

SUGGESTED REFERENCES

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- Reid, Stephen J.
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Global Warming
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NATIONAL SCIENCE EDUCATION STANDARDS

5 - 8

Physical Science
Transfer of energy

Science in Personal and Social Perspectives
Populations, resources and environments

9 - 12

Physical Science
Conservation of energy and Increase in disorder

Earth and Space Science
Energy in the earth system

Science in Personal and Social Perspectives
Natural resources
Environmental quality
Natural and human induced hazards

*Source: *National Science Education Standards, 1996, National Academy Press*

CREDITS

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SCIENCE
SCREEN
REPORT

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PROTECTING EARTH'S ATMOSPHERE



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SYNOPSIS

Earth is the only planet known to support life. The primary reason is a mixture of different gases, known as the atmosphere. These gases, along with the sun, warm our planet to an average temperature of 15 degrees Celsius. This delicate process is known as the greenhouse effect. Without it, the sun's energy would escape back into space leaving the earth frozen.

In this edition of SCIENCE SCREEN REPORT, we learn about the earth's atmosphere, climate, and the greenhouse effect. We explore the impact human activity is having on our atmosphere, and ways scientists believe we can prevent further destruction to the atmosphere, and allow our planet to continue to thrive.

CURRICULUM UNITS

- BIOLOGY
- EARTH SCIENCE
- ENVIRONMENTAL SCIENCE
- GEOLOGY
- PHYSICAL SCIENCE

RUNNING TIME

18:20

BACKGROUND

Earth is home to many living things. But, what makes Earth the only planet known to support life? The answer lies in the atmosphere. A mixture of gases, each with its own physical properties, work together with the sun's solar energy to create an average temperature of 15 degrees Celsius. Unlike any other planet, Earth's atmosphere absorbs the heat and reflects it back towards Earth. Without this intricate process known as the greenhouse effect, the earth would be a frozen planet.

In this edition of SCIENCE SCREEN REPORT, we explore the earth's atmosphere and the importance of the greenhouse effect. As we learn about the impact that human activity is having on the atmosphere, we also take a look at ways scientists think we can help prevent further interference with the greenhouse effect.

For millions of years, the earth has undergone natural changes. Approximately 150 years ago, the climate was almost entirely influenced by the sun. The earth has experienced dramatic climate cycles due to changes in its rotation and orbit.

Biologists and geologists have found evidence to document such climatic changes. Thirteen thousand year old forests reveal tree rings confirming weather patterns of the past, while sediment from the ocean floor uncovers changes in currents that might have affected surface temperatures. When temperatures rise globally, it affects global weather patterns.

From studying past climate changes, scientists have found that there is one-third more carbon dioxide in the earth's atmosphere today than there was before the industrial revolution. This leads them to believe that human activity plays a significant role in global warming. Activities such as deforestation, a process that involves the destruction of forests, and desertification, the process of land turning into dry arid desert, are to blame. Land that once flourished and provided a balance of the greenhouse effect is being destroyed. Both of these activities are causing an increase in carbon dioxide and, in turn, contributing to global warming.

Global warming is a growing concern. As scientists continue to study what causes the increase in carbon dioxide, countries around the world, like the United States, are working towards reducing human impact on the atmosphere. Environmentalists are providing education so that we can lend a helping hand. With the use of renewable energy sources such as wind, water, and solar energy we can help slow the global warming process. In addition, households can participate in conservation by saving electricity, carpooling, and recycling. By making conscious efforts to conserve, we will be aiding in the preservation of our environment.

ADVANCED ORGANIZERS

Prior to viewing this video, students should have some understanding of the following Benchmarks for Science Literacy, Oxford University Press which are excerpted and, in some cases, abbreviated below. Refer to the Benchmarks for more information.

Benchmark 4: The Physical Setting

Section B - The Earth

Know by Grade 8

- Climates have sometimes changed abruptly in the past as a result of changes in the earth's crust, such as volcanic eruptions or impacts of huge rocks from space. Even relatively small changes in atmospheric or ocean content can have widespread effects on climate if the change lasts long enough.
- The benefits of the earth's resources-such as fresh water, air, soil, and trees-can be reduced by using them wastefully or by deliberately or inadvertently destroying them. The atmosphere and the oceans have a limited capacity to absorb wastes and recycle materials naturally. Cleaning up polluted air, water, or soil or restoring depleted soil, forests, or fishing grounds can be very difficult and costly.

Know by Grade 12

- Weather (in the short run) and climate (in the long run) involve the transfer of energy in and out of the atmosphere. Solar radiation heats the land masses, oceans, and air. Transfer of heat energy at the boundaries between the atmosphere, the land masses, and the oceans results in layers of different temperatures and densities in both the ocean and atmosphere. The action of gravitational force on regions of different densities causes them to rise or fall and such circulation, influenced by the rotation of the earth, produces winds and ocean currents.

Section C - Processes That Shape the Earth

Know by Grade 8

- Human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and intensive farming, have changed the earth's land, oceans, and atmosphere. Some of these changes have decreased the capacity of the environment to support some life forms.

Know by Grade 8

- Plants alter the earth's atmosphere by removing carbon dioxide from it, using the carbon to make sugars and releasing oxygen. This process is responsible for the oxygen content of the air. Technology has made it possible to repair and sometimes replace somebody parts.

Section E - Energy Transformations

Know by Grade 8

- Energy appears in different forms. Heat energy is in the disorderly motion of molecules; chemical energy is in the arrangement of atoms; mechanical energy is in moving bodies or in elastically distorted shapes; gravitational energy is in the separation of mutually attracting masses.

**Benchmarks can be found at www.project2061.org/tools/benchol/bolinro.htm*

CRITICAL THINKING EXERCISES

1. Compare and contrast the effects on the environment of using fossil fuels and renewable energy sources.
2. Experiment with light and heat energy. Using a light bulb and a hot plate or equivalent, and a thermometer, record the temperature for both energy sources after a given amount of time. For example, thirty seconds, one minute, five minutes. Record your observations and discuss.
3. Visit Nova Online for a class debate activity titled, Venus Unveiled.
www.pbs.org/wgbh/nova/teachers/activities/2210_venus.html
4. Research environmental policies regarding the greenhouse effect. How do these policies affect human ways of life?
5. Visit a website such as: <http://yosemite.epa.gov/oar/globalwarming.nsf/content/index.html> to learn more about global warming, what it is and what we can do about it.
6. Construct a greenhouse (terrarium) to demonstrate how temperatures are affected by global warming. Visit a website such as: www.earth.uni.edu/EECP/mid/mod5_sc.html for further instruction and materials.

VOCABULARY

Atmosphere

Carbon dioxide

Deforestation

Desertification

Fossil fuels

Global warming

Greenhouse effect

Greenhouse gases

Gulf Stream

Heat energy

Industrial Revolution

Light energy

Renewable energy

Tree rings

CAREER POSSIBILITIES

- BIOLOGIST
- ENVIRONMENTAL SCIENTIST
- GEOLOGIST
- PHYSICAL SCIENTIST