

# Alternatives to Quantity-Based Climate Policy

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For details see  
[www.cramton.umd.edu/papers/climate](http://www.cramton.umd.edu/papers/climate)  
[www.global-energy.org](http://www.global-energy.org)

# Price Carbon

# Roadmap to Global Cooperation

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1. Avoid **cap-or-tax** fight
2. Avoid problems of **Copenhagen**
3. Replace **cap & trade** game with **pricing + green fund**
4. How **price commitment** works
5. **Cheap & effective**
6. **Oil security**, China and climate

(1) Not the Cap-or-Tax Fight

## **INTERNATIONAL AGREEMENT**

# Pricing Is Not Taxing

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## ❑ Under Global Carbon Pricing

- Every country could use cap and trade
- With **no carbon taxes anywhere** !!
- Or countries can use any mix of cap, tax & feebate they want.

*International commitment  $\neq$  National policy*

# What Do We Want in a Commitment?

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1. Make cooperation easy
2. An easy path to stronger commitments

(2)

**COPENHAGEN**

## APPENDIX I: QUANTIFIED ECONOMY-WIDE EMISSIONS TARGETS FOR 2020

DEVELOPED COUNTRY	<i>Quantified economy-wide emissions targets for 2020</i>	
	Emissions reduction in 2020	Base year

## APPENDIX II: NATIONALLY APPROPRIATE MITIGATION ACTIONS OF DEVELOPING COUNTRY PARTIES

DEVELOPING COUNTRY	<i>Actions</i>



# The Copenhagen Accord: China

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“China will endeavor to lower its carbon dioxide emissions per unit of GDP by 40-45% by 2020 compared to the 2005 level.”

- ❑ DOE (May 2009) estimated 45%
- ❑ Previous 15 years China cut intensity 44.4%
- ❑ So, 45% is Business as Usual

<http://www.global-energy.org/lib/2009/09-08>

# Copenhagen Accord: India

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- ❑ India committed to doing half as well as business as usual
- ❑ Other developing countries commit to nothing and want subsidies

# Developed Countries

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- ❑ All commit to more
- ❑ Europe and Japan commit to much more
- ❑ Everyone agrees there was a *polarization* of rich and poor countries, starting at Kyoto and now much worse

**Why?**

(3) A Theory of Cooperation

## **THE CAP-AND-TRADE GAME**

# Roadmap to Games

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- ❑ **Public Goods** game → Cooperation problems
  - If abate 50% is best
  - U.S. self-interest → abate 10%
  - Canadian self → abate 1%
- ❑ So, change the game — to **cap & trade** ?
  - U.S. self-interest → target 17% (buy 9% abroad)
  - Canadian self → target -6% (sell C permits)
- ❑ So, change the game to **Pricing** + **Green Fund**
  - Self-interest of all →  **$P^T$**  that's just right (strong)

# First: The Public-Goods Game

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- Country  $i$  picks an Abatement level,  $A_i$
- To maximize its net benefit =  
*benefit from all abatement*  
*minus* *its own abatement cost*
- Even big countries choose an  $A_i$  that is about five times too low

# The Cap-and-Trade Game

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1. Countries pick a Target level,  $T_i$
  2. Maximize the same net benefit *minus*  
*the cost of carbon permits for  $T_i - A_i$*
- How does their target,  $T_i$ , compare with their abatement,  $A_i$ , in public-goods game?

# Polarization Theorem

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- Identical countries  $\Rightarrow T_i = A_i$ 
  - Targets = Abatement in public-goods game
- Different size countries  $\Rightarrow$  Polarization
  - $T_i > A_i$  for big countries
  - $T_i < A_i$  for small countries
- Also, there is **less total abatement**



# Rich-Poor Polarization

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- Cap and trade causes Rich-Poor polarization

## Intuition

1. Trade → all face the same price of carbon
2. High abaters think it's cheap (and do more)
3. Low abaters think it's expensive (and do less)

- We can do better with

**Global Carbon Pricing & Green Fund**

# An Example World

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- ❑ Suppose \$30/ton carbon price is optimal
- ❑  $e$  = emissions/capita
- ❑  $\text{avg}(e)$  = world average
- ❑ low- $e \rightarrow e$  is less than average
- ❑ Low- $e$  countries (India) see abatement costs and green funds **amplified** by  $\text{avg}(e)/e$

# The Green-Fund Treaty

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1. Countries vote (name a  $P_i$ ) for global price
2.  $P^T$  = the **lowest** price named
3. Countries pay  $G \times$  (above average emissions)  
Countries receive  $G \times$  (below avg emissions)
4.  $G = 0.036 \times P^T$   
(  $G = \$1.10/\text{ton}$  if  $P^T = \$30/\text{ton}$  )

*So what  $P^T$  will countries vote for?*

# Three Country Example

Country	$e$	Voted $P$	$P^*$	Benefit	Cost	G.F.
	Ton/cap.	\$/ton	\$/ton	\$/capita/year		
U.S.	18	<b>\$26</b>	\$26	\$28	-\$12	-\$4
China	5	<b>\$30</b>	\$26	\$31	-\$14	\$0
India	1.1	<b>\$26</b>	\$26	\$6	-\$2	\$4

- ❑ \$26 is very close to optimal (\$30)
- ❑ Poorest countries gain even without climate benefits !

# Our Proposal Adds:

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- Green Fund rewards low-e countries for achieving  **$P^T$**
- Carbon-revenue trading to allow flexibility
- **$G$**  decided politically

(4) For a Better Commitment

## **FLEXIBLE GLOBAL CARBON PRICING**

# The Problems: Perverse Incentives

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1. Caps are **risky** and **unfair**
2. Poor countries paid **not to commit**  
( with CDM projects )
3. There is **no enforcement**
4. Polarizing incentives
5. 100 unique commitments

# A Cap Is Risky

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- ❑ US wants China to cap itself below its trend line
- ❑ In 2000, its trend line pointed to 3.5B tons in 2010
- ❑ It's BAU turned out to be above 7.0B tons
- ❑ Commitment to this cap would have meant buying 3.5B permits on the world market for ~ \$100B
- ❑ **Committing to a price** would mean collecting and *keeping* \$100B in carbon revenue



# Caps Appear Unfair

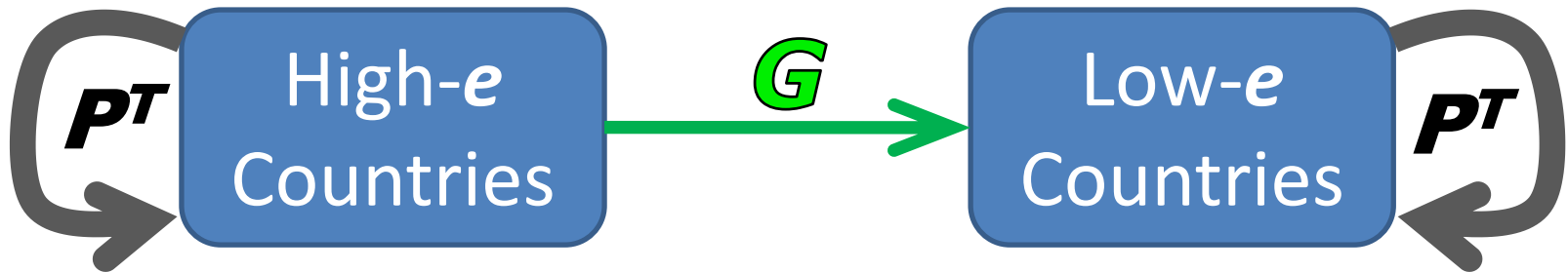
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- ❑ If India accepted a trend line cap, it would be capped at under 1.5 tons/person
- ❑ That is less than the US emitted in 1880
- ❑ Why should India be capped so low just because others have emitted so much?

# Pricing Overview

## Two global parameters

- Global carbon price target =  **$PT$**  ~ \$30/ton
- Global Green-Fund price =  **$G$**  ~ \$2/ton  
(Clean Development Incentive, CDI)



**$e$**  = the country's emissions / person

# Rule #1: National Policy Flexibility

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- ❑ Every country could *use cap and trade*,
- ❑ But carbon taxes or a mix are fine

# Rule #2: Carbon Price Flexibility

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❑ What if you don't meet the global **price target**?

What if you exceed it?

- Buy/Sell **carbon-revenue credits**
- from another country, through a central “market”

Target revenue:  $R^* = \text{Emissions} \times \mathbf{P^T}$

The country must pay  $\mathbf{Z} \times (R^* - R)$ , where  $\mathbf{Z} \approx 10\%$

# #3: Hitting the Carbon Price Target

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- Higher  $Z \rightarrow$  Higher global carbon revenues

- Global Average Price =  
(total revenues) / (total emissions)

- Adjust  $Z$  annually

to make Global Average Price =  $P^T$   
(the price target)

## #4: Green Fund Payments (example)

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- ❑ World average emissions,  $\text{avg}(e) \approx 5$  tons/capita/year
- ❑ Consider a country with  $e = 10$  tons/capita/yr
- ❑ Assume  $G = \$2/\text{ton}$

- ❑ The country pays  $(e - \text{avg}(e)) \times G$

$$(10 - 5) \times \$2 = \$10/\text{capita}/\text{yr}$$

- ❑ A country emitting 1 ton/cap/yr would receive  
 $-(1 - 5) \times \$2 = \$8/\text{capita}/\text{yr}$

# #5: The Green-Fund Incentive

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- ❑ It replaces the CDM
- ❑ It ***rewards*** cooperation
- ❑ If a country's carbon price,  $P$ , is less than  $P^T$  its GF payment is scaled back by  $P / P^T$
- ❑ It also rewards information and research programs that are missed by carbon pricing

# What Counts as Carbon Pricing?

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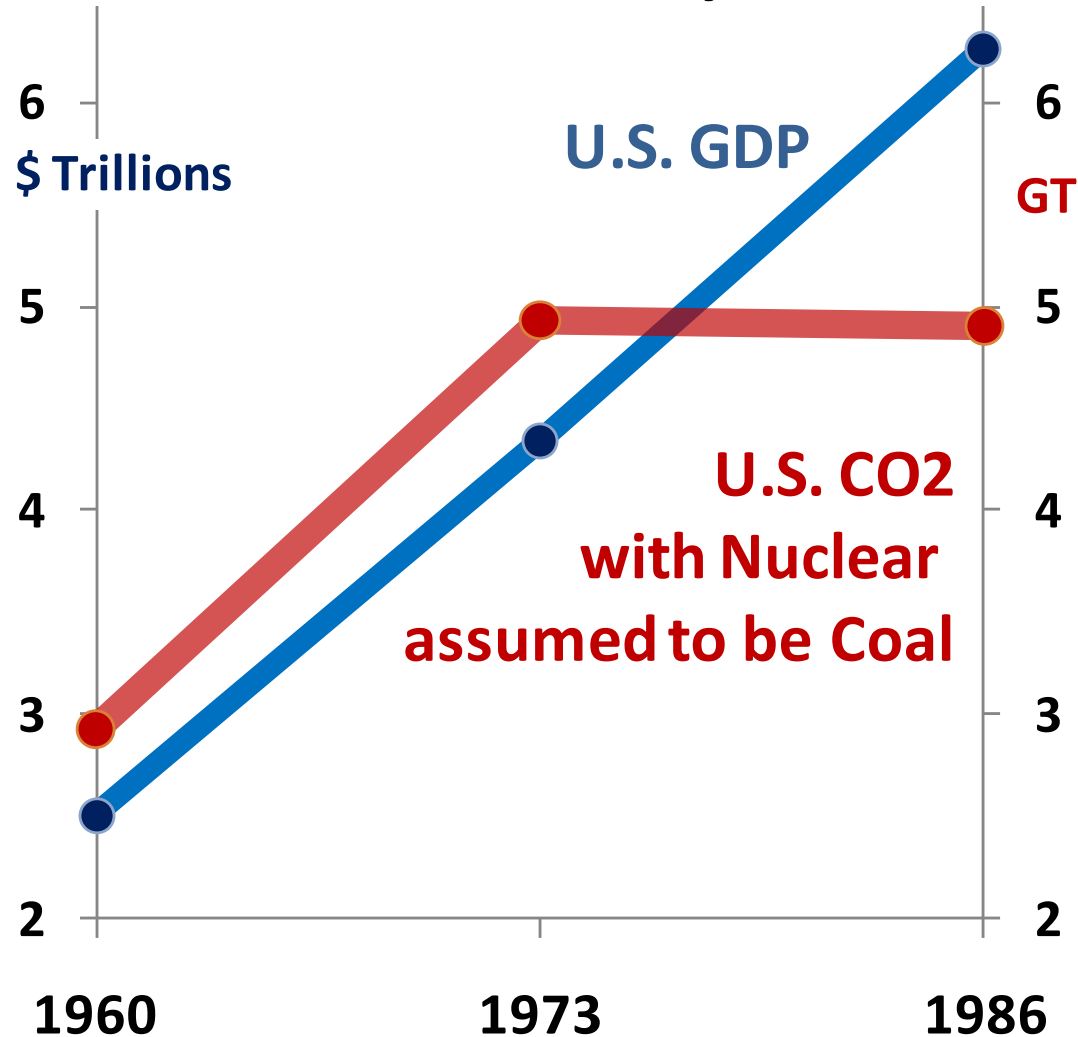
1. Carbon *permits used* under *cap and trade*
  2. Any *tax on fossil fuels*
  3. *Feebates*. E.g. \$1/ton of lifetime auto emissions
- ❑ But not subsidies or command and control policies



(5) Why Price Carbon?

**CHEAP AND EFFECTIVE**

# OPEC: The Best and Worst Climate Policy Ever



# U.S. EPA: Carbon Pricing Is Cheap

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$$\text{Abatement Cost} = \frac{1}{2} \times \text{Price} \times \text{Abatement}$$

- ❑ The  $\frac{1}{2}$  is because sensible abatements cost between \$0 and the price of carbon
- ❑ For several reasons this is likely too high

Example:  $P^T = \$30/\text{t}$ ,  $G = \$2/\text{t}$

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	Starting Emissions per Capita	Abatement Costs	Green Fund Cost	Total Cost
	(tons/year)	( cents / person / day )		
India	1	0.8 ¢	– 1.7 ¢	– 0.9 ¢
Average Country	5	4.1 ¢	0.0 ¢	4.1 ¢
United States	20	16.4 ¢	6.6 ¢	23.0 ¢

Assumes **emissions reduced by 20%** from values shown.  
China is close to average.

(7) The U.S. and China

## **OIL SECURITY AND CLIMATE**

# The Oil-Climate Alignment

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- Using less oil reduces:
  - GHG emissions
  - World price of oil
- Half of **IEA's** purpose:
  - To reduce oil use
- Half of **Kyoto's** purpose:

# How Strong Is the Effect?

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- ❑ MIT on caps: **oil price** down 34 – 47% in 2050
- ❑ IEA on a tight-oil market:  
A 1% cut in use → a 9% cut in price
- ❑ Six models, including DOE, found ***at least***:  
**A 1% cut in use → a 1.5% cut in price**

# What's It Worth to Save a Barrel?

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- ❑ Cut oil use by 1 barrel when price = \$100
- ❑ That saves \$100
- ❑ And reduces the cost of all other barrels  
Enough to save \$150
- ❑ Is this a free lunch?
- ❑ No, it's OPEC's lunch



# We Need an Oil Consumers' Cartel

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“The immediate objective [of the **IEA**] is ... the *consumers' counter-cartel*.”

—New York Times, 1974

“the Tokyo [G7] agreement amounts to a *consumers' cartel*.”

—New York Times, 1979

# It Could Pay for Climate Policy

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<b>20%</b>	<b>Decrease in oil demand by cartel</b>
<b>67%</b>	<b>Of world oil use covered</b>

	<b>China</b>
<b>\$49 B/year</b>	<b>Imported-oil savings</b>
<b>\$33 B/year</b>	<b>Climate-policy cost</b>

	<b>U.S.</b>
<b>\$41 B/year</b>	<b>Imported-oil savings</b>
<b>\$25 B/year</b>	<b>Climate-policy cost</b>

# Conclusion

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1. Carbon Pricing is *designed* for cooperation
2. It does not cap India and China
3. One price target, not 100 caps
4. No offset payments to *not* cooperate
5. Green Fund rewards (1) setting a high target, and (2) meeting that target

# Conclusion

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6. It's easier to comply with  
( Anyone can tax gasoline )
7. It's easier to enforce  
( Checkups at end of every year )
8. Oil savings brings immediate benefits  
( Not distant and uncertain benefits )