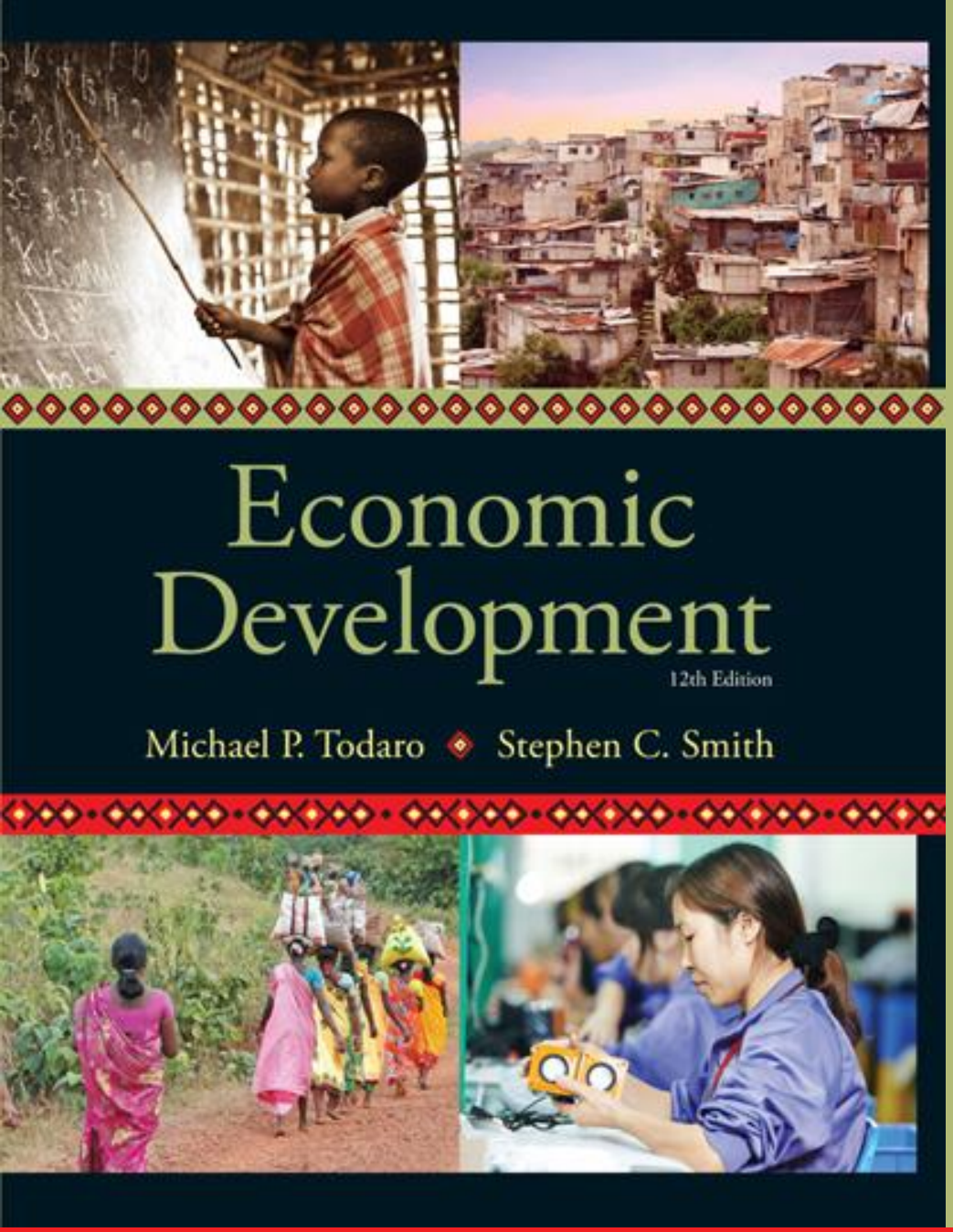


Chapter 10

The Environment and Development

10.1 Environment and Development: The Basic Issues

- Environmental issues affect, and are affected by, economic development
- Classic market failures lead to too much environmental degradation
- Poverty and lack of education may also lead to non-sustainable use of environmental resources
- Global warming and attendant climate change is a growing concern in developing countries

10.1 Environment and Development: The Basic Issues

- Sustainable development and environmental accounting
- Population, resources, and the environment
- Poverty and the environment
- Growth versus the environment?
- Rural development and the environment

10.1 Environment and Development: The Basic Issues

- Urban development and the environment
- The global environment and economy
- Nature and pace of Greenhouse Gas-Induced Climate change
- Natural Resource-Based Livelihoods as a pathway out of poverty: Promise and Limitations

10.1 Environment and Development: The Basic Issues

- Sustainable development and environmental accounting

10.1 Environment and Development: The Basic Issues

- Sustainable development has been defined as "meeting the needs of present generation without compromising the wellbeing of future generations"
- So, running down the capital stock is not consistent with the idea of sustainability
- Environmental and other forms of capital are substitutes only to a degree; eventually they likely act as complements
- In developing countries, environmental capital is generally a larger fraction of total capital
- To know whether environmental capital is increasing or decreasing, we need environmental accounting

10.1 Environment and Development: The Basic Issues

Sustainable net national product is:

$$NNI^{*} = GNI - D_m - D_n$$

Where

NNI* is sustainable national income

GNI is Gross national income

D_m is the depreciation of manufactured capital assets

D_n is the depreciation of environmental capital

10.1 Environment and Development: The Basic Issues

More expansively, sustainable net national product is:

$$NNI^{**} = GNI - D_m - D_n - R - A$$

Where

NNI** is the revised NNI calculation

GNI, D_m, and D_n are defined as before

R is expenditure needed to restore environmental capital

A is expenditure required to avert destruction of environmental capital

(Note: R and A are components of *GNI* but not *NNI***)

The poor as both agents and victims of environmental degradation

- Victims:
  - The poor live in environmentally degraded lands which are less expensive because the rich avoid them
  - People living in poverty have less political clout to reduce pollution where they live
  - Living in less productive polluted lands gives the poor less opportunity to work their way out of poverty
- Agents:
  - The high fertility rate of people living in poverty
  - Short time horizon of the poor (by necessity)
  - Land tenure insecurity
  - Incentives for rainforest resettlement

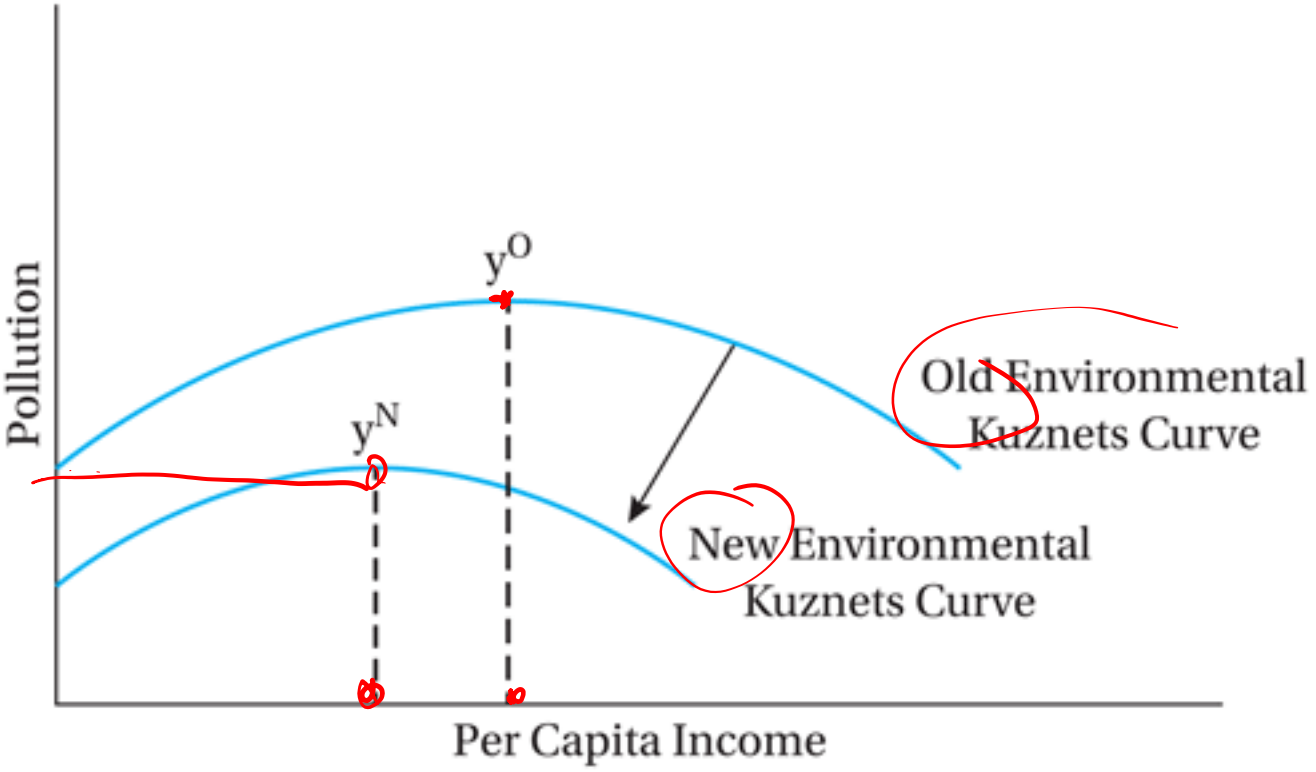
10.1 Environment and Development: The Basic Issues

- Natural resource based livelihoods are at risk
- The Scope of Domestic-Origin Environmental Degradation: An Overview
- Environmental problems have consequences both for health and productivity
  - Loss of agricultural productivity
  - Prevalence of unsanitary conditions created by lack of clean water and sanitation
  - Dependence on biomass fuels and pollution
  - Airborne pollutants

Rural Development and the Environment: A Tale of Two Villages

- Representative African village
- Representative South American village

Figure 10.1 Hypothetical Income-Pollution Relationship: Environmental Kuznets Curves



10.2 Global Warming and Climate Change: Scope, Migration, and Adaptation

- The benchmark 2007 Fourth IPCC report painted a dire picture for developing economies.
- Recent follow up reports have amplified findings and concerns:
  - Summary in World Bank 2009 World Development Report
  - 2010 U.S. NOAA study found evidence of global warming due to greenhouse gases on all 11 indicators examined
  - 2012 and 2013 "Turn Down the Heat" Reports show severity of consequences for developing countries
  - 2013/2014 Fifth IPCC reports released: Even less uncertainty regarding human causes and severe physical and social consequences of greenhouse gas emissions-based global warming
- Impact of global warming likely hardest on the poorest
- Agriculture harmed in tropical and subtropical areas
- Resultant conflicts over natural resources may grow
- Range of adverse health impacts

Some impacts of climate change in Developing Countries identified by IPCC

- prolonged droughts, expanded desertification
- increased severity of storms with heavy flooding and erosion
- longer and more severe heat waves
- reduced summer river flow and water shortages
- decreased grain yields
- climate-induced spreading ranges of pests and disease
- lost and contaminated groundwater
- deteriorated freshwater lakes, coastal fisheries, mangroves, coral reefs
- coastal flooding
- loss of essential species such as pollinators and soil organisms,
- forest and crop fires

10.2 Global Warming and Climate Change: Scope, Mitigation, and Adaptation

- Problem primarily but not exclusively caused by developed countries
  - Rapid industrial growth especially in Asia
  - Deforestation in developing countries
- Strategies for mitigation
  - Taxes on carbons
  - Caps on greenhouse gases (with “carbon markets”)
  - Subsidies to encourage technological progress
- Types of adaptation
  - Planned (or “policy”) adaptation
  - Autonomous adaptation (some types are reviewed in Box 10.1)

10.3 Economic Models of Environment Issues

- Privately owned resources
- Inefficiencies result from imperfections in property rights
- Perfect property rights are characterized by
  - Universality
  - Exclusivity or Excludability
  - Transferability
  - Enforceability

Allocational efficiency

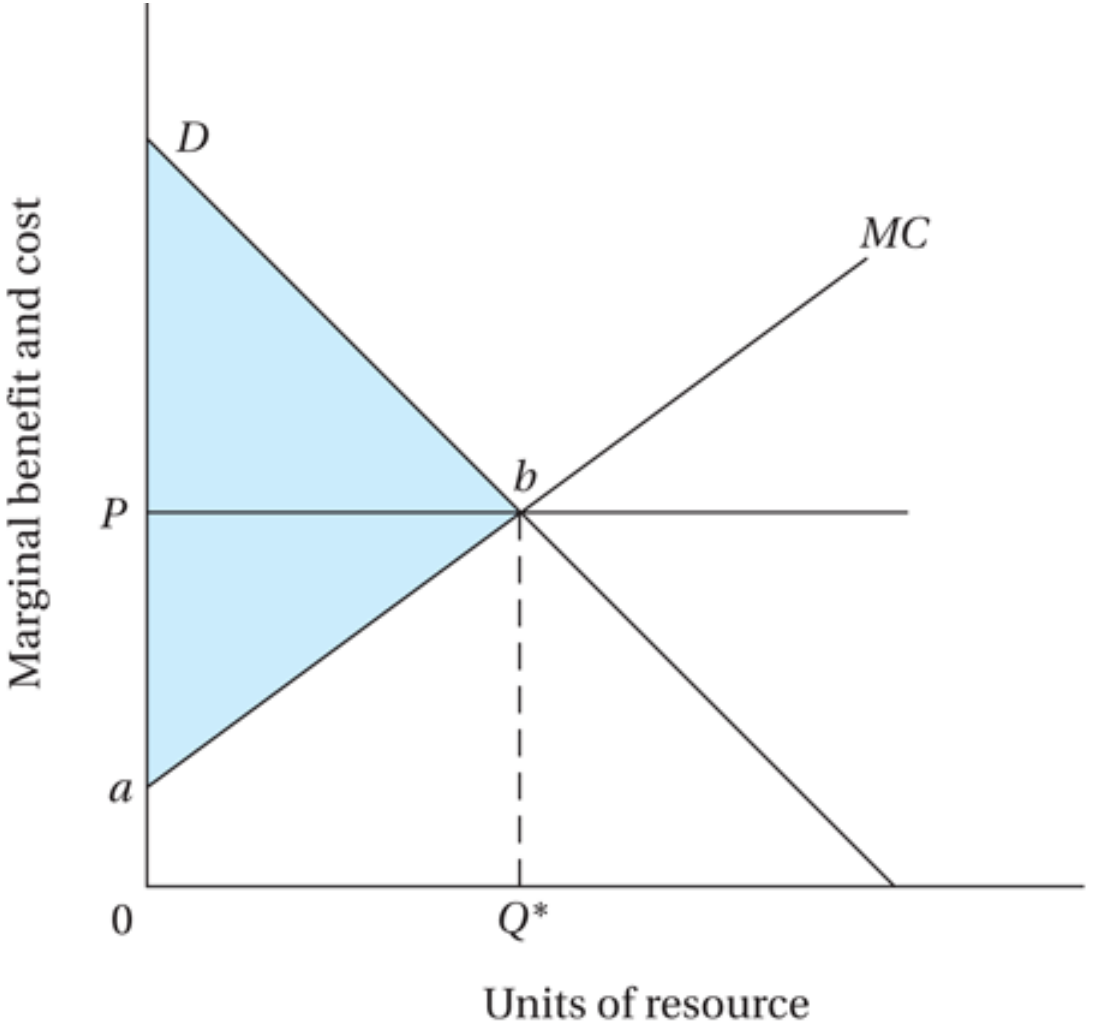
present Value

- Equate PV of marginal net benefits of last unit consumed in each period
- That is, for allocational efficiency, consumer must be indifferent between consuming last unit in this period or in another period

10.3 Economic Models of Environment Issues (cont'd)

- Common property resources
  - Inefficiencies may arise because resource is not privately owned
  - Traditional models do not concern themselves with equity and income distribution
  - Family farmers can benefit from extended tenancy or ownership
  - Who should buy publicly owned land

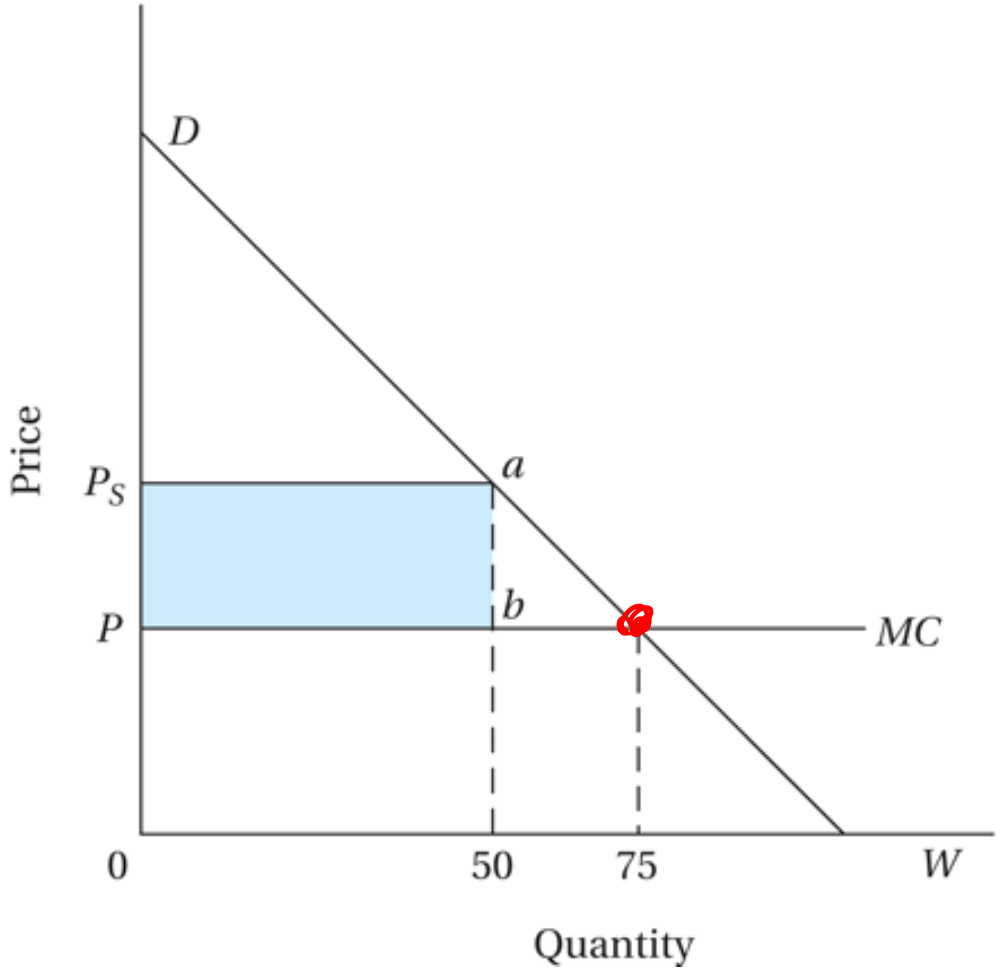
Figure 10.2 Static Efficiency in Resource Allocation



Understanding the Tragedy of the Commons

- Users fail to take account of an externality: that as each uses more of the common resource the average return is lowered for other users
- Traditional societies have sometimes responded effectively with social enforcement mechanisms
- Reviewed in Box 10.2

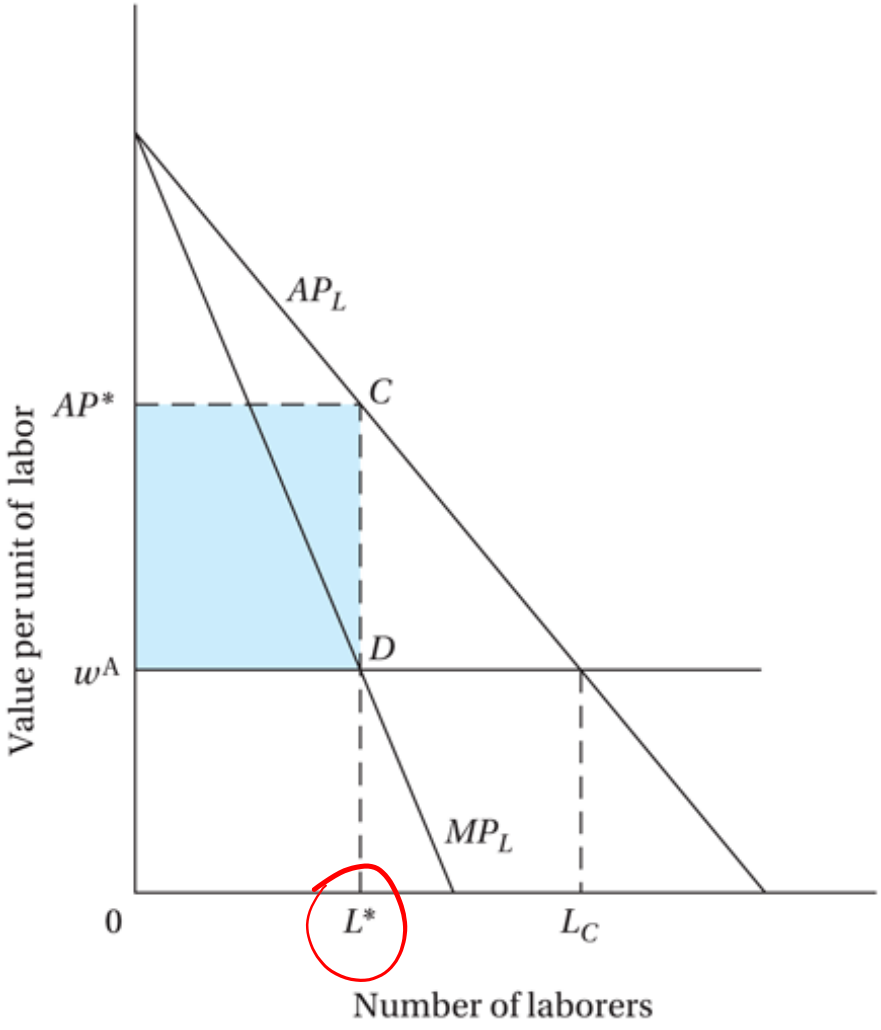
Figure 10.3 Optimal Resource Allocation over Time



Elinor Ostrom's Common Property Design Principles Derived from Empirical Studies

- Clearly Defined Boundaries of the resource system
- Proportional equivalence between benefits and costs for users
- Collective-choice arrangements including those affected
- Monitoring, with those who audit accountable to users
- Graduated Sanctions
- Conflict-resolution mechanisms
- Recognition of rights to organize
- Nested enterprises when resources are parts of larger systems

Figure 10.4 Common Property Resources and Misallocation



10.3 Economic Models of Environment Issues (cont'd)

- Public goods and bads: regional environmental degradation and the free-rider problem
  - Internalization of externalities is not easy
  - Free rider problems
- Limitations of the public goods framework
  - Pricing mechanism

10.4 Urban Development and the Environment

- Environmental Problems of Urban Slums
  - Health threatening pollutants
  - Unsanitary environmental conditions
  - Serious impact on poor
- Industrialization and urban air pollution
  - Environmental Kuznets curve (see Figure 10.1)
  - Pollution tax
  - Absorptive capacity of the environment
  - Severity of industrial pollution- impact on health

Figure 10.5 Public Goods, Private Goods, and the Free-Rider Problem

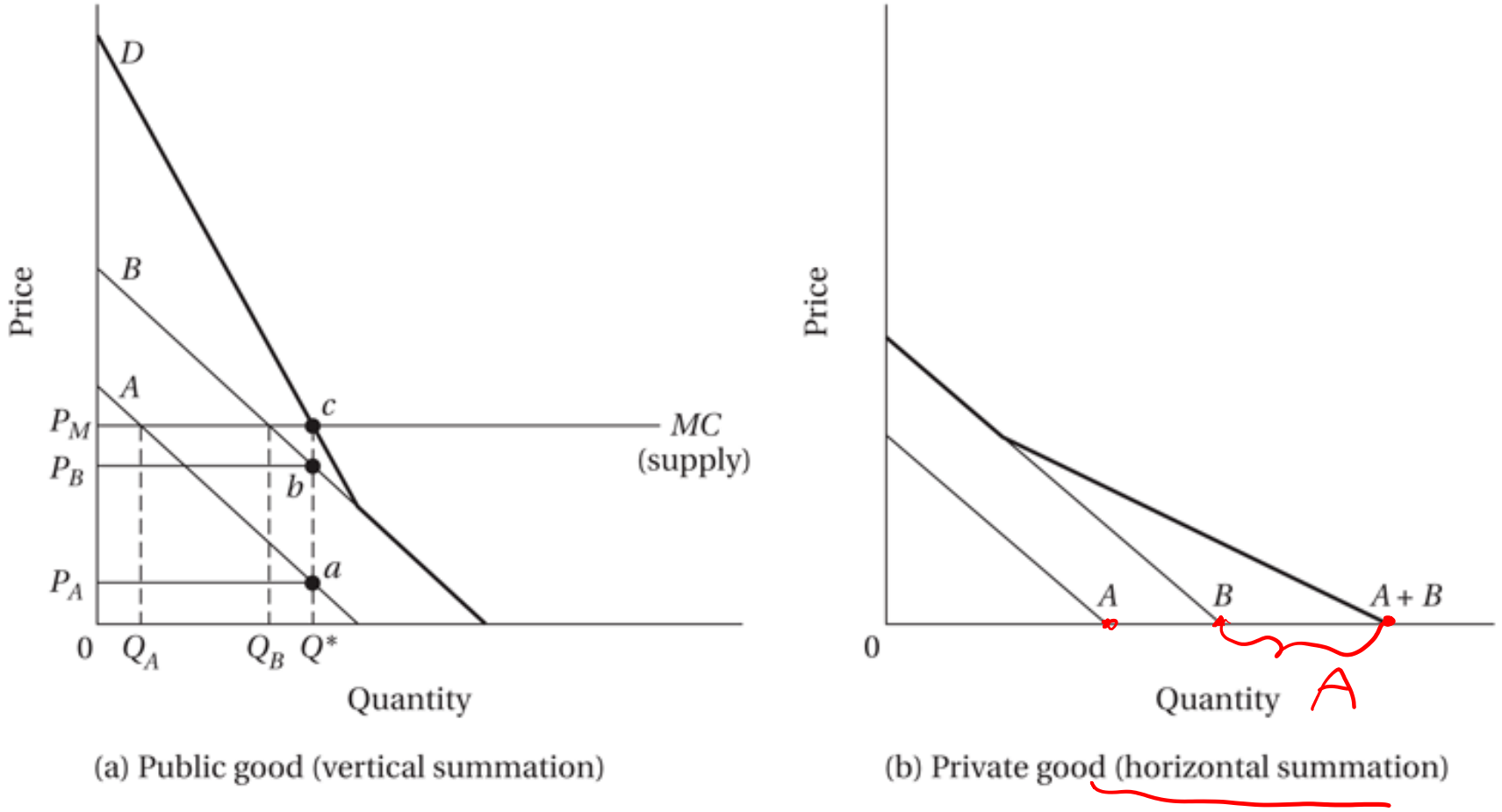


Figure 10.6 Pollution Externalities: Private versus Social Costs and the Role of Taxation

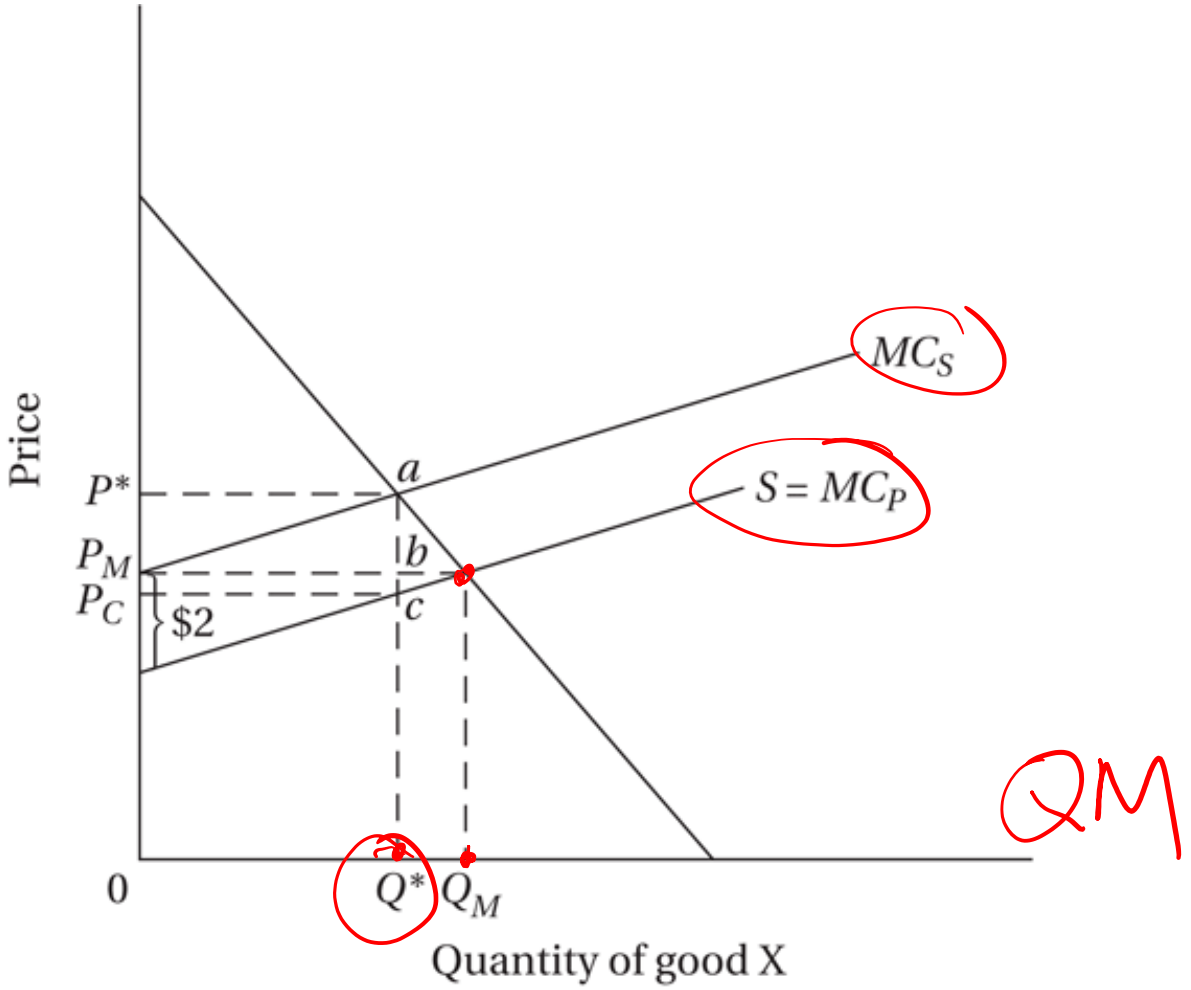


Figure 10.7 Increasing Pollution Externalities with Economic Growth

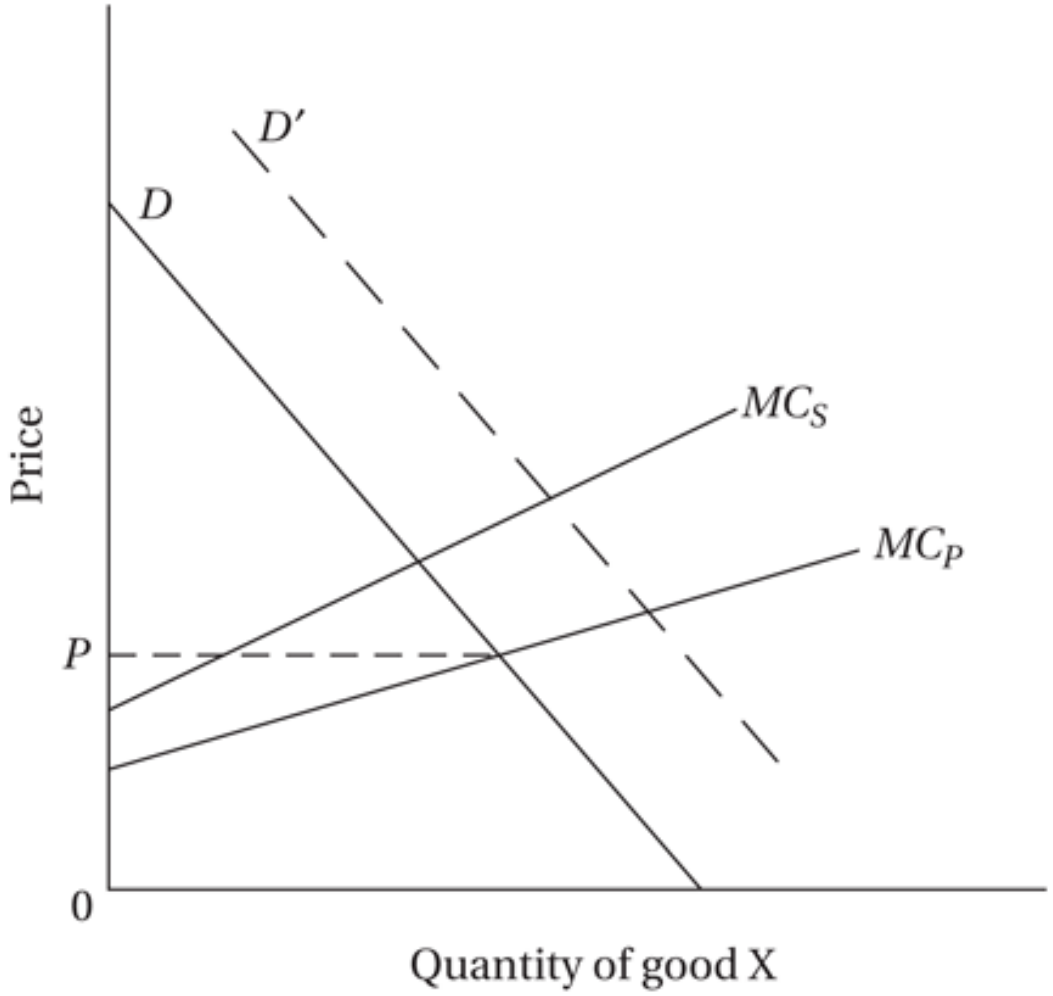


Figure 10.8 The Earth at Night, Reflecting Inequality of Energy Use across High-, Middle-, and Low-Income Countries; and Concentration of Economic Activity along Seacoasts

Craig Mayhew and Robert Simmon, NASA GSFC

10.4 Urban Development and the Environment (cont'd)

- Problems of congestion, Clean water, and Sanitation
  - High health and economic costs associated with environmental degradation
  - Drag on development
  - Impact on poor
  - Private wells have led to land subsidence and flooding
  - Impact on export earnings

10.5 The Local and Global Costs of Rain Forest Destruction

- Rainforest loss contributes to global warming
- Loss of biodiversity
- Loss of livelihoods for people living in poverty who depend upon them
- Much waste in the process of forest clearing
- Thus, rainforest preservation (and restoration) is a global public good - a restorative mechanism for the environment
- Sustainable management of rain forests is a priority
- Provide funds, debt relief to help enhance biodiversity
- In addition, support for forest preservation as climate change mitigation

10.6 Policy Options in Developing and Developed Countries

- What Developing Countries can do
  - Proper resource pricing
  - Community involvement
  - Clearer property rights and resource ownership
  - Improved economic alternatives for the poor
  - Improved economic status of women
  - Investments that yield returns regardless of the shape of climate change, such as a better road network
  - Industrial emissions abatement policies
  - Proactive stance toward adapting to climate change

10.6 Policy Options in Developing and Developed Countries (cont'd)

- How developed countries can help developing countries
  - Lower developing country costs for environmental preservation
  - Trade policies: reduce barriers, subsidies
  - Debt relief and debt for nature swaps
  - Development assistance

10.6 Policy Options in Developing and Developed Countries (cont'd)

- What developed countries can do for the global environment
  - Emissions controls, including greenhouse gases
  - Research and Development on green technology and pollution control
  - Transfer of technology to developing countries
  - Restrictions on unsustainable production

Concepts for Review

- Absorptive capacity
- Biodiversity
- Biomass fuels
- Clean technologies
- Climate change
- Common property resource
- Consumer surplus
- Debt-for-nature swap
- Deforestation
- Desertification
- Environmental accounting
- Environmental capital
- Environmental Kuznets curve
- Externality
- Free-rider problem
- Global public good
- Global warming
- Greenhouse gases

Concepts for Review (cont'd)

- Internalization
- Marginal cost
- Marginal net benefit
- Pollution tax
- Present value
- Private costs
- Producer surplus
- Property rights
- Public bad
- Public good
- Scarcity rent
- Social cost
- Soil erosion
- Sustainable development
- Sustainable net national income (NNI*)
- Total net benefit