

Teachers Guide

Indiana's Precipitation: Will It Be Wetter or Drier

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Activity Focus: Students learn about how global carbon dioxide emissions (greenhouse gases) are causing the Earth's temperature to increase and how this global warming is causing the Earth's climates to change, which is affecting Indiana's climate. Students will analyze precipitation data for the state to determine how global warming is impacting Indiana's climate. Students will also learn how changes in Indiana's precipitation is impacting the environment, agriculture, and human health.

Major Concepts: Global greenhouse gas emissions are causing the Earth's temperature to increase. This human caused global warming is changing the Earth's climates, impacting temperature, precipitation, humidity, wind, and cloudiness of the atmosphere; the day-to-day weather, for any given area on the Earth, including Indiana. Precipitation, water, plays a vital role in maintaining healthy ecosystems, societies, and people. Rain, snow, and snowmelt affect the amount of water available to plants and animals—all of life on Earth. And climate change is and will impact precipitation levels across the United States, affecting different states and regions of the country in different ways, including Indiana and the local water cycle.

Objectives: After completing this activity students will be able to:

1. Analyze precipitation data for Indiana to identify how Indiana's precipitation patterns have changed over the years.
2. Describe how global warming is impacting the local water cycle in Indiana.
3. Identify how changes in precipitation will impact Indiana's environment, people, and agriculture.

Five Critical Topics: This activity aligns with the following critical topics that every student should know about global warming and climate change.

Topic 1, Weather, Climate, and Climate Change. Students need to understand the relationship between weather and climate. Weather is a snapshot of day-to-day conditions at a location. Climate is the long-term average of weather conditions over 30 years or more. Knowing how climate data are generated and what those data actually represent are essential to understanding the concepts of climate variability and climate change.

Materials and Preparation: You will need to prepare the following materials before conducting this activity.

Activities for Conceptualizing Climate and Climate Change: INDIANA IMPACTS

- Copy the *Indiana's Precipitation: Will It Be Wetter or Drier* activity (make 1 copy per student). You may want to make a color copy for each group of students.
- You may want to make a PowerPoint slide for each data set for use in the class discussion.

Procedures: Students may work individually or as a group to complete the activity.

1. Organize students into small groups of 3-4 or have students work independently on completing the activity. If students are working in small groups have them read and discuss as a group each question before recording a consensus response. The exception being the “Engage Your Thinking” questions, in which students’ answer individually. Students will work best in the same group throughout the module.
2. Introduce the activity by asking students to identify some of the ways global warming might be impacting climate in the U.S. and in Indiana. List these climate impacts on the board and compare how students think the climate is changing in the U.S. and in Indiana.
3. Next have students answer the “Engage Your Thinking” questions before starting the activity. Discuss student responses. Note, what is important here are the students’ ideas not that they answered the questions “correctly”.
4. Have students read and work through the “Explore and Explain” section. Discuss students’ responses to the “Think about it” questions.
5. Have students read and work through the “Extend Your Thinking” section. Discuss the students’ responses.
6. Have students read and work through the “Apply What You Have Learned” section. Discuss students’ responses. For the concept map you might want to have students share and compare concept maps, looking for similarities and differences in their ideas.
7. Finally, have students complete the “Reflect on What You Have Learned” questions. Emphasize that students should think about how their ideas have changed, not on getting the correct answer. Ask students to share how their ideas and ways of thinking have changed.
8. Collect student/group responses.

Assessment: To assess students’ learning, have students answer the following questions:

1. Describe how Indiana’s precipitation has changed since 1895 and how it might change by 2100.
2. Explain how the local water cycle has changed.
3. List and describe three ways the change in Indiana’s precipitation have impacted the state.
4. Which portion of the state, southern, central, or northern has experienced the greatest increase in precipitation.
5. How has global warming impacted Indiana’s snow?