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IN FOCUS

Extreme Heat and Climate Change

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Scientific consensus supports a causal relationship between increasing global temperatures and the incidence of extreme heat. Extreme heat can have a range of serious consequences, with record-breaking temperatures and heatwaves occurring in recent years. For example, global temperature datasets from the National Aeronautics and Space Administration (NASA) and National Oceanic and Atmospheric Administration (NOAA) show 2024 was the warmest year on record and 2015-2024 was the warmest decade on record since records began in 1880. Both the year and the decade are part of a global warming trend (**Figure 1**). In addition, the United States experienced record-breaking heatwaves in 2021 and 2023. These heatwaves brought extreme temperatures and life-threatening conditions in some areas. Historical studies of the United States have found increases in heatwaves regionally during the period 1981-2015 and for the continental United States (CONUS) during the period 1981-2018.

This In Focus describes some of the health, infrastructure, and productivity impacts of extreme heat; the relationship between extreme heat and human-caused climate change; and related policy considerations. Although the terms *extreme heat* or *heatwave* lack a consensus definition, some studies have characterized extreme heat events by their frequency, intensity, and duration.

Extreme Heat Effects

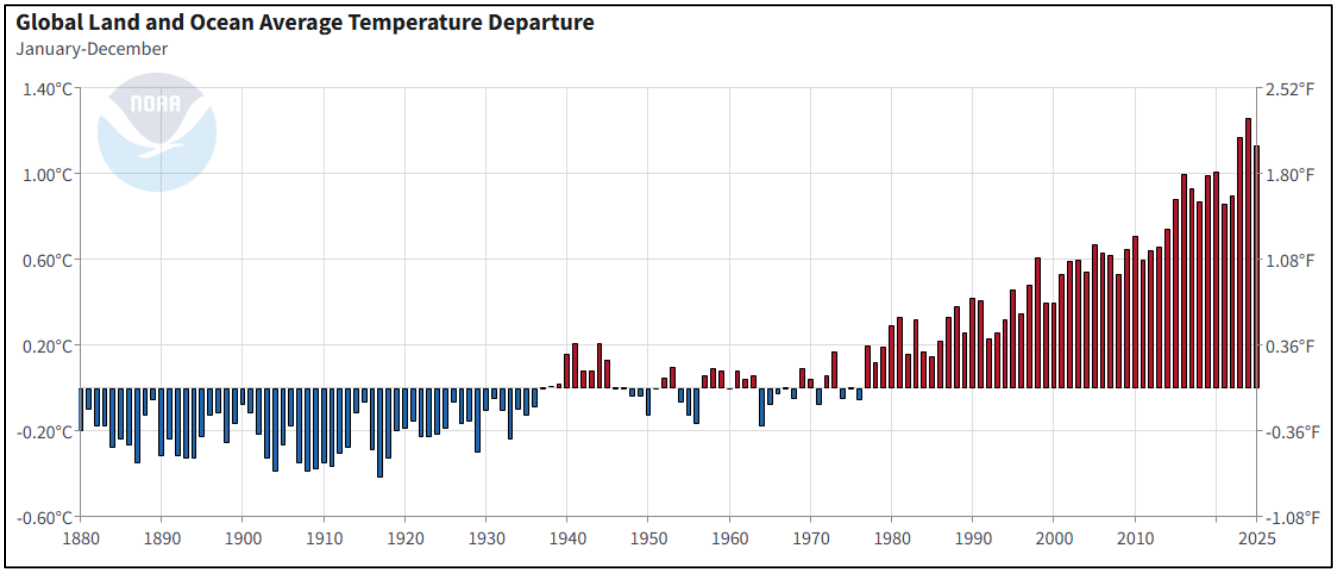
A study published in the *Journal of the American Medical Association* found that 1,722 heat-related deaths occurred in the United States in 2022. The Centers for Disease Control and Prevention (CDC) states that extreme heat can cause various effects, including heat stroke, heat exhaustion, fainting, heat cramps, and heat rash. Extreme heat has affected U.S. communities, causing heat-related deaths and increases in heat-related medical conditions. These extreme heat events can place a strain on health care systems.

Extreme heat can affect the health, safety, and productivity of workers. According to the CDC, extreme heat can put workers at increasing risk of workplace injuries and other issues.

Extreme heat can strain the power grid, potentially leading to high demand for air conditioning, refrigeration, and other power needs. It has been estimated that during summer 2023, about two-thirds of North America faced the potential for insufficient operating reserves of electricity from extreme heat. Extreme heat may accelerate the degradation of roads, bridges, and railroad tracks. Increases in heat and humidity may decrease aircraft performance, and extreme heat may reduce the operational capacity of military aircraft by reducing payload and range. According to some sources, past extreme heat events caused flight delays and cancellations in Seattle, Portland, London, and Phoenix.

Extreme heat can stress plants, livestock, and poultry, reducing agricultural yields. Extreme heat exposure during critical growth stages may reduce yields in crops, such as corn and soybeans. Extreme heat events can stress livestock and may reduce meat and milk production.

Figure 1. Global Average Temperature Departures, 1880-2025



Source: NOAA, National Centers for Environmental information, "Climate at a Glance: Global Time Series."
Note: Global average temperature departures calculated as deviations from the 1901-2000 baseline average.

Extreme Heat and Human-Induced Climate Change

According to the U.S. Global Change Research Program (USGCRP), human activity is warming the planet, leading to more frequent extreme high temperatures and heatwaves. The 2023 USGCRP *Fifth National Climate Assessment* (NCA5) stated the following:

> The connection between warming and heatwaves is well understood: at the very basic level, as average temperatures warm, the risk of extreme temperatures and record-breaking temperatures goes up.

The Intergovernmental Panel on Climate Change *Sixth Assessment Report* stated that "human-induced greenhouse gas forcing is the main driver of the observed changes in hot and cold extremes on the global scale."

In addition to studies on the general connection between warming and extreme heat, climate attribution studies examine the influence of human-caused climate change on individual extreme heat events. While not every extreme heat event is caused by climate change, some studies have found that human-caused climate change has increased the intensity of certain extreme heat events in the United States and other countries.

The NCA5 stated, based on modeling, that it is very likely that heatwaves will increase in frequency, severity, duration, and spatial extent as global warming continues. The NCA5 included estimates of the increase in annual days above 95°F for the CONUS, Hawaii, and Puerto Rico, for global warming of 2.0°C (3.6°F) above preindustrial temperatures (**Figure 2**). A Department of Defense indicator of changes in heat risk exposure is the average number of days with maximum temperatures above 95°F. The NCA5 estimated that the number of days above 95°F (i.e., one way to define extreme heat) is projected to change, depending on the region, by up to 50 additional days with 2°C of global warming. The largest increases are projected to occur in southern regions.

Considerations for Congress

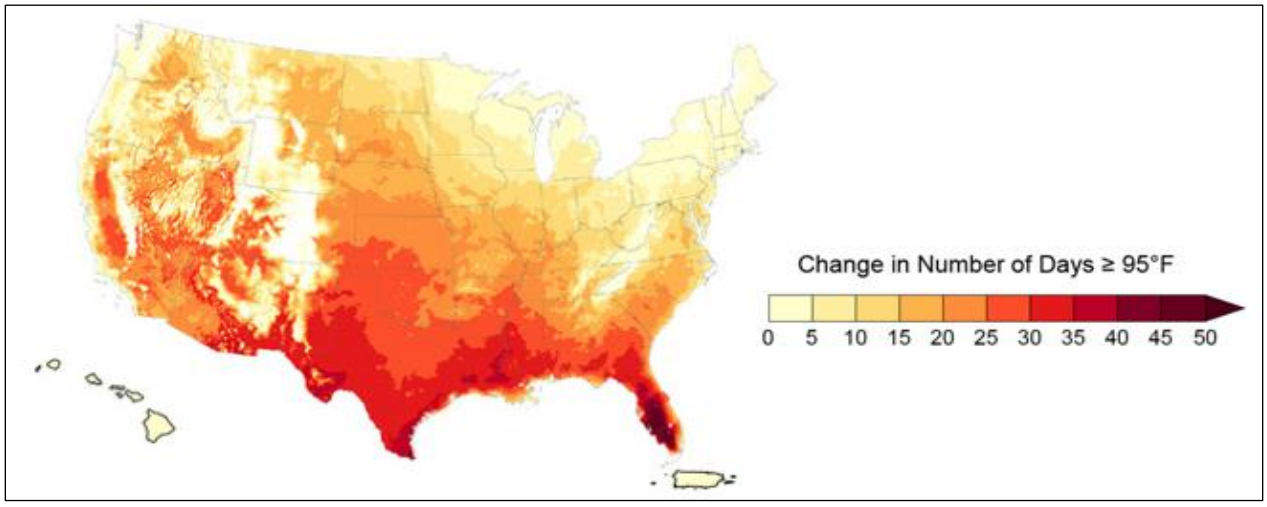
If Congress chooses to address extreme heat, it can do so in a variety of ways; the following discussion is not comprehensive. For example, Congress has oversight of federal activities authorized in congressional legislation, including those for research, preparation, response, and mitigation of extreme heat risks. Congress may consider the level of funding for research on extreme heat. For example, NOAA has ongoing research to forecast extreme heat. Some scientists have suggested the need to better account for vegetation dynamics and aerosol effects in order to improve modeling of heatwaves. Others have proposed interdisciplinary research on reducing vulnerabilities to extreme heat risk.

Federal actions to prepare and respond to heat extremes are subject to congressional oversight and include the National Integrated Heat Health Information System (NIHHIS). News sources have reported staff and program cuts at NIHHIS, and Congress may consider reviewing this interagency initiative.

In August 2024, the Occupational Safety and Health Administration (OSHA) published a Notice of Proposed Rulemaking for Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings. The post-hearing comment period for this rulemaking ended in October 2025. OSHA does not have specific heat exposure standards, and this rulemaking would develop a heat-specific workplace standard. Congress may engage in review of the proposed rule and its potential effects.

Some Members of Congress introduced legislation in the 119th Congress to prepare for and mitigate against the effects of extreme heat, including health and financial risks. Examples in the 119th Congress include studying the financial costs of extreme heat (S. 1743) and coordinating federal extreme heat planning and response (H.R. 3704).

Figure 2. Projected Changes in Annual Days with Temperatures at or Above 95°F at 2°C of Global Warming



Source: U.S. Global Change Research Program *Fifth National Climate Assessment* (NCA5); adapted by CRS from NCA5 Figure 2-11.
Notes: No change is projected for Alaska (not shown). Data were not available for the U.S.-affiliated Pacific Islands and the U.S. Virgin Islands. Changes are relative to the period 1991–2020.

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