

## OBJECTIVES AND MOTIVATION

**Motivation:** The Paris Agreement has set the long term goal of holding global mean warming well below 2 °C and pursuing efforts to limit it to 1.5 °C. It explicitly includes the possibility of using carbon dioxide removal (CDR) technologies to reach these goals by calling to achieve a “balance between emissions sources and sinks in the 2<sup>nd</sup> half of the century”. At the same time, this statement limits the possible use of solar radiation management (SRM) to reach the climate goals of the Agreement.

**Objective:** This workshop will look into a set of pertinent questions related to the 1.5 °C goal and climate engineering with a focus on carbon dioxide removal from the atmosphere. The following key questions will be addressed:

**1. To what extent will CDR be needed to keep the 1.5 °C target within reach?**

This touches upon a host of related question. What is the associated emissions budget, to what extent it can be extended by CDR deployment, how rapid can emissions be phased out by mitigation measures, what portfolios of CDR options are suggested in 1.5 °C pathways, and what socio-economic and policy developments increase or reduce the need for CDR?

**2. What are the implications of CDR requirements connected to the 1.5 °C target on sustainable development?**

There are a number of serious concerns about the environmental and social sustainability of individual CDR options. Those evolve around the competition for land and associated impacts on food supply and biodiversity, large-scale deployment of carbon capture and storage, and other environmental and social side effects.

**3. Is there a role for SRM for reaching the 1.5 °C target under the Paris Agreement?**

Depending on the actual value of climate sensitivity, balancing anthropogenic CO<sub>2</sub> sources and sinks in the 2<sup>nd</sup> half of the century may not limit the surface temperature sufficiently. Would radiation management schemes be able to prevent an overshoot of the temperature above 1.5 °C? If yes, would such a scenario be desirable when compared to an overshoot scenario, and would it be admissible under the Paris Agreement and other global treaties?

**4. How to inform the public debate about climate engineering and the 1.5 °C target, and what are the ethical implications of the connection between the two?**

Climate engineering technologies are not only controversial discussed among scientists, they are also met with great skepticism by the public and policy makers. However, the 1.5 °C target increases the need for such technologies, at least with regard to CDR. What is the implication of this connection for the public debate and ethical evaluations of both climate engineering and the 1.5 °C target?

These four key questions will be explored in a series of six sessions, followed by an input from stakeholders and policy makers. The workshop is organized by the Scientific Priority Programme on Climate Engineering (SPP 1689; [www.spp-climate-engineering.de](http://www.spp-climate-engineering.de)) funded by the German Research Foundation (DFG). It will bring together SPP researchers with external experts and stakeholders.

## 24 NOVEMBER // THURSDAY /// AGENDA

### Session 1: Setting the scene – 1.5 °C emissions budgets and CDR

- 9:00-9:15 Introduction SPP and workshop objective  
*Andreas Oschlies & Elmar Kriegler*
- 9:15-9:40 The 1.5 °C budget. Update from climate science  
*Myles Allen (University of Oxford)*
- 9:40-10:05 The scope of CDR to recover the 1.5 °C budget  
*David Keller (GEOMAR Helmholtz Centre for Ocean Research Kiel)*
- 10:05-10:30 The role of CDR in 1.5 °C mitigation pathways: CDR requirements, portfolios, and constraints  
*Jessica Strefler / Elmar Kriegler (Potsdam Institute for Climate Impact Research)*
- 10:30-10:50 Discussion
- 10:50-11:15 Coffee break

### Session 2: 1.5 °C transition and mitigation potentials

- 11:15-11:20 Introductory comments by the chair  
*Katrin Rehdanz (Kiel Institute for the World Economy)*
- 11:20-11:40 Decarbonization in a 1.5°C World:  
What determines the residual emissions from the energy system?  
*Gunnar Luderer (Potsdam Institute for Climate Impact Research)*
- 11:40-12:05 Bottom-up scenarios for a deep decarbonization  
*Vicki Duscha (Fraunhofer Institut für System- und Innovationsforschung, Karlsruhe)*
- 12:05-12:30 Potential and limitations for onshore and offshore CCS in geological formations  
*Owain Tucker (Shell International)*
- 12:30-13:00 Discussion
- 13:00-14:00 Lunch

### Session 3: Sustainability implications of CDR in 1.5 °C pathways

- 14:00-14:05 Introductory comments by the chair  
*Martin Visbeck (GEOMAR Helmholtz Centre for Ocean Research Kiel)*
- 14:05-14:30 CDR in the sustainable development / SDG context  
*Detlef van Vuuren (Utrecht University)*
- 14:30-14:55 Sustainability of marine CDR  
*Andreas Oschlies (GEOMAR Helmholtz Centre for Ocean Research Kiel)*
- 14:55-15:20 Sustainable vs. unsustainable carbon storage / carbon cycling options on land  
*Pete Smith (University Aberdeen)*
- 15:20-15:45 Discussion
- 15:45-16:15 Coffee break
- 16:15-16:40 The interplay of land demanding CDR options with other sustainability objectives  
*Alexander Popp (Potsdam Institute for Climate Impact Research)*
- 16:40-17:05 Sustainability effects of terrestrial CDR: insights from the CE-LAND project  
*Dieter Gerten / Lena Boysen (Potsdam Institute for Climate Impact Research)*
- 17:05-17:35 Concluding discussion
- 17:35-17:45 Wrap up of the day  
*Elmar Kriegler & Andreas Oschlies*
- 19:00 Joint dinner / Kieler Yacht Club (Ice breaker from 18:30)

## 25 NOVEMBER // FRIDAY /// AGENDA

### Session 4: Is there a role for SRM in maintaining the 1.5 °C limit?

- 8:45-8:50     **Introductory comments by the chair**  
*Thomas Leisner (Karlsruhe Institute of Technology)*
- 8:50-9:15     **What does a 1.5°C objective mean for SRM research?**  
*Olivier Boucher (National Center for Scientific Research, UPMC)*
- 9:15-9:40     **Is SRM an option to limit warming to 1.5 degrees after Paris?**  
*David Keith (Harvard University)*
- 9:40-10:05    **The role of SRM as insurance measure to keep warming below 1.5 °C in a world aiming for stringent emissions reductions**  
*Massimo Tavoni (Fondazione Eni Enrico Mattei)*
- 10:05-10:30   **Would a Potential Use of SRM be Lawful Under the Paris Agreement and the UNFCCC?**  
*Alexander Proelß (Trier University)*
- 10:30-11:00    **Discussion**
- 11:00-11:30    **Coffee break**

### Session 5: CE and 1.5° C: Social and ethical considerations

- 11:30-11:35    **Introductory comments by the chair**  
*Hermann Held (Universität Hamburg)*
- 11:35-11:55    **Public views on CDR, SRM and 1.5 °C: How connected and consistent are they?**  
*Christine Merk (Kiel Institute for the World Economy)*
- 11:55-12:15    **Mitigation and Compensation as Prerequisites for SRM?**  
*Konrad Ott /Christian Baatz (Kiel University)*
- 12:15-12:40    **1.5 °C and CE: Implications for the Post-Paris process**  
*Janos Pasztor (Carnegie Council for Ethics in International Affairs)*
- 12:40-13:00    **Discussion**
- 13:00-14:00    **Lunch**

### Session 6: Science-policy advice on 1.5 °C and CE

- 14:00-14:05    **Introductory comments by the chair**  
*Gernot Klepper (Kiel Institute for the World Economy)*
- 14:05-14:30    **Science-policy advice on 1.5 °C and CE: Needs, opportunities and challenges**  
*Ottmar Edenhofer (Potsdam Institute for Climate Impact Research & MCC)*
- 14:30-15:00    **Stakeholder views – position statements**  
*Eric Fee (German Environment Agency),  
Lili Fuhr (Heinrich Böll Foundation & Member of the Board of the ETC Group),  
Peter Horvath (DG Research),  
Astrid Schulz (German Advisory Council on Global Chance),  
Nicole Wilke (Federal Ministry for the Environment, Nature Conservation, Building  
and Nuclear Safety)*
- 15:00-15:45    **Discussion between panel and audience.**  
*Panelists: Ottmar Edenhofer, Eric Fee, Lili Fuhr, Peter Horvath, Astrid Schulz, Nicole Wilke*
- 15:45-16:00    **Wrap-up – Lessons learned and research questions identified**  
*Elmar Kriegler & Andreas Oschlies*
- 16:00           **Farewell and coffee**

## VENUE /// KIEL INSTITUTE FOR THE WORLD ECONOMY



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