

CITY OF ROCHESTER
Climate
Vulnerability
Assessment

HIGHLIGHTS

Understanding Rochester's potential climate impacts is critical to the city's continued economic prosperity, as well as to ensure that Rochester remains a safe, livable, and vibrant place to live and visit.



What is the Climate Vulnerability Assessment?

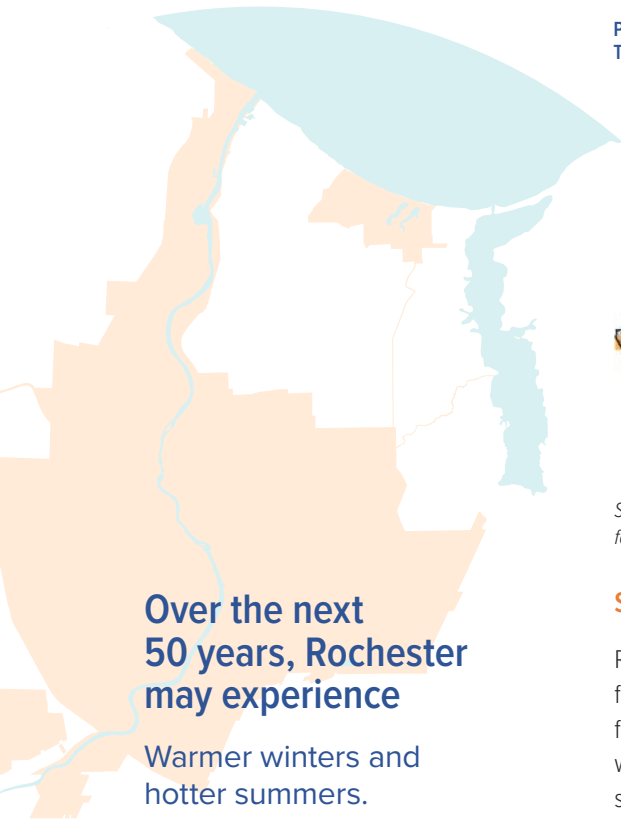
Rochester is planning for a resilient future.

To continue its climate action efforts and become more resilient, the City of Rochester has conducted a Climate Vulnerability Assessment (CVA). The purpose of this CVA is to evaluate the City's ability to adapt to anticipated climate change impacts in order to enhance its resilience planning efforts. By understanding the impacts to Rochester's resources, operations, and community, as well as who is most affected, the City can prioritize strategies that address its climate vulnerabilities.

What motivates this Climate Vulnerability Assessment?

Rochester's climate is changing.

The City of Rochester and surrounding areas are already experiencing changing climate conditions, particularly related to increased temperatures and changing precipitation patterns. Projections indicate that these trends will continue. These changing conditions present significant risks to the natural environment, economy, energy and agricultural systems, and public health and safety. They are also an opportunity to envision a more resilient Rochester.



Over the next 50 years, Rochester may experience

Warmer winters and hotter summers.

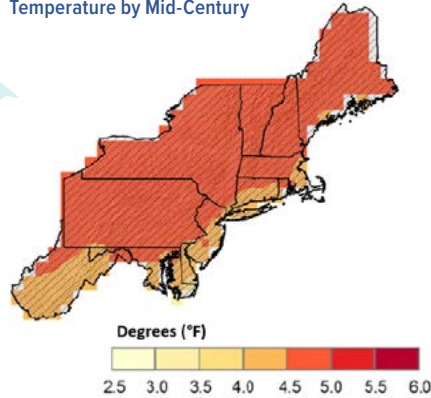
More short-duration summertime droughts.

More days with temperatures above 90°F and longer heatwaves annually.

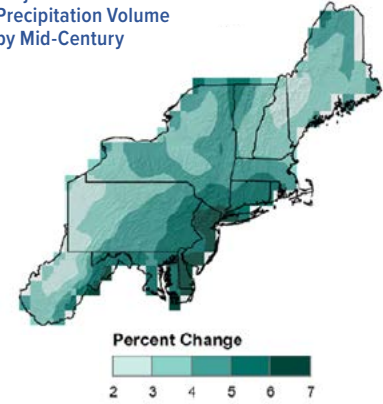
About 10% increase in average annual rainfall.

Two to three times more frequent extreme weather events.

Projected Increase in Annual Temperature by Mid-Century



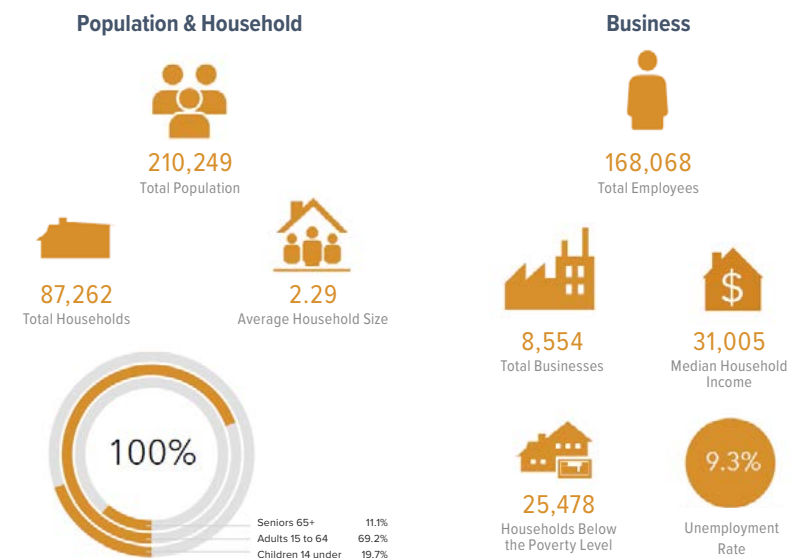
Projected Increase in Annual Precipitation Volume by Mid-Century



Source: NOAA Technical Report NESDIS 142-1, "Regional Climate Trends and Scenarios for the U.S. National Climate Assessment. Part 1, Climate of the Northeast U.S."

Some populations are more vulnerable than others.

Rochester's demographic and socio-economic trends provide important context for the City as it considers its long-term development and prosperity in the face of a changing climate. Rochester's economy benefits from an educated workforce and cutting-edge research at higher education institutions. At the same time, poverty and social disparity remain major issues to overcome.



Source: American Community Survey (ACS), Esri and Infogroup; 2011-2015, and 2017 data.

What does the Climate Vulnerability Assessment entail?

Assess climate vulnerabilities while engaging stakeholders.

Based on its investigation of climate change impacts, the City identified critical systems and assets, assessed their sensitivity and adaptive capacity, and ranked their vulnerability.

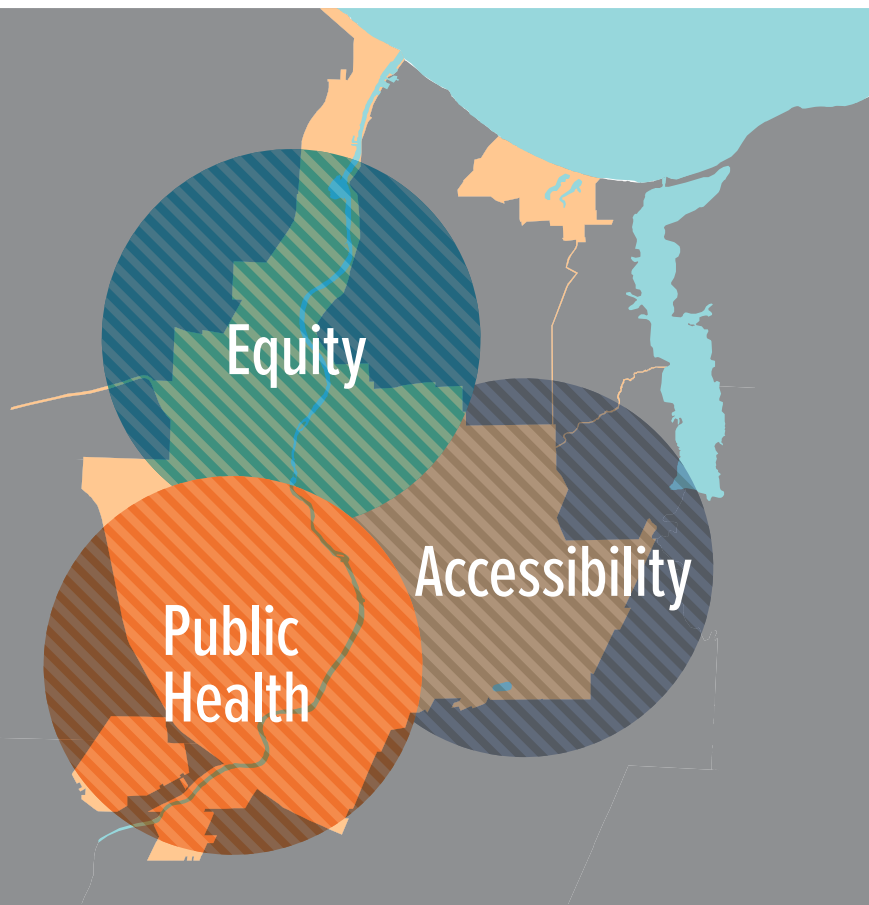
Sensitivity level indicates the degree to which a system might be affected by the climate impacts to which it is exposed. Adaptive capacity reflects a system's ability to respond successfully to climate variability or extreme events. These two indicators combine for an overall vulnerability ranking that reflects how susceptible the systems or sub-systems are to the effects of climate change. For example, if a system's sensitivity is low and adaptive capacity is high, vulnerability is likely to be low.

Rochester CVA Approach



Cross-cutting considerations influence the ability of systems to recover, accommodate, or adapt.

Applying the lenses of equity, accessibility, and public health to the analysis of potential climate implications for the systems and subsystems facilitated a more comprehensive understanding of the City of Rochester's sensitivity, adaptive capacity, and overall vulnerability.





**Interviews
with local
businesses &
community
organizations**



**Technical
Advisory
Committee
Workshops**



**Public
Input
Session**



Stakeholder Engagement

The City of Rochester recognizes that a thorough assessment of climate vulnerability requires input from an array of stakeholders.

**Interviews &
focus groups**

What did we find?

Evaluate Rochester's resources and plan for the future.

The following planning subject areas and systems served as the overarching framework to evaluate vulnerabilities and opportunities for Rochester's built environment, operational components, and services.

Highlighted strengths and vulnerabilities for each system within the three subject areas are provided in the following pages. See the [full CVA report](#) for more details.

Planning Subject Areas



Transportation

- Highways, local roads and bridges
- Public transportation
- Bike/pedestrian network
- Port and marina
- Airport
- Railways

Environmental Resources

- Water bodies and waterways
- Wetlands
- Urban forests

Public Health

- Healthcare programs and services
- Citizen health/public health
- Emergency services
- Air quality

Utilities/Energy

- Telecommunication
- Energy generation and distribution

Natural Habitat

- Sensitive and rare habitats

Economy

- Key industries/employers
- Jobs/workforce

Water

- Water supply
- Wastewater and stormwater management
- Flood-protection infrastructure

Recreational & Open Spaces

- Open space, public parks and facilities

Cultural Resources

- Historic and cultural resources

Buildings and Facilities

- Commercial and businesses
- Residential
- Industrial
- Municipal, public, and critical facilities
- Others (institutional, places of worship, data centers, etc.)

Social System/Human Services

- Food systems
- Quality of life

Infrastructure

Resilient infrastructure keeps the City of Rochester running smoothly.

Evaluation of the infrastructure systems and subsystems indicates high sensitivity to changing climate conditions. At the same time, the majority of these systems and subsystems also have high adaptive capacity, as many systems are equipped with redundancy or back-up systems. Overall, Rochester's infrastructure systems and subsystems are moderately vulnerable to climate change impacts.

Infrastructure systems, such as transportation networks, utilities, and critical facilities, are vital resources that keep the City of Rochester running smoothly. Increased temperatures and more intense precipitation patterns pose threats to these systems' functions and to the safety of their users. Furthermore, these systems are intricately connected, such that when one of them is compromised, it can cause a cascading impact that disrupts others.



The City offers approximately 64 lane miles of on-street bicycle facilities and an additional 140 miles are planned for. Pace Bike Share Program was also launched in July 2017, with 340 bikes spread across 46 stations throughout Rochester. Photo Credit: Communications Bureau, City of Rochester Bureau, City of Rochester

Transportation

- Rising temperatures and more frequent extreme heat events can affect pavement integrity and cause bridge structures and rail tracks to buckle or crack.
- Compounded by more frequent periods of drought, heavy rains and extreme storms that follow can also cause soil and culverts (road and bridge infrastructure support) to weaken or wash out, therefore putting the infrastructure's stability and safety at risk.
- More frequent heavy rains and extreme storm events (and foreign object debris from these storms) may also lead to reduced navigability and disrupt operations at the port and airport.

Energy Utilities Systems

- Additional stress to the energy grid, which may increase the frequency of brownouts and blackouts, particularly as more frequent hot days and heat waves are anticipated; increased cooling demand and costs associated with maintaining communication systems and equipment; and increased demand for maintenance and repairs due to downed communications resulting from electrical voltage spikes during severe storm events.

Water

- The projected increase in temperatures will result in warmer water temperatures, which enable algal blooms to intensify in lakes and reservoirs and threaten the city's water supply quality.
- More frequent periods of drought can also impact the health of trees and other large vegetation along the river banks, which may indirectly affect the operations of dams and reservoirs due to treefall and debris blockage.
- Combined sewer overflow is particularly concerning in the context of more frequent intense precipitation events that stress the storm sewer systems and can lead to an increase in the volume of untreated discharge into the Genesee River or local waterways. In addition, sewage backups occur during severe wet weather events, which can lead to untreated sewage in people's homes.

Critical Buildings & Facilities

- Fluctuation of extreme temperatures and frequency of extreme storms will accelerate the weathering and even deterioration of building exteriors, and in some cases even result in property loss.
- Seepage and flooding due to intense rainfall and extreme storms can damage critical systems and equipment if located in basements or lower levels of buildings.
- Increased risk of mold exposure due to driving rain could present serious health and safety issues. Older buildings are more likely to develop mold growth, a particular concern for low-income homeowners and renters without financial resources for remediation.

HIGHLIGHTS

Infrastructure Systems and Subsystems

Increase in extreme temperature days (over 90°F) and duration (heatwaves)

Vulnerabilities

- Increased stress on power grid due to higher cooling demand.
- Inadequate bus/public transit shelters to cool passengers while waiting.
- Uncertainty about resources needed for winter storm response.
- Buildings or homes without adequate ventilation—heat stress and other heat-related illness, especially for vulnerable populations (e.g., elderly, young children, pregnant women).

Strengths/Opportunities

- Ongoing efforts to increase power transformers' capacity and minimize risks (to the infrastructure) associated to increased temperatures.
- Reduced demand for heating, less stress on generation capacity with fewer extreme cold days.
- Water conservation measures in place—restrictions to permitted extraction volumes in lakes.
- Demand-response program available for larger customers to reduce energy consumption.

Increase in days per year with over 1" rainfall

- More frequent localized flooding of roadways.
- Flooding already experienced at water treatment plant during heavy rains.

- Available technical ability and expertise to harden/strengthen roadway infrastructure.
- Good systems in place for dams during emergency overflow.
- Available technology in place to modify wastewater treatment process.
- Zoning Code with specific on-site infiltration requirements.

Increase in extreme storm events (microbursts, severe t-storms, ice storms, tornadoes, etc.)

- Increased risk and damage to highways, roadways, bridges, and bike/pedestrian paths (with fallen trees and foreign object debris), making certain areas impassable or inaccessible.
- Increased risk of power outages, delays, or service disruption.
- Safety risk for maintenance workers

- Majority of bike and pedestrian network is new and in good condition.
- State of repair is good for many bridges – high and sufficient redundancies in place.

Natural Resources

Natural resources contribute to Rochester's economic, environmental, and social vitality.

Rochester's natural resources have high sensitivity to extreme temperatures and precipitation, as well as to extreme storm events. Although there is some adaptive capacity in place, the pace of natural resource adaptation to changing conditions may not keep up with the pace of climate change. Overall, natural resource systems and subsystems in Rochester are moderately to highly vulnerable to climate change impacts.

The City of Rochester is surrounded by unique natural resources and environmental assets and offers extensive access to recreational opportunities. Rochester also takes pride in its open space and urban forest systems, recognizing that these resources provide important economic, environmental, and social benefits for the city and its residents.



The Genesee River is an economic and ecological lifeline for the City of Rochester. It also offers recreational opportunities such as biking, hiking, and paddling, which are well enjoyed by residents and visitors. Photo Credit: Communications Bureau, City of Rochester

Environmental Resources & Natural Habitat

- Increased temperatures and more frequent occurrence of drought may cause seasonal wetlands to dry up more quickly, therefore impacting wetland habitats that are home to wildlife such as salamanders, birds, and invertebrates.
- Warmer seasons could also increase the presence of invasive species that would lead to damage and even loss of wetland biodiversity.
- Compromised water quality (i.e., algal blooms, pollutant and chemical run-off) due to overwhelmed stormwater and sewer systems during heavy rains and extreme storm events.
- Fluctuation in extreme temperatures and more frequent extreme storm events will negatively affect these native wetland habitats and vegetation.
- Increase in extreme warm temperatures, flash floods from extreme storm events, and prolonged rainfalls exacerbate the livelihood of sensitive and rare habitats.
- Combination of more frequent extreme weather events and drought periods will increase the risk of damage and significant loss to the city's urban forest.



The City partnered with RG&E to launch a program called "Cool Sweep," which helps city residents who have limited opportunities to find relief from summer heat through the use of cooling sprays from fire hydrants. Photo Credit: Communications Bureau, City of Rochester

The resiliency of the Rochester community is also largely dependent on the resiliency of its natural resource assets and they, themselves, provide functions to protect the city.

HIGHLIGHTS

Natural Resources Systems & Subsystems

Increase in extreme temperature days (over 90°F) and duration (heatwaves)

Increase in days per year with over 1" rainfall

Increase in extreme storm events (microbursts, severe t-storms, ice storms, tornadoes, etc.)

Recreational & Open Space

- Increased use of water and electricity will be expected to maintain parks and recreation facilities, as well as to accommodate cooling demand of park and facility users with more extreme hot days and heatwaves anticipated.
- At the same time, longer warm seasons will benefit those who enjoy outdoor activities, increasing visitation and use of parks and recreation facilities. However, warmer winters can also negatively impact winter tourism and any snow-dependent activities.

Vulnerabilities

- Canadice and Hemlock Lakes have limits on how much water can be pumped.
- Expanded range of pests and invasive species, which can stress or out compete native species overtime.
- Certain tree species (maple, beech, birch) may not be able to survive increased days of extreme temperatures.

- Potential sediment issues in canal/river with increased heavy rain events.

- Due to topography, Hemlock Lake is more exposed to microbursts.
- Increased risk of shoreline erosion along Lake Ontario and severe flash flooding events.

Strengths/Opportunities

- Completed an Urban Forest Master Plan in 2012.
- Majority of parks and recreational facilities are well-suited and have capacity for increased users.

- Rochester has more than 3,500 acres of open space and parklands—a significant amount of pervious surface to absorb rainfall and reduce pollutant, stormwater run-off.

Socioeconomic Resources

Climate changes impact Rochester's social and economic revitalization opportunities.

Increased temperatures, changes in precipitation patterns, and more frequent extreme weather events will have impacts on economic, social, and cultural resources within Rochester. Among residents, the degree of these impacts will vary, as some populations are more vulnerable than others. The city's social system indicates a high level of sensitivity with respect to projected climate impacts for vulnerable populations. On one hand, healthcare and emergency services indicate high adaptive capacity, as they are able to handle additional demand for care and services. On the other hand, the overall quality of life in Rochester may face negative impacts if resources become limited or vulnerable populations lack access to them. Overall, Rochester's socioeconomic systems and subsystems should be considered moderately vulnerable to climate change.

Changing climate impacts will not only present concerns related to public health issues, but also reduce the quality of life for many Rochester residents. Additionally, while Rochester has recently experienced a resurgence of economic reinvestment and revitalization opportunities, the city's growing economy could be compromised if businesses and employees are not protected or unable to adapt to the changing climate.



Rochester is economically, racially, and ethnically diverse. Community engagement is therefore critical for successful and effective implementation of the City's climate planning efforts. Photo Credit: Communications Bureau, City of Rochester

Economy

- Increases in extreme precipitation and storm events will increase the risk of physical damage to business facilities, as well as the infrastructure that supports their operations (e.g., roadway closure, power outages).
- For employees, increased temperatures may affect productivity, especially for outdoor workers (construction workers, landscapers, etc.) and for those working in older facilities without adequate cooling and ventilation. Extreme weather events will also impact the ability of employees getting to and from work.

Public Health Resources and Services/Quality of Life

- Flooding and extreme storms can cause service disruptions, property damage, and other complications that delay emergency service providers or prevent people from getting treatment.
- Potential rise in hospitalization rates, due to more frequent extreme temperatures and extreme storm events, will also put a significant strain on staffing, medical resources, and equipment available for timely treatment.
- Increased extreme temperature days will affect air quality, increase risk of heat-related illness, and lead to longer breeding seasons and ranges for pests (such as ticks and mosquitoes) that carry and can infect the population with harmful diseases (such as West Nile virus and Lyme disease).

- Increased precipitation can lead to mold exposure in homes and buildings, and increased risk of gastrointestinal (GI) diseases.
- Conditions during heat waves and extreme weather events can pose health and safety issues, compromising the ability of vulnerable residents to access community service resources (e.g., food pantries, soup kitchens, public markets, community gardens, schools, libraries). Disruptions or delays to these services may impact the ability of residents, especially under- and unemployed or those living near or below the poverty line, to meet their most basic needs.

HIGHLIGHTS

Socioeconomic Resources

Increase in extreme temperature days (over 90°F) and duration (heatwaves)

Vulnerabilities

- Increased risk of heat exposure and heat-related illness.
- Concern for respiratory-related illness due to poor air quality.

Strengths/Opportunities

- Emergency plan in place for potential disease outbreaks (County Public Health Department).
- Longer construction season and/or other outdoor work and activities.
- The City partnered with RG&E and deployed “Cool Sweep” program, which helps residents find relief from summer heat.

Increase in days per year with over 1” rainfall

- Increased risk of pollutant run-off, risk of pesticides entering the food chain—implications for the safety, distribution and consumption.

Increase in extreme storm events (microbursts, severe t-storms, ice storms, tornadoes, etc.)

- More frequent shutdown of businesses.
- More frequent delay and/or disruption of production or service due to property damage/loss, inaccessible resources, inability of employees to commute to work.
- Individuals with disabilities or language barrier may be disproportionately affected—unable to access evacuation routes and understand or receive warnings of impending danger, limited ability to communicate their needs.

- Existing healthcare facilities and services have high capacity to address potential increase in service demands.
- Redundancies and back-up systems already built-in for most of the City’s physical infrastructure systems, minimizing downtime for business operations and activities.

So what comes next?

Based on the assessment of sensitivity and adaptive capacity of the identified systems and subsystems, the following are key strengths and vulnerabilities for the City of Rochester.

Stay engaged!

Send us your comments and ideas:
<https://www.surveymonkey.com/r/RochesterCVA>



The City continues gathering feedback and additional ideas from community stakeholders via an online survey. This on-going effort will further inform the assessment and prioritization of strategies and actions in the upcoming adaptation planning phase.

Vulnerabilities

- Increased stress on existing systems
- Uncertainty about resources needed for repair and maintenance
- Uncertainty about the ability to accommodate increase demands
- Public health and safety risks - especially for vulnerable populations

Strengths & Potential Opportunities

- High adaptive capacity for most systems - redundancies are in place in the event of emergency
- Available technical know-how and expertise
- Best practices available in other regions/areas with similar climate (as projected for Rochester)
- New economic opportunities

Based on input and feedback from the Technical Advisory Committee and the community, key topics we will be focused on for adaptation planning include, but are not limited to:

- Incorporation of resiliency measures in design and construction standards as well as repair and maintenance procedures infrastructure systems (roadways, buildings, etc.)
- Flood mitigation
- Development of plans to protect native plants and animal species, as well as preparing for new plants and animals
- Public engagement and educational outreach campaign focusing on climate adaptation and resiliency practices, particularly for vulnerable populations.

