



Heavy Weather: How Climate Destruction Harms Middle- and Lower-Income Americans

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Introduction and summary recommendations

The devastating and tragic Hurricane Sandy and its connected storms caused a huge swath of destruction in the mid-Atlantic region of the United States on October 29, before then dumping vast quantities of snow in the Midwest. The storm is responsible for at least 110 fatalities in the United States and preliminary estimates indicate that it caused \$30 billion in damages, with only one-quarter to one-half covered by insurance.¹ It may be one of the costliest U.S. hurricanes in history.²

Unfortunately, Sandy is only the latest in a line of extreme weather events that severely afflicted Americans over the past two years. This includes destructive wildfires in Colorado, record-breaking temperatures across the nation, and severe thunderstorms and tornadoes across the Midwest. Farmers in the Great Plains are expecting to harvest just a fraction of their corn and other crops this year as the worst drought in 50 years plagues nearly two-thirds of the nation.³ Vicious heat waves, wildfires, hurricanes, and severe storms left more than 1,000 people dead. These are the extreme weather events that scientists predict will become more frequent and/or severe if the industrial carbon pollution responsible for climate change remains unchecked.⁴

Scientists and government agencies documented the devastating extreme weather events in 2011 and 2012. The National Oceanic and Atmospheric Administration reported 14 weather events that caused at least \$1 billion in damages each in 2011. By our estimates, from January through October 2012, there were at least seven additional extreme weather events with more than \$1 billion in damages each, with total damages from the two years combined topping \$126 billion.⁵ In addition to these events, economists predict that the 2012 drought will cause between \$28 billion and \$77 billion in damages, potentially bringing the two-year total to \$174 billion.⁶

The events during this time affected all but 4 of the lower 48 states. A recent study by Munich Re, the world's largest reinsurance firm, found that North America is experiencing a tremendous rise in extreme weather disasters—a nearly fivefold increase over the past three decades.⁷ The firm concluded that this is due to climate change and that this trend will continue in the future.⁸

One overlooked aspect of these disasters, however, is the rate at which they harm middle- and lower-income households—people who are less able to quickly recover from such disasters. This Center for American Progress analysis finds that on average, counties with middle- and lower-income households were harmed by many of the most expensive extreme weather events in 2011 and 2012. (see Table 1)

TABLE 1
Billion Dollar Extreme Weather Events by category, January 2011 through October 2012

Type of extreme weather	Events with damages totaling \$1 billion or more	Fatalities	Estimated economic damages (in billions of 2012 dollars)	Estimated damages per household in affected counties (in 2012 dollars)	Estimated median household income of affected counties (in 2012 dollars)	Estimated percent difference between disaster area median household income and U.S. median income
Floods	2	12	\$5	\$720	\$44,547	-14%
Droughts and heat waves	2	181	\$40 - \$88	N/A*	\$49,340	-5%
Wildfire**	2	12	\$2	\$355	\$50,410	-3%
Severe thunderstorms, tornadoes, hail and/or wind	10	590	\$33	\$1,022	\$50,293	-3%
Winter storms	1	36	\$2	\$186	\$51,977	0.1%
Tropical storms and hurricanes	4	183	\$43	\$1,056	\$59,155	14%

Note: U.S. Median household Income: \$51,914; Median income figures are Census Bureau 2005-2010 average

*Drought primary affects farmers, so damages per household was not calculated.

**Wildfires defined by NOAA as entire seasons costing \$1 billion, rather than individual fires. States included incurred at least \$50 million in costs from wildfires in 2012.

Sources: National Oceanic and Atmospheric Administration; U.S. Census Bureau; National news outlets

Most of these extreme weather events typically harmed counties with household incomes below the U.S. median annual household income of \$51,914:

- Floods damaged households in affected counties with average household incomes of \$44,547 annually—14 percent less than the U.S. median income
- Drought and heat waves affected counties with households that earned an average of \$49,340 annually—roughly 5 percent less than the U.S. median income.
- Wildfires, tornadoes, and severe thunderstorms devastated areas with households that earned an average of \$50,352 annually—3 percent less than the U.S. median income.

In fact, tropical storms and hurricanes were the only types of extreme weather events that affected more-well-off areas, on average, since January 2011. (see Table 2)

TABLE 2
The high cost of extreme weather

Estimated economic damages from U.S. extreme weather events that cost at least \$1 billion, 2011 and 2012

Event rank by economic damages	Event Name	Date	Fatalities	Estimated economic damages in billions of dollars (2012)	Estimated percent difference between disaster area median household income and U.S. median income	States with counties affected by \$1 billion+ extreme weather events
1	Hurricane Sandy	Oct-12	110	\$30.0	18%	CT, DC, DE, MA, MD, NC, NH, NJ, NY, RI, VA, VT, WV
2	Drought and heat wave (2012)	2012	86	\$28.0	-7%	AR, CO, GA, IA, IL, IN, KS, MS, MT, NE, NM, OK, SD, TX, UT, WY
3	Drought and heat wave (2011)	2011	95	\$12.2	-6%	AZ, KS, LA, NM, OK, TX
4	Southeast/Midwest tornadoes	April 25-28, 2011	321	\$10.4	-9%	AL, AR, GA, IL, KY, LA, MO, MS, OH, OK, TN, TX, VA
5	Hurricane Irene	Aug-11	45	\$10.0	24%	CT, DC, MA, MD, NC, NJ, NY, RI, VA, VT
6	Midwest tornadoes (including Joplin)	May 22-27, 2011	177	\$9.3	0.4%	AR, GA, IL, IN, KS, KY, MN, MO, OH, OK, PA, TN, TX, VA, WI
7	Mississippi River flood	May-11	7	\$3.1	-18%	AR, LA, MO, MS, TN
8	Southeast/Midwest tornadoes and severe storms	April 4-5, 2011	9	\$2.9	-11%	GA, IL, KS, KY, MO, NC, SC, TN
9	Severe tornadoes and storms	April 8-11, 2011	-	\$2.2	-13%	AL, IA, KS, NC, OK, SC, TN, TX, WI
10	Severe tornadoes and storms	April 14-16, 2011	38	\$2.1	-13%	AL, AR, GA, MS, NC, OK, PA, SC, TX, VA
11	Missouri River flood	Summer 2011	5	\$2.0	-4%	IA, KS, MO, MT, ND, NE, SD
12	Hurricane Isaac	Aug-12	7	\$2.0	-10%	AL, FL, LA, MS
13	Groundhog Day blizzard	February 1-3, 2011	36	\$1.8	0.1%	IL, MO, NM, OK, WA, WI
14	Severe storms and hail	June 6-7, 13, 2012	-	\$1.7	9%	CO, TX, WY
15	Severe tornadoes and storms	March 2-3, 2012	39	\$1.5	-7%	AL, GA, FL, OH, IL, IN, KY, MS, SC, TN, VA, WV
16	Severe tornadoes and storms	June 18-22, 2011	3	\$1.3	1%	GA, IA, IL, KS, MO, NC, NE, OK, SC, TN, TX
17	Tropical Storm Lee	Sep-11	21	\$1.3	18%	AL, CT, GA, LA, MD, MS, NJ, NY, PA, TN, VA
18	Wildfire season*	2012	7	\$1.1	9%	CA, CO, ID, MT, NM, UT
19	Wildfire season*	2011	5	\$1.0	-6%	AZ, NM, TX
20	Severe tornadoes and storms	July 10-14, 2011	2	\$1.0	2%	CO, IA, IL, MI, MN, OH, WY
21	Severe tornadoes and storms	April 3, 2012	-	\$1.0	-1%	TX
Total	21 events	-	1,013	\$126	-	44 States

Note: U.S. Median household Income: \$51,914; Median income figures are Census Bureau 2005-2010 average

*Wildfires defined by NOAA as entire seasons costing \$1 billion, rather than individual fires. States included incurred at least \$50 million in costs from wildfires in 2012.

Sources: National Oceanic and Atmospheric Administration; U.S. Census Bureau; National news outlets

In the following sections, we review the most damaging extreme weather events in the United States over the past two years, the household income of the counties harmed by them, and how climate change is increasing the frequency and severity of these devastating disasters. We also explain why middle- and lower-income Americans are disproportionately harmed by extreme weather events.

In order to curb climate change and help communities prepare for future extreme weather events, we propose a list of policy recommendations, detailed at the end of this report:

- The Obama administration should promulgate the proposed carbon pollution reduction standard for new power plants ⁹
- The administration should propose and promulgate carbon pollution standards for existing power plants and oil refineries
- Existing infrastructure should be hardened to become more resilient to floods, severe storms, and other effects of climate change
- Congress should provide \$5 billion annually—full funding—for the Low Income Home Energy Assistance Program, or LIHEAP, to assist low-income families with higher utility bills due to extreme heat and cold
- The Obama administration and Congress should oppose budget cuts in the Supplemental Nutrition Assistance Program to ensure that there is adequate funding for Disaster SNAP that assists people harmed by natural disasters to purchase food
- Congress should reauthorize the National Dam Safety Program and provide \$1 billion annually to rehabilitate our rundown dam and levee infrastructure that helps reduce flood risk
- Flood insurance for primary homes of middle- and lower-income households should be more affordable. A means-tested voucher program could help them purchase it
- Replenish the Pre-Disaster Mitigation Program fund, which enables local communities to evaluate their disaster risks and develop plans to make them more resilient to extreme weather damages. This annual funding should equal the three year average of federal disaster recovery spending

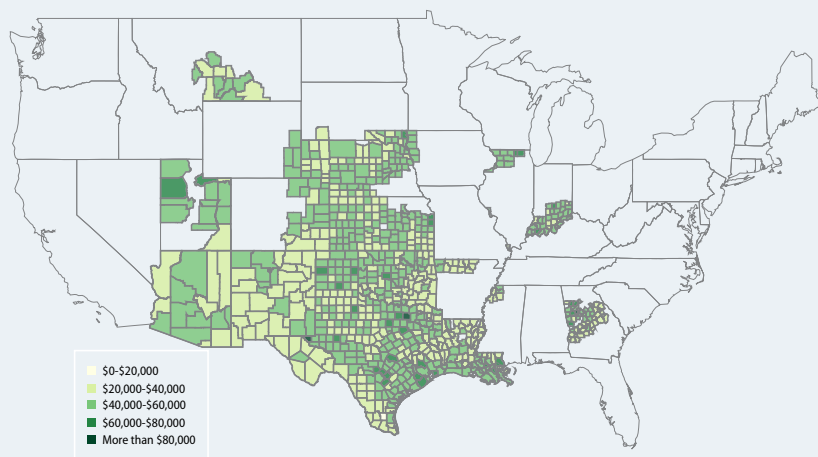
U.S. most damaging extreme weather in 2011-2012

Extreme heat, drought, and wildfires

Ongoing heat, especially in the Midwest, has intensified drought conditions. Nearly two-thirds of the United States experienced “severe or extreme” drought by October 2012,¹⁰ and more than 50 percent of the country was still experiencing drought conditions in early November 2012.¹¹ Moreover, drought and heat wave events impacted areas with households earning an average of \$49,340—5 percent below the U.S. median annual household income of \$51,914.

Extreme heat and drought

Median household income for counties affected by billion-dollar extreme weather events in 2011-2012*



* A NOAA official indicated these counties as places most likely to be included in the administration's calculation of the \$1 billion+ damages from the 2012 drought. Generally, these counties experienced the most severe drought, indicating the largest potential damages.

Fast facts

- September 2011 to August 2012 was the hottest 12-month period in U.S. history
- 181 heat-related fatalities occurred as part of the heat wave events that caused more than \$1 billion in damages in 2011 and 2012
- Half of the United States is still in moderate drought or worse as of November 1, 2012
- Drought damages in 2012 alone are estimated to total between \$28 billion and \$77 billion

The intense heat waves in 2011 and 2012 took more than 181 lives and set a flurry of temperature records across the nation.¹² The United States experienced the warmest 12-month period in history from September 2011 to August 2012.¹³ More than 28,000 daily high-temperature records were matched or broken as of

September 12, 2012.¹⁴ More than 80 million people lived in places that reached temperatures of 100 degrees Fahrenheit or more in 2011 and 2012.¹⁵ And from January 2012 through July 2012, daily record highs outnumbered daily record lows 12-to-1.¹⁶ (see Box)

September 2012 was the driest month for Montana, North Dakota, and South Dakota in 118 years of recordkeeping. It was the third-driest month for Nebraska and Oregon. Mark Svoboda, a climatologist with the University of Nebraska's National Drought Mitigation Center, said that soil moisture is such a major concern that farmers in the Great Plains are struggling to decide if it's even worthwhile to plant winter wheat crops.¹⁷ Even the intense precipitation from Hurricane Sandy did not provide relief for key farming states as it skipped over the severe drought in the Midwest.¹⁸

A Purdue University economist estimates that the 2012 drought will cause up to \$77 billion in economic costs,¹⁹ and experts at the University of Illinois predict that taxpayers will ultimately be responsible for at least \$10 billion of these costs.²⁰ The U.S. Department of Agriculture also projects a lower corn harvest as the drought's impact becomes clearer. Farmers in some states are seeing production levels as low as 37 percent below last year's yields.²¹ The chief U.S. economist at Deutsche Bank Securities Inc. recently said that the 2012 drought will reduce U.S. economic growth by up to 1 percentage point this year, largely as a result of reductions crop sales.²²

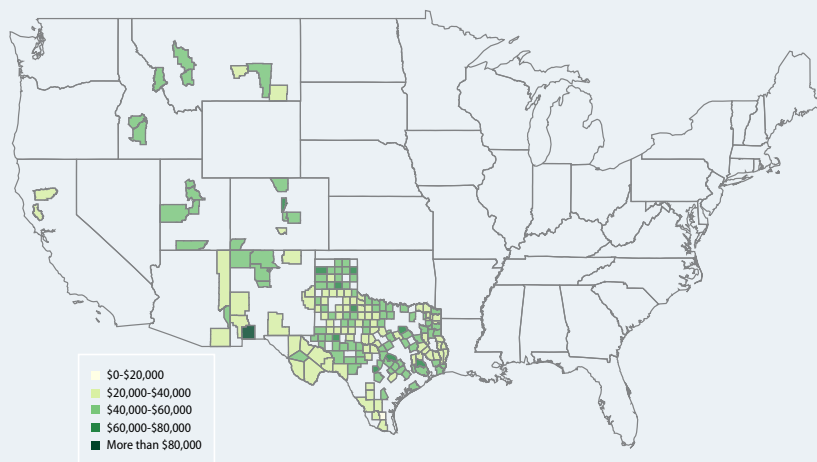
Even though the drought is slowly improving, agronomists caution that "the threat has not passed." Farmers are haunted by some of the lowest levels of soil moisture in years—climate experts say that farmers would need "5 to 6 feet of snow on top of more than 15 inches of rain over the next few months just to get back to normal."²³ A U.S. Department of Agriculture meteorologist told Reuters that "it is highly unlikely that we will see drought eradication by next spring."²⁴

In addition to the adverse consequences for farmers, these events also have significant impacts on states' economies, particularly those heavily dependent on agriculture. The 2011 drought "will have a lasting impact on Texas agriculture," said Travis Miller, an agronomist and member of Texas's Drought Preparedness Council.²⁵

Both extreme heat and droughts contribute to wildfires, which have also dramatically increased in recent years. High temperatures coupled with low humidity makes fuels from trees and grasses very dry and flammable, ripening conditions for fire.²⁶

Wildfires

Median household income for counties affected by billion-dollar extreme weather events in 2011-2012*



*Wildfires defined by NOAA as entire seasons costing \$1 billion, rather than individual fires. States included incurred at least \$50 million in costs from wildfires in 2012.

Fast facts

- 17.7 million U.S. acres have burned in 2011 and 2012, nearly the combined area of Massachusetts, New Hampshire, and Vermont
- 126,179 individual fires burned in 2011 and 2012 (as of October 31, 2012)
- Seven states had wildfires that burned through the end of September 2012

The 2012 wildfire season was the worst in decades and broke records across multiple states. Colorado saw the most destructive wildfire in its history burn 346 homes. New Mexico had the largest fire in state history, and Montana experienced the most acreage burned in the state since 1910.²⁷ Since 2011 more than 126,179 fires have burned 17.7 million U.S. acres—roughly the area of Massachusetts, New Hampshire, and Vermont combined.²⁸

The 2012 wildfires were so extensive and severe that the U.S. Department of Agriculture Forest Service ran out of money to fight them. Congress was faulted by forestry experts for providing only half of the necessary \$1 billion to battle wildfires in 2012, primarily due to relying on past, lower firefighting needs. Darryl Fears of *The Washington Post* writes:

*[Forestry experts] argued that the traditional method that members of an appropriations conference committee use to fund wildfire suppression—averaging the cost of fighting wildfires over the previous 10 years—is inadequate at a time when climate change is causing longer periods of dryness and drought, giving fires more fuel to burn and resulting in longer wildfire seasons.*²⁹

The households affected by wildfires in 2011 and 2012 earn an average of \$50,410 annually—3 percent below the U.S. median annual household income. In August

2012, for example, the destructive fires hit home, literally and figuratively, in Northern Cheyenne, Montana. The Ash Creek Fire burned through a reservation where one in three families lives below the poverty line—\$11,170 for an individual and \$23,050 for a family of four—and almost two-thirds of the adult tribal members are unemployed, making it difficult for residents to recover from such a costly disaster.³⁰

Reuters reported that on top of taking lives and property, “fires threaten human health by pumping smoke, containing noxious gases like carbon monoxide and fine particles, into the mountain valleys.”³¹ Recent wildfires triggered numerous air quality warnings in Idaho, Montana, and Wyoming.

The 2011 wildfire season also disproportionately affected lower-income areas. In the first week of September 2011, the Bastrop fire raged in central Texas, burning more than 34,000 acres and consuming almost 1,700 homes.³² The fire broke the Texas record for the number of homes lost due to a single fire, in a county where 14 percent of the households are at or below the poverty line.

A 2006 report by the U.S. Department of Agriculture demonstrated that low-income communities suffer unequally from wildfires. It concluded that “fewer resources are being allocated in some regions to the poorest citizens in communities that may need the most assistance.”³³ And a 2001 study by the Center for Watershed and Community Health contained similar findings:

*Wildfires intensify poverty by having a pervasive, disproportionately negative impact on those households and communities lacking adequate resources to reduce the flammability of nearby wild lands, fire-proof homes and other structures, respond quickly when wildfires occur, and recover from economic losses resulting from fires. The impacts also go in the reverse direction, with poverty increasing the incidence of wildfires, raising the costs of fighting fires, and creating additional risks for firefighters.*³⁴

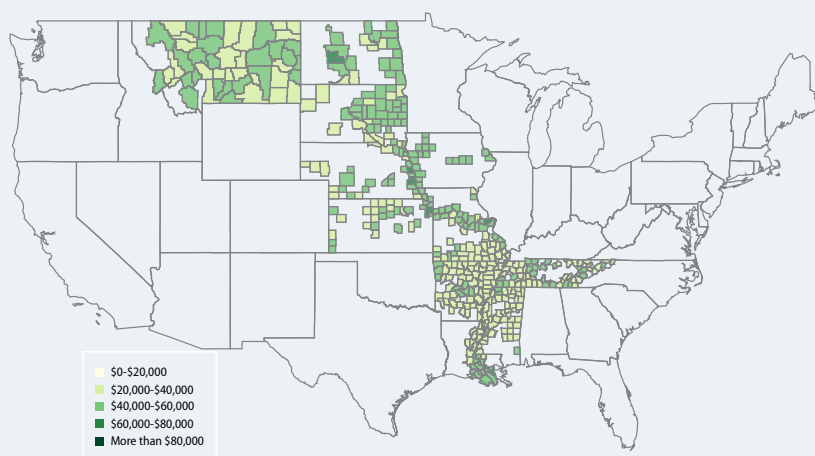
This is a major problem that will continue to grow over time. The United States should expect that larger wildfires will occur more often, according to a recent report from the nonprofit news and research organization Climate Central.³⁵ The study indicates that the Western wildfire season now lasts 10 weeks longer than in the 1970s and that big burns are likely to become the norm.³⁶

Harris Sherman, under secretary for natural resources and the environment at the U.S. Department of Agriculture, oversees the U.S. Forest Service and told *The Washington Post* that “the climate is changing, and these fires are a very strong indicator of that.”³⁷

Floods and extreme precipitation

Floods and extreme precipitation

Median household income for counties affected by billion-dollar extreme weather events in 2011-2012



Fast facts

- A single flood damaging a low-income household can push that household below the poverty line
- Mississippi River and Missouri River floods caused \$5 billion in economic damages in 2011
- Households in areas affected by the largest floods in 2011 and 2012 earn an average of 14 percent less than the U.S. median annual household income

Climate change has also increased the severity of precipitation events. Kevin E. Trenberth, senior scientist at the National Center for Atmospheric Research, recently noted:

All weather events are affected by climate change because the environment in which they occur is warmer and moister than it used to be.

The air is on average warmer and moister than it was prior to about 1970 and in turn has likely led to a 5–10 % effect on precipitation and storms that is greatly amplified in extremes. The warm moist air is readily advected onto land and caught up in weather systems as part of the hydrological cycle, where it contributes to more intense precipitation events that are widely observed to be occurring.³⁸

The Mississippi River and Missouri River floods in the spring and summer of 2011 caused billions of dollars of damage, particularly to lower-income homeowners near the rivers. The typical household in areas that suffered from these floods earns a staggering 14 percent below the U.S. median income, or roughly \$44,547 per year. (see Box)

As floodwaters rise to a certain maximum level, there are emergency outlets—spillways and floodways—that can be opened to divert waters out of rivers to decrease their volume of water.³⁹ In 2011 the high Mississippi River water levels led to the opening of all three existing emergency outlets—the Bonnet Carre Spillway, the Morganza Floodway, and the Atchafalaya Floodway—that release rising waters from the river. This was the first time in history that the U.S. Army Corps of Engineers opened all three simultaneously to decrease the flood risk.⁴⁰

The Missouri River surged to flood levels unseen since recordkeeping began in 1898. In June 2011 there was a record-breaking runoff of 13.8 million acre-feet of water, or 4.5 trillion gallons, in Sioux City, Iowa.⁴¹ The previous high was in April 1952.⁴²

As a result of these floods, farmers downstream in Arkansas, Mississippi, and Missouri suffered combined damages of \$1.5 billion.⁴³ Arkansas and Mississippi residents are particularly economically vulnerable because households in the disaster-declared counties in both states have average median incomes that are 23 percent and 30 percent, respectively, below the U.S. median income.

The Washington Post reported that “river flooding is making being poor in Mississippi even harder.”⁴⁴ And *The Boston Globe* said that “9 of the 11 counties that touch the Mississippi River in Mississippi have poverty rates at least double the national average.”⁴⁵ Similarly, researchers at Columbia University found that a single flood can knock low-income households below the poverty line.⁴⁶

“Poverty really makes a difference in one’s ability to survive these events,” said Jerold Kayden, a professor at the Harvard Graduate School of Design.⁴⁷ Poorer families are less mobile, making it difficult for them to leave their homes and find safety. They also lack the financial resources to protect themselves from major storms and rebuild after a storm hits. As *Scientific American* concluded, “The poor are going to be trapped with having lost everything ... and will have no money or resources” to recover.⁴⁸

Moreover, officials say that flooding is one of the most expensive and most common natural disasters.⁴⁹ Standard homeowner and renter insurance policies, however, don’t cover flood damage. Instead, property owners in flood-prone areas

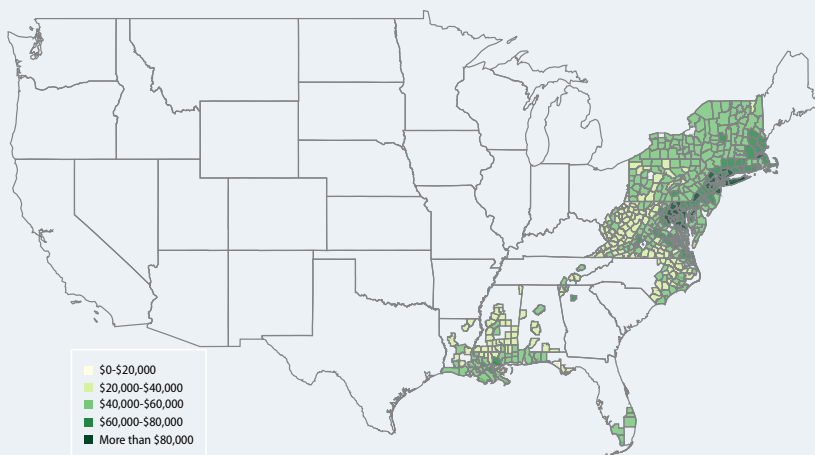
are required to purchase additional insurance through their provider or from the National Flood Insurance Program.⁵⁰

A Congressional Research Service report notes that the Federal Emergency Management Agency lacks nationwide data on the number of properties that are within floodplains. A Rand Corporation study from 2006, however, estimates that about 49 percent of properties in “special flood hazard areas” purchased insurance from the National Flood Insurance Plan. “Special flood hazard areas” are designated areas where homebuyers must purchase flood insurance in order to receive federally backed mortgages.⁵¹ Only 1 percent of properties outside of these areas purchased flood insurance. The Congressional Research Service indicates that there is concern “about the large number of homes that are not [federally backed] mortgages and thus are not required to be insured against flood risks.”⁵²

Hurricanes

Tropical storms and hurricanes

Median household income for counties affected by billion-dollar extreme weather events in 2011-2012



Fast facts

- Hurricane Isaac inflicted \$2 billion in damages and destroyed 13,000 homes in Louisiana and Mississippi in September 2012; the average annual income of these households was 10 percent below the U.S. median annual household income
- The journal *Science* predicts that the number of category 4 and category 5 hurricanes will double by the end of the century
- Lower-income and rural residents generally have less access to evacuation information in advance of tropical storms and hurricanes

Overall, hurricanes in 2011 and 2012 affected higher-income areas, but millions more Americans will be vulnerable to these storms in the future. According to the U.S. Census Bureau, 30 percent of the nation’s total population lived in the Atlantic and Gulf Coasts in 2010.⁵³ The population of

coastal watershed counties grew by 7.6 and 15.3 percent along the Atlantic and Gulf Coasts, respectively, between 2000 and 2010, and are projected to continue growing. And according to a new report from reinsurance firm Munich Re, “there has been a 35% increase in the size of storms in the Gulf of Mexico since 1995.”⁵⁴

Hurricane Sandy, which ravaged the mid-Atlantic region the week of October 29, 2012, is the latest in a line of recent extreme weather events that have severely afflicted Americans in the past two years. Sandy is responsible for at least 110 fatalities in the United States and preliminary estimates indicate that it caused \$30 billion in property damage.⁵⁵ It could be one of the costliest U.S. hurricanes ever.

Hurricane Sandy: The damages and aftermath

Here are some fast facts to bear in mind about Hurricane Sandy:

- Sandy resulted in at least 110 fatalities in the continental United States alone, in addition to 71 lives lost in the Caribbean
- More than 1 million people in a dozen states were ordered to evacuate their homes
- 8.5 million homes and businesses were without electricity at the height of the storm

Hurricane Sandy, combined with a mid-Atlantic blizzard, slammed over 20 states with high winds, record-breaking rains, and unseasonal and heavy snowfall.⁵⁶ The storm may have been one of the most severe to ever hit this region. Preliminary estimates indicate that it could cause \$30 billion in property damage, with less than one-half covered by insurance.⁵⁷

The worst hit areas were Long Island, New Jersey, and New York City. New Jersey Governor Chris Christie said that Sandy’s devastation is “beyond anything I thought I’d ever see... the level of devastation at the Jersey Shore is unthinkable.”⁵⁸

Although the average income level of households in areas hit by Sandy is well above the national median, there were multiple lower-income communities devastated by the storm. These places include Atlantic City, New Jersey and Kings County, New York (Brooklyn) as well as other parts of New York City. Residents in Atlantic City and Kings County earn 42 and 16 percent below the U.S. median household income, respectively.

New York City’s economic divide is among the highest in the nation.⁵⁹ Many people who were forced to evacuate their homes couldn’t afford to stay in a hotel, miss work, or easily rebuild their damaged homes. Tens of thousands of people were stranded in the city for over one week, without power, food, and water. As journalist Michelle Chen noted, “Residents’ levels of resilience to the storm—the capacity to absorb trauma—will likely follow the sharp peaks and valleys of the city’s economic landscape.”⁶⁰

Power outages spoiled food for many residents throughout the region. Participants in the Supplemental Nutrition Assistance Program were in particularly dire straights. The program uses swipe cards to purchase items with food stamps, but when the power is out, grocery stores can only accept cash.⁶¹ Additionally, the SNAP program had difficulty adding funds to the cards in a timely fashion. New York Gov.

Continued: Hurricane Sandy: The damages and aftermath

Andrew Cuomo ordered \$65 million in new funds for storm victim food stamp recipients, but many still hadn't received them over a week after the storm hit. As a result, many people were forced to rely on shelters and food pantries.⁶²

The Metropolitan Transit Authority transports an average of 8.7 million riders on weekdays. But within hours of Sandy striking, seven subway tunnels were flooded,⁶³ and the subway may not be back to full capacity for weeks.⁶⁴ The MTA described the situation as "the worst disaster in the subway's 108-year history."⁶⁵

Many lower- and middle-income residents rely on public transit to travel to and from employment, and purchase necessities. This disruption is especially hard on hourly-wage workers, which make up one-third of New York City's workforce.⁶⁶ Many of these employees will not be paid unless they work, yet commuting to and from employment may take hours rather than minutes due to public transportation disruptions.

New Jersey commuters also rely heavily on NJ Transit, which had 23 percent of its rail cars and 35 percent of its engines damaged or ruined by Sandy.⁶⁷ The train system typically serves more than 250,000 daily commuters.

Red Hook—part of Brooklyn—is home to the borough's largest housing project, of which roughly 4,000 of the 6,000 residents were without heat or water for over a week after the storm. Although local residences and businesses in Red Hook suffered from the five-foot floodwaters, just down the street, on the affluent side of town, a majority of the area had power and some businesses even reopened quickly.⁶⁸ One public housing complex resident said "this is a horrible experience" and that he has "never seen anything like this in all my 70 years in Red Hook."⁶⁹

Sandy's destruction spread south along the Atlantic coastline. Atlantic Ocean storm surges relentlessly flooded one of Atlantic City's poorest neighborhoods while casinos and beachfront properties were mostly shielded from the storm. Overall, about 25 percent of the city's population lives below the poverty line.⁷⁰ One of the hardest hit neighborhoods is home to some of the city's poorest residents, "many

of whom are black or Hispanic," *Bloomberg Businessweek* reported.⁷¹ The Army Corps of Engineers proposed a 1,600-foot seawall to protect residents from storm surges like Sandy almost 20 years ago, but was never built due to "lack of money." Linda Steele, president of the Atlantic City NAACP chapter, told *Bloomberg* that construction delays demonstrate that the government overlooked the needs of the poor and instead, gave priority to profitable gambling resorts.

In addition to these direct costs, there are huge public health impacts from flooding. One example is evident in several low-lying areas throughout New York. Over 600,000 people live and work in six communities deemed "Significant Maritime and Industrial Areas." These predominantly minority communities are found throughout the South Bronx, Newtown Creek, Brooklyn Navy Yard, Red Hook, Sunset Park, and Staten Island.⁷² Floods brought water badly contaminated by raw sewage and toxic chemicals including mercury. Dee Vandenburg, president of the Staten Island Taxpayers Association, said that spreading contamination in heavily populated areas will "get to a point where people get sick, so health care costs go up."⁷³

Elected officials from one of the hardest hit regions—New York City—made the connection between Hurricane Sandy and climate change. New York Governor Cuomo observed, "part of learning from this [disaster] is the recognition that climate change is a reality. Extreme weather is a reality."⁷⁴

New York City Mayor Michael Bloomberg went further, warning

*Our climate is changing. And while the increase in extreme weather we have experienced in New York City and around the world may or may not be the result of it, the risk that it might be – given this week's devastation – should compel all elected leaders to take immediate action.*⁷⁵

Some climate scientists explain that climate change increased Sandy's ferocity. Dr. Kevin E. Trenberth of the National Center for Atmospheric Research noted the warming Atlantic Ocean surface temperature provides the optimal conditions "for a huge intense storm, enhanced by global warming influences."⁷⁶

Just two months before Sandy hit the eastern seaboard, Hurricane Isaac slammed into the Gulf of Mexico, hitting lower-income counties there with households that earn an average of \$46,685 per year—10 percent less than the median U.S. annual household income. Isaac ripped up the Mississippi and Louisiana coasts, causing an estimated \$2 billion in losses.⁷⁷ The storm damaged at least 13,000 homes and disrupted electricity for 903,000 homes and businesses.⁷⁸

One of the areas hit hardest by Hurricane Isaac was St. John's Baptist Parish, Louisiana. The effects of the storm lingered in the region for days, engulfing homes with water up to four feet deep. Eleven percent of the parish's households are below the poverty line and only 35 percent of its residents have flood insurance.⁷⁹

In August 2011 Hurricane Irene roared up the East Coast of the United States. The price of this mammoth storm system's high winds and flood-inducing rains was nearly \$10 billion.⁸⁰ In North Carolina alone, the storm forced thousands of businesses to close and destroyed 1,100 homes.⁸¹ In total, at least 7.4 million homes lost electricity due to the storm.⁸² Well-heeled areas of New Jersey were among the areas hit hardest by the storm. Poverty-stricken communities, such as Paterson, New Jersey—where one-third of the households are below the poverty line—were hit too.⁸³ Irene also inundated some less-well-to-do parts of Vermont, where households on average earn 6 percent below the national median income.

The evidence demonstrating Irene harmed lower-income households includes a report from Virginia Commonwealth University, which says the hurricane caused “extreme demands” on the Central Virginia Food Bank that assists lower-income households:

‘Given the recent reports of increases in poverty, especially children living in poverty, compounded by the devastation of Hurricane Irene, we learned of the extreme demands on the Central Virginia Food Bank to provide for people in Central Virginia,’ [vice provost Cathy] Howard said.⁸⁴

Tropical Storm Lee followed closely on the heels of Irene, forcing more than 120,000 beleaguered easterners to evacuate to avoid dangerous flash floods.⁸⁵ Heavy rains soaked cotton fields in Virginia and South Carolina and pushed the price of cotton futures to a two-month high, according to *The Wall Street Journal*.⁸⁶ In all, the tropical storm caused more than \$1.3 billion in damages, much of which was uninsured.⁸⁷

Well into 2012, many families who lost their homes during Lee were still struggling with housing, according to Sen. Kristin Gillibrand (D-NY). In response, she proposed a low-income housing tax credit similar to the one enacted after Hurricane Katrina in 2005.⁸⁸ Volunteers in July 2012 cited more than 39 homes in York County, Pennsylvania, alone that still needed to be repaired after Lee.⁸⁹

In the wake of the storm, the New York State Energy Research and Development Authority released a report stating, “Minorities and low-income residents tend to live in areas vulnerable to flooding in New York City and upstate. ... rural residents and small towns are less able to cope with extreme events such as floods, ice storms and droughts.”⁹⁰

Unfortunately, a disconnect also exists between shrinking insurance coverage and increasing need for disaster relief. Sen. Mary Landrieu (D-LA) noted that the southern United States has a low percentage of homes with hazard insurance, which covers physical property damage incurred by incidents like fire, lightning, and wind.⁹¹ At a July 2011 hearing of the Subcommittee on Disaster Recovery and Intergovernmental Affairs, she said:

*The southern United States, where many of these storms hit, has the lowest hazard insurance absorption rate of any region in the country, at 82.6% compared to 96% nationwide, and in many parts of the South, poverty and unemployment rates vastly exceed the national average.*⁹²

The Louisiana senator added that “it is critical that our nation find a sustainable method to finance disaster risk for all segments of the population.”

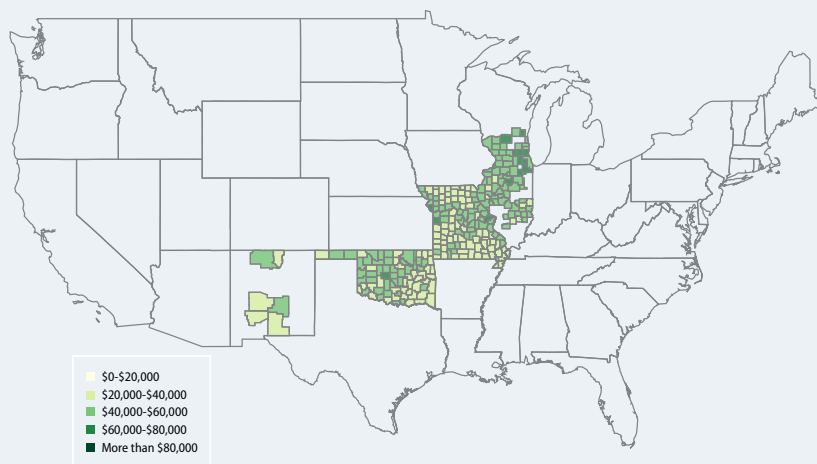
The damages from tropical storms will likely increase, as scientists predict these storms will become fiercer as climate change continues to warm the oceans. Science predicts that the number of category 4 and category 5 storms will double by the end of this century.⁹³ And a 2010 study commissioned by the World Meteorological Organization and published in the peer-reviewed scientific journal *Nature Geoscience* confirms that besides “substantial increases in the frequency of the most intense cyclones,” we can expect rainfall to increase by up to 20 percent in areas up to 60 miles from a storm’s center.⁹⁴ The National Oceanic and Atmospheric Administration adds that a 2 percent to 11 percent increase in the mean maximum wind speed of hurricanes is also “likely with projected 21st century warming.”⁹⁵

Joseph Romm, Senior Fellow at the Center for American Progress and editor of Climate Progress, agrees that climate change makes the deadly storms more severe, and that “it’s going to get much worse.”⁹⁶ Sea level rise from polar ice melting will make storm surges more destructive, and higher sea surface temperatures will amplify rainfall as well as flooding. It’s a frightening prospect to citizens and federal coffers alike. Romm stresses that “preserving the habitability of the Gulf and South Atlantic Coast post-2050 means the time to act on climate change is now.”⁹⁷

Heavier winter storms yet milder winters

Heavier winter storms yet milder winters

Median household income for counties affected by billion-dollar extreme weather events in 2011-2012



Fast facts

- The Groundhog’s Day Blizzard of 2011 was the worst snow storm in Chicago’s history, leaving 375,000 households without power; it blanketed 22 states in snow
- In many places, climate change will bring milder winters and severely harm ski resort tourism, with the 2011-12 season having 15.7 percent fewer visitors across the country

A large winter storm impacted 22 central, eastern, and northeastern U.S. states in early February 2011, leading to at least 36 fatalities and causing \$2 billion in economic damages. It resulted in Chicago’s third-largest snow accumulation ever—the two feet of snow from the storm brought the city to a standstill. More than 20 inches of snow accumulated in parts of Oklahoma. At one point the snowstorm blanketed 2,000 square miles covering 22 states with snow. More than 375,000 households lost power due to snow, ice, and powerful winds.⁹⁸ The storm affected areas with middle-class households that earn an average income equal to the U.S. median household income, or roughly \$51,977 per year.

Winter storms inflict direct and indirect costs on already cash-strapped state and local governments, and these costs increase dramatically in years with heavier-than-average snowstorms. In addition, the American Highway Users Alliance found that state economies lose up to \$700 million for each day of shutdowns from winter storms. Costs include lost wages, lost sales and sales tax revenue, and snow-related business closures.⁹⁹

To make matters worse, this snowpack, combined with above-average spring precipitation, resulted in significant flooding (previously described) across the Northern Plains and the Mississippi and Ohio River Valleys in late spring 2011.¹⁰⁰

A National Wildlife Federation report authored by climate scientist Amanda Staudt and two other scientists describes climate change's impact on winter weather as "seemingly peculiar,"¹⁰¹ because it leads to heavier yet less predictable precipitation events. This "peculiarity" was felt in the last few years, which brought several unusually heavy snowstorms.

Large, unpredictable snowstorms aren't the only wintertime symptom of a warming climate, however. While big storms can arrive unexpectedly, winter seasons overall have been increasingly milder as wintertime temperatures increase, particularly across the northern part of the United States.¹⁰²

This seasonal variability has huge implications for outdoor recreation and tourism industries. Americans spend more on snow sports (\$53 billion) than they do on hunting and fishing combined (\$40.3 billion), according to an analysis by the Outdoor Industry Association.¹⁰³ Ski resorts and other outdoor recreation companies need a long, consistent snow season to make a profit.

The 2011-12 ski season was the worst in 20 years due to an average snowfall that was 41 percent lower than the previous winter season. Five out of every six ski resorts nationwide had fewer visitors than the previous winter season as well—*The Denver Post* reported ski resort visitors across the country declined by 15.7 percent. Also as a result of the lower snowfall, half of the country's resorts opened late and closed early. The average number of days that resorts were open fell 7.5 percent.¹⁰⁴

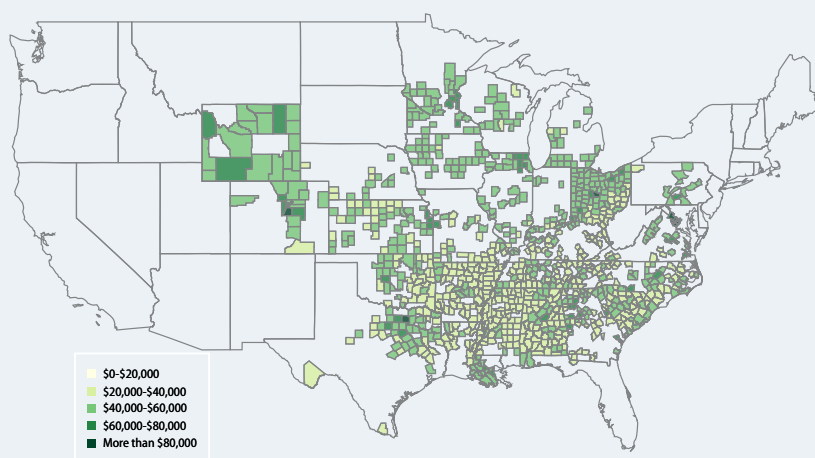
The *Post* indicated that ski operators hope that "2011-12 will remain the worst for another 20 years" and that the following year will be better. National Oceanic and Atmospheric Administration officials, however, predict that the 2012-13 winter season could be another warm one, in the Midwest and West, as the current

drought is expected to persist and possibly expand westward into ski country in Idaho, Montana, and elsewhere. Deke Arndt, chief of climate monitoring for the National Oceanic and Atmosphere Administration's Climatic Data Center, says "It is likely that 2012 will be the warmest of the 118-year record for the contiguous United States."¹⁰⁵

Tornadoes and severe storms

Tornadoes and severe storms

Median household income for counties affected by billion-dollar extreme weather events in 2011-2012



Fast facts

- Joplin, Missouri, which experienced the deadliest tornado in U.S. history in May 2011, has a poverty rate of 19.6 percent
- Half of tornado deaths nationwide occur to residents of mobile homes
- A warming climate helped fuel the fierce, early season of tornado outbreaks in 2012, according to Weather Underground meteorologist Dr. Jeff Masters

The relationship between tornadoes and a warming climate is less clear than for other extreme weather events, but Kevin E. Trenberth of the National Center for Atmospheric Research does believe that there is a connection. As he told Climate Progress: "What we can say with confidence is that heavy and extreme precipitation events often associated with thunderstorms and convection are increasing and have been linked to human-induced changes in atmospheric composition."¹⁰⁶

Harold Brooks, a research meteorologist at the National Oceanic and Atmospheric Administration, agreed that a warmer climate increases storm energy and therefore expects that "there will be more environments that are favorable for severe thunderstorms."¹⁰⁷

In March 2012 *USA Today* reported that “[t]he USA’s freakishly warm winter may have played a role in the ferocity of last week’s early-season tornado outbreaks.”¹⁰⁸ It cited meteorologist Jeff Master who noted that “a key ingredient for tornado formation is the presence of warm, moist air near the surface, which helps make the atmosphere unstable.” A warming Atlantic Ocean yields such conditions.

Certainly, the United States has experienced a higher rate of tornadoes and severe storms these past two springs, with estimated total damages exceeding \$32 billion. And these massive storms are affecting middle- and lower-income households. On average, these severe rainstorms and tornadoes harmed counties with households that earn about \$50,293 annually—3 percent less than the U.S. median annual household income.

Families that live in unprotected structures—those without access to a basement or shelter—are especially vulnerable to tornadoes. Specifically, National Weather Service data shows that the percentage of fatalities involving mobile homes is increasing. A Northern Illinois University study found that 50 percent “of all fatalities during tornadoes occur in mobile homes.”¹⁰⁹

Furthermore, while higher-income families have insurance to replace lost homes, furniture, and belongings, lower-income families often do not. “I dropped the insurance on the house because I couldn’t pay it no more. The economy got me,” said Robert Jamison of North Birmingham, Alabama, whose house was destroyed in an Alabama tornado on May 5, 2011.¹¹⁰ In the aftermath of tornadoes, vulnerable people were even more victimized. A Kansas City newspaper reported that after the 2011 tornadoes, “evictions spiked and rents soared. Scam artists victimize[d] homeowners, and some landlords [took] advantage of renters.”¹¹¹

Though the tornadoes in 2012 were far less destructive compared to those in 2011, severe storms during the 2012 season—late winter to early summer—still inflicted more than \$1 billion in damages each.¹¹² Three events in 2012 hit the South and Midwest in the spring of 2012, resulting in a combined \$4.2 billion in damages.

The National Oceanic and Atmospheric Administration reported that there were an unusually high number of tornadoes in the Southeast in the early part of 2012—the January 2012 tornado total of 95 was almost three times more than the 1991–2010 annual average of 35 for the month of January.¹¹³ The season’s destructive activity continued through late June. In just 48 hours in early March 2012, 132 tornadoes swept through the Ohio River Valley and the Southeast,¹¹⁴ inflicting 40 fatalities and \$1.5 billion in damages.¹¹⁵ One month later, 21 tornadoes

tore up the Dallas-Fort Worth region, leaving 28,000 homes without power and causing an estimated \$1 billion in damages.¹¹⁶ In early June 2012, two hailstorms in the Southwest dropped baseball size pellets on Colorado, Texas, and Wyoming resulting in \$1.7 billion in damages.¹¹⁷

In April and May 2011, the Midwest experienced an astounding 1,065 tornadoes, causing more than \$26 billion in damages.¹¹⁸ There were 553 tornado fatalities in 2011—the second highest loss of life from tornados in a single year.¹¹⁹

The single deadliest tornado in U.S. history hit Joplin, Missouri in May 2011, taking 157 lives.¹²⁰ According to Census data, Joplin has a median annual household income of \$36,884—29 percent below the U.S. median.¹²¹ The city's poverty rate is almost 20 percent, with even greater economic distress in the outlying areas.¹²² Tina Beer, operations director for the Missouri Housing Development Commission, said “The tornado [in Joplin, Missouri] could not have picked a worst path to go through as it relates to affordable housing.”¹²³

Alabama bore the largest loss of life from tornadoes out of any U.S. state during the past two years, with 241 fatalities in 2011. To make matters worse, many Alabamans are not particularly well-prepared to cope with the resulting financial burden from damages. Thirty-six of the 42 Alabama counties affected by these tornadoes in 2011 have poverty rates higher than the national average. In fact, 14 of the Alabama counties hit by tornadoes in 2011 have poverty rates above 20 percent.¹²⁴

The Wall Street Journal reported that one badly battered community was Birmingham, Alabama, where 26 percent of the population lives below the poverty line.¹²⁵ Birmingham is still struggling to rebuild from 2011 storms. Birmingham's fire marshal, C.W. Mardis, said the people that are newly homeless from the storms are unlikely to have the financial capacity to rebuild. He noted that they need government assistance that may take a long time to arrive.¹²⁶

Extreme weather is the new normal

The disasters of 2011 and 2012 serve as a tragic—and expensive—foreshadowing of future weather disasters in what has become the new climate “normal.”¹²⁷

The American Meteorological Society 2011 “State of the Climate” report was compiled by nearly 400 scientists in 48 countries.¹²⁸ This annual report was also accompanied by the first-ever separate analysis, “Explaining Extreme Events of 2011 from a Climate Perspective.” This document explains how climate change influences key weather events, including major droughts in the United States.

The analysis examines six global weather crises in 2011, with the Texas drought that lasted half the year representing the only U.S. event.¹²⁹ Peter Stott, climate monitoring and attribution team leader at the United Kingdom’s National Weather Service, said in reference to the Texas drought, “Such a heat wave is now around 20 times more likely during a La Niña year than it was during the 1960s. ... we have shown that climate change has indeed altered the odds of some of the events that have occurred.”¹³⁰

Additionally, atmospheric concentrations of carbon dioxide pollution and other greenhouse gases are already having a devastating effect on our nation and planet. According to standards set by the World Meteorological Organization, climate “normals” are the temperature averages of a 30-year span.¹³¹ Rather than changing annually, these averages shift each decade to reflect the country’s new “typical” climate. The climate normal for the previous decade released by the National Oceanic and Atmospheric Administration in 2011 show that 2001–2010 was the warmest decade on record.¹³²

A seemingly incremental shift in tri-decadal climate normal weather patterns, however, can have disastrous implications for the weather. Warmer air holds more moisture, so as atmospheric temperatures rise, there is more water available to fuel storms, increasing the intensity and frequency of precipitation events. Frequent soaking leaves the soil unable to absorb more moisture, resulting in heavier runoff

and water pollution. When these torrential downpours occur as snow, they create more snowpack than usual and can cause devastating springtime floods such as those in North Dakota and Mississippi in 2011.¹³³

Heat waves and droughts are also symptoms of a heating planet, such as 2012's record-breaking drought. A recent study from the journal *Nature* indicates that the United States will suffer a series of severe droughts over the next two decades.¹³⁴ Two additional studies in the last few years determined that:

*By century's end, extreme temperatures of up to 122°F would threaten most of the central, southern, and western U.S. Even worse, Houston and Washington, DC could experience temperatures exceeding 98°F for some 60 days a year. Much of Arizona would be subjected to temperatures of 105°F or more for 98 days out of the year—14 full weeks.*¹³⁵

A number of major studies indicate that the Southwest and parts of the Midwest are headed to sustained, or near permanent, drought and dust bowl-like conditions if we remain on our current emissions path.¹³⁶ Meteorologist Jeff Masters warns that the increased frequency and intensity of these droughts will lead to increases in the “amount of damage and economic hardship for the United States.”¹³⁷ The National Center for Atmospheric Research concluded that “dust-bowlification” could be the worst and most devastating impact of human-caused climate change. And Aiguo Dai, climate scientist with the National Center for Atmospheric Research, warns that “the U.S. may never again return to the relatively wet conditions experienced from 1977 to 1999.”¹³⁸

A recent National Oceanic and Atmospheric Administration-led study found that shifting wind patterns in the Arctic could increase extreme weather events in North America, such as heavy snowfall, flooding, and heat waves.¹³⁹ Jennifer Francis, research professor at Rutgers University, said that this presents:

... stark evidence that the gradual temperature increase is not the important story related to climate change; it's the rapid regional changes and increased frequency of extreme weather that global warming is causing. ... [we can expect] increased probability of extreme weather events across ... the northern hemisphere, where billions of people live.

For these reasons, it is essential that we face the reality of these climate “normals.” Failing to prepare for increased disasters will lead to increase in injury and fatalities and huge economic costs.

Sick of climate change: Health risks, including West Nile breakout

Children, the elderly, the infirm, and lower-income people are much more vulnerable to health impacts from climate change than the rest of the population. Though the full range of health effects and economic costs from climate change are not yet fully known, we know that health harms from extreme weather impacts are on the rise. The World Health Organization explains that the “overall health effects of a changing climate are likely to be overwhelmingly negative.”¹⁴⁰ Scientists agree that key health risks include:

- Increases in airborne and insect-borne illnesses
- Doubled asthma attack rates and a longer asthma season
- Cardiovascular and respiratory disease from extreme high air temperatures
- Threatened access to clean drinking water
- Increase in hospitalizations that results in rising health care costs¹⁴¹

This year, the West Nile virus, a mosquito-borne illness, has been particularly prevalent in the United States. There have been 5,054 reported cases of West Nile illnesses in the United States this year as of November 6, 2012, with 228 deaths—the highest in nearly a decade.¹⁴² Outbreaks in the United States are relatively new to the

western hemisphere, as the first cases were reported in 1999. Symptoms include headaches, high fever, joint pain, flu-like symptoms, and occasionally even death.

Higher temperatures and drought conditions increase the breeding ground for mosquitoes that can carry and transmit the disease. Though one might assume droughts would reduce mosquito populations, it is actually the exact opposite. *Scientific American* reports that the primary mosquito transmitter of West Nile transmission is *Culex pipens*, a species that especially “thrives in drought conditions.”¹⁴³

As the late Paul Epstein, associate director of the Center for Health and the Global Environment at Harvard Medical School, explained, “We have good evidence that the conditions that amplify the life cycle of the disease are mild winters coupled with prolonged droughts and heat waves—the long-term extreme weather phenomena associated with climate change.”¹⁴⁴

Warmer weather also amplifies the potential for the virus to spread by extension of mosquito breeding season, faster mosquito maturation to reach the biting stage, faster multiplication of the virus inside mosquitoes, and larger mosquito niches extending into higher altitudes. As a result, there are more biting mosquitoes with more copies of the virus in more places during a longer season due to climate change.¹⁴⁵

Middle- and lower-income Americans more vulnerable to extreme weather events

Over the past two years, 16 states experienced five or more billion-dollar extreme weather events. The households in the counties in the declared disaster areas in these states earn an average of 7 percent less than the U.S. median household income. These states are ranked by total economic damages from the most severe weather events.

TABLE 3
States that experienced five or more extreme weather events in 2011 and 2012

Majority of counties slammed with multiple extreme weather events were home to middle- and lower-income households

Rank	State	Percentage of state population affected	Extreme weather events	Total number of events	Estimated median household income of affected counties	Percentage difference between estimated disaster area median household income and U.S. median
1	Texas	100%	Drought, severe weather*, wildfire	10	\$50,499	-3%
2	Illinois	94%	Drought, severe weather, winter storm	9	\$57,479	11%
3	Georgia	67%	Drought, severe weather, tropical storm	8	\$51,228	1%
4	Missouri	100%	Flood, severe weather, winter storm	8	\$47,118	-9%
5	Oklahoma	100%	Drought, severe weather, winter storm	8	\$43,276	-17%
6	Tennessee	86%	Flood, severe weather, tropical storm	8	\$43,063	-17%
7	Kansas	98%	Flood, drought, severe weather	7	\$50,967	-2%
8	Virginia	95%	Severe weather, tropical storm	7	\$65,783	27%
9	Alabama	100%	Severe weather, tropical storm	6	\$42,793	-18%
10	Mississippi	92%	Flood, drought, severe weather, tropical storm	6	\$39,378	-24%

Rank	State	Percentage of state population affected	Extreme weather events	Total number of events	Estimated median household income of affected counties	Percentage difference between estimated disaster area median household income and U.S. median
11	North Carolina	55%	Severe weather, tropical storm	6	\$46,189	-11%
12	Arkansas	86%	Flood, drought, severe weather	5	\$39,807	-23%
13	Iowa	61%	Flood, drought, severe weather	5	\$50,118	-4%
14	Louisiana	100%	Flood, drought, severe weather, tropical storm	5	\$43,927	-15%
15	New Mexico	100%	Drought, wildfire, winter storm	5	\$44,592	-14%
16	South Carolina	99%	Severe weather	5	\$53,969	4%
Average		90%	-	-	\$48,137	-7%

*Severe weather includes tornadoes, severe thunderstorms, and hail

Note: U.S. Median household Income: \$51,914; Median income figures are Census Bureau 2005-2010 average

Sources: National Oceanic and Atmospheric Administration; U.S. Census Bureau; National news outlets

Disaster aid, while essential, cannot eradicate the damages that severe weather delivers to the lives and livelihoods of middle- and lower-income Americans. In addition to causing fatalities and injuries, recent extreme weather events damaged property, incurred cleanup and health care costs, forced lost workdays, and drove up food prices.¹⁴⁶ These disasters are a drain on the incomes of middle-class Americans.

Extreme weather is a growing threat to homeowners and renters, as reports show that insurance companies “could be on the verge of failing the very people they’re meant to protect” because of outdated risk models that do not accurately take into account climate change impacts, and therefore do not provide enough coverage to help families recover all damages from increasingly severe and/or frequent storms.¹⁴⁷

In an interview with the Center for American Progress, Russ Johnson, global director of public safety and disaster response at the Environmental Systems Research Institute explained that extreme weather disasters have huge long-term consequences for lower-income communities:

Typically, when large disasters occur, after two months, three months, when the story goes away, the long-term recovery can take years—sometimes decades—and those stories aren’t told well. And who is most impacted by those [events]?

*Well, it's the lower-income folks who have the least ability to deal with it.*¹⁴⁸

These findings reflect a cruel phenomenon sometimes called “the climate gap”—the concept that climate change has a disproportionate and unequal impact on society’s less fortunate.¹⁴⁹ Kristina Scott, executive director of the Alabama Poverty Project, said that in general, “natural disasters hit high poverty communities the hardest.”¹⁵⁰ Natural disasters in the United States have a significant impact on those who are least able to anticipate, prepare for, and recover from them. Lower-income households are frequently less resilient to natural disasters because they often lack insurance, access to health care, and financial savings.

A 2006 survey from the National Association of Counties found that counties rely on federal support for disaster relief, with between 58 percent and 84 percent of U.S. counties participating in federal relief programs. The report noted that counties are ill equipped to assist the most vulnerable people. It found that “most county disaster plans do not address special populations. This is especially true for minorities, non-English-speaking persons, [and] homeless and indigent persons.”¹⁵¹ Less than 25 percent of counties nationwide have specific plans to meet the needs of these people.¹⁵²

Lower-income households face greater risk from extreme weather events. For instance, lower-income people are more vulnerable to extreme heat, as some cannot afford air conditioners or the electricity to run them. A 2009 report from the University of Southern California found that “households in the lowest income bracket use more than twice the proportion of their total income on [energy costs] than households in the highest income bracket.”¹⁵³

Their exposure to high temperatures can lead to heat stroke, extremely high body temperatures, unconsciousness, and even death.¹⁵⁴ Without public assistance to help them pay their electricity bills, low-income residents are being forced to forgo air conditioning and fans—the very tools essential to protect them during dangerous heat waves. The Associated Press reported that such assistance was swiftly cut out of state budgets in Illinois, Indiana, and Oklahoma, some of the states hit hardest by heat waves over the past several years.¹⁵⁵

Advocates for lower-income people believe that this lack of resources increases the risk from heat waves. Kansas City Mayor Sly James told National Public Radio during a 2011 heat wave that “generally, the folks who have died have been those who have been less able to protect themselves against the heat for lack of air conditioning, fans, [and] cool places.”¹⁵⁶

Protection from extreme temperatures is an issue in the winter as well. The Energy Information Administration recently projected that households will need to spend “nearly 20 percent more on heating oil and 15 percent more on natural gas” this coming winter due to higher prices and colder temperatures.¹⁵⁷

Higher fuel costs will especially hurt the low-income families who receive help paying their heating and cooling bills from the Low Income Home Energy Assistance Program, commonly called LIHEAP. Congress cut this program’s funding by \$1.6 billion—or 30 percent—between 2011 and 2012, resulting in more than 1 million households losing benefits entirely.¹⁵⁸ Funding will remain at this inadequate level until at least March 2013 due to the continuing resolution (Public Law 112-175) that funds the federal government and its programs.¹⁵⁹

The Supplemental Nutrition Assistance Program, or SNAP, commonly referred to as food stamps, is another vital program to help low-income families survive extreme weather events. As the Food Research and Action Center notes, “The Disaster SNAP/Food Stamp Program provides replacement benefits for regular food stamp recipients who lose food in a disaster and extends benefits to many households which would not ordinarily be eligible but suddenly need food assistance.”¹⁶⁰

Unfortunately, the House-passed budget for fiscal year 2013 would slash SNAP funding by \$134 billion over the next decade.¹⁶¹ This would endanger funding for this vital program that helps middle- and lower-income families purchase food after a natural disaster.

Reducing climate change risks

We must reduce climate change pollution

Reps. Henry Waxman (D-CA) and Ed Markey (D-MA) recently issued a report that outlined the past year's record-setting extreme weather events in an attempt to educate the public and press about the growing health and economic threats posed by climate change.¹⁶² The two representatives urge the adoption of domestic industrial carbon pollution reduction standards. Rep. Waxman warned that “the evidence is overwhelming – climate change is occurring and it is occurring now.”

The recent billion-dollar natural disasters are helping Americans understand the connection between extreme weather and climate change. A new poll by George Mason University and Yale University finds that “a large and growing majority—75 percent—of Americans say ‘global warming is affecting weather in the United States.’”¹⁶³ One in five Americans says that they have suffered harm to their health, property, and/or finances from the past year's heat wave.

The Obama administration has already taken the first concrete steps to reduce carbon pollution. In 2009 it adopted the goal of cutting U.S. emissions by 17 percent below 2005 levels by 2020.¹⁶⁴ As of the end of 2011, the United States was about halfway toward that goal.¹⁶⁵ The Energy Information Administration reported that carbon emissions decreased while the economy was growing, which means “the carbon intensity of the economy fell.” The Energy Information Administration further explained that the decrease was “mainly a result of using less energy, or in some cases, using less carbon-intensive energy, to achieve the same economic output.”¹⁶⁶

To achieve these pollution reductions, the Obama administration adopted the first-ever carbon pollution standards for motor vehicles, which will reduce emissions by 6 billion tons over the life of cars built from 2017 to 2025.¹⁶⁷ The administration also proposed the first-ever reduction in carbon pollution from new power plants.¹⁶⁸ It must finalize this proposal and propose and adopt reduction standards for existing power plants and oil refineries.

In addition, investments in wind, solar, and other clean sources has doubled the amount of nonhydropower renewable electricity generated in the United States. Finally, low natural gas prices led many utilities to switch from coal to gas, which can also reduce emissions.¹⁶⁹

Some states are also taking steps to reduce their carbon pollution. Ten Northeast and Mid-Atlantic states—containing one-sixth of the U.S. population that produces one-fifth of the nation’s GDP—began the Regional Greenhouse Gas Initiative in 2009.¹⁷⁰ It is the first U.S. market-based program to reduce carbon dioxide pollution from power plants. This program cut harmful pollution by 23 percent in its first three years and also benefited state economies by producing \$1.6 billion in net benefits and adding about 16,000 new jobs.¹⁷¹ Evaluations of the program show an average of \$3 to \$4 in benefits for every \$1 invested in it by power plants.¹⁷²

California is implementing its “Global Warming Solutions Act,” commonly referred to by its bill number, A.B. 32.¹⁷³ It requires the state to reduce carbon pollution levels to 1990 levels by 2020, which means cutting about 80 million metric tons of greenhouse gas emissions by 2020.¹⁷⁴ To achieve this level of reduction, California requires pollution cuts from motor vehicle fuels, landfills, port operations, and other sources. The state will soon implement a “cap and trade” system to lower pollution from oil refineries, power plants, and other industrial sources.

Increase resilience from extreme weather events

It is essential to slash carbon pollution responsible for climate change to prevent its worst impacts. Since extreme weather and other global warming effects are already underway, however, it is clear that even a prompt and steep drop in pollution is inadequate to protect Americans from these harms. We must also make investments to help Americans cope with the new climate change normal. This includes hardening our infrastructure so that buildings, roads, airports, and water treatment plants can withstand the increasingly frequent and/or intense extreme weather that scientists tell us will continue to worsen as the planet warms.

The United States has huge infrastructure investment needs, from rebuilding highways to updating our dam and levee systems.¹⁷⁵ Rehabilitated or new infrastructure should be built employing more resilient designs that can withstand extreme weather events.

For instance, the design and construction of any new or rehabilitated buildings, roads, or other structures in coastal areas should account for the potential for severe storms and sea level rise. Plans for new or rebuilt drinking water or sewage treatment infrastructure in the arid Southwest should anticipate the potential for future droughts. Likewise, planning fuel production or electricity generation from heavily water-dependent technologies, including from coal or nuclear power plants, as well as oil and gas drilling should account for the potential for future droughts.

Protect lower-income households

It is also essential that Congress protect lower-income households, particularly those with children, senior citizens, and people with disabilities from extreme heat and winter storms. Fully funding the Low Income Home Energy Assistance Program, or LIHEAP, would provide these people with the resources to pay for cooling and heating during extreme weather events. It would cost \$5 billion annually to fully protect these vulnerable people. For perspective, special tax breaks for Big Oil companies cost the U.S. Treasury Department \$4 billion per year, including nearly two-thirds going to the five largest oil companies—BP plc, Chevron Corp., ConocoPhillips, ExxonMobil Corp., and Royal Dutch Shell Group—which earned a record-high \$137 billion in profits in 2011.¹⁷⁶

In addition, the president and Congress should oppose budget cuts to the Supplemental Nutrition Assistance Program to ensure adequate funding for Disaster SNAP assistance for middle- and lower-income families suffering from damages or lost income due to extreme weather events.

Insurance policies should reflect new risks

Future homeowners and renters insurance policies must also reflect the coming increase in extreme weather due to climate change. Ceres, a nonprofit advocate of sustainable business practices, recently reported that the insurance industry's pricing models follow outdated and lower risk assessments that under predict the potential for extreme weather damage. Insurance companies are also starting to decline or limit coverage to homes or businesses located in places prone to extreme weather.

To avoid this, insurance models should be required to use the latest available data for risk-analysis projections. Ceres also argues that “the insurance industry itself should be aggressively lobbying for updated building codes, better federal [adaptation] policies, and reducing carbon emissions.” Failure to do so will result in major losses for homeowners, taxpayers, and the insurance companies themselves.¹⁷⁷

Flood insurance reforms

In July 2012 Congress passed and President Barack Obama signed the “Biggert-Waters Flood Insurance Reform Act of 2012” as part of Public Law 112-141.¹⁷⁸ It reauthorizes the National Flood Insurance Program that provides coverage for communities that participate in the program and agree to adopt local floodplain management ordinances. The new law would discourage new development in floodplains and improve the program’s fiscal soundness by removing subsidized insurance rates for secondary residences and businesses.¹⁷⁹

The new law also allows insurance rates to increase by up to 20 percent per year for all policies and by 25 percent per year on certain categories of policies until actuarial rates are achieved.¹⁸⁰ The new law also removes subsidies for properties that incur flood-related damages higher than their market value and for properties with repetitive losses. For the first time, the act authorizes an ongoing National Flood Mapping Program and stipulates that it include mapping future flood conditions, projected effects of future development, and anticipated effects of sea level rise.

The reforms will eliminate subsidies that were useful earlier in the life the 44-year-old program but now interfere with people’s accurate assessment of flood risk conveyed by actuarially sound rates and diminish the fiscal soundness of the National Flood Insurance Program. The reforms also streamline the numerous flood-mitigation programs funded by policy holders to improve the programs’ effectiveness and efficiency in reducing unnecessary drain on the National Flood Insurance Fund.¹⁸¹ Flood-hazard mitigation is a sound investment in reducing flood disaster costs. Studies found that for every \$1 spent on flood mitigation, \$5 is saved.¹⁸²

Hurricane Sandy will likely rank as the nation’s second most expensive hurricane ever based on damages paid out by the flood insurance program. Yet *The New York Times* reported “it will be many years, if ever, before many homeowners are required to pay premiums that accurately reflect the market cost of the coverage.”¹⁸³

While increasing premium rates is an important step towards improving the program, there are equity issues to consider for those who are less able to afford it. A major gap in the reformed program is the failure to address the affordability of flood insurance for the primary homes of middle- and lower-income families. Not only do they need help to protect their most valuable assets but they and their communities will recover more quickly from disasters if they're insured as opposed to receiving taxpayer-funded Disaster Relief capped at \$31,900 per household, though the average payment is several thousand dollars. A means-tested voucher program could help ensure this protection while signaling the long-term risk of remaining in their current location. The legislation calls for a study of affordability issues.

Rehabilitate flood control infrastructure

Climate change will bring heavier precipitation in the Northeast and upper Midwest, increasing the likelihood of floods.¹⁸⁴ A recent CAP report, “Ensuring Public Safety by Investing in Our Nation’s Critical Dams and Levees,” documented the crumbling of dams and levees—our flood control infrastructure.¹⁸⁵ The report warned:

If we do not make changes soon to the way we monitor and maintain our nation’s dams and levees, catastrophes ... will continue to occur—likely with greater frequency. The combination of extreme weather and flooding resulting from global warming and our aging dam and levee infrastructure means that without action, thousands of lives and communities are at risk and avoidable public costs will rise.

To begin to address this threat, Congress must promptly reauthorize the National Dam Safety Program and should also create a similar National Levee Safety Program. It must invest at least \$1 billion annually to rehabilitate our rundown dam and levee infrastructure.

Increase community resilience

In order to be prepared for the increase in frequency and/or intensity of extreme weather due to climate change, we must invest in “pre-disaster mitigation” measures. They should follow a bottom-up approach, with local communities evaluating their risk from extreme weather events and developing resiliency plans with technical and financial support from the federal government.

The local approach should entail a partnership among local, state, and federal government, private business, and nonprofits. While there are multiple programs under FEMA for postdisaster rebuilding and hazard mitigation, the array of programs should be consolidated under one resilience-focused entity.

Experts in disaster management emphasize the importance of implementing local resilience plans. Russ Johnson, the global director of public safety and disaster response at ESRI (a mapping firm), with 30 years of government disaster response experience, explained that “locals are the best prepared to figure it out.” Communities must be proactive by identifying vulnerabilities and establishing solutions, instead of waiting for the next disaster to strike.

The first pre-disaster-mitigation program—Project Impact—was created under FEMA Director James Lee Witt in 1997 and designed to make every community more disaster resistant.¹⁸⁶ The program provided financial and technical support to governments, local businesses, and nonprofits.¹⁸⁷ Project Impact’s original budget of \$25 million provided varying degrees of funding to 225 communities across the nation. Each participating community agreed to establish a partnership that identified risks, identified and prioritized measures designed to mitigate these risks, and secured the public, financial, and political support needed to implement the mitigation measures. Former FEMA Deputy Director George Haddow noted, “By all indications from the feedback we were getting back on the ground, this was the kind of program that local communities wanted. The receptivity to the idea was incredible.”¹⁸⁸

Unfortunately, FEMA under President George W. Bush eliminated Project Impact in 2002. Its successor was a confusing, competitive, grant-based program with funding decided by politics instead of need.¹⁸⁹ After increasing annual funding to \$150 million, the Congressional Research Service reported that Congress began earmarking grants to specific programs in 2008, with \$50 million from the predisaster mitigation fund allocated politically instead based on communities’ need.¹⁹⁰

Congressional appropriations to fund predisaster mitigation have been decreasing even as natural disaster costs have increased. In 2011 predisaster mitigation received \$50 million, but the United States incurred over \$60 billion in damages from the most destructive billion-dollar extreme weather events.¹⁹¹ Similarly, in 2012 Congress allocated \$35.5 million for predisaster mitigation while an estimated \$65.3 billion in destruction occurred due to the most damaging extreme weather.¹⁹² The Obama administration even proposed to eliminate funding for

predisaster mitigation for FY 2013 because it believed there was ample unspent revenue.¹⁹³ Federal spending for disaster relief and recovery will only increase as extreme weather events become more intense and/or frequent. The most effective way to protect the taxpayer from some of these costs is to increase funding for predisaster mitigation planning and implementation.

To reduce the human impact and economic costs of future extreme weather events, former senior FEMA officials Jane Bullock and George Haddow recommend the creation of a “national fund to promote and financially support hazard mitigation activities.”¹⁹⁴ They propose that this fund be based on “the average of the past several years” of postdisaster federal spending for recovery.¹⁹⁵ Over the past three years, this average would have been \$7.1 billion annually for pre-disaster mitigation efforts.¹⁹⁶ Although this is a large amount of money at a time when many federal officials want to cut domestic discretionary spending, such an investment could save money by reducing future federal disaster relief and recovery expenditures from extreme weather events. Haddow notes, “This level of investment is needed and will pay big dividends in terms of economic development, community vitality and growth, and environmental protection and restoration.”

Conclusion

Hurricane Sandy is the exclamation point on the warnings about climate change, after deadly and expensive extreme weather events repeatedly struck the United States in 2011 and 2012. Such disasters are becoming part of the “new normal”—the heat waves, droughts, severe storms, and floods that will grow in severity and/or frequency in the coming years due to unchecked climate change. During the massive heat wave in July 2012, Seth Borenstein, science reporter for the Associated Press, wrote, “If you want a glimpse of some of the worst of global warming, scientists suggest taking a look at U.S. weather in recent weeks.”¹⁹⁷

The most damaging extreme weather events alone over the past 22 months took more than 1,000 lives and caused at least \$126 billion worth of damage. Our analysis found that most of these types of events disproportionately harmed middle- and lower-income Americans. These households have fewer resources to prepare for and recover from such disasters. Federal and state disaster-relief policies must help cushion the human and economic losses to those people with fewer resources to recover from severe weather disasters.

The American people understand that climate change is linked to the tragic extreme weather events of recent years, and support carbon pollution reductions to attack the problem. A post-election poll by Zogby Analytics for the National Wildlife Federation found that:

- Two-thirds of voters (65 percent) say elected officials should take steps now to reduce the impact of climate change on future generations, while just 27 percent say we should wait for more evidence
- A strong majority (57 percent) says climate change is adding to the severity of recent extreme weather such as Superstorm Sandy and the summer droughts

- Seven in 10 voters (69 percent) are greatly or somewhat worried about the growing cost and risks of extreme weather disasters fueled by climate change¹⁹⁸

We are not helpless victims on the receiving end of a suddenly angrier climate. These recent weather events are a call to action and preparation. The increase in extreme weather reflects scientists' warnings over the past two decades that we must reduce the carbon dioxide and other pollution responsible for climate change, or else we will suffer the consequences. It seems, however, that scientists' admonitions became reality more quickly than they predicted. For those reasons, climate preparedness—the need to manage the risks associated with a changing climate—is equally essential.

President Obama and the 113th Congress *must* take steps to protect middle- and lower-income households from the economic harms wrought by extreme weather events linked to climate change. They must also take action to dramatically reduce the American production of carbon pollution that leads to climate change and these extreme weather events. Such pollution-reduction measures are essential. Fortunately, they will provide other benefits to our economy, including more investment in the clean energy technologies of the future, job creation, and economic competitiveness.

Methodology

This Center for American Progress analysis compiled data from multiple sources. Extreme weather events data were from the National Oceanic and Atmospheric Administration's National Climatic Data Center, or NCDC.¹⁹⁹ The NCDC 2011 database includes fatalities, estimated damages, and states affected by these events. The NCDC 2012 is still unpublished, so the information about the human and economic impacts of these events were gathered from government websites, like the U.S. Department of Agriculture, or news sources. A full list of sources by event can be found in the appendix.²⁰⁰

Counties affected by each event were compiled from the Federal Emergency Management Agency's Declared Disasters database.²⁰¹ If the agency has not yet declared the event an emergency, the counties affected were either found in the "Storm Prediction Center" or the "Summary of Weather Events across a Four State Region," both available from the National Oceanic and Atmospheric Administration's National Weather Service.²⁰²

In order to assess income levels for the most affected counties, we used median household income (2006–2010) data and number of households (2006–2010) data from the U.S. Census Bureau's State and County QuickFacts.²⁰³ The 2006–2010 values are an average over the five-year period. We compared the percent difference between the average annual median household incomes for the affected counties in each weather event to the U.S. median—\$51,914. We accounted for the population of each county when calculating these values. The cost per household was calculated by taking the cost of the event divided by the total number of households for each event.

Appendix: Costs and regional data

The data collected were broken down by year, as the National Climatic Data Center's list of billion-dollar weather/climate disasters provided the cost and states affected for 2011.²⁰⁴ Since the 2012 list of billion-dollar weather events will not be released until the end of the year, cost estimates and states affected for 2012 events were taken from major news sources.

For a majority of the events, the Federal Emergency Management Agency's list of disaster declarations provided counties affected.²⁰⁵ If FEMA data were not available, the Storm Prediction Center from the National Oceanic and Atmospheric Administration was used for county information. As a last resort, local and national news sources were utilized.

To ensure consistency between the two years, 2012 events were compiled similarly to the National Climatic Data Center's method for the 2011 list of billion-dollar weather events.

Floods

Missouri, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:** FEMA list of disaster declarations

Mississippi, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:** FEMA list of disaster declarations

Drought

2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:** U.S. Department of Agriculture Drought Monitor²⁰⁶

2012

- **Cost (range):**
 - **Lower figure:** \$13 billion–\$14 billion (private) and \$15 billion (public)²⁰⁷
 - **Upper figure:** \$77 billion total²⁰⁸
- **Regional data:**
 - **States:** NOAA official forecasted from Natural Resources Defense Council topsoil map²⁰⁹
 - **Counties:** Highest level of drought for that state (D2-D4) from USDA Drought Monitor²¹⁰

Wildfires

2012 season

- **Cost:**
 - Costs taken from major news sources²¹¹
 - Only included states with costs totaling more than \$50 million
- **Regional data:**
 - **States:** Must have costs of more than \$50 million
 - **Counties:** FEMA list of disaster declarations

2011 season

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:** FEMA list of disaster declarations

Severe weather

April 4-5, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - Not including Iowa or Wisconsin
 - **Counties:**
 - National Weather Service: Paducah, Kentucky; Louisville, Kentucky; Nashville, Tennessee; Wilmington, Ohio; Jackson, Kentucky; Jackson,

- Mississippi; New Orleans/Baton Rouge, Louisiana; Mobile, Alabama;
Little Rock, Arkansas; Peachtree City, Shreveport, Morristown²¹²
– StormerSite: Kansas (hail damage)²¹³

April 8-11, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:**
 - Storm Prediction Center

April 14-16, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:**
 - Storm Prediction Center

April 25-28, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:**
 - Storm Prediction Center²¹⁴
 - Illinois data from CBS News²¹⁵

May 22-27, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:**
 - Storm Prediction Center
 - StormerSite: Georgia (hail damage)²¹⁶

June 18-22, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:**
 - Storm Prediction Center
 - StormerSite: Georgia, South Carolina, and North Carolina (hail damage)²¹⁷

July 10-14, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:** Local weather sources²¹⁸

March 2-3, 2012

- **Cost:** *Scientific American*²¹⁹
- **Regional data:** Storm Prediction Center

April 3, 2012

- **Cost:** Wunderground²²⁰
- **Regional data:** Storm Prediction Center

June 6-7, 13, 2012

- **Cost:** *Bloomberg Businessweek*²²¹
- **Regional data:** Storm Prediction Center

Tropical Storms

Lee, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:**
 - **States:** NCDC 2011 list of billion-dollar weather/climate disasters
 - **Counties:**
 - Pennsylvania, New York, Maryland, Virginia, Louisiana, and New Jersey: FEMA list of disaster declarations
 - Connecticut: Local news sources²²²
 - Tennessee: Local news source²²³
 - Georgia: National Weather Service²²⁴
 - Alabama: Local news source²²⁵
 - Louisiana: Reuters²²⁶
 - Mississippi: Associated Press²²⁷

Hurricanes

Irene, 2011

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:** FEMA list of disaster declarations

Isaac, 2012

- **Cost:** CBS News²²⁸
- **Regional data:** FEMA list of disaster declarations

Sandy, 2012

- **Cost:** *Time* magazine²²⁹
- **Regional data:** FEMA list of disaster declarations

Winter storms

2011 Groundhog's Day Blizzard

- **Cost:** NCDC 2011 list of billion-dollar weather/climate disasters
- **Regional data:** FEMA list of disaster declarations

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