

Technology and the Environment

Climate change does not respect border; it does not respect who you are—rich and poor, small and big. Therefore this is what we call global challenges which require global solidarity.

—Ban Ki-moon, UN Secretary General, 2007–2016

Essential Question: What were the causes and effects of environmental changes from 1900 to the present?

During the 20th and 21st centuries, human agricultural, industrial, and other commercial activity contributed to many environmental changes that led to increased competition for increasingly scarce resources. These problems include:

- **Deforestation**—the loss of Earth’s trees as a result of cutting down trees so the land could be used for agriculture
- **Desertification**—the removal of the natural vegetation cover through expansion and intensive use of agricultural lands in arid and semi-arid lands
- A decline in **air quality** as a result of increased pollutants in the air
- Increased consumption of the world’s supply of fresh water

Scientists observed that, along with these changes, Earth was getting warmer. Ban Ki-moon, a South Korean politician and diplomat, and many other world leaders concluded that climate change was a global problem and debated the best ways to approach it through global action.

Causes of Environmental Changes

A number of interconnected factors contributed to the environmental changes that have taken place since 1900.

Population Growth In 1900, the world population was 1.6 billion. By 1950 it had risen to 2.55 billion, and by 2000 the population was 6.12 billion. All of the billions more people that lived on the planet since 1900 needed to be fed. Growing populations led to a demand for more croplands. This increase in land used for agricultural purposes resulted in deforestation, soil erosion, and smaller habitats for many species of plants and animals.

Growing populations affected not only land resources but also water resources. Overfishing in the oceans has led to the near disappearance of cod. Although fresh water is a renewable resource, growing populations consume increasing amounts of it.

Urbanization Another cause of environmental change is the increasing size and number of cities. By some estimates, by 2025, 5.1 billion people will live in cities, which will pressure those who grow food to use intensive farming methods that deplete the soil and cause erosion or to clear more forests for agricultural use. City dwellers also produce vast amounts of waste, some of which pollutes the water they depend on.

Globalization and Industrialization The global reach of industrialization has also affected the environment. As industry spread to developing countries, energy and other natural resources used in manufacturing were in demand, drawing further on the reserves of resources. Workers in industry in these developing countries are creating a new middle class that increases the market for such products as cars that require metals and other resources and that also contribute to pollution.

Effects of Environmental Changes

While humans have always competed for raw materials and natural resources, this competition became more intense as industrialization spread. With an ever-growing population, humans grappled with hunger, environmental damage, and global epidemics.

Resource Depletion Since the mid-1800s, when petroleum extraction began in earnest and oil pumped energy into the Industrial Revolution, about half of the earth's finite resources of this vital resource have been used up. With the rapidly growing urban and industrial population, some experts predict the remaining half could be used up at a much faster rate, within the next 30 to 40 years. While supplies of coal will last longer, if coal is used to make up for the loss of petroleum, coal reserves could also be depleted in 60 years. (Connect: Evaluate the claim that the Industrial Revolutions have created dependency on natural resources that will soon lead to their depletion. See Topic 5.5.)

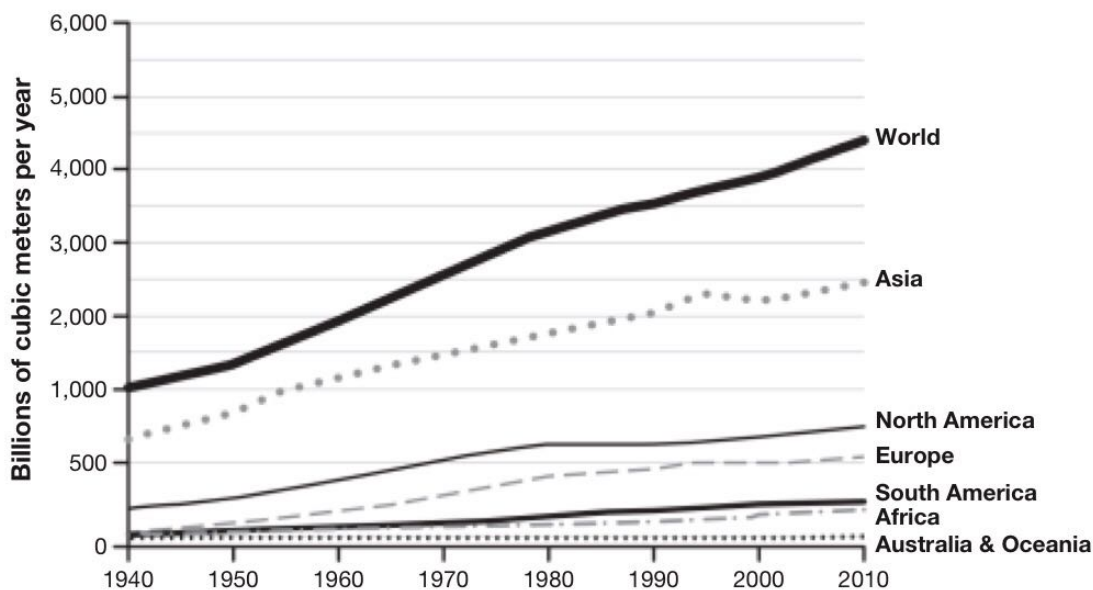
Inequality and Scarce Resources According to the United Nations, 31 countries are facing **water scarcity** and more than 1 billion people lack clean, accessible drinking water. As water consumption continues to increase, some corporate interests are depleting, polluting, and exploiting water sources. The World Health Organization predicts that by 2025, half of the world's population will lack clean and safe drinking water.

Water scarcity is also linked to other inequalities. Surveys from 45 developing countries show that women and children bear the primary responsibility for water collection in most households. This is time not spent working at an income-generating job or attending school. A study in Ghana found that a 15-minute reduction in water collection time increases the proportion of girls attending school by 8 percent to 12 percent.



In 2015, world leaders agreed to 17 goals for a better world by 2030. Many of these global goals address the environmental problems the world faced after 1900 that relate to extreme poverty, inequalities and injustice, and climate change.

Global Water Consumption, 1900–2025



Source: Adapted from Sampa, Commons.Wikimedia.org

Changes in the Atmosphere Factories, automobiles, airplanes, and many other products and processes of industrialization have emitted huge amounts of pollutants, including carbon dioxide and other **greenhouse gases**—those that build up in the atmosphere and let the heat of the sun reach Earth but trap it from escaping Earth. At the same time, some of Earth’s natural carbon trapping resources, including forests and ground cover for unused farmlands, are shrinking.

Development of Renewable Energy Sources Concerned about unsustainable demands for energy through **fossil fuels** (coal, oil, petroleum, and natural gas), companies and nations began to invest in **renewable energy**, energy derived from resources that are continuously replenished, such as wind, solar, tidal, and geothermal power. At first, high costs slowed development of such sources. However, as new techniques and technologies reduced costs, these sources became increasingly attractive options. Renewable energy provides only about 7 percent of the world’s energy needs. However, a 2018 study predicted that by 2050, half the world’s electricity will come from wind power and solar power.

Increasing Environmental Awareness In 1968, the “Club of Rome”—an organization of scientists, industrialists, diplomats, and others—formed in Europe to promote solutions to global challenges facing humanity. It called attention to concerns that resource depletion would limit economic growth. In many countries, people joined a **Green Party** that focused on environmental issues. Some supported the **Green Belt Movement** to protect wilderness areas from urban growth. (See Topic 9.5.) By the 21st century, the Green Belt



Movement had planted more than 51 million trees in Kenya. The trees help to preserve ecosystems and lessen the effects of greenhouse gases. Planting trees also created employment and the improved soil quality.

Debates About Global Warming

Air pollutants and greenhouse gases prompted debates about rising temperatures. Scientists, including those on the United Nations’ Intergovernmental Panel on Climate Change, cited data showing that the emissions of carbon dioxide and other greenhouse gases caused by the burning of fossil fuels were causing **global warming**. This is an increase in the average temperature of the world. Experts advised governments to reduce their countries’ **carbon footprint**—the amount of carbon dioxide that each person produces. Without a reduced carbon footprint, global warming would contribute to catastrophes: more powerful hurricanes, more severe droughts, and rising sea levels that could flood islands and coastal areas. Some activists argued that the term “global warming” was too mild to express the urgency of action. They said that humanity faced a “climate emergency” or “climate crisis.”

Climate-change skeptics, in contrast, questioned whether global warming was happening and whether human activities had any influence on the climate. In addition, some people in the energy industries resisted the interference of government, arguing that market forces would cause consumers to reduce their carbon footprint if that became necessary. In contrast, other leaders of energy companies began planning for a shift to renewable fuel sources.

Most government leaders, however, agree that global warming requires a global response, but countries disagree on how to reduce carbon emissions.

Debate over Reducing Carbon Emissions		
Issue	Developed Countries (including the United States and Western Europe)	Developing Countries (including China, India, Russia, and Brazil)
Reason for Reducing or Producing Carbon Dioxide	Developing countries need to reduce their rapidly increasing outputs of carbon dioxide.	Developing countries are trying to provide electricity, cars, and a path out of poverty for their citizens. (Developed countries already did this by using huge amounts of coal and oil.)
Quantity of Carbon Dioxide Produced	In 2007, China passed the United States as the world’s biggest emitter of carbon dioxide.	Developing countries emit far less carbon dioxide <i>per person</i> than developed countries do. Therefore, developed countries must take the lead in restricting their use of fossil fuels.

Kyoto The first major international agreement to reduce carbon emissions was the **Kyoto Protocol**, signed in 1997. Developed nations in Western Europe, along with the United States, argued that developing countries, such as China, India, Russia, and Brazil, needed to curb their rapidly increasing output of carbon dioxide. However, the United States refused to ratify it, and China and India were not required to agree to the strictest terms of the protocol.



Global Action at Paris In 2015, 195 countries signed a deal, the **Paris Agreement**, that gave new hope for progress against global warming. Leaders of both the United States and China supported this new deal. However, in 2017, President Donald Trump announced that the United States would withdraw from the Paris Agreement.

Climate Activism Increasing global temperatures led to calls to action. “You say you love your children above all else, and yet you are stealing their future in front of their very eyes,” 15-year-old climate activist Greta Thunberg raged in a speech at a United Nations climate conference in 2018. Beginning with a solo protest in her native Sweden, Thunberg eventually led a global climate strike with more than 1.6 million participants in more than 125 countries.

Extinction Rebellion, a climate activist group formed in 2018, engaged in civil disobedience in London, blocking a main bridge and key intersections for more than a week, chaining themselves to the headquarters of big companies, and interrupting “business as usual” in other ways. About a thousand people were arrested, but the group succeeded in having Members of Parliament call a citizens’ assembly to discuss ideas for addressing the climate emergency. Many other citizen groups are pressuring lawmakers in many countries to take necessary steps to avert the worst consequences of continued warming predicted in reports from the UN’s Intergovernmental Panel on Climate Change.

A New Age?

What should people call the time period we live in? Traditionally, geologists have called the current period the Holocene epoch. *Holocene* means “entirely recent.” This time period started about 11,700 years ago, at the end of the last significant ice age.

However, some scientists believed humans have left the Holocene. They wanted to call the present time the **Anthropocene**. This term means “new man.” These scientists wanted to change the name because humans now affect almost the entire planet. In 2019, a panel of scientists voted to approve the name. *Anthropocene* reflects the idea that humans are the strongest influence on Earth’s climate and environment—for better and for worse.

KEY TERMS BY THEME		
<p>CULTURE: Movements and Organizations Green Party Green Belt Movement</p>	<p>ENVIRONMENT: Scientific Studies deforestation desertification air quality greenhouse gases fossil fuels water scarcity</p>	<p>renewable energy global warming carbon footprint Anthropocene</p> <p>GOVERNMENT: International Agreements Kyoto Protocol Paris Agreement</p>