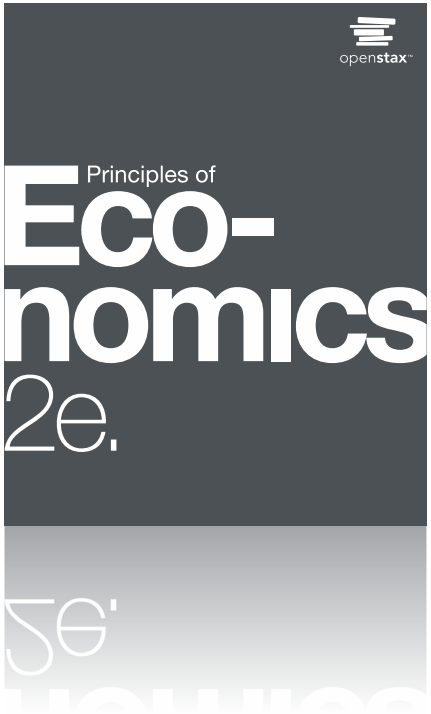
PRINCIPLES OF ECONOMICS 2e

Chapter 12 Environmental Protection and Negative Externalities



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CH.12 OUTLINE

12.1: Economics of Pollution

12.2: Command-and-Control Regulation

12.3: Market-Oriented Environmental Tools

12.4: Benefits and Costs of Environmental Laws

12.5: International Environmental Issues

12.6: Tradeoffs between Economic Output and Environmental Protection

Humans and Nature

"When we speak of nature it is wrong to forget that we ourselves are part of Nature."

-- Henri Matiss, in a letter to André Rouveyre, as published in the book "Matisse on Art," edited by Jack Flam.

US Background

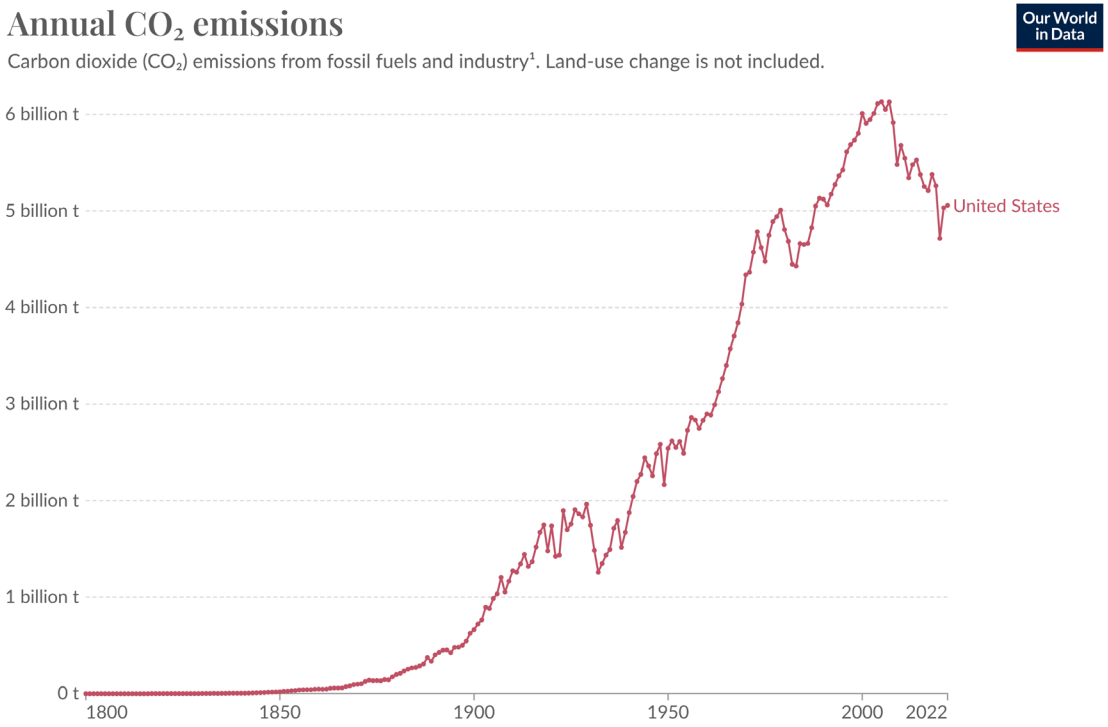
Image: Oil-coated Brown Pelican
Image source: Devastating Photos of the Santa Barbara Oil Spill | Audubon

Desire to protect the environment became urgent in the 1960s.

- 1962: Silent Spring (Rachel Carson) powerfully attacked the indiscriminate use of pesticides, which were linked to cancer in humans threatened bird species with extinction.
- In 1969, an offshore oil rig in near Santa Barbara, California fouled beaches with millions of gallons of spilled oil.
- 1969: Near Cleveland, Ohio, the Cuyahoga River, choking with chemical contaminants, had spontaneously burst into flames. The Time Magazine coverage sparked national outrage. ([click]Video.)

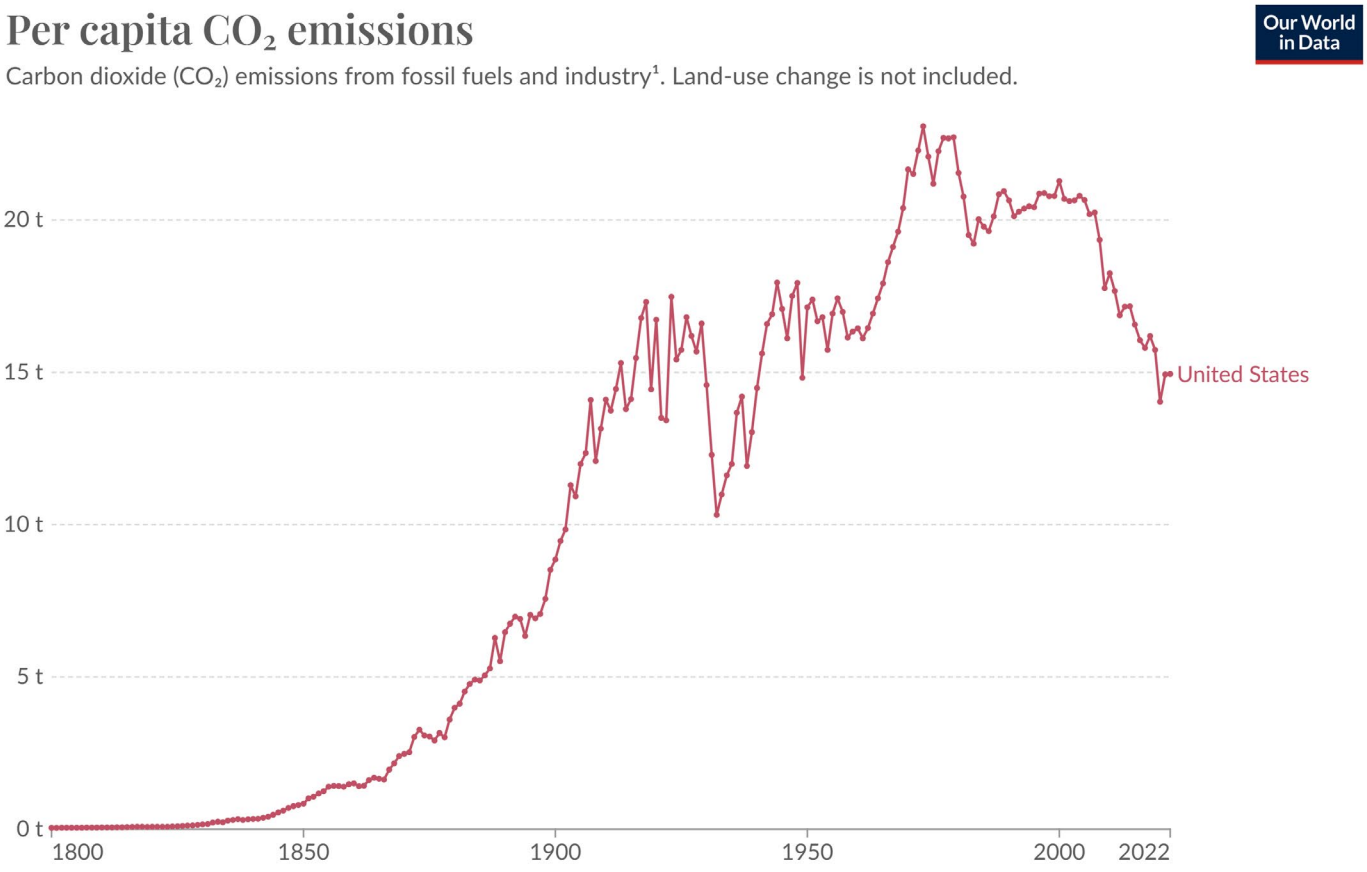
12.1 The Economics of Pollution

- Since the 1970s, a variety of US anti-pollution policies genuinely reduced many pollutants.



1. Fossil emissions: Fossil emissions measure the quantity of carbon dioxide (CO_2) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO_2 includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.

US CO2 Emission Per Capita



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Persistent Issues

- Despite the gradual reduction in emissions from fossil fuels, many important environmental issues remain.
    - CO_2 emissions are still high enough to force climate change
    - Air and water pollution remain serious problems.

- Other issues include:
    a) hazardous waste disposal,
    b) destruction of wetlands and other wildlife habitats,
    c) and the impact on human health from pollution.

Externalities

- The effect of a market exchange on a third party who is outside or “external” to the exchange is called an **externality** or **spillover**.

- Externalities can be negative or positive.

  - **Negative externality** - a situation where a third party, outside the transaction, suffers from a market transaction by others.

  - **Positive externality** - a situation where a third party, outside the transaction, benefits from a market transaction by others.

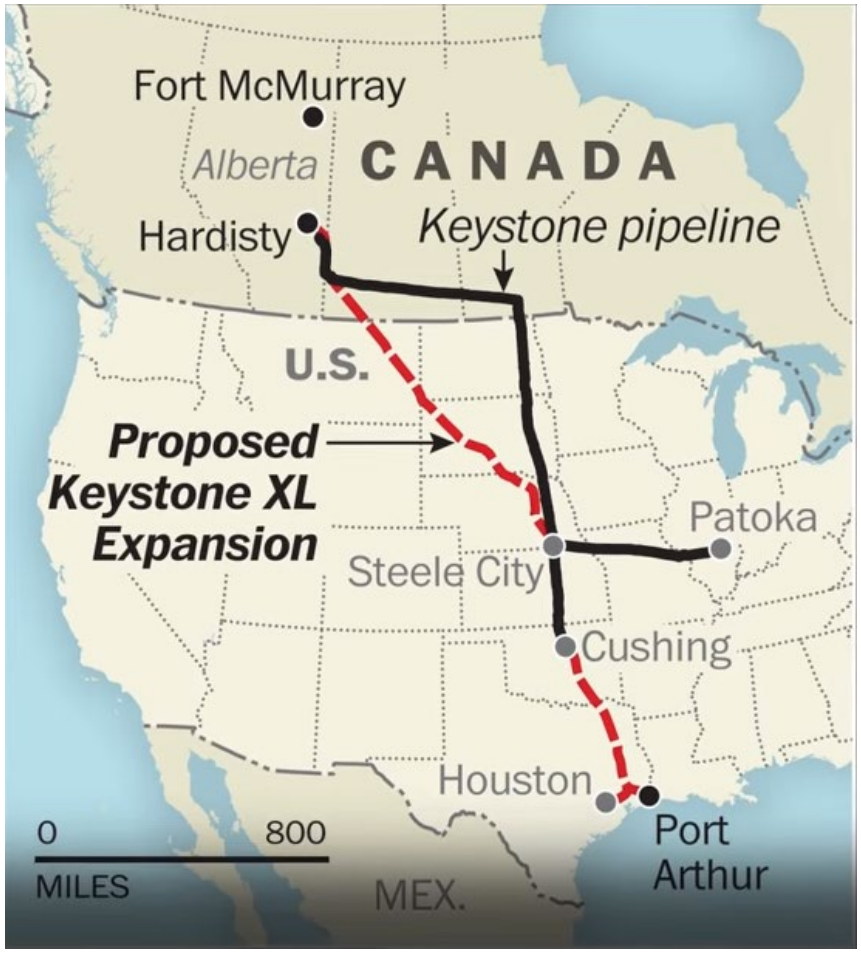
Pollution as a Negative Externality

- Pollution is a negative externality.
- **Additional external costs** - additional costs incurred by third parties outside the production process when a unit of output is produced.
- **Social costs** - costs that include both the private costs incurred by firms and also additional costs incurred by third parties outside the production process.

Costs and Benefits of Fracking

Video: Costs and Benefits of Fracking (Links to an external site.) by Brookings

Keystone XL Pipeline



Video: Canada tar sands by TechInsider

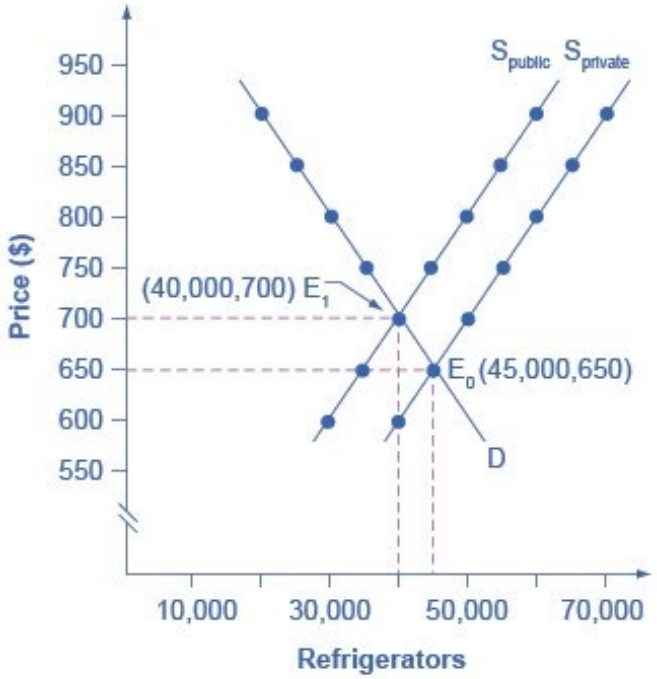
Video: What is the Keystone XL Pipeline? by National Geographic

Colony Collapse Disorder (CCD)

“Colony Collapse Disorder is the phenomenon that occurs when the majority of worker bees in a colony disappear and leave behind a queen, plenty of food and a few nurse bees to care for the remaining immature bees and the queen.”

Many crops depend on bees for pollination. According to the USDA pesticides (particularly neonicotinoids) may be contributing to CCD, along with other factors. Most corn (maize) grown in the US is grown from seeds treated with neonicotinoids.

Taking Social Costs into Account: A Supply Shift



- If the firm takes only its own costs of production into account, then its supply curve will be $S_{private}$, and the market equilibrium will occur at E_0.
- If force to account for additional external costs of $100 for every unit produced, the firm's supply curve will be S_{social}. The new equilibrium will occur at E_1.

Market Failure

- **Market failure** - when the market, on its own, does not allocate resources efficiently in a way that balances social costs and benefits; externalities are one example of a market failure.

- If firms were required to pay the social costs of pollution, they would create less pollution but produce less of the product and charge a higher price.

12.2 Command-and-Control Regulation

- **Command-and-control regulation:**
  - laws that specify allowable quantities of pollution
  - may also may detail which pollution-control technologies one must use.

- Requires that firms increase their costs by installing anti-pollution equipment.

- Thus, firms are required to account for the social costs of pollution in deciding how much *output* to produce.

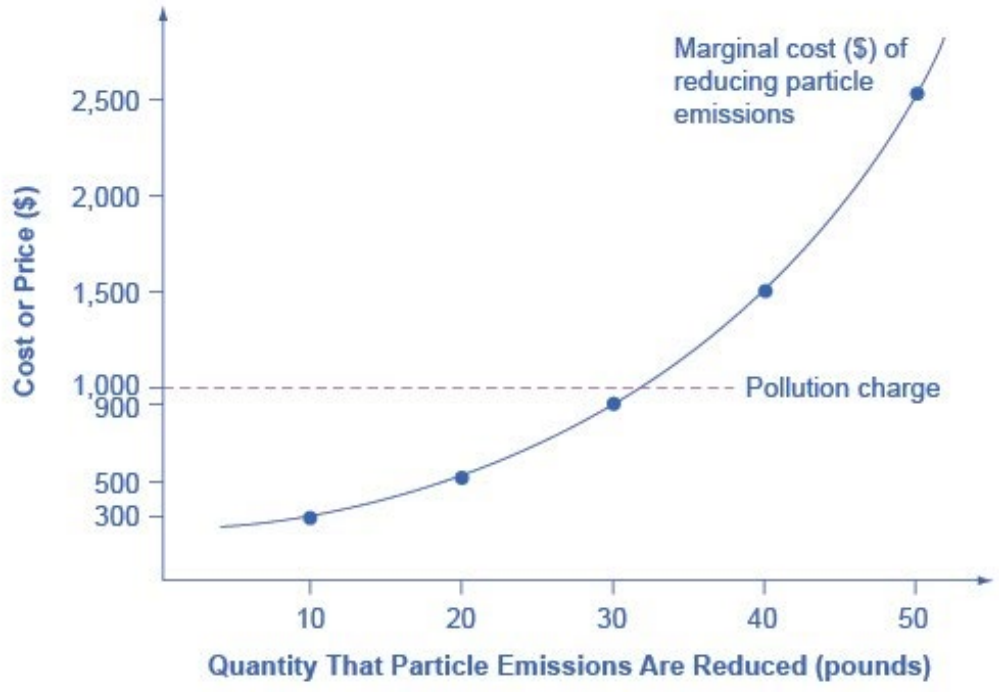
Difficulties with command-and-control environmental regulation

- 3 difficulties with command-and-control environmental regulation:
  - Regulation offers no incentive to improve the quality of the environment beyond the standard set by a particular law.
    - No incentive to do better.
  - Inflexible.
    - Requires the same standard for all polluters, and often the same pollution-control technology as well.
  - Subject to compromises in the political process.
    - Full of fine print, loopholes, and exceptions.

12.3 Market-Oriented Environmental Tools

- **Pollution charge** - tax imposed on the quantity of pollution that a firm emits.
  - Gives a profit-maximizing firm an incentive to determine the least expensive technologies for reducing pollution.
  - Firms that can reduce pollution cheaply and easily will do so to minimize their pollution taxes.

A Pollution Charge Example



- Each additional reduction in emissions is increasingly costly
- On its own, a profit maximizing firm engages in no emissions reduction.
- But if a pollution charge is set equal to $1,000 per pound, then the firm will reduce pollution by 30 pounds,
- Why? Because even the $900 cost of the last pound of reduction is less than the cost of paying the pollution charge.

Marketable Permits

- **Marketable permit program:** provides a permit that allows a firm to emit a certain amount of pollution. The firms can se. (e.g. cap-and-trade)
    - Firms with more permits than pollution-reduction needs can sell the remaining permits to other firms

Better-Defined Property Rights

- **Property rights** - the legal rights of ownership on which others are not allowed to infringe without paying compensation.

- Property rights issues are highly relevant in cases involving endangered species on privately owned land.

12.4 The Benefits and Costs of U.S. Environmental Laws

- Benefits of a cleaner environment:

  (1) people may stay healthier and live longer;

  (2) certain industries that rely on clean air and water, such as farming, fishing, and tourism, may benefit;

  (3) Unpolluted property may have higher value;

  (4) people may simply enjoy a cleaner environment in a way that does not need to involve a market transaction.

Marginal Benefits and Marginal Costs

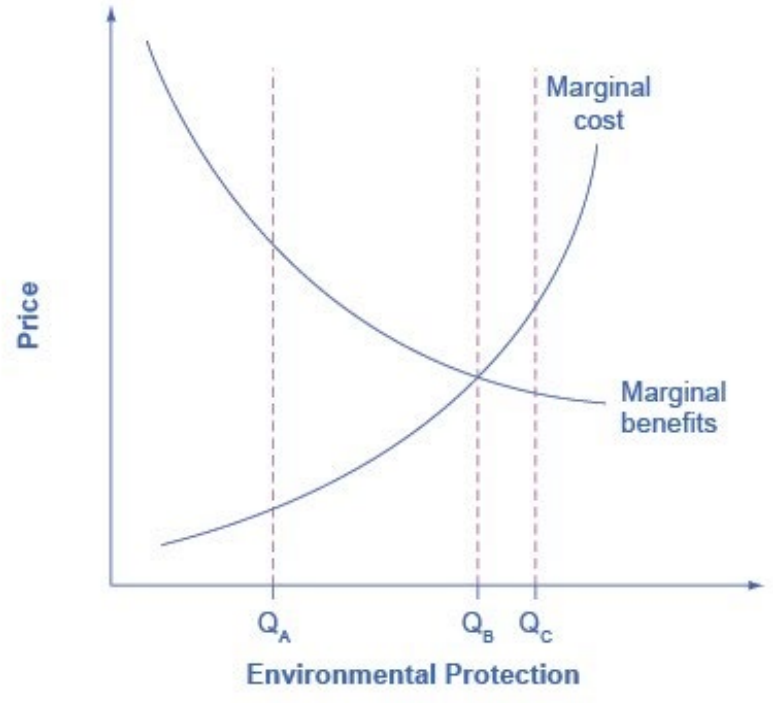
- Tools of marginal analysis can be used to illustrate the marginal costs and the marginal benefits of reducing pollution.

- Reducing pollution is costly - resources must be sacrificed.

- The marginal costs of reducing pollution are generally increasing,
  - The least expensive and easiest reductions can be made first, leaving the more expensive methods for later.

- The marginal benefits of reducing pollution are generally declining,
  - The steps that provide the greatest benefit can be taken first, and steps that provide less benefit can wait until later.

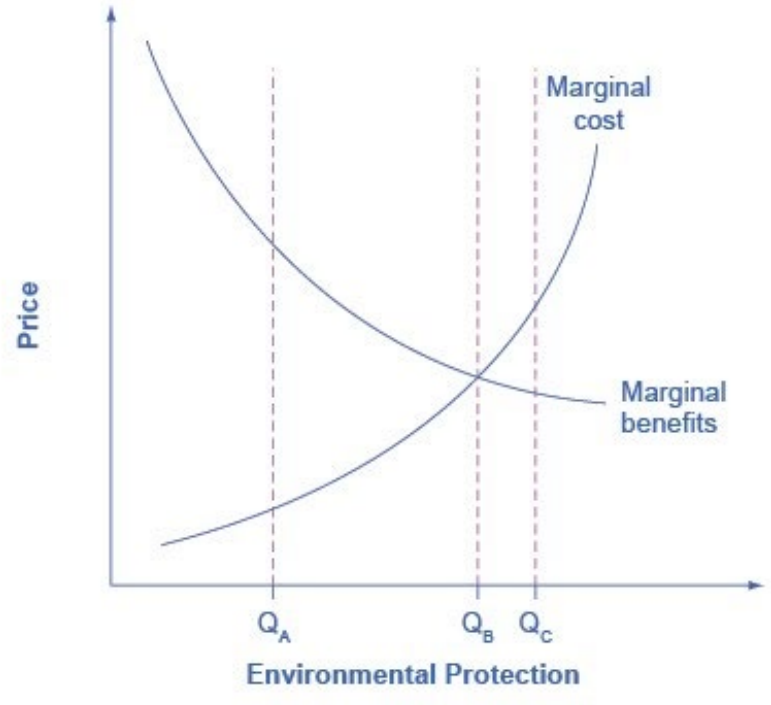
Marginal Costs and Marginal Benefits of Environmental Protection



- When the quantity of environmental protection is low (Q_A):
  - Pollution is extensive (and MB is high).
  - There are cheap & easy ways to reduce pollution (so MC is low).

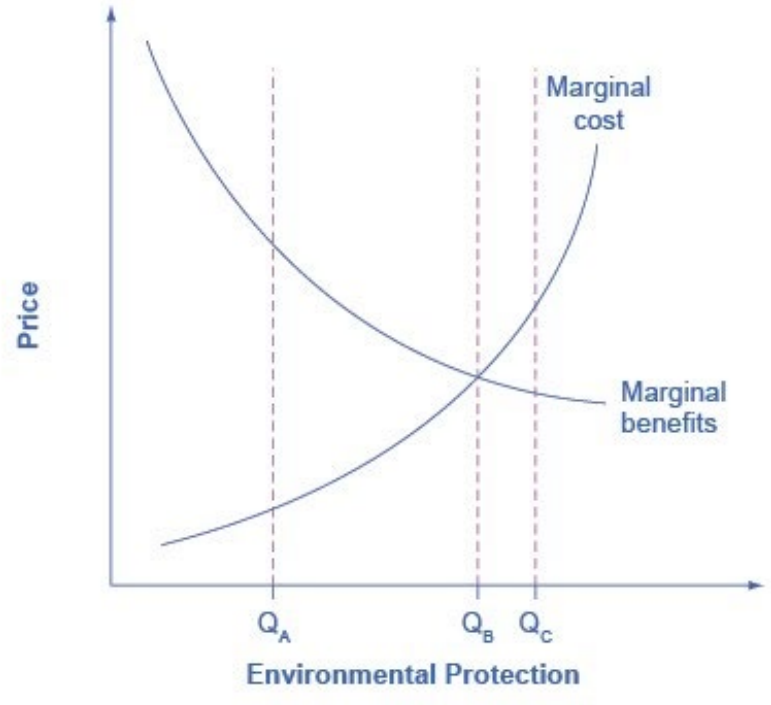
- At Q_A, it makes sense to allocate more resources to fight pollution.

Marginal Costs and Marginal Benefits of Environmental Protection, Continued



- As the environmental protection increases:
  - the cheap and easy ways of reducing pollution begin to decrease, and one must use more costly methods.
  - the marginal cost rises.
  - the largest marginal benefits happen first, followed by reduced marginal benefits.

Marginal Costs and Marginal Benefits of Environmental Protection, Continued



- As the quantity of environmental protection increases to Q_B, the gap between marginal benefits and marginal costs narrows.
- At point Q_C the marginal costs > marginal benefits.
- At this level of environmental protection, society is not allocating resources efficiently.
  - It may be forfeiting too many resources to reduce pollution.

12.5 International Environmental Issues

- Certain environmental problems spill over national borders.
- **Biodiversity:** the full spectrum of animal and plant genetic material.
- **International externalities:** externalities that cross national borders and that a single nation acting alone cannot resolve.
  - No nation by itself can reduce emissions of carbon dioxide and other gases by enough to solve the problem of global warming.

Fossil Fuels and Climate Change

- High-income countries have historically been the primary contributors to greenhouse warming by burning fossil fuels - and still are today.

- Paris Climate Agreement - committed participating countries to significant limits on CO_2 emissions.

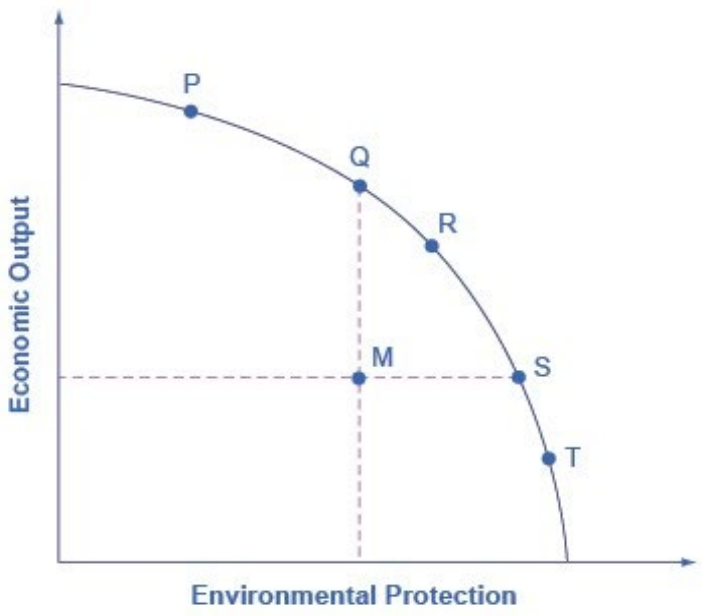
Details of an International System

- The practical details of an international system and how it would operate across international borders are complex.
- It seems unlikely that some form of world government will or can impose a detailed system of environmental command-and-control regulations around the world.
- As a result, a decentralized and market-oriented approach may be the only practical way to address international issues such as global warming and biodiversity.

12.6 The Big Tradeoff: Economic Output vs Environmental Protection

- The tradeoff between *economic output* and the *environment* can be analyzed with a production possibility frontier (PPF).
- Economists believe that an inefficient choice on the PPF is undesirable.
- Market-oriented environmental tools offer a mechanism for providing either the same environmental protection at lower cost, or providing a greater degree of environmental protection for the same cost.

A Big Tradeoff:
Economic Output vs Environmental Protection



- Economists use a PPF to illustrate social tradeoffs. What are the available tradeoffs between economic output and environmental protection? This is a positive (i.e., scientific) question.
- Should a society choose a point like P, with *more economic output* and *less environmental protection*? Or a point like T, with *more environmental protection* and *less economic output*? This is a normative (i.e., value-laden) question.
- Either way, an inefficient choice such as M is undesirable.

END