



EXTERNALITIES: ENVIRONMENTAL PROTECTION PART I

We have forgotten how to be good guests, how to walk lightly on the earth as its other creatures do.

Barbara Ward

THE ENVIRONMENT AND ECONOMY ARE INTRICATELY LINKED.



- Economies receive inputs of resources from the environment, process them in complex ways that enable human society to function, then discharge outputs of waste into the environment.
- Environmental systems support economies, purifying air and water, cycling nutrients, providing pollination and serving as receptacles for waste; these are called **ecosystem services**.



ENVIRONMENTAL PROTECTION

- Environmental protection is a practice of protecting the environment, on individual, organizational or governmental levels, for the benefit of the natural environment and (or) humans.
- Protection of the environment is needed due to various human activities.



THE ENVIRONMENTAL THREAT

- Pollution impairs health, reduces life expectancy and thus reduces labor-force activity and output.
- It entails real costs, as measured by impaired health, reduced life spans and other damages.



AIR POLLUTION: ACID RAIN

Sulfur dioxide (SO_2) is an acrid, corrosive and poisonous gas created when high-sulfur fuels are burned.





AIR POLLUTION: SMOG

Nitrogen oxides (NO_x), another ingredient in the formation of acid rain, are also a principal ingredient in the formation of smog.



THE GREENHOUSE EFFECT

- Excess buildup of carbon dioxide (CO_2) is creating a gaseous blanket around the earth.
- The potential effects of this blanket are intensely debated.
- Some scientists warn that CO_2 is warming the earth's atmosphere and predict the polar caps will melt, continents will flood and weather patterns will go haywire.
- Other scientists are skeptical about both the temperature change and its cause.



WATER POLLUTION

Water pollution is another environmental threat.





WATER POLLUTION: ORGANIC POLLUTION

- The most common form of water pollution comes from the disposal of organic wastes from toilets and garbage disposals.
- Inadequate treatment systems often result in the closure of waterways and beaches.



WATER POLLUTION: THERMAL POLLUTION

Thermal pollution is an increase in the temperature of waterways brought about by the discharge of steam or heated water.



SOLID-WASTE POLLUTION

- Most solid wastes originate in agriculture and mining.
- Solid waste originating in residential and commercial use is considered dangerous because it accumulates where people live.



POLLUTION DAMAGES

- Some monetary measure of environmental damage is important to our decision making.
- We won't get clean air unless we spend resources to get it.



ENVIRONMENTAL ECONOMICS

How do we measure economic productivity?

- Accounting at all levels needs to better reflect the true, long-term, sustainable value of economic activities.
- Many practices that today are “profitable” are clearly actually contributing to long-term degradation of natural systems and human well-being. They are, in truth, counter-productive.



ASSIGNING PRICES

- Economists can estimate the dollar value of damage by assessing the economic value of lives, forests, lakes and other resources.
- It is difficult to measure the value of intangibles like lost views of sunsets, wildlife and recreation opportunities.



CLEANUP POSSIBILITIES

The EPA estimates that 95% of current air and water pollution could be eliminated by known and available technology.



MARKET INCENTIVES

Market incentives play a major role in pollution behavior.





THE PRODUCTION DECISION

- Business managers seeking to maximize profit will produce the rate of output where $MR = MC$.
- **production decision** – the selection of the short-run rate of output (with existing plant and equipment)



THE EFFICIENCY DECISION

- The efficiency decision requires a producer to choose that production process that minimizes costs for any particular rate of output.
- **efficiency decision** – the choice of a production process for any given rate of output



COST OF POLLUTION ABATEMENT

- The efficiency decision does *not* lead to a low production of pollution.
- Pollution abatement can be achieved, but only at significant cost to the producer.



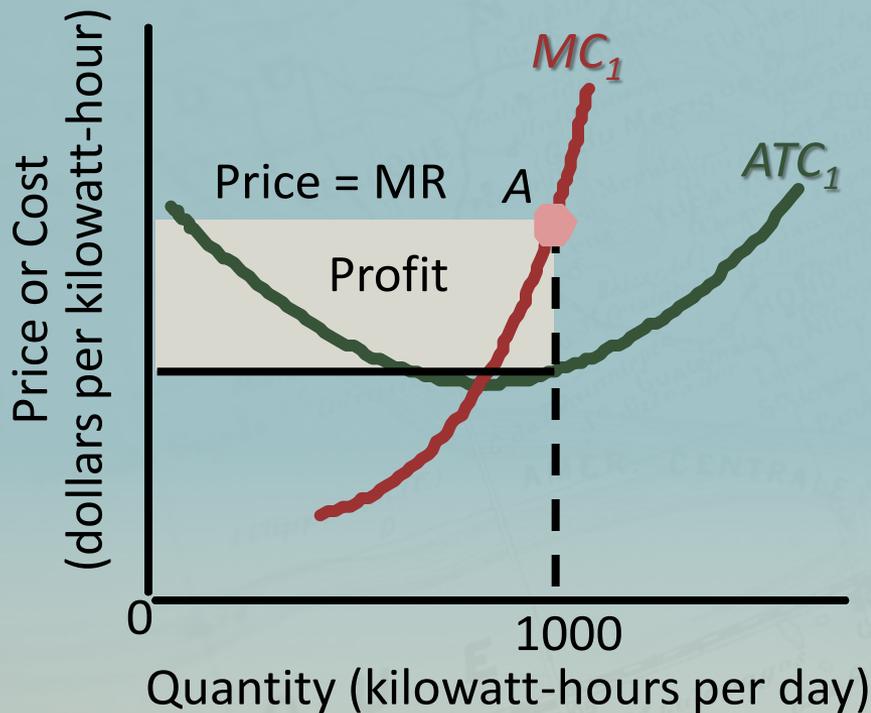
COST OF POLLUTION ABATEMENT

The behavior of profit-maximizers is guided by comparisons of revenues and costs, not by philanthropy, aesthetic concerns or the welfare of the environment.

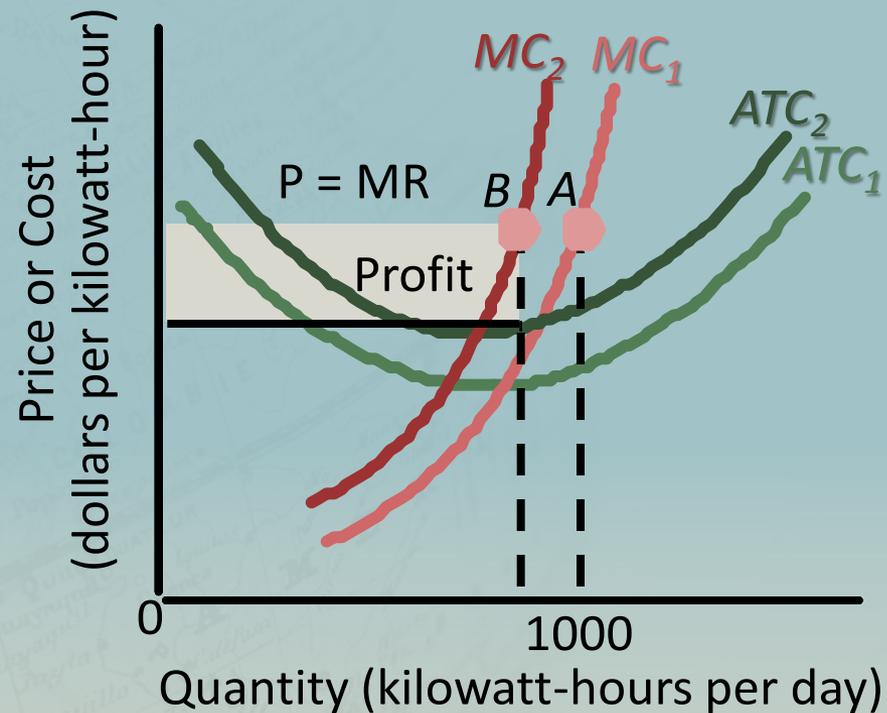
CHART: PROFIT MAXIMIZATION IN ELECTRIC POWER PRODUCTION



Using cheap but polluting process



Using more expensive but less polluting process





MARKET FAILURE: EXTERNAL COSTS

- People – businesses and individuals – tend to maximize their personal welfare, balancing private benefit against private cost.
- They ignore costs that are external to them.
- **External costs** are costs of a market activity borne by a third party.



EXTERNALITIES IN PRODUCTION

- Whenever external costs exist, a private firm will not allocate its resources and operate its plant in such a way as to maximize social welfare.
- If pollution costs are external, firms will produce too much of a polluting good.



EXTERNALITIES IN PRODUCTION

- External costs exist when social costs differ from private costs.
- External costs are equal to the difference between the social and private costs.

external costs = social costs – private costs



EXTERNALITIES IN PRODUCTION

- **Social costs** are the full resource costs of an economic activity, *including externalities*.
- **Private costs** are the costs of an economic activity directly borne by the immediate producer or consumer (*excluding externalities*).

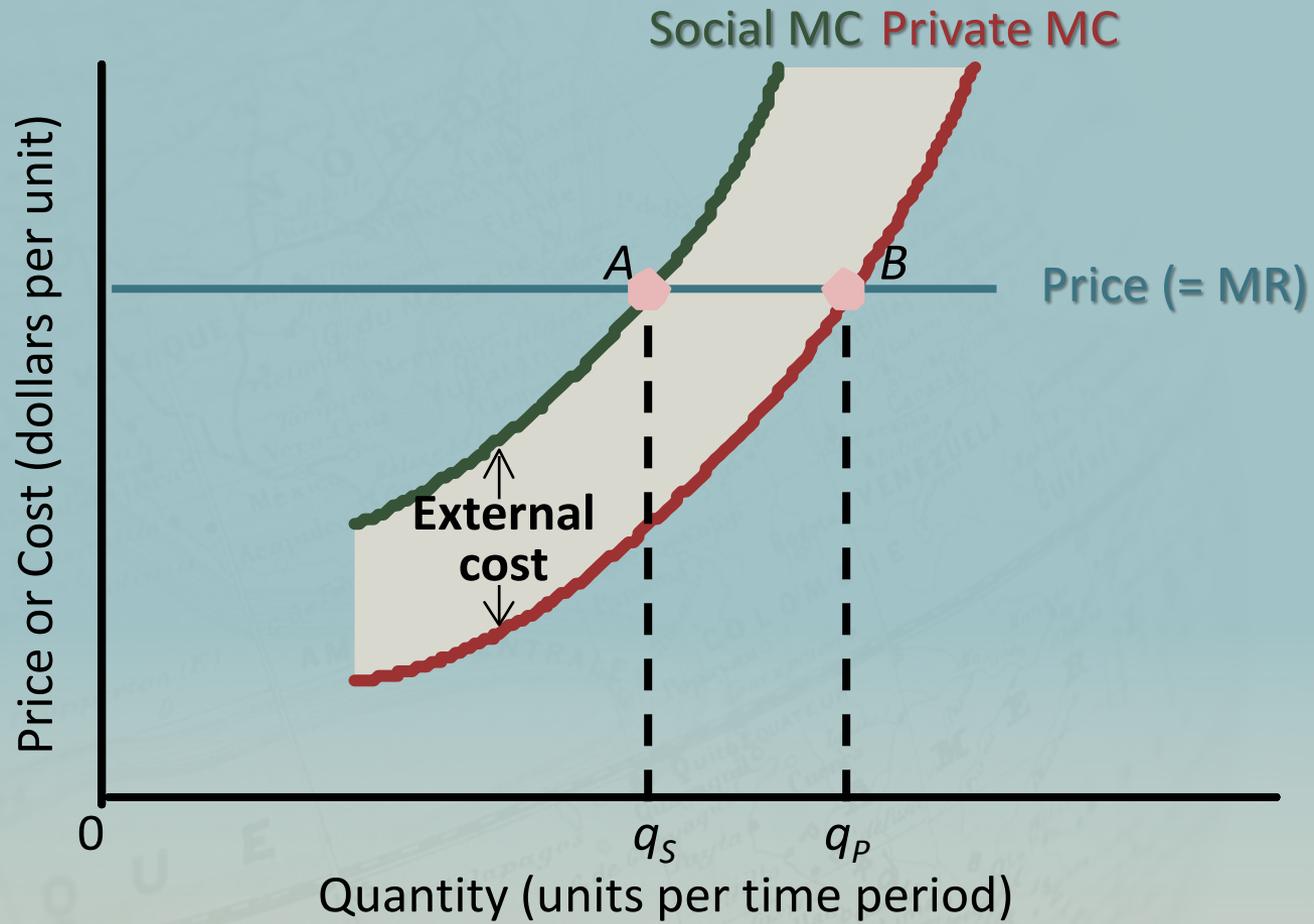


EXTERNALITIES IN PRODUCTION

- The market does not allocate resources efficiently when external costs are present.
- This is a case of market failure.
 - **market failure** – an imperfection in the market mechanism that prevents optimal outcomes



CHART: MARKET FAILURE





EXTERNALITIES IN CONSUMPTION

- A consumer, like a producer, tends to maximize personal welfare.
- When people use vacant lots as open dumps, the polluter benefits by substituting external costs for private costs.



THE REAL COST OF GASOLINE

- How much cost to add for the billions spent to preserve access to Persian Gulf Oil?
- How much for lives lost on suburban freeways?
- How much for oil spills and water pollution?
- How much for cancer, asthma, and emphysema from air pollution?
- How much for supply dependence on unfriendly states and tax subsidies for oil companies?
- How much for the costs of global warming and resulting fires, floods, droughts, and blizzards?

NEOCLASSICAL ECONOMICS HAS PROFOUND IMPLICATIONS FOR THE ENVIRONMENT.



- Workers and other resources are assumed to be infinite or substitutable.
- Long-term effects, occurring far in the future, are discounted.
- Costs and benefits are assumed to be internal to all transactions (e.g. it ignores externalities).
 - The market does not take the costs of pollution into account.
 - Costs or benefits of a transaction are assumed to all be borne by individuals engaging in the transaction. However, this is often incorrect. There can be external costs, such as health problems or pollution cleanup, which are paid by others.
- Growth is required to keep employment high and maintain social order.

NEOCLASSICAL ECONOMICS INCORPORATES PSYCHOLOGY AND COST-BENEFIT ANALYSIS.



- The conflict between buyers and sellers results in a compromise price being reached and the “right” quantity of commodities being bought and sold.
- In **cost-benefit analysis**, the estimated costs for a proposed action are totaled and compared to the sum of benefits estimated to result from the action.
- *Economic benefits tend to be overrepresented* in traditional cost-benefit analyses because they’re more easily identified.
- Not all costs and benefits are easily identified, defined or quantified.

ECOSYSTEM SERVICES ARE NOT CURRENTLY INCORPORATED INTO ACCOUNTING.



- Ecosystem services (clean water, pollination, etc.) are said to have “non-market values”, values not usually included in the price of a good or service.
- One technique of assigning non-market value is using surveys to determine how much people would be willing to pay to protect a resource or to restore it.
- An alternative approach is to calculate the overall economic value of all services that an ecosystem provides.

ECOSYSTEM SERVICES ARE NOT CURRENTLY INCORPORATED INTO ACCOUNTING.



In 1997, an international team of economists and environmental scientists put a dollar amount on all the ecosystems services provided to humanity free of charge by the living natural environment.

Drawing from multiple databases, they estimated the contribution to be \$33 trillion or more each year.

This amount is nearly twice the 1997 combined gross national product (GNP) of all countries in the world, or gross world product, of \$18 trillion.



CONTINUED IN EXTERNALITIES: ENVIRONMENTAL PROTECTION PART II