

Environmental Science



What is Environmental Science?

The study of how humans interact with their environment

Our environment is everything that surrounds us, both natural and man-made.



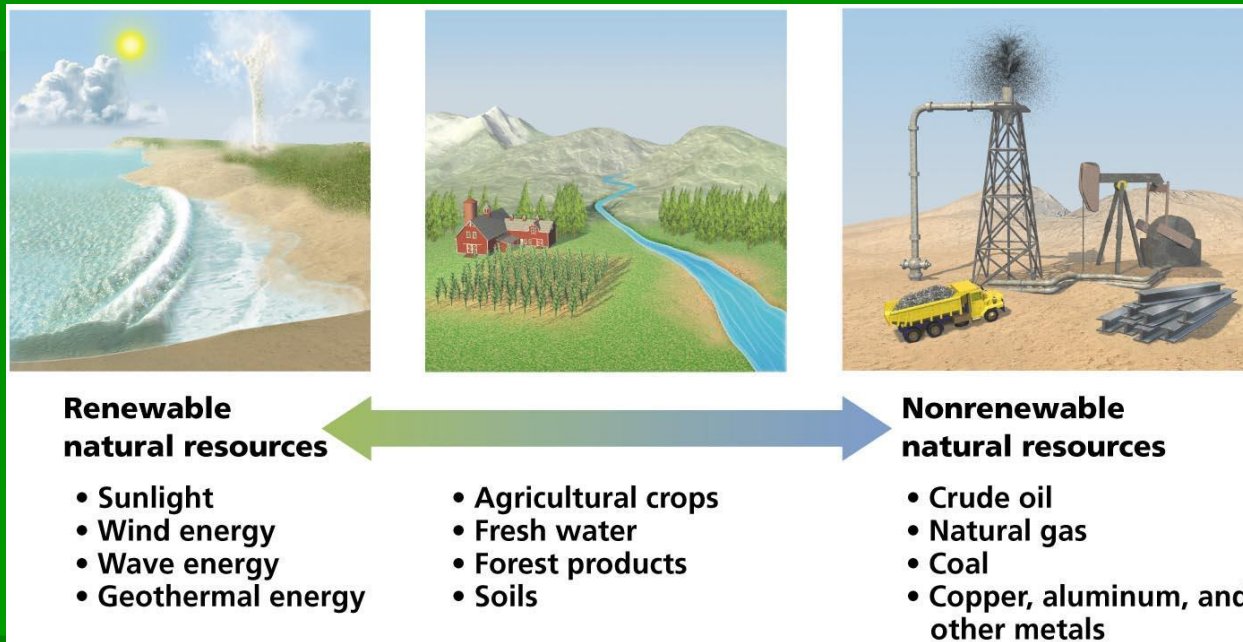
Environment: the total of our surroundings

- All the things around us with which we interact:
 - Living things
 - Animals, plants, forests, fungi, etc.
 - Nonliving things
 - Continents, oceans, clouds, soil, rocks
 - Our built environment
 - Buildings, human-created living centers
 - Social relationships and institutions



Natural resources: vital to human survival

Natural resources = substances and energy sources needed for survival



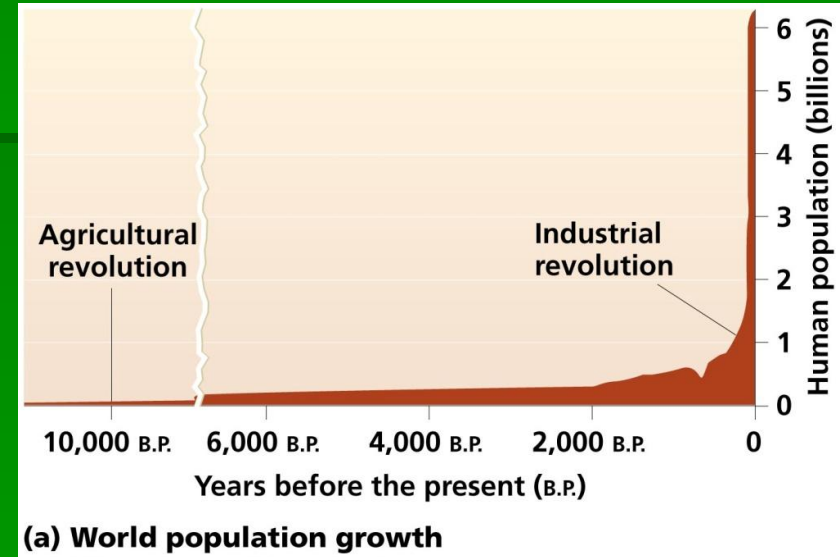
- **Renewable resources:**
 - Perpetually available: sunlight, wind, wave energy
 - Renew themselves over short periods: timber, water, soil
 - These can be destroyed
- **Nonrenewable resources: can be depleted**
 - Oil, coal, minerals



- “...the earth enables our people to survive, the environment must be respected and maintained. As long as the earth remains healthy, the people remain healthy.” (*Long and Fox, 1996*)

Global human population growth

- More than 6.7 billion humans
- Why so many humans?
 - Agricultural revolution
 - Stable food supplies
 - Industrial revolution
 - Urbanized society powered by fossil fuels
 - Sanitation and medicines
 - More food



(b) Urban society

- **Human population growth exacerbates all environmental problems**

- *The growth rate has slowed...but we still add more than 200,000 people to the planet each day*

We depend completely on the environment for survival

- Life has become more pleasant for us so far (Increased wealth, health, mobility, leisure time)
- But...natural systems have been degraded and environmental changes threaten long-term health



Brainstorm

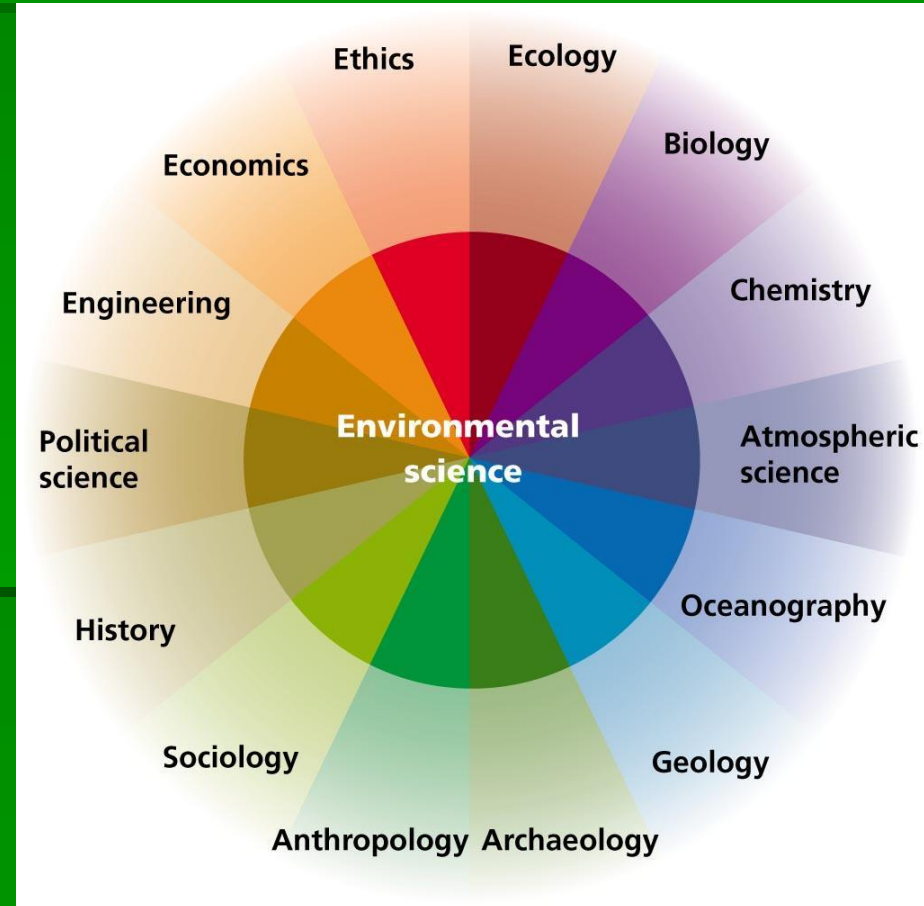
- With your partner/group, brainstorm at least 10 ways in which destruction to the environment and depletion of resources can affect our overall well being as a population



Environmental science: how does the natural world work?

Environment \square impacts \rightarrow
Humans

- It has an applied goal: developing solutions to environmental problems
- An interdisciplinary field
 - Natural sciences: information about the world
 - Social sciences: values and human behavior, politics, economy, etc.



What is an “environmental problem”?

- The perception of what constitutes a problem varies between individuals and societies
- Ex.: DDT, a pesticide
 - In developing countries: welcome because it kills malaria-carrying mosquitoes
 - In developed countries: not welcome, due to health risks



Environmental science is not environmentalism

- **Environmental science**

- The pursuit of knowledge about the natural world
- Scientists try to remain objective

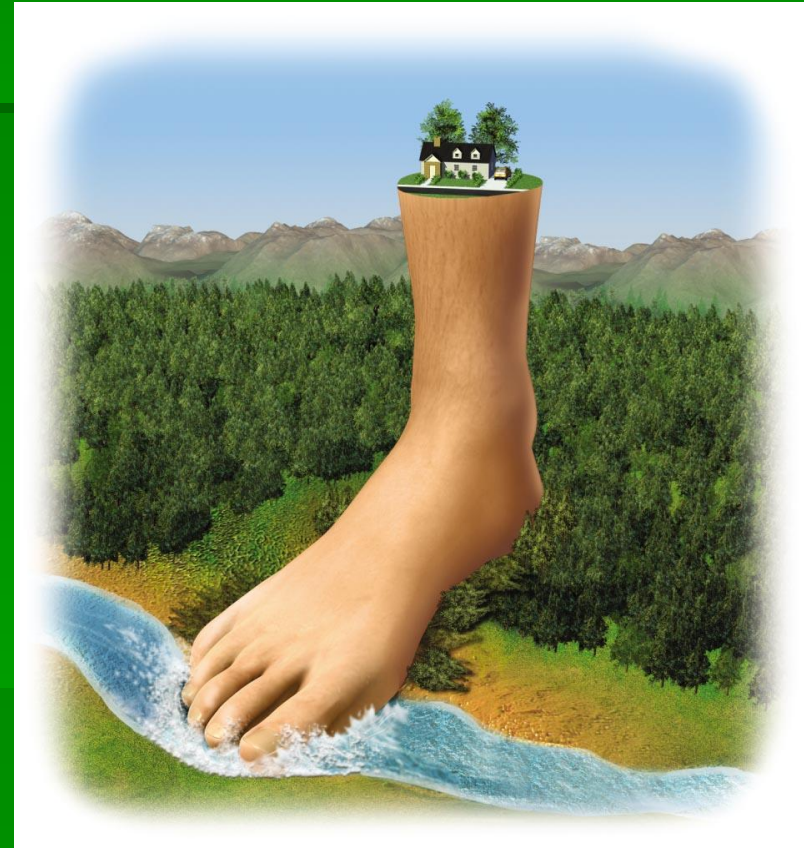
- **Environmentalism**

- A social movement dedicated to protecting the natural world



The “ecological footprint”

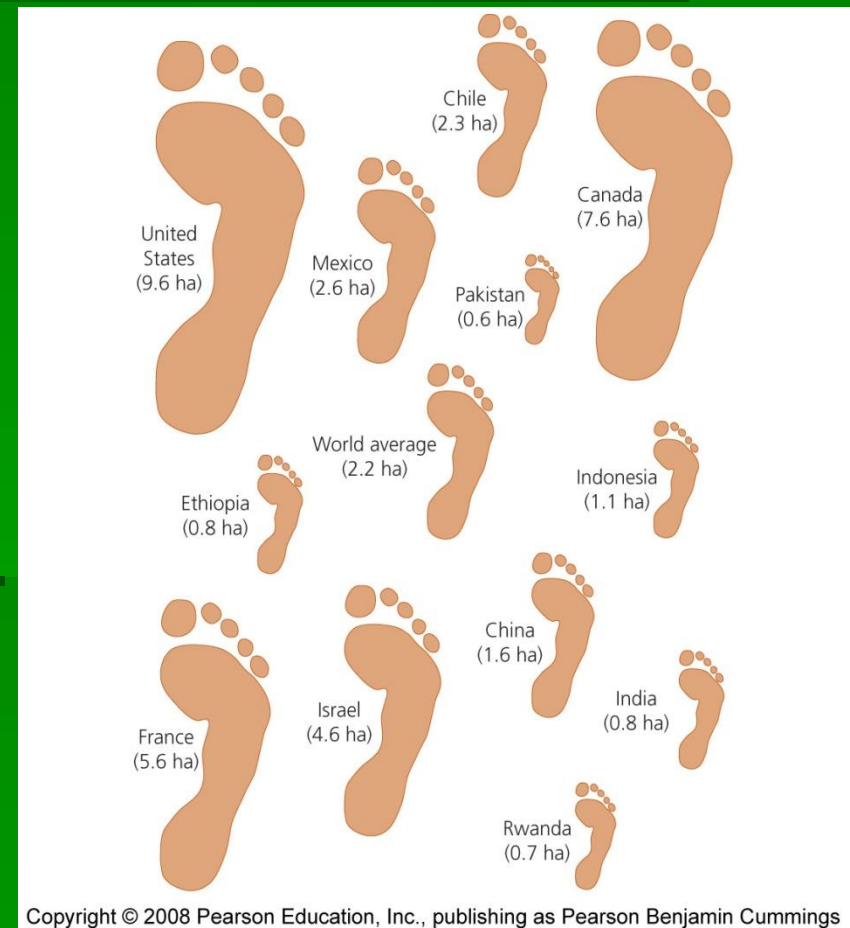
- The environmental impact of a person or population
 - Amount of biologically productive land + water for raw materials and to dispose/recycle waste
- **Overshoot:** humans have surpassed the Earth’s capacity



We are using 30% more of the planet’s resources than are available on a sustainable basis!

Ecological footprints are not all equal

- The ecological footprints of countries vary greatly
 - The U.S. footprint is almost 5 times greater than the world's average
 - Developing countries have much smaller footprints than developed countries



What are the challenges we face?

- What are the environmental issues we are facing today?
- Come up with at least 10!



We face challenges in agriculture

- Expanded food production led to increased population and consumption



It's one of humanity's greatest achievements, but at an enormous environmental cost

- Nearly half of the planet's land surface is used for agriculture
 - Chemical fertilizers
 - Pesticides
 - Erosion
 - Changed natural systems



We face challenges in pollution

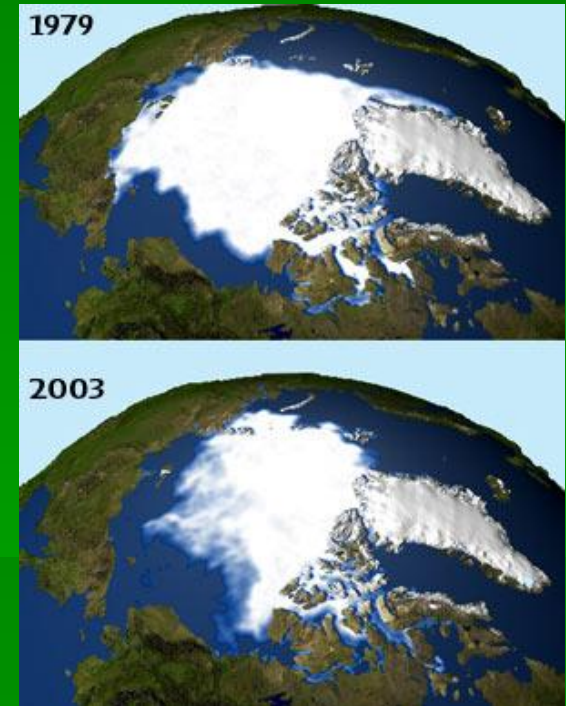
- Waste products and artificial chemicals used in farms, industries, and households



Each year, millions of people die from pollution

We face challenges in climate

- Scientists have firmly concluded that humans are changing the composition of the atmosphere
- The Earth's surface is warming
 - Melting glaciers
 - Rising sea levels
 - Impacted wildlife and crops
 - Increasingly destructive weather



Since the Industrial Revolution, atmospheric carbon dioxide concentrations have risen by 37%, to the highest level in 650,000 years

We face challenges in biodiversity

- Human actions have driven many species extinct, and biodiversity is declining dramatically



Biodiversity loss may be our biggest environmental problem; once a species is extinct, it is gone forever

Our energy choices will affect our future

- The lives we live today are due to fossil fuels

- Machines
- Chemicals
- Transportation
- Products

- Fossil fuels are a one-time bonanza; supplies will certainly decline

We have used up 1/2 of the world's oil supplies; how will we handle this imminent fossil fuel shortage?



Sustainable solutions exist

- We must develop solutions that protect both our quality of life and the environment
- Organic agriculture
- Technology
 - Reduces pollution
- Biodiversity
 - Protect species
- Waste disposal
 - Recycling
- Alternative fuels



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Are things getting better or worse?



- Many people think environmental conditions are better (Human ingenuity will solve any problem)
- Some think things are much worse in the world (predict doom and disaster)
- How can you decide who is correct?
 - Are the impacts limited to humans, or are other organisms or systems involved?
 - Are the proponents thinking in the long or short term?
 - Are they considering all costs and benefits?

Sustainability: a goal for the future

- How can humans live within the planet's means?

- **Sustainability**

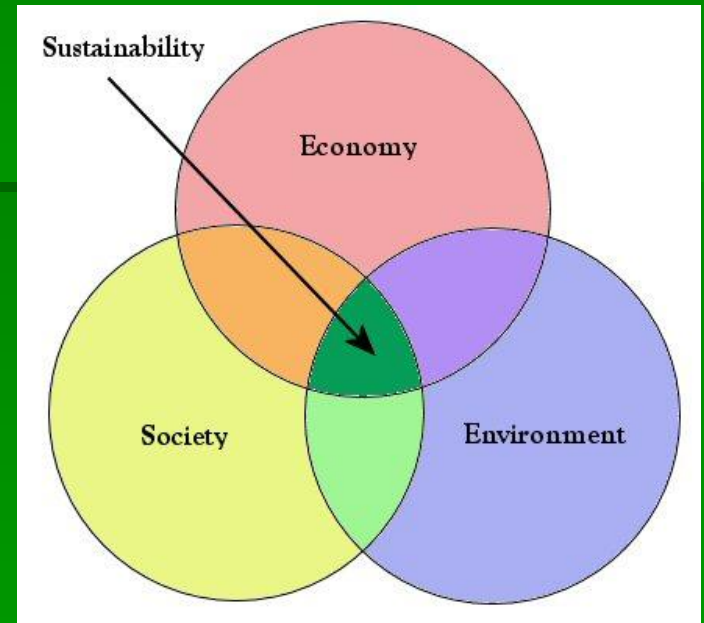
- Leaves future generations with a rich and full Earth
- Conserves the Earth's natural resources
- Maintains fully functioning ecological systems

- **Sustainable development:** the use of resources to satisfy current needs without compromising future availability of resources



Will we develop in a sustainable way?

- The **triple bottom line**: sustainable solutions that meet
 - Environmental goals
 - Economic goals
 - Social goals
- Requires that humans apply knowledge from the sciences to
 - Limit environmental impacts
 - Maintain functioning ecological systems



Conclusion

- Environmental science helps us understand our relationship with the environment and informs our attempts to solve and prevent problems.
- Solving environmental problems can move us towards health, longevity, peace and prosperity
- Environmental science can help us find balanced solutions to environmental problems

