

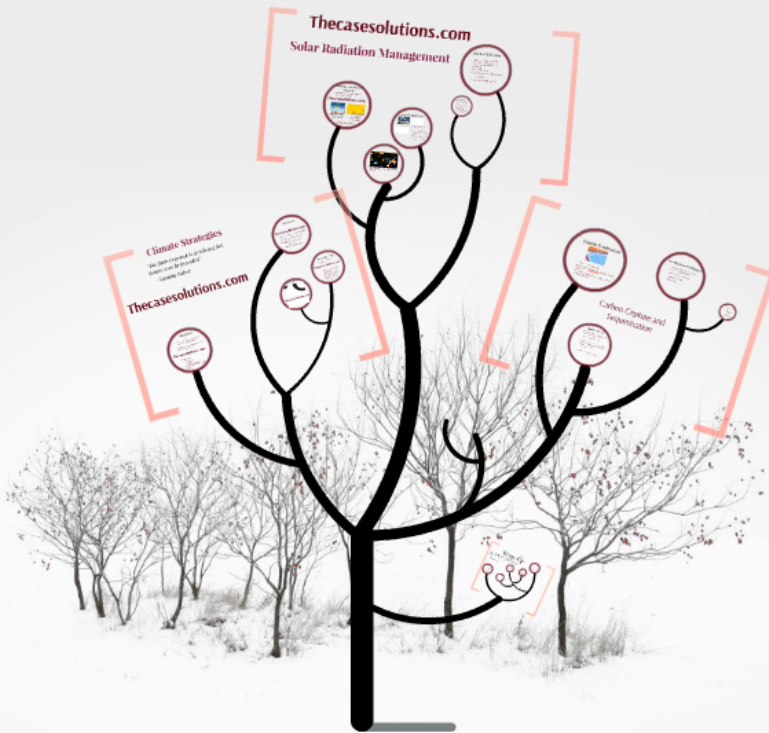
Solar Geoengineering

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My questions for you:

- What's the right regulatory model here?
- How might we go about building an international consensus on what technique to employ?
- How can we prevent or discourage unilateral action by state or non-state actors?
- How can we plan for portfolio interactions?

Jon Lawhead, PhD
University of Southern California



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Climate Strategies

"The future cannot be predicted, but futures can be invented"

-Dennis Gabor

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Mitigation

- Stop climate change before it starts (or before it goes any further)
- Usually involves intervening on human behavior or institutions

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- Examples include:
 - Carbon tax
 - Cap & trade
 - Alternative energy R&D
 - Gold standard of climate change response

Adaptation

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- Reduce the negative impact of climate change
- Often given an economic basis
- Changes to human or natural systems
- Examples include:
 - Emigration/immigration plans
 - Levee construction
 - Agricultural land use changes

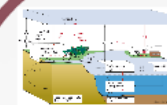
Geoengineering

for the purposes of our discussion, geoengineering

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- Is deliberately pursued as a response to climate change, and not an unintended side-effect of another activity
- Primarily involves interventions in the functioning of geosystems rather than human institutions or behavior
- Is designed to produce an effect that is global in scope and capable of persisting for decades or timescales of at least years

Pretty Pictures



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Project Name	Project Location	Project Status
Project A	Location A	Status A
Project B	Location B	Status B
Project C	Location C	Status C

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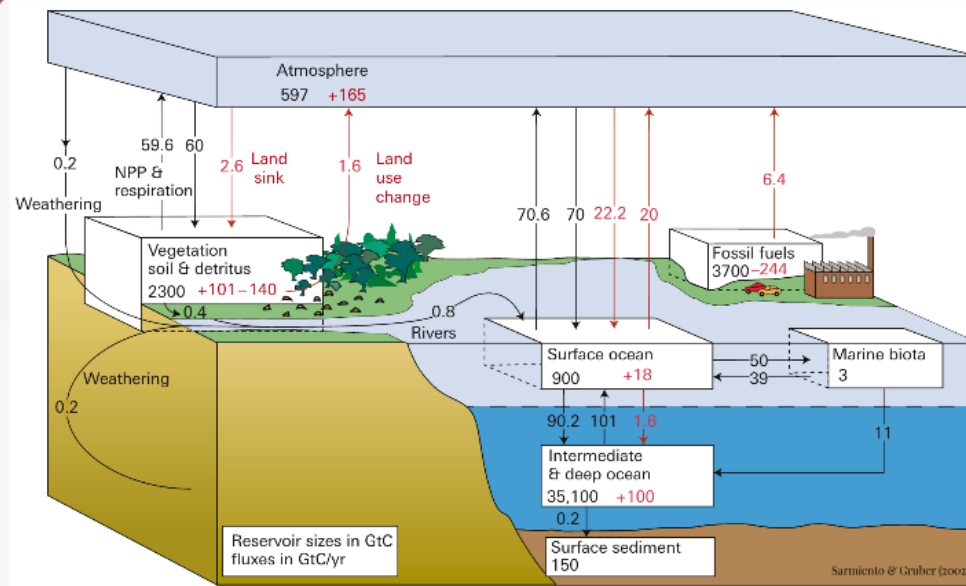
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Pretty Pictures



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	Prevent Climate Change	Prevent Climate-Related Damage	Prevent Global Average Temperature Increase
Alter Human Behavior	Mitigation	Adaptation	-
Alter Natural Systems	Mitigation/geoengineering	Geoengineering	Geoengineering

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Solar Radiation Management

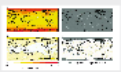
Stratospheric Aerosol Injection

- Probably the most popular idea in the scientific literature

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• Hydrogen sulfide or sulfur dioxide



• ~2% decrease in insolation offsets a CO2 doubling

5-7 Tg every year!

Aerosol Challenges



18. Pinatubo, June 1991



Global mean temperature drop of 0.5 degrees C, 5-7 years.

- But that's not all! We can also expect:
- More damage, snowier (day by day)
 - ~10 years
 - Increased atmospheric water vapor (enhanced greenhouse effect)
 - Cost several times as high!



This is only slightly less ridiculous than a hand villain plot.

Albedo Challenges

- Incredibly, ridiculously expensive (several trillion dollars per year to approach effectiveness for some approaches)
- Ecosystem disruption
- Changes in local atmospheric circulation
- Land use conflicts
- Not easily (or cheaply) reversible

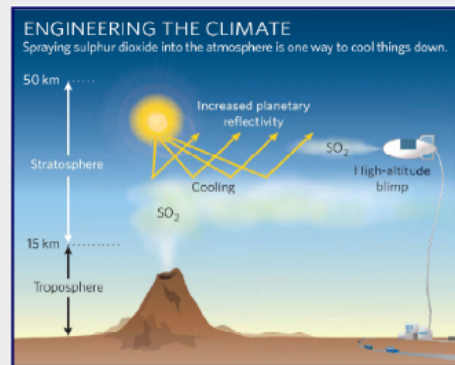
Albedo Management

- More and cheaper than a... (text is small and partially obscured)

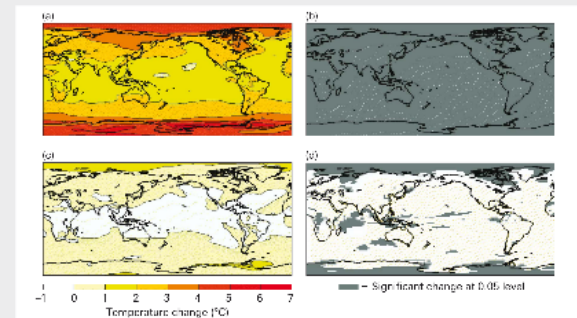
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