



# Extreme Weather Cost U.S. Taxpayers \$99 Billion Last Year, and It Is Getting Worse

By Kat So and Sally Hardin | September 1, 2021

The climate crisis is here. Extreme weather events fueled by climate change are becoming increasingly more frequent, more destructive, and more costly. Wildfires are burning millions of acres annually.<sup>1</sup> Frequent back-to-back hurricanes,<sup>2</sup> coupled with increased flooding, cause damage to already-climate-vulnerable communities unable to recover fully before the next disaster strikes. And the science reveals it will only get worse.

The Sixth Assessment Report<sup>3</sup> from the U.N. Intergovernmental Panel on Climate Change (IPCC), released on August 9, 2021, paints a dire picture of climate change, with the U.N. chief referring<sup>4</sup> to its findings as “a code red for humanity.” The report, which was written by 234 scientists and reviews thousands of existing scientific studies on climate change, states that it is unequivocal that humans are responsible for climate change, and—what’s more—that the increasing frequency and severity of specific extreme weather events can be attributed<sup>5</sup> to climate change with a high degree of certainty.

The findings from this most recent IPCC report are also particularly alarming in part because they prove what reports from prior decades predicted: Climate change is happening now, and its impacts—especially in the form of extreme weather—are already having devastating effects on humans. The report concludes that many of these changes are now “locked in,” meaning that communities are likely to continue experiencing extreme events for decades into the future.

The increasing frequency and severity of these extreme weather events across the United States, explained in further detail below, underscore the need for urgent, major investments from Congress in climate action and environmental justice. This means delivering on the totality of President Joe Biden’s Build Back Better agenda through budget reconciliation,<sup>6</sup> in addition to the initial steps taken in the bipartisan, Senate-passed Infrastructure Investment and Jobs Act.<sup>7</sup> These investments in climate action, jobs, and justice will put the United States on the path to a clean economy that is both resilient to, and no longer fuels, the climate crisis.

With that in mind, this issue brief takes a closer look at extreme weather events by the numbers over the past four decades; explains the different categories of extreme weather that the National Oceanic and Atmospheric Administration (NOAA) catalogues, analyzing how each is exacerbated by the climate crisis; and recommends that Congress make significant investments to lessen the human and infrastructure costs that result from these catastrophic events, while transforming the nation's economy to one that is 100 percent clean.<sup>8</sup>

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## Extreme weather in the United States has increased in frequency and severity

The United States' experience with extreme weather over the past four decades—and just this summer alone—only serves to underscore the most recent IPCC report's findings. In fact, since NOAA started tracking billion-dollar extreme weather events in 1980, there have been 298 events that met their threshold—exceeding a total of \$1.975 trillion in damages and costs.<sup>9</sup>

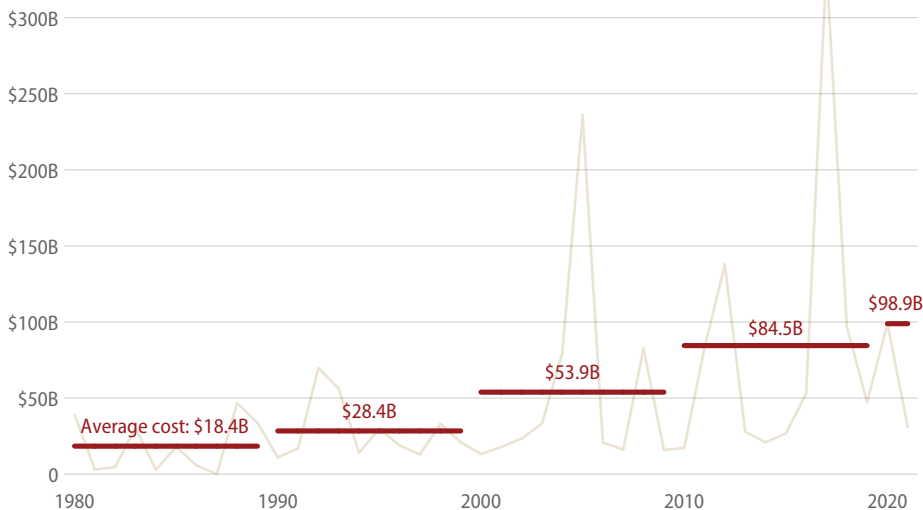
Overall, the four decades of data collected by NOAA reveal two particularly concerning trends. First, the frequency<sup>10</sup> of these major, damaging extreme weather events is increasing: All five top years for event frequency occurred in the past decade. With 22 events, 2020 had the most billion-dollar extreme weather events of any year—nearly one-third more than the second-worst year on record, 2016, which recorded 16 events.<sup>11</sup> From 1980 to 2020, the annual average is 7.1 events, but the annual average for the past five years (from 2016 to 2020) is 16.2 events per year. Similarly, the average annual cost per decade<sup>12</sup> is increasing at an alarming rate. (see Figure 1) These statistics are shocking when one considers that the four-decade total is almost certainly an undercount of the number of total events,<sup>13</sup> as well as an average underestimation<sup>14</sup> due to incomplete data because of a lack of insurance coverage information and data latency.

2021 is following the same trend and already looks to be even more devastating than previous years. For starters, this past June was the hottest June<sup>15</sup> on record across the United States, and this past July was the hottest July worldwide.<sup>16</sup> With recorded data from a little more than halfway through the calendar year, the United States has already experienced eight extreme weather events<sup>17</sup> with costs greater than \$1 billion each. The continental United States is still in hurricane season, and wildfires, exacerbated by droughts, are raging in the Western states. For example, the Dixie Fire<sup>18</sup> has been burning since July 13 and has consumed nearly 725,000 acres of California—making it the second-largest<sup>19</sup> wildfire in state history. Its costs are not yet calculated, but they will no doubt cause further significant economic impacts and damage to communities and livelihoods.

FIGURE 1

### The average costs associated with extreme weather events in the United States have increased steadily since 1980

Annual and average decadal costs (in billions of dollars) of extreme weather damages in the United States, 1980–2020



Source: National Oceanic and Atmospheric Administration, "Billion-Dollar Weather and Climate Disasters: Summary Stats," available at <https://www.ncdc.noaa.gov/billions/summary-stats> (last accessed August 2021).

It is also important to note that extreme weather does not affect everyone equally. Historically marginalized communities are forced to bear the disproportionate<sup>20</sup> brunt of pollution impacts while also confronting concurrent crises resulting from the COVID-19 pandemic, its economic fallout, and fewer pathways for recovery. That means that as extreme weather events increase in frequency and severity, there is a higher likelihood that the impacts to already-vulnerable communities will be disproportionately worse and result in further suffering if Congress does not act.

## How U.S. extreme weather events are exacerbated by climate change

The new IPCC report stated conclusively that specific extreme weather events, as well as their frequency and severity, are attributed to climate change caused by humans. Below are the different categories of extreme weather events that NOAA considers each year as part of its analysis of damages, along with a brief explanation of how each is being exacerbated by a warmer, wetter climate.

### Hurricanes and tropical cyclones

Climate change is fueling more frequent, intense, and damaging<sup>21</sup> hurricanes and cyclones. Warming ocean temperatures lead to more evaporation, creating wetter conditions perfect for heavier rainfall and stronger winds. Furthermore, climate change-induced sea level rise leads to more storm surge<sup>22</sup>—when higher waters are pushed inland by wind—and flooding, which are often the deadliest<sup>23</sup> parts of

hurricanes. As the country faces more and more of these storms at more frequent intervals, it is critical to protect at-risk communities through federal investments and comprehensive disaster planning. This is especially vital as COVID-19 continues to be a threat to the health of communities and their ability to adequately prepare and recover from these storms.<sup>24</sup>

More than half of 2020's historic number of billion-dollar disasters were hurricanes and tropical cyclones. Worse yet, NOAA forecasts that there will be between 13 and 20 named storms during the 2021 hurricane season, with a 60 percent chance of an above-normal season.<sup>25</sup> Since the official start of hurricane season on June 1, already there have been eight named storms. This category of extreme weather events accounts for the greatest cost of overall damage (\$1.03 trillion) among all events, as well as the highest average event cost (\$19.9 billion per event). Since data collection began in 1980, the total decadal cost of hurricanes has skyrocketed from \$39.6 billion to \$459.8 billion in the 2010s—a more than tenfold increase in damages, which is consistent with increased development in coastal areas that are often in the path of these storms. The past five years of hurricanes alone amassed a total cost of \$401.8 billion. With more frequent, stronger, slow-moving storms coupled with the co-effects of sea level rise and other impacts of climate change, these numbers are expected to continue to increase significantly.<sup>26</sup>

### Flooding

Flooding and inland flooding (such as flash floods<sup>27</sup>) are the third-most frequent<sup>28</sup> billion-dollar extreme weather event that the United States experiences, following severe storms and hurricanes or tropical cyclones, respectively. Inland flooding is the leading cause of death attributed to tropical cyclones.<sup>29</sup> Closely tied<sup>30</sup> to the rise in severe and more frequent hurricanes, sea level rise—caused<sup>31</sup> by rapidly melting ice sheets and glaciers and thermal expansion of warming waters, again due to a global rise in temperatures—can significantly amplify the devastation caused by extreme weather events. Rising sea levels increase the frequency of flooding during hurricanes, tropical cyclones, and even previously less-destructive severe storms. Climate change often makes storms slower-moving and more moisture laden<sup>32</sup> due to increased evaporation, resulting in lingering storms that can release a deluge of rain—and subsequent flooding—on a single geographic location unprepared to deal with the effects. For example, Hurricane Harvey<sup>33</sup> in 2017 intensified over the Gulf of Mexico before making landfall and slowing to 5 miles per hour, dumping as much as 60.28 inches of rain over a single area in four days.

Already in 2021, places such as Louisiana have experienced<sup>34</sup> widespread flooding and damage to infrastructure and homes due to torrential rainfall. The area around Lake Charles, in southwestern Louisiana, was inundated with more than 12 inches of rainfall in 12 hours, leaving thousands of residents without power, vehicles stranded, and more than 250 people in need of water rescues.<sup>35</sup> The impacts to the region's communities are even worse since the area is still recovering from hurricanes Laura and Delta from the previous hurricane season nine months prior. And it is not just

coastal flooding from climate change: Parts of the Midwest, including Michigan, have also experienced<sup>36</sup> an increased number of flooding events this year as a result of heavy rainfall over short periods of time that overwhelmed<sup>37</sup> the local sewage and water infrastructure.

In fact, in late August, catastrophic flash flooding in central Tennessee tragically took the lives of at least 21 people, with dozens more still unaccounted for.<sup>38</sup> The region was hit with a quickly formed weather system—propelled by warmer atmospheric temperatures holding more moisture—that dumped more than 17 inches of rain during a 24-hour period, breaking the previous state record of 13.6 inches.<sup>39</sup> The enormous amount of rain overwhelmed the network of creeks and streams that crisscross the region, resulting in a 1 in 1,000-chance event from which the community is still recovering.<sup>40</sup>

### Severe storms

NOAA's severe storm category encompasses events in which instances of tornadoes, high winds, and/or hail<sup>41</sup> may occur. The climate change forces that are driving hurricanes, tropical cyclones, and flooding to be more destructive are similarly worsening the impacts of severe storms and are driving more storms to be classified as “severe.” Severe storms account for 46 percent of all the billion-dollar extreme weather events that NOAA has ever recorded.<sup>42</sup> In 2020 alone, these storms made up 59 percent of the year's 22 extreme weather events and cost \$34.8 billion, well above the average annual cost of \$7.3 billion.<sup>43</sup> The powerful derecho<sup>44</sup> that swept across the central United States last year, with winds of 100 miles per hour, rain, and at least 15 tornadoes, was the nation's second-costliest severe storm to date, totaling \$11.5 billion in damages to homes, infrastructure, and crops.<sup>45</sup> As this makes clear, severe storms have the potential to cause widespread damage to areas they affect.

### Drought and heat waves

Higher temperatures caused by climate change also result in more soil evaporation,<sup>46</sup> contributing to in-year and multiyear droughts across the country and further perpetuating extreme heat waves. Drought conditions are defined<sup>47</sup> as a lack of precipitation resulting in water shortages. These conditions can lead<sup>48</sup> to drier vegetation, which can act as fuel for wildfires; have negative agricultural impacts; decrease the amount of available snowpack; and cause extreme water shortages for wildlife, agriculture, and population centers alike. Heat waves, brought on by spiking temperatures<sup>49</sup> that are then trapped in the atmosphere by greenhouse gases, are also increasing in frequency and severity<sup>50</sup> across all 50 states, and are lasting an average of four days. Additionally, heat waves are happening both on land and in the ocean,<sup>51</sup> with devastating impacts for the ocean economy, wildlife, and ecosystems.

Since 1980, droughts and heat waves together have cost an annual average of \$6.4 billion and are the deadliest extreme weather event over a 30-year average.<sup>52</sup> Texas, North Dakota, and Kansas are the three states with the highest costs<sup>53</sup> from droughts since 1980. Currently, 47.33 percent<sup>54</sup> of the contiguous United States is considered

to be experiencing drought conditions. Furthermore, recent studies<sup>55</sup> warn that extreme heat events will worsen drastically in the coming decades if the United States does not curb greenhouse gas emissions. Record-breaking heat waves are expected to more than double in frequency in the Northern Hemisphere in the coming decades, posing increased threats to both people and the broader environment.



The Center for American Progress recently published recommendations for how U.S. legislators can address the heat crisis.

[Read: "It's Time for Congress To Protect Americans From Deadly Extreme Heat."](#)

In addition to June 2021 being the hottest<sup>56</sup> June on record in the contiguous United States, that month saw the Pacific Northwest experiencing a record-shattering heat wave<sup>57</sup> that brought temperatures into the 100-degree Fahrenheit range—incredibly high for a region that averages 77 degrees Fahrenheit at that time of year.<sup>58</sup> That prolonged heat dome resulted in nearly 200 deaths,<sup>59</sup> more than 1 billion sea creatures getting cooked alive<sup>60</sup> in their shells, and drier vegetation<sup>61</sup> with the potential to contribute to increased wildfire danger later this season. Furthermore, heat waves disproportionately affect vulnerable populations<sup>62</sup> such as people experiencing homelessness, farm workers and laborers, the elderly, and people without access to air conditioning.

### Wildfires

The Western United States is ravaged by wildfires year after year, and studies show that wildfires are only going to get more intense and destructive.<sup>63</sup> The 2018 wildfire season was the most catastrophic<sup>64</sup> on record in the United States, costing \$25.7 billion and burning 8.7 million acres.<sup>65</sup> The three most expensive wildfire years occurred in the past four years: \$25.7 billion in 2018, \$19.6 billion in 2017, and \$17.1 billion in 2020.<sup>66</sup> In comparison, the average annual wildfire season costs about \$5.9 billion,<sup>67</sup> taking into account available data since 1980. The costs<sup>68</sup> associated with wildfires are mostly attributed to damage to infrastructure and firefighting services.

The increased frequency of drought and higher temperatures spurred by climate change result<sup>69</sup> in less snowpack and precipitation. The resulting drier vegetation, coupled with stronger winds, provides limitless fuel for more extreme<sup>70</sup> fires. For example, the Dixie Fire currently burning in northern California worsened significantly due to existing and long-term drought conditions and prolonged high temperatures. Even worse, experts forecast<sup>71</sup> that it may continue to burn until late fall when rains are expected in the region. In addition to damage to property and loss of human lives, smoke from these wildfires poses health risks to those in the immediate area and, as many people on the East Coast experienced in July, as far as 3,000 miles away.<sup>72</sup>

Like other instances of climate change-fueled extreme weather, damages from wildfires also tend to disproportionately affect<sup>73</sup> low-income people and people of color who often do not have the ability to recover from the impacts of wildfire. Black and Hispanic people are 50 percent more vulnerable to the impacts of wildfires than white people, and Native Americans are six times more vulnerable.<sup>74</sup> Additionally, wildfire smoke is often detrimental to public health. A recent study found that smoke from wildfires is directly linked to a surge in COVID-19 cases in Oregon, California,

and Washington, where fires are currently occurring. Moreover, when inhaled, fine particulate matter—also known as PM2.5—can cause inflammation of the respiratory system, worsen existing conditions such as asthma, and result in worse outcomes from contracting the coronavirus.<sup>75</sup> The Centers for Disease Control and Prevention (CDC) recommends that those at higher risk of COVID-19 take extra precautions when the air quality in their community is rendered unhealthy by wildfire smoke.<sup>76</sup>

### Winter storms and freezes

Climate change does not just mean warmer weather; it also means wetter atmospheric conditions that can lead to supercharged winter storms.<sup>77</sup> The combined wetter atmosphere and warmer temperatures result in a greater rate of evaporation and the perfect conditions for increased snowfall in certain regions of the United States. (These regions tend to be different than those experiencing extreme drought.) The path of storms is increasing the frequency with which the United States experiences winter storms. Research also illustrates that winter storms are lingering longer due to the changing of the jet stream.<sup>78</sup> The weakening<sup>79</sup> of the jet stream can also lead to polar vortex<sup>80</sup> conditions with unusually frigid temperatures such as those that much of the central United States, including Texas, experienced<sup>81</sup> earlier in 2021.

NOAA estimates that since data collection began in 1980, winter storms and freeze events have resulted in \$2.5 billion in damages per year.<sup>82</sup> The February 2021 Texas winter storm event alone caused a sustained average temperature drop 40 degrees Fahrenheit below normal; the temperature was 8 degrees Fahrenheit in Austin.<sup>83</sup> The storm resulted in power outages that affected 10 million people, and it cost<sup>84</sup> \$20.4 billion total—the costliest superstorm ever recorded. Some researchers estimate the true costs<sup>85</sup> to be from \$80 billion to \$130 billion in direct and indirect economic losses. The events in Texas revealed vulnerabilities in the energy infrastructure of a state not prepared for this kind of extreme weather event—an event that will only become more frequent and potentially severe with climate change.

### What's next

Despite the most recent IPCC report's conclusion that many of the changes in climate that are fueling extreme weather are “locked in”<sup>86</sup>—meaning quick action now will not reverse their effects—there is still a window of time in which to take urgent action to transition to a 100 percent clean energy economy and stop additional worse effects from happening. As the foreword<sup>87</sup> of the IPCC's Sixth Assessment states, “Every bit of warming matters.” Right now, Congress has a once-in-a-generation opportunity through budget reconciliation<sup>88</sup> to invest in meaningful climate action that has the power to transform the U.S. economy.

The Senate-passed budget resolution to begin the reconciliation process would fund a few key transformative programs, including a clean energy payment program and tax credits that would support additional deployment of clean energy and achieve 80 percent clean electricity by 2030; tax credits for electric vehicles and rebates for more efficient home appliances to make clean technology more affordable for American households;

and the Civilian Climate Corps,<sup>89</sup> a jobs program that would put people to work fighting the climate crisis. Furthermore, the Biden administration's commitment to delivering environmental justice would deliver 40 percent of the benefits of these investments to disadvantaged communities—many of them communities of color too long overburdened by a toxic legacy of pollution—through the Justice40 initiative.<sup>90</sup> Finally, Congress must continue to invest in climate science,<sup>91</sup> research, and modeling to keep pace with the changes occurring in the physical world and help policymakers understand how to confront and adapt to them.

For those changes that are already locked in—the severity and increased frequency of extreme weather events, and the damage and destruction they cause—the United States must prioritize mitigation, preparedness, and resilience to protect communities from the worst effects and help them recover. To do this, Congress should appropriate higher levels of funding to federal programs such as the Weatherization Assistance Program. This program would help communities combat the grueling effects of extreme heat,<sup>92</sup> including its effects on energy affordability, through improvements to energy efficiency and performance in the homes of limited-income residents. Additionally, investing \$10 billion, through budget reconciliation, for coastal restoration<sup>93</sup> and resilience projects such as restoring blue carbon ecosystems, such as mangroves and coastal wetlands, can increase the ability of these natural systems to sequester carbon. Other forms of natural infrastructure, such as coral reefs and salt marshes, can further protect coastal communities vulnerable to the impacts of storm surge, hurricanes, and tropical storms. Additional funds for the U.S. Department of Housing and Urban Development's (HUD) Community Development Block Grant Mitigation Program<sup>94</sup> would help support climate-ready community development, including resilient infrastructure and affordable, energy-efficient housing.

Finally, Federal Emergency Management Agency (FEMA) programs<sup>95</sup> such as Building Resilient Infrastructure and Communities, the Hazard Mitigation Grant Program, the National Flood Insurance Program, and the Flood Mitigation Assistance Program can be improved and further funded to advance mitigation and the preparedness of communities, especially low-income communities and communities of color, as well as post disaster relief. However, programs are only as good as their implementation, and the government must take intentional care<sup>96</sup> in administering these programs in ways that remove the racial biases that have consistently denied people of color the essential resources they need to repair and rebuild their homes and that maximize the benefits that climate-impacted and disadvantaged communities receive.<sup>97</sup>

In addition to mitigating the worst effects of extreme weather and climate change that are already locked in, Congress should not miss this opportunity to make every fraction of a degree count. It should move swiftly to pass comprehensive reconciliation legislation that invests in a just and equitable economy of the future.



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## Conclusion

As the recent IPCC report underscores, climate change will only continue to exacerbate extreme weather disasters. The United States will continue to see an increase in frequency, intensity, and cost of these disasters if leaders do not take bold action. Congress has the opportunity to make a huge leap forward in addressing the planet-warming, storm-fueling greenhouse gas emissions that have spurred or worsened so many of these billion-dollar disasters. By enacting the full scope of President Biden's Build Back Better agenda, Congress can make aggressive and meaningful investments in climate action. Science indicates that the international community only has a few years left for impactful action. The time is now.

**Authors' note:** *This issue brief does not include extreme weather events occurring after August 23 due to timing constraints associated with readying the piece for publication. Such events include Hurricane Henri making landfall as a hurricane in Connecticut—the first time this has occurred in 30 years, and causing record levels of flooding<sup>98</sup>—and the explosive Caldor Fire in California, as well as many additional wildfires currently burning in the West. Tragically, Hurricane Ida made landfall in Louisiana on August 28, the anniversary of Hurricane Katrina, as a Category 4 storm with maximized sustained winds of 150 miles per hour. Ida's destructiveness was magnified by warming water temperatures in the Gulf that allowed the storm to pick up more moisture.<sup>99</sup> These events, which occurred even as CAP moved toward publication, provide further evidence climate-fueled extreme weather is increasing in pace and severity and that Congress must act now.*

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