Importance of Air and Water

Using some natural resources, such as fossil fuels and minerals, makes life easier. You would miss them if they were gone, but you would still survive.

Air and water, on the other hand, are resources that you cannot live without. Most living organisms can survive only a few minutes without air. Your lungs take in oxygen from the air and pass it on to the blood. Oxygen helps your body provide energy for your cells.

Water is needed for many life functions. Water is the main component of blood. Water also helps protect body tissues, helps maintain body temperature, and plays a role in many chemical reactions, such as the digestion of food.

In addition to drinking water, people use water for other purposes that you will learn about later in this lesson, including agriculture, transportation, and recreation.

Air

Most living organisms need air to survive. The polluted air described in the figure at the top of the next page can harm humans and other living organisms.

Air pollution is produced when fossil fuels burn in homes, vehicles, and power plants. It also can be caused by natural events, such as volcanic eruptions or forest fires.
Smog  Burning fossil fuels releases not only energy, but also substances such as nitrogen compounds. **Photochemical smog** is a brownish haze produced when nitrogen compounds and other pollutants in the air react in the presence of sunlight.

Smog can irritate your respiratory system. In some individuals, it can increase the chance of asthma attacks. Smog can be particularly harmful when it remains in an area for several days. Pollution becomes trapped under a layer of warm air, as shown in the figure above.

**Acid Precipitation**  Nitrogen and sulfur compounds released when fossil fuels burn can react with water in the atmosphere and produce acid precipitation. **Acid precipitation** is precipitation that has a pH less than 5.6.

When acid precipitation falls into lakes, it can harm fish and other organisms. It also can pollute soil and kill trees and other plants. Acid precipitation can even damage buildings and statues made of some types of rocks.

**Natural Events**  Forest fires and volcanic eruptions release gases, ash, and dust into the air. Dust and ash from one volcanic eruption can spread around the world. Materials from forest fires and volcanic eruptions can cause health problems similar to those caused by smog.

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**Smog Formation**

1. During winter, the Sun’s rays are less intense, so air near Earth’s surface is cooler.

2. Sometimes warmer air traps colder air and acts as a lid, holding cold air near the ground.

3. The warm air also traps a layer of pollution from vehicles, industry, and homes.

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**Math Skills**

The carbon monoxide (CO) level in Seattle air went from 7.8 parts per million (ppm) in 1990 to 1.8 ppm in 2007. What was the percent change in CO levels?

**a.** Subtract the starting value from the final value.

\[
1.8 \text{ ppm} - 7.8 \text{ ppm} = -6.0 \text{ ppm}
\]

**b.** Divide the difference by the starting value.

\[
-6.0 \text{ ppm}/7.8 \text{ ppm} = -0.769 \text{ ppm}
\]

**c.** Multiply by 100 and add a % sign.

\[
-0.769 \times 100 = -76.9\%
\]

It decreased by 76.9%.

**4. Use Percentages**

Between 1900 and 2000, the ozone (O\textsubscript{3}) levels in New York City went from 0.098 ppm to 0.086 ppm. What was the percent change in ozone levels?
Water

Suppose you saved $100, but you were allowed to spend only 90 cents. You might be frustrated! If all the water on Earth were your $100, freshwater that we can use is like that 90 cents you can spend.

Most water on Earth is salt water. Only 3 percent is freshwater, and most of that is frozen in glaciers. That leaves just a small part, 0.9 percent, of the total amount of water on Earth for humans to use.

This relatively small supply of freshwater must meet many needs. In addition to drinking water, people use water for farming, industry, electricity production, household activities, transportation, and recreation. Each of these uses can affect water quality.

For example, rain and water used to irrigate fields can mix with fertilizers. This polluted water then can run off into rivers and groundwater, reducing the quality of these water supplies.

Let’s look at another example. Water used in industry often is heated to high temperatures. This hot water can harm aquatic organisms when it is returned to the environment.

Managing Air and Water Resources

Animals and plants do not use natural resources to produce electricity or to raise crops. But they do use air and water. Those who manage these important resources must consider human needs and the needs of other living organisms.

Management Solutions

Legislation is an effective way to reduce air and water pollution. The regulations of the U.S. Clean Air Act, passed in 1970, limit the amount of certain pollutants that can be released into the air. The graph at the top of the next page shows how levels of sulfur compounds have decreased since the act became law.

Similar laws are now in place to maintain water quality. The U.S. Clean Water Act legislates the reduction of water pollution. The Safe Drinking Water Act legislates the protection of drinking water supplies. By reducing pollution, these laws help ensure that all living organisms have access to clean air and water.
8. Apply How can individuals help manage air and water resources wisely?

What You Can Do

You have learned that reducing fossil fuel use and improving energy efficiency can reduce air pollution. You can make sure your home is energy efficient by keeping the filters in the air conditioner or the furnace clean and by using energy-saving lightbulbs.

You can help reduce water pollution by properly disposing of harmful chemicals so that less pollution runs off into rivers and streams. You can volunteer to help clean up litter from a local stream. You also can conserve water so enough of this resource remains for you and other living organisms in the future.

Visual Check

7. Describe the trend of the concentration of sulfur compounds in the atmosphere from 1980 to 2005.

<table>
<thead>
<tr>
<th>Year</th>
<th>Concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>0.00</td>
</tr>
<tr>
<td>1985</td>
<td>0.01</td>
</tr>
<tr>
<td>1990</td>
<td>0.02</td>
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<tr>
<td>1995</td>
<td>0.03</td>
</tr>
<tr>
<td>2000</td>
<td>0.01</td>
</tr>
<tr>
<td>2005</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Key Concept Check

8. Apply How can individuals help manage air and water resources wisely?
Mini Glossary

- **acid precipitation**: precipitation that has a pH less than 5.6
- **photochemical smog**: a brownish haze produced when nitrogen compounds and other pollutants in the air react in the presence of sunlight

1. Review the terms and their definitions in the Mini Glossary. Write a sentence explaining why photochemical smog is harmful to people.

   ____________________________________________________________

2. One use of water is for household activities. Complete the diagram by writing the other uses in the empty circles.

   [Diagram showing water uses with empty circles]

3. Describe the effects of acid precipitation.

   ____________________________________________________________

What do you think NOW?

Reread the statements at the beginning of the lesson. Fill in the After column with an A if you agree with the statement or a D if you disagree. Did you change your mind?

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