

Environment and Sustainable Development:
The environment is not separate from the economy. It is one of the foundations on which the economy operates.



Without the Environment, the Economy Cannot Function

ENVIRONMENT

Supplies resources, assimilates waste, sustains life through biodiversity, and provides aesthetic services such as scenery.

ECONOMICS

Resource supply provides production inputs; waste assimilation has limits; biodiversity sustains livelihoods; aesthetic services may not be captured in market prices.

What Do We Mean by Environment?

ENVIRONMENT

The total planetary inheritance and the totality of all resources. Biotic: birds, animals, plants, forests and fisheries. Abiotic: air, water, land, rocks and sunlight.

ECONOMICS

Agriculture depends on soil, water, sunlight and biological systems; industry depends on minerals, energy and water; damage to interconnected systems affects several activities at once.



Abiotic & biotic planetary inputs.

Economic Development and Environmental Quality

ENVIRONMENT

Economic development so far has come at a cost to environmental quality. Population growth, industrialisation and rising consumption pressure resources. The Industrial Revolution, commonly dated from approximately 1760 and beginning in Britain, marks a turning point. The chapter does not specify an exact starting year.

ECONOMICS

Industrialisation expands output and employment, but needs energy and raw materials and may generate pollution. The question is whether total benefits justify full costs, including environmental damage.

The Four Functions of the Environment and Their Economic Connections

ENVIRONMENT

1. Resource supply (renewable and non-renewable). 2. Waste assimilation. 3. Life sustenance through biodiversity and genetic diversity. 4. Aesthetic services such as natural scenery.

Functions remain uninterrupted only while demand stays within carrying capacity.

ECONOMICS

1. Resource supply enables production and consumption. 2. Waste assimilation is finite; beyond it, pollution accumulates. 3. Biodiversity supports resource-dependent activities. 4. Aesthetic services provide welfare benefits not directly traded in markets.

Renewable and Non-Renewable Resources

ENVIRONMENT

Renewable resources regenerate through continuous replenishment, provided use is sustainable (for example, trees in forests and fish in oceans). Non-renewable resources are exhausted through use (the textbook gives fossil fuels).

Classify trees, fish, petroleum, coal, iron ore and water as renewable or non-renewable, explaining why the answer depends on replenishment and rate of use.

ECONOMICS

Renewable does not mean unlimited, since extraction can exceed regeneration. Non-renewable resources face depletion. Present extraction affects future availability.

Carrying Capacity: The Limits Within Which an Economy Operates

ENVIRONMENT

The environment performs its functions only while demand stays within carrying capacity. Resource extraction must not exceed regeneration; waste must remain within assimilating capacity.

ECONOMICS

If resource use exceeds regeneration, future supplies may decline. If waste exceeds absorption, pollution and associated costs rise. Herman Daly later used carrying capacity to argue that the scale of human activity must remain within ecological limits.

How an Environmental Crisis Emerges

ENVIRONMENT

The textbook identifies two pressures: rising population in developing countries, and affluent production and consumption standards in developed countries. Resources become depleted and waste exceeds absorptive capacity.

ECONOMICS

Earlier, demand for environmental resources was lower than supply. With population growth and industrialisation, demand increasingly exceeds what nature can regenerate or absorb, creating scarcity and raising costs of obtaining resources, managing waste and correcting damage.



River aquifer under pressure.

Water Scarcity: When an Environmental Resource Becomes an Economic Good

ENVIRONMENT

Environmental degradation has polluted and dried up rivers and other aquifers. Water faces pressure from extraction, contamination and misuse. Unpolluted freshwater sources become increasingly valuable.

ECONOMICS

Water becomes an economic good when clean, accessible supplies are limited relative to demand. Households need it for basic needs, agriculture for irrigation, industry for production. Scarcity requires allocation among competing uses.

Discussion: Why can water be physically present in an area but still be economically scarce?

Opportunity Costs of Environmental Damage

ENVIRONMENT

Degradation damages air and water quality, reduces resource availability and increases the need for corrective measures. The chapter links degraded quality with respiratory and water-borne diseases.

ECONOMICS

Resources spent on healthcare, water treatment, pollution control, research and restoration cannot be used elsewhere. The opportunity cost is the value of the best alternative use forgone.

Historical textbook statement: 70% of India's water was polluted. This is presented as a historical figure, not a current estimate.

Global Warming: Environmental Process and Economic Consequences

ENVIRONMENT

Box 7.1 describes global warming as a gradual increase in the average temperature of the Earth's lower atmosphere, associated with rising greenhouse gases from burning coal and petroleum products, deforestation, methane from animal waste, and increased cattle production. The text refers to the Industrial Revolution and increased greenhouse-gas concentrations since 1750.

Historical textbook figures: carbon dioxide 31% above pre-industrial levels; methane 149% above pre-industrial levels.

ECONOMICS

Risks to snowmelt-dependent drinking water, coastal flooding from sea-level rise, damage to ecological systems and livelihoods, and risks to health and productive assets. Emissions may create costs beyond the private cost of fossil fuel use.

Ozone Depletion: A Historical Case of International Action

ENVIRONMENT

Box 7.2 explains reductions in stratospheric ozone. The textbook identifies CFCs (refrigeration, air-conditioning, aerosol propellants) and halons (fire extinguishers). An approximately 5% reduction in the ozone layer between 1979 and 1990 is reported. Reduced ozone lets more harmful ultraviolet radiation reach Earth.

ECONOMICS

Environmental consequences cross national boundaries. The Montreal Protocol restricted ozone-depleting chemicals. Coordinated international policy may be required when countries cannot address a shared problem alone.

India's Natural Resource Endowment

ENVIRONMENT

Fertile Indo-Gangetic plains; black soil of the Deccan Plateau suitable for cotton; rivers, forests, mountains and the Indian Ocean; deposits of iron ore, coal, natural gas and other minerals. India accounts for nearly 8% of the world's total iron-ore reserves.

ECONOMICS

Fertile soil supports agriculture; minerals and energy support industry; endowments influence regional specialisation; forests and fisheries support livelihoods. Abundance does not guarantee sustainable development.



Mining & mineral reserves.



Poverty & industrial pressure.

India's Environmental Dilemma: Poverty and Affluence

ENVIRONMENT

Two dimensions: poverty-induced environmental degradation, and pollution associated with affluence and a rapidly growing industrial sector. Also air pollution, water contamination, soil erosion, deforestation and wildlife extinction.

ECONOMICS

Poverty can increase dependence on natural resources for basic needs; high consumption raises energy and material demand; industry generates pollution alongside employment; poorer, resource-dependent households may bear damage disproportionately.

Central question: Why must environmental policy consider both poverty and high-consumption production patterns?

Land Degradation: Causes

ENVIRONMENT

Loss of vegetation through deforestation; unsustainable fuelwood and fodder extraction; shifting cultivation and encroachment into forest land; forest fires and overgrazing; inadequate soil conservation and improper crop rotation; indiscriminate use of fertilisers and pesticides; improper irrigation; groundwater extraction beyond recharge capacity.

ECONOMICS

Land is finite and has competing uses: agriculture, forestry, pastures, settlements and industry. Unsustainable use reduces future productive capacity and creates costs for farmers and communities, involving trade-offs between immediate benefits and long-term productivity.



Topsoil loss & gully erosion.



Excess forest resource extraction.

Forests, Land Pressure and Resource Scarcity

ENVIRONMENT

Historical textbook estimates: per-capita forest land in India 0.06 hectare; requirement to meet basic needs 0.47 hectare; excess felling of approximately 15 million cubic metres of forest resources over the permissible limit.

ECONOMICS

Scarce land must serve competing purposes: forests supply ecological services and raw materials; agriculture, settlements and industry require land. Forest depletion affects livelihoods, water flows and soil quality. Alternative land uses must be assessed against wider, longer-term costs.

Soil Erosion: Loss of a Productive Resource

ENVIRONMENT

Estimated erosion of 5.3 billion tonnes annually. Annual nutrient losses: nitrogen 0.8 million tonnes; phosphorus 1.8 million tonnes; potassium 26.3 million tonnes. A separate government estimate quoted in the chapter places nutrient losses due to erosion at 5.8–8.4 million tonnes. Both estimates are reported as given.

ECONOMICS

Soil is a productive natural asset. Erosion and nutrient loss reduce fertility, increase need for soil-improvement inputs, threaten agricultural productivity, and create long-term costs for farmers and the wider economy.

Appiko: Forest Conservation and Competing Economic Interests

ENVIRONMENT

On 8 September 1983, 160 men, women and children hugged trees in Salkani forest in Sirsi district. The volunteers continued their vigil for six weeks. In the cited incident, 12,000 trees were saved. The movement spread to adjoining districts. Commercial felling can affect soil, rivers, rainfall patterns and crops.

ECONOMICS

Forests support industrial raw-material supply and the daily needs and livelihoods of local communities. Should forest allocation be judged only by industrial employment, or should the needs of the wider population count? Assessment must weigh concentrated benefits against wider costs.



Sirsi forest ecosystem preservation.

Vehicular Air Pollution: Historical Data

ENVIRONMENT

Registered motor vehicles increased from approximately 3 lakh in 1951 to 35 crore in 2022. Two-wheelers and cars accounted for about 85% of registered vehicles in the cited discussion. Vehicle emissions release near ground level. Industries and thermal power plants are also identified as sources of pollution.

ECONOMICS

Transport supports commuting, trade, mobility and economic activity. Increasing vehicle use creates pollution-related health costs and pressure on urban infrastructure. The problem is balancing mobility with the social costs of emissions.

Pollution Control Boards: Regulation in Practice

ENVIRONMENT

The Central Pollution Control Board (CPCB) was established in 1974, followed by state-level boards. Functions include investigating and monitoring pollution, setting and enforcing standards for emissions and effluents, inspecting industries, supporting research and public awareness, and monitoring water quality in rivers, wells and lakes. The textbook identifies 17 categories of large and medium-scale industries as significantly polluting.

ECONOMICS

Pollution control is government intervention. Regulation can require producers to control emissions and effluents rather than leaving costs on others. Implementation requires monitoring, technical expertise, administrative capacity and compliance.

Global Environmental Problems and Economic Coordination

ENVIRONMENT

Global warming and ozone depletion show that environmental effects can extend beyond the location of the activity. Greenhouse gases drive climate change; ozone-depleting substances damage the stratospheric ozone layer. The two involve different mechanisms and policy responses.

ECONOMICS

Cross-border problems require cooperation. Producers and countries may not bear full costs. The chapter's examples are the Kyoto agreement (Box 7.1) and the Montreal Protocol.

From Environmental Problems to Sustainable Development

ENVIRONMENT

Resource demand has risen beyond the environment's capacity to regenerate resources and assimilate waste. Degradation can undermine life-support functions and resource quality.

ECONOMICS

Development that ignores environmental consequences may undermine its own foundations. Sustainable development meets current needs while preserving future generations' ability to meet theirs, integrating protection with poverty reduction, employment, production and welfare.

Transition question: What should development achieve beyond increasing the quantity of goods and services produced?

Defining Sustainable Development

ENVIRONMENT

The Brundtland definition, quoted in the chapter: “Development that meets the needs of the present generation without compromising the ability of the future generation to meet their own needs.” The environmental dimension includes conservation, ecological regeneration and avoiding transfer of damage to future generations.

ECONOMICS

Two central ideas: needs (development must address basic human requirements) and future generations (current decisions must preserve future opportunities). The chapter links sustainable development with income, education, healthcare, sanitation, water supply and secure livelihoods.

Poverty, Distribution and Human Welfare

ENVIRONMENT

Natural resources support food, energy, water, housing and livelihoods. Degraded land, contaminated water and damaged forests affect the basic needs of resource-dependent communities.

ECONOMICS

The chapter discusses Edward Barbier's emphasis on raising the material standard of living of poorer people. Indicators include increased income and real income, educational services, healthcare, sanitation and water supply. Meeting everyone's needs requires attention to distribution.

Key idea: Sustainable development is not simply about protecting nature. It also requires improving the living conditions of people whose basic needs remain unmet.

Intergenerational Equity

ENVIRONMENT

Natural assets can be depleted, ecosystems damaged and environmental quality reduced over time. The chapter argues the present generation must hand over the planet in good order to future generations.

ECONOMICS

Intergenerational equity asks whether present decisions unfairly reduce future opportunities. Current resource use affects future availability; environmental damage imposes costs on people who did not cause it; development should avoid transferring excessive risks to the future.

Discussion: Should the present generation be allowed to maximise current benefits if doing so substantially reduces future generations' welfare?

Herman Daly's Principles of Sustainable Development

ENVIRONMENT

1. Keep human scale within the carrying capacity of the environment. 2. Make technological progress input-efficient rather than input-consuming. 3. Extract renewable resources on a sustainable basis. 4. Ensure non-renewable depletion does not exceed the rate at which renewable substitutes are created. 5. Correct inefficiencies arising from pollution.

ECONOMICS

Scale must respect ecological limits; efficiency should reduce resource intensity; renewable extraction must be sustainable; non-renewable use requires attention to future substitutes; pollution-related inefficiencies require corrective measures.

The UN Sustainable Development Goals

ENVIRONMENT

The United Nations formulated 17 Sustainable Development Goals in 2015, intended to be achieved by 2030. The goals cover interconnected priorities, including environmental protection and human welfare.

2015: Formulation of the 17 SDGs. 2030: Target year stated in the textbook.

ECONOMICS

The SDGs connect economic development with social and environmental objectives, framing development as more than output growth. Progress requires coordination across economic, social and environmental priorities.

Strategy 1: Non-Conventional Sources of Energy

ENVIRONMENT

Thermal plants emit carbon dioxide and generate fly ash. Hydroelectric projects can inundate forests and affect natural water flows. Wind and solar energy are discussed as alternatives. Solar photovoltaic cells convert solar energy into electricity.

ECONOMICS

Energy is essential for households, industry and development. Alternatives can reduce certain pressures, but adoption involves investment, technology and infrastructure choices. The question is how to meet energy needs while limiting environmental damage.



Alternative clean energy conversion.

Strategy 2: LPG and Gobar Gas in Rural Areas



Rural biogas & organic slurry.

ENVIRONMENT

Rural households may use wood, dung cakes and other biomass, causing deforestation, loss of green cover, indoor air pollution and wastage of cattle dung. Gobar gas plants use cattle dung to generate gas; the remaining slurry serves as organic fertiliser and soil conditioner.

ECONOMICS

The chapter discusses subsidised LPG and easy loans or subsidies for gobar gas plants, supporting cleaner household fuels. Biogas shows productive reuse of waste: dung becomes an energy input, slurry an agricultural input.

Strategy 3: CNG in Urban Areas

ENVIRONMENT

The textbook describes adoption of compressed natural gas (CNG) in Delhi's public transport as associated with lower air pollution and cleaner air. Other Indian cities began using CNG in subsequent years.

ECONOMICS

Urban transport provides mobility for workers, households and businesses. Fuel substitution changes the environmental consequences of transport, but the transition requires appropriate vehicles, fuel availability and infrastructure. The aim is to preserve mobility while reducing pollution-related costs.



Urban CNG public transport.



Zero-emission wind generation.

Strategy 4: Wind Power

ENVIRONMENT

Wind turbines generate electricity using moving air. Wind power works where wind speeds are sufficiently high and generates electricity without direct fuel-combustion emissions associated with thermal generation.

Teaching question: Why might a technology with a high initial cost still be economically worthwhile over its useful life?

ECONOMICS

The textbook acknowledges high initial costs but argues the benefits can justify investment. Assessment must consider initial investment, generation over time, fuel requirements, environmental consequences and location suitability.

Strategy 5: Solar Photovoltaic Cells

ENVIRONMENT

India receives substantial sunlight. Photovoltaic cells convert solar energy into electricity, useful in remote areas where grid supply is unavailable or expensive. The chapter refers to India's participation in the International Solar Alliance.

ECONOMICS

Solar can provide electricity where grid extension is difficult or costly. Evaluation considers equipment and installation costs, electricity needs and expected output, grid availability, maintenance, and the value of improved electricity access.



Decentralised solar access.



Low-impact stream hydel plant.

Strategy 6: Mini-Hydel Plants

ENVIRONMENT

Mini-hydel plants use flowing water in streams to drive small turbines. They can meet local demand with less disruption to land use than some large-scale alternatives, and may reduce the need for transmission towers and cables.

ECONOMICS

Local generation can reduce dependence on long-distance transmission. Economic value depends on local demand, water availability, installation costs and site suitability. Decentralised generation aligns provision with local conditions.

Strategy 7: Traditional Knowledge and Practices

ENVIRONMENT

Traditional practices in agriculture, healthcare, housing and transport have often relied on locally available resources and environmental knowledge, including traditional healthcare systems and medicinal plants.

ECONOMICS

Traditional knowledge can inform local resource use and alternative production methods, clarifying resource requirements, livelihoods and alternatives to resource-intensive processes. Any practice must be assessed for effectiveness, cost and environmental consequences.



Traditional botanical systems.



Organic biocomposting & soil health.

Strategy 8: Biocomposting

ENVIRONMENT

A shift towards chemical fertilisers during efforts to raise agricultural production had adverse effects on land and water. Biocomposting converts organic waste into compost; earthworms can accelerate decomposition.

ECONOMICS

Biocomposting turns waste into a useful input: less waste for disposal, improved soil condition, productive reuse of organic matter, and possible changes in demand for purchased soil inputs. Value depends on local conditions and compost suitability.

Strategy 9: Biopest Control

ENVIRONMENT

Excessive chemical pesticide use contaminates food, soil, water and groundwater. Alternatives include neem-based pest-control products, mixed cropping and natural predators such as snakes, owls, peacocks and lizards.

ECONOMICS

Pest control affects agricultural output, input costs and environmental risk. Alternatives may reduce chemical dependence, but farmers must weigh effectiveness, costs and suitability for specific crops and conditions.



Neem-based biological pest control.

Integrating the Sustainable Development Strategies

ENVIRONMENT

Strategies include wind and solar energy, LPG and gobar gas, CNG for urban transport, mini-hydel plants, traditional knowledge, biocomposting, biopest control and forest conservation. They address different environmental pressures rather than one universal problem.

ECONOMICS

Alternative energy changes the energy source; biogas and composting reuse organic materials; cleaner fuels change mobility's effects; biopest control changes input choices; forest conservation weighs competing demands. No single strategy suffices; solutions depend on context, cost, technology and resource availability.

The Economics of Pollution: Private Benefits and Social Costs

ENVIRONMENT

Production can generate waste and emissions affecting air, water, land and nearby communities. Damage may extend beyond the production site.

ECONOMICS

Private benefits: received directly by producer or consumer. Private costs: borne directly by them. External costs: imposed on others. Social costs: total costs borne by society, including external costs. When external costs are not reflected in decisions, private choices can impose wider damage; regulation and pollution control can help.

Recap: The Complete Economic Argument

ENVIRONMENT

The environment supplies resources, assimilates waste, sustains life and provides aesthetic services. Population growth, industrialisation and consumption pressure capacity. India faces land degradation, air pollution, water contamination and deforestation. Sustainable development requires conservation and preservation of ecological regeneration.

ECONOMICS

Scarcity creates allocation choices; extraction affects future availability; degradation creates opportunity costs and health expenditure; government intervention can address pollution; sustainable development connects present needs, poverty reduction, distribution and future welfare.

Final Conclusion: Development Must Be Sustainable

ENVIRONMENT

The environment cannot indefinitely supply resources or absorb waste beyond capacity. Conservation of natural assets, preservation of ecological regeneration and reduction of damage are necessary for long-term environmental quality.

The environment is not an optional consideration added to Economics after production takes place. It is one of the conditions that makes production, consumption and human welfare possible.

Final question: If a development project creates employment and income today but damages resources future generations will need, how should its economic benefits and costs be evaluated?

ECONOMICS

Development must meet present needs while preserving future generations' ability to meet theirs. This requires weighing resource scarcity, opportunity costs of damage, distribution, public policy and the long-term foundations of welfare.