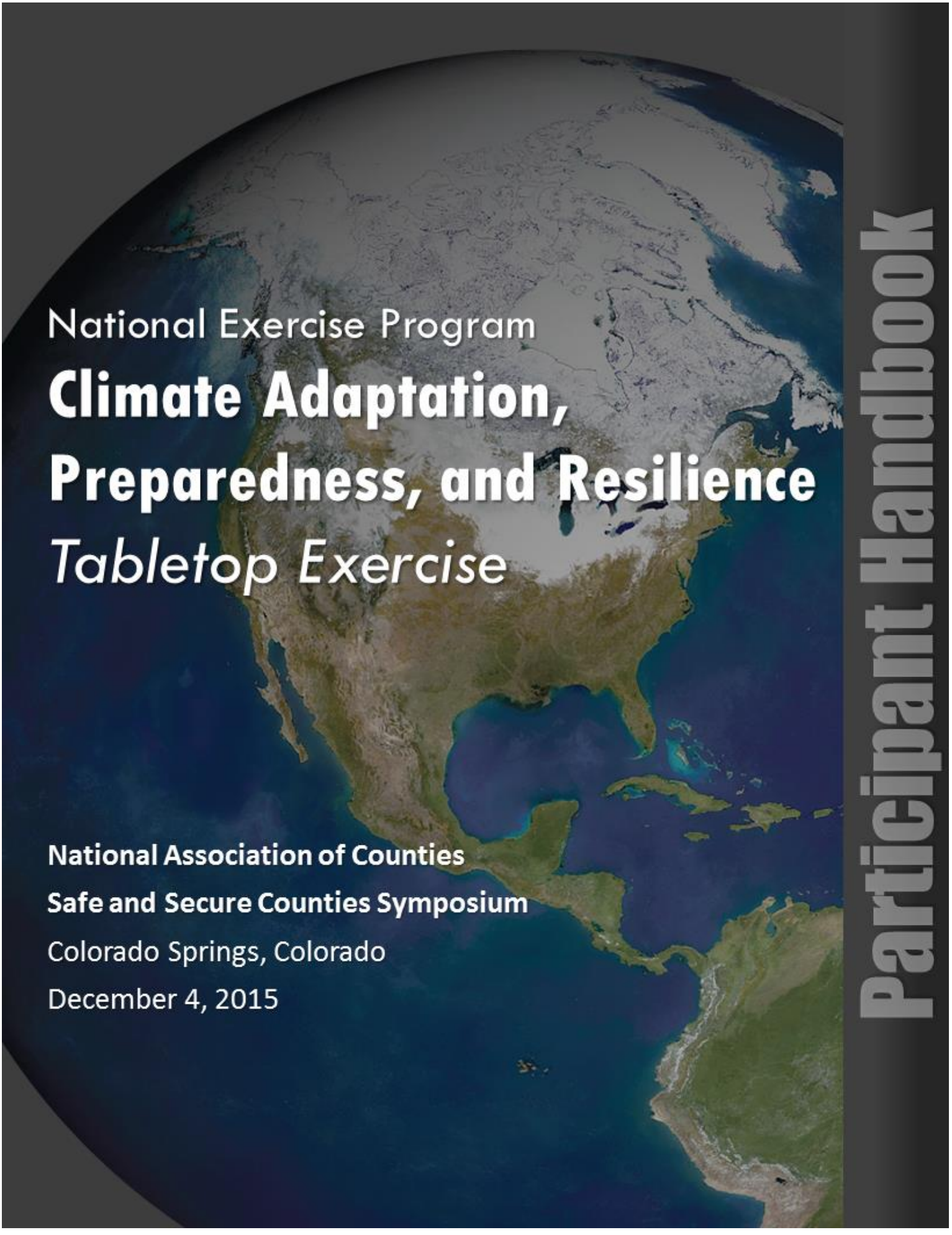

National Exercise Program

Climate Adaptation, Preparedness, and Resilience

Tabletop Exercise

National Association of Counties

Safe and Secure Counties Symposium

Colorado Springs, Colorado

December 4, 2015

Participant Handbook

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INTRODUCTION

In collaboration with the National Exercise Division, the National Association of Counties (NACo) is hosting the Climate Adaptation, Preparedness, and Resilience Tabletop Exercise for the Safe and Secure Counties Symposium. This exercise continues the national climate adaptation dialogue to identify collaborative and sustainable approaches to community-based climate preparedness and resilience capabilities.

Exercise participants include a wide-range of partners who have roles, responsibilities, and varied expertise in adaptation, hazard mitigation, and resiliency planning efforts. The multitude of players and relevant experience supports the goal of improving collaboration amongst whole community partners.

This *Participant Handbook* provides the goals and objectives for the tabletop exercise, detailed scenarios, and discussion questions for discussion during the exercise.

Goal

The primary goal for this exercise is to stimulate climate adaptation and community resilience activities within participants' respective counties to prepare, now, for the second- and third-order effects of a changing climate in the coming decades, consistent with local and state risk management strategies.

Objectives

The three objectives of this tabletop exercise are:

1. To identify and examine adaptation and resiliency strategies for forecasted effects and consequences of changing climate;
2. To identify collaborative and sustainable whole-community approaches to advance and sustain local climate adaptation and resilience programs, policies, and strategies, to include identification of investment opportunities and coalition partners to resource investments; and
3. To examine coordination and collaboration opportunities among members of the National Association of Counties.

The National Exercise Division, in conjunction with the National Association of Counties, will draft a *Summary Report* based on findings from the tabletop exercise discussion and hotwash.

Format

The exercise is a two and a half hour (9:30 a.m-12:00 p.m.), facilitated event that is tailored to the specific needs of the National Association of Counties Safe and Secure Counties Symposium.

Participants will split into multiple breakout groups to discuss one of two scenarios. A facilitator will guide discussion for each breakout group and evaluators will capture key discussion points. A summary of findings will be presented after the main discussion is complete.

Two scenarios will prompt exercise participants for discussion based on information from the *Third U.S. National Climate Assessment*:

- Scenario A: Adapting to Drought and Wildfire Conditions (Southwest U.S., 2045)
- Scenario B: Adapting to Frequent Heavy Precipitation (Northeast U.S., 2045)

The schedule for the event is as follows:

Welcome and Exercise Overview	9:30 a.m.
Scenario Descriptions	9:45 a.m.
Moderated Small Table Group Discussions	10:00 a.m.
Breakout Group Brief-outs	11:00 a.m.
Closing Remarks	11:45 a.m.
Adjournment	12:00 p.m.

Exercise Scope and Assumptions

Exercises play a vital role in national preparedness, enabling whole community stakeholders to test and validate capabilities. Exercises also identify planning requirements for improving preparedness as well as potential capability shortfalls. A well-designed exercise provides a low-risk environment to share understanding of requirements, familiarize personnel with roles and responsibilities, and foster meaningful interaction and communication across organizations. Exercises unite and strengthen the whole community in its efforts to prevent, protect against, mitigate, respond to, and recover from all hazards. Overall, exercises are cost-effective and useful tools that practice and refine the collective capacity to build, sustain, and deliver the core capabilities needed to achieve climate preparedness and resilience.

Exercise participants include attendees of the National Association of Counties Safe and Secure Counties Symposium. Attendees represent a wide-range of backgrounds and areas of expertise (see **Appendix C** for full list of exercise participants). Participants are encouraged to share their expertise and experience. Facilitators will ensure that all participants have an opportunity to contribute to all discussions. The scenarios integrate existing climate issues identified in the *Third U.S. National Climate Assessment*. Discussion questions aim to assist participants in achieving exercise objectives.

Participants should consider the following exercise ground rules to ensure the exercise runs smoothly and meets objectives in a reasonable amount of time:

- Keep exercise objectives in mind throughout the exercise;
- Participate openly – asking questions; sharing thoughts; and offering forward-looking, problem-solving suggestions, and focus discussions on appropriate topics to enhance the exercise experience; and
- Focus comments and consider time constraints.

In any exercise, a number of assumptions may be necessary to complete play in the time allotted. During this exercise, the following apply:

- The scenarios are plausible, and events occur as they are presented;
- There are no "hidden agendas" or trick questions; and
- All players receive the same information at the same time.

Exercise Evaluation

The exercise evaluation process is consistent with Homeland Security Exercise and Evaluation Program doctrine and aligns with requirements of this national exercise guidance. Evaluation efforts validate strengths and identify opportunities for improving climate resiliency by capturing key discussion points, identifying strengths and areas for improvement, and consolidating these discussion points within a Summary Report. This approach affords participating organizations an opportunity to revise, update, or modify current climate change adaptation and hazard mitigation plans and strategies.

The *Summary Report* will capture key discussion points to include the following:

- Recommendations on adaptation and resiliency strategies for forecasted effects and consequences of changing climate
- Recommendations on collaborative and sustainable whole-community approaches to advance and sustain local climate adaptation and resilience programs, policies, and strategies
- Areas of coordination and collaboration opportunities among members of the National Association of Counties

The National Exercise Division will assign evaluators to capture participant discussions. The evaluation team will then produce the *Summary Report* and deliver it to the National Exercise Division within two weeks of exercise conclusion. The exercise planning team will participate in a virtual After-Action Meeting in December 2015 with key participants. The meeting will review the draft, then validate and revise the findings and observations to produce a final output.

Core Capabilities

The National Preparedness Goal, released in September 2011, defines what it means for the whole community to be prepared for all types of disasters and emergencies. It also identified five mission areas – Prevention, Protection, Mitigation, Response, and Recovery – which encompass 32 core capabilities needed to achieve a secure and resilient Nation. This exercise will focus on the Mitigation mission area, comprised of "the capabilities necessary to reduce the loss of life and property by lessening the impacts of disasters." This tabletop exercise focuses on three of the Mitigation mission area core capabilities:

Core Capability	Description[1]
Community Resilience	Lead the integrated effort to recognize, understand, communicate, plan, and address risks so the community can develop a set of actions to accomplish mitigation and improve resilience.
Long-term Vulnerability Reduction	Build and sustain resilient systems, communities, and critical infrastructure and key resources lifelines so as to reduce their vulnerability to natural, technological, and human-caused incidents by lessening the likelihood, severity, and duration of the adverse consequences related to these incidents.
Planning	Conduct a systematic process engaging the whole community as appropriate in the development of executable strategic, operational, and/or community-based approaches to meet defined objectives.

[1] Department of Homeland Security. *National Preparedness Goal*. September 2011.

SCENARIO A: SOUTHWEST UNITED STATES

Scenario Background: Adapting to Future Drought and Wildfire Conditions

As the climate continues to change, longer and more pronounced periods without rain are expected to occur in the southwest U.S. According to the *Third U.S. National Climate Assessment*[2], the potential effects to the southwestern United States include:

- **Projected decline in snowpack and streamflow:** Snowpack and streamflow amounts are projected to decline in parts of the Southwest, decreasing surface water supply reliability for cities, agriculture, and ecosystems.
- **Threatened Agriculture:** The Southwest produces more than half of the nation's high-value specialty crops, which are irrigation-dependent and particularly vulnerable to extreme moisture, cold, and/or heat. Reduced yields from increasing temperatures and increasing competition for scarce water supplies will also displace jobs in some rural communities.
- **Increased wildfires**: Increased warming and drought, all caused by or linked to a changing climate, have increased wildfires and their effects to people and ecosystems in the Southwest. Fire models project more wildfires and increased risks to communities across extensive areas.

Local Background Information for Southwest United States[3]

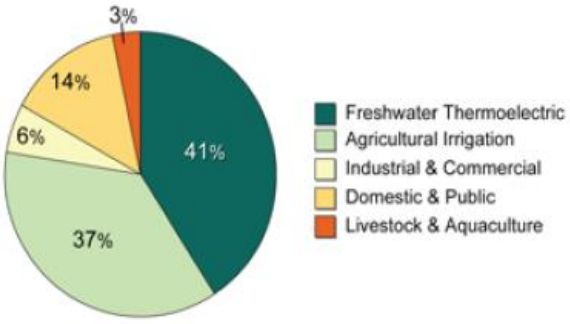
The Southwest is the hottest and driest region in the United States, where the availability of water has defined its landscapes, history of human settlement, and modern economy. Climate changes pose challenges for an already parched region that is expected to get hotter and, in its southern half, significantly drier. Increased heat and changes to rain and snowpack will send ripple effects throughout the region's critical agriculture sector, affecting the lives and economies of 56 million people – a population that is expected to increase 68% by 2050, to 94 million. Severe and sustained drought will stress water sources, already over-utilized in many areas, forcing increased competition amongst farmers, energy producers, urban dwellers, and ecosystems for the region's most precious resource.

Agriculture, a mainstay of regional and national economies, also faces uncertainty and change. The Southwest produces more than half of the nation's high-value specialty crops, including

[2] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 20: Southwest. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 463-486. doi:10.7930/J0NP22CB.

[3] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 20: Southwest. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 463-464. doi:10.7930/J0NP22CB.

Figure 1. Freshwater Withdrawals by Sector



Total water withdrawals (groundwater and surface water) in the U.S. are dominated by agriculture and energy production, though the primary use of water for thermoelectric production is for cooling, where water is often returned to lakes and rivers after use (return flows). *Third National Climate Assessment.*

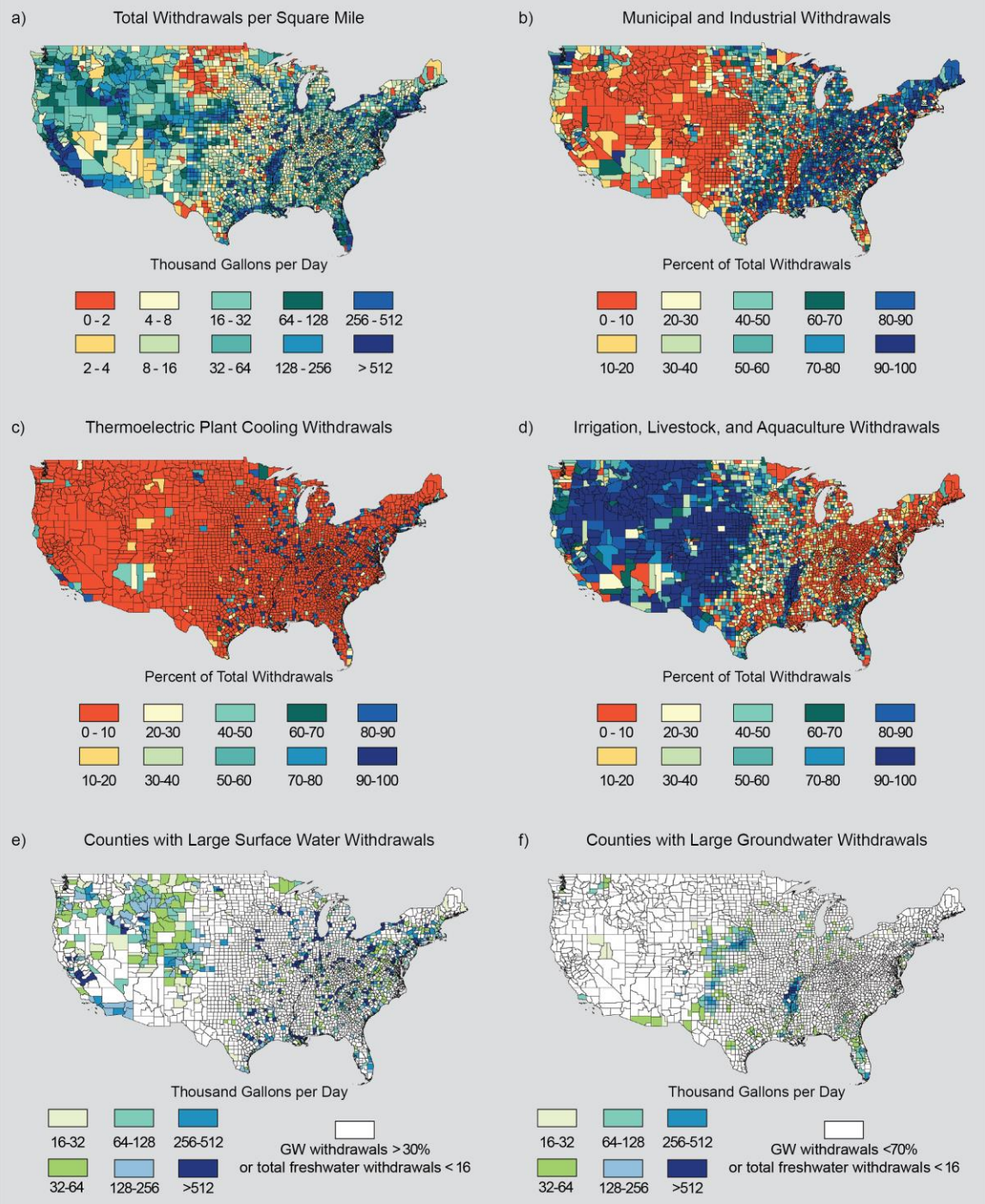
certain vegetables, fruits, and nuts. The severity of future impacts will depend upon the complex interaction of pests, water supply, reduced chilling periods, and more rapid changes in the seasonal timing of crop development due to projected warming and extreme events.

Projected climate changes will increase stress on the region's rich **diversity of plant and animal species.** Widespread tree death and fires, which already cause billions of dollars in economic losses, are likely to increase, forcing wholesale changes to forest types, landscapes, and the communities that depend on them.

Tourism and recreation is a powerful economic generator for the area, thanks to the areas' winding canyons, snow-capped peaks, and Pacific Ocean beaches. The industry, as well as the famous natural landmarks, also face climate-related challenges. The recreational economy will be increasingly affected by reduced streamflow and a shorter snow season, influencing everything from the ski industry to lake and river recreation.

Native communities and tribes experience unique issues in adapting to climate change. Specifically, water infrastructure is in disrepair or lacking on some reservations. Many communities in American Indian nations are not served by municipal systems and must haul water to meet their daily needs. Longer-term impacts of this lack of control over water access are projected to include loss of traditional agricultural crops. Furthermore, there is an overall lack of financial resources to support basic water infrastructure on tribal lands. Uncertainty associated with undefined tribal water rights make it difficult to determine strategies to deal with water resource issues. Potential effects to treaty rights and water resources exist, such as a reduction of groundwater and drinking water availability and water quality decline, including impacts from oil and natural gas extraction and rising sea level-induced saltwater intrusion into coastal freshwater aquifers. New datasets on climate impacts on water in many locations throughout Indian Country, such as the need to quantify available water and aquifer monitoring, will be important for improved adaptive planning.

Figure 2: Observed U.S. Water (Surface and Groundwater) Withdrawal Distribution

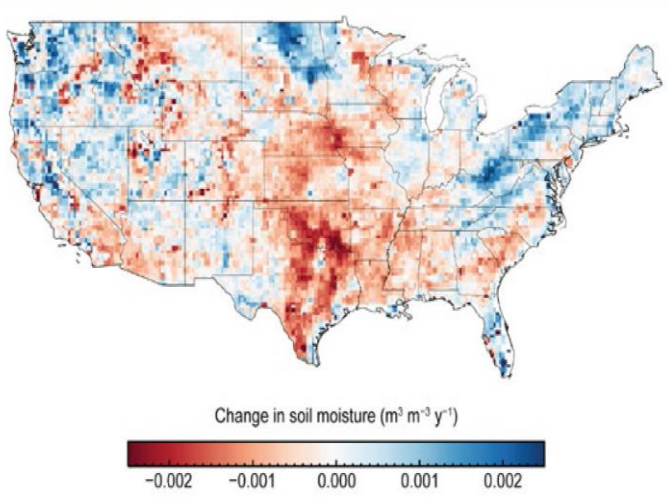


Based on the most recent United States Geological Survey water withdrawal data (2005). This figure illustrates water withdrawals at the U.S. county level: (a) total withdrawals (surface and groundwater) in thousands of gallons per day per square mile; (b) municipal and industrial (including golf course irrigation) withdrawals as percent of total; (c) irrigation, livestock, and aquaculture withdrawals as percent of total; (d) thermoelectric plant cooling withdrawals as percent of total; (e) counties with large surface water withdrawals; and (f) counties with large groundwater withdrawals. The largest withdrawals occur in the drier western states for crop irrigation. In the east, water withdrawals mainly serve municipal, industrial, and thermoelectric uses. Groundwater withdrawals are intense in parts of the Southwest and Northwest, the Great Plains, Mississippi Valley, Florida and South Georgia, and near the Great Lakes. *Third National Climate Assessment*.

Projected Future Climate Changes for the Southwest United States

Projected Increase in Drought: While there has been no universal trend (see **Figure 3**) in the overall extent of drought across the continental United States since 1900, in the Southwest, widespread drought in the past decade has reflected both precipitation deficits and higher temperatures in ways that resemble projected changes. Summer droughts are expected to intensify almost everywhere in the continental U.S. due to longer periods of dry weather and more extreme heat, leading to more moisture loss from plants and earlier soil moisture depletion in basins where snowmelt shifts to earlier in the year.[4] Under a continuation of current rising emissions trends, reduced winter and spring precipitation is consistently projected for the southern part of the Southwest by 2100 as part of the general global precipitation reduction in subtropical areas. Already the Southwest is prone to drought. Southwest paleoclimate records show severe mega-droughts at least 50 years long. Future droughts are projected to be substantially hotter, and for major river basins such as the Colorado River Basin, drought is projected to become more frequent, intense, and longer lasting than in the historical record.[5]

Figure 3. Annual Surface Soil Moisture Trends



Changes in annual surface soil moisture per year over the period 1988 to 2010 based on multi-satellite datasets. Surface soil moisture exhibits wetting trends in the Northeast, Florida, upper Midwest, and Northwest, and drying trends almost everywhere else. *Third National Climate Assessment.*

Winter snowpack, which slowly melts and releases water in spring and summer, when both natural ecosystems and people have the greatest needs for water, is key to the Southwest's hydrology and water supplies. Streamflow totals in the Sacramento-San Joaquin, the Colorado, the Rio Grande, and in the Great Basin were 5% to 37% lower between 2001 and 2010 than the 20th century average flows. Projections of further reduction of late-winter and spring snowpack and subsequent reductions in runoff and soil moisture pose increased risks to the water supplies needed to maintain the Southwest's cities, agriculture, and ecosystems. Temperature-driven reductions in snowpack are compounded by dust and soot accumulation on the surface of snowpack. This layer of dust and soot, transported by winds from lowland regions, increases the amount of the sun's energy absorbed by the snow. This leads to earlier snowmelt and evaporation–both of which have negative implications for water supply, alpine vegetation, and forests. The prospect of more lowland soil drying out from drought and human disturbances (like

[4] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 3: Water Resources. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 75. doi:10.7930/J0NP22CB.

[5] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 20: Southwest. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 465. doi:10.7930/J0NP22CB.

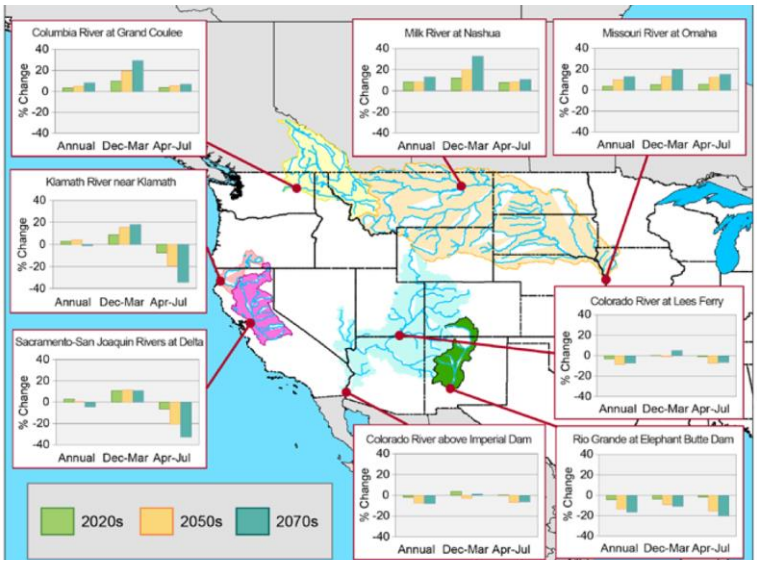
agriculture and development) makes regional dust a potent future risk to snow and water supplies.[6]

Projected Increase in Temperatures: Regional annual average temperatures are projected to rise by 2.5°F to 5.5°F by 2041-2070 and by 5.5°F to 9.5°F by 2070, with the greatest increases in the summer and fall. Summertime heat waves are projected to become longer and hotter, whereas the trend of decreasing wintertime cold air outbreaks is projected to continue. These changes will directly affect urban public health through increased risk of heat stress, and urban infrastructure through increased risk of disruptions to electric power generation. Rising temperatures also have direct impacts on crop yields and productivity of key regional crops, such as fruit trees.

Potential Climate Change Consequences for the Southwest United States

Scarce Water Resources: Intense drought conditions present a huge challenge for regional management of water resources and natural hazards such as wildfire. In light of climate change and water resources treaties with Mexico, discussions will need to continue into the future to address demand pressures and vulnerabilities of groundwater and surface water systems that are shared along the border. Human-caused climate change, when superimposed on past natural variability, may amplify these past extreme conditions. Projected changes in runoff for eight basins in the Northwest, Great Plains, and Southwest are illustrated in **Figure 4**.

Figure 4.
Streamflow Projections for River Basins in the Western U.S.



The panels show percentage changes in average runoff, with projected increases above the zero line and decreases below. Projections are for annual, cool, and warm seasons, for three future decades (2020s, 2050s, and 2070s) relative to the 1990s. *Third National Climate Assessment.*

In California, drinking water infrastructure needs are estimated at $4.6 billion annually over the next 10 years, even without considering the effects of climate change. Conservation efforts have proven to reduce water use, but are not projected to be sufficient if current trends for water supply and demand continue. Large water utilities are currently attempting to understand how water supply and demand may change in conjunction with climate changes, and which adaptation options are most viable.

Increased Wildfire: Drought and increased temperatures have caused extensive tree death across the Southwest. Numerous fire models project more wildfire as climate change continues.

[6] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 20: Southwest. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 465. doi:10.7930/J0NP22CB.

Models project a doubling of burned area in the southern Rockies, and up to a 74% increase in burned area in California. Fire contributes to upslope shifting of vegetation, spread of invasive plants after extensive and intense fire, and conversion of forests to woodland or grassland. Historical and projected climate change makes two-fifths (40%) of the region vulnerable to these shifts of major vegetation types or biomes; notably threatened are the conifer forests of southern California and sky islands of Arizona.

Threats to Agriculture: California produces about 95% of the nation's apricots, almonds, artichokes, figs, kiwis, raisins, olives, cling peaches, dried plums, persimmons, pistachios, olives, and walnuts, in addition to other high-value crops. Drought and extreme weather affect the market value of fruits and vegetables more than other crops because they have high water content and because sales depend on good visual appearance. The combination of a longer frost-free season, less frequent cold air outbreaks, and more frequent heat waves accelerates crop ripening and maturity, reduces yields of corn, tree fruit, and wine grapes, stresses livestock, and increases agricultural water consumption. This combination of climate changes is projected to continue and intensify, possibly requiring a northward shift in crop production, displacing existing growers and affecting farming communities.[7]

Vulnerable Communities: The Southwest's 182 federal recognized tribes and communities in its United States-Mexico border region share particularly high vulnerabilities to climate changes such as high temperatures, drought, and severe storms. Tribes may face loss of traditional foods, medicines, and water supplies due to declining snowpack, increasing temperatures, and increasing drought. Historic land settlements and high rates of poverty – more than double that of the general United States population – constrain tribes' abilities to respond effectively to climate challenges.[8]

Jurisdictional Coordination: Most of the Southwest border population is concentrated in eight pairs of fast-growing, adjacent cities on either side of the United States-Mexico border (like El Paso and Juárez) with shared problems. If the 24 United States counties along the entire border were aggregated as a 51st state, they would rank near the bottom in per capita income, employment rate, insurance coverage for children and adults, and high school completion. Lack of financial resources and low tax bases for generating resources have resulted in a lack of roads and safe drinking water infrastructure, which makes it more daunting for tribes and border populations to address climate change issues. These economic pressures increase vulnerabilities to climate-related health and safety risks, such as air pollution, inadequate erosion and flood control, and insufficient safe drinking water.[9]

[7] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 20: Southwest. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 467. doi:10.7930/J0NP22CB.

[8] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 20: Southwest. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 465. doi:10.7930/J0NP22CB.

[9] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 20: Southwest. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 465. doi:10.7930/J0NP22CB.

Scenario A: Events (Southwest United States, 2045)

It is December 2045. The entire Southwest has suffered a severe drought for more than six years. The overall mean temperature for the region has also increased about six degrees Fahrenheit over the past twenty-five years[10], exacerbating drought conditions and impacts to the environment and communities. Dust-storms have become more frequent and dangerous for nighttime driving and outdoor activity. Nighttime temperatures have not fallen below 85 degrees Fahrenheit in over three weeks, creating an unsafe environment for the elderly, young children, and other vulnerable populations.

Table 1: Scenario A: Estimated Population

State	2010 Population[11]	2045 Population (est.) [12]
Arizona	6.4 million	12 million
California	37.3 million	50 million
New Mexico	2.1 million	2.8 million[13]

For the last nine months, the states of Arizona, California, and New Mexico have each been enforcing mandatory water-use restrictions of up to 50 percent. Along with the drought, this has resulted in significant costs for the agricultural industry, especially in California. Subsequent effects include a roughly twenty percent increase in fruit and vegetable prices nationwide, and thousands of jobs for agricultural workers.[14] Vulnerable communities in tribal nations have been especially hard-hit, experiencing greater effects than the non-native population.

Officials in Scottsdale and the metropolitan Phoenix, Arizona area (**Figure 5**) are monitoring an ongoing (five-week long) wildfire in the Salt River Reservation that has already burned through three thousand square miles, and is approaching residential neighborhoods in Central Scottsdale, including approximately 135,000 housing units.[15] Also in the path of the fire is the Salt River Pima-Maricopa Indian Community (**Figure 6**), with around 9,000 members on 52,600 acres of protected reservation land, much of which is for agriculture and residential neighborhoods.[16]

The Salt River and Scottsdale Fire Department have been fighting the fire for several weeks, but are experiencing significant difficulty due to high winds that strengthen the fire. Officials are considering ordering an evacuation of most at-risk residential areas. Officials in the neighboring jurisdictions of Mesa, Tempe, Fountain Hills, and Phoenix are also closely monitoring the wildfire. The Mayo Clinic Medical Center and HonorHealth Scottsdale Shea Medical Center, both on East Shea Boulevard, are both on alert, checking backup generators, and preparing to

[10] Temperature increase predictions from U.S. Geological Survey. *Climate Research and Development Program: National Climate Change Viewer*. Online resource. http://www.usgs.gov/climate_landuse/clu_rd/nccv/viewer.asp.

[11] U.S. Census Bureau. *2010 U.S. Census: Resident Population Data*. Online Resource. http://www.census.gov/2010census/data/apportionment-dens-text.php.

[12] Population estimated from U.S. Census Bureau projections. *Interim Projections of the Total Population for the United States and States.* Online resource. https://www.census.gov/population/projections/files/stateproj/SummaryTabA1.pdf.

[13] Population estimated from University of New Mexico Geospatial and Population Studies Group (GPS). *Population Projections for New Mexico and Counties.* Online resource. https://bber.unm.edu/demo/PopProjTable1.htm.

[14] Agricultural industry projections from U.S. Department of Agriculture. *California Drought: Food Prices and Consumers.* Web resource. http://www.ers.usda.gov/topics/in-the-news/california-drought-farm-and-food-impacts/california-drought-food-prices-and-consumers.aspx.

[15] 2010 U.S. Census data (projections). Online resource. http://quickfacts.census.gov/qfd/states/04/0465000.html?cssp=SERP.

[16] Salt River Pima-Maricopa Indian Community. *Quick Facts About the Community*. http://www.srpmic-nsn.gov/community/quick.asp.

evacuate if necessary. The Tri Cities Biomass Power Plant is also considering shutting down if the fire turns towards their location along the banks of the Salt River.

Figure 5: Phoenix Metropolitan Area

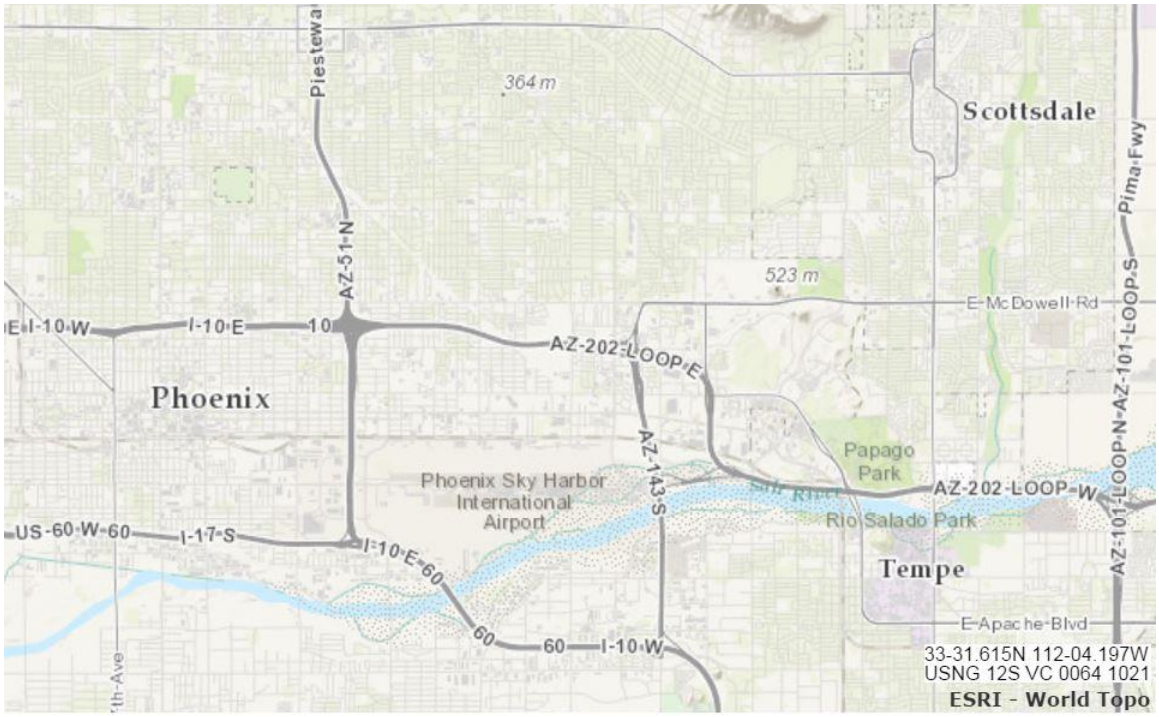
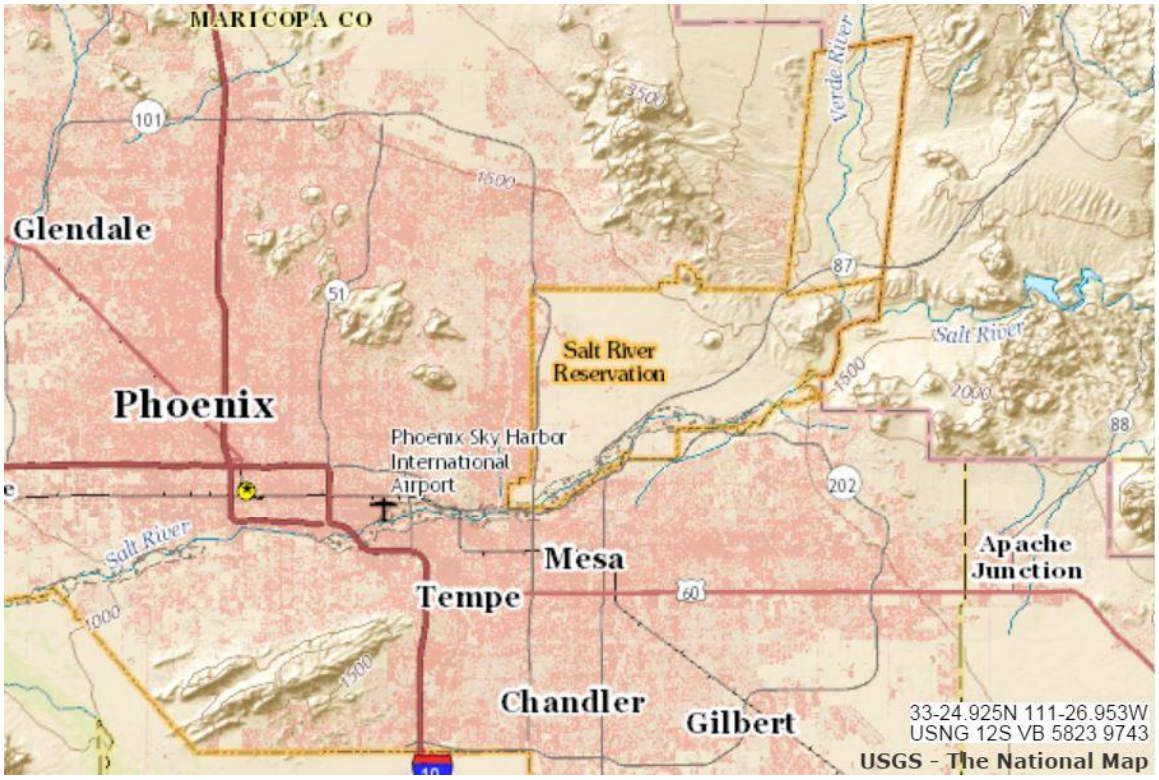


Figure 6: Salt River Pima-Maricopa Indian Community



SCENARIO B: NORTHEAST UNITED STATES

Scenario Background: Adapting to Future Frequent Heavy Precipitation

Changes in the climate are effecting heavier and more frequent rainfall in the northeast U.S. Climate-related risks to this heavily populated and economically important area will have consequences that affect the entire nation. According to the *Third U.S. National Climate Assessment*[17], the climate change impacts to the Northeast include:

- **Increased people and infrastructure vulnerability:** Heat waves, coastal flooding, and river flooding will pose a growing challenge to the region's environmental, social, and economic systems. This will increase the vulnerability of the region's residents, especially its most disadvantaged populations. Infrastructure will be increasingly compromised by climate-related hazards, including sea level rise, coastal flooding, and intense precipitation events.

- **Increased Agriculture and ecosystem compromise:** Agriculture, fisheries, and ecosystems will be increasingly compromised over the next century by climate change impacts. Farmers can explore new crop options, but these adaptations are not cost- or risk-free. Moreover, adaptive capacity, which varies throughout the region, could be overwhelmed by a changing climate.

Local Background Information for the Northeast U.S.[18]

64 million people are concentrated in the Northeast. The high-density urban coastal corridor from Washington, D.C., north to Boston is one of the most developed environments in the world. It contains a massive, complex, and long-standing network of supporting infrastructure. The region is home to one of the world's leading financial centers, the nation's capital, and many defining cultural and historical landmarks.

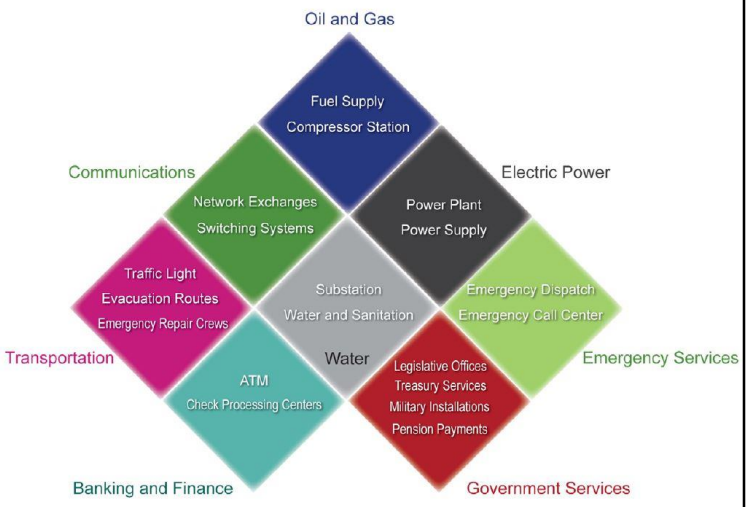
The region has a vital rural component as well. The Northeast includes large expanses of sparsely populated but ecologically and agriculturally important areas. Much of the Northeast landscape is dominated by forest, but the region also has grasslands, coastal zones, beaches and dunes, and wetlands, and it is known for its rich marine and freshwater fisheries. These natural areas are essential to recreation and tourism sectors and support jobs through the sale of timber, maple syrup, and seafood. They also contribute important ecosystem services to broader populations – protecting water supplies, buffering shorelines, and sequestering carbon in soils and vegetation. The twelve Northeastern states have more than 180,000 farms, with $17 billion in annual sales. The region's ecosystems and agricultural systems are tightly interwoven, and both are vulnerable to a changing climate.

[17] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 371-395. doi:10.7930/J0NP22CB.

[18] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 372-373. doi:10.7930/J0NP22CB.

Urban and rural regions in the Northeast have profoundly different built and natural environments, both, however, include populations that have been shown to be highly vulnerable to climate hazards and other stresses. Both also depend on aging infrastructure that has already been stressed by climate hazards including heat waves, as well as coastal and riverine flooding due to a combination of sea level rise, storm surge, and extreme precipitation events.

Figure 7. Urban Support Systems are Interconnected



In urban settings, climate-related disruptions of services in one infrastructure system will almost always result in disruptions in one or more other systems. When power supplies that serve urban areas are interrupted after a major weather event, for example, public health, transportation, and banking systems may all be affected. This schematic drawing illustrates some of these connections. *Third National Climate Assessment*.

Although infrastructure and urban systems are often considered individually–for example, transportation, water supply, or wastewater/drainage–they are usually highly interactive and interdependent.[19] Approximately 245 million people live in United States urban areas, a number expected to grow to 364 million by 2050. Paradoxically, as the economy and population of urban areas grew in past decades, the built infrastructure within cities and connected to cities deteriorated, becoming increasingly fragile and deficient. Existing built infrastructure (such as buildings, energy, transportation, water, and sanitation systems) is expected to become more stressed in the next decades – especially when the impacts of climate change are added to the equation. As infrastructure is highly interdependent, failure in particular sectors is expected to have cascading effects on most aspects of affected urban economies. Further expansion of the U.S. urban landscape into suburban and exurban spaces is expected, and new climate adaptation and resiliency plans will need to account for this. Significant increases in the costs of infrastructure investments also are expected as population density becomes more diffuse.

The vulnerability of different urban populations to hazards and risks associated with the changing climate depends on exposure to particular stressors, sensitivity to impacts, and ability to adapt to changing conditions. As people begin to respond to new information about climate change through the urban development process, social and infrastructure vulnerabilities can be altered. For example, the City of New York conducted a comprehensive review of select building and construction codes and standards in response to increased climate risk in order to identify adjustments that could be made to increase climate resilience. Climate stressors will bundle with

[19] *National Climate Assessment*, Ch. 11 Urban Systems, Infrastructure, and Vulnerability.

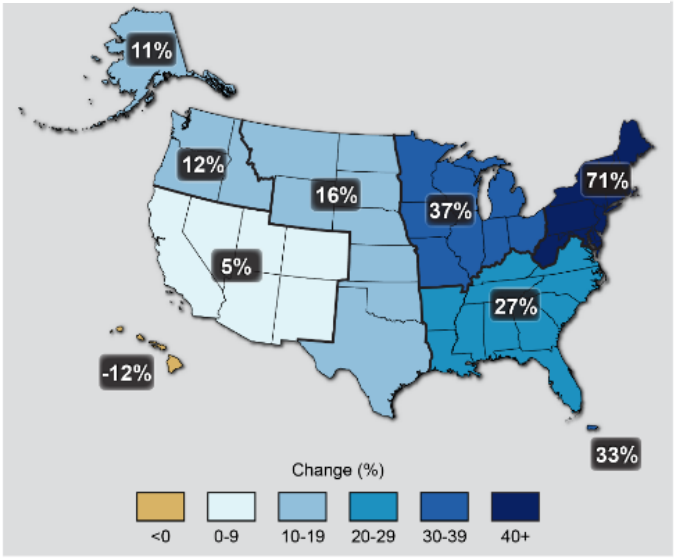
other socioeconomic and engineering stressors already connected to urban and infrastructure systems.[20]

The Northeast is characterized by a diverse climate. Average temperatures in the Northeast generally decrease to the north, with distance from the coast, and at higher elevations. Average annual precipitation varies by about 20 inches throughout the Northeast with the highest amounts observed in coastal and select mountainous regions. During winter, frequent storms bring bitter cold and frozen precipitation, especially to the north. Summers are warm and humid, especially to the south. The Northeast is often affected by extreme events such as ice storms, floods, droughts, heat waves, hurricanes, and major storms in the Atlantic Ocean off the northeast coast, referred to as nor'easters. However, variability is large in both space and time. For example, parts of southern New England that experienced heavy snows in the cold season of 2010-2011 experienced little snow during the cold season of 2011- 2012. Of course, even a season with low totals can feature costly extreme events; snowfall during a 2011 pre-Halloween storm that hit most of the Northeast, when many trees were still in leaf, knocked out power for up to ten days for thousands of households.

Projected Future Climate Changes for the Northeast United States.

Projected Increase in Heavy Precipitation Events: The number and intensity of very heavy precipitation events (defined as the heaviest 1% of all daily events from 1901 to 2012) have been increasing significantly across most of the United States (see **Figure 8**). The amount of precipitation falling in the heaviest daily events has also increased in most areas of the United States. For example, from 1950 to 2007, daily precipitation totals with 2-, 5-, and 10-year average recurrence periods increased in the Northeast and western Great Lakes. Very heavy precipitation events are projected to increase everywhere. Heavy precipitation events that historically occurred once in 20 years are projected to occur as frequently as every 5 to 15 years by late this century. The number and magnitude of the heaviest precipitation events is projected to increase everywhere in the United States.[21]

Figure 8. Observed Change in Very Heavy Precipitation



Winter and spring precipitation is projected to increase, especially but not exclusively in the northern part of the region. A range of model projections for the end of this century under a

[20] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 11: Urban Systems, Infrastructure, and Vulnerability. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 284-285. doi:10.7930/J0NP22CB.

[21] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 3: Water Resources. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 71. doi:10.7930/J0NP22CB.

higher emissions scenario averaged over the region, suggests about 5% to 20% (25th to 75th percentile of model projections) increases in winter precipitation. Projected changes in summer and fall, and for the entire year, are generally small at the end of the century compared to natural variations.[22] The frequency of heavy downpours is projected to continue to increase as the century progresses. In mountainous regions, including much of West Virginia and large parts of Pennsylvania, New York, Vermont, and New Hampshire, more intense precipitation events will mean greater flood risk, particularly in valleys, where people, infrastructure, and agriculture tend to be concentrated.[23]

Figure 9. Trends in Flood Magnitude

Trend magnitude (triangle size) and direction (green = increasing trend, brown = decreasing trend) of annual flood magnitude from the 1920s through 2008. Flooding in local areas can be affected by multiple factors, including land-use change, dams, and diversions of water for use. Most significant are increasing trends for floods in Midwest and Northeast, and a decreasing trend in the Southwest.

Projected Increase in Flooding Events: Flash floods occur in small and steep watersheds and waterways and can be caused by short-duration intense precipitation, dam or levee failure, or collapse of debris and ice jams. Snow cover and frozen ground conditions can exacerbate flash flooding during winter and early spring by increasing the fraction of precipitation that runs off. Urban flooding can be caused by short-duration very heavy precipitation. Urbanization creates large areas of impervious surfaces (such as roads, pavement, parking lots, and buildings) and increases immediate runoff. Stormwater drainage removes excess surface water as quickly as possible, but heavy downpours can exceed the capacity of drains and cause urban flooding.[24]

Projected heavy rainfall events and increased soil moisture results in an increase likelihood of flash flooding, exacerbated in urban areas. Land cover, flow and water-supply management, soil moisture, and channel conditions are also important influences on flood generation and must be considered in projections of future flood risks. Region-specific storm mechanisms and seasonality also affect flood peaks. Because of this, and limited capacity to project future very heavy events with confidence, evaluations of the relative changes in various storm mechanisms may be useful. Warming is likely to directly affect flooding in many mountain settings, as catchment areas receive increasingly more precipitation as rain rather than snow, or more rain falling on existing snowpack. In some such settings, river flooding may increase as a result – even where precipitation and overall river flow decline.[25]

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[22] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 374. doi:10.7930/J0NP22CB.

[23] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 378. doi:10.7930/J0NP22CB.

[24] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 3: Water Resources. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 80. doi:10.7930/J0NP22CB.

[25] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 3:*

Potential Climate Change Consequences for the Northeast United States.

Human Health and Well-Being: Not only are most United States occurrences of Lyme disease in the Northeast, several studies in the Northeast have linked tick activity and Lyme disease incidence to climate, specifically abundant late spring and early summer moisture. Suitable habitat for the Asian Tiger Mosquito, which can transmit West Nile Virus and other vector-borne diseases, is expected to increase in the Northeast from the current 5% to 16% in the next two decades and from 43% to 49% by the end of the century, exposing more than 30 million people to the threat of dense infestations by this species.

Many Northeast cities, including New York, Boston, and Philadelphia, are served by combined sewer systems that collect and treat both stormwater and municipal wastewater. During heavy rain events, combined systems can be overwhelmed and untreated water may be released into local water bodies. In Connecticut, the risk for contracting a stomach illness while swimming significantly increased after a one inch precipitation event, and studies have found associations between diarrheal illness among children and sewage discharge. More frequent heavy rain events could therefore increase the incidence of waterborne disease.[26]

Stressed Infrastructure: Disruptions to services provided by public and private infrastructure in the Northeast both interrupt commerce and threaten public health and safety. Throughout the Northeast, populations are also concentrated along rivers and their flood plains.[27] Flash floods develop within minutes or hours of the causative event, and can result in severe damage and loss of life due to high water velocity, heavy debris load, and limited warning. Most flood-related deaths in the United States are associated with flash floods.[28]

Although infrastructures and urban systems are often considered individually – for example, transportation or water supply or wastewater/drainage – they are usually highly interactive and interdependent. Such interdependencies can lead to cascading disruptions throughout urban infrastructures. Flash and urban floods can very quickly compromise public transit systems, street-level property, electricity and power grids, and waste management systems. These disruptions, in turn, can result in unexpected impacts such as public safety and communication, clean water, and public health sectors, at least in the short term.[29]

Over the past 30 years in the United States, floods have caused 4,586 deaths from 1959 to 2005 while property and crop damage averaged nearly $8 billion (in 2011 dollars). The risks from

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Water Resources. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 75. doi:10.7930/J0NP22CB.

[26] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 377-378. doi:10.7930/J0NP22CB.

[27] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 16: Northeast. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 378. doi:10.7930/J0NP22CB.

[28] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 3: Water Resources. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 80. doi:10.7930/J0NP22CB.

[29] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 11:Urban Systems, Infrastructure, and Vulnerability. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 286. doi:10.7930/J0NP22CB.

future floods are significant, given expanded development in coastal areas and floodplains, unabated urbanization, land-use changes, and human-induced climate change.[30]

Scenario B: Events (Northeast United States, 2045)

It is December 2045. The entire northeast region has been experiencing heavy precipitation for the last few months. Most storm water sewage systems, reservoirs, and natural waterways are completely full or overflowing, and the ground is saturated. The overall mean temperature for the region has also increased about seven degrees Fahrenheit over the past 25 years[31], adding increased ice-melt to northeast watershed systems.[32]

Table 2: Scenario B: Estimated Population

State	2010 Population[33]	Estimated 2045 Population[34]
Connecticut	3,574,097	3.7 million
Delaware	897,934	1million
Maine	1,328,361	1.4 million
Maryland	5,773,552	7.4 million
Massachusetts	6,547,629	7.2 million
New Hampshire	1,316,470	1.8 million
New Jersey	8,791,894	10.2 million
New York	19,378,102	19.4 million
Pennsylvania	12,702,379	12.7 million
Rhode Island	1,052,567	1.1 million
Vermont	625,741	730,000
Washington, D.C.	601,723	390,000
West Virginia	1,852,994	1.7 million

A nor'easter is moving through the region, and already causing issues for low-lying neighborhoods and infrastructure. Across many states, flash floods have swept through residential streets, submerging basements and ground floors in one to two feet of water. In the worst cases, small cars have floated down the street, hitting other cars, power lines, and trees. Community members have reported a few dozen injuries related to flash floods. Thousands of schools and businesses have closed until the floods recede, costing millions of dollars to the economy. Many of the people living in the northeast are also vulnerable populations, including those who live in poverty, with disabilities, and are elderly.

On a busy December Saturday three days into the nor'easter, the Muddy River is overflowing onto the streets of downtown Boston, Massachusetts. Flash flooding in the city has been fluctuating throughout the storm, with some streets impassable for hours at a time. As with all urban centers, Boston has more impervious surfaces than the suburbs, exacerbating the already

[30] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 3: Water Resources. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 80. doi:10.7930/J0NP22CB.

[31] Temperature increase predictions from U.S. Geological Survey. *Climate Research and Development Program: National Climate Change Viewer*. Online resource. http://www.usgs.gov/climate_landuse/clu_rd/nccv/viewer.asp.

[32] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 3: Water Resources. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 72. doi:10.7930/J0NP22CB.

[33] U.S. Census Bureau. *2010 U.S. Census: Resident Population Data*. Online Resource. http://www.census.gov/2010census/data/apportionment-dens-text.php.

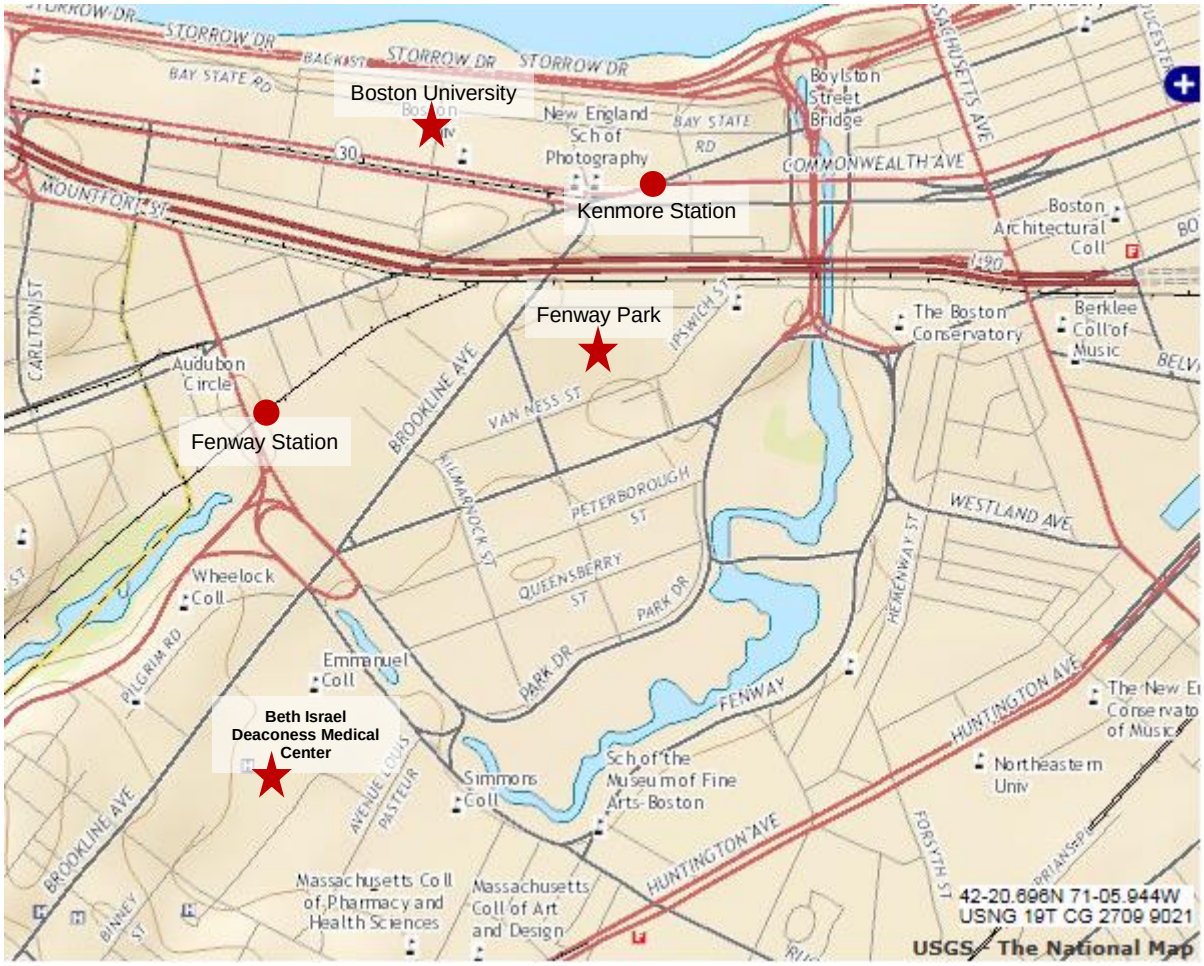
[34] Population estimated from U.S. Census Bureau projections. *Interim Projections of the Total Population for the United States and States.* Online resource. https://www.census.gov/population/projections/files/stateproj/SummaryTabA1.pdf.

inundated storm-water sewage system. Officials learn that water from the Muddy River has breached the subway tunnel at Fenway station, and is filling up the underground Green Line towards Kenmore station. There are two train cars still inside the tunnel between Fenway and Kenmore stations.

In the immediate area on the ground level is Fenway Park stadium, Boston University, and the Beth Israel Deaconess Medical Center. As the Kenmore station is also the juncture point of three branches of the Green Line, the Massachusetts Bay Transportation Authority must decide how many subway stations to close, inevitably cutting off most of the western stations from the main sections of the city.

As emergency response personnel dispatch to the scene, officials are considering the ramifications on traffic if the incident commander decides to shut down busy highways that are in the immediate vicinity of the incident area. There are already congestion and dangerous driving conditions, and forcing traffic away from such a major artery through the city will cause more delays and frustrated drivers. Officials send engineers to check and test the structural integrity of the extensive underground network of subway and highway tunnels throughout central Boston.

Figure 10: Downtown Boston, Massachusetts



APPENDIX A: TABLETOP EXERCISE DISCUSSION QUESTIONS

The following questions are aimed at guiding the discussion during the tabletop exercise. Participants should consider these questions in the context of either scenario. Questions were developed, in part, using *Key Message 11: Adaptation Opportunities and Challenges* from the *National Climate Assessment.*[35]

Consider these questions in the context of the scenario, or of your own jurisdiction:

1. Climate adaptation involves both addressing risks and leveraging opportunities that may occur from climate shifts. What key challenges related to the scenario does the community face in the short- and long-term?

2. Climate change will stress already aging infrastructure to varying degrees across the country over time. What specific challenges does the scenario pose to this issue?

3. If no action was taken to adapt to climate change in these regions, how would the scenario affect health and social services in the community, given the expected rise in population and projected socio-economic conditions of the mid-21st century?

4. The economic, social, and environmental implications of climate change have already shown to be significant, as is the cost of inaction to adapt. What are the costs and benefits of available action versus no action when it comes to community preparedness and adaptation?

5. In the past few years, many local, state, federal agencies and tribal governments have begun to address climate adaptation and resilience, integrating it into existing decision-making, planning, or infrastructure-improvement processes. Discuss some specific examples of how this has been done in your jurisdiction.

6. How can communities incorporate climate change adaptation into existing societal goals, such as sustainable development, disaster risk reduction, or improvements in quality of life?

7. What long-term natural infrastructure development or re-development efforts should the community pursue to prepare for the climate impacts expected in 2045?

8. Adapting to climate change can offer co-benefits for communities. What investment opportunities or co-benefits exist for communities to adapt to a changing climate?

9. What public messaging/communications strategies have you developed or observed that have been effective? What public messages or strategies can planners utilize and implement? Will using these messages and strategies in the present connect with the public on issues related to climate adaptation and hazard mitigation in the long-term?

10. How do you communicate the risks of climate change to your elected officials and other key decision-makers?

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[35] Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear, *2014: Ch. 3: Water Resources. Climate Change Impacts in the United States: The Third U.S. National Climate Assessment*, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 89-90. doi:10.7930/J0NP22CB.

11. National, state, and local policies play an important role in fostering and sustaining adaptation. At present, there are no national regulations specifically designed to promote urban adaptation. How can the whole community coordinate today to ensure that the adaptation actions taken now are effective to withstand the projected climate impacts of 2045?

Consider these questions in the context of your own jurisdiction:

12. Has your department/agency faced challenges that affect collaborative adaptation planning? What strategies have you already implemented or could implement in the future to remove those obstacles?

13. What incentives can be pursued to enhance local, state, tribal, and federal preparedness and resilience in the face of climate change risks in the short-, mid-, and long-term?

14. Have you shared success stories or lessons learned with your peers? If so, does this occur on a regular basis? If not, how can communities share success stories and strategies with peers?

APPENDIX B: ADDITIONAL RESOURCES

White House Resources:

- Council on Environmental Quality: http://www.whitehouse.gov/administration/eop/ceq/initiatives/resilience
- Office of Science and Technology Policy: http://www.whitehouse.gov/administration/eop/ostp
- White House Climate Data Initiative: http://www.data.gov/climate/

Federal Resources:

- The U.S. Climate Resilience Toolkit: https://toolkit.climate.gov
- The U.S. Global Change Research Program: www.globalchange.gov
- Third U.S. National Climate Assessment: http://nca2014.globalchange.gov
- Third U.S. National Climate Assessment Download Materials: http://www.globalchange.gov/nca3-downloads-materials
- FEMA Map Journal: http://napsg.maps.arcgis.com/apps/MapJournal/index.html?appid=fef06301a9504f548bb1c69c5994c506
- The U.S. Global Change Research Program Adaptation Page: http://www.globalchange.gov/explore/adaptation
- The U.S. Global Change Research Program Federal Adaptation Resources Library: http://www.globalchange.gov/browse/federal-adaptation-resources

Regional Resources:

- Third U.S. National Climate Assessment: Regions: http://nca2014.globalchange.gov/report#section-1948
- Third U.S. National Climate Assessment: Southwest Region: http://nca2014.globalchange.gov/report/regions/southwest
- Third U.S. National Climate Assessment: Northeast Region: http://nca2014.globalchange.gov/report/regions/northeast

Status of State and Local Adaptation Planning:

- Georgetown Climate Center: http://www.georgetownclimate.org/adaptation/state-and-local-plans

APPENDIX C: EXERCISE PARTICIPANTS

Organization	State
Clarke County	Alabama
Morgan County	Alabama
City and Borough of Juneau	Alaska
Arizona Association of Counties	Arizona
Coconino County	Arizona
Maricopa County	Arizona
Clark County	Arkansas
Randolph County	Arkansas
Colorado Counties	Colorado
Douglas County	Colorado
El Paso County	Colorado
Larimer County	Colorado
Otero County	Colorado
Ouray County	Colorado
Kent County	Delaware
Broward County	Florida
Leon County	Florida
Miami-Dade County	Florida
DeKalb County	Georgia
Rockdale County	Georgia
Honolulu City & County	Hawaii
Kauai County	Hawaii
Maui County	Hawaii
Ada County	Idaho
Idaho Association of Counties	Idaho
Idaho Public Health North Central District	Idaho
Valley County	Idaho
Black Hawk County	Iowa
Iowa State Association of Counties	Iowa
Linn County	Iowa
Polk County	Iowa
Jefferson County	Kentucky
Lafourche Parish	Louisiana
St. James Parish	Louisiana
Baltimore City	Maryland
Queen Anne's County	Maryland
Michigan Association of Counties	Michigan
Oceana County	Michigan
Wayne County	Michigan
Blue Earth County	Minnesota
Carver County	Minnesota
Hennepin County	Minnesota
Ramsey County	Minnesota

Jasper County	Missouri
Phillips County	Montana
Douglas County	Nebraska
Pershing County	Nevada
New Hampshire Association of Counties	New Hampshire
McKinley County	New Mexico
New Mexico Association of Counties	New Mexico
San Miguel County	New Mexico
Cleveland County	North Carolina
Durham County	North Carolina
North Carolina Association of County Commissioners	North Carolina
Pitt County	North Carolina
Cass County	North Dakota
Dunn County	North Dakota
Lake County	Ohio
Union County	Ohio
Association of Oregon Community Mental Health Programs	Oregon
Jackson County	Oregon
Multnomah County	Oregon
Berks County	Pennsylvania
County Commissioners Association of Pennsylvania	Pennsylvania
Greenville County	South Carolina
Fall River County	South Dakota
Lincoln County	South Dakota
Tarrant County	Texas
Washington County	Utah
Weber County	Utah
Fairfax County	Virginia
Spotsylvania County	Virginia
Virginia Association of Counties	Virginia
King County	Washington
Pierce County	Washington
Skagit County	Washington
Ohio County	West Virginia
Dunn County	Wisconsin
Eau Claire County	Wisconsin
St. Croix County	Wisconsin
Vernon County	Wisconsin
Wisconsin Counties Association	Wisconsin
Laramie County	Wyoming