

## Summary

There is growing concern that future reductions in greenhouse-gas emissions may be insufficient to avert dramatic climate change effects. In an attempt to expand the portfolio of options for reducing the risk of dangerous climate change, some scientists have proposed to develop global-scale engineering methods in order to offset some of the effects of greenhouse gas emissions. Methods suggested include an enhanced reflection of solar radiation back into space (e.g., by injecting aerosols into marine clouds or the stratosphere) and the removal of carbon dioxide from the atmosphere (e.g., by enhancing oceanic or terrestrial carbon sinks). Climate Engineering (CE) is defined as such intentional intervention in the environment on a planetary scale. It is a relatively new topic that is rapidly gaining public, scientific, political and even commercial attention. However, a conclusive scientific assessment, characterized by an appropriate disciplinary breadth and depth, of the potential environmental, political and moral risks, challenges and opportunities of CE is lacking. On the one hand, risks and adverse “side” effects might be ignored or underestimated, possibly leading to premature approval and problematic reliance on ineffective options. On the other hand, uncertainty about opportunities possibly opened up by CE may forestall early exploration of technologies that might eventually turn out to be sufficiently reliable and beneficial.

With no rigorous overall assessment of CE available, the deployment of some of the proposed CE schemes may appear relatively simple and cheap compared to ambitious mitigation efforts that are hard to achieve. An engineering and economic perspective that takes only direct deployment costs into account may be an incentive for certain countries, consortia, or even wealthy individuals to push for action. Currently, an appropriate framework of research guidelines, legal regulations and political measures is lacking at both national and international levels. Therefore it is important to assess the potential impacts of CE, to evaluate the legal situation and to consider developing governance structures that can be capable of ensuring that any CE research and potential deployment will be carried out in a transparent, responsible and sustainable manner. This is particularly challenging as CE with its intended and unintended global and long-term impacts gives rise to intricate scientific, ethical, social and political questions and concerns. Altering the climate, whether inadvertently or deliberately, has the potential to affect every person on Earth, in both the present and the future. Is it thus possible to ensure fair participation or an informed consent/dissent of the “test persons” (at least those already alive)? Who would be held responsible if a CE field trial resulted in disastrous unexpected effects, and how could the responsible parties rectify the situation without introducing substantial further risks? Moreover, given our incomplete understanding of natural climate variability, how could cause and effect be attributed? How would CE affect mitigation policies? These are only a few out of many questions that, in our view, highlight gaps in our knowledge and available governance tools, which need thorough consideration already at an early stage of CE research and certainly well before decisions about CE field trials can be made.

The aim of the Priority Programme proposed here is to help reduce the significant uncertainties in our current understanding of the environmental, societal and political risks, challenges and possible opportunities of Climate Engineering. To this extent, we will investigate the potential impacts and implications of CE in a comprehensive, rigorous and reflective manner. Because of the intricate complexity of the topic, an inherently interdisciplinary approach is needed, which goes well beyond the disciplinary pilot studies that, so far, have mostly concentrated on technical and climatic aspects of CE. Our approach of problem-oriented fundamental research toward CE and its potential implications on nature, society and international relations is, to our knowledge, both unique and timely. Having brought together an interdisciplinary team of experts on CE from the natural and social sciences, humanities and law, we will provide a thorough, critical and well-balanced analysis and assessment of CE across a broad

range of scientific, environmental, economic, social, legal, political, ethical and communicative dimensions. On this basis, research carried out by this Priority Programme will enable us to provide much-needed knowledge for creating a framework for the responsible conduct of research on and decision making about CE.

 [Climate Engineering SPP 2011 proposal.pdf \(503,3 KiB\)](#)