

Practising responsibility at a UK Funding body: Lessons from the SPICE (Stratospheric Particle Injection for Climate Engineering) project

Climate Intervention in a Earth Systems Science Framework: A Workshop

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SPICE project: **S**tratospheric **P**article Injection for **C**limate **E**ngineering (2010–2013)

EPSRC, NERC, STFC funding

Objective: to investigate the effectiveness of reflecting heat & light back into space using stratospheric particles.

Evaluating candidate particles: what would be an ‘ideal’ particle to inject into the stratosphere (maximizing solar radiation scattering while having minimal impact on climate, weather, ecosystems and human health).

Delivery Systems: feasibility and design of using a tethered-balloon to inject particles into the stratosphere. Use data from **the 1km high test-bed project** in computer models to investigate how a full-scale system might work at an altitude of 20km.

Climate and environmental modelling:

what can be learned from past volcanic eruptions. Also modelling the potential impact on ozone layer concentrations, regional precipitation changes and atmospheric chemistry.

SPICE FIELD TRIAL

Water sprayed through a 1-kilometre-high hose will test equipment with potential for climate engineering.

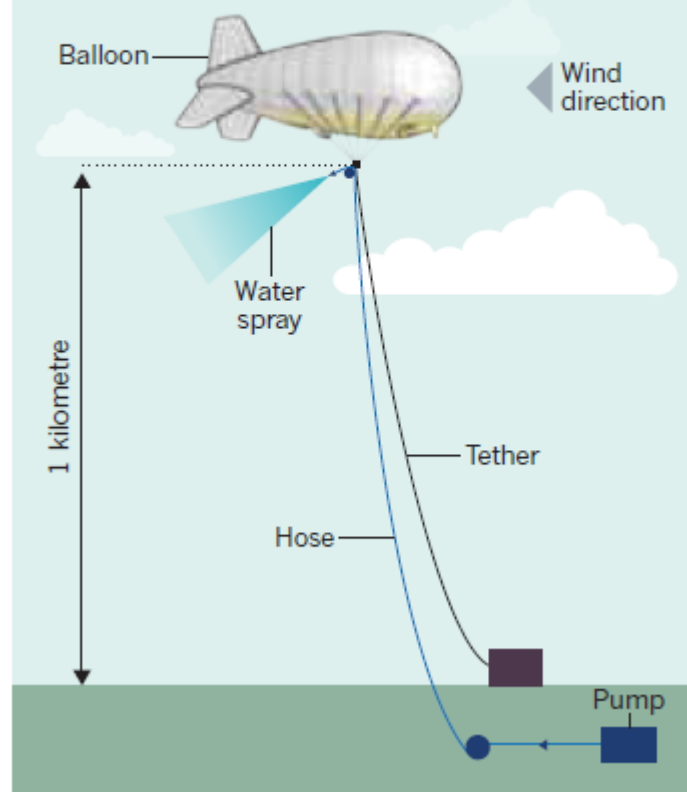


Figure Macnaghten and Owen, 2011

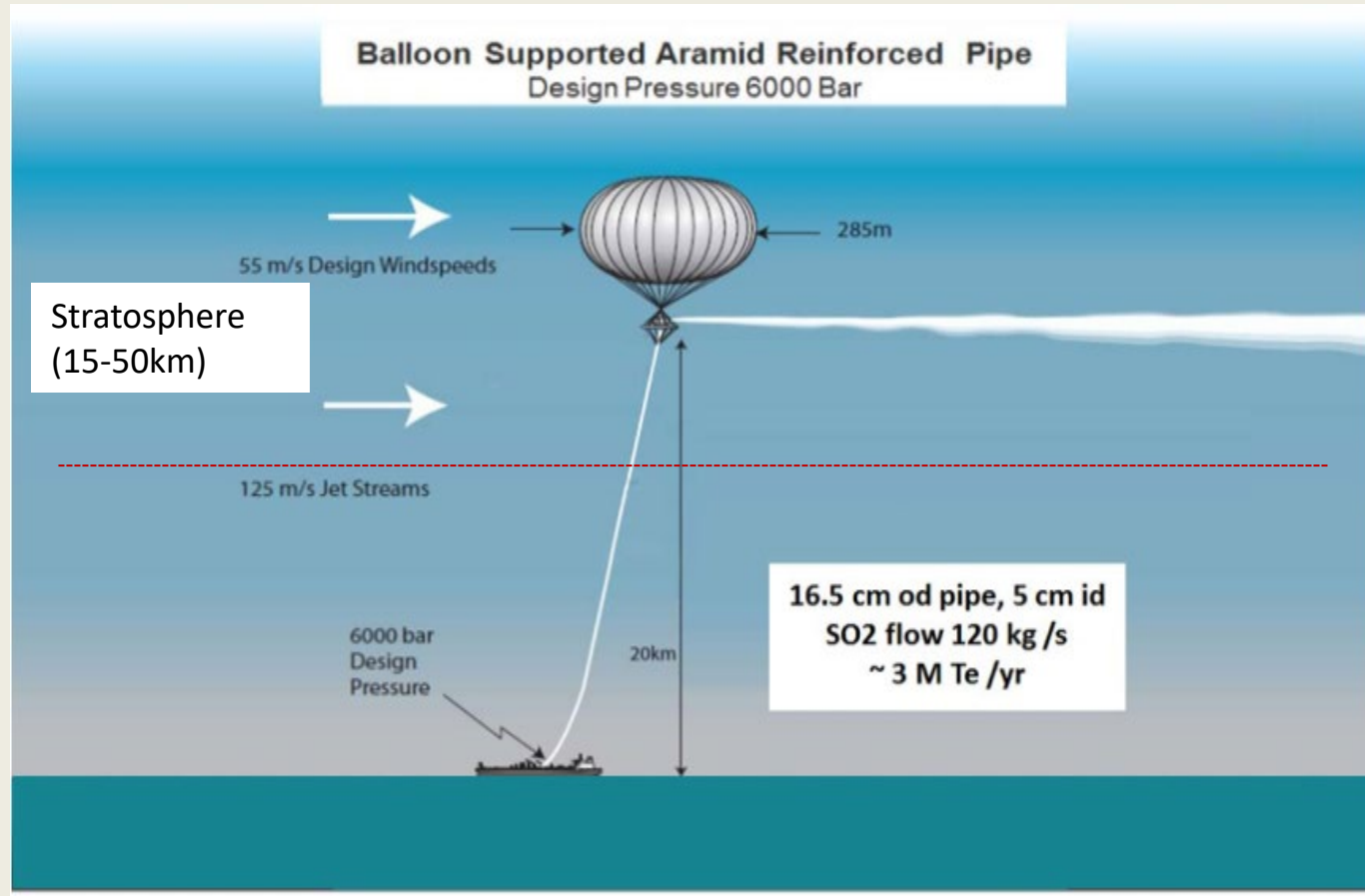


Fig courtesy of SPICE project team

EPSRC's Societal Issues Panel (approx. 2010)



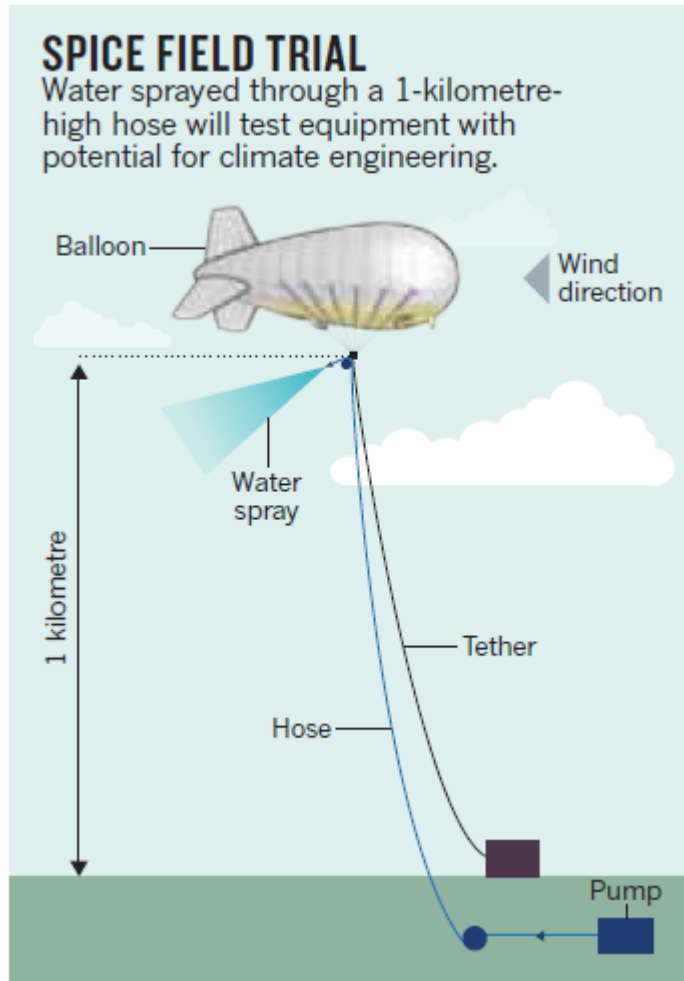


Figure Macnaghten and Owen, 2011

A balloon 1 km high spraying
water over Cambridgeshire

or

UK's 1st field trial of climate-
engineering technology

The oversight panel

- Aerospace engineer
- Atmospheric scientist
- Civil society actor
- 2 social scientists



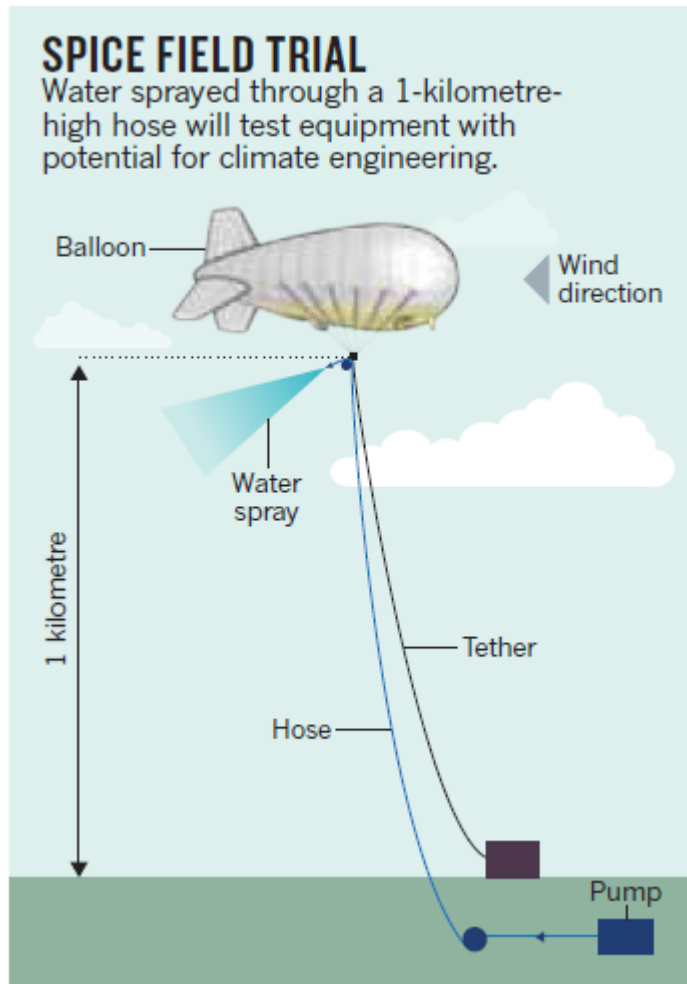
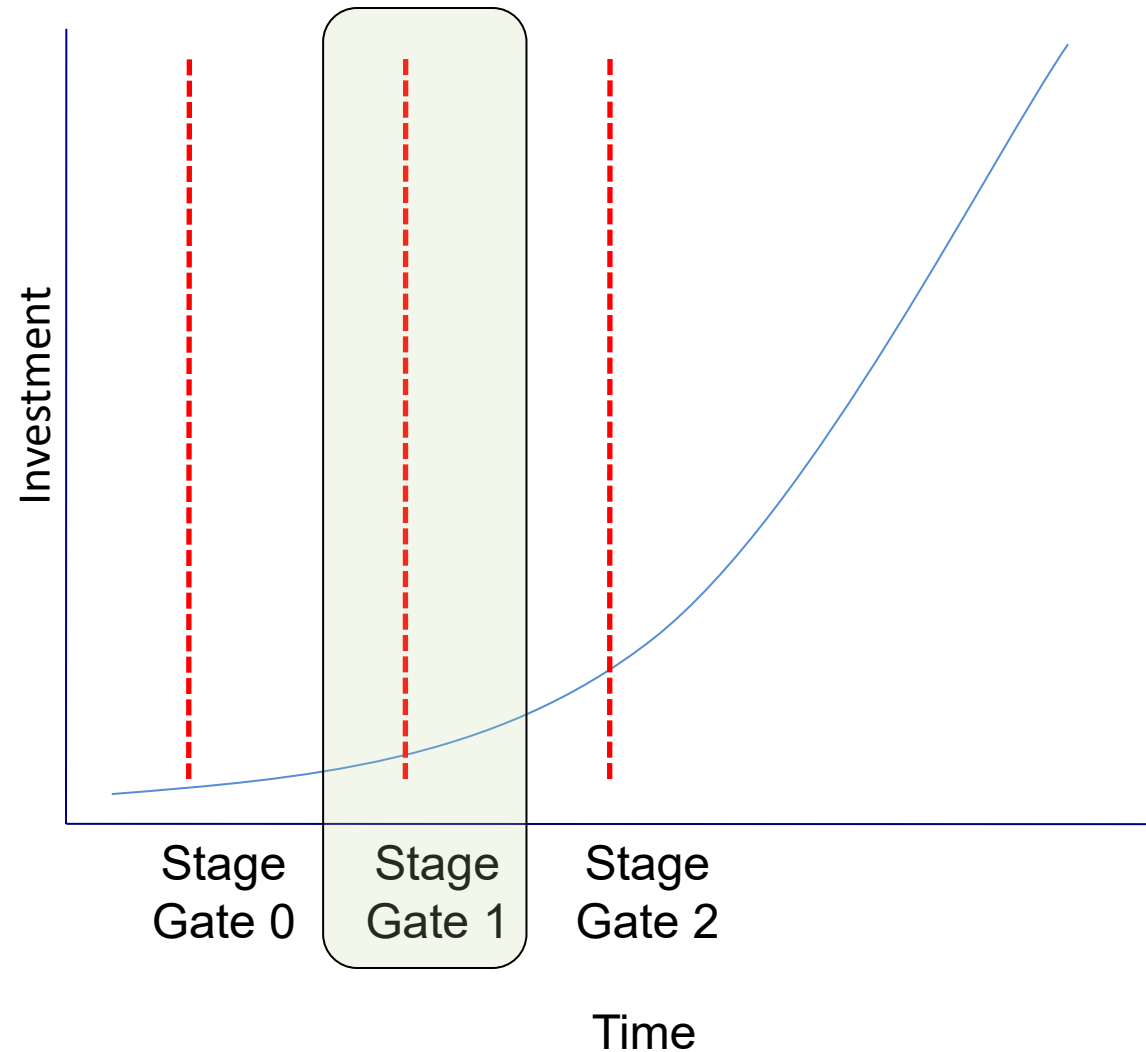
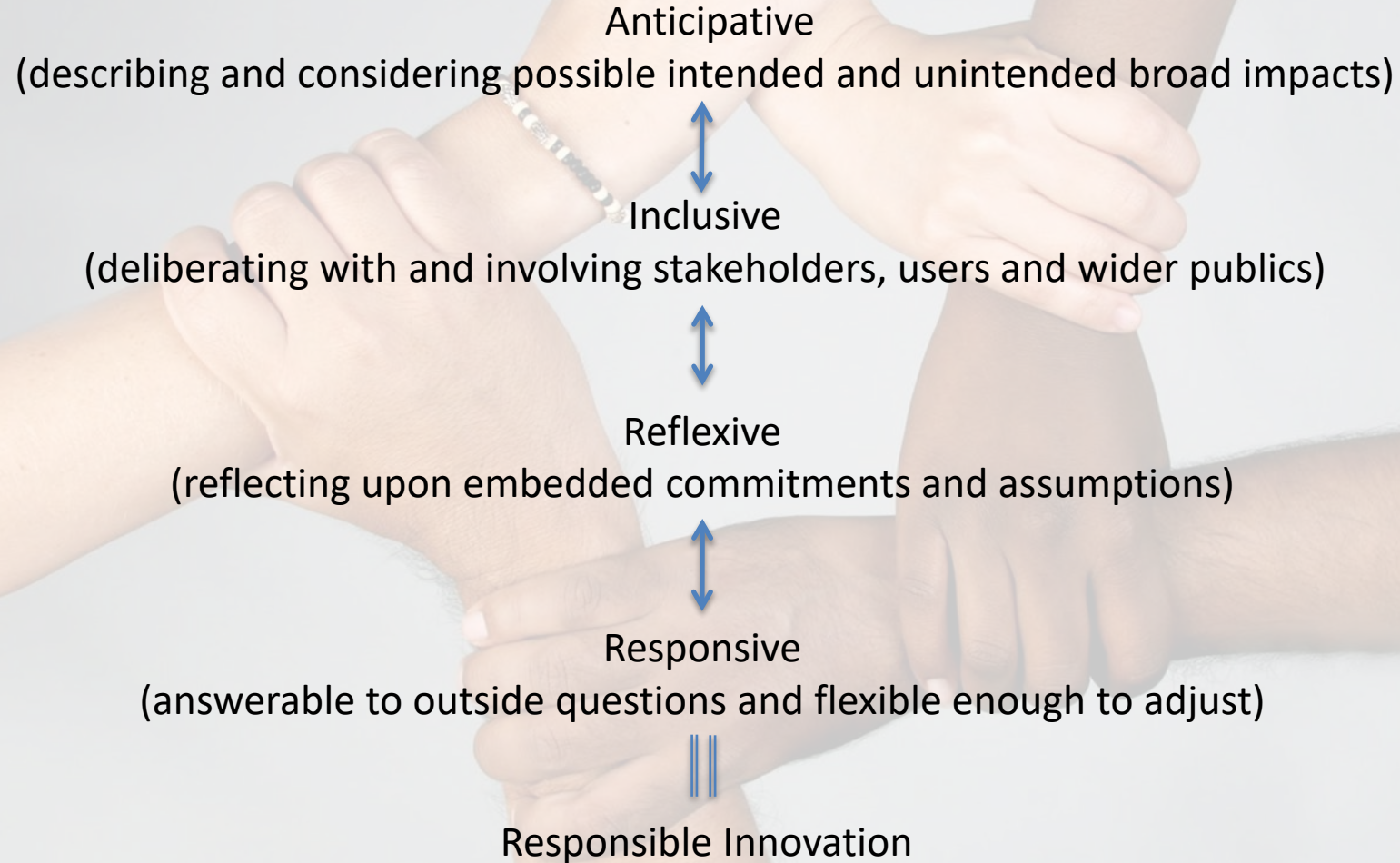


Figure Macnaghten and Owen, 2011

Stage gating – oversight and governance



Responsible innovation (AIRR dimensions)



Stage Gate Responsible Innovation Criteria

1. (Dimension:)

The field test deployment is safe, the principal risks have been identified and managed, and are deemed acceptable. (PASSED)

2. (Dimensions:)

The field test deployment is compliant with relevant regulations. (PASSED)

3. (Dimension: *reflection*)

The framing of the project (nature, purpose) for external communication is clear (PASSED PENDING)

4. (Dimensions: *anticipation, responsiveness*)

Future potential application(s) and associated impact(s) have been described and mechanisms put in place to review these as significant information emerges. (PASSED PENDING)

5. (Dimension: *inclusion*)

Mechanisms have been identified to understand wider public and stakeholder views regarding these envisaged applications and impacts. (PASSED PENDING)



Reflections on this experiment in governance

- A process of co-construction in understanding the 'stakes' of the issue
- Roles and responsibilities had to be invented: governing beyond 'risk'
 - Research councils (the project had passed ethical review; negligible risk)
 - Researchers (their responsibilities in 'world making')
 - Governance frameworks (testing the RI framework)
 - The role of the social sciences in a project led by engineers and volcanologists
- Take home lessons for the research councils
 - It is critically a question of timing
 - Hard to segregate the governance of research from questions of deployment
 - The language of thresholds/ physical risk can be misleading

Public engagement (Dec 2012)

- In-depth discussion groups (x 7)
- Objectives
 - Deep reflection on assumptions that underpin SRM geoengineering
 - Fault-lines of concern
 - Governing intent
 - Imaginations of future politics
- Sources of unease
 - Unforeseen consequences
 - Nature does not conform to the models
 - Treats the symptom, not the cause
 - Scale of intervention (without precedent)
 - Will engender an undemocratic politics (no space for dissent)
 - Effects will only materialise through deployment (research-deployment boundary seen as unstable)



Living the global social experiment: An analysis of public discourse on solar radiation management and its implications for governance

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“it’s a bit frightening to go there”

“I’m very sceptical about it. It’s just another messing going on. I don't know how to explain it. I mean I have a faith and I believe that this world was created. I mean that’s a very contentious thing to throw out there, but I think this is like we’re messing, we’re messing on such a... I know we’re messing already but to mess outside of our world it seems the most amazing thing to consider. It’s frightening, I think it’s a bit frightening to even go there.”

(Focus Group 4)

“nature kicks back at man”

F: Don't you think that's nature taking over though?

F: Well I do. I think nature kicks back at man for all the things] that he does. We interfere with nature, we have cloned animals, we have unnatural things, I just think that nature kicks back. That is just my feeling. That's always been my feeling.

F: It sounds like Frankenstein stuff to me.

(Focus Group 4)

“I can’t believe there won’t be other effects”

F “What I am doing, I am very uneasy, uneasy about the other effects it’ll have. Okay, it’ll mitigate some effects but I can’t believe there won’t be other effects that we’ll have as a result of it.”

Mod “You can’t believe it?”

F “No I can’t actually. I don’t know why I can’t, but I just think there’ll be something else that will be created and we’ll have another issue to deal with. Which is probably because I’m not a scientist and I don’t see it that clearly that we can get an answer like that. I’m too sort of... emotional.”

(Focus Group 4)

“It might be even more dangerous that what we’ve stopped”

M: I just don’t think you can mess with nature...

M: It’s alright you telling us that it’s the right thing to do, but 20 years down the line we might find out it weren’t...

M: That it might be even more dangerous that what we’ve stopped.

Mod: Does it seem a pretty stupid idea?

M: Yeah.

M: Would anything affect the water cycle though? Obviously if other clouds are mixing with the new clouds, obviously the water cycle is based on the geometry of the earth, so obviously rain, precipitation, mountains, rivers, lakes, streams, sea, evaporation... If you’ve got more clouds, would that stop a lot of evaporation? So when the sea level dries, things like that...

M: I wonder what, sort of, reaction they got when some guy from some lab came out with this idea. Don’t tell me they didn’t fucking laugh at him, because this just sounds...

(Focus Group 6)

“These are radical things to the Earth”

F: Yeah. These are radical things to the Earth. It's not used to what we're gonna be doing with that and I think we'll have problems somewhere along the line.

(Focus Group 7)

“You actually totally won’t know what the effects will be until you’ve done it I think”

F: I think going back to what I said earlier in terms of – again I’m with Karen in terms of I’m all for new technology and research and things like that. In terms of the advancements in my lifetime it’s been huge and for most of them very appreciative, but for me for this I think you can’t totally know until you do it, and there’s one chance because again there’s just one sun. So realistically, putting the water up one kilometre, putting the water up two kilometres: great, all research; but until you actually shoot something into the atmosphere you actually totally won’t know what the effects will be until you’ve done it I think.

(Focus Group 1)

“I think it’s very sad”

Karen: I think it’s very sad, I think it’s sad that we know that we’re saying that the politicians or money can’t change behaviour and what we’re doing is just throwing more money at a different way to do it. And I think that’s what we do with everything. I think that we don’t have a true commitment to changing climate change. All we just want to do is “Let’s think of another option. Let’s think of the easy option.” We’re not prepared to change behaviour; we’re not prepared to throw money at it. Like this is just another option, another easy way out.

(Focus Group 1)

“We don’t need to worry about Plan A”

- M: Which I think is quite dangerous in politicians terms, because what they’ll do is say, ‘We don’t need to worry about Plan A, because the next Government will go for Plan B if we fuck it up...’*
- M: So, although restoring the climate would be good, if someone has got that restoration process, then in one hundred years time again they go, ‘Fuck it, we’re just going to make loads more climate change, don’t worry about the weather.’ Because in one hundred years time we’ve got the secret, we just re-introduce that technique and it worked the last time so we’ll do it again. We’re back to square one. So it’s always, just – which it won’t be, I don’t think.*

(Focus Group 6)

‘it opens up a massive can of worms’

DAVID: Well you know you could - they could - in theory if you say the superpowers all have it, and everybody else doesn't, they hold the rest of them to ransom, don't they? And it's just - you know, it opens up a massive can of worms, that. Huge. And if the superpowers have all this technology - which they're always gonna have anyway - they're gonna have more technology than the third world. They're always going to hold them to ransom to a certain extent. But something like this, like you say, having the thermostat on the globe is a huge –
(Focus Group 5)

“ I don’t want a big fucking sulphur cloud over me”

M: That’s what I’m saying, the whole planet has got to accept what some nutcase in a laboratory has decided, do you know what I mean? It doesn’t seem right. I mean, I wouldn’t be up for it. I imagine this Hands Off Mother Earth, all joking aside, like, it probably is a few students that, you know, ain’t got nothing else to do, but I can see that growing because people saying, ‘Bollocks, I don’t want a big fucking sulphur cloud over me.’ ..

(Focus Group 6)

Pathways to scepticism

1. The science is uncertain
2. There will be unforeseen effects
3. Effects will only be known under deployment
4. The good intention of SRM cannot be assured
5. It cannot be accommodated under democratic governance

Conditions for acceptance (but are these plausible)

1. Confidence in climate science as a reliable guide to policy and action (Condition of scientific robustness);
2. Confidence in the ability of research to anticipate the side-effects of SRM geoengineering (Condition of research foreseeability);
3. Confidence in the ability of research to demonstrate the efficacy of SRM geoengineering (Condition of research efficacy);
4. Confidence in the political organisation and effective governance of SRM geoengineering (Condition of effective governance);
5. Confidence in the capacity of existing political systems to accommodate SRM geoengineering (Condition of democracy).

How plausible are the conditions perceived to be under real world conditions?

1. Confidence in climate science as a reliable guide to policy and action (Condition of scientific robustness);
2. Confidence in the ability of research to anticipate the side-effects of SRM geoengineering (Condition of research foreseeability);
3. Confidence in the ability of research to demonstrate the efficacy of SRM geoengineering (Condition of research efficacy);
4. Confidence in the political organisation and effective governance of SRM geoengineering (Condition of effective governance);
5. Confidence in the capacity of existing political systems to accommodate SRM geoengineering (Condition of democracy).



Solar geoengineering: The case for an international non-use agreement

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New questions for governance

- Is climate engineering a governable object?
- Is climate engineering only compatible with highly autocratic forms of governance?
- How to do 'inclusion' and 'participation' in planetary-scale decisions?
- What is the legitimacy of 'national' funding bodies outside global agreements?
- What are the dangers of normalizing solar geoengineering as a future policy option?
- Is climate engineering an example where governance considerations need to lead the debate?
- Do these questions have to be addressed before proceeding with ... say field trials?