

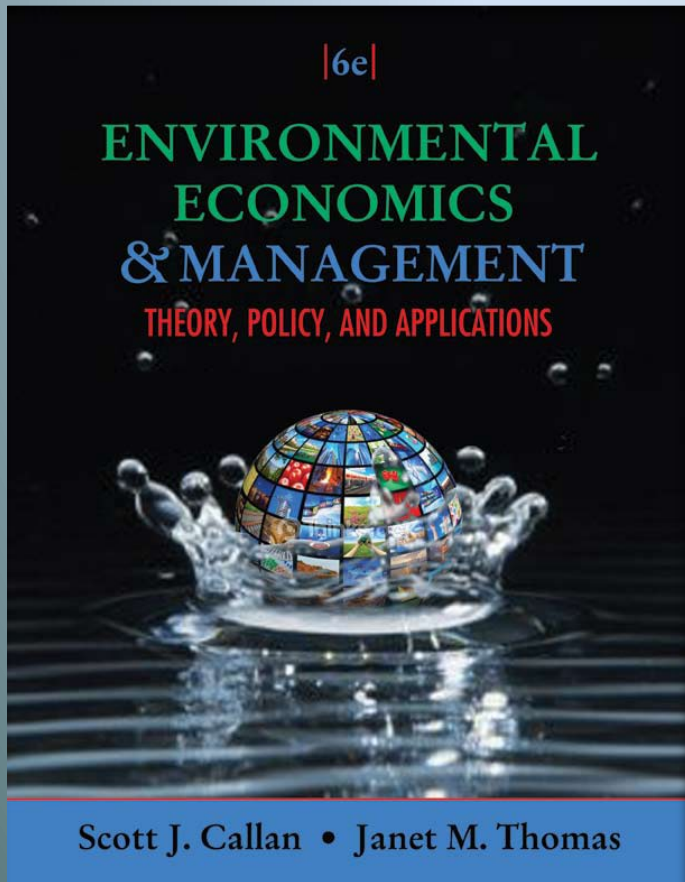
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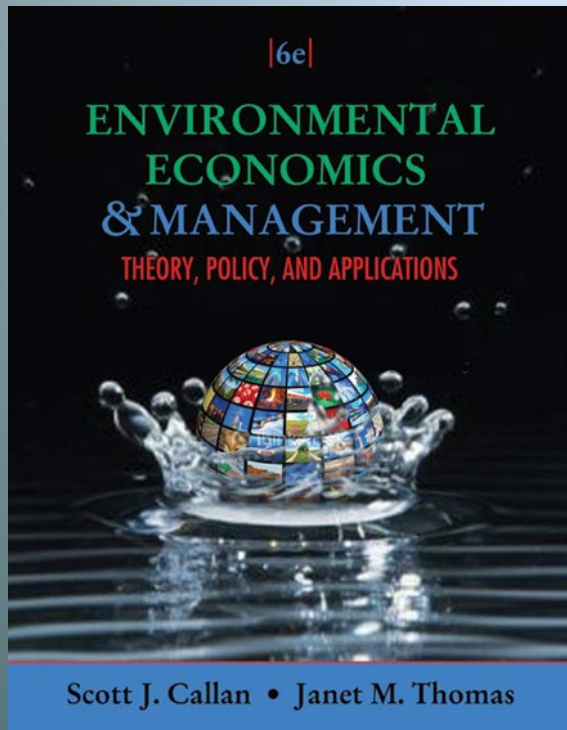


# Environmental Economics and Management: Theory, Policy, and Applications 6e

by Scott J. Callan and Janet M. Thomas

Slides created by Janet M. Thomas

# THE ROLE OF ECONOMICS IN ENVIRONMENTAL MANAGEMENT



## ■ Chapter 1

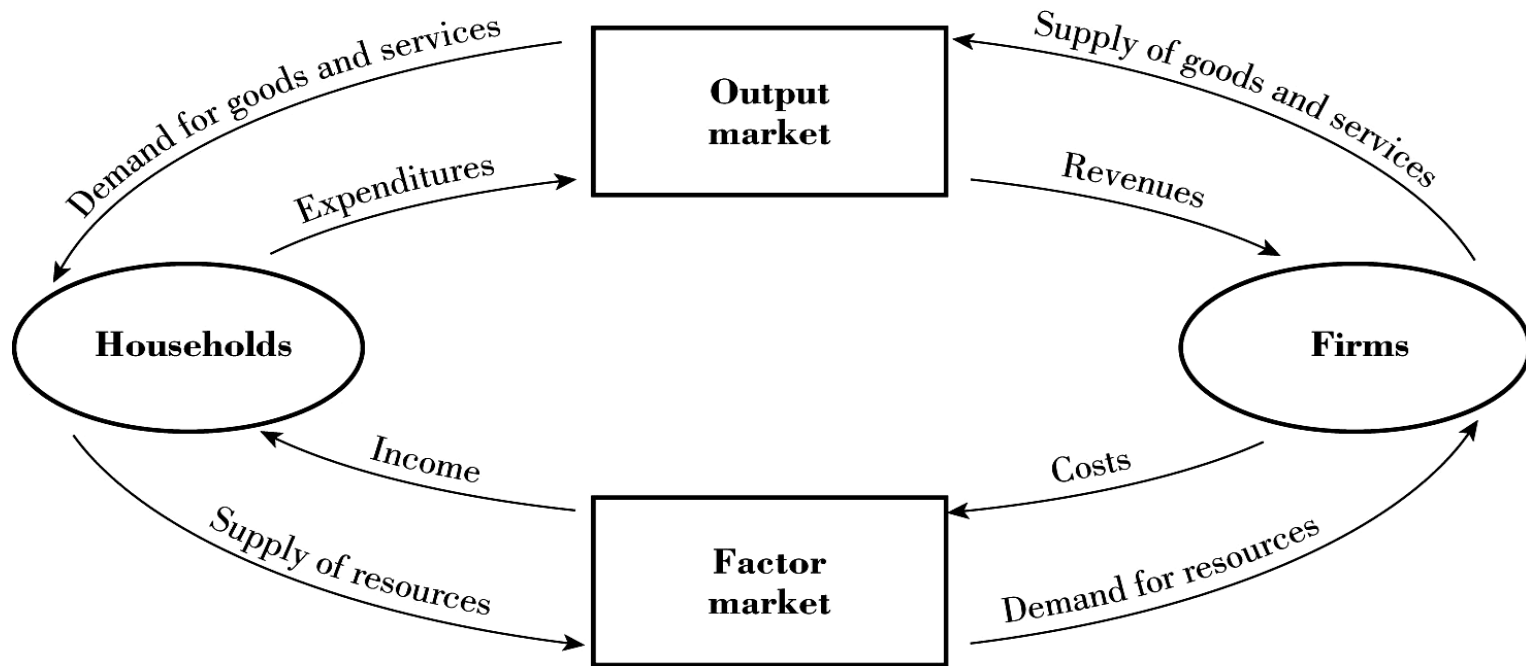
# Economics and the Environment

- Economic theory explains what we observe in reality, including environmental problems
- Recognize the link between economic activity and the environment using models
  - Circular Flow Model
  - Materials Balance Model

# Circular Flow Model

- Shows the real and monetary flows of economic activity through the output and factor markets (see next slide)
  - Forms the basis for modeling the relationship between economic activity and the environment
  - But does not explicitly show the linkage between economic activity and the environment

# Circular Flow Model



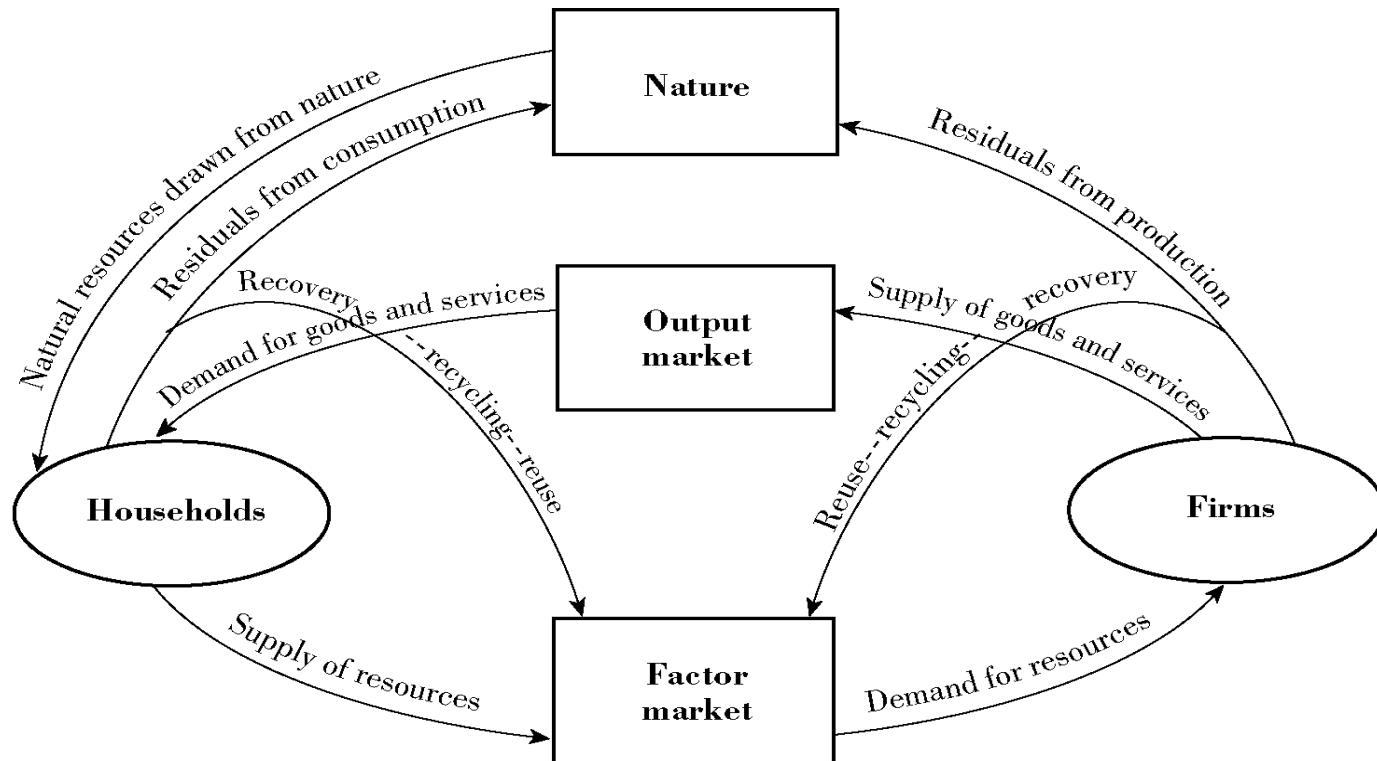
# Materials Balance Model

- Places the circular flow within a larger schematic to show links between economic activity and the natural environment via two sets of flows
  - Flow of resources *from* the environment *to* the economy
    - ▣ The focus of **Natural Resource Economics**
  - Flow of residuals *from* the economy *to* the environment
    - ▣ The focus of **Environmental Economics**
- Residuals are pollution remaining in the environment after some process has occurred
  - Residuals can be delayed, but not prevented, through **recovery, recycling, and reuse**
    - ▣ Shown as inner flows in the model



# Materials Balance Model

*The Interdependence of Economic Activity and Nature*



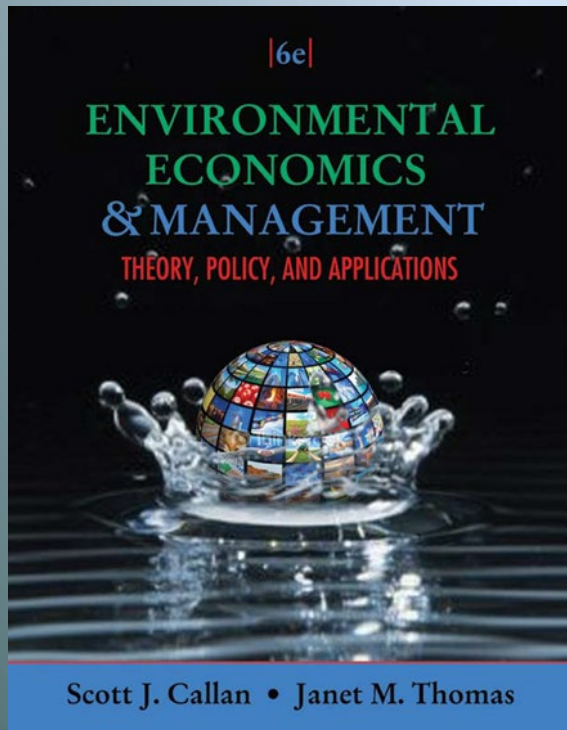
**Source:** Based on Kneese, Ayres, and D'Arge (1970).



# Science and the Materials Balance Model

- The flow of resources and residuals are balanced according to laws of science
- First Law of Thermodynamics
  - Matter and energy can neither be created nor destroyed
- Second Law of Thermodynamics
  - Nature's capacity to convert matter and energy is not without bound

# FUNDAMENTAL CONCEPTS IN ENVIRONMENTAL ECONOMICS



## ■ Terms and Definitions

# Causes of Environmental Damage

- **Natural Pollutants** arise from nonartificial processes in nature
  - ▣ e.g., ocean salt spray, pollen
- **Anthropogenic Pollutants** are human induced and include all residuals associated with consumption and production
  - ▣ e.g., chemical wastes, gases from combustion
  - ▣ Of greater concern to environmental economists

# Sources of Pollution

- Sources grouped by mobility
  - Stationary Sources: fixed-site
  - Mobile Source: any nonstationary source
- Sources grouped by identifiability
  - Point source: single identifiable source
  - Nonpoint Source: a source that cannot be accurately identified, degrading in a diffuse way

# Scope of Environmental Damage

## ■ Local Pollution

- Damage not far from the source
  - e.g., urban smog

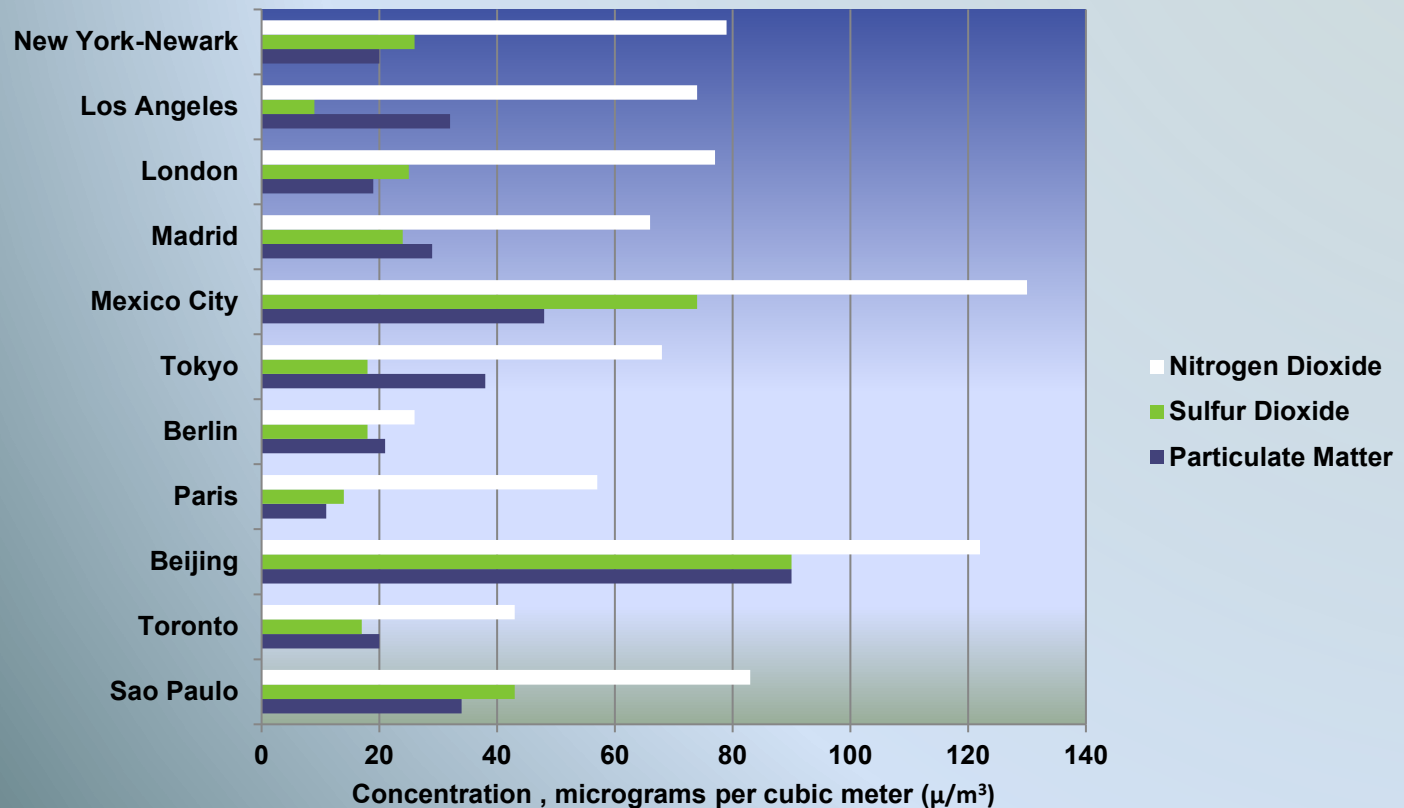
## ■ Regional Pollution

- Damage extends well beyond the source
  - e.g., acidic deposition

## ■ Global Pollution

- Involving widespread environmental effects with global implications
  - e.g., global warming, ozone depletion

# Urban Air Pollution in Major Cities



**Source:** World Bank (2010), Table 3.14, pp. 206–207.

# Environmental Objectives

- **Environmental Quality** – reduction in anthropogenic contamination to socially acceptable levels
- **Sustainable Development** – management of resources to ensure long-term quality and abundance
- **Biodiversity** – assuring the variety of distinct species, genetic variability, and variety of inhabitable ecosystems



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# Environmental Policy Planning

- Environmental planning involves many segments of society
- In the U.S., the Environmental Protection Agency (EPA) acts as liaison to numerous constituents within each sector

# Environmental Policy Planning

## PRIVATE SECTOR

Environmentalists

Private Industry

Scientists

Economists

Labor Unions

Private Citizens

ENVIRONMENTAL  
PROTECTION  
AGENCY

## PUBLIC SECTOR

Executive Branch

Congress

Judiciary

Food and Drug Administration

Occupational Safety and  
Health Administration

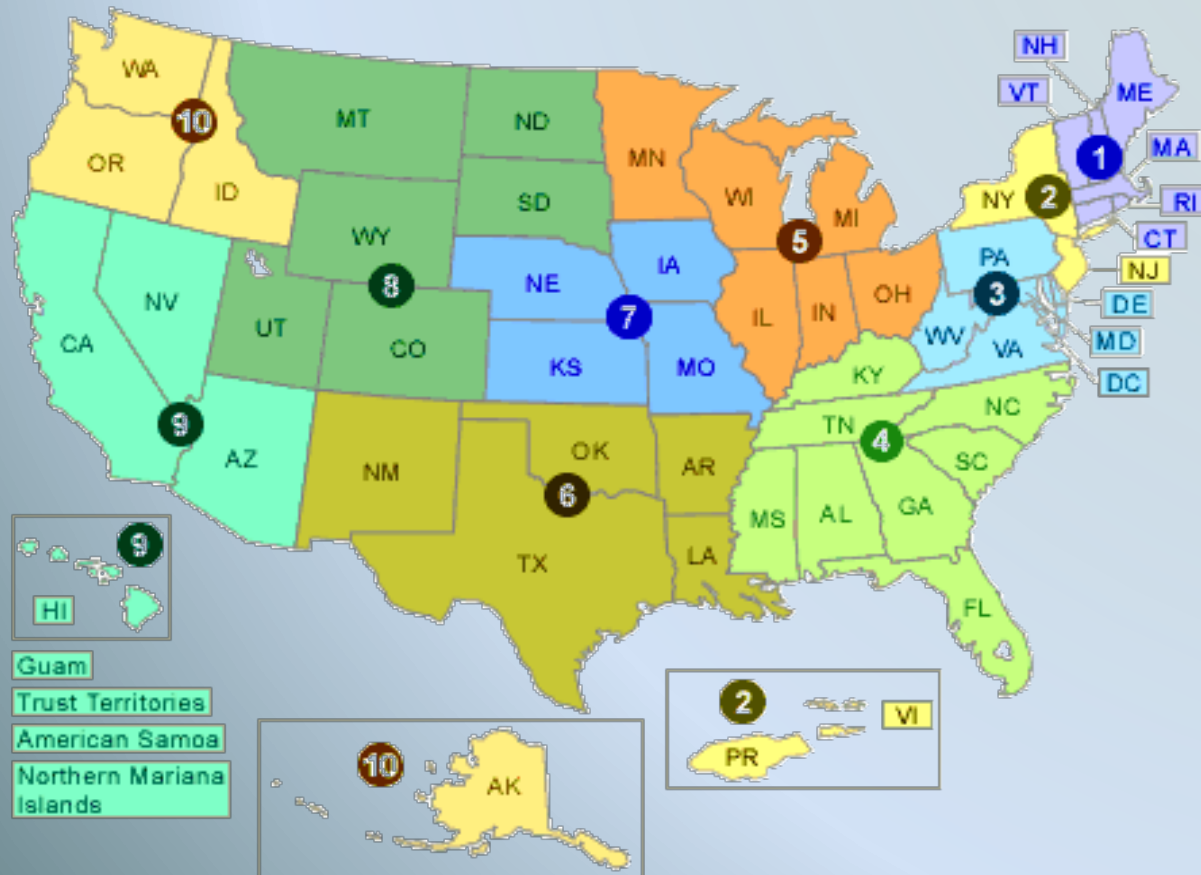
Other Administrative Agencies

State and Local Governments

**Source:** Based on Vaupel (1978), Figure 5-3, p. 75.

EPA headquarters are in Washington, D.C., and there are 10 regional offices across the nation.

# EPA's 10 Regions



Source: U.S. EPA (February 19, 2011).

# National Environmental Policy Act (NEPA) of 1969

- Directs the integration of effort across agencies, executive departments, and branches of government in the U.S.
- Guides U.S. federal environmental policy
- Requires that environmental impact of public policy proposals be addressed
  - Calls for an Environmental Impact Statement (EIS) on proposals or major federal actions

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# Risk Analysis

## Chief Tool Guiding Policy Planning

- Two decision-making procedures
  - Risk Assessment – qualitative and quantitative evaluation of risk posed by an environmental hazard
  - Risk Management – decision-making process of choosing from alternative responses to environmental risk

# Risk Management

## Policy Evaluation Criteria

### ■ Economic Criteria

- Allocative Efficiency – requires resources to be appropriated such that additional benefits equal additional costs
- Cost-effectiveness – requires that the least amount of resources be used to achieve an objective

### ■ Equity Criterion

- Environmental Justice – concerned with the fairness of the environmental risk burden across segments of society or geographic region

# Government Policy Approach

- **Command-and-Control Approach** – regulates polluters through the use of rules
- **Market Approach** – incentive-based policy that encourages conservation or pollution reduction
  - Can follow the “polluter-pays principle” whereby the polluter pays for the damage caused



# Setting the Time Horizon

- **Management Strategies** – short-term strategies intended to manage an existing problem
  - An ameliorative intent
- **Pollution Prevention (P2)** – a long-term strategy aimed at reducing the amount of toxicity of residuals released to nature
  - A preventive intent