

Cambridge Core Science Series: GeoBasics

ENVIRONMENTAL ISSUES AND HUMAN IMPACT



Introduction

This Teacher's Guide provides information to help you get the most out of *Environmental Issues and Human Impact*, Part 8 of the *GeoBasics* series. The contents in this guide will allow you to prepare your students before they use the program, assist them as they navigate through the program, and present follow-up activities to reinforce the program's key learning points.

The *GeoBasics* series is intended to excite young people about science and teach them concepts that meet national educational standards for science literacy. Science, in its multiple disciplines, is inherently fascinating and helps explain the world around us. In addition to fulfilling our natural curiosity, studying science and learning critical thinking skills provides numerous practical benefits, including helping us make informed and reasoned decisions, solve problems, think creatively, and continue to learn.

This 22-minute video provides high school students, grades 7 through 12, with an exploration of the various environmental issues facing our planet now and in the future, and highlights humans' negative and positive impact on the environment. The program, however, is not limited to usage by this audience, as science literacy is important for all people in various audiences. Thus, the information presented in *Environmental Issues and Human Impact* can also be presented to vocational / technical schools or in adult education courses that focus on science.

Learning Objectives

After watching *Environmental Issues and Human Impact*, students will understand how to:

- Demonstrate an understanding of the various sources of pollution and types of pollutants.
- List various examples of marine pollution that are putting oceans in peril.
- Cite examples of how humans are impacting the greenhouse effect, global warming, and the climate.
- Demonstrate an understanding of the potential ramifications of global warming.
- Explain how an increase in population, tourism, and recreation can affect the environment.
- Describe potential solutions to pollution, global warming, and environmental concerns on individual, national, and global levels.

Educational Standards

The *Environmental Issues and Human Impact* video program correlates with the following Standards: the National Standards of the National Academy of Sciences National Science Education, International Society for Technology in Education (ISTE), National Educational Technology Standards (NETS), and National Council of Teachers of English; and the State Standards of Florida, Ohio, and Texas for Earth and Space Sciences; Biology; Processes that Shape the Earth; How Living Things Interact with Their Environment; and Listening, Viewing, and Speaking.

- Develops an understanding of energy in the earth system, geochemical cycles, origin and evolution of the earth system, and origin and evolution of the universe. (*National Academy of Sciences National Science Education Standards*)

- Recognizes that processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the Earth; understands the need for protection of the natural systems on Earth; understands the competitive, interdependent, cyclic nature of living things in the environment; and understands the consequences of using limited natural resources. (*Florida State Standards: Processes that Shape the Earth; How Living Things Interact with their Environment; Listening, Viewing, and Speaking*)
- Demonstrates an understanding about how earth systems and processes interact in the geosphere resulting in the habitability of Earth; understands how concepts and principles of energy, matter, motion, and forces explains Earth systems, the solar system, and the universe; understands historical perspectives, scientific approaches, and emerging scientific issues associated with Earth and space sciences; and locates, selects and makes use of relevant information from a variety of media, reference and technological sources, using an appropriate form to communicate their findings. (*Ohio State Earth and Space Science Standards*)
- Knows that interdependence and interactions occur within an ecosystem; knows the significance of plants in the environment. (*Texas State Biology Standards*)
- Understands and applies scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognizes the historical development of ideas in science. (*New York State Standards for Earth Science, Language for Information and Understanding, and Language for Social Interaction*)
- Understands climate is the long-term average of a region's weather and depends on many factors. (*California State Earth Sciences Standards*)
- Understands the fundamental concepts, principles, and interconnections of the life physical, and earth/space sciences. (*Illinois State Standards for Concepts and Principles, Listening and Speaking*)

Program Overview

The *Cambridge Core Science* series is a 40-part series composed of subsets of programs addressing Life Science, Earth Science, Physical Science, Human Body Systems, and Space Science. The series is designed as a whole to give high school and some college students a basic scientific understanding of themselves and the world around them.

The *GeoBasics* video program series consists of eight titles:

- Our Planet Earth
- Plate Tectonics
- Rocks and Minerals
- Oceans and Seas
- Geocycles
- Atmosphere, Climate, and Weather
- Energy and Resources
- Environmental Issues and Human Impact

The final title in the series, *Environmental Issues and Human Impact*, not only explores the effect humans have on the environment and the Earth through use and abuse, but also cites the possible positive impact humans can have when the right steps are taken towards nurturing the planet instead of destroying it. By offering both possible outcomes for the future, the viewer can understand the delicate balance and conflict that now exists between the two and how his or her actions can tip the scale one way or the other.

Main Topics

Topic 1: Introduction

The program begins with an introduction to environmental geology, focusing on the importance of studying the impact of human activities on the environment in order to preserve the planet and its resources.

Topic 2: Environmental Issues

Solving air and water pollution problems is not a simple task. This section highlights the many essential environmental issues facing the world today. Causes and sources of pollution are described—from construction waste in landfills, to farming, ranching, and mining. Finally, this section looks at the disruption of the ecosystem caused by deforestation and clear-cutting.

Topic 3: Global Warming

Global warming is considered by many to be humankind's most serious environmental concern. This section delves into what global warming is, how humans are contributing to it, and the potentially devastating effects of a warmer planet.

Topic 4: Conclusion

The program wraps up with suggestions of steps to take that will help humans make a positive environmental impact on our delicate planet Earth.

Fast Facts

- 2005 ranked as the hottest year on record (tied with 1998), according to NASA. The U.S. ranked *first* as a global warming polluter when ranked against other large nations.
- Glacier National Park will have no glaciers left by 2030, according to U.S. Geological Survey predictions. 400,000 square miles of Arctic sea ice have melted in the last 30 years, threatening polar bear habitats and further accelerating global warming.
- Global warming cannot be halted quickly. CO₂ and other greenhouse gases (GHGs) can remain in the atmosphere for many centuries. Even if emissions were eliminated today, it would take centuries for the heat-trapping GHGs now in the atmosphere to fall to pre-industrial levels.
- In 1950, fewer than one person in three lived in a town or city. Currently, nearly half the world's population is urban. By 2030, the proportion will be more than 60%. Virtually all population growth in the next quarter-century will be in urban areas in the less developed countries. The fastest growth will not be in the bigger cities, but in urban centers with fewer than 500,000 people.

- Over 4 billion pounds of toxic chemicals are released by American industry into the environment each year, including 72 million pounds of recognized carcinogens.
- As of 2002, the state with the highest- reported releases of toxic chemicals by industrial facilities was Alaska (547,987,529 pounds). From 1988 to 2002, total releases increased 1,900%.
- Americans generate more than 225 million tons of trash annually. About one-third of that is recycled or composted, leaving 150 million tons of trash to be managed.
- Examples of alternative fuel vehicles that are better for the environment include Flex-Fuel Vehicles (FFVs), Bi-Fuel Vehicles (which are gasoline-powered vehicles that can be modified to use compressed natural gas or liquefied propane gas), and electric vehicles (EVs).
- Federal Express currently has 18 hybrid diesel-electric delivery vehicles in service in Sacramento, New York, Tampa, and Washington, D.C. The trucks have reduced particulate matter by 96%, nitrogen oxides by 65%, and increased fuel efficiency by 57%, compared to the 1999 baseline vehicle.

Vocabulary Terms

atmosphere: The gaseous mass or envelope surrounding the Earth and retained by the Earth's gravitational field.

biosphere: The part of the Earth and its atmosphere in which living organisms exist or which is capable of supporting life.

clear-cutting: Removal of all of the trees in a tract of timber.

climatology: The meteorological study of climate and climatic phenomena.

deforestation: The cutting down and removal of trees.

ecosystem: An community of organisms together with its environment, functioning as a unit.

energy: A source of usable heat or power, such as petroleum or coal.

environmental impact: Human environmental health impact, risk to ecological health, and changes to the ways in which nature benefits humans—sometimes referred to as “nature’s services”—caused by an activity.

fossil fuel: Fuel consisting of the remains of organisms preserved in rocks in the Earth's crust with high carbon and hydrogen content.

greenhouse effect: The phenomenon whereby the Earth's atmosphere traps solar radiation, caused by the presence in the atmosphere of gases such as carbon dioxide, water vapor, and methane that allow incoming sunlight to pass through but absorb heat radiated back from the Earth's surface.

global warming: An increase in the average temperature of Earth's atmosphere, especially a sustained increase sufficient to cause climatic change.

hydrosphere: The watery layer of the Earth's surface; includes water vapor.

lithosphere: The solid outermost shell of the Earth, which includes the crust and the uppermost layer of the mantle.

mangrove: Any of several tropical evergreen trees or shrubs of the genus *Rhizophora*, having stiltlike roots and stems and forming dense thickets along tidal shores.

natural resource: A material source of wealth, such as timber, fresh water, oil, or a mineral deposit, that occurs in a natural state and has economic value.

rainforest: Forest with an annual rainfall of at least 100 inches.

zeroscaping: The use of landscaping with rocks instead of plants to promote water conservation.

Pre-Program Discussion Questions

1. In what ways have you personally witnessed the environment being negatively impacted by human activities? Cite examples from your local area.
2. What environmental issue do you most see discussed on national news or in newspapers and magazines? Why is that so? Do you think the American media provides more or less coverage on the issue than do other countries? Why or why not?
3. What is the greenhouse effect? What indications are evident of the greenhouse effect on our planet?
4. According to the National Oceanic and Atmospheric Administration (NOAA), there has been an increase in hurricanes in the tropical Atlantic since 1995. Do you think that an increase in extreme weather is proof that humans are negatively impacting the environment? Why or why not?
5. Have you visited a tourist attraction (e.g., the Grand Canyon, Carlsbad Caverns, coral reefs, etc.) where restrictions were in place to help reduce the negative impacts on the environment?

Post-Program Discussion Questions

1. Given what you know about how humans affect the environment, think about how the planet will be 100 / 1,000 / 10,000 years from now. Describe what you believe the planet will look like, including the climate and the natural resources available.
2. What would happen to Earth and the human race if there were a new ice age? What if the average temperature increased 5 degrees? Describe each scenario in detail.
3. How do construction, industrialization, agriculture, and mining affect the environment?
4. What types of forests exist today, and what are their benefits to the planet and to humankind?
5. What are some steps your school can take to make a positive impact on the environment?

Internet Activities

- Consider how an increase in population, tourism, and recreation affects the environment. Using the Internet, research how various vacation spots, tourist attractions, and national parks have been negatively affected. Then present your findings to the class in a speech of five to seven minutes.

Group Activities

- What kind of cars do you or your family drive? Using <http://www.fueleconomy.gov/feg/find-acar.htm> or another Web site that calculates greenhouse gas emissions, tally the yearly emissions of your family's car(s). Then, research hybrid cars and SUVs and consider environmentally-friendly replacements for each family car. Finally, have the class create two charts: one of all the vehicles currently owned and their total emissions, and a second detailing the hybrid vehicles and corresponding emissions. Compare and discuss the results.
- There is active debate over whether global warming is really caused by human activity. Some experts offer evidence that our current global warming is really part of a natural cycle to which everyone is overreacting; others disagree. Splitting the class in half, ask Group 1 to research all the evidence it can find of experts stating why global warming is not truly an issue, and have the group present its findings to Group 2. After listening and taking notes, Group 2 should then research evidence that refutes or explains Group 1's findings. Discuss as a class why such a debate continues and draw conclusions as to possible motivations for taking one stand or the other.

Individual Student Projects

- Think hard about how you can be part of the solution instead of the problem. Create a list of 100 (or more!) ways that you can personally help make a positive impact on the environment. Present your list in a creative way, such as in a multimedia presentation using graphics, video, and/or audio, or by creating a poster with drawings and/or photos.
- Choose one of the following environmental issues (or come up with one of your own) and write a paper of 3-5 pages in length about its causes; its negative effects; why some feel the activity cannot simply be stopped; and possible alternatives.
 - loss of wetlands
 - deforestation
 - fresh water alterations
 - overfishing
 - Alaska refuge drilling
 - new home construction

Assessment Questions

Q1: Building houses creates what percentage of waste of all landfills?

A: 15-30%.

Q2: The environment suffers from over-_____ due to human activities.

A: Among other things, the environment suffers from overuse, overconsumption, overexposure, and overfishing due to human activities and overpopulation.

Q3: What is "zeroscaping"?

A: Zeroscaping is the use of landscaping with rocks instead of plants to promote water conservation.

Q4: What are ways to help preserve forests, natural preserves, and wildlife?

A: Tread lightly and observe the natural beauty without touching, changing, or removing anything from its natural habitat.

Q5: True or False: The various geocycles work together, so if you pollute the air, you might also be polluting the water.

A: True. All systems work together, not in isolation. Pollutants in the air can reach the ground through acid rain and runoff into streams, thereby polluting the water.

Q6: True or False: Agriculture helps the environment.

A: False. Farming wastes water, and fertilizers sprayed on crops are hard to get back out of water, thereby contaminating the water system. According to waterconserve.org, "Farming accounts for 70% of the water consumed and a majority of its waste. Mismanagement of resources leads to a lack of safe drinking water for one-fifth of the world's population."

Q7: What percent of the world's population lacks access to safe drinking water?

A: An astounding 20% is estimated to be lacking access to safe drinking water; and as the population grows, demand grows proportionately, increasing the danger of depleting natural resources.

Q8: The temperature has increased ____ degree(s) over the last century, and is expected to increase ____ degree(s) in the next 100 years.

A: The temperature has increased 1 degree over the last century, and is expected to increase 2-6 degrees in the next 100 years.

Q9: What are greenhouse gases, and what would the temperature be if there were no greenhouse effect?

A: Greenhouse gases are gases that trap the sun's heat in the Earth's atmosphere, producing the greenhouse effect. The two major greenhouse gases are water vapor and carbon dioxide. Others include methane, ozone, chlorofluorocarbons, and nitrogen oxides. The Earth would be at an average of zero degrees instead of 57 degrees without the greenhouse effect.

Q10: True or False: Soils take 100 years to form.

A: False. Soils take thousands of years to form.

Additional Resources

USGS Education: Science for a Changing World

www.usgs.gov/education

Educyclopedia: The Educational Encyclopedia

<http://users.pandora.be/educyclopedia/education/geology.htm>

NASA's Science Mission Directorate Website

<http://science.hq.nasa.gov>

The Center for International Earth Science Information Network (CIESIN)

www.ciesin.org

The Earth Institute at Columbia University

www.earthinstitute.columbia.edu

The WWW Virtual Library: Earth Science

<http://vlib.org/EarthScience>

Earth Science Week

www.earthsciweek.org

National Earth Science Teachers Association

www.nestanet.org

Additional Resources at www.filmsmediagroup.com

Available from Films Media Group • www.filmsmediagroup.com • 1-800-257-5126

Earth Science I Video Library

- VHS #30977
- VHS #30992—in Spanish
- DVD #30962
- Closed captioned
- Correlates to National Science Education Standards
- Includes a User's Guide

Contains 18 video clips on the history of the Earth, fossils, paleontology, and mapping the Earth. Clips include *Introduction to Earth History*, *Thermal Features*, *Blue Hole*, *Extinction*, *Glaciers*, *Fossil Hunter*, *Fossil Voyage*, *Amber*, *Mammoth*, *Rhino Fossils*, *Fossil Tunnels*, *Early Maps*, *Remote Sensing*, *Global Positioning System*, *Mountains*, *Seafloor Maps*, *Measuring Latitude*, *Measuring Longitude*. A User's Guide is included, containing an overview; a numbered index of clips, with brief descriptions and lengths; time codes (VHS only); suggested instructional strategies; and a list of additional resources. A Discovery Channel/FFH&S Production. © 2003.

Earth Science II Video Library

- VHS #30978
- VHS #30993—in Spanish
- DVD #30963
- Closed captioned

- **Correlates to National Science Education Standards**
- **Includes a User's Guide**

The *Earth Science II Video Library* contains 24 video clips on volcanoes, earthquakes, oceans, seasons, weather, and climate. Clips include *Introduction to Volcanoes*, *Birth of a Volcano*, *Death and Destruction*, *Types of Volcanoes*, *Volcanology*, *Plate Tectonics*, *Earth in Motion*, *San Andreas Fault*, *Seismology*, *Earthquake-Proof*, *Earthquake Zone*, *Introduction to Oceans*, *Coral Reefs*, *Waves and Tides*, *Fish Harvesting*, *Currents*, *Introduction to Weather*, *Polar Weather*, *Man-Made Weather*, *Rain*, *Violent Weather*, *Heat and Weather*, *Weather Systems*, *Water Cycle*. A User's Guide is included, containing an overview; a numbered index of clips, with brief descriptions and lengths; time codes (VHS only); suggested instructional strategies; and a list of additional resources. A Discovery Channel/FFH&S Production. © 2003.

Earth Story

- **8-part series**
- **VHS/DVD-R #8503**
- **"Extremely well done!" —Booklist**

Beginning with the first land formations that emerged from a primordial ocean 4 billion years ago, this eight-part series explores how all geologic phenomena, from volcanoes to earthquakes, are intertwined. Journeying from the sea bottom to the highest peak in the Andes, the series presents the latest theories on plate tectonics, earthquakes, volcanoes, land formations, and continental drift. An indispensable resource for teaching earth science and geology. A BBC Production. (50 minutes each)

The series includes *Dating the Earth*, *Journey to the Ocean Floor*, *Continental Drift: Legacy of Fire*, *Death of the Dinosaurs*, *Winds of Change*, *Noah's Children*, *Oxygen: The Poison Gas*, *The Earth and the Moon*.

Landforms

- **CD-ROM #6978 (Windows only)**

What causes volcanoes and earthquakes? Why do tsunamis and floods occur? How do river beds and coastlines change? And what challenges do the forces that shape the Earth pose for people? Using this highly interactive CD-ROM, students can freely explore the Geodome, a virtual laboratory of geologic landforms. Learning stations provide targeted opportunities to manipulate 3-D topographical models, conduct simulations of natural disasters, examine hundreds of slides, and watch video clips. Plus, info/quiz features offer additional background and test comprehension. Headline-making catastrophes and issues of geologic concern drive home the present-day relevance of earth science, geology, and physical geography. Plate tectonics and seismology, eruptions and erosion, landslides and sedimentation—this disc has it all.

The Life and Times of El Niño

- **VHS/DVD-R #34956**
- **Closed captioned**

It has been linked to famines, epidemics, even the fall of empires. This program follows El Niño's deadly path through human history and the progress science has made in understanding the once-mysterious phenomenon. The effects of El Niño are presented in detail, including an 1878 outbreak of yellow fever in Tennessee, a concurrent drought that ravaged much of China, and more recent calamities that have brought the true nature of this climatic occurrence to light. Focusing on high-tech advances in meteorology, the video outlines El Niño's significance in the global warming debate and illustrates the use of computer models that can predict its next appearance. A BBCW Production. (50 minutes) © 2005.

Man and the Biosphere

- 12-part series
- VHS/DVD-R #2333
- **Recommended by Science Books & Films**

Using an integrated interdisciplinary approach combining the natural and the social sciences, these videos look at the relationships between living beings and their environments. The work of botanists, biologists, geologists, and demographers is used to examine the realities of ecological concerns in the framework of political realities. From the tops of the Himalayas to the bottom of the sea, from empty deserts to overcrowded cities, these videos show life where it thrives and where it has died out. Based on UNESCO's ground-breaking Man and the Biosphere Program, they illustrate the problems and concerns of preserving life, including human life, on Earth, and demonstrate numerous environmental projects that have successfully met the needs of both humankind and nature. (28 minutes each)

The series includes *Life in Arid and Semi-Arid Lands; The Desert as Laboratory; Life at the Top; Equilibrium in a Mountain Habitat; The Tropical Rain Forest; Preserving the Rain Forest; Coastlines; Ecology of the Coral Reef; Lagoons; Wetlands and Pinelands; Urban Ecology; Toward a Livable City.*

BioBasics

- 8-part series
- VHS/DVD-R #33833
- **Preview clip online at www.films.com (Search on 33833)**
- **Includes viewable/printable Teacher's Guide**
- **Correlates to National Academy of Sciences National Science Education Standards and the American Association for the Advancement of Science Benchmarks for Science Literacy**
- **"A welcome replacement for outdated life science programs."—*School Library Journal***

Use the comprehensive 8-part *BioBasics* series to excite your students about life science as you present the fundamental concepts they'll need for a firm foundation in biology. An engaging blend of computer graphics, interviews with scientists, and animations will hold their attention as they open their minds to a wide range of essential life science topics.

The series includes *Introduction to Life Science; Cells: The Building Blocks of Life; Genetics and Evolution; Organization and Diversity; Life Processes of Animals; Life Processes of Plants; Microorganisms; Interdependence of Life.* A Cambridge Educational Production. Viewable/printable teacher's guides are available at www.cambridgeeducational.com. (25 minutes each) © 2005.



For information on other programs

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