Exploring How Global Warming Affects You!

What do you know about global warming? Share your thoughts below.

After watching the introductory video, list three things that stood out to you and explain why.

Today we are going to focus on average surface temperatures. We will use data to see changes in global surface temperatures but also see how these changes affect us on a more local level.

Vocabulary

- **Global Warming**: the long-term heating of Earth's surface observed since the pre-industrial period due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere. This term is not interchangeable with the term "climate change."
- **Climate change**: a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates. These changes have a broad range of observed effects that are synonymous with the term.
- **Surface Area Temperature**: the temperature of the air near the surface of the earth; almost invariably determined by a thermometer in an instrument shelter.
- **Anomaly**: A departure from a reference value or long-term average. A positive anomaly indicates that the observed temperature was warmer than the reference value, while a negative anomaly indicates that the observed temperature was cooler than the reference value.
- **Base period**: Time interval to which anomalies are relative. For our data, the base period is 1951-1980.

https://climate.nasa.gov/global-warming-vs-climate-change
https://glossary.ametsoc.org/wiki/Surface_temperature
https://www.ncei.noaa.gov/access/monitoring/global-temperature-anomalies
https://earthobservatory.nasa.gov/world-of-change/global-temperatures

Task 1: Analyzing global annual mean temperatures

The global mean surface area temperature from 1951 - 1980 was 14ºC (57ºF).

1. The anomaly for 2000 was 0.39ºC. What was the mean temperature in ºC and ºF?

2. The anomaly for 2020 was 1.02ºC. What was the mean temperature in 2020?

Below are the anomalies (in ºC) for each year since 1980, organized by decades.

Year	Anomaly
1980	0.26
1981	0.32
1982	0.14
1983	0.31
1984	0.16
1985	0.12
1986	0.18
1987	0.32
1988	0.39
1989	0.27

Year	Anomaly
1990	0.45
1991	0.40
1992	0.22
1993	0.23
1994	0.32
1995	0.45
1996	0.33
1997	0.46
1998	0.61
1999	0.38

Year	Anomaly
2000	0.39
2001	0.54
2002	0.63
2003	0.62
2004	0.53
2005	0.68
2006	0.64
2007	0.66
2008	0.54
2009	0.66

Year	Anomaly
2010	0.72
2011	0.61
2012	0.65
2013	0.68
2014	0.75
2015	0.90
2016	1.02
2017	0.92
2018	0.85
2019	0.98

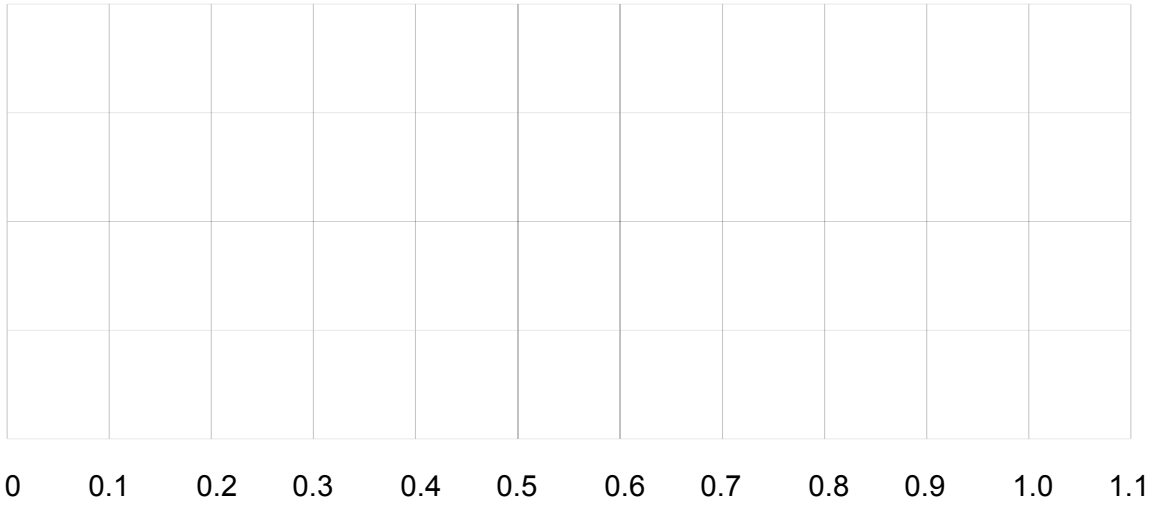
3. For each decade, find the average of the anomalies.

   1980s: _____ 2000s: _____

   1990s: _____ 2010s: _____

4. What do you notice? What do you wonder?

5. Use technology to construct boxplots for the anomalies of each decade. Sketch the boxplots on the graph below. Then compare the centers and spread of each distribution.



6. Use technology to create a scatterplot of anomaly vs year. Describe the association between year and anomaly.

7. Add a line of best fit to your data set. Write the equation of the line and interpret the slope and y-intercept.

8. If the trend were to continue, predict the global mean temperatures for 2030, 2050 and 2100.

Task 2: Analyzing local annual mean temperatures

Navigate to https://data.giss.nasa.gov/gistemp/station_data_v4_globe/ and scroll down to the globe. Click on the station nearest you and select “Generate plots”. You can also search your for your city below the globe. Once your station is selected, scroll down to “Download monthly data as text or CSV”.

The data provided are the temperatures (in ºC) for your area over the years.

1. Examine the **metANN** column (annual mean temperature) for the years 1980 - 2023. What do you notice? What do you wonder?

2. Use technology to construct boxplots for the temperatures of each decade. Sketch the boxplots on the graph below. Then compare the centers and spread of each distribution.

3. Use technology to create a scatterplot of mean temperature vs year. Describe the association between year and mean temperature.

4. Add a line of best fit to your data set. Write the equation of the line and interpret the slope and y-intercept.

5. If the trend were to continue, predict the mean temperatures for 2030, 2050 and 2100 in your area.

Extension: Repeat the steps from Task 2 using one of the following cities:

- Moscow, Russia
- Paris, France
- Östersund, Sweden
- La Serena, Chile
- Washington DC, USA