
Climate Engineering Politics: Game Theory vs. International Relations Theory

Presentation at the Kiel Institute for World Economy
Summer School on Economic Policy, Kiel

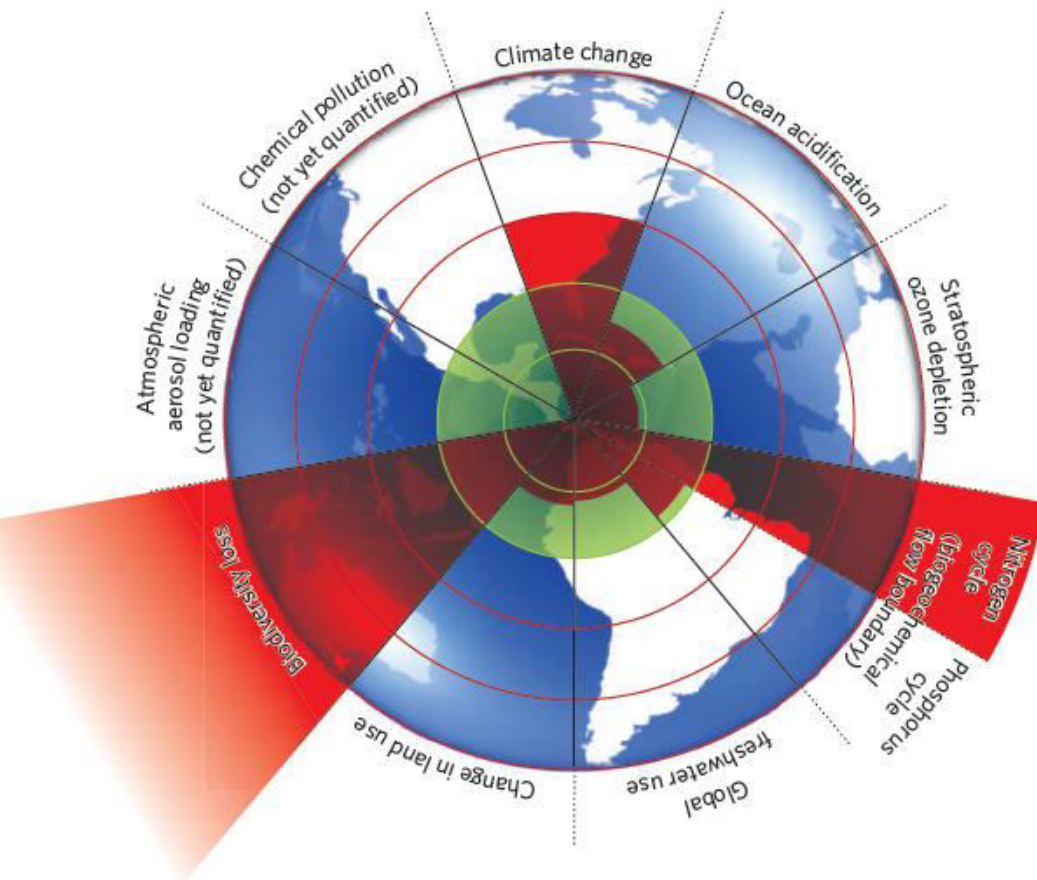
Research Questions

1. How do different disciplines model uncertainty and risk in the study of Climate Engineering?
2. Are these approaches compatible and how would an interdisciplinary approach look like?

Outline

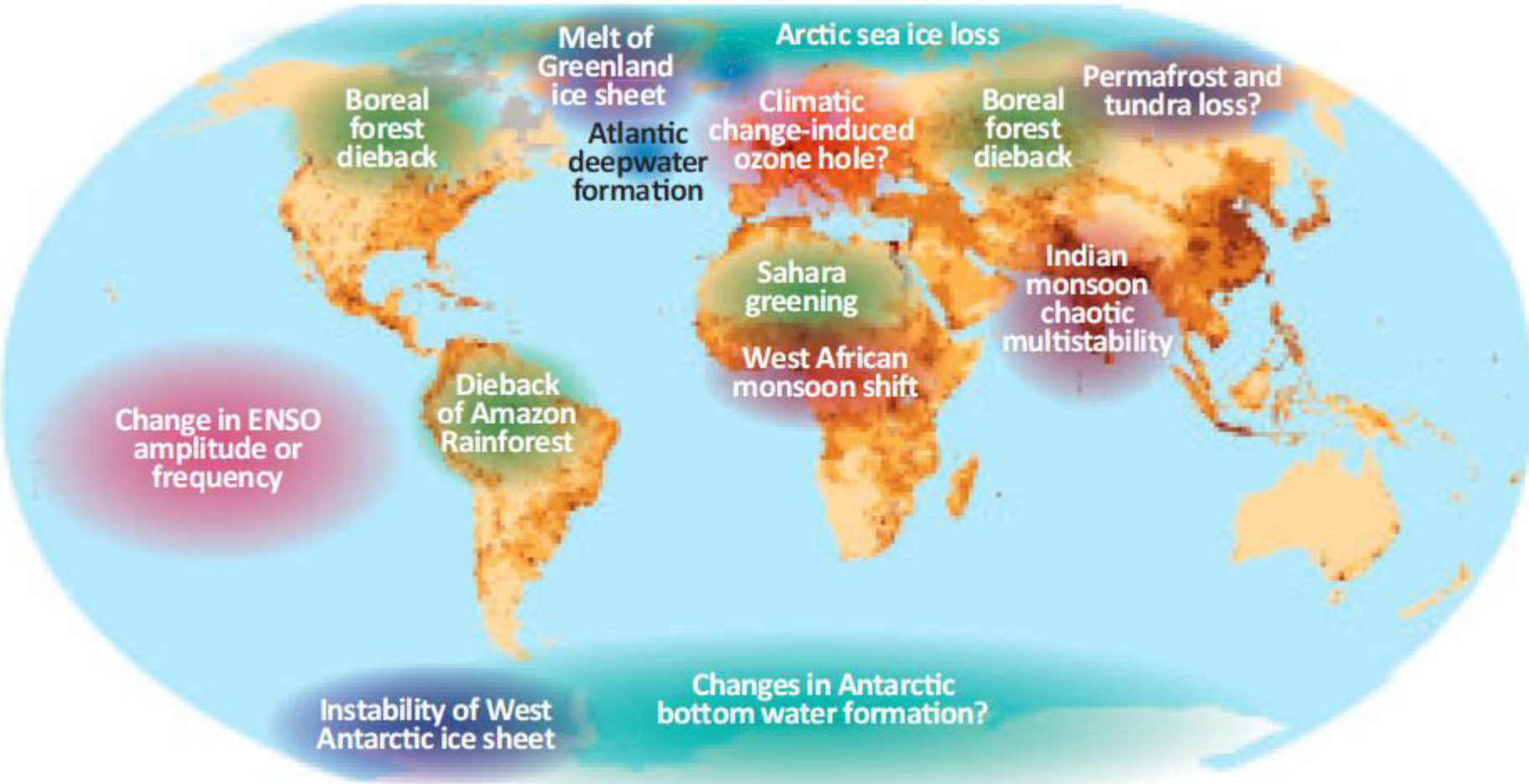
1. Research Question
2. Economics approach to CE
3. Political Science approach to CE
4. International Law approach to CE
5. Conclusion and Outlook

Anthropogenic Climate Change: From Uncertainty to Risk



- **Anthropocene:** Planetary era in which anthropogenic influences match or exceed natural influences.
- **Planetary Boundaries:** Some limits of the planetary system must be avoided (at all costs).
- **IPCC IV (2007):** Climate Change is causally related to anthropogenic influences, most notably CO₂-Emissions.
- **From Uncertainty to Risk:** Since the anthropogenic impact is known, today's behaviour regulates tomorrow's risks.

Figure 2.7: Map of large-scale tipping elements in the global climate system.



KEY: Persons per sq km



Robinson Projection

Quelle: Mabey et al. 2011: 43

Economic approaches

Economic theorizing: distinction between formal models and game theory

- **Formal theories:**

- defined by the method of theory construction and less by content of theories
- refers to use of mathematical models to derive propositions from a set of basic assumptions
- Mathematics help to ensure logical consistency among propositions
- intended to represent particular real-world situations and the use of mathematics to identify the specific solution (equilibria) for the models

- **Game theory:**

- defined by the situational character (interdependence) of the decision.
- refers to a set of techniques for analysing individual decisions, in situations where each player's pay-off depends in part on what the other players are expected to do.
- Games theory thus differs from formal decision theory theoretic approaches, which analyse individual utility maximization against an exogenous, noncalculating environment.

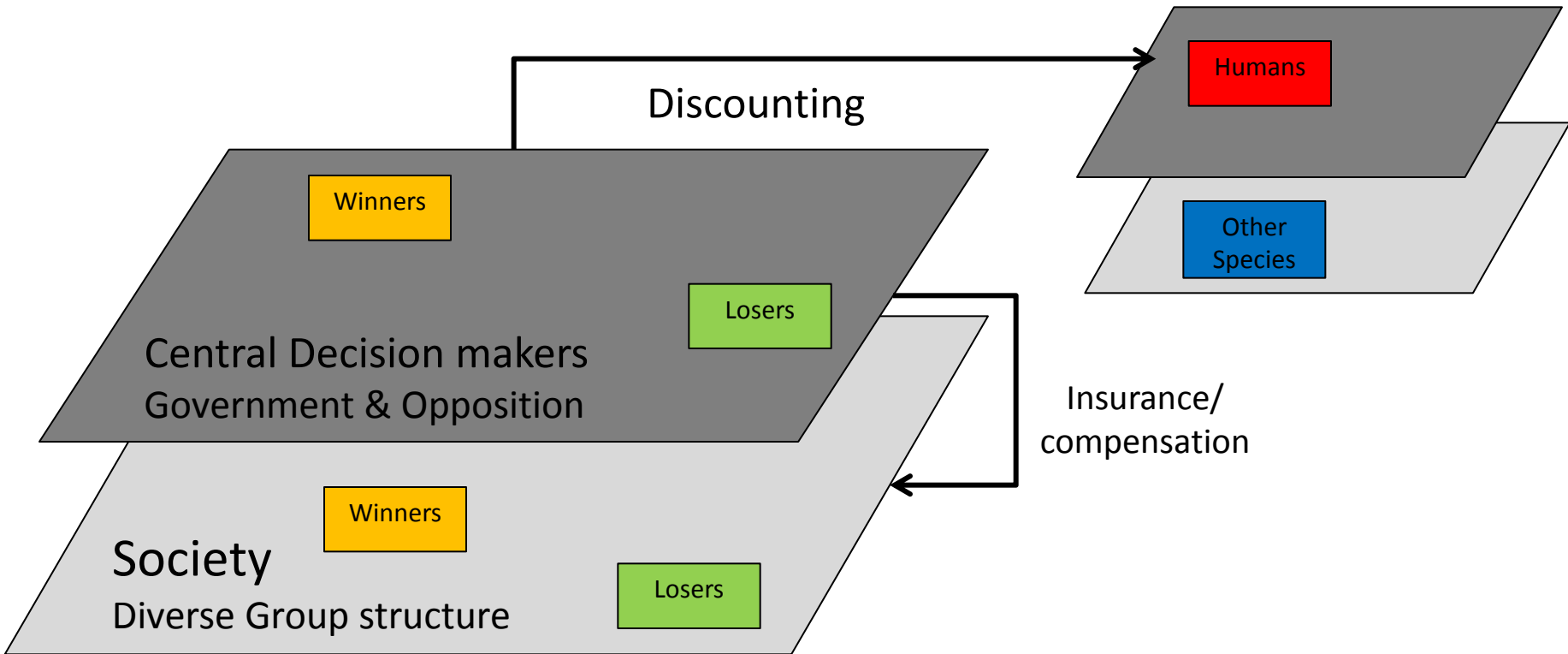
The discounting method

- A method to apply a value today to an investment that will only pay-off tomorrow.
- Dilemma: Aggressively transitioning away from fossil fuels entails relatively known costs in the near term; transitioning more slowly entails less well-known costs in the more distant future.
- Political implications: Different discounting rates result in different political strategies: in the Nordhaus-Stern debate on the discounting rate for today's climate mitigation efforts the range was 1,5 to 5 %, implying that aggressiveness today will most likely pay-off (Stern).
- Problems with economic cost-benefit analysis:
 - Cost/benefit is not distributed equally in current generation
 - Cost/benefit will not always improve everyone's situation (Pareto superior)
 - Cost/benefit may disadvantage current or future generations
 - Cost/benefit analysis does not address human/nature, human/other species distributions

Discounting and decision making structure

Presence

Future

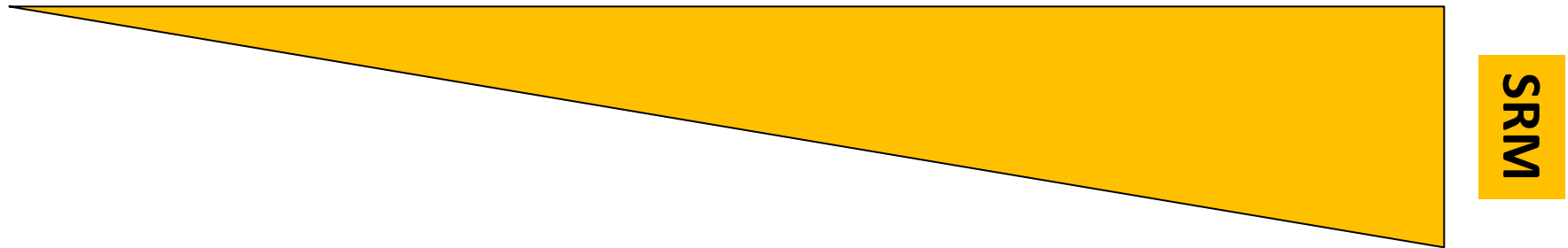


Climate Engineering techniques and moral hazard

Moral hazard refers to the tendency for insurance against loss to reduce incentives to prevent or minimize the cost of loss (*Baker 1996: 239*).

| | SRM | CDR |
|----------------------|--|---|
| Effectiveness | immediate effects on the climate system | removing CO ₂ from the air, slowly reducing global warming |
| Side effects | large regional climatic changes, affects on weather patterns and rainfalls, changing colour of the sky, etc. | unintended ecological consequences, biodiversity implications, ocean acidification, etc. |
| Incentives | unilateral deployment, methods are effective and inexpensive, no collective action problems | counter the risk of CO ₂ already in the air, CCS will reduce CO ₂ at source |
| | no further investments in mitigation or adaptation efforts | |

CE and abatement: a brief digest of their interaction



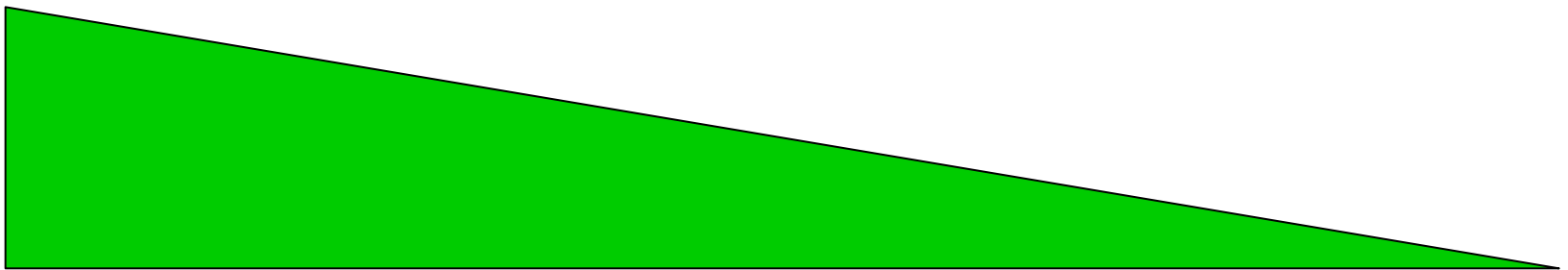
Moral Hazard

Moreno-Cruz
2009

Beneficial



Abatement



Unilateral SRM is likely: moral hazard is pending

„In contrast to emission reductions, this approach [Climate Engineering, d. A.] is inexpensive and can be undertaken by a single country, unilaterally“ (Barrett 2008: 45).

- a) CE-Measures exist that are so cheap and effective, that they are likely to be applied by a small group of states or even unilaterally.
- b) The cost of CE intervention are so low that the relative gains by other nations from the intervention are negligible
- c) There are no international legal limits to CE research, testing or application at this time.

Unilateral intervention is unlikely

- Unilateral SRM application is unlikely, because there are strong negative incentives. Separately, they may not be sufficient to suppress SRM application, summarily they do and they may even initiate collective action.
 1. Technical characteristics of SRM application reduce the benefits of unilateral application while the costs for respective counter measures remain stable.
 2. Other costs, beyond technical counter measures, may consist of trade sanctions, diplomatic isolation, sanctions across policy areas, or even the application of military force.

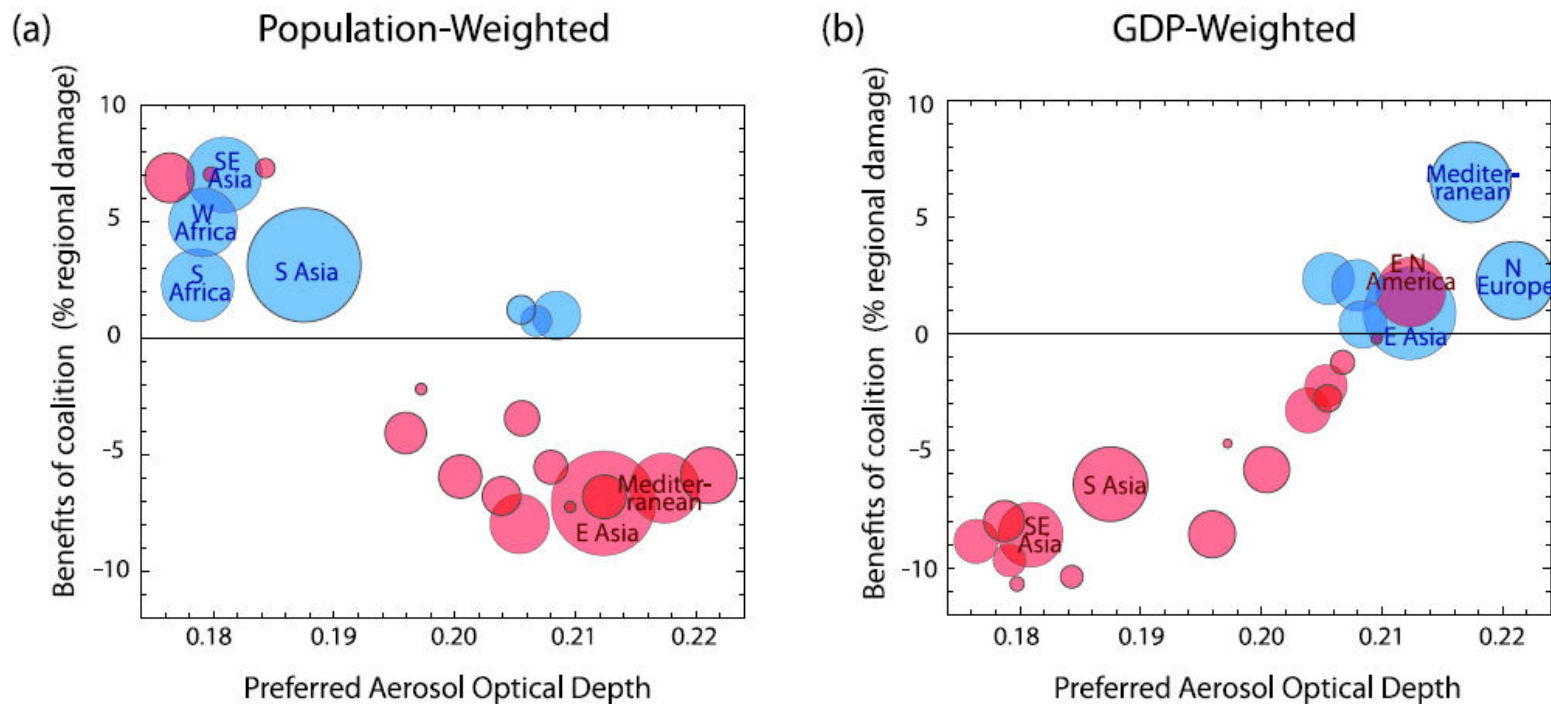
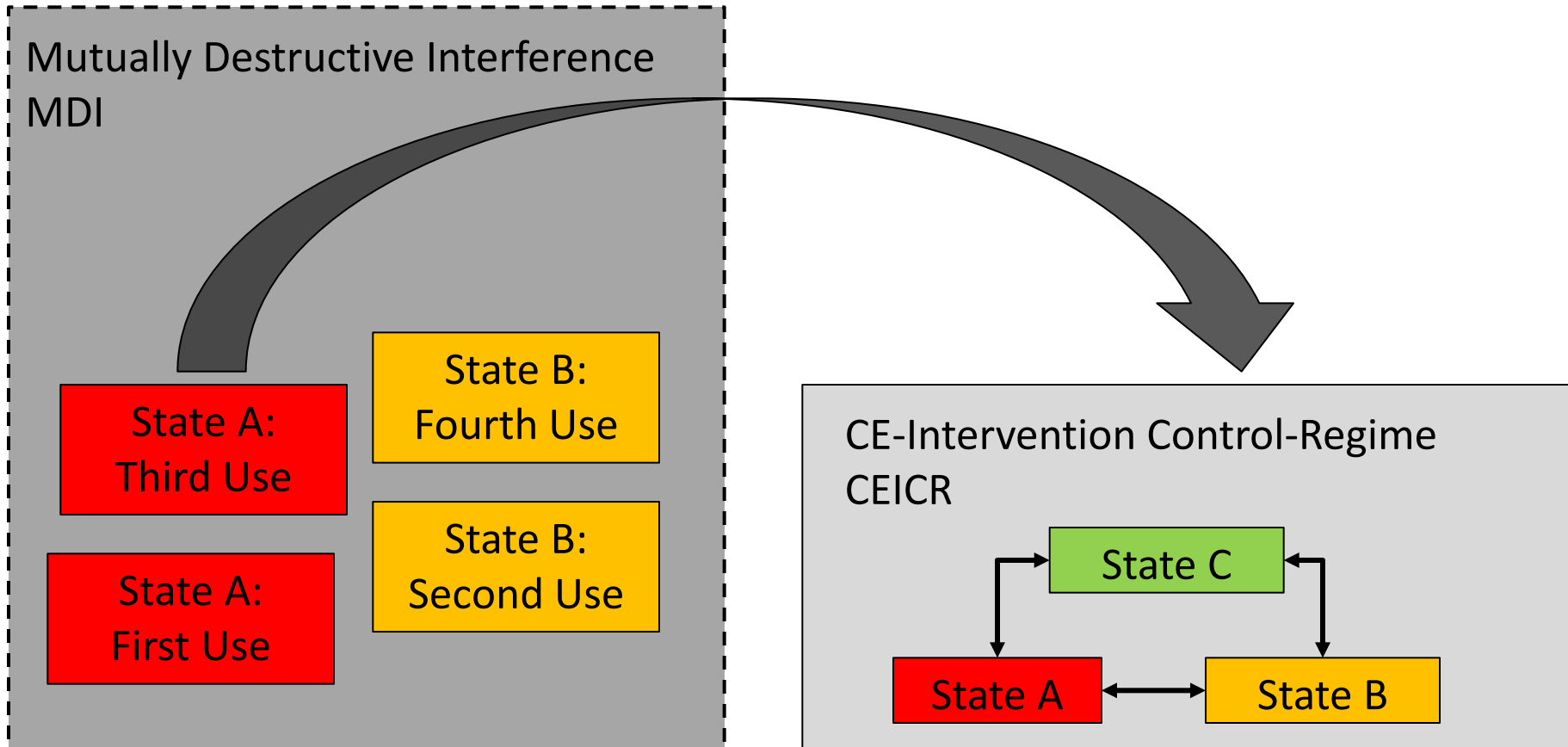


Figure 2. The benefits of exclusive coalition-implemented solar geoengineering relative to open membership by region in 2070. Benefits are displayed as per cent regional climate damages reduced, for coalitions formed under different power metrics. Regions are plotted by preferred amount of solar geoengineering (*x*-axis), with members of the winning coalition in blue and non-members in red. The size of each bubble is proportional to regional power. (a) Illustrates the results for a population-weighted power scheme and (b) shows the results for a GDP-weighted power scheme.

CE Policy Interdependence – Prisoner's dilemma and cooperative regime building

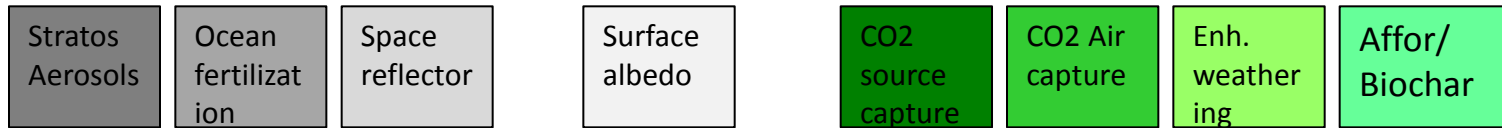


Political Science approaches

Risk in IR theory

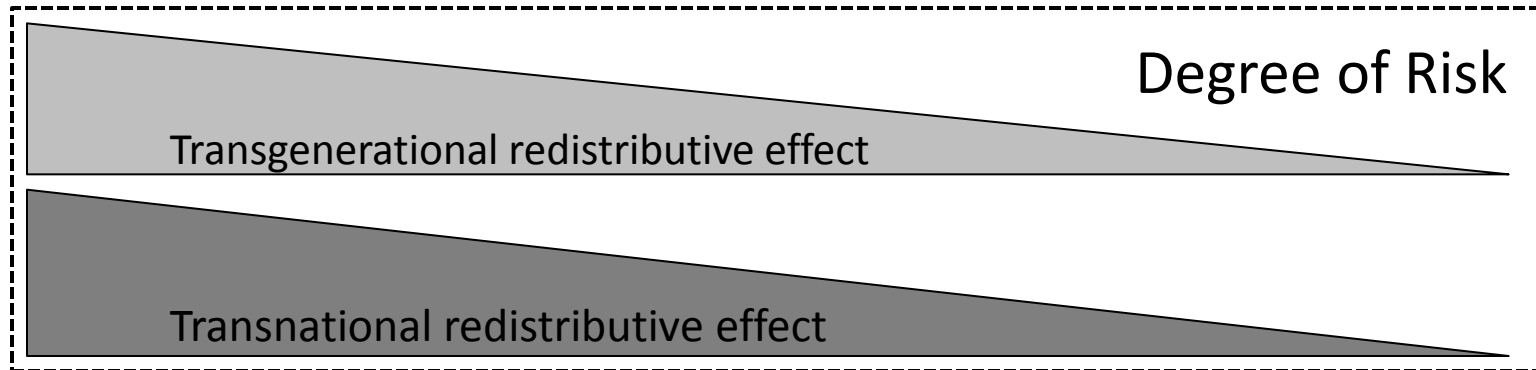
| | Realism | Rationalism | Soc. constructiv. |
|------------------------|---|---|---|
| Nature of reality | Objective + real | Objective + real | Soc. constructed, but intersubject. reified |
| Risk concept | Fear of predation : possibilistic | Ignorance about Cost/benefit probabilistic | Indeterminacy: what is appropriate? |
| Instruments | Power | Information | Norms/Identities |
| Learning | Realisation of objective truth | Updating of information to optimize utility | Take on identity: Socialization/ Persuasion |
| Situative structure | Prisoner's dilemma | Collective good: mixed motive g. | Game is open to interpretation |
| Regime building | Power deter- mines regime | Information + Credibility | Identity formation |

CE-Techniques: Risk and Regime building I

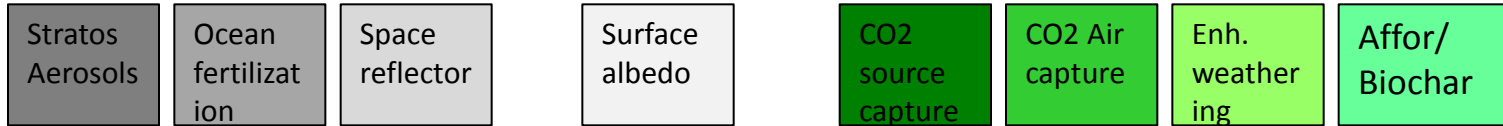


SRM

CDR

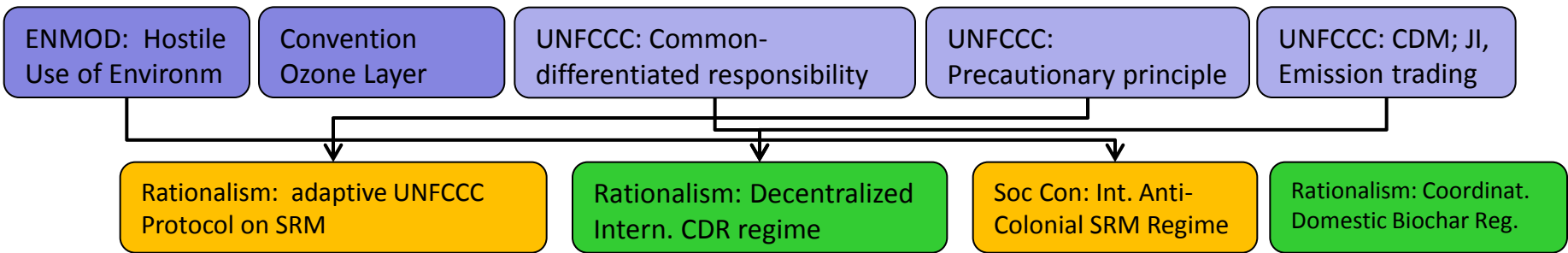
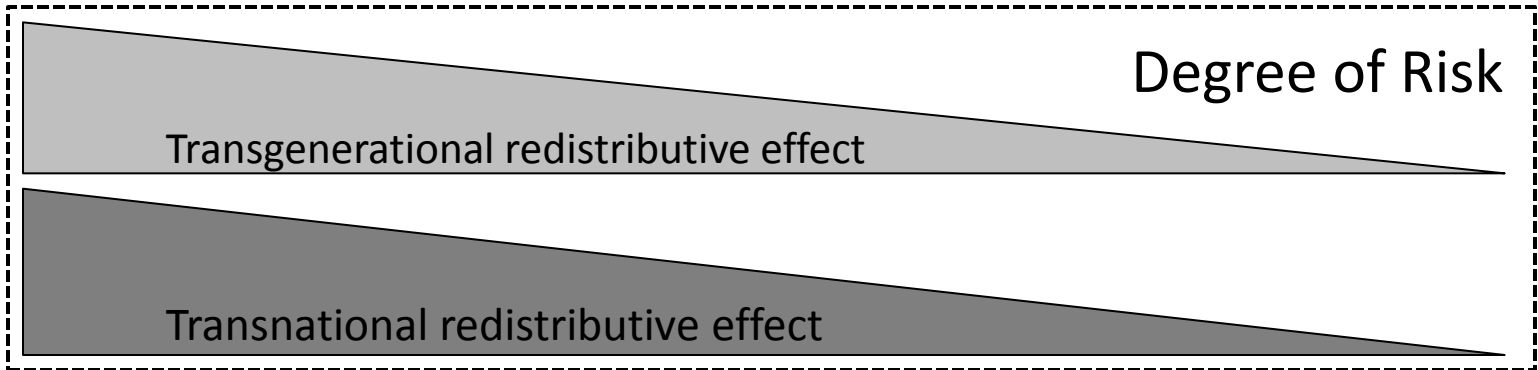


CE-Techniques: Risk and Regime building II



SRM

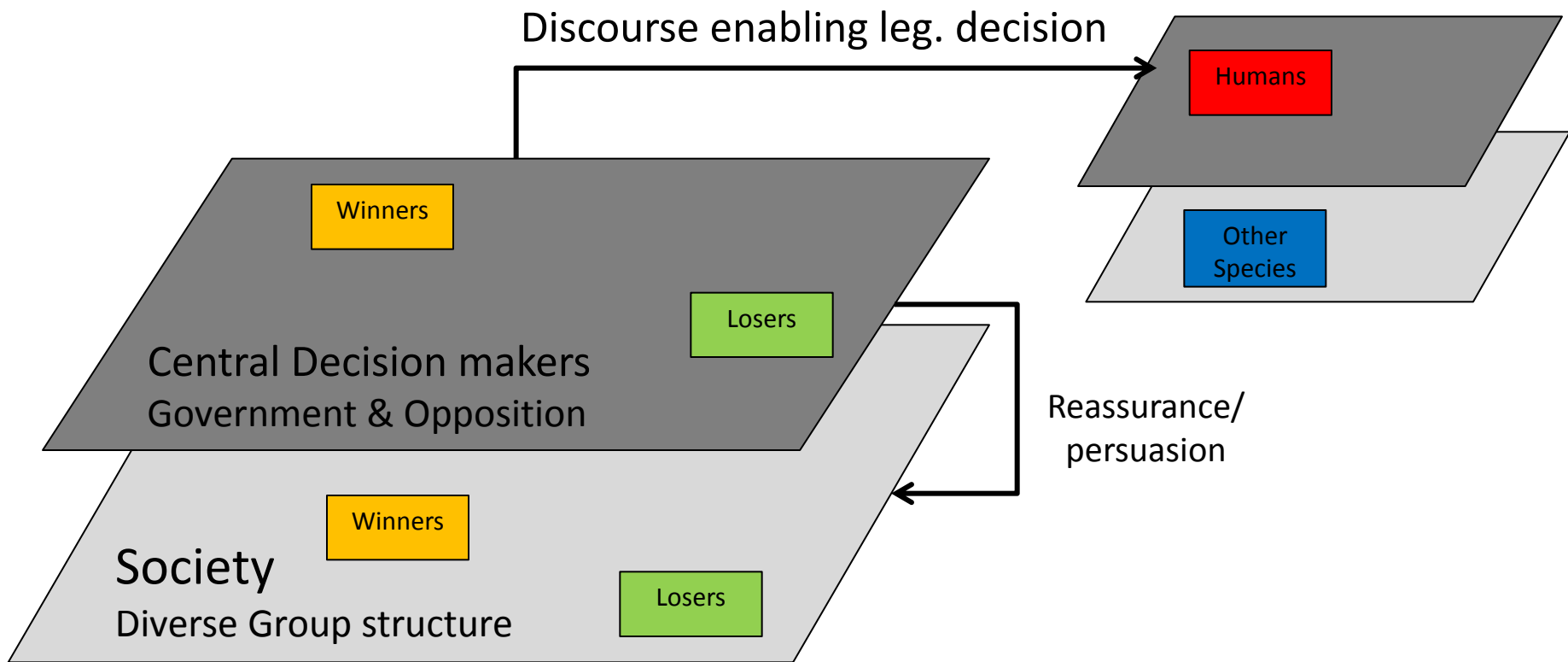
CDR



CE Discourse analysis: legitimating political decisions

Presence

Future



The CE discourse in the US, 2006-2010: approach

- Questions:
 1. What main pro and con arguments regarding the research on and implementation of CE technologies have been being used in the scientific, public and political spheres in the USA since 2006?
 2. Are arguments being used within each sphere reflected in the other spheres?
 3. Have the arguments being used in the three spheres changed/developed over time?
- Data set: 70 docs: 17 con-arg. (568)/16 pro (471) SRM research/deployment.
 - Scientific Scholarship: *Science, PNAS, Technology Review, Climatic Change, Solutions, Oceanography, The Review of Economics and Statistics, Foreign Affairs, Journal of Geophysical Research, Issues in Legal Scholarship, Physics Today, Bulletin of the Atomic Scientists, Journal of Economic Perspectives and The Environmental Forum.*
 - Scientific Conferences: *NASA Workshop on Managing Solar Radiation (April 2007), University of Montana workshop: The Ethics of Geoengineering with Solar Radiation Management, (October 2010), Annual Meeting of the American Political Science Association (Sept. 2009), The Asilomar Conference: Recommendations on Principles for Research into Climate Engineering Techniques (November 2110)*

The CE discourse in the US, 2006-10: Main arguments

- **Pro research**

- The **‘need for knowledge’ argument**
- The **‘control through knowledge’ argument**

- **Pro deployment**

- The **“insurance policy” argument,**
- The **“mitigation failure” argument**
- The **“buying time” argument**

- **Contra research**

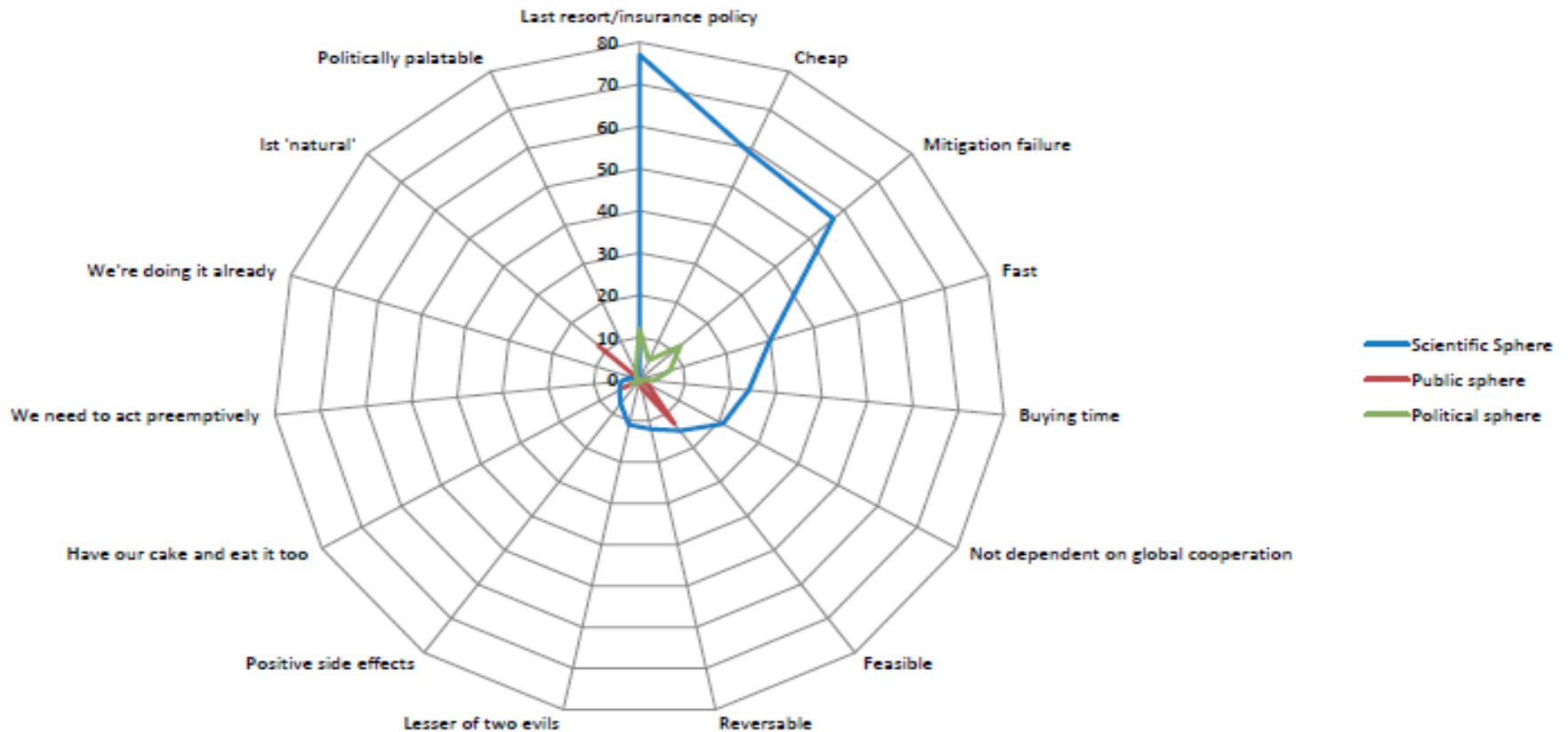
- The **“moral hazard”**
- The **“testing problems” argument**
- The **“unilateral deployment” argument**

- **Contra deployment**

- The **“negative side effects” argument**
- The **“unknown unknowns” argument**
- The **“conflict potential” arguments**

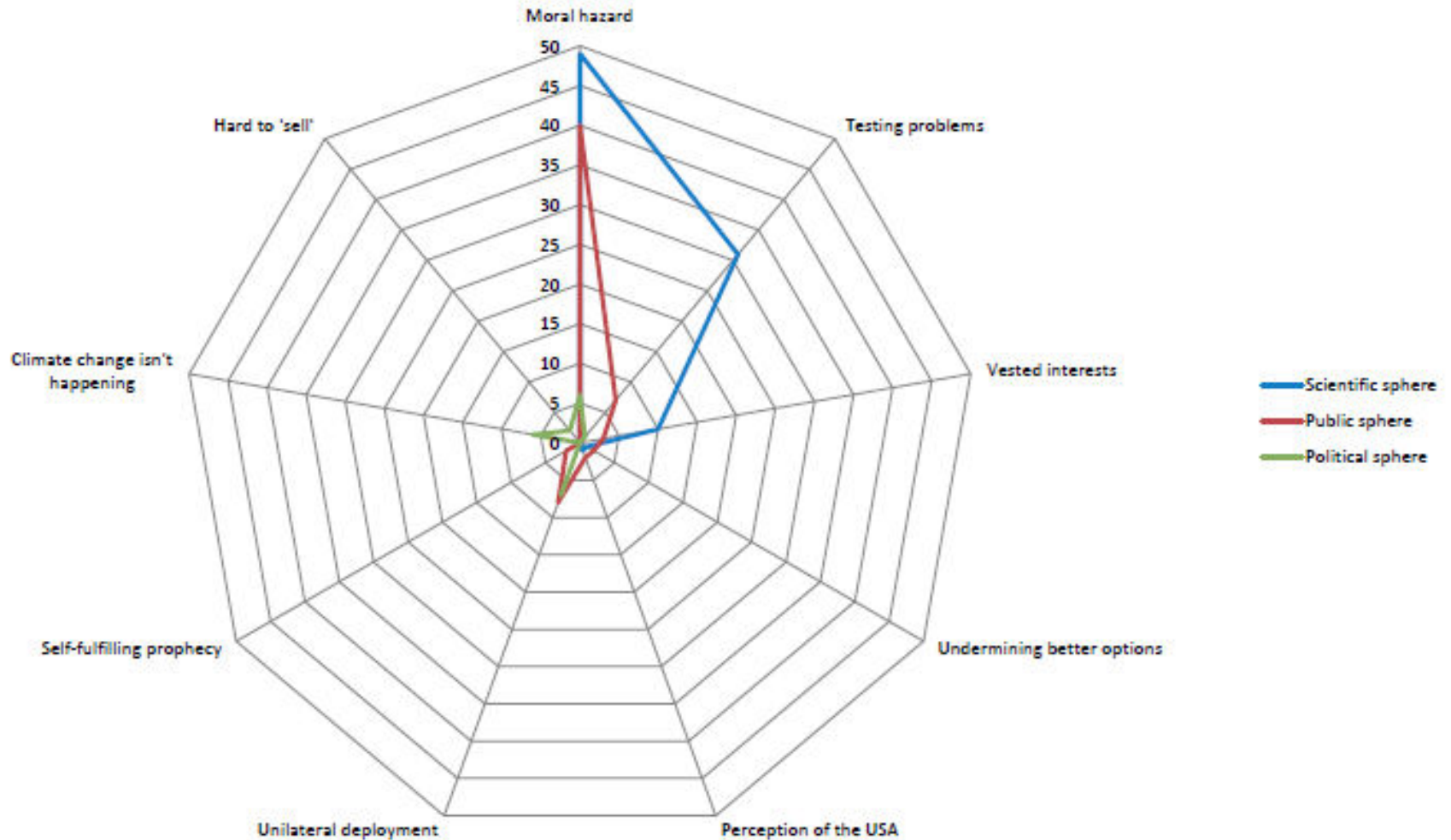
The CE discourse in the US 2006-10: Findings

Comparison of pro-deployment arguments

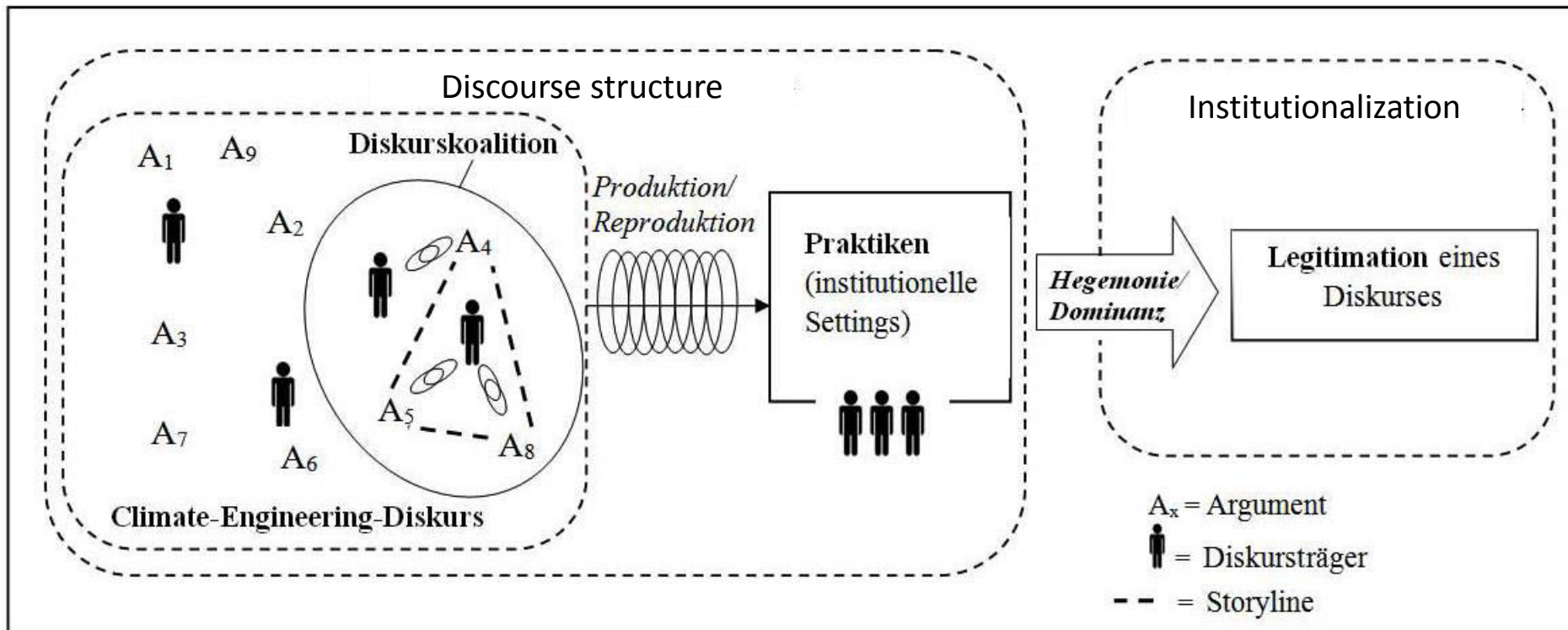


The CE discourse in the US 2006-10: Findings

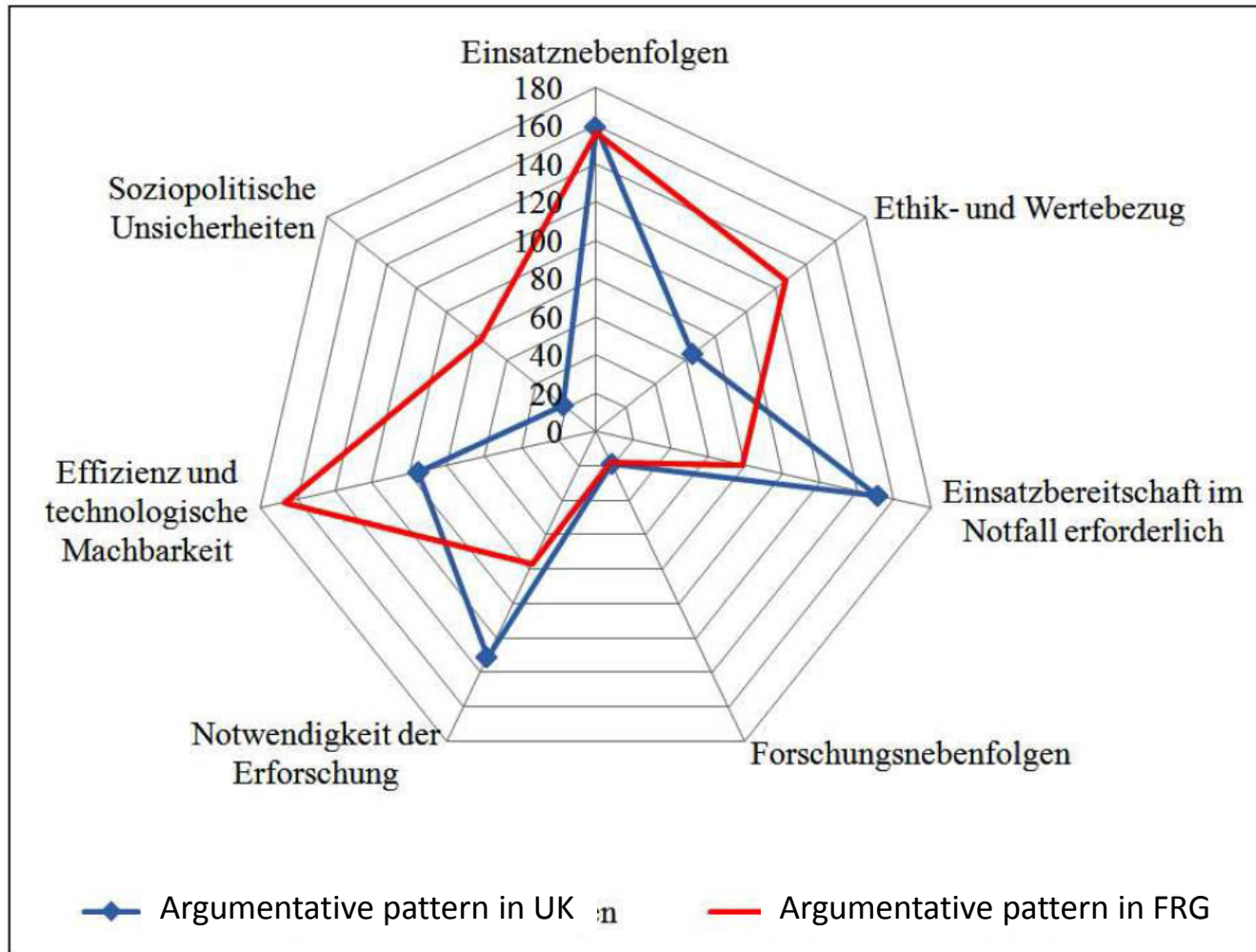
Comparison of contra-research arguments



Climate Engineering discourse and CE research

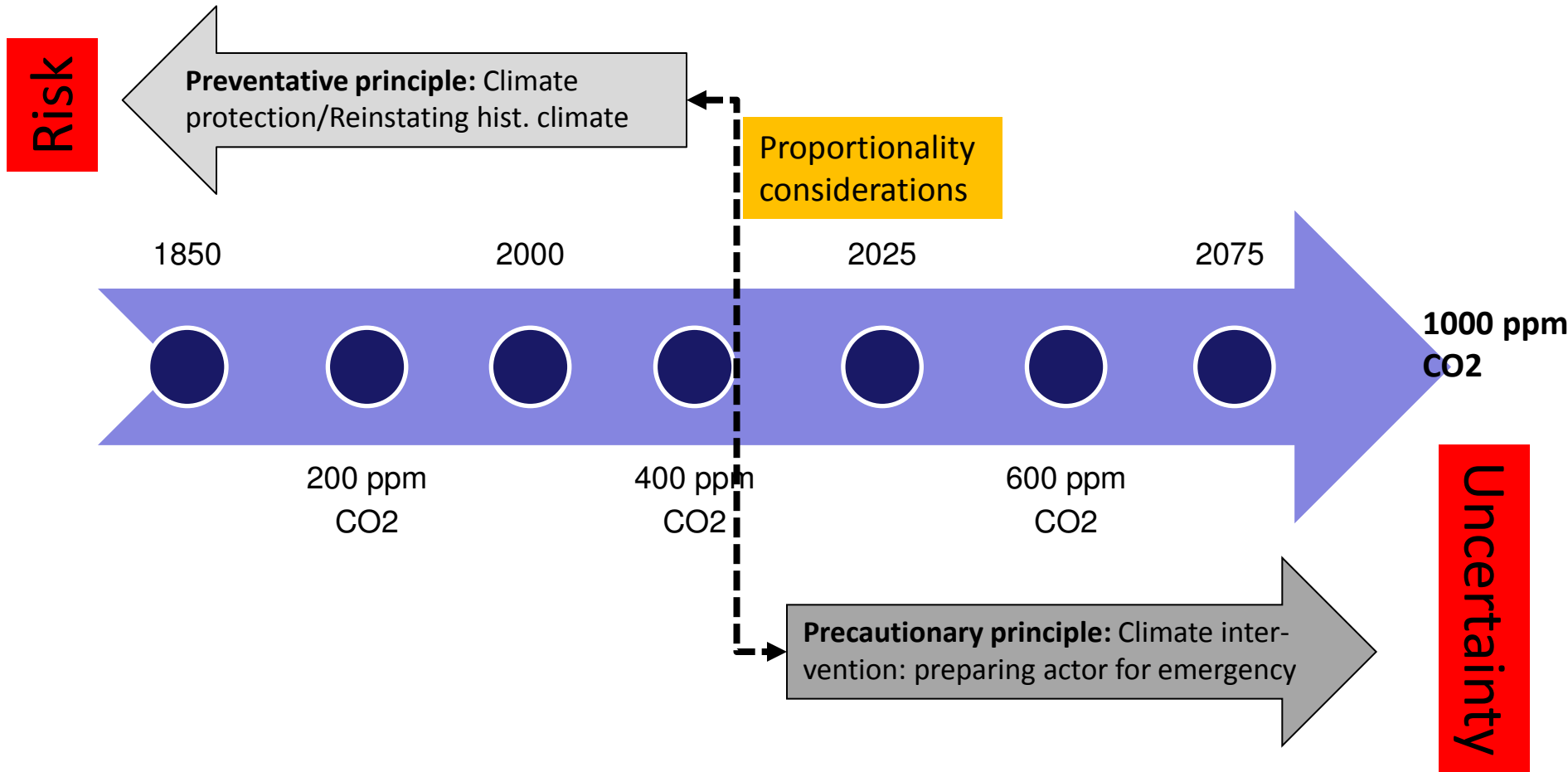


Uther 2013: Comparing UK and German CE discourses



International Law approaches

Int Law and Intl Relations in dialogue: preventative vs. precautionary principle



Conclusion

Some hypothesis on interdisciplinary dialogue

1. There is no inherent incompatibility between disciplinary theoretical aspirations to understand/explain CE behavior:
 - Economic approaches focus on logical consistency and therefore prefer fixed interests/preference orders
 - Some IR approaches relax fixed assumption and therefore prefer discursive detection of legitimizing speech acts.
2. Central concepts of the CE debate must be understood in their disciplinary (assumption-based) context to account for their policy implications:
 - Moral hazard: NO MH occurs if unintended consequences of SRM application (termination problem) are neglected.
 - Precautionary principle: a standard IL interpretation implies that „arming for an (un)known future“ may be as legitimate as preserving a past that is known.

CE-Regime typology: Positions in the debate 2011

| Approach | Protagonist | Logic | IL conformity |
|------------------------|---|---|---|
| Uni-/minilateral | Schelling 1996; Barrett 2008, Victor 2008; Millard-Ball 2011 | Efficiency and low cost provide huge incentive | No intl legal obligations |
| Multilateral Treaty | Bodansky 1996; Lin 2009; Virgoe 2009; Banerjee 2011 | Unblock the UN based-Kyoto regime | Compatibility with specific IL is problematic |
| UN-based | Lin 2009; Royal Society 2009; Virgoe 2009; Humphrey 2011 | High Legitimacy + limit unintended consequences | Compatibility with UNFCCC |

Opening the 'window of responsibility': a new approach to SRM testing

