

# **EXTREME WEATHER**

*— and the —*

# **CLIMATE CRISIS**

*What You Need to Know*



The Climate  
Reality Project

# INTRODUCTION

Every new year seems to arrive on the heels of another unfortunate climate record set. And 2017's is among the most startling: Climate-related and other natural disasters caused a staggering \$306 billion in total damages in the US, making 2017 by far [the most expensive year on record](#) for disasters in the country.

And globally, in the wake of Hurricanes Maria, Irma, and Harvey, an immensely destructive wildfire season in the American West, and a dire drought in South Africa, one question has been hard to escape:

*Is the climate crisis making weather more extreme?*

**THE SIMPLE ANSWER IS YES.**

Carbon pollution from burning fossil fuels like coal, oil, and natural gas is warming our planet and driving climate change. It's throwing natural systems out of balance – to often devastating effect.

What does that mean for us? Events like torrential rains, floods, heatwaves, hurricanes, the “polar vortex,” and drought are becoming more frequent and/or intense.

You don't have to be a scientist to know what's on the horizon, if politicians and business leaders keep denying reality and refusing to act. **We're seeing it already.**

# HURRICANES

“For a long time, we’ve understood, based on pretty simple physics, that as you warm the ocean’s surface, you’re going to get more intense hurricanes,” [renowned climate scientist Dr. Michael Mann told Climate Reality last year.](#)

“Empirical studies show that there’s a roughly 10-mile-per-hour increase in sustained peak winds in Cat 5-level storms for each degree Fahrenheit of warming. And keep in mind that the global oceans have warmed more than a degree Fahrenheit,” he continued.

But looking at increases in sustained wind speed alone doesn’t paint the full picture of a storm’s destructive potential. A hurricane is more than just its winds – it’s a major rainfall event accompanied by dangerous storm surge. And those things gain strength exponentially right alongside the rising winds.



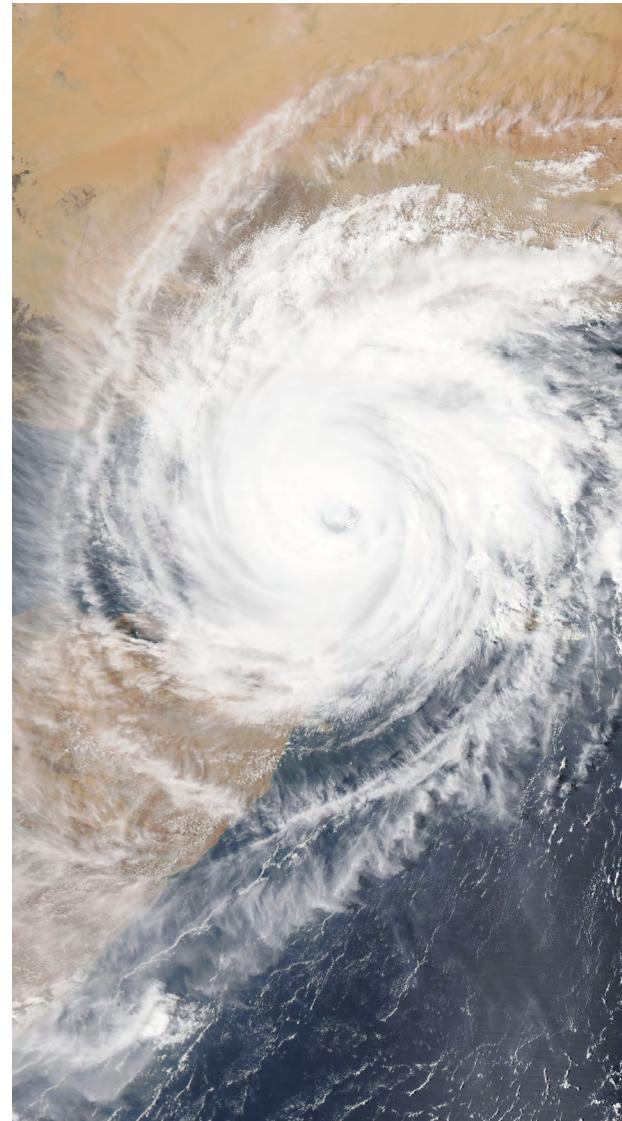
IN SHORT, HURRICANES AND TYPHOONS ARE LIKELY TO BECOME MORE INTENSE AND DESTRUCTIVE WITH STRONGER WINDS AS THE PLANET, ESPECIALLY OUR OCEANS, CONTINUES TO WARM.

## HERE'S WHY:

**1. CLIMATE CHANGE ADDS FUEL TO THE FIRE.** Average global sea surface temperatures are rising, and as sea surface temperatures become warmer, hurricanes can become more powerful. Warmer oceans, and especially increased deep ocean warmth, also fuel rapid intensification of storms, so a once-relatively weak storm can cross the right stretch of water and become major in a matter of hours. This can lead to citizens being under-prepared for the intensity of the actual hurricane that makes landfall, resulting in greater damage and even loss of life.

**2. CLIMATE CHANGE IS LINKED TO EXTREME RAINFALL** (more on that below). As the world becomes warmer, more water evaporates from the surface of our oceans. Hurricanes suck up this water vapor as they travel over the sea surface, and when they make landfall, the same water vapor returns to the earth's surface as heavy precipitation.

**3. SEA-LEVEL RISE CAUSED BY CLIMATE CHANGE CAN “DRAMATICALLY EXTEND THE STORM SURGE DRIVEN BY HURRICANES.”** [According to NOAA](#), a storm surge “is the abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide.” To put it another way, the storm surge is the ocean water pushed onto the coast by the force of the hurricane. As sea levels rise because of climate change, ever-stronger storms are expected to carry water farther and farther inland.



## THE HUMAN IMPACT OF CLIMATE CHANGE



On September 9, 2017, strong winds from Hurricane Irma knocked a powerline onto [Climate Reality Leader](#) Becky Van Horn's family home in Florida and started a fire that would eventually burn the structure down. Though she and her family were safe, the loss of the family home was devastating.

*“Woke up this morning to the news that my house in Florida was ‘engulfed’ in flames. Fire is out, and hopefully we will be able to salvage the most important things,”* Becky wrote in an email to Climate Reality.

*“The past 23 years of my life were spent in that same house and for nearly 24 hours, all I had was one picture of when the fire had just begun. For 24 hours, I had no idea what was left. It was one of the most tragic and influential experiences that has ever happened to me.”*

# FLOODING AND DROUGHT

Climate change increases our risk of both heavy rains and extreme droughts. But why – and how – is that? Aren’t the two contradictory?

Science has shown that climate change touches every corner of our planet’s ecosystem, and the water cycle is no exception. Specifically, as global temperatures have increased at their fastest rates in millions of years, this rise has directly affected things like water vapor concentrations in the atmosphere, clouds, and precipitation and stream-flow patterns. Because the processes involved are highly dependent on temperature, changes in one have consequences on the other.

So how does climate change impact the water cycle? To explain, let’s take a closer look at the two most extreme impacts of a water cycle in crisis: severe flooding and drought.



[Learn More: Climate Change and the Water Cycle: Four Big Questions Answered](#)

## FLOODS



When water evaporates from the land and sea, it eventually returns to Earth as rain and snow. Climate change intensifies this cycle because as air temperatures increase, more water evaporates into the air.

Because warmer air holds more water vapor, this is contributing to an increase in the average annual amount of rain and snow in some places and creating more intense rainstorms in others. The result is major problems like extreme flooding in communities around the world.

Additionally, at the same time, sea levels are rising faster than at any time in almost 3,000 years, and it's worsening coastal flooding globally. [The United Nations Environmental Programme estimates](#) that half of the world's population lives within 60 kilometers (about 37 miles) of a coast – and three-quarters of all major cities are on a shoreline.

# THE HUMAN IMPACT OF CLIMATE CHANGE



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[Climate Reality Leader](#) Martha Bell's home in Houston barely escaped Hurricane Harvey's floodwaters in August 2017.

*“My house narrowly escaped being flooded. According to my neighbors, the water came up to the sill of the front door and stopped right there. My next-door neighbors and their three young children were evacuated by boat halfway down the street. Two blocks over, my good friend’s home flooded; she barely escaped the swift and rising floodwater with the help of her neighbors. She stayed in my home until she was able to find another place of her own. Her home is still uninhabitable,”* Martha said.

Her brother was also evacuated. She hadn't heard from him, but reported back that he did manage to make it to Dallas before the flooding completely took over the evacuation route.

# DROUGHT



At the same time that some areas are experiencing more intense precipitation, others are experiencing more drying and even drought. As discussed above, as temperatures rise, evaporation increases. And when this evaporation happens over land, soils dry out. Then, when rain does come, much of the water runs off the hard ground into rivers and streams and is carried back to the sea – all while the soil remains dry.

In urban, suburban, and agricultural areas, this runoff can pick up pollutants from the landscape – including sewage from overwhelmed single-pipe systems – and carry them to nearby rivers and other waterways, including reservoirs.

On the other end of this same spectrum, periods of drought, enhanced evaporation, and decreases in overall annual rainfall result in reduced water levels in streams, rivers, and lakes. This leaves less water to dilute even relatively common pollutants – and eventually less water to irrigate crops or drink.

A major drought can have serious consequences for people's livelihoods, affecting everything from agriculture and transportation to public health. [And of course, all of this has some major implications for food security and supplies of drinkable water.](#)

Then there are consequences of severe drought you might not immediately think about – like the role it plays in worsening forest fires.

*"We predicted this long ago, and we are seeing it play out now before our very eyes."*

**DR. MICHAEL MANN,**  
world-renowned climate scientist  
and author of *The Madhouse Effect*.

[Learn More: Soil Health and Climate Change](#)

# WILDFIRES

Making the connection between global temperature rise and wildfires is also pretty simple science: Droughts dry out the land, killing plant life – which then also dries out itself, becoming far easier to ignite. And, with less predictable rains, it's harder to stop these fires once they begin. Wildfires can leave communities and governments with billions of dollars in damages, not to mention the incalculable costs of lost plant, animal, and even human life.

[National Wildlife Federation \(NWF\)](#) offers a bit more detail on how increases in average annual temperatures create conditions that dramatically elevate the risk and severity of forest fires.

## HERE'S HOW:

### 1. LONG FIRE SEASONS:

When warm weather arrives early, it leads to premature spring snowmelt and runoff. Many places are seeing their snowpack melt one to four weeks earlier than just 50 years ago...at the same time as unseasonably warm temperatures creep deeper into the fall. Keeping in mind that forests are considered combustible about a month after the snowmelt ends, the result is a much longer than usual period of time when forests are vulnerable to fire.



## 2. DRY CONDITIONS:

Below-average rainfall in some areas – a result of the enhanced evaporation rates associated with warming and the climate crisis – naturally increases the probability and duration of a fire.

## 3. INFESTATIONS:

Warm and dry conditions, particularly in months that were once cooler, allow some very destructive insects like the mountain pine beetle to survive winters and reproduce quickly. The beetles and other pests kill trees and brush, which then dry out.

## 4. LIGHTNING:

One major impact of climate change is increasing the potential for severe storms. Severe storms carry a lot of energy, and NWF estimates that “lightning in the [American West] could increase by 12 to 30 percent by mid-century.”

Taken together, the first three of the above effects create favorable conditions for a dangerous forest fire – and the fourth acts as a match. In pretty short order, a once-thriving, vibrant forest is transformed into a massive tinderbox.



## THE HUMAN IMPACT OF CLIMATE CHANGE



Climate Reality Leader Kathi King is a resident of Santa Barbara County, California. In January 2018, a major mudslide swept through the area following wildfires that destroyed vegetation that otherwise could have held back the earth. At least 20 people were killed, and Kathi was forced to take refuge in a tree until help arrived. She shared her story with Climate Reality:

*"The Thomas Fire, the largest in California history, was contained in early January, just in time for a storm to approach Santa Barbara, with warnings of debris flow from the denuded hillsides. We remained awake and vigilant through the night of January 8. At about 3:30 AM, the sky glowed orange. The power went out. We got in our packed cars and headed for a rendezvous nearby.*

*"I left first, using the Highway 101 frontage road. A van up ahead turned around at an intersection, so I did too, thinking if the van couldn't cross whatever was ahead, neither could my Prius. As I made the U-turn, the street turned into a river and my car began to fill with water.*

*"I saw the pillars of a driveway in the glow of my taillights. I wedged my car against a tree, squeezed out onto the roof, wrapped my arms around a branch, and began making phone calls. I called my husband and son – no answer. I feared the worst."*

## **CONTINUED...**

*"I reached my daughter in New York City. She reached my husband. He and my son were trapped with several other cars on an off-ramp. They were in about a foot of mud, but first responders had reached them and told them to shelter in place.*

*"My car started feeling unstable, so I climbed into the tree. My husband called our friend, Dave, who lives nearby. He drove as close to my location as he could, and flagged down a fireman and a neighbor. There was about 20 feet of fast-moving, debris-filled water between my tree and the nearest house.*

*"[The firemen] found two ladders in nearby garages, and they put both ladders in the debris flow and 'walked' them to me, reversing the process to get me out. Dave and I walked through waist deep mud to his van and then to his house.*

*"We sat in the dark scanning our phones for news. Good friends were missing, reports of major destruction began filtering in, and rescue helicopters flew overhead non-stop. It was a long two hours before my husband and son, mud-soaked and exhausted, walked up the street to Dave's house. We were thrilled to be reunited, but along with the rest of our community, mourn the loss and destruction."*



# EXTREME HEAT



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As you might expect, extreme heat is one of the most direct and easiest to understand effects of man-made climate change.

*“If you warm up the planet, you’re going to have more frequent and intense heat waves,”* [Dr. Michael Mann explained to Climate Reality.](#)

Perhaps unsurprisingly, 17 of the 18 hottest years on record have occurred this century.

Extreme heat elevates the rate of death from illnesses like heart attack, heat stroke, organ failure, and more. The journal [Nature Climate Change](#) reports that potentially deadly extreme heat is a growing concern, and will likely become more frequent and will occur over a larger portion of the planet in the coming decades.

[According to a study published in the journal last year](#), “Around 30 percent of the world’s population is currently exposed to climatic conditions exceeding this deadly threshold (where daily mean surface air temperatures and relative humidity become deadly) for at least 20 days a year. By 2100, this percentage is projected to increase to ~48 percent under a scenario with drastic reductions of greenhouse gas emissions and ~74 percent under a scenario of growing emissions. An increasing threat to human life from excess heat now seems almost inevitable, but will be greatly aggravated if greenhouse gases are not considerably reduced.”

# EXTREME COLD



First things first, we need to be very clear about something here: There is a difference between climate and weather. Weather refers to atmospheric conditions in the short term, including changes in temperature, humidity, precipitation, cloudiness, wind, and visibility. Climate is the average of weather patterns over a longer period of time – usually 30 or more years.

Weather always has—and always will—fluctuate. There are warm days, mild days, cool days, and even some very cold days. There are dry periods and wet periods. And this will continue to be the case.

When we talk about climate, we are talking about long-term trends and expectations. Some skeptics, however, like to point to cold snaps as evidence against climate change. In many instances, they couldn't be more wrong.

“The unusual weather we’re seeing this winter [2017–18] is in no way evidence against climate change,” [Dr. Michael Mann explained to Climate Reality](#). “It is an example of precisely the sort of extreme winter weather we expect because of climate change.”

Why is this happening? The short answer, at least in part: it’s about the jet stream.

While the scientific community is still investigating the intricacies of the phenomenon, a growing body of research indicates that as global temperatures rise and the Arctic continues to warm, the jet stream is both slowing and growing increasingly wavy, allowing bone-chilling cold Arctic air to both spill much farther south than usual and linger over areas unaccustomed to it for longer.



[Learn More: The 12 Questions Every Climate Activists Hears](#)

# IS IT TOO LATE TO DO ANYTHING?

**NOT AT ALL.**

First, let's face it: disasters are bound to occur – as disheartening as it is, that's Mother Nature at work. And it's also true that even if we completely stopped emitting carbon pollution today, we'd continue to experience climate change impacts for a considerable time to come. The pollution that has caused our current crisis stays in the atmosphere for hundreds of years; climate change is not a phenomenon that can be stopped in its tracks immediately.

But it's our responsibility to do everything we can to prevent the worst of it. And it certainly could get **much** worse.

Acting now to swiftly transition from dirty fossil fuels to clean energy can limit global warming to no more than 2 degrees Celsius (3.6 degrees Fahrenheit). Two degrees of warming could have significant impacts, there's no denying. But if we do nothing and continue on the path we're on, the global average temperature could rise 6 degrees Celsius (10.8 degrees Fahrenheit) by the end of the century. To say the difference between these two scenarios would be dramatic is perhaps quite literally the understatement of the century.

Good thing we have the practical, clean-energy solutions to do it!



# ACT ON CLIMATE NOW

Ready to make a difference for the future of our planet? One of the most important things you can do to take action now is to share your concerns about the climate crisis widely with your networks, friends, and family.

When you talk, your friends and family listen. Whether it's at the grocery store, over lemonade at a family picnic, or on social media networks like Twitter and Facebook, discussing the reality of the climate crisis and extreme weather is your chance to change minds and ensure the people you care about know what is happening to the planet – and what they can do about it.

## CLICK TO SHARE THESE GRAPHICS TO FACEBOOK:



## WRITE A LETTER TO THE EDITOR

The opinions section of a publication is one of the most valuable places to discuss the climate crisis. By writing a letter to the editor, your insights and opinions on the topic will be out there for hundreds or even thousands of people to read. It's an incredible tool for reaching and educating the public. And influencers, including business leaders and elected officials, pay attention to opinion pieces, which function as a direct line to local voices.

Be sure to keep it short and sweet, and make it personal, explaining your concerns about climate change-intensified severe weather and its impact on your community.

## LEARN MORE ABOUT THE CRISIS – AND SPREAD THE WORD

A global challenge needs a global solution. Wherever you are, whatever you do, and whatever time you have, you can do something right now to bring us one step closer to a future without carbon pollution. But first, you need to arm yourself with the facts.

Climate Reality works hard to provide our friends and supporters with the latest climate science and all the ways that they can take climate action. [Click here to sign up to receive regular updates.](#)

Be sure to follow us on [Facebook](#) and [Twitter](#), and share/re-tweet our content regularly with your networks.





# The Climate Reality Project®

Founded and chaired by former US Vice President and Nobel Laureate Al Gore, The Climate Reality Project is dedicated to catalyzing a global solution to the climate crisis by making urgent action a necessity across every level of society.

Today, climate change is standing in the way of a healthy tomorrow for all of us. But we know that practical solutions are right in front of us. We can create a healthy, sustainable, and prosperous future by making a planet-wide shift from dirty fossil fuels to clean, reliable, and affordable renewable energy. At Climate Reality, we combine digital media initiatives, global organizing events, and peer-to-peer outreach programs to share this good news with citizens everywhere and build overwhelming popular support for policies that accelerate the global transition to a clean energy economy.

To learn more, visit [www.climaterealityproject.org](http://www.climaterealityproject.org)