Beyond Severe Weather: Extreme Temperatures are a Growing Public Safety Issue

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Introduction

Severe weather is typically defined as an event that can potentially cause loss of life, significant structure damage, or serious community disruptions. When it comes to disastrous events, hurricanes, severe thunderstorms, tornadoes, and blizzards top the list. However, other forms of severe weather create significant public safety concerns and require the same level of attention. Right now — particularly with the many recently published studies on climate change — we cannot omit extreme temperatures from this definition.

The Federal Emergency Management Agency (FEMA) recognizes the vital support and responsibilities of state and local emergency managers, particularly when it comes to weather events that are less site-specific, like extreme temperatures.

In early 2021, FEMA committed to doubling available funds to help cities and states prepare for extreme weather disasters, particularly the impacts of climate change on local communities.

Local agencies can bolster their plans by increasing their understanding and management of extreme temperature risks. Accurate weather insights can help improve forecasts, measurements, and preparation for these extreme events, which have increased both in frequency and severity over the past few decades.

Climate change impacts

Conversations around weather and the environment typically center on climatological changes, such as increasing sea and surface temperatures, as well as the rise of extreme weather events. A recent **report** showed climate-related disasters jumped 83% in the last 20 years, with significant increases in floods, severe storms, droughts, wildfires, and heatwaves. This is just one of many pieces of evidence of global warming causing changes in climate patterns.

Climate change has also impacted temperatures — and the 10 warmest years on record have all happened since 2005. Seven of those years have occurred since 2014. Since 1880, there's been a two-degree increase in the global average surface temperature, resulting in a significant increase in accumulated heat. That extra heat drives extreme temperatures — reducing snow cover and sea ice and intensifying heavy rainfall.

Climate change is not only driving warmer temperatures but also extreme cold. Recent **studies** show that the warming of the Arctic Ocean is causing instability in historically normal weather patterns, including the jet stream and the polar vortex. Research shows that warm air pushing into the polar vortex and destabilizing its typical circular pattern causes unusual and historic extreme cold temperatures, much like those seen in **Texas** in early 2021.

7

The number of the 10 hottest years on record occurring since 2014.

Extreme temperatures

While extreme heat and cold both pose public safety risks, heat is the larger concern for many offices of emergency management (OEMs). Extreme events typically occur over a long period (two to three days) of temperatures above 90 degrees Fahrenheit. Extreme heat can also be much hotter weather than average for a location — and is sometimes more humid, too. Extreme heat is more than an inconvenience. It can result in serious health impacts, including injury, hospitalization, and death.

90+ & 2-3

The average extreme heat event is over 90 degrees F for two to three days, often with humidity.

Extreme heat isn't just on the rise in the United States. It's a global phenomenon with devastating consequences for many, especially those already vulnerable due to age, medical issues, or socio-economic conditions. As extreme heat increases, it causes a ripple effect, elevating the risk of related events, such as drought, wildfires, or flash floods.

Growing research supports not only the connection between extreme heat and climate change but also public health implications. A recent study at the University of Bern found that across 43 countries, an average of 37% of heat-related deaths could be attributed to climate change. The study also suggested the risk of climate change-related heat deaths has grown by more than one-third in the past 30 years.

In the United States, more than 600 people die from extreme heat each year. From 2001 to 2010, the nation had around 28,000 heat-related hospitalizations.

High temperatures can bring about heat-related illnesses or death due to the body's inability to cool itself sufficiently by sweating. Heat is the leading weather-related killer in the United States, and it often results in emergency room visits or hospital admissions. And, while any person can suffer from heat stress, regardless of age, sex, or health status, it is older adults and children with the **higher risks** of illness due to extreme heat exposure. The socially isolated and economically disadvantaged, the chronically ill, and some communities of color are also especially vulnerable to the heat.

In recent decades, unusually hot summers have become more common across the United States, and extreme heat events are expected to be more frequent and intense. As a result, the risk of heat-related illness will also grow. However, hospitalization rates can change as people acclimate and communities strengthen heat response plans and adapt.

As with extreme heat, extreme cold has a variable definition depending on location and the population's ability to acclimate to the temperatures. For example, Floridians may find 50 degrees cold, while those who live in colder states, such as Minnesota, may find 50 degrees comfortable or even warm.

37%

The number of heat-related deaths attributed to climate change in a study by the University of Bern.

Extreme cold can be as dangerous as heat, particularly for those experiencing homelessness or who don't have reliable, safe home heating. Extreme cold also brings the possibility of power outages that can lead to the inability to safely heat homes. When homeowners try such tactics as turning on gas stoves or using a grill inside the house, it can lead to fires or carbon monoxide poisoning. Cold weather can also cause aging infrastructure and systems, such as electrical or plumbing, to freeze or fail.

On average, U.S. death rates are eight to 12% higher in winter versus non-winter months, primarily due to weather-related behavioral changes, as well as increased exposure to respiratory diseases. Cold-weather death rates also see increased heart attacks — likely due to the cold's effects on the circulatory system — and frostbite and hypothermia, especially in places where people are unused to cold temperatures.

There are a few specific populations at greater risk during extreme cold. They include older adults, infants, people with pre-existing medical conditions, those on medications or using drugs, the homeless, and those without appropriate clothing or heating sources.

While unusually cold winter temperatures are less common, there are still dangers for many in vulnerable populations. Cold-related death rates can change as communities strengthen their cold-weather plans and take steps to protect people during the winter months.

Extreme temperatures can be deadly for anyone, but people living on the streets and seniors on their own without air conditioning or heat are particularly susceptible. There's an urgent need for strategies that minimize the public health impacts of climate change, especially extreme heat or cold.

8-12%

The increase in average U.S. death rates in winter, due to weather-related behavioral changes and respiratory diseases.

Adding to an already-strained workload

Extreme temperatures and their impact on public safety have grown exponentially, adding to the already heavy workloads of emergency management teams. Often, extreme temperatures are the catalysts for other weather-related disasters, including severe thunderstorms, tornadoes, wildfires, drought conditions, and in cold weather — ice and snow-related challenges.

Extreme heat can indicate an unstable atmosphere, and often, severe weather results from the heat near the earth's surface as it mixes with cooler air above. So, while extreme heat is serious in and of itself, it can indicate the need for additional emergency planning around severe thunderstorms or tornadoes.

Extreme heat is also one of the most critical inputs for fire weather and drought, creating another level of concern and risk planning for OEM leaders. Wildfires have increased in recent years, challenging emergency management teams, particularly in the western half of the United States.

The devastation from wildfires is often more visible; however, droughts still create significant public safety concerns. While agricultural impacts are usually at the forefront of discussions, another drought-related issue is air quality. The increase in drought-related wildfires and dust storms cause the suspension of particulate matter in the air, irritating the bronchial passages and lungs, making chronic respiratory illnesses worse and increasing the risk of infections like bronchitis and pneumonia. Compromised drinking water quantity and quality and unstable access to energy sources are also related public health concerns.

While extreme heat can feed many other weather emergencies, extreme cold can also lead to additional threats, including ice storms and wind events. During extreme cold, high winds can create hazardous wind chills, and more than 1,000 people die of hypothermia in the United States each year. Extreme cold can also lead to ice storms, particularly in the southern region of the country. While ice storms can disrupt ground and air travel by creating unsafe conditions, heavy ice accumulations can bring down trees and topple utility and communication towers, causing potentially dangerous service disruptions.

Leveraging weather insights to manage extreme temperature events

For those working in OEMs, helping communities manage heatwaves and related emergencies like wildfires, brownouts, and power outages are all a part of extreme temperatures. Ideally, year-round planning and preparation can help make towns and cities more resilient overall. The challenge is working within budget limitations and with part-time and even volunteer staff serving as emergency managers on the local level.

Weather analytics is one of the most underused yet readily available resources that organizations can implement now to prepare for the future. While the weather causes many disasters that require site-specific emergency responses, real-time radar, weather elements, storm tracking, and long-range outlooks can benefit from analytics. Integrating weather insights into the four key phases of public safety disaster management can help OEMs make better-informed decisions based on real-time information.

While planning is the main focus of the prevention phase, the right weather resource can contribute much more. In addition to assessing and reducing disaster risk by creating response plans based on a thorough understanding of the community and its infrastructure, warning thresholds and systems are key to faster responses.

Real-time, map-based local weather reports, hyper-local data, and meteorological consultations can help OEMs establish an appropriate response. Some solutions allow users to create highly custom, location-specific alerts focused on the conditions of greatest importance to the community. The right solution will also push those alerts across desktop, mobile, and integrated siren systems so that everyone has the same information. In addition to pre-event alerts, automated all-clear notifications can let team members know when it is safe to resume normal activity.

For extreme heat, Wet Bulb Globe Temperature (WBGT) data can support a more effective response to a community's needs. Access to appropriate information and observations to monitor extreme heat and humidity is imperative during above-average temperatures. WBGT measures heat stress in direct sunlight, which makes it different from the heat index that also looks at temperature and humidity, but in shady areas. While not as commonly referenced as the heat index, WBGT is vital for accurately addressing how prolonged exposure to heat pushes the human body beyond its limits. When extreme heat combines with high humidity, the situation can become lethal.

Readiness

During the preparedness phase, weather forecasts are at the heart of planning for natural disasters and severe weather. First responder training and community education on what to do during a specific event are also essential for ensuring readiness. For extreme heat, this can include identifying dangerous conditions with WBGT forecasts and having heat stress prevention plans in place, as well as implementing resources to treat those suffering from heat stress, if necessary. When quickly diagnosed and treated, exertional heat stroke has a 100% survival rate. WBGT information can mean the difference between life and death when used with a comprehensive **response plan** for extreme temperatures.

Response

In the response phase, weather insights help drive appropriate actions, so the entire team needs access to accurate, real-time weather information. Knowing when and where conditions are happening at a hyper-local level can help ensure that all response teams have the right equipment and people in place. Accurate temperature information and forecasts during extreme heat events can ensure that schools and hospitals are prepared to respond, that shelters are open and ready with resources to help, and that communication with first responders occurs. Ideally, OEMs will have access to counsel and input from meteorologists to help them understand the severity and timing of extreme events.

Recovery

During the recovery phase, OEMs can't lose sight of the weather. When an extreme heat or cold event ends, continuous monitoring of conditions while the community gets back on its feet is critical as responders work collecting and distributing donations and goods or assisting with reconstruction tasks.

Managing disasters requires preparation for all potential situations, and silent killers like extreme temperatures need thoughtful, complete weather-related plans. The ability to monitor temperatures and WGBT in real-time with accurate information while communicating the threats to the broader team in a timely matter is crucial. Working collaboratively with an expert weather partner facilitates informed decision-making that can reduce the potential human impacts of adverse weather.

Get in touch with our **weather experts** for information and resources to ensure your emergency response plan works well for your community.