Introduction to large-scale Carbon Dioxide Removal (CDR) and Solar Radiation Modification (SRM) and key governance challenges

Dr Arunabha Ghosh
CEO, CEEW

C2G Monthly Webinars

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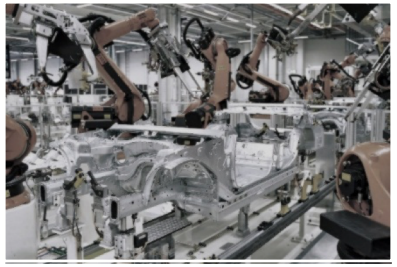

Low-Carbon Pathways

Risks & Adaptation

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CEEW research & engagement on governance of climate altering approaches

21 June 2011 | Lima, Peru

CEEW Lecture

International Cooperation and the Governance of Geoengineering

Keynote Lecture to the Expert Meeting on Geoengineering, Intergovernmental Panel on Climate Change

ARUNABHA GHOSH

March 2011 | Chicheley, United Kingdom

CEEW Working Paper 2011/1

Does Geoengineering Need a Global Response – and of What Kind?

Working Paper of The Solar Radiation Management Governance Initiative

JASON BLACKSTOCK AND ARUNABHA GHOSH

COMMENT

Developing countries must lead on solar geoengineering research

The nations that are most vulnerable to climate change must drive discussions of modelling, ethics and governance, argue **A. Atiq Rahman** and colleagues.

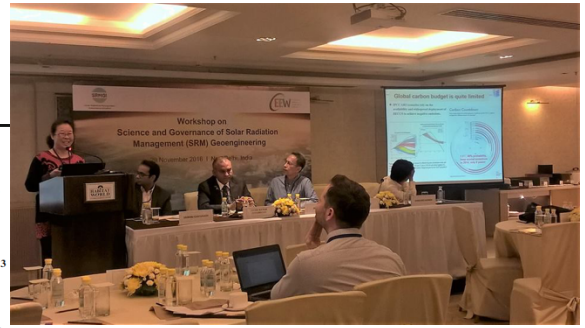
ENVIRONMENTAL INSTITUTIONS, INTERNATIONAL RESEARCH PROGRAMMES, AND LESSONS FOR GEOENGINEERING RESEARCH

Arunabha Ghosh

C2G2 Carnegie Climate Geoengineering

An initiative of the CARNEGIE COUNCIL for Ethics in International Affairs

Geoengineering: the need for governance



Climatic Change
DOI 10.1007/s10584-017-1994-0

ESSAY

The Asia-Pacific's role in the emerging solar geoengineering debate

Masahiro Sugiyama[1] • Shinichiro Asayama[2] • Atsushi Ishii[3] • Takanobu Kosugi[4] • John C. Moore[5,6] • Jolene Lin[7] • Penehuro F. Lefale[8] • Wil Burns[9] • Masatomo Fujiwara[10] • Arunabha Ghosh[11] • Joshua Horton[12] • Atsushi Kurosawa[13] • Andy Parker[14] • Michael Thompson[15] • Pak-Hang Wong[16] • Lili Xia[17]

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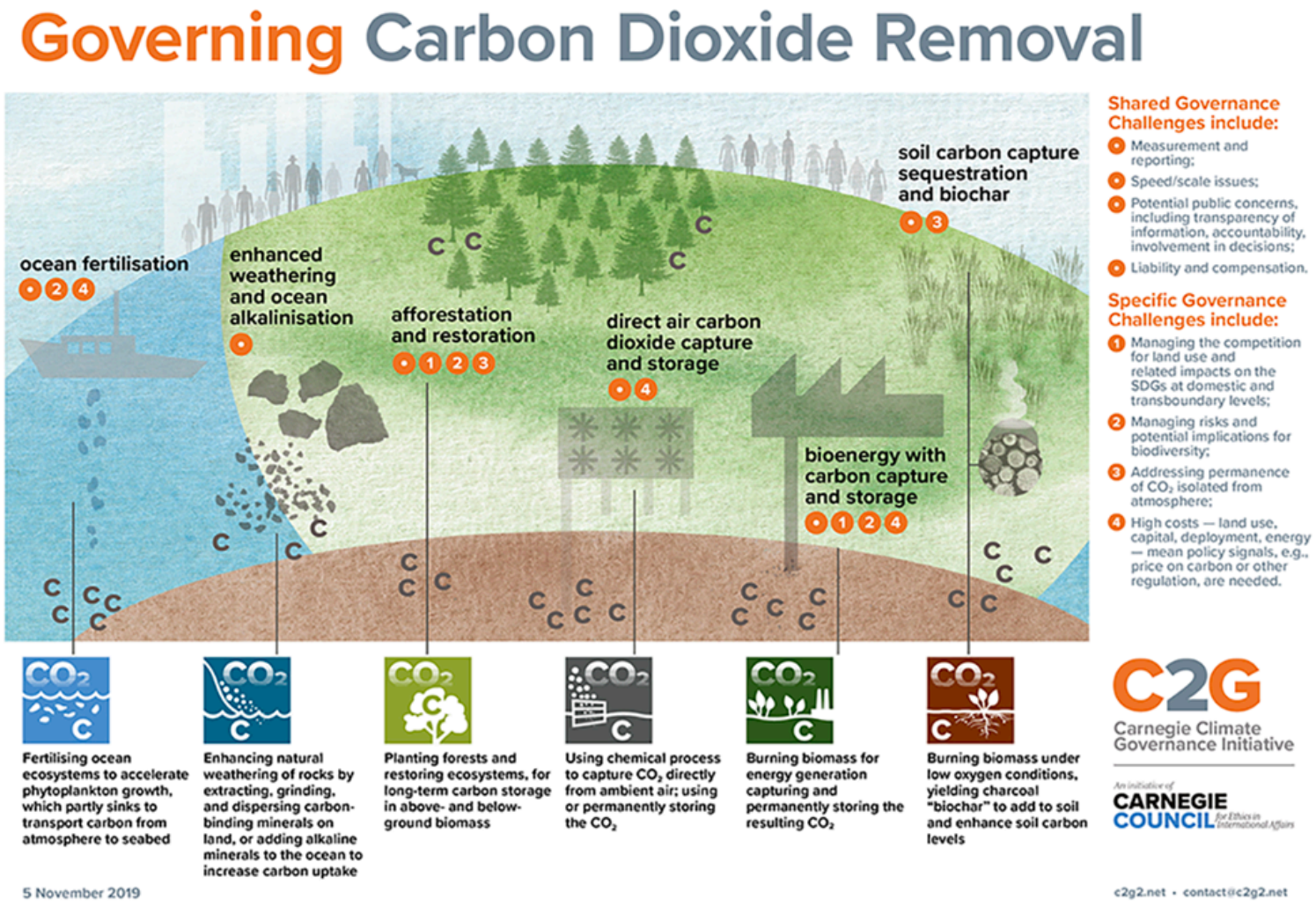
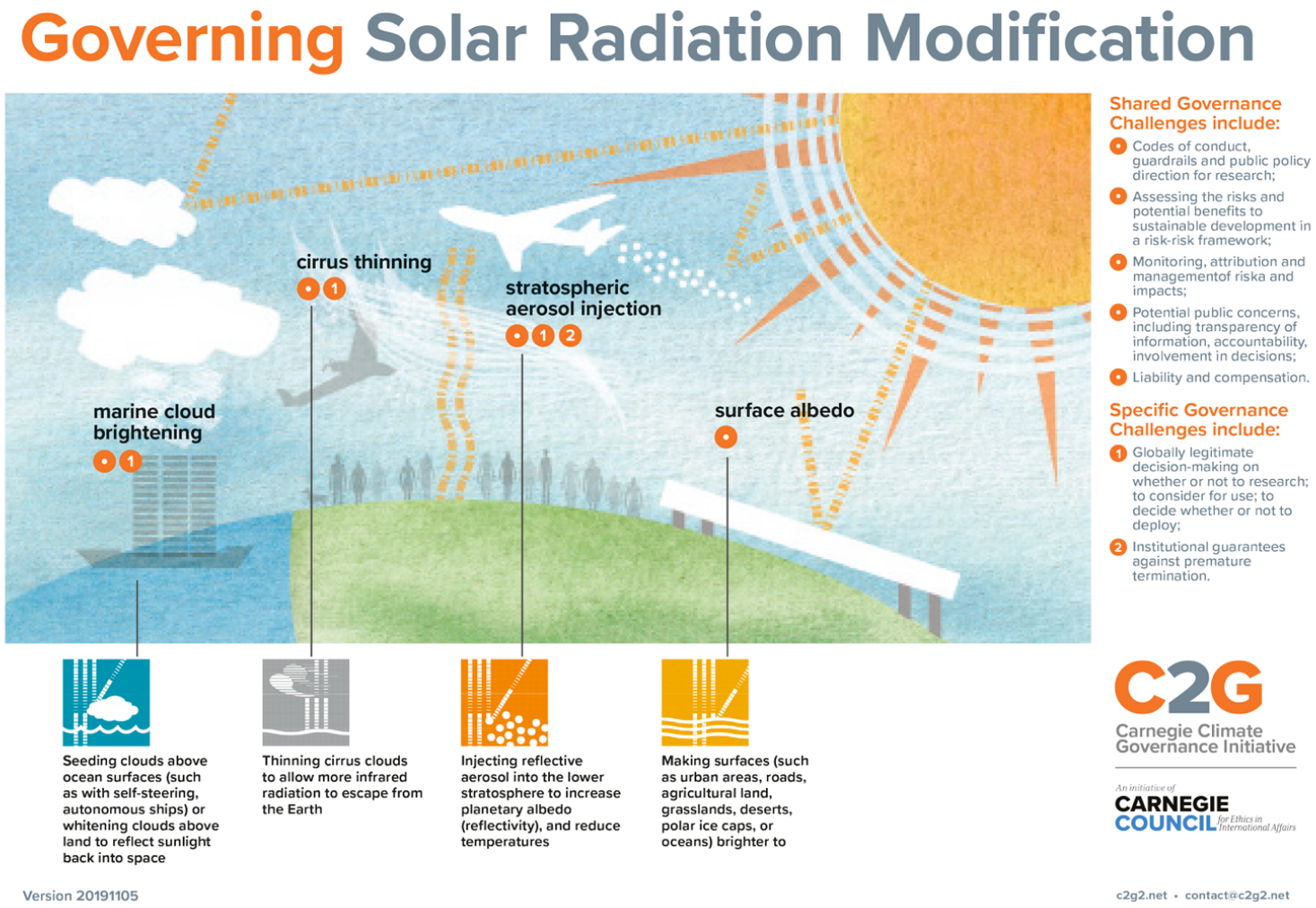
Climate-altering approaches include carbon dioxide removal…..



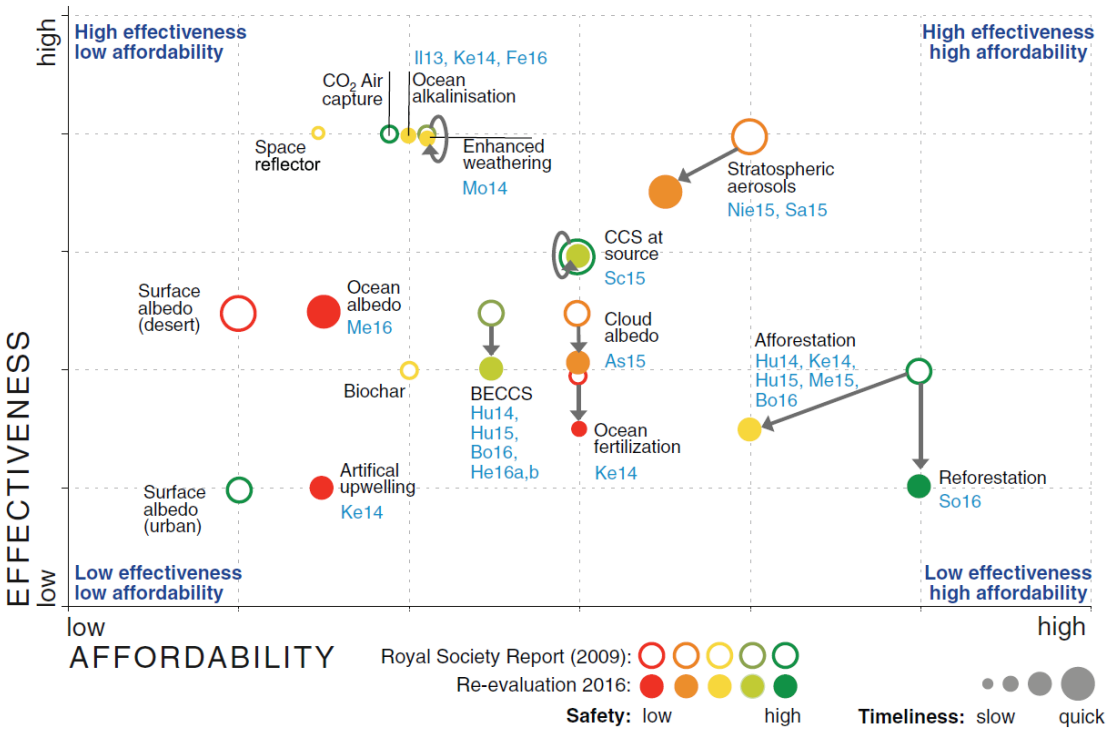
SOURCE: C2G

….. and solar radiation modification



SOURCE: C2G

Challenge 1: Evaluating options, but considering precautions



Nature-based vs technological solutions

- Natural: afforestation, biochar
- Technological: accelerated weathering, direct air capture
- Bioenergy with Carbon Capture & Sequestration a combination of the two
- Other land use/ wetlands: less costly
- Restoration of degraded lands vs new land requirement
- CO2 to durable carbon: more costly, more R&D needed

SOURCE: Oschlies & Klepper (2017) (Update of Royal Society 2009)

Challenge 2: What risks? Material concerns centre on risks

- Lack of physics knowledge about aerosols in the stratosphere
- Loss of biodiversity, impacts on agriculture and ecosystems
- Rainfall and hydrological cycle
- Additional acid rain and snow
- Ozone
- Termination effect
- Risk of unilateral action
- Socio-political concerns
- Localised impacts: Developing Country Impacts Modelling Analysis for SRM (DECIMALS) project
- Technological race


COMMENT

Developing countries must lead on solar geoengineering research

The nations that are most vulnerable to climate change must drive discussions of modelling, ethics and governance, argue **A. Atiq Rahman** and colleagues.

22 | NATURE | VOL 556 | 5 APRIL 2018

SOURCE: Ghosh (2011); Ghosh (2018) referencing other literature as well

Challenge 2: What risks? Ethical concerns centre on intentions

- Opposition to interference with nature
- Opposition to commercial control and profiteering
- Moral Hazard: No or little action on climate mitigation
  - UNEA4: “not a substitute for emissions reduction”
- Free rider versus free driver
- Ascertain the intent behind research into climate altering technologies
  - **Can’t imagine change without imagining means and can’t imagine means without imagining motives**
- Demand a say over actions that have transborder impacts
- Intergenerational equity

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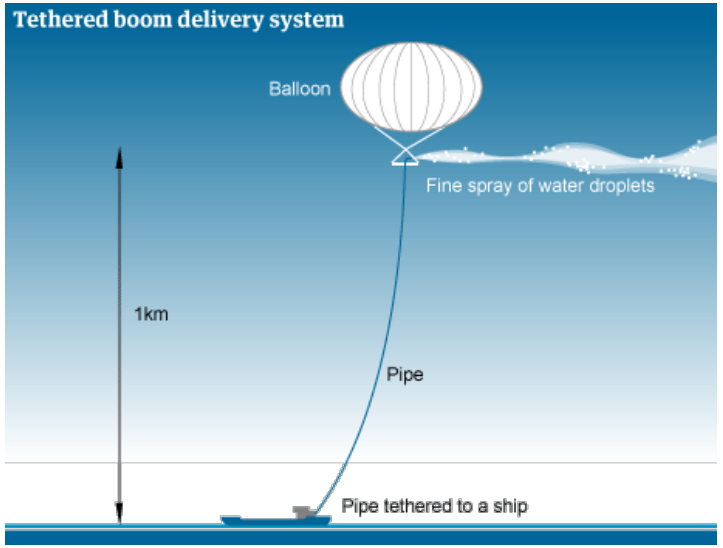
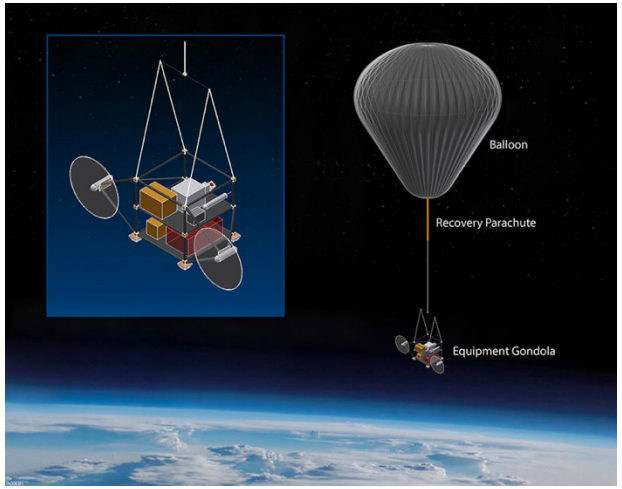
SOURCE: Ghosh (2011); Ghosh (2018) referencing other literature as well

Challenge 3: Establishing thresholds for research and deployment

- Laboratory studies/computer modelling
  - Climate observations and inter-comparison modelling
- Small-scale field experiments
  - Experiments with aerosols
  - Cloud brightening
  - Any good to gather sufficient insight?
- Medium- to large-scale field experiments
  - Designing delivery mechanisms
  - How much sea-water spraying? How much SO2 injection?
- Are large-scale experiments any different from deployment?
- Precautionary principle at each stage





SOURCE: Morgan and Ricke (2010); Burger and Gundlach (2016)

IMAGE: Guardian (2011); Harvard

Challenge 4: Who could/would deploy?

Why

- Last resort?
- First resort?
- Buy time?
- Localised emergency?

Incentives

- Cost
- Signalling
- Technological lead
- No one else will help

Who

- Scenario 1: Privately funded research
- Scenario 2: Small number of countries
- Scenario 3: Several countries collaborate
- Scenario 4: Large economy acts alone
- Scenario 5: Small island state/ coalition of vulnerable countries permit the use of territory

Is national governance enough?

Representation in SCoPEx Advisory Committee

SOURCE: Ghosh (2011); Nature (2012); Ghosh (2014); Reynolds and Wagner (2019)

PHOTO: HSRC

Challenge 5: A thin layer of international governance

- Potentially applicable to **all climate altering methods**
  - ENMOD; UNFCCC
  - **CBD:** no climate-related geo-engineering activities that may affect biodiversity take place, until there is an adequate scientific basis (COP10); no single geoengineering approach that currently meets basic criteria for effectiveness, safety and affordability… (COP11); more transdisciplinary research and sharing of knowledge among appropriate institutions is needed (COP13)

- Potentially applicable to **specific methods**
  - London Convention/ London Protocol (ocean fertilisation); Montreal Protocol (aerosols); MARPOL (marine cloud brightening); Outer Space Treaty (solar arrays)

- Potentially applicable to **activities** within or impacting upon specific method
  - UNCLOS

- Potentially applicable to **specific substances**
  - Sulphates: IMO, CLRTAP, Montreal Protocol; Space Mirrors: Outer Space Treaty

- Potentially applicable over **geographical or spatial** limitations
  - CLRTAP limited to Europe/N. America; IMO (LC/LP); Outer Space Treaty

- Which functions to assign to these institutions?

SOURCE: Blackstock and Ghosh (2011)

Choose from at least four governance routes

Ad hoc principles and codes of conduct

Flexibility, speed, stakeholder-led

VS

Who decides, conflict of interest, lack of public control, future options constrained

National

Sovereignty, speed, enforcement

VS

No international monitoring or dispute resolution, legal uncertainties

Adapting existing treaties

Speed, flexibility, legitimacy

VS

Overburdened agendas, lack of expertise, complicated process, enforcement

Creating new treaties and/or organisations

Fill regulatory gaps, functional division, soft law

VS

Time lag, regime complex and incoherence across institutions

- ***We are willing to contemplate technology interventions on a planetary scale but not human interactions on a planetary scale.***

SOURCE: Ghosh and Blackstock (2011)

Challenge 6: Transparency to reduce risk and build public trust

- Transparency is a common principle
- Transparency about research idea and methodology
- Transparency about outdoor experimentation
- Transparency about funding of research
- Transparency about research outputs and impact assessment
- **Overall, resistance to assess science, actors and activities, frameworks for research and governance (UNEA4 resolution failed to pass in 2019)**

SOURCE: CEEW (2014); Chowdhury and Ghosh (2013); Sugiyama, Asayama, Ishii, Ghosh et al (2017); Royal Society (2009); Oxford Principles (2010); National Academy of Sciences (2015); Nicholson and Jinnah (2017); Blackstock et al. (2015); Parker (2014); Bodle et al. (2014); Gans and Murray (2012); Morgan et al (2013)

Who would do what for *de minimis* transparency?

- Self-reporting
  - Announcing national positions: Germany (2018); UK (2018)
  - Mandatory reporting: Disclosure under Cartagena Protocol on Biosafety
- Peer review and consultations
  - 1998 Aarhus Convention extends principles of transparency and accountability beyond the nation-state
  - But limited to affected population
- National/ regional research platforms
- International assessments
  - Role of non-state actors (C2G, SRMGI, CEEW, FCEA)
- Bottom-up monitoring, top-down enforcement?

SOURCE: Ghosh (2017); Ghosh and Viswamohanan (under preparation); Long, Loy, Morgan (2015); Nicholson, Jinnah and Gillespie (2018); Bodle et al (2014); Horton (2011); Gupta and Mason (2016)

Challenge 7: Designing international research programmes

- **Research capacity**
  - 19 climate modeling groups have simulated climate response to reduced insolation under GeoMIP
  - Localised research
  - Research on ethical, legal, social and political issues
- **Flexible funding**
  - In-kind support: staff, material inputs, institutional resources
  - CGIAR Fund, 2009: to balance donors and researchers
- **Responsibility & liability**
  - Explicit clauses when research creates international institutions e.g. CERN
  - Flexible options: European initiative for Implementing Geological Disposal of Radioactive Waste Technology Platform
- **Intellectual property & access to data**
  - Human Genome Programme; Bermuda Principles: data released within 24 hours
  - CERN: tighter rules but “open science” model; dissemination takes precedence over revenues
  - ITER: royalty-free access to other members
- **Cooperation & institutional design**
  - Voluntary or formal agreement
  - Scope, thresholds and rules
  - Transparency: codes of conduct; self-report; independent review

SOURCE: Ghosh (2018); Kravitz et al. (2011)

Climate altering approaches occupy both a rarefied world of climate science as well as the messy world of geopolitics.

Currently, we have no means to legitimately weigh the risks of not acting against climate emergencies against the risks entailed in deploying controversial climate alterning methods.

This is not a mere technical debate; it is high politics. *We have no means today to govern this uncertainty.*

SOURCE: Ghosh (2019)

IMAGE: Fleming (2010)

Thank you

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