Outline

• Human Population Growth
  - More Developed Countries and LDCs
  - Age Structure
• Resources and Pollution
  - Land
  - Water
  - Food
  - Energy
  - Wastes
• Sustainable Society
Human Population Growth

- Prior to 1750, human population growth was relatively slow.
  - Growth rate is a percentage that reflects the difference between the number of persons in a population who are born each year and the number of persons who die each year.
  - After 1750, the world population growth rate steadily increased until it peaked at 2% in 1965.
Human Population Growth

- **Biotic potential** - Maximum growth rate under ideal conditions.
- **Environmental resistance** - Controls population growth due to limiting factors such as food and space.
- **Carrying capacity** - Maximum population the environment can support for an indefinite period.

MDCs Versus LDCs

- **More-developed countries (MDCs)** are typified by modest population growth and a good standard of living.
  - North America, Europe.
- **Less-developed countries (LDCs)** are typified by dramatic population growth and a high degree of poverty.
  - Asia, Africa.
Comparing Age Structure

- LDCs are experiencing a population momentum as more women enter the reproductive years than leave them.
  - Population age groups.
    - Dependent.
    - Reproductive.
    - Postreproductive.
- MDC’s typically have a stabilized age-structure diagram.

Age-structure diagrams for population growth
Resources and Pollution

- **Resource** is anything needed from the biotic or abiotic environment by humans.
  - **Nonrenewable.**
    - Limited supply.
  - **Renewable.**
    - Unlimited supply.

- **Pollution** is any undesirable alteration of the environment.

Land

- **Beaches and Human Habitation.**
  - At least 40% of the world population lives within 100 km of a coastline.
    - An estimated 70% of the world’s beaches are eroding.
    - Coastal areas are particularly subject to pollution because toxic substances placed in rivers and lakes may eventually reach the coast.
Beach Erosion

Key:
- Brown: Severely eroded
- Beige: Moderately eroding

Fig. 13-03b
Land

- Semiarid Lands and Human Habitation.
  - Forty percent of the Earth’s lands are already desertified.
    - Desertification is the conversion of semiarid land to desertlike conditions.
    - Overgrazing a major cause.

Desertification
Tropical Rain Forest and Human Habitation

- Deforestation is the removal of trees.
  - Often cleared for human habitation.
    - Tropical rain forests’ soil is often thin and nutrient-poor, and thus is susceptible to desertification and other soil problems when cleared.
    - Contributing to biodiversity loss.
Water

- Surface of planet is 70% water.
  - Most of fresh water is tied up in ice caps, ice sheets, and glaciers.
    - Less than 1% of fresh water is readily available.
  - Estimated 1.2 billion people worldwide drink impure water.
    - Much of increased water demand stems from increased industrial activity and agriculture.

Freshwater Resources

<table>
<thead>
<tr>
<th>Region</th>
<th>Freshwater Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oceania</td>
<td>53,711</td>
</tr>
<tr>
<td>South America</td>
<td>36,988</td>
</tr>
<tr>
<td>Middle Africa</td>
<td>20,899</td>
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<tr>
<td>North America</td>
<td>16,801</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>14,818</td>
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<tr>
<td>Western Europe</td>
<td>2,215</td>
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<tr>
<td>Western Asia</td>
<td>1,771</td>
</tr>
<tr>
<td>South-Central Asia</td>
<td>1,465</td>
</tr>
<tr>
<td>Southern Africa</td>
<td>1,289</td>
</tr>
<tr>
<td>Northern Africa</td>
<td>495</td>
</tr>
</tbody>
</table>

Regions with most fresh water

Regions with least fresh water
Water

- Increasing Water Supplies.
  - Dams.
  - Aquifers.
- Environmental Consequences.
  - Subsidence.
  - Sinkholes.
  - Saltwater Intrusion.

Sources of surface water pollution

<table>
<thead>
<tr>
<th>Sources of Water Pollution</th>
<th>Leading to Cultural Eutrophication</th>
</tr>
</thead>
<tbody>
<tr>
<td>oxygen-demanding wastes</td>
<td>Biodegradable organic compounds (e.g., sewage, wastes from food-processing plants, paper mills, and paper plants)</td>
</tr>
<tr>
<td>plant nutrients</td>
<td>Nitrogen and phosphates from detergents, fertilizers, and sewage treatment plants</td>
</tr>
<tr>
<td>sediments</td>
<td>Enriched soil in water due to soil erosion</td>
</tr>
<tr>
<td>thermal discharges</td>
<td>Heated water from power plants</td>
</tr>
<tr>
<td>Health Hazards</td>
<td>Disease-causing agents (e.g., sewage)</td>
</tr>
<tr>
<td></td>
<td>Pesticides, industrial chemicals (e.g., PCBs)</td>
</tr>
<tr>
<td></td>
<td>Inorganic chemicals and minerals (e.g., arsenic, mercury)</td>
</tr>
<tr>
<td></td>
<td>Radiation (e.g., radioactive elements from nuclear power plants)</td>
</tr>
</tbody>
</table>
Food

• In 1950, the human population numbered 2.5 billion and there was enough food to provide approximately 2,000 calories per day.
  - Currently with 6 billion people, there is enough food to provide approximately 2,500 calories per day.

Food

• Increasing Food Supplies.
  - Modern farming practices.
    ✤ Planting of a few genetic varieties.
    ✤ Heavy use of fertilizers, pesticides, and herbicides.
    ✤ Generous irrigation.
    ✤ Excessive fuel consumption.
Food

• Soil Loss and Degradation.
  - Topsoil is very rich in organic matter and is the most capable of supporting grass and crops.
    ◆ Monocropping and the use of large farming machines has greatly increased soil erosion.
  - Another side effect of modern farming practices is salinization.

Food

• Green Revolutions.
  - About 50 years ago, dramatic increases in yield due to introduction of new varieties.
    ◆ Most green revolution plants are high responders.
      ➢ Need high levels of fertilizer, water, and pesticides.
    ◆ Genetic engineering can produce transgenic plants.
Food

• Domestic Livestock.
  - Almost two-thirds of US cropland is devoted to producing livestock feed.
    - Large percentage of natural resources committed to raising livestock.
    - Livestock production accounts for much of the pollution associated with farming.

Food

• Fishing.
  - Worldwide, between 1970 and 1990, the number of large boats devoted to fishing doubled.
    - Result of increased number and efficiency of fishing boats is a severe reduction in fish catch.
    - Reduction in biodiversity due to large fishing nets.
Fisheries

Energy

- Nonrenewable Sources.
  - About 75% of the world’s energy supply comes from fossil fuels, and 6% comes from nuclear power.
    - Fossil fuels (oil, natural gas, coal) are derived from the compressed remains of plants and animals.
      - Burning of fossil fuels emits pollutants into the air.
Energy

- Fossil Fuels and Global Climate Change.
  - Human activities are causing the emission of greenhouse gases to rise.
  - Allow solar radiation to pass into the atmosphere, but hinder escape of infrared heat back into space.
  - Further increases of greenhouse gases may bring about further increases in global temperature.

Global Warming - rising temps from greenhouse gasses
Energy

- Renewable Energy Sources.
  - Hydropower.
  - Geothermal.
  - Wind.
  - Solar.
    - Photovoltaic cells.
  - Hydrogen.
    - Produces water when burned.

Minerals

- Minerals are nonrenewable raw materials in the Earth’s crust that can be mined and used by humans.
  - Subject to depletion.
    - Strip mining degrades large areas.
    - Many heavy metals are released into the air and water during mining and processing, and can lead to serious human health issues.
Synthetic Organic Compounds

- Synthetic organic compounds play a role in the production of plastics, pesticides, herbicides, cosmetics, and many other products.
  - Include Chlorofluorocarbons (CFCs) which have brought about a thinning of the Earth’s ozone shield.

Wastes

- Wastes are generated during the mining and production of a product.
  - Ten most common contaminants are heavy metals and organic compounds.
    - Some are endocrine-disrupting contaminants.
Working Toward a Sustainable Society

- A **sustainable society** would be able to provide the same level of goods now and in the future.
- **Economic Well-Being and Quality of Life.**
  - **Gross National Product.**
    - Pertains solely to economic activities.
    - Does not take into consideration activities that are socially or environmentally harmful.

Sustainable Society
Review

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  - MDCs and LDCs
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