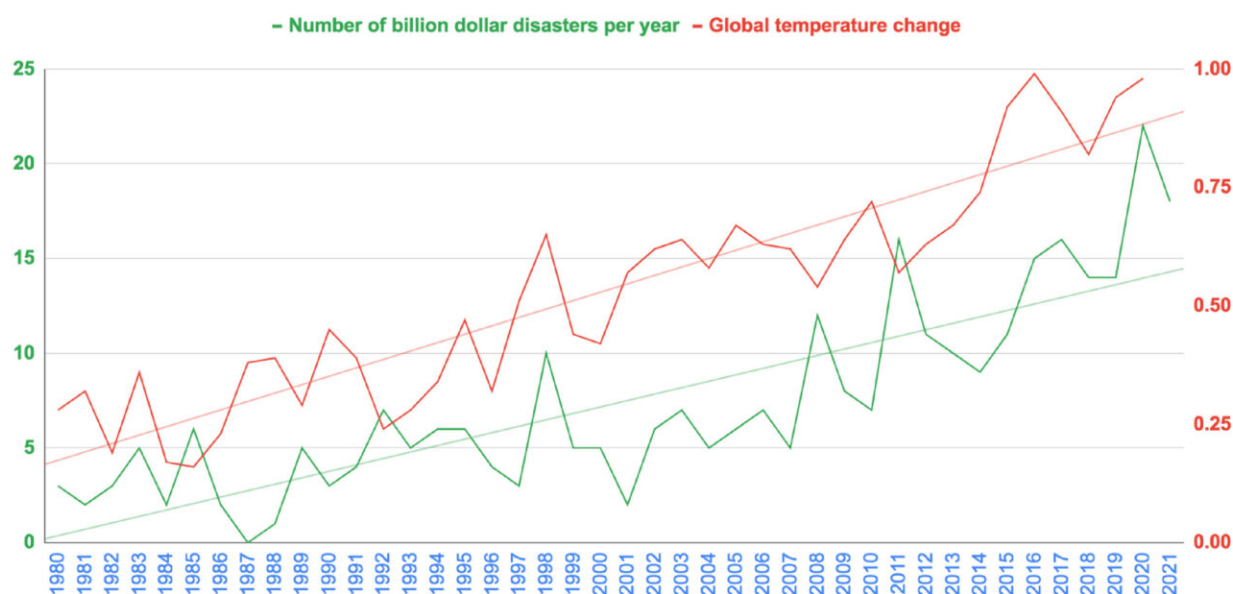


# Costs of natural disasters set to increase with continued rise in CO2 and global temperature

April 6 2023, by Jacqueline Mitchell

Number of Billion Dollar Disasters in the US between 1980-2021 vs change in Global Temperature



Number of Billion Dollar Disasters in the US between 1980 and 2021 vs change in Global Temperature. Credit: *The Journal of Climate Change and Health* (2023). DOI: 10.1016/j.joclim.2022.100201

Scientists have long predicted that global climate change could fuel an increase in the frequency and severity of natural disasters including hurricanes, heatwaves and cold snaps, droughts and floods and wildfires. In a paper published in *The Journal of Climate Change and Health*,

members of the Beth Israel Deaconess Medical Center (BIDMC) Fellowship in Disaster Medicine estimated that climate change–related natural disasters have increased since 1980 and have already cost the United States more than \$2 trillion in recovery costs. Their analysis also suggests that as atmospheric carbon dioxide levels and the global temperature continue to rise, the frequency and severity of disasters will increase, with recovery costs potentially rising exponentially.

"The United States spends a staggering amount on costs secondary to [natural disasters](#)," said senior author Gregory Ciottone, MD, director of the Disaster Medicine Fellowship at BIDMC. "Carbon dioxide levels and temperatures have increased over the past four decades and are strongly positively correlated with the number and cost of billion-dollar [disasters](#), suggesting the annual number of events will continue to increase along with their [economic burden](#). Measures are needed to mitigate those costs."

To assess the relationship between rising carbon dioxide levels, temperatures and the number of disasters costing a billion dollars or more in the United States, Ciottone and colleagues analyzed data between 1980 and 2021 from the National Center for Environmental Information (NCEI). Since 1980, NCEI has kept track of disasters such as hurricanes, droughts, floods, [winter storms](#), cold waves and crop freeze events that exceeded a billion dollars in damages. Costs factored in include physical damage to infrastructure, agricultural losses and business interruption.

The team found that the increases in [atmospheric carbon dioxide levels](#) and temperature—tightly linked to each other—were associated with increasing numbers of events per year, as well as fatalities. After adjusting dollar values for inflation, their analysis showed that more frequent and more severe disasters are incurring rising costs.

Among their findings:

- As the [global temperature](#) rose by almost one degree Celsius, there was a steady increase in the frequency of billion-dollar disasters, from just 3 in 1980 to 22 in 2020.
- From 1980 to 1989, there were 3 billion-dollar events per year and 297 deaths per year, costing a total of \$19.5 billion. By 2010–2019, the rise in carbon dioxide levels and temperature were linked with 13 annual events, 523 annual deaths, and \$89.2 billion in recovery costs, a fourfold increase.
- In the last five years, the rise in carbon dioxide levels was associated with 18 events per year, 911 deaths per year, and \$153 billion in recovery costs, almost double the amount spent in the previous decade.

"Taken together, these [data points](#) suggest an exponential relationship between carbon dioxide levels, temperature and disasters that could translate into increased disaster frequency, severity, unpredictability, healthcare costs, healthcare utilization and deaths in the United States," said Ciottone, who is also president of the World Association for Disaster and Emergency Medicine and an associate professor of [emergency medicine](#) at Harvard Medical School. "To truly mitigate the economic impacts of disasters, policies combatting CO<sub>2</sub> emissions and therefore temperature change are required. Disaster Risk Reduction strategies can also lead to cost reductions and save human lives."

Disaster Risk Reduction emphasizes taking steps to reduce the harm and impact caused by disasters on society. Such measures include adopting the latest building codes and retrofitting critical disaster infrastructure lifelines such as telecommunications, roads, power and water infrastructure. A study in 2005 estimated that for every one dollar invested in disaster risk mitigation efforts saved four dollars in post-disaster rebuilding efforts. New data in 2019 showed one dollar spent on

mitigation measures could save 11 dollars post-disaster.

"Framing disasters in this economic light can bring more attention and motivation for change to alter policymakers' decisions," said corresponding author Vijai Bhola, MD, a graduate of the Disaster Medicine Fellowship at BIDMC, who notes the current analysis captures just a fraction of the costs incurred by climate change. "These costs represent a combination of immediate and longer-term restoration estimates. What they do not reflect, however, are factors such as destruction of natural resources or loss of life, and therefore these numbers significantly underestimate the true cost of climate-related disasters."

**More information:** Vijai Bhola et al, Escalating costs of billion-dollar disasters in the US: Climate change necessitates disaster risk reduction, *The Journal of Climate Change and Health* (2023). DOI: [10.1016/j.joclim.2022.100201](https://doi.org/10.1016/j.joclim.2022.100201)

Provided by Beth Israel Deaconess Medical Center

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