

Chapter 3: Climate Resilience

The Western New York region is already experiencing changing climate conditions. Some of the most noticeable changes are increasing temperatures, more severe storms, and changing precipitation patterns.¹³ Climate projections suggest that these trends will continue, especially under the most severe GHG emission scenarios.¹⁴ These changing conditions present significant risks to Erie County and its residents. Particularly concerning are the disproportionate impacts that climate change has on vulnerable populations (e.g., elderly, youth, and disadvantaged communities).¹⁵ Some of the major climate change impacts that are expected in the Western New York region include, but are not limited to:

- Increased temperatures and more frequent and intense heat wave events.
- Increased intensity of both floods and drought.
- More intense wind and precipitation events, magnified by warmer lake temperatures.
- Longer growing seasons, and changes in what type of crops are able to be effectively grown.
- More variability in lake levels and increased shoreline erosion on Lake Erie.
- Warmer Lake Erie temperatures that exacerbate algal blooms, leading to polluted water.
- Amplified threats to public health (e.g., reduced air quality, risk of disease-carrying insects, and extreme temperatures)

Understanding and addressing the threat posed by climate change is essential for Erie County to prosper economically, socially, and environmentally. It is also critical for enabling the County to remain a safe, livable, and vibrant place to live, work, and visit. Erie County has a leading role in supporting vulnerable people in our community through emergency services, public health, and human services. Therefore, it is especially important that the County is ready to protect our community from the impacts of climate change.

While Erie County is vulnerable to climate change impacts, it is located far away from the ocean, has an existing temperate climate with fertile soils, and its proximity to significant freshwater resources buffers it in comparison with areas that are or will be adversely affected by the same factors. Because Erie County has less vulnerability and more nature-based resiliency than many places, the County needs to prepare for climate-related immigrants and refugees as drought, sea level rise, and other threats dislocate populations within the United States and around the world. A large future influx of climate immigrants and refugees has the potential to create complex problems that could be strategically alleviated with more intentional plans and programs now. For example, a population increase typically results in increased housing costs, increased

¹³ Great Lakes Regional Integrates Sciences and Assessments Center (GLISA)(2021). 2021 Annual Report. Available at: <https://glisa.umich.edu/publication/2021-annual-report/>

¹⁴ New York State Energy Research and Development Authority (2014). Climate Change in New York State: Updated Climate Projections Report. Available at: <https://www.nyserda.ny.gov/-/media/Project/Nyserda/Files/Publications/Research/Environmental/ClimAID/2014-ClimAid-Report.pdf>

¹⁵ New York State Climate Act: Disadvantaged Communities Criteria Face Sheet. Available at: <https://climate.ny.gov/-/media/project/climate/files/LMI-dac-criteria-face-sheet.pdf>

development pressures, and the displacement of existing low- and moderate-income residents. The County will need to work with local government and community partners to assure that we are prepared for and welcoming to climate immigrants and refugees while also minimizing impacts to existing residents.

At the outset of this planning process, the Task Force assembled a Climate Resilience Work Group (“Work Group”) to guide the efforts on this topic. The Work Group determined that because climate resilience touches most aspects of climate action, from transportation to agriculture, this Plan must include climate resilience strategies and actions in each of the sector chapters. A process was implemented where each strategy in all the chapters was reviewed by the Work Group as they were developed, which assured a coordinated and comprehensive treatment of resilience topics within the Plan.

This remainder of this chapter is written in two parts. The first part is a summary of the County’s recently completed Climate Vulnerability Assessment, which serves as a guidepost to actions the County needs to take to protect the community. The second part of this chapter is a discussion of several overarching climate actions that are important to consider for the subsequent chapters.

Climate Vulnerability Assessment

To understand the implications of future climate impacts to our community, the county partnered with a research group at the University at Buffalo led by Dr. Susan Clark to conduct a [Climate Vulnerability Assessment \(CVA\)](https://www3.erie.gov/climateaction/climate-vulnerability-assessment).¹⁶ The CVA identified some of the County’s key climate threats and hazards, assessed how sensitive the County is to these threats, and examined the current capacity to handle these hazards at the County level. The results inform this Plan regarding actions needed to reduce the impact of future events resulting from climate change.

Based on a literature review and stakeholder input, four hazard categories were selected to investigate: 1) temperature focused on extreme heat; 2) precipitation focused on local and downstream flooding; 3) wind focused on shifting wind patterns and thunderstorm winds; and 4) biological threats focused on invasive species and vector-borne disease. These were selected from a longer list of climate threats based on their frequency and duration in Western New York, County jurisdiction, and impacts posed by the threats. The CVA also included a mobility analysis of Erie County residents during an emergency.

Sensitivity to Extreme Heat

Sensitivity to extreme heat is a major concern for Erie County, and it is predicted that the region will experience more frequent and more intense heat waves in the future. Where the County has more experience addressing extreme cold and lake effect snowfall events, vulnerability to heat waves and elevated temperatures is particularly problematic for its residents and infrastructure,

¹⁶ <https://www3.erie.gov/climateaction/climate-vulnerability-assessment>.

which are both unaccustomed to high temperatures. This is a particular concern for the County's many residents who have health issues that make them vulnerable to heat, and who may live in unprotected, poorly insulated housing without air conditioning.

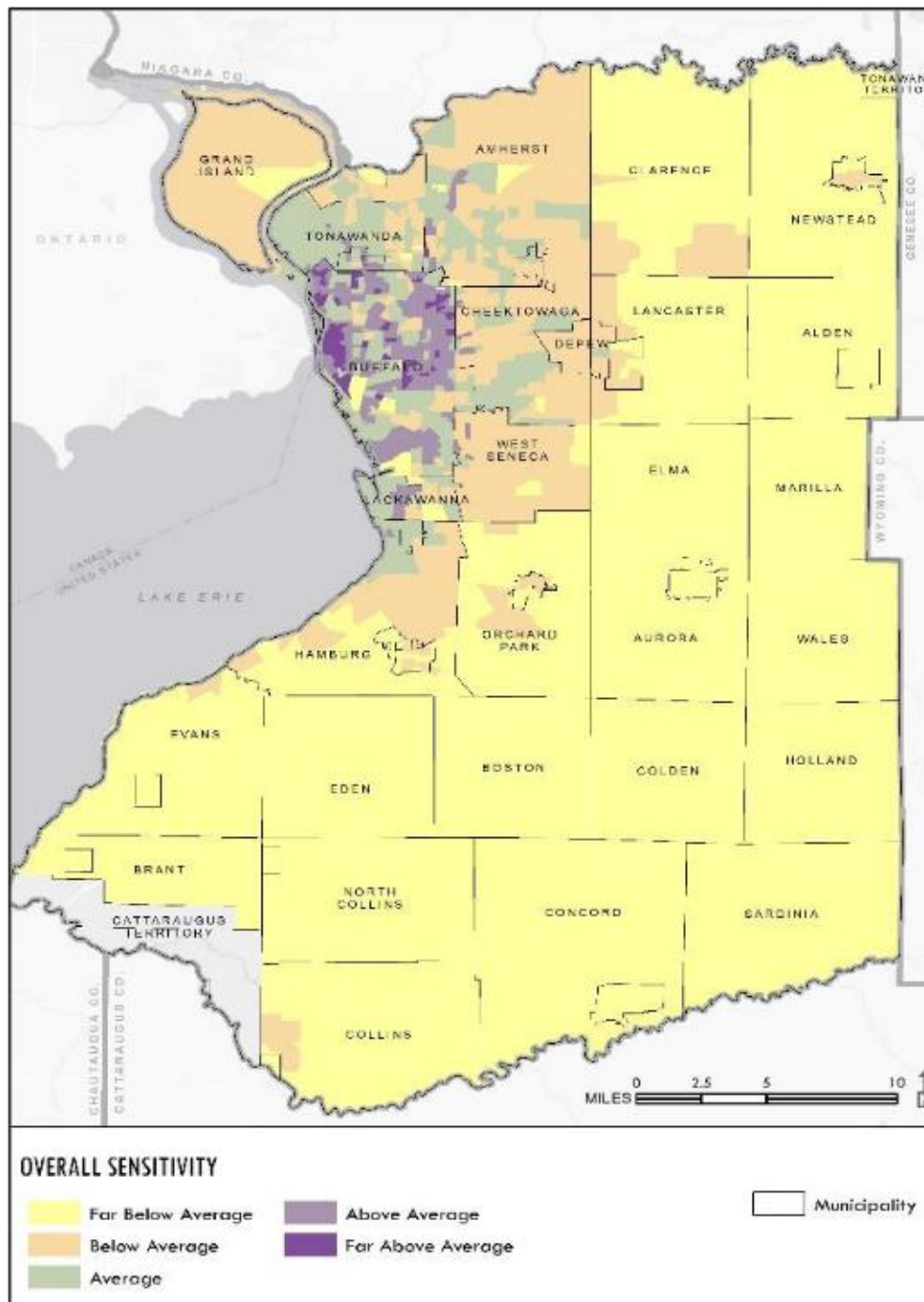


Figure SEQ Figure * ARABIC 3. Overall sensitivity to extreme heat, including both landscape and socio-demographic factors.

To assess sensitivity to extreme heat for the CVA and this Plan, the County considered landscape factors including tree canopy, proximity to water sources, the prevalence of paved surfaces, and industrial parcels. We also considered socio-demographic factors related to economic, social, physiological, and mobility factors of County residents. When both the landscape and socioeconomic factors are considered, the overall results (Figure 3) indicate that urban areas of the County, which are predominantly located in and around the City of Buffalo, are the most highly sensitive to extreme heat, while much lower extreme heat sensitivities are found in rural areas. The most sensitive locations are, in general, characterized by a high percentage of economic- and mobility-sensitive populations with a relatively low percentage of tree cover, more paved surfaces, and a high number of surrounding industrial parcels and/or truck terminals, which have a warming effect on surrounding areas.

Sensitivity to Flooding

Patterns in precipitation are changing because of the impacts of climate change, and this has resulted in greater frequencies of extreme rainfall and snow events. These events exacerbate flooding and runoff issues, which impact Erie County's property and operations as well as private property. There is also an increased risk of injury or death to the general public.

To create this Plan, sensitivity to flooding was looked at regarding local flooding, on-site flooding, and downstream flooding. The local flooding assessment shows large regions of Erie County's urban areas in and around the City of Buffalo, as well as areas along the northern border of the County, with the highest sensitivities. There are above-average sensitivities located throughout the central and southern areas of the County as well. The downstream flooding assessment suggests that while most of Erie County is characterized by far-below-average sensitivities, there are areas, located mostly in the northern part of the County and along waterways that are highly sensitive to downstream flooding. It is important to note that stormwater infrastructure is not factored into either of these analyses and tends to mitigate risks in the more urban areas.

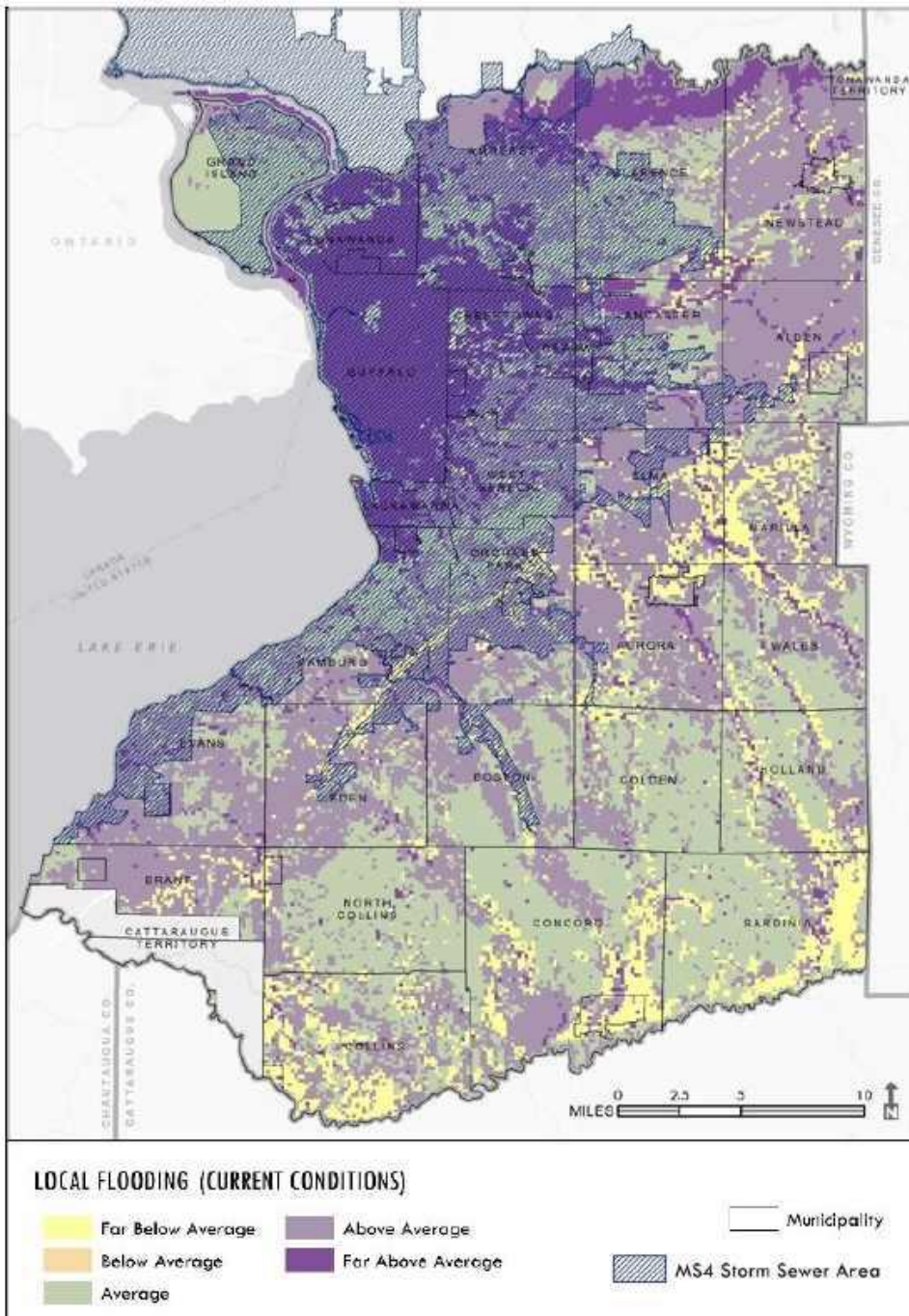


Figure 4. Sensitivity to local flooding based on the capacity of soils to infiltrate water and FEMA's 100-year flood risk areas.

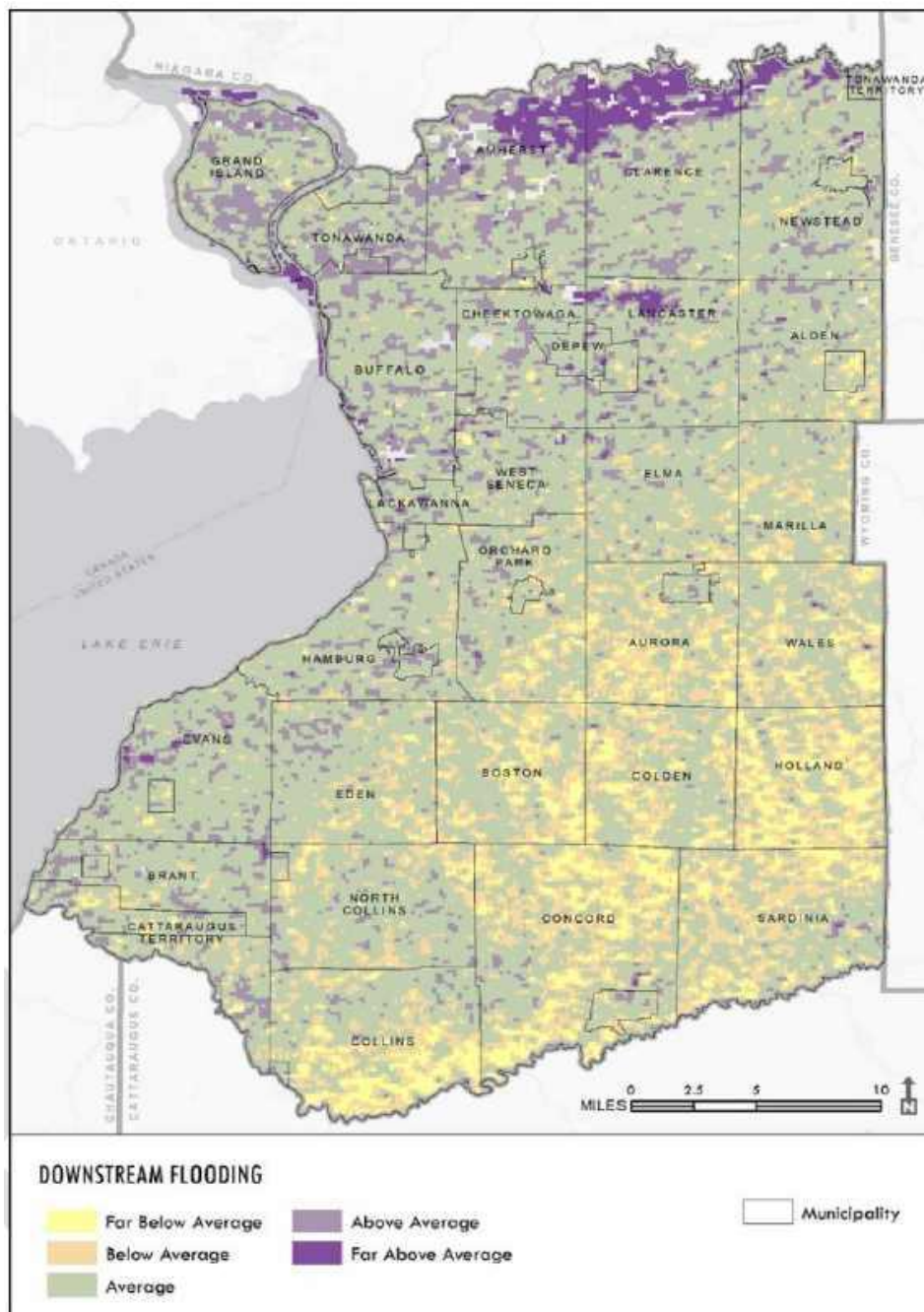


Figure 5. Sensitivity to downstream flooding based on Topographical Wetness Index and FEMA's 100-year flood risk.

Sensitivity to Wind

Through a literature review and interviews with climate experts, the sensitivity to wind assessment focused on changes in wind speed, wind direction, and seasonality of wind events observed and projected for Western New York. This was seen recently with the Blizzard of 2022, where extreme prolonged winds combined with heavy snow caused power outages and severely impacted the community, resulting in the deaths of more than 40 individuals. The assessment found that wind speeds are projected to increase in the winter and summer months as the climate warms, which may continue the locally-observed trend toward more frequent and intense thunderstorm winds. Wind direction is also changing, and while Erie County currently experiences prevailing winds from the southwest, we could experience more northeasterly winds as the climate changes. This shift in direction, along with increased wind speeds, may increase the likelihood of wind damage to infrastructure, houses, trees, and other important components of the Erie County community.

In terms of seasonality, the Western New York region may experience a slight increase in the number of winter storms (due to an expected northerly shift of the jet stream) and associated high wind events. More off-season storms are also expected, which can be detrimental to trees and infrastructure. Snowstorms occurring in late Spring or early Fall, for example, can be particularly damaging. In regard to trees, once leaves on trees are budding in spring or still remaining on trees in the fall, the weight of the snow will make trees and their branches more susceptible to being knocked down by the wind, ice, and/or snow, increasing the likelihood of power outages. We are also expected to see a summertime increase in the strength of the lake breeze coming from Lake Erie due to enhanced temperature differences between the lake and land, which could be beneficial for helping to cool the region during the summer months.

Sensitivity to Biological Threats

As the climate changes, so do the ecosystems and habitats in our region. These changes in habitat suitability can lead to changes in the geographic range of many species. Vector-borne diseases, invasive species, and other biological threats may become more prevalent or have a greater impact as the region's climate becomes more suitable for them. For example, diseases spread by mosquitoes, ticks, and invasive species are becoming more prevalent where they already occur and are spreading to new areas.

The CVA mapped habitat suitability for thirteen vector-borne diseases and found that the issues that Erie County may face in terms of these diseases will likely be dynamic and change over time as climate conditions change, with new species and diseases changing in prevalence over time. For example, by mid-century, Erie County's habitat will be less suitable to the Deer Tick, which carries Lyme disease. Meanwhile, Erie County's habitat will become highly suitable for the Asian longhorned tick, a vector for cattle diseases, and which currently is not found in Erie County.

Sensitivity with Respect to Mobility and Accessibility

Levels of mobility means how far a person can travel in a given amount of time, while levels of accessibility means the number of transportation services a person can reach in that given amount of time. Both of these indicators vary across space and socioeconomic demographics.¹⁷ A key concern for the County is the potential lack of access to care during emergency situations, especially for less mobile or disadvantaged populations that are more vulnerable to climate hazards.

In this analysis, mobility and accessibility were estimated for twenty-four hospital emergency departments across Western New York, and thirty-seven County library cooling shelters. Accessibility in terms of minimum driving times to area hospital emergency departments was found to be relatively low for rural communities, whereas access to County cooling shelters is more uniform.

Adaptive Capacity

The final phase of the CVA assessed the adaptive capacity of Erie County in light of its sensitivity to climate threats. Adaptive capacity refers to the ability of the County to adapt or adjust to climate hazards and risks. Representatives from relevant Erie County departments were interviewed and asked to respond to questions about current practices and planning related to the identified climate sensitivities. This phase found that the County has significant capacity to address climate impacts, but there are also key gaps. For example, although the County's public libraries have been identified as cooling center locations, in the event of a blackout, cooling centers do not have backup power for cooling systems. For a full description of adaptive capacity and capacity gaps, please refer to the CVA report.

Overall Vulnerability

In general, Erie County is expected to experience increases in the frequency and severity of heat waves, flooding, and storms with damaging winds. Changes in wind direction and seasonality of storms are also potential threats. Projected climate change in the region is also likely to reduce habitat suitability for a variety of native species while improving conditions for existing and new invasive species. Exposure to vector-borne diseases from both native and invasive species will therefore continue to change over time as habitat suitability shifts for particular species over time. Finally, accessibility to area hospital emergency departments is relatively low for rural communities, whereas access to County cooling shelters is more uniform. Table 1 summarizes Erie County's areas of vulnerability to climate change impacts that this resilience assessment has

¹⁷ Lee, J., & Miller, H. J. (2018). Measuring the impacts of new public transit services on space-time accessibility: An analysis of transit system redesign and new bus rapid transit in Columbus, Ohio, USA. *Applied geography*, 93, 47-63.

identified, along with potential opportunities to mitigate this vulnerability now and into the future.

Table 1. Summary of major vulnerabilities and potential opportunities according to threat type.

<i>Threat</i>	<i>Vulnerabilities</i>	<i>Opportunities</i>
<i>Increase in the frequency and intensity of heat waves</i>	<ul style="list-style-type: none"> • Stress on the power grid due to higher cooling demand • Increased health impacts, especially for vulnerable populations (e.g., the elderly, youth, and pregnant women) • Old, under-insulated housing stock and lack of access or affordability to air conditioning for the most vulnerable 	<ul style="list-style-type: none"> • Increase communication and coordination with electric utility companies • Enhance outreach and awareness about heat vulnerability and ways to avoid impacts • Develop a heat emergency plan for Erie County • Create a system to check on and aid the most vulnerable County residents during a heat wave
<i>Increase in frequency and severity of flooding</i>	<ul style="list-style-type: none"> • More frequent local flooding, including County land, homes, and roadways • Increased debris in sewer systems • Reduced drinking water quality during flooding events 	<ul style="list-style-type: none"> • Invest in the development and maintenance of green infrastructure projects to improve water infiltration capacity, retention, and stormwater management • Map location of past and current flooding hotspots • Take steps to avoid or reduce development in high-flood-risk areas

<i>Increase in wind damage</i>	<ul style="list-style-type: none"> • More power outages • Reduced tree health and more tree damage • Financial burden and increased safety risk for workers 	<ul style="list-style-type: none"> • Increase power backup system capacity (mobile generators, micro-grids, etc.) • Plant wind-resistant trees in tree-planting initiatives • Provide financial support for proactive tree removal
<i>Changing habitat suitability for species/diseases</i>	<ul style="list-style-type: none"> • Increased exposure and health impacts of County employees and residents to Vector-Borne Disease 	<ul style="list-style-type: none"> • Increase monitoring of changing species and health risks • Prepare and train County employees • Provide information and outreach to increase awareness and reduce the impacts of disease-carrying species
<i>Accessibility and Mobility Challenges for Vulnerable Populations</i>	<ul style="list-style-type: none"> • Access to critical lifeline services during and after extreme events and emergencies, especially for the most vulnerable residents 	<ul style="list-style-type: none"> • Identify local community shelters in the most vulnerable communities • Increase access to public transportation services, especially in rural communities

Overarching Climate Resilience Actions

The Climate Resiliency Working Group decided that rather than having a single chapter describing all the climate resilience strategies and actions, it would be better to have these developed by the sector-specific working groups and included in the sector-specific chapters. For example, transportation resilience strategies and actions are described in the Transportation chapter of this Plan. There are some actions that the Climate Resilience Working Group identified as being overarching and relevant to multiple or all sectors. These overarching actions are described below.

Heat Emergency Plan. The CVA identified Erie County as being vulnerable to extreme heat, especially in urban areas where there is a lack of green space, older housing stock without air conditioning, and where residents tend to be older and suffer from health issues like asthma. The County has some rudimentary procedures for dealing with extreme heat, but the CVA identified developing a Heat Emergency Plan as an important next step. This project is planned to commence in mid-2023 and will build upon the extreme heat-related analysis in the CVA to develop a locally informed plan for mitigating the effects of, and responding to, heat wave conditions. This project will also build upon current programs to check on and provide aid to the most vulnerable during a heat wave.

Electric Grid Resilience. As we saw recently with the Blizzard of 2022, our community is vulnerable to severe winter storms that can cause power outages during extremely cold temperatures, which magnifies the impact on residents and the economy from these storms. Electrification is an important strategy to mitigate climate change, but it is especially important that as we increase reliance on electric power and invest in increasing the capacity of our electric system, we also consider strategies to increase resilience during power outages, such as installing back-up power systems for critical facilities. To this end, the County should strongly advocate to the electric utility companies and the Public Utility Commission for the creation of an electric system that is resilient and can withstand severe storms year-round.

Coastal Resiliency. As the climate warms, it is expected that there will be greater impacts from lake seiche events, which are large waves caused by high winds on the lake, and which are magnified by extreme precipitation events. Lake Erie will also have less ice coverage, which will increase shoreline erosion in the winter months. These changes will make homes, businesses, and infrastructure on Lake Erie and nearby waterways more vulnerable. The County will work with local, state, and federal government partners to identify opportunities to develop coordinated approaches to make our coastal areas more resilient.

Reducing Social Vulnerability. Social vulnerability refers to a community's capacity to prepare for and respond to the stress of hazardous events, including natural disasters and human-caused events, as well as disease outbreaks.¹⁸ Social vulnerability assessments of the County suggest relatively high vulnerability near and around downtown Buffalo, but also areas in the southwest and rural areas of the County. Strategies to reduce the overall social vulnerability of Erie County residents will help improve the overall livelihoods of residents throughout the County and help reduce the impacts of extreme events.

Ongoing Improvement to Resilience Planning. While much about climate change has become clearer in recent years and we now know and experience our local weather dramatically warming and changing, many aspects of how our local climate will change and what impacts County residents will experience in the future are unknown. The trajectory of our local climate understanding of Erie County's climate vulnerability will become clearer as climate modeling improves and as we continue to experience climate change impacts. To best protect life and

¹⁸ CDC, 2020.

property in our community, the County will regularly update and improve its climate resilience planning and resulting actions as new information becomes available .

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