CHAPTER 17: THE RESOURCE CYCLE

Renewable Resources – their supply is replenished by new one in short period of time, like every season.
Example: Crops

Nonrenewable Resources – they can be replenished naturally but the rates of replenishment are measured in millions of years (long period of time) rather than in small time.
Example: Petroleum
The carrying capacity of a biological species in an environment is the maximum population size of the species that the environment can sustain indefinitely, given the food, habitat, water and other necessities available in the environment. In population biology, it is defined as the environment's maximal load.
HUMAN POPULATION AND ENVIRONMENTAL RESISTANCE

Based on World Bank projections

Key
- Fast-growth scenario
- Slow-growth scenario

Potential growth in less-developed countries

Today

More-developed countries

Human population in billions

Time taken to double each billion to population

Doubbling times

- 9 yr
- 11 yr
- 12 yr
- 15 yr
- 30 yr
- 130 yr
- 130 yr
- 500 yr

Beginnings of agriculture

Beginnings of urbanism

Bubonic plague

Industrial Revolution and medical-technical advances

~ +7 Billion

Environmental resistance (such as limited food)

Cultural and technological advances (such as the rise of agriculture) increased the effective carrying capacity of the environment, and population increased.
THE HUMAN ECONOMY AS PART OF THE EARTH SYSTEM

(A) RESOURCES → HUMAN ECONOMY -> Production & Manufacturing → WASTES AND BY-PRODUCTS

(B) RESOURCES → HUMAN ECONOMY -> Production & Manufacturing → WASTES AND BY-PRODUCTS

Impacts of pollution

Resource depletion

Impacts of pollution
MINING
FOREST CHANGES
Human settlement and subsequent land-use changes have had substantial impacts on forest cover worldwide. Remote sensing can be combined with on-site mapping to assess changes in the extent and health of forest cover from year to year, as shown here in this series of satellite images showing progressive deforestation in the Rondonia region of the Amazonian rain forest in Brazil.
This map shows areas of the world that are experiencing water stresses as a result of demand outstripping the available supply of water.
SOURCES OF ENERGY
WHAT IS THE SOLUTION?

Too much Logging, Farming and Mining on Land can spoil the sea
Sustainable Development is a pattern of resource use that aims to meet human needs while preserving the natural environment so that these needs can be met not only in the present, but in the indefinite future.
The term was used by the Brundtland Commission (created by UN in 1983 to 1987) which coined what has become the most often-quoted definition of sustainable development as the development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."
The field of sustainable development can be conceptually broken into three constituent parts:

1. environmental sustainability
2. economic sustainability
3. social-political sustainability
SCHEME OF SUSTAINABLE DEVELOPMENT: AT THE CONFLUENCE OF THREE CONSTITUENT PARTS

- Social
  - Bearable
  - Equitable
  - Sustainable
- Environment
- Economic
  - Viable
The United Nations Division for Sustainable Development lists the following areas as coming within the scope of sustainable development:

- Agriculture
- Atmosphere
- Biodiversity
- Biotechnology
- Capacity-building
- Climate Change
- Consumption and Production Patterns
- Demographics
- Desertification and Drought
- Disaster Reduction and Management
- Education and Awareness
- Energy
- Finance
- Forests
- Fresh Water
- Health
- Human Settlements
- Indicators
- Industry
- Information for Decision Making and Participation
- Integrated Decision Making
- International Law
- International Cooperation for Enabling Environment
- Institutional Arrangements
- Land management
- Major Groups
- Mountains
- National Sustainable Development Strategies
- Oceans and Seas
- Poverty
- Sanitation
- Science
- Sustainable tourism
- Technology
- Toxic Chemicals
- Trade and Environment
- Transport
- Waste (Hazardous)
- Waste (Radioactive)
- Waste (Solid)
- Water
THE BIG CHALLENGE...
TRIANGLE OF SUSTAINABLE DEVELOPMENT

Economic
- growth
- efficiency
- stability

Social
- empowerment
- inclusion/consultation
- institutions/governance

Environmental
- resilience/biodiversity
- natural resources
- pollution

Poverty
Equity
Sustainability
Climate Change

Intra-generational equity
Basic needs/livelihoods

Inter-generational equity
Values/culture

Valuation/externalisation
Incidence of impacts
How to get Sustainable Development?

What to develop?
- Human development
- Economic development
- Social community development

What to sustain?
- Culture and community
- Ecosystems
- Life support systems
- Biodiversity

Sustainable Development?

- Reducing our footprint
- Delivering bulk petrochemicals
- Providing the lowest total delivered cost
- Sustaining value chains
- Through simpler structures
- To large industrial customers
- Creating our future

Building social capital
Solving the Energy Problem with Renewal Energy Sources
Renewable Energy
Nuclear power is the use of sustained nuclear fission to generate heat and electricity. Nuclear power plants provide about 6% of the world's energy and 13–14% of the world's electricity, with the U.S., France, and Japan together accounting for about 50% of nuclear generated electricity.
Solving the Transportation Problem with Mass Transport
Solving the Problem of Waste Management by Recycling
Solving the Problem of Living by Building Green
What is the future of the Earth System?
Watch the YouTube video called "Earth's Precious Resources"