Environmental Science
Chapter 1 Notes

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Environmental Science

- study how humans interact with environment

  (study how humans interact w/env.)

  - major goal is to understand and solve environmental problems

    (GOAL- understand + solve env. Problems)

  - study 2 main types of interactions between humans and their environment
    - how we use natural resources
    - how our actions alter the environment
  - an interdisciplinary science

Environmental Science

– one important foundation of environmental science is ecology

Ecology

- study of how living things interact with each other and their nonliving environment
  - major fields of study that contribute to environmental science:
    - biology
    - earth science
    - physics
    - chemistry
    - social science

Ecology

- often the observations of nonscientists are the first step toward addressing an environmental problem

Hunter-gatherers

- people who obtain food by collecting plants and by hunting wild animals or scavenging their remains
  - groups were small and migrated during different times of the year based on food supply
  - hunted bison
  - set fires to burn prairies and prevent tree growth
  – helped spread plants

Hunter-gatherers

– rapid climate change and overhunting led to extinctions of giant sloths , mastodons, cave bears, and saber-toothed cats

Agriculture

- practice of growing, breeding, and caring for plants and animals that are used for food, clothing, housing, transportation, and other purposes.
  - started over 10,000 years ago and changed society and the environment so much that it is called the agricultural revolution

Agriculture

- humans populations grow at an incredible rate
- an area of land can support up to 500x as many people by farming than by hunting and gathering
- populations concentrated into smaller areas, placed increased pressure on local environments
– changed food we eat by creating domesticated plants

Agriculture

- habitat destroyed using slash and burn agriculture
– forest replaced by farmland causes soil loss, floods, and water shortages

Industrial Revolution-

- involved a shift from water-, animal-, and human-powered energy sources to fossil fuels
  - increased efficiency of agriculture, industry, and transportation
  - large-scale production of goods in factories became less expensive than local production
  - on the farm, machinery reduced the amount of land and labor needed to produce food.

Industrial Revolution-

- Populations in urban areas grew as people stopped growing their own food
- Motorized vehicles allowed food and goods to be transported cheaply across long distances
- Improved the quality of life….light bulb
- Agricultural productivity increased, sanitation, nutrition and medical care improved

Industrial Revolution-

- Pollution and habitat loss became more common
- Artificial substances began to be used which bring about their own sets of problems

Closed system

- only the energy from the sun enters and the only thing that leaves is heat
  - potential problems involve some resources that are limited and the fact that we will produce more wastes than we can dispose of them.
  - environmental problems can occur on different scales: local, regional, or global

Closed system

- population growth increases, caused by industrial and agricultural revolutions along with modern medicine and sanitation
- human population almost quadrupled during the 20th century
– producing enough food has environmental consequences—habitat destruction and pesticide pollution

Closed system

- most scientists believe the population will double before it begins to stabilize in the 21st century

Main Environmental Problems

Resource Depletion

- Natural Resource- any natural material that is used by humans- 2 types
  - Renewable- can be replaced relatively quickly by a natural process
  - Nonrenewable- forms at a much slower rate than the rate at which it is consumed

Resource Depletion

- most common are minerals and fossil fuels….could take millions of years to replenish it
- depleted- a large fraction has been used up

Pollution

- a change in air, water, or soil that adversely affects the health, survival, or activities of humans or other organisms. Two main types:
  - biodegradable pollutants- pollutants that can be broken down by natural processes
  - nondegradable pollutants- pollutants that cannot be broken down by natural processes

Loss of Biodiversity

- Biodiversity- refers to the number and variety of species that live in an area
- Mass extinction- large-scale extinction
- Permian period, 95% of all species became extinct
- Organisms that share the world with us can be considered natural resources

Loss of Biodiversity

- Important to preserve organisms due to their potential economic, ecological, scientific, aesthetic, and recreational value.

“The Tragedy of the Commons”

- Garrett Hardin, 1968, published an essay arguing that the main difficulty in solving environmental problems is the conflict between the short-term interests of individuals and the long term interests of society.
- Commons- areas of land that belonged to a whole village where anyone could graze cows or sheep.

“The Tragedy of the Commons”

- If too many animals grazed the commons then the animals destroyed the grass and everyone would suffer.
- So everyone in the group had to take responsibility for maintaining the resource.

“The Tragedy of the Commons”

- Hardin did not consider the social nature of humans. Humans live in groups and depend on one another.
- Solution may override the interests of individuals in the short term but improves the environment for everyone in the long term

Economics and the Environment

1) Law of Supply and Demand-

- the greater the demand for a limited supply of something, the more that thing is worth.
- price of oil is an example

2) Costs and Benefits-

- Cost-Benefit Analysis- balances the cost of the action against the benefits one expects from it
  - The results depend on who is doing the analysis
  - Industry- cost of pollution control outweighs the benefits
- Community- benefits outweigh the high price

3) Risk Assessment-

- tool that helps us create cost-effective ways to protect our health and the environment
- public must perceive the risk accurately in order to come up with an effective solution to an environmental problem.

Developed and Developing Countries

Undeveloped Countries-

- lower average incomes, simple and agriculture-based economies, and rapid population growth.
- In-between the two types are middle-income countries (Mexico, Brazil, and Malaysia)

Population and Consumption

- almost all population problems can be traced back to two root causes
- 1) human population is growing too quickly for the local environment to support
- 2) people are using up, wasting, or polluting many natural resources faster than they can be renewed, replaced, or cleaned up

Local Population Pressures

- in severely overpopulated regions
  - forests are stripped, topsoil is exhausted, animals are driven to extinction
  - constant threats of malnutrition, starvation, and disease
  - population grows most rapidly in these areas
  - food production, job creation, and education cannot keep pace

Local Population Pressures

- of the 4.5 billion people in developing countries, fewer than half have safe drinking water, enough food, and proper sanitation

Consumption Trends

- in wealthy countries
  - improved pollution controls, population has stabilized or is growing slowly
  - use much more of the earth's resources
  - developed nations use about 75% of world's resources and make up 20% of population
  - more waste and pollution produced per person

Ecological Footprint-

- productive area of the Earth needed to support one person in a particular country
  - includes land use(crops, grazing, forest products, and housing), ocean area(seafood), and forest area (absorb air pollution)
- U.S.- requires 30 acres of land per person

Environmental Science in Context

- how do you balance the rights of individuals and property owners with the needs of society as a whole?

Critical Thinking and the Environment

- people need to make informed decisions and be aware that information can be distorted to suit whoever is using it
- First- be prepared to listen to many viewpoints
- Second- investigate the source of the information you encounter and question the conclusions that are drawn from the data.

A Sustainable World

- Sustainability- the condition in which human needs are met in such a way that a human population can survive indefinitely
- not an unchanging world
- requires everyone's participation