

Climate in Jeopardy Q&A

Below are questions for the Climate in Jeopardy game at the fair. They are divided into 4 general topics, with three questions in each topic. The yellow highlights are the answers. The talking points are suggestions for staff to say when the answers are revealed. Copies of this document will be available for distribution at the fair and will be sent to all staff working the display.

Causes: 100. Which of the following is a primary cause of climate change?

1. Increased intensity of sunlight.
2. The burning of fossil fuels by humans.
3. Nature's ongoing climate cycle, such as ice ages.

Talking points: Coal (for generating electricity), oil (for transportation), and natural gas (for heating/electricity generation) are all derived from fossil fuels and all release large amounts of greenhouse gasses when burned.

Citation Check: While there are several causes of climate change, it is generally held that the increased carbon-dioxide (and other greenhouse gases) produced by humans since the Industrial Revolution are one of the primary factors causing climate change. The largest emitting sectors are transportation and electricity generation, which, when combined, produce more than half of total U.S. greenhouse gas emissions (2017). Transportation and electricity sectors use large amounts of oil and coal, which emit greenhouse gases that gradually warm the environment and contribute to climate change.

For more information, please visit <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>.

Causes: 200. Scientists describe the main cause of climate change as “anthropogenic”. What does this mean?

1. Genetic defects in plants and animals.
2. The shrinking ice caps raising sea-levels.
3. Human-induced.

Talking points: Scientific consensus is that nearly 100% of climate change is caused by human activity since the mid-1800s.

Citation Check: The vast majority of scientific authorities have accepted that an overwhelming majority of climate change since the Industrial Revolution has been caused by human greenhouse gas emissions. According to the EPA, People have increased the amount of carbon dioxide since the late 1700s by 40%.

Please refer to the EPA's “What Climate Change Means for Minnesota” handout, published August 2016. See <https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-mn.pdf>

For an extensive listing of American Scientific Societies and Agencies, please refer to <https://climate.nasa.gov/scientific-consensus/>

Causes: 300. Which of these gasses contribute significantly to climate change?

1. Hydrofluorocarbon (used in refrigeration)
2. Carbon dioxide (from fossil fuel use and deforestation)
3. Methane and Nitrous Oxide (from agricultural activities)

Talking points: Although emitted in differing quantities, **all** of these gasses are major contributors to climate change. For example, hydrofluorocarbons are thousands of times more heat-trapping than carbon dioxide, but are emitted in smaller quantities.

Citation Check: The largest measured emitted greenhouse gas is carbon dioxide, mostly produced from fossil fuels and deforestation. Methane and Nitrous Oxide, which are both more heat trapping than carbon dioxide, are also emitted in large quantities but make up significantly less of total emissions than CO₂. These gases come mostly through agricultural activities. Fluorinated gases such as hydrofluorocarbons, make up the smallest fraction of emissions by volume, but also are significant contributors to climate change, and are the result of losses in refrigeration systems.

For the latest statistics on greenhouse gas emissions, their sources, and their effects, visit <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>

Signs & Signals: 100. Minnesota's average surface temperature has risen about 2 degrees Fahrenheit since the early 20th century. True or False?

1. True
2. False

Talking points: *Most of the warming has occurred in the past 35 years, as our use of fossil fuels has dramatically increased.*

Citation Check: MPR holds that since the 20th century, the average temperature in Minnesota has increased by 2 degrees. The annual mean temperature of Minnesota has increased by 2.6 degrees Fahrenheit (1.5 degrees Celsius) since 1985. A large majority of this increase occurred after 1950. Additionally, the average temperature of Minnesota has exceeded the 20th century average for 16 out of the past 20 years.

Dunbar, Elizabeth and Kraker, Dan, "Climate Change in Minnesota: More heat, more big storms," MPR News. 2 February, 2015. <https://www.mprnews.org/story/2015/02/02/climate-change-the-proof>

These statistics were taken from the "How will global warming of 2°C affect Minnesota?" presentation produced by Climate Research Center (CSRC) of the University of Massachusetts Amherst. See:

https://www.geo.umass.edu/climate/stateClimateReports/MN_ClimateReport_CSRC.pdf

Signs & Signals: 200. Ice cover on Lake Superior has declined by about what percent since the early 1970s?

1. 15%
2. 80%
3. 45%

Talking points: *Reduced ice cover leads to warmer lake temperatures which leads to changes in lake and shoreline ecosystems.*

Citation Check: Lake Superior is considered one of the fastest warming lakes on the planet. There are several reporting sources showing that the annual ice coverage of Lake Superior (and the other Great Lakes) has decreased in the past 40 years. Coverage is typically defined both in terms in the percentage of the lake covered and the duration of the cover (i.e. 45% cover refers to 100% cover for 45% of the time and 45% cover for 100% of the time).

See: Dunbar, Elizabeth and Kraker, Dan, "Climate Change in Minnesota: More heat, more big storms," MPR News. 2 February, 2015. <https://www.mprnews.org/story/2015/02/02/climate-change-the-proof>

Signs & Signals: 300. Which of the following can be attributed to climate change affecting Minnesota?

1. Warming winters
2. More frequent, higher intensity rain events.
3. Earlier ice-out dates on lakes.

Talking points: *All of these events—and many others—are related to a warming Minnesota climate.*

Citation Check: Like most states, Minnesota has seen rising average temperatures. Notably, these rising temperatures are more prevalent in the winter instead of summer heat waves. Minnesota has seen higher intensity precipitation in the past few years than ever before, including increased rain events such as flooding associated with large rain storms, which are getting bigger and more frequent.

For more information, see: Dunbar, Elizabeth and Kraker, Dan, "Climate Change in Minnesota: More heat, more big storms," MPR News. 2 February, 2015. <https://www.mprnews.org/story/2015/02/02/climate-change-the-proof>

Future Trends: 100. At the current rate of climate change, Faribault in summertime will feel more like which city by 2050?

1. Des Moines, Iowa
2. Shreveport, Louisiana
3. Branson, Missouri

Talking points: *Although multiple country music venues may not be part of the changes, the warmer climate will lead to changes in buildings, infrastructure, and people's lives and activities.*

Citation Check: See Chapter 1, Figure 3 of Bryan, Alexander M., Morelli, Toni Lyn, and Staudinger, Michelle D., *Integrating Climate Change into Northeast and Midwest State Wildlife Action Plans*. DOI Northeast Climate Science Center. May 2015. (Page 5 of the report)

<http://necsc.umass.edu/sites/default/files/Staudinger%20et%20al.%202015%20Integrating%20Climate%20Change%20into%20NE%20and%20MW%20SWAPs.pdf>

Future Trends: 200. Which iconic Minnesota resident will likely be gone from the state by 2080 due to a warming climate?

1. Loon
2. Wood tick
3. Maple trees

Talking points: *The loon thrives in cool northern lakes, which will now be in Canada; wood ticks and maple trees will expand their ranges and thrive in a warmer climate.*

Citation Check: The National Audubon Society anticipates that by 2080, Minnesota loons will abandon the state for colder climates. This retreat will accompany the loss of forestry and damaged ecosystem that accompanies rising temperatures.

For more information, refer to Du, Susan, "Minnesota's climate begins its descent toward an unrecognizable future." City Pages. 20 February 2019. <http://www.citypages.com/news/minnesotas-climate-begins-its-descent-toward-an-unrecognizable-future/506067291>

Future Trends: 300. Which of these popular Minnesota outdoor activities are endangered due to climate change?

1. Fishing for walleye
2. Cut-your-own-Christmas tree outings
3. Pond-hockey tournaments

Talking points: *Warmer lakes will change fish habitat, the range for balsam fir will shift to Canada, and warmer winters will affect many other winter activities.*

Citation Check: Warmer climates will affect the growth of forests, with the death of many types of trees arising from disease, heatwaves, drought and early springs. The biggest change will likely be the loss of boreal forestry. The rising temperatures will constrain fish populations to narrower habitats (the tops of fresh water systems will likely be too warm, and their depths will be oxygen depleted). The loss of smaller freshwater fish species will impact larger walleye populations. Lastly, rising temperatures limit the amount of time that ponds are completely frozen over.

For more information, refer to Du, Susan, "Minnesota's climate begins its descent toward an unrecognizable future." City Pages. 20 February 2019. <http://www.citypages.com/news/minnesotas-climate-begins-its-descent-toward-an-unrecognizable-future/506067291>

Actions: 100. Using electric vehicles (cars, busses, trucks, trains) will do little to reduce climate effects. True or false?

1. True
2. False

Talking points: Transportation is now the leading source of greenhouse gas emissions in Minnesota, and switching to electric vehicles while Minnesota's utilities continue to decrease carbon emitting generation, will reduce the impacts significantly.

Citation Check: Reducing emissions from the transport sector is an incredibly important part of meeting the state's greenhouse gas emission goal. E-vehicles are a good way to accomplish this end, as in 2017, MN state agencies reduced their fossil fuel consumption by over 700,000 gallons primarily through the use of e-vehicles. Every bit helps!

For more, please refer to: Minnesota Environmental Quality Board, *Minnesota Environment and Energy Report Card*. State of Minnesota. 2019. <https://www.eqb.state.mn.us/sites/default/files/documents/E%26E%20FINAL%202019.pdf>

Actions: 200. Which of these is the *most* effective thing you can do to reduce climate change effects and help in reaching Minnesota's climate goals?

1. Recycle aluminum, paper, and glass
2. Support the transition to carbon-free sources of electricity
3. Insulate and air-seal buildings

Talking points: Supporting the shift to clean energy in our communities by participating in utility green pricing programs, investing in community solar projects, or installing your own renewable energy generation will all move Minnesota closer to our climate goals.

Citation Check: While all of the answers suggest ways to reduce our carbon footprint, a recent study by the McKnight Foundation holds that the transition to clean sources of electricity is the primary way to meet Minnesota's goal of reducing GHG by 80% from 2005 levels by 2050. A large portion of GHG come from the electricity sector, and supporting the larger scale transition to carbon-free energy sources is the most effective thing that can be done to reduce climate change effects.

For more see: Dunbar, Elizabeth, "Study: Minnesota can meet climate goals through clean energy, electrification." MPR News. 3 August, 2018. <https://www.mprnews.org/story/2018/08/03/study-minnesota-can-meet-climate-goals-through-clean-energy-electrification>

Actions: 300. Which of these personal actions are effective in reducing our climate change effects?

1. Driving less and taking transit when possible
2. Persuading your community to participate in clean energy programs
3. Investing in efficient lighting, appliances, and equipment

Talking points: All of these will contribute to reducing greenhouse gas emissions and helping Minnesota reach our climate goals.

Citation Check: Reducing emissions from vehicles by not driving, clean energy programs, and increased energy efficiency are all noted by the State of Minnesota as great ways to reduce the amount of GHG emissions and meet Minnesota Energy goals.

For more, please refer to: Minnesota Environmental Quality Board, *Minnesota Environment and Energy Report Card*. State of Minnesota. 2019. <https://www.eqb.state.mn.us/sites/default/files/documents/E%26E%20FINAL%202019.pdf>