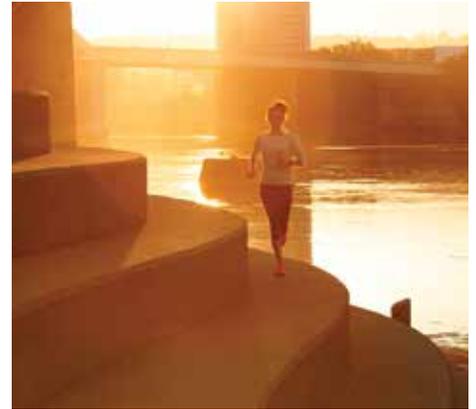


# Climate Change in the United States: Benefits of Global Action

A new EPA report, *Climate Change in the United States: Benefits of Global Action*, explores the question: What are the benefits to the United States of reducing global greenhouse gas emissions? To answer this, we need to understand the basic scale of the difference between a world with and without global climate action. This report summarizes peer-reviewed results from the Climate Change Impacts and Risks Analysis (CIRA) project, which estimates the physical and monetary benefits to the U.S. of global action on climate change. This brochure provides key findings and regional highlights of the report, showing that Americans significantly benefit from global action. Importantly, this report analyzes only some of the impacts of climate change, and therefore estimates just a portion of the total benefits of reducing GHGs.



## KEY FINDINGS

- **Global Action on Climate Change Avoids Costly Damages in the U.S.** Across sectors, global greenhouse gas (GHG) mitigation (actions to reduce GHGs) is projected to prevent or substantially reduce adverse impacts in the U.S. this century compared to a future without emission reductions.
- **Global Action on Climate Change Reduces the Frequency of Extreme Weather Events and Associated Impacts.** Global GHG reductions are projected to substantially reduce how often extreme temperature and precipitation events occur by the end of the century.
- **Global Action Now Leads to Greater Benefits over Time.** For a majority of sectors, the benefits to the U.S. of GHG mitigation are projected to be even greater by the end of the century compared to the next few decades. Therefore, decisions we make today on GHG emissions have long-term effects, and delaying action increases the risks of significant and costly impacts in the future.
- **Adaptation Can Reduce Damages and Overall Costs in Certain Sectors.** Though actions to prepare for climate change incur costs, they can be very effective in reducing certain impacts and will be necessary in addition to GHG mitigation.
- **Impacts Are Not Equally Distributed.** Some regions are more vulnerable than others and therefore will experience greater impacts.



## Highlights by Sector

Compared to a future of unchecked GHG emissions, global action on climate change is projected to provide the following annual benefits to the U.S.<sup>1</sup> The majority of these benefits (avoided impacts) are shown for the end of the century, assuming significant global action happens in the near term and continues. Importantly, this report analyzes only some of the impacts of climate change, and therefore estimates just a portion of the total benefits of reducing GHGs. While projecting decades into the future involves uncertainty, this report shows a substantial difference between a world with and without global climate action, making a clear case that acting now is vital for the U.S.

### HEALTH

**Air Quality:** An estimated 57,000 fewer deaths annually from poor air quality in 2100.<sup>2</sup>

**Extreme Temperature:** In 49 major U.S. cities, an estimated 12,000 fewer deaths annually from extreme temperature events in 2100. Adaptive measures could also reduce the number of deaths.

**Labor:** Approximately \$110 billion in avoided damages annually from lost labor due to extreme temperatures in 2100.

**Water Quality:** An estimated \$2.6-\$3.0 billion in avoided damages annually from poor water quality in 2100.

### INFRASTRUCTURE

**Bridges:** An estimated 720-2,200 fewer bridges made structurally vulnerable annually from heavy river flows in 2100.

**Roads:** An estimated \$4.2-\$7.4 billion in avoided adaptation costs for roads annually in response to changes in temperature and precipitation in 2100.

**Urban Drainage:** In 50 U.S. cities, an estimated \$50 million-\$6.4 billion in avoided adaptation costs annually in response to heavy precipitation in 2100.

**Coastal Property:** Approximately \$3.1 billion in avoided damages and adaptation costs annually to coastal property from sea level rise and storm surge in 2100.

### ELECTRICITY

**Electricity Demand:** An avoided increase in demand in 2050 of approximately 1.1%-4.0% due to smaller increases in temperature.

**Electricity Supply:** An estimated \$10-\$34 billion in savings on power system costs in 2050.

### WATER RESOURCES

**Inland Flooding:** Estimates range from approximately \$2.8 billion in avoided damages to \$38 million in increased damages annually in 2100.

**Drought:** An estimated 40%-59% fewer severe and extreme droughts in 2100.

**Supply and Demand:** An estimated \$11-\$180 billion in avoided damages annually from water shortages in key economic sectors in 2100.

### AGRICULTURE AND FORESTRY

**Agriculture:** An estimated \$6.6-\$11 billion annually in avoided damages to agriculture in 2100.

**Forestry:** An estimated \$520 million to \$1.5 billion annually in avoided damages to forestry in 2100.

### ECOSYSTEMS

**Coral Reefs:** An avoided loss of approximately 35% of current Hawaiian coral in 2100, with an annual recreational value of \$1.1 billion.

**Shellfish:** An avoided loss of approximately 34% of the U.S. oyster supply, 37% of scallops, and 29% of clams in 2100.

**Freshwater Fish:** An estimated 230,000-360,000 acres of cold-water fish habitat preserved in 2100.

**Wildfire:** An estimated 6.0-7.9 million fewer acres burned annually by wildfires in 2100.

**Carbon Storage:** An estimated 1.0-26 million fewer tons of carbon stored in vegetation in 2100.

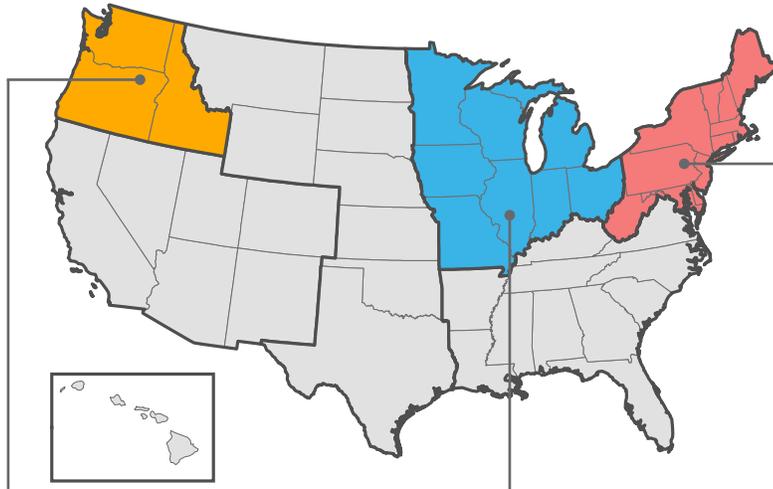
<sup>1</sup> The results presented here correspond to a GHG emissions reduction scenario that limits future global temperature increase to 2°C (3.6°F) above preindustrial levels. Unless otherwise noted, the results presented here are undiscounted estimates of annual benefits (or disbenefits) of GHG reductions in the year 2100 for the contiguous U.S. None of the estimates presented should be interpreted as definitive predictions of future impacts at a particular place or time. For detailed information on the results, including the supporting methods and assumptions, please refer to the main report.

<sup>2</sup> The analysis held emissions of traditional air pollutants constant at current levels to isolate the climate change related impact on air quality. As such, the substantial benefits to air quality and health that would stem from the co-control of traditional air pollutants along with GHG emissions are not included here.



# Regional Highlights

The following highlights from the CIRA report provide examples of climate change impacts in U.S. regions, focusing on the risks of inaction and/or the benefits of global action on climate change.<sup>3</sup> As these results were primarily developed to analyze changes at a national-scale, precision at local scales should not be assumed in most sectors.



## NORTHWEST

- In the Pacific Northwest, unmitigated climate change is projected to result in \$120-340 million in damages due to decreased water quality in 2100. Global action on climate change would avoid approximately \$100-260 million of these damages.
- In the Pacific Northwest, approximately 56% (8,300) of inland bridges are projected to become vulnerable in the second half of the century due to unmitigated climate change. Global action on climate change would reduce this number to 25% or approximately 3,700.
- Throughout the Northwest, unmitigated climate change is projected to result in the loss of a substantial amount of the habitat currently suitable for coldwater fisheries, which supports valuable species such as trout. Global action on climate change is projected to preserve nearly all of this habitat.
- In the Northwest, unmitigated climate change is projected to increase area burned by wildfire annually by approximately 95% by the end of the century.
- In the national market, ocean acidification is projected to result in a 32-48% decline in the harvest of select shellfish by the end of the century. Global action on climate change could prevent most of the decreases in supply, therefore avoiding an estimated \$380 million in consumer losses in 2100.

## MIDWEST

- In 11 major cities of the Midwest, unmitigated climate change is projected to result in approximately 1,700 deaths in 2100 due to extreme temperatures. Global action on climate change, which would reduce future increases in temperature, is estimated to avoid 87% of these deaths. Adaptive measures are also likely to reduce the number of expected deaths.
- In the Great Lakes region, approximately 37% (7,900) of inland bridges are projected to become vulnerable in the second half of the century due to unmitigated climate change. Global action on climate change would reduce this number to 9% or approximately 2,000.
- In many large cities in the Midwest, unmitigated climate change is projected to result in average adaptation costs per square mile of up to \$1 million in 2100 associated with impacts from extreme precipitation events on urban drainage infrastructure.
- In the Great Lakes region, global action on climate change is projected to decrease inland flooding damages by 13%-38% in 2100 compared to a future with no GHG emission reductions.

## NORTHEAST

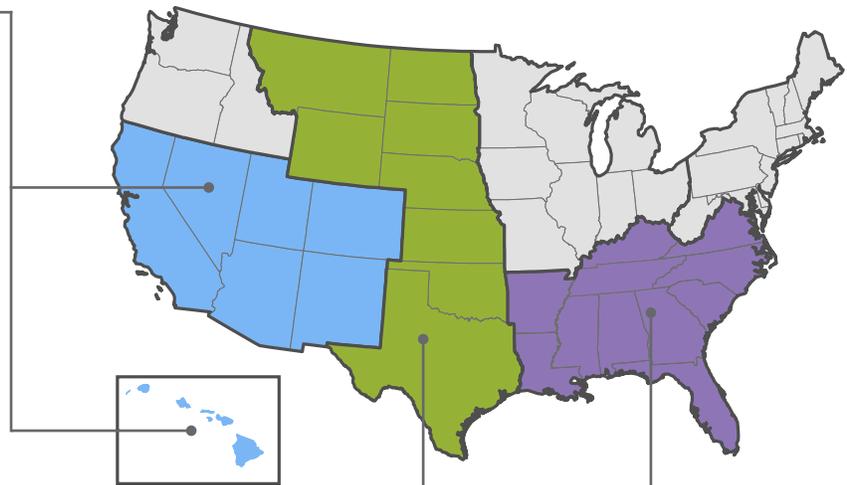
- In eight major cities of the Northeast and Mid-Atlantic, unmitigated climate change is projected to result in approximately 2,600 deaths in 2100 due to extreme temperatures. Global action on climate change, which would reduce future increases in temperature, is estimated to avoid 93% of these deaths. Adaptive measures are also likely to reduce the number of expected deaths.
- In New England, unmitigated climate change is projected to result in \$60-90 million in damages due to decreased water quality. Global action on climate change would avoid approximately \$77-89 million of these damages in 2100.
- In the Mid-Atlantic, approximately 76% (24,000) of inland bridges are projected to become vulnerable in the second half of the century due to unmitigated climate change. Global action on climate change would reduce this number to 35% or approximately 11,000.
- Coastal properties in the Northeast are at risk of significant economic damages from sea level rise and storm surge. In New Jersey and Delaware, the costs of adaptive responses, such as beach nourishment and property elevation, are estimated at approximately \$21 billion (discounted at 3%) through 2100.
- Throughout the Appalachians, unmitigated climate change is projected to result in the loss of nearly all of the habitat currently suitable for coldwater fisheries, which supports valuable species such as trout. Global action on climate change is projected to preserve approximately 70% of this habitat.

<sup>3</sup> This brochure presents a selection of the estimated benefits of global GHG mitigation for regions of the contiguous U.S. and Hawaii (regions loosely defined as those used in the U.S. Global Change Research Program's Third National Climate Assessment, [nca2014.globalchange.gov](http://nca2014.globalchange.gov)). These regional highlights were developed using results presented in the report, the underlying literature, and in the accompanying data available at [www2.epa.gov/cira/downloads-cira-report](http://www2.epa.gov/cira/downloads-cira-report).

# Regional Highlights (continued)

## SOUTHWEST AND HAWAII

- In California, global action on climate change is projected to result in 39-75% fewer severe and extreme droughts by the end of the century compared to a future with no GHG emission reductions.
- In some areas of California, unmitigated climate change is projected to increase area burned by wildfire annually by approximately 45% by the end of the century.
- In the Southwest, particularly Arizona and Southern California, changes in extreme temperatures due to unmitigated climate change are projected to reduce hours worked in outdoor labor industries (e.g., construction) by up to 7% in 2100, equating to millions of lost labor hours. Global action on climate change would limit lost labor hours to no more than 2.9%
- In Arizona, Nevada, and California, unmitigated climate change is projected to result in \$1.5-2.2 billion in damages due to decreased water quality. Global action on climate change would avoid approximately \$1.3-1.7 billion of these damages in 2100.
- In Hawaii, unmitigated climate change is projected to result in coral cover declining from about 38% today to less than 1% by the end of the century. Global action on climate change could avoid approximately 35% of this loss, saving \$20 billion in recreational activity through 2100 (discounted at 3%).



## GREAT PLAINS

- In the southern states of the Great Plains, changes in extreme temperatures due to unmitigated climate change are projected to reduce hours worked in outdoor labor industries (e.g., construction) by up to 7% in 2100. Global action on climate change would limit lost labor hours to no more than 3.9%.
- In many large cities in the Great Plains, unmitigated climate change is projected to result in average adaptation costs per square mile of up to \$2.1 million in 2100 associated with impacts from extreme precipitation events on urban drainage infrastructure.
- In the southern states of the Great Plains, rising demand for air conditioning is projected to increase total electricity demand by 2%-4% in 2050 due to unmitigated climate change.
- Throughout the Mountain West, unmitigated climate change is projected to result in the loss of a substantial amount of the habitat currently suitable for coldwater fisheries, which supports valuable species such as trout. Global action on climate change is projected to preserve nearly all of this habitat.
- In the Mountain West, unmitigated climate change is projected to increase area burned by wildfire annually by approximately 64% by the end of the century.

## SOUTHEAST

- In the Southeast, changes in extreme temperatures due to unmitigated climate change are projected to reduce hours worked in outdoor labor industries (e.g., construction) by up to 7% in 2100. Global action on climate change would limit lost labor hours to no more than 3%.
- In the South Atlantic-Gulf region, unmitigated climate change is projected to result in \$410-430 million in damages due to decreased water quality. Global action on climate change would avoid approximately \$320-360 million of these damages in 2100.
- In the South Atlantic-Gulf region, up to approximately 41% (26,000) of inland bridges are projected to become vulnerable in the second half of the century due to unmitigated climate change. Global action on climate change would reduce this number to 9% or approximately 5,600.
- Coastal properties in the Southeast are at risk of significant economic damages from sea level rise and storm surge. For the Tampa area, the costs of adaptive responses, such as beach nourishment and property elevation, are estimated at approximately \$90 billion (discounted at 3%) through 2100.
- In the Southeast, rising demand for air conditioning is projected to increase total electricity demand by 2%-6% in 2050 due to unmitigated climate change.

To view and download  
 the full report, visit:  
[www.epa.gov/cira](http://www.epa.gov/cira)

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