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Geoengineering, or the Governance of Uncertainty

Dr Arunabha Ghosh

Climate Geoengineering: A Realistic Option to Combat Climate Change?
Singapore International Energy Week
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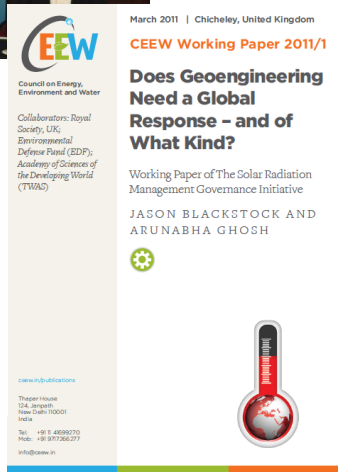
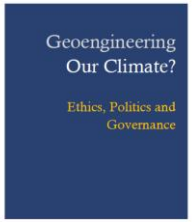
CEEW research & engagement on climate engineering governance



C2G2 Carnegie Climate Geoengineering

An Initiative of the CARNEGIE COUNCIL for Ethics in International Affairs

Geoengineering: the need for governance



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Environmental Institutions, International Research Programmes, and Lessons for Geoengineering Research

Arunabha Ghosh

Climatic Change
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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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How to interpret CBD resolutions on climate-related geoengineering?

- COP10, Decision X/33, para 8 (w): Ensure, in line and consistent with decision IX/16 C, on ocean fertilization and biodiversity and climate change, in the absence of science based, global, transparent and effective control and regulatory mechanisms for geo-engineering, and in accordance with the precautionary approach and Article 14 of the Convention, that **no climate-related geo-engineering activities** that may affect biodiversity take place, until there is an adequate scientific basis on which to justify such activities and appropriate consideration of the associated risks for the environment and biodiversity and associated social, economic and cultural impacts, with the exception of small scale scientific research studies that would be conducted in a controlled setting** in accordance with Article 3 of the Convention, and only if they are justified by the need to gather specific scientific data and are subject to a thorough prior assessment of the potential impacts on the environment;

- COP13, Decision XIII/14, para 5: **more transdisciplinary research and sharing of knowledge among appropriate institutions is needed** in order to better understand the impacts of climate-related geoengineering on biodiversity and ecosystem functions and services, socio-economic, cultural and ethical issues and regulatory options

- Para 6: …taking into account sciences for life and the knowledge, experience and **perspectives of indigenous peoples** and local communities…

SOURCE: CBD

UNEA4: uncertainties affecting technological research, political intentions, legitimacy of forums, and public trust

- "[D]eeply concerned about…potential global risks and adverse impacts…"
  - Requests the Executive Director of the United Nations Environment Programme to
    - OP1. Prepare an assessment of the status of geoengineering technologies, in particular carbon dioxide removal technologies and solar radiation management, to include, inter alia:
      a. criteria which define these technologies;
      b. the current state of the **science**, including research gaps;
      c. the **actors and activities** with regard to research and deployment;
      d. current knowledge of **potential impacts**, including risks, benefits, and uncertainties with regard to each geoengineering technology;
      e. current state, including challenges, of governance **frameworks for research, potential deployment and control** for each geoengineering technology;
      f. conclusions on **potential global governance frameworks** for each geoengineering technology.

    - OP2. Call for proposals of and select participants for an Ad Hoc Independent Expert Group to advise the Executive Director on the development of the abovementioned assessment.

    - OP3. Engage the relevant entities of the United Nations, including treaty secretariats, in the above.

    - OP4. Submit the assessment, no later than by August 2020, for consideration at the fifth session of the United Nations Environmental Assembly.

- Switzerland PLUS Burkina Faso, Federated States of Micronesia, Georgia, Lichtenstein, Mali, Mexico, Montenegro, Niger, South Korea and Senegal

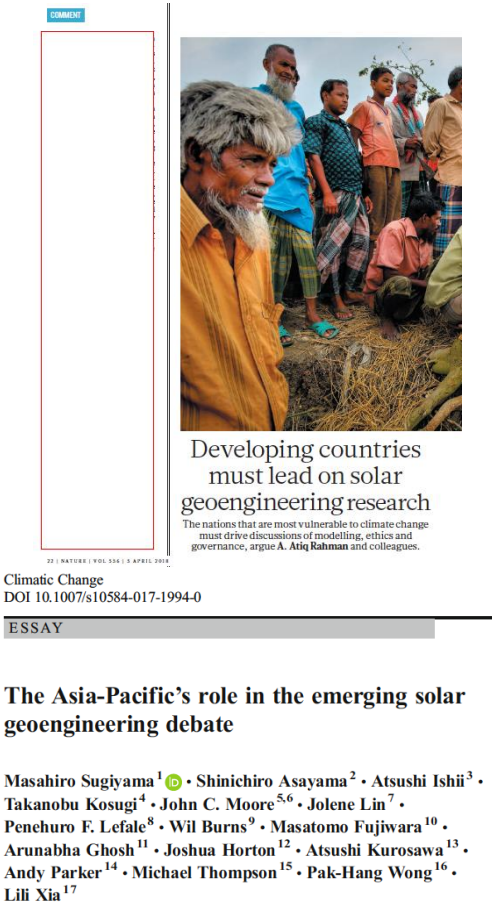
SOURCE: UNEA (2019)

Lesson 1: Recognise the governance of uncertainty

- More explicit links to Paris Agreement and SDGs
  - Many more actors and upgraded ambitions for transparency

- Options? Precautions?
  - When should we deploy CGE and what kind of CGE?
  - Natural: afforestation, biochar
  - Technological: accelerated weathering, DAC
  - BECCS 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
  - Solar geoengineering versus ecosystem-based measures

- Objectives? No consensus
  - Governance should reduce uncertainty
  - Enable reliable research but controlling or regulating research?
  - Promote international collaborative action
  - Coordination, monitoring, disputes


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.

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

SOURCE: Fuchs (2018); Ghosh (2018); Sugiyama, Asayama, Ishii, Ghosh et al (2017) ; Rahman et al (2018)

Overall, governance concerns have not changed

- Material concerns centre on **risks**
  - Loss of biodiversity
  - Rainfall and hydrological cycle (Bala et al., 2008; Brovkin, 2009)
  - Tropical forests (Eliseev, 2010)
  - Ozone (Royal Society, 2009; Heckendorn et al., 2009)
  - Oceans' ecological balance (Scott, 2005; Lampitt, 2008; Trick et al., 2010)
  - Termination effect (Robock, 2008; Leinen, 2011)
  - Risk of unilateral action (Victor 2008; ETC, 2010; Keohane and Victor 2011; Lloyd and Oppenheimer, 2011)
  - Socio-political concerns (Morgan, Nordhaus, Gottlieb 2013)
  - Technological race

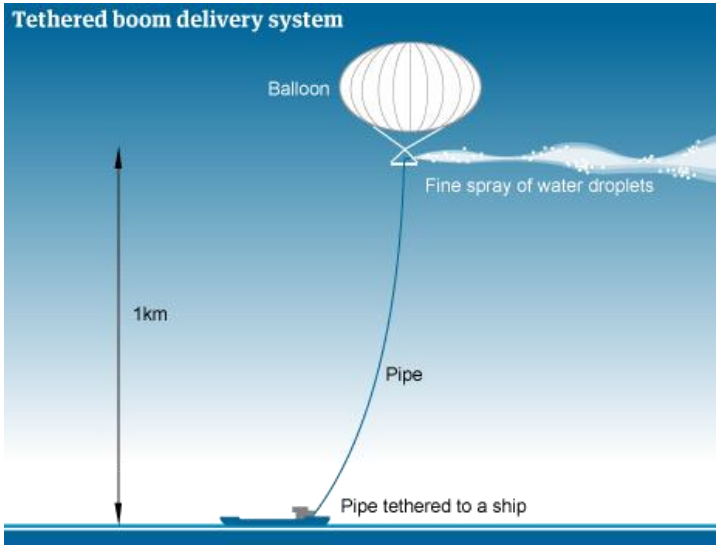
- Ethical concerns centre on **intentions**
  - Opposition to interference with nature
  - Moral Hazard: No or little action on climate mitigation (Caldeira and Wood, 2008; Keith et al., 2010)
    - UNEA4: "not a substitute for emissions reduction"
  - Ascertain the intent behind research into geoengineering technologies (Fleming, 2007; Barrett, 2008)
    - Event small experiments raise questions about implied intent
    - **Can't imagine change without imagining means and can't imagine means without imagining motives (Morton, 2017)**
  - Demand a say over actions that have transborder impacts (ETC, 2009; Banerjee, 2011; NGOs letter, 2011)
  - Intergenerational equity (Burns, 2011; Weiss, 1992; UNFCCC Art. 3(1))

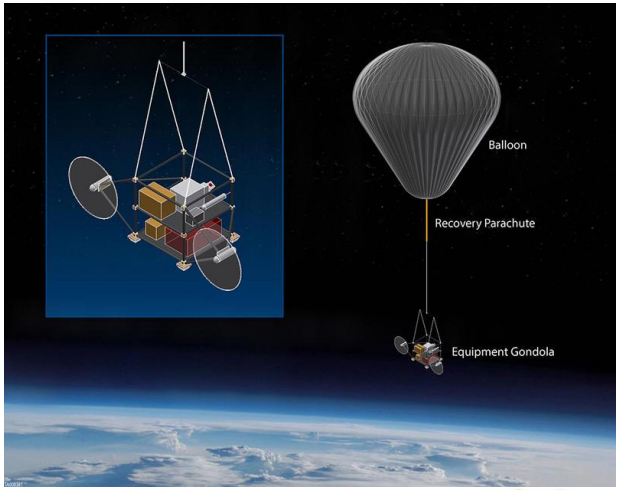
SOURCE: Ghosh (2011); Ghosh (2018)

Lesson 2: Establish thresholds for research and deployment

- Laboratory studies/computer modelling
  - Climate observations and inter-comparison modelling
- Small-scale field experiments
  - Experiments with aerosols
  - Cloud brightening
- Medium- to large-scale field experiments
  - Designing delivery mechanisms
  - How much sea-water spraying? How much SO2 injection?
- Deployment
- Precautionary principle at each stage

No non-American in SCoPEx Advisory Committee





SOURCE: Morgan and Ricke (2010); Burger and Gundlach (2016)
IMAGE: Guardian (2011); Harvard

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Means, motives, opportunity: Who could/would deploy?

- Scenario 1: Privately funded research
- Scenario 2: Small number of countries collaborate on field experiments
- Scenario 3: Research groups in several countries collaborate
- Scenario 4: Large economy unilaterally acts
- Scenario 5: Small island state/ coalition of vulnerable countries permit the use of territory

Is national governance enough?

SOURCE: Ghosh (2011); Nature (2012); Ghosh (2014)

PHOTO: HSRC

Lesson 3: 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

SOURCE: Ghosh and Blackstock (2011)

A thin layer of international governance

- Potentially applicable to **all geoengineering 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)
- 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)

Lesson 4: Transparency to reduce public risk and build public trust

- Transparency is a common principle
  - Royal Society, 2009; Oxford Principles, 2010; National Academy of Sciences, 2015; Nicholson and Jinnah 2017
- Transparency about research idea and methodology
  - Blackstock et al 2015
- Transparency about outdoor experimentation
  - Parker 2014; Bodle et al 2014
- Transparency about funding of research
  - Gans and Murray 2012
- Transparency about research outputs and impact assessment
  - Morgan et al 2013

SOURCE: CEEW (2014); Chowdhury and Ghosh (2013); Sugiyama, Asayama, Ishii, Ghosh et al (2017)

Whose voice? Whose vote? What if they said no?

	Government and its agencies	Civil Society stakeholders	General public	Researchers and Funders
Type of information that needs to be communicated	- Risk assessment of field research/ deployment - scientific, technical and social, political, ethical, economic and legal issues relating to SRM research and deployment	- Risk assessment of field research/ deployment - strategies, policies, programmes and action plans relating to SRM research	- Strategies, policies, programmes and action plans relating to SRM research - Information about the decision-making process	- Specific outcomes of research - Success of deployment - Records of research/ studies that can be verified or taken forward
Stages at which involvement is required	- In an ideal scenario, at all decision-making stages of research conceptualisation, outcome and utilisation of results for further action.	- Research idea and methodology conceptualisation - Research outcomes and funding - Decision-making regarding outdoor experimentation - Utilisation of results from research (next steps)		
Mode of communication	- Government briefings - Filing of information before the concerned departments	- Research registries - Briefs targeted at civil society organisations	- Research registries - Public hearings (EIA) - Access to government records - Effective engagement	- Research papers - Academic networks

SOURCE: Ghosh and Viswamohanan (under preparation)

Lesson 5: Who would do what for transparency?

- Self-reporting
  - Efficient but inadequate
  - Voluntary reporting by research groups
  - Announcing national positions: Germany (2018); UK (2018)
  - Mandatory reporting: Disclosure under Cartagena Protocol on Biosafety
- Peer review and consultations
  - Public information and public consultation are one-way flows of information
  - Public participation is bi-directional, but what if the public said no?
  - 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 (C2G2, SRMGI, CEEW, FCEA)
  - Centralised governance or club model or polycentric governance?
- 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)

How do we design international research programmes?

- **Research capacity**
  - Localised research
  - ITER/CERN: Sourcing inputs from developing countries for larger research infrastructure
  - Mapping out institutions in poorer countries to include them in research collaborations
  - 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**
  - HGP; 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)

Science-based policymaking or policy-based scientific research?

IMAGE: https://www.adworld.ie/2018/01/29/putting-the-genie-back-in-the-bottle/

Climate geoengineering occupies 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 CGE 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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