7 Billion and Counting

Scientists estimate that more than 7 billion people currently live on Earth. It is estimated that by 2025, the human population will reach 8 billion. How do the human population and human activities impact Earth?

You are on a team of scientists who are trying to answer this question. You will gather evidence to support an argument about how increases in human population and resource use affect Earth's systems. You will present your argument in a panel discussion with your team.



Get Started!

- Begin your task by reviewing Earth's systems and what is included in each of those systems.
- Next, create a list of natural resources with your class. Select a natural resource to investigate as a team. How has that resource and Earth's systems been impacted by population increases?
- As you begin your research, keep these questions in mind:

□ How is your natural resource obtained? Processed?

- What are its current rates of usage? What are its projected rates of usage?
- How does your resource impact Earth's systems? Which systems are impacted directly? Indirectly?
- □ What is a specific example of your chosen natural resource impacting Earth's systems?
- What new technologies or policies might lessen the impact on Earth's systems?



Finish Up!

- Review your research. Make sure you can address the following as you construct your argument.
 - □ Have you included evidence to support your argument?
 - Have you taken a clear position in your argument? If so, what evidence convinced you to take this position? If not, what evidence would make your argument stronger?
 - □ Have you represented your data with the correct graphics? Explain.
- Finalize your argument. Read it over carefully.
- Present your argument to your class as a panel of scientists.
- Be prepared to answer questions after you present your argument. You should have a list of your sources and be able to back up your statements with scientific evidence.



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Project Overview

Scientists estimate that more than 7 billion people currently live on Earth. It is estimated that by 2025, the human population will reach 8 billion. How do the human population and human activities impact Earth?

Your students are on a team of scientists who are trying to answer this question. They will gather evidence to support an argument about how increases in human population and resource use affect Earth's systems. Your students will present their argument in a panel discussion with their team.

- Students will research data about a particular natural resource.
- Students will determine how the use, collection, and processing of their chosen resource impacts Earth's systems.
- Students will construct and present an argument about how increases in resource use impact Earth's systems.

Objective

The goal of this project is to help students make a real-world connection to the following Earth Science topic:

• As human populations and per-capita consumption of natural resources increase, so do the impacts on Earth and its systems unless the activities and technologies involved are engineered otherwise.

Before You Begin

- Based on class size and student abilities, have students work in groups of 3-4.
- Allow 3 class periods for this activity.
- Students will need access to computers and the Internet for research purposes.
- Students will present their argument to the rest of their class in a question-and-answer panel session.

Additional Resources

The following information can be used to guide student research.

Key Terms to Research

- Human population growth
- Per capita consumption of resources
- Impact of human population on natural resources
- Impact of human population on Earth's systems
- Projected reserves of energy resources
- Natural resources
- Land management
- Carbon footprint
- Pollution

Key Web Sites

- Environmental Protection Agency (EPA)
- Bureau of Land Management (BLM)
- Army Corps of Engineers (ACOE)
- Natural Resources Conservation Service (NRCS)
- United States Department of Agriculture (USDA)

Rubric

Performance assessment rubrics can be found in **Blueprints for Success**.

Guide the Investigation / Suggested Pacing

Day 1

7 Billion and Counting Slide

- Introduce the project by reading the slide titled **7 Billion and Counting.**
- Engage students by asking them how they used resources today. Make sure they consider indirect uses. For example, if they ate cereal for breakfast, resources were used to grow the cereal and transport it to the store and then to their homes. Resources were used to make the bowl that held the cereal. After students have offered their ideas, ask them to think about how Earth's systems would be impacted if one person's daily resource use were multiplied by 7 billion.
- When students hear the word *argument,* they may think of a heated exchange between two or more people. Make sure they understand that a scientific argument is based on logic and evidence, rather than emotion and opinion.

Get Started! Slide

- Review with students Earth's major systems—atmosphere, biosphere, cryosphere, geosphere, and hydrosphere. Review the definitions of each and what makes up each system.
- Suggest that groups consider that some resources are needed regardless of location or economic status, such as freshwater, minerals, or energy resources.
- Work as a class to create a list of natural resources for students to research and investigate. Some examples can include: wood (rainforest, lumber, paper), fossil fuels (coal, oil, natural gas, petroleum products), water, land (farms, forests), wildlife, mineral resources (copper, iron, diamonds), and air (ozone, greenhouse gases).
- For the remainder of this class period, students should focus on selecting a natural resource and researching its use and the impact of its extraction, processing, and use on Earth's systems.
- Suggest that students download and print copies of graphs showing human population growth over time. Later, they can incorporate these graphs to show how population growth and consumption of their resource are related.

Day 2

Get Started! Slide

- Students may find it helpful to divide up the research and investigation of the environmental impact on Earth's systems. For example, if there are four students in a group, each student can research the impact on one of Earth's systems. Then each student can share what he or she learned with the rest of the group.
- Point out that students can incorporate potential methods of reducing environmental harm into their arguments.
- Remind students that visuals are a powerful tool. They should include appropriate visuals in the presentation of their argument.
- Briefly review the structure and function of different types of graphs. A line graph, for example, shows the relationship between two variables, such as population growth over time. A circle graph displays data as parts of a whole; it might be used to display the different sectors (public, industry, agriculture, etc.) that use a particular resource. Refer students to the **Student Resources** section of their texts for further information.
- Tell students that they should not ignore evidence that does not support their argument. Instead, they should briefly address the evidence, and then counter it with facts that do support their position.

Day 3

Finish Up! Slide

- Student teams should finalize their information. They should construct a short (5-minute) presentation about their natural resource, its use and consumption by humans, and what impact it has on Earth's systems.
- Display students' presentation visuals on the wall for all classes to study.
- End the activity with a class discussion about the limits of science. Lead students to understand that science can describe the consequences of human population growth and resource use, and make recommendations to address these consequences. But science cannot ultimately decide which actions a society should take to address consequences.