Prentice Hall

EARTH SCIENCE

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Chapter

4

Earth's Resources

4.1 Energy and Mineral Resources

Renewable and Nonrenewable Resources

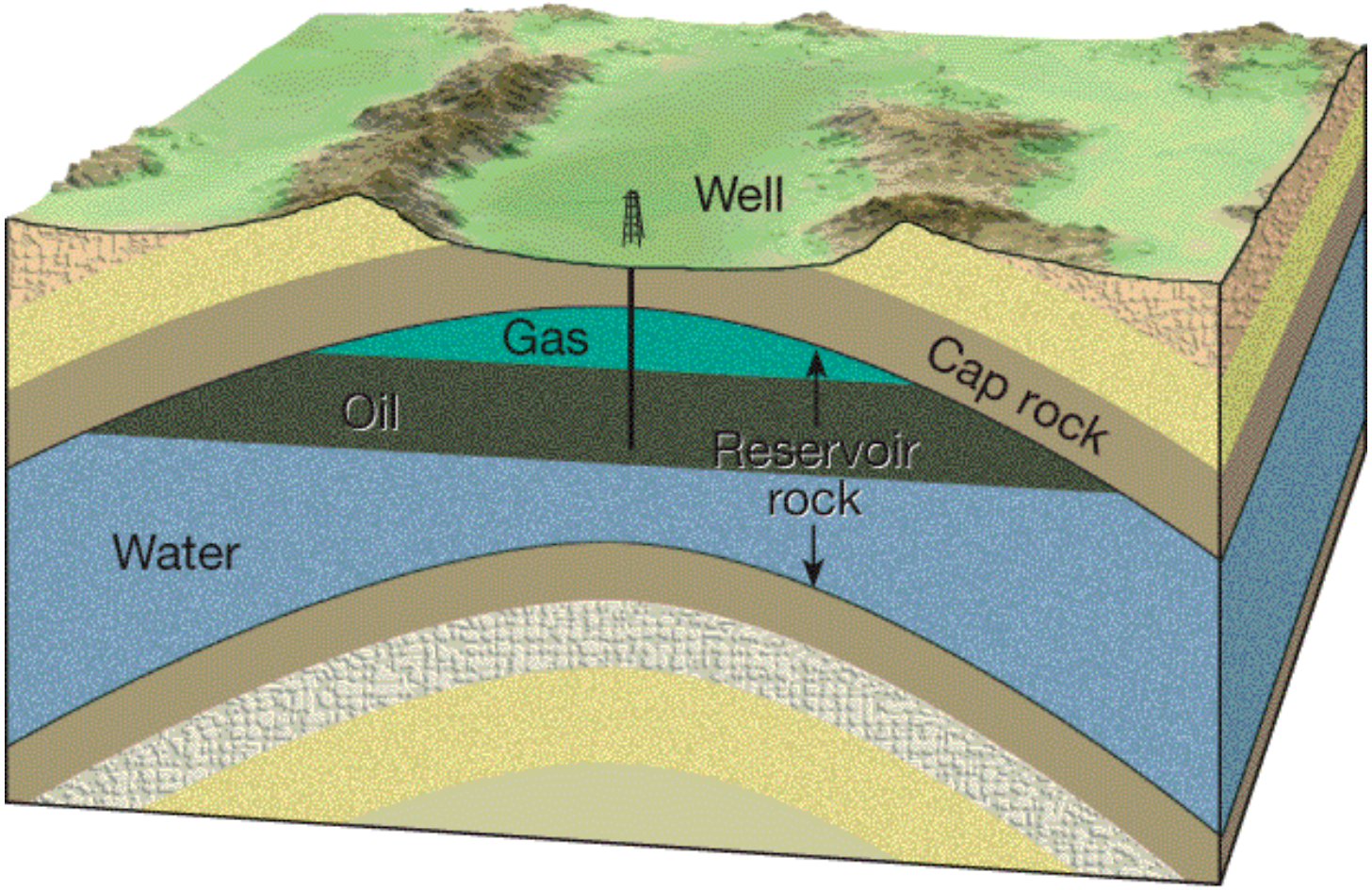
- **Renewable resources** can be replenished over fairly short spans of time, such as months, years, or decades.
- **Nonrenewable resources** take millions of years to form and accumulate.

4.1 Energy and Mineral Resources

Fossil Fuels

- **Fossil fuels** are hydrocarbons that may be used as fuel, including coal, oil, and natural gas.

Anticlines Are Common Oil Traps



4.1 Energy and Mineral Resources

Tar Sands and Oil Shale

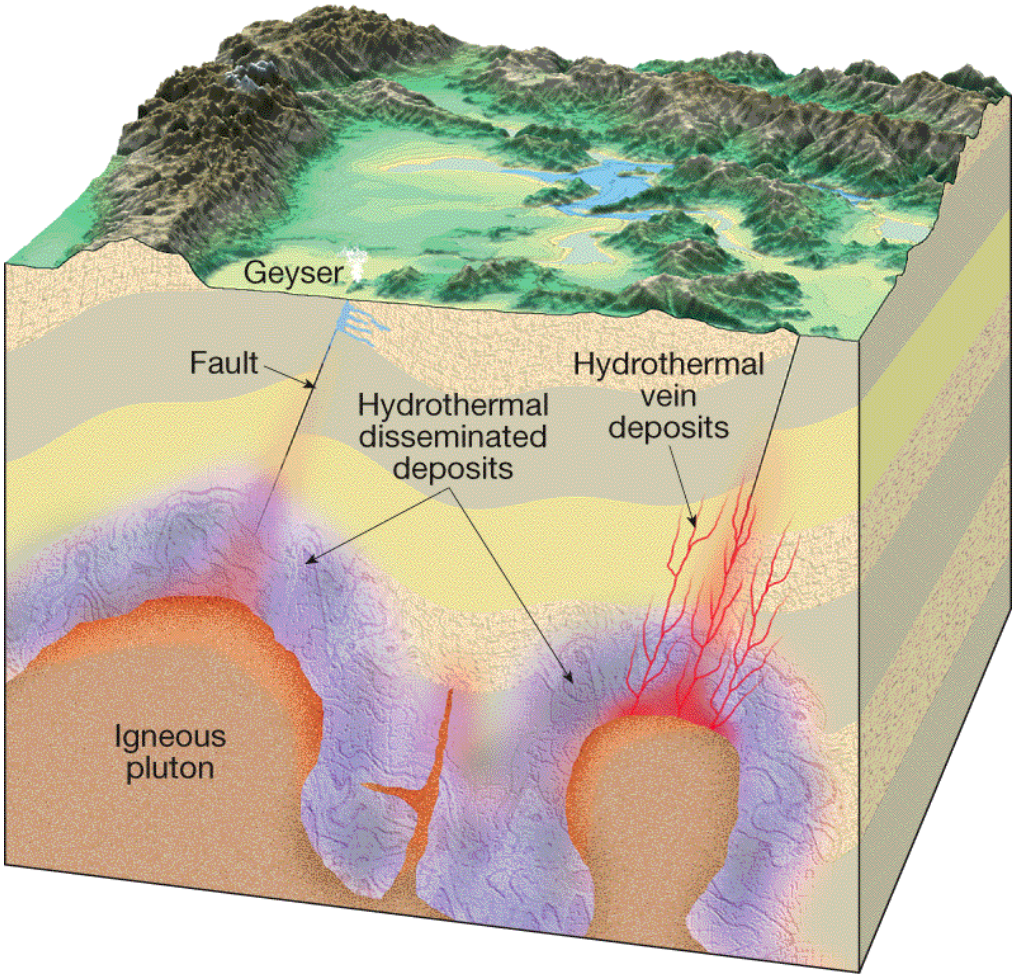
- Fuels derived from tar sand and oils shales could become good substitutes for dwindling petroleum supplies.

4.1 Energy and Mineral Resources

Formation of Mineral Deposits

- Some of the most important mineral deposits form through igneous processes and from hydrothermal solutions.
  - **Ore** is a useful metallic mineral that can be mined at a profit.

Mineral-Rich Hot Water Seeps into Rock Fractures



4.1 Energy and Mineral Resources

Nonmetallic Mineral Resources

- Nonmetallic mineral resources are extracted and processed either for the nonmetallic elements they contain or for their physical and chemical properties.

Uses of Nonmetallic Minerals

Table 1 Occurrences and Uses of Nonmetallic Minerals

Mineral	Uses	Geological Occurrences
Apatite	Phosphorus fertilizers	Sedimentary deposits
Asbestos (chrysotile)	Incombustible fibers	Metamorphic alteration
Calcite	Aggregate; steelmaking; soil conditioning; chemicals; cement; building stone	Sedimentary deposits
Clay minerals (kaolinite)	Ceramics; china	Residual product of weathering
Corundum	Gemstones; abrasives	Metamorphic deposits
Diamond	Gemstones; abrasives	Kimberlite pipes; placers
Fluorite	Steelmaking; aluminum refining; glass; chemicals	Hydrothermal deposits
Garnet	Abrasives; gemstones	Metamorphic deposits
Graphite	Pencil lead; lubricant; refractories	Metamorphic deposits
Gypsum	Plaster of Paris	Evaporite deposits
Halite	Table salt; chemicals; ice control	Evaporite deposits, salt domes
Muscovite	Insulator in electrical applications	Pegmatites
Quartz	Primary ingredient in glass	Igneous intrusions, sedimentary deposits
Sulfur	Chemicals; fertilizer manufacture	Sedimentary deposits, hydrothermal deposits
Sylvite	Potassium fertilizers	Evaporite deposits
Talc	Powder used in paints, cosmetics, etc.	Metamorphic deposits

4.2 Alternate Energy Sources

Solar Energy

- Solar energy has two advantages:
  1. Solar energy's "fuel" is free.
  2. Solar energy is non-polluting.

4.2 Alternate Energy Sources

Nuclear Energy

- In nuclear fission, the nuclei of heavy atoms such as uranium-235 are bombarded with neutrons.
- The uranium nuclei split into smaller nuclei and emit neutrons and heat energy.

Diablo Canyon Nuclear Plant

4.2 Alternate Energy Sources

Wind Energy

- In the next 50 to 60 years, wind power could meet between 5 to 10 percent of the country's demand for electricity.

Wind Turbines

4.2 Alternate Energy Sources

Hydroelectric Power

- **Hydroelectric power** is the power generated by falling water.
- The water held in a reservoir behind a dam is a form of stored energy that can be released through the dam to produce electric power.
- The strong water flow that results drives turbines and electric generators.

Glen Canyon Dam

4.2 Alternate Energy Sources

Geothermal Energy

- **Geothermal energy** is harnessed by tapping natural underground reservoirs of steam and hot water.
- Hot water is used directly for heating and to turn turbines that generate electric power.

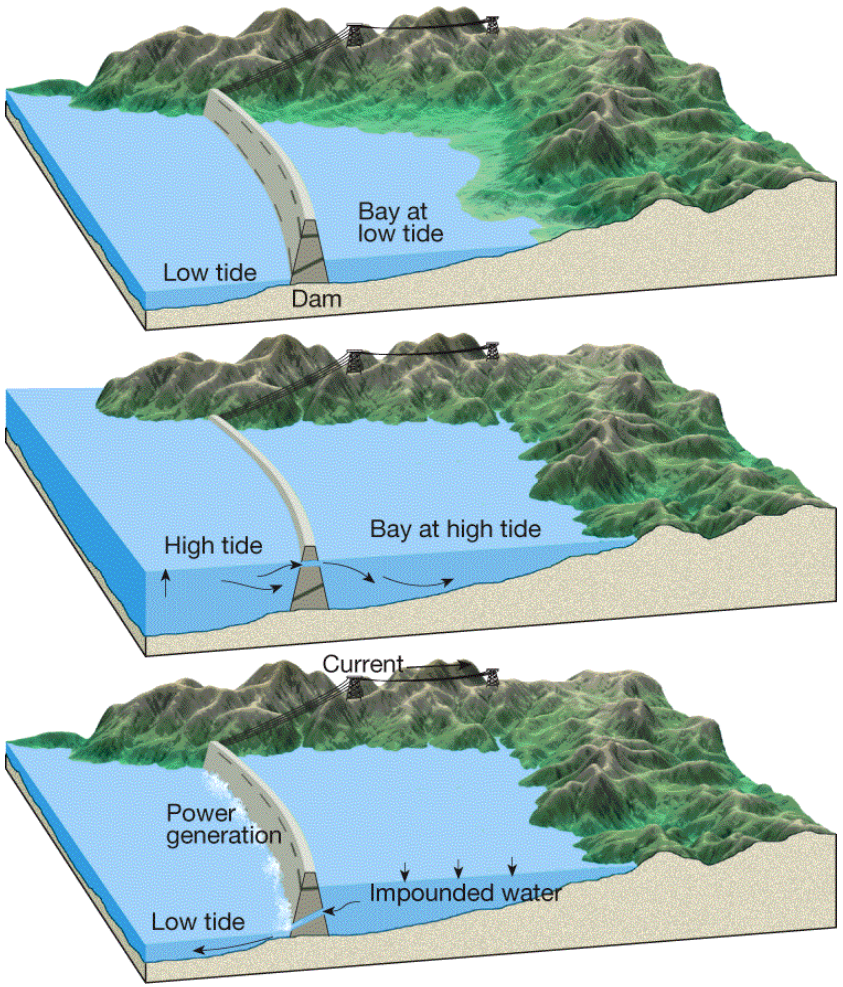
The Geysers Is the World's Largest Electrical Geothermal Facility

4.2 Alternate Energy Sources

Tidal Power

- Tidal power is harnessed by constructing a dam across the mouth of a bay or an estuary in coastal areas.
- The strong in-and-out flow of tidal water drives turbines and electric generators.

Tidal Dams


Bay at
low tide
Low tide
Dam
High tide
Bay at high tide
Current
Power
generation
Impounded water
Low tide

4.3 Water, Air, and Land Resources

The Water Planet

- Each day, people use fresh water for drinking, cooking, bathing, and growing food.

4.3 Water, Air, and Land Resources

The Water Planet

- Freshwater Pollution
  - **Point source pollution** comes from a known and specific location, such as factory pipes.
  - **Nonpoint source pollution** is pollution that does not have a specific point of origin.
  - **Runoff** is the water that flows over the land rather than seeping into the ground, often carrying nonpoint source pollution.

Major Types of Water Pollution

Table 2 Major Types of Water Pollution

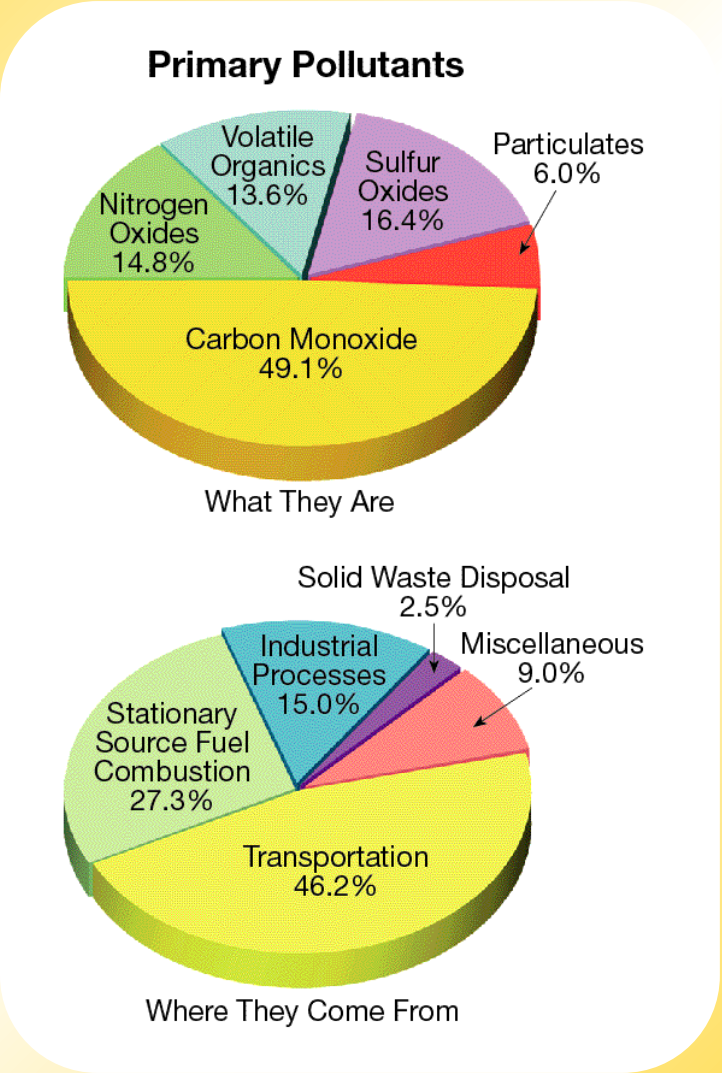
Type	Examples	Sources	Effects
Disease organisms	Bacteria, viruses	Wastes from people and animals	Typhoid, cholera, dysentery, infectious hepatitis
Wastes that remove oxygen from water	Animal manure and plant debris that bacteria decompose	Sewage, animal feedlots	Great amounts of bacteria can remove oxygen from water, killing fish
Inorganic chemicals	Acids, toxic metals	Industrial effluent, urban runoff, household cleaners	Poisons fresh water and can sicken those who drink it
Organic chemicals	Oil, gasoline, plastic, pesticides, detergent	Farm and yard runoff, industrial waste, household cleaners	Some cancers, disorders of nervous and reproductive systems
Plant fertilizer	Water soluble compounds with nitrate, phosphorus ions	Sewage, manure, farm and garden runoff	Spurs rapid growth of algae that decay and deplete water's oxygen; fish die
Sediment	Soil	Erosion	Disrupts aquatic food webs, clogs lakes and reservoirs, reduces photosynthesis of aquatic plants
Radioactive substances	Radon, uranium, radioactive iodine	Nuclear power plants, uranium ore mining and processing	Some cancers, birth defects, genetic mutations

4.3 Water, Air, and Land Resources

Earth's Blanket of Air

- The chemical composition of the atmosphere helps maintain life on Earth.
- Pollution in the Air
  - The increase of carbon dioxide in the atmosphere has altered the carbon cycle and contributed to **global warming**—the unnatural warming of the lower atmosphere.
  - Through a series of chemical reactions, these pollutants in the air are converted into acids that are a major cause of acid precipitation.

Major Primary Pollutants and Their Sources



4.3 Water, Air, and Land Resources

Land Resources

- Earth's land provides soil and forests, as well as mineral and energy resources
- Damage to Land Resources
  - Mines produce many mineral resources, but mines are destroying, soil, vegetation, and Earth's contours.
  - Mines also cause soil erosion and pollution that contaminates soil and water and destroys ecosystems.

Surface Mining Destroys Earth's Surface

4.4 Protecting Resources

Keeping Water Clean and Safe

- **Conservation** is the careful use of resources.
- Pollution prevention means stopping pollution from entering the environment.

4.4 Protecting Resources

Keeping Water Clean and Safe

- Starting in the 1970's, the federal government passed several laws to prevent or decrease pollution and protect resources.
  - In 1972, the Clean Water Act (CWA) required industries to reduce or eliminate point source pollution into surface waters.
  - The Safe Drinking Water Act of 1974 helped protect drinking resources.

Preventing Water Pollution

Table 3 How You Can Prevent Water Pollution
• Never pour household chemicals (paints, thinners, cleaners, pesticides, waste oil) down the drain or into the toilet.
• Never dump toxic chemicals in the gutter or onto the ground.
• Don't put items that contain hazardous substances, such as batteries or old computer monitors, into the trash.
• Find out about hazardous waste collection sites and times from your local sanitation or public works department.
• Avoid using hazardous substances in the first place.

4.4 Protecting Resources

Protecting the Air

- In the 1970's, Congress passed the Clean Air Act, the nation's most important air pollution law.
  - National Ambient Air Quality Standards (NAAQS) established for six "criteria" pollutants known to cause health problems – carbon monoxide, ozone, lead, sulfur dioxide, nitrogen oxides and particulates (fine particles).

Saving Energy

Table 4 How You Can Save Energy
• Recycle when possible.
• Let the sun in on bright winter days using solar energy to warm rooms.
• Use energy-saving fluorescent bulbs instead of incandescent bulbs where you can.
• Turn off lights when you leave a room. Turn off the radio, TV, or computer when you're not using them.
• Walk or ride a bike when you can.
• When buying electric products, look for the Energy Star sticker which denotes energy-saving products.

4.4 Protecting Resources

Caring for Land Resources

- Protecting land resources involves preventing pollution and managing land resources wisely.
  - **Compost** is partly decomposed organic material that can be used as fertilizer.
  - **Recycling** is the collecting and processing of used items so that they can be made into new products.