Fall Term - 2013

Woodrow Wilson School 585b

Living in a Greenhouse: Technology and Policy

Robert Socolow

Phil Hannam, AI

Week Seven: October 21, 2013

International Governance and Cooperation

Evolution

Slime molds cooperate to survive.

Is it necessary for humans to cooperate to save the planet?

[John Bonner, Princeton]

Local problem → Locally-focused policy

Global problem → Globally-focused policy

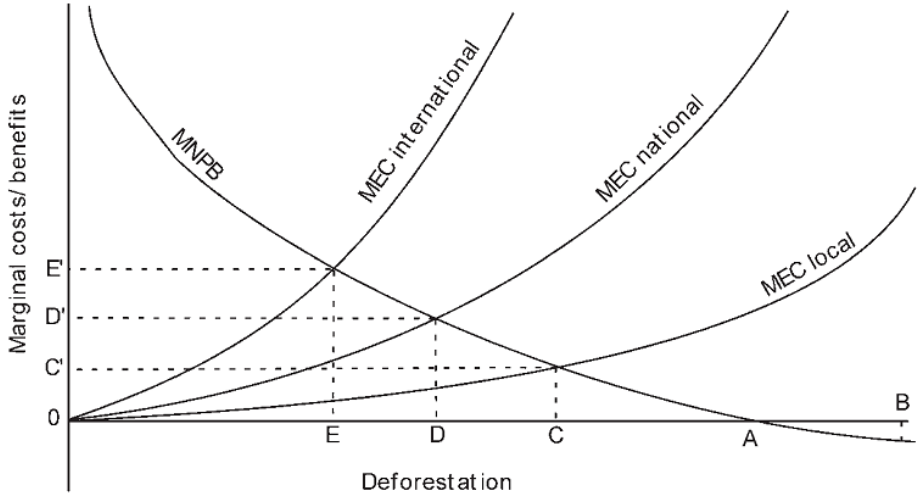


Figure 23.1 • Marginal costs and benefits of deforestation at different spatial levels. Curve MNPB shows the marginal net private benefits of deforestation to farmers on the Atherton Tablelands. This curve accounts for the cost of lost ecosystem services that directly benefit the farmer. Through ignorance, farmers initially cleared amount OB of forest, while had they been better informed, they would have cleared amount OA. Marginal external costs of deforestation are shown for local, national, and international society, along with the corresponding optimal levels of deforestation: C, D, and E, respectively.

[Daly and Farley 2003]

Global “Governance”

- Assumptions of IR Scholars
  - Cannot invent international government
  - Consent of major players always required
  - International cooperation ≠ harmony

Logic of Collective Action

- "Unless the number of individuals in a group is quite small, or unless there is coercion or some other special device to make individuals act in their common interests, rational, self-interested individuals will not act to achieve their common or group interests."

[Mancur Olsen 1965]

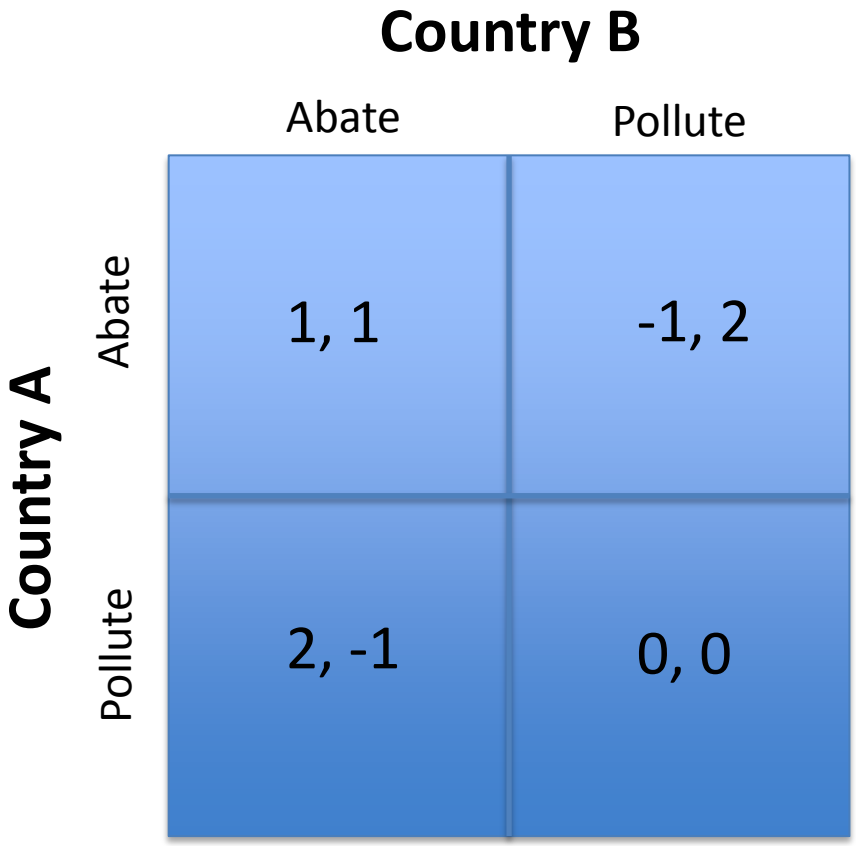
Logic of Collective Action

- Three models:
  - Individuals in large groups have difficulty overcoming rational incentives to free ride while others bear the costs of supplying non-excludable public goods (Mancur Olsen 1965)
  - Tragedy of the commons (Hardin 1968);
  - The two-actor non-cooperative game of Prisoner's Dilemma;

Inefficient outcome

[Ostrom 1992]

Why is cooperation difficult?



Logic of Collective Action

- *Is cooperation possible?*
  - Smaller groups (Oye 1986)
  - Iterated play and reciprocity (Axelrod 1984)
  - Create institutions (Keohane 1982, 1984)
    - Side payments
    - Issue linkages
    - Regularized procedures and rules contribute to flow of information and development of trust
    - Monitoring
  - Make agreements "self-enforcing" (Barrett 2003)
    - Change incentives such that it is in the state's interest to comply (sanctioning, grim trigger). Participation challenges
  - Create thresholds to reduce brinksmanship (Fearon 1998, Barrett and Dannenberg 2013)

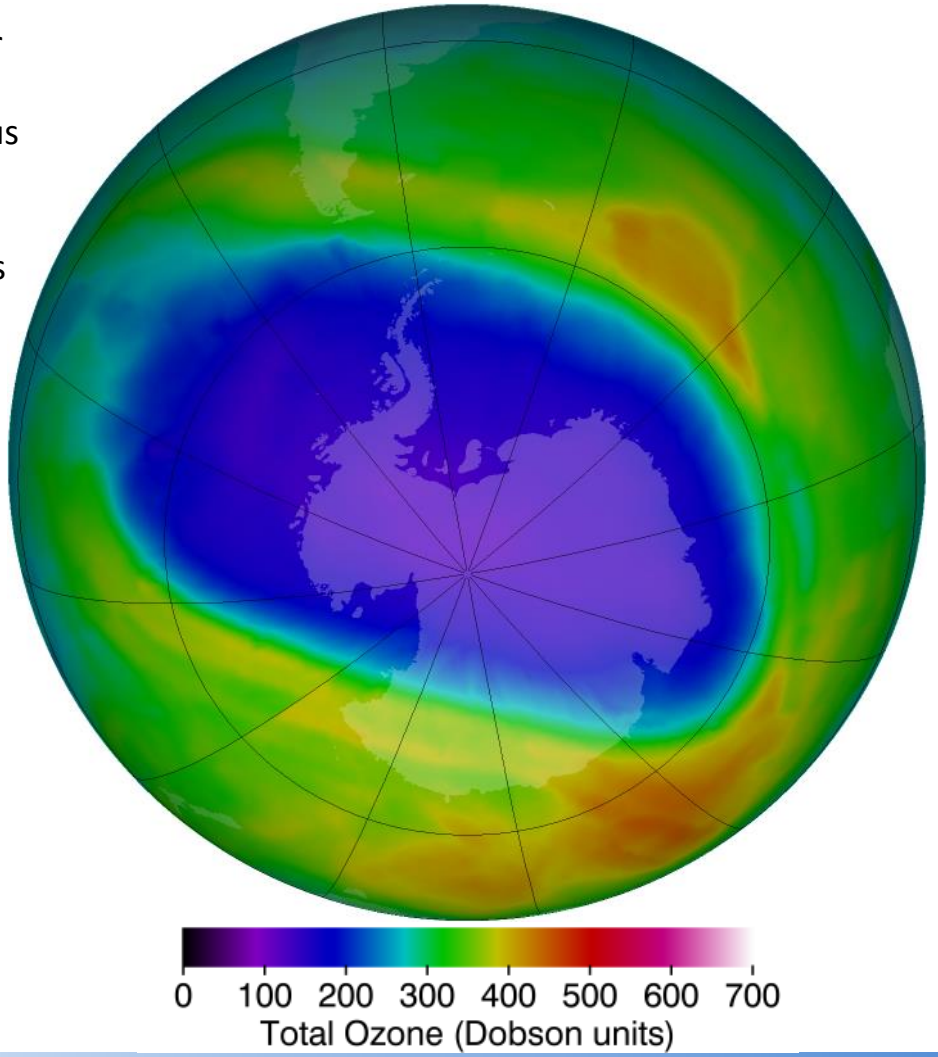
Montreal Protocol

"I am pleased to sign the instrument of ratification for the Montreal protocol [governing] substances that deplete the ozone layer. The protocol marks an important milestone for the future quality of the global environment and for the health and wellbeing of all peoples of the world. Unanimous approval of the protocol by the Senate on March 14th demonstrated to the world community this country's willingness to act promptly and decisively in carrying out its commitments to protect the stratospheric ozone layer . . ."

-- President Ronald Reagan

"I oppose the Kyoto Protocol because it . . . would cause serious harm to the U.S. economy. The Senate's vote, 95-0, shows that there is a clear consensus that the Kyoto Protocol is an unfair and ineffective means of addressing global climate change concerns."

-- President George W. Bush



[NASA Ozone Hole Watch, 25 Sept 2013; Sunstein 2006]

Agreement structures

Participation geometry

Legal Status of commitments	Clubs	Universal Access
Non-Binding	- G8 and G20 - Asia-Pacific Platform - North Sea Pollution	- Technical standards (Int'l standards Organization)
Binding	- WTO/GATT - Strategic arms control treaties	- Montreal - Kyoto

[Victor, Lecture 14 Jan 2009]

Agreement strength

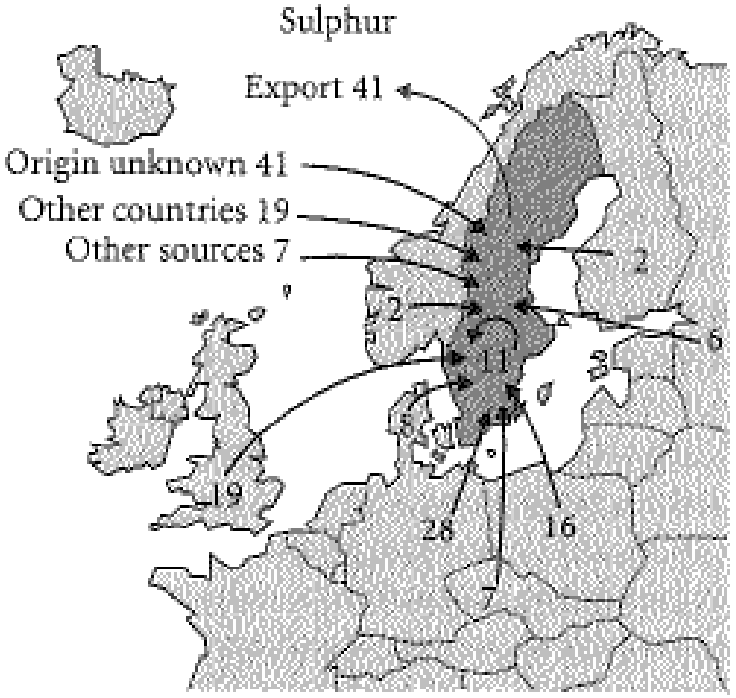
- Three dimensions of agreement strength:
  - **"Obligation"** legally binds actors by rules or commitments under international law, and/or domestic law.
  - **"Precision"** specifies that rules are unambiguous in specifying the conduct required, authorized or proscribed.
  - **"Delegation"** specifies that third parties have been granted the authority to implement, interpret, and apply the rules, and in some cases to make further rules and resolve disputes.

Soft law versus hard law

[Abbott and Snidal 2000]

Participation and Compliance

Example:
Long-Range Transport of Air Pollution (LRTAP)



Sweden receives large quantities of acidifying sulphur dioxide from other countries. Figures for 1997, expressed as thousands of tonnes of sulphur. Source: EMEP Report 1/99.

Figure 1.1. *Flows of acidfying sulfur emissions to and from Sweden, 1997 (thousand tons of sulfur)*

Source: Swedish Environmental Protection Agency (1999).

[Barrett, 2003, Environment and Statecraft]

Participation and Compliance

Example: Long-Range Transport of Air Pollution (LRTAP)

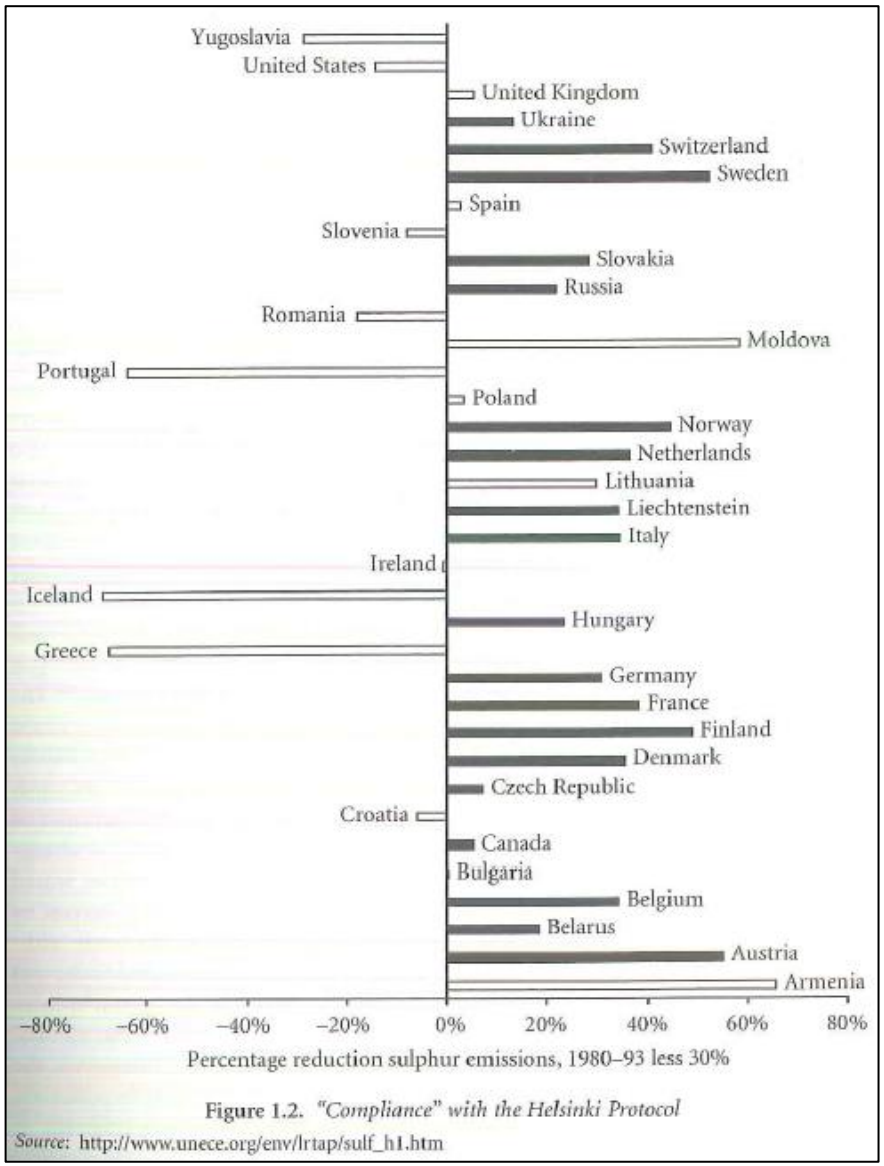


Figure 1.2. *"Compliance" with the Helsinki Protocol*

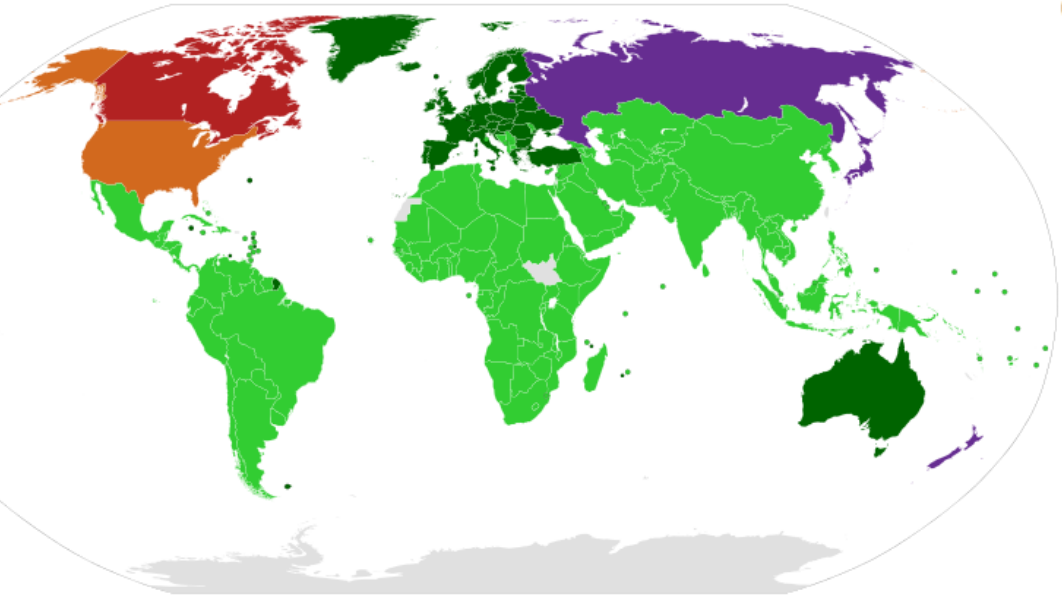
Source: http://www.unece.org/env/lrtap/sulf_h1.htm

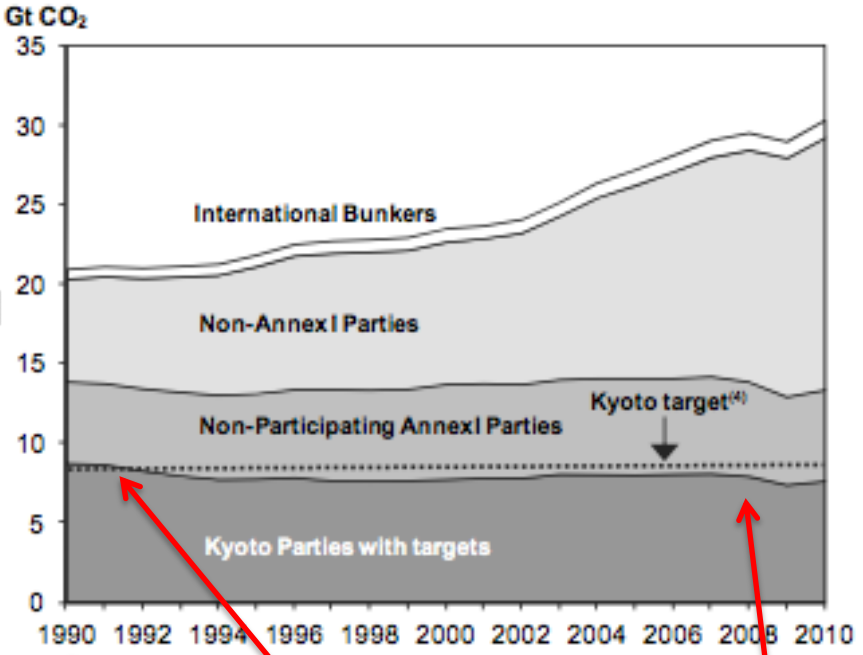
[Barrett, 2003, Environment and Statecraft]

Key Points in Climate Negotiations

- 1972: Stockholm Conference
- 1977-late 80's: Rising prominence in the U.S.
- 1988: Toronto Conference
- 1992: UN Conference on Environment and Development (Rio)
- 1995: COP-1 (Berlin)
- 1997: COP-3 (Kyoto)
- 2001: COP-6 (Berlin)
- 2007: COP-13 (Bali)
- 2009: COP-15 (Copenhagen)

Kyoto Protocol





- Parties; Annex I & II countries with binding targets
- Parties; Developing countries without binding targets
- States not Party to the Protocol
- Signatory country with no intention to ratify the treaty, with no binding targets
- Countries that have denounced the Protocol, with no binding targets
- Parties with no binding targets in the second period, which previously had targets

Fall of Soviet Union

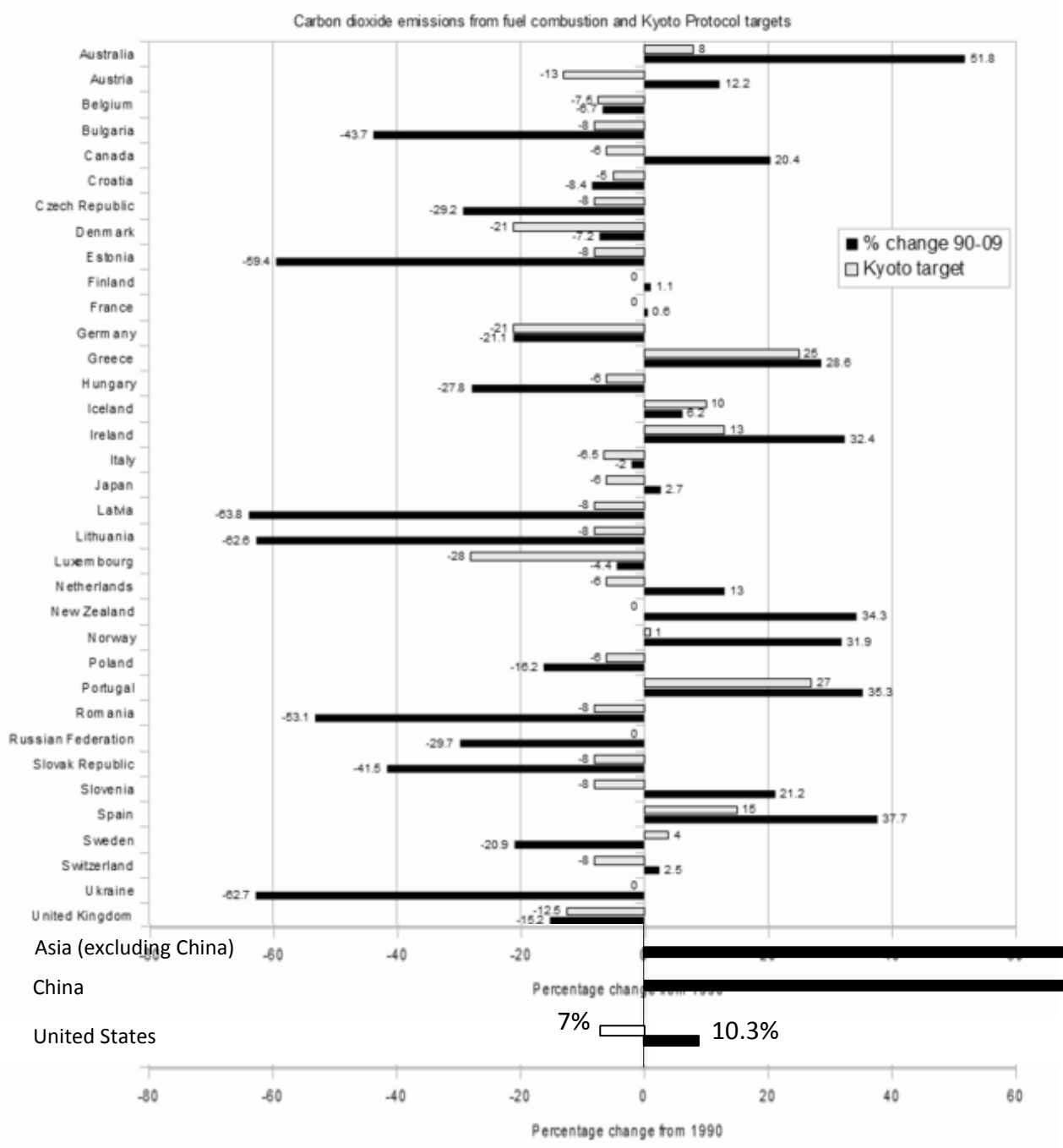
Financial Crisis

Baseline year

[Wikipedia (Kyoto Protocol), IEA 2012]

Kyoto Protocol

Compliance



[Wikipedia plotting IEA 2012, with my modifications]

Regime Complex

[Keohane and Victor 2010]

Required readings for Week 8 Energy efficiency and bioenergy (1 of 2)

Foresight (2011) *The Future of Food and Farming: Challenges and Choices for Global Sustainability*, Executive Summary.

Burney et al. (2010) "Greenhouse gas mitigation by agricultural intensification", *PNAS*

Shindell et al. (2012) "Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security", *Science*

Gillingham, K., Newell, R., & Palmer, K. (2006). Energy efficiency policies: a retrospective examination. *Annu. Rev. Environ. Resour.*, *31*, 161-192.

Searchinger et al. (2008) "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change," *Science*

Required readings for Week 8 Energy efficiency and bioenergy (2 of 2)

Beddington et al. (2012) "What next for Agriculture after Durban?", *Science*

Crutzen et al. (2008) "N_2O release from agro-biofuel production negates global warming reduction by replacing fossil fuels," *Atmospheric Chemistry and Physics*

Smil V. (2001) *Feeding the World*, The MIT Press, Chapter 1

Clapp J. (2003) "Transnational corporate interests and global environmental governance: negotiating rules for agricultural biotechnology and chemicals," *Environmental Politics*, 12(4):1-23.

Smith K. (ed.) (2010) *Nitrous oxide and climate change*, Earthscan

Recommended readings for Week 8 Energy efficiency and bioenergy

Edward Abbey, 1985, Desert Solitaire. Ballantine Books. Read sections "The First Morning" (pp. 1-7) and "Polemic: Industrial Tourism and the National Parks" (pp.45-67).

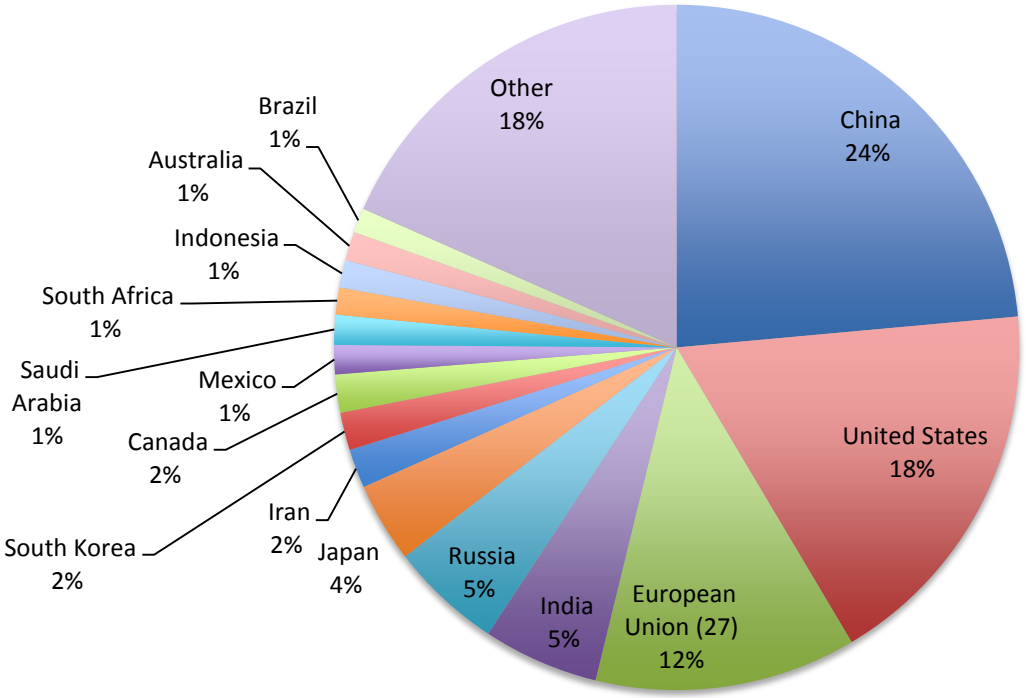
Aldo Leopold, 1949/2001, A Sand County Almanac. Oxford University Press. Read section "Land Ethic" on pages 201-226.

John McPhee, 1971/1980, Encounters with the Arch-Druid. Farrar, Straus and Giroux. Read Part 3: A River (~60 pages).

Club agreements

Club agreements

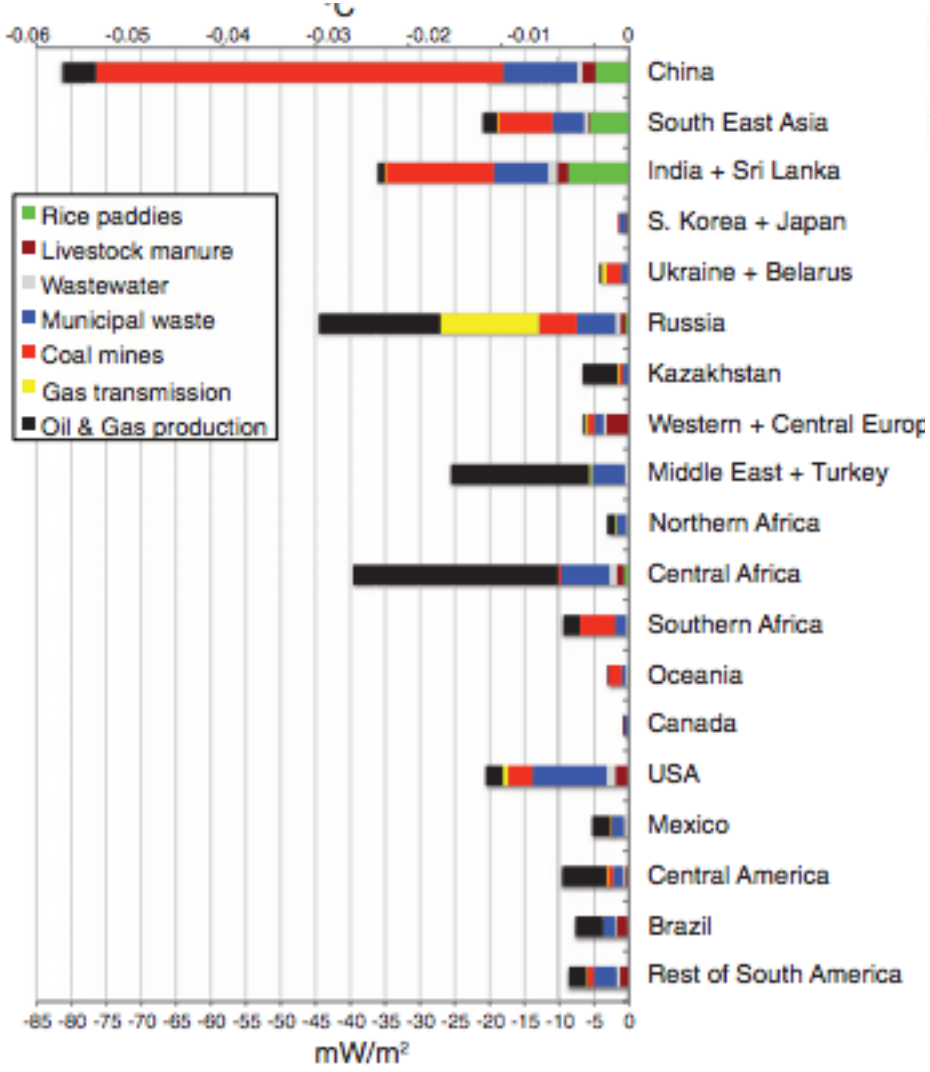
Global emissions shares

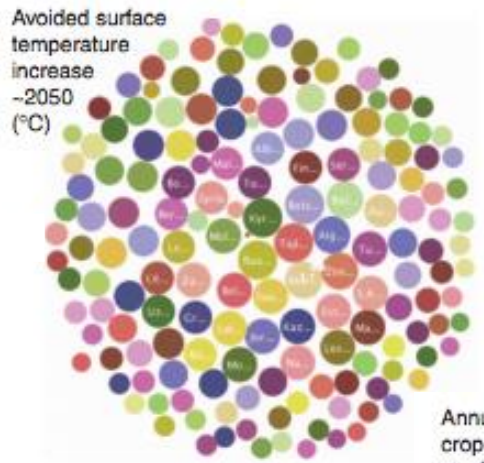


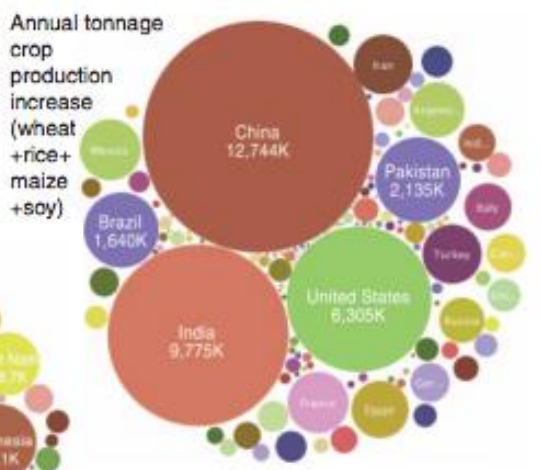
14 Top emitters + EU27 constitute 82% of global emissions

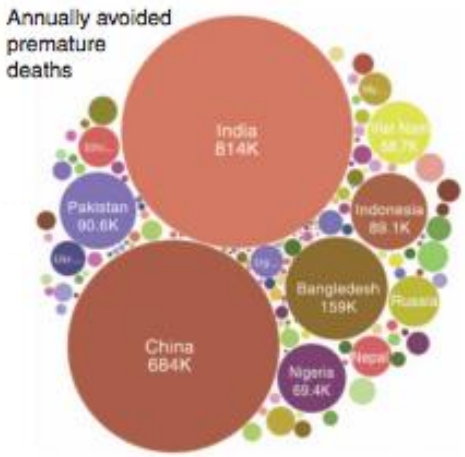
[EIA 2010 Sectoral Emissions]

Club Theory – a cobenefits approach





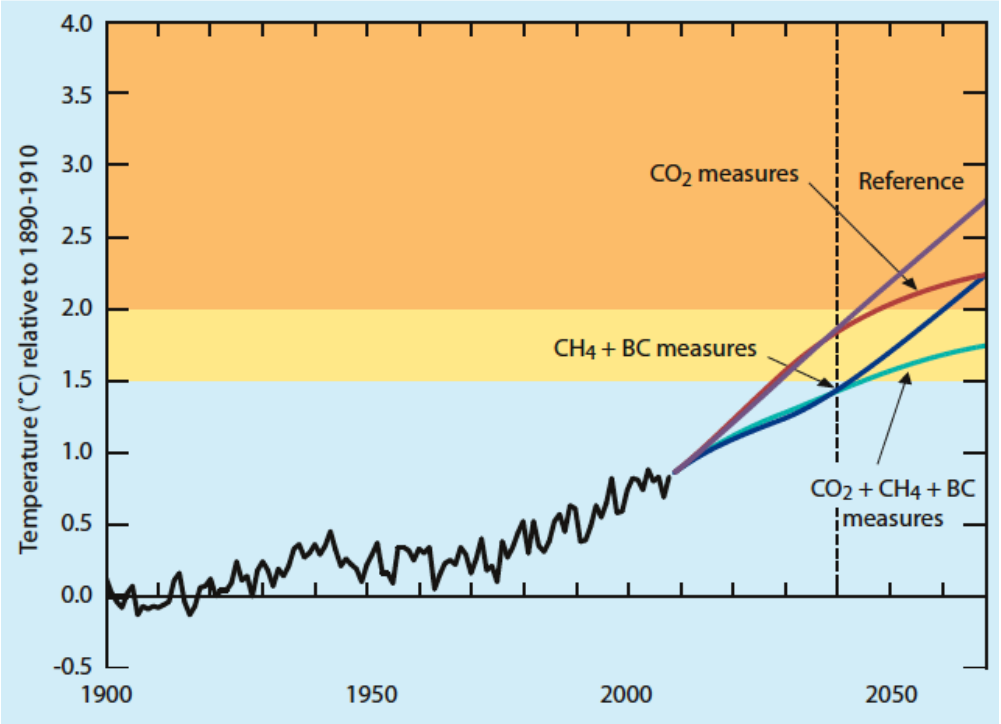




Club Theory

Climate and Clean Air Coalition

- Reduce methane, black carbon and HFCs
- Prevent 0.7-4.6 million premature deaths, loss of 21-57 million tonnes of crops by 2030
- Identify low-cost and high-benefit projects
- "Club" has grown from 6 to 26 countries in 14 months



Can such a "club" unlock cooperation within the climate regime?

[Shindell et al 2012]

Motivation and Club Theory

Climate and Clean Air Coalition

- Obligation: Non-binding, voluntary
- Precision: Focus on non-CO2 gases, prioritized sectors
- Delegation: Demand driven; growing club (6 countries, 25% methane emissions)
- Epistemic groups [Haas 1992]
- Leverages competitive demand-driven market for scarce financing
- Little funding!

Asia Pacific Partnership

- Obligation: Non-binding, voluntary
- Precision: Focus on sectors and sponsored technologies, not gases
- Delegation: Supply driven; set membership (6 countries, 50% emissions)
- Highly funded!

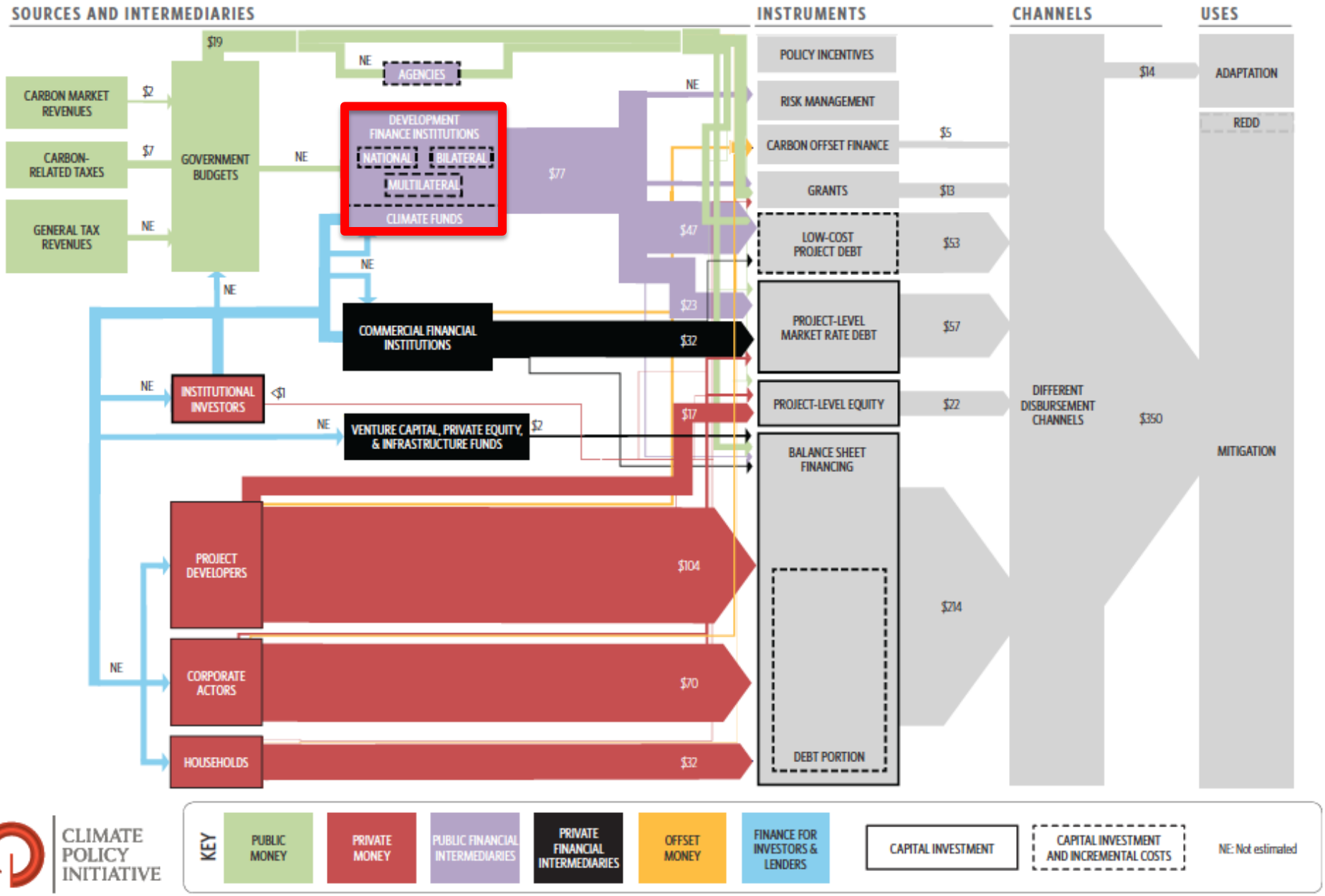
[applying Abbott and Snidal 2000]

Climate Finance

Montreal Protocol Multilateral Fund

- A model for international financial transfers for climate?
- Is the matriculation model of Montreal appropriate?

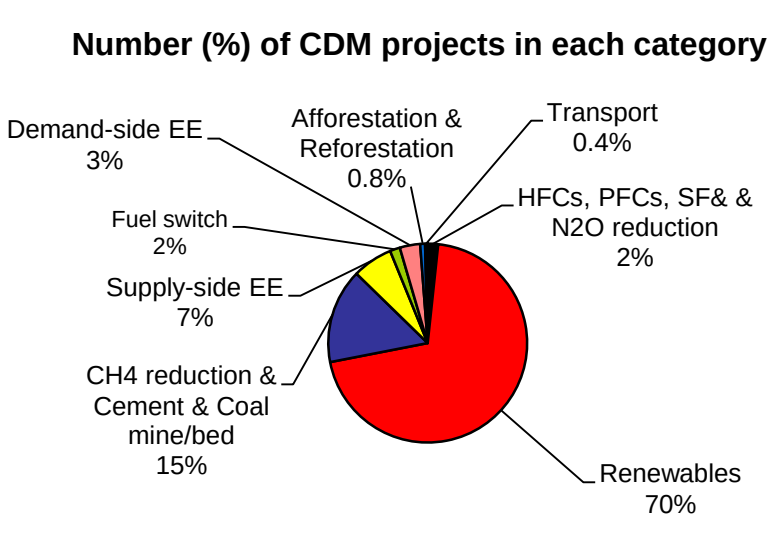
Landscape of Climate Finance (CPI 2012)

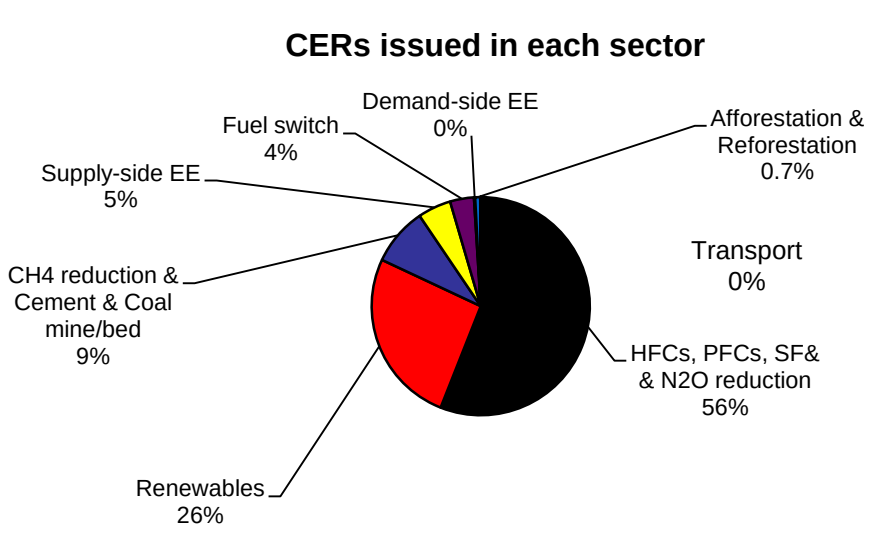


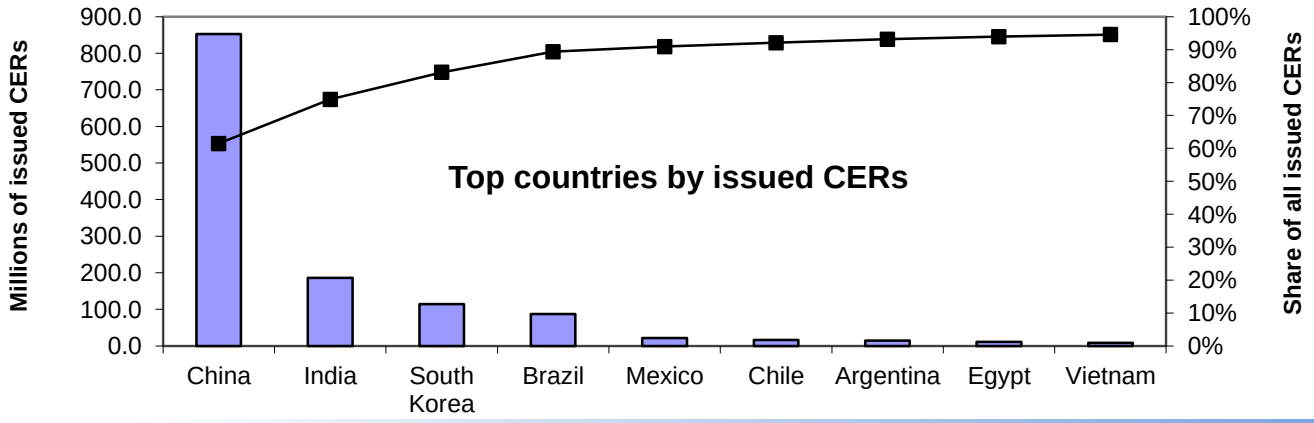
CLIMATE POLICY INITIATIVE

Kyoto Flexible Mechanisms

Clean Development Mechanism







[CD4CDM 2012, Wara 2007]

International Cooperation Outlook

Decentralized negotiations:

- Clubs and bilateral arrangements
- Use of existing institutions (WTO, MDBs, etc)
- Co-benefits approach to reductions

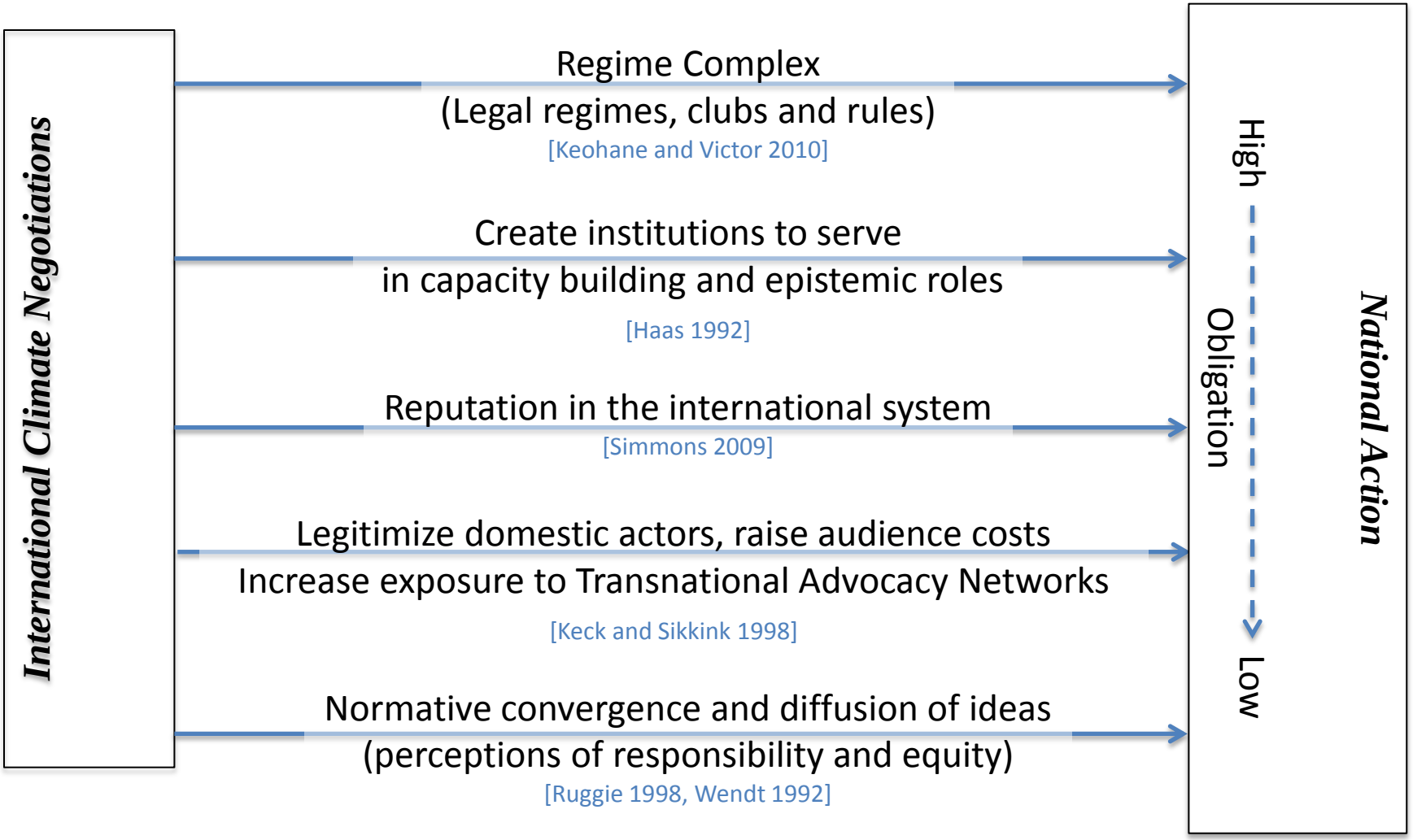
Centralized activity:

- Kyoto Protocol second commitment period (through 2020)
- Durban Platform for Enhanced Action (by 2020)
- Green Climate Fund (to be capitalized at US$100 billion annually by 2020?)…in the meantime?
- Pillars: Mitigation, Adaptation, and (New!) “Loss and damage”

Aside: U.S. Senate ratification of any international climate treaty: don’t count on it.

Channels of influence:

International climate processes on domestic outcomes



[With Neha Joseph, Centre for Policy Research]

National Action

U.S.

- Reduce emissions in “range of” 17% below 2005 levels by 2020
- EPA authorization under the Clean Air Act (Mass. V. EPA)
- Carbon intensity restrictions on NEW coal burning powerplants and gas powerplants
- Restrictions on EXISTING powerplants forthcoming
- Auto efficiency standards
- Disaggregated carbon-trading schemes (AB32 and RGGI)

Europe

- 30% reduction below 1990 levels by 2020 (conditional on “comparable” actions by others)

National Action

China

- Lower CO2 emissions intensity of GDP by 40-45% below 2005 levels by 2020
- Increase share of non-fossil fuel in primary energy mix to ~15%
- Solar in the 12th FYP: 715% growth over 2010, to 20 GW by 2015 and 50 GW by 2020
- Wind in the 12th FYP: 225% growth over 2010, to 100 GW and 200 GW by 2020

India

- Lower CO2 emissions intensity of GDP by 20-25% below 2005 levels by 2020
- "National Solar mission" (2009): 20 GW grid-connected by 2022, 2GW off-grid component(starting at ~17 MW)
- "National Solar mission" (2009): 20 GW grid-connected by 2022, 2GW off-grid component (starting at ~17 MW)

Implications of disparate measures

- Collective action more difficult (free riding)
- Carbon leakage reduces effectiveness
- Larger markets for emissions reductions reduce costs
- Institutional “stickiness”: Integration of disparate regimes more complicated than new construction
- Time running short

Extra Slides

General Policy Design Principles

1. Every independent policy goal requires at least one independent policy instrument
2. Policies should strive to attain the necessary degree of macro-control with the *minimum* sacrifice of micro-level freedom and variability
3. Policies should leave a margin of error because of biological uncertainties *[spaceship earth]*
4. Policies must recognize that we must always start from historically given initial conditions *[e.g. the market is here to stay; owners of private property will not relinquish it, etc]*
5. Policies must be able to adapt to changing conditions
6. Design policies at the scale of their effects *[e.g. local problems need local solutions; global problems need global solutions]*

[Adopted from Daly and Farley 2003]

General Policy Design Principles
Property Rights

Coase theorem:

As long as property rights are assigned (and there are negligible transaction costs) the market can efficiently allocate resources

Three types of property rights:

- Property Rule: One person is free to interfere with another, or free to prevent interference
- Liability Rule: One person is free to "interfere" with another or prevent interference, but must pay compensation
- Inalienability Rule: If a person is entitled to the presence or absence of something, then no one can legally take that right away for any reason.

Policy Tools

- Direct Regulation
- Pigouvian Taxes
- Pigouvian Subsidies
- Tradable Permits

Policy Tools

Direct Regulation >>>Command-and-Control regulations

Positive Features

- Limits pollution/ harvest to acceptable level
- Directly addressed biological limits
- Can be tailored to all, or some, individuals
- Familiar to most policy makers and easy/cheap to monitor and administer

Negative Features

- Low allocative efficiency
- No incentive to surpass the goal (mercury example)
- Does not allow micro-flexibility (violates our policy principles)

Policy Tools

Pigouvian Taxes >>> LIABILITY RULE (polluter pays principle)

Positive Features

- Ideally, the tax operates at the marginal external cost (effectively a market correction)
- Cost effectively reduces environmental costs
- Tax per unit of pollution creates an incentive for further reductions!
- If a firm is driven out of business, it implies it the social benefit was lower than the social cost

Negative Features

- If economy grows, more firms come online, who can still increase pollution/ extraction
- Assumes that revenue from the tax is used to remedy the environmental/ social harm
- Incentivizes outsourcing of the pollution

Policy Tools

Pigouvian Subsidies >>>Assume polluter has right to pollute!
(but society pays him/her not to)

Positive Features

- If the abatement costs are lower than the subsidy, the firm reduces pollution
- Useful as an incentive for ecosystem restoration (paying you to reforest your land)
- Useful as an international mechanism to get sovereign nations to reduce

Negative Features

- The subsidy might attract new entrants, thus increasing pollution (Example: HFC's in China)
- Reward goes to the polluter!

Policy Tools

Tradeable Permits >>> Impose a property right to the entity owning the quote (rights to absorptive capacity of a medium)

Positive Features

- Assigns rights to a rival good made excludable by quotas
- Distribution of the quotas can be designed to achieve other social goals
- If the economy grows, the quota does not
- Allows micro-level freedom: Harnesses power of markets

Negative Features

- Determination of the proper quota level is difficult and contentious
- If demand rises, or the quota is reduced, prices can spike (supply/ demand), creating political pressure.

Setting and Theory

- 1,199 coal projects planned in 59 countries *(Yang and Cui: WRI 2012)*

- Thought experiment:
  - Existing infrastructure will contribute to mean warming of 1.1° to 1.4°C by 2100
  - Continued fossil fuel expansion leads to warming of 2.4°C to 4.6°C by 2100

"The primary threats posed by climate change are a consequence of emissions from devices that do not yet exist."

(Davis, Caldeira and Matthews: Science 2010)

- With UNFCCC pledges implemented: 20% chance >4°C by 2100
- Without implementation: >4°C as early as 2060, >6°C by 2100

(World Bank 2012)

- Nearly all countries rely on fossil fuels, nuclear, hydropower, or geothermal for more than 90% of power generation *(Pizer and Morris 2013)*

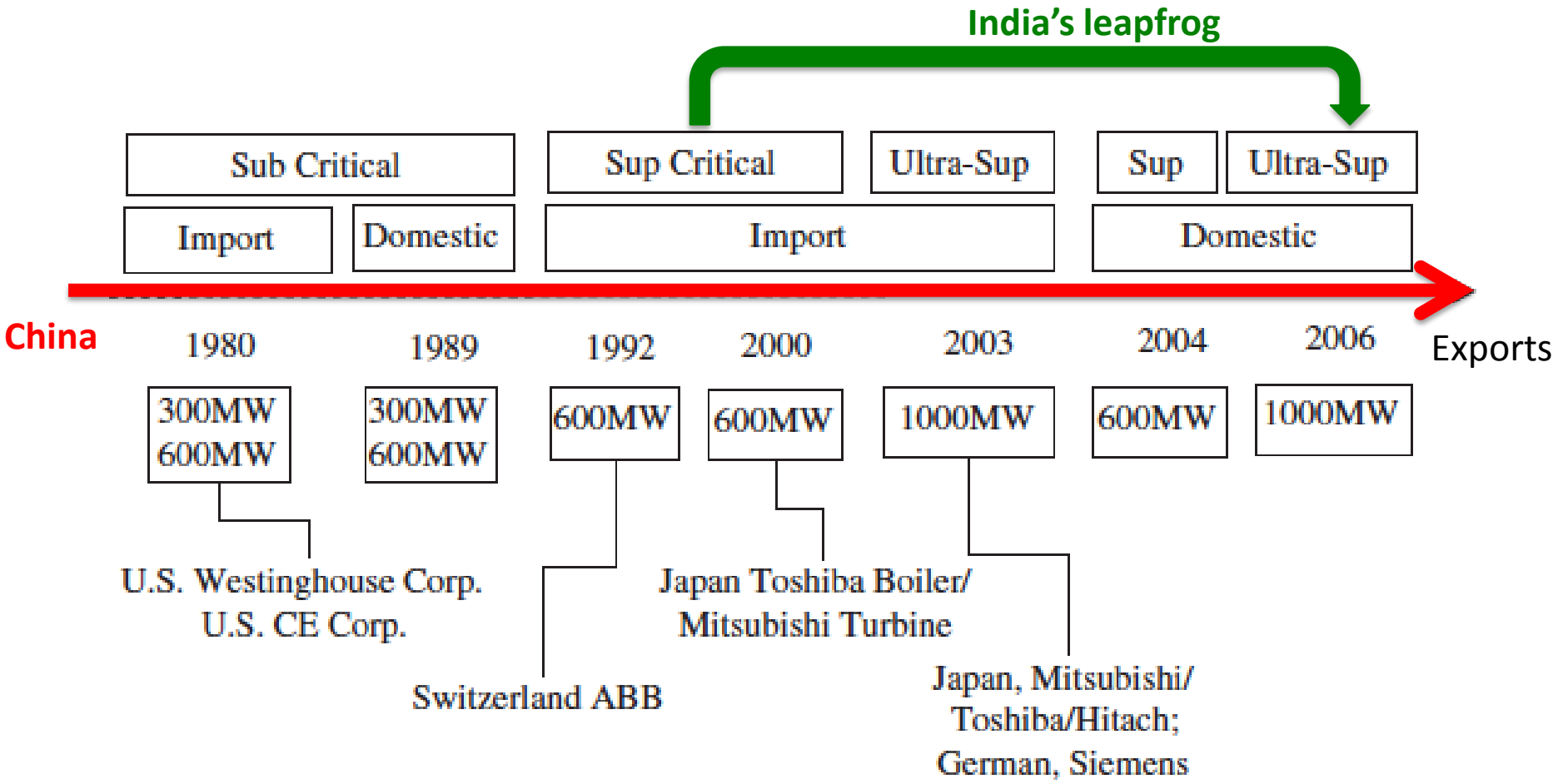
Benefits of enacting Montreal Protocol

Global Benefits and Costs of Montreal Protocol, 1987–2060

Avoided cases of skin cancer	20,600,000
Avoided cases of skin cancer deaths	333,500
Avoided cases of cataracts	129,100,000
Monetized benefits (including damages to fisheries, agriculture, and materials; not including the health benefits mentioned about)	$459 billion
Monetized benefits in terms of deaths averted	$333 billion
Monetized health benefits (nonfatal skin cancers and cataracts averted)	$339 billion
Monetized costs	$235 billion
Net benefits	>$900 billion

[Sunstein 2006, referencing Barrett 2003]

A small leapfrog



[Yue 2012]

Thank you

Phil Hannam
phannam@princeton.edu