

Principles of Policy Analysis: An Economic View of Energy & Environmental Policy

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“What business are you in?”



“I’m an environmental economist.”

“Environmental economics” is *not* oxymoronic.

1. The *causes* of environmental problems (in a market economy) are economic.
 2. The *consequences* of environmental problems have important economic dimensions.
- Therefore, an economic perspective is *essential* for
 - *Understanding* environmental problems
 - And therefore can be *exceptionally helpful* for the design of *solutions* that will be *effective, economically sensible, and politically pragmatic*.

The Causes of Environmental Pollution are Economic

May firms go beyond full compliance with the law (sacrifice profits in the social interest)?

For publicly-owned firms:

- Fiduciary responsibility to shareholders
- But the business-judgment rule

Annual Report 2004
Year ended March 31, 2004

ACCELERATION
AHEAD

Can firms -- public or private -- go beyond full compliance on a sustainable basis?

- Increase prices?
- Reduce profits?
- But some firms can pass on price increase -- monopolists

	12/31/05	12/31/06	12/31/07	12/31/08	12/31/09	12/31/08
SALES						
5 Self Service Bays	0	72,000	96,000	108,000	120,000	132,000
1 Automatic Bay	0	18,000	24,000	30,000	36,000	42,000
7 Vacuums	0	16,800	25,200	33,600	33,600	33,600
Total Annual Revenue	0	106,800	136,800	171,600	189,600	206,700
OPERATING EXPENSES						
Chemical and Vending	0	5,300	6,800	8,600	9,500	10,400
Gas and Electric	0	6,400	8,200	10,300	11,400	12,500
EDU Fees	24,000	0	0	0	0	0
Water & Sewer	0	3,200	4,100	5,200	5,700	6,300
Utility Connections/Permits	5,000	0	0	0	0	0
Telephone	0	250	250	300	350	400
Trash Removal	0	1,100	1,400	1,700	1,900	2,100
Insurance	0	3,200	4,100	5,200	5,700	6,200
Real Estate Taxes	0	5,000	5,500	6,000	6,500	7,000
Accounting & Legal	500	300	500	600	700	800
Repairs & Maintenance	0	2,100	2,700	3,400	5,700	6,200
Labor	0	8,000	9,400	10,700	12,100	13,500
Depreciation	0	39,800	39,800	39,800	39,800	39,800
Bank Charges	0	250	250	300	350	400
Bank Loan Costs	8,200	0	0	0	0	0
Advertising and Promotion	2,000	2,300	2,500	2,500	2,500	2,500
Total Operating Expenses	39,700	72,400	85,500	94,600	102,200	108,100
Operating Profit/Loss	(39,700)	29,400	51,300	77,000	87,400	99,500
Interest Expense	0	35,100	33,300	31,300	29,100	26,800
Pre-Tax Loss/Income	(39,700)	(5,700)	18,000	45,700	58,300	72,700
Taxes	0	0	7,200	18,300	23,300	29,100
NET INCOME(LOSS)	(39,700)	(5,700)	10,800	27,400	35,000	43,600

Where does the pollution go?

- Commercial laundry next door
- Does cost (to laundry) show up in annual report of steel producer?

Pollution is an externality. 3

The Consequences of Environmental Pollution have important Economic Dimensions

1. Producer → Producer

(steel production & laundry services -- \$)

2. Producer → Consumer

(paper production & recreational fishing)

3. Consumer → Consumer

(secondary exposure to cigarette smoke)

4. Consumer → Producer

(littering in a movie theatre -- \$)

- Economic consequences \geq financial consequences
 - Economics is *not* the same as accounting
- When carrying out economic analysis, don't act like the drunk under the street lamp!

Economic Valuation of the human health impacts of environmental pollution

- You drink dirty water: feel sick for two days, stay home from work, go see the doctor
- How should we economically value the damages of your exposure to this pollution?
 1. Lost wages (reduced productivity)?
 2. Medical costs (whether paid, insured, or “free”)? [Opportunity Cost]
 3. “Pain-and-suffering”?
- Economics takes a *holistic* view, because #3 cannot be observed
 - The *economic value of the damages* are whatever you *truly* feel (believe) that they are!
 - *Not* what you *say* the damages are, but what you *really feel* that they are.
 - Your minimum *willingness to accept* (WTA) *compensation* to tolerate exposure
 - Your maximum *willingness to pay* (WTP) to avoid exposure

Can meaningful numbers be put on these concepts?

- There's good news and bad news. First, some good news ...
 - Over the past 50 years, economists have developed rigorous methods for *reliably estimating* people's WTA and WTP associated with a wide range of environmental threats and damages
 - But you need to take an environmental economics course to cover that!
- Are these methods just the province of academics?
 - No, the concepts and specific methods are *validated*, even *required* by:
 - Executive orders, laws, and regulations *in many countries*
 - *Best analytic methods* are laid out by official government guidelines & rules
- Is this framework necessary and/or sufficient for assessing the economic value of (non-health) environmental impacts, i.e. ecological damages?
 - Yes, it's necessary.
 - No, it's not sufficient.

Valuing Ecological Impacts

- Lake Baikal, Southeast Siberia



- Komodo National Park
Indonesia



- Central Amazon Conservation Complex, Brazil



- The Grand Canyon
Arizona



Valuing Ecological Impacts

- The Cambridge Children's Park – How can it be valued?
 - Use Value
 - Option Value
 - Existence Value
- What about private recreational parks: Disneyland?
- Endangered Species & the importance of non-use value
- If we have concepts and methods for valuing *damages* of environmental pollution, then we have methods for valuing *benefits* of public policies.

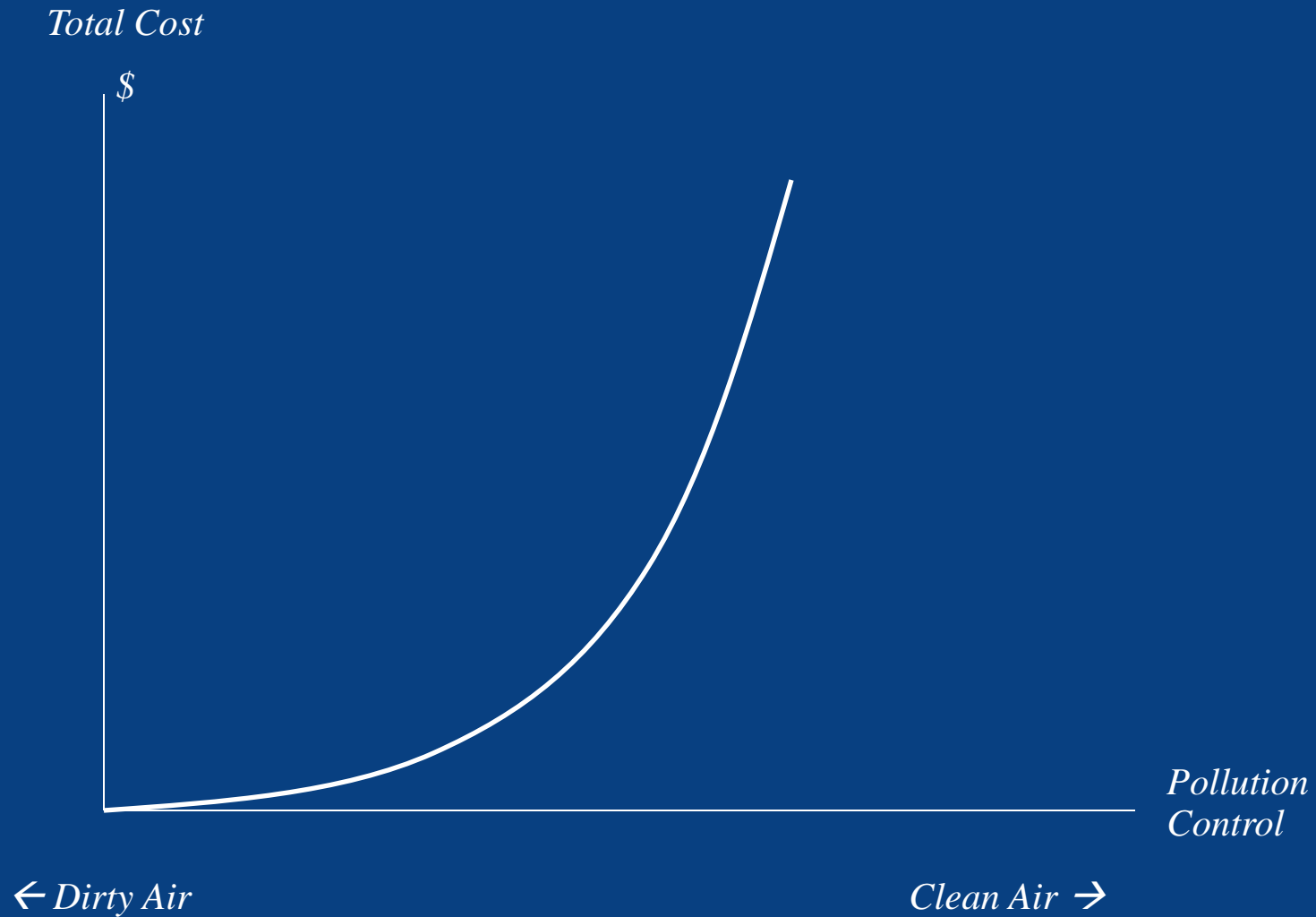
What about the costs of environmental policies?

- How much does it cost to reduce a ton of SO₂?
- Total costs increase at an increasing rate.
- In other words, incremental or *marginal costs increase*.

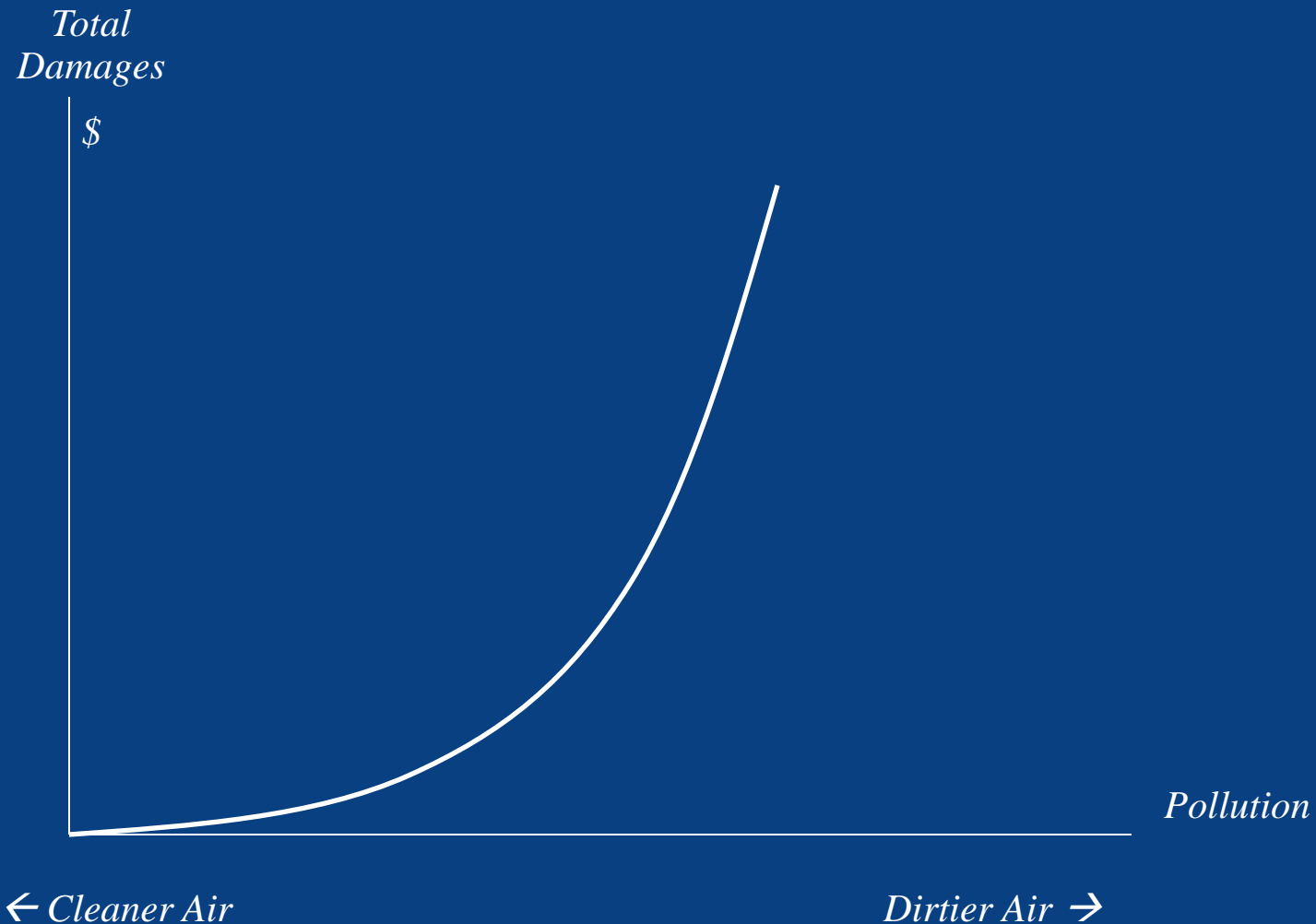
Emission Reduction (million tons)	Total Cost (\$ billion)	Average Cost (\$/ton)	Marginal Cost (\$/last ton)
8	\$2.2	\$270	\$270
10	\$3.6	\$360	\$720
12	\$9.3	\$720	\$2,775

- This general pattern is *ubiquitous* -- for virtually all environmental policies:
 - Increasing marginal costs

The Costs of Pollution Control

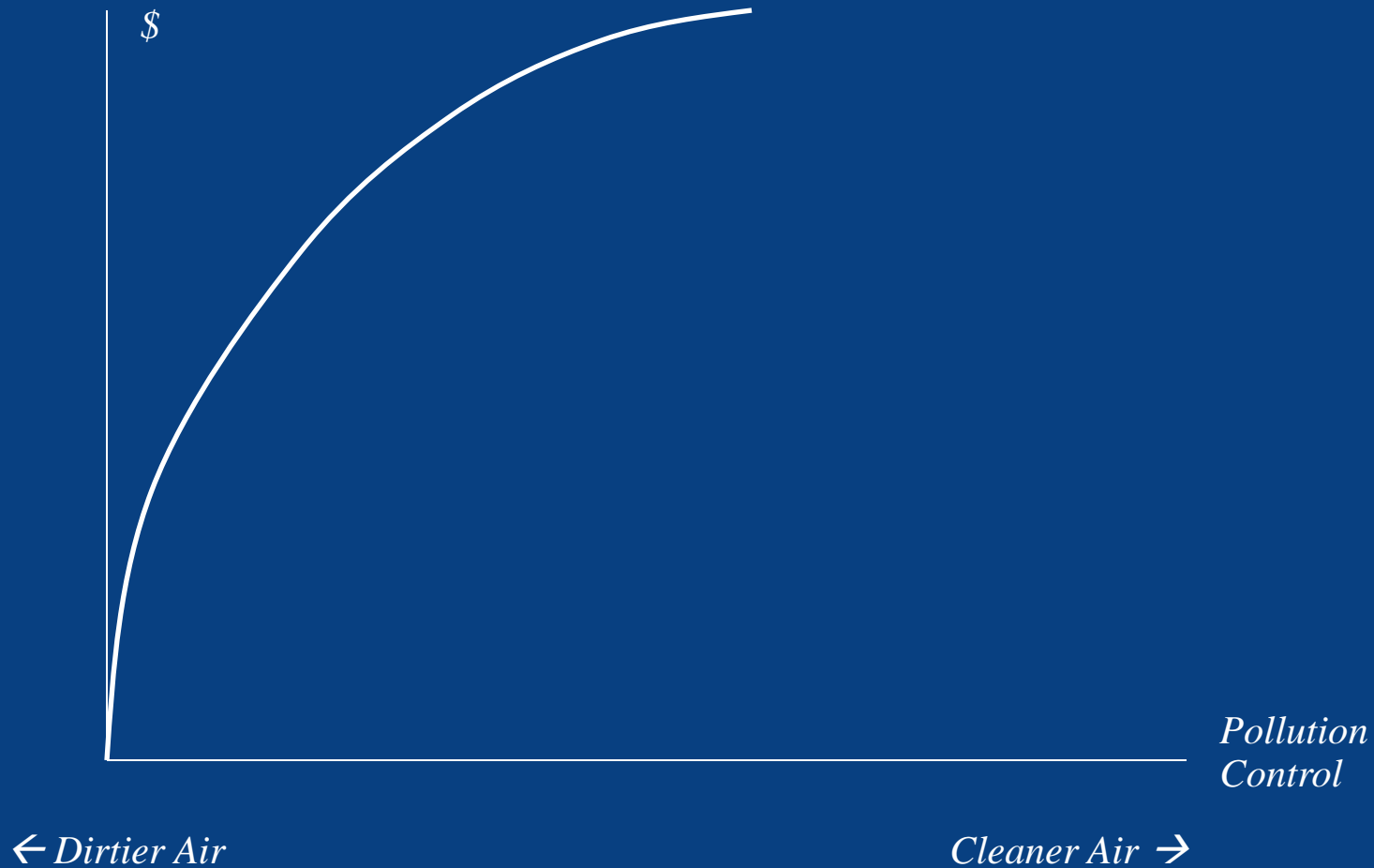


The Damages of Pollution



The Benefits of Pollution Control

Total Benefits (Avoided Damages)



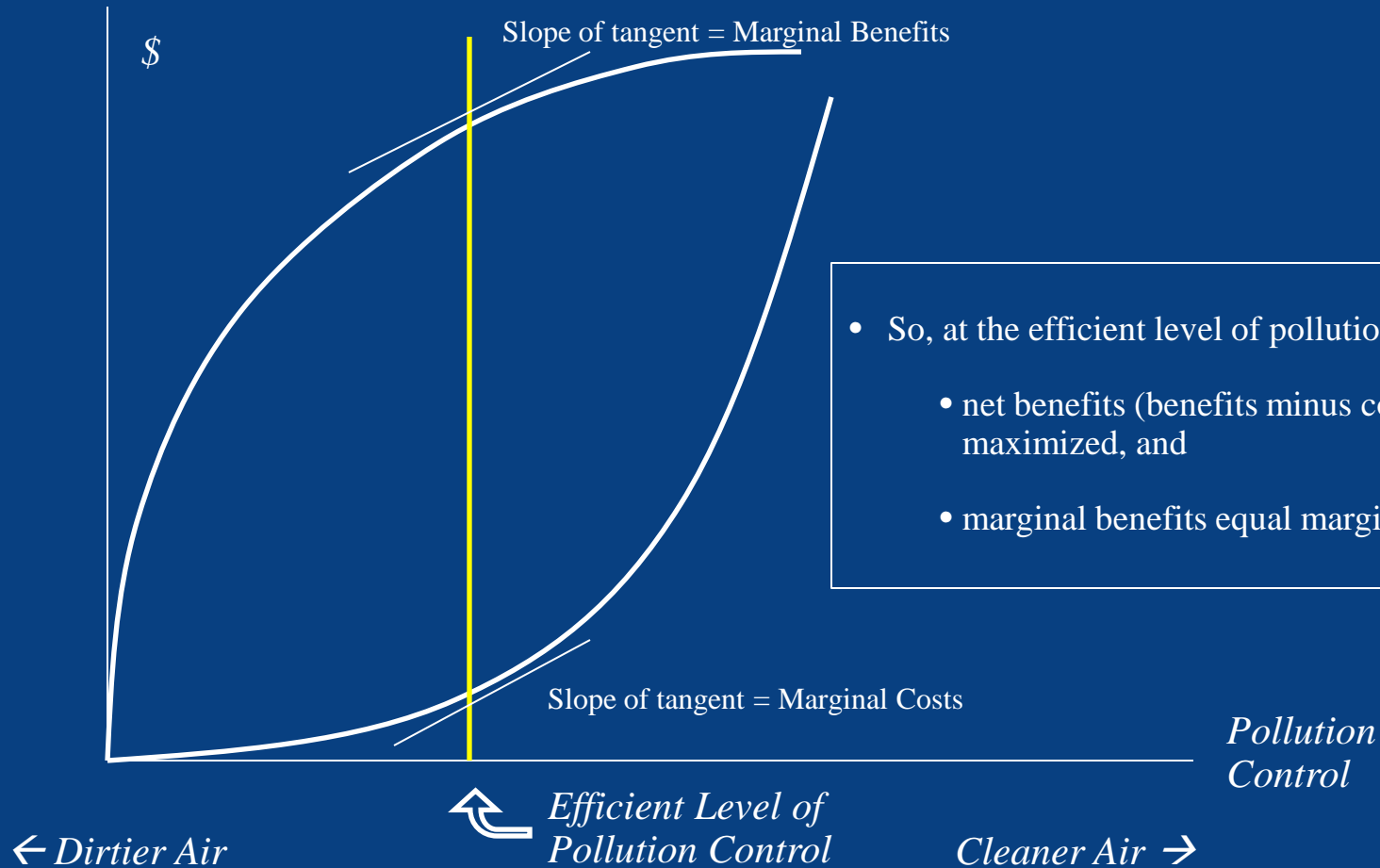
Think about your own pollution-control policies.

- We all exercise pollution control policies, where we get the benefits and we pay the costs
 - Keeping the *kitchen floor* clean
 - Do you keep it *perfectly* clean?
 - *Why not?*
- And how clean do you keep your *garage* floor?
- What about the cleanliness you expect in a *surgical theatre*?
- *Why* do we individually and collectively choose different levels (standards) of acceptable cleanliness in these different cases?
 - It seems that *benefits and costs* matter.
 - In fact, we behave *as if* we're doing a very specific kind of analysis!

Benefits and Costs of Pollution Control

Total Benefits (Avoided Damages)

Total Costs



The Efficient Level of Pollution Control

- Maximizing the difference between benefits and costs: the *efficient* level of pollution control effort is *not* an infinite level.
 - The efficient amount of pollution is *not* zero.
 - Interest groups on both sides of the policy spectrum may be dissatisfied
 - Not enough benefits to please Greenpeace
 - Too much cost to please the Chamber of Commerce
- Markets produce this quantity of goods and services for most products,
 - But *not* for *externalities*.
- So, this is *not* a call for laissez-faire, but for a *legitimate* role for public (government) intervention.
 - But not all government intervention is created equal.
 - There are some *very costly* forms of environmental regulation,
 - ... and other approaches that *harness market forces* on behalf of environmental protection, and hence are *cheaper* – example is “cap-and-trade” -- later

Another perspective on externalities: public goods

	Excludable	Non-Excludable
Rival (in consumption)	<p>Pure Private Goods Most Nonrenewable Resources (Fossil Fuels & Minerals) Some Privatized Renewables (Aquaculture)</p>	<p>Renewable Resources Characterized by Open Access (Ocean Fishing) Some Nonrenewable Resources (Ogallala Aquifer)</p>
Non-Rival	<p>Club Goods (Cinemas, Satellite Television)</p>	<p>Pure Public Goods (Broadcast TV, Clean Air, Greenhouse Gases & Climate Change)</p>

Wait! *Who Gets the Benefits? Who Pays the Costs?*

- Economics can also examine the *distribution* of benefits and costs
- Are all *efficient* policies *fair*?
 - *No*
 - Hypothetical: Improving Los Angeles visibility by increasing electricity rates
 - Who gets the benefits?
 - The “wine, cheese, and Gortex set”
 - Who pays the costs?
 - Beverly Hills mansion?
 - Inner-city low-income housing
 - An efficient, but *regressive* policy (transfer from poor to rich)
- Does this mean that *all* environmental policies are *regressive*?
 - *No*
 - Example of a *progressive* environmental policy: Superfund, cleaning up abandoned hazardous waste sites (transfer from rich to poor)

Summary: An Economic Perspective of Energy & Environmental Policy

1. The *causes* of environmental pollution are economic
 - Pollution is an *externality*
2. The *consequences* of environmental pollution are economic
 - The most important pathways are *not* the easiest to analyze
3. *Economic value* of health damages are whatever people *truly feel* that they are (*willing to accept, willing to pay*)
4. Reliable methods exist for *quantifying* these values
 - Methods are *validated and required* by laws and regulations
5. When we get the benefits and pay the costs, we *choose* our own standards of cleanup in different situations based upon perceived *benefits and costs*
 - We tend to choose the “*efficient*” level of cleanup
6. *Markets* provide the efficient amount of many goods & services,
 - But *not* when there are externalities; markets *fail* to deal efficiently with pollution
 - That’s a *legitimate* reason for government intervention
7. Economics can examine the *distribution* of benefits and costs of policies

- “Environmental Economics” is *not* an oxymoron.



- An economic perspective is *essential* for a
 - full *understanding* of environmental problems.
- Economic analysis is key for design of *solutions* that are:
 - *environmentally effective*
 - *economically sensible*
 - *politically pragmatic*

Thank You!