Public Health Functions

7.1 Assessment and Surveillance for Climate Change and Health

Introduction

Assessment is a core function of public health and encompasses monitoring health status to identify community health problems and diagnosis and investigation of health problems and health hazards in the community. Local health departments are already engaged in disease surveillance, community health assessments, vital statistics, and program evaluation. The skills, data, and analysis used in these activities can be applied to assessment for climate change and health, which provides a foundation to:

- Inform the public and policy makers about climate-related health risks and outcomes.

- Determine the need for enhanced surveillance and environmental monitoring.

- Increase opportunities for realizing health benefits through greenhouse gas mitigation and adaptation strategies.

- Spur action to promote health equity and climate resilience.

To better integrate climate change into current surveillance and assessment activities, LHDs can:

- Conduct climate, health and equity vulnerability assessment.

- Enhance existing environmental monitoring.

- Enhance surveillance of climate-related health behaviors and health outcomes.

- Conduct health analyses and health impact assessments of climate-related policies and programs.

Climate, Health and Equity Vulnerability Assessment

"Climate vulnerability is the degree to which people or communities are at risk of experiencing the negative impacts of climate change."[1]

A community health assessment (CHA) is a collaborative process that "involves systematic collection and analysis of data and information to provide a sound basis for decision-making and action.[2]" A climate, health and equity vulnerability assessment (CHEVA) identifies climate-related risks, their likely health impacts, and the people and places at higher risk. Coupled with knowledge of community resources to reduce risks and promote health, it provides the foundation for guiding LHD actions to protect and promote health in the era of climate change.

Awareness within your LHD of the broad scope and scale of climate changes projected for your jurisdiction will allow you to provide a more evidence-based assessment of potential climate-related health risks, how climate

change will exacerbate existing health problems, and appropriate interventions to reduce the health impacts of climate change.

CHEVA can be a stand-alone effort; but because climate change has such broad impacts on health and health equity, both the CHEVA and CHA will be strengthened if you integrate climate risks and vulnerabilities into your CHA process. Similarly, integration of climate change into Community Health Needs Assessments performed by not-for-profit hospitals provides another avenue for assessing the impacts of climate change on health and health equity. See: Leveraging Hospital Community Benefit Activities to Address Climate Chang and Environmental Risks.[3]

- The Alaska Department of Health and Human Services partnered with local Tribes, agencies, and organizations to assess potential health impacts from climate change. The assessment included climate predictions for Alaska based on the National Climate Assessment and described potential health impacts across mental health, injury, nutrition, infectious disease, chronic disease, environmental health, and health service capacity considerations.[4]

- The Macomb County Health Department (MI) used the MAPP (Mobilizing for Action through Planning and Partnerships) strategic planning framework to develop its Community Health Assessment, and identified climate change as one of the key "forces of change".[5]

Community Engagement in CHEVA

Climate and health vulnerability assessments are most valuable when they incorporate the perspectives and knowledge of community residents and are shared widely and seen as useful tools for informing community and policy decisions. Bringing community partners into the assessment process as early as possible will help to ensure that the information you produce will be disseminated and used.

Community residents and community-based organizations (CBOs) can share information about assets and needs in their communities, prior efforts to address problems, resources and challenges, and specific ideas for how to support and facilitate community efforts to promote health through climate mitigation, adaptation, and resilience. For more on community engagement see the Health in All Policies Guide.[6]

LHDs have invited and/or contracted with community partners to comment on an initial list of proposed indicators proposed, provide information on community assets and concerns that may not be reflected in available data, participate in data collection and interviews of community members, review the draft assessment, and present the assessment to residents in impacted communities as a tool for engaging in conversations about actions that can build preparedness capacity and climate resilience.

- Youth organizers in Richmond, California used community surveys, maps, and GIS applications to understand climate vulnerabilities and community risks and assets. The results helped spur youth-led proposals on job opportunities and policy changes for enhanced resilience.[7]

Steps in a Climate, Health and Equity Vulnerability Assessment

One common framework for assessing climate and health vulnerability combines geographically refined data on 1) current and future physical threats of climate change; 2) population vulnerabilities including social determinants of health; 3) "adaptive capacity" that reflects individual and community-based resources that could counteract the negative impacts of climate change; and 4) health impact projections.

The tables below list the common indicators used in CHEVA. Climate change and climate and health data sources are available through the CDC: Climate and Health.[8]

Current and Future Physical Threats of Climate Change

Understanding current and projected climate risks is the first step in developing a climate and health vulnerability assessment. What are the environmental impacts of climate change that are happening now and will be experienced? How will those vary across the jurisdiction, and over time? What difference will actions now make? Start by checking with planning and emergency management agencies to see if they have conducted an assessment of projected climate impacts in your jurisdiction. (See Table 7.1.1)

Table 7.1.1	INDICATORS OF CLIMATE THREATS	
Category	**Indicator**	**Data Source**
Temperature	Maximum temperature	
	Minimum temperature	
	Extreme heat days	
Pollen	Pollen loads	
	Ragweed presence	
Wildfire	Annual average of area burned	
	Percent of population currently living in high fire risk hazard zone	
Drought	Palmer Drought Severity Index	3rd National Climate Assessment, Human Health Chapter
	NDMC's drought impact reporter	
	Water scarcity (water supply < 1,000 m3/person)	
	Annual mean precipitation (inches)	
	Snow water equivalent	
Air Quality	Three-year annual mean concentration of particulate matter ($PM_{2.5}$)	
	Three-year ozone concentration exceedance above state standard	
Sea Level Rise	Percent of population living in 100-year flood zone and 55 inches of sea level rise	
	Sea level rise scenarios	
Water Quality	Harmful algal blooms	

Understanding Climate Change Projections[9,10]

You don't need to be a climate scientist or understand complex climate change models to use climate projections in your CHEVA. But here are a few useful things to know:

- Climate projections are not the same as weather forecasts. Climate change will not make year-to-year variability in climate go away. There may be a very cold winter one year, but decade-over-decade warming persists. Climate projections tell us how conditions are likely to change in the future, on average, over multiple decades.

- Climate change impact projections and greenhouse gas emissions scenarios are not the same thing. Emissions scenarios use projections of population, demographics, economic growth, energy supply and demand, land use, and technological developments as inputs to complex socio-economic models that estimate emissions of greenhouse gas emissions. These scenarios represent different possible futures, for example business-as-usual with continued high levels of emissions or low-emissions scenarios based on aggressive efforts to reduce GHGE.

- Climate scientists use emissions scenarios as input into very complex computer models that use basic laws of physics and chemistry and information about oceans, land surface, ice, and the atmosphere to produce climate projections. These projections forecast environmental changes associated with various levels of GHGE at different points in the future for every part of the earth.

- Planners often average across different climate projections to assess the most likely outcomes for a particular emissions scenario. But they do not average across the emissions scenarios, because those represent different futures based on what actions society may take to reduce GHGE. Understanding the different climate projections for high emissions versus low emissions scenarios can help LHDs understand the health implications of our choices about climate action, and can help the public and policy makers decide how much cost and effort should go into emissions reduction.

- Climate change is the result of all of the GHG in the atmosphere cumulatively over time. Because GHG persist in the atmosphere for long periods of time, the cumulative amount changes with each incremental addition of GHGE. It also takes time for GHG in the oceans, earth and atmosphere to equilibrate, so warming will continue even if GHGE stop.

- Climate projections differ significantly for different time periods in the future. Both nearer term and longer term projections are important for planning. The nature of interventions required to reduce the health impacts of climate change range from very short-term (warnings for extreme weather events) to multi-decadal (working with other sectors to achieve systems transformations in energy and transportation) and everything in between (planting trees to provide shade).

Population Vulnerability

Table 7.1.2 provides indicators associated with increased population vulnerability to climate-related adverse health outcomes, including demographic characteristics such as age, and socioeconomic determinants such as poverty, education, and race/ethnicity. While the indicators below are most often used to assess population

prevalence in a particular geographically defined area (e.g. census tract), it may also be useful to identify and map specific sensitive institutional populations such as schools, nursing homes, or prisons. In areas that are rapidly changing, for example due to gentrification or migration, consider updating these indicators more frequently.

Table 7.1.2	INDICATORS OF CLIMATE THREATS	
Indicator	**Definition**	**Data Source**
Children	Percent of population aged less than 5 years	American Community Survey (2016) Uniform Crime Report (2017)
Elderly	Percent of population aged 65 years or older	
Poverty	Percent of population whose income in the past year was below poverty level	
Education	Percent of population aged > = 25 years with less than s high school education	
Race and Ethnicity	Percent of population of color	
Outdoor Workers	Percent of population employed and aged > = 16 years working outdoors	
Linguistic Isolation	Percent of households with no one aged > = 14 years speaking English	
Physical Disability	Percent of population living with physical disability	
Mental Disability	Percent of population living with mental disability	
Health Insurance	Percent of population without health insurance	
Violent Crime Rate	Number of violent crimes per 1,000 residents	
Linguistic Isolation	Percent of households with no one aged > = 14 years speaking English	
Physical Disability	Percent of population living with physical disability	
Mental Disability	Percent of population living with mental disability	
Health Insurance	Percent of population without health insurance	
Violent Crime Rate	Number of violent crimes per 1,000 residents	

Chronic Disease:		
Asthma	Prevalence of current asthma	CDC 500 Cities
Cardiovascular Disease	Prevalence of coronary heart disease	CDC 500 Cities
Diabetes	Prevalence of diagnosed diabetes	CDC 500 Cities

Identifying Indicators and Assets for Adaptation and Resilience

Several indicators of adaptive capacity are recognized to lower climate risks (Table 7.1.3). These include avoidance of the threats by temporary evacuation or using technologies such as air conditioning to create a safe environment during heat waves. Adaptive capacity may also leverage social and political relationships so resources can be shared before, during, and after extreme events.

Table 7.1.3 — INDICATORS OF ADAPTIVE CAPACITY

Indicator	Definition	Data Source
Impervious surfaces	Percent of urban impervious surfaces	National Land Cover Database (2011)
Air conditioning access	Percent of the population with access to residential air conditioning	RAS Data
Motor vehicle access	Percent of households with access to a vehicle	ACS
Transit access	Percent of the population residing ½ mile from a rail or bus stop with 15 minute frequency during peak commuter hours	MPOs
Tree canopy	Population-weighted percentage of the census tract area with tree canopy	National Land Cover Database (2011)
Social cohesion	Percentage of registered voters who voted in the most recent general election	UC Berkeley Statewide Database

Resiliency and Asset Mapping

Communities have resources that are not easily identified through existing data but that are important in withstanding climate stresses and building climate resilience (Table 7.1.4). Community surveys provide information about social cohesion, strongly associated with better outcomes after climate-related extreme events as well as other improved health outcomes. Community-based participatory asset mapping will identify people, structures, organizations, and other intangible factors that may confer community climate resilience. To learn more, see UCLA's Center for Health Policy Research Asset Mapping Toolkit.[11]

Table 7.1.4	RESILIENCE INDICATORS	
Short Title	**Indicator**	**Data Source**
Social cohesion[12]	Frequency of interaction with friends/family Available support networks Frequency in feelings of loneliness Inter-group bridging (e.g., cross-group socialization, integration of different groups) Trust (in neighbors, workplaces, government, social groups) Membership in voluntary associations, clubs, and religious institutions Presence of neighborhood associations Neighborhood and senior centers	Community surveys

Climate and Health Vulnerability Indices

Different indicators can be combined to create an index of climate vulnerability, either for a specific exposure such as heat, or for overall climate vulnerability. Index construction—such as choice of indicators and approach to weighting of indicators—requires careful consideration.

- The Climate and Health Program in the North Carolina Division of Public Health used a wildfire vulnerability index developed by the EPA to identify counties with high exposure and sensitivity to smoke health impacts.[13]

- The California Environmental Health Tracking Program mapped population climate vulnerability in Fresno and Los Angeles.[14]

- Denver Department of Environmental Health created a Heat Vulnerability Index and accompanying story map that shows heat vulnerability by census tract.[15]

Projected Health Outcomes Associated with Climate Change

An assessment of the burden of disease (mortality and morbidity) due to climate change asks how the number of deaths or other health outcomes would change if a future climate threat increased by a specific amount from the historical baseline. While LHDs can reasonably predict some of the ways and directions in which future health outcomes will change due to climate change, it is more challenging to develop quantitative projections of the magnitude of change in health outcomes that will accompany these impacts. These quantitative projections can inform public health adaptation and preparedness planning and may help communities and policy makers understand the longer term benefits of taking climate action now. Quantitative projection of health outcomes associated with future climate change requires:

- Data on current disease burden associated with a particular impact (e.g. baseline asthma hospitalizations).

- Estimates of the quantitative relationship between temperature, related weather metrics (e.g. humidity), and air pollution levels on mortality.

- Projections of changes in temperature, air pollution, etc. (and how those differ based on emissions scenarios).

- Projections of changes in future size and geographic distribution of sensitive populations.

- Assumptions about future use of adaptation strategies such as air conditioners or of strategies to reduce air pollution.

The CDC provides documents that address methodological issues in projecting future climate-related disease burden.[16,17] In particular is the need to integrate demographic change, since changes in populations exposed to climate risks can be significant. Between 2000 and 2016, while temperatures increased about 1.1°F on average in the U.S., the number of Americans exposed to heat wave events annually increased by an average of approximately 14.5 million, and the number of elderly exposed increased significantly.[18]

Communicating the Results of CHEVA

Report, websites, and community meetings have all been used to communicate the results of a CHEVA to community residents, stakeholders, agency partners, and policy makers. Maps are a powerful way to display information and make it more relevant and usable.

- Use geographic analysis systems to create color-themed maps that demonstrate the intersection of specific climate impact projections (e.g. heat islands, flood zones), social and population vulnerability, and assets at the census tract level. Add information on specific sites (e.g. schools). The LHD Spotlight below addresses flood health vulnerability assessment; it is one of a series of assessments of specific climate-related risks. See the end of this section for maps from Denver, Minneapolis, Multnomah County (OR) and others.

Enhanced Monitoring and Surveillance

Climate change is altering disease and illness dynamics globally. Enhancing current monitoring and surveillance protocols can detect emerging risks, track impacts on health outcomes, and assess effectiveness of public health interventions.

Community Engagement in Monitoring and Surveillance

LHDs can work with communities and academic partners to conduct community-based participatory research (CBPR) to engage community residents, understand local health impacts of climate change and the contributors to it, and identify strategies to promote health and equity. CBPR is "a collaborative process that equitably involves all partners in the research process and recognizes the unique strengths that each brings. CBPR begins with a research topic of importance to the community with the aim of combining knowledge and action for social change to improve community health and eliminate health disparities."[21]

- Coast Salish Tribal Communities in Washington and Oregon partnered with local agencies and academic institutions to conduct CBPR projects in local Native American communities on health inequities and exacerbations due to climate change. Project researchers interviewed local leaders and community members and held workshops to inform a set of six Indigenous Health Indicators to address health equity and climate change impacts. These indicators included measures that are often not seen in traditional indicator sets: community connection, natural resources security, cultural use and practices, self-determination, and emotional stability.[22]

Emerging community science programs also offer opportunities for enhanced surveillance and youth and community engagement. As climate change threatens to drive Chagas disease northward from South America, researchers in Texas established a project in which the public mailed "kissing bugs" for testing for *Trypanosoma cruzi*, the parasite that carries the disease, allowing assessment of vector distribution and infection prevalence.[23]

Air quality monitoring provides another opportunity to engage communities in surveillance and assessment. A variety of portable and lower-cost monitoring devices are being developed to enhance air quality monitoring capabilities and provide information about air quality in locations without permanently stationed monitors. The U.S. EPA resources for community scientists to do their own air monitoring—Citizen Science Opportunities for Monitoring Air Quality.[24] In 2016, a Salt Lake City advocacy group participated in the global Unmask My City initiative. In a campaign to support air pollution control measures, volunteers used personal $PM_{2.5}$ monitors with masks that changed color to show real-time air pollution measurements.[25]

LHD Spotlight:
San Francisco Department of Public Health[19]

The San Francisco Department of Public Health (SFDPH) conducted a flood health vulnerability assessment in order to focus resources on and design interventions for vulnerable populations (Table 7.1.5). SFDPH included indicators on socioeconomic and demographic, exposure to flooding, pre-existing health conditions, and housing quality. To obtain data, the department used results from the American Community Survey and from the local police and fire departments, San Francisco Public Utilities Commission, California Office of Statewide Health Planning and Development, and the 2015 San Francisco Homeless Count.


LHD Spotlight continued

TABLE 7.1.5	VULNERABILITY INDICATORS
Vulnerability	Indicators[20]
Social and Demographic	Age: Percent of residents who identify as under 18 and over 65
	Percent of residents who do not identify as white
	Percent of residents below 200% of the federal poverty rate
	Percent of residents over 25 with at least a high school degree
	Percent of households with adults who do not speak English
Exposure	Percent of land in 100-year flood plain with 36 inches of sea level rise
	Percent of land projected to have over 6 inches of precipitation during a 100-year storm
	Minimum elevation
Health	Adult hospitalization rate due to diabetes
	Adult hospitalization rate due to asthma
	Adult hospitalization rate due to schizophrenia and other psychotic disorders
	Percent of residents who report a physical disability
Housing	Homeless population, per 1000 residents
	Annual housing violations, per 1000 residents
	Percent of residents who report living alone

SFDPH overlaid available data, creating vulnerability indexes for each indicator set and a combined flood health vulnerability score by block group and neighborhood. The resulting maps defined areas that are most likely to experience flooding and areas that are most likely to experience its health impacts.

Figure 22. Final Flood Health Vulnerability Index
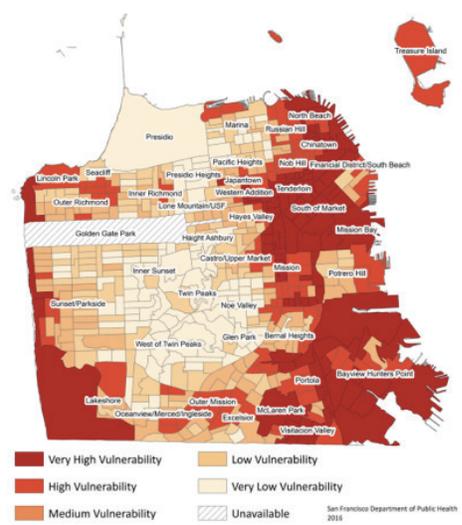
Environmental Monitoring

Share data with sister agencies to stay apprised of environmental changes associated with changes in disease risk:

- Changes in ocean or waterway temperature may enable growth of infectious agents.

- Changes in ambient temperature may put people at greater risk of heat illness.

- Buildout of impervious surfaces will increase risk of urban heat islands and heat illness.

- Community rain water collection could increase mosquito habitats without proper prevention.

- Bioengineered adaptation projects for storm water management and flood control may alter or create new vector habitat.

Water and food safety

As temperatures increase in the ocean and other bodies of water:

- Increase monitoring of water temperature in areas where seafood and shellfish are harvested, as *Vibrio* bacteria contamination can increase after periods of extreme heat.

- Increase frequency of monitoring for harmful algal blooms/toxins.

- Increase frequency of retail food inspections as higher ambient temperatures increase food safety risks.[26]

Disease vectors

The frequency and location of monitoring for disease vectors should incorporate likely changes in the distribution and types of these species with climate change impacts.

- Ideal habitats for disease vectors are expected to expand in some regions, which will require monitoring in areas that were previously outside endemic zones for these species.

- New vector species are expected to move into areas where they were not previously found, so surveillance procedures will need to be altered (i.e. new types of traps and different monitoring times).

- Plan for enhanced surveillance during droughts and after flooding and storm surge events.

- Notify vector-borne disease agencies of mosquitoes tentatively identified as *Aedes aegypti* or *Aedes albopictus*; confirm identification.

- Use data on blighted properties, substandard properties without protections against mosquitos to understand neighborhoods in need of response and education.

Environmental hazards

- Improve air monitoring capacity in areas at known wildfire risk for better warning systems during an event.

- Prepare to monitor for toxics, for example in floodwater in areas at risk of flooding and located in proximity to facilities that store or use hazardous materials or in ash residue following wildfire.

Health equity

Communities change over time, for example with aging; gentrification and displacement may create more rapid change in the economic, race and ethnicity, social and health status, and access to services of neighborhoods. Finding ways to monitor change at the micro level is challenging but important in keeping vulnerability assessments current. Providing information about social and health inequalities in conjunction with environmental and health monitoring data provides context and assists in identifying preventable inequities and the need for targeted interventions.

Health outcomes

Climate change may already be influencing patterns of health outcomes that are reported in vital statistics and other surveillance programs.

- Epidemic curves are a basic tool to describe extreme heat events and other climate-related events of multi-day duration. These curves may be constructed, for example, using the daily number of deaths, hospital admissions, and/or emergency room visits for heat illness and the larger pool of heat-sensitive diagnoses such as cardiovascular disease, diabetes, and kidney disease during and after extreme heat events.[3] Similar data can demonstrate health impacts (e.g. increases in asthma ED visits or hospitalizations) associated with wildfire smoke exposure. Analysis of ER visits during extreme weather events can also provide planning information for emergency services providers.

Data collection and analysis may be done in real time or post-event. Coupled with meteorological data, these data can generate dose-response relationships for longer-term analysis of climate health impacts.[4] Local health departments have established protocols with community physicians, laboratories, and hospitals to exchange data from electronic medical records, and climate-related conditions like heat-illness may be added to these protocols.

- Syndromic surveillance systems provide health data in real time (i.e. a patient comes to a health facility with specific symptoms). These systems are used in heat surveillance programs to:[28,29]

    - assess the severity of an ongoing heat event.

    - allow early detection in disease or injury frequency.

    - target messages to vulnerable communities.

    - justify additional response resources (more cooling center hours or water distribution sites)

    - prepare ER and clinic staff for visit surges.

 Standardized search terms are available for heat and other conditions.[30,31]

For More Information:
- National Notifiable Diseases Surveillance System[39]

- National Syndromic Surveillance Program[40]

- BioSense Platform[41]

- Behavioral Risk Factor Surveillance System[42]

Rapid Epidemiologic assessment

CDC developed the Community Assessment for Public Health Emergency Response (CASPER) system to monitor for health outcomes in emergency and non-emergency settings using neighborhood cluster sampling and personal interviews or direct observation of residential areas.[34] In 2008, the Iowa Department of Public Health teamed with impacted county agencies to use the CASPER methodology to evaluate community needs following severe flooding in the region. Results demonstrated that many households had been displaced and that there were potential risks related to the presence of environmental hazards and disruption in medication access, highlighting the need for improved risk communication and ongoing surveillance during recovery efforts.[35] Other examples of LHD CASPERs include an evaluation of cooling center availability and access in Maricopa County, AZ and an assessment of the health impacts of the 2015 California drought in Tulare County.[36,37]

Surveys

Surveys are an important tool to understand community experience and knowledge of climate-linked extreme events and to assess impacts. In 2014, Macomb County, Michigan experienced unprecedented damage due to historic levels of flooding in areas with little flooding experience. In 2017, the Macomb Health Department (MHD) surveyed impacted residents to ascertain perceptions of the flooding and its long-term physical and mental health impacts.

Intersectoral Collaboration and Health Impact Assessment

Many local health departments are actively engaged in Health in All Policies, strategies that integrate a health lens into policy-making across sectors (See Section 7.3—Collaboration). Providing qualitative and quantitative assessments of the health benefits and/or adverse health consequences of climate action plans, programs and policies is an important strategy for promoting health and health equity.

- Representatives from the Springfield Department of Health and Human Services and the Williamsburg Board of Health collaborated with the Massachusetts Department of Public Health to conduct an HIA of local climate action plans, including assessment of approaches specific for vulnerable populations (i.e. cooling centers during extreme heat events for low-income communities without access to AC).[43]

- The city of Davidson, NC conducted an HIA on the city's Davidson Walks & Rolls: Active Transportation Plan, including a social and health equity analysis to identify priority communities for pedestrian and bicycle improvements. The assessment found that 29% of the city's population lived in areas considered high priority for future active transport infrastructure due to high prevalence of low-income communities and existing chronic disease. The assessment also demonstrated that small increases in biking and walking would result in over $1 million in benefits to the city due to health benefits associated with, in part, reductions in greenhouse gas and resulting climate impacts.[44]

These assessments draw on a wide array of qualitative and quantitative techniques, can be scaled for rapid as well as resource-intensive and rigorous implementation, and have been used to examine many aspects of climate change and health. Community engagement and health equity analysis are key components of health impact assessments (HIAs). For more information on how to conduct an HIA and related community engagement, see Human Impact Partners Health Impact Assessment Toolkit: A Handbook to Conducting HIA.[45]

Current Fossil Fuel Facilities and Projects

LHDs can provide assessments of the health impacts of facilities and projects that may contribute to climate change through supporting or expanding the fossil fuels infrastructure.

- In 2011, the Green River District Health Department in Kentucky completed an HIA on three proposed coal gasification plants to inform the community and policy makers on how benefits from job creation in the region compared to potential health impacts, including on low-income communities and other vulnerable populations.[46,47]

LHD Spotlight:
Maricopa County Department of Public Health[32]

In Arizona, Maricopa County Department of Public Health (MCDPH) obtained hospital data from the National Syndromic Surveillance Program BioSense Platform to implement a heat-related illness (HRI) syndromic surveillance system. Health facilities throughout the county transmitted data from patient records to the BioSense platform. To use this data, MCDPH standardized queries for HRI specifying MCDPH ICD codes and symptom terminology related to heat-illness diagnoses. They also identified "exclusion terms" to prevent non-heat-related cases from being misclassified. The system was validated by comparing emergency room visits identified by the query with the final diagnosis for each result. For more information, see the Heat-Related Illness Syndrome Query: A Guidance Document for Implementing Heat-Related Illness Syndromic Surveillance in Public Health Practice.[33]

The Maricopa County Department of Public Health (MCDPH) is no stranger to extreme heat. In 2005, 35 individuals died over a 9-day period of extreme heat. In response to extended periods of extreme heat, the county set up cooling centers. In order to ensure that these centers were accessible to the most vulnerable populations, MCDPH partnered with the Arizona Department of Health Services and Arizona State University to evaluate community access to and perceptions of cooling centers by surveying facility visitors and managers and observing use during an extreme heat event.

There are 58 private and public cooling centers in Maricopa County. The evaluation found that many cooling centers were open only on weekdays, primarily in community centers, senior centers, and religious institutions without clear or visible signs notifying the public of the availability of a cooling center. The survey also found that 84% of visitors were unemployed, 33% had no permanent residence, and 11% of those who indicated a permanent residence had no air conditioning at their place of living.

Maricopa County subsequently developed a Heat Relief Regional Network to mitigate heat health risks. The Network maintains an updated list of operational cooling centers and their availability and services on a publicly available map, hosts trainings provided by MCDPH and the local National Weather Service, and identifies new cooling center sites.[38]

- In 2016, a public health advisory panel in Oakland, California reviewed the potential health impacts from the proposed transport, storage and handling of coal through the city and in a former army base. The HIA demonstrated the significant increase in concentrations of fine particulate matter ($PM_{2.5}$) this transport and handling would have on surrounding neighborhoods that were already suffering adverse health outcomes from low air quality, poverty, and discrimination. It also highlighted the adverse health risks to Oakland residents resulting from burning the exported coal.[48] This HIA contributed to the decision of the city council to vote to ban shipment of coal from the city, a decision recently overturned in court.

Assessments of the Health Benefits and Harms from Climate Mitigation and Adaptation Strategies

Strategies to reduce carbon emissions may have health consequences beyond reducing pollutants that are generated when fossil fuels burn.

Three such strategies have large potential health co-benefits. First, substituting walking and cycling for short car trips facilitates physical activity, which is associated with reduction in mortality and morbidity due to cardiovascular disease, stroke, dementia, depression, and some cancers.[49,50] Second, substituting plant-based protein for red meat in the diet reduces farm inputs based on fossil fuels (e.g., fertilizers, pesticides, tractor fuel) and methane emissions from ruminants and their waste products. Lower red meat consumption also reduces risk for cardiovascular disease and some cancers.[51,52] A third strategy to achieve health benefits is from improving energy efficiency in residential buildings, particularly through weatherization and ventilation controls that reduce fine particulate pollution.[53]

The Oregon Health Authority carried out an HIA in the transportation sector, using the Integrated Transport and Health Impacts Model (ITHIM). ITHIM quantifies the health benefits and harms of regional transportation plans, mobility goals of state and local transportation agencies, and health-based goals.[54,55,56,57,58,59] This HIA demonstrated that replacing short car trips with walking, cycling and transit would reduce overall mortality and that this benefit is greater than that from air pollution reduction. However, these assessments also show the potential for increased pedestrian and cyclist deaths as walking and cycling increase until better infrastructure for these activities is built.[60]

Knowledge of health benefits and harms can inform jurisdictional partners as they put forward their comprehensive plans, regional transportation and housing plans, and hazard mitigation plans.

Other Intersectoral Collaboration

Increased coordination and data sharing among public health, environmental, meteorological, water, agricultural, emergency responder, and other agencies can facilitate better understanding of the climate impacts, how they are expected to impact infectious disease transmission, and who in your community is most at risk.[61,62]

For More Information

Resiliency and Asset Mapping

- U.S. Climate Resilience Toolkit - Assessing Health Vulnerability to Climate Change: A Guide for Health Departments and Social Vulnerability Index and Metadata Access Tool for Climate and Health (MATCH)[63,64,65]

- GlobalChange.Gov - Climate and Health Assessment[66]

- San Francisco Public Health Department - San Francisco Heat Vulnerability Index[67]

- Centers for Disease Control and Prevention - Preparing for the Health Effects of Drought: A Resources Guide for Public Health Professionals[68]

Example Vulnerability Maps

- San Francisco Flood Vulnerability Maps[69]

- Denver Heat Vulnerability Maps[70]

- Multnomah County Urban Heat Island Maps7[1]

- Minneapolis Climate Change Vulnerability Maps[72]

- Contra Costa Heat Vulnerability Maps[73]

Addressing Heat Vulnerability: Denver Department of Public Health and Environment

Denver Department of Public Health and Environment (DDPHE) plays an integral role in climate change activities in Denver city government. Equity and place are strong themes in Denver's climate action and adaptation plans and its community health needs assessment. DDPHEs *Health in All Policies* program developed a Neighborhood Equity Index based on socioeconomic factors, access to care, built environment, and mortality and morbidity data. In 2014, the City and County of Denver released its first climate adaptation plan identifying increased temperature and urban heat island effects, extreme weather events, and reduced snow pack as priority vulnerabilities. The plan proposed activities to reduce vulnerability and assigned responsibility to specific city departments.

In January 2016, DDPHE began the *Denver Neighborhood Climate and Health Vulnerability Project* (DNCHV), aiming to DDPHE build on its Health in All Policies approach to explicitly incorporate climate change into its work on the upstream determinants of health and engage with diverse partners to integrate climate, health, and equity across divisions and agencies. The goal of the project was to conduct geographically refined climate and health vulnerability assessments and connect them with established city neighborhood-level planning activities such as *Strong Neighborhoods* and *Denver Moves*.

Moving the conversation from climate science to climate and health

DDPHE contracted to develop a heat vulnerability tool in which thirteen variables were combined into a heat vulnerability index using factor analysis. The analysis is displayed on a story map that shows census tract vulnerability to extreme heat in the context of the interconnected socioeconomic, health and environmental conditions that can increase heat vulnerability. The program then engaged with other local agencies and community based organizations (CBOs) to disseminate the tool widely for use in planning and policy development.

In partnership with the Trust for Public Lands (TPL), DDPHE hosted a community forum to discuss how to build a resilient Denver in the face of climate change. The Forum brought together a diverse group of health agencies, CBOs, and academic partners to enable partnerships to assess current health vulnerabilities to climate change and coordinate and prioritize interventions in the most impacted areas. DDPHE then co-hosted a series of climate, health, and equity walks, collaborating with the local Walk2Connect program. The walks provided an opportunity for Denver residents to join health department staff and local experts for fun physical activity on walks that showcased *Denver and Its Water*, *Denver's Urban Forest*, the *Green Roofs Initiative*, and *Gardening in Denver's New Weather*.

In summer 2018, DDPHE examined ways to create relevant messaging that connects climate change to injury prevention and other community concerns. DDPHE partnered with the National Highway Transportation Safety Administration to integrate climate change messaging into heat illness prevention public service announcements (PSA), which will be posted in 40 buses during the month of July. DDPHE also created PSAs for outdoor workers in collaboration with the Parks and Recreation Department and for pet owners in collaboration with Animal Protection division.

Future Work and Lessons Learned

Building on the success of the extreme heat vulnerability map to inform city plans, such as the Denveright Plans, the Ultra-Urban Green Infrastructure Guidelines, and the Neighborhood Plans, DDPHE will continue to disseminate the vulnerability map to partner agencies and organizations to prepare for extreme heat in Denver. Despite the challenges of limited staff capacity, DDPHE continues to work on systems and policy level changes to improve climate resilience and equity throughout Denver. Additionally, DDPHE plans to continue to identify existing messaging campaigns and seasonal health alerts to integrate simple climate change messaging.

Learn More

Department of Public Health and Environment - Heat Vulnerability

Key Action Steps:

- Build on existing *Health in All Policies* initiatives to integrate climate change and health and expand collaboration with new agency partners.

- Conduct a climate and health vulnerability assessment. Make accessible story maps based on the assessment to share with CBOs, policy makers, and other local agencies.

- Collaborate with local CBOs and other local organizations to host community meetings to share the CHEVA and discuss and prioritize community-driven climate resilience and adaptation strategies.

- Establish other avenues to continue community engagement around climate change, built environment, health, and equity (e.g., Walk2Connect).

- Continue meeting with other LHD program and jurisdictional agencies climate champions to support the *Health in All Policies* approach to climate change.

- Integrate climate change messaging into seasonal health messaging and established PSA
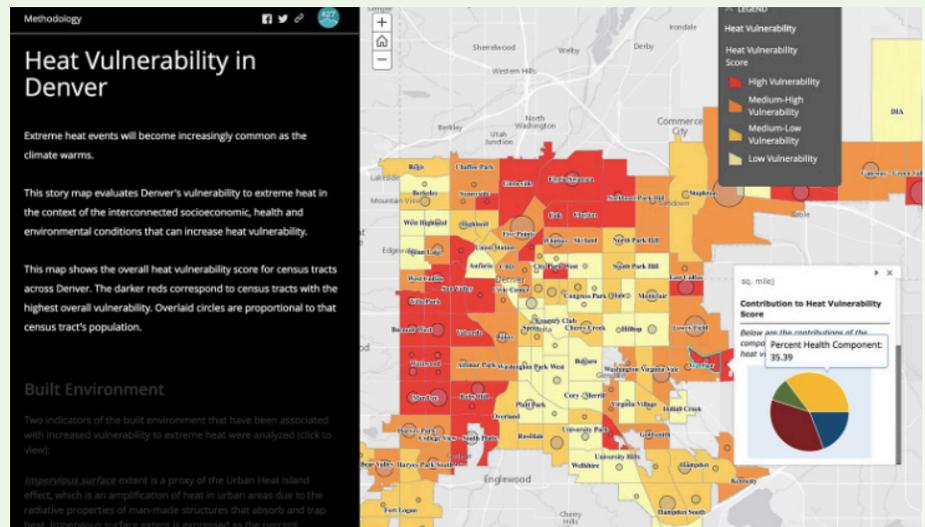
7.2 Community Engagement

"Building an equitable and just climate future will require that all our voices are heard, which also means that we should reject any efforts to diminish our political agency. We are, indeed, at a crossroads on how we will move forward to address one of the most challenging social and environmental problems in history. … The activism being undertaken by women, Indigenous, communities of color, and youth from around the world are leading the way in addressing climate change in just and sustainable ways…Achieving climate equity is about respect, inclusion and collective action."

– Dr. Cecilia Martinez, Center for Earth, Energy and Democracy[1]

A central tenet of patient-centered health care is "nothing about me without me."[2] The same principle applies in public health: community residents must be included in decisions that affect community health. Despite being disproportionately impacted by climate change, low income communities and communities of color have been, at worst, purposefully excluded from and, at best, under-represented in decision making that impacts their health and climate resilience. Climate justice and health equity require that the response to climate change is inclusive, transparent, and accountable.

Community engagement is a critical strategy to ensure that climate action optimizes health and equity co-benefits and avoids missed opportunities or unintended adverse consequences on disadvantaged communities. Community residents and community based organizations can share important information about assets and needs in their communities, nuanced history of neighborhood experience with heat, drought, and flooding, expert input about the likely acceptability and effectiveness of proposed strategies, and ideas for how government agencies can support and facilitate community efforts to build climate resilience and sustainability.

Community-Driven Climate Resilience Planning

- Improve infrastructure for community participation in decision making.

- Build authentic and equitable partnerships between local government and community-based organizations that bring expertise and capacity to build community leadership and facilitate the development and implementation of community- driven climate resilience solutions.

- Increase awareness of structural racism and other systemic issues contributing to disproportionate climate impacts.

- Create more comprehensive solution sets that address the root causes of climate vulnerability.

- Increase communication, coordination and collaboration across governmental agencies for effective disaster preparedness and for implementation of policy and systems changes needed to achieve climate resilience.

– National Association of Climate Resilience Planners[3]

There are many strategies for community engagement entailing a spectrum of involvement and control by the LHD and community, as shown in Figure 7.2.1 below. At all levels of the ladder, communication is critical in order to foster the trust and information-sharing necessary to develop solutions that work to meet community needs. Greater community participation is one measure of community climate resilience.

Figure 7.2.1: Ladder of Community Participation - Adapted from Contra Costa Health Services[4]

THE LADDER OF COMMUNITY PARTICIPATION

1 HEALTH DEPARTMENT INITIATES AND DIRECTS ACTION
Local health department takes the lead and directs the community to act.

2 HEALTH DEPARTMENT INFORMS AND EDUCATES COMMUNITY
Local health department shares information with the community.

3 LIMITED COMMUNITY INPUT/CONSULTATION
Local health department solicits specific, periodic community input.

4 COMPREHENSIVE COMMUNITY CONSULTATION
Local health department solicits ongoing, in-depth community input.

5 BRIDGING
Community members serve as conduits of information and feedback to and from the local health department.

6 POWER-SHARING
Community and local health departments define and solve problems together.

7 COMMUNITY INITIATES AND DIRECTS ACTION
Community makes decisions, acts, and shares information with the local health department.

Conduct a scan to assess potential interest in climate change, health, and health equity. Look for current and new potential partners that address:

- Environmental justice, toxics, air pollution, water, farmland conservation, open space
- Healthy eating and active living, food justice, healthy food systems, transportation access and public transit
- Racial and gender justice, educational equity, economic justice
- Other community-based organizations in neighborhoods that have experienced climate impacts

Conduct outreach to local CBOs and community leaders to begin conversations regarding their interest and activities related to climate change, health, and equity.

- The Minneapolis and New Orleans Health Departments both mapped social and climate vulnerability and then identified community organizations in neighborhoods with higher levels of risk for climate-related health impacts. Formal agreements were made to compensate CBO staff for their time and knowledge in planning, recruiting for, and facilitating workshops held in the communities on climate change and health.

- The Seattle-King County Public Health Department surveyed and interviewed local community leaders to assess their interest in climate change and health and their perceptions and ideas about LHD involvement in addressing the health impacts of climate change. The results informed the *Blueprint for Addressing Climate Change and Health*, which will serve as a guide for LHD action on climate, health, and equity.

Meet potential CBO or community partners where they are: develop an understanding of their current priorities, concerns and challenges, membership and constituency, strengths and resources, and level of interest in climate change and health equity. Help to connect the dots between climate change and the issues various groups are currently addressing.

Recognize and acknowledge the inherent power dynamics between community members and government employees, and between people of color and White people and people with different educational and socioeconomic backgrounds. Provide space and processes—such as agreed on ground rules for meetings and opportunities for one-on-one conversations—to address those dynamics. Reflect on habits and patterns that perpetuate inequities and replace them with practices that support community empowerment.[5]

Share important information about how climate change impacts community health or the health benefits of actions to reduce GHGE. Listen respectfully to community residents who have much to share about their lived experience of climate change and health inequities, community strengths and assets, and how to improve community health in an equitable and sustainable manner.

Identify ways to build community capacity as you partner with CBOs.

- Share information and allocate resources transparently.

- Ask for input as you develop metrics or indicators for climate change and health, share data so that community partners can interpret it, and work with community partners to exhibit and communicate data in ways that are accessible and understandable to community residents.

  - In partnership with local community-based organization, Coalition of Communities of Color and the Portland State University Planning Department, the Multnomah County Health Department created a climate and health indicator tool built from input from community members.[6]

- Share decision-making with community partners

- Make sure that CBO partners and community members are aware of how their input and feedback will be used in LHD and other agency processes.

  - How will information from the community be used in a planning process or program implementation?

- ○ Will the information be shared with other government partners?

- ○ When they can expect to see the results of their participation.

- Establish fair and supportive mechanisms for participation when requesting CBO or community member participation in meetings or other partnership activities.

  - ○ Compensate CBO staff and community members for time spent preparing for and participating in meetings, responding to surveys, providing feedback on reports, etc.

  - ○ Provide food, childcare, and subsidized transportation.

  - ○ Make sure to provide translation in relevant language at meetings, and to translate written materials for non-English speakers.

  - ○ Address the needs of community members with communications impairments, e.g. disabilities such as blindness and deafness.

- Use collaborative Community-Based Participatory Research (CBPR) strategies to identify community challenges, use community knowledge, support community assets and develop community informed and relevant solutions (See Section 7.1—Surveillance).

Environmental Justice Principles
For Policy Implementation At Regulatory Agencies[7]

The California Environmental Justice Alliance and its members developed the following principles to assess whether agencies are effectively integrating environmental justice (EJ) into their policy development and implementation. While most LHD functions are not regulatory in nature, the principles apply to all government agencies.

(1) **Prioritize and value prevention, human health and improving quality of life:** Impacts on health must be given full weight in decision-making, not overlooked in favor of business interests or cost effectiveness, as is often the case, and particular concern must be given to the health and well-being of residents in highly impacted neighborhoods.

(2) **Do no harm:** Regulatory agencies must commit to actions that do not further harms in environmental justice communities. The most egregious decisions are those that actively exacerbate environmental health and justice inequalities.

(3 **Prioritize environmental justice communities:** State regulatory agencies have a responsibility to address the historic legacy of pollution in low-income communities and communities of color. This goes beyond simply preventing future harms, but also providing redress for the impacts of long-standing, disproportionate burdens of pollution. There is an ethical, environmental and public health imperative to ensure environmental justice communities are prioritized for resources, programs, and receive special consideration within regulatory decision-making by state agencies.

Environmental Justice Principles continued

(4) Meaningful community engagement: Residents in environmental justice communities must have the ability and opportunity to inform design and implementation for policies that impact their health and quality of life. Many agencies use a flawed "decide, announce, defend," process whereby an agency determines and releases documentation on a policy devoid of any community input, engages with environmental justice communities in public discussions after-the-fact, and ultimately moves forward with implementing their initial proposed policy without incorporating significant feedback from environmental justice communities. Other times, community organizations and members are engaged in dialogue but agencies do not alter any decisions even after hearing significant feedback. Environmental justice communities must be engaged early, often and in a meaningful way.

(5) Responsiveness: Agencies must respond, and be willing to address, community concerns once they have been articulated rather than simply noting them in the public record. Without a clear commitment to responsiveness, community engagement efforts become a "check box" rather than a meaningful attempt to work with stakeholders in policy design and implementation.

(6) Accountability: Agencies must be accountable for any and all actions, or lack of action, commitments made, and decision-making processes that result in or perpetuate harm to environmental justice communities, related to the agency's area of jurisdiction.

(7) Transparency: Agencies must be clear in: (a) detailing the processes by which all decisions are made and regularly reviewing the processes to ensure accessibility by environmental justice communities, (b) disclosing all factors and stakeholders that inform and influence all decisions affecting all policies and projects, and (c) describing decisions made, in addition to upholding the principles of engagement and responsiveness outlined above.

(8) Proactive partnerships: To be truly stellar on environmental justice issues, agencies need to work proactively and in partnership with environmental justice communities and organizations to develop innovative ways of addressing key environmental justice issues.

For More Information:

- Contra Costa County Health Services - Community Engagement in Public Health[8]
- Urban Sustainability Directors Network - Guide to Equitable Community Driven Climate Preparedness[9]
- Center for Community Engagement & Service Learning - Community Organizing Handbook[10]
- International Association for Public Participation[11]
- Institute for Local Government - Inclusive Public Engagement[12]
- National Association of Climate Resilience Planners - Community-Driven Climate Resilience Planning: A Framework[13]

Supporting Community Resilience: Minneapolis Health Department

The Minneapolis City Council first established goals for greenhouse gas emissions in 2012 (now updated to an 80 % reduction by 2050). The 2013 Minneapolis Climate Action Plan (CAP) focused on energy efficiency, renewables, reducing vehicle miles traveled and developing active transport infrastructure, and reducing the overall waste stream. However, the City did not start to actively consider adaptation and resilience until 2016 when the Minneapolis Health Department (MHD) and the Office of Sustainability (OoS) partnered with the University of Minnesota School of Public Affairs to conduct a climate, health, and equity vulnerability assessment. The goal of the assessment was to identify neighborhoods most vulnerable to climate-related heat and flooding, and work with local residents to develop community-driven strategies to increase resilience to climate-related changes and extreme events. Using indicators of social vulnerability as well as risk factors in the built and natural environments, the MHD/OoS team identified neighborhoods with underlying vulnerabilities that increase the risks due to climate impacts.

Bringing Science to People

The team then reached out to existing and new community partners in three vulnerable neighborhoods, and contracted with groups in each to work with City staff to organize a community climate and health workshop. Staff of the community based organizations (CBO) were compensated for their time spent working with MHD to plan, recruit for, and facilitate the community workshops, each of which included an overview of the health impacts of climate change, the specific climate, health, and social vulnerabilities of the neighborhood, a discussion of residents' experiences and ideas, and specific requests for LHD support and action.

CBO staff provided community connections, insight into issues of concern and community assets, and historical knowledge about prior events that impacted the neighborhoods. The success of the workshops was attributed in part to the willingness of the city team to share resources and decision-making with community residents. The workshops—and the process—increase both community capacity and social cohesion critical components of community climate resilience.

Building on the information from the CHEVA and the community engagement process, the MHD/OoS team contributed to the City's Comprehensive Plan to ensure that climate, health, and equity are prominently featured throughout and elevated as priorities across the City.

Future Work and Lessons Learned

The MHD/OoS team plans to provide continued financial and technical assistance to partner CBOs to organize additional community workshops focused on parental and family preparedness during extreme weather events. MDH is now participating in drafting and reviewing the City of Minneapolis Strategic Plan. For the first time, the plan will include information about the health impacts of climate change and the health and equity benefits of climate action, and an action step to increase community resilience through strategies that enhance social cohesion and build community capitals (See Section 6.5—Preparedness).

Learn More

Minneapolis Health Department - Climate Change Resiliency

Key Action Steps:

- Conduct a climate and health vulnerability assessment including climate and social vulnerabilities (See Section 7.1—Surveillance).

  o Reach out to other LHD programs/ divisions and other city and county agencies to compile data (e.g. asthma ED visits, air quality, heat indexes, tree cover).

- Partner with local community-based organizations to hold workshops to review the CHEVA and brainstorm community-based solutions.

  o Provide funding to CBO partners and use their expertise to shape the workshops and expand resident capacity and engagement.

- Use resident insights and recommendations to inform LHD action on climate, health, and equity.

- Engage in local, regional, and LHD planning processes (e.g. climate action plans, strategic plans, community health improvement plans) to integrate health into climate planning and climate change into health planning.

7.3 Intersectoral Collaboration

As public health practice has deepened its focus on the upstream social determinants of health, it has also shifted from a siloed approach to a more collaborative "Health in All Policies" (HiAP) approach. HiAP is rooted in the recognition that the policies of non-health agencies have profound impacts on health and that integrating health into decision making across sectors is required for policy, systems, and environmental change to create healthy living conditions and opportunities for health for all. It brings together expertise, tools, and decision makers for effective health policy advancement based on five key elements: 1) promote health, equity, and sustainability; 2) support intersectoral collaboration; 3) benefit multiple partners; 4) engage stakeholders; 5) create structural or procedural change.[1]

To identify opportunities for intersectoral collaboration on climate change, health, and equity, ask:

- Which agencies are you already working with whom you can expand your collaboration to integrate climate-related work?

- What other agencies are currently addressing climate change efforts to reduce greenhouse gas emissions and/or efforts to prepare for climate impacts and reduce the effects on the community?

- Are there interagency initiatives that address climate change or impacts, and opportunities for LHD participation?

- Is any agency engaged in strategic planning related to climate change, for which you could offer to provide a health and equity lens and data?

Figure 7.3.1: Spectrum of Collaboration - Adapted from the Policy Consensus Initiative & National Policy Consensus Center[2,3,4]

COLLABORATION
Invites shared responsibility in decision-making and implementation.

ENGAGEMENT
Implies a more active partnership including opportunities for partners and stakeholders to propose solutions and choose priorities.

CONSULTATION
Provides for more specific information gathering for improved decisions, while explicitly reserving the decision-making prerogative.

INFORMATION EXCHANGE
Allows partners to guage reactions, gain insight into other viewpoints, and allay controversy or conflict due to misinformation.

Remember that building partnerships takes time. Be prepared to talk honestly with potential collaborators:

- What are their priorities, concerns, and constraints?

- Who are their partners and stakeholders?

- How do your interests and goals align?

- Why do you think it's important for the LHD to be involved?

- Does your partner have specific concerns about your involvement, or your perspective?

- What might the LHD bring to the table to help your new partner reach their objectives or strengthen a particular initiative or process?

- What specifically can you offer? (data, assistance with community engagement, information, contacts, staff resources)

- Is there something specific you want others to do? (integrate health data into their analysis, share resources)

- Are there specific opportunities for win-win climate action strategies with health and equity benefits (urban greening, local food systems, active transportation)?

Table 7.3.1 provides a few examples of potential opportunities for intersectoral collaboration for climate, health, and equity. Don't forget that robust community engagement and collaboration across programs and divisions within the LHD will strengthen your ability to partner effectively with agencies across the whole of government.

Table 7.3.1 — INTERSECTORAL COLLABORATION FOR CLIMATE, HEALTH AND EQUITY		
Opportunities	**Policies & Programs**	**Agencies (city/county/regional)**
Active Transportation	General and specific area plans Master walking and bike plans Safe Routes to Schools School siting Transit funding (route expansion, schedule expansion, operations, maintenance, reduced fares, youth transit passes, bus stop shading) Parks (location, amenities, funding, maintenance, programming) Trails development, maintenance Tree canopy and urban forestry (location, species)	Metropolitan planning and regional transportation organizations Planning, public works, transportation, parks, and forestry agencies School districts

Opportunities	Policies & Programs	Agencies (city/county/regional)
Healthy & Sustainable Food Systems	Farmer's markets (new, expanded, EBT) Community and school gardens Urban and peri-urban agriculture Healthy food retail Healthy food vending Food waste reduction Edible food donation Gleaning Farm to fork (school, hospital, other institutions)	Environmental health Planning and zoning, business development, agriculture, public works, parks, and waste management agencies School districts Community hospitals
Heat Adaptation	Tree canopy Parks, streams, and water features Hours/amenities/location of public cooling shelters Alerts and warnings School sports policies Cool and green roofs Cool pavements Prevention of utility shutoffs Home weatherization AC provision	Planning, public works, emergency management, parks, forestry, libraries, aging, building, social services, and law enforcement agencies School districts Hospitals Utilities
Flooding	Parks Trees Permeable pavements Green infrastructure (e.g. bioswales) Evacuation	Waste and sanitation facilities Planning and zoning, transportation, water quality, public works, waste and sanitation, and emergency management agencies

For More Information

- National Association of Climate Resilience Planners - Community-Driven Climate Resilience Planning: A Framework[5]

- APHA-CDPH-PHI: Health in All Policies Guide[6]

7.4 Organizational Capacity

Many local health departments recognize climate change as an important issue but are concerned that it's too complex to address without new and dedicated resources. But public health has a long history of taking on challenging emerging issues by building one step at a time on existing skills, resources, and relationships.

Building Organizational Capacity for Climate Change and Health Equity Efforts in LHDs
(adapted from NACCHO Local Health Departments Prepare for the Health Impacts of Climate Change[1])

- Assess current and future health impacts of climate and climate-related hazards in your jurisdiction.

- Develop a comprehensive plan to reduce and prevent health and equity impacts of climate change and increase climate resilience. Integrate local concerns and priorities, evidenced-based results and both mitigation and adaptation strategies.

- Increase cross-sector collaboration around climate change and health equity using a Health in All Policies approach.

- Engage in meaningful partnership with community residents, groups and organizations in climate change adaptation and mitigation efforts.

Getting Started: How ready is your LHD?

An informal assessment and scan may help to determine the level of interest, support, capacity, and resources for climate and health equity work, and to identify available information and potential partners. Many LHD staff have been surprised to learn how much climate-related activity is already occurring in their jurisdictions, and have built new partnerships based on shared interests in expanding climate work.

Climate and Health Equity Readiness and Capacity Assessment
(adapted from the Oregon Health Authority[2,3,4])

Internal

- Is departmental leadership committed to health equity and upstream public health?
    - Are these commitments reflected in the department's strategic plan? Are there upcoming program or department-wide strategic planning processes or community health assessments?
    - Has the department developed data and maps on health inequities?

Climate and Health Equity Readiness and Capacity Assessment
continued

- Interest and support for climate and health work: Is there LHD leadership and senior management support for initiating work on climate and health equity? Are any staff currently interested in and knowledgeable about these topics?

    o What resource might be available? e.g. local philanthropy interest?

    o Is any funding available now or in the near future to support this work? Do any current funding streams allow integration of climate change and health equity, or could they?

    o Can any interested staff devote some time each week to getting started?

- Collaboration: Are there mechanisms in the department that support learning and collaboration across programs? Is the department already engaged in Health in All Policies or other collaborative work with agencies in other sectors such as transportation, housing, agriculture, planning, parks, public works?

External

- Is there support for work on climate change in the jurisdiction broadly - e.g. among executive and elected leadership?

    o Are jurisdiction leaders/managers engaged in work on climate change?

    o Has your jurisdiction had experience with climate-related events, e.g. wildfires, floods, droughts?

    o Are there other agencies nearby who are planning and/or taking action on climate change?

    o Are local elected officials speaking about climate change (or against climate action)?

- Are there local people/resources that can help staff learn about climate impacts in your jurisdiction? e.g. Resilience or Sustainability office? Planning department? local NGOs? local academics?

- Community partnerships: Is the department working with community-based organizations who are concerned about or working on climate change and health equity?

o Are there potential new partners i.e NGOs, environmental justice organizations, academics, businesses - concerned about climate change and health equity?

- Are you familiar with any State laws and funding requirements that mandate or provide incentives for local involvement in climate change?

Depending on the informal assessment, think about how to use even limited capacity and resources to get started. If there is very little support or resources available, identify a couple of interested staff and work together to provide opportunities for staff and leadership to learn about climate change and health. Bring in a local speaker to talk about climate change that relates to a department priority, and use that for initial discussion about what your LHD might do. With management support, suggest conducting a survey to assess staff capacity and interest, or ask to provide an overview on climate and health at some routine trainings or staff meetings.

Understanding the nature of current and projected climate impacts in your region is an important first step to connect the dots between climate change and current LHD work. Look for existing climate assessments, and seek out organizations and individuals with information and expertise about climate impacts in your region.

Be opportunistic: Look for opportunities to connect with others who are interested in climate work, or to bridge current LHD work to climate change. Because climate change exacerbates health inequities and disproportionately impacts disadvantaged communities, and because health inequities and climate change share systemic causes, current work to address chronic diseases, the built environment, social determinants of health, and health and racial equity provide logical building blocks for work on climate change and health equity.

- Are there LHD efforts underway to promote policy and systems changes that also reduce greenhouse gas emissions (e.g. active transportation)? Talk to partners and stakeholders about how these changes have health and climate benefits.

- Has your community experienced climate-related events, such as extreme heat events? If so, talk to those in your department who were involved in response and recovery, or to emergency management agencies, about whether climate change may make such events more frequent or more severe.

- What climate-change related activities are your sister agencies engaged in? Has your jurisdiction done a climate action or climate adaptation or resilience plan? Has your mayor or local governing body signed on to any of the groups of elected officials that are supporting climate action, such as the C40 Compact of Mayors or We Are Still In coalition? Who are their community partners and stakeholders?[5,6]

- Is the LHD or local not-for-profit hospital starting a community health assessment process? Consideration of climate change impacts might be incorporated into that process, or included in the analysis of forces of change in the community. Macomb County Health Department collaborated with a stakeholder coalition to engage in the Mobilizing for Action through Planning and Partnerships (MAPP) process, subsequently incorporating the MAPP outputs indicating areas in which climate change and health could be addressed in the overall Macomb County Community Health Assessment.[7]

- Are any local health care systems engaged in reducing their hospital greenhouse gas emissions, reducing waste, procuring local and sustainable food, or preparing the health care system for extreme weather events?

- Which community-based organizations are engaged in activities directly related to climate change or in advocacy around healthy communities and/or health equity and social justice? Who in the LHD already works with them?

- Are there fossil fuels facilities or infrastructure in the jurisdiction and are there concerns about the health impacts of associated air pollution or water contamination? Has the LHD conducted an assessment of the health impacts?

Staff and Leadership Development

Few public health schools and health professional schools have yet integrated climate change into their curricula. This means that both LHD staff and leadership will need to deepen their understanding of climate change to build capacity to integrate climate change into LHD work.

Survey department leadership and staff to assess current perceptions of climate and health, and the role of LHD programs in addressing these issues. Develop staff and leadership training based on responses.

- Seattle—King County's Public Health Department developed key informant interview guides and survey instruments and interviewed department leadership and staff in Preparedness, Communications, Chronic Disease & Injury Prevention, and Environmental Health Services to assess current perceptions of the nexus between climate, health, and equity and the perceived role of public health. The interviews heightened awareness of the climate-health-equity nexus, and identified individuals interested in a Climate and Health Action Team.

Provide climate change, health, and equity trainings for leadership and staff and brainstorm potential entry-points for climate change in existing programs. Find nearby academics, staff from other agencies, or community partners with relevant expertise. Use this Guide and internet resources to provide more information.

- Faculty and students from the University of California, Los Angeles School of Public Health facilitated trainings on climate change and health for the Los Angeles County Department of Public Health. Participants identified climate impacts that may affect their programs or clients. These trainings served as the foundation for launching of a Climate and Health Workgroup that fleshed out a "Five Point Plan" outlining how LADPH can integrate climate change into its work.[8]

Integrate climate, health, and equity information and trainings into routine staff trainings and new staff orientation to support sustained institutionalization of climate change into LHD activities. New Orleans Health Department hosted an all-staff meeting on climate change, health, and equity as well as a training for Louisiana Health Department's Environmental Tracking Advisory Board.

Provide information to staff about local and regional conferences on climate change.

Develop a peer learning exchange with other LHDs.

- Several Colorado Front Range LHDs meet informally to discuss climate, health and equity priorities and action steps.

Seek to hire individuals who have a background in climate change and health equity/environmental justice.

Greater familiarity and expertise on the impacts of climate change and climate action on health and health equity is important, but promoting health in the era of climate change requires much more. Building LHD skills and capacity in health and racial equity, intersectoral collaboration, community and stakeholder engagement, and effective communication is also vitally important (but beyond the scope of this Guide) See additional resources below.

Organizational Structure

There is no "best" way to structure a climate, health, and equity program within a LHD. Climate change impacts all aspects of public health, so it is important to integrate it across departmental programs over time. It is also important fort LHDs to build relationships with local agencies likely to work to reduce GHGE, using a Health in All Policies approach, and develop partnerships with community-based organizations.

Integration across the LHD, intersectoral collaboration, and stakeholder engagement will be more effective with a "back bone" staff—staff designated at least part-time to coordinate climate-related activities across programs, facilitate the building of staff capacity, and build partnerships with other agencies and community-based organizations. Where this back-bone staff is placed depends on factors including the nature and scope of initial efforts, availability of staff resources and interest, level of commitment by leadership, and current levels of involvement in intersectoral collaboration. Basic administrative support will foster greater success.

Effective LHD climate and health initiatives have been led by staff in Environmental Health, Policy and Planning, Emergency Preparedness, Chronic Disease, and Epidemiology programs. In the California Department of Public Health, the climate and health program is located within the Office of Health Equity. The greater the level of visibility and leadership support for the work of the back-bone staff, the more that staff and external partners will understand that the LHD sees climate change as an urgent issue.

Strategic Planning

"A strategic plan sets forth what an organization plans to achieve, how it will achieve it, and how it will know if it has achieved it. The strategic plan provides a guide for making decisions on allocating resources and on taking action to pursue strategies and priorities."[9]

– Public Health Accreditation Board

Integrate Climate Change into LHD Strategic Planning

Strategic planning offers an ideal opportunity to engage in discussion across the programs about how climate change connects to what you are already doing, and to think through what your LHD can do to address climate change comprehensively. Incorporating goals for climate and health work and designating a responsible party for developing an action plan to meet those goals is critical to support sustained climate action for health within your LHD.

- The Philadelphia Department of Public Health's Preparedness Program established a Climate Change and Health Advisory Group. They engaged numerous divisions in their meetings, including Disease Control, Environmental Health Services, Ambulatory Health Service, Chronic Disease Prevention, and Air Management. The advisory group demonstrated the climate and health connection to each LHD program and reached leadership, resulting in the institutionalization of climate change as an objective in the department's strategic plan.[10]

Develop a Strategic Plan for Climate Change and Health

Development of a strategic plan focused on climate change, health, and equity work within LHDs is a foundational step for sustained action at the local level. Collaborating with division/program leads and motivated staff, local partners, and CBOs to develop priorities into action steps within a strategic plan can take LHD work to the next level.

- Public Health-Seattle and King County's (PHSKC) Climate and Health Action Team developed a *Blueprint for Addressing Climate Change and Health* that reflects the values and priorities of PHSKC, partner agencies, and community partners. The Blueprint builds organizational capacity to address climate change and health with equity as an overarching consideration. It covers climate and health impacts in King County, core public health functions, and strategies to develop internal expertise and assess opportunities to build on current work.

Build and Blend Funding

There is yet no dedicated funding stream for climate change and health. LHDs need to be creative in finding resources. Many LHDs have found that even very small amounts of funding can jumpstart activity and mobilize resources among community partners.

Use existing funding streams to provide resources for climate change work.

- Build work on climate change into proposed Scope of Work for funding from state and federal programs.
  - Propose a climate and health vulnerability assessment as a component of PHEP planning and assessment work.
  - Propose community outreach to prevent heat illness in people with diabetes in a funding proposal for diabetes case management.
- Integrate climate change into routine and new communications.

Talk to local foundations, many of whom are funding academics, environmental organizations, and others to work on climate change.

- Apply for a grant in partnership with local community organizations.

Partner with other agencies that are working on climate change to integrate health funding into their grants or contracts.

Use students, interns, and faculty at local colleges and universities.

- Students from the University of Minnesota worked with the Minneapolis Department of Health and Office of Sustainability to develop a climate and health vulnerability assessment.

For More Information

- Human Impact Partner's Health Equity Guide: Building Organizational Capacity Resources[11]
- Governing Alliance for Racial Equity: Resources[12]
- APHA-CDPH-PHI: Health in All Policies Guide[13]
- Contra Costa County Public Health: Community Engagement in Public Health[14]
- University of Kansas, Center for Community Health and Development: Community Tool Box[15]

A Blueprint for Equity and Justice: Seattle-King County Public Health

Public Health - Seattle-King County (PHSKC) has put the elimination of health inequities at the core of its mission. In 2015, after participating in the development of the King County Strategic Climate Action Plan, PHSKC staff formed a Climate Health Action Team (CHAT) to develop internal expertise on climate change and health, elevate the public health voice for climate action, and develop a strategic approach to PHSKC engagement on this critical issue. The team includes representatives from across the department, including Preparedness, Communications, Chronic Disease & Injury Prevention, and Environmental Health Services.

Building Capacity for Climate and Health

CHAT started with an assessment of internal and external perspectives on the role of public health in climate change. CHAT members conducted key informant interviews with 19 individuals on the Public Health Executive Team, as well as with leaders and staff of community-based organizations in disadvantaged communities. Several key themes emerged from these interviews plus two focus groups at community based gatherings and two surveys—one for PHSKC staff and the other for community stakeholders:

- **Knowledge:** While both PHSKC staff and community residents are aware of climate change and believe it is a health risk, they lack knowledge about specific impacts to health.

- **Priority:** Climate change is not seen as an urgent issue relative to other concerns.

- **Role:** PHSKC should take action and play a leadership role on climate change impacts on health. Action should be grounded in equity and in evidence, integrated into existing functions, and connected to community and to policy development.

- **Equity:** Work on climate and health must address equity and social justice, social determinants of health, at-risk populations, health in all policies, and increased preparedness and resiliency.

- **Collaboration:** Community representation and engagement are essential, including mechanisms to better participation in county decision making processes.

STAY SAFE IN THE HEAT
Check on family and neighbors who may be more vulnerable to heat.

Source: Public Health Seattle-King County

Based on these themes, and with input from CBO partners Puget Sound Sage and Got Green, and from the County Climate Leadership Team, the CHAT team developed a PHSKC Blueprint for Addressing Climate Change and Health. The Blueprint discusses existing opportunities and gaps, outlines strategies to increase internal capacity, and identifies ways in which climate change can be integrated into existing public health programs and functions.

Additionally, CHAT recommended a series of climate and health trainings for PHSKC staff. The Climate Leadership Team requested that those trainings be made available to all county staff. Engagement of senior PHSKC leadership from the outset of the CHAT work has also helped to establish climate change as a priority within the executive team.

Complementary to CHAT's internal capacity building and community engagement efforts, they partnered with University of Washington to develop a comic zine series focused on extreme heat and heat coping strategies. The zine was designed to specifically reflect the cultural and ethnic diversity in the Chinatown-International District and Rainier Valley areas.

Future Work and Lessons Learned

Public health staff are now working with other agencies to determine the most relevant climate and health content for various county staff, and scheduling climate and health trainings across various agencies, to include issues such as storm water, food systems, air quality, extreme heat, and open space.

Learn More

- Beating the Heat, for Your Health

Key Action Steps:

- Establish a Climate and Health Action Team that includes representatives from as many LHD programs/divisions as possible. Include subject matter experts, CBOs, academic institutions, and other relevant stakeholders.

- Conduct interviews and/or survey LHD leadership and staff to assess current knowledge and perceptions about climate and health and LHD action on climate, health, and equity. Conduct interviews, surveys, and focus groups with CBOs, and stakeholders.

- Develop an internal and/or external guidance document for LHD climate action on health. Provide climate and health training for LHD staff and other local agency staff.

- Develop a series of public educational materials that are culturally linguistically appropriate and accessible.

7.5 Greening Local Health Departments

LHDs can implement many practices to lead by example and reduce their own carbon footprint, while contributing to improvements in community health. The National Academies of Science, Engineering and Medicine recommend that "every city should develop a cohesive sustainability plan," and many have already done so.[1] Find out what your jurisdiction and others in your region are already doing, and consult the many resources that are available on greening health care systems, businesses, schools, and government agencies that contain recommended practices that can be easily adopted and adapted for LHDs.

For example, in 2009 the Chattanooga Green Committee (TN) identified electricity production and transportation as the largest contributors of GHG in the region and established an ambitious goal to reduce GHG emissions by 20% by 2020 and 80% by 2050 compared to 1990 levels.[2] Initially the committee focused on increasing energy efficiency and renewable energy procurement, drawing upon nearby wind and solar farms; in 2012 the Chattanooga mayor issued an executive order mandating a 25% reduction in energy use by city departments and buildings by 2020. The committee, Mayor's Office, and other partners continue to advance their goals through green building initiatives, coupled with affordable housing and anti-displacement measures.[3]

Greening" your department reduces GHGE, creates a healthier work and community environment, and saves money through more responsible use of resources. Encourage all staff to be involved in green solutions to show that your department is leading by example to build a healthier and more sustainable community. Encourage all staff to be involved in green solutions and make climate change, health, equity more visible. This will show that your department leads by example and is building a healthier community.

Ten Reasons to Green Your Department

- Greening strategies reduce greenhouse gas emissions
- It promotes responsible use of resources
- Departments save money by lowering expenses
- It creates a healthier work environment
- It encourages teamwork by involving all staff in green solutions
- The climate change, health, and equity connections become more visible
- The department is seen as leading by example, because you will "walk the talk"
- It decreases air pollution, water consumption, and waste
- You can build a healthier community
- It helps to make sustainability a part of everyone's daily life

– Adapted from MyGreenDoctor.org[4]

Use "greening" as an opportunity to talk with colleagues, LHD leadership, and other agencies about climate change, its connection to health and equity, and why it's important for your jurisdiction to lead by example on climate action to improve and protect health.[5]

Establish a "Green Team"

The recommendations below are adapted from the Alameda County, California Green Ambassadors program.[6]

Some action steps require buy-in from senior leadership or other agencies, so it is helpful to seek leadership buy-in from the start by talking about the many benefits of greening the LHD.

Cast a wide net when inviting people to join or lead a Green Team: Green Teams provide an opportunity for staff in all classifications and across programs to work together for meaningful improvement in your work place.

- Use staff meetings and trainings to talk about the Green Team and recruit volunteers to participate. Reach out to other departments and programs in your LHD and request a few minutes during their staff meetings as well.

- Ask managers to send out an announcement about the first several Green Team meetings and to endorse use of work time to participate.

Ask if jurisdiction efforts are already in place to reduce waste, improve energy efficiency, transition to renewable energy, reduce vehicle miles traveled, or implement local and sustainable procurement practices. What resources or recommendations are available from others in sister agencies?

- Find out who is responsible for decision making in these areas, either within your LHD or in another agency, and share information with them about the health benefits of greening.

Identify goals and priorities—it may be helpful to think about ways in which greening relates to LHD goals or to a climate action or sustainability plan.

- Alameda County encouraged employees to participate in a county Clean Commute Challenge that would also increase physical activity rates.

- Los Angeles County Department of Public Health staff are developing proposals to adjust routes for staff who drive a lot for inspections or home visits to reduce miles traveled

Invite members from Green Teams from other agencies, institutions or LHDs in other jurisdictions to attend your meetings and share ideas for action.

Greening Actions

The Tables below provide recommendations for actions to green your LHD related to energy, transportation, waste, and procurement, ranging from those that can be taken by individuals to others that will require more coordination, support and authorization from LHD and jurisdiction leadership.

Table 7.5.1	ENERGY CONSERVATION, ENERGY EFFICIENCY, AND CLEAN ENERGY *(SEE SECTION 5.2—ENERGY)*

- Train staff on energy conservation and efficiency practices
    - Turn off lights, computers, monitors, fax machines, copiers, and printers when not in use
- Work with operations and facilities managers to adopt and implement sustainable, healthy energy practices.
    - Reduce "plug" load in LHD offices by removing personal equipment such as desk lamps and space heaters or installing smart power strips[7]
    - Set thermostats to 74°F (23°C) in the summer and 68°F (20°C) in the winter, put reminder stickers on thermostats, and inspect weekly[8]
    - Audit and monitor building energy use[9]
    - Regularly replace air filters and clean cooling towers to maximize equipment performance.
    - Replace all fluorescent lighting with LED lights.
    - Implement energy efficiency and toxics reduction protocols for custodial and cleaning services[10]
    - Develop and implement a financing plan and schedule for energy retrofit projects[11,12]
    - Use cool and green roofs on new roofs and repairs
    - Purchase energy efficient equipment
    - Incorporate natural ventilation and lighting in new or remodeled buildings
    - Use non-potable water for landscapes[13]
    - Procure renewable energy

Table 7.5.2	SUSTAINABLE AND ACTIVE TRANSPORTATION *(SEE SECTION 5.1—TRANSPORTATION)*

- Encourage and incentivize staff to use transit and active transportation to commute to work.
    - Provide discounted or pre-tax fare cards, showers and locked bicycle storage, and discounts on bike share.
- Support planning and financing of safe active transportation infrastructure (bike lanes, trails, sidewalks).
- Provide a shuttle service from public transit for employees, clients, and visitors to reach your facilities without driving.
- Expand opportunities for telecommuting and allow schedules (e.g. 4 day/10 hour) that reduce commuting.
- For workers who drive to inspection sites or home and provider visits, consider the use of vehicle routing and scheduling apps and scheduling trips so that first and last work assignments are closest to employees' homes, to reduce vehicle miles travelled.
- Limit parking availability, and offer preferred parking for vanpool/carpools
- Install EV charging stations in parking areas and offer preferred parking for electric vehicles.
- Invest in electric vehicles when making fleet upgrades; use low-carbon fuels until then.

Table 7.5.3	HEALTHY AND SUSTAINABLE FOOD *(SEE SECTION 5.3—AGRICULTURE)*

- Encourage staff to eat less meat by providing information about the health and climate impacts.
- Source vegetarian meals from local, sustainable, underrepresented community-based caterers for meetings and events.
    - Creating partnerships will local businesses and farmers for local will reduce transport-related emissions of the food you serve, reducing overall emissions from agriculture systems.
- If your department operates cafeterias or hospitals, implement purchasing/procurement guidelines for healthy foods and provide information to patients, clients, and visitors about healthy and sustainable food. See Health Care Without Harm's Purchasing Considerations—A Supplement to Redefining Protein—Adjusting Diets to Protect Pubic Health and Conserve Resources.
- Establish food waste prevention initiatives (e.g. trayless dining in cafeterias)
- Establish surplus food recovery or donation program in partnership with local non-profit hunger relief agencies.
- Establish composting or food/organics waste recycling program (e.g. partner with local farmer to divert food waste from the waste stream to compost or animal feed)

Waste Reduction, Procurement

Waste production leads to direct greenhouse gas emissions from incinerators and landfills, while also increasing emissions related to the extraction, transport, and processing of raw materials and to manufacture the products.[15] (Tables 7.5.3 and 7.5.4)

- According to the EPA, if the amount of waste generated in the US was reduced to 1990 levels, greenhouse gas emissions would be lowered by 18 million metric tons of carbon equivalent[16]

- Government procurement has immense power to direct public funds to particular food and service providers within a local economy.[17]

Table 7.5.4 WASTE REDUCTION

- Use compostable or reusable dishware in office kitchens and for meetings and events.
- Eliminate the use of bottled water for meetings and events whenever possible.
    - Provide hydration stations in office buildings, clinics, and hospitals.
- Work with operations and facilities managers to adopt and implement waste reduction practices
    - Conduct a waste audit and create a "Waste Management Plan" and strategies to incentivize reuse, recycling, and composting, such as easily accessible bins for recycling and compostable waste.
    - Implement procurement policies that favor office and medical supplies with lower environmental impact, such as those made from 100% post-consumer products.

For More Information:

- National Association of Counties, Green Government - Creating a Green County Team[18]
- New York State Department of Environmental Conservation - How to Boost Energy Efficient in Municipal Facilities/Operations[19]
- International Council for Local Environmental Initiatives - Virtual Library[20]
- Institute for Local Government - Sustainability Best Practices Framework[21]
- The City Fix - Seven Ways to Encourage Sustainable Community in Your Workplace[22]
- Health Care Without Harm - Purchasing Considerations[23]
- Practice Greenhealth[24]
- My Green Doctor[25]

Building Capacity: Los Angeles County Department of Public Health

The Los Angeles County Department of Public Health (LADPH) is the largest local health department in the nation, servicing over 10 million extremely diverse residents. LADPH appears to be unique among local health departments as it has employed a full-time staff member dedicated to coordinate the department's climate change and health efforts since 2014.

The first activities of the LADPH Climate and Health program focused on education and planning. In collaboration with the University of California Los Angeles Fielding School of Public Health, LADPH sponsored a sixteen week workshop series, open to all staff, that provided a comprehensive overview on climate and health, and offered staff an opportunity to brainstorm about how LADPH could expand its work on climate change and released a public-facing report on Your Health and Climate Change. The department also developed a Five Point Plan to Reduce the Health Impacts of Climate Change, which established 5 key priorities: 1) inform and engage the general public about the nature of climate change and the health co-benefits associated with taking action to reduce carbon emissions, 2) promote local planning, land use, transportation, water, and energy policies that reduce carbon emissions and support the design of healthy and sustainable communities, 3) provide guidance on climate preparedness to local government and community partners to reduce health risks and create more resilient communities, 4) build the capacity of departments staff and programs to monitor health impacts, integrate climate preparedness, and improve climate response, and 5) adopt best management practices to reduce carbon emission associate with department al facilitate and internal operations.

In 2015, LADPH sought to expand its climate change work through more intentional engagement of senior management and formation of a cross-department Climate and Health Workgroup. Staff met with 19 LADPH executive staff who were engaged in discussions on how their divisions and programs were addressing climate change, how they could enhance those activities, and who they would nominate for the workgroup In June 2016, a 22-member intradepartmental workgroup was established with representatives from the public information office, operations/facility management, chronic disease prevention and health promotion, environmental health and emergency preparedness, nursing, veterinary health, communicable disease control, health assessment and epidemiology, children's medical services, and women's health. Over the course of the next year, the workgroup identified 25 specific objectives based on the overarching Five Point Plan, guiding the work described below.

The Climate and Health Program also worked with an interagency group to address urban heat islands. LADPH has chaired a multi-agency intersectoral Healthy Design Work Group since 2012. That group created the LA Climate Committee—chaired by LADPH and comprised of Beaches and Harbors, Internal Services, Fire, Parks and Recreation, Public Works, and Regional Planning, specifically to develop an urban heat island reduction plan. The Urban Heat Island Reduction Plan outlines four strategic areas: 1) expand and maintain the urban forest, 2) promote cool roofs, 3) increase urban green space, and 4) promote cool and permeable pavements. Simultaneously, the Committee is also developing an outreach strategy to gain feedback and buy-in for the Plan from key stakeholders.

From 2017 to 2018 the Climate and Health Workgroup developed an Extreme Heat response Framework that outlines objectives and strategies that improve the department's preparedness and response for extreme heat, in order to help protect the public from the health impacts of extreme heat events. The strategies within the Framework reflect the importance of increasing accessibility to information and resources for vulnerable populations. For example, "Objective 1: Target Vulnerable Populations" includes strategies such as "1.2 Partner with organizations serving vulnerable persons to disseminate heat safety information and best practices." Other strategies address accessibility and distribution of cooling centers.

Though a partnership with the LA Department of Parks and Recreation's Parks After Dark program, set up booths at Parks After Dark resource fairs to engage with community members about extreme heat and distribute information about extreme heat resources such as maps to nearby cooling centers. Complementary to this community engagement effort, LACDPH published two articles in the physician newsletter, Rx for Prevention, on climate change, health, and the role of providers.

Future Work and Lessons Learned

Based on the robust foundation of internal capacity building, the LACDPH plans to expand their reach to more robustly engaging with the County's Board of Supervisors. In Summer 2018, LACDPH plans to deliver customized climate change and health presentations to each Board office in order to convey the specific climate, health, and equity impacts for unique populations and constituents.

Additionally, LACDPH plans to continue to engage in the Parks After Dark program to enhance the community engagement process regarding extreme heat.

KEY ACTION STEPS:

- Develop a climate and health training or workshop for LHD staff to increase interest and capacity within the LHD. See LADPH workshops sessions.

- Seek input from LHD leadership and staff to assess current climate and health knowledge and identify potential entry points for climate and health work

- Implement a climate and health work group with participation across LHD programs.

- Develop a plan that includes actionable steps for each LHD program/division to implement in order to meet shared goals

- Collaborate with other county agencies to identify venues and events for public outreach regarding climate and health.

Learn More

- Los Angeles County Environmental Health Division - Climate Change and Health

- Los Angeles County Climate and Health Workshops (LA Regional Collaborative for Climate Action and Sustainability)

- Los Angeles County CalBRACE Climate and Health Profile

- California Department of Public Health's LACDPH Case Story