

PUBLIC HEALTH AND CLIMATE CHANGE



*A Guide for Increasing the Capacity of
Local Public Health Departments*



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ORGANIZATIONS

The Resource Innovation Group (TRIG) is a 501(c)(3) based in Eugene, Oregon, providing innovative solutions to the challenges of sustainability, climate change and other social, economic and ecological concerns. TRIG is affiliated with Willamette University's Center for Sustainable Communities and is a member of the NOAA sponsored RISA (Regional Integrated Science Assessment Program) for the Pacific Northwest. TRIG is engaged in partnerships with a number of academic institutions, non-profits, private companies and government agencies across the United States.

TRIG's Climate Adaptation & Preparedness Program provides a range of services including support of model adaptation planning projects, best practice research and evaluation, policy advisory services, technical assistance, and training. TRIG has partnered on numerous projects with the Oregon Coalition of Local Health Officials and the Oregon Health Authority. www.theresourceinnovationgroup.org

Biositu, LLC, previously Adele Houghton Consulting, LLC, is a limited liability corporation based in Austin, Texas, providing consulting services, training, and applied research at the intersection of green building, climate change, and public health. We help clients tailor sustainability initiatives to improve the health of building occupants and the surrounding community.

Biositu, LLC has worked with local and state public health departments across the country to build internal capacity around climate change and health; perform gap analyses, needs assessments, and action plans to increase public health engagement with environmental sustainability and climate change initiatives; and, develop environmental public health indicator tracking tools to integrate public health considerations into local and regional climate change policies. <http://biositu.com>



“Climate change is one of the most serious public health threats facing our nation. Yet few Americans are aware of the very real consequences of climate change on the health of our communities, our families, and our children.”

Georges Benjamin, MD
Executive Director
American Public Health Association

From Maibach, E.W., A. Chadwich, D. McBride, et.al. 2008. Climate Change and Local Public Health in the United States: Preparedness, Programs and Perceptions of Local Health Department Directors. PLoS ONE 3, no 7: e2838.

PURPOSE OF GUIDEBOOK

This guidebook is designed to support efforts to initiate and integrate climate planning within county, regional and tribal public health departments and agencies. It will provide you and your department with the knowledge and skills to build capacity to address climate impacts and/or develop a climate action plan for your department. The strategies and activities will enhance your efforts to both reduce greenhouse gas emissions and to prepare for impacts. By working through the guidebook and activities over the next six months to a year, you can build sustained institutional capacity to manage the health impacts of climate change.

An individual can complete the guidebook and associated activities independently. However, adoption and integration of the recommendations by your department is likely to be more effective when the guidebook is completed in partnership with, or at least with support from, organizational leadership.

The guidebook is divided into four sections:

[Section One](#) provides an overview of the impacts of climate change on public health;

[Section Two](#) discusses opportunities and strategies for integrating climate planning across programs;

[Section Three](#) focuses on identifying and building unique external collaborations to help you meet your goals in a resource-efficient way; and

[Section Four](#) provides recommendations for communicating with different stakeholders.

Each section has an activity or series of activities to move you and your program or department further down the path of implementation. The Appendices at the end of the guidebook provide additional resources. While the guidebook was designed to be completed from start to finish, you can focus on certain sections where you need the greatest support and skip those where you've already made progress.

Because we have found that a climate mitigation or adaptation process must meet the unique needs (and constraints) of the community, sector, or department for which it's being developed, we do not provide a step-by-step methodology for climate planning. Instead, this guidebook is intended to supplement planning efforts and provide strategies to build support for action among colleagues and within your community. For additional support on climate planning, please refer to [Appendices A and B](#).

THE NEED FOR PUBLIC HEALTH ACTION

Climate change is happening, and we can already see the adverse impacts on human health around the world. Public health departments are the "first line of defense" in our public health system. As such, it is

GLOSSARY OF TERMS

Climate preparedness in many ways is similar to preparedness in public health, as it refers to anticipation of likely impacts from climate change and taking steps proactively to reduce or eliminate vulnerability. The climate community also uses the term **adaptation** to mean proactive or reactive adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. We use “preparedness” and “adaptation” interchangeably throughout this document.

Climate resilience, refers to the capability to anticipate risk, limit impact, and bounce back rapidly through survival, adaptability, evolution, and growth in the face of turbulent change.

Climate mitigation is an action taken to reduce greenhouse gas emissions as a means for reducing the long-term risk and hazards of climate change.

Hazard mitigation is an action taken to reduce or eliminate long-term risks to life and property from natural and technological hazards (e.g. nuclear power plant failure).

Emergency preparedness is a continuous cycle of planning activities, implementation, and evaluation and improvement of those activities to ensure effective coordination and enhancement of capabilities to prevent, protect against, respond to, recover from, and mitigate the effects of natural disasters, acts of terrorism, and other man-made disasters.

Emergency response: Emergency management can be divided into two phases: response and recovery. During the first phase, emergency response, emergency services and first responders are mobilized in the designated disaster area. Once immediate needs have been met, the emergency enters into the recovery phase. In many ways, emergency management protocols could be seen as a local jurisdiction’s first line of defense when responding to climate-related natural disasters. The type and severity of emergency response and recovery will therefore be influenced by the success of climate preparedness initiatives to reduce community vulnerability to these events. Each of these stages can relate to, and in many cases support, climate preparedness or adaptation and mitigation.

Definitions adapted from the Federal Emergency Management Agency:

<http://training.fema.gov/EMIWeb/edu/termdef.asp>

Environmental Protection Agency: <http://www.epa.gov/climatechange/effects/adaptation.html>

critical that the public health community has both the expertise and the resources to identify and respond to the challenges presented by climate change.¹

However, we don't have to start from scratch. Previous successful efforts working on multi-decade time scales for initiatives like polio and tobacco provide a model for tackling climate change threats. It is important to keep in mind that investing in climate change adaptation and preparedness today will reduce costs in the future.^{2,3} In many cases, existing programs and initiatives already meet your needs for climate preparedness: this guidebook will help you identify where those actions are already in place and in what instances additional efforts may be required.

There are two key aspects to managing climate change: mitigation and adaptation. Mitigation efforts are meant to stabilize the climate by reducing greenhouse gas emissions caused by, for instance, energy production and consumption, land use, housing, and fossil-fuel powered transportation. Reducing concentrations of greenhouse gases in the atmosphere will reduce future changes to the earth's climate and would decrease the likelihood of some climate impacts on health. Adaptation includes preparing communities for both climate-related extreme weather events (such as heat waves, flooding, and drought), as well as long-term ecological shifts (such as sea level rise and migration of disease-carrying vectors). Adaptation supports a community's ability to withstand and recover from the increasing frequency and intensity of existing risks, as well as to identify and prepare for new risks.



In 2010, The Resource Innovation Group's Climate Leadership Initiative (TRIG) released two climate change guidebooks for the public health sector: [Leading By Example](#) and [Ready for Change](#). These two guidebooks outline specific activities that public health departments can take to reduce emissions and prepare for health-related climate risks both internally and in their community. Some of the activities and recommendations presented in the two guidebooks are captured or referenced in this document. For specific actions and recommendations, please review these guidebooks and related webinars: <http://www.theresourceinnovationgroup.org/public-health-climate-change>.

The content and focus of this publication is based on feedback received during workshops and trainings with public health workers, as well as gaps identified in national resources on climate change and public health. We hope you find this guidebook helpful as your department embarks on efforts to build climate resilience. Please send your feedback to admin@trig-cli.org.

OBTAINING LOCAL HEALTH JURISDICTION LEADERSHIP BUY-IN

Most local health jurisdictions are already stretched for financial and personnel resources. With so many existing urgent concerns they are working to address, why should they take on another issue? Here are a few talking points you can use to build support from your leadership:

- Climate change is a public health issue. The United States Centers for Disease Control and Prevention, American Public Health Association, National Association of County and City Health Officials, and World Health Organization have all identified climate change as an area of concern for public health officials.
- Strategies for reducing greenhouse gas emissions and preparing for the health impacts of climate change align with the Ten Essential Services of Public Health (see Section 1, Figure 1) and benefit current health priorities (e.g. addressing cancer, obesity, asthma, etc).
- Climate planning can be integrated across the department and into existing programs with minimal additional resources or capacity.
- It makes economic sense: taking internal action to reduce energy use (and associated greenhouse gas emissions) will provide immediate economic benefits, while preemptive action to prepare for the impacts of climate change will result in long term economic benefits.
- Integrating climate planning into your current work provides an opportunity for new collaborations and access to new funding sources.

Resources:

The Lancet. 2010. *Climate Change Series*. <http://www.thelancet.com/series/health-and-climate-change>

American Public Health Association Policy Statement on Climate Change:

<http://www.apha.org/advocacy/policy/policysearch/default.htm?id=1351>

Climate Leadership Initiative and EcoNorthwest. 2009. *An Overview of Potential Economic Costs to Oregon of a Business-As-Usual Approach to Climate Change*.

<http://www.theresourceinnovationgroup.org/climate-economics-pubs/>

PARTICIPANT EXPLORATION

Identify your public health department's mission, goals and priorities.

Where does climate planning lie in your department's list of priorities? Do you expect this to change over time? (Consider existing hazard mitigation and emergency preparedness activities that might support climate preparedness, even if climate change is not specifically called out in planning activities.)

Our Mission: _____

Our Goals: _____

Our Priorities: _____

Current and Future Priorities for Climate Planning: _____

Look for these symbols throughout this guide:



An activity that you should complete before moving to the next section.



A key point or strategy to take into consideration.

SECTION ONE

CLIMATE CHANGE AND PUBLIC HEALTH CONCERNS

LEARNING OBJECTIVES

After completing this section, readers will be able to:

- Articulate the basics of climate change and how it's impacting human health.
- Demonstrate why the public health community has a role to play in mitigating and adapting to climate change.
- Assess how climate change is already, and will continue to, impact the health of the general public with specific consequences for vulnerable populations.
- Determine the climate-related risks in your region and what programs are already in place to address them.

Part A: Overview of Climate Change, Impacts and Preparedness Strategies

Introduction to Climate Change

The earth remains habitable in part due to the gases in the atmosphere that trap a portion of the sun's energy. These are called greenhouse gases due to their ability to absorb heat – much like a car in the sun will retain and radiate heat inside the vehicle. If these gases didn't exist, our planet would be too cold to inhabit. Recent human activity has led to an increase in atmospheric greenhouse gases, which scientists now recognize is causing the destabilization of our climate. Since the onset of the industrial revolution in the 1750s, concentrations of carbon dioxide (CO₂), nitrous oxide (N₂O) and methane (CH₄) have significantly increased in the atmosphere by approximately 36%, 18% and 148% respectively.⁴ This increase in greenhouse gases is due to human activities such as the burning of fossil fuels for transportation and energy, deforestation, and emissions from landfills and agricultural practices (specifically, fertilizer use and animal husbandry). Global concentrations of all three of these primary greenhouse gases, measured in parts per million (ppm), now far exceed preindustrial values. The atmospheric concentration of carbon dioxide, the most common greenhouse gas released by human activity, now exceeds the natural range measured over the last 650,000 years (scientists use ice core samples to determine historical concentrations).⁵ Left unchecked, rising global temperatures and the resulting changes in climatic patterns will affect ecological health and undermine economic and social prosperity as well as security locally and abroad.

The 2007 report from the Intergovernmental Panel on Climate Change (IPCC) declared that the evidence is now “unequivocal” that the Earth's atmosphere and oceans are warming, and that it is “very likely” (greater than 90% likelihood) that most of the increase in global average temperatures since 1950 can be attributed

to human-caused emissions of greenhouse gases.^{6,7} (Note: Science does not employ the concept of “proof.” Proof is a mathematical term. Science uses a “balance of evidence” approach to determine the likelihood of an event.) Further, a 2010 study found 98 percent of climate scientists most actively publishing in their field agree with the IPCC’s primary conclusions.⁸ Finally, national academies from 32 nations have issued joint statements confirming anthropogenic, or human-caused, climate change.

Impacts from a Shifting Climate

It is important to recognize that climate change is not an issue of the distant future: the consequences are already being observed around the globe. For instance, increased average air and ocean temperatures, widespread melting of glaciers, and rising global average sea levels have already been recorded. In addition, there has been an increase in instances of extreme weather events across the globe, including droughts, heavy precipitation, heat waves, and hurricanes.⁹

In the United States, climate impacts vary across regions.¹⁰ For example:

- **Southwest:** greater than national average increase in temperature, prolonged drought, increased intensity and extent of wildfires.
- **Southeast:** more severe warming compared to other regions of the United States, sea level rise, and weather events of increased frequency and severity.
- **Northwest:** severe decrease in snowpack, reduced stream flow, and an increase in invasive insect outbreaks.
- **Northeast:** warming and increased precipitation events (in the form of rain).
- **Midwest:** heavier rainfall events, flooding, and heat waves.
- **Great Plains:** increase in severity and frequency of heat waves and droughts.
- **Alaska:** loss of permafrost and lakes, insect outbreaks and drier conditions.
- **Hawaii and Pacific Islands:** sea level rise and loss of freshwater resources.

You Don’t Need to Become a Climate Expert — Identify a Network of Scientists!

As a public health practitioner, your primary role in relation to climate change is to understand the potential impacts of climate change on health and to develop strategies to reduce risk. While a basic understanding of the causes and science of climate change may help you in discussing these issues, it can be valuable to identify a network of individuals with expertise in climate science that you can turn to when posed with questions by policy makers, colleagues, or the media.

Look for experts at local universities and through the resources identified in Appendix B. Additional guidance on how to establish successful collaborations with external partners is covered in Section 3. And, tips on how to craft an effective climate change message is covered in Section 4.



Map from National Climate Assessment: <http://www.nesdis.noaa.gov/>

Based on these varied climate impacts, each of the regions will experience a range of public health threats, from heat illness, to injury and mortality from weather and flood events, to stress on the drinking- and waste-water systems. We'll look in more detail at the specific consequences for public health in Part B of this section.

Consequences for Public Health and Opportunities for Leadership

Climate change is a significant and emerging threat to public health, linked to hundreds of thousands of annual deaths worldwide.^{11,12,13} Adverse health impacts are a direct result of the effects of the climatic shifting from historical norms, with more frequent and intense events like heat waves, drought, flooding and severe weather events. Climate change also negatively affects public health through impacts to agriculture, access to clean water, and distribution of infectious diseases. One step removed, but still affecting public health, are the social and economic effects of climate change, such as human migration, competition for scarce resources like water, and increased potential for armed conflict. Collectively, these impacts have the potential for devastating effects on global health in the upcoming decades.^{14, 15}

Globally, many communities are already beginning to experience the public health impacts of climate change and these impacts are likely to increase in the near future.¹⁶ The United States is not immune to these effects. The 2009 report by the United States Global Change Research Program (USGCRP)¹⁷ identified the following key public health threats for the United States from climate change:¹⁸

- Increases in illness and death-related to extreme heat and heat waves are very likely.
- Warming is likely to pose challenges to meeting air quality standards.
- Flooding and windstorms are projected to increase, resulting in higher rates of physical and mental health problems.

- Some diseases transmitted by food, water, and insects are likely to increase.
- Rising temperature and carbon dioxide concentration increase pollen production and prolong the pollen season in a number of plants with highly allergenic pollen, exacerbating allergies and respiratory conditions.
- Certain groups, including children, the elderly, and the poor, are most vulnerable to the health impacts posed by climate change.

These impacts will be expensive to address.¹⁹ For example, in Oregon, lack of action to reduce greenhouse gas emissions is likely to result in additional public health costs of \$900 million by 2020 and over \$1 billion by 2040 (these costs are already beginning to accrue).²⁰ While action to reduce greenhouse gas emissions must be taken to prevent further consequences, the public health sector must also prepare employees and communities for the impacts that are now inevitable. Many preparedness strategies are cost effective as they can also lower energy costs and reduce the cost of responding to extreme events. Despite this imminent need for preparedness, at the time of writing only six states (California, Washington, Oregon, New Hampshire, Maryland and Virginia) have climate action plans that address public health and national studies have shown a lack of knowledge on how to address climate and health issues.²¹ Further, national studies have shown public concern for the health impacts from climate change, but a lack of knowledge on how to address these issues.²²

While much attention appropriately has focused on reducing our greenhouse gas emissions by 80% or more of 1990 levels, the persistence of emissions already built-up in the atmosphere means the climate will not re-stabilize for at least 50-100 years once cuts are made.^{23,24} Thus, the global mean temperature will continue to rise for many more decades. An aging population, changes in migration patterns, and other socioeconomic factors will only exacerbate climate change-related health threats across the country.²⁵ Efforts to prepare for the unavoidable consequences of climate change must become as important a priority for governments, the private sector, and individual households worldwide as is the effort to reduce greenhouse gas emissions.

With the public health sector's expansive and diverse reach across various fields and populations, you play a pivotal role in protecting communities from the health impacts of climate change.²⁶ Public health can take action now in all of the areas where you currently work to reduce emissions and prepare for the health impacts associated with climate change – in many cases, current activities and programs are already reducing vulnerability. For instance, by supporting programs that help communities become more walkable and bikeable, you can help reduce both greenhouse gas emissions and risk of exposure to asthma triggers such as particulate matter. Active transportation policies also offer the added benefit of reducing the population risk of obesity, diabetes, and cardiovascular diseases. A proactive planning approach might require only a minor adjustment, a slight shift in focus, or amplification of existing efforts. By working closely with partners, such as emergency responders, community planners, policy makers, and climate scientists, the public health sector can help reduce the risks, effects and costs of the likely health impacts of climate change. Moreover, many climate preparedness strategies complement health and nutritional goals, emer-

gency response, and prevention of communicable diseases (see Table 1 for the link between climate change and the Ten Essential Services of Public Health).

Considerations For Implementing Preparedness and Mitigation Activities

As you will see throughout this document, climate change is clearly a public health issue. It is therefore the responsibility of public health departments around the country and the world to take action to reduce the impacts of climate change and prepare for potential risks. However, the significant regional differences projected for climate change impacts will mean that it will not be possible to take a one-size-fits-all approach to prioritizing policies and interventions. When prioritizing actions that benefit public health, look for the ones that are highly impactful and that meet the needs of both preparedness and mitigation.

Remember that different communities may have different criteria for selecting priorities – you should think explicitly about what your priority criteria are to inform local climate planning.

Table 1. Relationship Between the Ten Essential Health Services and Climate Change.

Essential Service	Climate Link
1. Monitor health status to identify and solve community health problems	Track new and emerging diseases
2. Diagnose and investigate health problems and health hazards in the community	Investigate water-, food-, and vector-borne disease
3. Inform, educate, and empower people about health issues	Incorporate climate risks into outreach materials and engage in climate policy planning
4. Mobilize community partnerships and action to identify and solve health problems	Collaborate with external partners to initiate and expand climate adaptation and mitigation strategies
5. Develop policies and plans that support individual and community health efforts	Develop individual and community-wide flooding and heat preparedness plans
6. Enforce laws and regulations that protect health and ensure safety	Advocate on behalf of policy that protects public health from and prepares for climate impacts
7. Link people to needed personal health services and assure the provision of health care when otherwise unavailable	Provide easy access to immunization during outbreaks, or to mental health care following disasters
8. Assure competent public and personal health care workforce	Provide internal outreach, education and training for staff on climate risks
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services	Assess the impact of planning and outreach efforts (e.g. for flooding) following a disaster
10. Research for new insights and innovative solutions to health problems	Identify new collaborations or research opportunities for climate-related health risks

Adapted from Frumpkin et al. 2008. Climate change – the public health response. *American Journal of Public Health*. 98 (3): 435 More on the Ten Essential Public Health Services available at: <http://www.cdc.gov/nphsp/essentialServices.html> or on the Ten Essential Environmental Public Health Services at: <http://www.cdc.gov/nceh/ehs/home/HealthService.htm>

For instance, weatherizing houses (particularly for low-income or other vulnerable populations) both reduces greenhouse gas emissions by reducing energy consumption and provides preparedness benefits by protecting against the health effects of extreme heat and mold growth. (Please note that these types of programs should be implemented in combination with CDC and the Department of Housing and Urban Development’s Healthy Homes inspections to ensure that contaminants are not being sealed into the house. The Department of Energy recently launched a “Weatherization Plus Health” initiative to start addressing this problem.²⁷⁾

Promoting increased tree canopy supports preparedness efforts through improved air quality and reduced heat island effect during extreme temperature days, while playing a role in climate change mitigation through the trees’ sequestration of carbon and contribution to energy conservation. Among the highest impact areas where public health can play a role in both mitigation and preparedness are transportation and land use planning and policy, as well as improving building energy efficiency. Planning and policy efforts that decrease driving rates have been associated with both reductions in greenhouse gas emissions and improved health across multiple measures, including obesity.²⁸ Additional suggestions for synergies between climate change mitigation and preparedness activities are available in the 2010 TRIG guidebooks. (<http://www.theresourceinnovationgroup.org/public-health-climate-change/>).

While priority should be given to actions that have benefits across health, preparedness and mitigation, in some cases you may need to implement an initiative or action that has negative consequences for either preparedness or mitigation. For instance, opening a cooling center or retrofitting older schools with air conditioning systems will benefit the health of the elderly and young, and provide a preparedness strategy for extreme heat. However, cooling centers and air conditioners are incredibly energy intensive and therefore release greenhouse gases (unless they are powered with renewable energy). As such, this positive measure for preparedness leads to negative consequences for mitigation efforts. Whenever possible, consider these tradeoffs and concentrate efforts on measures that meet the highest needs of the community while furthering both preparedness and mitigation efforts.



 You can also use a table like the sample shown in Table 2 to begin to weigh some of the costs and benefits of proposed actions.

Table 2. Sample assessment of costs and benefits for proposed actions.

Impact: Warmer summers				
Proposed Actions:	Adaptation/ Preparedness	Mitigation	Populations Affected	Other Sectors Affected
1. Provide air conditioning to high-risk populations	Benefit (+): Reduce likelihood of heat mortality and morbidity	Cost (-): Increase energy consumption	Benefit (+): Elderly, Low income, School Children	Cost (-): Energy Infrastructure
2. Increase urban tree canopy cover	Benefit (+): Natural cooling, Provide protective UV cover	Benefit (+): Carbon sequestration	Benefit (+): Elderly, Youth, Low Income, Homeless	Benefit (+): Natural systems, Infrastructure/ Buildings Cost (-): Loss of Development Space

PARTICIPANT EXPLORATION

What are the greatest climate-related risks that your community is likely to face over the next 25-50 years?

 Consider consulting your emergency preparedness coordinator, county emergency manager, and any available climate projection data. You may want to start with your county's hazard vulnerability assessment to identify current concerns and then evaluate how these risks may change in the future. The programs to address the risks that you identify below do not need to be labeled primarily as climate change-related activities per se, but should help to reduce or prepare for current and future health risks. For example, promoting alternative transportation options to reduce obesity or heart disease is also a mitigation and preparedness strategy. Emergency alert systems (e.g. heat, disease outbreak, etc.) can also fall under a climate adaptation strategy.

1. Extreme catastrophic events: e.g., 100-year floods, extreme storms.

My community is at risk of:

What programs are in place to address these risks?

2. Repeated smaller scale disasters: e.g. forest fires, record-breaking heat, drought, unusually heavy rains.

My community is at risk of:

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What programs are in place to address these risks?

3. Long term, graduate changes in climate: e.g., increases in average air temperatures, increases in average water temperatures, sea level rise, etc.

My community is at risk of:

What programs are in place to address these risks?

Part B: A Closer Look at the Public Health Consequences of Climate Change

This section explores six major threats to public health as they relate to climate change (extreme heat, disease patterns, water, food, air quality, and extreme weather) and identifies populations that are most at risk. Additional details on each of these threats, as well as specific actions for addressing them, are provided in the 2010 TRIG guidebooks at: www.theresourceinnovationgroup.org/public-health-climate-change. At the end of the section, we provide an overview on the benefits to health from reducing greenhouse gases (mitigation).

Health Risks From Climate Change and Strategies to Address Them

While action is needed to reduce greenhouse gas emissions that are causing climate change, the public health sector must simultaneously begin to prepare their employees and communities for the inevitable impacts, making the most of their limited funding and staff. See Table 3 for an overview of climate change health impacts in the United States, the additional burden of those impacts, and preparedness measures.

EXTREME HEAT

How Will Climate Change Affect Extreme Heat?

One expected consequence of climate change is increased temperature variance, which includes higher average temperatures overall, an increase in record-setting temperatures, longer periods of hot weather, and warmer nighttime temperatures. It is likely that the warmer ambient temperatures will be exacerbated by high levels of humidity from increased water vapor in the atmosphere.²⁹ Northern cities in the U.S. that are unaccustomed to high temperatures will face additional challenges to prepare residents and equip buildings for increasingly frequent record-breaking days each year. Coupled with prolonged dry weather conditions, extreme heat may also result in dust storms and drought (see the Water Section for more information on the health impacts of these conditions).



What Are The Potential Public Health Risks?

Extreme heat is a direct threat to public health — high temperatures can cause serious heat-related illnesses and even death, especially among vulnerable populations such as individuals who perform strenuous work outdoors and the elderly. Extreme heat accounts for more weather-related deaths in the U.S. than floods, hurricanes, earthquakes and tornadoes combined.

Table 3. Anticipated Health Effects of Climate Change in the United States

Adapted from: Frumpkin et al. 2008. Climate change – the public health response. *American Journal of Public Health*. 98 (3): 435. See the original article for populations most affected, non-climate determinants, and data for surveillance.

Weather Event	Health Effects	Additional US Health Burden	Preparedness Measure
Heat waves	Heat stress	Low to moderate	Architecture; air conditioning; warning systems; distributed, resilient, “smart power grid”; community response
Extreme weather events	Injuries; drowning	Uncertain: likely moderate	Architecture; engineering; planning; early warning systems
Winter weather anomalies (e.g. rain, ice)	Slips and falls; motor vehicle crashes	Uncertain: likely moderate	Public education; mass transit
Sea-level rise	Injuries; drowning; water and soil salinization; ecosystem and economic disruption	Low	Sea walls and levees; abandonment
Increased ozone and pollen	Respiratory disease exacerbation (e.g. chronic obstructive pulmonary disease, asthma, allergic rhinitis, bronchitis)	Low to moderate	Pollution controls; air conditioning; education; medical therapy
Drought, ecosystem migration	Food and water shortages; malnutrition	Low	Technological advances; enhanced delivery systems; trade negotiations
Droughts, floods, increased mean temperature	Food- and water-borne diseases	Low to moderate	Public education; water treatment; medical treatment; watershed management
Droughts, floods, increased mean temperature	Vector-borne disease	Low to moderate	Public education; vector control; medical prophylaxis and treatment; vaccination
Extreme weather events; drought	Mass population movement; international conflict	Uncertain: potentially moderate to high	Negotiation and conflict mediation; post-disaster response
Climate change generally; extreme events	Mental health	Uncertain: potentially moderate	Health communication; post-disaster mental health outreach; various therapeutic and medical management options

If our current level of annual greenhouse gas emissions remain constant, extreme heat-related deaths in the U.S. are projected to climb from 700 to between 3,000 and 5,000 annually by the year 2050.³⁰

Extreme heat is notable among climate change-related public health risks because it threatens human health directly, rather than indirectly. Permanent disability and even death can occur when high temperatures – combined with other environmental risk factors such as urban air pollution – cause dehydration and/or make it difficult for the body to properly cool itself. Common heat-related ailments include heat rash, sunburn, heat cramps, heat exhaustion, and heat stroke.³¹

Who Is At Greatest Risk?

Although anyone can suffer from the effects of overheating and dehydration, some people are at greater risk than others due to age, occupation or medical conditions. The elderly are at a high risk of heat-related mortality as they are more likely to live alone and/or have pre-existing health conditions that exacerbate heat-related illnesses. Young children and infants are dependent upon others to keep them hydrated and to regulate their environmental conditions. People who are obese or overweight tend to retain more body heat. People who perform strenuous work or exercise outdoors, as well as the homeless, run a heightened risk of dehydration and overexposure to heat. Additionally, people who suffer from mental illness, chronic medical conditions, have pre-existing conditions such as cardiovascular disease, or are taking certain medications (such as those for poor circulation or high blood pressure) have a higher risk of heat-related illness.

How Are Local Health Departments Responding?

Best practices among local health departments include: training employees to recognize and treat the symptoms of heat-related illness; issuing timely public warnings of extreme heat days and providing clear steps individuals and families can take to reduce risk; opening cooling centers; establishing a “buddy” program for socially-isolated populations and populations with limited mobility; and, ensuring health and social services (e.g., senior centers, adult care, and services for other high-risk populations) continue to reach vulnerable populations during and after the event.

DISEASE PATTERNS

How Will Climate Change Affect Disease Patterns?

As climate patterns like average temperatures and precipitation shift, changes are likely to occur in the distribution and incidence of communicable diseases.³² Climatic factors like temperature and precipitation interacting with shifts in trade, travel, land use, and demographics are likely to affect the occurrence of vector-borne disease in the United States and



Categories of Communicable Diseases

Communicable diseases are subdivided into three categories based on the source of infection:

Zoonoses are diseases transmissible from animals to people (e.g. either directly transmitted like rabies or through indirect, vector-borne transmission like Lyme disease).

Sapronoses are diseases transmissible from the abiotic environment such as water, soil, and decaying material to humans (e.g. botulism and tetanus).

Anthroponoses are diseases transmissible from human to human (e.g. either directly transmitted like measles and tuberculosis or through vector-borne transmission, such as malaria and dengue fever).

Source: wwwnc.cdc.gov/eid/article/9/3/02-0208_article.htm

around the world.^{33,34} Water-borne disease replication, survival, persistence, and transmission are subject to environmental influences and do best under warmer conditions such as those projected for the future.

What Are The Potential Public Health Risks?

Zoonoses, transmitted by mosquitoes, ticks, and other vectors, are projected to increase with warmer temperatures, and increased exposure to “still” water from flooding events. West Nile virus, dengue fever, Lyme disease, and malaria (all of which are already making appearances around the country) may become more apparent in certain parts of the United States.³⁵

There are more than 210 million reported cases of water- and food-borne pathogens in the United States each year in the form of 900,000 hospitalizations and 6,000 deaths.³⁶ Some sapronoses outbreaks occur from water that is contaminated by bacteria (e.g. *Salmonella*, *Shigella*), viruses (e.g. rotavirus) and protozoa (e.g. *Giardia lamblia*, amoebas, *Cryptosporidium*, and *Cyclospora*). As temperatures rise and precipitation patterns shift, pathogens are able to expand into different geographic areas.³⁷

Communicable anthroponoses spread quickly, especially in populous urban areas that are densifying.³⁸ With more than one-half of the world’s population now living in urban areas and no end to urban migration in sight, the risk of exposure to communicable diseases is likely to increase.



Who Is At Greatest Risk?

Many communities in the Northwest and Northeast are anticipating an influx of “climate migrants” (individuals or populations displaced by a climate-related event, such as sea level rise). This demographic shift

and increase in population may further strain the basic services offered by local public health departments in growing areas. In addition, denser populations in urban areas may be more at increased risk.³⁹

Directly transmitted anthroponoses include a number of diseases (e.g. influenza) that affect populations differently. In general, these diseases pose the greatest risk to young children, the elderly, and to individuals with compromised immune systems. Some diseases are specific to a certain region or climate; for example, influenza is generally known as a “high latitude” disease. As climate change causes the distribution of disease-causing microbes to shift, entire populations may find themselves exposed to diseases for which they have developed no immunity.⁴⁰ People in low-income areas or crowded housing may be at high risk.

How Are Local Health Departments Responding?

Best practices among local health departments include: encouraging staff to get vaccinated and providing access to free or low cost health services; educating staff and the community about proper protection from mosquitoes and other vector carriers; developing collaborations to ensure real-time monitoring of disease outbreaks; and, educating the public on strategies to minimize the risk of infection.



WATER

How Will Climate Change Affect Water Resources?

STORMS & FLOODING: Nearly 75% of Americans are expected to live in coastal counties by 2025 - this growth in coastal population is concurrent with increased storm severity and sea-level rise, which could magnify the number of people impacted by water-related emergencies.^{41,42} Scientists predict that storm impacts from events like hurricanes and tropical storms will continue to grow in severity. While the impacts of climate change on frequency are unclear, intensity and duration are likely to increase in a warmer, more humid future. At the same time, coastal and low-lying area residents are especially vulnerable to floods and storm surges due to rising sea levels from melting glaciers and thermal expansion.

As precipitation patterns shift (e.g. more snow falling as rain and more rain falling in a shorter amount of time) and average temperatures rise, floods are likely to occur more often and with increased severity. Increased flooding could have severe impacts on water quality in areas using combined sanitary and storm water sewers.

WATER SCARCITY & DROUGHT: With shifts in precipitation patterns, droughts are expected to become more frequent and severe. While some regions experience increased precipitation, other regions will see a decline in annual rainfall, often consolidated into short periods of deluge rather than steady rain and earlier

snowmelt. The western United States in particular could face perpetually strained water supplies and heightened wildfire vulnerability from depleted snowpack and declining precipitation.⁴³

WATER TEMPERATURE: Water temperatures will rise as ambient air temperatures increase. Warming water temperatures can lead to algal blooms, and increase the concentration of other pathogens and contaminants in water bodies.⁴⁴ Water temperatures are expected to increase most dramatically in regions with milder winters, scarce vegetation, and a retreating snowpack.

CHANGES IN MARINE ENVIRONMENTS: Increasing surface water temperatures and agricultural pollutant runoff in rivers (in part to manage changes in pests and climatic conditions) has led to an increase in seafood toxicity. The ocean also absorbs carbon dioxide, and, as its concentration increases, the pH of the water is

changing. This issue, called ocean acidification, has negative impacts on marine organisms, particularly those that form shells.⁴⁵



What Are The Potential Public Health Risks?

STORMS & FLOODING: Flooding can result in disastrous human, environmental, and economic costs that include injuries or mortality from drowning, as well as damage to infrastructure.⁴⁶ Coastal flooding can result in salt infiltration of fresh water tables, negatively

affecting water quality. Increased coastal and inland flooding will also lead to displacement of people and communities, resulting in increased stress to mental health - see Extreme Weather for more information.

Storm water runoff carrying pollutants like pesticides and fertilizer, erosion, and sewage overflows from heavy precipitation episodes, can contaminate water supplies and lead to water-borne disease outbreaks. For example, following Hurricane Katrina, respiratory and diarrheal disease was common among rescue workers. An additional primary health threat from the severe flooding was exposure to molds in flood-damaged structures and to toxic residue from flooded chemical factories and oil refineries between Baton Rouge and New Orleans.⁴⁷

WATER SCARCITY & DROUGHT: During periods of drought, water quality becomes a significant concern. As water supplies decline, stagnant waters become a breeding ground for insects that may carry diseases, and concentrations of waste and pollutants increase.⁴⁸ Flooding can also compromise the safety of drinking water supplies by increasing the risk of water-borne diseases.⁴⁹ In addition, drought years may lead to reduced irrigation allocations, potentially resulting in lower crop yields and/or reduced nutritional value.

WATER TEMPERATURE: Warming water temperatures can lead to algal blooms, which in turn can cause an increase in certain diseases such as cholera. Harmful algal blooms occur when microscopic algae grow too quickly in water, depleting the oxygen and sunlight that many organisms need to live, and often releasing

toxins that are harmful to humans and animals.⁵⁰ The concentration of other pathogens and contaminants can also be affected by water temperature and may have severe consequences for those reliant on well systems for drinking water.

CHANGES IN MARINE ENVIRONMENTS: Impacts to marine species from warming temperatures, shifts in acidity, and pollution runoff impacts public health. Communities that rely on marine species for subsistence or income face food security risks. Consuming contaminated fish can lead to neurological damage, respiratory and skin irritation and gastrointestinal illness.⁵⁰

Who Is At Greatest Risk?

Coastal populations and people who reside in floodplains are most vulnerable to potential injury and water-borne disease from sea level rise, earlier snow melt and flashier stream events, or extreme weather events. Individuals with compromised immune systems have a higher risk of contracting a water-borne disease. Those reliant on well systems for drinking water (whether inland or coastal) are at greater risk for contamination from flooding, changes in ground or surface water supply, and warming water temperatures. Recreational users of water bodies (boaters, fishermen, swimmers, etc.) are at higher risk of water-borne diseases. Children are particularly vulnerable to water-borne diseases like rotavirus, because compared to adults, they drink more water relative to their body mass and have less developed immune systems.⁵² They are also more likely to enter a stream or lake without checking to see if there is a water quality alert in effect.

How Are Local Health Departments Responding?

Best practices among local health departments include: improving monitoring, surveillance and alert systems for water-borne disease outbreaks; developing programs to further study the health impacts of drought and flood; separating combined sanitary sewers from storm sewers; educating the public about how to reduce the risk of flooding through storm water mitigation practices and how to protect themselves from flooding-related injuries; and, sponsoring research for rapid diagnosis of water-borne diseases.

FOOD AND NUTRITION

How Will Climate Change Affect Food Systems?

Higher temperatures can benefit crops in high latitude countries, while the additional carbon dioxide in the atmosphere that causes climate change may provide a short-term benefit to crops in a process called CO₂ fertilization. However, in general, higher temperatures and extreme weather events associated with climate change, such as heavy rains and droughts, have a negative impact on crop growth, nutritional content and yields.^{53,54,55,56} Higher temperatures and extreme weather events also negatively impact soil, water and biodiversity - the fundamental components of food



production.⁵⁷ Crops and livestock can be harmed by the emergence of weeds, pests, and diseases that thrive in higher temperatures and different precipitation patterns than previously existed in an area.

Agriculture and livestock production simultaneously is affected by and affects climate change, with agriculture representing 8.6% of greenhouse gas emissions in the US.⁵⁸ Severe weather events and rising temperatures are likely to cause a decline in livestock productivity. Higher heat places stress on animals, which reduces dairy production and slows growth and conception rates.⁵⁹ Marine fish population and distribution are already changing due to higher ocean temperatures.⁶⁰

What Are The Potential Public Health Risks?

The waning quantity and quality of crop and livestock yields as well as rising food prices could threaten the stability of the supply, as well as availability, accessibility, safety, and nutritional value of food.⁶¹ In addition, given the United States' increasing trend towards importation of food, extreme weather events may make current transportation systems for food unreliable, leading to increased food prices and food insecurity in communities with low socioeconomic status. The United States produces \$200 billion in food commodities annually; however, we import about 15% (by volume) or \$78 billion of our food supply.⁶² Reduced domestic food yields may also increase food importation, which can introduce additional food-borne diseases and pests.⁶³ The emergence of new diseases or pests may lead to increased use of herbicides and pesticides, raising costs for farmers and increasing exposure of farm workers and their families to toxic chemicals that could contaminate area soil and water and jeopardize food safety.⁶⁴

In 2009, 14.7% of US households (50.2 million people, including 17.2 children) were food insecure during the year, the highest recorded rate of food insecurity since the national food security survey began.⁶⁵ Future food security may depend on the agriculture sector's ability to prepare for the challenges of climate change.

Many policies aimed at increasing the resilience of the agriculture industry to the effects of climate change also offer public health co-benefits, such as reducing the risk of heart disease, diabetes, obesity, and outbreaks of food-borne illness. For example, reducing consumption of animal products such as meat and dairy can both reduce the agricultural sector's contribution to greenhouse gas emissions and reduce the risk of heart disease.⁶⁶

Who Is At Greatest Risk?

Populations that rely on imported foods, such as minority populations that favor foods produced in other parts of the country or world, may see their food supply impacted by interruptions to transportation systems. In addition, as food prices rise due to climate events disrupting crops and transportation in other parts of the world (fire, flood, drought), populations with low socioeconomic status will be disproportionately impacted and may face greater risk for nutritional deficits.

How Are Local Health Departments Responding?

Best practices among local health departments include: promoting local food economies, such as farmers markets, initiatives to protect agricultural land, and community gardens; working with local partners such as food banks and churches to ensure the food supply in case of an extreme event; and, producing pamphlets in multiple languages that identify the symptoms and treatment options for food-related illness.

AIR QUALITY

How Will Climate Change Affect Air Quality?



Climate change is a key determinant of air quality on multiple fronts.

GROUND-LEVEL OZONE: The most prevalent outdoor air pollutant in the United States, ground-level ozone (or smog) is formed by reactions between gases - such as hydrogen and nitrogen oxide from vehicles and power plants - combined with heat and sunlight. Ground-level ozone will increase along with rising temperatures.⁶⁷

SMOKE FROM WILDFIRES: With warming temperatures and increased drought, wildfires are expected to become more frequent and severe around the country. Wildfires release a number of pollutants, such as mercury, carbon monoxide, ozone, and volatile organic compounds (VOCs), as well as increase the concentration of particulate matter (PM).⁶⁸

NITROGEN DIOXIDE, SULFUR DIOXIDE, & PARTICULATE MATTER: Nitrogen dioxide and sulfur dioxide are produced by the combustion of fossil fuels in automobiles and industrial processes – the same processes (but different gases) that cause climate change. Together, they combine to form particles that irritate the respiratory system, and are also the main components of acid rain. This particulate matter (i.e. “soot”) is emitted into the atmosphere by cars, trucks, power plants and industry. These pollutants may also increase in concentration and dispersion due to climatic shifts in temperature, wind, fire patterns, dust from drying agricultural lands, and precipitation.⁶⁹

POLLEN LEVELS: Rising temperatures, carbon emissions, and shifts in precipitation patterns can also influence the timing, productivity, and distribution of fungal spores and pollen producing plants.⁷⁰

What Are The Potential Public Health Risks?

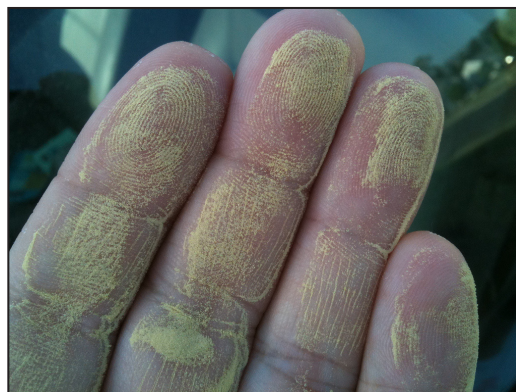
Climate change will likely increase the prevalence of asthma, respiratory and cardiovascular disease due to decreased air quality. In December of 2009, the U.S. Environmental Protection Agency (EPA) made a public declaration that greenhouse gases pose a threat to public health, in part due to decreased air quality.⁷¹

Reducing our fossil fuel emissions, and therefore our carbon emissions, can have immediate health benefits by decreasing particulate matter and ground-level ozone and subsequently preventing air pollution-related morbidity (e.g. asthma and chronic bronchitis) and mortality.^{72,73} It is important that steps are taken not only to improve air quality, but also to prepare employees and communities for more frequent reduced air quality days.

GROUND-LEVEL OZONE: While ozone in the upper atmosphere (stratosphere) protects us from ultraviolet rays, ozone closer to the ground creates major problems for those with asthma and respiratory ailments. Ground-level ozone is harmful to breathe and can cause coughing, shortness of breath, eye irritation, and can increase risk of chronic obstructive pulmonary disease, asthma, allergic rhinitis, and premature mortality.⁷⁴ Studies have linked ground-level ozone to hundreds of deaths per year in the United Kingdom, with studies in the US and other countries showing similar results.⁷⁵ Long-term exposure to ozone in childhood has been linked to reduced lung function in adults and it may restrict breathing pathways in all people. In addition, studies have shown significant crop production loss in areas of high ozone.⁷⁶

SMOKE FROM WILDFIRES: Smoke inhalation from fires can cause acute and chronic respiratory conditions and worsen cardiovascular disease.⁷⁷ Winds can carry air pollutants from wildfires over long distances and can even affect individuals who are far from the event.⁷⁸ Communities that are not in direct danger of wildfires may still be at risk of smoke inhalation depending upon wind direction. Individuals with pre-existing conditions, such as asthma, respiratory allergies, and chronic obstructive pulmonary disease, may be at higher risk.

NITROGEN DIOXIDE, SULFUR DIOXIDE, & PARTICULATE MATTER: Breathing these air pollutants can damage lung tissue, exacerbate asthma, and lead to respiratory infections, lung cancer, cardiovascular disease, and premature death.⁷⁹ Exposure to particulate matter may become more common as a result of climate change due to increased temperatures, changes in wind patterns, increased wildfires, higher concentrations of dust from drying agricultural lands and increased ground-level ozone, resulting in higher asthma risks, which already affects 34 million Americans. This number is expected to triple by 2025.^{80,81}



POLLEN LEVELS: Earlier and longer pollen seasons have increased the concentration of some aeroallergens and contributed to shifts in the burden of pollen-induced allergic diseases like allergic asthma and allergic rhinitis. Allergic rhinitis is a common allergic disease that is becoming more prevalent in the United States.⁸²

IDEAS IN ACTION

The Athens City County Health Department in Ohio installed photovoltaic panels to provide backup power to the department during emergencies (such as maintaining controlled temperatures for vaccines). The solar electric system feeds back into the local grid lowering electric bills for the Health Department while also serving to improve air quality.⁸⁴

Who Is At Greatest Risk?

Children are particularly vulnerable to air pollution as their lungs are still developing, and they also tend to participate in higher levels of outdoor activity than adults. The elderly, people with chronic heart and lung disease, and those who work or exercise outdoors are also vulnerable to the health risks of air pollution.⁸³ Current asthma and respiratory disease sufferers are also likely to experience more extreme or frequent attacks, and allergy sufferers may experience prolonged or more intense allergy seasons.

How Are Local Health Departments Responding?

Best practices among local health departments include: providing widespread air quality alerts; working with the Forest Service and other forest managers to ensure prescription burns are instigated on days where air quality is minimally impacted; and, educating employees about staying inside or wearing masks if their job takes them outdoors on a poor air quality day.

EXTREME WEATHER

How Will Climate Change Affect Extreme Weather?

Major weather events such as tornados, wildfires, floods, droughts, and heat waves are occurring with greater intensity and frequency. Scientists are reluctant to link a single event to climate change; however, the probability that any of these events will occur in a given year is increasing, and the events themselves are becoming more severe. (See the complex discussion on extreme weather and climate change in the Intergovernmental Panel on Climate Change's 2011 Special Report: <http://www.ipcc-wg2.gov/SREX/>.)

What Are The Potential Public Health Risks?

The direct public health impacts of extreme weather events include mortality, injury and mental health issues, as affected communities struggle with the environmental, social, and economic disruptions and interruptions of psychiatric care that result from extreme weather events. Consider the effect of major disasters – such as Hurricanes Katrina and Rita in 2005 and the Midwest tornadoes and floods in 2011 – on the mental and physical health of the impacted communities. Those who directly experience extreme weather events such as hurricanes, tornadoes, heat waves, droughts, and floods may face displacement from their communities, housing and employment instability, physical injury, personal mortality or loss of a loved one, disruption of psychiatric care, and/or general disruption of daily life. Close proximity to a disaster has been shown to

provoke short-term psychiatric reactions at six times the rate of the general population.⁸⁵ Additionally, the threat of future catastrophic events can lead to mental health outcomes such as depression, emotional distress, and anxiety in individuals who have not been directly involved in disaster.⁸⁶ Depending upon the severity, duration, and frequency of exposure, the resultant mental health impacts on communities affected by extreme events may include:

- Posttraumatic stress disorder (PTSD)
- Other stress-related disorders such as grief, depression, aggression, anxiety, and drug and alcohol abuse
- Reduced worker productivity
- Increased rates of suicide and attempted suicide
- Increased risk of crime, domestic violence and child abuse
- Increased risk for people with preexisting mental health conditions
- Exacerbation of physical ailments due to the effect of long-term psychiatric problems
- Climate change delusion (psychosis or anxiety disorders focused on climate change or future disasters)



Not all psychiatric reactions are pathological; some are to be expected as a normal and temporary reaction to a high-stress situation. More severe psychiatric symptoms tend to manifest between 6 and 12 months following a disaster after short-term responses such as shock, anxiety, and insomnia recede. Individuals (particularly young children) who do not receive early psychiatric interventions are especially vulnerable to long-term symptoms. These mental health impacts may last for months or even years and may shift or worsen as the long-term impacts of the event or threat of additional events become clear. Fear and distress following extreme weather events may also lead to a sense of powerlessness that can inhibit affected communities from taking actions toward recovery.⁸⁷

Who Is At Greatest Risk?

Vulnerability to injury, mortality, and the mental health impacts of climate change-related extreme weather events depends upon the community's proximity to the event and its ability to adapt to a disaster, such as having the resources to reestablish social networks following displacement. Major weather events have been shown to disproportionately affect the elderly, rural, poor, and communities of color. Communities without access to social and economic resources such as employment opportunities, education, and housing may also lack the information and resources that would allow them to adequately respond to a disaster. In addition, these vulnerable populations are often already under economic or other stress. As a result, these groups, along with people who suffer from pre-existing mental health conditions, are more likely to experience psychological trauma following a climate-related disaster. Other vulnerable groups include single

parents, children, bereaved and injured individuals, and rescue workers.⁸⁸ Many extreme events can disrupt access to medical care, which disproportionately affects the elderly and individuals with pre-existing conditions, such as dialysis and cancer patients.

How Are Local Health Departments Responding?

Best practices among local health departments include: establishing tracking and early warning programs to ensure information reaches the public and media in a way that avoids panic; collaborating with community and faith-based organizations to ensure that needs can be met in the hours and days following the disaster; and, providing specific projects or activities that volunteers can become involved in as a means of reducing feelings of helplessness.

The Health Benefits of Reducing Emissions

Reducing carbon emissions not only conserves resources and prevents further impacts of climate change but also has immediate benefits for public health. The array of positive impacts, or “co-benefits,” from carbon-reducing activities could include lower rates of obesity and associated chronic diseases and reduced cases of respiratory disease from lower levels of air pollution. Public health agencies are uniquely positioned to not only adopt lower-emissions practices but also to encourage others do the same through showcasing a commitment to efforts such as reduced energy use, alternative energy generation, green building design, alternative transportation options, sustainable food choices, green purchasing practices, waste reduction, and responsible water use. By prioritizing these operational shifts, public health agencies can help to reduce carbon dioxide and other greenhouse gas emissions in our atmosphere, while also empowering employees and others in the community to change their own behavior. Areas to consider when developing a carbon emissions reduction strategy (each of these areas is addressed in further detail in the 2010 TRIG guidebooks- See Appendix B):

- **Reducing energy waste:** e.g. efficient heating, cooling, lighting.
- **Green building design:** e.g. site selection, building materials, efficiency.
- **Alternative energy generation:** e.g. solar, biomass, geothermal, wind.
- **Employee and visitor transportation:** e.g. access by public transit, teleconferencing and telecommuting.
- **Food:** e.g. organic, in-season, local.
- **Purchasing and products:** e.g. energy efficient equipment.
- **Waste:** e.g. reduce, reuse, recycle.
- **Water Use:** e.g. low flow, grey water, native plants, fixing leaks.
- **Outreach:** e.g. communicating with the public about climate change and its impacts on health.

IDEAS IN ACTION

Hennepin County, the most populous county in Minnesota with approximately 1.13 million residents, is working to reduce emissions within its sphere of influence. Recognizing that lodging facilities, grocers and restaurants are substantial consumers of energy, Hennepin County Human Services and Public Health Department is building relationships with licensed food and lodging businesses, local building officials, state and local health officials, and other local environmental resources to assess current efforts to reduce greenhouse gas emissions from these establishments. Read more: <http://www.naccho.org/topics/environmental/climatechange/resources/hennepin.cfm>

PARTICIPANT EXPLORATION

What are the public health consequences of climate change in your area and what preventative measures can be taken?

Step 1. Circle the key public health-related impacts your region is likely to experience from climate change.

Heat Illness

Birth/Development Defects

Chronic Respiratory Diseases (e.g., Asthma)

Mental Health and Stress Disorders

Vector-Borne and Zoonotic Diseases

Neurological Diseases and Disorders

Food-Borne Diseases

Extreme Weather-Related Injury and Mortality

Water-Borne Diseases

Cardiovascular Disease and Stroke

Nutritional Deficit

Medical Care Disruption

Step 2. List *primary*, *secondary* and *tertiary* measures that your department and/or partnering agencies already have in place or that could be implemented to reduce climate-related health risks in your community. You can also identify actions being taken (internally and within your community) to reduce greenhouse gas emissions such as improving energy efficiency, increasing tree canopy for shading, promoting home weatherization programs, and providing alternative transportation options. (For more information and examples of climate change measures that address each of the three tiers of public health prevention (primary, secondary, and tertiary) see: Ebi, Kristie L. and Semenza, Jan C. Community-Based Adaptation to the Health Impacts of Climate Change. 2008. *American Journal of Preventive Medicine*, 35(5): 501-507. Available at: <http://www.ajpmonline.org/article/S0749-3797%2808%2900684-3/fulltext>.)

PARTICIPANT EXPLORATION

Primary prevention measures - Primary measures aim to avoid the suffering, cost and burden of a health risk (e.g. disease) by intervening before the onset of any harm occurs. Primary disease prevention is usually focused on the population as a whole and is considered the most cost-effective preventative health care available. Examples include: immunizations, water treatment, and using window screens or insect repellent. At the highest level, shifts in policy to enhance overall community health resilience could be considered primary prevention..

Examples from our community:

1. _____
2. _____
3. _____
4. _____
5. _____

Secondary prevention measures - A secondary measure is intended for those who have risk factors for a health condition but do not yet have a diagnosis or symptoms. The goal is to reduce the probability of negative health outcomes by targeting high risk individuals for screening and prophylactic treatments. Examples include: mapping vulnerable populations, instituting early warning systems for climate-related events, and establishing a “buddy” system to check on high risk populations during events.

Examples from our community:

1. _____
2. _____
3. _____
4. _____
5. _____

PARTICIPANT EXPLORATION

Tertiary prevention measures - Tertiary measures are used after symptoms of a disease become evident in a patient. Tertiary treatments are designed to minimize both the negative health effects of the disease and the risk of complications associated with the treatment. Attempts are made to minimize the negative impact of the sickness, restore function, and prevent complications. Examples include: treatment for heat-related illness, therapy for mental or behavioral illness, and dispensing antibiotic/antiviral drugs for exposure to a water-borne disease.

Examples from our community:

1. _____
2. _____
3. _____
4. _____

Climate Change Mitigation measures – Policies and programs that reduce greenhouse gas emissions.

Examples from our community:

1. _____
2. _____
3. _____
4. _____

Step 3. Circle the “no regret” actions: “No-regret” actions increase the ability of the local emergency management system to respond to natural hazards in a timely, efficient, and equitable manner regardless of whether or not the climate shifts in accordance with scientific projections.

Step 4. Star the “low hanging fruit”: “Low hanging fruit” are actions with a positive impact (large or small) that require minimal or no additional cost, staffing, other resources, or adjustments to management.

Keep in mind that many standard public health and emergency management policies and interventions can also benefit climate change mitigation and preparedness objectives - although their scope may require a slight modification to expand their time horizon to include projected changes to the climate. Include these activities on your list even if they were not developed with climate change in mind.

SECTION TWO

INTERNAL COLLABORATIONS AND INTEGRATING EFFORTS ACROSS EXISTING PROGRAMS

LEARNING OBJECTIVES

After completing this section, readers will be able to:

- Implement a four-step framework to identify opportunities for collaboration with other internal programs.
- Develop strategies for integrating climate planning into existing programs.
- Assess the level of need for a new, local climate change and health program.

Overview

As discussed throughout this document, many health departments and agencies are strained for financial and human resources and often do not have the ability to initiate large-scale programmatic change. It's important to keep in mind that in many cases climate change is not expected to create previously unseen impacts to public health, but rather will change the frequency, intensity, and geographic distribution of existing threats. Shifting priorities to accommodate climate impacts and integrating climate change planning across existing programs and processes can be more efficient and beneficial to your organization and the community you serve than starting new programs from scratch. When new climate-related public health threats do appear in your area, looking to the experiences of other parts of the country and the world and forming collaborations may provide lessons and means for effective response, as described below and in Section Three.



What follows is a framework for assessing your department or program's current capacity to respond to the public health impacts of climate change. Financial resources, personnel, and stakeholder interest will determine how many of the questions you answer and the depth of your analysis. Remember to first focus on collaboration and integration as a means for climate planning and action. You can begin by identifying the key internal partners and thinking about integrating climate change preparedness and mitigation efforts throughout your departments' work. Consider what you are already doing that meets your needs (or activities that could be slightly adjusted in order to fill gaps) before initiating a new program that requires additional human and financial resources and may be a duplication of existing work.

STEP ONE: LOOK TOWARD A DIFFERENT FUTURE BY VIEWING DATA IN A NEW WAY

To allocate resources to programs and effectively plan preventions and responses to health risks, your public health department will be best served by incorporating future climate projections into your planning processes, rather than relying upon past frequencies of natural disasters, extreme heat events, incidence of vector-borne diseases, etc.



The first step for effective planning, therefore, is to gather information on what climate change is expected to look like in your area of responsibility and how climatic shifts are likely to impact public health.

What information and resources are needed to make that happen? If available, you will want to collect climate projections for your region or community, including annual and seasonal temperature, precipitation, streamflow, fire, vegetation, and snowpack data (where available and applicable). If this information is not readily available in the public domain, consider commissioning its development either on your own, collectively with other departments, or in partnership with external organizations. However, please note that the process for modeling climate data at the local level can be expensive, and there are limited institutions in the United States that provide data at a refined scale. Additionally, in most instances climate modelers are not able to provide public health departments the modeling GIS layers due to the assumptions and uncertain-

ties that are ingrained in the modeling process. Despite this limitation, localized climate projection data can help decision-makers and community members visualize likely changes to the climate over time. It can help you identify specific climate impacts for your community – and therefore the resulting health risk – as well as which neighborhoods may be more vulnerable to specific climate-related events, such as heat waves or impaired water quality. Your local National Oceanic and Atmospheric Administration's (NOAA) Regional Integrated Sciences and Assessments (RISA) department is tasked with providing climate change data to decision-makers and may be a source for this type of data. Online tools such as [Climate Wizard](#) are also available, providing regional projections on a less refined scale. See Appendix B for more information on the RISAs and other sources of climate data.

Double Dipping

Design climate change policies and programs not only to help the community reduce greenhouse gas emissions and prepare for future health risks but also to help the health department meet the objectives and requirements of assessment metrics such as the ten essential services, the national public health performance standards, and departmental accreditation.

More information on how to coordinate climate change planning with these public health standards is available in Appendix A.

Go beyond the exploration you conducted in Section One to find data specific to your region (see sources below and in Appendix B). Consider impacts that are both near term (the next 10-20 years) and long term (up to 2050 or 2080). This will provide for integration into the usual planning timeframe, as well as allow for adequate preparedness for longer term impacts.⁸⁹



An effective way to perform this step is through a community engagement process, so you can understand your stakeholders' greatest concerns regarding climate change, and what health risks they expect.

PRINCIPLES OF PROGRAM COLLABORATION

(adapted from Slonim et al 2007)

- Do no harm to categorical program integrity.
- Respect individual program identity and acknowledge priorities, responsibilities, capacities, and success.
- Encourage cooperation, coordination and collaboration among program agencies.
- Clearly identify and state mutual benefits and opportunities: the benefits of working together should outweigh the sum of individual program contributions.
- Be guided by efficiency-oriented processes.
- Be focused on health outcomes: improved population health should be the driver and enhanced by collaboration.
- Evaluate outputs and health outcomes as a result of working together.
- Engage stakeholders.
- Mobilize leaders.

Work closely with representatives from the groups you have identified to be the most vulnerable to risks (Section One), as well as with your local sustainability coordinator, emergency manager, utility providers and other key collaborators.

To effectively accommodate the climate projections, certain public health programs that existed before (emergency planning and preparedness for extreme heat events, for example) may need to ramp up, while other programs may not require the same focus and resources as in past climatic conditions.

PARTICIPANT EXPLORATION

Identification of Gaps and Opportunities

Step 1. On a piece of paper or a spreadsheet, list in column one the climate planning goals or the climate-related issues that need to be addressed (e.g. establish cooling center, expand weatherization program for low-income families, enhance vector disease monitoring, provide public outreach and education).

Step 2. Across the top of the sheet, list each of the programs within your department.

Step 3. For each of the programs, mark “x” where they are fulfilling the goal or need.

Step 4. For each of the goals/needs that are not currently associated with a particular program, mark “o” for the programs that could potentially take on this task.

Step 5. Use lines or color coding to identify where there are opportunities for programs to work together on specific tasks.

Step 6. At the bottom of your spreadsheet, list the capacity and other resources that each partner would bring by engaging in climate planning.

Step 7. Finally, list the benefits that climate planning would bring to each partner.

Example:

	Drinking Water	Epidemiology	Chronic Disease	Emergency Preparedness
Identify three cooling centers				o
Develop preparedness brochures in Spanish	o			o
Develop information sharing program on disease monitoring with neighboring counties		x		

X=currenty doing; o=could lead task

STEP TWO: IDENTIFY INTERNAL INTEGRATION OPPORTUNITIES FOR CLIMATE CHANGE MITIGATION AND PREPAREDNESS

Based on your findings from step one in this section, evaluate your current public health programs, planning processes and activities to determine which programs currently have the capacity to address projected climate impacts and where programs are lacking. Work with staff from within your own program and public health department, and where possible, get input from folks from the local sustainability office, emergency management, Red Cross and other health or emergency providers.



Together, respond to the following questions:


- In an ideal world, how would we address the projected public health threats resulting from climate change?
- Which programs already address climate impacts (whether or not they connect their work with climate change)? Refer back to the Participant Exploration in Section One.
- Which of our existing programs address projected climate impacts, but lack the capacity to meet the scale of the projected threat to public health?
- Which programs have the capacity (current or easily built) to address projected climate impacts?
- Are there future public health threats that will not be addressed by our existing programs?

The responses to these questions will identify which programs require a greater focus, and which programs must simply maintain their current functionality.

Alternatively, you can look at specific health outcomes that are sensitive to climate change and determine if there are sufficient strategies, policies and measures to address them. If you prefer this approach, answer the following questions (draw from the public health threats identified in Section One to complete this activity):⁹⁰

- What is currently being done to address the public health threat? Are these policies and measures effective?
- What data is being gathered to track health outcomes and/or to assess the effectiveness of existing programs?
- What can be done to reduce existing vulnerabilities? What, if any, barriers to implementation exist?
- What measures can be implemented now to reduce future vulnerabilities and barriers?

STEP THREE: IDENTIFY OPPORTUNITIES TO COLLABORATE INTERNALLY

Another means of addressing the climate impacts for your region and gaps in your ability to meet those needs is to forge partnerships within a public health department.  Partnerships between programs can increase efficiency as well as improve communication and coordination with industry partners, providers, and government funding agencies.⁹¹ Once you have identified potential partnerships with other departments in your agency, consider the benefits of expanding your reach to include external collaborations (Section Three).

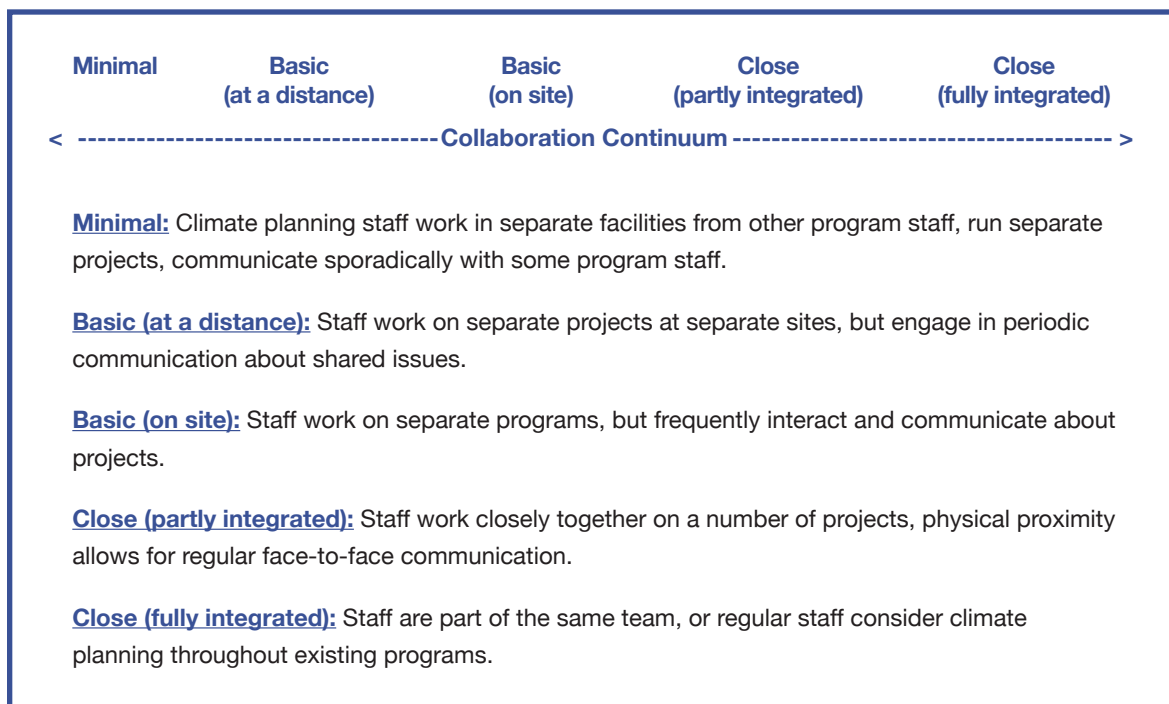
Most literature on collaboration focuses on the drawbacks, such as barriers and risks of failure. This is likely because there are a number of challenges associated with successful partnerships, and efforts can fail if approached too quickly or without careful planning.⁹² Sufficient political will, stakeholder engagement, and leadership are essential to establishing successful partnerships.⁹³

Reasons for partnering across programs on climate planning include: the public health co-benefits of climate change preparedness and mitigation activities can improve health outcomes for multiple programs; the burden of managing climate planning may be too great for a single department; financial opportunities for climate planning may arise that could also benefit other programs; and, services may be enhanced through collaboration.



Follow these steps to initiate a discussion within your health department on developing a multi-disciplinary climate change program:⁹⁴

1. Convene a cross-program meeting.
2. Define the purpose of collaboration and identify specific points of change.
3. Identify overlap or linkage points across programs.
4. Identify benefits and costs to programs.
5. Identify ways to share resources and workload.
6. Develop and establish a program for measuring outcomes and reviewing programs for efficiency and effectiveness.
7. Ensure program, department, and other leadership endorsement.
8. Provide regular progress updates.



Different levels of collaboration may be appropriate with different departments depending on your agency's needs and existing level of climate preparedness. The following chart and descriptions can help you determine the level of collaboration best suited to each member of your internal climate change program.⁹⁵

The most effective intra-agency collaboration models involve multi-disciplinary teams that work together closely over many years. Although it takes time to build trust and rapport, the payoff of this type of “close-partly integrated” collaboration is typically collegial decision-making and a common-team culture.⁹⁶

To build the case for collaboration, it's important to document the impact of your efforts by developing scorecards or other reporting means that capture the following: for example, changes you see internally and in the community in terms of awareness, energy savings, and improved health; and, how other programs will benefit from the collaboration. Share these successes with other programs and begin to develop recommendations for changes in operations and policies. Developing partnerships with other agencies (see Section Three) may also support your efforts.


PARTICIPANT EXPLORATION

Identifying Opportunities for Collaboration

In the matrix below, begin by identifying internal departments or programs that may have work that would overlap with a climate change initiative. Then, identify their current level of support for working on a climate change initiative, their desired level of support, and desired level of collaboration. You can either base the ratings on your own opinion or through conversations with staff from the other programs. Use a -3 to +3 rating, with -3 for strongly against, and +3 being strongly supportive.

Program/Department	Current Support	Desired Support	Desired Collaboration

STEP FOUR: EVALUATE PRIORITIES

Few local public health departments have the resources to fill all the gaps identified in the previous analyses. To maximize efficiencies, evaluate your current activities to determine where it is imperative for climate preparedness to be built into existing efforts to support the Ten Essential Public Health Services.  To reflect on the previous steps and begin to understand priorities for collaboration, you can respond to the following questions:

- Are program and department planning efforts taking climate change projections into consideration? If not, how crucial to overall population and vulnerable population health are integration of climate change impacts and preparedness for those impacts into the plan or program activities? The Community Task Force, a national expert panel, makes evidence based recommendations regarding the effectiveness of community based prevention strategies. Their recommendations can support cost/benefit analysis for particular programs and interventions. See: www.thecommunityguide.org
- What data sources and surveillance activities could be repurposed to track the health impacts of climate change in your area? Work with your epidemiology department to identify and prioritize gaps in information. See Appendix B for resources.
- What programs can provide the greatest benefit to public health from the integration of climate change into their efforts? As discussed in previous sections, climate change will impact different populations differently. Consider health disparities that result from environmental risks that threaten certain segments of the population disproportionately (e.g. low-income populations in New Orleans during Hurricane Katrina).⁹⁷
- What upcoming plans would benefit the most from the addition of a section on climate impacts and preparedness for those impacts?
- Is funding distributed appropriately to accommodate projected impacts of climate change to public health? (e.g. Does it make sense to shift resources internally? If not, are there external resources that could provide additional support to existing programs or foster the development of new programs? For example, look at opportunities from CDC, NIH, NACCHO and state or foundation funding opportunities.)




- How do climate change-related priorities align with cost benefit analyses and other decision support tools your department uses?

If the decision is made to initiate measures or programs to address an impact that is new to (or has not yet been addressed in) your region, look to other state or county health departments for effective preparedness measures. For examples, states with mild temperatures (e.g. Oregon, Colorado) may want to look at heat planning programs from states in the Southwest (e.g. Arizona).



Review the array of measures taken in those locations with similar health concerns to identify which one aligns most closely with your region’s challenges. Explore whether your department or program has sufficient resources in terms of technology, financial, human and social capital to implement the most effective preparedness measures.⁹⁸

Categorize potential activities into tiers, starting with small changes to departmental programs and operations that could be implemented before your agency’s leadership commits to full-scale implementation of a climate-preparedness program.  By demonstrating the benefits of implementing some of these smaller integration strategies, widespread climate planning across programs may be seen as more appealing. Some low cost steps that can be taken to prepare for integration include:

- Highlighting successes of those programs and departments already addressing projected climate impacts;
- Assessing the capacity of other programs and departments to address climate change;
- Conducting vulnerability assessments of populations in your community that are most at risk of climate-related health impacts, or integrating climate projections into ongoing or existing assessments;
- Strengthening local partnerships that build redundancy for climate resilience (e.g. churches, food banks, shelters, etc.) – See Section Three;
- Developing climate and health internal trainings and awareness building mechanisms for staff; and,
- Incorporating education on the links between climate change and health into existing community outreach programs.

After you’ve made as many changes as possible within your current operations and shifted available resources towards climate planning as appropriate, integration with other internal departments and external entities can move your program forward (as covered in Section Three).

Table 4. Recommended Data Sources for Surveillance of Climate-Related Health Impacts.

Here we revisit the Frumkin (2008) chart to help you think about the type of data you are already tracking and how a climate change tracking program could be integrated into existing programs:

Adapted from: Frumpkin et al. 2008. Climate change – the public health response. *American Journal of Public Health*. 98(3):435.

Weather Event	Health Effects	Health Data Sources for Surveillance	Meteorological and Other Data for Surveillance
Heat waves	Heat stress	Emergency Department (ED) and ambulatory visits; hospital admissions; mortality	Daily minimum and maximum temperatures; humidity; soil moisture
Extreme weather events	Injuries; drowning	Attributed risks; ED visits; hospital admissions; FEMA records; mortality	Meteorological event data; extent, timing, severity, return time for rare events
Winter weather anomalies (e.g. rain, ice)	Slips and falls; motor vehicle crashes	ED visits	Meteorological event data
Sea-level rise	Injuries; drowning; water and soil salinization; ecosystem and economic disruptions	Attributed risk; ED and ambulatory visits; mental health measures (indirect effects)	Satellite mapping of coastal areas; sea level and tidal surge records
Increased ozone and pollen formation	Respiratory disease exacerbation (e.g. asthma, allergic rhinitis, bronchitis)	ED and ambulatory visits; hospital admissions	Daily and weekly temperature; rainfall; pollen counts; ozone
Drought, ecosystem migration	Food and water shortages; malnutrition	Growth monitoring; food insecurity data	Crop yields; rainfall patterns; data on food sources and marketing
Drought, floods, increased mean temperature	Food- and water-borne diseases	Disease surveillance, ED and ambulatory visits; seasonal patterns in incidence; focused observations at geographic margins	Temperature and rainfall data; vector population and habitat/range monitoring
Drought, floods, increased mean temperature	Vector-borne disease	Disease surveillance; ED and ambulatory visits; focused observations at geographic margins	Temperature and rainfall data; vector population and habitat/range monitoring
Extreme weather events; drought	Mass population movement; international conflict	Event and population movement monitoring; mental health outcomes surveillance	Meteorological event data; regional economic and resource use data
Climate change generally; extreme events	Mental health	Mental health outcomes surveillance	Correlation of mental health outcomes with regional variable responses to extreme events; climate change as a whole

PARTICIPANT EXPLORATION

Pitching Collaboration

Develop a pitch to the head of your public health department (or for the various leadership associated with all internal programs) on the benefits of collaboration. Consider what was covered in Section One of the guidebook as well, including benefits to health, finances, efficiency, capacity, and staff morale. Also identify the value that leadership brings to engaging in climate preparedness planning. Test your pitch on colleagues working in different programs.

SECTION THREE

BUILDING EXTERNAL COLLABORATIONS

LEARNING OBJECTIVES

After completing this section, readers will be able to:

- Apply strategies for identifying collaborations with external entities.
- Implement steps to building and maintaining an effective collaboration.
- Assess the strength of your climate planning collaboration and enhance its chance of success.

Most readers of this guide likely already collaborate with external entities for various purposes. Public health is often overcommitted, understaffed and underfunded. Developing and strengthening partnerships can help you fulfill current obligations and expand services. It can provide access to new resources, skill sets, and areas of expertise. Engaging in a range of partnerships provides extended opportunities for both reducing harmful carbon emissions and preparing for the impacts of climate change, allowing public health departments to think outside the box and develop innovative strategies for both improving and preparing for the impacts of climate change. By working hand-in-hand with other professionals and organizations in your community, public health can both address the climate challenge and increase benefits to the population.⁹⁹

Collaborations should be based on:¹⁰⁰

- Shared objectives to protect public health, reduce emissions, and/or adapt to climate change.
- Development of carefully-defined projects.
- Clear delineation of roles and responsibilities.
- Agreement that acting alone will be less successful than a partnership.
- Identification of complementary needs and vulnerabilities.
- Shared evaluation of success.

This section can help you identify and build appropriate partnerships that do not duplicate efforts.



STEP ONE: IDENTIFYING APPROPRIATE COLLABORATIONS

When forming collaborations, look for historical ties between departments and agencies, shared vision, or shared values as they relate to the health of your community. Understand the differences and similarities between the two organizations or departments to optimize effective coordination. For example, see the text box below on Hazard Vulnerability Planning Collaboration.

While each partner will bring different strengths and expertise to the table, ensure that by working together you'll be able to achieve more than you could independently.



Start by asking the following questions:

- What are the current practices of the departments or agencies involved in the collaboration?
- What are they responsible for delivering? How is it delivered?
- How do they interact with the public?



If the relationships are not yet in existence, consider creating formal or informal ties with social service providers, churches or other faith based groups, neighborhood associations, watershed associations, and private organizations involved in public health, environmental conservation or justice, or public safety. Health departments can also collaborate with research institutions, other agencies and departments, and nonprofit organizations on a variety of projects. For example, in Oregon, many county public health jurisdictions are beginning to work more with agencies such as the Department of Environmental Quality, Economic and Community Development, Watershed Councils, Emergency Management, US Forest Service, University Extension Office, Department of Energy, Health Care Systems, Environmental Protection Agency, Department of Agriculture, Public Works, State Drinking Water, Water Resources, Sheriff's Offices, and more. These partners and others can work together to better understand likely health impacts by modeling climate change projections and identifying potential impacts to public health and vulnerable populations such as young children, the elderly, low-income communities, and people with disabilities or chronic medical conditions.

Hazard Vulnerability Planning Collaboration

In Crook County, Oregon, the public health department has been working closely with the Crook County Emergency Manager on hazards planning. Together, the two departments convened partners (such as the Bureau of Land Management, Fire and Rescue, the Chamber of Commerce, Public Works, Road Department and others, to develop an all-hazards vulnerability assessment. At the urging of the public health department, climate change was incorporated into the assessment. The hazards vulnerability assessment will meet the needs of both FEMA planning requirements and the required public health preparedness plan.

Resource: personal contact with Dir of Public Health for Crook Co, November 2011.

IDEAS IN ACTION

Following the Midwest Flood of 1993, mental health professionals trained in disaster response saw that individuals under stress from the event often turned to community leaders like clergy members and teachers, rather than seeking the treatment of mental health professionals. Project CREST (Community Resources for Education, Support, and Training) was developed to equip community leaders with the tools to provide supplementary emotional support and crisis counseling services following a disaster. Additionally, the American Red Cross and the American Psychiatric Association established a joint disaster intervention plan to facilitate cooperative relationships between mental health disciplines during disaster events.¹⁰¹

Community Engagement and Working with Vulnerable Populations

Public health has a long history of engaging and working closely with vulnerable populations and the organizations that serve them. Vulnerable populations may be defined as groups who are least able to cope with any adverse event, such as children, the elderly, and populations with low socioeconomic status. They may also include isolated populations who may not have access to traditional means of communication; individuals who speak little or no English; and, Native American Indian Tribes who are often dependent on natural resources and have limited mobility due to reservation confinement. These populations are both at greater risk of negative health outcomes and likely to be hardest hit by climate-related extreme weather events (see Resources listed below). Therefore, working with vulnerable populations on climate mitigation and preparedness strategies can both improve their health status and reduce the overall community's vulnerability to climate change. Public health's focus on and relationship with vulnerable populations is an incredibly valuable asset that can be brought to a collaboration with partners who may not be successfully reaching these groups. Additionally, the public health department can leverage its existing relationship with vulnerable populations to engage with them in community participatory climate change planning. As part of this process, consider running focus groups or conducting interviews with partner organizations or individuals to have a better understanding of what their needs are and to make sure your programs can meet those needs.

Tips from a public health preparedness and emergency management project in Philadelphia that engaged with vulnerable populations include:

- Work with large organizations — like the American Red Cross, United Way and Voluntary Organizations Active in Disaster — because they have a good roster of which agencies in the community are doing what.
- Conduct a needs assessment of who in the community has functional needs; this helps prioritize who to work with first.
- Ensure that outreach efforts include bidirectional communication. Don't just tell them what you can provide, but ask what their needs are in case of an emergency.
- Understand that planning and relationship-building will take a long time and require patience.¹⁰²

Resources:

More information on climate change and vulnerable populations available here: Rachel Morello-Frosch "Minding The Climate Gap: What's at Stake if California's Climate Law isn't Done Right and Right Away"
<http://dornsife.usc.edu/pere/documents/mindingthegap.pdf>

National Wildlife Federation "Facing the Storm: Indian Tribes, Climate Induced Weather Extremes, and the Future for Indian Country"
http://www.nwf.org/~media/PDFs/Global%20Warming/Reports/NWF_TribalLandsExtremeWeather_FINAL.ashx

For a description of a project building capacity and resilience to climate change in Tribal Communities, please see: <http://www.heartlandcenters.slu.edu/ephli/finalprojects2011/08ArndtMegan.pdf>

PARTICIPANT EXPLORATION

Sample Evaluation

After reading a brief description for each of the areas, rate the statements to best reflect your opinion of how your collaboration is functioning using the following scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree or Disagree, 4 = Agree, and 5 = Strongly Agree.¹⁰³ Each partner organization should do this independently, and then share results with the group. Prior to entering into the collaboration, establish a process for discussing and problem solving for those statements rated 1 to 3 by staff from any of the collaborating entities. You should aim to define steps that can be taken by all partners to lead to a ranking of 4 or 5 on each statement.

Rate each of these statements on a scale of 1 through 5:

1. *Communication*: The collaboration has open and clear communication. There is an established process for communication between meetings. _____
2. *Sustainability*: The collaboration has a plan for sustaining membership and resources. This involves guidelines on which staff are engaged and how staff time is compensated. _____
3. *Research and Evaluation*: the collaboration has conducted a needs assessment or has obtained information to establish its goals. The collaboration continues to collect data to measure goal achievement. _____
4. *Political Climate*: The history and environment surrounding power and decision-making is positive. Political climate may be characterized by the community as a whole, by systems within the community, or by networks (you may want to rate each of the political climates separately). _____
5. *Resources*: The collaboration has access to needed resources. Resources refer to four types of capital: environmental _____ in-kind _____ financial _____ and human. _____
6. *Catalysts*: The collaboration was started because of existing problem(s) or the reason(s) for collaboration to exist required a comprehensive approach. _____
7. *Policies/Laws/Regulations*: The collaboration has changed policies, laws, and/or regulations that allow the collaboration to function effectively. _____
8. *History*: The community has (or partners have) a history of working cooperatively and solving problems. _____
9. *Connectedness*: Members of this collaboration are connected and have established informal and formal communication networks at all levels. _____
10. *Leadership*: The leadership facilitates and supports team building, and capitalizes upon diversity and individual, group and organizational strengths (you may want to rate separately for project leadership and overall collaboration leadership). _____
11. *Understanding*: The collaboration understands each of its partners, including its people, cultures, values and habits. _____

STEP TWO: DEFINING THE VALUE OF THE COLLABORATION

Many people tend to think that collaboration is a good idea, but identifying why can be challenging. This is because collaboration can mean different things to different people and organizations. 🗨️ When embarking on your collaboration, be sure there is a clear understanding among the partners as to why you are collaborating and how it will benefit your institutions and the community.

Once you've identified potential partners to collaborate with, but before committing to the partnership, assess the value of the collaboration for both institutions. If your practices and responsibilities are in line or complementary, as clarified in step one, begin to identify what each of you will gain from the collaboration and any potential roadblocks that might prevent a successful partnership. 🚲 Consider:

- What can each of us gain independently from this partnership?
- What can each of us gain collectively from this partnership? Are there unique opportunities such as working with a new population or access to new funding opportunities?
- Are there any foreseen barriers that can be managed for now? Are there potential conflicts with missions, mandates, competition, staffing?



You may also look to previous collaborations that have been formed, for instance between emergency management and public health preparedness, to identify characteristics of successful and failed partnerships. Are there any lessons to be learned and applied to your collaboration? Refer back to the list of characteristics of a successful collaboration as identified in the introduction of this section (e.g. shared objectives; delineation of roles and responsibilities; agreement that acting alone will be ineffective and less successful than a partnership; identification of mutual needs and vulnerabilities; carefully-defined projects; and, shared evaluation of success). Identify how each characteristic will be achieved through the new collaboration.

Explore New Funding Opportunities

Forming new collaborations within your department as well as with external partners may open up new and unique opportunities for funding. Depending on your partner, you might be able to explore opportunities that your public health department didn't previously consider, for example: ecosystem restoration, green job development, energy efficiency improvements, or hazards mitigation.

STEP THREE: BUILDING THE PARTNERSHIP

Once the potential collaborators have agreed upon the value of working together, the next step is to build the partnership. The thought and time put into this step will help to build a strong foundation for a lasting and effective collaboration. Start by working through some of the overarching principles that will define your collaboration. 🚲 For instance:

- Develop a shared vision and goals: What would we like to see happening in our community? What are our roles? How will we make a difference? What steps will take us closer to our vision in the short- and long- term? What measures will we use to evaluate success?
- Identify specific opportunities for integration within each others' work: What program areas would benefit most from collaboration? How will staff from different organizations work together?
- Identify or develop specific projects that you can work on together: Are there existing projects where collaboration can begin immediately? Are there upcoming funding opportunities to pursue collectively?
- Identify any tools, education, or trainings needed to further foster the collaboration: Should we schedule a brownbag presentation for staff to answer questions about the collaboration? Should we define a common language? Should we plan standing meetings between collaborating departments?

Building a successful collaboration is often based on personal relationships among the individuals that initiate the partnership. 🖐️ However, to sustain collaboration after the initiators have moved on, consider additional core competencies for interagency collaboration. For example:

- Understand and respect how other sectors approach the problem.
- Don't push the relationship too far before it is ready – for instance, identify one clear objective that you might tackle together, and then slowly expand if you're successful.
- Clearly identify roles of leadership – these don't need to be static, but may vary depending on the topics or project. Establishing criteria ahead of time may reduce feelings of competition in the future.

Once you feel that your collaboration has a solid foundation and is ready to move forward, **make it public!** Let your employees and the community know that you are working together. You may want to hold a media event, describe the collaboration on your website, or hold forums with each other's institution or stakeholder groups.



STEP FOUR: MAINTAINING AND EVALUATING THE PARTNERSHIP

As your collaboration evolves, you will face difficulties as you would with any relationship. Working through the steps above and identifying potential barriers and conflicts before they arise can help to resolve issues quickly. Common challenges that you could come up against include: unfamiliarity with values; differences in language, constraints, management style, or modes of operation; and, stereotypes or pre-conceived notions about how the partner operates (particularly if they are from a different sector). Build in opportunities for constant communication not just about projects but also about how the collaboration is progressing.



Consider a periodic evaluation to assess the value of the collaboration. A sample evaluation process is provided below, but you can design your own or pull from existing evaluation methods. The main questions you should seek to address in your evaluation are: Is public health better off because of this relationship? Should we continue to foster and develop the collaboration?

IDEAS IN ACTION

In Portland, Oregon, a Portland Air Toxics Solutions Advisory Committee was developed to identify solutions to an issue affecting the interests of a number of agencies and organizations. The Committee includes participants from neighborhood associations, the Department of Environmental Quality, local public health jurisdictions, the American Lung Association, the Department of Transportation and regional transit providers, industries, universities, and the port authority. The objective of this community-based project is to reduce the public health impacts from air toxins. Existing collaborations such as this one may offer an opportunity for climate change preparedness and mitigation activities to help established programs leverage resources and co-benefits by expanding their scope, mission, and vision to include climate change.

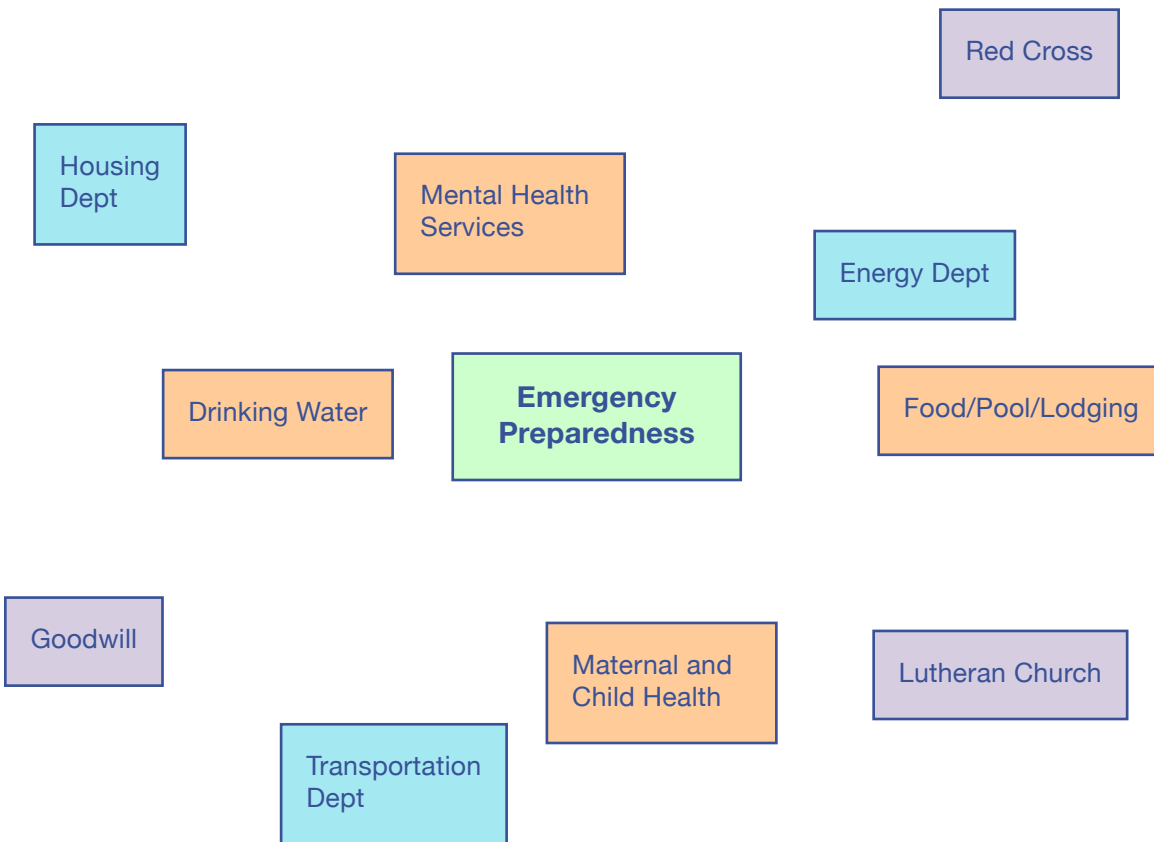
For more information, visit: <http://www.deq.state.or.us/aq/toxics/patsmeetings.htm>

PARTICIPANT EXPLORATION

Climate Planning Collaboration Assessment

Draw a map of the agencies, organizations, and the departments and programs that you feel should collaborate on addressing the public health impacts of climate change.

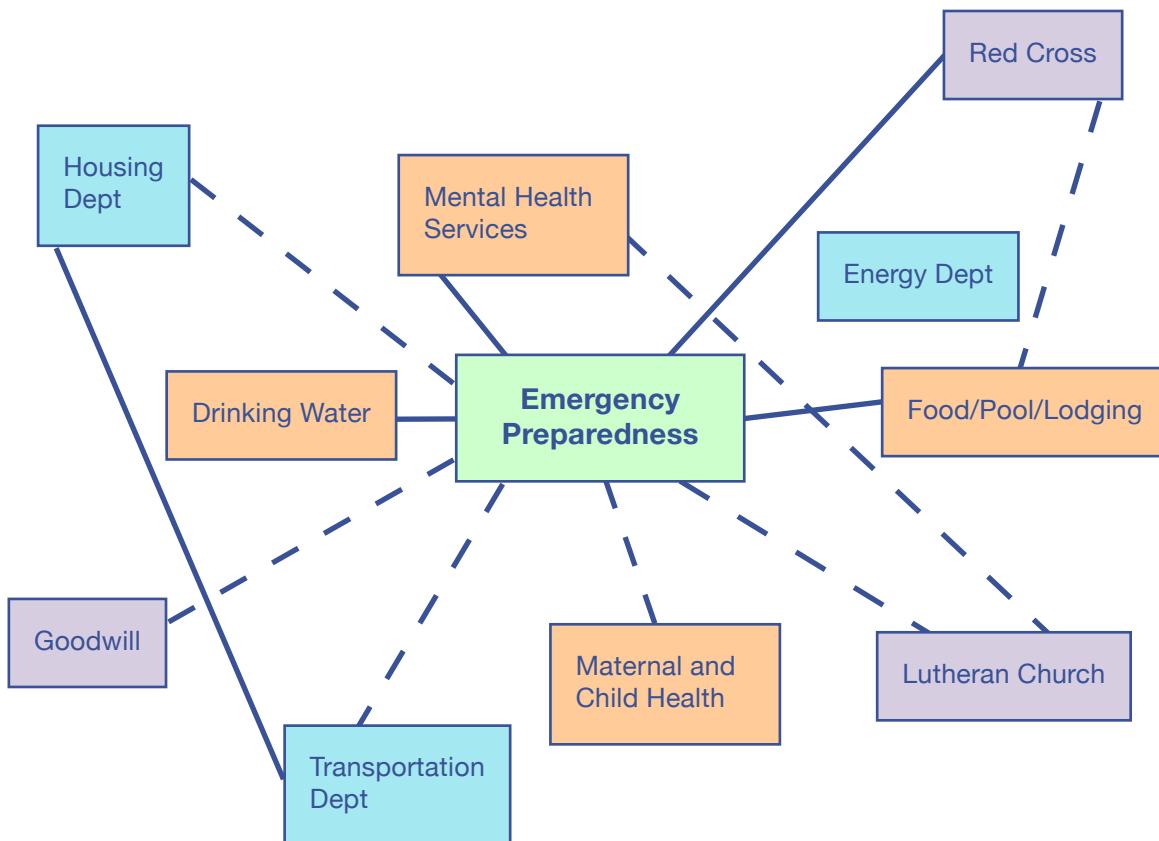
Step 1: Write the name of your program in the middle of a piece of paper (green in example below). Then, around your program, write the names of other programs within your department (orange). Next, write the names of other departments at the county and state level (blue), and finally external organizations in your community that have some ties to health or climate change (purple). Below is an example:



PARTICIPANT EXPLORATION

Step 2: Make solid lines connecting each of the entities that currently do, and dotted lines for those you think ought to, collaborate on climate change planning and public health in the future.

Step 3: On the lines connecting entities, or at the bottom of the page, identify the opportunities for collaboration, with specific program areas that you could work on together, as well as contact information where available. This is your Partnership Chart.



SECTION FOUR

COMMUNICATING EFFECTIVELY ABOUT CLIMATE CHANGE AND PUBLIC HEALTH

LEARNING OBJECTIVES

After completing this section, readers will be able to:

- Develop tools for communicating with vulnerable populations about climate-related risks to public health.
- Apply strategies for effective integration of climate change into communications with colleagues, the public, and clients.
- Articulate guidance for avoiding communication pitfalls.

Overview

Public health officials have a variety of opportunities and approaches for communicating with the public about climate change and related public health impacts. At one end of the spectrum, public health

practitioners can communicate effectively around climate-related risks to public health without direct mention of a connection to climate change. At the other end of the spectrum, public health practitioners may wish to actively engage in the discussion of climate change and public health by working with the media, testifying, educating, and empowering the public to take action on mitigation and preparedness. Another approach includes communication strategies that engage industry

partners (e.g. restaurants, hotels) in a discussion about how they can pass their health inspection, while also reducing emissions and implementing strategies to prepare for climate change. This section provides recommendations for this range of communication strategies. Pick and choose from the strategies to craft an approach that best meets your audience, goals, and outcomes.



Part A: Messaging on a Specific Issue

The steps below describe how to develop an effective communication approach about climate-related health risks with different audiences, including a process for identifying your issues and your audiences (e.g. vulnerable populations), understanding public perceptions, and developing strategies for delivering messages.¹⁰⁴ This information can be applied to communications with colleagues, industry partners, and the public.

STEP ONE: IDENTIFY THE ISSUE AND YOUR AUDIENCE

Before initiating a climate communications strategy, clearly identify the issue or topic you would like to focus on: for example, start with an issue that is familiar with your community. We will use a communication program developed by Health Canada that focused on Extreme Heat to illustrate the steps involved in developing a robust message and dissemination strategy.¹⁰⁵ For most of the US (as well as many areas around the world), the frequency, severity, and length of heat waves is expected to increase significantly in the coming decades, potentially leading to increased illness and mortality.¹⁰⁶ The health risks are preventable with effective communication and outreach to the public, particularly to the most vulnerable populations, and offering guidance on steps they can take to protect themselves.

Once you have agreed on the focus of your message, select your audience. Typically, this includes the population most at risk of consequences from the issue identified (refer back to Section One). Sample populations that are most vulnerable to heat illness or mortality may include: older adults, infants and young children, people with immune deficiencies or who are physically impaired, socially disadvantaged individuals (living alone, low income, homeless), residents of high rise apartment buildings without air conditioning, and individuals who work or exercise outside.

Once you have identified specific vulnerable populations, you may want to map out where these people are located, so your messaging can be targeted towards specific geographic locations. For example, identify on a map the location of child care centers, retirement/assisted living housing, adult care housing, etc.

STEP TWO: IDENTIFY PERCEPTIONS OF RISK



Understanding how the public perceives their risk can shape how you communicate with different populations or individuals. For example, heat illness and mortality is preventable if individuals (or those who care for individuals) take appropriate actions to reduce longterm exposure to heat. However, many individuals do not identify themselves as vulnerable and therefore do not take action.¹⁰⁷ For instance, individuals may not view themselves as elderly or may not associate

living alone with increased risk. In addition, the public may be receiving mixed or confusing messaging from the media, neighbors, or loved ones about what actions to take. Public health departments can work with emergency managers and the media to deliver consistent, clear, science-based messaging to the public. Examples of messaging to manage perceptions are provided below.

STEP THREE: IDENTIFY YOUR COMMUNICATION STRATEGY

Regardless of the topic of your communication strategy, plan well in advance to allow adequate time for outreach and behavior change in the population or community most at risk. Waiting to develop your communication strategy for extreme heat until the middle of a heat wave will not be effective! Messaging around extreme heat should begin in early spring, and campaign planning should begin in winter. 🖱️ Your department's specific approach to planning the communications strategy will depend on a variety of things, including:

- Goals and objectives: Are you aiming for zero heat mortality and a 25% reduction in heat illness, or just building awareness about a new cooling center?
- Available resources: Do you have funding for the campaign or are you relying on existing program funds?
- Audience reach: How large is the audience at whom you are targeting your messaging? Is it likely that the message will be passed on by word of mouth within your audience? What percent of the vulnerable population in your community are you hoping to reach?
- Specific needs of your audience: How much information is needed and in what format?
- Involvement of community partners: Are there other departments, nonprofits, or volunteers that can support messaging development and delivery? Are there partners that work with the specific vulnerable populations with whom you can collaborate?




You will also need to identify the means by which you will deliver your message:

- Media: including mass/broadcast as well as targeted via television, internet, print, radio, and text messaging.
- Billboards, posters.
- Interpersonal networks.
- Community and group events.
- Phone (e.g. reverse 911) or text messaging.
- Creative strategies, like placemats for child care centers, assisted living facilities and soup kitchens.

STEP FOUR: DEVELOP YOUR MESSAGES

The steps above should provide you with a clear understanding of your audience and how you want to communicate with them. Consider the age, reading level, ethnic and cultural background of the audience when developing your messaging.

 Involving your most vulnerable populations in developing messaging specific to their needs is an effective means of community engagement. You can hold focus groups and/or conduct surveys and interviews to gather input on which messaging is most appropriate for various socioeconomic, racial and cultural groups. Provide simple and practical steps to reduce vulnerability that take into account the challenges and perspectives of each of the audiences. Additional considerations include:

- Use messages that capture attention (e.g. bold, colors, graphics).
- Avoid fear messaging.
- Messages should be accessible (not too complex), credible, and personally relevant.
- Consider what existing knowledge your audience has that you can build from.
- Focus on practical, achievable actions or outcomes.
- Avoid contradictions with other health messaging (see below).

In some cases, messaging around climate change and health impacts may encourage contradictory actions for individuals. For example, messaging around high heat or ozone days may inform the public to go outside during the cool parts of the day (dawn and dusk), while messaging around vector diseases (like West Nile Virus) encourages the public to stay indoors during those times. Health Canada recommends integrating health messaging campaigns and developing a database of messaging to identify what information is being given to the public.

SPEAK TO YOUR AUDIENCE

In the Navajo Nation, approximately 25% of households are not connected to a public water system. These households, and even some connected households, haul drinking water from outside, often from untreated sources. Climate change will likely impact these water sources. For example, drier summers may result in higher concentrations of toxins as water sources dwindle. Additionally, extreme precipitation events could lead to flooding and soil erosion, impairing water quality by increasing turbidity. The CDC has worked with the Navajo Nation and the Office of Tribal Affairs to develop and distribute brochures and public service announcements to educate members of the tribal nation. The campaign is in both the Navajo language and English and includes culturally relevant information like, “use a long-handled dipper to serve water,” and for cleaning the container, “scrub the inside with a cleaning rag, soft bristle broom, or small stone.”

Learn more at: <http://www.atsdr.cdc.gov/tribal/states/az.html>

Examples of clear extreme-heat messaging for different audiences include:

- Child Care Centers/Schools/Parents: Check on children frequently for signs of heat stress, and make sure they drink plenty of cool fluids even if they are not thirsty.
- Communities: If you have neighbors that are over 65 or overweight, check on them at least twice a day to make sure they have a place to cool off (either air conditioning or access to a cooling center) and plenty of cold fluids to drink.
- Older Adults/General Public: If you are taking medications, ask your doctor if you should take special precautions in warmer conditions.
- General Public: If you work or exercise outdoors, drink plenty of fluids and rest in the shade frequently. Check on co-workers or your exercise buddy to ensure that they are not becoming confused, faint, or breathing rapidly. If they are showing these signs, get them to a cool spot immediately.



The communication strategies described above inform the public and vulnerable populations about how to protect themselves against a climate change-related health threat, yet do not specifically mention the connection to climate change. The following section (Part B) describes how public health workers can take a more active role in communicating about climate change.

IDEAS IN ACTION

On July 13th, 1995, the average temperatures in Chicago reached a 48-year high, with a heat index of 118° F and temperatures failing to fall below 84° F at night. The heat wave continued for six days with massive power outages and resulted in 525 heat-related fatalities, 208 deaths from health problems further complicated by heat exposure, and thousands of people hospitalized with heat-related symptoms. Following this tragedy, the city implemented an Extreme Weather Operations Plan to reduce the impact of future heat waves on human health. The plan instituted a National Weather Service public warning system that in turn mobilizes city service departments in the event of a “heat watch” to alert the public and monitor vulnerable populations at senior facilities and hospital emergency rooms. The Extreme Weather Operations Plan was put to the test soon after implementation, and more than 1,000 people were transported to Chicago’s cooling centers when the National Weather Service designated an “excessive heat warning.”¹⁰⁸

PARTICIPANT EXPLORATION

Vulnerable Population Assessment

Step 1. Refer back to the Participant Exploration in Section One to identify a particular hazard or impact you are concerned about (e.g. extreme heat).

Step 2. Identify the types of populations in your community that are likely to be most vulnerable to this impact (e.g. elderly).


Step 3. Identify if there are regions of your community where there is a concentration of vulnerable populations (e.g. neighborhoods, types of buildings, etc).

Step 4. Pick one of the populations or vulnerable regions identified above. Identify a goal or objective for reducing risk, specific messaging needs of the audience, potential community partners, and the proposed means for delivering the message. See the example below.

<i>Impact: High frequency of extreme heat events.</i>				
Population	Goal	Messaging Needs	Partners	Messaging Options
65+ y.o.	Zero heat mortality county-wide	Simple guidance on cooling centers, number to call, one-on-one contact	Senior Centers, Neighborhood Associations, Clinics/Doctors Office	Simple brochures provided by doctors, advertisements during news hours on TV and radio, door-to-door outreach

Part B: Making an Explicit Connection Between Climate Change and Health

Public health leaders are in a unique position to inform, educate, and empower the public, as well as to elevate the prominence of health issues in climate preparedness planning. However, even with an interest in doing so, incorporating climate change into your communications may feel uncomfortable. The science can be difficult to keep up with, and the topic remains politically charged in the United States. However, exploratory research shows that framing climate change as a public health issue can effectively engage many members of the public on the topic of climate change. Particularly compelling are messages around the public health benefits of emission-reducing practices such as biking and walking and the use of clean energy. This means that public health officials have an opportunity not only to focus on climate change preparedness but also to make the connection between health co-benefits and climate change mitigation, or emissions reduction.¹⁰⁹ Moreover, engagement with the issue strengthens the case for inclusion of public health leaders in planning and policy decisions that affect the health of vulnerable populations.

 To bolster your communication efforts and reduce the potential for pitfalls with both internal and external audiences, start by building a coalition of spokespeople with different backgrounds and expertise. This alliance could include climate scientists as well as local decision-makers, leaving public health officials free to disseminate information that falls within their area of proficiency and comfort. This coalition can be called upon to provide quotes for the media, to contribute content for staff trainings, and to review relevant content in communication materials and reports. Such a coalition can help shape communications around issues that might easily confuse the public, like the connection between extreme events and climate change and the intersection between mitigation and preparedness efforts.



 Other strategies to consider when communicating with any audience include:¹¹⁰

- Relate your messaging to the values or interests of the target audience.
- Preparing for or mitigating climate change does not have to be the focus or driver of the conversation, but instead can be the co-benefit of an action that improves the health of the individual or community. When you do mention preparedness or mitigation benefits, try to be clear as to which benefit you are talking about. As discussed in Section One, some actions with preparedness benefits may have negative ramifications for efforts to reduce greenhouse gas

emissions or vice versa (for example, air conditioning protects against extreme heat, but results in greenhouse gas emissions, which cause climate change).

- Focus on the human health impacts of climate change (as opposed to impacts on wildlife or the environment), such as increased asthma, exacerbated cardiovascular disease, and impacts to water quality.
- Provide a clear path to action rather than instilling fear. This could include strategies for your program to prepare for increased heat illness and mortality, or means for the public to protect themselves from vector-borne disease.
- Localize the issue by providing local examples of health risks and projected changes using the exercise completed in Section One. Emphasize the immediate health benefits from taking action, such as improved air quality, reduced obesity, and mortality and injury prevention.

BECOMING A VOICE FOR PUBLIC HEALTH AND CLIMATE CHANGE

For additional information on how to become a public voice on climate change and health, we recommend the extensive communication primer from George Mason University designed for the public health sector. The guide discusses how public health can take an active leadership role in writing letters to the editor, engaging decision-makers, and attracting media attention. The Resource Innovation Group's Social Capital Project has also developed a guide titled *Climate Communications and Behavior Change*, which helps practitioners understand their audience and offers tools for working with different stakeholders. See the Resources section for more information.


Maibach E, Nisbet M, & Weathers M. 2011. Conveying the Human Implications of Climate Change: A Climate Change Communication Primer for Public Health Professionals. Fairfax, VA: George Mason University Center for Climate Change Communication. www.climatechangecommunication.org

Pike, C., B. Doppelt, and M. Herr. 2010. Climate Communications and Behavior Change: A Guide for Practitioners. Available at: <http://www.theresourceinnovationgroup.org/SCP-publications>

In the section below, we outline strategies for effectively communicating with different audiences about climate change as it relates to public health.

Colleagues

When talking with coworkers, a supervisor, or staff, describe how climate change is linked with existing public health concerns like air and water quality. Understanding these connections will allow public health departments to be prepared for future events and to participate more effectively in climate planning and policy efforts.

 Since climate change often seems abstract and distant, highlight the health risks that are specific to your particular region in order to make the issue relevant to peoples' lives. Refer back to Section One and consider how climate change will affect the health of your community. For example, is your area urban and especially prone to air pollution, or are you in a coastal town concerned with

potential flooding or sea level rise? Focus on these local impacts as you bring climate change to the table as an important issue.

Colleagues may feel overwhelmed by the prospect of adding more work to their already full plates. Emphasize that many preparedness strategies do not necessarily mean developing new actions, resources or capacity. Many strategies can be, and should be, integrated across existing programs. Integrating climate change may also provide unique funding opportunities that your department or program has not been able to pursue in the past, such as through NACCHO, CDC, NIH and other federal agencies. Finding a specific funding opportunity to bring into the conversation may also increase their willingness to listen!

Sample language: *Climate change is already impacting the public health sector. We're seeing increased asthma rates, new and emerging diseases, and higher heat-related illnesses and mortality. It is essential that our department take action on this issue. We need to consider how each of our programs will be affected by future conditions and what changes we can make now to reduce the future impacts. By making changes now, we can proactively prepare for future risks and reduce economic costs and further stress on our programs.*

In order to enhance knowledge about climate change among state and local public health officials, agencies should cross-train their workforce through informational meetings, lunches, etc. Consider forming a climate planning team that can identify and develop cross-training opportunities. For example, epidemiologists, who specialize in infectious disease surveillance, can be trained to research the increased risk of heat-related morbidity and mortality expected with climate change. Emergency preparedness planners, who specialize in pandemic and all-hazards preparedness, can be educated about the increased risk of extreme weather events as a result of climate change. Finally, the expertise of public health leaders can be augmented with climate-specific trainings and guidance that support their involvement in climate change preparedness policy decisions. Integrate these trainings into discussions on internal and external collaborations, as outlined in Sections Two and Three.

Oregon Incident Response Information System

The Oregon Department of Environmental Quality (DEQ), funded by the Oregon State Fire Marshal's Office, and in partnership with the Oregon Public Health Division and Portland State University's Center for Spatial Analysis and Research, has created a response tool aimed at providing key geographic information needed to guide response efforts to emergency response personnel – the Oregon Incident Response Information System (OR-IRIS). Affectionately nicknamed the Oregon Map of Everything, OR-IRIS leverages existing GIS datasets useful to understanding the natural, physical and jurisdictional setting of a hazardous release so that a safe, appropriate and efficient response can be conducted. OR-IRIS consists of pre-packaged GIS layers within a common projection, in an ordered group/sequence designed to provide critical information first, and in a format that allows for exploration and analysis by those without advanced GIS skills. Counties are able to input their own GIS layers, or use pre-populated information on locations of child care centers, elderly/adult care, hospitals, and other facilities caring for vulnerable populations. Through collaboration with Portland State University's Center for Spatial Analysis and Research, the cost for the first generation of the project has been kept impressively low. The impact of the project is not yet known, but it promises to increase public safety and the quality of Oregon's environment well beyond its modest development cost.

PARTICIPANT EXPLORATION

Communicate with your colleagues

Design a presentation for colleagues on the impacts of climate change on public health and why they should consider climate change in their work. Visit the following webinars to gather ideas for presentations.

- The California Department of Public Health has a series of webinars that can provide ideas for presentations: <http://www.cdph.ca.gov/programs/CCDPHP/Pages/ClimateChange.aspx>
- The presentations from the APHA climate change webinar series can be found here: <http://www.apha-environment.org> (choose “climate change” at the bottom of the page, and select the “webinars” on the right side).
- The CDC Climate and Health webinar series also provides great presentation ideas: http://www.cdc.gov/climatechange/webinar_series.htm

The Public

State and local health departments are uniquely qualified to develop messages and public education campaigns that convey the health risks of climate change and the benefits of preparedness to the general public. These campaigns can be ongoing efforts or they can be responsive, tied to health threats that correlate with current climatic events.

Many responsive communication alerts and advisories follow the all hazards approach to emergency operations planning. Such an approach includes Emergency Operation Plans (EOP) that describe exactly who should be doing what at all stages of an emergency, including communication efforts. Public health departments can help to build awareness of the link between extreme weather events (each one of which is not necessarily directly caused by climate change) and the need to prepare for more severe events in the future (due to the fact that the climate is changing).



Environmental indicators can inform communications around extreme events. Indicators can be used to track trends over time, so that individual events can be associated with a larger trend in vulnerability and/or exposure to environmental hazards. At the time of publication, state level environmental indicators, including indicators for climate change and public health, were under development through the State Environmental Health Indicators Collaborative (SEHIC). More information can be found at: <http://www.cste.org/OH/SEHIC.asp>

These indicators are being adapted and tested at the state level in many pilot areas around the country. For more information, see the presentation “Lessons Learned from the Council of State and Territorial Epidemiologists (CSTE) Climate Change Indicators Pilot” at the 2011 National Environmental Public Health Tracking Conference: <http://www.trackinginaction.com/pdfs/tracking/5/Tran.pdf>.

Ongoing efforts might include a section on your website that discusses how your department is managing climate-associated health risks, and climate messaging across different brochures and handouts. Social networking tools can be used to engage the public in the conversation and allow them to ask questions or post comments about different reports that you release. You can also consider holding a public forum or participating in neighborhood association meetings to talk about health concerns.

Public health leaders can also encourage the public to get involved in preparedness planning efforts and support strong climate policies, particularly as they relate to public health. A public health climate preparedness advisory council, for example, could focus on climate change preparedness and serve as a liaison with nonprofit networks and citizen groups to show how the health of communities can be improved through climate preparedness.

Regarding messaging, the potential health implications of climate change are severe and can leave people feeling helpless or overwhelmed. 🗨️ Rather than focusing on the negative impacts of climate change, emphasize the benefits that will come from thoughtful preparedness and mitigation efforts. For example, take the bus, biking or walking will reduce emissions while also saving money and providing a means of exercise. Identifying and getting to know elderly neighbors so you can check in on them during an emergency may lead to more neighborhood cohesion.

Sample language: *In addition to doing everything we can to reduce the long-term effects of climate change, we must also prepare for increases in the health risks we are already experiencing. Just like a responsible parent with a sick child, we can't wait for the worst effects of climate change to reach us before we take action.¹¹¹ There are actions we can take in our everyday lives to help: take the bus, bike or walk to school and work; check in on elderly or sick neighbors; or start a community garden. These actions can help save us money, improve our health and build social interactions.*

Industry Partners

When interacting with industry partners, public health practitioners have the opportunity to share information about the health implications of climate change and recommended actions to prepare for risks and reduce emissions. Whether you are inspecting restaurants or childcare centers, working with a mental health provider, providing guidance to an organization on hazards preparedness, or working with property owners to clear mosquito breeding grounds, you can help to make the connections between climate change and health, and provide guidance on actions that industry can take to make a difference.

For instance, you can share with hotel owners that weatherizing their buildings will reduce energy costs and greenhouse gas emissions, while also protecting public health in the case of an extreme heat event. Provide guidance to childcare centers and other social services about how to build a preparedness strategy for a major heat or flooding event, and make them aware of the heightened vulnerability of their clientele. Talk with mental health providers about the potential increases in stress, abuse, depression, and suicide following extreme weather events, both in your area and among displaced populations settling in your region after experiencing an extreme event. Discuss with local organizations the value of integrating climate change into the regional hazard preparedness plan, and the role they could play during a major event (e.g. collaborating with a local food shelter, helping shuttle the elderly to a cooling center, etc.). If working with property owners to clear mosquito breeding grounds, talk to them about the potential influx of disease-carrying vectors as the climate changes. Additional details on reducing



greenhouse gas emissions and preparing for climate impacts are provided in TRIG's 2010 guidebooks at: <http://www.theresourceinnovationgroup.org/public-health-climate-change>.

Sample language (Childcare Center): *We really appreciate the effort you have made to make your Center a safe place for kids during extreme events. Because extreme events such as heat waves are likely to increase with climate change, one thing we'd like to encourage you to do is to educate the kids about steps they can take when it's hot outside. We'd like to provide you with these supplies to help the kids develop "heat wave placemats." Each placemat has a cooling tip, with an outlined image. For instance, "drink water even if you're not thirsty"; "seek a cool, shady spot, and rest"; and, "stay inside and play in a cool house." The kids can use crayons to decorate the placemat of their choice. Our hope is that they can take these home and educate their parents as well.*

Communicate with your industry partners

Develop tipsheets/talking points for colleagues working with industry partners on ways to improve health while also helping prepare for or mitigate climate change.

Examples:

For restaurants, recommend energy (cost) saving tips such as upgrading appliances to Energy Star level, connecting with local food growers, and possible storage of nonperishable food items in case of an emergency event or power outage.

For child-care centers, consider recommending that they develop an emergency preparedness plan and engaging the children in related education activities. Provide a list of items (and samples if possible) that child-care centers should include in their 72-hour emergency kit.

For hotels, recommend improving insulation to reduce energy costs (and therefore reduce energy waste, protect guests during extreme weather events, and reduce mold). Hotels may want to consider coordinating stockpiles of supplies and emergency shelter protocols with the regional office of emergency management and Red Cross. Provide an incentive and free goods if possible, in exchange for the space.


Policymakers and Planners

Public health practitioners have a unique opportunity to engage with local policymakers about both the need for proactive climate change health preparedness and consideration of public health in other climate change preparedness and mitigation work. By participating in climate change policy discussions, public health professionals will be able to communicate the significant health impacts that are likely to occur should adequate preparedness measures not be adopted. For many people, climate change is an abstract concept that is not connected to their daily lives. Incorporating public health objectives into climate change planning processes will highlight the fact that rising temperatures directly affect local people today, not only polar bears or future generations. For example, in terms of mitigation, instituting policies that make bicycle commuting more accessible and convenient will help reduce carbon emissions, improve air quality, and decrease obesity rates by facilitating physical activity. Public health professionals can also educate policymakers on the health benefits that will result from sound climate preparedness planning, such as: sharing disease surveillance data across jurisdictions and setting policies for cooling standards at childcare centers and elderly/adult care housing facilities.

If climate change-related planning and policy efforts in your community and state have not yet engaged the public health perspective, make the case for including that focus. The American Public Health Association provides advocacy and policy resources that will help you make your case: <http://www.apha.org/advocacy/priorities/issues/GlobalClimateChange.htm>. You might also consider requesting permission to testify at the local or state level on certain policies or planning processes that can affect health and prepare for or mitigate impacts of climate change.



Media

Media outlets jump on health stories.¹¹²  Consider contacting media outlets such as newspapers, television, radio, and online sources to provide them with a local story connecting climate change with public health. The distribution of a press release connecting climatic events with public health can be written into Emergency Operation Plans, as described above. You can also highlight the connections between climate change and public health at other times by briefing editorial boards, writing an Op-Ed, and offering to engage in a radio, online or televised interview. Referencing a scientific report or study that highlights local or regional impacts and the risks to the community can also draw media attention. When contacting media outlets, attempt to reach different populations of your community, including through non-English newspapers, television or radio shows. This is a good time to connect with your coalition of spokespeople to strengthen your message and allow you to remain within your area of expertise.

Additional Communication Considerations

Public health departments and agencies should keep in mind that communication tools and actions tailored to the community and population they are working with will have greater impact for community members. For example:

- Use a variety of media outreach strategies that would be effective for different age groups (on public radio, local news, popular radio stations, social media sites, etc.).
- Publish brochures and media outreach in multiple languages.
- Door-to-door outreach may be more effective for some communities.
- Use non-traditional outlets for education and outreach (Meals on Wheels, YMCAs, local celebrities, sporting events, etc.).

PARTICIPANT EXPLORATION

Developing your capacity building plan

Here you will begin to pull together all of the activities you have completed and ideas that have been spurred through reading this guidebook. Using the next page or in a spreadsheet, begin to develop your climate and health capacity building plan by identifying the following elements listed below.

For each Outcome, identify how it contributes to the 10 Essential Services of Public Health, National Public Health Performance Standards, Healthy People 2020 Goals, and Public Health Department Accreditation (see Appendix A for more information on these initiatives). For each Objective, ensure that it is SMART (Specific, Measurable, Attainable, Relevant, and Trackable).

1. Climate Change and Health Project Goal:

2. Health Problem Addressed:

3. Outcome Objective:

4. Process Objectives:

a. Objective 1:

i. Event:

Activities:

Outcomes:

ii. Event:

Activities:

Outcomes:

b. Objective 2:

i. Event:

Activities:

Outcomes:

ii. Event:

Activities:

Outcomes:

PARTICIPANT EXPLORATION

APPENDIX A

PUBLIC HEALTH FRAMEWORKS AND PROGRAMS

Building Resilience Against Climate Effects (BRACE): A five-step framework developed by CDC for climate preparedness planning among health jurisdictions, currently under testing by local health jurisdictions. The five steps include: 1) Impact and Vulnerability Assessment; 2) Health Risk Assessment; 3) Intervention Assessment; 4) Health Adaptation Planning and Implementation; and, 5) Evaluation. Currently being tested in pilot programs across the country and likely to be released widely in 2012. CDC Climate Change website: <http://www.cdc.gov/climatechange/>. 2011 presentation outlining the BRACE framework: http://www.epa.gov/region2/climate/pdf/EPA_Region_2_Webinar_BRACE.pdf.

Community Health Assessment (CHA): A systematic methodology for collecting data on and setting priorities for improving the health of a defined population. <http://www.assesstoolkit.org>

Health Impact Assessments (HIA): A means of assessing the health impacts of policies, plans and projects in diverse economic sectors using quantitative, qualitative and participatory techniques. HIA helps decision-makers make choices about alternatives and improvements to prevent disease/injury and to actively promote health. WHO supports tools and initiatives in HIA to dynamically improve health and well-being across sectors. <http://www.cdc.gov/healthyplaces/hia.htm>

Healthy People 2020: Provides science-based, 10-year objectives for improving the health of Americans. For 2020, they have added the topic of preparedness, with the goal of improving the country's ability to prevent, prepare for, respond to, and recover from major health incidents. <http://www.healthypeople.gov/2020/default.aspx>

Mobilizing for Action through Planning and Partnerships (MAPP): A community-driven strategic planning process for improving health. <http://www.naccho.org/topics/infrastructure/mapp/index.cfm>

National Public Health Performance Standards are based on the 10 Essential Services: <http://www.cdc.gov/nphpsp/index.html>

Note: there are also **National Environmental Public Health Performance Standards**, which are based on the 10 Essential Services of Environmental Public Health. <http://www.cdc.gov/nceh/ehs/envphps/>

Protocol for Assessing Community Excellence in Environmental Health (PACE EH): A methodology to guide local communities in identifying and addressing environmental health priorities. <http://www.cdc.gov/nceh/ehs/ceha>

PACE Tutorials: <http://www.naccho.org/topics/environmental/CEHA/paceeh.cfm>

Public Health Department Accreditation: A voluntary accreditation program to improve and protect the health of every community by advancing the quality and performance of public health departments. <http://www.phaboard.org>

Press release on the trial program:

http://www.cdc.gov/media/releases/2011/p0324_publichealthdeptaccreditation.html

Public Health Hazard Vulnerability Assessments (PH-HVA): A tool to identify, prioritize and plan for natural hazards and climate-related events. It uses quantitative and qualitative hazard analysis to identify vulnerabilities and resource availability. It can be used by public health departments and communities to plan and establish appropriate preparedness measures before an event occurs. The PH-HVA originated as an emergency management hazards planning tool, but it applies a greater emphasis on public health and the socioeconomic factors that affect a population's vulnerability. Sample from Florida available at: www.myfloridaeh.com/programs/EhGis/HVAGUIDE.pdf

State Environmental Health Indicators Collaborative: The Council of State and Territorial Health Officials has identified working groups of state and local health practitioners to develop a set of indicators for environmental health surveillance and practice. Several working groups are developing indicators around climate change and public health risks. <http://www.cste.org/OH/SEHIC.asp>

10 Essential Services of Public Health: <http://www.cdc.gov/nphpsp/essentialservices.html> as described in the Section One of this guidebook.

Note: There are also **10 Essential Services of Environmental Public Health**, which is slightly different: <http://www.cdc.gov/nceh/ehs/home/HealthService.htm>

APPENDIX B

RESOURCES

Climate Change Guidebooks

APHA Climate Change - Mastering the Public Health Role Guidebook:

http://www.apha-environment.org/pdf/APHA_ClimateChg_guidebook.pdf

The Resource Innovation Group's Climate Leadership Initiative (TRIG) Public Health Guidebooks:

<http://www.theresourceinnovationgroup.org/public-health-climate-change>

Climate Data Sources:

Allergies: The National Allergy Bureau provides a map of regional pollen and mold levels

<http://www.aaaai.org/nab/index.cfm?p=pollen>

Centers for Disease Control and Prevention National Environmental Public Health Tracking Program, Climate Change Portal: <http://ephtracking.cdc.gov/showClimateChangeLanding.action>

Climate Wizard – National Climate Projection Data: <http://www.climatewizard.org>

Coastal Flood Exposure Snapshot (NOAA): <http://www.csc.noaa.gov/digitalcoast/tools/snapshots/index.html>

Environmental Protection Agency's daily Air Quality Index reports: www.airnow.gov

NOAA Regional Integrated Sciences and Assessments Program:

http://www.climate.noaa.gov/cpo_pa/risa/index.jsp?pg=../cpo_pa/cpo_pa_index.jsp&pa=risa&sub=1

NOAA Sea Level Rise and Coastal Impacts Viewer: <http://csc.noaa.gov/digitalcoast/tools/slrviewer>

Oxfam America, Vulnerability and Climate Change in the US Southeast: <http://adapt.oxfamamerica.org>

TRIG's Modeling and Preparedness Reports:

<http://www.theresourceinnovationgroup.org/climate-preparedness-pubs>

US Drought Monitor: <http://droughtmonitor.unl.edu>

US Geological Survey Disease Maps: <http://diseasemaps.usgs.gov/index.html>

US Global Change Research Program's Climate Assessment Reports:

<http://globalchange.gov/publications/371>

Evaluation Resources

From CDC: <http://www.cdc.gov/eval/resources/index.htm>

Tipsheets and Pamphlets

“Are You Ready for a Heat Wave?” A preparedness tip sheet from the American Red Cross, FEMA, NOAA: www.redcross.org/www-files/Documents/pdf/Preparedness/AreYouReady/AreYouReadyforaHeatwave.pdf

Centers for Disease Control and Prevention Extreme Heat Media Toolkit: <http://emergency.cdc.gov/disasters/extremeheat/index.asp>

Coping with a disaster or traumatic event (CDC): Information in English, Spanish and Vietnamese. <http://www.bt.cdc.gov/mentalhealth>

“Extreme Heat: A Prevention Guide to Promote Your Personal Health and Safety” http://www.bt.cdc.gov/disasters/extremeheat/heat_guide.asp

“Extreme Heat” A Federal Emergency Management Agency (FEMA) fact sheet. <http://www.tallyredcross.org/library/FS-ExtremeHeat.pdf>

Health, Safety and Resilience for Disaster Responders Pamphlet (OSHA): http://www.osha.gov/SLTC/emergencypreparedness/resilience_resources/support_documents/predeploy/cdc_pamphlet.pdf

ICLEI Climate Resilient Communities: www.iclei.usa.org/climate_and_energy/Climate_Adaptation_Guidance

“Learning about Urban Heat Islands” An overview from the Heat Island Group. <http://heatisland.lbl.gov>

Seafood Watch guide to safe and sustainable seafood choices: www.montereybayaquarium.org/cr/cr_seafoodwatch/download.aspx

When Disaster Strikes: Managing Mental Health in the Workplace Pamphlet (National Partnership for Workplace Mental Health): www.workplacementalhealth.org/pdf/disasterbrochure.pdf

General Information

Brand, M. et. al. 2006. A Model for Assessing Public Health Emergency Preparedness Competencies and Evaluating Training Based on the Local Preparedness Plan. *Journal of Homeland Security and Emergency Management*. Vol 3, Issue 2. <http://www.bepress.com/jhsem/vol3/iss2/3/>

Centers for Disease Control and Prevention. Climate Ready States and Cities Initiative. http://www.cdc.gov/climatechange/climate_ready.htm

Centers for Disease Control and Prevention. Division of Vector-Borne Diseases.

<http://www.cdc.gov/ncidod/dvbid/index.html>

Centers for Disease Control and Prevention. Human Health Perspective on Climate Change:

http://www.cdc.gov/climatechange/pubs/HHCC_Final_508.pdf

Centers for Disease Control and Prevention. Information on the Impact of Climate Change on Public Health.

<http://www.cdc.gov/ClimateChange/>

Climate and Health Council. An organization of health professionals mobilizing action on climate change and human health. <http://www.climateandhealth.org/>

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