeritus

Michael Mehling • MIT Center for Energy & Environmental Policy Research • *Deputy Director*

Channing Arndt • International Food Policy Research Institute • *Director of Environment* and Production Technology Division

Kathleen Theoharides • Commonwealth of Massachusetts, Executive Office of Energy & Environmental Affairs • *Secretary*

12:30 Closing Remarks

Prof. Ronald G. Prinn • MIT Joint Program • Director

12:45 LUNCH

Biographies

Opening Remarks

Prof. Ronald G. Prinn



Director, MIT Joint Program on the Science and Policy of Global Change

Director, MIT Center for Global Change Science

Prof. Prinn works extensively with social scientists to link the science, economics and policy aspects of global change. He co-led the development of the unique MIT Integrated Global System Modeling (IGSM) framework coupling economics, climate physics and chemistry, and land and ocean ecosystems, which is used to estimate uncertainty in climate predictions and analyze proposed climate policies. He leads the Advanced Global Atmospheric Gases Experiment, in which the rates of change of the concentrations

of the greenhouse and ozone-depleting gases have been measured continuously over the globe for the past 44 years to determine their emissions, lifetimes in the atmosphere, and radiative forcing of climate change. A past Head of the MIT Department of Earth, Atmospheric and Planetary Sciences (1998-2003), Prof. Prinn is a Fellow of the American Geophysical Union (1981) and the American Association for the Advancement of Science (2001), a recipient of the AGU's Macelwane Medal (1981), and past Chair of the AAAS Atmospheric and Hydrospheric Sciences (1998-2001). He has twice given invited testimony to Congress on climate change (1997, 2007). He was the inaugural Chairman of the Steering Committee of the International Global Atmospheric Chemistry Project from 1988-1995. He was a member of the NAS/NRC Space Science Board, and Chairman of its Committee on Earth Sciences from 1982-1984.

Session 1

Ms. Anne Slinn, Moderator



Executive Director for Research, MIT Joint Program on the Science and Policy of Global Change

Ms. Slinn has over 30 years of experience at MIT facilitating cooperative interdisciplinary research, and multi-institutional and international collaborations that address global challenges at the nexus of the environment, energy and economics. An engineer by training and an alumna of MIT, she serves as Executive Director for Research at the MIT Center for Global Change Science and the MIT Joint Program. She manages a diverse portfolio of sponsored research supported by federal agencies, industry, foreign ministries, foundations and private donors. Her key roles involve

alignment of priorities and resources, oversight of finances, administration and communication, and coordination of collaborative efforts.

Dr. C. Adam Schlosser



Deputy Director, MIT Joint Program on the Science and Policy of Global Change

Senior Research Scientist, MIT Center for Global Change Science

Dr. Schlosser was previously an Associate Research Scientist at the NASA Goddard Space Flight Center (2001-2003) and a research scientist at the Center for Ocean Land Atmosphere Studies (1997-2001). He conducted his postdoctoral work (1995-1997) at NOAA's Geophysical Fluid Dynamics Laboratory. His primary interests are the modeling, prediction and risk assessment of the natural, managed and built water-energy-land

systems using the MIT Integrated Global System Modeling (IGSM) framework, which includes model development of the Global Land System (GLS) and Water Resource System (WRS). Dr. Schlosser has also undertaken studies of hydrology, weather and climate and their predictability and limits-to-prediction. He also has participated in and led international experiments aimed at assessing the performance of Earth-system model simulations and predictions. In earlier work, he served as a member of the NASA Energy and Water Cycle Study Science Integration Team to improve observational capabilities for monitoring, understanding and predicting the Earth's global water and energy cycles. His current research activities also include: the study of extreme events and associating their potential changes and risks for natural, managed and built environments; water-resource assessments to inform mitigation and adaptation strategies; and renewable-energy resource and intermittency assessments.

Dr. Joeri Rogelj



Director of Research and Lecturer in Climate Change and the Environment

Grantham Institute, Imperial College London

Dr. Rogelj's research has had an exceptional impact on international climate policy. His pioneering work on climate change scenarios changed the global conversation around the feasibility of keeping global warming to 1.5°C in advance of the UN Paris Agreement. His other major contributions that have increased understanding of climate action include studies of the effectiveness of international climate agreements, of carbon budgets and net zero targets for limiting climate change, and of

the interaction between climate action and sustainable development. Over the past decade, Dr. Rogelj has played a leading role in international climate science and policy, serving as an author on highly influential reports of the Intergovernmental Panel on Climate Change (IPCC) and the UN Environment Programme (UNEP), providing expert evidence to the UN Framework Convention on Climate Change (UNFCCC) and serving as the youngest member on the UN Secretary-General's Climate Summit Science Advisory Group in 2019.

Session 2

Dr. Jennifer Morris, Moderator



Research Scientist, MIT Joint Program on the Science and Policy of Global Change

Dr. Morris is a Research Scientist at the MIT Joint Program. Much of her research focuses on risk analysis, uncertainty analysis, and decision-making under uncertainty in energy and environmental systems. This work involves quantifying key uncertainties (e.g. changes in world markets, policies, technologies, climate, etc.), and applying different methodological approaches to models in order to formally represent such uncertainties and explore how they impact near-term decisions. A key focus is evaluating risks to different investment options in energy and water and identifying

those that are robust to potential risks. Dr. Morris also works on the assessment of energy technologies and energy/climate policies, and contributes to the development of the Joint Program's computable general equilibrium model, the EPPA model. She holds a PhD in Engineering Systems and an MS in Technology and Policy from MIT.

Dr. Sergey Paltsev



Deputy Director, MIT Joint Program on the Science and Policy of Global Change

Senior Research Scientist, MIT Energy Initiative

Dr. Paltsev is the lead modeler for the MIT Joint Program's Economic Projection and Policy Analysis (EPPA) model of the world economy. He has co-authored more than 100 peer-reviewed publications in scientific journals and books focused on energy economics, climate policy, transport, advanced energy technologies, and international trade. Dr. Paltsev was a Lead Author of the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), and a

recipient of the 2012 Pyke Johnson Award (by the U.S. Transportation Research Board of the National Academies for the best paper in the area of planning and environment).

Dr. Peter Levi



Industry Lead, Energy Technology Policy Division, International Energy Agency

Dr. Levi first joined the Energy Technology Policy Division of the IEA in 2016 and now leads the sectoral analysis of Industry within the Division. His work is focused on the technologies and policies that can be employed to mitigate greenhouse gas emissions from hard-to-abate sectors within industry, as well as cross-cutting themes, such as energy security, hydrogen, carbon capture and electrification. Before joining the IEA, Peter worked in the private sector for three years in an engineering consultancy. He attended the University of Cambridge, where he obtained PhD and MPhil degrees, and prior to

that the University of Bristol and the University of California for an MEng degree, all in engineering.

Session 3

Mr. Horacio Caperan, Moderator



Executive Director of External Affairs, MIT Joint Program on the Science and Policy of Global Change

Mr. Caperan has over 20 years of experience in strategic planning, marketing, business development and program management for organizations in the transportation, agroindustry, life sciences and technology sectors in the U.S. and international markets. He is an alumnus of the MIT Sloan School of Management where he earned an MBA with honors. Previously he received a Fellowship in the Management of Clean Energy Ventures from Boston University and the New England Clean Energy Council. He holds a dual Master's degree in Biology and Biotechnology from Tufts

University. He earned a BS in management and economics in Chile, where he later held positions as a professor of economics and finance.

Dr. Angelo Gurgel



Research Scientist, MIT Joint Program on the Science and Policy of Global Change

Dr. Gurgel focuses on developing economic modeling and applied research on climate policy, climate change, land-use changes, bioenergy, agricultural and environmental economics. He served as Professor at the Sao Paulo School of Economics, Fundacao Getulio Vargas (FGV), Brazil (2012-2020), and the University of Sao Paulo, Brazil (2004-2011). He coordinated the FGV master's program on Agribusiness and the FGV Observatory of the Plan on Low-Carbon Emissions in Agriculture from 2012 to 2020. He was a recipient of the Best Policy Analysis Paper of 2012 by the journal *Environmental*

Science and Technology. He has served as consultant or advisor in projects for institutions as the World Bank, the Climate and Land Use Alliance, the California Air Resource Board, the Research Association of the Large Scale Experiment of Biosphere-Atmosphere in the Amazon, the Brazilian Development Bank, and the National Industry Confederation of Brazil, among others. He holds a BS in Agricultural Engineering and PhD in Applied Economics from University of Viçosa – Brazil.

Dr. Suzi Kerr



Senior Vice President and Chief Economist, Environmental Defense Fund

Dr. Kerr was, until May 2019, a Senior Fellow, and from 1998 to 2009, Founding Director, at Motu Research in New Zealand. She has also worked at the University of Maryland, College Park; Resources for the Future (USA); and the MIT Joint Program. She was a Visiting Professor at Stanford University for the 2009/10 year, and at the University of the Andes in Bogotá, Colombia in 2014. In 2018, she was President of the Australasian Agricultural and Resource Economics Society. Her research focuses on domestic and international climate-change mitigation policy with special emphasis

on emissions pricing and natural climate solutions. She is the leader of the international 'Climate Action Teams' initiative. She is a member of the Advisory Boards for the Climate Econometrics group at Oxford and the International Emissions Trading Association 'Markets for Natural Climate Solutions' initiative. Dr. Kerr received a PhD in Economics from Harvard University in 1995.

Session 4

Adam Schlosser, Moderator - See Session 1

Prof. Noelle Eckley Selin



Professor, MIT Institute for Data, Systems and Society, and Department of Earth, Atmospheric and Planetary Sciences

Director, MIT Technology and Policy Program

Prof. Selin's research uses atmospheric chemistry modeling to inform decision-making on sustainability challenges, including air pollution, climate change and hazardous substances such as mercury and persistent organic pollutants. Her work also examines interactions between science and policy in international environmental negotiations and develops systems approaches to address sustainability challenges. Before joining the MIT faculty, Prof. Selin was a research scientist with the MIT Joint Program.

Her articles were selected as the best environmental policy papers in 2015 and 2016 by the journal Environmental Science & Technology. Her many awards range from a U.S. National Science Foundation CAREER award (2011) to a Hans Fischer Senior Fellowship at the Technical University of Munich Institute for Advanced Study (2018-2021). At Harvard University, she received her BA in Environmental Science and Public Policy, and MA and PhD in Earth and Planetary Sciences.

Dr. Pallavi Pant



Senior Staff Scientist, Health Effects Institute

Dr. Pant leads the institute's Global Health program. She has more than a decade of experience in research and public engagement on air pollution, particularly in low- and middle-income countries. Her research has focused on urban air quality including source apportionment and exposure monitoring and assessment. She serves on the editorial board for Air Quality, Atmosphere and Health and is the social media editor for the Journal of Exposure Science and Environmental Epidemiology. She also has experience working with non-profit organizations and she currently advises several organizations. Although primarily trained as an exposure

scientist, she has extensive science communication experience and is active in several initiatives to promote public understanding of air pollution and its impacts. She holds a PhD in Environmental Health from the University of Birmingham, UK, and a Master's in Environmental Sciences from TERI School of Advanced Studies, India.

Keynote Speaker

Prof. Richard Lester



Japan Steel Industry Professor of Nuclear Science and Engineering

Associate Provost, Massachusetts Institute of Technology

As MIT's Associate Provost, Prof. Lester oversees the international activities of the Institute. On the MIT faculty since 1979, Prof. Lester is the founder and faculty chair of the MIT Industrial Performance Center. He previously served as head of MIT's Department of Nuclear Science and Engineering. Prof. Lester's research focuses on innovation, productivity and industrial competitiveness, and he has led several major studies of innovation and industry performance in the U.S. and around

the world. He is also well known for his research on energy and climate policy and nuclear policy. Professor Lester's most recent book, *Unlocking Energy Innovation*, with David M. Hart, outlines a strategy for mobilizing America's innovation resources in support of the transition to an affordable, reliable low-carbon global energy system. He is the author or co-author of seven other books, including *The Productive Edge–A New Strategy for Economic Growth*; *Innovation–The Missing Dimension* (with Michael Piore); *Making Technology Work–Applications in Energy and the Environment* (with John M. Deutch); *Made By Hong Kong* (with Suzanne Berger); and *Made in America: Regaining the Productive Edge* (with Michael Dertouzos and Robert Solow). From 2015 to 2018 he served as chair of the U.S. National Academies' Board on Science, Technology and Economic Policy. He currently serves as chair of the Global Council of Universities of the OECD Nuclear Energy Agency.

Session 5

Dr. Sergey Paltsev, Moderator - See Session 2, page 6 Dr. Jennifer Morris - See Session 2, page 6

Prof. Niall Mac Dowell FIChemE FRSC



Professor of Energy Systems Engineering, Imperial College London

Prof. Mac Dowell is a Chartered Engineer and a Fellow of both the IChemE and Royal Society of Chemistry. His research centers on understanding the transition to a low-carbon economy. Since receiving his PhD in 2010, he has published more than 200 peer-reviewed scientific papers at the molecular, unit-operation, integrated-process, and system scales in this context. He has more than a decade's experience as a consultant to the public and private sectors. His clients include energy companies and government agencies such as DECC/BEIS (where he is currently serving as an

expert policy advisor on CCUS and GGR) and the UK's National Infrastructure Commission. He is a member of the Scientific Advisory Board of TotalEnergies, the Norwegian CCS Research Centre, Joule, and a science advisor to Carbon Direct. He served on the US National Petroleum Council CCUS Roadmap Team, the Carbon Capture and Storage Association and the technical working group of the Zero Emissions Platform. A multi-award-winning scientist, Prof. Mac Dowell received the Qatar Petroleum medal for his research in 2010 and the IChemE's Nicklin and Junior Moulton medals for his work on low-carbon energy in 2015 and 2021, respectively.

Session 6 - Panel

Prof. Henry D. Jacoby, Moderator



William F. Pounds Professor of Management, Emeritus, MIT Sloan School of Management

Founding Co-Director, Emeritus, MIT Joint Program on the Science and Policy of Global Change

At MIT Prof. Jacoby has served as Director of the Center for Energy and Environmental Policy Research, Associate Director of the Energy Laboratory, and Chair of the Faculty. He has also served on the U.S. National Petroleum Council, the Scientific Committee of the International Geosphere-Biosphere Program, and on several National Academy Committees. Recent NACs include one on Approaches to Updating the Social Cost of

Carbon, and another to advise the U.S. Global Change Research Program. Prof. Jacoby holds a BA in Engineering from the University of Texas, Austin, a PhD in Economics from Harvard University, and a Doctorats Honoris Causa from the University of Geneva.

Dr. John Reilly



Co-Director, Emeritus, MIT Joint Program on the Science and Policy of Global Change

Senior Lecturer, Emeritus, MIT Sloan School of Management

As an energy, environmental and agricultural economist, Dr. Reilly focuses on understanding the contribution of human activities to global environmental change and the effects of environmental change on the economy and society. Key to his work is the integration of models of the global economy with models of the Earth system, with the primary goal of enabling the design of policies that can effectively limit the contribution of human activity to environmental change, to facilitate adaptation

to unavoidable change, and to understand the consequences of the deployment of large-scale energy systems that will be needed to meet growing energy needs. His research is published in more than 150 articles, reports and volume chapters. He has served in multiple capacities on the Intergovernmental Panel on Climate Change, among other committees. Prior to joining MIT in 1998, Dr. Reilly spent 15 years with the U.S. Department of Agriculture's Economic Research Service, and previously for the Pacific Northwest National Laboratory and the Institute for Energy Analysis, Oak Ridge Associated Universities. He holds MS and PhD degrees in Economics from the University of Pennsylvania.

Prof. Michael Mehling



Deputy Director, MIT Center for Energy and Environmental Policy Research (CEEPR)

Professor, University of Strathclyde Law School, Glasgow

Prof. Mehling is a founding editor of the *Carbon & Climate Review* and a founding board member of Ecologic Institute in Washington DC, the Blockchain & Climate Institute in London, and the European Roundtable on Climate Change and Sustainable Transition in Brussels. He has coordinated research and advisory projects on climate policy design and implementation for international organizations, government agencies and civil society organizations in North America, Europe and the developing

world. Trained as a lawyer and admitted to the bar in the European Union, he holds German and American citizenship, and has lived for extended periods in Europe, the United States and Latin America.

Dr. Channing Arndt



Director of Environment and Production Technology Division, International Food Policy Research Institute

Dr. Arndt has 30 years of experience in development economics, with seven years combined resident experience in Morocco and Mozambique. He has published more than 85 articles in leading academic journals. His recent books include *Growth and Poverty in Sub-Saharan Africa; Measuring Poverty and Wellbeing in Developing Countries;* and *The Political Economy of Clean Energy Transitions.* He has taken leadership roles in major policy documents such as the *Economics of Adaptation to Climate Change* for the World Bank; the design of a carbon tax for the National

Treasury of South Africa; and the Second, Third and Fourth National Poverty Assessments for the Government of Mozambique. Dr. Arndt has an established reputation for building institutional capacity in Mozambique, South Africa, Morocco and Viet Nam and within the framework of the African Economic Research Consortium. His research has focused on agricultural development, poverty measurement, poverty alleviation and growth, market integration, nutrition, gender and discrimination, HIV/AIDS, technological change, trade policy, aid effectiveness, energy, bioenergy, climate variability, and the implications of climate change.

Kathleen Theoharides



Secretary of Energy and Environmental Affairs, Commonwealth of Massachusetts

Secy. Theoharides has served in her current position since May 2019, overseeing Massachusetts' energy and environmental agencies tasked with protecting, preserving and enhancing the Commonwealth's environmental resources while ensuring a clean energy future for the state. Upon joining the Baker-Polito Administration in 2016, she led the development of the State Hazard Mitigation and Climate Adaptation Plan, and created the Municipal Vulnerability Preparedness program. As Secretary, she has spearheaded key initiatives to advance the Administration's

climate, clean energy, and environmental agenda, including establishing a nation-leading target of Net Zero by 2050 and supporting the development of offshore wind in Massachusetts. She also led negotiations that resulted in nation-leading climate legislation signed by Governor Baker in March 2021. Secy. Theoharides received a BA in Ecology and Evolutionary Biology from Dartmouth College and MS in Ecology and Environmental Biology from University of Massachusetts, Boston.

Closing Remarks

Prof. Ronald G. Prinn - See Opening Remarks, page 4

FRONT DESK FORUM STAFF

Available to answer questions or assist with door access and conference materials:

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POST-FORUM FEEDBACK

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