Breakout event

Governance of Solar Geoengineering and Carbon Removal

CCDA-IIIV, Nairobi, Kenya
Friday 12th October 2018

www.c2g2.net
The challenge

- Paris Agreement (temp, E-R=0, net negative)
- Pathways/Scenarios (IPCC AR5) include large R
- Science on large scale removal and solar radiation management
- Precautionary and Risks management
  - Cost & potential benefits
  - Acceptability
  - Takes time
Our mission

- Catalyze the creation of effective governance
- Shift the conversation from science to policy
- Encourage a broader, society-wide discussion
- C2G2 is impartial: not for or against a technology and outcome of decisions regarding them
- C2G2: no decision without good governance (knowledge, participation, reporting, decision making etc)
Our priorities

1. Governance of Solar Geoengineering
   • *Prevent deployment unless*…

2. Governance of Research

3. Governance of Carbon Removal Technologies
   • *Local, national, global, UNFCCC sufficient?*
Our approach

Catalyse, Learn, Decide

**CATALYSE**
- Bring issue to governments, international organizations, civil society
- Highlight urgency and risks

**LEARN**
- Understand better the risks and potential benefits
- Develop governance and monitoring frameworks

**DECIDE**
- National, international fora agree to rules and guardrails to prevent hasty, unilateral, ungoverned deployment
- Decide whether or not to deploy
CBD 2018
Development of Research Agenda

UNFCCC 2018-2022
Carbon Removal & Research

UNGA 2022
‘No solar geo deployment unless...’

UNEA 2019
Resolution including ‘No solar geo deployment unless...’

Science & Research Bodies (e.g., Future Earth, Belmont Forum, ISC, etc.)

Other IG Processes (e.g., OECD, G20, G7, Arctic Council, AU, EC)
The technologies

Carbon Removal

- Afforestation and forest ecosystem restoration
- Bio-energy with carbon capture and storage
- Enhancing soil carbon content
- Direct air capture and storage
- Enhanced weathering and ocean alkalinity
- Ocean fertilisation

Solar Geoengineering

- Cloud modifications over land or water surfaces
- Stratospheric aerosol injection
- Surface albedo modifications
What we already know:

- World MUST reduce emissions from fossil fuels- none of what is being discussed changes that.
- No method or technology alone can "solve" climate change.
- Some of these proposals MAY potentially play an ADDITIONAL role in climate policy, if
- IPCC 1.5C pathways call for BOTH rapidly reducing emissions AND removing carbon from the atmosphere for storage.
Carbon Removal

**NATURAL**
- Forestry / Agriculture
  - Afforestation / Reforestation: Tree growth takes up CO₂ from the atmosphere
  - Biochar: Partly burnt biomass is added to soil absorbing additional CO₂
  - Soil Carbon Sequestration: Land management changes increase the soil carbon content, resulting in a net removal of CO₂ from the atmosphere
  - Other Land-Use / Wetlands: Restoration or construction of high carbon density, anaerobic ecosystems

**COMBINED**
- Natural + Technological
  - Bioenergy with Carbon Capture and Storage (BECCS): Plants turn CO₂ into biomass that fuels energy systems; CO₂ from conversion is stored underground

**TECHNOLOGICAL**
- Energy / Industry
  - Accelerated Weathering: Natural minerals react with CO₂ and bind them in new minerals
  - Direct Air Capture: CO₂ is removed from ambient air and stored underground
  - Ocean Alkalinity Enhancement: Alkaline materials are added to the ocean to enhance atmospheric drawdown and negate acidification
  - CO₂ to Durable Carbon: CO₂ is removed from the atmosphere and bound in long-lived materials

- Less costly → More costly
- Closer to deployment → Greater R&D needs
- More vulnerable to reversal → Less vulnerable to reversal

Note: This figure includes the major strategies that have been discussed in the literature so far (Mink et al., 2017).
Carbon Removal
Carbon Removal

- Business as usual
- Below 2°C
- Decreased greenhouse gas emissions
- CO₂
- Other greenhouse gas
- Gross positive greenhouse gas emissions CO₂ from fossil fuels, industry and land use changes methane, N₂O and F-Gases
- Net-zero emissions
- Gross negative CO₂ emissions
- Net negative greenhouse gas emissions

Year:
- 2010
- 2020
- 2030
- 2040
- 2050
- 2060
- 2070
- 2080
- 2090
- 2100

Greenhouse gas emissions (Gt/CO₂/year)
Solar geoengineering
Carbon Removal and Solar Geoengineering: Potential implications for the delivery of the Sustainable Development Goals

www.c2g2.net
Potential implications for the SDGs

• A report based on recent literature review, expert analysis and insights by international academics and practitioners.

• Two angles: technological - SDGs

• At least 13 of the 17 of the SDGs affected.

www.c2g2.net/geoeng-sdgs/
Technologies

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Potential implications for the SDGs

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- **Potential research gap identified.**
- **Key research gap identified.**
- **Interaction identified**
- **Risk identified**
Potential Implications for the SDGs

- **Physical side effects (social, economic and environmental):**
  land-use and food security; water quality and availability; health; energy; economic productivity; and biodiversity.

- **Political implications:**
  Opportunity costs of technology, political tensions, governance demands.

www.c2g2.net/geoeng-sdgs/
Recommendations for next steps

1. More transdisciplinary & geographically diverse research
2. Common assessment principles or metrics.
3. Comprehensive quantitative analysis of risks and benefits
4. More social science and humanities research
5. Integrated policy impact assessments for policy design
6. Governance of research and any potential future deployment
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