

GEOENGINEERING SCENARIOS FOR CLIMATE ASSESSMENT AND POLICY: EXPERIENCE, INSIGHTS, PROSPECTS

NCAR CCIS WEBINAR

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Scenario Basics:

- Scenarios represent future uncertainties to inform near-term decisions
- Scenarios represent conditions ...
 - Needed for the exercise at hand (model, assessment, decision support);
 - External to it (exogenous, boundary conditions): Stipulated, not calculated
 - Deep uncertainty: Precise, closed-form estimates not available (not even subjective pdfs)
- Blend knowledge, judgment, speculation: not “Scientific,” not “Objective”
- What gets included in scenarios? Come in groups (usually) that ...
 - Span range judged plausible ...
 - On most important uncertainties for decisions at issue ...
 - Judged by scenario users (decision-makers or their proxies) and creators
- “Not predictions:” Correct, but misleading.
 - Threshold judgment: Likely enough, given stakes, to warrant analysis and attention
- Representation ≠ Endorsement: Scenarios should include challenging futures
 - Exception: Normative “Back-casting” scenarios (Robinson)

Climate Scenarios: Distinct challenges

- Vast audience, no single decision or decision-maker
 - Confounds uncertainties and decisions: Your decision is my uncertainty
 - No basis to define boundaries of relevance: Temptation to throw in everything
 - Ongoing tension: Qualitative/narrative (honored then ignored) vs. Quantitative
 - Complex structure and process: Coordination/consistency vs. Bottom-up diversity
- Scenarios have high stakes, become political objects:
 - Clear implications for human welfare, course of action (E.g., RCP 8.5 vs. 2.6)
 - Contested, easy to attack, hard to defend
 - Response: Move scenarios outside ass'ts, neg'ns – Deniability, take that fight outside ...
- Historical landmarks in Climate Change Scenarios:
 - First need: Quantitative emissions scenarios as climate-model inputs
 - IS92 scenarios (Leggett et al 1992)
 - SRES scenarios (Nakicenovic and Swart, IPCC 2000)
 - Need: 1) Faster production for GCM/ESM inputs; 2) Richer specification for IAV, policy studies
 - New framework: RCPs, SSPs, SPAs (Moss et al, van Vuuren et al, O'Neill et al)

Climate Intervention Scenarios: The Story thus far

- GeoMIP: Model comparison with specified solar geo forcings
 - RCP baselines plus quantitative intervention trajectories
 - Aim (like early climate/GCM scenarios): Big push, strong signal/noise
 - Scenarios don't aim for policy realism
 - But ... early results cited (incorrectly) as damning solar geo
- Stand-alone studies: Quantitative policy-relevant scenarios
 - Stipulate incremental or constrained deployment
 - Or calculate deployment in optimizing model (Napkin diagram, DICE)
- Narrative/qualitative scenario exercises
 - Posit international deployment challenges
 - Explore and stress-test governance responses
 - Aim to bootstrap early steps to develop governance capacity

Climate Intervention Scenarios: Highlights thus far

- GeoMIP: Model comparison with specified solar geo forcings
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CI Scenarios for Governance Explorations

- Presume: Future deployment-related challenges (some form) likely
- No preparation, consultation re governance underway
- Structure of scenario exercises:
 - Stipulate specific challenge or crisis
 - Develop and critique governance response
 - Critique, iterate, refine – Seek insights relevant to near-term decisions
- Qualitative/narrative, 1 – 2 discrete time points, no modeling
- Similar to classic political-military exercises, crisis simulations
- Aims: expand thinking, ID plausible risks/opportunities/strategies

Banff Summer School 2019 Governance Scenarios

- 2040: Limited mitigation progress, 2.2°C, severe impacts
- 4 scenarios, 2 groups of ~ 8 people on each, 5 hours over 3 days
- Structure:
 - Challenge scenario – Group has designated role, task, superior
 - Response to challenge (incl. Governance)
 - Stress test (presented by counterpart group)
 - Response, synthesis, report out
- Challenge Scenarios:
 - The Middle Powers Roar
 - Vulnerable States Demand, and Act
 - Grassroots Decentralized Deployment
 - The Private Sector to the Rescue?

Climate Intervention Scenarios: Questions, Next steps

- Governance studies, narrative challenge scenarios – What next?
- Quantitative intervention trajectories in headline scenarios? How?
- Integrate narrative and quantitative scenarios – to what end?
- Assess and enable the “Napkin diagram:” How can scenarios help?

References:

- Banerjee, B., Collins, G., Low, S. & Blackstock, J. *Scenario Planning for Solar Radiation Management*. <https://www.cigionline.org/publications/scenario-planning-solar-radiation-management> (2013).
- Belaia, M. Optimal Climate Strategy with Mitigation, CDR, and Solar Geoengineering. ArXiv190302043 Econ Q-Fin (2019).
- Boettcher, M., Gabriel, J. & Low, S. Solar Radiation Management: Foresight for Governance. <https://www.iass-potsdam.de/en/output/publications/2016/solar-radiation-management-foresight-governance-project-report> (2016).
- Intergovernmental Panel on Climate Change. *Special report on emissions scenarios*. (Cambridge University Press, 2000).
- Kravitz, B. et al. The Geoengineering Model Intercomparison Project Phase 6 (GeoMIP6): Simulation design and preliminary results. *Geosci. Model Dev.* 8, 3379–3392 (2015).
- Leggett, J. *et al.* Emissions scenarios for the IPCC: an update. *Clim. Change* 69–95 (1992).
- Moss, R. *et al.* Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts, Response Strategies. (2008).
- O’Neill, B. C. et al. The Scenario Model Intercomparison Project for CMIP6. *Geosci. Model Dev.* 9, 3461–3482 (2016).
- Parson, E.A., “Useful Global Change Scenarios,” ***Environmental Research Letters*** 3:4, 045016 (Oct – Dec 2008).
- Parson, E.A, and M.G.Morgan, “Socioeconomic Context for Climate Impact Assessment”, Chapter 3, pp. 93-107, in ***Climate Change Impacts on the United States***. National Assessment Synthesis Team, USGCRP Cambridge U Press. 2001
- Parson, E.A., V. Burkett, K. Fisher-Vanden, D. Keith, L. Mearns, H. Pitcher, C. Rosenzweig, M. Webster, ***Global-Change Scenarios: Their Development and Use***. Assessment Product 2.1b, US Climate Change Science Program, 2007.
- Robinson, J. Future subjunctive: back-casting as social learning. *Futures* 35, 839–856 (2003).
- Sugiyama, M. et al, Next steps in geoengineering scenario research: limited deployment scenarios and beyond. *Clim. Policy* 18, 681–689 (2018).
- van Vuuren, D. P. et al. The Representative Concentration Pathways: An Overview. *Clim. Change* 109, 5–31 (2011).

QUESTIONS, DISCUSSION ...

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