

Climate Extremes Communications Guidebook

A resource to help local governments communicate about weather and climate extremes in the context of climate change



January 2014

ICLEI Local Governments for Sustainability USA
World Wildlife Fund



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Description of Partners

World Wildlife Fund

The world's leading conservation organization, World Wildlife Fund (WWF) works in 100 countries and is supported by 1.2 million members in the United States and close to 5 million globally. WWF's unique way of working combines global reach with a foundation in science, involves action at every level from local to global, and ensures the delivery of innovative solutions that meet the needs of both people and nature.



To inspire cities to address the growing threat of climate change, the WWF launched the Earth Hour City Challenge, a competition among cities to prepare for climate extremes and take steps to transition towards a 100% renewable energy future.

The Earth Hour City Challenge offers a platform and benefits package to empower and reward participating cities taking action on climate change. Over 160 cities across fourteen countries have taken the challenge, sharing their plans and strategies. WWF provides promotional and financial support as well as engagement with WWF members and partners to help drive cities' actions forward. Learn more at www.EarthHourCityChallenge.org.

ICLEI – Local Governments for Sustainability

ICLEI-Local Governments for Sustainability is the leading network of local governments committed to sustainability, clean energy, and climate action, with more than 1,000 cities, towns, and counties around the globe. ICLEI provides leading resources and technical guidance to help local governments reach their goals, and connects leaders to share solutions and accelerate progress. Learn more at www.icleiusa.org.



Resilient Communities for America

The Resilient Communities for America Agreement is a national campaign that is mobilizing hundreds of U.S. local elected officials—mayors, county executives, city council members, etc.—who pledge to create more resilient cities, towns, and counties, built to overcome our nation's extreme weather, energy, and economic challenges. The campaign is a partnership between ICLEI, WWF, National League of Cities, US Green Building Council, and other leading organizations.



How to Use This Guidebook: Content and Purpose

The purpose of this communications guidebook is to help local governments communicate about weather and climate extremes in the context of climate change. This guidebook will help mainstream climate preparedness into local government planning processes, and/or build support for any existing climate preparedness efforts that have been already undertaken by local governments.

This guidebook provides local government planners with concise explanations of climate extremes; the relationships of these climate extremes to climate change; tips on national, state, regional and local data related to climate extremes and their impacts; and extensive guidance on how to communicate about climate extremes.

Introduction

Weather patterns in the United States and globally are changing, driven increasingly by rising atmospheric concentrations of greenhouse gases. When climate extremes such as storms, heat waves, heavy rains, or droughts occur, and when they result in cascading impacts, local governments are among the first responders. Just as cities and counties have been the leaders on climate change mitigation—reducing their greenhouse gas emissions—they must also become the leaders on climate change adaptation—preparing and adapting their communities to climate change, including changes in climate extremes. Communicating about extreme weather in the context of climate change is a critical factor in initiating preparedness at the local government scale.

Background on Weather and Climate Extremes

It is important to understand the basic description of commonly used terminology in climate science, including the terms “weather”, “climate”, and “climate extremes”. The World Meteorological Organization states that “on the simplest level, the weather is what is happening in the atmosphere at any given time”, whereas “the climate, in a narrow sense, is usually defined as the ‘average weather’”. In its Special Report on Managing The Risks Of Extreme Events And Disasters To Advance Climate Change Adaptations (SREX) (2012), the Intergovernmental Panel on Climate Change (IPCC) uses the term “climate extreme” (as we do in this guidebook) to include both weather and climate extremes, defining these as “the occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable.” The IPCC provides some important and useful clarifications on these terms:

- *“Some climate extremes (e.g., droughts) may be the result of an accumulation of weather or climate events that are, individually, not extreme themselves (though their accumulation is extreme).”*
- *“Compound events, that is, two or more events occurring simultaneously, can lead to high impacts, even if the two single events are not extreme per se (only their combination).”*

It is also essential to recognize the distinction between extreme *weather* and *climate*, and extreme *impacts*. The impacts of weather and climate events are not determined solely by the nature of those events. Exposure and vulnerability also affect the impacts. Extreme impacts can result from weather and climate conditions that are not themselves considered extreme; and extreme weather and climate conditions do not necessary produce extreme impacts. For example, rainfall that is not extreme may cause disastrous flooding because of land-use and land cover changes that reduce the capacity of the landscape to absorb the water without flooding. Conversely, extreme summer temperatures may not result in disastrous impacts on human health in a community that has taken effective steps to reduce its vulnerability.

Similarly, trends in climate and weather extremes are distinct from (though related to) trends in extreme impacts. For example, while trends in insured losses from tropical storms are certainly influenced by changes in the frequency, intensity and tracks of those storms over time, they also are affected by the extent and quality of coastal development. Consequently, changes in insured losses from tropical storms over time cannot simply or solely be attributed to changes in the frequency, intensity and tracks of tropical storms. A key to successfully communicating around climate extremes is to understand these terms and their differences, and using the terms carefully and appropriately.

Observed Trends in Weather and Climate Extremes

Evidence clearly indicates that some climate extremes are on the rise in the U.S. According to the draft of the *National Climate Assessment 2014 (draft NCA 2014)* report produced by the National Climate Assessment Development and Advisory Committee, “over the last 50 years, much of the U.S. has seen an increase in prolonged stretches of excessively high temperatures, more heavy downpours, and in some regions more severe droughts.” As measured by the National Oceanic and Atmospheric Administration’s (NOAA) Climate Extremes Index (CEI), the area of the U.S.

affected by climate extremes annually has been trending sharply upward since 1970. The CEI incorporates 6 components including temperature and precipitation extremes, drought and land-falling tropical storms. As shown in Figure 1, the CEI reached the second highest level on record in 2012.

Figure 1: The Annual Climate Extremes Index for the Contiguous U.S. from 1910 through 2012 (January – December).

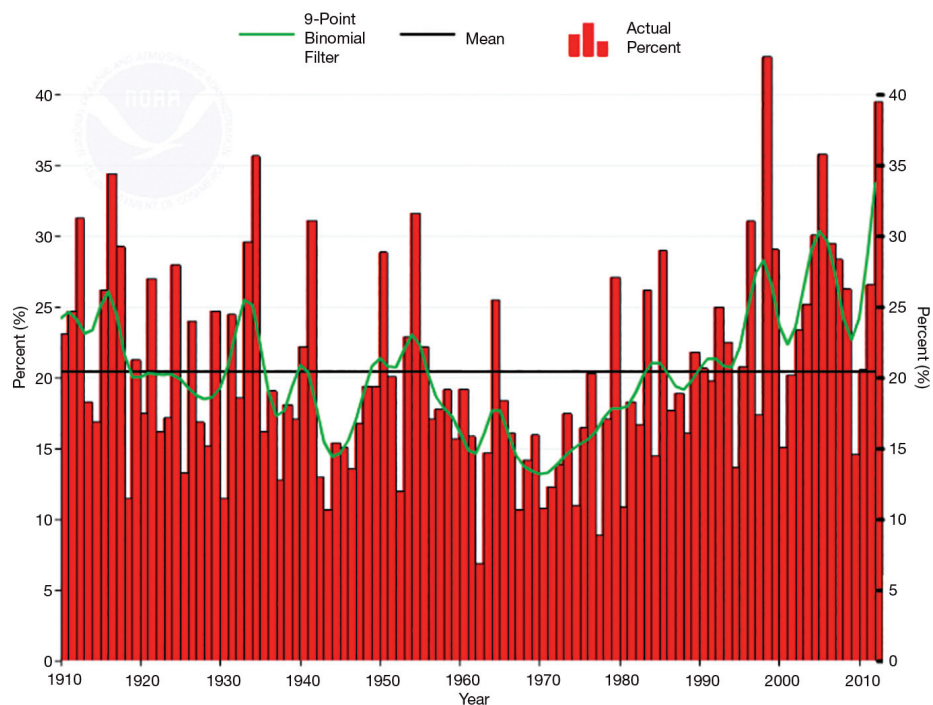


Figure 1: The Annual Climate Extremes Index for the Contiguous U.S. from 1910 through 2012 (January – December). The index, showing the percentage of the U.S. affected by climate extremes, has been rising since the 1970s, and in 2012, reached the second highest level on record. Nearly 40% of the U.S. was affected by extreme conditions in 2012 – roughly double the long term mean. Source: NOAA, U.S. Climate Extremes Index.

Among the individual components of CEI, the sharpest rise has been in the portion of the U.S. experiencing daily minimum and maximum temperatures that are well above normal; and experiencing daily (24-hour) precipitation extremes. As shown in Figure 2, the annual CEI for maximum daily temperatures reached a record high in 2012: 87% of the U.S. experienced extremely *high* daily maximum temperatures that year, while 0% of the U.S. recorded daily maximum temperatures that were extremely *low*.

Figure 2: Contiguous U.S. Extremes in Annual Maximum Temperature from 1910 - 2012 (January - December)

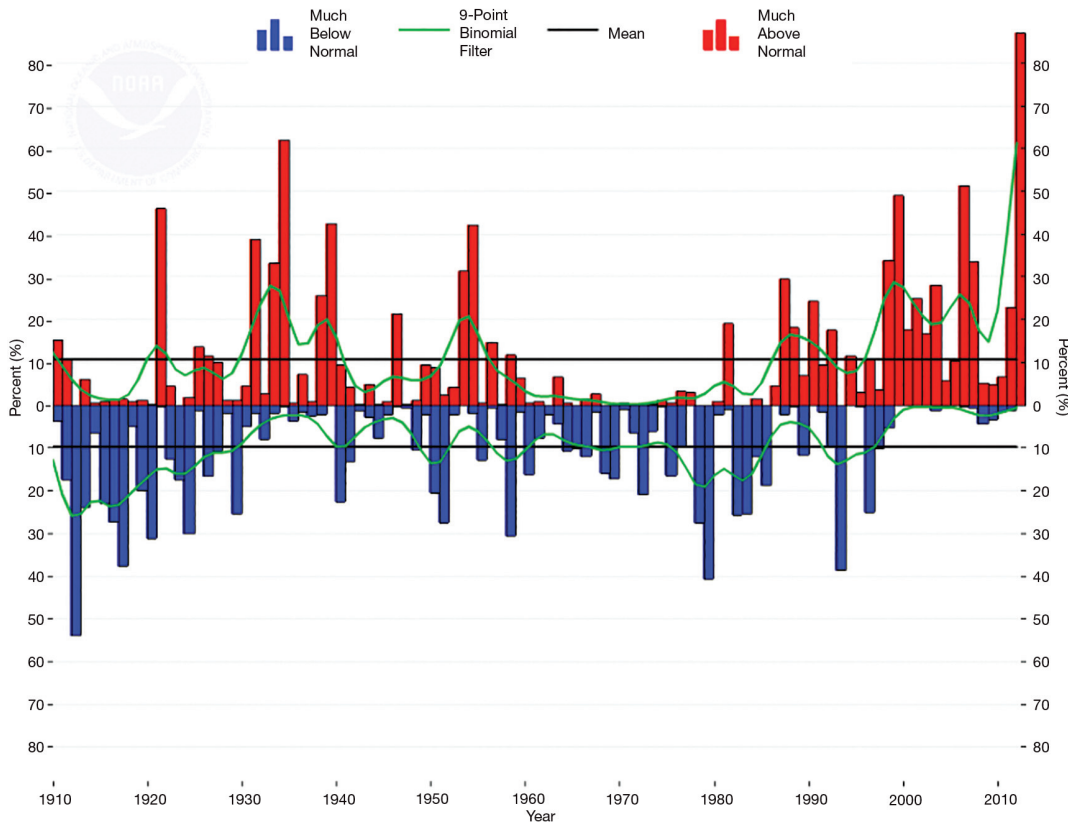


Figure 2: Contiguous U.S. Extremes in Annual Maximum Temperature from 1910 - 2012 (January - December). The red bars show the percent of the contiguous U.S. experiencing maximum temperatures well above normal, while the blue bars show the percent of the U.S. with maximum temperatures well below normal. A record area of the U.S. experienced well above normal maximum temperatures in 2012. Source: NOAA, U.S. Climate Extremes Index.

The trends in extremes vary by region of the U.S. and by time of year. For example, the upward trend in well above normal maximum and minimum temperatures is especially pronounced in the spring and summer. *“The U.S. temperatures in the summer of 2012 are an example of a new trend of outlying seasonal extremes that are warmer than the hottest seasonal temperatures of the mid-20th century,”* GISS director James E. Hansen said in a press release on 15 January 2013.

In the case of the CEI for extreme 24-hour precipitation events, the sharpest increase is in the Northeast and Midwest since the mid-1980s. The increase in the Northeast has been concentrated in the Spring and the Fall (shown below in Figure 3).

Figure 3: Extremes in 1-Day Precipitation in the Northeast in Fall (September–November) from 1910–2012

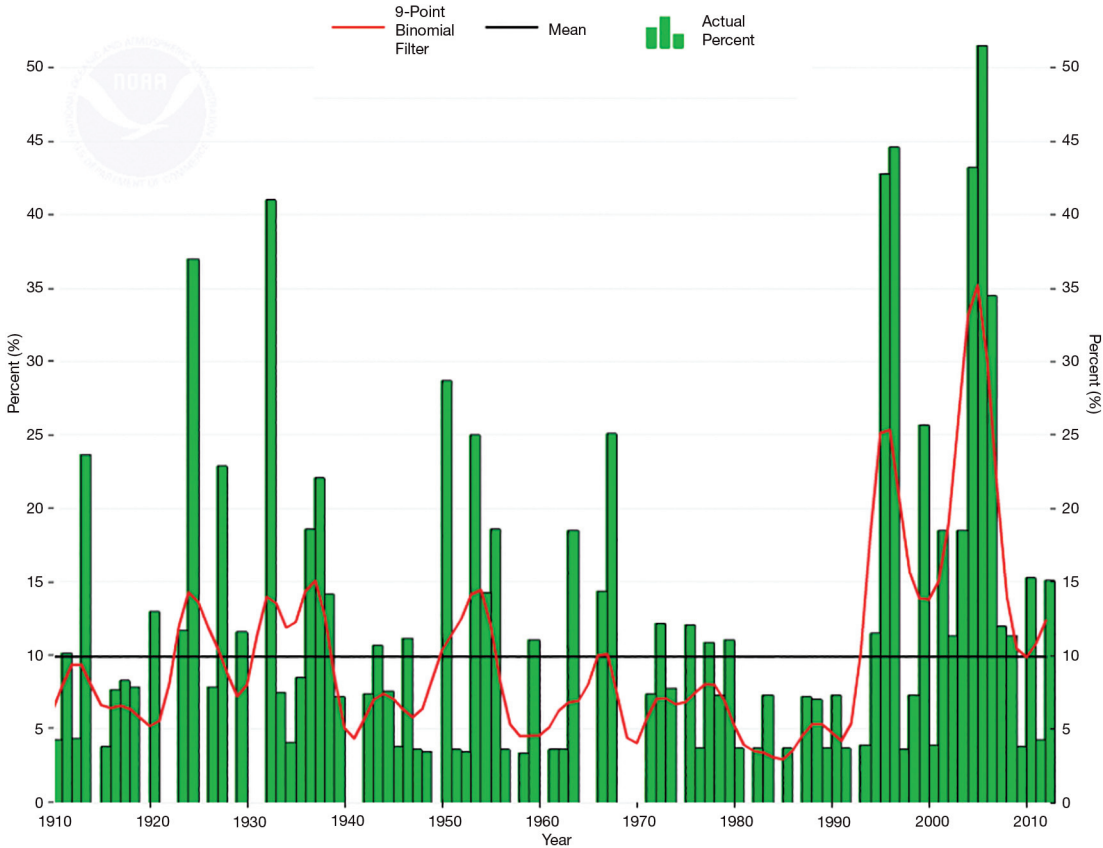


Figure 3: The Climate Extremes Index for 24-hour precipitation events in the Fall months (Sep–Nov) in the northeastern U.S., 1910–2012. The vertical axis shows the percentage of the region experiencing the extreme conditions. Since 1990, the northeast has experienced a large increase in the area affected by extreme 24-hour precipitation events during the Fall months. Source: NOAA, Climate Extremes Index.

Similarly, Figure 4 on the following page shows trends in extreme precipitation across the U.S. since the early 1900s.

Finally, hurricanes are another example of climate extremes in which trends can be discerned in particular regions of the U.S. For instance, the draft *NCA 2014* report concludes, that “*there has been an increase in the overall strength of hurricanes and in the number of strong (Category 4 and 5) hurricanes in the North Atlantic since the early 1980s... With regard to other types of storms that affect the U.S., winter storms have increased slightly in frequency and intensity, and their tracks have shifted northward over the U.S. Other trends in severe storms, including the numbers of hurricanes and the intensity and frequency of tornadoes, hail, and damaging thunderstorm winds are uncertain and are being studied intensively.*”

Figure 4: Trends in Extreme Precipitation across the U.S. since the 1900s

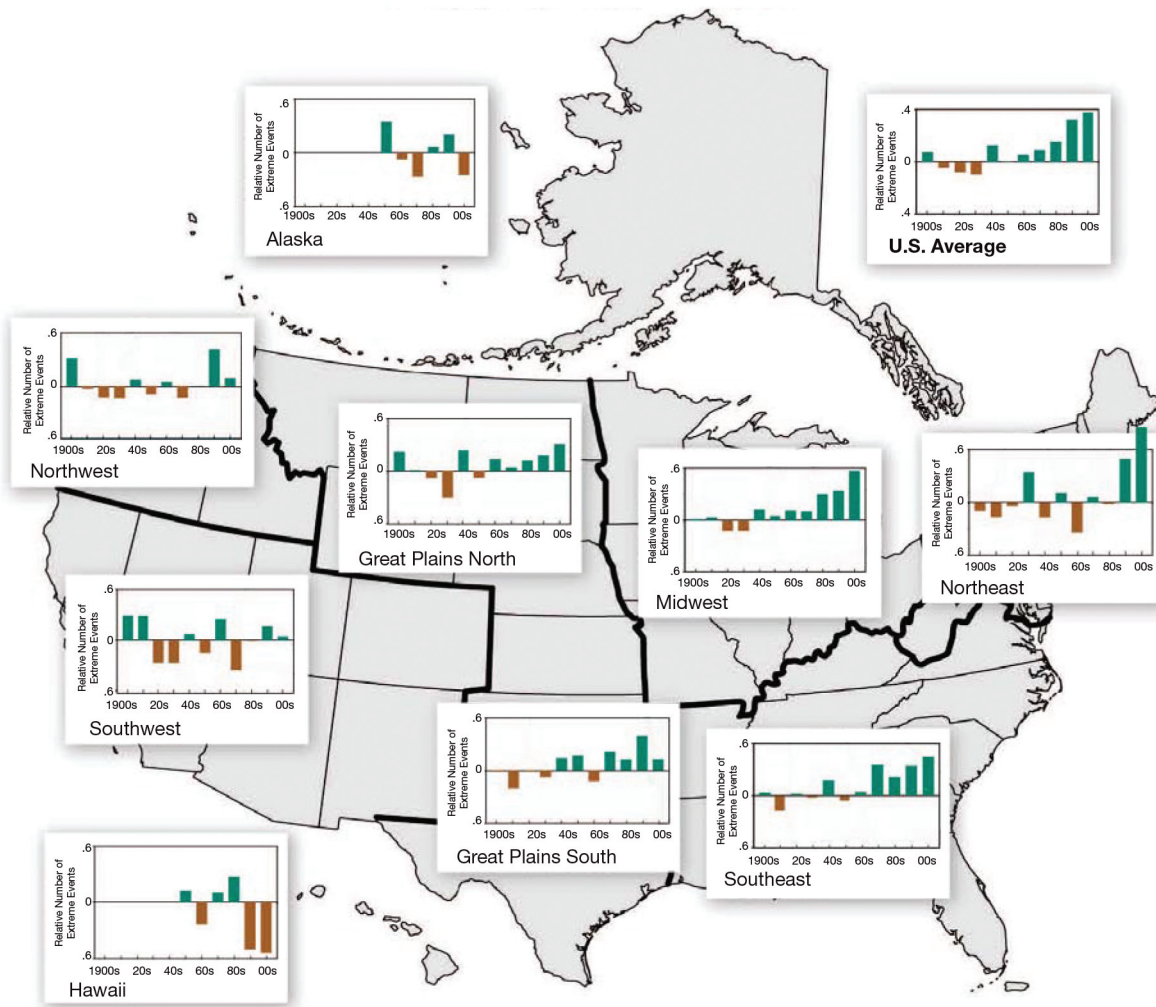


Figure 4 (above): “Heavy downpours are increasing nationally, with especially large increases in the Midwest and Northeast... Despite considerable decadal-scale natural variability, indices such as this one based on 2-day precipitation totals exceeding a threshold for a 1-in-5-year occurrence exhibit a greater than normal occurrence of extreme events since 1991 in all U.S. regions except Alaska and Hawaii. Each bar represents that decade’s average, while the far right bar in each graph represents the average for the 11-year period of 2001–2011.” Source: NOAA as published in public review draft (January 2013) of the National Climate Assessment 2014 report by the National Climate Assessment and Development Advisory Committee (NCADAC).

Impacts of Observed Climate Extremes

As climate extremes change, changes also are being recorded in their impacts and their economic costs. However, variables other than climate change also affect those impacts, making it much more difficult to precisely quantify the degree to which impacts result from climate change per se, as opposed to natural climate variability or changes in exposure and vulnerability. Nevertheless, the observed changes compelled reinsurer Munich Re to conclude in its report, *Severe Weather in North America* (2012), that “In reviewing the last 30 years of activity, it is clear that the intensity and

frequency of most event types are on an upward trend, ultimately leading to growing economic and insured losses.”

The annual number of weather/climate-related disasters costing at least a billion dollars each in the U.S. has increased since 1980, with a record 14 such events in 2011. Similarly, there were 11 billion dollar events in 2012, the second highest annual total on record. The total annual costs of the billion dollar events also are increasing. The costliest year was 2005, with total damages of around \$187.2 billion (2012 dollars). The second costliest year was 2012 with total damages estimated at over \$110 billion.

Are Humans Contributing to Changes in Climate Extremes?

The Federal National Climate Assessment Development and Advisory Committee said in its January 2013 draft of the *National Climate Assessment 2014 (draft NCA 2014) report*:

“Some extreme weather and climate events have increased in recent decades, and there is new and stronger evidence that many of these increases are related to human activities... Human-induced climate change has already increased the frequency and intensity of some extremes.”

The “human activities” that are referred to in this report are primarily the combustion of fossil fuels, and changes in land use and land cover. These result in rising atmospheric concentrations of greenhouse gases in the atmosphere, which are trapping solar energy and warming the planet. That “global warming” then drives a suite of additional climatic changes, including changes in climate extremes.

This does not mean that every climate extreme results *solely* from human activities. Nor does it necessarily mean that human activities are even the *primary* driver of every climate extreme. However, it *does* mean that we have changed the atmosphere and warmed the planet to the point where we can generally state that there is a substantially increased likelihood that climate extremes will occur.

With regard to some climate extremes, the attribution to climate change already appears to be very pronounced. For example, the draft *NCA 2014* report states, that “*there is strong evidence to indicate that human influence on the climate has already roughly doubled the probability of extreme heat events like the record-breaking summer of 2011 in Texas and Oklahoma*”.

Similarly, the IPCC states in its SREX report, that “*a changing climate leads to changes in the frequency, intensity, spatial extent, duration, and timing of extreme weather and climate events, and can result in unprecedented extreme weather and climate events.*” However, the IPCC also says that natural variability also is a factor and “*will be an important factor in shaping future extremes in addition to the effect of anthropogenic changes in climate.*”

Overall, the scientific consensus is that “*in general, single extreme events cannot be simply and directly attributed to anthropogenic climate change, as there is always a possibility the event in question might have occurred without this contribution,*” says the IPCC in its 2012 SREX report.

“However, for certain classes of regional, long-duration extremes (of heat and rainfall) it has proved possible to argue from climate model outputs that the probability of such an extreme has changed due to anthropogenic climate forcing.”

For the major changes that have been observed in climate extremes in the U.S. over the last 50 years, Table 1 summarizes what is known about the linkages to human activities.

Projected Trends in Weather and Climate Extremes

Arguably more significant than the observed trends in climate and weather extremes, are **projected** changes in extremes. The U.S. Global Change Research Program (USGCRP) warns in *Weather and Climate Extremes in a Changing Climate (2008)*:

“In the future, with continued global warming, heat waves and heavy downpours are very likely to further increase in frequency and intensity. Substantial areas of North America are likely to have more frequent droughts of greater severity. Hurricane wind speeds, rainfall intensity, and storm surge levels are likely to increase. The strongest cold season storms are likely to become more frequent, with stronger winds and more extreme wave heights.”

Similarly, James E. Hansen, former director of the Goddard Institute for Space Studies said in a press release on 15 January 2013, that *“the climate dice are now loaded”*, and that *“some seasons still will be cooler than the long-term average, but the perceptive person should notice that the frequency of unusually warm extremes is increasing. It is the extremes that have the most impact on people and other life on the planet.”*

Figure 5 shows projected increases in extreme precipitation across the U.S. up to the end of the century.

Figure 5: Projected Increases in Extreme Rainfall Events across the U.S. under different Emissions Scenarios

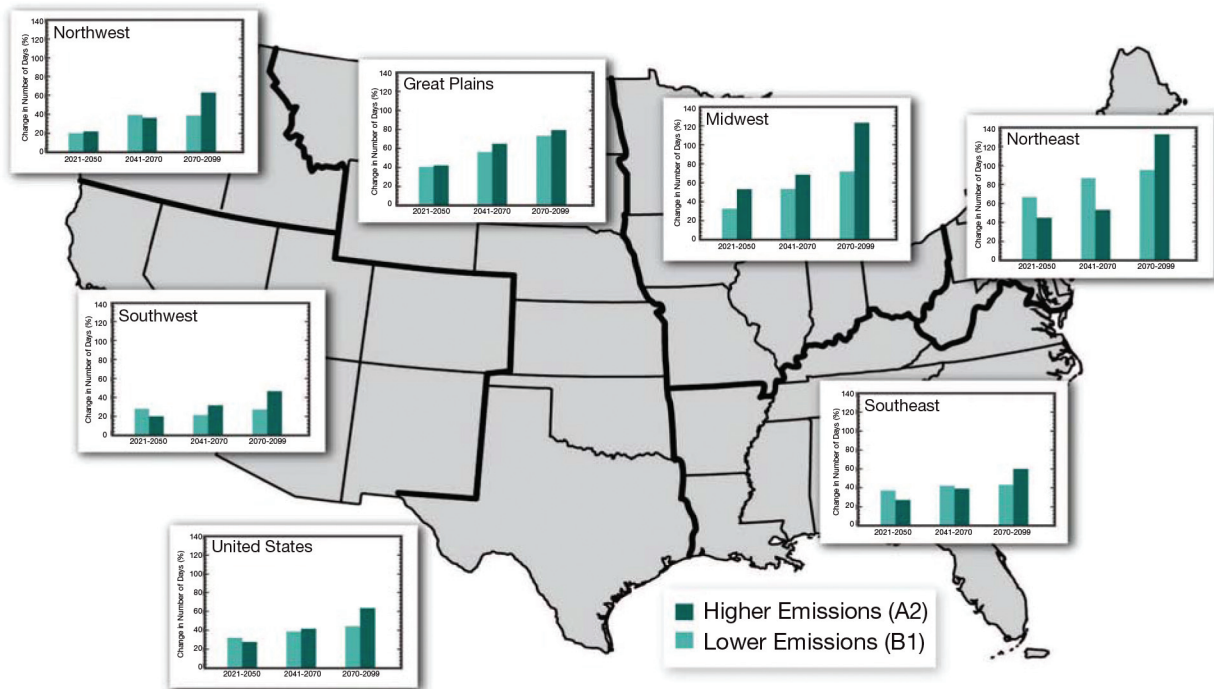


Figure 5: “Projected increases in number of days per year with rainfall greater than 3 inches for 30-year averages centered on 2035, 2055, and 2085 (compared to 1971-2000) assuming a lower-emissions scenario in which emissions of heat-trapping gases are substantially reduced (B1, lighter blue bars on left) and a higher-emissions scenario in which emissions continue to grow (A2, darker bars on right). Waterborne disease outbreaks occur more frequently after extreme rainfall events, so more of these events will increase risks of associated illnesses.” Source: NOAA, as published in the public review draft (January 2013) of the National Climate Assessment report by the National Climate Assessment and Development Advisory Committee (NCADAC).

Figure 6 shows projected increases in numbers of summer days across the U.S. up to the end of the century.

Figure 6: Projected Increases in Days over 100°F under different Emissions Scenarios

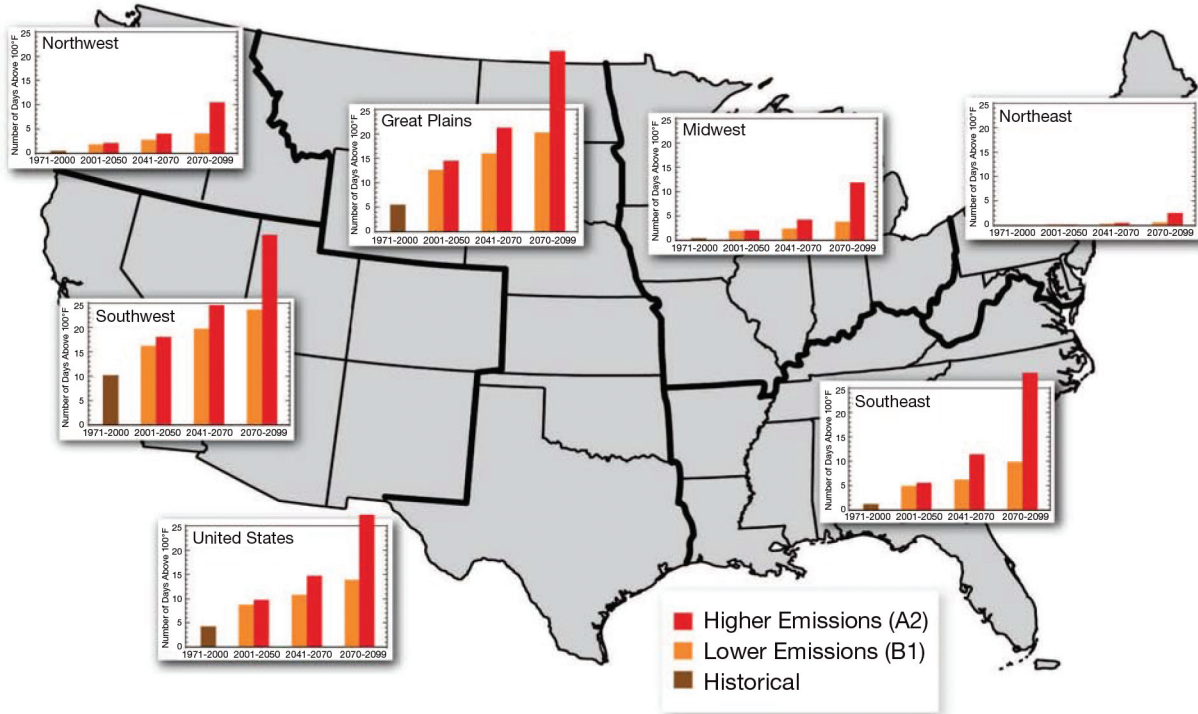


Figure 6: “Projected numbers of summer days per year (regional averages) with temperatures greater than 100°F under a lower-emissions scenario in which emissions of heat-trapping gases are substantially reduced (B1) and a higher-emissions scenario in which emissions continue to grow (A2). Historical data are for 1971-2000 (farthest left bar in plots). Projections shown are 30-year averages centered on 2035, 2055, and 2085 (bars left to right).” Source: NOAA, as published in public review draft (January 2013) of the National Climate 2014 report by the National Climate Assessment and Development Advisory Committee (NCADAC).

Table 1: Observed and Projected Changes in North American Climate Extremes


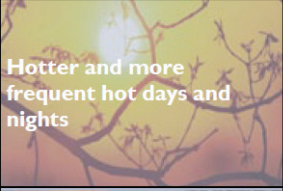

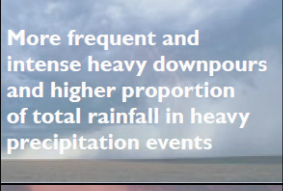


Phenomenon and direction of change	Where and when these changes occurred in past 50 years	Linkage of human activity to observed changes	Likelihood of continued future changes in this century
 Warmer and fewer cold days and nights	Over most land areas, the last 10 years had lower numbers of severe cold snaps than any other 10-year period	Likely warmer extreme cold days and nights, and fewer frosts ²	Very likely ⁴
 Hotter and more frequent hot days and nights	Over most of North America	Likely for warmer nights ²	Very likely ⁴
 More frequent heat waves and warm spells	Over most land areas, most pronounced over northwestern two thirds of North America	Likely for certain aspects, e.g., nighttime temperatures; & linkage to record high annual temperature ²	Very likely ⁴
 More frequent and intense heavy downpours and higher proportion of total rainfall in heavy precipitation events	Over many areas	Linked indirectly through increased water vapor, a critical factor for heavy precipitation events ³	Very likely ⁴
 Increases in area affected by drought	No overall average change for North America, but regional changes are evident	Likely, Southwest USA. ³ Evidence that 1930's & 1950's droughts were linked to natural patterns of sea surface temperature variability	Likely in Southwest U.S.A., parts of Mexico and Caribbean ⁴
 More intense hurricanes	Substantial increase in Atlantic since 1970; Likely increase in Atlantic since 1950s; increasing tendency in W. Pacific and decreasing tendency in E. Pacific (Mexico West Coast) since 1980 ⁵	Linked indirectly through increasing sea surface temperature, a critical factor for intense hurricanes ⁵ ; a confident assessment requires further study ³	Likely ⁴
¹ Based on frequently used family of IPCC emission scenarios ² Based on formal attribution studies and expert judgment ³ Based on expert judgment ⁴ Based on model projections and expert judgment ⁵ As measured by the Power Dissipation Index (which combines storm intensity, duration and frequency)			

Table 1: Observed changes in North American extreme events, assessment of human influence for the observed changes, and likelihood that the changes will continue through the 21st century. Source: *Weather and Climate Extremes in a Changing Climate. Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands (2008)*. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [Thomas R. Karl, Gerald A. Meehl, Christopher D. Miller, Susan J. Hassol, Anne M. Waple, and William L. Murray (eds.)]. Department of Commerce, NOAA's National Climatic Data Center, Washington, D.C., USA, 164 pp.

Cities are Particularly Vulnerable

In *Climate Change & Cities* (2011), the Urban Climate Change Research Network leaves no doubt about the threat cities face globally from changes in climate extremes:

“Heat events are projected to increase in frequency, severity and duration... Most cities are expected to experience an increase in the percentage of their precipitation in the form of intense rainfall events. In many cities, droughts are expected to become more frequent, more severe, and of longer duration. Additionally, rising sea levels are extremely likely in all the coastal cities, and are likely to lead to more frequent and damaging flooding related to coastal storm events in the future. Climate change impacts on cities are enhanced by factors including high population density, extensive infrastructure, and degraded natural environments. Vulnerabilities will be great in many regions that currently experience frequent climate hazards, such as low-lying areas already exposed to frequent flooding. Vulnerabilities will also be large among resource-poor populations...”

An October 2012 report from Oak Ridge National Laboratory (ORNL) produced as input to the National Climate Assessment, *Climate Change and Infrastructure, Urban Systems, and Vulnerabilities* warned that urban areas in the United States – like those elsewhere -- are vulnerable to climate extremes. Impacts and disruptions, especially to infrastructure, will *“involve not only the costs associated with the clean-up, repair, and/or replacement of affected infrastructures but also economic, social, and environmental effects as supply chains are disrupted, economic activities are suspended, and/or social well-being is threatened,”* wrote the authors.

In early 2013, the draft *NCA 2014* report was published, including a chapter on Urban Systems, Infrastructure, and Vulnerability that echoes the conclusions of the Urban Climate Change Research Network and ORNL reports. It lists four key messages:

1. *“Climate change and its impacts threaten the well-being of urban residents in all regions of the U.S. Essential local and regional infrastructure systems such as water, energy supply, and transportation will increasingly be compromised by interrelated climate change impacts.*
2. *In urban settings, climate-related disruptions of services in one infrastructure system will almost always result in disruptions in one or more other infrastructure systems.*
3. *Climate vulnerability and adaptive capacity of urban residents and communities are influenced by pronounced social inequalities that reflect age, ethnicity, gender, income, health, and (dis)ability differences.*
4. *City government agencies and organizations have started urban adaptation efforts that focus on infrastructure systems and public health. However, these efforts face many barriers to implementing and incorporating wider governmental, general public and private efforts.”*

Figure 8 shows how urban support systems are interconnected, and how disruptions resulting in one system due to climate extremes can cause cascading effects on other systems.

Figure 8: Interconnected Urban Support Systems Affected by Climate Extremes

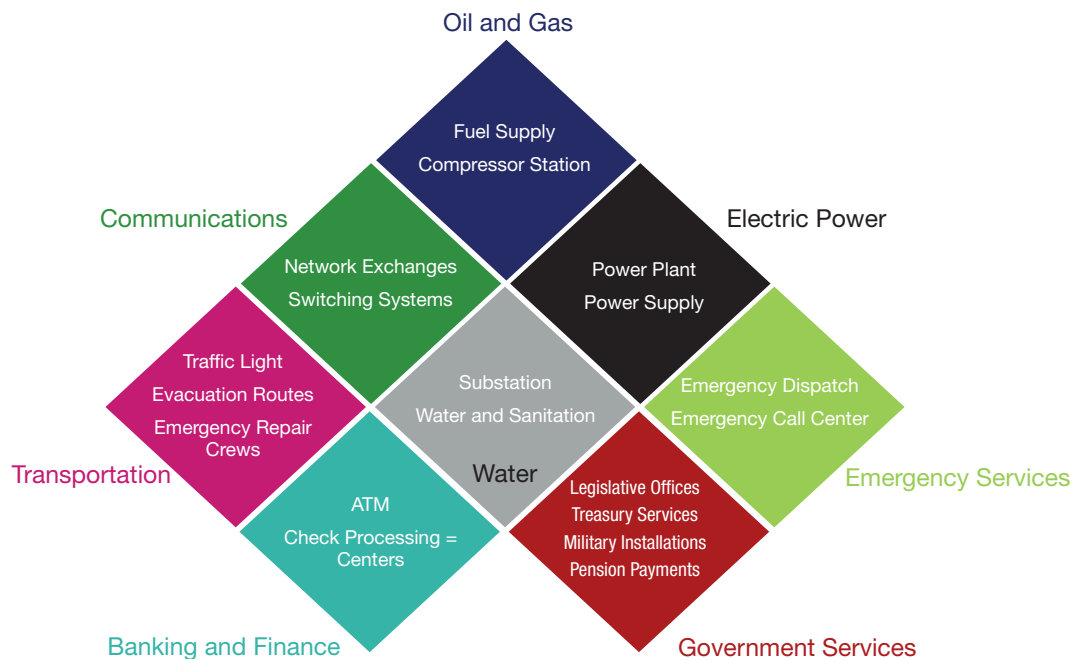


Figure 8: “In urban settings, climate-related disruptions of services in one infrastructure system will almost always result in disruptions in one or more other systems. When power supplies that serve urban areas are interrupted after a major weather event, for example, public health systems, transportation systems, and banking systems may all be affected. Schematic drawing illustrates some of these connections.” Source: Oak Ridge National Laboratory, Climate Change and Infrastructure, Urban Systems, and Vulnerabilities, 2012.

The Role of Local Governments

Local governments have a responsibility to protect their residents, infrastructure, economic assets and natural resources. When climate extremes strike, they are the first responders tasked with coordinating evacuations, rescue operations, and coordinated communication.

But before and after disasters, local governments also have a responsibility to improve their communities’ preparedness and resilience. Resilience strategies must be initiated along with greenhouse gas reduction measures.

“Climate adaptation” is defined in the context of human as well as natural systems. In human systems, adaptation is the process of adjustment to actual or expected climate change and its effects, in order to moderate harm or exploit beneficial opportunities that result from those impacts. In natural systems, adaptation is the process of adjustment to actual climate change and its effects; human intervention may facilitate adjustment to expected climate change.

Local climate adaptation measures may include the following:

- Encourage energy efficiency and conservation; and distributed power generation from multiple renewable sources to reduce potential for grid overload during heat waves, decreasing the likelihood of blackouts
- Reduce vulnerability to flooding by promoting functional watersheds, including healthy forests and open space
- Counteract urban heat island impacts by planting trees to provide shade and cooling
- Strengthen infrastructure to deal with increased flooding, such as larger bridges and culverts and other storm-water conveyance systems
- Develop building standards that include greater resistance to high winds and flooding
- Diversify water supplies, and promote conservation actions, such as harvesting rainwater

Communication Is Key

Building support for climate adaptation and local preparedness efforts requires that a range of individuals and groups fully understand the threat of climate extremes to their local communities. Effective communication is essential.

More extreme weather and climate events make climate change a real issue that people can grasp because it is happening now and in their backyards. After the record Colorado wildfires in 2012, Michael Oppenheimer, a Princeton University climate scientist said, *“What we’re seeing is a window into what global warming really looks like. It looks like heat; it looks like fires; it looks like this kind of environmental disaster. This provides vivid images of what we can expect to see more of in the future.”*

The good news is that the American public more strongly recognizes that climate extremes are on the rise, and the climate is changing. An April 2013 national survey, summarized in *Extreme Weather, Climate & Preparedness in the American Mind*, found that 85 percent of Americans personally *“experienced one or more extreme weather events in the past year.”* These include extreme high winds (60%), extreme rainstorms (41%), extreme heat waves (51%), drought (42%), extreme cold temperatures (37%), extreme snowstorms (26%), flood (18%), hurricanes (15%) or wildfires (13%).

The survey report also states that “many Americans believe global warming made recent extreme weather and climatic events “more severe,” specifically: 2012 as the warmest year on record in the United States (50%); the ongoing drought in the Midwest and the Great Plains (49%); Superstorm Sandy (46%); and Superstorm Nemo (42%).”

As more people understand and accept the connections between climate extremes and climate change, it is the role of communicators at the local level to go further and inform people about the local trends and projections, exposure vulnerabilities, and impacts, and about the appropriate responses. This *Communications Guidebook* provides guidance to help local governments begin these vital conversations.

Climate Extremes and Climate Change: Understanding the Science, Gathering Data to Tell Your Story

Climate communication begins with a commitment to accuracy and a basic understanding of what climate scientists tell us about connections between climate extremes, climate change, and rising atmospheric concentrations of greenhouse gases. The science is complex, but grasping the in-depth processes is not necessary for most people. The problems arise when non-scientists make generalized statements that research does not support, or incorrectly characterize the relationship between a specific climate extreme and climate change. Overstating the contribution of human activity to climate extremes is a sure way to lose credibility and be dismissed as an alarmist. Using careful and correct language is essential.

This section of the toolkit provides a primer on climate extremes, and on the connections between those extremes and human-induced climate change. It is formatted in the form of “Frequently Asked Questions” so that you can cut and paste this text for use in your communications materials. In the second part of this section, we will provide guidance on how to gather the best data on your local, regional, and national climate trends and impacts.

A Primer on Climate Extremes and Climate Change

Are Climate Extremes on the rise in the United States?

Yes. According to the January 2013 draft *NCA 2014* report produced by the National Climate Assessment Development and Advisory Committee: “*Over the last 50 years, much of the U.S. has seen an increase in prolonged stretches of excessively high temperatures, more heavy downpours, and in some regions more severe droughts.*” The report also concludes:

“There has been an increase in the overall strength of hurricanes and in the number of strong (Category 4 and 5) hurricanes in the North Atlantic since the early 1980s... With regard to other types of storms that affect the U.S., winter storms have increased slightly in frequency and intensity, and their tracks have shifted northward over the U.S. Other trends in severe storms, including the numbers of hurricanes and the intensity and frequency of tornadoes, hail, and damaging thunderstorm winds are uncertain and are being studied intensively.”

Has anthropogenic climate change increased climate extremes?

Yes. The draft *NCA 2014* report states:

“Some extreme weather and climate events have increased in recent decades, and there is new and stronger evidence that many of these increases are related to human activities... Human-induced climate change has already increased the frequency and intensity of some extremes.”

Climate change driven by rising atmospheric concentrations of greenhouse gases has made certain climate extremes more frequent, more intense, or longer in duration. While natural variability plays a key role in any weather event, a warmer planet has shifted the odds to make certain types of extreme weather events more likely.¹³

The strength of the evidence linking *observed* changes in climate extremes to climate change depends on the type of extreme, as indicated in Table 1. For changes in some extremes, such as well above normal temperature and intense precipitation events, the links to climate change are relatively stronger. In contrast, for changes in other climate extremes such as hurricanes, the linkages appear not to be as strong.¹⁴

However, scientists are confident that as greenhouse gases continue to accumulate in the atmosphere and to fuel climate change, the impacts on climate extremes are very likely to increase.

Can specific climate or weather extremes be attributed to climate change?

“In general, single extreme events cannot be simply and directly attributed to anthropogenic climate change, as there is always a possibility the event in question might have occurred without this contribution,” says the IPCC in its 2012 SREX report. *“However, for certain classes of regional, long-duration extremes (of heat and rainfall) it has proved possible to argue from climate model outputs that the probability of such an extreme has changed due to anthropogenic climate forcing.”*

“The odds have changed to make certain kinds of events more likely,” said Kevin Trenberth, head of the Climate Analysis Section at the US National Center for Atmospheric Research, in a presentation at the American Meteorological Society’s annual meeting in January 2011. *“It is [therefore] not a well-posed question to ask ‘is it caused by global warming?’ or ‘is it caused by natural variability?’ Because it is always both.”*

A year later, Trenberth wrote in the journal *Climatic Change*: *“The answer to the oft-asked question of whether [a particular extreme weather or climate] event is caused by climate change is that it is the wrong question. All weather events are affected by climate change because the environment in which they occur is warmer and moister than it used to be.”*¹⁵

How do scientists and communicators effectively convey the link between an individual climate extreme and climate change?

While formal “detection and attribution” studies can help quantify the influence of climate change on specific extreme weather and climate events, such studies are not conducted for most events — and the results are typically not available until well after the events occur.

¹³ Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX), Intergovernmental Panel on Climate Change, 2012

¹⁴ Ibid.

³ Framing the way to relate climate extremes to climate change, *Climatic Change*, 21 March 2012

Alternatively, the events can be placed in the context of observed trends in climate extremes and of projected changes in those extremes. Where an event is consistent with both trends and projections, it offers a valuable opportunity to inform the public about the future threat posed by such events and about appropriate response options.

Another approach is to explain how climate change makes a particular type of climate extreme more likely to occur, and its impacts more severe. For example, in the 2012 Colorado wildfires, there were some weather and fuel conditions that set the stage for the fires, and there were some connections between these conditions and climate change:

- Spring and Summer temperatures in Colorado are increasing; Spring 2012 was tied with 1934 as the warmest Spring on record and Summer 2012 was the hottest summer on record.
- Spring precipitation is declining in Colorado and Spring 2012 was the fourth driest on record.

A second example relates to Hurricane Sandy. Climate scientists Robert Corell and Kevin Trenberth, and meteorologist Jeff Masters wrote, *“We know that a warming climate puts more energy into storms, including hurricanes, loading them with more rainfall and the stronger winds pushing more of a storm surge. That makes flooding more likely. We also know that storm surge now rides higher on sea levels that have risen over the last century due to global warming, amplifying losses where the surge strikes. Overall, we know that climate change has stacked the deck so that this kind of event happens more frequently.”*¹⁶

What about scientific uncertainty on climate extremes and climate change? Doesn't that impede policymakers' decisions to take action?

Every day, individuals and governments make decisions even though an economic forecast or weather report lacks complete certainty. There is enough information to weigh the risks at hand and the choice of acting versus not acting. The same is true of climate science and say, determining a course of action based on climate projections at the regional or state level.

Uncertainty doesn't mean that experts don't know *anything*. In fact, climate scientists have a great deal of certainty about the basic facts: human activities are causing the planet to warm and are driving an increase in climate extremes.

The website *Talking Climate* sums up how communicators should treat uncertainty:

“Perhaps the most important task for communicating climate change effectively is being clear that uncertainty is not an enemy of science that holds it back – it is actually a stimulus that drives it forward. Just like any area of complex science, uncertainty is a feature of climate science that will never go away. Science doesn't deal in certainties – it weighs up the evidence and tells you which of several possible answers has the most support. Where uncertainties remain, scientists know where to put their efforts into what to investigate next. Getting the message across that uncertainty is not a bad thing, and that we

16 “Did climate change contribute to Sandy? Yes” Dr. Bob Correll, Dr. Jeff Masters, and Dr. Kevin Trenberth, Politico, Nov. 5, 2012 <<http://www.politico.com/news/stories/1112/83335.html>>

make decisions every day based on less than certain information is an important place to start for climate change communicators.”¹⁷

Gathering Information to Tell Your Story

Local government decision-making on curbing greenhouse gas emissions, climate adaptation and climate preparedness must be based on the most accurate, credible and recent scientific information possible. Where can you find information on extreme weather and climate events, trends, projections, vulnerability, impacts and responses from the national level down to your own local community? The following is a list of helpful resources with national, regional and state information, as well as suggestions for how to find and assemble local information.

National, Regional, and State-level Information

- 1. National Climate Assessment (NCA):** The NCA is a national process conducted under the auspices of the U.S. Global Change Research Program (USGCRP). The NCA generates reports and other resources on national and regional climate change trends and projections, impacts, vulnerabilities and response options. The January 2013 draft of the *National Climate Assessment 2014 (draft NCA 2014)* report is currently available online. The NCA also provides Scenarios for Climate Assessment and Adaptation down to the regional levels (and including climate extremes). In addition, the following final reports have been produced as contributions to the NCA:
 - **Regional Reports:** These are available from Island Press, the Climate Adaptation Knowledge Exchange, and from the USGCRP.
 - **Sectorial Reports:** These are available from the USGCRP. In particular, the report titled *Climate Change and Infrastructure, Urban Systems, and Vulnerabilities* is relevant to city-level adaptation planning.
- 2. Global Climate Impacts in the United States:** Thomas R. Karl, Jerry Melillo, and Thomas C. Peterson (eds), Cambridge University Press. 2009. This is the last completed USGCRP assessment of climate change impacts in the U.S., and will be updated when the next NCA overview report is published in 2014. Among the Companion Materials that are available are regional factsheets.
- 3. Weather and Climate Extremes in a Changing Climate. Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands:** A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. [Thomas R. Karl, Gerald A. Meehl, Christopher D. Miller, Susan J. Hassol, Anne M. Waple, and William L. Murray (eds.)]. Department of Commerce, NOAA’s National Climatic Data Center, Washington, D.C., USA, 164 pp. See also *Weather and Climate Extremes in a Changing*

¹⁷ “Communicating uncertainty in climate science,” Guide; Talking Climate, <http://talkingclimate.org/guides/a-guide-to-communicating-uncertainty-in-climate-science/>

Climate. Findings and Summary of the U.S. Climate Change Science Program. Frequently Asked Questions. Published in 2008. 4 pages

4. **Special Report on Managing The Risks Of Extreme Events And Disasters To Advance Climate Change Adaptations (SREX):** This report has been developed by the Intergovernmental Panel on Climate Change (IPCC). In addition, a fact sheet on the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, produced by the IPCC is particularly helpful.
5. **U.S. Climate Extreme Index:** This index has been developed by NOAA. It provides data on the occurrence of specific extreme events over time since 1910, how extreme weather events have changed over the past 50 or more years, in what ways, and by how much. Analyses are available at the national and regional levels.
6. **U.S. Temperature and Precipitation Records:** These records have been compiled by NOAA at the national, regional, and state levels.
7. **Plot Time Series:** A NOAA site through which users can create graphs presenting monthly, seasonal and annual climate data for the contiguous U.S., regions, states and NOAA climate divisions within states.
8. **U.S. Drought Monitor:** This monitor has been produced by the National Drought Mitigation Center, the United States Department of Agriculture, and NOAA. It includes data and figures at the national, regional and state levels.
9. **U.S. Hazards Outlook:** This resource has been developed by NOAA, and provides information on weather- and climate-related hazards to the United States for the next three to fourteen days.
10. **State of the Climate reports:** These are monthly summaries from NOAA, including national overviews as well as reports on drought, wildfires, tropical storms, and other climate extremes.
11. **NOAAWatch:** This is NOAA's All Hazards Monitor.
12. **Climate Change Indicators in the United States, 2012.** This report has been published in 2012 by the U.S. Environmental Protection Agency. The sections on High and Low Temperatures; Heavy Precipitation; Drought; Tropical Cyclone Activity; and Heat-Related Deaths are the most relevant to climate extremes.
13. **NOAA Regional Climate Centers:** The centers are federal-state cooperative effort that produces useful climate data for each region.
14. **Regional Integrated Sciences and Assessments (RISA):** These assessments have been developed by NOAA, and "*support research that addresses complex climate sensitive issues of concern to decision-makers and policy planners at a regional level.*" They include the Consortium on Climate Risk in the Urban NE (CCRUN), the only RISA that primarily focuses on urban climate change adaptation.

15. **State Climatologists:** Most states have a state climatologist. They usually are state employees or university faculty members.
16. **U.S. EPA’s State Impacts & Adaptation Page:** this resource provides tools and resources on adaptation planning.
17. **Climate Impacts on Business:** Groups like Small Business Majority periodically produce reports and research about small businesses and their opinions on various issues. United Nations Environment Program (UNEP) has also releases reports on how a changing environment like climate change impacts businesses.

Guidance on finding Local-level Information on Climate Extremes

The National Weather Service Forecast Offices (listed online by region and state) provide access to weather forecasts, data on past weather, and other local weather and climate information including “record event reports.” Another excellent source of information is the Weather Underground’s Record Extremes section, which includes an interactive map providing quick access to information on recent local temperature and precipitation extremes. The site’s Weather Extremes blog covers recent global extremes, with an emphasis on the U.S.

The U.S. Environmental Protection Agency maintains a Local Impact and Adaptation page that is a good starting point for local information.

Other local information (e.g. city maps showing neighborhoods within cities that are especially vulnerable to heat-waves and the urban heat island effect, or to inundation caused by excessive rain or storm-surge) also can be extremely effective in communicating with the public about the local impacts of climate extremes. Such data can be obtained from various sources such as local universities, city planning departments, or county divisions.

For example, the City of Chicago’s Department of the Environment developed a map showing the city’s hottest spots – an effort that has helped target the city’s cooling and energy efficiency measures¹⁸. Similarly, the Southeast Florida Regional Climate Compact, a partnership between several counties in Florida to address climate change mitigation and adaptation, worked with County Geographic Information Systems (GIS) professionals, academia, and federal agency representatives to develop sea level inundation maps for the Southeast Florida region¹⁹.

18 City of Chicago Climate Action Plan < <http://www.chicagoclimateaction.org/pages/adaptation/49.php>>

19 Southeast Florida Regional Climate Change Compact < <http://www.broward.org/NATURALRESOURCES/CLIMATECHANGE/Pages/SoutheastFloridaRegionalClimateCompact.aspx>>

Communication Approaches

Effective communication paves the way for local climate action. Even if the general public or elected officials understand that climate change is happening, they may not be aware of all the direct and indirect ways that climate extremes can affect their communities—exacerbated air pollution and strained electrical grids during heat waves, pollution runoff and storm-water overflows during floods, or higher food prices due to drought. It is a communicator’s job to make these impacts clear, setting the stage for enhanced climate preparedness and reduced greenhouse gas emissions.

Beginning a conversation about local climate extremes and preparedness is often easier than other types of climate communication. That’s because the topic is easier to make local and concrete, and relevant to peoples’ lives. And it doesn’t always require agreement on the degree to which recent climate extremes are linked to global warming. In this section of the guidebook we’ll outline some basic strategies for communicating with community members, elected officials, and other municipal staff. We’ll highlight the experiences, tactics, and sample materials from local governments around the country.

Remember, that overall, you want communication that leads to action without unnecessarily provoking unproductive ideological debates about the science of climate change.

“A lot of extreme weather media coverage has been about, ‘Is this global warming?’ rather than ‘What are we going to do?’” says Cara Pike, a communications expert and Founder and Director of the Social Capital Project and the website Climate Access (www.climateaccess.org). *“We need to leverage extreme weather in a way that shifts us into an active mode where we’re discussing preparedness.”*

Define Your Communication Objectives

Any successful communications endeavor requires that you understand your goal at the outset. What are you trying to achieve? Who is your audience? What do you want them to do or to understand? There are many opportunities for proactive communication before, during and after climate extremes occur (depending on the type of extreme and other circumstances).

Here are some common communications goals related to climate extremes and climate communication:

- Help elected officials understand climate-extreme trends and projections, vulnerabilities, impacts, risks, and responses.
- Build support and awareness among community members for preparedness and climate adaptation measures (existing or new).
- Educate community members about their own need to be prepared and safe.

- Build support among elected officials and community members for measures to slow the long-term pace of climate change by reducing greenhouse gas emissions.
- Help municipal colleagues understand climate change trends and incorporate them into their plans and projections.
- Build partnerships with community organizations and businesses to address preparedness and climate mitigation.

Messaging Checklist for Local Governments

Does your message...

- Come from the best possible messenger?
- Use easy-to-understand language and avoid jargon?
- Stick to a few key points and repeat them?
- Make clear why your issue matters and why it is a local issue?
- Make clear what you're asking people to do?
- Tap into shared community values? (Security, safety, responsibility, health, prosperity, etc.)?
- Meet people where they are and not push them too far, too fast?
- Emphasize commonsense, practical solutions?
- Win on economic terms (dollars saved, costs avoided, etc.)?
- Reflect community input and identified priorities?

Source: Sightline Institute <<http://www.sightline.org/>>

Make a List: With Whom Should You Communicate?

Increasing climate extremes affect communities in many ways. That makes climate change an issue for a diverse range of individuals and organizations. They all need to be part of the dialogue on the issues and solutions to create a stronger, more prepared and resilient community. Once you bring them to the table, they can carry the message of preparedness and climate action to their own followers and constituents.

Make a list of these individuals and organizations, and why climate extremes and climate change matters to them. A few examples:

- Elected officials: overall community safety, loss of life during floods and heat waves, economic costs from infrastructure damage and business closures, etc.
- Local media and bloggers: any number of climate impacts as they become newsworthy
- Public works staff: sewer overflows during floods, sea-level rise effects on water pumps

- Public health staff: increased asthma and Chronic Obstructive Pulmonary Disease problems during extreme heat events, increased vector-borne diseases, increased vulnerability of local hospitals to power outages
- Utility staff: stress on energy grid, blackouts during heat waves
- Religious leaders: heat exhaustion and loss of life during heat waves, especially among elderly and homeless
- Neighborhood groups and homeowners association: damage to property during floods, strong storms and wildfires
- Chamber of commerce: property damage, utility interruptions, transportation disruptions, business closures etc.

Start Strong with a Simple Message

“Keep it simple” is one of the most important maxims in proactive communication about climate extremes. Too often scientists or policymakers will begin a presentation or conversation by jumping straight into detailed scientific data or background information, and gradually work up to a conclusion. Local government staff cannot make the same mistake in front of audiences with limited time and bandwidth. Get to the point immediately, and make it a strong point!

Boil down your message into one or two easy-to-understand sentences and begin your communication with it. Emphasize what is known and irrefutable, and frame the information in a way that speaks to your audience. Some examples:

- *“We are facing more frequent heat waves as our climate changes. Is your family prepared?”*
- *“Severe flooding has cost us \$20 million in infrastructure repairs, and rising sea levels will bring more of these floods than we’ve ever seen in the past.”*
- *“We have an opportunity to reduce our energy demand during heat waves and save money at the same time.”*

How your overview addresses climate change is up to you, depending on your audience and communication goal. Ask yourself, what opening message will keep the conversation going longest, rather than lead to people dismissing the message right away?

Just as important: determining who should deliver the message. Find credible champions to talk about climate extremes, climate change, and preparedness, who can speak to it from their individual perspectives: business leaders, religious leaders, emergency first responders, neighborhood association leaders.

Fort Lauderdale: Working Climate into the Conversation

“After flooding events occur, we send out internal managers’ memos, and I’ve been editing the messages to add that we’re vulnerable and these events are going to happen more often,” says Susanne Torriente, Assistant City Manager at the City of Fort Lauderdale, FL. *“I make it part of the conversation, and I don’t treat climate change as a debate. I’m very matter of fact: sea level is rising and climate change is happening.”*

In a document to community members asking for feedback to create the City’s 2035 plan, the language is similarly forthright: *“What can we do as a community to ensure we are prepared for any emergency or disaster situation, especially with the anticipated increase in extreme weather events and sea level rise as a result of climate change?”*

Connect Recent Events to Climate-Extreme Trends and Projections

A fundamental task in communicating about climate extremes is showing how individual events fit into a trend— for example, how local heat waves have become more frequent and severe, and how that trend is projected to continue and perhaps accelerate. Trends and projections show the link between climate extremes and a climate change. They make climate change something that is more difficult for decision makers to ignore, because it is now a local issue with real local consequences.

The days or weeks after an extreme precipitation event or a severe heat wave – or anytime during an extreme drought -- are an opportune time to educate your audiences about relevant climate trends, when the impacts are vivid and part of active community conversations. From here, you can open up a dialogue about solutions, educate people about existing preparedness initiatives, or build partnerships with community groups or businesses.

Examples:

Fort Collins, CO: During the 2012 High Park fire, the city issued a press release linking the fires to climate change and explaining the City’s preparedness and climate adaptation efforts. An op-ed from the Mayor further underscored the connection and need for action.²⁰

Miami-Dade County, FL: The County used its *Climate Change Action Plan*²¹ to communicate the link between recent extreme events and climate trends. In documenting “current and future regional threats,” the plan notes an example of extreme weather in which the region’s second driest period on record (November 2008-April 2009) rapidly shifted into one of the wettest on

²⁰ <<http://www.fcgov.com/climateprotection/policy.php>>

²¹ Miami-Dade County, Climate Change Action Plan for Miami-Dade, March 2011: http://www.miamidade.gov/greenprint/pdf/climate_action_plan.pdf

record (May 2009–July 2009). This period culminated in a summer storm that dumped almost 10 inches of rain in three hours and resulted in flooding of as much as three feet in areas of South Beach, Miami Beach and Downtown Miami. The Climate Action Plan then connects these events back to climate trends and projections, citing NOAA data showing significant drops in regional spring precipitation in the 20th century and an increase in heavy downpours, along with projections of increased downpours and bigger shifts between wet and dry periods in the future.

Chicago, IL: The city of Chicago has used relatively simple illustrations to connect alternative GHG emissions scenarios to alternative impact trajectories. For example, Figure 9 shows the projected number of 100 degree Fahrenheit days per year in the city.

Figure 9: Projected number of days over 100 degrees Fahrenheit relative to Alternative Emissions Scenarios



Source: Chicago Climate Action Plan, 2008.

Fort Lauderdale, FL: Local government staff assembled data and maps to show how high-tide flooding affected different parts of the City as Hurricane Sandy passed by in 2012. They also assembled the same flood data for a heavy rainfall event that happened at the same time in October 2011. This side-by-side comparison²² opened up a conversation with local leaders about sea level rise and the City’s menu of options to deal with flooding. During the time when flooding from Hurricane Sandy was occurring, staff reached out to homeowner associations to build awareness that flooding events are on the rise, and explained how it will affect their property.

Boston, MA: Boston’s *Climate Ready Boston*,²³ released in October 2013, also threads together the elements of extreme events, climate trends, and climate projections. Mayor Thomas M. Menino unveiled the report which identifies ways in which the City of Boston will prepare for the impacts of climate change on municipal operations. The report begins by making the extreme weather connection: *“As a coastal city with many neighborhoods built on filled tidelands, Boston has always been vulnerable to storms. And in the past 12 months, Superstorm Sandy, nor’easter Nemo, and this summer’s three heat waves have reminded Bostonians of the power of natural forces. [recent extremes] As the climate changes, the risks from these types of events will grow. Sea-level rise, rising temperatures, and more intense storms will increase the vulnerability of all parts and sectors of the city [projections]. That is why Boston is taking steps to prepare for climate change and to make Boston the most resilient city in the country.”*

Are You Only Scaring People?

Local government staff: Remember that if you present climate change only as a formidable threat and don’t offer appealing responses, people may react to this overwhelming fear by ignoring or denying the problem. That’s why it’s important to meet people where they are, and determine how to move your audience toward action without going too far, too fast.

For example, presenting *only* a 2100 sea-level rise scenario to municipal colleagues could seem so bleak and depressing that they can’t see a way to fix it. While the long-term projection is essential, it may be more effective to emphasize shorter time spans—the next five or 10 years—so people feel they can exert control. Likewise, presenting elected officials with modest initial actions may pave the way for deeper engagement, rather than pitching a \$200 million infrastructure upgrade at the start. It takes time to create a common language for solutions.

²² “City Encourages Neighbors to Be Prepared for Seasonal High Tides.” Seasonal High Tides. City of Fort Lauderdale. http://www.fortlauderdale.gov/high_tides.html

²³ City of Boston, *Climate Ready Boston*, October 2013:

Translate Data into Tangible Impacts and Human Costs

A line on a graph showing an upward trend in past and future heat waves is helpful but is not enough by itself to spur action. Communicators must translate data into meaningful local impacts that convey the risks and costs of climate extremes: estimated lives lost in a severe heat wave, or ER visits for asthma attacks; economic costs from damage to homes, businesses, and infrastructure during floods. This translation depends on the amount and quality of data available—often from past events—but it is nevertheless essential.

A key action is to humanize and localize the data—on your government website, in presentations to city council or colleagues, how can you describe what heat waves, storms, or drought will mean for families, or for people living in a given neighborhood or area of the city? This is the time to be hyper-local and specific in detail—as well as visual. Show images of what climate extremes look like on the ground.

For example, Figure 10 shows the amount of inundation in a neighborhood in Belmar, NJ in the aftermath of Super-storm Sandy on October 30, 2012. This image was posted by the Office of the Governor of the State of New Jersey.



Figure 10: Hurricane Sandy damage in Belmar, N.J. on Tuesday, October 30, 2012

Source: Governor's Office/Tim Larsen.

Additional Climate Communication Resources

- Extreme Weather Messaging Resources. From ClimateAccess.org.
- *Right Here, Right Now: A Communications Guide to Climate Change Impacts* (2013). From Climate Nexus.
- *Connecting the Dots: A Communications Guide to Climate Change and Extreme Weather* (2012). From Climate Nexus.
- *Visualizing Climate Change: A Guide to Visual Communication of Climate Change and Developing Local Solutions* (2012). By Stephen R.J. Sheppard.
- *Conveying the Human Implications of Climate Change: A Climate Change Communication Primer for Public Health Professionals* (2011). From the George Mason University Center for Climate Change Communication.
- *Climate Communication for Local Governments* (2011). From ICLEI–Local Governments for Sustainability USA.
- *The Psychology of Climate Change Communication* (2009). From Center for Research on Environmental Decisions.
- Flashcards. “Quick reference tools for effective communications strategies” from the Sightline Institute. Many focus on climate change.

“Local governments need to respond to human needs and talk about caring for people, protecting people and keeping them safe,” says Cara Pike of Climate Access. “Frame your information around preparedness.”

Talking about preparedness can allow you to pivot to a positive narrative: Rather than talking only about avoiding disastrous impacts, you can create a more livable, prepared, and resilient community that is strong and about to bounce back from challenges.

In short: “Climate change is a local government issue, just like housing or crime or transportation,” says Susanne Torriente, Assistant City Manager of Fort Lauderdale, FL. “When it affects them, people will look to City Hall for answers, not the White House.”

Keep Climate Preparedness Coupled with Reducing Emissions

Any discussion of climate impacts and preparedness should present a range of climate and impact projections linked to alternative emissions scenarios. This will make it clear that (1) the future is uncertain and that there is a range of possible futures we must prepare for; (2) the range of climate projections depends on the actions we take to reduce emissions; and (3) we cannot adequately prepare for –or adapt to – the scenarios in which emissions are not sharply reduced. Failure to present the alternative scenarios will give the false impression that we can successfully cope with the consequences of unconstrained emissions, potentially *undermining* efforts to curb emissions.

Communications must furthermore explicitly acknowledge that we must prepare for the impacts **and** strive to reduce emissions, and that the two strategies are inextricably linked. Successful adaptation to a changing climate requires that we slow the pace of change and that we carefully consider the climate resilience of alternative energy futures. Similarly, successfully curbing emissions requires careful consideration of the impacts climate change – and climate adaptation – will have on energy supplies, on energy demand, and on our different options for reducing emissions.

Beyond the fundamental importance of keeping both emission reductions and preparedness coupled and part of the conversation, there are lots of options for ordering the discussion and for emphasizing one topic over another. It often may be advantageous to *lead* with local impacts/preparedness and to emphasize those issues when addressing an audience that might reject a framing that leads with and/or emphasizes options for reducing emissions. Recent research suggests that talking about preparedness and climate adaptation can subsequently open up a conversation about reducing greenhouse gas emissions, and lead to greater support for curbing emissions.

The mnemonic below is a helpful reminder for communicating through impacts and connecting back to the emissions driver of climate change.

C-H-I-P-S talking points (with hurricanes as an example)

- **Change.** *The overwhelming majority* of scientists agree that the atmosphere and oceans are changing and that relatively rapid changes will continue.
 - **Oceans are warming.** Energy associated with global warming has gone into the oceans. Sea surface temperatures are increasing in the tropical Atlantic where tropical cyclones originate, along the U.S. Eastern Seaboard frequented by tropical and extra-tropical cyclones.
 - **Sea level is rising.** Under intermediate scenarios, sea level would rise 0.5-1.2 meters (20-47 inches) by 2100.
 - **Atlantic tropical cyclone (hurricane) activity has substantially increased since around 1970 in association with rising sea surface temperatures.**
 - Total seasonal precipitation and precipitation extremes are increasing

- **Humans.** Scientists also agree that the changes over the last century have been largely caused by human activity.
- **Impacts.** Serious impacts already are emerging and much more disruptive changes are coming, especially if we do not respond.
- **Prepare.** We must prepare for the impacts.
- **Slowdown.** We urgently need to slow the growth of dangerous risks by rapidly and sharply reducing our dependence on fossil fuels.²⁴

Elected Officials Talking Climate Change

Elected officials are often highly effective and credible speakers to connect extreme weather and climate change. An effective approach is for them to talk in personal terms:

“Don’t lead with climate science, lead with your own personal view of what you’re seeing in your community: ‘I grew up here and I’ve never seen weather like this,’” says Cara Pike of Climate Access. Personal experience is a gateway to then summarizing the consensus science, regional trends and impacts, and the need to act—and from there to convey strength and a positive vision for creating a stronger, safer, and more prepared community.

²⁴ The CHIPS mnemonic was created by WWF’s Nick Sundt. He is also one of the editors of this guidebook.

Climate Communication Guidelines for Local Governments

#1: Know what you are talking about. You should know:

- The key trends and projections for climate extremes in your community, state or region.
- Sea level projections (if you are in a coastal community) and the implications for coastal storm impacts
- Your community's key vulnerabilities.
- The connection between emissions scenarios and climate scenarios. For example, to what extent might a low emission scenario reduce the frequency or severity of heat waves during this century? (see figure 9 to see how Chicago presents the connection)
- The top emission-reduction and climate resilience/preparedness options
- What options reduce emissions *and* increase resilience. Example: home insulation reduces energy use and helps maintain comfort levels during more extreme heat waves.
- What options solve one problem while undermining the other (i.e. reduce emissions but reduce resilience, or increase resilience while increasing emissions. Example: Conventional diesel generators can increase resilience in the face of power outages caused by climate extremes, but increase carbon emissions.

#2: Know your audience so that you can target your messages to them.

- Engage the broadest possible group of stakeholders in your community.
- Identify the motivations of different groups for supporting local climate action.
- Find credible messengers to deliver your targeted messages.
- Be clear about what you're asking of people before you engage them.

#3: Be aware of how Americans' values shape their beliefs on climate change.

- Six categories of Americans have varying beliefs about climate change, based on their underlying psychology and core values.¹³
- Understand which climate change messages may conflict or align with your audience's core values.
- Frame climate change in ways that your audience can relate to, in ways that consider their beliefs.
- Recognize that broad support exists for some climate action initiatives (energy conservation and efficiency, renewable energy, disaster preparedness, etc.), even among those that are dismissive of climate change.

¹³ Leiserowitz, A., Maibach, E., Roser-Renouf, C., Feinberg, G. & Howe, P. (2013) *Global Warming's Six Americas, September 2012*. Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change Communication. <http://environment.yale.edu/climate/publications/Six-Americas-September-2012>

#4: Talk about climate impacts in local, immediate terms.

- Climate change is often not perceived as an immediate, local issue for many Americans—as something that already affects their communities or families.
- If you want people to care, make the issue local, tangible, and in the here-and-now. People need to understand how climate change affects—and will affect -- them personally.
- Show local climate impacts visually: photos of the elderly being affected by a heat wave, beaches eroded due to an extreme coastal storm or your infrastructure after a historic flood.
- Frame climate action as about smart planning to protect your citizens' safety and health, as well as protect local assets and natural resources.

#5: Emphasize the power and practicality of local climate solutions, especially community preparedness.

- Spend more time talking about climate solutions than scary climate problems, which can overwhelm people.
- Make climate solutions seem like a no-brainer (saving money, creating jobs, etc.).
- Highlight low-cost, low-risk actions and the benefits they bring to individuals and municipal governments.
- Consider talking about the need to prepare and adapt your community to impacts before you talk about reducing greenhouse gas emissions.
- Choose the most effective “frames” to talk about climate solutions in your community, such as preparedness/resilience, public health/quality of life, economic prosperity, or stewardship.

Engage Your Municipal Colleagues

Many local government sustainability staff report that staff from other departments don't see climate change as “their issue,” and may be resistant to incorporating climate projections into their work—especially when there is limited leadership from elected officials, or no formal climate action plan goals.

“I've struggled with our emergency management staff, who don't see climate as their agenda,” says one municipal planner. “Our water management staff has also been resistant, because they are extremely proud of the infrastructure that they maintain, and they have been resistant to any message that suggests they need to be doing something different.”

Another city manager has tackled this issue with different engagement approaches. “I've been chipping away over the past few years, putting staff from different departments on panels, inviting them to meetings,” she says. “You have to give them information and play out the scenario—what

does this mean to you and your job? How does a climate change scenario affect what you're doing at your desk today?"

When engaging other departmental staff, make sure you're speaking their language, framing climate change not as a general environmental problem, but as a public health issue, or an economic issue or a water infrastructure issue. Show colleagues how you can help them be successful—rather than trying to create more work and headaches for them.

In Grand Rapids, MI, the development of the City's sustainability plan proved to be a rich opportunity to engage all departments about their roles in climate and sustainability actions. The sustainability plan has enforceable goals and has been approved and gone through a public process.

Ways to Get the Message Out

There are ample opportunities for local government staff and elected officials to communicate about climate extremes, climate change, and preparedness initiatives.

Websites: Create a page or section on your website about climate change and impacts, or work in climate messages on existing pages about emergency management and community preparedness.

Press releases: Issue a release or hold a press conference before, during or after a climate extreme; work in messages about climate change trends and projections, or about your local government's preparedness or climate adaptation initiatives. Consider joint press releases and statements with partner organizations or multiple government departments.

Op-eds: Publish an op-ed from an elected official in the local newspaper, outlining the issues and how your local government is responding.

Media interviews and pitches: Reach out to local media and bloggers to pitch them stories on how community members can prepare for climate extremes, or how your city is responding. During or after climate extremes, help them frame the issue correctly and turn your ongoing climate adaptation efforts into a timely news story.

E-mails and e-newsletters: Include stories on climate change and climate extremes into internal or external mass email communications.

Fact sheets, flyers, and brochures: Weave short climate messages into existing documents about heat waves, public health and water conservation.

Presentations at city council meetings: Request permission to present information to elected officials and the public during regular sessions.

Workshops and community meetings: Discuss climate impacts at community planning

workshops, or create presentations that municipal staff can give at neighborhood group meetings or church events.

Social media: Create awareness and begin a public dialogue on preparedness via Facebook pages or Twitter feeds.

Internal staff memos: When providing updates and reports to fellow municipal staff or managers—especially after a weather event—work in climate and preparedness information to create greater awareness.

