



Climate
Engineering
Conference
2014

CRITICAL
GLOBAL
DISCUSSIONS



Program

18 – 21 August, Berlin, Germany
Scandic Berlin Potsdamer Platz
ce-conference.org



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Program

Climate Engineering Conference 2014

CRITICAL
GLOBAL
DISCUSSIONS

Welcome to the Climate Engineering Conference 2014: Critical Global Discussions

We are extremely pleased to extend a warm welcome to you as one of the over 300 professionals from academia, civil society and the policy community that have gathered in Berlin this August to discuss, over a period of four days, the many complex and interlinked issues that arise when considering the possibility of deliberate, large-scale interventions into the climate. A total of 40 sessions and 6 plenary panel discussions will address topics from the natural and social sciences and the humanities, to questions such as how to enable and promote participation and open debate, whether research should proceed and if so in what form, and the role that climate engineering is likely to play in international climate policy, if any.

The conference takes place five years after the U.K. Royal Society's 2009 assessment of the science, governance, and uncertainty of climate engineering first broadened the conversation. The 2010 Asilomar International Conference on Climate Intervention Technologies represented the first attempt by the academic community to generate research guidelines, but new governance proposals and initiatives have since proliferated. International governance for climate engineering is advancing rapidly in the case of marine activities; however, there has not been any significant advance in international governance regarding atmospheric activities beyond what is accepted as customary international law. Climate engineering

has been addressed by all three working groups of the IPCC in their contributions to the Fifth Assessment Report, and many ongoing projects are coming close to conclusion or are reaching important milestones.

CEC14 thus comes at an important moment in the debate. We aim to provide a forum for vigorous exchange and creative dialog, for new voices to join the debate, and for examining how climate engineering intersects with other topics both within and outside of the climate change discussion. Against this background, the overarching objectives of CEC14 are:

- » to address comprehensively and in a balanced manner the technical, geophysical/geochemical, ethical, and societal contexts in which the idea of engineering the climate is being contemplated;
- » to bring together the diverse stakeholders involved in the debate – including academic researchers and representatives from the policy and civil society communities and from geographically and culturally diverse backgrounds – in order to promote transparency and dialogue;
- » to provide a forum to review the current state of the debate, present and discuss recent research results, and scope key research questions and challenges for academia and society;



» to provide a forum for innovative session formats aimed at addressing the disciplinary, interdisciplinary and transdisciplinary complexity of the issue;

» to provide a platform for exchange, networking, and collaboration across disciplines, sectors (particularly academia, policy and civil society), geographical regions, cultures, and generations;

» to explore the value of a large-scale conference held on a semi-regular basis as an appropriate forum for the emerging field of climate engineering.

We look forward to an exciting week of critical global discussions!

Mark Lawrence
Scientific Director
SIWA Cluster
Institute for Advanced Sustainability Studies

Stefan Schäfer
Academic Officer
SIWA Cluster
Institute for Advanced Sustainability Studies

Hosted by



Endorsed by



Museum für Naturkunde Berlin – Leibniz Institute for Research on Evolution and Biodiversity

The mission of the Museum für Naturkunde is: Discovering and describing life and earth – with people, through dialog. It is an integrated research museum with strong national and international partnerships and networks. The research is collections based, the collections are developed through the research and the public engagement is science driven.

<http://www.naturkundemuseum-berlin.de/en/>



The **Haus der Kulturen der Welt** is a cosmopolitan place for international contemporary arts and a forum for current developments and discourse located in the capital city of Berlin. Over the past two years, HKW's Anthropocene Project has been exploring the manifold implications of the Anthropocene thesis for the sciences and arts in cooperation with the Max-Planck-Gesellschaft, Deutsches Museum, the Rachel Carson Center for Environment and Society, and the Institute for Advanced Sustainability Studies, Potsdam. In conclusion to the project, A report presents a program of visual, performative, and discursive elements, opening on October 16, 2014.

<http://www.hkw.de/en/>



The **Earth System Governance Project** is the largest social science research network in the area of governance and global environmental change. Our international research programme takes up the challenge of exploring political solutions and novel, more effective governance systems to cope with the current transitions in the biogeochemical systems of our planet.

<http://www.earthsystemgovernance.org/>



Future Earth is a global research platform providing the knowledge and support to accelerate our transformations to a sustainable world. Future Earth exists to build and connect global knowledge to intensify the impact of research and find new ways to accelerate sustainable development.

<http://www.futureearth.info/>



The **International Global Atmospheric Chemistry (IGAC)** Project, a core project of the International Geosphere-Biosphere Programme (IGBP) and co-sponsored by the international Commission on Atmospheric Chemistry and Global Pollution (iCACGP), coordinates and fosters atmospheric chemistry research towards a sustainable world.

<http://igacproject.org/>



Deutsche Gesellschaft
CLUB OF ROME

The **German Chapter of the Club of Rome** (Deutsche Gesellschaft Club of Rome) is a think-and-do tank that focuses not only on the world "problematique", but also on the world "resolutique". We work as initiators and supporters with projects such as DESERTEC, Global Marshall Plan and our Club of Rome School network.

<http://www.clubofrome.de/>

SRMGI

Solar Radiation Management Governance Initiative

The **Solar Radiation Management Research Governance Initiative (SRMGI)** is an international NGO-driven project launched in 2010 and co-convened by Environmental Defense Fund, the Royal Society, and TWAS, the world academy of sciences. It aims to foster an inclusive, interdisciplinary and international discussion on how research into SRM technologies could be governed, and seeks to bring in new voices and perspectives, particularly from the developing world.

<http://www.srmgi.org/>



Polity is a leading international publisher in the social sciences and humanities, with a particular focus in the areas of sociology, politics and social and political theory.

<http://www.polity.co.uk/>



Routledge is the leading global publisher in the inter-disciplinary field of Environment and Sustainability studies, offering a broad array of titles from accessible introductions to supplementary readings to cutting-edge research for a range of academics, professionals and general readers.

<http://www.routledge.com/sustainability/>



Springer SBM publishes a wide variety of scientific books and journals in order to broaden the communication between researchers worldwide.

www.springer.com

The IASS is funded by



The **Federal Ministry of Education and Research** (BMBF, Bildungsministerium für Bildung und Forschung).

<http://www.bmbf.de/en/index.php>



Research for Sustainable Development (FONA, Forschung für nachhaltige Entwicklung).

<http://www.fona.de/en/index.php>



The **Ministry for Science, Research and Culture of Brandenburg** (Ministerium für Wissenschaft, Forschung und Kultur des Landes Brandenburg).

<http://www.mwfk.brandenburg.de/sixcms/detail.php/bb1.c.221589.de>

Steering Committee

Stefan Schäfer (chair) Academic Officer, IASS – Institute for Advanced Sustainability Studies, Germany
Bidisha Banerjee Junior Research Fellow, Red Cross/Red Crescent Climate Centre, USA
Holly Jean Buck PhD Student, Cornell University, USA
George Collins Red Cross/Red Crescent Climate Centre, USA
Daniel Heyen PhD Student, University of Heidelberg, Germany
Dr. Clare Heyward Leverhulme Trust Early Career Researcher, University of Warwick, UK
Dr. Ben Kravitz Postdoctoral Research Associate, Pacific Northwest National Laboratory, Atmospheric Science and Global Change Division, USA
Sean Low Research Fellow, IASS – Institute for Advanced Sustainability Studies, Germany
Nigel Moore Research Fellow, IASS – Institute for Advanced Sustainability Studies, Germany
Andy Parker Research Fellow, Harvard Kennedy School, Belfer Center for Science and International Affairs, USA
Dr. Naomi Vaughan Lecturer, University of East Anglia, UK



Advisory Group

- Prof. Dr. Mark Lawrence** (chair) Scientific Director, IASS – Institute for Advanced Sustainability Studies, Germany
- Prof. Berhanu Abegaz** Executive Director, African Academy of Science, Kenya
- Prof. Paulo Artaxo** University of São Paulo; Professor of Environmental Physics
- Richard Benedick** Battelle's Joint Global Change Research Institute, University of Maryland; Senior Advisor
- Prof. Ken Caldeira** Senior Scientist at the Department of Global Ecology, Stanford University, USA
- Mike Childs** Head of Policy, Research and Science, Friends of the Earth UK, UK
- Prof. Paul J. Crutzen Emeritus** Scholar, Max Planck Institute for Chemistry in Mainz, Germany
- Dr. Arunabha Ghosh** CEO, Council on Energy, Environment and Water, India
- Dr. Kristina Gjerde** Senior High Seas Advisor, International Union for Conservation of Nature, Global Marine and Polar Programme, USA
- Prof. Clive Hamilton** Professor of Public Ethics, Centre for Applied Philosophy and Public Ethics, Australia
- Prof. Mike Hulme** Professor of Climate and Culture, King's College London, UK
- Prof. David Keith Gordon McKay** Professor of Applied Physics, Harvard University, School of Engineering and Applied Sciences, USA
- Dr. Elmar Kriegler** Deputy Chair, Potsdam Institute for Climate Impact Research, Sustainable Solutions Research Domain, Germany
- Tim Kruger** Programme Manager & James Martin Research Fellow, Oxford Martin School, Oxford Geoengineering Programme, UK
- Dr. Margaret Leinen** Director, Scripps Oceanographic Institution, USA
- Dr. Jane C.S. Long** Principal Associate Director at Large, Lawrence Livermore National Laboratory, USA
Oliver Morton Briefings Editor, The Economist (magazine), UK
- Prof. Dr. Andreas Oeschlies** Professor of Marine Biogeochemical Modelling, University of Kiel, GEOMAR Helmholtz Centre for Ocean Research, Germany
- Prof. Dr. Konrad Ott** Professor, Department of Philosophy, Christian-Albrecht University, Germany
- Prof. Jiahua Pan** Director-General, Chinese Academy of Social Sciences, Institute for Urban & Environmental Studies, China
- Prof. Alexander Proelss** Director of the Institute of Environmental and Technology Law, University of Trier, Germany
- Prof. Rosemary Rayfuse** Professor, University of New South Wales, Faculty of Law, Australia
- Dr. Catherine Redgwell** Chichele Professor of Public International Law, University of Oxford, All Souls College, UK
- Prof. Alan Robock** Distinguished Professor of Climatology, Rutgers University, Department of Environmental Sciences, USA
- Prof. Lynn M. Russell** Professor of Atmospheric Chemistry, University of California at San Diego, Scripps Institution of Oceanography, USA
- Dr. David Santillo** Honorary Research Fellow (Greenpeace), University of Exeter, UK
- Prof. Dane Scott** Director, University of Montana, Mansfield Ethics and Public Affairs Program, USA
- Pablo Suarez** Associate Director for Research and Innovation, Red Cross/Red Crescent Climate Centre, USA
- Prof. Nancy Tuana** Founding Director, Penn State University, Rock Ethics Institute, USA



Can
technology
control
the climate?



Can we
control
technology?



Plenary Sessions

Welcome and Context Setting



Date Monday, August 18th, 2014



Time 14.00 - 15.00



Room Aurora Borealis 2 and 3



Speakers Welcome by Prof. Dr. Mark Lawrence (Institute for Advanced Sustainability Studies), Prof. Dr. Dr. h.c. Klaus Töpfer (Institute for Advanced Sustainability Studies), Opening statement by Dr. Georg Schütte (State Secretary at the Federal Ministry of Education and Research)



Special notes: Overview of Conference Program and Logistics by Mr. Stefan Schäfer (Institute for Advanced Sustainability Studies)

Prof. Dr. Mark Lawrence

Mark Lawrence is the scientific director of the cluster “Sustainable Interactions With the Atmosphere” (SIWA) at the Institute for Advanced Sustainability Studies in Potsdam, Germany, and an Honorary Professor at the University of Potsdam. His primary interests lie in assessing the co-benefits of short-lived climate-forcing pollutants (SLCPs) numerical modeling and forecasting of the chemical weather and chemistry-climate interactions in the troposphere, and trans-disciplinary research into the impacts, uncertainties and risks of climate engineering. He received his PhD in Earth and Atmospheric Sciences from the Georgia Institute of Technology in 1996, followed by a position as research group leader at the Max Planck Institute for Chemistry. He is coordinator of the European Transdisciplinary Assessment of Climate Engineering Project (EuTRACE) and formerly co-coordinated the EU project MEGAPOLI. He has been an associate editor of Atmospheric Chemistry and Physics (ACP) and on the editorial board of Atmospheric Environment.

Prof. Dr. Dr. h.c. Klaus Töpfer

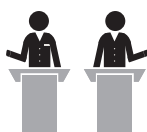
Klaus Töpfer is the founding Director and current Executive Director of the Institute for Advanced Sustainability Studies (IASS). He is also the former Executive Director of the United Nations Environment Programme (UNEP) based in Nairobi and Under-Secretary-General of the United Nations (1998–2006). He earned his PhD from University of Münster in 1968. He also served as a consultant on development policy on Egypt, Malawi, Brazil and Jordan. He was Professor and Director of the Institute for Spatial Research and Planning at the University of Hannover. In government, he has served as the Minister for Environment and Health, Rheinland-Pfalz as well as Federal Minister for the Environment, Nature Conservation and Nuclear Safety and Federal Minister for Regional Planning, Housing and Urban Development. For eight years, he was also a member of the German Bundestag and has received numerous awards and honors.

Dr. Georg Schütte

Dr. Georg Schütte completed degrees in journalism at the Dortmund University and the City University of New York. He is a Fulbright Alumnus and a Visiting Fellow at Harvard University. After completing his PhD he started his career at the Alexander von Humboldt Foundation in Bonn. From 2001–2003 he became Executive Director of the Fulbright Commission in Berlin and served as a Member of the Expert Group “Benchmarking Human Resources” of the EU Commission in Brussels. In 2004 he returned to the Alexander von Humboldt Foundation as the Secretary General. Since 2009 he holds the position of the State Secretary at the Federal Ministry of Education and Research.

Mr. Stefan Schäfer

Stefan Schäfer is the Academic Officer of the Sustainable Interactions with the Atmosphere Research Cluster at the Institute for Advanced Sustainability Studies, Potsdam. He is also the co-leader of the research group on climate engineering at the IASS, together with IASS Scientific Director Mark Lawrence. A political scientist by training, his current research focuses on national and international governance of emerging technologies in general and of climate engineering technologies in particular.



From Fringe to Fashion? Looking Back at the Past Decade of Climate Engineering Research



Date Monday, August 18th, 2014



Time 15.30 - 17.30



Room Aurora Borealis 2 and 3



Moderator Prof. Dr. Mark Lawrence
(Institute for Advanced Sustainability Studies)



Speakers Dr. Jason Blackstock (University College London),
Prof. Dr. Ken Caldeira (Carnegie Institute for Science and Stanford
University), Prof. Steve Rayner (Oxford University),
Prof. Alan Robock (Rutgers University)



Panel Description

Over the past ten years research into climate engineering – particularly Solar Radiation Management techniques and their governance – has grown tremendously. How was this trend sparked and sustained? What has been learned, and how have early assumptions about CE techniques and their appropriateness changed as an increasing number of scientists have contributed to a fast-growing knowledge base? This opening plenary will feature some of the most active and influential researchers in the field over the past decade and aim to enlighten conference attendees about how the growing body of research into CE has come to shape scientific, political, and public conceptions about CE. Panelists will identify and discuss major scientific findings and other milestones of the past decade in order to help tell the story of the ongoing emergence of CE research. At the end of the conference, another plenary panel will discuss the future of CE research. The discussion in this panel will therefore primarily be focused on reflection upon the past rather than speculation about the future of the field.

The plenary discussion will open with an impulse presentation by Prof. Ken Caldeira.

Prof. Dr. Mark Lawrence

Mark Lawrence is the scientific director of the cluster “Sustainable Interactions With the Atmosphere” (SIWA) at the Institute for Advanced Sustainability Studies in Potsdam, Germany, and an Honorary Professor at the University of Potsdam. His primary interests lie in assessing the co-benefits of short-lived climate-forcing pollutants (SLCPs) numerical modeling and forecasting of the chemical weather and chemistry-climate interactions in the troposphere, and trans-disciplinary research into the impacts, uncertainties and risks of climate engineering. He received his PhD in Earth and Atmospheric Sciences from the Georgia Institute of Technology in 1996, followed by a position as research group leader at the Max Planck Institute for Chemistry. He is coordinator of the European Transdisciplinary Assessment of Climate Engineering Project (EuTRACE) and formerly co-coordinated the EU project MEGAPOLI. He has been an associate editor of Atmospheric Chemistry and Physics (ACP) and on the editorial board of Atmospheric Environment.

Dr. Jason Blackstock

Jason Blackstock is the Acting Head of Department and Senior Lecturer of Science and Global affairs in the Department of Science, Technology, Engineering and Public Policy (STePP) at University College London. Since 2008, he has developed and led research and policy engagement programs from the International Institute for Applied Systems Analysis (Austria) and the Centre for International Governance Innovation (Canada) that have interactively examined the scientific, political and global governance dimensions of our planetary climate and energy challenges. Jason is an Associate Professor (Adjunct) at the University of Waterloo, and in 2010 was elected an Associate Fellow of the World Academy of Art and Science.

Prof. Ken Caldeira

Ken Caldeira is an atmospheric scientist in the Department of Global Ecology at the Carnegie Institution at Stanford University. He also serves as a professor in Stanford’s Department of Environmental Earth System Science. Caldeira’s research focuses on the long-term evolution of the climate and global carbon cycle; marine biogeochemistry and chemical oceanography, including ocean acidification; and energy technologies and geo-engineering. Previously, Caldeira was with the Energy and Environment Directorate at the Lawrence Livermore National Laboratory. He received his Ph.D. in 1991 in atmospheric sciences from New York University. He is currently serving on a panel producing a report on climate engineering for the US National Academy of Sciences.

Prof. Steve Rayner

Steve Rayner is James Martin Professor of Science and Civilization at Oxford University’s School of Anthropology and Museum Ethnography and Director of the Institute for Science, Innovation and Society, where he also co-directs the Oxford Programme for the Future of Cities and the Oxford Geoengineering Programme, both supported by the Oxford Martin School. He previously held senior research positions in two US National Laboratories, has taught at leading US universities, including Cornell, Virginia Tech, and Columbia, and has served on various US, UK, and international bodies addressing science, technology and the environment. Until 2008, he also directed the national Science in Society Research Programme of the UK Economic and Social Research Council, and is the Founding and General Editor of the Science in Society book series published by Earthscan.

Prof. Alan Robock

Alan Robock is a Distinguished Professor of Climatology in the Department of Environmental Sciences at Rutgers University. He was a professor at the University of Maryland from 1977–1997, and the State Climatologist of Maryland from 1991–1997. His areas of expertise include geoengineering, climatic effects of nuclear war, effects of volcanic eruptions on climate, regional atmosphere-hydrology modeling, and soil moisture variations. Robock is Editor of Reviews of Geophysics and a member of the Board of Trustees of the University Corporation for Atmospheric Research, has served as Lead Author of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, and is a member of the Board of Trustees of the University Corporation for Atmospheric Research. His honors include being a Fellow of the American Meteorological Society, the American Association for the Advancement of Science, and the American Geophysical Union.

Climate Politics at the Crossroads: Is Climate Engineering a Wrench in the Works or a Tool in the Toolbox?



Date Monday, August 18th, 2014



Time 18.30 - 20.30



Room Aurora Borealis 2 and 3



Moderator Mr. Oliver Morton (The Economist)



Speakers Prof. Dr. Dr. h.c. Hans Joachim Schellnhuber (Potsdam Institute for Climate Impacts Research), Mr. Frank E. Loy (Environmental Defense Fund), Dr. Jane Long (Environmental Defense Fund and Bipartisan Policy Center), Dr. Harry Lehmann (Federal Environment Agency)



Special notes: Will be followed by a reception

Panel Description

Continuously rising global greenhouse gas emissions and the slow progress of international climate negotiations are often cited as reasons for the increased attention that is being paid to climate engineering. The question arises: how will the emergence of climate engineering research and its rapidly increasing prominence, for example in the IPCC and various national and international research programs, influence climate policy? Is climate engineering something that policy-makers should take seriously, even at this early stage? How might it alter the prospects for global cooperation on climate change? What are some of the risks and opportunities that climate engineering brings to the table, and how might they be managed to ensure that any engagement by policy communities on this issue is scientifically and ethically sound? This panel of eminent scientists and policy-makers with extensive experience in climate science and the climate policy arena will provide various perspectives on some of these contentious questions. The plenary will also feature a lengthy question and answer session to allow the audience to frame the discussion around some of their own curiosities.

The plenary discussion will open with an impulse presentation by Prof. Hans Joachim Schellnhuber.

Mr. Oliver Morton

Oliver Morton is briefings editor for The Economist. Before returning to The Economist as energy and environment editor in 2009, he was the chief news and features editor of Nature, the international scientific journal. He specializes in the energy business, climate science and policy, and other environmental and planetary issues. He is the author of *Eating the Sun: How Plants Power the Planet*, a study of photosynthesis, its meanings and its implications, and *Mapping Mars: Science, Imagination and the Birth of a World*. He is currently writing a book on climate engineering, titled *The Deliberate Planet*.

Prof. Dr. Dr. h.c. Hans Joachim Schellnhuber

Hans Joachim Schellnhuber is founding Director of the Potsdam Institute for Climate Impact Research (PIK) since 1992. He holds a Chair in Theoretical Physics at Potsdam University and is an External Professor at the Santa Fe Institute (USA). From 2001–2005 he also served as Research Director of the Tyndall Centre in the UK and became a Visiting Professor at Oxford University thereafter. Currently, he is Co-Chair of the German Advisory Council on Global Change (WBGU), Governing Board Chair of the Climate-KIC of the European Institute of Innovation and Technology (EIT) and Chair of the Standing Committee on Climate, Energy and Environment of the German National Academy of Sciences (Leopoldina). Schellnhuber was awarded Commander of the Most Excellent Order of the British Empire in 2004, the Order of Merit of the State of Brandenburg in 2008 and the Order of Merit of the Federal Republic of Germany in 2011. He has been a long-standing member of the Intergovernmental Panel on Climate Change, and served as Chief Government Advisor on climate and related issues during the German G8/EU twin presidency in 2007.

Mr. Frank E. Loy

Frank E. Loy was named Alternate U.S. Representative to the 66th Session of the UN General Assembly in 2011 by President Obama. In the second administration of President Clinton he served as Under Secretary for Global Affairs, and was the lead US climate negotiator for three years. Under previous administrations, he was Director of the Department's Bureau of Refugee Programs, with the personal rank of Ambassador and Deputy Assistant Secretary for Economic Affairs. During 2007 and 2008 he served in the Obama Campaign as a co-leader of the Energy and Environment team, and as a member of the National Finance Committee. From 1981–95 he was president of The German Marshall Fund of the US. At present he serves on the boards of numerous non-profit organizations, including the Environmental Defense Fund, The Nature Conservancy, and the American Institute of Contemporary German Studies. In recognition of his long-time service, the President of the Federal Republic of Germany, in November 2010, awarded him the Grosses Verdienstkreuz des Verdienstordens der Bundesrepublik Deutschland, Germany's highest civilian award.

Dr. Jane C.S. Long

Jane C.S. Long is currently a senior contributing scientist for the Environmental Defense Fund and Visiting Researcher at UC Berkeley, Co-chair of the Task Force on Geoengineering for the Bipartisan Policy Center and chairman of the California Council on Science and Technology's California's Energy Future committee. She is an Associate of the National Academies of Science (NAS) and a Senior Fellow and council member of the California Council on Science and Technology (CCST) and the Breakthrough Institute. Her current work involves strategies for dealing with climate change including reinvention of the energy system, geoengineering and adaptation. Previously, she held positions at the Lawrence Livermore National Laboratory, was the Dean of the Mackay School of Mines, University of Nevada, Reno and Department Chair for the Energy Resources Technology and the Environmental Research Departments at Lawrence Berkeley National Lab.

Dr. Harry Lehmann

Harry Lehmann has been head of the division "Environmental Planning and Sustainable Strategies" of the German Federal Environment Agency since 2004. After working in the field of fundamental research in physics, he founded and owned the Engineering Consultancy "UHL Data" for systems analysis and simulation in the field of energy and environment in 1984. From 1990 until 1999 he was at the Wuppertal Institute for Climate, Environment and Energy. Then he founded and was Director of the Institute for Sustainable Solutions and Innovations, at that time he was also Director of Greenpeace International "Solutions Unit". He is one of the founders of Eurosolar and was vice president from 2000 to 2006. Since 2011 he has been executive Chairman of the World Renewable Energy Council.

Climate Engineering and the Meaning of Nature



Date Tuesday, August 19th, 2014



Time 20.30 - 22.00



Location Museum für Naturkunde



Moderator Dr. Katrin Vohland (Museum für Naturkunde)



Speakers Mr. Jamais Cascio (Open the Future Institute), Mr. René Röspel (Parliamentarian at the Bundestag, Social Democratic Party), Mr. Rafe Pomerance (Climate Policy Center)



Special notes: Will be followed by a reception

Panel Description

In an era where human driven climate change threatens the earth system on an unprecedented scale, some have begun to question the very notion of what ‘pristine’ or ‘wild’ nature actually means. With so few spaces left untouched by humanity, some say that the age of planetary management must begin – that humanity will inevitably become ‘gardeners’ of a much tamer planet, and that the real question is whether or not we will prove worthy of the task. Into this comes the prospect of technologies for intentionally engineering the earth system. On one hand some climate engineering technologies might be seen as the only plausible option for protection of some severely threatened wild spaces (such as the arctic). On the other they may be seen as simply another extension of humanity’s reach – powerful tools with which humans should not be trusted. This panel, consisting of experts from policy, civil society, and futurist communities, will present competing ideas about the meaning of nature in the age of human dominion over the earth, how climate engineering may challenge the notion of conservationism, and whether it might be seen as an enabler or impediment to harmonious human co-existence with what is commonly called the natural world.

The session will open with a welcome speech by Prof. Johannes Vogel, Director General of the Museum für Naturkunde.

How to Get There

The shuttle bus from Scandic to the Museum für Naturkunde departs at 19.30. Shuttles returning to the Scandic Hotel will leave from the Museum at 22.00, 22.30 and 23.00.

Dr. Katrin Vohland

Katrin Vohland is Head of the Science Programme Public Engagement with Science at the Natural History Museum in Berlin (Museum für Naturkunde). Her main focus of work lies on research how to communicate at the interface between (biodiversity) science and policy, and on the increasing role of citizen science.

Prof. Johannes Vogel, PhD

Johannes Vogel is the Director General of the Museum für Naturkunde, Berlin, one of the world's greatest scientific and cultural institutions. The main tasks are the leadership of the Museum für Naturkunde, Berlin, and science and science policy advisory work at national and international level. His research focuses on the role of museums in science and society, public engagement with science; citizen science; national and international science policy; biodiversity and plant evolutionary biology. He is also Professor of Biodiversity and Public Science at the Humboldt-Universität, Berlin, Chair of the European Citizen Science Association and represents the museum in many other national and international committees.

Mr. Jamais Cascio

Selected by Foreign Policy magazine as one of their Top 100 Global Thinkers, Jamais Cascio has explored the intersection of environmental dilemmas, emerging technologies, and cultural evolution for nearly 20 years, specializing in plausible scenarios of the future. Cascio is presently a Distinguished Fellow at the Institute for the Future in Palo Alto, and also serves as Senior Fellow at the Institute for Ethics and Emerging Technologies. In 2009, Cascio published *Hacking the Earth: Understanding the Consequences of Geoengineering*. Cascio's written work has appeared in the *Atlantic Monthly*, *Foreign Policy*, and the *New York Times*, among many others. He has been featured in a variety of television programs on future issues, including *National Geographic's* 2008 documentary on global warming, "Six Degrees," and the 2010 CBC documentary "Surviving the Future." Cascio speaks about future possibilities around the world, at venues including the Aspen Environment Forum, the National Academy of Sciences in Washington DC, and TED.

Mr. René Röspel

René Röspel has been a Member of the German Federal Parliament since 1998 and a member of the Social Democratic Party since 1983. In the Bundestag, he is a member of the Committee for Education, Research and Technology Impact Estimation and a vice member of the Committee for Environment, Nature Conservation, Building and Nuclear Safety. Since 2005 he has been his party's deputy spokesperson for research policy. Ancillary to his parliamentary activities and without conflict of political interests, René Röspel occupies several unsalaried positions. Among others, he is a Member of the Senate of the Helmholtz-Association of German Research Centers and of the Board of Trustees of the Max Planck Institute of Molecular Physiology in Dortmund. Röspel studied biology at the Ruhr-University of Bochum, obtaining a degree (Diplom-Biologe) in 1993, and worked as a research assistant in the field of tumor studies at Essen University Hospital before becoming a Member of Parliament.

Mr. Rafe Pomerance

Rafe Pomerance is a climate strategy consultant implementing projects that focus on support for geoengineering research, the consequences of rapid warming of the Arctic and the reframing of the climate problem around local impacts such as sea level rise. Pomerance has been a leader on the climate change problem since the late 1970's having served as US Deputy Assistant Secretary of State for Environment and Development from 1993–9 including the lead up to Kyoto Protocol and as a Senior Associate at the World Resources Institute. Pomerance has served as President of Friends of the Earth US, Chairman of the Board of American Rivers and the Board of the League of Conservation Voters. He earned a degree in history from Cornell University.

The Writer's Role: Reflections on Communicating Climate Engineering to Public Audiences



Date Thursday, August 21st, 2014



Time 14.00 - 15.00



Room Aurora Borealis 2 and 3



Moderator Mr. Oliver Morton (The Economist)



Speakers Mr. Eli Kintisch (Science magazine), Mr. Gwynne Dyer (Independent Journalist), Mr. Jeff Goodell (Rolling Stone magazine), Ms. Dagmar Dehmer (Der Tagesspiegel)



Panel Description

While scientists can influence public knowledge and perceptions of science, technology, and the context within which our understandings of these phenomena arise, it is those who translate 'hard-science' into accessible language and give it common meaning that are particularly influential in shaping perceptions. Climate engineering—because of its complexity, intrinsic links with other ongoing debates, and the value-laden nature of its proposition—presents writers in particular with a considerable challenge in getting such communication 'right'. What could or should be the role of the writer in complex science-policy debates like CE? And how might this role evolve over time with changing scientific understanding and political landscapes? This panel discussion will feature a moderated conversation amongst some of the more experienced and articulate journalists who have begun engaging with the topic of climate engineering in their work.

Mr. Oliver Morton

Oliver Morton is briefings editor for The Economist. Before returning to The Economist as energy and environment editor in 2009, he was the chief news and features editor of Nature, the international scientific journal. He specializes in the energy business, climate science and policy, and other environmental and planetary issues. He is the author of Eating the Sun: How Plants Power the Planet, a study of photosynthesis, its meanings and its implications, and Mapping Mars: Science, Imagination and the Birth of a World. He is currently writing a book on climate engineering, titled The Deliberate Planet.

Mr. Eli Kintisch

Eli Kintisch is a correspondent for Science magazine with an emphasis on climate, energy research, and Arctic matters. Since joining Science in 2005 he has covered oceanography, science budgets, the politicization of science and geoengineering. His book Hack the Planet, published in April, 2010, was given a starred review by Publisher's Weekly, which called it a "fascinating wake-up call...engaged but balanced". Kintisch's work has appeared in The Washington Post, Slate, Discover, MIT Technology Review, and the Los Angeles Times. He was a 2009 Kavli fellow and a 2011 and 2012 Knight Fellow at MIT.

Mr. Gwynne Dyer

Gwynne Dyer has worked as a freelance journalist, columnist, broadcaster and lecturer on international affairs for more than 20 years, but he was originally trained as an historian. Born in Newfoundland, he received a Ph.D. in Military and Middle Eastern History from the University of London. He served in three navies and held academic appointments at the Royal Military Academy Sandhurst and Oxford University before launching his twice-weekly column on international affairs, which is published by over 175 papers in some 45 countries. His more recent television works include the 1994 series 'The Human Race', and 'Protection Force', both of which won Gemini awards. His award-winning radio documentaries include 'Millenium', a six-hour series on the emerging global culture. His new book "Climate Wars" deals with the frightening geopolitical implications of large-scale climate change.

Mr. Jeff Goodell

Jeff Goodell has been a Contributing Editor at Rolling Stone since 1996, and has also written for The New York Times Magazine, The New Republic, and Wired. His book How to Cool the Planet: Geoengineering and the Audacious Quest to Fix Earth's Climate won the 2011 Grantham Prize Award of Special Merit as an "immensely readable, carefully researched and groundbreaking contribution to the literature on climate change". He has also written best-selling and award-winning books on subjects as diverse as Silicon Valley and the coal industry, and has appeared as an energy and environment commentator on most major US networks.

Ms. Dagmar Dehmer

Dagmar Dehmer is the editor for politics at the Tagesspiegel, where she has worked since 2001. She is also responsible for coverage of the environment, with the focus on climate change and the "Energiewende" (Germany's push for more renewable energies), as well as developmental topics, especially with regard to East Africa and Nigeria. She was awarded the German Environment Media Prize in 2010 (Deutscher Umweltmedienpreis).

Assess, Test or Terminate: What Future for Climate Engineering Research?



Date Thursday, August 21st, 2014



Time 15.30 - 17.00



Room Aurora Borealis 2 and 3



Moderator Mr. Andy Parker (Harvard Kennedy School)



Speakers Dr. Victoria Wibeck (Linköping University),
Prof. Dr. Mark Lawrence (Institute for Advanced Sustainability Studies),
Dr. Hauke Schmidt (Max Planck Institute for Meteorology),
Dr. Wil Burns (Washington Geoengineering Consortium)



Panel Description

This panel discussion will focus on the near-term future of climate engineering research within the next decade. The key questions that will be explored by panelists concern whether and how climate engineering research can be responsibly undertaken. What are the key scientific and social uncertainties that must be explored in order to support decision-making? How can academic, civil society and policy communities work together to take research forward responsibly? And what does responsibility mean in this context? This panel will allow leading researchers engaged in research on CE to share their visions and predictions of the next decade of climate engineering research, including the possible roles and priorities of important actors.

Mr. Andy Parker

Andy Parker is a research fellow at the Belfer Center for Science and International Affairs in the Harvard Kennedy School, where his research focuses on the governance and politics of research into solar geoengineering. Before moving to Harvard he spent four years as a senior policy advisor at the Royal Society, leading the Society's work on geoengineering, including the production of the 2009 report *Geoengineering the Climate*, and the SRM Governance Initiative (SRMGI). He has planned and run geoengineering outreach meetings in India, China, Pakistan, Senegal, South Africa and Ethiopia. He was also a member of the UN Convention on Biological Diversity's expert working group on geoengineering and co-led the Royal Society's policy work on climate change, environment and energy. Andy has an M.Sc. in international policy analysis from the University of Bath and a B.Sc. in psychology from the University of Warwick (both UK).

Dr. Victoria Wibeck

Victoria Wibeck is Associate Professor and Director of Studies for the PhD education in Environmental Science at Linköping University. She is currently leading the projects "Social representations of novel dual high-stake technologies: the case of geoengineering", funded by the Swedish Research Council, and "Making Sense of Climate Engineering", funded by the Swedish Research Council Formas. Her research focuses on the public understanding and science-policy interface of climate change, climate engineering and other emerging technologies. Wibeck received her degree in communications studies from Linköping University in 2002.

Prof. Dr. Mark Lawrence

Mark Lawrence is the scientific director of the cluster "Sustainable Interactions With the Atmosphere" (SIWA) at the Institute for Advanced Sustainability Studies in Potsdam, Germany, and an Honorary Professor at the University of Potsdam. His primary interests lie in assessing the co-benefits of short-lived climate-forcing pollutants (SLCPs) numerical modeling and forecasting of the chemical weather and chemistry-climate interactions in the troposphere, and trans-disciplinary research into the impacts, uncertainties and risks of climate engineering. He received his PhD in Earth and Atmospheric Sciences from the Georgia Institute of Technology in 1996, followed by a position as research group leader at the Max Planck Institute for Chemistry. He is coordinator of the European Transdisciplinary Assessment of Climate Engineering Project (EuTRACE) and formerly co-coordinated the EU project MEGAPOLI. He has been an associate editor of *Atmospheric Chemistry and Physics (ACP)* and on the editorial board of *Atmospheric Environment*.

Dr. Hauke Schmidt

Hauke Schmidt is an atmospheric scientist at the Max Planck Institute for Meteorology in Hamburg. His research interests are the interactions of dynamics, chemistry and radiation in the middle and upper atmosphere; the implications of geoengineering schemes to limit climate change; adjoint modeling (data assimilation and sensitivity studies) and air pollution modeling. He participates in two projects assessing the potential impacts of climate engineering, sponsored by the German Research Foundation's (DFG) Priority Program on climate engineering (SPP), as well as the European Transdisciplinary Assessment of Climate Engineering Project (EuTRACE) and the Geoengineering Intercomparison Model Project (GeoMIP).

Dr. Wil Burns

Wil Burns is a Scholar in Residence at the School of International Service, at American University, and co-founder and co-Executive Director of the Washington Geoengineering Consortium. From 2012 to 2014 he founded and directed the MS in Energy Policy and Climate Program at Johns Hopkins University. He holds a PhD in International Environmental Law from the University of Wales-Cardiff School of Law. He also serves as the Co-Chair of the International Environmental Law Committee of the American Branch of the International Law Association and is the President of the Association of Environmental Studies and Sciences. Prior to becoming an academic, Burns served as Assistant Secretary of State for Public Affairs for the State of Wisconsin and worked in the non-governmental sector for twenty years, including as Executive Director of the Pacific Center for International Studies.

Closing Panel: The Anthropocene – An Engineered Age?



Date Thursday, August 21st, 2014



Time 18.30 – 20.30



Location Haus der Kulturen der Welt (House of World Cultures)



Moderator Mr. Oliver Morton (The Economist)



Speakers Prof. Dr. Dr. h.c. Klaus Töpfer (Institute for Advanced Sustainability Studies), Prof. Dr. Armin Grunwald (Karlsruhe Institute for Technology),



Prof. Clive Hamilton (Charles Sturt University), Prof. Thomas Ackermann (Joint Institute for the Study of the Atmosphere and Ocean)



Special notes Will be followed by the conference dinner

Panel Description

The acknowledgement that human impact on the planet is on the scale of geologic forces presents a defining challenge to the human species. Simultaneously, the capacity to engineer or at least intervene substantially in systems, from genetic code to the climate, is growing rapidly. To what extent will this knowledge be put to use, how will it be managed, and in what ways will it shape society and the story of the Anthropocene? In this public panel discussion, a group of eminent individuals with high-level scientific and policy experience will explore the promise and pitfalls of relying on ingenuity to guide us through the geological epoch profoundly defined by the power of human choice.

How to get there:

The shuttle bus from Scandic to HKW departs at 17.30.

The shuttle buses returning to the Scandic depart from HKW every 30 minutes between 21.30 and 23.00.

The nearest train station is the “Hauptbahnhof” (Berlin main station), which is served by lines S5, S7 and S75. These lines cross with the S1, S2 and S25 at the station “Friedrichstraße”.

Mr. Oliver Morton

Oliver Morton is briefings editor for The Economist. Before returning to The Economist as energy and environment editor in 2009, he was the chief news and features editor of Nature, the international scientific journal. He specializes in the energy business, climate science and policy, and other environmental and planetary issues. He is the author of Eating the Sun: How Plants Power the Planet, a study of photosynthesis, its meanings and its implications, and Mapping Mars: Science, Imagination and the Birth of a World. He is currently writing a book on climate engineering, titled The Deliberate Planet.

Prof. Dr. Bernd M. Scherer

Bernd M. Scherer is Director of Haus der Kulturen der Welt since 2006. He holds a Ph.D. in Philosophy from the Universität des Saarlandes, Saarbrücken. Philosopher and author of several publications focusing on aesthetics and international cultural exchange, Scherer came to the HKW from the Goethe-Institut. From 1987–1989, he served as lecturer at the Goethe-Institut Düsseldorf, while from 1989–1994 he was Director of the Goethe-Institute Karachi and Lahore, and from 1999–2000 he directed the Goethe-Institut Mexico City, subsequently acting as Director of the Arts Department at the Goethe-Institut main office in Munich from 2004–2005. Previous positions at the HKW include Head of the Department of Humanities and Culture from 1994–1996 and Deputy Director from 1996–1999. Since January 2011, he teaches as Honorary Professor at the Institute for European Ethnology, Humboldt-Universität zu Berlin.

Prof. Dr. Dr. h.c. Klaus Töpfer

Klaus Töpfer is the founding Director and current Executive Director of the Institute for Advanced Sustainability Studies (IASS). He is also the former Executive Director of the United Nations Environment Programme (UNEP) based in Nairobi and Under-Secretary-General of the United Nations (1998–2006). He earned his PhD from University of Münster in 1968. He also served as a consultant on development policy on Egypt, Malawi, Brazil and Jordan. He was Professor and Director of the Institute for Spatial Research and Planning at the University of Hannover. In government, he has served as the Minister for Environment and Health, Rheinland-Pfalz as well as Federal Minister for the Environment, Nature Conservation and Nuclear Safety and Federal Minister for Regional Planning, Housing and Urban Development. For eight years, he was also a member of the German Bundestag and has received numerous awards and honors.

Prof. Dr. Armin Grunwald

Armin Grunwald is Professor of Philosophy of Technology at the Karlsruhe Institute of Technology (KIT) in Germany. He is head of the Institute for Technology Assessment and Systems Analysis (ITAS) and speaker of the Helmholtz program “Technology, Innovation and Society” (TIS). Since 2002, Grunwald has led the Office of Technology Assessment at the German Bundestag (TAB). He earned his PhD in physics in 1987 from the University of Cologne, and received degrees in mathematics and philosophy as well from the University of Marburg.

Prof. Clive Hamilton

Clive Hamilton is an Australian author and public intellectual. In June 2008 he was appointed Professor of Public Ethics at the Centre for Applied Philosophy and Public Ethics, a joint centre of Charles Sturt University and the University of Melbourne. For 14 years, until February 2008, he was the Executive Director of The Australia Institute, a progressive think tank he founded. He completed a doctorate at the Institute of Development Studies at the University of Sussex. He has published on a wide range of subjects but is best known for his books, including *Earthmasters: The Dawn of the Age of Climate Engineering* (2013). In 2009 he was made a Member of the Order of Australia (AM), and in 2012 he was appointed by the Federal Government to the Climate Change Authority.

Prof. Thomas Ackermann

Thomas Ackerman is Director of the Joint Institute for the Study of the Atmosphere and Ocean (JISAO) and Professor of Atmospheric Sciences at the University of Washington. From 1999 through 2005, he served as the Chief Scientist of DOE’s Atmospheric Radiation Measurement (ARM) Program and was a Battelle Fellow at Pacific Northwest National Laboratory in Richland, WA. The ARM Program is the largest ground-based atmospheric observing program in the world. He was Professor of Meteorology at the Pennsylvania State University from 1988 to 1999, as well as Associate Director of the Earth System Science Center. Earlier, he was a staff research scientist at the NASA Ames Research Center in Mountain View, CA. Dr. Ackerman is the recipient of the NASA Distinguished Public Service Medal and the Leo Szilard Award for Science in the Public Interest, awarded by the American Physical Society. He is a Fellow of the American Association for the Advancement of Science and a Fellow of the American Geophysical Union.

Lunchtime Discussion: Will Climate Engineering Unduly Hinder Emissions Reductions? Discussing the “Moral Hazard”



Date Tuesday, August 19th, 2014



Time 13.15 - 14.15



Room Aurora Borealis 3



Moderator Jesse Reynolds (Tilburg University)



Speakers Prof. Martin Bunzl (Rutgers University), Prof. Albert Lin (University of California, Davis), Prof. Steve Rayner (University of Oxford), Prof. Alan Robock (Rutgers University)

Panel Description

The concern that consideration of climate engineering (CE) would reduce political willpower and incentives for the preferred alternatives of emissions reductions and adaptation has long been a central question in CE debates. This so-called “moral hazard” (or more accurately, risk compensation) concern led to a decades-long taboo. Even now this concern arises in nearly every discussion of CE, and arguably reduces the quantity and visibility of CE research. However, the existence and problematic nature of the moral hazard is largely assumed, and the matter remains under-conceptualized and under-explored. Consequently, it is unclear whether consideration of CE would hinder emissions reductions; if so, whether any hindrance would actually be problematic; and, if so, whether policy could or should do anything effective to minimize the hindrance.

This session will discuss this moral hazard concern from interdisciplinary perspectives. At least three contrasting analytic and normative positions will be put forth. These could be, e.g.,

- » that CE research should be limited because this concern is serious;
- » that CE research should proceed because, although this concern is serious, there is little that policies can feasibly do to reduce the risk;
- » that this concern is not problematic because emissions reductions will not be hindered; and/or
- » that this concern is not problematic because the hindrance will be outweighed by the benefits of greater knowledge of CE.

Audience members are invited to tweet questions and comments, accompanied by the keyword **#LunchMH**. The most thought-provoking queries will be posed to the panelists. Participants can also make use of the note-cards stationed by each seat to ask questions in-session.

Lunchtime Discussion: The Politics of Climate Engineering



Date Wednesday, August 20th, 2014



Time 13.15 -14.15



Room Aurora Borealis 3



Moderator Mr. Oliver Morton (The Economist)



Speakers Mr. Matthias Honegger (ETH Zurich and Perspectives Climate Change), Dr. Olaf Corry (Open University), Mr. Duncan McLaren (Lancaster University), Prof. Axel Michaelowa (University of Zurich and Perspectives Climate Change)



Panel Description

The fireside chat on climate engineering politics goes to the heart of the matter on present and future politics of climate engineering and the steering thereof in the 21st century: the dynamic roles of mass media, public perception, trust and perceived conspiracies as well as political negotiation formats, the role of civil society participation, justice, equity, and legitimacy, the role of market mechanisms, and the lessons from the UN Climate Convention are critically discussed.

Drawing on two previous sessions it presents the respective core statements and addresses the most hard-hitting questions. In the spirit of broad participation, the session invites anyone's questions and comments in the format of 140 characters tweeted including the keyword **#LunchCEPoli** – the most relevant and carefully phrased inputs will be taken up. The moderator Oliver Morton (Science Writer and briefings editor at the Economist) will press the four discussants to share a crystal clear picture on these interlinked issues, based on their own hands-on experience and the discussions held in the two preceding panels: “Exploring the Politics of Climate Engineering” and “Climate Engineering Governance – is the Climate Convention the Right Place for It?”. Prepare your toughest questions to tweet and expect an exciting and heated debate.



Land-use

Carbon Capture

Soil

Oceans

Co-operation

Emerging
Economies

Development

Worldviews

Climate
Engineering

Dialogue

Research
Conflict

Vulnerable Populations

Atmosphere

Democracy

Sunshades

Clouds

Aerosols

Arctic

Sessions

19–21 August 2014

International Law for the Regulation of Climate Engineering (Part 1)



Date Tuesday, August 19th, 2014



Time 09.00 - 10.30



Room Pine



Conveners Ms. Anna-Maria Hubert
(Institute for Advanced Sustainability Studies)

Session Description

In this first session, international legal scholars and experts will present their assessment of the existing legal landscape as it relates to climate engineering. The discussion aims to elucidate some of the limitations of public international law in addressing different challenges that arise in the regulation of climate engineering. This discussion lays the groundwork for a second related session, which explores a potential legal architecture for regulating climate engineering, drawing upon lessons from a wide range of existing international regimes to demonstrate possible substantive and procedural mechanisms that could be adopted at the international level in the future.

Speakers

Ms. Anna-Maria Hubert (IASS-Potsdam): *The Regulation of Scientific Research involving Climate Engineering under International Law*

Prof. Albert C. Lin (University of California, Davis): *The Missing Pieces of Geoengineering Research Governance*

Prof. Karen Scott (University of Canterbury): *Climate Engineering and the Precautionary Principle*

Dr. Neil Craik (University of Waterloo): *Transboundary EIA and Geoengineering: Do Emerging Technologies Require Special Rules?*

Dr. Chris Vivian (Center for Environment, Fisheries and Aquaculture Science): *Regulation of Marine Geoengineering under the London Protocol – Where We Have Got to and Where Might We be Going?*

Ms. Barbara Saxler (University of Trier): *State Liability for Transboundary Damage arising from Aerosol Injections*

Dr. Ralph Bodle (Ecologic Institute): *Wishful and Fearful Thinking regarding International Law and Climate Engineering*

Progress in the Geoengineering Model Intercomparison Project (GeoMIP)



Date Tuesday, August 19th, 2014



Time 09.00 - 10.30



Room Birch and Yew



Conveners Dr. Ben Kravitz (Pacific Northwest National Laboratory),
Prof. Alan Robock (Rutgers University)

Session Description

The Geoengineering Model Intercomparison Project (GeoMIP) is one of the most recognized efforts in climate engineering research and has been a key provider of information about the potential climate effects of climate engineering. Participating climate models have conducted the same simulations, determining robust climate model response to solar dimming, stratospheric sulfate aerosols, and marine cloud brightening. Many of the results from GeoMIP have been published in a special issue of *Journal of Geophysical Research Atmospheres* (Volume 118, Issue 23, 2013). There is also ongoing discussion about the new set of experiments, called GeoMIP6, to be conducted in parallel with the Coupled Model Intercomparison Project Phase 6 (CMIP6). The design for GeoMIP6 has not been finalized, and the last portion of this session will consist of a description of the draft plan and then discussion and ideas from the audience. One of the simulations now planned to be included in CMIP6 is a cirrus thinning experiment, which will be discussed more extensively in the session “Novel SRM techniques: Cirrus cloud thinning and marine sky brightening” on Wednesday, August 20 from 11.00 to 12.30.

In this session, we will present the latest results from analyses of GeoMIP simulations. There will be a particular focus on the newly set of completed sea spray geoengineering simulations. We would encourage anyone to attend who is interested in learning about cutting edge climate model results, as well as potential collaborators who wish to use GeoMIP output to investigate geoengineering impacts. We are also very interested to hear questions from the attendees, including comments on scientific evaluation of results, possible policy relevance, and use of the output for impacts assessment. We are very interested in knowing how GeoMIP can best address societal concerns.

Feedback we get from this session will be used to inform the discussions at the next GeoMIP meeting, to be held at the National Center for Atmospheric Research in Boulder, Colorado on 20–21 July 2015. This will be the fifth meeting, with previous meetings held at Rutgers University (United States), the University of Exeter (United Kingdom), the Institute for Advanced Sustainability Studies (Germany), and the Université Pierre et Marie Curie (France). The sixth meeting has been scheduled to be held in 2016 at the University of Oslo (Norway). The oral session will consist of six short talks presenting the latest results from GeoMIP, as well as a brief overview and discussion of the new experiment design for GeoMIP6. There will be additional presentations during the poster.

Speakers

Dr. Ben Kravitz (Pacific Northwest National Laboratory): *Introduction to GeoMIP*

Ms. Aswathy Nair (University of Leipzig): *Multimodel Analysis of Climate Extreme Events in Sea Salt and Sulphate Aerosol Geoengineering*

Dr. Giovanni Pitari (Università degli Studi de L'Aquila): *Sensitivity of the Methane Lifetime to Sulfate Geoengineering: Results from the GeoMIP*

Dr. Andrew Lenton (Commonwealth Scientific and Industrial Research Organisation): *The Integrated Carbon Cycle Response to Solar Radiation Management*

Dr. Hauke Schmidt (Max Planck Institute for Meteorology): *Are Volcanic Eruptions a Good Analogue for Sulfate Climate Engineering? The Case of Stratospheric Dynamics*

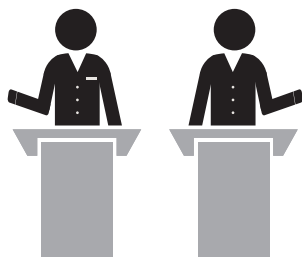
Dr. Odd Helge Otterå (Bjerknes Centre for Climate Research): *Ocean Circulation and Heat Content Responses to Climate Engineering by Sulphur Injection (G3 Scenario)*

Prof. Alan Robock (Rutgers University): *GeoMIP6*

Solar Radiation
Management

GeoMIP6

Sulphate Aerosol
Geoengineering



Responsible Innovation and Climate Engineering



Date Tuesday, August 19th, 2014



Time 09.00 - 10.30



Room Copenhagen



Conveners Dr. Rob Bellamy (University of Oxford),
Dr. Pak-Hang Wong (University of Oxford),

Session Description

This session will explore different conceptions of and ways of supporting the responsible emergence of climate engineering science and innovation in society. Drawing on anticipatory, inclusive, reflexive and responsive modes of assessment, engagement and governance, it will 'open up' debate and examine what being 'responsible' in climate engineering research and development really means.

Speakers

Dr. Rob Bellamy (University of Oxford): *'Opening up' Propositions for Responsible Geoengineering Governance*

Dr. Pak-Hang Wong (University of Oxford): *Responsible Innovation and Technological Imperialism:*

A Case of Geoengineering

Dr. Karen Parkhill (Bangor University): *Public Perceptions of Geoengineering Through the Lens of Responsible Innovation*

Dr. Bron Szerszynski (Lancaster University): *Epistemological and Ontological Responsibility in Geoengineering Research*

Emergence

Anticipation

Responsive
Inclusion

Perspectives on Climate Engineering From People on the Front Lines of Climate Change



Date Tuesday, August 19th, 2014



Time 09.00 - 10.30



Room Aurora Borealis 2



Conveners Ms. Katharina Beyerl
(Institute for Advanced Sustainability Studies)

Session Description

In this session, everybody is invited to reflect on climate engineering together with speakers from Small Island States, Africa and South America: after short input statements, working groups will discuss perceptions of and perspectives on climate engineering research, concerns, aspirations, and ideas against the background of regional challenges in developing countries. Participants from all parts of the world and with different levels of climate engineering expertise are welcome.

The input statements will kick off the discussion by giving a first impression of the challenges and perspectives in different regions. After that, it will be possible to share individual views on several basic questions in small groups and thereby foster the critical global discussion of climate engineering, which is a relatively new topic for many.

Examples of questions:

- » What are/will be the most important challenges presented by climate change in your region?
- » How have you perceived the debate and research on climate engineering so far?
- » What are the most striking difficulties that come to your mind when you think about climate engineering?
- » Which climate engineering technologies do you consider most important to discuss?
- » How do you see the role of climate engineering (or specific climate engineering technologies) in the debate of climate change in your region?

At the end of the session, the results of the working group discussions will be summarised. The focus of this session will be mainly on a meta-level, whereas Andy Parker's session on "Developing Countries and SRM" will delve more into the specifics of how developing countries might engage with SRM research, governance and international policymaking.

Speakers

Mr. Penhuro Lefale (Bodeker Scientific)
Dr. Cush Ngonzo Luwesi (Kenyatta University)
Dr. Pablo Suarez (Red Cross/Red Crescent Climate Centre)
Mr. Viliamu Iese (University of the South Pacific)

This session features short introductory input statements, followed by an open discussion amongst participants.

Exploring the Politics of Climate Engineering



Date Tuesday, August 19th, 2014



Time 09.00 - 10.30



Room Stockholm



Conveners Dr. Olaf Corry (The Open University), Mr. Duncan McLaren (Lancaster University)

Session Description

This area is substantively underexplored. The session will share preliminary work done and help map out a future research agenda exploring the emerging modes of political practice and engagement with climate engineering, examining the discourses arising in public and political domains, the interests in which they are being deployed, and their implications for power and governance. It will cover both invited and invented modes and spaces of political practice – such as protest, media coverage, deliberative public engagement and political negotiation – within and beyond the existing climate regime. Through a combination of presented papers and moderated discussion, the session aims specifically to explore the discourses that are resonating with policy makers and publics and the risks they might create or accept. It will also seek to consider how different publics and political actors co-produce different political practices, and what we can learn from deliberative public engagement about emerging attitudes, narratives and involvement. Participants will also seek to draw out implications for governance, such as appropriate standards for participation and procedural justice, or the application of ‘responsible innovation’ approaches to climate engineering research. Through such discussions we will begin to explore questions of trust, transparency, legitimacy and accountability and their implications for the governance and politics of climate engineering and national and international scales.

Speakers

Dr. Olaf Corry (The Open University): *The Politics of Direct Intervention: Climate Engineering and Security Dynamics in Climate Politics.*

Mr. Duncan McLaren (Lancaster University): *Public Conceptions of Justice in Climate Engineering: Participation and Vested Interests – Some Implications for Governance*

Dr. Anders Hansson (Linköping University): *Discourses for and against Climate Engineering in the International Mass Media.*

Dr. Rose Cairns (University of Sussex): *Legitimacy, Secrecy and Control: Exploring what the Belief in ‘Chemtrails’ Reveals about the International Politics of Climate Engineering*

Prof. Nick Pidgeon (University of Cardiff): *Artificial Trees and Moral Hazards: Framing Effects on Public Perceptions of Geoengineering*

What do People Think and Feel about Climate Engineering – and How do we Know?



Date Tuesday, August 19th, 2014



Time 11.00 – 12.30



Room Copenhagen



Conveners Ms. Holly J. Buck
(Cornell University)

Session Description

In this roundtable, we'll hear from social scientists who have been working in the field to research how people understand climate engineering. From public perception studies to public engagement, social scientists have been working to understand societal and cultural perspectives on the issue, and the forces shaping them.

Yet climate engineering poses specific challenges to research, in that 1) it is an emerging idea that is somewhat imaginary; 2) many people haven't heard of it before; and 3) it is a global issue, but results from one area would not necessarily transfer to another. What methods can be used in this context? How can we avoid instrumentalism, or accusations of instrumentalism (i.e., being co-opted and used by special interests), and how do we move forward upon this tricky ground? How can sociologists, political scientists, anthropologists, geographers, economists, data scientists and other social researchers work together best? What new methods might be helpful?

This session will discuss how social scientists might work within these methodological challenges to design studies which are rigorous, useful, representative, and non-biased. We'll hear from researchers who have been doing this type of work, and debate useful directions for future study of the critical topic of how people understand climate engineering. Questions to discuss may include:

- » How do you see your work on a continuum from measuring public perception to doing public engagement (or would you contest such a concept?)
- » Is it possible to get a global picture of public understanding of CE? What would it take? If not, what's the next best thing to do? Is some research better than none?
- » What might new digital technologies offer in terms of research methodology?
- » How have you dealt with the problem of deliberating or eliciting opinions with a public who might not have ever heard of CE?
- » What lessons has your work thus far taught you? What would you like to do next?

Speakers

Prof. Nick Pidgeon (Cardiff University)
Dr. Rose Cairns (University of Sussex)
Dr. Bron Szerszynski (Lancaster University)
Ms. Pamela Feetham (Massey University)
Dr. Masahiro Sugiyama (University of Tokyo)

This session features short introductory input statements, followed by an open discussion amongst participants.

International Law for the Regulation of Climate Engineering (Part 2)



Date Tuesday, August 19th, 2014



Time 11.00 - 12.30



Room Pine



Conveners Prof. Dr. Rosemary Rayfuse (University of New South Wales), Prof. Karen Scott (University of Canterbury), Ms. Kristina Gjerde (International Union for Conservation of Nature)

Session Description

In this Round Table Q&A session international law experts will discuss existing international law principles, processes and mechanisms and the lessons that can be learned from them for the design of new international regulatory frameworks for climate engineering. The systemic challenges of international law, including the limitations on its applicability, the problem of rogue operators and the problem of regime proliferation will be examined with a view to illuminating the design elements of possible new principles, processes and mechanisms suited to the 'cradle to grave' regulation of both research and deployment of climate engineering. Issues to be explored will include the application of international law to scientific research, the application of the precautionary principle, regime interaction, human rights and intellectual property considerations and issues of liability and responsibility.

This session will build on the preceding session on International Law of the Regulation of Climate Engineering Part I. Whereas that session will focus on the current shortcomings in the international law regime as it applies to climate engineering, this session will focus on drawing lessons from a broad range of current international regimes (such as those relating to nuclear power, GMOs and ocean fertilisation) to demonstrate possible substantive and procedural mechanisms that could be adopted in future.

Speakers

Prof. Dr. Rosemary Rayfuse (University of New South Wales)
Prof. Karen Scott (University of Canterbury)
Ms. Kristina Gjerde (International Union for Conservation of Nature)
Dr. Ralph Bodle (Ecologic Institute)
Mr. Jesse Reynolds (Tilburg University)
Prof. Albert Lin (University of California, Davis)
Prof. Daniel Bodansky (Arizona State University)
Ms. Anna-Maria Hubert (Institute for Advanced Sustainability Studies)
Mr. David Reichwein (Institute for Advanced Sustainability Studies)
Neil Craik (University of Waterloo)

This session features a roundtable discussion amongst participants.

Understanding Carbon-cycle and Climate Feedbacks of Carbon Dioxide Removal Methods



Date Tuesday, August 19th, 2014



Time 11.00 – 12.30



Room Stockholm



Conveners Dr. David Keller (GEOMAR – Helmholtz Center for Ocean Research Kiel), Dr. Vivian Scott (University of Edinburgh)

Session Description

Carbon Dioxide Removal (CDR) suggests enhancing carbon storage either through engineered isolation of CO₂, or by enhancing or accelerating natural carbon sinks. Application of CDR will entail major alteration to land or marine ecosystems, biogeochemical cycles and potentially associated physical climate systems. Simplistically, any change in the carbon content of one reservoir of the carbon cycle is opposed by an opposite change from other reservoirs – the rebound effect. However, such rebounds will likely occur differently depending on the method, location and rate of CO₂ removal. Alongside, climate-impacting scale implementation of CDR might also have indirect (non-CO₂) climatic side-effects – e.g. changes in biogenic greenhouse gas emissions, surface albedo or hydrological cycles.

This session will explore and discuss the possible carbon-cycle and climatic feedbacks associated with CDR methods. How well are these feedbacks understood – are they significant, do they have a beneficial or perverse effects on the outcome of the CDR? Do these effects change through time? What implications might there be for the efficacy of different CDR methods in efforts to stabilize global climate? How might these feedbacks be further researched and quantified and what research priorities can be identified?

As suggested by the conference organisers we will put together an accessible to all disciplines 1 page overview poster to communicate and advertise and outline the session to potential participants.

Speakers

Dr. David Keller (GEOMAR – Helmholtz Center for Ocean Research Kiel): *Introduction: Understanding Carbon-cycle and Climate Feedbacks of Carbon Dioxide Removal Methods*

Dr. Sebastian Sonntag (Max Planck Institute for Meteorology): *Carbon Sequestration Potential and Climatic Effects of Reforestation in an Earth System Model*

Dr. Jerry Tjiputra (Bjerknes Centre for Climate Research): *Large Scale and Regional Impacts of Enhanced Ocean and Terrestrial CO₂ Sinks to Future Stratospheric Aerosol Injection*

Mr. Wei Cheng (Beijing Normal University): *Desert Climate Engineering Simulation and Effect Analysis*

Ms. Vera Heck (Potsdam Institute for Climate Impact Research): *Biogeochemical and Hydrological Impacts of Terrestrial Carbon Dioxide Removal Strategies*

Ms. Nadine Mengis (GEOMAR – Helmholtz Center for Ocean Research Kiel): *Reduced Potential of Ocean Iron Fertilisation due to Induced Albedo Changes*

Linkages between Climate Engineering and Short-Lived Climate-forcing Pollutants: Two “Quick Fixes” for the Climate?



Date Tuesday, August 19th, 2014



Time 11.00 – 12.30



Room Birch and Yew



Conveners Dr. Tim Butler (Institute for Advanced Sustainability Studies),
Mr. Sean Low (Institute for Advanced Sustainability Studies)

Session Description

This session focuses on linking the two debates. Since the backdrop of the session is a conference on climate engineering, the session will begin with a presentation outlining the basic issues behind SLCPs. Subsequent presentations will be of a short, general nature, given by invited speakers selected for their expertise in relevant fields. Ample time for discussion is planned. Session attendees will have the opportunity to ask questions immediately following each presentation, and to participate in an open discussion to complete the session.

As a concrete example, the management of sulphate aerosol emissions from ships as a “proxy” form of climate engineering will be explored, including potential trade offs with air quality and associated impacts on human health, and the effectiveness of such emissions management on controlling radiative forcing due to co-emitted absorbing species such as black carbon and ozone precursors.

Following on from this, the session will examine the potential issues of performing climate mitigation through action to reduce SLCPs without tackling the major cause of anthropogenic global warming, emissions of carbon dioxide. Parallels with climate engineering will be drawn. Rounding out the session, both with respect to SLCPs and climate engineering examples of regulatory and governance approaches will be given and placed in the broader context of international climate law and governance.

Speakers

Prof. Dr. Mark Lawrence (Institute for Advanced Sustainability Studies): *Introduction*

Dr. Marianne Lund (CICERO): *The Climate Impacts of Shipping Emissions*

Prof. Christopher Preston (University of Montana): *How a ‘Climate Imperative’ Might Defuse the Moral Hazard*

Dr. Birgit Lode (Institute for Advanced Sustainability Studies): *‘Quick Fixes’ for the Climate? – Assessing the Status Quo of Climate Law and Governance Options with a Focus on SLCPs and CE*

Dr. Jason Blackstock (University College London): *Summary and Moderated Discussion*

Modeling Extreme Risk: Assessing High Impact, Low Probability Events



Date Tuesday, August 19th, 2014



Time 11.00 – 12.30



Room Aurora Borealis 2



Conveners Mr. Jordan Smith (Harvard University),
Mr. Simon Driscoll (University of Oxford)

Session Description

Models assessing high-impact, low-probability events enable more comprehensive analyses of scenario projections, and have a wide range of applications in quantifying the uncertainties associated with global climate change scenarios. Improved methods of representing such risks are explored in this session with emphasis on dissecting environmental, governance, and economic interactions.

Speakers

Mr. Jordan Smith (Harvard University): *Modeling Extreme Risk: Assessing High Impact, Low Probability Events*

Dr. Tamas Bodai (University of Hamburg)

Prof. Bob Robert Kopp (Rutgers University): *Assessing the Economic Risks of Extreme Weather in a Changing Climate: A U.S. Assessment with Detailed Physical Projections and Empirical Impact Functions*

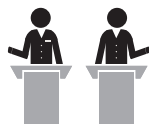
Modeling
Extreme Risk

Low Probability
Events

Detailed Physical
Projections

Changing
Climate

Empirical Impact
Functions



Assessment Methodologies for Climate Engineering Technologies



Date Tuesday, August 19th, 2014



Time 14.30 – 17.00



Room Pine



Convener Dr. Phil Renforth (Cardiff University)

Session Description

Scrutiny of climate engineering proposals is invariably coordinated from the perspective of the scrutinisers. Naturally, we limit our investigation to our own realm of expertise, and that of our co-investigators, and imbed caveats to appease the excluded disciplines. While this may be a suitable compromise for established technologies with well understood norms and stakeholders, the emerging field of climate engineering lacks this groundwork, and the nature of most proposals is unprecedented.

We are only starting to develop overarching guidance on how climate engineering should be assessed, and it is necessary to continually evaluate this in the context of ongoing research. To this end, this session will provide a platform to interweave both meta-level and operational assessment. We may ask, is it possible, or even necessary, to develop commonalities between assessment approaches? Are there norms we can develop? Through appropriate method selection, can we ingrain responsible innovation into our work? The following speakers will present their work with these questions in mind.

Speakers

Dr. Rob Bellamy (University of Oxford): *'Opening Up' Climate Engineering Assessment*

Dr. Nico Bauer (Potsdam Institute for Climate Impact Research): *What are the Issues About Carbon Dioxide Removal and What Can Integrated Assessment Models Say*

Dr. Dian Seidel (National Oceanic and Atmospheric Administration, US): *Potential Assessment of Albedo Changes Due to Climate Engineering*

Dr. Anastasia Revokatova (Hydromet Centre of Russia): *The Potential Role of Negative CO₂ Emissions in Solving the Climate Problem*

Dr. Amir Yadghar: *Climate Models a Tool for Risk Assessment of Climate Engineering*

Dr. Ryo Moriyama (Institute of Applied Energy, Japan): *Exploring the Engineering Parameter Space of Stratospheric Aerosol Injection*

Prof. Dr. Hermann Held (University of Hamburg): *Cost-effective Integrated Mitigation and Aerosol Solar Radiation Management Scenarios Under Combined Temperature and Precipitation Guardrails*

Dr. Naomi Vaughan (University of East Anglia): *"Developing a Framework for Assessing Climate Geoengineering*

Risks and Conflict Potential of Climate Engineering



Date Tuesday, August 19th, 2014



Time 14.30 – 17.00



Room Aurora Borealis 3



Conveners Prof. Dr. Jürgen Scheffran (University of Hamburg),
Mr. Achim Maas (Institute for Advanced Sustainability Studies)

Session Description

Climate engineering (CE) raises difficult environmental, political and ethical questions that could affect different security dimensions, provoke complex conflict constellations and have fundamental geopolitical implications. Referring to historic backgrounds (such as weather manipulation), this session discusses peace and security issues related to climate engineering, and identifies knowledge gaps and emerging research questions. Potential pathways of climate engineering options and techniques, and the impacts and consequences are considered. On the one hand, climate engineering may avoid some risks and conflicts of climate change, on the other hand it may provoke new threats and frictions from local to global levels, including resource competition; resistance against CE impacts; distribution conflicts; security dilemmas; and power games on climate control. Alternatives are considered to prevent risks and conflicts in an anticipative and adaptive governance framework for CE regulation under deep uncertainties. This would be based on the evolving state of knowledge about the Earth system and characteristics of CE technologies, possible perceptions and responses of affected groups, as well as precautionary principles and guardrails to avoid dangerous areas and critical thresholds. Besides global, regional and local governance concepts; it will be important to compare mitigation, adaptation and CE strategies according to principles of risk prevention, mediation, conflict resolution and sustainability. Participatory policies are justified in political dialogues with stakeholders and exchange of arguments that claim plausibility and relevance.

Speakers

Dr. Susanne Dröge (German Institute for International and Security Affairs): *Europe Left Behind? The Geopolitics of Climate Engineering*

Prof. Dr. Michael Brzoska (Institute for Peace Research and Security Policy): *Security Risks of Climate Change and Climate Engineering*

Ms. Jasmin S.A. Link (University of Hamburg): *Potential Implications of Climate Engineering for Security, Conflict and Peace*

Prof. Dr. Paul Nightingale (University of Sussex): *The Security Implications of Geoengineering: Blame and Critical Infrastructure*

To Gabon or Not To Gabon: A Game on Geoengineering Research and Policy



Date Tuesday, August 19th, 2014



Time 14.30 - 17.00



Room Aurora Borealis 2



Convener Dr. Pablo Suarez (Red Cross/Red Crescent Climate Centre)

Session Description

Join us for an intensely interactive session. We will use a playable system dynamics model of the changing relationships between information, decisions and consequences to explore the individual and collective options or managing climate risks. There will be winners and losers, and prizes. Most importantly, there will be serious fun in the context of rich, realistic discussions about our current and future choices.

Speakers

This session features no speakers. Instead, an introduction from the convener will be followed by open game-play amongst participants.



Exploring the Intersections Between Climate Engineering and Systems Engineering



Date Wednesday, August 20th, 2014



Time 09.00 - 10.30



Room Birch and Yew



Conveners Prof. Dr. Stephen Salter (University of Edinburgh),
Dr. Ben Kravitz (Pacific Northwest National Laboratory)

Session Description

Climate engineering involves manipulating the climate to achieve a particular goal. This manipulation would occur in the presence of vast uncertainty. There would also be attempts to minimize side effects and accurately measure and attribute one's efforts to specific changes in the presence of limited resources. All of these problems are essentially questions of engineering.

In this session, we explore problems and solutions in climate engineering that require real engineering. In the oral session, consisting of six talks, we present a wide range of problems in climate engineering. These include issues in chemistry, systems identification, feedback, and uncertainty management. Parallels will also be made with other complex systems that have been engineered in the past. Each talk will focus on the strengths and limitations of each approach. One of the key outcomes from this session will be to open the door toward discussions about rates of learning and gaining new information about the system that is being engineered. Part of the discussion will also include an assessment of feasibility of certain proposed climate engineering techniques. Please note that the organizers of this session do not endorse or advocate real-world testing or deployment of climate engineering techniques. The purpose of this session is to conduct theoretical explorations and assessments.

Speakers

Mr. Julian Wittmer (University of Bayreuth): *Exploring the Activation of Chloride by Iron(III) Salt for a Reduction of Methane as Part of the ISA Method for CE*

Dr. John Dykema (Harvard University): *A Potential Test for SRM*

Prof. Dr. Stephen Salter (University of Edinburgh): *Everywhere-to-Everywhere Transfer Function for Marine Cloud Brightening*

Ms. Debra Weisenstein (Harvard University): *Stratospheric Geoengineering by Injection of Solid Particles: Risks and Benefits*

Dr. Ben Kravitz (Pacific Northwest National Laboratory): *Use of Explicit Feedback to Manage Uncertainties in Solar Geoengineering*

Prof. Damon Matthews (Concordia University)

Civil Society and Geoengineering: Who's Engaging Whom?



Date Wednesday, August 20th, 2014



Time 09.00 - 10.30



Room Stockholm



Conveners Mr. Jim Thomas (ETC Group),
Ms. Rachel Smolker (Biofuelwatch)

Session Description

Some say that geoengineering must now be brought to the attention of the public and civil society because responsible technology development requires proactive engagement. In fact civil society and social movements have been engaged in this topic for several years. Come learn who's engaging whom, how, and why it matters.

Speakers

Mr. Jim Thomas (ETC Group): *Civil Society Engagement: A Brief History*

Ms. Helena Paul (EcoNexus): *Locked in the Same Old Mindset: UK Engagement on Geoengineering.*

Dr. Bronislaw Szerszynski (Lancaster University): *Assembling the "Right" Public: Lessons from Agricultural Biotechnology.*

Mr. Elpidio Peria (Third World Network): *Civil Society and the Ocean Nourishment Corporation's Experiment in the Philippines*

Ms. Rachel Smolker (Biofuelwatch): *Starting Points for Engagement and Why They Matter*

Dr. Elizabeth Bravo (Network for a Latin America Free from GMOs – RALLT): *Civil Society Engagement and the Case of Planktos in Galapagos*



Enhanced Mineral Weathering: Potential and Consequences (Part 1)



Date Wednesday, August 20th, 2014



Time 09.00 - 10.30



Room Copenhagen



Conveners Dr. Francesc Montserrat (Royal Netherlands Institute for Sea Research), Dr. Phil Renforth (Cardiff University), Prof. Jens Hartmann (University of Hamburg)

Session Description

The breakdown of mineral rocks is an integral part of the global carbon cycle and as such may capture substantial amounts of CO₂ from the atmosphere. Mineral weathering is a natural process that has provided a negative feedback on atmospheric CO₂ levels throughout geological history. By increasing the surface area of highly reactive mineral rocks, it may be possible to increase the natural rates of mineral weathering and consequently reduce atmospheric CO₂ levels. Furthermore, the geophysical and/or geochemical characteristics of particular environments (acidic soils, or highly dynamic coastal zones) may result in elevated dissolution rates.

Enhanced mineral weathering (EMW) as a Carbon Dioxide Removal method, is viewed as one of the most natural processes in the entire portfolio that needs to be employed in order to realise negative emissions of greenhouse gases. However, the large unknowns are:

- 1) Can EMW be accelerated, producing an effect on human timescales?
- 2) What are the environmental consequences of this approach?

In this session, the State Of The Art in research on the natural process of mineral weathering will be explored in as many facets as possible. For instance, recent and current laboratory and field experiments will help us directly answer the abovementioned questions.

Enhanced weathering of mineral rocks could fulfill a number of other functions (e.g. fertilisation and/or stabilisation of soils), although the appropriateness of such approaches remains far from proven. The aim of this session is to provide a platform for evidence on enhanced weathering, and to inspire further research in the field. The land-river-coast-ocean continuum in which mineral weathering is envisioned to take place will be treated as such, where weathering processes on land are irrevocably connected to riverine and coastal geochemistry and ultimately affecting the global ocean. As such, the session will explore all of these environments. Additionally, we will explore mineral weathering within a wider framework and assess its place within the larger portfolio and both the technology and collective effort needed to come to meaningful effects.

Speakers

Dr. Francesc Montserrat (Netherlands Institute for Sea Research): *Enhanced Olivine Weathering in Coastal Environments: Proxies, Processes and Potential*

Dr. Nils Moosdorf (University of Hamburg/ZMT Bremen): *A Carbon Dioxide Budget of Terrestrial Enhanced Weathering*

Dr. Thorben Amann (University of Hamburg): *Beneficial and Harmful Side Effects of Element Release from Enhanced Weathering – A Global Perspective*

Dr. Arie Vonk (University of Amsterdam): *Olivine in Constructed Ecosystems: A New Way to Combat CO₂ Rising and Restore Aquatic Systems?*

Dr. Judith Hauck (Alfred Wegener Institute for Marine and Polar Research): *Impact of Open Ocean Dissolution of Olivine on Atmospheric CO₂, Surface Ocean pH and the Biological Carbon Pump*

Ms. Miriam Ferrer Gonzalez (Max Planck Institute for Meteorology): *Study of Artificial Ocean Alkalinization with an Earth System Model: Mitigation Potential and Fate of Added Alkalinity*

Mr. Pol Knops (University of Louvain/Innovation Concepts BV): *Accelerated Olivine Weathering Using Point-source CO₂ Combined with (Profitable) Product Replacement: Application and Upscaling*

Mr. Tim Kruger (Oxford Martin School): *Accelerated Limestone Weathering Combined with low-pCO₂ Direct Air Capture Enabling Long-term CO₂ Sequestration*



From Geoengineering to Geo-weaponizing: The Security Dimensions of Climate Engineering



Date Wednesday, August 20th, 2014



Time 09.00 - 10.30



Room Aurora Borealis 3



Conveners Ms. Cheryl Durrant (Department of Defence, Australia), Ms. Jane Holloway (Department of Defence, Australia), Dr. Chad M. Briggs (GlobalInt LLC), Prof. David Galbreath (University of Bath), Ms. Sheryl Boxall (New Zealand Defence Headquarters)

Session Description

The session would be structured around a series of vignettes or scenarios. Each vignette would present a hypothetical yet plausible climate engineering action which has a security aspect. The session would contribute to larger questions of how climate engineering impacts such security concerns, questions that are often raised, but rarely answered by security and defence experts in this field. It will explore the political and strategic implications of emerging technologies in geoengineering, and how these risks might be addressed by countries, international security organizations, and the international research community. Rather than predict what will happen, experts will consider potential risks and security impacts from a range of related technologies, including solar radiation management, carbon sequestration, and bioengineering.

Speakers

This session features no speakers. Instead, an introduction from the conveners will be followed by an open discussion amongst participants.



Intentional and Unintentional Interferences in the Climate System



Date Wednesday, August 20th, 2014



Time 09.00 - 10.30



Room Pine



Conveners Dr. Harald Stelzer (Institute for Advanced Sustainability Studies),
Dr. Fabian Schuppert (Queen's University Belfast)

Session Description

In the 'Anthropocene' we see more and more ideas to intentional interfere in natural processes on large scale to counteract different unintended consequences of former our persisting actions or behaviour traits. One of the most important ideas in this context is the intentional interference in the climate system by Climate Engineering (CE) technologies, especially via stratospheric solar radiation management (S-SRM).

Arguments have been put forward that we are already engaged in a large scale experiment with the climate through our use of fossil fuels. In contrast to the alteration of the climate as an unintended consequence of our global energy use, S-SRM would represent an explicitly intentional and deliberate intervention in the climate system. This intentionality is not only part of the definition of CE more generally but also matters morally.

Intentional actions normally create a stronger link between moral responsibility and harms resulting from those actions, also in the context of law. Still, even though the distinction between intended effects and foreseen but unintended effects is commonsensical and plays an important role in other fields like ethics of war or medical ethics, it is philosophically controversial. For some philosophers, like the utilitarian Henry Sidgwick, the possibility to foresee some results of our actions is not different from intentionally bringing them about. The relationship between intention and consequences is made significantly more complex due to uncertainties linked to the probabilities of various adverse effects of CE. Furthermore, technology often generates unintended consequences, which may exacerbate the problem. S-SRM, therefore puts forward important questions about intentionality and responsibility of the interference in natural processes, which we want to discuss in the section also in dialogue with legal studies.

Speakers

Dr. David R. Morrow (University of Alabama at Birmingham): *The Ethics of Intentional Risk Shifting*

Prof. Christopher Preston (University of Montana): *From Changing to Fixing the Climate: What does the Atmospheric Anthropocene Permit?*

Dr. Clare Heyward (Warwick University): *The Moral Significance of Intentional Climate Change*

Climate Engineering Governance – Is the Climate Convention the Right Place for it?



Date Wednesday, August 20th, 2014



Time 11.00 – 12.30



Room Birch and Yew



Conveners Dr. Axel Michaelowa (Perspectives Climate Change),
Mr. Matthias Honegger (Perspectives Climate Change),
Mr. Matthias Holenstein (Stiftung Risiko-dialog)

Session Description

Climate engineering is currently discussed by a small group of academics, who are largely out of touch with the current climate policy regime under the UNFCCC. Within the epistemic community of the Climate Convention, many are aware of the theoretical possibility of technical interventions in the atmosphere, but hardly anyone acknowledges climate engineering as a very real political issue. Due to the lack of exchange between these two fractions there is a proliferation of preconceived views on how climate engineering should or could be politically addressed and what the most likely governance scenarios are. When discussing the riskiness of climate engineering (e.g. termination risk), oftentimes one or another governance scenario is assumed without clarification.

The proposed panel of distinguished scholars, many of whom have been involved in UNFCCC negotiations for a long time, sheds some light on these shady areas. It addresses: 1) whether climate engineering is governable under the Convention; whether the expected political dynamics of climate engineering can result in acceptable outcomes. 2) Can the high degree of access of civil society organizations to the UNFCCC negotiations make climate engineering decisions accountable and transparent? 3) Can the equity discourse that has developed for over 20 years under the UNFCCC provide guiding principles for climate engineering governance? 4) Is the multilateral forum of the UNFCCC the best placed to address climate engineering? 5) Can the policy instruments under the UNFCCC adequately incentivize carbon dioxide removal or even solar radiation management?

Speakers

Prof. Clive Hamilton (Charles Sturt University): *“The Current and Anticipated Influence of Civil Society Organisations on Climate Engineering as a Policy Response to Climate Change”*

Prof. Daniel Bodansky (Arizona State University): *“Advantages and Disadvantages of Multilateral Processes for Decisions on the Use of Climate Engineering”*

Dr. Ying Chen (Institute for Urban and Environmental Studies, Chinese Academy of Social Sciences): *“Equity Principles Used Under the Climate Convention Can Be Applied to Climate Engineering Regulation”*

Dr. Axel Michaelowa (Perspectives Climate Change): *“The UNFCCC Market Mechanisms – An Effective Tool to Mobilize Deployment of Carbon Dioxide Removal?”*

Mr. Matthias Honegger (Perspectives Climate Change): *“The UN Climate Convention Is the Most Adequate Forum to Launch a Decision Making Process on Climate Engineering”*

Novel SRM Techniques: Cirrus Cloud Thinning and Marine Sky Brightening



Date Wednesday, August 20th, 2014



Time 11.00 – 12.30



Room Aurora Borealis 3



Conveners Prof. Jón Egill Kristjánsson (University of Oslo),
Dr. Kari Alterskjær (University of Oslo), Prof. Trude Storelvmo (Yale University),
Dr. Helene Muri (University of Oslo)

Session Description

Studies have shown that the simplest form of solar radiation management achieves the desired cooling only at the cost of a significant suppression of precipitation. Radiation management through either marine sky brightening or cirrus cloud thinning may avoid some of these side effects. We explore the potential and uncertainties involved.

Speakers

Dr. David Mitchell (Desert Research Institute): *An Overview of Cirrus Cloud Thinning and Recent Developments*

Dr. Julia Crook (University of Leeds): *Can Cirrus Cloud Thinning Cool Climate Without Severe Climate*

Side Effects?

Prof. Trude Storelvmo (Yale University): *Cirrus Cloud Seeding – A Climate Engineering Mechanism with Reduced*

Side Effects

Dr. Helene Muri (University of Oslo): *The Climatic Effects of Cirrus Cloud Thinning*

Dr. Ulrike Niemeier (Max Planck Institute for Meteorology): *Solar Irradiance Reduction via Climate Engineering - Impact of Different Techniques on the Energy Balance and the Hydrological Cycle*

Dr. Renaud de Richter (University of Montpellier): *Earth Radiation Management Strategies as Alternatives to SRM Techniques*

Prof. Thomas Ackerman (University of Washington): *Investigating the Effectiveness of Marine Cloud Brightening using Effervescent Spraying of Seawater*

Ms. Nadine Mengis (GEOMAR – Helmholtz Center for Ocean Research Kiel): *Arctic Bubbles – Using Microbubbles to Increase the Surface Albedo of the Arctic Ocean*

Dr. Suginori Iwasaki (National Defense Academy): *Solar Radiation Management by Use of Air Lubrication Method*

Climate Geoengineering and the Potential Role of Human Rights Regimes



Date Wednesday, August 20th, 2014



Time 11.00 - 12.30



Room Stockholm



Conveners Prof. Dr. Simon Nicholson (Washington Geoengineering Consortium), Dr. Wil Burns (Washington Geoengineering Consortium), Mr. Michael Thompson (Washington Geoengineering Consortium)

Session Description

This session will examine the human rights implications of climate geoengineering proposals, and will consider what a privileging of human rights understandings and concerns offers to the developing climate geoengineering conversation.

Many of the most 'promising' climate engineering proposals entail a complex mix of benefits and risks. How are such risks to be parsed and understood, most particularly in relation to the world's most vulnerable peoples? This session will bring together prominent human rights practitioners and theorists to do two things:

First, panelists will consider how and in what ways climate geoengineering proposals might complicate the abilities of states or peoples to have human rights protected or enforced.

Secondly, participants will use insights from the human rights tradition to assess the entitlements that might properly accrue to populations impacted by climate geoengineering and the obligations that fall on those who would wield such technologies.

The session will include an interactive component, which, from a needs-based perspective, will have the audience examine a range of plausible futures for humanitarian organizations confronted with difficult choices involving scenarios where rights are invoked but not necessarily fulfilled under an imperfectly managed climate. With limited information, participants organized in teams will be invited to make individual decisions with collective consequences - setting the stage for discussion of differing priorities and emerging complexities.

Questions to be explored by the session include:

1. What does climate geoengineering look like through the lens of human rights?
2. What kinds of analytical traction and potential avenues for shaping climate geoengineering technological trajectories lie in established and evolving human rights regimes?
3. What non-climate negotiating spheres should be considered as viable approaches to giving voice to vulnerable populations when considering climate geoengineering research and potential deployment?
4. How can a human rights lens help keep the climate geoengineering conversation focused on the most vulnerable?

The Washington Geoengineering Consortium is organizing this session because it believes there is a need to explore both the science and politics of climate geoengineering technologies' development and deployment, as well as properly understanding what it will mean for 'CE to work.'

This exploration of potential human rights violations, relevant regimes, and types of resistance available to those most vulnerable to potential impacts of climate geoengineering schemes gone wrong (or gone 'right') must be explored to truly understand the nature of the questions we are posing and trying to answer when talking about climate geoengineering as a response, or part of a response to climate change.

This session will be valuable because it will bring into the discussion some presently missing voices- those considering human rights protection and advocacy. It will help both proponents and opponents of research and the option of deployment understand the kinds of rights that are affected, and how this should impact their decision making. It will also expose advocates and leaders in the human rights field to a topic (and thinkers on that topic) that will be of increasing relevance to their work.

Speakers

Dr. Pablo Suarez (Red Cross / Red Crescent Climate Centre): *What If 'Rights' Is All That's Left in a Geoengineered World? – Explorations on Solar Radiation Management and Human Rights from a Needs-based Perspective*

Ms. Holly J. Buck (Cornell University): *Climate Engineering and Climate-induced Migration: At the Intersection of Two Emerging Policy Challenges*

Dr. Toby Svoboda (Fairfield University): *Aerosol Geoengineering, Fairness, and Human Rights*

Dr. Wil Burns (Washington Geoengineering Consortium): *What's Missing?*

Prof. Dr. Simon Nicholson (Washington Geoengineering Consortium)



Regional Paths to Global Change: Approaches and Governance for Regional Climate Engineering Technologies and Strategies



Date Wednesday, August 20th, 2014



Time 11.00 – 12.30



Room Pine



Conveners Prof. Tracy Hester (University of Houston),
Dr. Jane Long (Bipartisan Policy Center and Environmental Defense Fund),
Ms. Jane Flegal (UC Berkeley)

Session Description

Proposals to govern climate engineering assume projects will proceed on a global scale, but initial efforts may instead focus on regional projects to offset immediate local climate threats and disruptions. For example, possible regional projects could include restricted aerosol dispersal to reduce threatening local heat waves, regional cloud brightening efforts, and projects to promote restoration of Arctic ice. This middle-tier approach to climate engineering, however, remains largely unexplored from a policy and governance perspective. The gap in current international and domestic governance tools may provide an opportunity for nations and groups to build new practices, institutions and credibility to manage emerging climate disruption threats on a larger scale.

Speakers

Primary presenters:

Dr. Jane C.S. Long

Prof. Tracy Hester

Ms. Jane Flegal

Commenters:

Dr. Pablo Suarez (Red Cross/Red Crescent Climate Centre)

Enhanced Mineral Weathering: Potential and Consequences (Part 2)



Date Wednesday, August 20th, 2014



Time 11.00 – 12.30



Room Copenhagen



Conveners Dr. Francesc Montserrat (Royal Netherlands Institute for Sea Research), Dr. Phil Renforth (Cardiff University), Prof. Jens Hartmann (University of Hamburg)

Session Description

The breakdown of mineral rocks is an integral part of the global carbon cycle and as such may capture substantial amounts of CO₂ from the atmosphere. Mineral weathering is a natural process that has provided a negative feedback on atmospheric CO₂ levels throughout geological history. By increasing the surface area of highly reactive mineral rocks, it may be possible to increase the natural rates of mineral weathering and consequently reduce atmospheric CO₂ levels. Furthermore, the geophysical and/or geochemical characteristics of particular environments (acidic soils, or highly dynamic coastal zones) may result in elevated dissolution rates.

Enhanced mineral weathering (EMW) as a Carbon Dioxide Removal method, is viewed as one of the most natural processes in the entire portfolio that needs to be employed in order to realise negative emissions of greenhouse gases. However, the large unknowns are:

- 1) Can EMW be accelerated, producing an effect on human timescales?
- 2) What are the environmental consequences of this approach?

In this session, the State Of The Art in research on the natural process of mineral weathering will be explored in as many facets as possible. For instance, recent and current laboratory and field experiments will help us directly answer the abovementioned questions.

Enhanced weathering of mineral rocks could fulfill a number of other functions (e.g. fertilisation and/or stabilisation of soils), although the appropriateness of such approaches remains far from proven. The aim of this session is to provide a platform for evidence on enhanced weathering, and to inspire further research in the field. The land-river-coast-ocean continuum in which mineral weathering is envisioned to take place will be treated as such, where weathering processes on land are irrevocably connected to riverine and coastal geochemistry and ultimately affecting the global ocean. As such, the session will explore all of these environments. Additionally, we will explore mineral weathering within a wider framework and assess its place within the larger portfolio and both the technology and collective effort needed to come to meaningful effects.

Speakers

Dr. Francesc Montserrat (Royal Netherlands Institute for Sea Research): *Enhanced Olivine Weathering in Coastal Environments: Proxies, Processes and Potential*

Dr. Nils Moosdorf (University of Hamburg/ZMT Bremen): *A Carbon Dioxide Budget of Terrestrial Enhanced Weathering*

Dr. Thorben Amann (University of Hamburg): *Beneficial and Harmful Side Effects of Element Release from Enhanced Weathering – A Global Perspective*

Dr. Arie Vonk (University of Amsterdam): *Olivine in Constructed Ecosystems: A New Way to Combat CO₂ Rising and Restore Aquatic Systems?*

Dr. Judith Hauck (Alfred Wegener Institute for Marine and Polar Research): *Impact of Open Ocean Dissolution of Olivine on Atmospheric CO₂, Surface Ocean pH and the Biological Carbon Pump*

Ms. Miriam Ferrer Gonzalez (Max Planck Institute for Meteorology): *Study of Artificial Ocean Alkalinization with an Earth System Model: Mitigation Potential and Fate of Added Alkalinity*

Mr. Pol Knops (University of Louvain/Innovation Concepts BV): *Accelerated Olivine Weathering Using Point-source CO₂ Combined with (Profitable) Product Replacement: Application and Upscaling*

Mr. Tim Kruger (Oxford Martin School): *Accelerated Limestone Weathering Combined with low-pCO₂ Direct Air Capture Enabling long-term CO₂ Sequestration*

Application and
Upscaling

Ecosystems

Biological
Carbon Pump

A new way

Earth System
Model



Climate Engineering and Human Engineering: Social and Technological Challenges in the Anthropocene



Date Wednesday, August 20th, 2014



Time 11.00 – 12.30



Room Aurora Borealis 2



Conveners Dr. Harald Stelzer (Institute for Advanced Sustainability Studies),
Mr. Achim Maas (Institute for Advanced Sustainability Studies)

Session Description

Over the last centuries humans have constantly changed the surface of the Earth and have influenced natural processes. Based on the increased impacts of human activities on the earth's global future, comparable to a 'geological force', the term 'Anthropocene' has been introduced. In the last years we have seen an increase in ideas to intentionally interfere in natural processes on an unprecedented scale and with unforeseeable consequences for the future of humankind and ecosystems. Both "Climate Engineering (CE)" and "Human Engineering (HE)", understood as biotechnological, cybernetic or interventions in the human body for the enhancement of human beings, can be understood as currently controversial debated potential technological solutions for global problems. Furthermore, they are both symptoms for at least two diverging quests: first for stewardship, looking for ways how to steer different systems all the way from the human genome to the climate system with the long-term perspective to create a truly sustainable world community. The second quest is also motivated by the aim of taking total control of our own natural resources, but guided by the goal to produce short-term advantages in a highly competitive, globalized economy.

Here, we take a look at parallels and differences between two currently emerging fields, CE and HE on a scientific, social-political and normative level.

Speakers

Dr. Pak-Hang Wong (University of Oxford): *Living Well With Climate Engineering and Human Engineering*

Prof. Dr. Forrest Clingerman (Ohio Northern University): *Microcosm and Macrocosm: The Interconnections of Meaning Between Human and Climate Engineering*

Mr. Jamais Cascio (Open the Future): *From the Anthropocene to the Noöcene*

Mr. Jesse L. Reynolds (Tilburg University): *Why "big Technology" is Not Homogenous: Reflections and Genuflections in Climate Engineering and Human Genetic Engineering*

Prof. Dr. James R. Fleming (Colby College): *Fixing Everything: Technology and the Interventionist Anthropocene*

Biogenic Carbon Sequestration: Multifunctionality for Global Resilience



Date Wednesday, August 20th, 2014



Time 14.30 - 17.00



Room Copenhagen



Conveners Dr. Rüdiger Grote (Karlsruhe Institute of Technology)

Session Description

Afforestation and improved land management have the potential to mitigate climate change until other options are effective but are met with reluctance since this might compete with food production. However, since land-use fulfills multiple functions, this might not be a principle obstacle and appropriate action can even lead to more resilient systems – from local to global. So what are possible strategies that provide win-win situations and what are the challenges and knowledge gaps that we have to face? The session provides talks presenting the current knowledge and new scientific results and a panel discussion addressing questions of how to implement and execute carbon sequestration measures.

Speakers

Dr. Martin Wattenbach (Deutsches GeoForschungsZentrum [GFZ]): *Opportunities and Challenges in Modelling Carbon Sequestration und Land-use Change*

Prof. Dr. Azia Khamzina (University of Bonn): *Constraints and Benefits Through Afforestation in Irrigated Drylands*

Dr. Jürgen Kern (Leibniz Institute for Agricultural Engineering): *Options to Enhance Soil Carbon Sequestration on Arable Land*

Climate Emergency: Science, Framing, and Politics (Part 1)



Date Wednesday, August 20th, 2014



Time 14.30 - 17.00



Room Pine



Conveners Dr. Jana Sillmann (CICERO), Prof. Hans Asbjørn Aaheim (CICERO), Dr. Joshua Horton (Harvard University), Mr. Andy Parker (Harvard University), Dr. Francois Benduhn (Institute for Advanced Sustainability Studies)

Session Description

One of the primary arguments for research on climate engineering (CE), and in particular solar radiation management (SRM), is to have a technology ready in case of a climate emergency. The concept of climate emergency, however, may differ substantially between the natural and social sciences, as well as in the way it is presented to a wider public. From a physical point of view, the concept of climate emergency is tantamount to a climatic state that comes, for instance, with a significant increase in weather extremes, or a threshold at which strong non-linearities may rapidly drive the system in an unpredictable way (i.e., so-called tipping points). Some social scientists focus instead on how the physical aspects of climate change might impact socioeconomic systems.

Meanwhile, other social scientists and commentators criticize a climate emergency framing for its potentially negative consequences. The emergency framing has been criticized on multiple grounds, including questions about the plausibility of emergency scenarios, the feasibility of rapid and effective responses, the socially constructed nature of defining an emergency, the power relations implicit in any climate emergency decision, and the potential for undemocratic political outcomes.

It thereby becomes clear that the assessment of a climatic state in terms of its qualification for a climate emergency differs a lot both among and within disciplines. This session will give opportunity for exploring the various viewpoints on the concept of a climate emergency from different disciplines and whether agreement could ever be found on a situation that may beyond reasonable doubt serve as compelling argument for the implementation of CE. Moreover, the session will consider the emergency framing critique, both in terms of the risks engendered by treating CE as an emergency response measure, and in terms of the risks inherent in downplaying the possible need for emergency action.

Speakers

Prof. Dr. Mike Hulme (King's College London): *The Dangers of Climate Emergencies*

Prof. Anders Levermann (Potsdam Institute for Climate Impacts Research): *Thoughts on Climate-engineering and the Limit to Adaptation*

Prof. Timothy Lenton (University of Exeter): *Can Emergency Climate Engineering Really Avoid Climate Tipping Points*

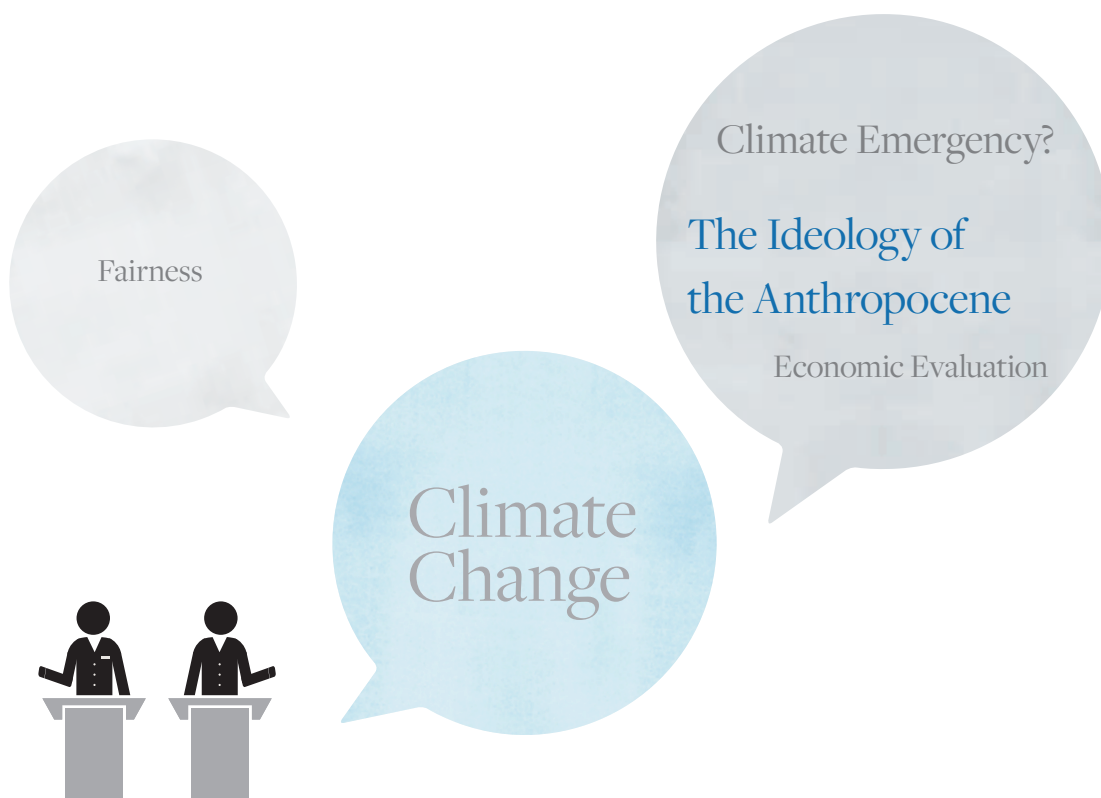
Mr. Jeremy Baskin (University of Melbourne): *The Ideology of the Anthropocene and the Legitimation of Geoengineering*

Ms. Judith Kreuter (University of Muenster): *Climate Engineering – A Solution to the Crisis of Climate Change?*

Prof. Alan Robock (Rutgers University): *Will Climate Engineering Worsen a Climate Emergency?*

Dr. Bjørn H. Samset (CICERO): *Counteracting the Climate Effects of Volcanic Eruptions using Short-Lived Greenhouse Gases*

Dr. Taoyuan Wei (CICERO): *An Economic Evaluation of Climatic Side-effects of Solar Radiation Management*



The International Control of Climate Engineering Experiments – Debating Why, How and Who



Date Wednesday, August 20th, 2014



Time 14.30 – 17.00



Room Aurora Borealis 2



Conveners Mr. Ralf Becker (German Federal Environment Agency),
Dr. Harald Ginzky (German Federal Environment Agency),
Dr. Ralph Bodle (Ecologic Institute)

Session Description

Although the effectiveness of climate engineering measures has not been proven yet and there might be significant risks to human welfare and the environment such measures, especially field trials, could be conducted unilaterally or even by private enterprises. These findings suggest a need for effective international governance of climate engineering experiments. The session will explore unsolved key questions: What are the pro and cons of international governance? Which form is adequate? How should it address field trials?

Most climate engineering (CE) techniques are still in a very early stadium. However, field experiments might be conducted in the near future. Based on the working assumption that some form of international governance of CE experiments is needed, the session will focus on the control of CE scientific research and address unsolved key questions.

This poses specific questions because scientific research requires a certain level of freedom and is often privileged in international and national legislation (e.g. as “freedom of the high seas” according to UNCLOS). Therefore, any regulation or governance of CE must strike a balance between needs of scientific research and other policy objectives such as the protection of the environment or food security. In the first part of the session the status quo of international regulation of CE scientific research will be presented. This includes the new regulation under London Protocol with respect to marine geoengineering activities and the CBD decisions. Furthermore a set of governance objectives and criteria (e.g. the precautionary principle) which were developed in a research study mandated by the German Federal Environment Agency will be presented.

The second part will be a world café discussion on the international governance of scientific research. The following questions should be discussed in an interactive manner:

- » Regulatory functions: Which are the objectives of international regulation of CE research, in particular field research? What are the benefits of governance of CE research, in particular for science itself? How could concerns over CE research be reconciled with legitimate needs of scientific research?
- » Regulatory form: Which form of regulation for CE experiments is needed? Which type is suitable? In which forum should it take place?
- » Regulatory design: Which level of government should be responsible? Which stakeholders need to participate in the regulation? How can legitimacy be gained? Which substantial requirements should CE experiments meet? Is there a need for a de minimis clause?

The session will then discuss the results of the world café groups in plenary and conclude with a wrap up. Participants should represent various perspectives such as scientific community, legal experts, policy makers, civil society.

Speakers

Mr. Ralf Becker (German Federal Environment Agency): *Status Quo of International Regulation of Scientific Research*

Dr. Ralph Bodle (Ecologic Institute): *Proposals for Objectives and Criteria for the International Regulation of Scientific Research*

Moderator:

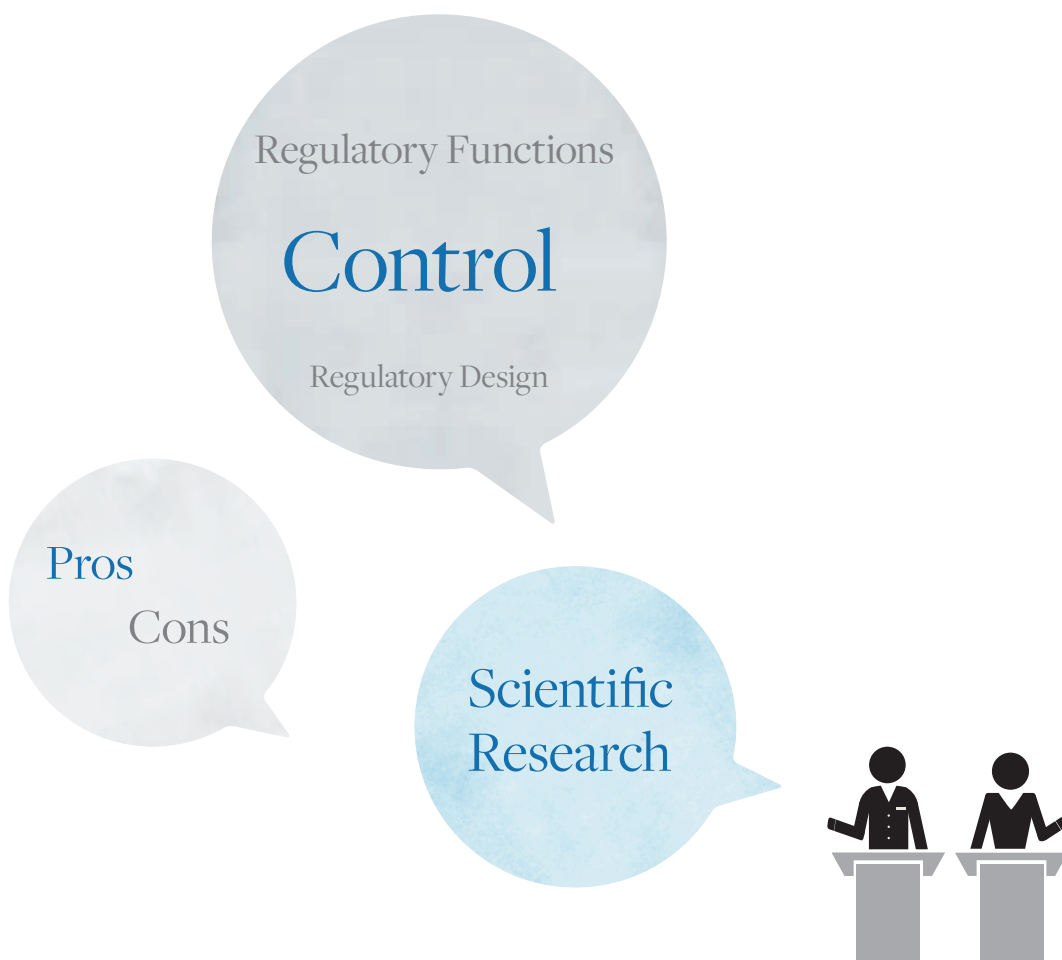
Prof. R. Andreas Kraemer (Ecologic Institute)

World Café Moderators for Topics:

Dr. Stefan Hain (Alfred Wegener Institute): *Regulatory Functions*

Dr. Nadja Salzborn (German Federal Environment Agency): *Regulatory Form*

Dr. Chris Vivian (Centre for Environment, Fisheries and Aquaculture Science): *Regulatory Design*



The Potential Role of Space in Climate Engineering Concepts



Date Wednesday, August 20th, 2014



Time 14.30 - 17.00



Room Stockholm



Conveners Dr. Isabelle Dicaire (European Space Agency),
Ms. Athanasia Nikolaou (European Space Agency),
Dr. Leopold Summerer (European Space Agency)

Session Description

Since its early days space activities have provided tools for solving global societal challenges and have contributed to a better understanding of the Earth's climate. This session, organised by researchers from the European Space Agency, will address the role of space in relevance to climate engineering around two main focal points. Built upon the pragmatic needs identified by the climate scientific community, the first theme describes the opportunities offered by current remote sensing tools in the monitoring of climate engineering activities, including the observation of field experiments. Advances and opportunities in the field of space-based remote sensing of key climate variables, adjacent to potential climate engineering activities and naturally occurring analogues, are presented to show the interconnections between climate change and climate engineering research.

The second theme covers future, potentially more active space-based climate modification concepts, with an emphasis on the nearer term applications. For both themes the speakers and the audience are invited to highlight opportunities for international collaboration in space-based activities.

Speakers

Dr. Isabelle Dicaire (European Space Agency): *Space-based Laser Filamentation for Climate Engineering and Weather Modification*

Ms. Athanasia Nikolaou (European Space Agency): *The Capability of Earth Observation Satellites in Detecting and Disentangling Ocean Iron Fertilization Activities from Natural Phytoplankton Blooms: Case Study of Ocean Fertilization Experiments.*

Dr. Joan Pau Sánchez (Universitat Politècnica de Catalunya): *Optimal Sunshade Configurations for Space-based Geoengineering near the Sun-Earth L1 Point*

Dr. Aidan Cowley (Dublin City University): *Space Based Solar Power for Regenerative Atmospheric Geoengineering and Anthropogenic Pollution Control*

From Projections to Control: The Role of Climate Modeling in SRM



Date Wednesday, August 20th, 2014



Time 14.30 – 17.00



Room Birch and Yew



Conveners Dr. Peter Irvine (Institute for Advanced Sustainability Studies),
Mr. Thilo Wiertz (Institute for Advanced Sustainability Studies)

Session Description

SRM aims at the deliberate modification of the climate, and projections of the climate consequences would be critical to monitoring and evaluation of its real world effects. What are the potentials and limitations of Global Circulation Models (GCM) when it comes to ‘controlling the climate’? GCMs have imperfect representations of climate system processes as many processes are incompletely understood, under-observed, or occur at a scale below the resolution of most GCMs. Comparisons between state-of-the-art GCMs and observations show significant biases below the continental-scale and for shorter timescales. However, GCMs do reproduce many of the important emergent features of the climate system and large-scale trends observed over the last century. Modeling can also help us to learn more about the potentials and limits of controlling complex systems.

The climate system is highly variable, and in the first years after any SRM deployment it will be difficult to build a robust picture of the consequences. Despite this, studies suggest that the global mean temperature and other large-scale aspects of climate could be controlled through feedback approaches on the SRM deployment even in the face of a great degree of model uncertainty. How would decision-making function within an ‘augmented reality’, where observations are not sufficient and climate model projections are essential to anticipating and monitoring the effects of an action?

This session proposes to investigate these questions by bringing together perspectives from climate modeling, control theory, philosophy of science and social science. The first session will consist of a number of short talks followed by discussion. The second session will consist of a discussion of the challenges and surprises that the first 15 years of SRM deployment may bring.

Speakers

Dr. Ben Kravitz (Pacific Northwest National Laboratory): *Feedback, Uncertainty, and the Role of Climate Models in SRM*

Dr. Gabriele Gramelsberger (Free University Berlin): *From Predictive to Instructive – A Philosophy of Science Perspective on the Use of Models*

Dr. Peter Irvine (Institute for Advanced Sustainability Studies): *Detection, Attribution and Climate Control: Technical Limitations to Climate Control*

Dr. Erica Thompson (London School of Economics): *Limitations of Modelling Climate Control: Are Simulation Results Adequately Informative?*

Strange Bedfellows – Political Contestation over SRM on the Left and Right



Date Thursday, August 21st, 2014



Time 09.00 – 10.30



Room Birch and Yew



Conveners Prof. Dr. Simon Nicholson (Washington Geoengineering Consortium), Dr. Wil Burns (Washington Geoengineering Consortium), Mr. Michael Thompson (Washington Geoengineering Consortium)

Session Description

When it comes to SRM technologies, some on the right who have long been critical of aggressive action in response to climate change are coming out in support of climate geoengineering interventions. At the same time, some of the strongest advocates of climate action, on the left, are highly critical of attempts to develop SRM capabilities. This is not the full picture, though. The climate geoengineering conversation is also creating some “strange bedfellows,” with pockets on the left and right finding themselves arguing for similar strategies for different reasons. What’s going on? What’s shaping this mix of clashing factions and odd coalitions?

A large body of communications literature suggests that political ideology plays a crucial role in determining how individuals and groups respond to new technologies and technological forms, and to complex political and social matters. This is an obvious point to all who have been involved for any length of time in climate change discussions. To say that the point is obvious, though, hardly lessens its importance. How, precisely, is ideology shaping the climate geoengineering conversation, particularly around SRM, with what effects and implications? This panel will seek to unpack and shed light on such important questions.

Speakers

Dr. Olaf Corry (The Open University)

Prof. Clive Hamilton (Charles Sturt University)

Prof. Dr. Simon Nicholson (Washington Geoengineering Consortium)

Dr. Wil Burns (Washington Geoengineering Consortium)

This session features an introduction from the conveners will be followed by a panel discussion.



Local Laws, Global Liability: Using National and Local Laws to Regulate Climate Engineering and Allocate Responsibility for Its Impacts



Date Thursday, August 21st, 2014



Time 09.00 – 10.30



Room Copenhagen



Conveners Prof. Tracy Hester (University of Houston)

Session Description

Because climate engineering ultimately will seek to create multinational effects and there is little prospect in the near future of a new international agreement to comprehensively govern climate engineering, domestic national laws will almost certainly provide the first effective basis to regulate climate engineering and impose liability for any damages or disruption that it allegedly might cause. As a result, some nations likely have laws (or will pass laws) that provide the best legal foundation for claimants who want to challenge climate engineering efforts – but, to date, no one has attempted to identify those laws and how they might apply. In theory, claimants could seek a judgment for injunctions, damages or civil and criminal liability in one nation for injuries allegedly occurring within its jurisdiction, and then move to enforce or collect it in a different nation that hosts the project or whose citizens conduct the work.

While many researchers have explored possible governance approaches under new international legal conventions or existing treaty arrangements, very few (if any) have explored how these multiple existing national domestic laws might provide an ad hoc governance system that could promote – or stifle – climate engineering research and field projects.

Speakers

Mr. Jesse Reynolds (Tilburg University): *Compensation for Harm from Climate Engineering Research: An Economic Analysis*

Justice Swatanter Kumar (former Justice, Supreme Court of India): *The Social Panoramas of Climate Engineering vis-a-vis PILs: Indian and Global Perspectives*

Prof. Tracy Hester (University of Houston): *Local Laws, Global Liability: Using Domestic Laws to Challenge Climate Engineering Projects in Other Nations*

Carbon Air Capture Efficiency Prospects: Current Research and Future Directions



Date Thursday, August 21st, 2014



Time 09.00 - 10.30



Room Stockholm



Conveners Prof. Martin Bunzl (Rutgers University)

Session Description

When it comes to air capture, the idea of cleaning up carbon used now in the future, with clean energy, rather than using clean energy now, only seems irrational if you (erroneously) assume no restrictions on clean energy supply now relative to demand.

This is the crux of the matter. You can't talk about sustainability without seeing it through the eyes of the Developing World, but both political self-interest and rational self-interest don't march to the beat of how those with surplus wealth may see things. That is especially true if you look at the assumptions underlying the economic growth in this century to stabilize at 9 billion people and the associated near term energy demand needed to fuel that growth.

But almost everyone who has looked at air capture using existing technology now has concluded it is not feasible on the likely needed scale.

This panel will examine the prospects for new technologies that might make this possible.

Speakers

Prof. Stefano Brandani (University of Edinburgh): *"The Challenge of Direct Carbon Dioxide Capture from Air"*

Dr. Nina Kamennaya (University of Warwick): *"Biological Carbon Sequestration"*

Challenge

Direct Carbon
Dioxide Capture

Biological
Carbon
Sequestration



Climate Emergency: Science, Framing, and Politics (Part 2)



Date Thursday, August 21st, 2014



Time 09.00 - 10.30



Room Pine



Conveners Dr. Jana Sillmann (CICERO), Prof. Hans Asbjørn Aaheim (CICERO), Dr. Joshua Horton (Harvard University), Mr. Andy Parker (Harvard University) and Dr. Francois Benduhn (Institute for Advanced Sustainability Studies)

Session Description

One of the primary arguments for research on climate engineering (CE), and in particular solar radiation management (SRM), is to have a technology ready in case of a climate emergency. The concept of climate emergency, however, may differ substantially between the natural and social sciences, as well as in the way it is presented to a wider public. From a physical point of view, the concept of climate emergency is tantamount to a climatic state that comes, for instance, with a significant increase in weather extremes, or a threshold at which strong non-linearities may rapidly drive the system in an unpredictable way (i.e., so-called tipping points). Some social scientists focus instead on how the physical aspects of climate change might impact socioeconomic systems.

Meanwhile, other social scientists and commentators criticize a climate emergency framing for its potentially negative consequences. The emergency framing has been criticized on multiple grounds, including questions about the plausibility of emergency scenarios, the feasibility of rapid and effective responses, the socially constructed nature of defining an emergency, the power relations implicit in any climate emergency decision, and the potential for undemocratic political outcomes.

It thereby becomes clear that the assessment of a climatic state in terms of its qualification for a climate emergency differs a lot both among and within disciplines. This session will give opportunity for exploring the various viewpoints on the concept of a climate emergency from different disciplines and whether agreement could ever be found on a situation that may beyond reasonable doubt serve as compelling argument for the implementation of CE. Moreover, the session will consider the emergency framing critique, both in terms of the risks engendered by treating CE as an emergency response measure, and in terms of the risks inherent in downplaying the possible need for emergency action.

Speakers

Prof. Timothy Lenton (University of Exeter)
Prof. Dr. Wolfgang Lucht (Potsdam Institute for Climate Impact Research)
Prof. Dr. Konrad Ott (University of Kiel)
Prof. Steve Rayner (University of Oxford)

Mapping the Landscape of Climate Engineering



Date Thursday, August 21st, 2014



Time 09.00 – 10.30



Room Aurora Borealis 2



Conveners Dr. Bron Szerszynski (Lancaster University)

Session Description

This session will explore different ways of capturing and representing the emerging landscape of climate engineering research.

In advance of any systematic system of governance of climate engineering research, testing or deployment, it has been argued that de facto or implicit governance is occurring as the field of individuals, institutions, disciplines, funders, intellectual property, discourses, instrumentation and knowledge-production practices is consolidating itself. One way of increasing the reflexivity and thereby ‘epistemological responsibility’ of the climate engineering research (including governance research) community is to find ways of making visible this structuring of the landscape: the people, institutions, disciplines, networks and communities involved; and the frames, discourses and arguments.

To date, there have been a number of attempts to capture the field, for example:

- » visual ‘argument maps’ of the ethical literature on climate engineering (Betz et al.)
- » visualisations of networks of scientists, institutions, funders and disciplines and geographical locations (Belter and Seidel; Szerszynski, Oldham and Stilgoe)
- » analyses of the implicit frames used in climate engineering appraisal literature (Bellamy et al.)
- » analyses of the frames and narratives in public discourse (Cairns; Pidgeon, Corner and Parkhill; Macnaghten and Szerszynski),
- » lists of the metaphors used in media reporting (Nehrllich and Jaspal; Luokkanen et al);

CEC14 is a timely opportunity – before the field becomes both too complex and too sedimented – to compare and contrast different ways of mapping the emerging landscape, to discuss the role that such mappings can play in the climate engineering research and governance community, and to explore the extent to which they might be brought productively together, in order to render visible and accountable the way that this highly consequential field of research and policy debate is being structured.

Speakers

Dr. Rob Bellamy (University of Oxford)
Mr. Sebastian Cacean (Karlsruhe Institute of Technology)
Dr. Rose Cairns (University of Sussex)
Dr. Nils Markusson (Lancaster University)
Ms. Frederike Neuber (Karlsruhe Institute of Technology)
Dr. Bronislaw Szerszynski (Lancaster University)

Design of Practical Hardware for Climate Engineering



Date Thursday, August 21st, 2014



Time 11.00 - 12.30



Room Stockholm



Conveners Mr. Andrew Lockley,
Prof. Dr. Stephen Salter (University of Edinburgh)

Session Description

While there has been a great deal of work on climate modeling and even more about ethics and governance less attention has been paid to the actual nuts and bolts, bearings and seals, corrosion and fatigue or instruments and controls for climate engineering. The session aims to identify the key engineering problems of implementing climate engineering and suggest some practical solutions.

Speakers

Prof. Tom Ackerman (University of Washington): *Super-Critical Salt Water Spray for Marine Cloud Brightening*

Prof. Julian Evans (University College London): *Approaches to the Longevity of Foams for the Ocean Mirror*

Dr. Hugh Hunt (University of Cambridge): *Practical Considerations for Pumping Sulphur Dioxide or Other Materials to the Stratosphere*

Mr. Andrew Lockley: *New Gun Designs for Stratosphere Aerosol Injection*

Prof. Dr. Stephen Salter (University of Edinburgh): *Hardware for Marine Cloud Brightening*



Climate Engineering in Popular Culture: Art, Media, Games, and Fiction



Date Thursday, August 21st, 2014



Time 11.00 – 12.30



Room Birch and Yew



Conveners Ms. Holly J. Buck (Cornell University),
Mr. Sean Low (Institute for Advanced Sustainability Studies)

Session Description

The “Whole Earth” picture from the moon helped galvanize the modern environmental movement. Jules Verne’s submarine was a self-fulfilling prophecy. Eric Drexler’s “Engines of Creation” spawned massive interest in the capacity of nanotechnology to reinvent human industry. Technical reports or policy meetings cannot fully capture or influence how we conceive of emerging technologies. In thinking about the future of climate engineering, we must look just as strongly at its depiction in art, media, games and fiction- for often where the imaginary goes, reality follows.

Speakers

Dr. Isabell Schrickel (Leuphana University Lueneburg): *Visioneering the Anthropocene*

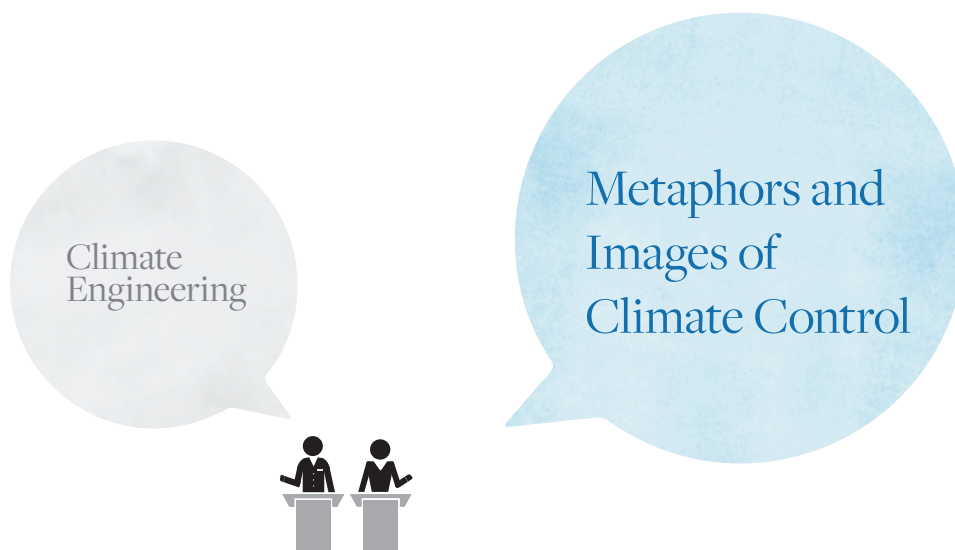
Ms. Karolina Sobocka: *Art for the Anthropocene*

Mr. Jamais Cascio (Open the Future): *It’s All Fun and Games Until Somebody Wrecks the Climate*

Ms. Catherine Bush (University of Guelph): *The Weather Changers: Fiction Responds to Climate Engineering*

Prof. Dr. James R. Fleming (Colby College): *Metaphors and Images of Climate Control*

Dr. Maialen Galarraga (Lancaster University) and Ms. Alba Sotorra Clua: *From Clouds to Screen: Developing a Climate Engineering Film Project*



The Ethics of Carbon Dioxide Removal



Date Thursday, August 21st, 2014



Time 11.00 - 12.30



Room Copenhagen



Convener Dr. Harald Stelzer (Institute for Advanced Sustainability Studies)

Session Description

Arguments for different CDR techniques are often backed up by the assumption that the expected consequences for most of them seem to be less negative, severe or risky than those of SRM and that by removing greenhouse gases CDR treats the natural causes of climate change. Still, some CDR techniques could have severe side effects, especially in the case of large scale deployment. Possible complications and risks may result from CO₂ storage, land use issues or in the case of ocean fertilization from impacts on marine ecosystems and biodiversity as well as incite changes in the macronutrient balance. Therefore it is important to distinguish between different CDR techniques, as not all of them seem to raise the same normative problems. For a normative assessment of CDR one also has to deal with the potential ineffectiveness of many CE techniques in regard to the scale of GHG emissions and the level of their atmospheric concentration we may reach in the future. Furthermore, circumstances under which the different CDR techniques are economically viable and socially and ecologically sustainable remain to be determined. In many cases their feasibility would only be given, if the uptake of CO₂ would be cheaper and/or more efficient than limiting emission in the first place. It also has been argued that some CDR techniques may exacerbate carbon-based path dependency in the near term, and therefore create a possible moral hazard. Additionally, many environmentalists are opposed to grand-scale environmental manipulation schemes that do not tackle the underlying economic and political drivers of climate change.

Speakers

Dr. David R. Morrow (University of Alabama at Birmingham): *Geoengineering and Non-Ideal Theories of Justice*

Ms. Haomiao Du (University of Amsterdam): *An Overview of CDR Techniques - Adverse Impacts and Ethical Concerns*

Mr. Erik Thorstensen (Oslo and Akershus University College): *Public Participation and Stakeholder Inclusion for Geoengineering: What Do We Know From CDMA/R?*

Mr. Tim Kruger (University of Oxford): *Would the Development of a Safe, Robust and Scalable Technique to Sequester Carbon Dioxide From the Air Create an Obligation to 'Clean Up the Mess'?*

How can Civil Society and the Scientific Community Jointly Address Climate Engineering?



Date Thursday, August 21st, 2014



Time 11.00 – 12.30



Room Aurora Borealis 3



Convener Dr. Thomas Bruhn (Institute for Advanced Sustainability Studies)

Session Description

Discussions on endeavors of overarching societal impacts require transdisciplinary approaches in order to include knowledge from outside the classical academic realm. Civil society organizations (CSOs) represent an important stakeholder in society and their knowledge and perspectives on critical issues like the ones concerning climate engineering (CE) can provide important impulses for the public discussion as well as to the scientific community. A mutual learning process between both the scientific community and CSOs could be beneficial to both sectors and provide a more holistic understanding of the societally relevant aspects of climate engineering. So far, however, there are no well-established concepts how such an exchange between the scientific community and CSOs could be facilitated. The objective of this session will be to elucidate the perspectives of such a trans-boundary exchange and come up with first ideas of how such a joint process could concretely be facilitated.

Overarching key questions will be:

- 1) Which motives drive CSOs to get involved or not to get involved in the topic of CE?
- 2) How does the engagement and outreach of CSOs depend on their specific context (e.g. the US and Europe)?
- 3) What could be the concrete prospects and benefits of an exchange between scientists and CSOs on the critical societal challenges of climate engineering?
- 4) How could CSOs and scientists exchange constructively and learn from each other in order to contribute jointly to a more holistic understanding of the perspectives of climate engineering?
- 5) In which format could co-generated knowledge be fed into the public and scientific discussion?

Speakers

Prof. Mojib Latif (GEOMAR – Helmholtz Center for Ocean Research Kiel)

This session features short introductory input statements, followed by an open discussion amongst participants.

Developing Countries and SRM



Date Thursday, August 21st, 2014



Time 11.00 – 12.30



Room Aurora Borealis 2



Conveners Mr. Andy Parker (Harvard University),
Dr. Benjamin Gyampoh (African Academy of Sciences),
Ms. Ndivhuwo Cecilia Mukosi (Council for Geoscience)

Session Description

Developing countries and their people perhaps have to the most to gain or to lose from solar geoengineering, as they are typically most vulnerable to environmental change whether caused by climate change or any attempts to address it. However most discussions and research to date have taken place in developed countries with large scientific and academic infrastructures, with little participation by people from the developing world. Projects such as the SRM Governance Initiative, with its range of international participants and partners, have tried to kick-start discussions in developing countries, but what next steps are required?

This session will emphasize small group and participant interaction as they discuss how developing countries might engage with SRM research, governance, and international policymaking. It will seek to replicate a similar session organised by some developing country participants at the 2013 geoengineering summer school, which sought to generate concrete proposals for next steps. It is hoped that this session might spark new ideas and actions that can be taken beyond CEC14.

Speakers

This session features no speakers. Instead, an introduction from the conveners will be followed by an open discussion amongst participants.



Poster Sessions

The poster sessions will take place on
Tuesday, August 19 and Wednesday,
August 20 in Aurora Borealis 1
from 17.30–19.00.

Part 1



Date Tuesday, August 19th, 2014



Time 17.30 – 19.00



Room Aurora Borealis 1; lead-in presentation in Aurora Borealis 3, with video projection to Aurora Borealis 2



Special notes Finger food is available throughout the session.

Lead-in Presentation to the Poster Session

A Monument to the Anthropocene: The Solar Balloon and Tomás Saraceno's Cloud City

Tomás Saraceno and Sasha Engelmann (University of Oxford)

Climate engineering brings the planet's climatic system into the orbit of human making. Tomás Saraceno's vision of Cloud Cities, most recently articulated in a residency at the Centre National d'Études Spatiales (CNES), proposes a collective and creative “en-forming” of the atmosphere.¹ Saraceno is known for his large-scale installations evoking spider webs, Weire-Phelan bubble geometries, neurological networks and cosmology. For an upcoming exhibit at Les Abattoirs in Toulouse, curated by Bruno Latour, Bronislaw Szerszynski and Olivier Michelon, Tomás will submit his proposal for a “monument to the Anthropocene”: an artwork which conveys the shape of the new geologic epoch. This “monument” will be lighter-than-air: a solar balloon that rises and falls dependent on solar flux, circles the globe, and samples the biomes of the lower stratosphere. In the framework of this conference, this paper will discuss Tomás Saraceno's current experimentation and speculation with solar balloons, and his larger Cloud City project, as a speculative making, engaging and re-shaping of Earth's atmosphere; and an embodiment of the geologic politics provoked by climate engineering in the Anthropocene.

Tomás Saraceno, born in 1973 in Argentina, studied art and architecture. Currently he lives and works in Berlin. Saraceno became one of the artists most in demand at contemporary art exhibitions around the world, participating with major installations at the Venice Biennale 2009, and at the São Paulo Biennial in 2006. His works have also been shown at a variety of museums, including the Bonniers Konsthall in Stockholm in 2010, the Hamburger Bahnhof in Berlin in 2011, on the roof of the Metropolitan Museum in New York in 2012, the Hangar Bicocca in Milan 2012 and currently at K21 in Düsseldorf in 2013. Saraceno was artist in residence at the International Space Studies Program of NASA in the summer of 2009. He has also completed a residency at the MIT Center for Art, Science Technology (CAST) in 2012 and was visiting artist for the Paris Atelier program at Columbia University's Graduate School of Architecture 2013. He was the 2009/10 Winner of the Calder Prize.

Sasha Engelmann, a native of Los Angeles, holds degrees from Stanford University in Earth Systems, and English and French Literatures. In past years she worked in San Francisco with the Natural Resource Defense Council and received a Marshall Scholarship to pursue a post-graduate degree in Geography and the Environment at Oxford University. Engelmann's academic research lies at the intersection of climate science, contemporary art and spatial theory. She has recently worked with artists exploring air quality, breathing bodies, and clouds (of data, affect, vapor), and is currently undertaking fieldwork for her PhD at Tomás Saraceno's studio in Berlin.

Part 2



Date Wednesday, August 20th, 2014



Time 17.30 - 19.00



Room Aurora Borealis 1; lead-in presentation in Aurora Borealis 3, with video projection to Aurora Borealis 2



Special notes Pretzels and drinks are available throughout the session.

Lead-in Presentation to the Poster Session Nephologies

Karolina Sobecka

How has living in the Anthropocene changed our notion of nature? This question is approached by constructing and deploying devices which display and probe the knowledge, technology, ethics and aesthetics of our culture in respect to this notion. The Cloud Machine is a personal device for landscape and weather modification based on a geo-engineering technique to create brighter clouds. The Cloud Collector is a personal device for Thinking Like a Cloud. It is used to collect cloud samples which are then analyzed for microbes constituting the cloud microbiome, and ingested by human volunteers. Through the DIY approach, Nephologies engage the issue of climate change in a way that taps into experienced human realities: by putting faith in the ability of the amateur to create a whole new level of engagement with the world around us.

Karolina Sobecka is an artist and designer. Her artwork often engages public space and explores the way we interact with the world we create. Her recent projects focus on narratives that inscribe humans in nature. Sobecka's work has been shown internationally, including at the V&A, MOMA Film, Beall Center for Art + Technology, Science Gallery, and ISEA, and has received awards including from Creative Capital, Rhizome, NYFA, Princess Grace Foundation, Vida Art and Artificial Life Awards and Japan Media Arts Festival. Sobecka is the founder of an art and design studio Flightphase, has taught at University of Washington and at the School of the Art Institute of Chicago, and is currently teaching at Rhode Island School of Design.

¹ "En-forming" denotes the giving of shape, volume or mould to a metastable system. The term is borrowed from Galarraga and Szerszynski (2012) "Making climates: solar radiation management and the ethics of fabrication." *Engineering the Climate: The Ethics of Solar Radiation Management*, ed. Christopher Preston, Lanham, MD: Lexington Books, 2012, pp. 221–235.

Poster Contributions²

(all posters will be available on both days)

Group 1: GeoMIP

Dr. Christoph Kleinschmitt (University of Heidelberg): *What Processes can Limit the Magnitude of the Radiative Forcing by Stratospheric Aerosol Injection?*

Dr. Blaž Gasparini (ETH Zurich): *The Efficiency and Climate Responses of Stratospheric Sulphur Injection in the Arctic*

Dr. Annette Rinke (Alfred Wegener Institute, Helmholtz Center for Polar and Ocean Research):

Arctic Sea Ice and Atmospheric Circulation under the GeoMIP G1 Scenario

Mr. Simon Driscoll (University of Oxford): *Asymmetries between the onset and termination of geoengineering in the UM-CLASSIC configuration of HadGEM2*

Mr. Xiaoyong Yu (Beijing Normal University): *Effectiveness and Regional Inequality of GeoMIP G1 to G4 Scenarios*

Dr. Jerry Tjiputra (Bjerknes Centre for Climate Research): *Large Scale and Regional Impacts of Ocean and Terrestrial Biogeochemistry to Future Stratospheric Aerosol Injection*

Dr. Charles Curry (University of Victoria): *A Multimodel Study of Climate Extremes in an Idealized Geo-engineering Experiment*

Mr. Hong Yu (Beijing Normal University): *Change of ENSO Multiyear Signatures in Warming and Geoengineering Scenarios*

Dr. Peter Irvine (Institute for Advanced Sustainability Studies): *The Initial Climate Response Following a Termination of SRM*

Mr. Songsong Fang (Beijing Normal University): *Comparing the Impacts of Solar Dimming versus Stratospheric Aerosol Injection Scenarios on Temperature and Precipitation Extremes*

Dr. Glauco Di Genova (Università degli Studi dell'Aquila): *Stratospheric Ozone Response to Sulfate Geoengineering: Results from the Geoengineering Model Intercomparison Project*

Group 2: Mechanics and Impacts of SRM

Dr. Debra Weisenstein (Harvard University): *Stratospheric Geoengineering by Injection of Solid Particles: Modeling Fractal Structures, Liquid Coatings, and Ozone Impacts*

Dr. Anastasia Revokatova (Hydromet Centre, Russia): *Classification of Supposed Negative Effects of the "Stratospheric Aerosol" Method*

Prof. John Moore (Beijing Normal University): *Serendipitous Field Tests on Solar Climate Engineering: Lessons from China*

Dr. Annabel Jenkins (University of Leeds): *Marine Cloud Brightening – How do Implementation Assumptions Change its Effectiveness?*

Dr. Michael Robertson (University of Strathclyde): *Geoengineering: Closing the Control loop Using State Space Methods*

Prof. Stephen Salter (University of Edinburgh): *Coded Modulation Method for Getting an Everywhere-to-everywhere Transfer Function*

Prof. Stephen Salter (University of Edinburgh): *Arguments For and Against Marine Cloud Brightening*

Prof. Stephen Salter (University of Edinburgh): *Design of Spray Vessel Hardware*

Prof. Chaochao Gao (Zhejiang University): *What Can Past Volcanism Tell Us about the Monsoon Precipitation Impact of Stratospheric Aerosols?*

Dr. Helene Muri (University of Oslo): *Tropical Forest Response to Marine Sky Brightening*

Ms. Hilary Costello, Dr. Kirsty Kuo, Dr. Hugh Hunt, and Prof. Peter Davidson (University of Cambridge): *A Tethered Balloon System for Delivery of Aerosols into the Stratosphere (SPICE)*

Mr. Salif Kone (Malian National School of Engineers): *Solar Radiation Management and Olivine Dissolution Methods in Climate Engineering*

Dr. Renaud de Richter (University of Montpellier), Dr. Tingzhen Ming (University of North Texas) and Dr. Sylvain Caillol (University of Montpellier): *Climate Engineering by Atmospheric Convection Enhancement*

Dr. Renaud de Richter (University of Montpellier), Dr. Tingzhen Ming (University of North Texas) and Dr. Sylvain Caillol (University of Montpellier): *Pros and Cons of Earth Radiation Management vs. Sunlight Reflection Methods*

Mr. Andrew Lockley: *New Gun Designs for Stratospheric Aerosol Injection*

Group 3: Mechanics and Impacts of CDR and Biogenic Carbon Sequestration

Dr. Vivian Scott (University of Edinburgh): *Can We Store It All?*

Dr. Sebastian Sonntag (Max Planck Institute for Meteorology): *Carbon Sequestration Potential and Climatic Effects of Reforestation in an Earth System Model*

Ms. Lena Boysen (Potsdam Institute for Climate Impact Research): *Terrestrial Carbon Dioxide Removal (tCDR): Opportunities for Climate, Challenges for Agriculture and Nature Conservation*

Mr. Pradeep Kumar (Government of Sikkim, India): *Vegetation Carbon Pool using Remote Sensing and GIS: Opportunities and Challenges*

Dr. Dorothea Mayer (Max Planck Institute for Meteorology): *Climatic Consequences of Land-based Climate Engineering*

Prof. Murray Moinester, Dr. Israel Carmi, Prof. Joel Kronfeld (Tel Aviv University): *Sequestration of Inorganic Carbon via Forestation*

Dr. He Yin (University of Bonn): *Forest Cover and Land Degradation Mapping in Central Asia – Implications for Carbon Sequestration*

Group 4: Mapping Perspectives and Governance

Dr. Suvi Huttunen (Finnish Environment Institute): *Emerging Policy Perspectives on Geoengineering: An International Comparison*

Dr. Robert Chris (The Open University): *Geoengineering as an Emergency Response to Climate Change: The Cultural Theory View from the Lifeboat*

Dr. Masahiro Sugiyama (University of Tokyo): *Mapping Technology Choices of Climate Engineering onto Social Concerns*

Ms. Frederike Neuber and Mr. Sebastian Cacean (Karlsruhe Institute of Technology): *The Moral Controversy About Climate Engineering – An Argument Map*

Ms. Kerry Brent (University of Newcastle): *The Potential of the ‘No-Harm’ Rule to Prevent Transboundary Harm and Harm to the Global Atmospheric Commons from SRM Geoengineering*

Prof. Jim Falk (University of Melbourne): *Out of Control? Dynamics and Dimensions of Climate Engineering Governance*

Dr. Takanobu Kosugi (Ritsumeikan University): *Global Warming Mitigation Strategies Considering the Uncertainty of Aerosol Geoengineering Availability*

Dr. Annabel Jenkins (University of Leeds): *A Framework for Assessing Climate Geoengineering*

Mr. Nils Matzner (RWTH Aachen University): *Co-produced Climate Interventions: Responsibility and Governance at the Boundaries of Climate Science and Climate Politics*

Mr. Hannes Fernow (University of Heidelberg): *Decision-making in the Age of Technical Reproducibility – Climate Engineering between Risk and Practice*

Prof. Nicholas Pidgeon (Cardiff University), Dr. Karen Parkhill (Bangor University), Dr. Adam Corner (Cardiff University), Dr. Naomi Vaughan (University of East Anglia): *Deliberating Geoengineering Risks: The Case of Stratospheric Aerosols and the SPICE Project*

Dr. Dian Seidel (NOAA Air Resources Laboratory): *A Bibliometric Analysis of Climate Engineering Research*

² Due to spatial limitations, only the first author of the poster is listed. The full list of authors is available on the conference website.

Timetable



Monday August 18th, 2014

12.00 – 14.00 Conference Registration

14.00 – 15.00 Welcome Speeches AB 2 and 3

- » Prof. Dr. Mark Lawrence,
- Prof. Dr. Dr. h.c. Klaus Töpfer,
- Dr. Georg Schütte

15.30 – 17.30 Panel Discussion AB 2 and 3

- » The Past Decade of Climate Engineering Research

18.30 – 20.30 Panel Discussion AB 2 and 3

- » Climate Politics at the Crossroads: Is Climate Engineering a Wrench in the Works or a Tool in the Toolbox?

20.30 – 22.00 Reception Foyer AB



Friday
August 22nd,
2014

9.00 – 17.00
Deepening the Debate:
Conference rooms available
for ad-hoc meetings and
discussions.

Please contact the
Conference Office
for this.

Rooms:

Aurora Borealis 1, 2 and 3: AB 1, AB 2 and AB 3

Copenhagen: C

Pine: P

Stockholm: S

Birch and Yew: B and Y



Tuesday August 19th, 2014

9.00 – 10.30 Sessions

- » Exploring the Politics of Climate Engineering **S**
- » International Law for the Regulation of Climate Engineering (Part 1) **P**
- » Perspectives on Climate Engineering from the Front Lines of Climate Change **AB 2**
- » Progress in the Geoengineering Model Inter-comparison Project (GeoMIP) **B and Y**
- » Responsible Innovation and Climate Engineering **C**

11.00 – 12.30 Sessions

- » Modeling Extreme Risk: Assessing High Impact, Low Probability Events **AB 2**
- » What do People Think and Feel about Climate Engineering — and How do we Know? **C**
- » International Law for the Regulation of Climate Engineering (Part 2) **P**
- » Linkages between Climate Engineering and Short-Lived Climate-forcing Pollutants: Two “Quick Fixes” for the Climate? **B and Y**
- » Understanding Carbon-cycle and Climate Feedbacks of Carbon Dioxide Removal Methods **S**

12.30 – 14.30 Lunch Break

13.15 – 14.15 Lunchtime Discussion

- » Will Climate Engineering Unduly Hinder Emissions Reductions? Discussing the “Moral Hazard” **AB 3**

14.30 – 17.00 Sessions

- » Risks and Conflict Potential of Climate Engineering **AB 3**
- » Assessment Methodologies for Climate Engineering Technologies **P**
- » To Gabon or Not To Gabon: A Game on — Geoengineering Research and Policy **AB 2**

17.30 – 19.00 Poster Session AB 1

- » Lead-in Presentation: A Monument to the Anthropocene: The Solar Balloon and Tomas Saraceno's *Cloud City* **AB 3**

19.30 Shuttle from Scandic to the Museum für Naturkunde

20.30 – 22.00 Panel Discussion and Reception

- » Climate Engineering and the Meaning of Nature



Wednesday August 20th, 2014

9.00 – 10.30 Sessions

- » Civil Society and Geoengineering: Who’s Engaging Whom? **S**
- » Enhanced Mineral Weathering: Potential and Consequences (Part 1) **C**
- » Exploring the Intersections between Climate Engineering and Systems Engineering **B and Y**
- » From Geoengineering to Geo-weaponing: The Security Dimensions of Climate Engineering **AB 3**
- » Intentional and Unintentional Interferences in the Climate System **P**

11.00 – 12.30 Sessions

- » Novel SRM Techniques: Cirrus Cloud Thinning and Marine Sky Brightening **AB 3**
- » Climate Geoengineering and the Potential Role of Human Rights Regimes **S**
- » Climate Engineering Governance — is the Climate Convention the Right Place for It? **B and Y**
- » Regional Paths to Global Change: Approaches and Governance for Regional Climate Engineering Technologies and Strategies **P**
- » Enhanced Mineral Weathering: Potential and Consequences (Part 2) **C**
- » Climate Engineering and Human Engineering: Social and Technological Challenges in the Anthropocene **AB 2**

12.30 – 14.30 Lunch Break

13.15 – 14.15 Lunchtime Discussion

- » The Politics of Climate Engineering **AB 3**

14.30 – 17.00 Sessions

- » Climate Emergency: Science, Framing, and Politics (Part 1) **P**
- » The International Control of Climate Engineering and Research: Debating Why, How and Who **AB 2**
- » The Potential Role of Space in Climate Engineering Concepts **S**
- » From Projections to Control: The Role of Climate Modeling in SRM **B and Y**
- » Biogenic Carbon Sequestration: Multifunctionality for Global Resilience **C**

17.30 – 19.00 Poster Session AB 1

- » Lead-in Presentation: Nephologies **AB 3**
- » Fend for yourself dinner



Thursday August 21st, 2014

9.00 – 10.30 Sessions

- » Strange Bedfellows — Political Contestation over SRM on the Left and Right **B and Y**
- » Local Laws, Global Liability: Using National and Local Laws to Regulate Climate Engineering and Allocate Responsibility for Its Impacts **C**
- » Carbon Air Capture Efficiency Prospects: Current Research and Future Directions **S**
- » Climate Emergency: Science, Framing, and Politics (Part 2) **P**
- » Mapping the Landscape of Climate Engineering **AB 2**

11.00 – 12.30 Sessions

- » Design of Practical Hardware for Climate Engineering **S**
- » The Ethics of Carbon Dioxide Removal **C**
- » How can Civil Society and the Scientific Community Jointly Address Climate Engineering? **AB 3**
- » Climate Engineering in Popular Culture: Art, Media, Games, and Fiction **B and Y**
- » Developing Countries and SRM **AB 2**

12.30 – 14.00 Lunch Break

14.00 – 15.00 Panel Discussion

- » The Writer’s Role: Reflections on Communicating Climate Engineering to Public Audiences **AB 3 and AB 2**

15.30 – 17.00 Panel Discussion

- » Assess, Test or Terminate: What Future for Climate Engineering Research? **AB 3 and AB 2**

17.30 Shuttle to Haus der Kulturen der Welt

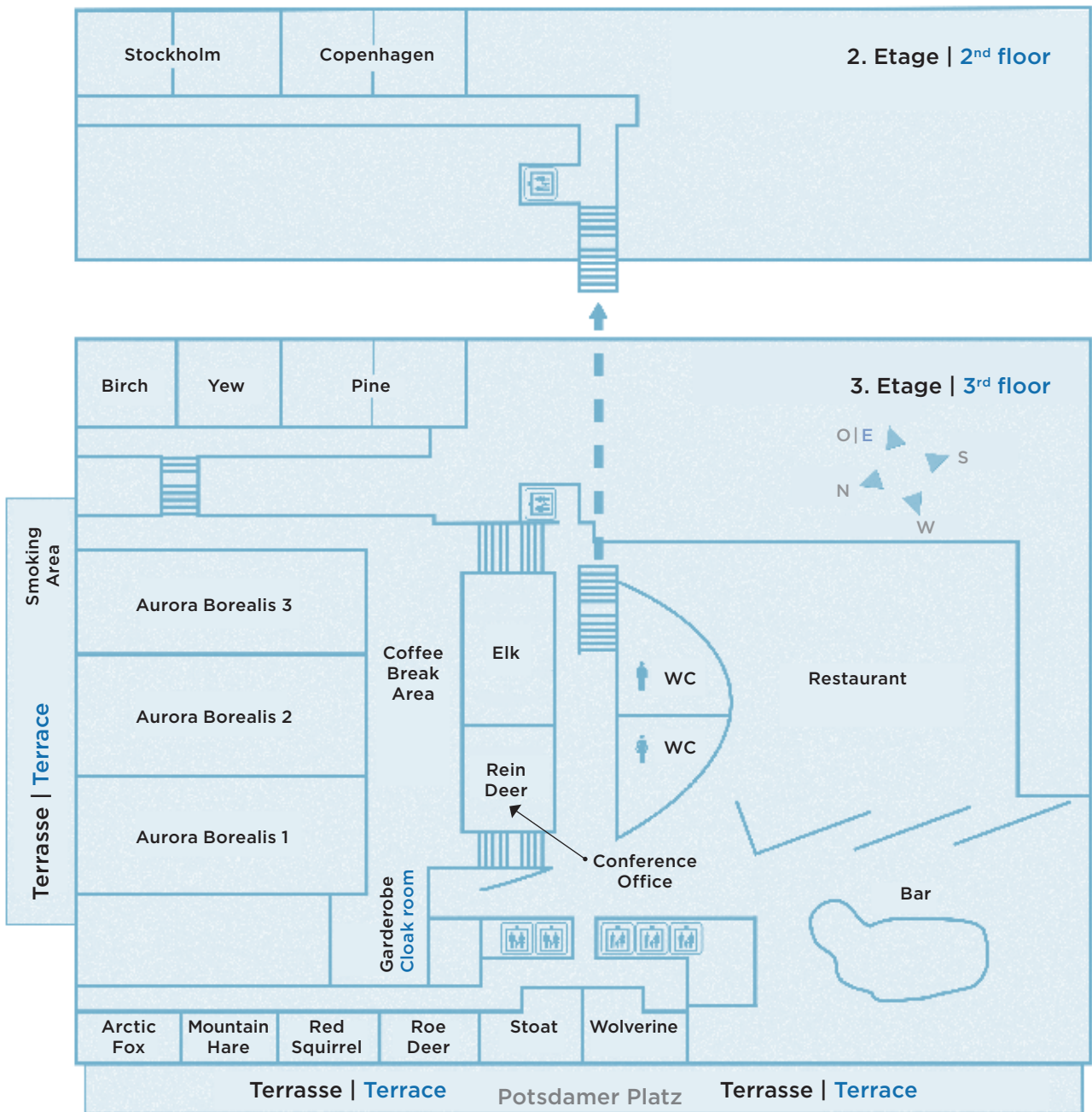
18.30 – 20.30 Closing Panel

- » The Anthropocene: An Engineered Age?

20.30 – 22.30 Conference Dinner

Floorplan

Scandic Berlin
Potsdamer Platz

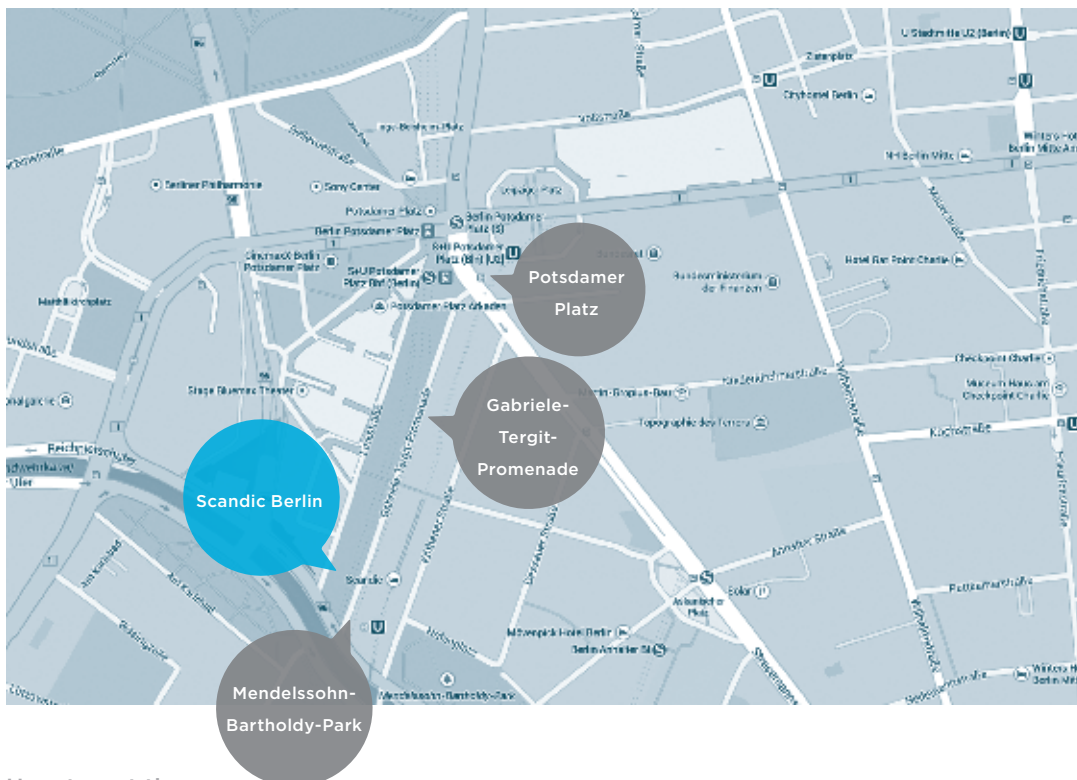


Information About Transport in Berlin

Scandic Berlin

Main Conference Venue

Gabriele-Tergit-Promenade 19
10963 Berlin
Germany
Phone: +49 30 700 779 0
Fax: +49 30 700 779 2211
E-mail: potsdamerplatz@scandichotels.com



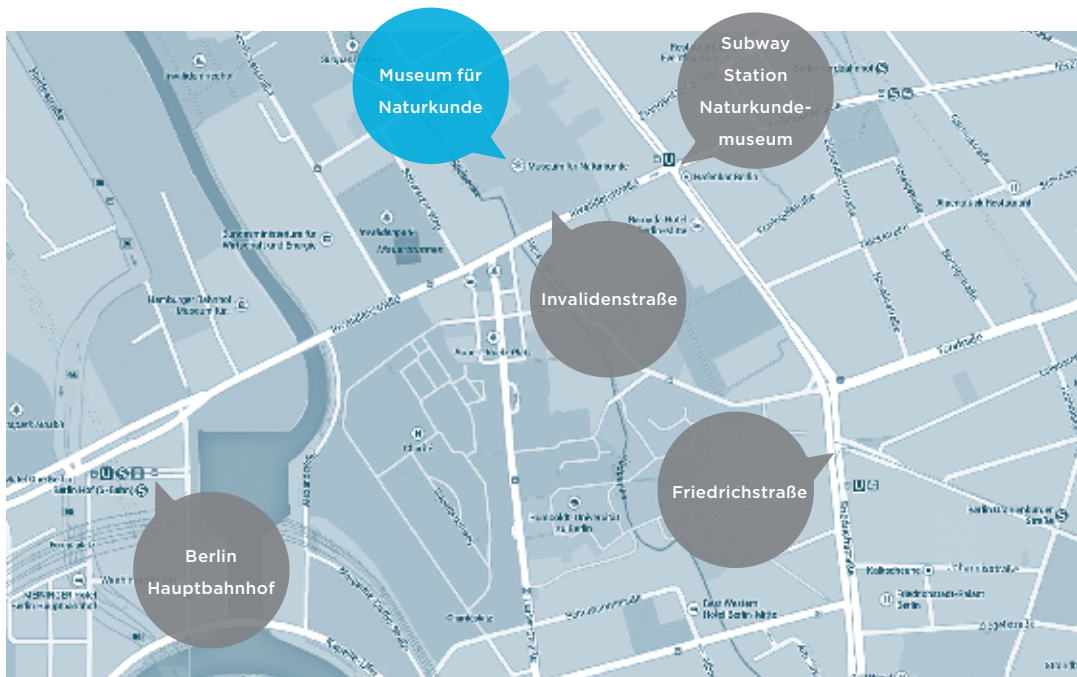
How to get there

The nearest underground stop is the station “Mendelssohn-Bartholdy-Park”, serviced by subway line U2. The nearest train station is “Potsdamer Platz”, serviced by lines S1, S2 and S25, as well as underground line U2 and regional trains.

Natural History Museum (Museum für Naturkunde)

This is the venue for the panel The Meaning of Nature in an Engineered World on Tuesday, 19th August.

Invalidenstraße 43
10115 Berlin
Germany



How to get there

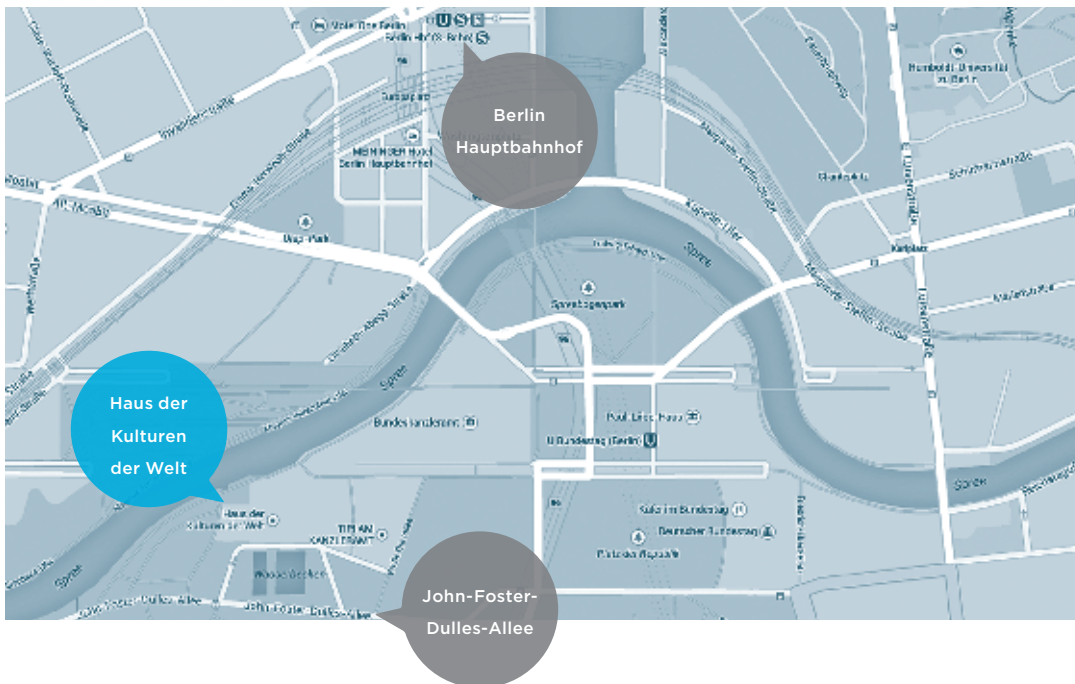
The shuttle bus from Scandic Hotel to the Museum on departs at 19:30. Shuttles returning to the Scandic Hotel will leave from the Museum at 22.00, 22.30 and 23.00

The nearest underground stop is the subway station Naturkundemuseum , serviced by subway line U6. The subway line U2 crosses the U6 at the station “Stadtmitte”.

House of World Cultures (HKW – Haus der Kulturen der Welt)

*This is the venue for the panel *The Anthropocene: An Engineered Age?* followed by the conference dinner on Thursday, 21st August.*

John-Foster-Dulles-Allee 10
10557 Berlin
Germany



How to get there

The shuttle bus from Scandic to HKW departs at 17.30.

The shuttle buses returning to the Scandic depart from HKW at 21.00 until 23.00 every 30 min.

The nearest train station is the “Hauptbahnhof” (Berlin main station), which is served by lines S5, S7 and S75.

These lines cross with the S1, S2 and S25 at the station “Friedrichstraße”.

For additional information on public transportation, please visit <http://www.bvg.de>.

Registration and Further Inquiries About CEC14

Registration

Lobby, 3rd Floor

Conference Office

Rein Deer, 3rd Floor

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List of Participants

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Dr. Thorben Amann, Universität Hamburg, Germany
Ms. Roslyn Arayata, British Embassy In Manila, Philippines
Mr. Jeff Ardron, Institute for Advanced Sustainability Studies, Germany
Dr. Shinichiro Asayama, National Institute for Environmental Studies, Japan
Mr. Thomas Baldauf, Germany
Mr. Jeremy Baskin, Univ. of Melbourne, Australia
Dr. Nico Bauer, Potsdam Institute for Climate Impact Research, Germany
Mr. Ralf Becker, Umweltbundesamt, Germany
Dr. Rob Bellamy, University of Oxford, United Kingdom
Dr. Francois Benduhn, Institute for Advanced Sustainability Studies, Germany
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Mr. Christopher Bennett, University of Warwick, United Kingdom
Ms. Ulrike Bernitt, Kiel Earth Institute, Germany
Ms. Katharina Beyerl, Institute for Advanced Sustainability Studies, Germany
Ms. Ingela Björck, Swedish Society for Nature Conservation, Sweden
Dr. Jason Blackstock, University College London, United Kingdom
Mr. Max Bliss, The REAL Institute, France
Dr. Tamas Bodai, University of Hamburg, Germany
Prof. Daniel Bodansky, Arizona State University, United States
Dr. Ralph Bodle, Ecologic institute, Germany
Mr. Leonard Borchert, University of Hamburg, Germany
Ms. Lena Boysen, Potsdam Institute for Climate Impact Research, Germany
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Prof. Dr. Martin Bunzl, Rutgers University, United States
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Dr. Peter Irvine, Institute for Advanced Sustainability Studies, Germany
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Dr. Suginori Iwasaki, National Defense Academy, Japan
Mr. Alfredo Jakob, Germany
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Ms. Karin Kartschall, Federal Environment Agency, Germany
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Dr. Juergen Kern, Leibniz Institute for Agricultural Engineering Potsdam-Bornim e.V., Germany
Ms. Vera Keur, VARA public broadcasting organisation, Netherlands
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Mr. Zabardast Khan, United Nations Development Program (UNDP), Pakistan
Dr. Tatjana Kiesow, German Aerospace Center, Germany
Mr. Eli Kintisch, Science magazine, United States
Dr. Jan Ole Kiso, UK Government, United Kingdom
Mr. Christoph Kleinschmitt, Institute of Environmental Physics – Heidelberg University, Germany
Mr. Pol Knops, KU Leuven/Innovation Concepts B.V., Netherlands
Mr. Salif Kone, Malian National School of Engineers ENI-ABT, Mali
Prof. Robert Kopp, Rutgers University, United States
Dr. Takanobu Kosugi, Ritsumeikan University, Japan
Prof. R. Andreas Kraemer, Ecologic Institute, Germany
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Mr Terry Lawton, United Kingdom
Mr. Penehuro Fatu Lefale, Bodeker Scientific, New Zealand
Dr. Harry Lehmann, Federal Environment Agency, Germany
Dr. Andrew Lenton, CSIRO, Australia

Dr. Wera Leujak, Federal Environment Agency, Germany
Prof. Albert Lin, University of California Davis, United States
Ms. Jasmin S. A. Link, University of Hamburg, Germany
Dr. P. Michael Link, University of Hamburg, Germany
Ms. Ivonne Lobos, Institute for Advanced Sustainability Studies, Germany
Mr. Andrew Lockley, United Kingdom
Dr. Birgit Lode, Institute for Advanced Sustainability Studies, Germany
Dr. Jane Long, EDF/BPC, United States
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Floorplan and Timetable



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