

## Cost-benefit decisions and uncertainty

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The analysis of the pro and cons of anthropogenic interventions in the climate system necessarily has to be economical: What are the financial costs resulting from a global temperature increase (e.g. from crop failure, flooding)? How much should the global community be willing to spend on stopping the temperature rise by means of mitigation? In comparison, what are the costs of manipulating the climate system by geoengineering? What are the unintended damages caused by such an intervention?

These questions might lead us to conclude that we have to do nothing but draw up a simple balance sheet. However, pondering further one easily detects a fundamental problem. An absolutely crucial aspect of intervening in the climate is the uncertainty about how the system in question will react. This has an ambivalent influence upon our considerations. On the one hand, it suggests acting with caution using geoengineering because side effects are hard to estimate. On the other hand, since predictions concerning a rise in global temperature are defective, it further urges that we develop emergency plans. What if some day humankind is faced with an unexpected temperature rise well above previous prognoses?

The concrete work of the Marsilius project „The Global Governance of Climate Engineering“ is divided into three sections.

It is indispensable to start with developing models to capture costs and benefits of geoengineering, what has to be realized in close cooperation with environmental physics. Inter alia, we seek to answer the following questions. What is the cheapest combination of technologies to reduce the global temperature over a period of several years? How much would be the extra-costs if a very quick reduction had to be undertaken?

Thereupon, we turn toward decision makers and focus on the questions if and eventually how much should be invested in geoengineering research. Having in mind that these complex decisions are taken by humans and based on human opinions, we directly see the huge need for scientific exchange with the psychologists.

Consequently, the uncertainty mentioned above will play a large role in this analysis. Our goal is to develop a very general theory of investment under uncertainty to be able to model a wide range of constellations.

Finally, the impact of the availability of geoengineering on international agreements on climate protection will be investigated.

The analyses so far abstract from the strategic incentives that motivate different countries to use geoengineering. However, as the reality of international climate politics shows clearly, strategic incentives are central determinants of national actions. Asymmetries in technological and economic abilities as well as the extent to which a country will be affected by the negative consequences of climate change or benefit from geoengineering measures will clash. A game theoretical analysis in close collaboration with political scientists and experts in international law is expected to clarify opportunities and dangers of this global interaction.