

Atmospheric Methane Removal: Development of a Research Agenda

Open Session

April 20, 2023

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Atmospheric Methane Removal: Development of a Research Agenda

Meeting 1 | Information Gathering Open Session

THURSDAY, APRIL 20, 2023 | All times EDT

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| 2:00–2:10 PM | Welcome, study introduction, and session agenda
Gabrielle Dreyfus, Institute for Governance and Sustainable Development, Committee Chair |
| 2:10–2:55 | Sponsor discussion and Q&A
Jan Mazurek and Frances Wang, ClimateWorks Foundation |
| 2:55–3:10 | Methane emission sources and removals driving recent trends
Ben Poulter, National Aeronautics and Space Administration |
| 3:10–3:25 | ARPA-E REMEDY program on methane abatement
Jack Lewnard, Advanced Research Projects Agency–Energy (ARPA-E) |
| 3:25–3:40 | Overview of EPA’s Coalbed Methane Outreach Program
Volha Roshchanka and Jerome Blackman, US Environmental Protection Agency |
| 3:40–3:55 | Break |
| 3:55–4:10 | Agricultural emissions and possible intervention points
Kris Johnson, Washington State University |
| 4:10–4:25 | Environmental justice and carbon removal technologies
Vanessa Suarez, Carbon180 |
| 4:25–4:40 | Recent methane removal convening
David Mann and Erika Reinhardt, Spark Climate Solutions |
| 4:40–5:00 | Discussion and Q&A with all speakers |
| 5:00 | ADJOURN |

Contributing Meaningfully in a Virtual Setting

INTRODUCTION

Occasionally, some National Academies meetings will be held virtually. Virtual meeting technology allows us to continue our important work of providing independent, objective advice to inform policy, spark progress and innovation, and confront challenging issues for the benefit of society, even when in-person meetings are not possible. The skills and practices that help you successfully contribute to an in-person meeting are just as important in a virtual setting, but some additional adaptations can help improve the virtual meeting experience.

BEFORE THE MEETING

Make time before your meeting for the following essential types of preparation:

- **Intellectual Preparation:**
 - Review the agenda, the Statement of Task, and any other provided materials.
 - Develop a list of questions you have or points you want to discuss.
 - If possible, familiarize yourself with the list of meeting participants and their expertise.
- **Technology Preparation:**
 - Ensure you have a reliable high-speed internet connection.
 - Install the latest version of the virtual meeting platform installed (Zoom, Microsoft Teams, etc.).
 - Gain familiarity with the basic features of the platform. Check out our *Training on Systems and Tools* PDF for more information on the specific platform you'll be using.
 - If possible, close all other computer programs and turn off notifications to minimize distractions and interruptions.
- **Location and Logistics Preparation:**
 - Choose a private location to ensure the confidentiality of the meeting.
 - Minimize potential disruptions and background noise.
 - Clean up the space behind you or use a virtual background.
 - Dress appropriately for the formality of the meeting.
 - To make a great impression, ensure your face is clearly lit.
 - Login a few minutes early to check your audio, headphones, camera, and microphone. Arriving early helps the meeting organizers begin on time and minimizes distractions for other participants.

DURING THE MEETING

The success of the virtual meeting is up to you and the other participants. Each volunteer at the meeting was chosen because they have valuable expertise and insight to contribute. To make the most of this unique opportunity to share your expertise and learn from other volunteers, try to:

- Be deliberate and assertive in sharing your own insights and questions – no one else can do this for you.
- Take a lead in encouraging discussion. If you notice someone hasn't spoken up yet, ask their opinion.
- Avoid interrupting others – in a virtual setting, this is especially disruptive to the flow of a meeting. If you want to build on or respond to a comment, write down your ideas and share them when the other speaker has finished, or share your insights via chat.
- Remember that the chat transcript can become an important record of the meeting, and use it to share information, ideas, and responses to comments. As much as possible, post in complete sentences and clearly note which comments you are replying to, to make the transcript clearer.
- When possible, leave your camera on to create an inclusive, consistent experience for all.
- Ensure your name is displayed to others.
- Consider adding your pronouns to your name display.
- Be aware of your mute button. Muting your audio improves the audio experience for others, but make sure to unmute yourself as you speak up.
- When screen sharing, ensure you do not have distracting, unnecessary, or unprofessional tabs and programs open.
- Don't multitask. Treat this meeting as you would an in-person meeting and devote your attention fully to the discussion.
- Avoid personal grooming while on camera.
- Acknowledge and deal with any personal interruptions, such as from children or pets.

Following this guidance will enable you to make meaningful contributions to the meeting, which will lead to a more impactful final product.

Statement of Task

The National Academies will examine the need for atmospheric methane removal, assess the potential, risks, and co-benefits of viable technological options, and recommend research that could improve understanding. The following topics will be addressed:

- Why might atmospheric methane removal be needed? What specific situations/scenarios might call for deployment of methane removal?
- What are viable options for atmospheric methane removal? To the extent possible, assess how much methane could be removed from the atmosphere for each option, as well as the cost of deployment, technological efficiency, scale potential, potential risks, and key uncertainties and challenges.
- What potential tradeoffs, co-benefits, and unintended consequences should be considered in developing atmospheric methane removal approaches? What are potential social barriers associated with atmospheric methane removal?
- What new research is needed to improve understanding of atmospheric methane removal?

Speaker Bios

Kristen A. Johnson is a Professor in the Department of Animal Sciences at Washington State University. She received her MS and Ph.D. from Michigan State University and conducted post-doctoral research at the Metabolic Laboratory at Colorado State University. She conducts research in ruminant nutrition, more specifically animal energy metabolism. She has applied this work to examine basic and applied issues to improve the efficiency and sustainability of ruminant production. Current projects include the development of management systems to allow producers to minimize resource (land, water and energy) use by livestock while remaining or increasing productivity. The development of implementable technologies that can assist livestock producers to reduce trace gas emissions and manure managers to mitigate emissions of pollutants such as CH₄, NH₄, N₂O is a research focus. Additionally, mitigation of ruminant enteric methane emissions has been a long-term focus. She has also served as Director of WSU's Center for Environmental Research Education and Outreach, Associate Dean of the Graduate School, as a member of the NRC Committee on Animal Nutrition, the editorial board of the Journal of Animal Sciences and Frontiers in Animal Nutrition and as a reviewer for IPCC and many professional journals. Other service includes service on the Board of Directors for the American Society of Animal Sciences, and the EPA SAB Agriculture Committee.

Jack Lewnard is a Program Director in DOE's Advanced Research Program Agency- Energy (ARPA-E), which focuses on high-risk high-impact energy technologies. His programs include REMEDY (methane abatement), REPAIR (fix gas pipelines from the inside with high-strength coatings deposited by robots), methane pyrolysis to make hydrogen and solid carbon, REUSE (convert unrecyclable plastics into fungible hydrocarbon liquids), and FLECCS II (load-following carbon capture systems for natural gas combined cycle power plants). Previously positions include VP Business Development at Chesapeake Utilities, CTO at the Gas Technology Institute, VP Process Development at Greenfuel Technologies (algae biofuel start-up), and 20 years prior experience in diverse engineering roles. He has a BS in Chemical Engineering from the University of Cincinnati and a PhD in Chemical Engineering from Berkeley.

David Mann, Ph.D. is a co-founder and the head of strategy of Spark Climate Solutions, a non-profit focused on field-building in emerging, high-impact climate fields. At Spark, in addition to helping build the organization, he has led the development of the methane removal program at Spark, and drives strategy across programs. David's climate solutions experience includes co-founding an NGO (now RMI's Carbon Dioxide Removal Initiative) focused on accelerating CDR innovation, and previous roles at RMI, Khosla Ventures, and McKinsey. David studied Applied Physics at Stanford (PhD '06) and Physics at Harvey Mudd.

Benjamin Poulter is a Research Scientist in the Earth Sciences Division at the NASA Goddard Space Flight Center. Trained as an ecologist, with a PhD from Duke University in 2005, he combines measurements made from towers, aircraft and satellites to understand how climate change and human activities are driving changes in greenhouse gas concentrations. He has worked with the Global Carbon Project for the past ten years as co-lead for the Global Methane Budget to assess sources, removals and trends in methane emissions and removals. His team develop global models of wetlands to estimate methane emissions as the basis for methane accounting and for models that assimilate satellite retrievals of methane. He was a contributing author to Working Group I of the 5th and 6th Assessment Reports of the Intergovernmental Panel on Climate Change, and is a member of the Science Leadership Group of the North American Carbon Program.

Erika Reinhardt is a co-founder and the Executive Director of Spark Climate Solutions, a non-profit focused on field-building in emerging, high-impact climate fields. At Spark, she drives organization-building and contributes to strategy across programs. Previously, Erika started and co-led U.S. Digital Response's local election offices work, led the Payments Experience engineering group at Stripe, served as the Director of Engineering at OpenAI, and was the Director of Product Engineering at Planet Labs. She studied Mechanical

Engineering, Electrical Engineering, and Computer Science at MIT.

Vanessa Suarez is as a Managing Advisor for Environmental Justice at Carbon180. Since joining the Carbon180 team in October 2019, she has helped build out the organization's federal policy work and environmental justice program. In her current role, she conducts original research, analysis, and policy development for responsible, equitable, and just advancement of the broad portfolio of carbon removal approaches. Her work includes the field's first justice-focused Congressional and Administrative policy priorities for carbon removal, development of accessible carbon removal materials for environmental justice organizations and communities, and vision-building with environmental justice leaders on a just and equitable carbon removal field. Prior to Carbon180, Vanessa worked with Brightline Defense, an environmental justice organization serving the vulnerable communities of the San Francisco Bay Area. She earned her Bachelor's of Science in Conservation and Resource Studies from UC Berkeley, where she completed a senior thesis on carbon sequestration in working rangeland systems. She has also earned a Farmer Citizen Food Policy certificate from the National Young Farmer Coalition, done advocacy work with the Fresno Sunrise Movement, and was a Public Voices Fellow on the Climate Crisis with the Op-Ed Project and Yale Program on Climate Change Communications.

Committee Bios

Gabrielle Dreyfus (*Chair*) is chief scientist at the Institute for Governance & Sustainable Development (IGSD) and an adjunct lecturer at Georgetown University. She has over a decade of experience working at the science and policy interface including through positions with the U.S. Department of Energy, National Oceanic and Atmospheric Administration, and U.S. Senate. In addition to dozens of scientific and technical publications, Dreyfus worked as the lead coordinating author on a synthesis report by the International Energy Agency and United Nations Environment Programme on the intersection of energy efficiency and the phasedown of fluorinated gases in the cooling sector. She is a member of the Climate and Clean Air Coalition's Scientific Advisory Panel and the Montreal Protocol's Technology and Economic Assessment Panel. She was a 2021 Honoree of Environment+Energy Leader 100. Dreyfus received a B.A. in Earth and planetary sciences from Harvard University, and an M.S. and Ph.D. in geosciences from Princeton University and Sorbonne Université. In 2022 she served on the National Academies of Sciences, Engineering, and Medicine's Committee on Development of a Framework for Evaluating Global Greenhouse Gas Emissions Information for Decision Making.

Dreyfus has provided uncompensated feedback to philanthropic organizations, including Spark Climate Solutions, that are engaged in activities related to methane removal research. IGSD has received funding from Spark Climate Solutions for research related to methane mitigation and the president of IGSD has made public statements related to curbing methane emissions. Dreyfus has co-authored several opinion pieces on reducing methane emissions.

Hinsby Cadillo-Quiroz is an Associate Professor at Arizona State University with a dual appointment in the School of Life Sciences and Biodesign Institute and leads the Ecology of Microorganisms and Ecosystems laboratory. His expertise spans the microbial physiology of methanogens and methanotrophs, ecosystem studies of methane emissions, as well as collaborations on landscape-level assessments of atmospheric methane. Cadillo-Quiroz's current research focuses on methane production, consumption, and possible management questions including microbial interaction tests with pure cultures, small to medium scale bioreactors, as well as environmental studies of landfills, northern forest, and tropical peatlands in the Amazon Basin. He has been recognized with a Fulbright Scholarship, a Presidential Scholarship at Cornell University, a National Science Foundation CAREER Award, and an Honorific Doctorate in Forestry by the National University of the Peruvian Amazon. Cadillo-Quiroz received a B.S. in biology and microbiology from Universidad Nacional Mayor de San Marcos, Peru and a Ph.D. in microbiology with a minor in ecology from Cornell University.

Benjamin A. Converse is an Associate Professor of Public Policy and Psychology at the University of Virginia. He is a social psychologist with appointments in the Frank Batten School of Leadership and Public Policy and the Department of Psychology. As Director of the Social Behavior and Decisions Lab, Converse collaborates with graduate and undergraduate students, postdocs, and research associates at the University of Virginia and beyond to conduct behavioral science research in the lab and field. The team explores social, behavioral, and cognitive processes that contribute to human goal pursuit and decision making in a social and resource-constrained world. Converse received a B.A. in psychological and brain sciences from Dartmouth College and a Ph.D. in managerial and organizational behavior from the University of Chicago Booth School of Business.

Faruque Hasan is an Associate Professor and the Kim and Phillip McDivitt Faculty Fellow in the Artie McFerrin Department of Chemical Engineering at Texas A&M University. He also serves as an Assistant Director of Decarbonization at the Texas A&M Energy Institute. His research group develops multiscale methods, tools, and techniques for process systems engineering, design, analysis, and optimization with direct applications to decarbonization of the energy and industrial sectors. Specific technological interests include carbon capture,

utilization and storage, methane separation, sustainable hydrogen economy, and resilient supply chains. Hasan is the recipient of a National Science Foundation CAREER award, American Chemical Society Petroleum Research Fund New Doctoral Investigator award, and Outstanding Young Researcher award from the Computing & Systems Technology Division of the American Institute of Chemical Engineers. Hasan received a Ph.D. in chemical engineering from National University of Singapore and completed his postdoctoral training at Princeton University.

Hasan is the scientific co-founder of CryoL, LLC, which focuses on technology for removal of carbon dioxide from industrial flue gas.

Robert Jackson is the Douglas Provostial Professor of Energy and Environment at Stanford University. He chairs the Global Carbon Project, which tracks emissions of greenhouse gases such as carbon dioxide, methane, and nitrous oxide. His lab measures methane emissions from anthropogenic systems, including oil fields, city streets, and homes and buildings, and natural systems, recently establishing the new FLUXNET-CH₄ database of nearly 100 methane flux towers globally and a new network of tropical wetland emissions. He is a member of the American Academy of Arts and Sciences, a Guggenheim Fellow, and a Fellow in the American Association for the Advancement of Science, American Geophysical Union, and the Ecological Society of America. Jackson received a B.S. in chemical engineering from Rice University and an M.S. in statistics and Ph.D. in ecology from Utah State University.

Jackson currently serves in an uncompensated advisory role for Spark Climate Solutions and previously received compensation for consulting services for Spark. Jackson serves on the board of Methane Action. He co-founded Torch, a methane mitigation startup in 2020, and the entity is no longer active. Jackson has made public statements in the media on methane emissions and methane removal.

Sikina Jinnah is a Professor of Environmental Studies and affiliated graduate faculty of Politics at the University of California, Santa Cruz. She edits the journal Environmental Politics and co-chairs Harvard University's Advisory Committee for the Stratospheric Controlled Perturbation Experiment (SCoPEX). Her research focuses on global environmental governance, in particular, the areas of climate change, climate engineering, and the nexus between international trade and environmental politics. Most recently she has been working to develop theoretically-derived recommendations for the governance of solar geoengineering technologies. She is the author or editor of 6 books, including "Post-treaty Politics" (MIT Press 2014), which received the 2016 Harold and Margaret Sprout Award for best book in international environmental affairs from the International Studies Association and "Greening through Trade" (MIT Press 2020), which was a finalist for the 2021 Canadian Political Science Association Prize in International Relations. She is a 2017 Andrew Carnegie Fellow. Jinnah received a B.A. in environmental science from the University of California, Berkeley, an M.S. in environmental studies from the University of Montana, Missoula, and a Ph.D. in environmental science, policy, and management from the University of California, Berkeley.

Christopher W. Jones (NAE) is the John F. Brock III School Chair and Professor of Chemical and Biomolecular Engineering at the Georgia Institute of Technology. His research activities focus on catalysis and adsorptive gas separations and he has extensively studied the removal of carbon dioxide from the atmosphere. Jones is currently the Vice President of the North American Catalysis Society and the International Adsorption Society. He was the founding Editor-in-Chief (EIC) of the American Chemical Society (ACS) journal ACS Catalysis and is currently the EIC of the journal JACS Au. He is a Fellow of ACS, the American Association for the Advancement of Science, and was elected to the National Academy of Engineering in 2022. Jones received a B.S.E. in chemical engineering from the University of Michigan and an M.S. and Ph.D. in chemical engineering from the California Institute of Technology. He previously served on the National Academies of Sciences, Engineering, and Medicine's Committee on Developing a Research Agenda for Carbon Dioxide Removal and Reliable Sequestration.

Jones has a financial interest in Global Thermostat, a technology start-up that seeks to remove carbon dioxide from the air.

April Leytem is a research scientist with the United States Department of Agriculture (USDA) – Agricultural Research Service at the Northwest Irrigation and Soils Research Laboratory in Kimberly, Idaho. Her research focuses on improving the sustainability of integrated cropping and livestock production systems. Leytem has over 17 years' experience monitoring greenhouse gas emissions from livestock production and cropping systems. In addition, she works collaboratively to improve whole farm modelling efforts aimed at estimating the carbon footprint of dairy production as well as improving national inventories. She has participated as a contributing author to the IPCC 2019 refinement of "Chapter 10 - Emissions from Livestock and Manure Management" and is the lead author of the 2023 refinement of "Chapter 4 – Quantifying greenhouse gas sources and sinks in animal production systems" in the USDA "Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry." Leytem received a B.A. in economics from Brandeis University and an M.A. in international development (natural resources) and Ph.D. in soil science with an organic chemistry minor from North Carolina State University. She previously served on the National Academies of Sciences, Engineering, and Medicine's Committee on Anthropogenic Methane Emissions in the United States: Improving Measurement, Monitoring, Reporting, and Development of Inventories.

Thomas McKone is Professor Emeritus in the School of Public Health at the University of California, Berkeley and a Retired Affiliate at Lawrence Berkeley National Laboratory (LBNL). His research career focused on the development, use, and evaluation of models and data for environmental risk assessments and the health and environmental impacts of energy, industrial, and agricultural systems. He served on the U.S. Environmental Protection Agency Science Advisory Board, worked with several World Health Organization committees, and has been on consultant committees for the Organization for Economic Cooperation and Development, the World Health Organization, the International Atomic Energy Agency, and the Food and Agriculture Organization. McKone is a fellow of the Society for Risk Analysis, former president of the International Society of Exposure Science from which he received the Constance L. Mehlman Award and the Jerome J. Wesolowski award for outstanding contributions to exposure science, and was the 2019 Recipient of the LBNL Lifetime Achievement Award. McKone received a B.A. in chemistry from St. Thomas College and an M.S. and Ph.D. in engineering from the University of California, Los Angeles. He has been a member of more than a dozen committees of the National Academies of Sciences, Engineering, and Medicine and most recently served on its Board on Environmental Studies and Toxicology.

Desirée Plata is an Associate Professor of Civil and Environmental Engineering at Massachusetts Institute of Technology (MIT) and previously served as the John J. Lee Assistant Professor of Chemical and Environmental Engineering at Yale University, Associate Director for Research at the Center for Green Chemistry and Green Engineering at Yale, and Assistant Professor at Duke University. Her research uses tools derived from environmental organic and inorganic chemistry to probe and predict environmental impacts associated with industrially-relevant materials and processes. Her interests span from nano materials synthesis and use in environmental applications, to heterogeneous catalysis, to fossil energy extraction processes, and the fate of industrial chemicals and materials in the environment. Plata is a National Science Foundation CAREER Awardee, an Odebrecht-Braskem Sustainable Innovation Awardee, a two-time National Academy of Engineering Frontiers of Engineering Fellow, a two-time National Academy of Sciences Kavli Frontiers of Science Fellow, a Caltech Resnick Sustainability Fellow, and winner of MIT's Junior Bose Teaching Award, Edgerton Faculty Achievement Award, and Perkins Graduate Advising Award. Plata received a B.S. in chemistry with minors in biology and mathematics from Union College and a Ph.D. in chemical oceanography and environmental chemistry from the MIT and Woods Hole Oceanographic Institution's Joint Program in Oceanography.

Plata has provided uncompensated feedback to Spark Climate Solutions and holds two provisional patents for oxidation of methane at low levels that are not applicable to direct air capture or removal.

José G. Santiesteban (NAE) is retired from ExxonMobil, where he served for more than 30 years in a number of technical leadership and management roles, including, most recently, strategy manager for ExxonMobil Research and Engineering Company. In this role, he led a team that developed strategic technology direction, provided research guidance, and ensured the robustness of the research and development portfolio. His scientific and engineering expertise in heterogeneous catalysis includes design, synthesis, physical-chemical characterization of novel catalytic materials, and reaction mechanisms and kinetics. He has led and made significant technical contributions to the discovery, development, and commercialization of more than 20 novel catalyst technologies for the production of high-performing lubricants, clean fuels, and petrochemicals. Santiesteban is a member of The Academy of Medicine, Engineering, and Science of Texas, the National Academy of Engineering (NAE), and is a Council Member and on the Board of Trustees of NAE. He received the Society of Hispanic Professional Engineers 2018 Innovator Award and multiple technical and leadership awards within ExxonMobil Research and Engineering Company and Mobil Research and Development Company. Santiesteban received a B.S. in chemical engineering from Instituto Tecnológico de Chihuahua, México, an M.S. in chemical engineering from Instituto Tecnológico de Ciudad Madero, México, and a Ph.D. in physical chemistry from Lehigh University. He previously served as a member of the National Academies of Sciences, Engineering, and Medicine's Committee on Chemical Engineering: Challenges and Opportunities in the 21st Century and currently serves on the Board on Energy and Environmental Systems.

ExxonMobil Research and Engineering, where Santiesteban was the Strategy Manager from 2016-2021, has many activities related to the mitigation of methane emissions.

Lisa Stein is a Professor and the Associate Chair of Research in the Department of Biological Sciences at the University of Alberta where she leads the Climate Change Microbiology laboratory. She was a postdoctoral scholar at the California Institute of Technology and National Aeronautics and Space Administration Jet Propulsion Laboratory in the Astrobiology and Life Detection groups and was previously an Assistant Professor at the University of California, Riverside. Stein's expertise is on the ecophysiology and genomics of microorganisms that produce and consume methane and nitrous oxide. Projects include constructing genome-scale metabolic models for ammonia- and methane-oxidizing bacteria that can pinpoint global gene expression as their environment becomes conducive to greenhouse gas emissions, or they can predict how oxidation products of methane are gated into value-added products like bioplastics and biofuels for methane remediation. She received the Killam Award for Excellence in Mentoring in 2022 and the Great Supervisor Award in 2018. She was elected as a Fellow in the American Academy of Microbiology in 2023. Stein received a B.A. in molecular, cellular, and developmental biology from the University of Colorado Boulder and a Ph.D. in molecular and cellular biology from Oregon State University.

Stein previously served as an uncompensated advisor for Mango Materials, Inc. and currently serves as an uncompensated advisor to Cvictus, Inc. and Bioconversion Databank Foundation.

Alex Turner is an Assistant Professor at the University of Washington in the Department of Atmospheric Sciences and the Calvin Professor of Atmospheric Science. He is an atmospheric scientist whose research combines satellite remote sensing, numerical modeling, and Bayesian inference to study interactions between the carbon cycle and atmospheric chemistry. Much of Turner's work investigates the processes controlling the abundance and variations of greenhouse gases such as methane in the atmosphere. He is the recipient of the 2020 James R. Holton Junior Scientist Award from the American Geophysical Union. Turner received a B.S. in mechanical engineering from the University of Colorado Boulder, a Ph.D. in atmospheric chemistry from Harvard University, and was a Miller Postdoctoral Fellow at the University of California, Berkeley.

Turner is currently a compensated technical consultant on the use of satellite remote sensing for methane emission estimation for Geofinancial Analytics. Turner has previously provided expert commentary for news pieces on methane removal.

Katey Walter Anthony is an Aquatic Ecologist and Professor at the University of Alaska Fairbanks. Her research focuses on methane emissions from Arctic lakes, the degradation of permafrost, and its feedbacks to global climate processes through the carbon cycle. She has over 25 years' experience conducting field work in Alaska and Russia, is a science team member of the National Aeronautics and Space Administration Arctic-Boreal Vulnerability Experiment, and a member of the Permafrost Carbon Network. She received the National Wildlife Federation Award in 2009, National Geographic Society Early Explorer's Award in 2009, Mount Holyoke College Mary Lyon Award in 2010, WINGS WorldQuest Award in 2011, and the University of Alaska Usibelli Distinguished Research Award in 2019. Anthony received a B.A. in geology from Mount Holyoke College, an M.S. in restoration ecology from the University of California, Davis, and a Ph.D. in aquatic biology from the University of Alaska Fairbanks. She previously served on the National Academies of Sciences, Engineering, and Medicine's Polar Research Board.

Anthony has provided uncompensated advice to E44 Management Company Ltd about projects in the Arctic.

**PREVENTING DISCRIMINATION, HARASSMENT, AND BULLYING:
POLICY FOR PARTICIPANTS IN NASEM ACTIVITIES**

The National Academies of Sciences, Engineering, and Medicine (NASEM) are committed to the principles of diversity, inclusion, integrity, civility, and respect in all of our activities. We look to you to be a partner in this commitment by helping us to maintain a professional and cordial environment. **All forms of discrimination, harassment, and bullying are prohibited in any NASEM activity.** This policy applies to all participants in all settings and locations in which NASEM work and activities are conducted, including committee meetings, workshops, conferences, and other work and social functions where employees, volunteers, sponsors, vendors, or guests are present.

Discrimination is prejudicial treatment of individuals or groups of people based on their race, ethnicity, color, national origin, sex, sexual orientation, gender identity, age, religion, disability, veteran status, or any other characteristic protected by applicable laws.

Sexual harassment is unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature that creates an intimidating, hostile, or offensive environment.

Other types of harassment include any verbal or physical conduct directed at individuals or groups of people because of their race, ethnicity, color, national origin, sex, sexual orientation, gender identity, age, religion, disability, veteran status, or any other characteristic protected by applicable laws, that creates an intimidating, hostile, or offensive environment.

Bullying is unwelcome, aggressive behavior involving the use of influence, threat, intimidation, or coercion to dominate others in the professional environment.

REPORTING AND RESOLUTION

Any violation of this policy should be reported. If you experience or witness discrimination, harassment, or bullying, you are encouraged to make your unease or disapproval known to the individual at the time the incident occurs, if you are comfortable doing so. You are also urged to report any incident by:

- Filing a complaint with the Office of Human Resources at 202-334-3400 or hrrservicecenter@nas.edu, or
- Reporting the incident to an employee involved in the activity in which the member or volunteer is participating, who will then file a complaint with the Office of Human Resources.

Complaints should be filed as soon as possible after an incident. To ensure the prompt and thorough investigation of the complaint, the complainant should provide as much information as is possible, such as names, dates, locations, and steps taken. The Office of Human Resources will investigate the alleged violation in consultation with the Office of the General Counsel.

If an investigation results in a finding that an individual has committed a violation, NASEM will take the actions necessary to protect those involved in its activities from any future discrimination, harassment, or bullying, including in appropriate circumstances **the removal of an individual from current NASEM activities and a ban on participation in future activities.**

CONFIDENTIALITY

Information contained in a complaint is kept confidential, and information is revealed only on a need-to-know basis. NASEM will not retaliate or tolerate retaliation against anyone who makes a good faith report of discrimination, harassment, or bullying.

A GUIDE TO THE Harassment Complaint Process for Participants AT THE NATIONAL ACADEMIES

Review the Policy [here](#).



Complaints regarding violations of the National Academies anti-harassment policies should be reported by:

- Filing a complaint with the Office of Human Resources at 202-334-3400 or hrrservicecenter@nas.edu or
- Reporting the incident to an employee involved in the activity in which you are participating.

Complaints of harassment, discrimination, or bullying should be filed as soon as possible after an incident. The Office of Human Resources will investigate the alleged violation in consultation with the Office of the General Counsel.



When reporting an incident, please provide as much of the following information as is possible and applicable:

- Name and role of the person or persons allegedly causing the harassment;
- Description of the incident(s), including the dates, locations and the presence of any witnesses;
- Steps taken to try to stop the harassment; and
- Any other information that may be relevant.



If the National Academies determines that a participant in a National Academies activity has violated this policy, the National Academies will take action as it deems appropriate to address the situation and to prevent the participant from engaging in future discrimination, harassment, or bullying in National Academies activities, up to and including banning that individual from current or future participation in National Academies activities.



All inquiries, complaints, and investigations are confidential, and information is revealed only on a need-to-know basis. Information contained in a complaint is kept confidential. The National Academies will not retaliate or tolerate retaliation against anyone who makes a good faith report of discrimination, harassment, or bullying, or participates in a complaint investigation.



For more information, please watch the following videos from our Expert Volunteer Orientation:

- Making a Commitment to Diversity, Equity, and Inclusion
- Preventing Discrimination, Harassment, and Bullying