ARE THE ECONOMICS OF GEOENGINEERING REALLY INCREDIBLE?

The second of a set of seven briefing notes summarising the findings of the Climate Geoengineering Governance Project.

The Climate Geoengineering Governance (CGG) project has brought together a broad range of expertise from the social sciences and humanities to examine the challenges of governance and regulation of climate geoengineering and to suggest ways forward.
What claims are being made for geoengineering economics?

The ‘economics’ of climate geoengineering are often regarded as exceptionally favourable relative to other ways of aiming to control the climate. Scott Barrett, well-known economist and distinguished climate scholar, goes so far, without evident irony, as to argue that the economics of geoengineering are ‘incredible’ – by which he means that their costs will be exceptionally cheap. Claims of this sort have led to a widespread view in the geoengineering discourse that even if the ethics of geoengineering are highly dubious and the risks high, at least it would save us all a lot of money compared to the continued and costly grind of climate mitigation. An example of the very low cost expectations is quoted in an influential Royal Society report where it is reported that stratospheric aerosol injection (SAI) costs could be 1000 times lower than the average costs of climate mitigation.

How well-founded are these claims?

But it is necessary to row back from these simplistic views on more than one count. First, only a very small number of geoengineering technologies are expected to be cheap – and indeed all of the so-called carbon reduction technologies (e.g. air capture of carbon, enhanced weathering of rocks) are anticipated – with good reason – to be extremely expensive. This leaves a small sub-set of solar radiation management technologies – especially stratospheric aerosol injection (SAI), the poster-child of geoengineering discourse - as having expectations of very low cost. One of the risks attaching to stratospheric aerosol deployment is that this expectation of exceptionally low (direct) costs could provide a rationale for early technological development. This could be followed by a process of ‘lock-in’, as institutional momentum grows, even if eventual costs prove much higher than original estimates.

Second there are good reasons to be highly suspicious of these very low cost expectations. All apparently cheap geoengineering technologies are currently ‘imaginaries’: none has yet been developed let alone deployed. A well-documented phenomenon in the early stages of projects – but especially where they are novel, large and politically controversial - is known as appraisal optimism or optimism bias. This is the tendency for early engineering-based estimates of the direct costs of such technologies to be gross under-estimates. Examples concern projects in nuclear power and defence procurement, where early estimates have proven optimistic by very large amounts.

What processes drive optimism in geoengineering cost estimates?

There are two systematic reasons for such bias in direct cost estimates:

• One is derived from Keynes’ notion of ‘animal spirits’, more recently formalized by Kahneman in terms of cognitive biases in information processing. Put simply, technology developers are enthusiasts who tend systematically to under-estimate costs and over-estimate benefits.

• A complementary and more systemic explanation for such bias lies in terms of the structure of incentives and contracts. Where technologies, including geoengineering, are developed by the state the developers have strong incentives to under-estimate
costs because low cost estimates maximize the chances of development, while the risks of escalation are borne by the state, not the developers. Information asymmetries – the developers know much more about the technology than those approving them – make these problems hard to correct.

Solar radiation management technologies seem likely to suffer from these biases to an extreme degree. They are at a very early developmental stages and further development would involve massive scaling-up likely to be accompanied by high degrees of global controversy involving discordant political, social and regulatory processes. On past evidence, for example in the nuclear power case, this will in all likelihood lead to major and ongoing cost escalation.

What about risks and wider geoengineering impacts?
So far we have only examined the direct cost issue. Where cost issues become even more potentially problematic is in terms of indirect costs. These indirect costs are often treated as ‘risks’ and left unquantified, sometimes for the understandable reason that it is exceptionally difficult to quantify them.

- If, as one study suggests, SAI causes a major disturbance in the pattern of monsoons in Asia and Africa, the indirect impacts on farming and food security could be immense. Just because it is hard to quantify the costs that might result from such effects is not a good reason to present the ‘economics’ as consisting of poorly established low direct-cost estimates, themselves resulting from naïve assumptions, plus unquantifiable but potentially huge risks which carry very high associated costs.

- There have been relatively few studies that attempt to model the long-term impacts of geoengineering technologies on a global scale and over long future time periods. One such attempt considers what might the impact be if SAs were for some reason to be interrupted. The results suggest that the negative effects on world income of such an interruption would (because of the rapid heating consequences) be substantially greater than the benefits of the preceding reduction in world temperatures. Such modeling is necessarily imprecise but its advantage over an approach that simply looks at optimistic estimates of direct costs alone can hardly be over-stated.

What does the CGG project conclude and recommend?

What is ‘incredible’ about the economics of solar radiation management is not that these techniques will be radically cheaper than the alternative mitigation strategies, but rather that such superficial and biased analyses have been subject to limited challenge and are being taken seriously in policy discourse. The danger is that currency given to these flawed ideas about cheapness of solar radiation management might encourage the view that it will at least be inexpensive to start applying the technology because of a mistaken view that the costs will inevitably be very low.

We recommend extreme caution about the estimates of direct costs of any proposed geoengineering technology, and additional care to ensure that all the indirect costs over the life cycle of that technology have been taken into account.
Further Resources:


About us
The CGG project has been carried out by researchers at the University of Oxford, the University of Sussex, and University College London (UCL). It was funded by the Economic and Social Research Council (ESRC) with contributory funding from the Arts and Humanities Research Council (AHRC) (project ES/J007730/1).

Project Website
http://geoengineering-governance-research.org

Key Contact
Prof Steve Rayner
Email: steve.rayner@insis.ox.ac.uk
Postal enquiries to: CGG, Institute for Science, Innovation and Society, 64 Banbury Road, Oxford OX2 6PN, United Kingdom