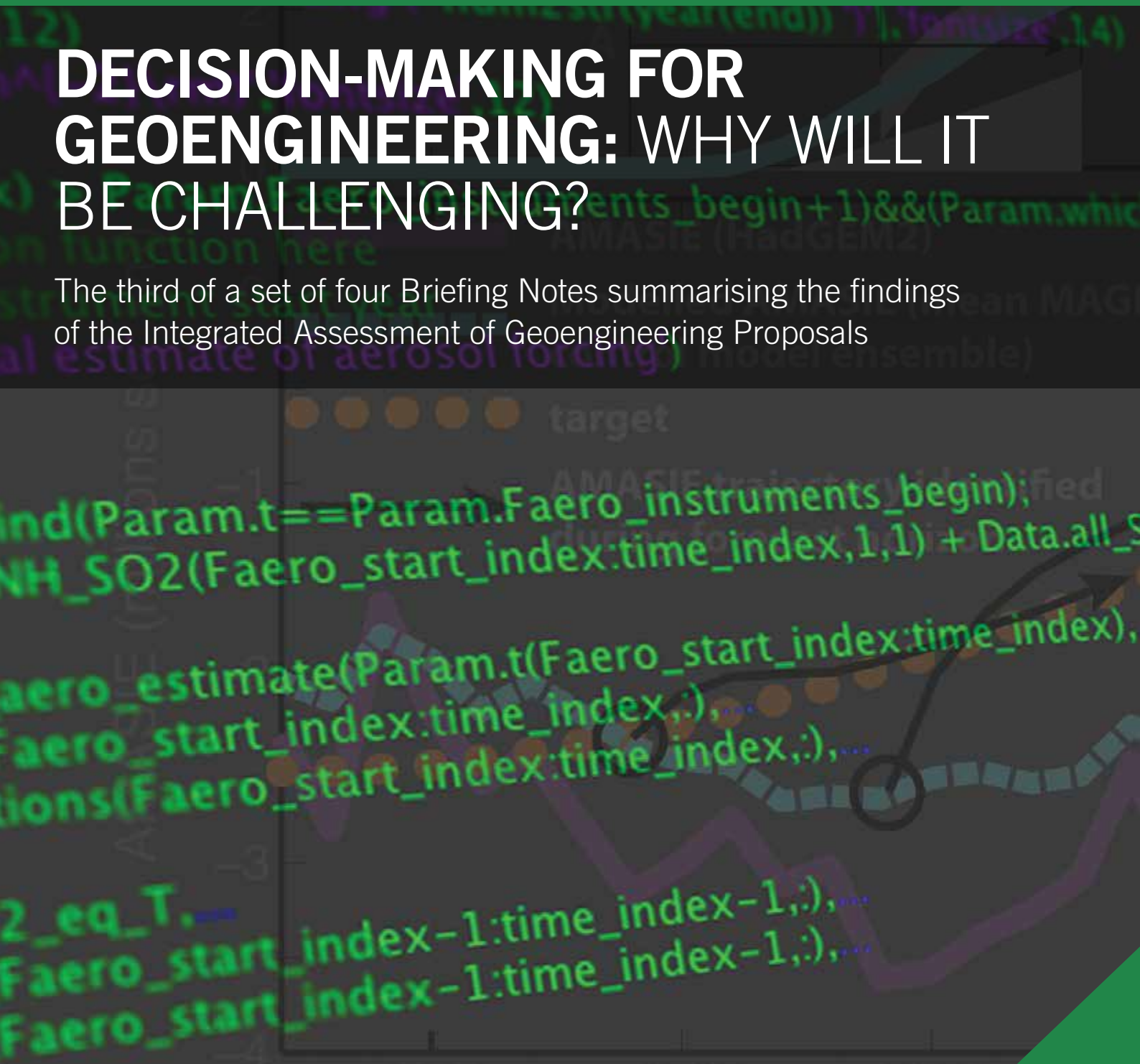
IAGP

Integrated Assessment of Geoengineering Proposals

DECISION-MAKING FOR GEOENGINEERING: WHY WILL IT BE CHALLENGING?

The third of a set of four Briefing Notes summarising the findings of the Integrated Assessment of Geoengineering Proposals



The Integrated Assessment of Geoengineering Proposals (IAGP) research project has brought together a broad range of expertise, from climate modelling to philosophy and from engineering to public perceptions, to situate the assessment of geoengineering within wider societal values

BRIEFING NOTE 3

Human society is familiar with the notion of planning for the climate. However, the prospect of geoengineering – particularly using the potentially fast-acting solar geoengineering – presents society with the entirely unprecedented prospect of planning the climate itself.

What would contribute to the decision-making process?

Many significant questions would need to be addressed before geoengineering could be deployed, including issues of safety, effectiveness and ethics. If the deployment stage was reached, there would be very challenging decisions to be made on how, when and where geoengineering would be implemented.

The strategic decision-making needed for geoengineering would be informed by both computer model forecasts of its effects on the climate, and a broader range of criteria including issues of ethics, governance and public views (Box 1, Briefing Notes 1 & 2).

However, decisions may not directly translate into actions (as has been the case with decisions on mitigation to date). Further, models of the climate system used to produce forecasts will always be imperfect so the climate may not change in a way that is anticipated.

Therefore, a review cycle, which uses observations of how the climate features change in reality would also be essential to the decision-making process (Box 1) and would allow:

- improvements in the forecast models
- refinement of the decision-making strategy, if needed

This review cycle would have to be more explicit and responsive than the review cycles associated with current climate negotiations.

Why would decision-making for geoengineering be particularly challenging?

Agreeing on a target climate will be fundamental to decisions for geoengineering. Establishing this target for the climate will be problematic and would depend on mitigation and adaptation pathways. Aside from potential differences in international political agendas, it is unclear how the views of the public and other stakeholders would be incorporated (see Briefing Notes 1 & 2).

Financial constraints would restrict decisions on the operation of geoengineering. This could influence both the scale and time-scale of implementation and in turn the effects on the climate.

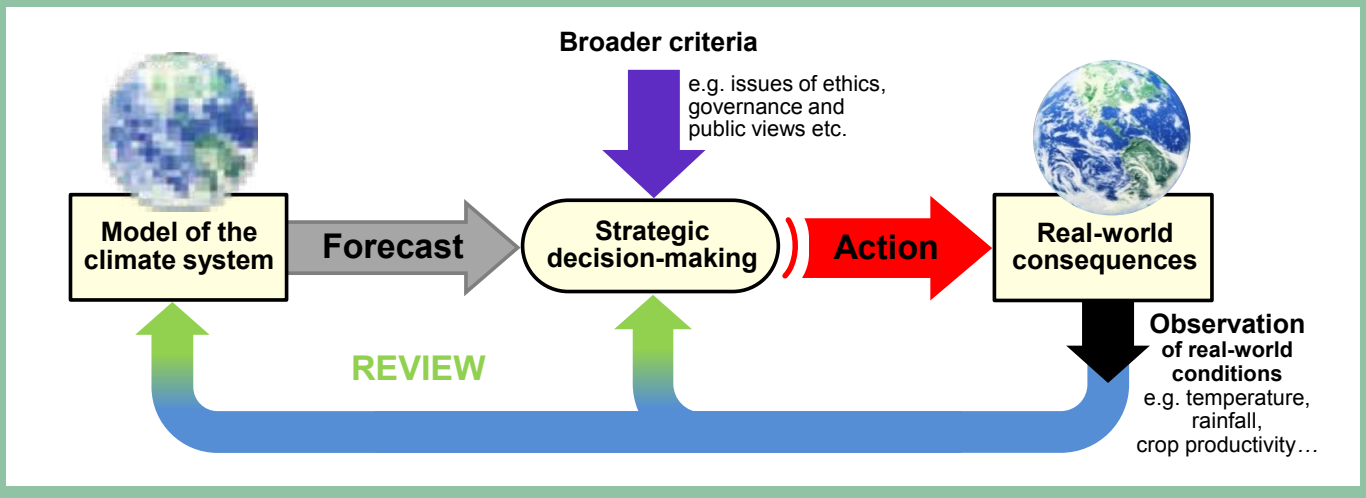
Attributing changes in the climate to geoengineering would be challenging because of the natural variability of the climate system. This is particularly true for short periods of time or for small regions. This means that:

- disputes over potential side-effects would be hard to resolve, affecting issues of justice
- justifying the continuation of possibly costly solar geoengineering would be difficult
- solar geoengineering may be perceived as being high risk

IAGP researchers explored aspects of these solar geoengineering decision-making challenges by undertaking computer simulations (Box 2).

Decision-making process for geoengineeering

Box 1



IAGP Case Study – Controlling Arctic Sea Ice

IAGP examined aspects of the decision-making process for geoengineering using a computer simulation. In the simulation, solar geoengineering was used to attempt to increase and hold Arctic sea ice extent at a target level.

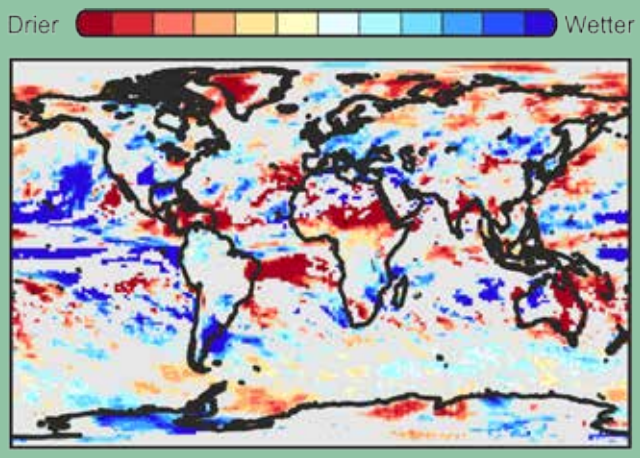
To make the decision-making process more realistic:

- we were only allowed to access limited data from the simulation, mimicking the limitations of current climate observations
- errors were added to this data to simulate the errors that occur in current climate observations
- we did not know how effective our solar geoengineering strategy would be at controlling the sea ice

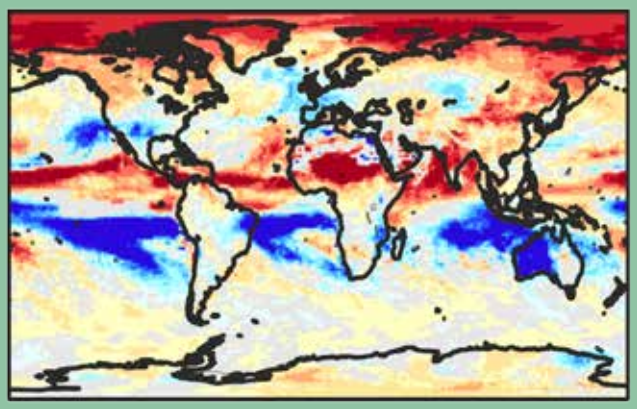
Our simulations showed that:

- Arctic sea ice only reached the target when a review cycle was included in the decision-making process
- the solar geoengineering led to serious side-effects, e.g., reduced rainfall over the semi-arid area south of the Sahara desert
- when solar geoengineering stopped, the climate rapidly rebounded
- we cannot tell how much cooling was caused by solar geoengineering and how much resulted from natural climate variability, e.g. volcanic eruptions
- using only the information that would be available in real-life, we estimated how solar geoengineering would change rainfall in the climate model. Our estimate did not match how the rainfall actually changed in the climate model (Box 2). We would have similar problems in the real-world.

Box 2



Our estimate of the rainfall changes in the climate model



The rainfall changes that occurred in the climate model

What does the IAGP project recommend?

The IAGP project recommends that:

- The ability to accurately detect and attribute changes in the climate should be a prerequisite for implementing geoengineering.
- To facilitate more accurate detection and attribution of changes in the Earth's climate, there needs to be significant improvements to the coverage and quality of observations along with the co-ordinated development of computer simulations.
- To better appreciate the real-world complexities associated with geoengineering, decision-makers should have access to interactive simulators similar to the one used in the IAGP Arctic sea ice study.

Further resources

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http://www.iagp.ac.uk/publications/

About us

The IAGP project has been carried out by researchers at Cardiff University, Lancaster University, Met Office, Tyndall Centre for Climate Change Research, University of Bristol, University of East Anglia, University of Leeds and University of Oxford. The IAGP project has received funding from the Engineering and Physical Sciences Research Council (EPSRC) (EP/I014721/1) and the Natural Environment Research Council (NERC) and support from Living With Environmental Change (LWEC).

Project Website

www.iagp.ac.uk

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