February 18, 2017
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Student Instructions for Group 1: Causes of Climate Change

Your group should research the causes and history of climate change, using the resources list given by your teacher or other resources that you or your teacher find online, in books or in journals. Find the most important data and graphs, put them into approximately 10–15 slides (with notes about sources and explanatory comments of your own) and give a short presentation in class to explain your findings and answer questions from the class. All of your statements and findings should be supported with appropriate data.

Start with the following resource:
Environmental Protection Agency presents educational resources about the causes of climate change:
https://www.epa.gov/climate-change-science/causes-climate-change

Then look at as many other sources as you can and gather the best data.

You should especially consider:

■ How have global temperatures changed over time?

■ How has the concentration of atmospheric greenhouse gases changed over time?

■ How has sea level changed over time?

■ How has ocean pH changed over time?

■ What natural factors have influenced recent climate change, how much of an effect have they had and how do we know?

■ What human-caused factors have influenced climate change, how much of an effect have they had and how do we know?

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Student Instructions for Group 2: Current State of the Climate

Your group should research the current state of the climate (compared with conditions druing the 19th and 20th centuries) using the resources below or other resources that you or your teacher find online, in books or in journals. Find the most important data and graphs, put them into approximately 10–15 slides (with notes about sources and explanatory comments of your own) and give a short presentation in class to explain your findings and answer questions from the class. All of your statements and findings should be supported with appropriate data.

Start with the following resources:

NASA Goddard Institute for Space Studies presents graphs on surface temperature analysis: https://data.giss.nasa.gov/gistemp/graphs/

NASA Goddard Institute for Space Studies shows maps on surface temperature analysis: https://data.giss.nasa.gov/gistemp/maps/

Then look at as many other sources as you can and gather the best data.

You should especially consider:

- What are current temperatures (highs, lows and averages globally and for different areas of the world and different times of year)?

- How do those temperatures compare with values from the past?

- How do current concentrations of atmospheric greenhouse gases compare with those of the past?

- How do current sea levels compare with those of the past?

- How do current ocean pH values compare with those of the past?

- How do current precipitation levels compare with those of the past?

- How do current volumes of glaciers, polar ice caps and sea ice compare with those of the past?

- What impact is climate change currently having on the extinction of species?

- What impact is climate change currently having on flooding?

- What impact is climate change currently having on agriculture?

- What impact is climate change currently having on storms and other natural disasters?

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Student Instructions for Group 3: Potential Future Climate Change Scenarios

Your group should research the potential future of the climate (compared with current or past conditions) using the resources below or other resources that you or your teacher find online, in books or in journals. Find the most important data and graphs, put them into approximately 10–15 slides (with notes about sources and explanatory comments of your own) and give a short presentation in class to explain your findings and answer questions from the class. All of your statements and findings should be supported with appropriate data.

Start with the following resources:

Environmental Protection Agency presents resources about the future of climate change:

https://www.epa.gov/climate-change-science/future-climate-change

Intergovernmental Panel on Climate Change offers numerous online reports:

http://ar5-syr.ipcc.ch/topic_futurechanges.php

NOAA Geophysical Fluid Dynamics Laboratory presents climate change data:

http://www.gfdl.noaa.gov/will-the-wet-get-wetter-and-the-dry-drier

Then look at as many other sources as you can and gather the best data.

You should especially consider:

- What are some leading scenarios that could occur as a result of continued greenhouse gas emissions?
- For those different emissions scenarios, how much are temperatures expected to change (global averages, as well as values for different areas of the world and different times of year) by 2050?
- What about by 2100 and beyond?
- For those different emissions scenarios, how much are sea levels expected to change by 2050, 2100 and beyond?
- For those different emissions scenarios, how much are ocean pH values expected to change by 2050, 2100 and beyond?
- For those different emissions scenarios, how much are precipitation levels expected to change by 2050, 2100 and beyond?
- What impact could future climate change have on the extinction of species?
- What impact could future climate change have on flooding of specific areas (especially consider the Louisiana coast, southern Florida, the North Carolina coast and the Chesapeake Bay area)?
- What impact could future climate change have on storms and other natural disasters?
- What impact could future climate change have on agriculture?
- What impact could future climate change have on human famines and wars?

Student Instructions for Group 4: Potential Methods of Limiting or Reversing Climate Change

Your group should research potential methods of limiting or reversing climate change using the resources below or other resources that you or your teacher find online, in books or in journals. Find the most important data and graphs, put them into approximately 10–15 slides (with notes about sources and explanatory comments of your own) and give a short presentation in class to explain your findings and answer questions from the class. All of your statements and findings should be supported with appropriate data.

Start with the following resources:

Environmental Protection Agency presents educational resources about climate change:

https://www.epa.gov/climatechange/adapting-climate-change

NASA suggests climate changes solutions:

http://climate.nasa.gov/solutions/adaptation-mitigation/

The National Academies offers Climate Intervention Reports and other resources:

https://nas-sites.org/americasclimatechoices/other-reports-on-climate-change/climate-intervention-reports/

Then look at as many other sources as you can and gather the best data.

You should especially consider:

■ What would be required to reduce global energy consumption?

■ What would be required to switch to energy sources that do not produce greenhouse gases?

■ What would be required to decrease solar heating of the Earth?

■ What would be required to remove carbon dioxide from the atmosphere and ocean?

■ What would be required to adapt human civilization if climate change continues?

Student Instructions for Group 5: Climate Change Policies and Winning Over

Your group should research some of the major environmental policies involving climate change preventions. Also research the arguments of climate change skeptics and what responses may convince them using the resources below or other resources that you or your teacher find online, in books or in journals. Find the most important data and graphs, put them into approximately 10–15 slides (with notes about sources and explanatory comments of your own) and give a short presentation in class to explain your findings and answer questions from the class. All of your statements and findings should be cited to the appropriate source.

Start with the following resources:

The National Center for Science Education provides resources on climate change and policy:

https://ncse.com/node/16981

Science News writes "Outgoing congressman Rush Holt calls scientists to action":

https://www.sciencenews.org/article/outgoing-congressman-rush-holt-calls-scientists-action#video

Science News writes "Depolarizing climate science":

https://www.sciencenews.org/blog/science-public/depolarizing-climate-science

Science News writes "Changing climate: 10 years after An Inconvenient Truth":

https://www.sciencenews.org/article/changing-climate-10-years-after-inconvenient-truth

American Association for the Advancement of Science describes the consensus of 31 scientific societies about climate change:

https://www.aaas.org/news/intersocietyclimateletter2016

Union of Concerned Scientists presents the scientific consensus on global warming:

www.ucsusa.org/ssi/climate-change/scientific-consensus-on.html

Then look at as many other sources as you can and gather the best data.

You should especially consider:

■ What environmental policies are already in place to help prevent climate change in the United States? In the world?

■ What are some of the people and groups that deny or cast doubt on human-caused climate change?

■ What are some of the primary arguments of those skeptics?

■ How do these arguments relate to the available scientific evidence?

■ Do the skeptics seem to be motivated by scientific evidence or by other factors?

■ Why is climate change science debated?