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CLEAN POWER:
THE CASE FOR CARBON POLLUTION LIMITS

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About NRDC

The Natural Resources Defense Council is a international nonprofit environmental organization with more than 1.4 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Montana, and Beijing. Visit us at nrdc.org.

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Foreword

The Environmental Protection Agency soon will issue final standards to limit dangerous carbon pollution from America's power plants.

To help sort out the debate over the Clean Power Plan, we have prepared this well-referenced resource book to help separate fact from fiction.

Climate change is the central environmental challenge of our generation. We may be running out of time but, as the Clean Power Plan illustrates, we are not running out of solutions. For the sake of our children and all future generations, we must rise to the challenge. Now.

–Rhea Suh,
NRDC president

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For the sake of my grandchildren, please do this.

– Margaret D. Kooistra, Mechanicsburg, PA

Introduction:
It's Time to Act

"No challenge poses a greater threat to future generations than climate change."

—President Obama's proposed 2016 budget

© Getty Images

President Barack Obama delivering remarks on climate change at Georgetown University on June 25, 2013.

Rising sea levels. Raging storms. Searing heat. Ferocious fires. Severe drought. Punishing floods.

This is what climate change looks like. It threatens our health, our communities, our economy, and our security.

It is the greatest environmental threat of our time.

Last year was the hottest, globally, since record keeping began in 1880.

And those threats are growing more urgent. Last year was the hottest, globally, since record keeping began in 1880. And 14 of the 15 hottest years have occurred in this century.

In response to the dangers, the U.S. Environmental Protection Agency (EPA) in June 2014 proposed the first-ever limits on the more than 2 billion tons of carbon dioxide spewed into the atmosphere each year by power plants—the largest source of U.S. greenhouse gas emissions.

The Clean Power Plan—the centerpiece of President Obama's climate action initiative—promises to be the most important action the government can take to combat climate change before it's too late to avoid the worst impacts.

The plan also is critical to spurring an international agreement to slow the impacts of climate change at this December's U.N. climate change conference in Paris.

While there are limits on emissions of arsenic, mercury, and other dangerous pollutants from power plants, there have been none for carbon pollution—until now.

Now, the EPA is using its authority under the Clean Air Act, the nation's bedrock air pollution law, to cut carbon pollution from the electric power sector. It proposed in June 2014 reducing emissions by 30 percent below 2005 levels by 2030.

NRDC favors even more aggressive action to better protect the health of our children and future generations.

We believe the Clean Power Plan can achieve greater pollution reductions—a 40 percent cut by 2030—by fully recognizing the vast potential for scaling up energy efficiency and renewable energy throughout the United States.

"The administration can make this good plan even better," said David Doniger, director of NRDC's Climate and Clean Air Program.

Either way, the Clean Power Plan will move America toward a cleaner, healthier environment for future generations while ensuring an ongoing supply of the reliable, affordable power needed for economic growth.

The plan will reduce not only carbon pollution but hundreds of thousands of tons of other harmful air pollutants from existing power plants, such as sulfur dioxide and particulate matter, preventing up to 100,000 asthma attacks and 2,100 heart attacks in just the first year of implementation, according to the EPA.

Utility customers will benefit from a projected 8 percent decline in electricity bills by 2030.

And the plan will spur innovation and investment in cleaner energy and low-carbon technologies, generating hundreds of thousands of jobs.

States are given time and flexibility to develop strategies to meet carbon-reduction targets that best suit their own circumstances, based on their mix of energy sources.

The EPA plans to issue the final carbon pollution guidelines by mid-summer 2015. States would have until the end of June 2016 to come up with their carbon-reduction plans.

The Clean Power Plan enjoys broad public support.

Among more than 8 million comments submitted to the EPA—far more than the agency has received on any other issue—the plan drew backing from faith groups, Fortune 500 companies, medical organizations, labor groups, and many ordinary Americans.

A Pennsylvania woman perhaps put it best in a letter to the EPA: "For the sake of my grandchildren, please do this."

Chapter I:
The Health Imperative

"As the climate continues to change, the risks to human health continue to grow... Every American is vulnerable to the health impacts associated with climate change."

—U.S. Global Change Research Program's draft Climate and Health Assessment, April 7, 2015[1]

The health threats from climate change are considerable: intensified cases of asthma and other respiratory diseases, longer pollen allergy seasons, increased cases of heat stroke and other heat-related illnesses, and increased risks of insect- and water-borne diseases.

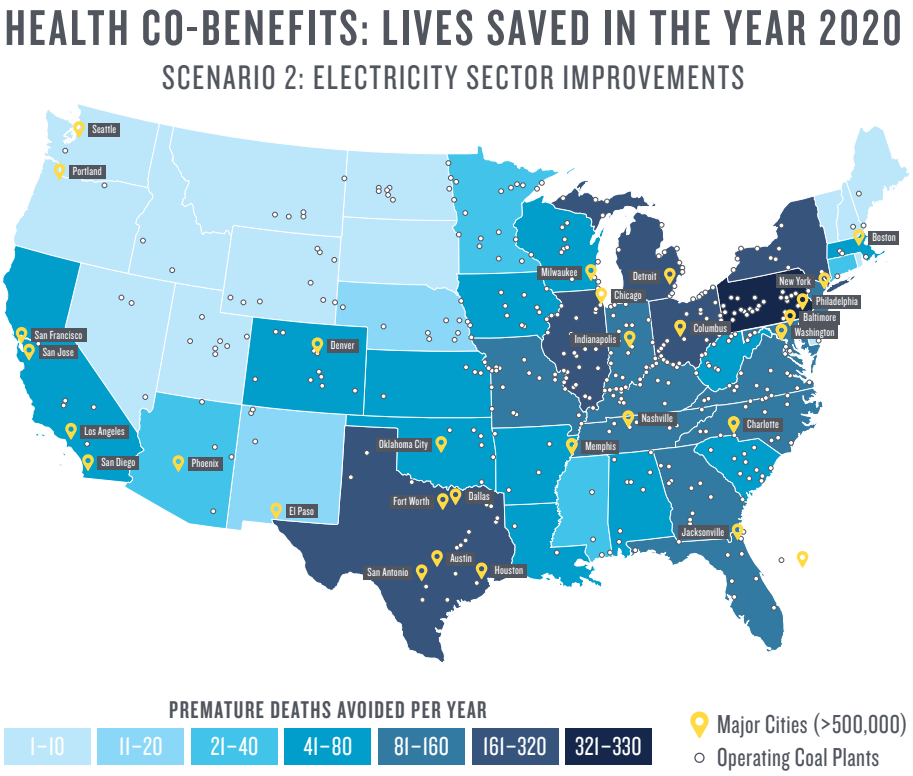
Climate change is "one of the most serious public health threats facing our nation," warned Dr. Georges Benjamin, executive director of the American Public Health Association.[2]

In a report published in the prestigious medical journal The Lancet in June, 2015, an international group of medical experts warned that climate change is so serious that it "threatens to undermine the last half century of gains in development and global health."[3]

"Climate change is a medical emergency," Hugh Montgomery, co-chair of the Lancet Commission on Health and Climate Change and director of the University College London's Institute for Human Health and Performance, said in a statement.[4] "It thus demands an emergency response, using the technologies available right now."[5]

Physicians report that patients are already experiencing the effects of climate change.

But with strong limits on carbon pollution, the public could see health benefits from cleaner air "almost immediately," research shows. The EPA's Clean Power Plan promises to reduce not only carbon pollution but other harmful air pollutants, preventing deaths and illnesses and saving billions in health care costs and lost productivity.

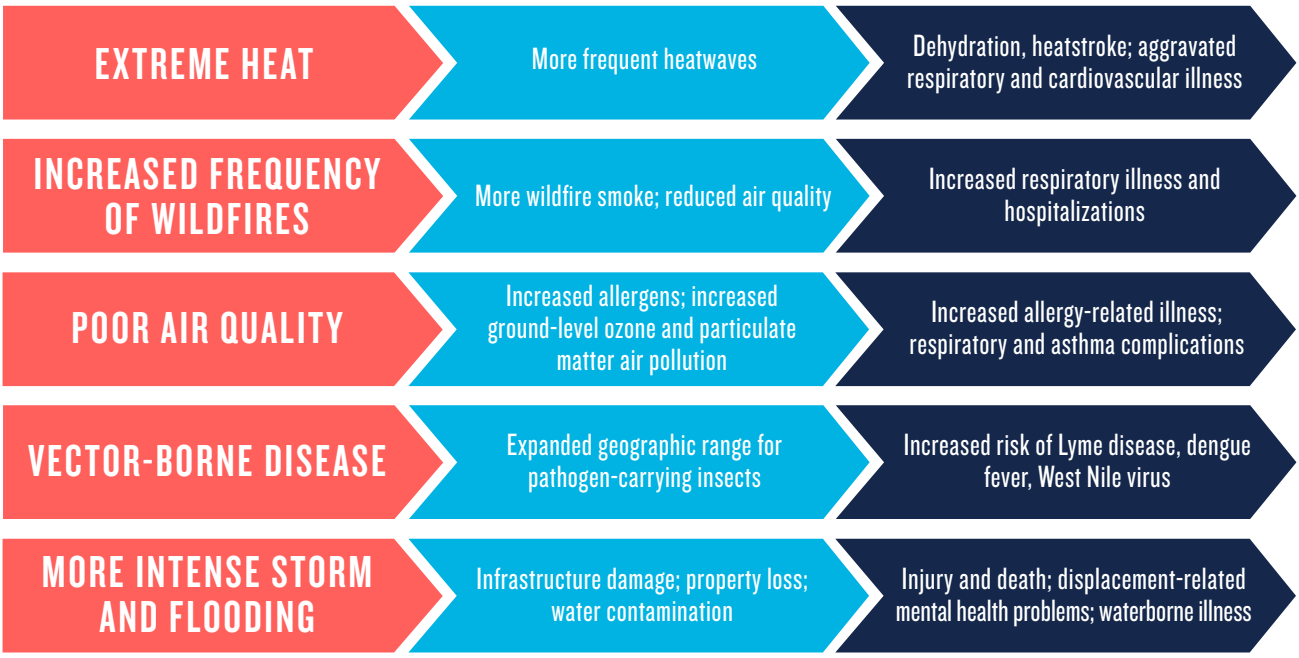


This map shows the change in number of premature deaths avoided per year under scenario 2 from the 2020 reference case by state. Scenario 2 is the moderate stringency, high flexibility & energy efficiency option and it results in the largest health co-benefits.

Positive values = increase in # of lives saved per year • Coal plant locations from U.S. Energy Information Administration 2012, 2013.

Source: Adapted from Driscoll et al., Nature Climate Change(2015), for a scenario similar to the Clean Power Plan.

CLIMATE CHANGE THREATENS HUMAN HEALTH



Source: Adapted from the American Public Health Association.

That's why health groups have been among the leading advocates for strong limits on carbon pollution.

"Implementing new power plant rules could prevent countless premature deaths, heart attacks and cases of chronic bronchitis, reduce co-pollutants, and slow hospital utilization rates that contribute to rising health care costs," Dr. Benjamin said in a 2013 statement.[6] He said that carbon limits would mean "the difference between a long, healthy life or debilitating, expensive, chronic illness for hundreds of thousands of American children and adults."[7]

Other groups, including the American Academy of Pediatrics and American Heart Association, have also expressed support for carbon limits.[8] Cutting carbon pollution would have "an immediate, positive impact on public health; particularly for those who suffer from chronic diseases like asthma, heart disease, or diabetes," said the American Lung Association.[9]

The EPA has estimated that the Clean Power Plan will annually prevent up to 150,000 asthma attacks, up to 6,600 premature deaths, 3,700 cases of bronchitis in children, and more than 1,800 visits to the hospital for cardiovascular and respiratory illnesses when fully implemented in 2030.[10]

Cutting carbon pollution from power plants carries the added benefit of reducing other harmful air pollutants, such as sulfur dioxide, nitrogen oxides, and particulate matter. These pollutants contribute to the smog and soot that worsen heart and lung disease, aggravate asthma, and contribute to premature death.[11]

Strong limits on carbon pollution, similar to those in the Clean Power Plan, could prevent 3,500 premature deaths, 1,000 hospitalizations, and hundreds of heart attacks each year by 2020, according to a 2014 study by scientists from Harvard, Syracuse, and Boston Universities on the health "co-benefits" of reducing carbon pollution.[12]

States with the most lives saved, according to the study, are Pennsylvania, Ohio, Texas, Illinois, Michigan, New York, North Carolina, Georgia, Missouri, Virginia, Tennessee, and Indiana.[13] Kentucky and West Virginia, where coal use is high, are among the states with the greatest estimated percent increase in premature deaths avoided.[14]

A year later, in a different study, researchers said the public could see health benefits "almost immediately" from strong carbon standards, with the greatest clean air and health benefits occurring when stringent targets for carbon reduction are combined with measures that promote energy efficiency and cleaner energy sources.[15]

"Ultimately...all of our families are going to be vulnerable. You can't cordon yourself off from air or from climate."
– President Barack Obama

By limiting carbon pollution, the Clean Power Plan is projected to prevent up to 150,000 asthma attacks by 2030.

"The more the standards promote cleaner fuels and energy efficiency, the greater the added health benefits," said Charles Driscoll, Syracuse University professor of environmental systems engineering and lead author of the study, published in May 2015 in Nature Climate Change.[16]

The health risks from climate change have been well documented in extensive studies by, among others, the World Health Organization and the U.S. Third National Climate Assessment.[17,18] Warnings of the risks have also come from a wide range of professional medical societies, including the American Academy of Pediatrics and the American Thoracic Society.[19,20]

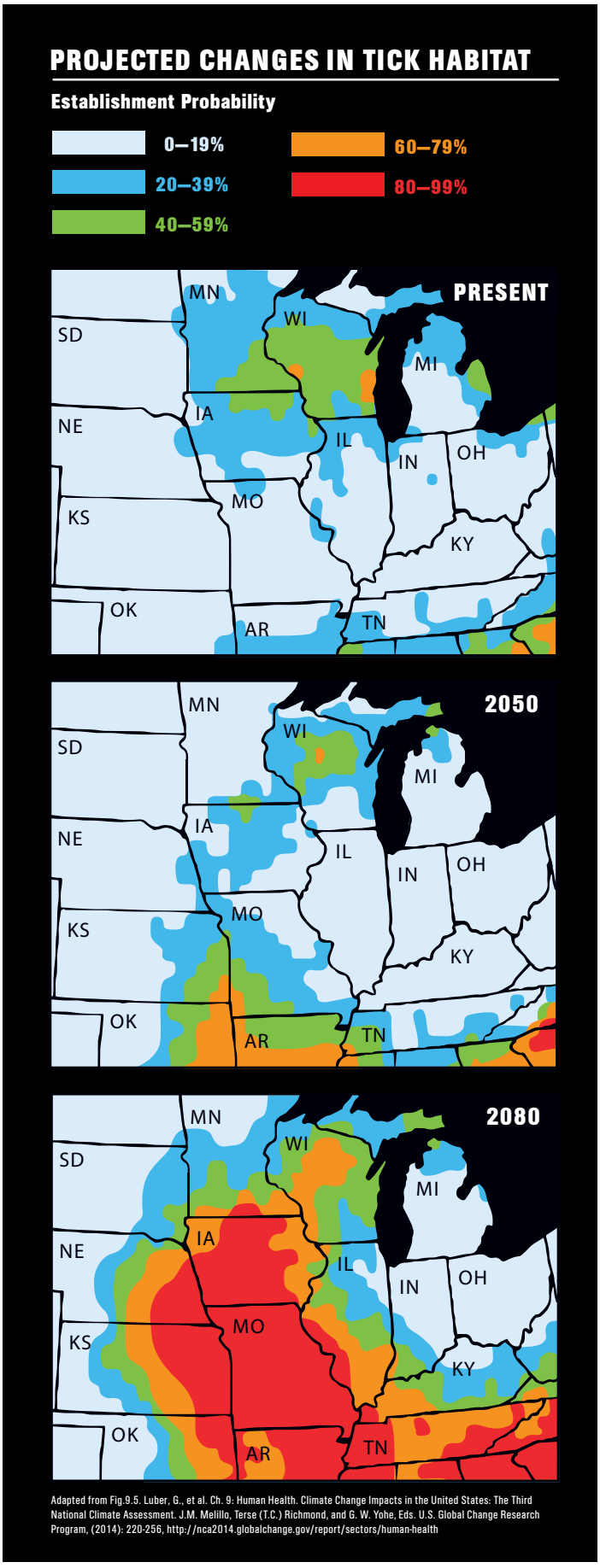
The American Thoracic Society found, in a survey of its members, that climate change is already affecting their patients' health.[21]

With strong limits on carbon pollution, the public could see health benefits from cleaner air "almost immediately."

Among the most common impacts were increases in chronic disease severity from air pollution (reported by 77 percent of respondents), allergic symptoms from exposure to plants or mold (58 percent), and severe weather injuries (57 percent).[22] The survey was conducted by George Mason University's Center for Climate Change Communication, and the results were published February 2015 in the Annals of the American Thoracic Society.

Additionally, 61 percent of physicians surveyed in 2014 by the National Medical Association, a professional society of African American doctors, reported their patients' health already has been affected by climate change.[23]

Those surveyed cited "most notably injuries due to extreme weather, health effects of hotter temperatures, detrimental impacts on chronic diseases due to air pollution, and more allergy problems—and they anticipate that some of these problems will increase in the next 10 to 20 years."[24]



Adapted from Fig.9.5. Luber, G., et al. Ch. 9: Human Health. Climate Change Impacts in the United States: The Third National Climate Assessment. J.M. Melillo, Terse (T.C.) Richmond, and G. W. Yohe, Eds. U.S. Global Change Research Program, (2014): 220-256, http://nca2014.globalchange.gov/report/sectors/human-health

"There are a whole host of public health impacts that are going to hit home," President Obama said April 7, 2015 in launching an initiative to highlight the health effects of climate change. [25]

"Ultimately…all of our families are going to be vulnerable," Obama added.[26] "You can't cordon yourself off from air or from climate."[27] The White House plans to hold a Climate Change and Health Summit in the summer of 2015 featuring Surgeon General Vivek Murthy.

While all Americans are at risk, some populations are especially vulnerable to the health effects of climate change, including children; the elderly; people with heart, lung, or kidney ailments; and low-income communities.

"As the effects of climate change result in increased negative health and environmental outcomes, children will disproportionately bear the burden of these outcomes," according to the American Academy of Pediatrics.[28]

Americans 65 years and older—a population that is projected to nearly double by 2050—are more vulnerable to extreme heat, air pollution, and infectious disease.[29]

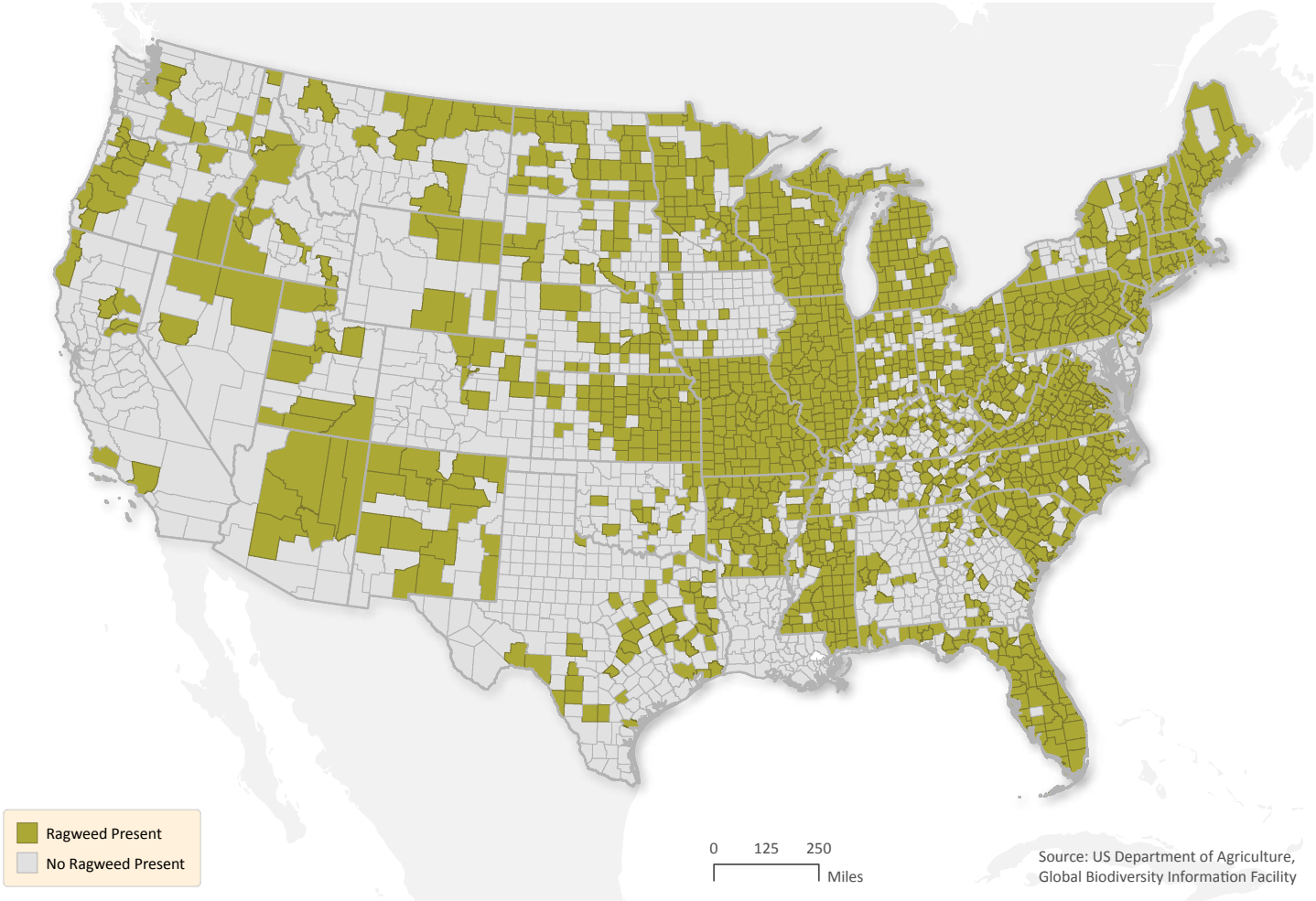
"Older people are at much higher risk of dying during extreme heat events," according to the Third National Climate Assessment.[30]

Climate change also will disproportionately affect certain communities. Coal-fired power plants tend to be located in low-income communities and communities of color, according to a study by the NAACP, the Indigenous Environmental Network, and Little Village Environmental Justice Organization.[31]

Additionally, African American children are twice as likely to be hospitalized for asthma as white children, and are more likely to die from asthma.[32] Latino children are 40 percent more likely to die from asthma than white children.[33]

As heat waves become more frequent and intense, rising temperatures are a major concern. On average, extreme heat kills more Americans every year than hurricanes, tornadoes, floods, and lightning combined.[34]

Ragweed Occurrence by County (reported as of 2014)



Warmer weather can mean more mosquitoes—and more disease.

Rising temperatures can increase the risk of heat exhaustion, heat stroke, cardiovascular disease, kidney disease, and even death.[35]

City dwellers are at particular risk because of elevated temperatures in cities, known as the "urban heat island effect," since paved surfaces absorb the sun's rays and later re-radiate heat as well as the lack of tree cover.[36] "Urban heat islands, combined with an aging population and increased urbanization, are projected to increase the vulnerability of urban populations to heat-related health impacts in the future," according to the 2014 National Climate Assessment.[37]

Rising temperatures also can worsen ground-level ozone smog, aggravating asthma symptoms and other respiratory illnesses.[38] Added to the mix are ragweed pollen and other allergens in the air—expected to worsen as rising carbon dioxide levels cause plants to grow bigger and produce more pollen over longer seasons.[39]

Today's increased levels of carbon dioxide can cause ragweed to produce twice as much pollen; by 2075, that could be four times as much.[40]

California is on the brink of a megadrought, compromising the water supply for millions.

One in three Americans—109 million people—are exposed to both unhealthy ozone levels and ragweed pollen.[41] Both exposures can worsen asthma, and both higher ozone smog and pollen levels are associated with climate change, NRDC says in its May 2015 *Sneezing and Wheezing* report.[42]

According to the report, the Top 10 "Sneeziest and Wheeziest" U.S. cities are Richmond, Memphis, Oklahoma City, Philadelphia, Chattanooga, Chicago, Detroit, New Haven, Allentown, and Atlanta.[43] "While these urban areas rank as the worst for both ragweed and high ozone levels, the most vulnerable regions nationally are the Los Angeles Basin, the region around St. Louis, the Great Lakes area, the Mid-Atlantic States, and New England," the report says.[44]

Scientists have projected that ozone concentrations in the New York metropolitan region will increase as a result of climate change, driving up the number of ozone-related emergency room visits for asthma among children in the area by 7.3 percent—more than 50 additional ozone-related emergency room visits per year in the 2020s, compared to the 1990s, according to a report in the American Journal of Preventive Medicine.[45]

Hotter weather also enables disease-carrying insects to expand their range, bringing new risks of illnesses such as Lyme disease, dengue fever, and West Nile Virus. As temperatures increase and rainfall patterns change—and summers become longer—these insects can remain active for longer seasons and in wider areas, increasing the health risks for nearby populations.[46]

"Tropical diseases that were once rare on our soil could become more common due to climate change," warned more than 75 health professionals and scientists in a letter to congressional leaders.[47]

"We are concerned about new infectious diseases arising in the Midwest as the organisms that carry them move north due to rising temperatures," according to a statement signed by 180 science faculty and researchers from 38 Iowa colleges and universities.[48] "We are now seeing new species of mosquitos and ticks in Iowa capable of transmitting diseases such as dengue fever and ehrlichiosis. With increasing temperatures, more rainfall, and longer summers, these mosquitos and ticks can live longer and expand their range."[49]

Among other health effects of climate change, more severe storms can lead to drownings, drinking water contamination, outbreaks of infectious disease, and moldy houses. Floodwaters also can overwhelm sewage systems, increasing infectious disease exposures.[50]

Climate change will worsen wildfires, and smoke can pose serious health risks to people hundreds of miles away from fire sources, a 2013 NRDC report found.[51] Wildfire smoke can cause serious health problems, such as asthma attacks and pneumonia, and worsen chronic heart and lung diseases.[52]

Lower birth weights are found among babies born to mothers exposed to wildfire smoke during pregnancy, according to a 2012 paper published in Environmental Health Perspectives.[53]

The health costs from climate change-related events already total in the billions, according to a 2011 economic analysis in Health Affairs.[54]

"Limiting climate change and its harmful health effects helps create healthier, more secure communities and is a legacy we can be proud to leave our children and grandchildren," said Kim Knowlton, a senior scientist with NRDC's Science Center.

The Clean Power Plan isn't just a program to help stabilize the climate. It is also a valuable investment in Americans' health and well-being.

Source: Adapted from the American Public Health Association, http://www.apha.org/news-and-media/multimedia/infographics/climate-and-health-infographic.

Chapter II:
Extreme Weather, Extreme Trouble

"We can choose to believe that Superstorm Sandy, and the most severe drought in decades, and the worst wildfires some states have ever seen, were all just a freak coincidence. Or we can choose to believe in the overwhelming judgment of science, and act before it's too late."

—President Obama, February 12, 2013, State of the Union

The year 2014 was the planet's warmest since recordkeeping began in 1880, 14 of the 15 hottest years have occurred this century, and the trend has continued into 2015, with the hottest four-month start of any year on record.[1,2,3,4]

Climate change is upon us, leaving behind a trail of death, injury, and destruction that damages communities, harms our health, and undermines our economy.

Heat waves have become more frequent and intense, especially in the West, where drought has also become more frequent and more severe.[5,6] Fire season starts earlier in the spring and lasts longer in the fall.

"All weather events are now influenced by climate change because all weather now develops in a different environment than before."
– Dr. Richard Somerville, Scripps Institution of Oceanography

Heavy downpours are increasing nationally, with the largest increases in the Midwest and Northeast.[7] High tides are flooding downtowns. Severe storms are wreaking havoc.

"Over the last 50 years, much of the U.S. has seen increases in prolonged periods of excessively high temperatures, heavy downpours, and in some regions, severe floods and droughts," according to the Third National Climate Assessment: Climate Change Impacts in the United States, released in May 2014.[8]

Climate change increases the risk of extreme weather the same way steroids make a baseball player stronger.[9]

"....If climate change isn't the main driver behind a given extreme, it might still play an important role—perhaps as the straw that breaks a camel's back," says the University Corporation for Atmospheric Research, a Colorado-based consortium of research universities.[10]

Climate change is warming the atmosphere and oceans, fueling weather events with more energy, such as higher wind speeds. As temperatures rise, more moisture evaporates from the oceans; bigger storms can be one of results. Warmer air over land evaporates more water from soil and plants and can create or extend drought. The Intergovernmental Panel on Climate Change, the world's most respected scientific body on the subject, has said that further climate change will likely amplify extreme heat, drought, heavy precipitation, and the highest wind speeds of tropical storms.[11]

"All weather events are now influenced by climate change because all weather now develops in a different environment than before," said Dr. Richard Somerville, a professor emeritus of Scripps Institution of Oceanography and science director of Climate Communication, a project of the Aspen Global Change Institute.[12] "Some types of extreme weather events are becoming more frequent and/or severe due to climate change, heat waves, heavy rain, floods, and droughts among them. Climate change is increasing the odds that extreme weather will occur."[13]

The Intergovernmental Panel on Climate Change (IPCC) has said that the warming of the climate is "unequivocal."[14] Since the 1950s, the IPCC said, many of the observed changes are "unprecedented" over decades to millennia.[15]

"The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased," the science panel said.[16]

Summers are longer and hotter, and extended periods of unusual heat last longer than any living American has ever experienced.

In May 2013, the daily mean concentration of carbon dioxide in the atmosphere surpassed 400 parts per million (ppm) for the first time since measurements began in 1958, according to data from the Mauna Loa Observatory in Hawaii.[17]

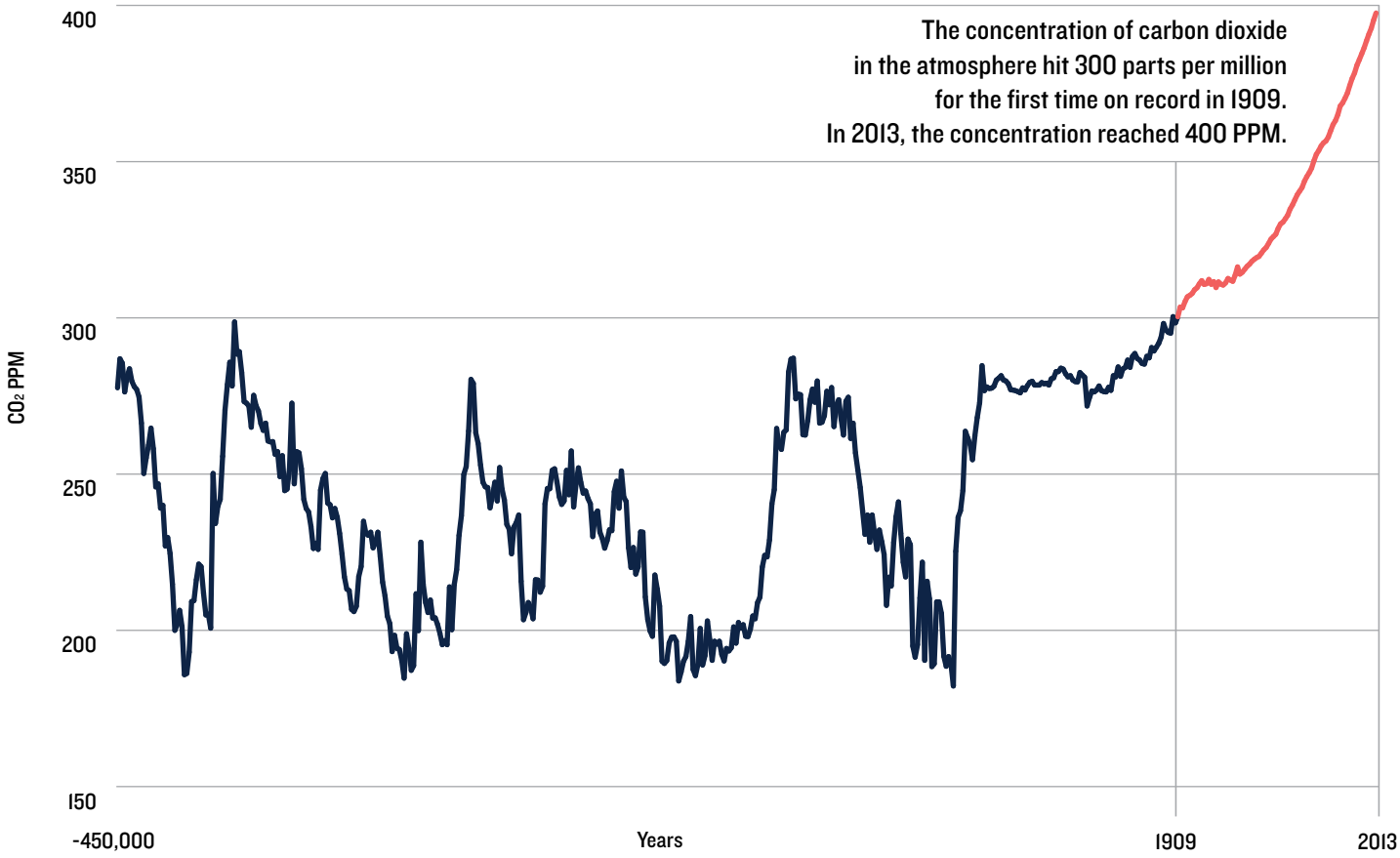
"We are in uncharted territory," NOAA reported.[18] "Ice core records show CO_2 levels never exceeded 300 ppm during the last 800,000 years until the early 20th century."[19]

Then came March 2015, when the global monthly average of carbon dioxide concentration surpassed 400 ppm for the first time.[20]

Scientists tell us that if we don't take action to slow, stop, and reverse the carbon pollution that is turbo-charging climate danger, the extreme weather we're experiencing today could become the new normal tomorrow.

All over the world, heat waves are becoming more frequent and lengthy—a trend that is expected to accelerate.

Atmospheric CO_2 Concentrations



Sources: From 420,000 years ago: Vostok Ice Core. From 1AD to 1958: Ethridge et. al., 1996; MacFarling Meure et al., 2006, "South Pole Ice Core". From 1958 to present: Muana Loa Observatory

Each of the past three decades has been hotter than the one before and the past three decades were hotter than any time in the past 1,400 years.[21,22]

"Summers are longer and hotter, and extended periods of unusual heat last longer than any living American has ever experienced," says the 2014 National Climate Assessment.[23] "The incidence of record-breaking high temperatures is projected to rise."[24]

California is now suffering from its worst drought in more than a century.[25] The mid-April, 2015 snowpack in the Sierra was at a record low.[26] That same month, Governor Jerry Brown ordered the first-ever mandatory statewide water reductions.[27]

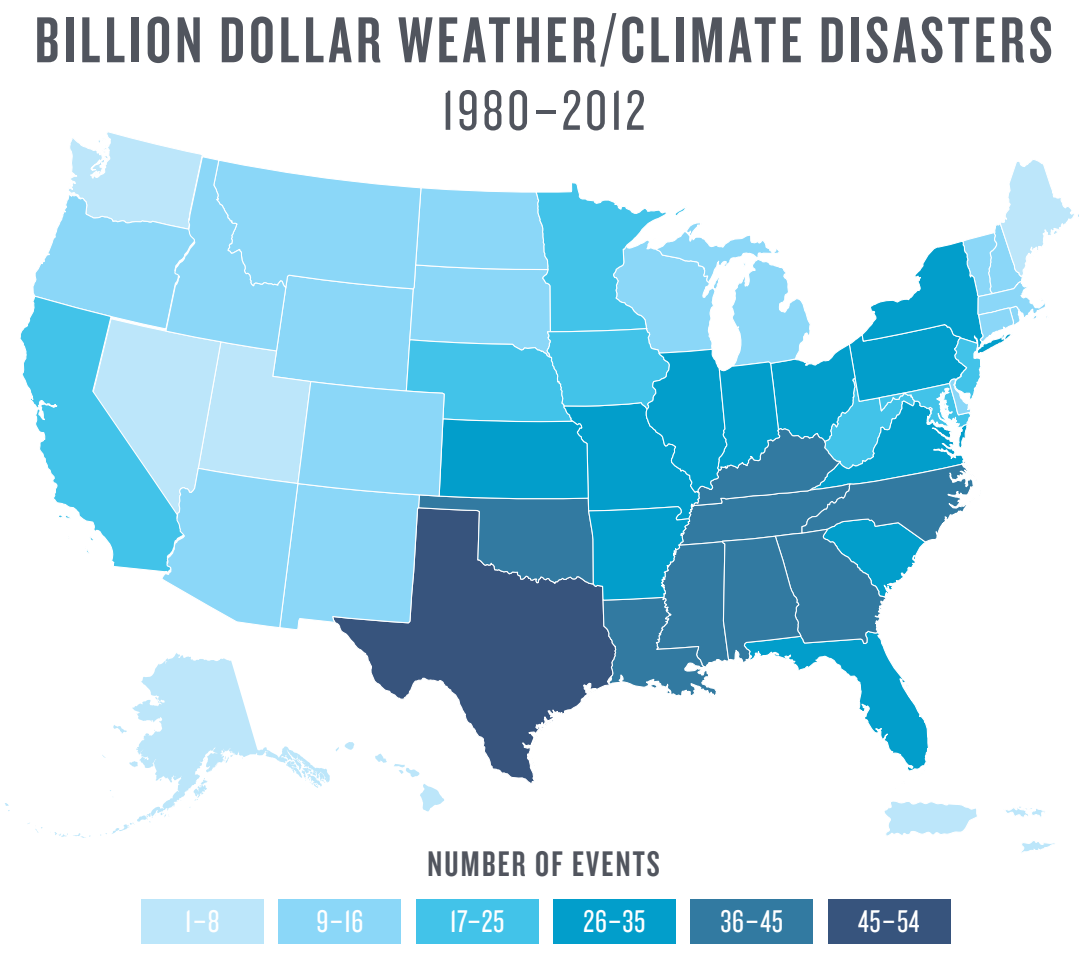
In 2011, Oklahoma broke a Dust Bowl era record, set in 1934, of the hottest summer for any state since recordkeeping began in 1895.[28] Many locations in Texas and Oklahoma experienced more than 100 days over 100 degrees.[29]

In 2011, Texas suffered through the worst one-year drought in the state's history.[30]

The year 2011 brought a record-breaking total of 14 weather and climate disasters that each caused more than $1 billion in damage, according to NOAA.[31]

"Sure, we've had years with extreme flooding, extreme hurricanes, extreme winter snowstorms, and even extreme tornado outbreaks. But I can't remember a year like this in which we experienced record-breaking extremes of nearly every conceivable type of weather." National Weather Service director Jack Hayes said, referring to the extreme weather in 2011.[32]

In 2012, 25 states east of the Rockies recorded their warmest March on record, according to NOAA. Every state experienced at least one record warm daily temperature during March.[33]



Source: Adapted from the National Climate Assessment 2014, Ch.17 (Southeast), Fig. 17.1.

In March 2012, Chicago recorded eight days with temperatures of at least 80 degrees.[34]

"To have as many [80-degree days] as we did is just unbelievable and historic and unprecedented," Richard Castro, a weather service meteorologist, told the Chicago Tribune.[35] "Summer in March is basically what we had."

Last year, Alaska, California, Arizona, and Nevada had their warmest year on record.[36]

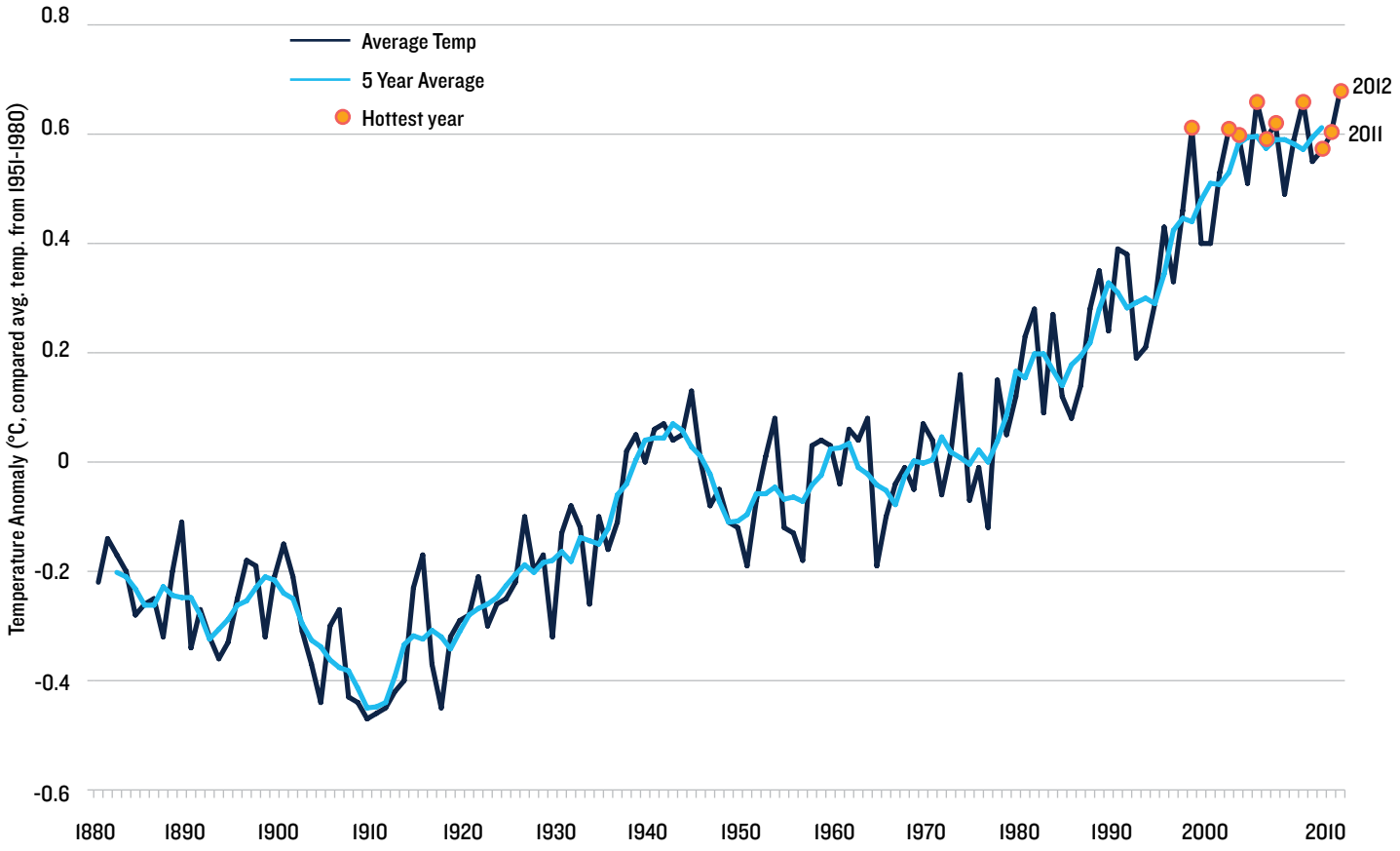
Residents of some coastal cities are seeing their streets flood more regularly during storms and high tides, according to the 2014 National Climate Assessment.[37] Inland cities near large rivers also are experiencing more flooding, especially in the Midwest and Northeast.[38]

Global sea level has risen by about 8 inches since 1880, according to Climate Central's Surging Seas, which provides online data on areas exposed to coastal flooding.[39] It is projected to rise another one to four feet by 2100, says the National Climate Assessment.[40]

As the amount of precipitation in the air increases, we are seeing more intense and frequent flooding all over the globe.

10 Warmest Years

The global average temperature has been steadily increasing since the start of industrial revolution. The 10 warmest years of the century have all occurred since 1998.



Source: NASA Goddard Institute for Space Studies.

Warmer and drier conditions in the West are contributing to ferocious wildfires.

And there was SuperStorm Sandy in 2012, which then-New York Mayor Michael Bloomberg called "a storm of unprecedented proportions."[41]

"The storm itself we can't immediately link to climate change, but the flooding damage we can," according to Cynthia Rosenzweig, a climate impacts expert at NASA Goddard Institute for Space Studies.[42] "As sea levels continue to rise, a storm of the same magnitude will cause even greater damages due to storm surges coming in on top of a higher 'baseline' water level."[43]

"We know that no single weather event is caused solely by climate change," President Obama said in a 2013 speech at Georgetown University.[44] "But we also know that in a world that's warmer than it used to be, all weather events are affected by a warming planet. The fact that sea level in New York, in New York Harbor, are now a foot higher than a century ago—that didn't cause Hurricane Sandy, but it certainly contributed to the destruction that left large parts of our mightiest city dark and underwater."[45]

Climate change is making the West warmer and its summers drier, setting the stage for even bigger wildfires, according to NRDC's 2013 Where There's Fire, There's Smoke report.[46]

In 2012, Western wildfires scorched an area larger than the state of Maryland.[47] In 2014, Washington State experienced the largest wildfire in state history, covering about 400 square miles and destroying an estimated 300 homes.[48]

Even Boston's record snowfall for the winter of 2014–2015 doesn't contradict the fact that global warming is happening; it could be another example of climate change in action.

This year, Boston recorded its snowiest winter since recordkeeping began in 1872—recording 108.6 inches at Logan International Airport.[49] As incongruous as a warming planet and a record snowfall seems, warmer ocean temperatures produce more moisture in the air, which means more snow.

"The conditions that have generated this winter's historic snowfall are consistent with global warming: record high sea-surface temperatures off the coast have provided moisture and energy to fuel these storms," Juliette Rooney-Varga, director of the Climate Change Initiative at the University of Massachusetts, Lowell, wrote in the Boston Globe.[50] "Ironically, it is also possible that the rapid decline in Arctic sea ice over the past several decades is causing the Polar Vortex to wander further south, bringing frigid Arctic air into our region."[51]

Extreme weather has not been limited to the United States.

This winter, Arctic sea ice was the smallest since satellite recordkeeping began in 1979.[52] "The Arctic Ocean is expected to become essentially ice-free in summer before mid-century," the National Climate Assessment warned.[53]

If nothing is done, the cost of flood damage to the world's coastal cities could exceed $1 trillion.

"In only five years, the 2010s have witnessed almost as many extreme weather events as the 1960s and 1980s combined."
– The Center for American Progress

In 2014, 19 European countries reported record high temperatures, according to the World Meteorological Organization.[54] In 2013, Australia saw its hottest year on record.[55]

Extreme weather events are taking a toll on life, property, and the economy.

In the last four years, extreme weather events across the United States caused 1,286 fatalities and $227 billion in economic losses across 44 states, according to an analysis by the Center for American Progress entitled "Extreme Weather on the Rise."[56]

"In only five years, the 2010s have witnessed almost as many extreme weather events as the 1960s and 1980s combined," according to the report.[57]

Climate change could add up to $60 billion to annual wildfire costs by 2050, according to "Flammable Planet: Wildfires and the Social Cost of Carbon" by NRDC, the Environmental Defense Fund, and NYU Law School's Institute for Policy Integrity.[58]

And flood damage to the world's largest coastal cities could rise to $1 trillion a year unless protective measures are put in place, according to the World Bank, which listed Miami, New York, New Orleans, Tampa, and Boston among the cities at greatest risk in overall cost of damages.[59]

"On our current trajectory, we are creating for ourselves—and even more so for coming generations—a future of extreme and catastrophic risks from a dangerously disrupted climate," said Franz A. Matzner, director of NRDC's Beyond Oil Initiative.[60] "We must protect them from the worst impacts of climate disruption, and that means starting to cut carbon pollution now."[61]

Chapter III:
A Matter of National Security

"A changing climate will have real impacts on our military and the way it executes its missions."

—U.S. Department of Defense[1]

Climate change isn't just a threat to public health, the environment, and the economy.

It poses "immediate risks to U.S. national security," warned a 2014 Pentagon report.[2]

Climate change could necessitate military responses to humanitarian crises, such as mass migrations or political instability, including armed conflicts, as a result of food and water shortages. At home, rising sea levels and flooding puts coastal military installations at risk while extreme weather threatens to disrupt military training.

"The national security risks of projected climate change are as serious as any challenges we have faced," warned a group of retired generals and admirals who serve on the military advisory board for CNA Corporation, a nonprofit military research organization.[3] Climate change, they warned, could be detrimental to military readiness.

The American Security Project, a Washington-based think tank whose board includes retired generals and admirals, called climate change "a clear and present danger to the United States through its effects on our global allies as well as its direct effects on our agriculture, infrastructure, economy, and public health."[4]

Naval Station Norfolk in Virginia, the world's largest naval base, has been singled out as especially vulnerable to rising sea levels.

"The change wrought by a warming planet will lead to new conflicts over refugees and resources, new suffering from drought and famine, catastrophic natural disasters, and the degradation of land across the globe," according to a White House national security report.[5]

"While climate change alone does not cause conflict, it may act as an accelerant of instability or conflict, placing a burden to respond on civilian institutions and militaries around the world. In addition, extreme weather events may lead to increased demands for defense support to civil authorities for humanitarian assistance or disaster response both within the United States and overseas," the Defense Department said in a 2010 review of its priorities.[6]

In a May 2015 report, the White House called the national security implications of climate change "far reaching, as they may exacerbate existing stressors, contributing to poverty, environmental degradation, and political instability, providing enabling environments for terrorist activity abroad."[7]

National security experts refer to climate change as a "threat multiplier" because of its potential to exacerbate troubles like food and water shortages and competition for resources. Climate change is enough of a national security concern that it was discussed in the 2015 Worldwide Threat Assessment, presented to Congress by Director of National Intelligence James Clapper.[8]

"The change wrought by a warming planet will lead to new conflicts over refugees and resources, new suffering from drought and famine, catastrophic natural disasters, and the degradation of land across the globe."

– The White House

Among other concerns: sea ice in the Arctic is melting, opening new waterways that could lead to competition—and international tensions—over natural resources. It also could open up new routes for smuggling and trafficking, warned a 2014 Department of Homeland Security report.[9]

Sea level rise could threaten coastal U.S. military bases. A National Intelligence Council report found more than 30 U.S. military installations at risk from rising sea levels.[10]

Norfolk, Virginia, home of the world's largest naval base, was singled out by the National Climate Assessment as vulnerable to damage from rising sea levels.

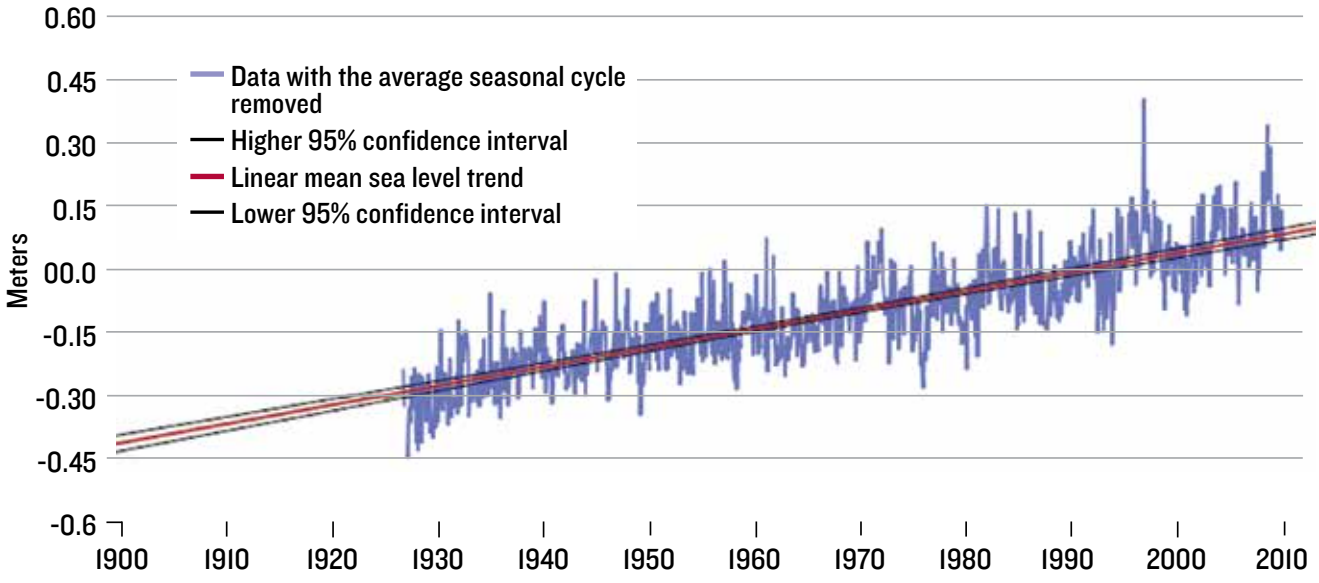
"As sea level has risen over the last century, utilities suspended beneath old single-deck piers have become increasingly vulnerable to damage from sea water immersion and are less accessible for maintenance," retired Captain Joseph Bouchard, commanding officer at Naval Station Norfolk from 2000 to 2003, has said.[11] "Utility outages have a serious impact on the readiness of ships at the piers."[12]

Hampton Roads, which includes Naval Station Norfolk and other military facilities, faces a projected sea-level rise of 1.5 feet over the next 20 to 50 years.[13]

On the Alaskan coast, thawing permafrost, decreasing sea ice, and rising sea levels have increased coastal erosion at several Air Force early-warning radar installations. At one facility, 40 feet of shoreline has been lost as a result of erosion, damaging half of a runway and preventing large planes from landing there, according to a Government Accountability Office report.[14]

In 2005, Hurricane Katrina devastated New Orleans and the Gulf Coast, exhausting regional resources and prompting a response from the National Guard and FEMA.

Historic sea level rise at Sewells Point, Norfolk, Virginia, 1927–2006



Source: NOAA, 2011, http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8638610.

"The Pentagon says that climate change poses immediate risks to our national security. We should act like it."
– President Barack Obama

"Daily operations at these types of remote radar installations are at risk due to potential loss of runways, and such installations located close to the coastline could be at risk of radar failure if erosion of the coastline continues," the report said.[15]

In the West, droughts and longer wildfires threaten military training.

Climate change also poses "potentially destabilizing threats to our international installations that hold strategic importance to the U.S. military," according to the American Security Project.[16]

"Climate change threatens to make fragile states even more fragile, which can lead to the potential for destabilizing violence, which can present direct security challenges to the United States and its allies," said the Center for Climate and Security.[17]

The military, as the nation's single largest energy consumer, is taking steps to reduce its carbon footprint and save taxpayer money through more energy efficiency and greater use of cleaner energy sources such as solar and wind power and advanced biofuels.[18,19]

NRDC is working with the Army to transform West Point into a net-zero energy base by 2020. The Air Force estimates that its $1.1 billion energy bill in 2012 would have been $300 million higher if not for efficiency and conservation measures undertaken over the past decade, according to a January 2014 report by the Pew Charitable Trust on the military's deployment of clean energy technologies.[20] In Arizona, all of the electricity for the Army's Fort Huachuca will be generated by the sun during peak daylight hours, following installation of one of the largest solar arrays on a Defense Department installation, reported Environmental Entrepreneurs (E2).[21]

As the Arctic ice melts, it opens new waterways, and international competition over natural resources.

The military has been looking into greater use of renewable energy such as solar-powered tents and greater energy efficiency for years—a lesson learned from the high casualty rates on fuel-delivery convoys in Iraq and Afghanistan, as well as rising fuel prices.[22,23]

Marines are carrying roll-up solar mats instead of heavy spare battery packs to power laptops, radios, GPS systems, and other battle gear.[24] The lightweight solar panels allow soldiers to move faster and farther and eliminate the need for dangerous fuel convoys or helicopter runs to drop off batteries.

"In Iraq and Afghanistan, our oil addiction demanded long, difficult supply lines that were dangerous and expensive," said retired Army Brig. Gen. Steven Anderson, the military's senior logistician in Iraq for 15 months in 2006 and 2007 and a member of E2.[25] "Including overhead, it costs taxpayers more than $30 billion annually for the fuel these military operations require."[26]

"One in 24 fuel convoys in Iraq and Afghanistan ended in an American casualty, with more than 3,000 Americans killed in fuel-supply convoys between 2003 and 2007 alone," Michael Breen, executive director of the Truman National Security Project, wrote in the San Francisco Chronicle.[27]

"Less energy use means fewer convoys, and fewer convoys mean fewer casualties," Army Secretary John McHugh wrote in a 2012 blog post.[28] "If we can find ways to better use and conserve our energy sources, we will, quite literally, be saving lives."[29]

In 2012, energy efficiency and renewable energy improvements, such as tactical solar gear at combat outposts in Afghanistan, saved roughly 20 million gallons of fuel—taking 7,000 truckloads worth of fuel off the battlefield.[30]

"Climate change threatens to make fragile states even more fragile."
– Center for Climate and Security

Additional information about the national security implications of climate change can be found in studies by the CNA Corp's military advisory board, Center for Climate Security, Council on Foreign Relations, and Defense Science Board.[31,32,33]

"The Pentagon says that climate change poses immediate risks to our national security. We should act like it," President Obama said in his 2015 State of the Union address.[34]

"We need to act—and we need to act now," the president said at the U.S. Coast Guard commencement in May 2015 in New London, Connecticut.[35] "Denying it, or refusing to deal with it endangers our national security."[36]

Peter Lehner, NRDC executive director, added: "The military's clear-eyed perspective on climate change contrasts sharply with the denial, ducking, and dodging that marks the stance of some members of Congress, who seem to think the issue will disappear if they continue to ignore it."[37]

Chapter IV:
Save the Animals

"Life on Earth is profoundly affected by the planet's climate. Animals, plants, and other living beings around the globe are moving, adapting, and, in some cases, dying as a direct or indirect result of environmental shifts associated with our changing climate."

–National Academies' Ecological Impacts of Climate Change[1]

Remember the animals.

They and their habitats are threatened by climate change.

Rising temperatures are disrupting ecosystems and threatening to push species that cannot adapt to extinction.[2]

Climate change is already shifting habitat ranges and altering migration patterns. While many species will continue to thrive, some populations may decline and in some instances, go extinct, the U.S. Fish and Wildlife Service warned.[3]

One in six animal and plant species could face extinction by 2100 if climate change is not addressed, according to study by Mark Urban, a University of Connecticut ecologist, which was published in the May 1, 2015 issue of Science.[4]

"Many species will be able to shift their ranges and keep up with climate change whereas others will not either because their habitat has disappeared or because they can't reach their habitat anymore," Urban said.[5]

It isn't just the majestic polar bears at risk due to their struggle to survive in melting Arctic sea ice.

Polar bears are not the only animals watching their habitats disappear.

Our birds are particularly vulnerable to the effects of climate change.

"Some of America's most iconic species—from moose to sandhill cranes to sea turtles—are seeing their homes transformed by rapid climate change," said Dr. Amanda Staudt, climate scientist at the National Wildlife Federation, which produced "Wildlife in a Warming World" a report on animals struggling to adapt to the climate crisis.[6]

Arctic ringed seals, for example, are "likely to become endangered in the foreseeable future due to climate change," according to the National Oceanic and Atmospheric Administration (NOAA).[7]

Nearly half of the bird species in the United States are seriously threatened by climate change, including the bald eagle, which could see its current range decrease by nearly 75 percent in the next 65 years, the Audubon Society warned.[8]

"In 2080, the Baltimore Orioles may have to play baseball under a different name," the Audubon Society said.[9] "That's because climate change is likely to have altered climatic conditions so drastically, the bird may no longer be able to reside in Maryland."[10]

Other state birds at risk include Brown Pelican (Louisiana), California Gull (Utah), Hermit Thrush (Vermont), Mountain Bluebird (Idaho and Nevada), Ruffed Grouse (Pennsylvania), Purple Finch (New Hampshire), and Wood Thrush (Washington, D.C.).[11]

"Some of America's most iconic species... are seeing their homes transformed by rapid climate change."
– Dr. Amanda Staudt, National Wildlife Federation

Animals on land, in water, and in the skies are feeling the effects of climate change.

Some animal species will be able to adapt to changing habitats—for example, by shifting their range northward or to higher altitudes in order to adjust to rising temperatures, says the EPA.[12] Many types of birds in North America, for example, are already migrating further north as the temperature warms.

Other animals, however, might not be able to adapt fast enough to keep pace with the rate of climate change.

"Future generations of America's wildlife and our outdoor heritage are already being hurt by climate change, with urgent action needed at all levels to avoid catastrophic changes," says a 2014 National Wildlife Federation report Wildlife Legacy: Climate Change and the Next Generation of Wildlife.[13]

For example, "between the increase in winter ticks and the summer heat, moose are having a tough time hanging on in the face of climate change—and future generations of the species are at risk," the report noted.[14]

In the West, the whitebark pine is threatened with extinction from a combination of factors, including a climate-driven infestation of mountain pine beetles.

The Fish and Wildlife Service, in response to an NRDC petition, determined in 2011 that the whitebark pine faces an "imminent" risk of extinction and warrants protection under the Endangered Species Act—the first widely dispersed tree species to be federally recognized as a climate casualty.[15]

The high-elevation tree used to be out of the beetles' reach, but as winter temperatures have climbed higher on average, the beetles have been able to move higher in elevation, survive over winter, and even reproduce more quickly.[16]

In the Greater Yellowstone area, 80 percent of whitebark pine forests are dead or dying.[17]

"The loss of whitebark pine has the potential to affect its entire ecosystem, as whitebark pine provides food and shelter to all kinds of critters and shades the winter snowpack for later in the spring," said Sylvia Fallon, NRDC scientist.[18] "In the Greater Yellowstone Ecosystem, whitebark pine has been an important food source for grizzly bears, providing a high fat food source that keeps them up high in the mountains—out of harm's way—in the late summer and fall."[19]

Climate change threatens cold water fish like trout and salmon and the economies that depend on them.

Climate change—including warmer water and reduced water flows due to drought—poses a threat to cold-water fish such as trout and salmon and to state economies that depend on commercial and recreational fishing.

"Climate change is creating new stresses on fish, whether brook trout in Appalachia, walleye in the Midwest, Apache trout in the arid Southwest, or salmon in the Pacific Northwest," the National Wildlife Foundation says in a 2013 report "Swimming Upstream: Freshwater Fish in a Warming World."[20]

"We must act now, as if the future of fish and wildlife and people hangs in the balance—for indeed, all indications are that it does," says the Fish and Wildlife Service.[21]

> ***"We must act now, as if the future of fish and wildlife and people hangs in the balance—for indeed, all indications are that it does."***
> ***– U.S. Fish and Wildlife Service***

Chapter V:
The Benefits Far Outweigh the Costs

"Climate inaction is costing us more money, in more places, more often,"

—EPA Administrator Gina McCarthy, June 2014 in unveiling the Clean Power Plan to cut carbon pollution from power plants

Billions of dollars in property damage. Crop losses. Water shortages. Increased disease. Human suffering.

Those are among the "potentially calamitous" costs of climate change.[1]

By the EPA's estimates, the Clean Power Plan will deliver annual benefits between $55 billion and $93 billion by 2030 from avoided climate-related damage to human health and property—far outweighing its estimated $8.8 billion annual cost.[2]

NRDC analysis, though, suggests that the plan will actually produce a savings rather than a cost for the electricity system.[3]

That analysis projects a savings of between $6.4 billion and $9.4 billion annually in 2030 rather than the estimated $7.3 to $8.8 billion cost, for the electric power industry to meet carbon-reduction targets.[4]

Industrial costs for investing in energy efficiency and cleaner energy sources, such as solar and wind, are likely to be less than the EPA projects, according to the NRDC analysis. The EPA also underestimated the potential growth for low-cost energy efficiency and cleaner energy sources.

Not only will the Clean Power Plan save billions by avoiding climate-related damage to health and property, but electricity customers will benefit from lower electric bills, projected to drop by about 8 percent by 2030, according to the EPA.[5]

If utilities invest heavily in energy efficiency to meet carbon reduction targets, electricity customers would save $37 billion in 2020 alone, an NRDC study found.[6] For the typical household, that's an average savings of about $103 annually.[7]

States generating more electricity from cleaner energy sources—such as South Dakota with significant wind generation and California with significant solar generation—have shown lower average retail electricity prices than states producing less electricity from renewable sources, found a March 2015 report by DBL Investors, a San Francisco-based venture capital firm.[8]

Public Citizen, a consumer advocacy group, notes that Clean Air Act regulations "historically have proved far more beneficial and less costly than what is forecast when they are created."[9]

"The total benefits of Clean Air Act rules from 1970 to 1990, for instance, were 43 times greater than the costs," the group noted.[10]

Consider the costs of inaction.

Climate change could cost the U.S. economy billions of dollars, from lower crop yields in the Midwest to massive property losses from rising sea levels on the East and Gulf Coasts, warned a 2014 report by a bipartisan business-focused group called the Risky Business Project.[11]

"Severe weather is the number one cause of power outages in the United States."
– White House Council of Economic Advisers and the U.S. Department of Energy

The group is co-chaired by former New York Mayor Michael Bloomberg, former Treasury Secretary Henry Paulson and Tom Steyer, a clean energy philanthropist and founder of NextGen Climate.

In June 2015, EPA said in a report, "Climate Change in the United States: Benefits of Global Action," that global action to curb carbon pollution would save billions of dollars and save thousands of lives.[12]

A growing majority of small business owners see a clear and present danger in climate change and they want government to address the threat, according to a poll commissioned by the American Sustainable Business Council, which represents more than 200,000 businesses nationwide.

"Climate change poses tremendous risks—insurance premiums will skyrocket, electricity prices will soar, jobs will be lost, food and transportation costs will dramatically rise, and taxes will likely increase in order to pay for needed infrastructure upgrades," Richard Eidlin, director of public policy for the American Sustainable Business Council, wrote in the San Jose Mercury News.[13]

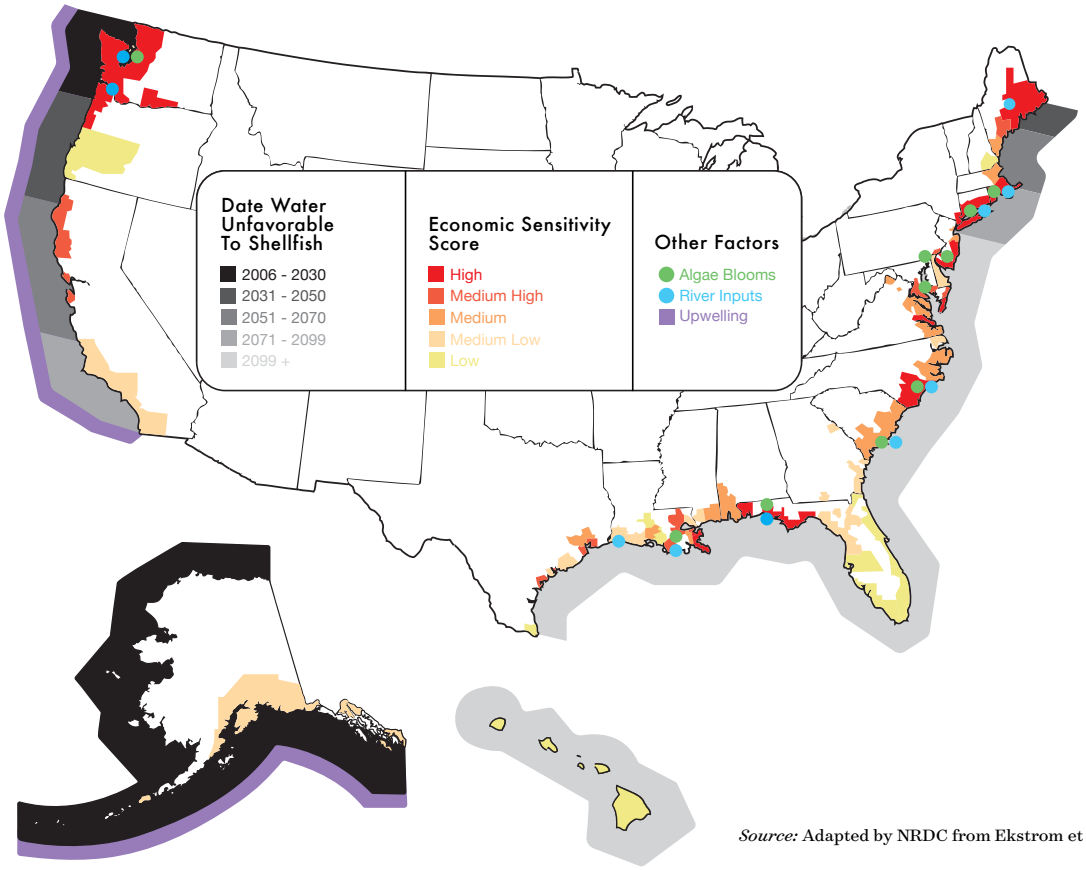
Nearly one third of companies surveyed by University of Notre Dame researchers reported having experienced climate change impacts that hurt their bottom lines, and more than 70 percent said they are at least "somewhat concerned" that climate change will have a material impact on their businesses.[14]

Two thirds of respondents expressed concern over increased operational and capital costs and reported t hey had already experienced cost increases or thought they were a likely outcome, according to a May 2015 report on the survey, conducted by Notre Dame's Global Adaption Index with Four Twenty Seven, a climate risk and adaptation consulting firm based in San Francisco.[15]

"We know that climate change has the potential to impact our business," Gap, Inc. reported.[16] "In fact, we have likely already experienced it. In 2010, cotton prices hit a nearly two-decade high...Volatile climate patterns in key cotton-producing regions played a role."

ECONOMIC THREATS FROM OCEAN ACIDIFICATION

The long-term economic impacts of ocean acidification are expected to be most severe in regions where ocean areas are acidifying fastest (black) and where the residents rely most on local shellfish for their livelihood (red). Coastal features such as algae blooms from nutrient pollution, local upwelling currents, and poorly buffered rivers (green, purple, blue) can amplify acidification locally.



Source: Adapted by NRDC from Ekstrom et al., 2015.

In October 2012, SuperStorm Sandy shocked and devastated the Northeast Coast.

"Sandy was a cruel reminder of how destructive coastal storms can be in our dense urban environment."
– The Office of the Mayor of New York City

The fishing and tourist industries could suffer economically from ocean acidification—the result of oceans absorbing the growing amounts of carbon dioxide. Change in the ocean's chemistry makes it more difficult for some creatures with calcium carbonate shells or skeletons (including mollusks, crabs, and corals) to grow their shells and survive.

"Ocean acidification has already cost the oyster industry in the Pacific Northwest nearly $110 million, and jeopardized about 3,200 jobs," said Julia Ekstrom, a former NRDC scientist and lead author of a February 2014 article in the journal Nature Climate Change.[17] Coastal communities from Maine to the Chesapeake Bay to the Louisiana bayou face similar risks of economic harm, according to the article.

And then there are the enormous costs from extreme weather.

An NRDC study found that when all federal spending on droughts, storms, floods, and forest fires were added up in 2012, the U.S. Climate Disruption Budget was nearly $100 billion—more than Washington spent on education or transportation.[18]

SuperStorm Sandy in 2012 caused about $67 billion in damage and 159 deaths, according to the National Oceanic Atmospheric Administration.[19] Sandy damaged or destroyed at least 650,000 housing units and 250,500 insured vehicles. More than 300,000 business properties were also affected, according to the reinsurance firm Aon Benfield.[20]

The New York City subway system suffered the worst damage in its 108-year history.[21] The New York Stock Exchange experienced an historic two-day closure as a result of the storm, the longest closure since the Blizzard of 1888.

Solar power shines a ray of hope to our clean energy future.

"Sandy was a cruel reminder of how destructive coastal storms can be in our dense urban environment—storms that, with climate change, are expected to increase in intensity," says a 2013 report calling for a nearly $20 billion plan ordered by then-Mayor Michael Bloomberg to prepare New York City for extreme weather and rising seas.[22,23]

Miami Beach is spending hundreds of millions of dollars on pumps to keep rising sea levels from flooding streets even on sunny days. Other coastal areas are bracing for similar impacts.

"Severe weather is the number one cause of power outages in the United States and costs the economy billions of dollars a year in lost output and wages, spoiled inventory, delayed production, inconvenience, and damage to grid infrastructure," according to 2013 report by the White House Council of Economic Advisers and the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability.[24] It forecasts the number of outages caused by severe weather to rise "as climate change increases the frequency and intensity of hurricanes, blizzards, floods, and other extreme weather events."[25]

"We must act now...
The longer we wait,
the more painful—and expensive—
the consequences will be."
– Rhea Suh

The White House Council of Economic Advisers also warned that the cost of addressing climate change will rise by about 40 percent each decade in which action is delayed—and failing to act would risk substantial economic damage.[26]

"We must act now," says Rhea Suh, NRDC president. "The longer we wait, the more painful—and expensive—the consequences will be."

Chapter VI:
Opportunities Knock

"In the 1970s, lobbyists told us that using the Clean Air Act to phase in catalytic converters for new cars and trucks would cause "entire industries' to 'collapse.' Instead, the requirement gave birth to a global market for catalytic converters and enthroned American manufacturers at the pinnacle of that market."

—Environmental Protection Agency Administrator Lisa Jackson in 2010 on the 40th anniversary of the Clean Air Act[1]

Here we go again.

Almost every time the government has moved to protect the public's health, industry has cried wolf. And that's exactly what is happening now, in the wake of the EPA's historic Clean Power Plan to cut dangerous carbon pollution from power plants.

"This is our new catalytic converter-moment," EPA Administrator Gina McCarthy told a Georgetown University conference.[2]

Studies show the Clean Power Plan will actually create new opportunities for jobs and economic growth by spurring investment in energy efficiency and cleaner energy, including new low-carbon technologies.

Wind power is an affordable, efficient and abundant source of domestic electricity.

The plan is likely to boost employment by up to 273,000 jobs by 2040, says an April 2015 study by economists from the University of Maryland and consulting firm Industrial Economics.[3]

"Tackling climate change is one of America's greatest economic opportunities of the 21st century," said a letter sent to the EPA in support of the plan and signed by more than 200 businesses, including Nike, Starbucks, Levi Strauss, and Kellogg.[4]

Since 1970, investments to comply with the Clean Air Act have provided $4 to $8 in economic benefits for every $1 spent on compliance, says the U.S. Office of Management and Budget.[5]

"We don't have to choose between a healthy economy and a healthy environment. Those goals are not separate, they're intertwined," McCarthy said in a Los Angeles speech in 2014.[6] "We don't act despite the economy, we act because of it."[7]

"While the costs of climate change keep rising, so does the value of unleashing American innovation and entrepreneurship to solve this problem," Environmental Entrepreneurs (E2), a non-partisan group of business leaders who promote clean energy and NRDC affiliate, said in a letter to members of Congress.[8]

Carbon limits will provide the "clear and sustained market signal businesses, entrepreneurs, and investors require to commit significant funds to clean energy projects across the nation," the group said.[9]

Many states are already showing they can reduce carbon pollution—and benefit their economies—through increased energy efficiency and greater use of cleaner energy such as solar and wind power.

Since 2011, private industry and the public sector have announced more than 230,000 new clean energy and clean transportation jobs.[10]

Many solar panel manufacturers are based in the United States, employing more than 27,000 Americans in high-earning, high-tech jobs.

"Tackling climate change is one of America's greatest economic opportunities of the 21st century." – Business for Innovative Climate and Energy Policy

North Carolina's clean-energy industry, for example, has experienced an annual growth of about 25 percent since 2012, outpacing the growth of other industries in the state, according to the North Carolina Sustainable Energy Association. Much of the growth can be attributed to the state's renewable portfolio standard.[11] In a 2014 poll, the majority of North Carolina small business owners said reducing industrial carbon pollution while increasing use of renewable energy would be good for the state's economy.[12]

Massachusetts' clean energy sector has recorded double-digit job growth for three consecutive years and a 47 percent growth rate since 2010, according to the 2014 Massachusetts Clean Energy Industry Report produced by BW Research.[13]

In California—the nation's leader in clean energy policies—clean energy now employs more 430,000 workers, more than the motion picture or aerospace industries, according to a 2014 survey by the Advanced Energy Economy Institute.[14]

Bloomberg News reported earlier this year that 26 California companies in its Clean Energy Index added employees at a median annual rate of 9.5 percent for the past two years—more than quadruple the 2.3 percent for the 115 U.S.-based companies in the index.[15]

Since 2007, U.S. clean energy investment totaled $386 billion, according to a Bloomberg New Energy Finance report commissioned by the Business Council for Sustainable Energy, a coalition of companies and trade associations from the energy efficiency, natural gas, and renewable energy sectors.[16] In 2014, U.S. clean energy investment jumped 7 percent from 2013 levels.[17]

Estimates project that another $268 billion will be invested in just wind and solar between now and 2026, according to the American Council on Renewable Energy (ACORE).[18]

Since 2008, renewable energy has been the fastest growing source of new U.S. electrical generation, responsible for 37 percent of new capacity.[19]

As a result of the growth, "key renewable electricity technologies experienced dramatic cost reductions, as innovation, competition, and certain national and state policies accelerated large-scale renewable energy deployments and continual efficiency increases across the entire supply chain," ACORE reported.[20]

And renewable sources of energy are projected to continue to grow.

"Solar is the fastest-growing renewable generation source, but wind accounts for the largest absolute increase in generation," according to the U.S. Energy Information Administration.[21] "Every four minutes, another American home or business goes solar," according to the EPA.[22] And jobs in the solar industry are growing faster than any other sector in the United States.

"We don't have to choose between a healthy economy and a healthy environment. Those goals are not separate, they're intertwined."
– Gina McCarthy

The Bureau of Labor Statistics projects that employment of solar installers is projected to grow by 24 percent from 2012 to 2022, much faster than the average for all occupations.[23] Jobs in solar manufacturing, sales and distribution, and project development are also projected to grow.

Wind power is on pace to provide 20 percent of the total U.S. electrical supply by 2030.[24] The wind-power industry employs more than 80,000 workers in the United States, a number that can double with the "right policies," according to ACORE.[25]

Renewable energy technology costs have fallen sharply, closing the cost gap between renewable resources and traditional fossil fuel resources, according to a November 2014 report on challenges facing the electric utility industry.[26] The report, authored by utility industry and finance experts, was commissioned by Ceres, a nonprofit group that seeks to mobilize business and investor leadership on climate change

Energy efficiency is another significant way to reduce carbon pollution at a low cost, as the Clean Power Plan recognizes.

A carbon-cutting plan that relies on energy efficiency investments could create by 2020 more than 274,000 efficiency-related jobs filled by electricians, roofers, carpenters, insulation workers, and heating/air conditioning installers, among others, an NRDC study found.[27]

Energy efficiency measures such as insulating homes, installing more efficient lighting in buildings, and offering rebates for purchase of more efficient appliances are the cheapest and fastest way to reduce carbon pollution. They also will offer the additional benefits of lowering electricity bills and reducing other harmful air pollutants.

Energy efficiency can provide the equivalent of at least 10 to 20 percent of total electricity sales within a decade, according to an NRDC report.[28]

Each dollar invested in energy efficiency measures yields $1.24 to $4 in benefits, according to a study by the American Council for an Energy-Efficient Economy.[29]

Yet, energy efficiency's potential remains largely untapped.

THERE THEY GO AGAIN

Big polluters seem to have a default response for every government initiative to better protect public health: Cry wolf and predict doomsday for business.

They did it when Washington required seat belts. They did it with air bags. They did it on a proposal to ban leaded gasoline and CFCs in aerosol cans and air conditioners. They did it when catalytic converters were required—with a fleet of auto executives forecasting Detroit's demise.

None of those predictions came true. In fact, quite the opposite happened: The public enjoyed unparalleled safety and businesses thrived. More people survived car crashes. The earth's ozone layer, which protects us from the sun's harmful ultraviolet rays, was saved. Catalytic converters not only reduced smog but also spawned a global market for them—to the benefit of U.S industry and workers.

Now the polluters are at it again, crying wolf over the EPA's effort to protect public health and fight dangerous climate change through the first-ever limits on carbon pollution from power plants.

It's more of the same old malarkey.

"Time after time, when science pointed to health risks, special interests cried wolf to protect their own agenda," EPA Administrator Gina McCarthy said as she unveiled the proposed Clean Power Plan last year. "And time after time, we followed the science, protected the American people, and the doomsday predictions never came true."

"Although an argument is sometimes made that the cost of complying with regulations is too high, that the societal benefits do not justify the investment, or that job losses will result, a review of past regulations reveals just the opposite," said the Pew Charitable Trusts,[30] which examined industry projections and the trust costs of health and safety measures. "Historically, compliance costs have been less and benefits greater than industry predictions, and regulation typically poses little challenge to economic competitiveness."

Solar power can slash utility bills for both residential and commercial consumers.

For example, a 2013 study by the United Technologies Corp in collaboration with the Rhodium Group found that a 30 percent improvement in building efficiency by 2030 is possible with existing technology and design practices and would net $65 billion per year in savings, for American households, businesses, and governments.[31]

States can go beyond the Clean Power Plan's projected energy savings targets of 1.5 percent of total annual electricity use.

In fact, 15 states have achieved or have standards in place to meet or surpass that level already (Arizona, California, Colorado, Hawaii, Illinois, Iowa, Maine, Massachusetts, Michigan, Minnesota, New York, Ohio, Rhode Island, Vermont, and Washington). NRDC projects that states could produce savings of at least 2 percent of retail sales annually.[32]

Energy efficiency is already paying off in a number of places.

"Our support is firmly grounded in economic reality."
– Business for Innovative Climate and Energy Policy

Investment by utilities and states of more than $7.6 billion in energy efficiency programs saved 24,000 gigawatt-hours of electricity, alone, in 2013, according to a Consortium for Energy Efficiency, Inc. report.[33] That is the equivalent to the electricity used to power 2.2 million homes.[34]

ISO New England, which runs the region's electricity grid, projects that because of anticipated savings from energy efficiency, the region can defer 10 transmission upgrades once considered necessary to ensure reliability.[35]

In the Pacific Northwest, a plan developed by the Northwest Power and Conservation Council finds that cost-effective efficiency can meet 85 percent of new demand over the next 20 years and, combined with more renewable energy, could delay investments in future fossil fuel power plants.[36]

The American Council for an Energy-Efficiency Economy (ACEEE) found that four energy efficiency initiatives alone could cut power sector carbon emissions 26 percent by 2030 relative to 2012 emissions. That would eliminate the need for nearly 500 power plants by 2030, according to the ACEEE report.[37]

"If the Environmental Protection Agency is looking for a way to cheaply cut carbon pollution and boost the economy while giving states the freedom to use their energy resources, energy efficiency is the answer," said ACEEE executive director Steven Nadel.[38]

The clean energy sector offers the potential for significant job opportunities, especially for workers of color in areas such as manufacturing, the construction and building trades, information technology and computer software design, engineering, sales and marketing, and operations and maintenance, according to an April 22, 2015 memo from the House Energy and Commerce Committee Democratic staff.[38] Also, because the military is heavily investing in clean energy and energy efficiency on domestic installations, an increasing number of veterans will enter the civilian workforce with the training that helps them secure good jobs in the growing clean energy industry.[40,41]

An NRDC analysis projected potential job creation in a number of states from a carbon-cutting plan that relied heavily on energy efficiency investments. Florida could gain 10,000 efficiency-related jobs; Ohio, 8,600; Illinois, 7,200; Minnesota, 7,500; Michigan, 6,900; North Carolina, 6,700; Virginia, 5,600; Pennsylvania, 5,100; Missouri, 3,900; Arkansas, 2,200; Colorado, 2,700; Iowa, 2,500; and Nevada, 1,200.[42]

The opportunities created by transitioning to a cleaner energy economy—and the dangers to the nation's economy from failing to confront climate change—explain why the Clean Power Plan has drawn strong support from businesses.

"Our support is firmly grounded in economic reality," stated a letter signed by more than 200 businesses.[43] "Climate change poses real financial risks and substantial economic opportunities and we must act now."[44] The letter was coordinated by the Boston-based sustainability advocacy group Ceres.

More than 300 business leaders also signed a letter of support sent by Environmental Entrepreneurs, whose members have been involved in financing, founding, or developing more than 1,700 companies that have created more than 570,000 clean-energy jobs.[45]

"By ensuring American leadership on climate and clean energy policy, the innovations we develop domestically will also be the products and services we export to the expanding international market for clean energy, a multi-trillion dollar opportunity," they wrote.[46] "U.S. manufacturers can be the leading global suppliers of cleaner cars; cleaner fuels; cleaner power; and technologies that improve industrial, power plant, and building efficiency."[47]

History shows that we can confront environmental challenges while creating economic opportunities.

The EPA's plan will unleash innovation and clean up the air—just like previous efforts to clean the air and protect the public's health.

Chapter VII:
The Public Wants Action—Now

"An overwhelming majority of the American public, including half of Republicans, support government action to curb global warming."

— The New York Times, January 30, 2015, reporting on a poll conducted with Stanford University and Resources for the Future[1]

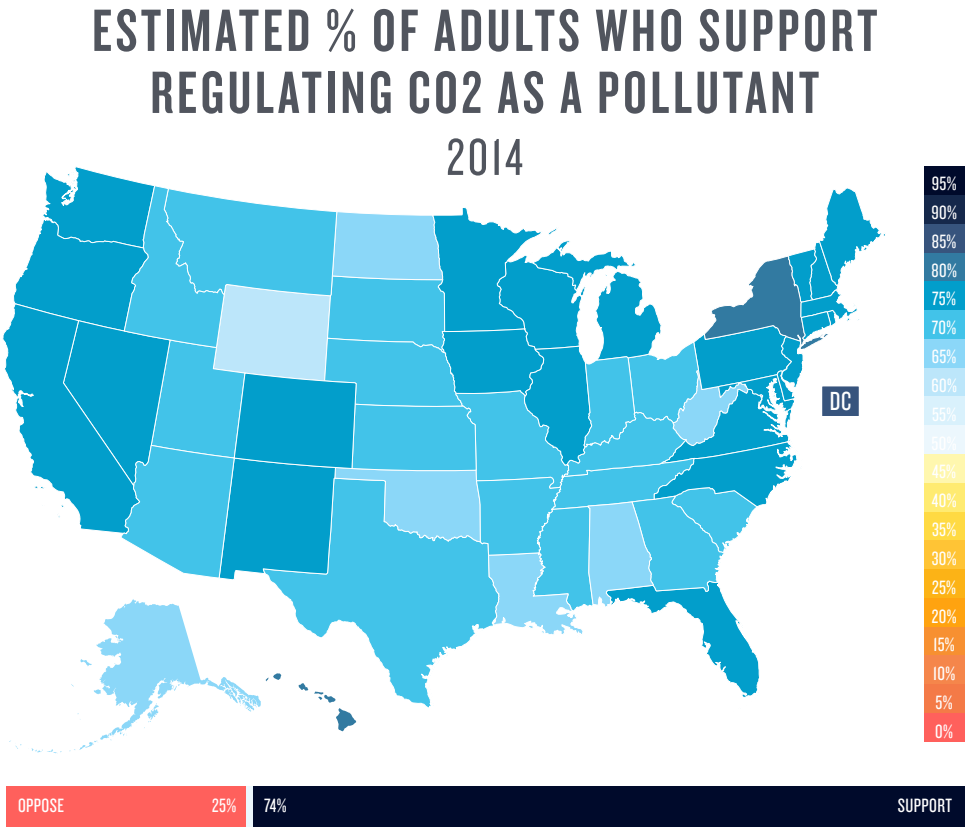
Americans want action to fight climate change, and they want it now.

Seven out of ten Americans view climate change as a serious problem, according to an ABC/Washington Post poll, and a "lopsided and bipartisan" majority support federal limits on greenhouse gas emissions, the Washington Post reported.[2,3]

Support for limits on carbon pollution comes from Republicans and Democrats alike, red states as well as blue states, Fortune 500 companies, faith leaders, health groups, labor organizations, and many others.

A poll conducted in October and November 2014, by the University of Michigan and Muhlenberg College in Pennsylvania confirmed majority support for the Clean Power Plan.[4] The poll also found that just 9 percent of those surveyed backed Senate Majority Leader Mitch McConnell's (R-KY) call for states to "just say no" and refuse to cooperate with the EPA plan.[5]

Growing public concern about climate change is reflected by the more than 8 million comments submitted on the Clean Power Plan—the most the EPA has ever received on an issue—and by the more than 400,000 people who turned out for the People's Climate March in New York City in September 2014.



Source: Adapted from the Yale Project on Climate Change Communication .

Nearly 80 percent of people worldwide are very concerned about the impacts of climate change, according to June 2015 consultations of 10,000 people in 75 countries. "I think we are in the process of putting to bed the myth of not enough public support," said Christiana Figueres, executive secretary of the U.N. Convention on Climate Change. "Action now is necessary."

"A huge majority of Americans support regulating carbon from power plants. And they're even willing to pay for it."
– The Washington Post

Polls by *Wall Street Journal*/NBC News, the *New York Times*, Stanford University, Resources for the Future, and the Pew Research Center also confirm the strong public support for limiting carbon pollution from power plants, which fuels dangerous climate change.[6,7,8]

"A huge majority of Americans support regulating carbon from power plants. And they're even willing to pay for it," read the *Washington Post* headline on its poll, conducted with ABC News.[9] The poll found that even in states where a majority of electricity is produced by burning coal, "69 percent say the government should place limits on greenhouse gas emissions."[10]

Polling shows that congressional Republicans fighting the EPA are out of touch with members of their own party.

Half of all Republicans said they favor government limits on carbon pollution, according to a poll by the Associated Press-NORC Center for Public Affairs Research and Yale University.[11]

Nearly half of Republicans said the United States should take a leadership role in the global fight against climate change, and majorities of both parties believe environmental protections "improve economic growth and provide new jobs" in the long run, according to the poll.[12]

Research by the Yale Project on Climate Change Communication and George Mason University Center for Climate Change Communication also found a majority of Republican voters in support of regulating carbon dioxide as a pollutant "in contrast to the current goal of Republican leaders in Congress to block EPA regulations."[13]

The People's Climate March, held in New York City in September 2014, drew more than 400,000 supporters for action on climate change.

On April 24, 2012, a broad coalition of clean air, labor and other progressive organizations, including NRDC, hand-delivered more than 735,000 comments to the EPA calling for the strongest possible carbon pollution standard for new and existing power plants.

Four EPA administrators from Republican administrations—William D. Ruckelshaus, Lee M. Thomas, William K. Reilly, and Christine Todd Whitman—have spoken out in support of carbon limits.

Nearly three-fourths of the U.S. population—red as well as blue states—support government limits on carbon pollution, according to a statistical model built by researchers from Yale and Utah State University using several years of polling data to estimate climate change opinion by state, county, and congressional district.[14]

Sixty-four percent of businesses, including majorities of Republicans, Democrats, and independents, believe government action is needed to reduce carbon emissions by power plants, according to a poll commissioned by the American Sustainable Business Council.[15]

"The costs of inaction are high."
– Joint State Comments to the EPA

There is also support from states that rely on coal to generate electricity.

In Pennsylvania, a December 2014 survey found eight in ten, including majorities across party lines, in support of state-based action to reduce carbon pollution.[16]

Pennsylvanians are especially enthusiastic about energy efficiency and wind and solar power, which they see as creating jobs, cleaning the air, and increasing energy independence, according to the bipartisan polling team of Fairbank, Maslin, Maullin, Metz, & Associates and Public Opinion Strategies.[17] The poll was commissioned by NRDC.

In Illinois, another heavy coal-using state, a February 2015 poll found "widespread enthusiasm" for increased use of renewable energy and energy efficiency.[18] Eight in ten, including majorities across party lines, support Illinois developing a state plan to reduce carbon pollution.[19]

In Ohio, eight in ten also supported a state plan to reduce carbon pollution and increase the use of clean energy and energy efficiency, according to a February 2015 poll by Fairbank, Maslin, Maullin, Metz, & Associates and Public Opinion Strategies for NRDC.[20]

Americans, by more than a 3 to 1 margin, trust the EPA more than Congress to address air pollution, according to a poll commissioned by the American Lung Association.[21]

Strong public support for limiting carbon pollution from power plants is further reflected by comments submitted to the EPA on the Clean Power Plan.

State environmental leaders, energy agency leaders, and public utility commissioners from 14 states—California, Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New York, Oregon, Rhode Island, Vermont, and Washington—expressed support for the plan.

"The costs of inaction are high," they wrote the EPA. "The harms from climate change will only continue to grow in the future, and the most vulnerable in our society are at greatest risk."[22]

The plan also has drawn support from business groups. More than 200 businesses— including Nike, Starbucks, Levi Strauss, and Nestlé—stated that the carbon limits are "grounded in economic reality."[23]

"We know that tackling climate change is one of America's greatest economic opportunities of the 21st century and we applaud the EPA for taking steps to help the country seize that opportunity," the groups wrote under the Business for Innovative Climate and Energy Policy (BICEP).[24]

There also is support from labor. The EPA's plan permits each state to tailor a carbon reduction plan "to the specifics of its local and regional economy; which in turn can create opportunities to sustain and grow jobs, encourage investment, and jumpstart new technologies," BlueGreen Alliance, a coalition of environmental and labor groups, said.[25]

The plan also has drawn widespread support from ordinary Americans.

A Pennsylvania woman wrote the EPA: "For the sake of my grandchildren, please do this."[26]

An increasing number of foundations, governments, universities, faith-based organizations, and others are expressing their support for climate action through their pocketbooks.

Governments from San Francisco and Seattle to Norway have moved to divest from some or all fossil fuel companies as have a number of universities, including Georgetown, Stanford, and the University of Hawaii.[27,28,29] Religious institutions such as the Church of England have joined in the divestment, as well as foundations, such as the Rockefeller Brothers Fund, whose family derived its fortune from Standard Oil Co., Inc.[30]

Some 181 institutions and local governments and 656 individuals representing more than $50 billion in assets have pledged to divest from fossil fuels, Arabella Advisors, which consults with philanthropists and investors, said in a September 2014 report.[31]

"The work of understanding and responding to the demands of climate change is urgent and complex. It requires our most serious attention."
– John J. DeGioia, president of Georgetown University

Universities have been especially active in response to student-led campaigns moved by the urgency of the climate crisis.

Georgetown University announced in June 2015 that it will not make any direct investments from its $1.5 billion endowment in companies whose principal business is mining coal for use in energy production.[32]

"The work of understanding and responding to the demands of climate change is urgent and complex," said Georgetown President John J. DeGioia.[33] "It requires our most serious attention."[34]

Stanford in May 2014 announced a similar move, citing its responsibility "as a global citizen to promote sustainability for our planet."[35] The University of Dayton, a Catholic university in Ohio, in June 2014, committed to divestment, saying its "values of leadership and service to humanity call upon us to act."[36]

In California, a state Senate committee in April 2015 passed legislation to require the state's pension system—the California Public Employees' Retirement System and California State Teachers' Retirement System—to divest from coal companies.[37] The bill, said its author Senate President pro Tempore Kevin de León, will align California's public employee retirement funds with the state's values as a global leader in addressing the threat of climate change.

Similar divestment legislation is under consideration in Massachusetts and Vermont, according to Institutional Investor.[38]

Just before the U.N. Climate Summit in September 2014, the Rockefeller Brothers Fund announced it would divest from fossil fuel, citing its commitment to combating climate change.[39]

"Americans don't want dirty energy; instead, they're calling for clean energy, health safeguards, and steady resolve to protect our future from dangerous climate change," said Franz Matzner, director of NRDC's Beyond Oil Initiative.[40]

Chapter VIII:
The Grid Will Remain Strong—And Become More Reliable

"Over EPA's long history of developing Clean Air Act pollution standards for the electric power sector, including the proposed Clean Power Plan, the agency has consistently treated electric system reliability as absolutely critical. ...at no time in the more than 40 years that EPA has been implementing the Clean Air Act has compliance with air pollution standards resulted in reliability problems."

—EPA Acting Assistant Administrator for Air Janet McCabe, February 19, 2015[1]

We can continue to reduce climate-altering carbon pollution from our power supply while protecting the grid reliability. The EPA's Clean Power Plan, in fact, is likely to make the grid stronger.

Studies support it.

The Brattle Group, a consulting firm specializing in energy, concluded that the plan is "unlikely to materially affect reliability."[2] The Analysis Group, another respected energy consulting firm, said there are "many reasons why carbon pollution at existing power plants can be controlled without adversely affecting electric system reliability."[3]

Additionally, three experts with more than 100 years combined experience in the power sector—Susan Tierney, Eric Svenson, and Brian Parsons—said in an April 2015 report: "We are confident that we can achieve a lower-emissions electricity grid while maintaining reliability."[4]

The real potential threat to reliability is climate change and the "more frequent and intense heat waves, higher sea levels, and more intense storms that will strain our electricity infrastructure," according to the Center for Climate and Energy Solutions. Severe weather is the leading cause of U.S. power outages, a 2013 White House report notes.[5]

The Clean Power Plan gives states and utilities plenty of time and flexibility to devise and implement their own carbon reduction plans to meet relatively modest targets while maintaining reliability.

"There is absolutely no scenario, no standard, no compliance strategy that I will accept where reliability comes into question. Period. End of statement," EPA Administrator Gina McCarthy recently assured energy executives.[6]

A number of utilities and state regulators—whose job it is to keep the lights on—have studied the plan and concluded that its flexibility provides the tools to make the transition to a cleaner and reliable electric system.

A recent survey found that more than 60 percent of utility industry executives said the EPA should stick to the implementation timetable or make it more aggressive.[7]

"....Doomsday predictions are simply not correct." said said Kathleen Barrón, senior vice president of federal regulatory affairs and wholesale market policy for Exelon, one of the nation's largest power generators. She expressed confidence that industry can "immediately begin to control carbon pollution while maintaining electric reliability."[8]

"We are confident that we can achieve a lower-emissions electricity grid while maintaining reliability."
– Power sector experts Susan Tierney, Eric Svenson, and Brian Parsons

Some states are already cutting carbon pollution without any impact on reliability.

The nine Northeast and mid-Atlantic states that make up the Regional Greenhouse Gas Initiative have demonstrated that states "can achieve greater emission reductions at a lower cost, all while creating jobs, maintaining grid reliability, and improving the regional economy," the states said in a letter to EPA in support of the Clean Power Plan.[9]

Our power grid stands to become more reliable if we harness the potential of renewable energy.

In California, which has moved aggressively to cut carbon pollution, Michael Gibbs, assistant executive officer of the state Air Resources Board, reported, "We have not experienced any significant reliability challenges, or market disruptions, associated with our carbon programs and pricing efforts."[10] With California on schedule to reduce greenhouse gas emissions to 1990 levels by 2020, Gov. Jerry Brown in April 2015 moved to step up efforts, setting a goal of reducing carbon pollution to 40 percent below 1990 levels by the year 2030.[11]

Frank P. Prager, Xcel Energy's vice president of policy strategy, said his Minneapolis-based company, which operates in eight Midwestern and Western states, has reduced carbon emissions by 20 percent since 2005 and is on track to reach 31 percent below 2005 levels by 2020 "while ensuring a safe and reliable electric system and maintaining electricity rates in all our operating regions below the national average."[12]

Renewable energy like solar and wind power and energy efficiency already are changing the face of the grid while maintaining reliability.

"As wind energy has grown to provide a larger share of our electricity mix, wind turbine technology has matured so that modern wind plants are able to provide the same grid reliability services as conventional generators...." according to the American Wind Energy Association.[13] "At times, wind has supplied more than 60 percent of the electricity on the main utility system in Colorado, nearly 40 percent of the main Texas power system, and 33 percent in the Southwest Power Pool, all without any reliability problems."[14]

"We're already seeing higher levels of renewable generation than the Clean Power Plan anticipates—with no negative impacts on reliability," reports the Center for Climate and Energy Solutions.[15]

Critics of the Clean Power Plan have exaggerated its threat to reliability. In fact, the grid can handle much higher levels of zero-carbon wind and solar power, far more than what's necessary to achieve the relatively modest carbon emission reductions in the EPA's plan to limit pollution from existing plants, according to an NRDC analysis.[16]

The electric grid is a dynamic and continually evolving system that can handle the incremental changes required over time to reflect new energy resources and economic conditions. When systems have encountered reliability problems, it generally has been the result of extreme weather events, human error, and accidents.

"The polluters' pollsters tell them that what will grab the public's attention is the threat that the lights will go out," said California Air Resources Board Chairman Mary Nichols.[17] "But time and again, this threat has proven to be overblown. In fact, state air regulators can be expected to design their compliance plans in coordination with their energy agency partners, and have more than a decade to fine-tune plan implementation."[18]

"There is absolutely no scenario, no standard, no compliance strategy that I will accept where reliability comes into question. Period. End of statement."
– Gina McCarthy

"We have a more than 40-year track record showing that environmental progress and electric reliability are compatible," John Moore, a senior attorney with NRDC's Sustainable Federal Energy Regulatory Commission (FERC) Project, told a House Energy and Commerce subcommittee, noting, "States have kept the lights on through every pollution-cutting program."[19]

Opponents' arguments "presume inflexible implementation, are based on worst-case scenarios, and assume that policy makers, regulators, and market participants will stand on the sidelines until it is too late to act," according to the Analysis Group. "There is no historical basis for these assumptions."[20]

The Clean Power Plan is likely to make the grid more reliable by increasing the use of wind and solar power, as well as energy efficiency, and modernizing our power delivery system, NRDC found.[21]

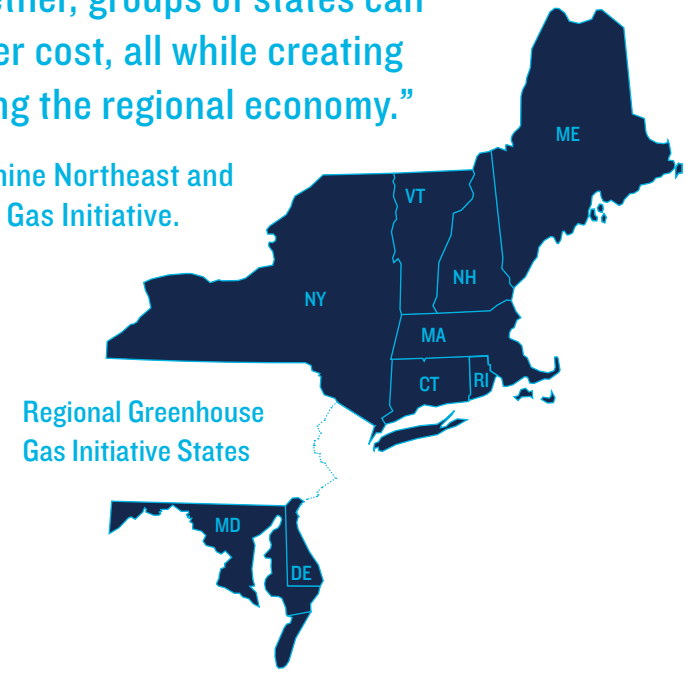
The nation's aging electricity system has become increasingly vulnerable to extreme weather events, according to a study by the Union of Concerned Scientists, which said greater energy efficiency and use of renewable energy would make the system more resilient and reliable.[22]

"The Clean Power Plan does not require a choice between fighting climate change and keeping the lights on," Moore told a FERC conference.[23] "Building on the momentum of proven, reliable, and affordable energy such as wind, solar, and energy efficiency, and giving the states many compliance options, the plan will preserve and even strengthen reliability while cutting carbon pollution."[24]

Chapter IX:
It's Already Being Done

"RGGI has demonstrated that, by working together, groups of states can achieve greater emission reductions at a lower cost, all while creating jobs, maintaining grid reliability, and improving the regional economy."

—Comments to the EPA on the Clean Power Plan from the nine Northeast and Mid-Atlantic states that make up the Regional Greenhouse Gas Initiative.



Never mind the doomsday predictions from critics of the EPA's plan to cut carbon pollution from power plants.

Since 2009, the Regional Greenhouse Gas Initiative (RGGI), made up of nine Northeast and Mid-Atlantic states, has been demonstrating that they, as a group, can cut carbon pollution and produce health and economic benefits without any risk to the grid.

Out West, California also is showing the way.

The RGGI has reduced carbon pollution by 40 percent below 2005 levels. By 2020, power plant CO_2 emissions in the nine states is projected to be half of the 2005 levels.[1]

Experts say RGGI states and California—long an environmental protection pioneer—could be models for other states in meeting the EPA's flexible state-based program to reduce dangerous carbon pollution from power plants.

Under the Clean Power Plan, states can form multi-state or regional programs as a way to meet carbon-reduction targets, which could be less costly and more flexible than going it alone.

"By our estimate, 41 of the 50 states are looking at multi-state collaboration while they also consider implementing as single states," Franz Litz, a program consultant for the Great Plains Institute, told Midwest Energy News.[2] Some states are looking at joining the RGGI.[3]

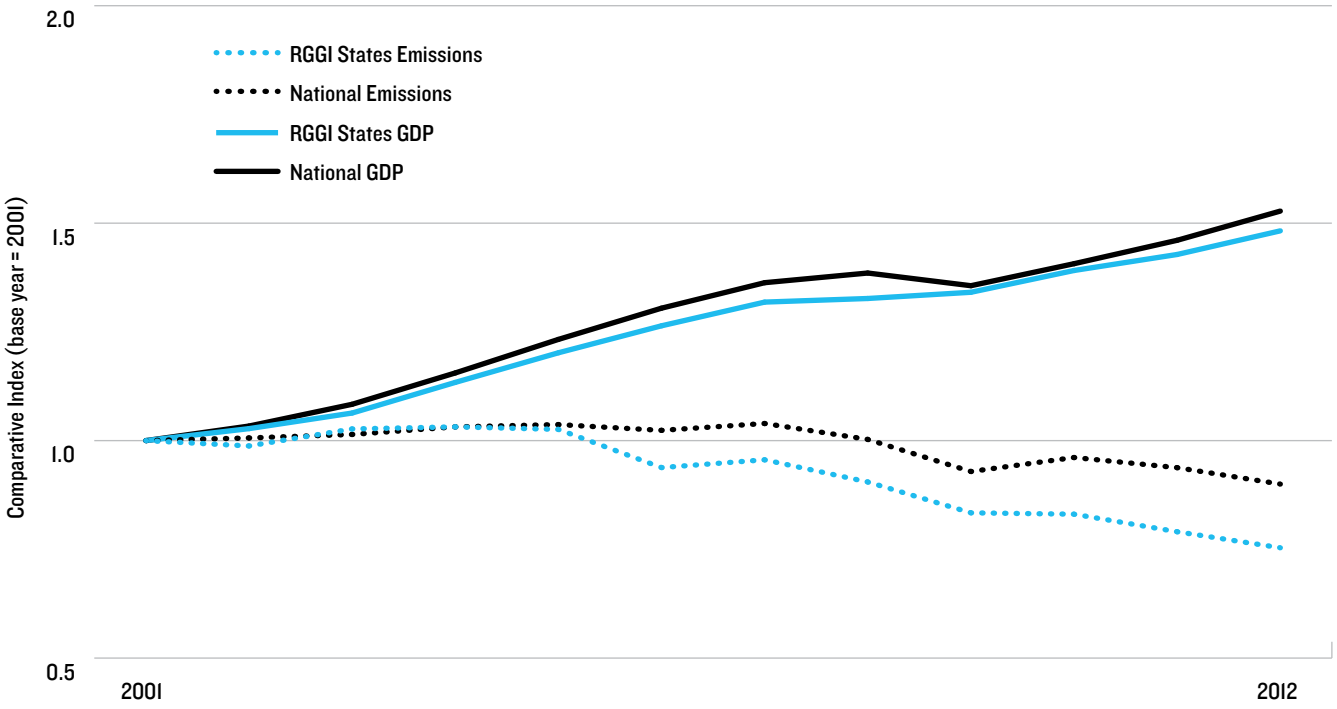
"The RGGI experience has taught these states that cutting carbon, especially through a market-based regional program, brings with it tons of additional advantages—job creation, lower energy bills, significantly improved public health," said Jackson Morris, director of NRDC's Eastern Energy, who has written about the RGGI experience.[4]

"Over the past five years, we've shifted from one of the dirtiest energy mixes in the nation to one of the cleanest," Governor Jack Markell of Delaware, an RGGI member, told an EPA hearing last year in support of the Clean Power Plan.[5] "We have decreased emissions by a greater percentage than any other state while creating jobs at the same time. And we have done so with the same approach that the president proposes for the country."[6]

"Over the past five years, we've shifted from one of the dirtiest energy mixes in the nation to one of the cleanest."
– Delaware Governor Jack Markell

The EPA cited the RGGI experience to illustrate how the first-ever national limits on carbon pollution from power plants—the biggest source of U.S. carbon pollution—can improve the air and the economy without threatening the reliability of the electricity supply.

Economy Grows As CO_2 Emissions Fall



Sources: U.S. Energy Information Agency and U.S. Bureau of Economic Analysis
Inspired by Arcadia Center Analysis: http://acadiacenter.org/wp-content/uploads/2014/05/AcadiaCenter_RGGI_Report_140523_Final3.pdf

The RGGI told the EPA that their experience shows "emission reductions are possible over a relatively short time period, while supporting economic goals and maintaining grid reliability."[7]

"The rate of pollution reductions in the RGGI states continues to outpace expectations," according to a report by Acadia Center, a nonprofit group that promotes clean energy.[8]

"Emissions in RGGI states have declined faster than in other states, even as economic growth in the region has outpaced growth in non-RGGI states. In fact, emissions in the region dropped 2.7 times faster than the rest of the country since RGGI was established, even as RGGI states' economies have grown 2.5 times faster than other states," according to another Acadia Center report.[9]

RGGI, pronounced Reggie, operates the nation's first interstate carbon cap-and-trade program. The coalition includes Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. Newly elected Pennsylvania Governor Tom Wolf, during his campaign, pledged to join RGGI. New Jersey dropped out of the program in 2011.

In full operation since 2009, RGGI sets a regional cap on CO_2 pollution from power plants by issuing a limited number of tradable CO_2 allowances. Each state devises its own approach to cutting carbon, but the scale of the regional endeavor helps drive efficiencies that individual states can't realize on their own.[10]

The benefits have been confirmed by a study by the Analysis Group, a respected energy consulting firm.[11]

A large chunk of the money raised from auctions of CO_2 allowances has gone to energy efficiency and other programs that have helped reduce electricity bills. The RGGI estimates that its investments will return more than $2.9 billion in lifetime energy bill savings to more than 3.7 million participating households and 17,800 businesses.[12]

RGGI states have been so successful in reducing carbon pollution that they urged the EPA to pursue more ambitious pollution cuts.[13]

"In less than a decade, the RGGI states have already achieved a larger regional emission reduction than the EPA projects the CPP will produce by 2030 across the nation," the states wrote the EPA.[14]

"In less than a decade, the RGGI states have already achieved a larger regional emission reduction than the EPA projects the CPP will produce by 2030 across the nation."

– Regional Greenhouse Gas Initiative

California also has been taking aggressive action to reduce carbon pollution for over a decade, more than the EPA's Clean Power Plan would require. The state and the Canadian province of Quebec linked their cap-and-trade program on January 1, 2014 to form North America's biggest carbon market, and Ontario announced on April 13, 2015 that it was joining the cap-and-trade program.[15] California, Oregon, Washington state, and British Columbia have formed the West Coast Climate Change Initiative, committing to cutting carbon pollution along the western edge of the continent.

California further has established greenhouse gas emission standards for cars, a low-carbon fuel standard, and a mandate for a third of its electricity to come from renewable sources by 2020.

The state is on track to meet its goal of cutting greenhouse gas emissions to 1990 levels by 2020. In April 2015, Governor Jerry Brown moved to step up efforts, setting a goal of reducing carbon pollution to 40 percent below 1990 levels by 2030.[16] Brown has also called for the state to generate half of its electricity from renewable sources by 2030.

"California's own experience demonstrates that states can prosper while they are reducing emissions and building a cleaner power sector, driving research and development, creating jobs and protecting public health," California Air Resources Board Chairman Mary Nichols told the EPA.[17]

Along the way, California has become a magnet for clean technology investment, Nichols told a state legislative hearing. In 2012, the state benefitted from more than $2 billion dollars in clean technology venture capital investment, more than the other 49 states combined.[18]

Indeed a group of state environmental leaders, energy agency leaders, and public utility commissioners from 14 states have recently expressed support for the Clean Power Plan.

"Our states and others have already demonstrated that it is quite feasible to cost-effectively reduce carbon pollution from the power sector and transition to a cleaner, more efficient electric power system that improves public health and strengthens our economies," they wrote.[19]

Chapter X:
Legal Authority for EPA Action

"The Clean Power Plan is … just another example of EPA doing its job to ensure that polluters account for the cost of their pollution in a manner that will result in substantial net economic benefits to the public."

—NYU Law School professor and Dean Emeritus Richard Revesz[1]

The Environmental Protection Agency has the authority and responsibility to reduce carbon pollution under the Clean Air Act, the landmark 1970 law that has led to the cleaner and healthier environment that we enjoy today.[2]

"I believe we're following what the Clean Air Act requires," Janet McCabe, the EPA's acting assistant administrator for the office of air and radiation, told the Senate Environment and Public Works Committee.[3] "This is a statute that Congress enacted to protect public health from air pollution."[4]

In 2007, the U.S. Supreme Court ruled, in Massachusetts vs. EPA, that the agency could limit greenhouse gases if they endanger the public's health or welfare.[5] The case grew out of efforts—opposed by the George W. Bush administration—to reduce emissions from motor vehicles, which account for about one fourth of the nation's greenhouse gas emissions.

© Getty Images

EPA Administrator Gina McCarthy in Washington, D.C., June 2014.

"The claim that it is unprecedented and unconstitutional is wrong on the facts and wrong on the law."
– NYU law professor Richard Revesz

After rigorous scientific review, the EPA in 2009 issued an "endangerment finding" that carbon dioxide and other heat-trapping gases do indeed threaten public health and welfare.[6] "In both magnitude and probability, climate change is an enormous problem," the agency concluded.[7]

That led the Obama administration to set carbon pollution and fuel-economy standards for new cars and light-duty trucks in 2010 and 2012. The standards are projected to keep 6 billion metric tons of carbon pollution out of the atmosphere over the life cycle of the vehicles.[8] The administration on June 19, 2015 proposed carbon pollution and fuel-efficiency rules for big rigs and other heavy-duty trucks in a move that would cut an additional one billion metric tons of carbon pollution.

In 2011, the Supreme Court addressed climate change again, this time holding in American Electric Power v. Connecticut that the EPA has the authority to curb carbon pollution from the nation's fleet of power plants under the very section of the Clean Air Act that the EPA is now using to establish the Clean Power Plan.[9]

Opponents of government action went back to court. But a three-judge panel of the U.S. Court of Appeals for the District of Columbia in 2012, in Coalition for Responsible Regulation v. EPA, upheld the agency's careful determination, based on a mountain of scientific evidence, that carbon dioxide and other heat-trapping pollutants threaten our health and our planet.[10] The Supreme Court in 2013 rejected appeals for further review of the endangerment finding.[11]

As the EPA moves to limit carbon pollution from power plants, industry groups and some states are challenging the agency's authority to act to curb the single largest contributor to dangerous climate change.

Many legal experts say the EPA is on sound legal footing.

NYU law professor Richard Revesz testified at a congressional hearing that the Clean Power Plan is "well justified under the Clean Air Act and the Constitution and is consistent with over 30 years of regulatory practice, under administrations of both political parties."[12]

"The claim that it is unprecedented and unconstitutional is wrong on the facts and wrong on the law," Revesz wrote in The Hill.[13]

While constitutional scholar Laurence H. Tribe, working for Peabody Energy, the nation's largest coal company, has attacked the Clean Power Plan, two of his Harvard Law School colleagues with expertise in environmental law—Jody Freeman and Richard J. Lazarus—have dismissed his arguments as "ridiculous" and "wholly without merit."[14]

"If Tribe were right, government could never regulate newly discovered air or water pollution, or other new harms, from existing industrial facilities, no matter how dangerous to public health and welfare, as long as the impacts are incremental and cumulative," they wrote on Harvard Law Today.[15] "The harm [the] EPA seeks to address with its power plant rule not only affects future generations, but also current ones already managing the impacts and risks of climate change."[16]

"In both magnitude and probability, climate change is an enormous problem."
– Environmental Protection Agency

Michael B. Gerrard, director of the Sabin Center for Climate Change Law at Columbia Law School, wrote in The Hill that the EPA is acting with "solid constitutional foundation."[17]

Lisa Heinzerling, a Georgetown University law professor, disputed Tribe's suggestion that the Clean Power Plan commandeers state governments in violation of the principles of federalism embodied in the Tenth Amendment.

The Obama Administration has set carbon pollution and fuel-economy standards for new cars and light-duty trucks, which will keep 6 billion metric tons of carbon pollution out of the air, and has proposed rules for heavy trucks that would cut another billion tons.

The Clean Power Plan, she told a Senate Environment and Public Works subcommittee, "does not require the states to do anything. It merely gives them the opportunity to develop their own plans for reducing carbon dioxide. Giving states the option of finding their own way to solve a problem does not offend constitutional principles of federalism; it respects them."[18]

David Doniger, director of NRDC's Climate and Clean Air Program, dismissed one of Tribe's key arguments against the Clean Power Plan: that it amounts to taking property in violation of the Fifth Amendment.

"This is a breathtaking argument," said Doniger, NRDC's chief climate change lawyer who has blogged extensively on court rulings upholding the EPA's authority and responsibility to act.[19] "If it had any force, it would have been impossible for the government to take toxic lead out of gasoline or paint, to ban cancer-causing asbestos insulation, to eliminate ozone-destroying CFCs, and on and on, without each time paying the polluters."[20]

In October 2013, NRDC issued a paper on the EPA's authority under the Clean Air Act to limit carbon pollution from power plants.[21] "The Supreme Court has repeatedly held that the Constitution does not require taxpayers to pay corporate polluters to stop polluting," Doniger wrote.[22] "Rather, it is a proper role of federal, state, and local governments to limit industrial activities that endanger public health and welfare, without compensating the companies that create the risks."[23]

Chapter XI:
The International Scene

"There is no Plan B because there is no Planet B"

—U.N. Secretary General Ban Ki-moon, September 2014 at the People's Climate March in New York[1]

The United States isn't going it alone.

Other countries—from China, the world's biggest carbon polluter, to tiny Fiji—are also moving to reduce carbon pollution in the realization that climate change is a grave global threat.

The Obama administration's efforts, though, to reduce carbon pollution from America's power plants, the largest source of carbon pollution in the United States, are widely regarded as pivotal to spurring even more—and more significant—international action.

"When the world's largest economy acts, it sends a powerful signal to other governments that they also can and must act aggressively on climate change," Jake Schmidt, director of NRDC's international program, told the House Science Committee on April 15, 2015.[2]

The U.S. pledge to cut greenhouse gas emissions 26 to 28 percent below 2005 levels by 2025 comes as negotiators from nearly 200 countries are due to meet in Paris in December to finalize a new international agreement to slow the impacts of climate change. The new agreement will include emissions reduction targets for all major emitters.

The international gathering has gained new urgency in the wake of a warning by scientists at the Intergovernmental Panel on Climate Change that climate change, if left unchecked, will increase the likelihood of "severe, pervasive, and irreversible impacts" to our planet.[3]

In November 2014, the United States and China agreed on a deal to cut greenhouse gas emissions.

"No nation is immune... I call on all countries to join us—not next year, or the year after, but right now, because no nation can meet this global threat alone," President Obama told the U.N. Climate Summit in New York last fall.

> ***"When the world's largest economy acts, it sends a powerful signal to other governments that they also can and must act aggressively on climate change."***
> ***– Jake Schmidt, NRDC***

Many countries are already taking action.

Sixty-one nations have passed laws to promote clean energy and 54 have passed legislation to advance energy efficiency, according to a study by the Global Legislators Organisation (GLOBE International) and the Grantham Research Institute on Climate Change and the Environment at the London School of Economics.[4]

About 500 climate-related laws have been passed worldwide, up from the less than 40 in 1997 when the Kyoto Protocol, the first international climate change treaty, was adopted.

Countries—big and small—have committed to reducing carbon pollution.

Last year, China and the United States reached an agreement on a plan to cut greenhouse gas emissions.[5]

China agreed to stop its emissions from growing by around 2030 and to try to reach the peak earlier. They will also expand the share of energy consumption from zero-emission sources by about 20 percent by 2030. More actions are expected from China in the coming months as they prepare their formal proposed target for the new climate agreement this December. The United States agreed to cut net greenhouse gas emissions 26 to 28 percent below 2005 levels by 2025, based upon the tools in the existing law.

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India is moving to double its production of wind and solar energy by 2020.

Smog obscures the view of China's iconic Forbidden City. China is the world's biggest polluter, followed by the United States.

"History proves that U.S. leadership can unleash global progress."
– EPA Administrator Gina McCarthy

India, the world's third largest carbon emitter, is moving to double its wind and solar power production by 2020.[6] Mexico recently announced an ambitious new commitment to peak its greenhouse emissions in 2026 and reduce them by 22 percent by 2030.[7] The European Union announced a commitment to cut its emissions at least 40 percent below 1990 levels by 2030

"No nation is immune... I call on all countries to join us—not next year, or the year after, but right now, because no nation can meet this global threat alone."
– President Barack Obama

Even Fiji, whose total greenhouse gas emissions are less than 0.06 percent of total global emissions, has committed to converting to 100 percent renewable energy by 2030—up from its current 60 percent renewable energy usage.

The U.N. Framework Convention on Climate Change also has compiled a long list of actions taken by national governments.[8]

The United States has taken a number of actions—including tougher vehicle fuel-economy rules, a $3-billion commitment to the international "Green Climate Fund" to help poorer countries address climate change, and, now, the first-ever limits on carbon pollution from power plants—seen as critical to spurring action by other nations.

For almost two-decades, inaction on climate change in the United States has been a major stumbling block to securing strong international action on climate change Schmidt said. Other countries often perceived that the United States wasn't willing to 'walk the walk.'

But strong domestic action from the United States in the past couple of years has begun to change that perception," NRDC's Schmidt told the House Science Committee. "When the United States is willing to step forward domestically, it can have a catalyzing impact in other countries."[9]

When President Obama rolled out his climate action plan in June 2013 at Georgetown University, it positioned him to "show up at the global climate change negotiating table with a credible, concrete action plan in hand, one that he can use to force action from other nations," the National Journal reported.[10]

"Make no mistake—the world still looks to America to lead," Obama said in the speech. "As the world's largest economy and second largest carbon emitter, as a country with unsurpassed ability to drive innovation and scientific breakthroughs, as the country that people around the world continue to look to in times of crisis, we've got a vital role to play."[11]

Challenges remain to get countries to commit to aggressive targets. In the coming months more countries will announce their climate targets as they lay the foundation for the new agreement this December.

But while opponents of climate action in the United States have argued that the United States shouldn't act until other nations do, the evidence is clear: other nations are acting.

"History proves that U.S. leadership can unleash global progress," EPA Administrator Gina McCarthy told the Council on Foreign Relations earlier this year.[12] "EPA's actions get the U.S. sprinting out of the gate. That's what climate leadership looks like."[13]

Chapter XII:
The Moral Imperative

"What kind of world do we want to leave to those who come after us?"

—Pope Francis, June 18, 2015 encyclical on climate change[1]

Besides all the other good reasons to limit climate-altering carbon pollution—the threats to our health, our environment, our economy, our national security—there is this:

The moral imperative.

"Climate change is a global problem with serious implications, environmental, social, economic, political, and for the distribution of goods. It represents one of the principal challenges facing humanity in our day," Pope Francis said in an encyclical calling for swift global action.[2] "The effects of the present imbalance can only be reduced by our decisive action, here and now. We need to reflect on our accountability before those who will have to endure the dire consequences."[3]

Pope Francis' encyclical on climate change and his U.S. visit in September will spotlight the fact that many faith leaders are calling for decisive action to combat climate change, while citing its disproportionate impact on the poor and vulnerable.

"The consequences of climate change will be borne by the world's most vulnerable people; inaction will worsen their suffering."
– Miami Archbishop Thomas G. Wenski

"The diversity of faith communities actively advocating for the Clean Power Plan is both broad and strong," according to the Reverend Stacy Martin, director of national policy and advocacy for the Evangelical Lutheran Church in America.[4]

"People of faith have a moral obligation to be good stewards of the Earth, to care for the environment, and to protect future generations by addressing the effects of climate change and carbon pollution," Delman Coates, senior pastor of Mount Ennon Baptist Church in Clinton, Maryland said at a July 2014 EPA hearing on the first-ever limits on carbon pollution from power plants.[5]

"Our faith demands that we act."
– Reverend Sandra Strauss, Pennsylvania Council of Churches

Speaking on behalf of the U.S. Conference on Catholic Bishops, Miami Archbishop Thomas G. Wenski called action on climate change necessary "to protect the common good."

"The consequences of climate change will be borne by the world's most vulnerable people; inaction will worsen their suffering," he said in a letter to the EPA.[6]

Tricia Bruckbauer, program director for Creation Justice Ministries, an ecumenical organization, said at a July 30, 2014 EPA hearing that climate change disproportionately impacts "the very people that we are called to serve."[7]

"All God's children deserve a future where they can breathe freely, think clearly, and pursue their dreams for a brighter America and an entire world not threatened from the food insecurity, water scarcity, foul air, extreme weather, forced migration, and sea-level rise," said the Reverend Mitchell Hescox, president and CEO of the Evangelical Environmental Network.[8]

Other religious groups have weighed in, including the Presbyterian Church (U.S.A.), United Methodist Church, Religious Action Center of Reform Judaism, and Interfaith Power & Light, among others.[9,10,11,12]

Pope Francis had strong words on climate change in his June 2015 encyclical.

The fight against climate change could be reaching a turning point with Pope Francis' encyclical to the world's 1.2 billion Catholics, the first pontiff to devote the entire text of a papal encyclical to environmental issues.[13] He also will address Congress on September 24, 2015 and the U.N. General Assembly in New York the following day in advance of a critical gathering of representatives of about 200 nations in Paris in December to work out an international treaty to slow or reduce climate change.

At the conclusion of an April 28, 2015 Vatican climate conference, about 60 scientists, diplomats, and religious and political leaders released a statement citing a "moral duty to respect rather than ravage the garden that is our home."[14]

A significant majority of Americans say world leaders are "morally obligated" to fight climate change, according to a February 2015 Reuters/IPSOS poll.[15]

"The result of the poll suggests that appeals based on ethics could be key to shifting the debate over climate change in the United States," Reuters reported.[16]

A growing number of churches and other faith groups are divesting holdings in fossil fuel companies, according to the Washington Post.[17]

> ***"People of faith have a moral obligation to be good stewards of the Earth."***
> ***– Delman Coates, senior pastor of Mount Ennon Baptist Church***

The Church of England, for example, announced that it is divesting itself of investments in "any company where more than 10 percent of its revenues are derived from the extraction of thermal coal or the production of oil from tar sands," citing a "moral responsibility" to protect the most vulnerable populations from climate change.[18]

Among those expressing support for carbon limits at power plants was the Reverend Sandra Strauss, director of public advocacy for the Pennsylvania Council of Churches.

"For far too long we have failed to truly care for the magnificent creation we have been given," she wrote the EPA. "Our faith demands that we act."[19]

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