



Direct Air Capture Governance and Environmental Intervention Principles

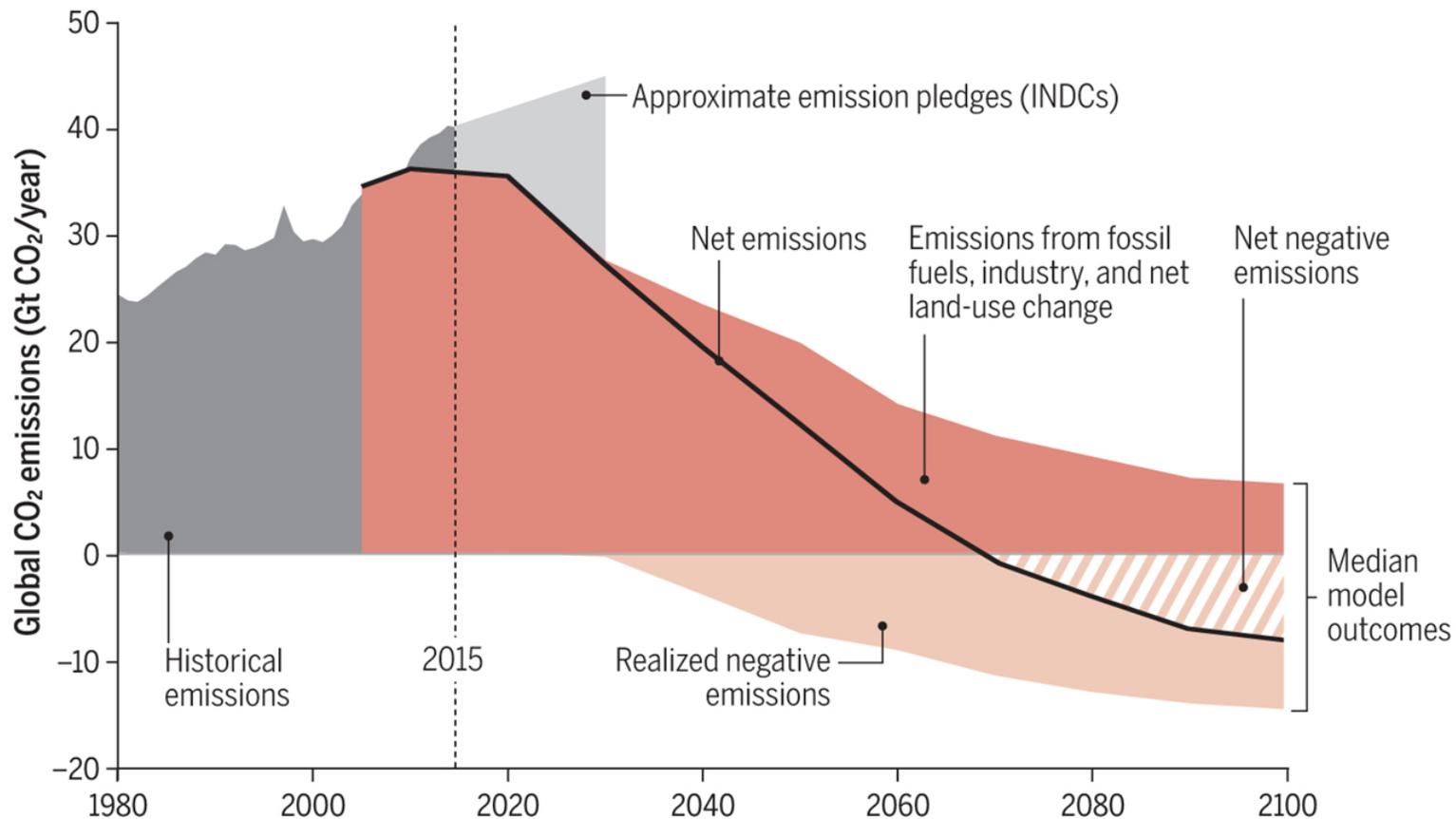
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The Need for NET

No quick fixes

Modelers generally report net carbon emissions, unintentionally hiding the scale of negative emissions. Separating out the positive CO₂ emissions from fossil fuel combustion, industry, and land-use change reveals the scale of negative CO₂ emissions in the model scenarios (16). INDCs, Intended Nationally Determined Contributions.

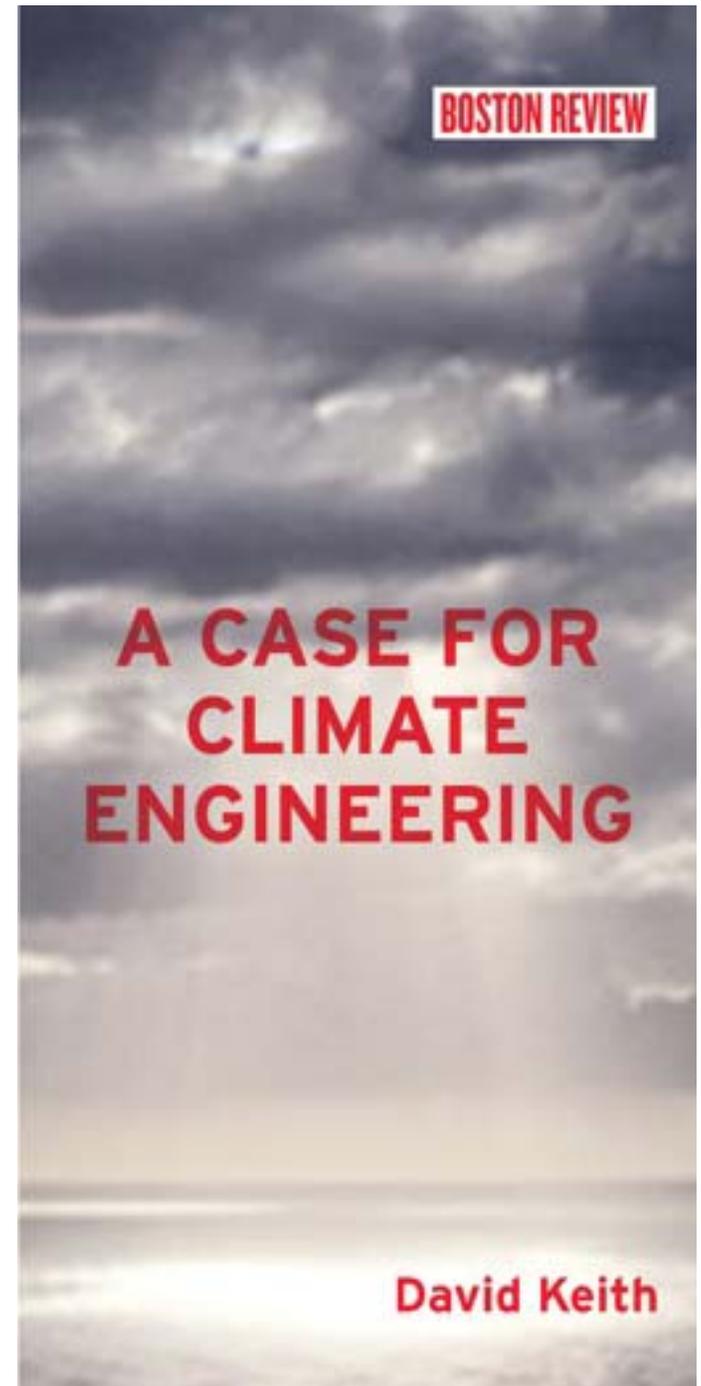


Carbon Removal and the Governance Divide

“This divergence of costs and risks means that the challenges of solar geoengineering and carbon removal raise for policy and governance are almost wholly different. Carbon removal is like mitigation....

Because solar geoengineering and carbon removal have little in common, we will have a better chance to craft sensible policy if we treat them separately.”

D. Keith, A CASE FOR CLIMATE ENGINEERING at p. xxi (2013)



The Varieties of Direct Air Capture



- Mechanical Direct Air Capture
- Carbon Capture & Storage (CCS)
- Biological Energy + CCS (BECCS)
- Ocean Iron Fertilization
- Biochar
- Soil enhancement
- Ocean CO₂ entrainment
- Afforestation
- Air Fuel Capture



U.S. Environmental Laws and Direct Air Capture

- Legal Advantages of DAC

- Slow Pace
- Reversibility
- Familiarity



- Likely focus of initial legal hurdles

- Permits and approvals for environmental side effects of the capture process
- Management of captured CO₂
- Legal status of products or materials generated from captured CO₂



The Default Governance Pathway: Permitting the Direct Air Capture Process

- All permit issues will be heavily dependent on facts of individual operations and process
- But in general, U.S. environmental laws would regulate in same way as any industrial process (air emissions, spent media). Not insurmountable.
- But some quirks:
 - Clean Air Act content and certification requirements for fuels
 - Integration of captured CO₂ into existing GHG permit programs
 - Environmental Impact Statements and analyses



Example: Environmental Legal Requirements for CO₂ from DAC

- Driven by CCS debate
- Example: RCRA conditional exclusion for captured CO₂
 - Heavily keyed to ultimate fate of CO₂
 - Class VI vs Class II wells
 - Limited to CO₂ captured *from source*
 - Feedstock and commercial use exemptions
 - Solid waste management requirements
 - Tort liability
- TSCA notification and premanufacture approvals



Short Term Regulatory Options to Promote DAC (from Deep Decarbonization Pathways Project)

- Start-up Research Gap – Increase Financial Support
- Emissions and other environmental impacts from DAC operation
 - Likely regular permit processes for conventional emissions. If needed, explore standard permits, legislative waivers
 - NEPA and EIS (if triggered) – CatEx or programmatic EIS
 - Land acquisition and use (BECCS, eminent domain, regional HCPs)
- Management of captured CO₂
 - Revisit Class VI UIC well rules and conditional RCRA exclusions
 - Regulatory pre-approval of products (fuels, mineralization)
 - Include within advanced renewable fuel mandates
 - Life cycle assessments of product CO₂ footprint



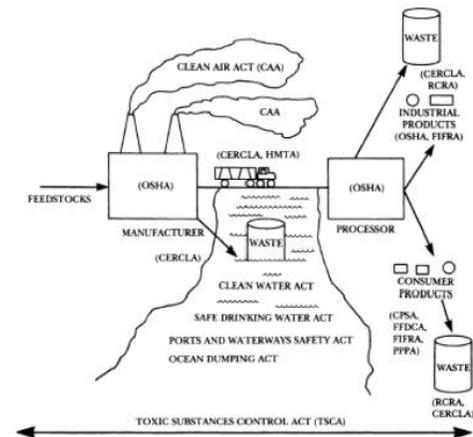
Short Term Regulatory Options to Promote DAC (from Deep Decarbonization Pathways Project)

- Incentives
 - Carbon pricing (especially if included in fuel pricing)
 - Tradable emission reduction credits
 - Integrating DAC into GHG permitting and trading
- Liability limitations and management
 - Liability caps (OPA, Price-Anderson)
 - Tort liability limits (LULU concerns, applicability of permit shields to DAC)



Longer-term governance pathway: regulation by surrogate

- Note that all of these regulatory options focus on regulating DAC through its environmental side effects.
- So focus on the hard case – how (or should) we regulate a DAC process that does not pose any obvious environmental side-effects
- Consequence of the black box model to U.S. environmental regulation, which consciously seeks not to regulate the production process itself
 - Clean Air Act (BACT, MACT, LAER)
 - Pollution Prevention Act of 1990
 - Toxic Substances Control Act



CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
FFDCA: Federal Food, Drug, and Cosmetic Act
RCRA: Resource Conservation and Recovery Act
FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act
CPSA: Consumer Product Safety Act
OSHA: Occupational Safety and Health Act
HMTA: Hazardous Materials Transportation Act
PPPA: Poison Prevention Packaging Act



Thought Experiment



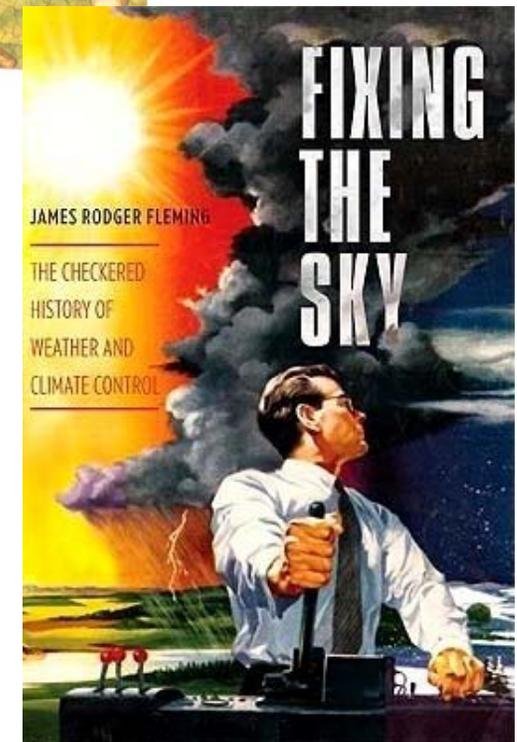
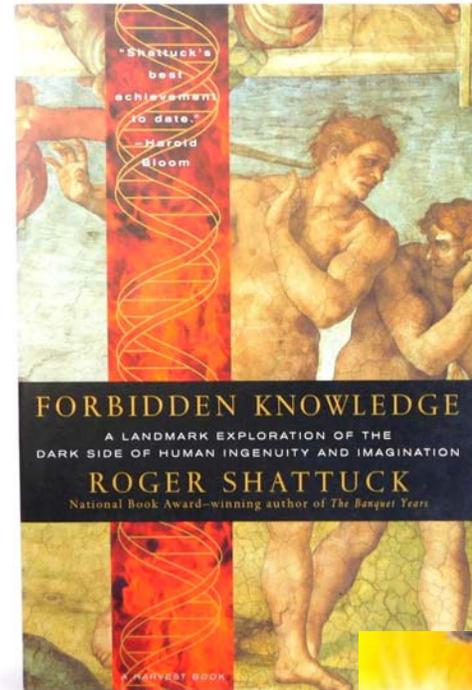
Possible alternative models for governance

- Pollutant discharge as surrogate for environmental impairment
 - Normative question: *should* we regulate DAC capture step?
 - Any possible risk of any conceivable damages from inept or faulty implementation of DAC?
- Frameworks – Economic model (emergent management via market mechanisms); Rights-based model (social acceptance); Information and recursive regulatory model (complex systems behavior)
- Embrace the gap – confirm absence_of permitting requirement for CO2 removal step via regulatory finding or guidance
- Ecosystem services disruption tort; akin to Good Samaritan model



Risks of the Inquiry

- Unnecessary distraction from vitally needed technology
- Role of precautionary principle and risk-risk comparisons
- If governance required, risk of anti-commons lockout
- Global forced pooling concepts





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