Name:
Date:

Human Impacts on Climate Change: What will happen and what can we do about it? - Student Guide

Driving Question(s):

- What do models tell us about the future of human impact on the Earth's climate?
- How can we change our current behaviors to have a more positive impact on the future of the Earth's climate?

Part 1: Understanding models for future climate change

The Intergovernmental Panel on Climate Change, a group of 1,300 scientific experts from countries all over the world, has concluded that human activities have led to the warming of our planet over the past 50 years. Given how our activities have impacted the Earth's temperature already, what impact will we have in the future? Is it too late to change our impact?

Read the article Antarctic Ice Melt Could Get Worse, But Humans Can Slow It Down, which focuses on this study, and examine the figure on the next page to answer the following questions:

1. What is the fate of the ice shelves under the scenario where we continue or increase our fossil fuel use and emissions?

2. What is the fate of the ice shelves under the scenario where we reduce our fossil fuel use and emissions?

3. What are some results of melting ice?

4. Thinking beyond physical changes in the Antarctic environment, what are some of the effects on biological functioning in Antarctica?

5. What impact does ocean warming have on the melting of ice shelves?

6. How is this information both bad news AND good news?

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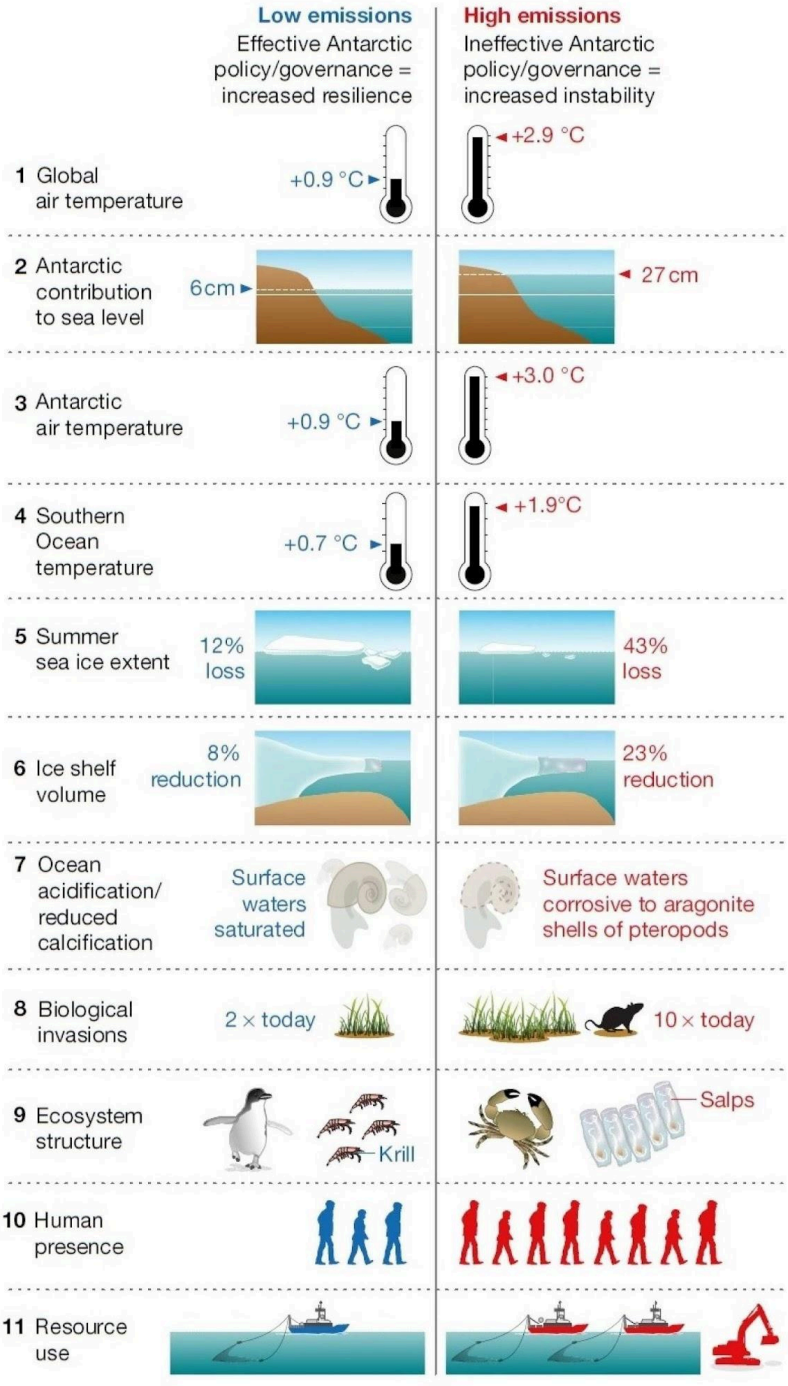
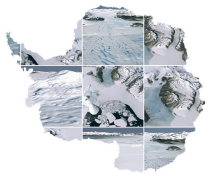


Illustration from Dunning, Hayley. 2018. How to save Antarctica (and the rest of Earth too). London Imperial College. Original image source: Rintoul et al., 2020, Choosing the Future of Antarctica, *Nature.*

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Part 2: How can we change our current behaviors to have a more positive impact on the future of the Earth's climate?

Now that you understand the predictions the models have projected for our future climate if we do not change our behaviors, we will focus on changes that we can make for a more positive impact on the future of the Earth's climate.

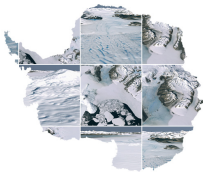
According to NASA's Climate Change Vital Signs of the Planet website, "The industrial activities that our modern civilization depends upon have raised atmospheric carbon dioxide levels from 280 parts per million to 412 parts per million in the last 150 years.". These industrial activities, including electricity and transportation, are dependent on the burning of fossil fuels that increase greenhouse gases such as carbon dioxide, methane, nitrous oxides, CFCs, and water vapor. Activities such as agriculture, food production, and land use can also contribute to increased greenhouse gas emissions.

In the space below, list 5 activities that you think contribute the most to greenhouse gas emissions and climate change. Share these activities with your classmates during a discussion.

Activities

It can often feel overwhelming to think about solutions to these problems. It can be especially difficult to imagine how one person can have an impact on a global issue such as climate change. But, one person can have a great influence through their individual actions in their own lives, or through working together with their communities.

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1. Open a web browser and go to this website: https://www.drawdown.org/solutions/table-of-solutions

2. On this page, you'll see a list of potential climate change solutions developed by Project Drawdown, an organization whose mission is to help the world reach "drawdown" - the point where the greenhouse gas levels stop increasing and begin to decline. Their list of solutions can be organized by two scenarios:

   Scenario 1 stops climate change with a 2 ℃ (3.6°F) increase.
   Scenario 2 stops climate change with a 1.5 ℃ (2.7°F) increase.

   These temperature increases are relative to a 'pre-industrial' baseline (the average worldwide temperatures in the years 1850-1900). For reference, an IPCC report released in late 2018 found that temperatures have already warmed about 1°C. While these temperature changes may seem small, they can have big impacts. The targets of 1.5°C and 2°C were chosen because the results from the world's scientists have been showing that the impacts of climate change, and the potential for irreversible change, are substantially higher at warming levels beyond 2.0°C warming. These findings led over 190 of the world's nations to come together and agree to limit warming to 2°C, or if possible 1.5°C, under the Paris Climate Agreement.

3. There are a number of solutions that limit warming. To see which have the greatest impact, based on the amount of carbon dioxide emissions (measured in gigatons, or billions of tons) that are reduced or sequestered (meaning prevented from entering the atmosphere), click on the small arrows next to Scenario 1, which seeks to limit warming to 2°C. Click the arrows until the highest numbers of gigatons are at the top.

4. Once the list is ordered with the solution with the greatest impact on the top, read through the top 10. Did the solutions ranked at the top of the list surprise you? Choose one of the top 10 solutions. For that solution, describe 1 or 2 ways that you could change your individual actions to work towards the solutions 1. In your own life, 2. In your school, 3 In your town or community, and 4. In the state or federal government.

Describe the actions that you could take to contribute to the solution to reduce carbon dioxide.

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In your own life	
In your school	
In your community or town	
In your state or federal government	

5. Now do the same for solution 2, which seeks to limit warming to 1.5°C. Rank the solutions from most impactful to least impactful and choose one of the top 10 solutions. For that solution, describe 1 or 2 ways that you could change your individual actions to work towards the solutions 1. In your own life, 2. In your school, 3 In your town or community, and 4. In the state or federal government.

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In your own life	
In your school	
In your community or town	
In your state or federal government	

6. Now, having compared the ways in which climate change could be limited to 2°C (Solution 1) or 1.5°C (Solution 2), think about the differences between the solutions. What is different about the top individual solutions in each? Is one based more on individual action, and one reliant upon both individual and structural (i.e., energy sources, conservation efforts, etc) change? What does this tell you about the necessary steps needed to limit warming? Share your thoughts below.

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