

# Introduction to Environmental Engineering

# What is Environmental Engineering Science?

- We are concerned with the quality and availability of environmental resources and with the waste streams that impact them
- **Science**...improve our understanding of natural processes
- **Engineering**...use this understanding to develop and apply technologies that will maintain or improve environmental quality



# What is an engineer?

- Problem solver.
  - Specifically, one who uses science to solve real world problems.
- SO, what about an environmental engineer?
  - Solves environmental problems using scientific tools



# What is Environmental Engineering?

- Environmental Engineering is the integration of science and engineering principles to improve the natural environment, to provide healthy water, air, and land for human habitation and for other organisms, and to remediate pollution sites.

# 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



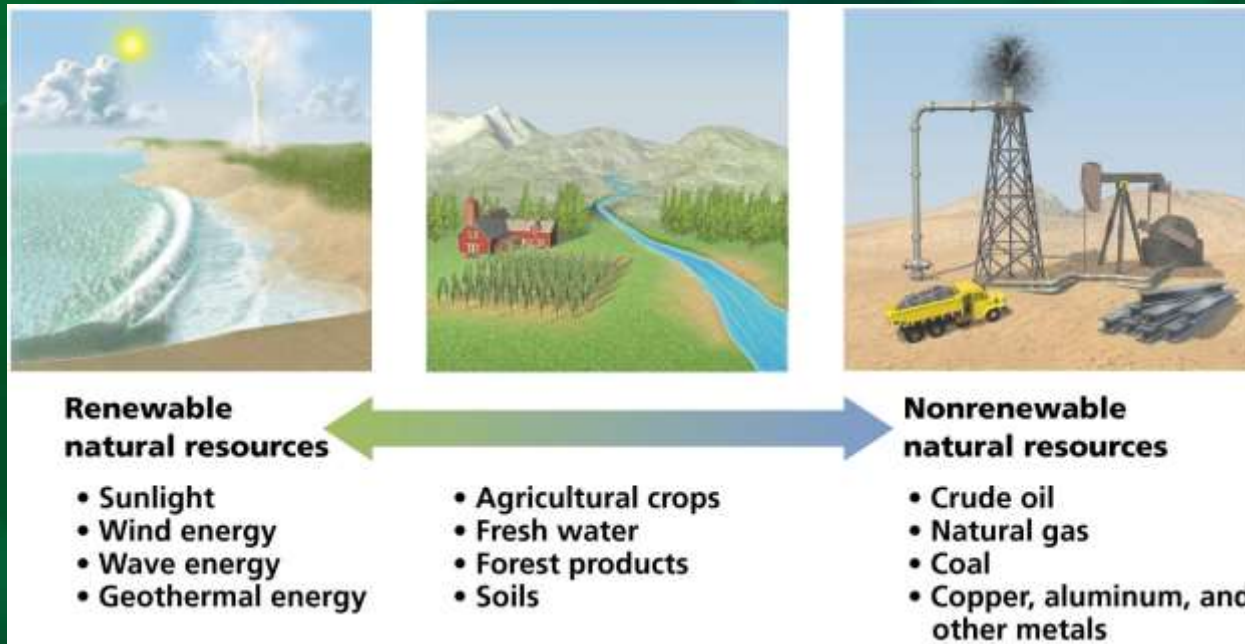
# Environmental Engineering

- **Air pollution**
  - Control devices
  - Permitting
  - Modeling
- **Water (surface and groundwater):**
  - Treatment & disinfection
  - Storage and distribution
  - Dispersion
  - Quality
- **Wastewater**
- **Solid Wastes**
- **Hazardous Wastes**
- **Radioactive Wastes**
- **Integrated Systems**
- **Pollution Prevention**
- **Other – noise and light pollution**



# Natural resources: vital to human survival

**Natural resources** = substances and energy sources needed for survival

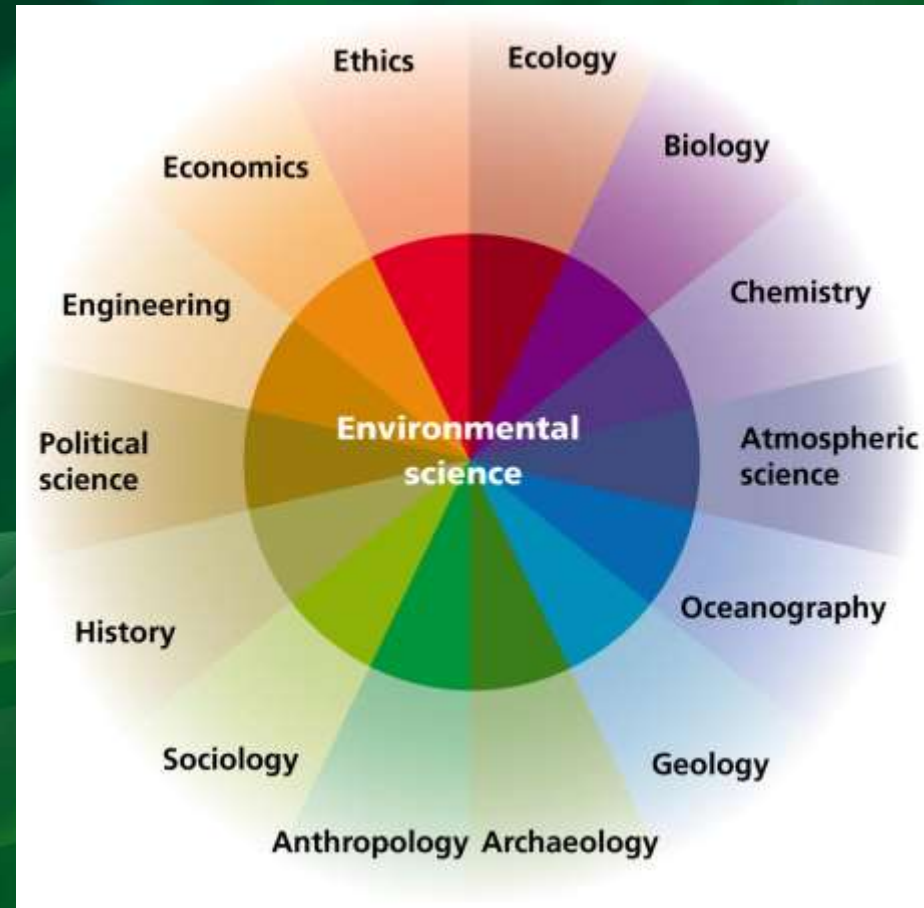


- **Renewable resources:**
  - Perpetually available: sunlight, wind, wave energy
  - Renew themselves over short periods: timber, water, soil
    - These can be destroyed
- **Nonrenewable resources:** can be depleted
  - Oil, coal, minerals

# Environmental science: how does the natural world work?

Environment ← impacts → 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



# 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

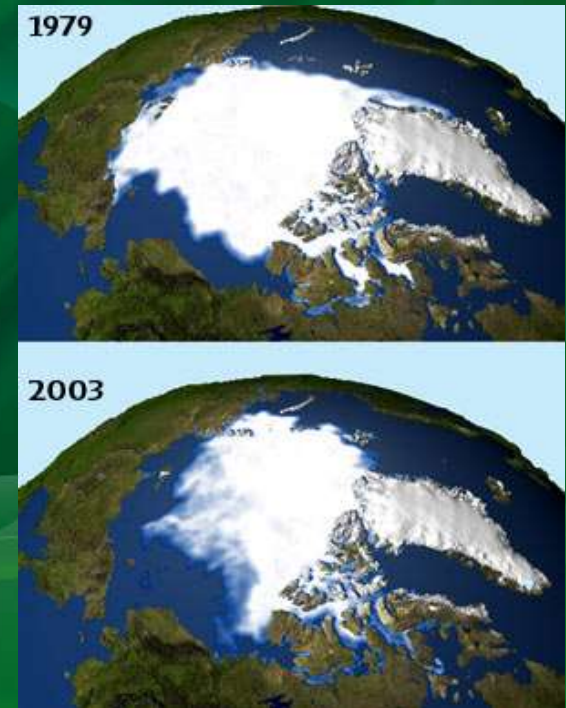
- Waste products and artificial chemicals used in farms, industries, and households



- *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 ½ 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



# Sustainability: a goal for the future

- **Sustainability**

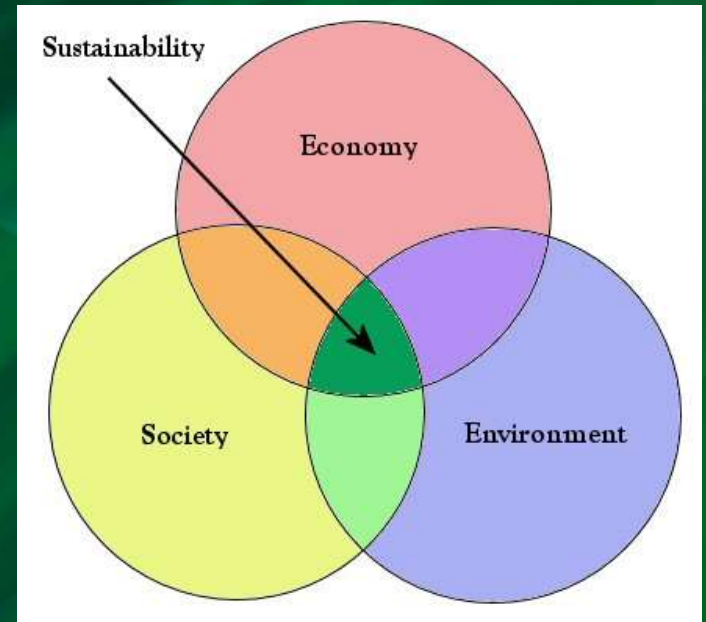
- Leaves future generations with a rich and full Earth
- Conserves the Earth's natural resources
- Maintains fully functioning ecological systems

- **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



# 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?

# 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



# Questions

1. Define Environment. Give example of different type of Environmental component.
2. What is Environmental Engineering? What are the fields of environmental Engineering?
3. What is Environmental Resource? Give example of different type of resource.
4. What is Environmental Problem? Describe different type of environmental problems.
5. What do you understand by Sustainability? Why is Sustainability important for environment?
6. “Environment is getting worse day by day” Are you agree with this statement? Justify your answer.