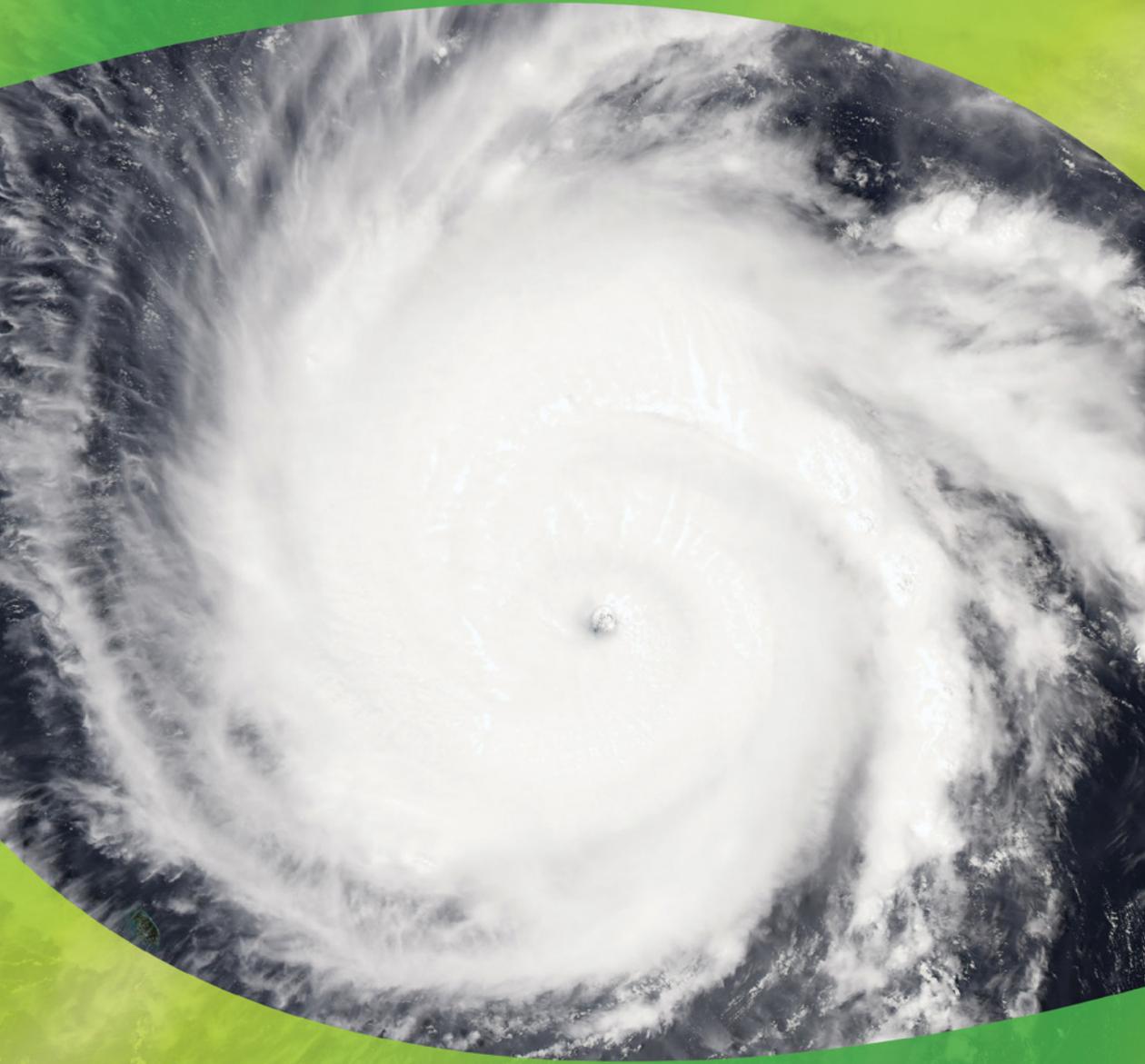


What Is the Impact of **CLIMATE CHANGE?**

Craig E. Blohm





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Climate Change and Natural Disasters

The town of Paradise is a small community of about twenty-six thousand people nestled in the foothills of Northern California's Sierra Nevada mountain range. With majestic pines and oaks surrounding the town and the benefits of a pleasant climate, Paradise has lived up to its name for more than a century. Then, in the fall of 2018, Paradise became a hell on earth.

On November 8, a wildfire sprang up about 7 miles (11 km) from Paradise. Driven by strong winds and high temperatures, the fire, which would become known as the Camp Fire, roared through the area. By the time it was brought under control eighteen days later, 153,336 acres (62,053 ha) of land were burned and more than eighteen thousand buildings were demolished. About 90 percent of Paradise was destroyed, and most of its population had to be evacuated. Eighty-five people died as a result of the Camp Fire, the worst wildfire in California's history.

It was later determined that the fire had been started by a spark from an electrical power line. But there was another factor that contributed to the destructiveness of the Camp Fire: the effects of climate change.

Growing Wildfires

The western United States is particularly vulnerable to wildfires due to its climate of warm, dry summers. According to Park Williams, a bioclimatologist at Columbia University, “In pretty much every single way, a perfect recipe for fire is just kind of written in California. Nature creates the perfect conditions for fire, as long as people are there to start the fires. But then climate change, in a few different ways, seems to also load the dice toward more fire in the future.”⁴

As temperatures rise due to climate change, areas that are usually moist and cool, such as forests, dry out and become more vulnerable to fires. Changes in rainfall patterns contribute to the increased risk of wildfires, as does the earlier melting of mountain snow in spring, which leads to soil drying out earlier in the year and remaining dry longer. These factors can affect



Pictured are the remains of a charred home in Paradise, California. In 2018, 90 percent of the town was destroyed by the worst wildfire in California's history.

the duration and extent of wildfires. A 2017 study published in the *PLOS ONE* scientific journal predicts that by 2039 the average area destroyed by wildfires will increase by more than 500 percent due to climate change. Climate change also affects the impact of lightning, one of the major triggers of wildfires, by increasing the frequency of strikes.

In the United States, wildfires cost billions of dollars each year; financial losses in California's Camp Fire hit a record \$16 billion. But the United States is not the only victim of increased wildfire activity due to climate change. Wildfires can occur almost anywhere on Earth where there is sufficient fuel to burn. "The most noted areas on Earth for wildfire," says natural resources consultant Steve Nix, "include the vegetated areas of Australia, Western Cape of South Africa and throughout the dry forests and grasslands of North America and Europe."⁵

In 2019, wildfires began burning in the Amazon rain forest in South America. The fires were set by farmers seeking to create more pastureland and loggers harvesting timber for houses,

furniture, and other uses. The Amazon rain forest spans parts of nine South American countries, covering 2.1 million square miles (5.5 million km²). The impact of turning such a large forest into a dry grassland will add to global climate change. The rain forest acts as a carbon dioxide

"sink," meaning its vegetation stores the gas and keeps it from escaping into the atmosphere. Without this storage effect, more carbon dioxide is released into the atmosphere, adding to the growing concentration of greenhouse gases. The Amazon sink effect normally prevents some 2 billion tons (1.8 billion t) of carbon dioxide from entering the atmosphere each year. However, the amount of carbon dioxide absorbed by the sink has been decreasing, and it has diminished by about one-third since around 2005.

IMPACT FACTS

In 2018, natural disasters cost US businesses about \$160 billion.

—Jim Foerster of *Forbes*

The Cost of Climate Change

When Hurricane Dorian finally moved away from the Bahamas and out into the open ocean, it left a path of destruction in its wake. Property damage estimates have ranged from \$1.5 billion to \$6.5 billion. As happened in the Bahamas, one huge storm can be enormously costly. Many huge storms—or a mix of storms and other weather events made more extreme by climate change—can be even more costly. Between 2016 and 2018, extreme weather events in the United States cost the nation more than \$450 billion.

Experts warn that those costs will only rise if no action is taken. But they have also noted that the measures needed to reduce climate change will also require a huge financial output. A 2018 report by the Intergovernmental Panel on Climate Change estimates that between 2018 and 2035, the world must invest \$2.4 trillion per year in clean energy. By 2050, the annual investment would need to be \$3.5 trillion.

No matter which path the world takes at this point, climate change will have a high price tag.

A Brazilian study predicts that between 30 and 60 percent of the Amazon rain forest could eventually become dry savanna due to climate change, creating an ecological disaster.

Climate Change and Hurricanes

Although fire can be a deadly natural force, so can the wind and rain associated with tropical storms. Around the world, 2005 was a disastrous year for tropical storms. More than two dozen hurricanes (also called cyclones or typhoons, depending on their geographic location) devastated many areas of the globe. Of these, Hurricane Katrina was one of the most catastrophic in terms of lives lost and property destroyed. When Katrina hit the southern coast of the United States, more than eighteen hundred people died, and property damage reached \$125 billion. In 2017 another huge storm, Hurricane Harvey, smashed into the southern US coast, causing damage equal to that caused by Katrina twelve years earlier.

In 2005, much of New Orleans (pictured) was submerged when Hurricane Katrina hit the southern coast of the United States. Property damage from the storm reached \$125 billion.



Scientists have struggled with the question of whether climate change played a part in creating these devastating storms, and how it will affect future storms. It is already clear that climate change is having an effect on global weather patterns, and these patterns will continue to be altered in the future, reports Climate Central, a nonprofit science and journalism organization. “Based on their understanding of how the climate system works, scientists expect that a warming Earth will see more and more episodes of weather extremes such as droughts, floods, heat waves, and severe storms,”⁶ the organization contends.

The most severe storms are hurricanes, which form over tropical oceans. Hurricanes need warm ocean waters, at temperatures of at least 80°F (27°C), to form. As these waters evaporate, they cause water vapor to rise into the lower atmosphere. Clouds form as the humid air rises, and winds begin to create

the familiar rotating pattern of these storms. When wind speeds reach 74 miles per hour (119 kmh), such a storm is officially classified as a hurricane. Many hurricane clouds can reach a height of 50,000 feet (15,240 m) and a diameter of 125 miles (210 km).

As climate change continues, the temperature of the ocean's waters will rise, creating more destructive hurricanes. "With warmer oceans caused by global warming," warns James B. Elsner of Florida State University's Department of Geography, "we can expect the strongest storms to get stronger."⁷ And it will not take much of a rise in ocean temperature to create problems: just a 1°F (0.56°C) increase in temperature can raise a hurricane's wind speed by up to 20 miles per hour (32 kmh). When a hurricane makes landfall, it leaves the warm ocean waters and begins to cool, losing much of its energy. But it can still cause widespread destruction on land, including torrential rains and tornadoes.

Winds also propel hurricanes as they move across the ocean. The forward speed of a typical hurricane can vary from around 16 miles per hour (26.7 kmh) to over 30 miles per hour (48.3 kmh), depending on the latitude in which it is located. Climate scientists have observed a trend in hurricane movement over the last several decades: sometimes a hurricane will slow to as little as 1 mile per hour (1.6 kmh) or stop moving forward altogether. When this happens, destruction of property and danger to life escalate in the areas below the storm. A slow-moving hurricane, says meteorologist Adam Douty, "makes the flooding worse, you have continued battering with the wind so it has time to weaken structures, and once they're weakened it could damage them further."⁸ In September 2019, Hurricane Dorian stalled over the Bahamas, its winds and rain intensified by its stationary position. At least sixty-three deaths were reported, along with thirteen

IMPACT FACTS

Each year since 2000, some 72,400 wildfires have destroyed about 7 million acres (2.8 million ha) in the United States.

—Congressional Research Service

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Make a Difference

- 1.** Unplug laptops, phone chargers, and other electronics when not in use; they can use electricity (“vampire power”) even when turned off.
- 2.** Walking or biking instead of driving will help reduce your carbon footprint.
- 3.** Help reduce ocean pollution by using reusable bottles, straws, and utensils rather than plastic ones.
- 4.** In winter, wear a sweater or hoodie around the house instead of raising the thermostat.
- 5.** When you leave a room, turn off the lights.
- 6.** Eating less beef (or replacing it with chicken) helps lower the greenhouse gases emitted by livestock production.
- 7.** On trips to the ocean, rivers, and lakes, picking up trash (yours or someone else’s) will help keep garbage out of waterways.
- 8.** Eat locally produced food whenever possible; it reduces the carbon emitted by delivery vehicles.
- 9.** When craving fast food, go into the restaurant instead of letting your car idle in the drive-through lane.
- 10.** Recycle whatever you can, and consider shopping at thrift stores for fashionable used clothing.
- 11.** Consider joining (or organizing) a climate strike to raise awareness of the dangers of climate change.
- 12.** Study climate science in school or on your own, and consider a career helping to solve the problem of climate change.

Climate.gov—www.climate.gov

This site is part of the National Oceanic and Atmospheric Administration, whose mission is to keep the public informed about the changing environment. Its website examines the issue of climate change by providing access to articles, charts, news, maps, and videos.

Intergovernmental Panel on Climate Change (IPCC)

—www.ipcc.ch

Part of the United Nations, the IPCC assesses the science related to climate change. It researches and publishes periodic reports on the effects of climate change. The reports are often technical, but executive summaries of these provide accessible facts and other information.

National Aeronautics and Space Administration (NASA)

—www.climate.nasa.gov

NASA is the premier US space agency. The “Global Climate Change: Vital Signs of the Planet” section of the NASA website provides excellent facts, explanations, articles, graphics, and more on the topic of climate change.

National Snow and Ice Data Center (NSIDC)—www.nsidc.org

The NSIDC researches the world’s glaciers, ice fields, snow, and frozen ground (aka the cryosphere), and it studies how the climate affects these frozen realms. In cooperation with NASA satellite data, it creates maps of the changes in arctic ice. The site provides answers to popular questions about ice and glaciers, quick facts about the cryosphere, a primer on Arctic climatology, and lists of resources for further information.

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