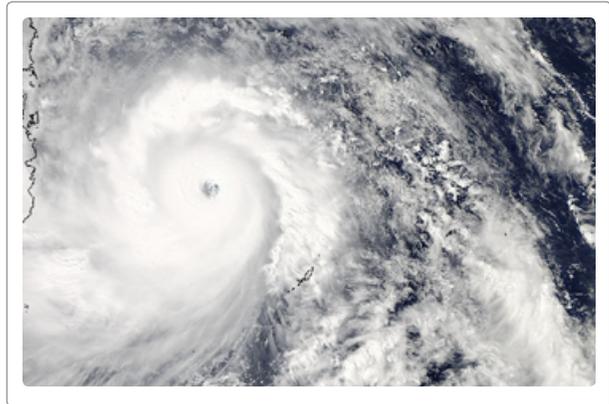


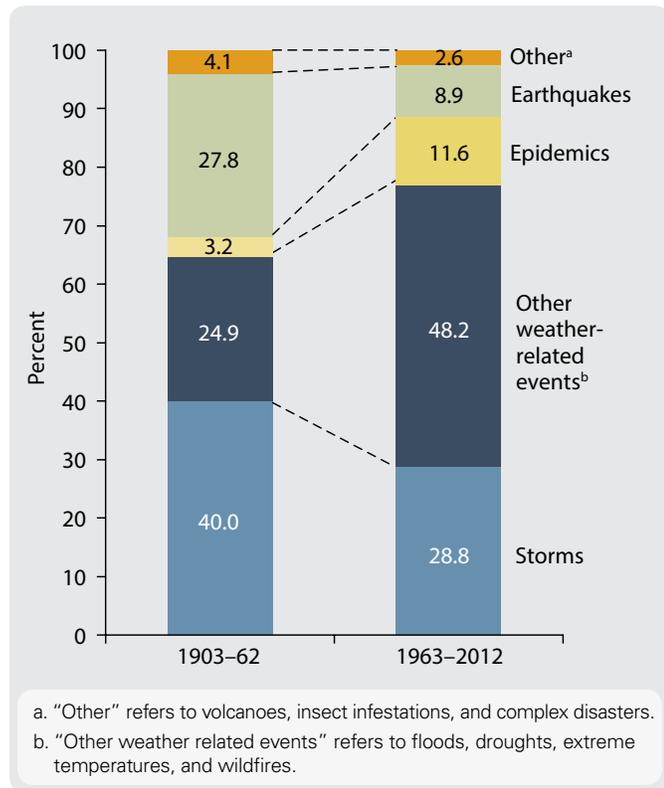
Data Analysis Activity: Weather Or Not?

Climate change is a major and lasting change in weather conditions. Today, climate change is mainly caused by global warming. The gas carbon dioxide (CO₂), which is released from burning coal, oil, and natural gas, builds up in the Earth’s atmosphere and traps in too much heat. The heat causes ocean temperatures to rise, making conditions for extreme weather more common. Learn more by exploring these graphs¹ and answering the questions that accompany them. Show your work with your final answer and write in complete sentences.



Courtesy of NASA Goddard MODIS Rapid Response Team

GRAPH A: A Changing Pattern of Natural Disasters



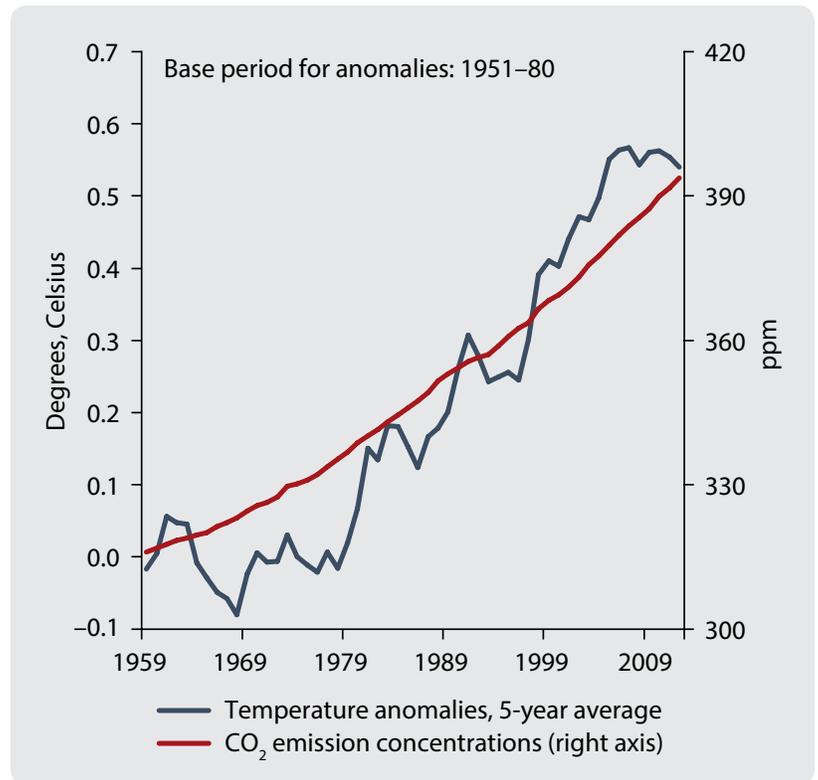
This graph compares the types and numbers of natural disasters that have occurred around the world over the past 50 years with the 60-year period right before it. Each colored rectangle shows what percentage of all disasters that type represents. For example, from 1903-62, storms made up 40% of all disasters.

1. Calculate the change in frequency for all 5 types of natural disasters from 1903-62 to 1963-2012. Which types of natural disasters increased in frequency compared to the others and which decreased in frequency?
2. What three types of natural disasters were most frequent in 1963-2012? What total percent did they account for of all natural disasters?
3. **Reflect:** What patterns do you see in the way that natural disasters have changed over time? What conclusions can you draw about climate change and global warming? What conclusions are you not able to draw from this data alone?

1 Source of graphs in this handout: World Bank. 2013. World Development Report 2014: Risk and Opportunity—Managing Risk for Development. Washington, DC: World Bank. doi: 10.1596/978-0-8213-9903-3. License: Creative Commons Attribution CC BY 3.0
 Source: WDR 2014 team based on Aldy, Orszag, and Stiglitz 2001; Barrett 2003, 2007, 2008; Cole 2007; DARA International 2012; IPCC 2007; Jacoby, Rabassa, and Skoufias 2011 (for loss estimates); Lenton and others 2008; Marcott and others 2013; Mercer 2011; Stern 2007; World Bank 2009, 2012c; and data from EM-DAT OFDA/CRED International Disaster Database; NASA Goddard Institute for Space Studies Surface Temperature Analysis (database); and Scripps Institution of Oceanography, Atmospheric CO₂ Concentration at Mauna Loa Observatory, Hawaii (database).

GRAPH B: Rising Temperature and CO₂ Concentrations

The blue (bumpier) line in this graph shows how the Earth's temperature has risen over a 50-year period, in degrees Celsius. The red (straighter) line shows how the amount of carbon dioxide (CO₂) in the atmosphere has grown over the same time, in parts per million. (Just as percent means out of a hundred, parts per million or ppm means out of a million.)



- Label each axis as described below. For each, state the distance between each number on the axis (and include the units of measure).
 - Box the first and last values on the left y-axis.
 - Circle the first and last values on the right y-axis.
 - Star the first and last values on the x-axis.
- Estimate the rise in temperature between 1959 and 2009 in degrees Celsius.
Bonus: Convert your answer from degrees Celsius to degrees Fahrenheit.
 Hint: $(^{\circ}C \times \frac{9}{5}) + 32 = ^{\circ}F$
- Write the carbon dioxide (CO₂) concentration of 390 parts per million (ppm) both as a decimal and as a simplified fraction. (This is the CO₂ concentration in 2009.)
- Reflect:** What relationship do you notice between the two lines on the graph? What conclusions can you draw about climate change and global warming? What conclusions are you not able to draw from this data alone?

BONUS: Scientists have shown that in order to maintain a healthy planet, we must bring CO₂ levels down from 400 ppm to below 350 ppm.² What are the likely consequences of increased CO₂ levels for our planet and for us as individuals? What actions can we take locally and globally to reduce those levels to a healthy amount?

Just for fun: Can you locate the carbon dioxide (CO₂) molecule that is hidden somewhere on this worksheet?



² Hansen, James, et al. Target Atmospheric CO₂: Where Should Humanity Aim? Submitted April 7, 2008. NASA climate scientist James Hansen's paper about the 350ppm target. <http://arxiv.org/abs/0804.1126> and <http://arxiv.org/abs/0804.1135v3>.