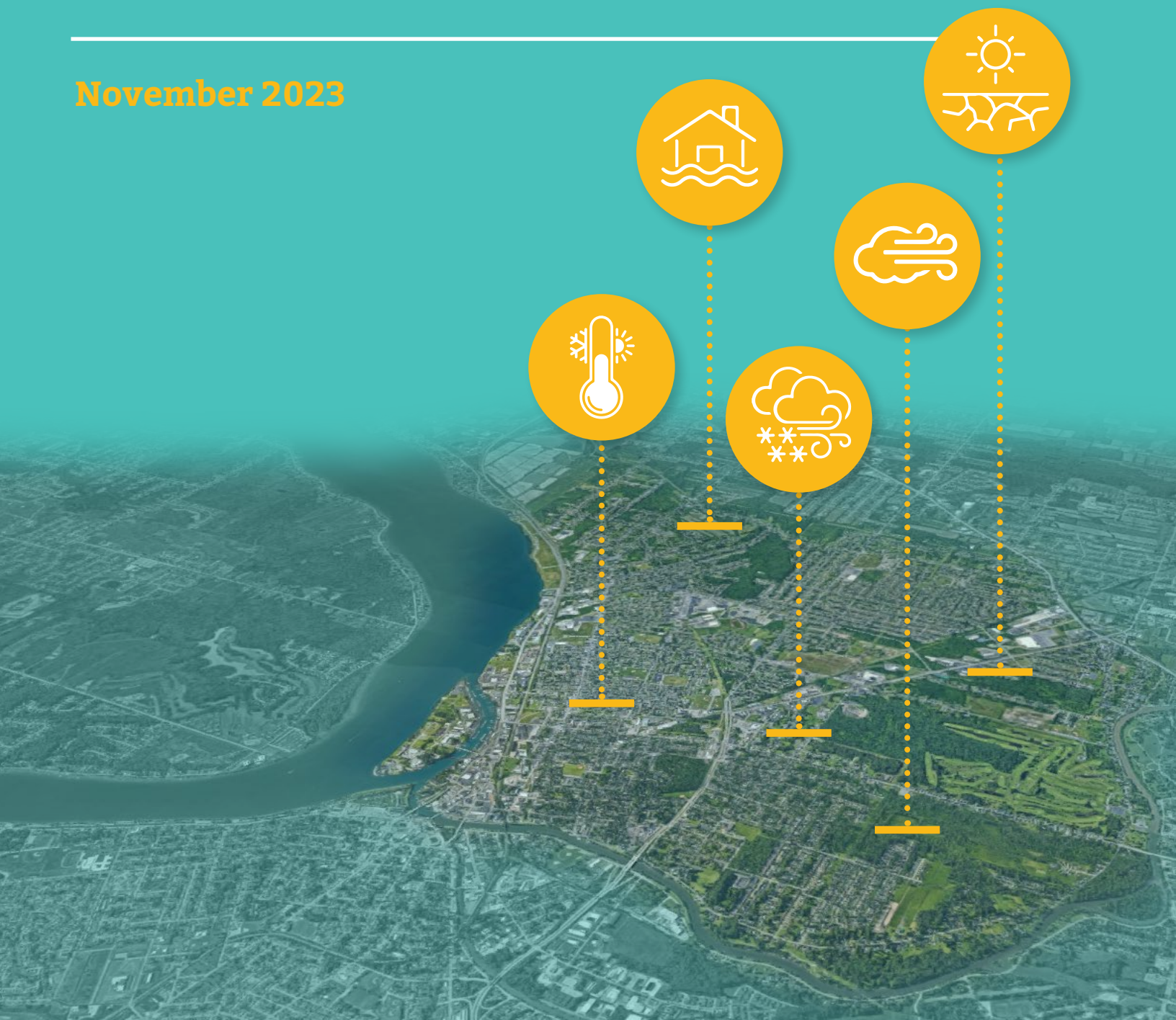




North Tonawanda Climate Resilience Plan

November 2023



A Message from the Mayor

The City of North Tonawanda’s first Climate Resilience Plan represents an important milestone. The plan helps prepare our city for extreme weather and natural hazards, which are expected to occur with greater intensity and frequency in the future. It also demonstrates the ability of North Tonawanda residents, elected leaders, and stakeholders to develop a deep understanding of the issues and to work together to take action. The plan identifies ways we can collectively adapt to climate-related challenges and create stronger, more resilient infrastructure and services in North Tonawanda.

The adoption of the City’s Climate Resilience Plan represents a commitment on the part of my office and the Common Council to ongoing efforts to address climate-related hazards in our city. This will include protecting natural assets, improving infrastructure and emergency preparedness, and prioritizing the safety and quality of life for all residents for decades to come.

The Climate Resilience Plan is the product of a robust community engagement effort led by our Climate Smart Task Force and the University at Buffalo Regional Institute (UBRI). This plan builds off the City’s Climate Vulnerability Assessment conducted in 2022. The recommended strategies were developed through feedback gathered in 2023—including a survey that collected 141 responses from community members, and a stakeholder workshop where 22 representatives from City departments and local organizations helped identify and prioritize climate resilience strategies for North Tonawanda. Residents had an opportunity to provide input on the draft plan via an online meeting facilitated by UBRI on October 4.

The Plan’s strategies are built to support ongoing City initiatives, these include: upgrading sewer systems to mitigate flooding; promoting green infrastructure on public and private property; enhancing emergency operations for extreme events; promoting sustainable development and protecting wetlands and natural spaces; bolstering climate awareness and household hazard preparedness; helping property owners upgrade structures to mitigate hazards; and acquiring additional funding to support climate resilience actions.

The city will soon begin the process of updating our Comprehensive Plan to guide future land use decisions. The findings and recommended strategies of this plan will help shape the new Comprehensive Plan and future community investments.

I wish to thank all the community members, the Climate Smart Task Force, City staff, and others who committed time and energy to create this document, as well as the New York State Department of Environmental Conservation for providing funding for the plan through its Climate Smart Communities program.

While we never know exactly the challenges that may arise in the future, I am confident our city is on a path to becoming resilient to climate-related threats by informing and equipping ourselves for action and re-committing to looking out for each other and the city we call home.

Respectfully,



Austin Tylec
Mayor, City of North Tonawanda

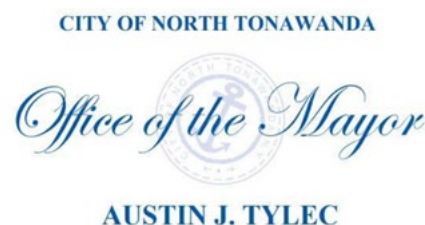


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Acknowledgements

This plan is a result of the contributions of many groups and individuals. In 2022, a University at Buffalo environmental design studio class produced a report that laid the groundwork for this plan. The North Tonawanda Climate Smart Task Force and Mayor Austin Tylec were pivotal in shaping the planning process, guiding the engagement of the community and stakeholders, and developing the plan and its recommendations. City staff and other local partners were essential to forming the strategies in the plan. The project was led by the University at Buffalo Regional Institute, through its role as the regional Climate Smart Communities coordinator, and was funded through the NYS Department of Environmental Conservation’s Climate Smart Communities program.

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- Erin Robinson (Vice Chair)
- Emily Root (Secretary)
- Austin Tylec (Mayor)
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- Mike Tuzzo
- James Berry
- Jack Kanack
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GLOSSARY OF TERMS

Climate hazard – natural hazards, such as flooding, extreme heat, drought, severe storms, and other meteorological events that can cause harm to people and properties and negatively impact communities, economies, and infrastructure systems

Risk – the potential for damage, loss, or other impacts created by the interaction of natural hazards with community assets

Exposure - the degree to which elements of an asset or system are in direct contact with hazards or sensitive to climate variability and the degree to which the hazard may change over time.

Vulnerability – characteristics of community assets that make them susceptible to damage from a given hazard

Resilience – the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning; the capacity for self organization and the capacity to adapt to stress and change.

Mitigation – efforts to avoid or reduce hazard risks and impacts on people, nature, and the built environments over the long term.

About the Climate Resilience Plan

While Earth’s climate has changed throughout its history, there is unequivocal evidence that global temperatures are increasing at an alarming rate. Global temperatures are rising at a rate that has not occurred in the past 10,000 years.¹

The purpose of the North Tonawanda Climate Resilience Plan (the Plan) is to identify community implementation strategies to reduce the risk of potential impacts of climate hazards over the long term, while adapting to changes, both minor and transformative. The strategies in the Plan are designed to cost-effectively reduce the vulnerability of the City to likely and potential climate hazard events.

This process was carried out by the planning team, guided by the Task Force, and led by feedback from the community and stakeholders.

The planning team at the University at Buffalo Regional Institute (UBRI) serves as the regional coordinator for the NYS Department of Environmental Conservation (DEC) Climate Smart Communities program. In this role, the planning team supported the North Tonawanda Climate Task Force (the Task Force) by developing a climate resilience plan. The planning team conducted research for the climate vulnerability assessment and potential resilience strategies for North Tonawanda.

The Task Force guided the process, provided oversight, and supported outreach to various stakeholders. The task force was founded by Mayor Tylec when he was Alderman in 2021 through a resolution. The Task Force members are appointed by Mayor Tylec and have monthly meetings throughout the year. In addition, the

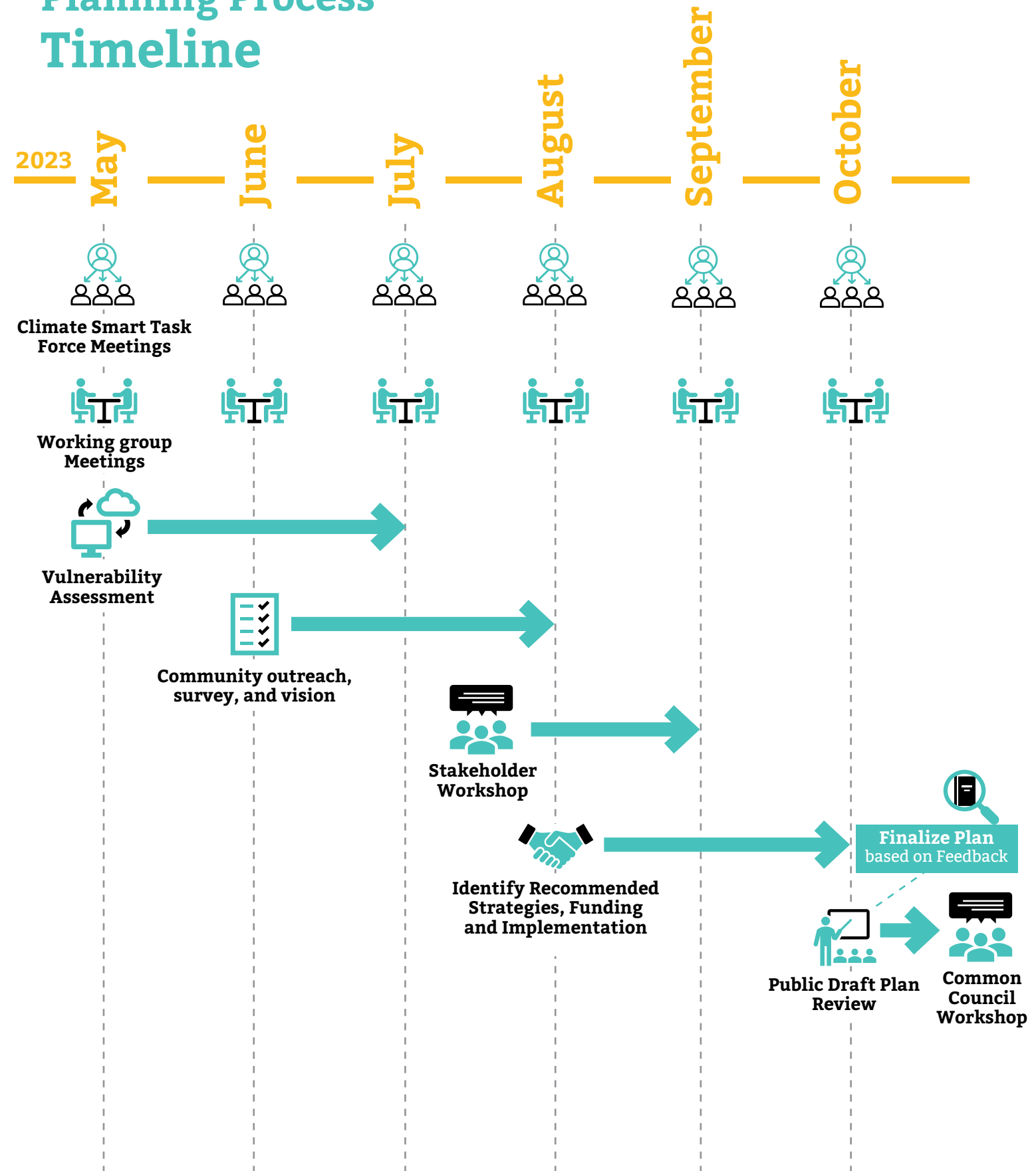
Task Force met separately with the planning team each month in working sessions to discuss this plan from May through October 2023.

Community members provided extensive input that serves as the foundation of the plan. The community participated in a survey and a public meeting where feedback was collected on the draft plan and recommended strategies. The community also provided feedback on the plan draft via an online form for a one-week comment period.

Local stakeholders from various City agencies, the school district, fire and police departments, and others, provided feedback in a climate resilience workshop, where they identified, prioritized, and detailed climate resilience strategies that led to plan recommendations.

Input from community members, City stakeholders, and Task Force members was incorporated by the planning team in the preliminary and final drafts of the Plan. The overall process of the Plan’s development is documented in meeting agendas, outreach materials, and stakeholder worksheets, included in the Appendix section.

Planning Process Timeline



About North Tonawanda

North Tonawanda is central to Niagara County's history and culture. The communities and economy of North Tonawanda developed due to its location along the major waterways of the Niagara River and Tonawanda Creek, which formed part of the Erie Canal. Tonawanda translates to "Swift Running Water" in the Seneca language, and the city is known as "The Lumber City," due to its primary industry when it was a major port on the Great Lakes during the height of the Erie Canal.²

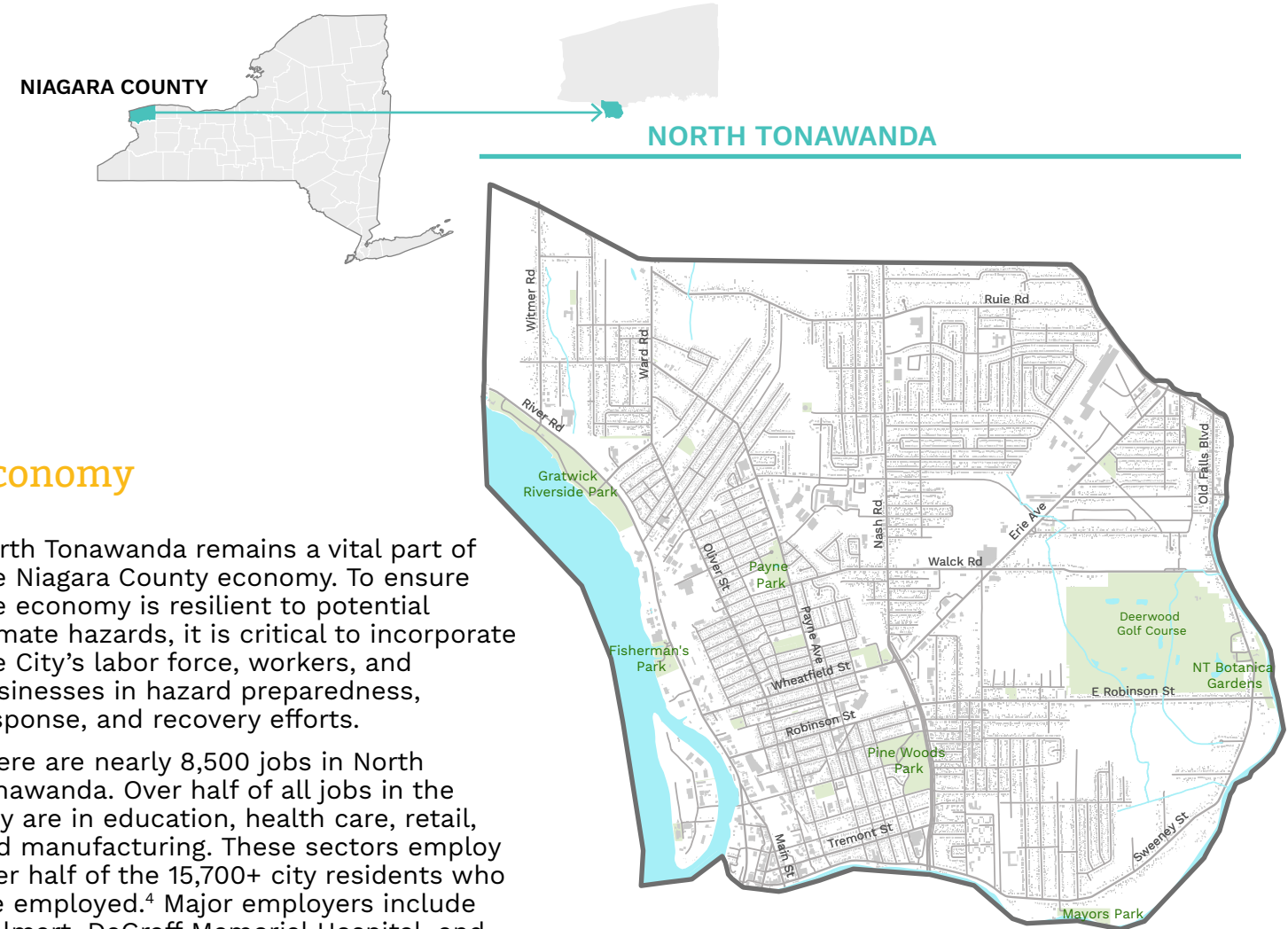
The total population of North Tonawanda in 2021 was nearly 30,600 people, down by 3% since 2011. Half of the population is over the age of 45 and nearly one out of five (19%) people in the City are over 65 years old, which is on par with Niagara County (19%). There are over 5,200 children under 18 in North Tonawanda, about 17% of the population—a lower share than Niagara County overall (20%). The City is 93% White, less diverse than the County overall, where 16% of residents are people of color. But the City is becoming more diverse—from 2011 to 2021, while the White population declined by 6%, the population of people of color increased by 65%. There are over 1,000 foreign born individuals in the City. About one-third of households are individuals living alone, which is higher than the US and Niagara County.³ This includes many seniors and others who may be more vulnerable to climate hazards.

City of North Tonawanda, Population and Economy, 2021

Total Population	30,592
Population Change, 2011-2021	-3.3%
AGE	
Median Age	45
% Under 18	17%
% Over 65	19%
RACE/ETHNICITY	
% White	93%
% Black	1.6%
% Hispanic	1.5%
% Asian/Pacific Islander	0.8%
% Other/Multiple Races	3.1%
Foreign Born Population	1,044
% Households with One Person	33%
Median household Income	\$61,926
Poverty Rate	10.9%
Jobs	8,497
Employed Residents	15,741
% 25+ with Bachelor's +	27%
% of Workers in NT who also live in NT	24%
Avg Commute Time	20 min.
% Working from Home	7%

*Highlighted numbers are higher than US averages.

Source: US Census, ACS, 5-year estimates, 2021.



Economy

North Tonawanda remains a vital part of the Niagara County economy. To ensure the economy is resilient to potential climate hazards, it is critical to incorporate the City's labor force, workers, and businesses in hazard preparedness, response, and recovery efforts.

There are nearly 8,500 jobs in North Tonawanda. Over half of all jobs in the City are in education, health care, retail, and manufacturing. These sectors employ over half of the 15,700+ city residents who are employed.⁴ Major employers include Walmart, DeGraff Memorial Hospital, and the school district. North Tonawanda also has a vibrant small business community, with many restaurants, shops, and local businesses concentrated in the downtown. The city is home to several industrial parks that house a variety of manufacturing and distribution businesses. Tourism is part of the City's economy, with visitors drawn to the waterfront, historic assets, and events.

About 24% of those who work in North Tonawanda are City residents.⁵ With average commutes of twenty minutes, employed residents typically work in nearby communities. The median household income in North Tonawanda was \$61,926. Nearly 11% of the population is below the poverty line, which is lower than the County and State overall. But this works out to nearly 3,300 individuals living in poverty who may be more vulnerable to climate hazards.⁶

Top Industries in North Tonawanda, 2021

	% Employed Residents	% Jobs
Education and Health Care	24%	23%
Retail	14%	17%
Manufacturing	14%	16%

Source: US Census, American Community Survey, 5-year estimates, 2021; OnTheMap, 2020.

Land Use

Land use can impair or enhance climate resilience. Over half of land in North Tonawanda is residential, primarily single-family homes.⁷ Nearly 8% of housing units are vacant and half of the City’s homes were built before 1954.⁸

More than a quarter of land is either a park/open space, or vacant;⁹ these open areas can help mitigate hazards like flooding. The remaining land is a mix of commercial, industrial, and other uses, such as public infrastructure and critical facilities. Critical assets are essential to protect the health, safety, wellbeing, and stability of the City, especially during and after a disaster.

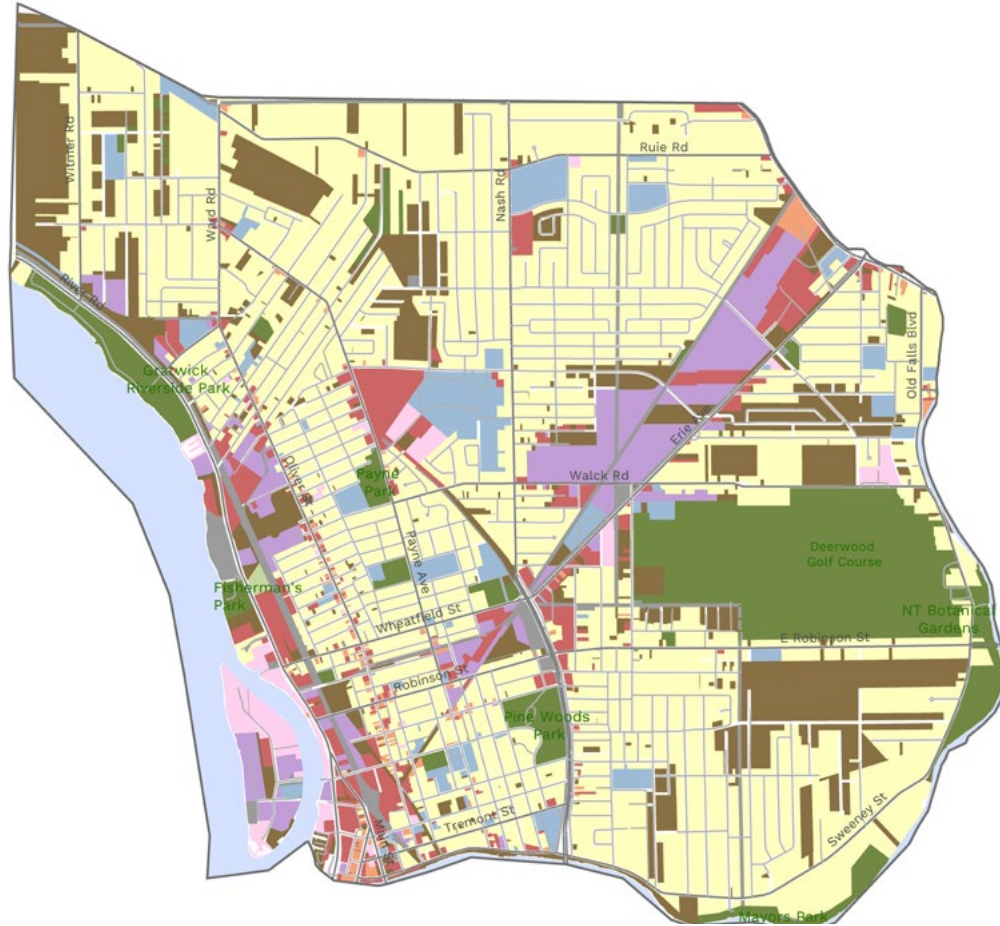
City of North Tonawanda, Housing, 2021

Housing Units	14,902
Vacancy Rate	7.6%
Home Value	\$140,500
Median Year Built	1954
% Renter Occupied	30%

Source: US Census, ACS, 5-year estimates, 2021.

City of North Tonawanda, Land Use, 2022

Residential	51%
Vacant	15%
Parks/Open Spaces	13%
Community Services	6%
Industrial	5%
Commercial	5%
Recreation	2%
Other	2%
Mixed Use	0.8%
Agriculture	0.1%



Source: Niagara County Tax Parcel Data, 2022.

Critical Assets

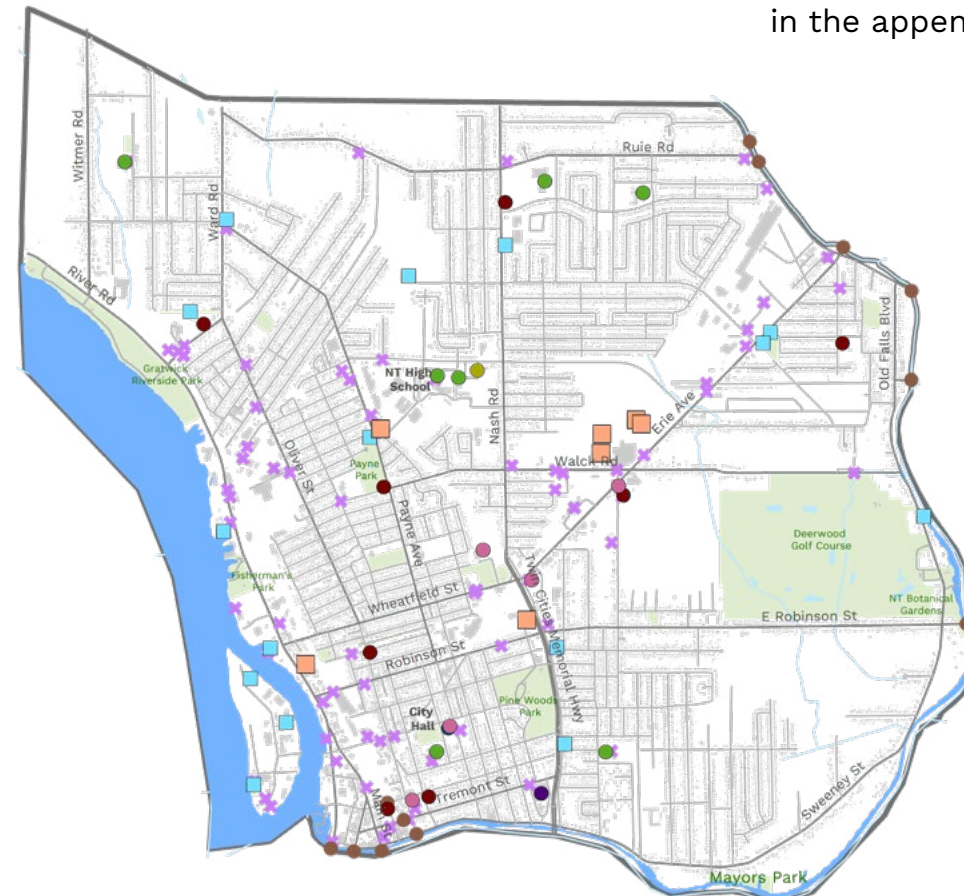
Critical assets and infrastructure are essential to climate resilience. The City is home to six schools, a hospital, police department, six volunteer fire companies, and other facilities that are critical to hazard preparedness and response.

The City’s infrastructure—roads, bridges, electricity, communications, utilities, and sewers—is critical to response and recovery from climate hazards. The City’s combined sewer system and other underground infrastructure is aging, which requires repairs and upgrades and may be potentially vulnerable to hazards. Resilience strategies can protect critical infrastructure and facilities from climate impacts, especially in hazard prone areas. For example, the City is equipping public facilities with emergency power, as recommended in the Niagara County HMP.

Planning Context

A number of previous plans informed this work. Two plans provide a foundation for this report: the Niagara County 2022 Hazard Mitigation Plan, and a Climate Vulnerability Assessment by a University at Buffalo undergraduate class which was presented to City officials in December 2022. City plans reviewed include the 2008 Comprehensive Plan, the 2021 Downtown Revitalization Initiative, the Local Waterfront Revitalization Program Update, the Brownfield Opportunity Area, and Community Forest Management Plan.

These plans informed the stakeholder engagement process, community vision, and strategies of this plan. City plans demonstrate the community’s commitment to open space preservation, sustainable development, hazard mitigation, and economic revitalization. The plans that were reviewed are included in the appendix materials.



Critical Assets in North Tonawanda

- Hospital
- Police department
- Fire stations
- Schools
- Library
- Government buildings
- Electric substations
- Wastewater treatment
- Bridge
- * Potential brownfields/chemical waste

Source: Various sources, see data notes.¹⁰

Climate Impacts and Vulnerabilities in North Tonawanda

Between 1901 and 2012, average temperatures increased every decade across New York State (NYS). This warming has been more pronounced in the winter, with average winter warming trends exceeding 1.1°F per decade between 1970 and 2008. Temperatures in NYS rose almost 2.5°F since the early 20th century, and are expected to continue increasing.¹¹

The average annual precipitation from 1901 to 2012 increased in all parts of NYS, and is projected to continue increasing.¹² Winter precipitation is expected to occur increasingly as rain rather than snow due to increasing temperatures,¹³ but the risk of lake effect snow may increase in the short- to mid-term, as surface temperatures in Lake Erie rise and polar air continues to move over the lake.¹⁴

These trends present concerns for North Tonawanda. Increased precipitation can add to flooding concerns, while rising temperatures can lead to potential urban heat island impacts. Meanwhile, the City will continue to experience severe winter weather, intense winds, and other hazards. How these climate trends impact North Tonawanda will partly depend on actions the City takes, in terms of land development, emergency preparedness, and other factors. Exploring potential climate scenarios can help the City develop strategies that will make the community resilient to a range of possible future hazards.

The scenario modeling for the vulnerability assessment was based on NOAA’s Climate Mapping for Resilience and Adaptation (CMRA) tool, the Niagara County Hazard Mitigation Plan, and other research on local climate impacts. The CMRA tool provides location-specific impacts for hazard types covered in the plan, including flooding and extreme heat/drought. Additional research on climate scenarios for severe winter weather and other potential climate hazards was also used to inform resilience strategies. The planning team analyzed geospatial data on structures, floodplains, elevation, and hydrology to estimate potential impacts of flooding under storm events. The planning team also explored the impacts of potential rise in the Great Lakes water levels, which may elevate waters along North Tonawanda’s shoreline on the Niagara River and Tonawanda Creek.

Three scenarios were analyzed as part of the vulnerability assessment. These scenarios are long-term and look to climate conditions more than fifty years in the future (2080 to 2099). These scenarios were integrated as part of the vulnerability assessment. The planning team summarized high-level findings from this assessment and presented the results to the Task Force, stakeholders, and the public. The vulnerability assessment results were used by these groups to prioritize resilience strategies and inform the content of those strategies.

The first scenario is based on **existing climate conditions** and assumes historical trends from the late 20th century persist through the late 21st century. This is referred to as the “Existing” scenario. Although this model neglects the reality of emerging climate change impact, hazards would still persist. In this scenario, North Tonawanda would expect 5 days of extreme heat (>90°F),¹⁵ 6 days of extreme precipitation, and 40–50 days of snowfall.¹⁶

The second scenario is called the **“Expected” scenario** which is based on climate projections that can be expected in the case that current GHG emissions remain stable or can be reduced. Under this scenario, the City would experience 30 days of extreme heat, 8 days of extreme precipitation,¹⁷ and 50–60 days of snowfall in 2080,¹⁸ as snowfall may increase due to potentially more favorable conditions for lake effect snow.

The **“Extreme” scenario** is based on increasing GHG emissions and would result in even higher temperatures. These higher temperatures would bring more extreme fluctuations in precipitation, which means an increased risk of flooding and droughts. The City could see 4–6 more days in a row without precipitation, and up to ten times as many days with high temperatures above 90°F compared to existing conditions. By 2080, the City could see 30 fewer days with low temperatures below freezing (32°F)—about 12 in total.¹⁹ Great Lakes water levels could also fluctuate under this scenario, increasing potential flooding issues along North Tonawanda’s shorelines.

Climate Scenario	Description	Annual days with max. temperature above 90°F	Days with max. temperature below 32 °F	Avg annual total precipitation	Annual extreme precipitation events
“Existing”	Climate conditions stay the same from now until 2080. Based on historical data.	5 days	42 days	34"	6 days
“Expected”	Climate becomes somewhat hotter and stormier by 2080. Modeled conditions based on current GHG emissions.	30 days	22 days	36"	8 days
“Extreme”	Climate becomes much hotter and stormier through 2080. Modeled conditions based on increasing GHG emissions.	58 days	12 days	38"	9 days

Sources: U.S. Global Change Research Program, CMRA Assessment Tool using National Climate Assessment LOCA data, 2018; Notaro, Bennington, and Vavrus, “Dynamically Downscaled Projections of Lake-Effect Snow in the Great Lakes Basin,” 2014.

Climate Impacts Extreme Heat and Drought

Currently there are no days on record when the City temperatures exceeded 100°F, but by the end of the century the City could experience up to 11 days over 100°F and 58 days with a maximum temperature over 90°F.²⁰ Extreme heat is something of a new concern for North Tonawanda and the community; City government, and institutions will have to adapt to these changing circumstances.

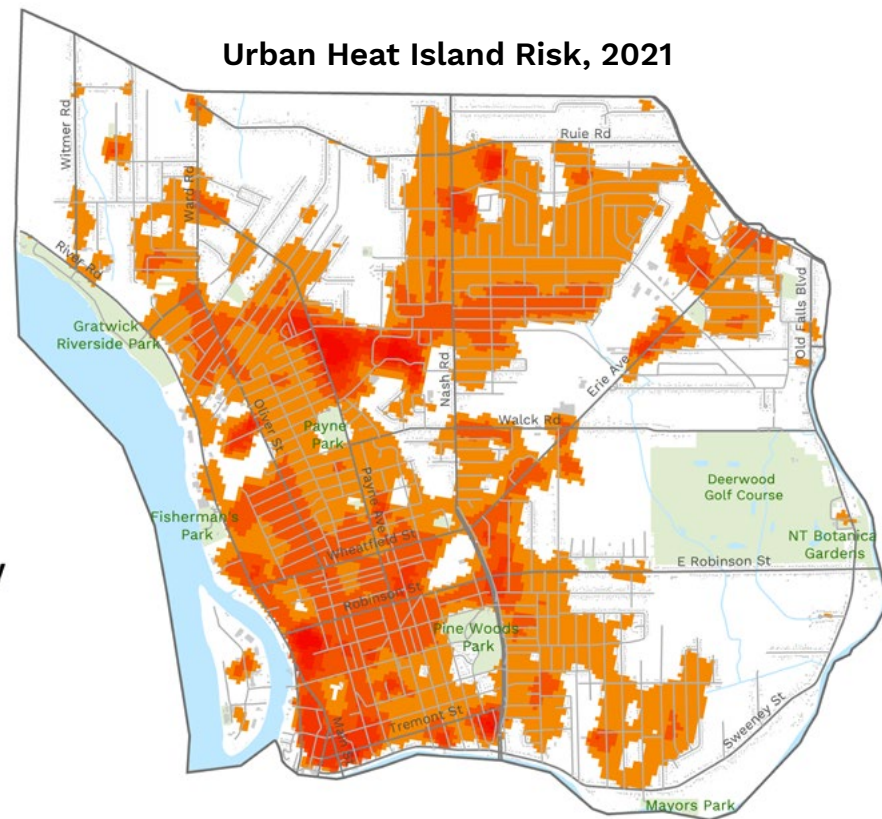
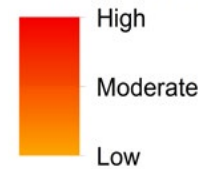
The potential for drought will also increase as temperatures rise and the climate becomes more unpredictable. The City could experience longer stretches of dry days—up to 15 days at a time on average compared to 11 days under existing conditions.²¹ This will impact water usage and could present health risks for residents, threaten vegetation, and affect what species can thrive within the local area.

EXTREME HEAT/DROUGHT IMPACTS BY CLIMATE SCENARIO

	“Existing”	“Expected”	“Extreme”
Annual days with maximum temperature > 100°F	0 days	2 days	11 days
Annual single highest maximum temperature °F	93 °F	100 °F	105 °F
Days per year with no precipitation (dry days)	147 - 156 days	146 - 172 days	145 - 185 days
Maximum number of consecutive dry days	9 - 11 days	9 - 13 days	9 - 15 days

Source: NOAA, CMRA Assessment Tool using National Climate Assessment LOCA data, 2018. Accessed July 2023 at <https://resilience.climate.gov/>;

Relative Urban Heat Island Severity



Source: The Trust for Public Land and National Integrated Heat Health Information System, Heat Severity Index, 2021. Accessed August 2023 at www.heat.gov/datasets/TPL::heat-severity-usa-2021/about

Climate Impacts Severe Winter Weather

While it seems contradictory, increasing global temperatures are causing increases in severe winter weather. Factors such as greater water in atmosphere (due to higher evaporation from lakes and oceans), changes in local wind patterns, and realigned storm tracks have caused more frequent and intense winter storms in many areas. This trend was made devastatingly clear in December 2022 when Western New York experienced an unprecedented winter storm. Although temperatures are increasing, severe winter weather will continue to be a concern for North Tonawanda.

Over the next several decades, the chance of lake effect snow is expected to increase as surface temperatures on Lake Erie rise and polar air still moves over the lake. Lake Erie surface temperatures are about 2.5°F warmer than in 1965 and the lake is covered by ice for sixteen fewer days per year,²² which increases the chances of lake effect snow. By mid-century (2040-2060) annual lake effect snow could increase by 4 inches on Lake Erie and 32 inches on Lake Ontario.²³

However, as the climate continues to warm, more precipitation will take the form of rain, meaning less snow overall. By late century (2080-2099) the City could see less than half the number of days with snowfall than today.²⁴

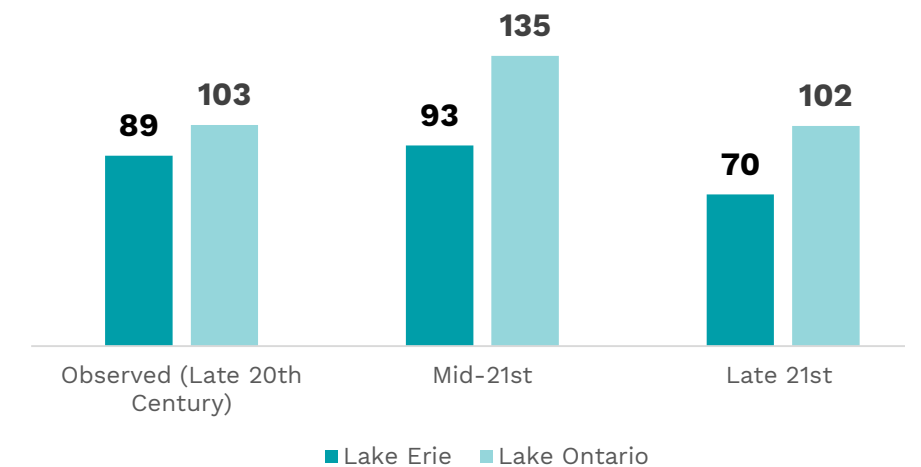
WINTER WEATHER IMPACTS BY CLIMATE SCENARIO

	“Existing”	“Expected”	“Extreme”
Total annual snowfall (in)	95”	113”	86”
Days with maximum temperatures below 32 °F	39-45 days	6-33 days	3-24 days

Warmer water temperatures and reduced ice coverage on Lake Erie could increase the chance of lake effect snow.

Compared to 50+ years ago (1965), average water temperatures in Lake Erie are about 2.5°F warmer and there are 16 fewer days of ice cover.

Projected Average Annual Lake Effect Snowfall (inches) through 21st Century Compared to Observed Trend



Sources: U. S. Global Change Research Program, CMRA Assessment Tool using National Climate Assessment LOCA data, 2018. Accessed July 2023 at resilience.climate.gov/; Notaro, Bennington, and Vavrus, “Dynamically Downscaled Projections of Lake-Effect Snow in the Great Lakes Basin,” 2014; Vermette, “Weathering Change in WNY: Climatic Trend Analysis (1965-2016),” 2017.

Climate Impacts Flooding

Flooding is a hazard of concern for the community. While a relatively small area lies in the FEMA floodplains, urban neighborhood flooding is common in areas outside of the floodplain due to the City's flat topography, poorly-draining soils, concentration of impervious surfaces, and aging infrastructure. The City is susceptible to sewer overflows during extreme precipitation.

Flooding risks are projected to increase in the future. By 2099, annual precipitation totals are expected to rise by up to four inches annually, while the City could see more than twice as many extreme precipitation events per year—up to 5 days with over one inch of precipitation.²⁵

Flooding can cause costly damages to infrastructure, emergency services, and homes. If a 500-year flood were to occur under the extreme scenario, 250 buildings totaling \$36M could be damaged in the City. This would be about four times the property values at risk of a 50-year storm, which would be expected to occur over the next fifty years under existing conditions.²⁶

FLOODING IMPACTS BY CLIMATE SCENARIO

	Existing	Expected	Extreme
Average annual total precipitation	34"	36"	38"
Maximum period of consecutive wet days	13 - 15 days	13 - 16 days	12 - 17 days
Annual days with total precipitation > 1 inch	1 - 2 days	2 - 4 days	2 - 5 days
Properties Damaged by Storms			
Buildings Damaged by Flooding	83	202	250
Total Assessed Value of Structures Damaged by Flooding	\$8.9M	\$10.7 M	\$36.1 M

Sources: NOAA, CMRA Assessment Tool, National Climate Assessment LOCA data, 2018;

Areas outside of the floodplain may also be susceptible to flooding due to climate impacts and extreme rainfall...

If water levels in Niagara River and Tonawanda Creek rise by 1 ft...
... 77 buildings valued at \$23.4M might be damaged.²⁷

If flash flooding occurs in areas with frequently ponded soils...
... 4,429 properties valued at over \$496M lie in soils subject to frequent ponding.²⁸

Sources: Kayastha, Ye, Huang, and Xue, "Future rise of the Great Lakes water levels under climate change," 2022; UBRI analysis of FEMA floodplains, Building Footprints from Columbia University's Center for International Earth Science Information Network (CIESIN) and Niagara County Tax Parcel Data, and the US Department of Agriculture's Soil Survey Geographic Database (SSURGO).
NOTE: Frequently ponded soils have an annual probability of surface ponding of at least 75%.

Flooding often occurs in areas beyond current floodplains, and this flooding may increase in the future. Nearly half of the land in North Tonawanda (45%) is covered by soils with poor drainage that are susceptible to frequent ponding which can create flooding issues. There are over 4,200 properties that lie in areas with frequently ponding soils, valued at nearly half a billion dollars (\$496M).²⁹

Research has estimated that water levels in the Great Lakes could increase with climate change. Lake Erie could rise by 1 foot or more,³⁰ which could impact water levels along the Niagara River and Tonawanda Creek. If water levels were to rise by 1 foot along the shorelines of North Tonawanda, another 77 buildings outside of the floodplain, valued at \$23M, could be damaged, along with potential shoreline erosion and damage to docks and other waterfront assets.³¹

Floodprone areas in North Tonawanda

- ▲ Flooding issues identified in NCHMP
- 100-year floodplain (1% annual chance)
- 500-year floodplain (0.2% annual chance)
- Areas within 1 ft elevation of shorelines
- Wetlands
- Frequent ponding soils
- Building footprints



Sources: Various sources, see data notes.³²

Climate Impacts

Other Climate Impacts

This plan focuses on climate hazards identified to be of highest concern in the City, but the plan must also consider a variety of other potential climate impacts that may require action to achieve climate resilience.

High winds may become more common and severe as global climate patterns shift. An analysis of climate trends found that the number of “thunderstorm” wind events over Lake Erie increased significantly from 1996 to 2016.³³ Severe wind is a common concern for the community and requires mitigation planning and action.

Invasive species could spread to the region as species adjust to new climate conditions. Invasive species, pest insects, blights and parasites can threaten ecosystems in the City. For example, the Emerald Ash Borer decimated the local ash tree population which created hazard risks. Similarly, **agriculture** will likely be affected as the warming climate extends the growing season and alters the types of crops that are able to thrive in the region; this could impact local food systems and may create agricultural and economic opportunities.³⁴

Air quality concerns could become more persistent due to climate change impacts. A recent study found that after decades of progress, air quality hazards are increasing in the US.³⁵ North Tonawanda experienced a number of days with unhealthy air quality in 2023 due to smoke from wildfires. These events present health concerns for the community, especially sensitive groups, and could have wider impacts.

People displaced by climate hazards and extreme events. In 2022, 32.6 million people were displaced by environmental hazards worldwide—more than any other year.³⁶ This number only includes internal displacements, or people displaced within their own nation. With increasing risks of severe storms, droughts, and extreme heat across the US and the globe, more people will be displaced. Places like North Tonawanda could offer displaced individuals a safer climate due to relatively moderate temperatures and freshwater access. New potential residents may present the community with new economic opportunities but also may bring challenges.



Climate Vulnerabilities

Social Vulnerability

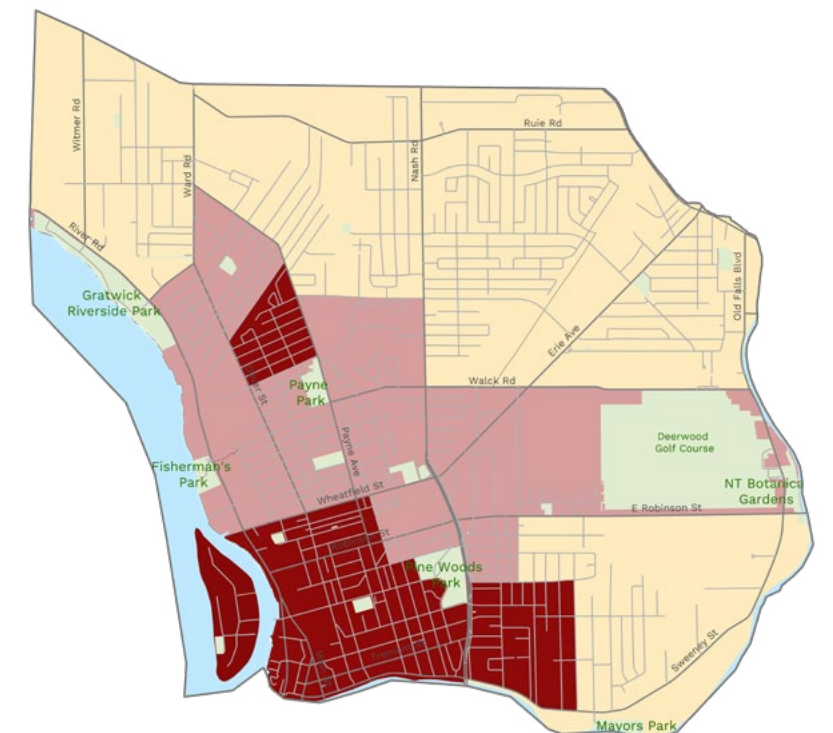
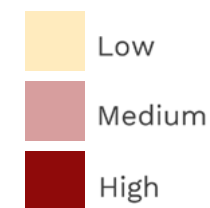
Certain factors put individuals at higher risk of experiencing negative impacts due to climate hazards. These include living in poverty, not having access to a vehicle or internet, or having disabilities. The relative social vulnerability shown on the map is measured using these and other socioeconomic and demographic variables. The ratings shown are relative to neighborhoods across Niagara County.

Neighborhoods in and near downtown North Tonawanda have a relatively high social vulnerability. These areas are more likely to include renters, seniors, households without a vehicle or internet, individuals with disabilities, and others whose circumstances may limit their ability to evacuate or shelter-in-place safely during climate hazard events. Neighborhoods with higher social vulnerability may require special attention to plan for

climate hazards, especially vulnerable populations near hazard prone areas. Critical facilities and service providers are crucial to assisting vulnerable populations in preparing and responding to climate hazards.

Many residents live in older homes that can commonly be in need of structural repair, roofs, basements and are typically less energy efficient. These buildings may make residents more vulnerable to climate hazards. Structural and insulation deficiencies are more common in older homes. These issues can make buildings more susceptible to damage from floods, winds, and less able to protect against extreme heat and cold. This may risk the safety of residents during hazards, but residents typically require financial and technical assistance to improve homes to better protect themselves from climate hazards.

Social Vulnerability in North Tonawanda



The social vulnerability index is measured using fourteen socioeconomic variables, including income, poverty, age, race, education, households with no vehicle or Internet, individuals with disabilities, and more. See Data Sources and Notes for additional information.³⁷

Sources: US Census, ACS, 5-year estimates block group data. From the and Niagara County 2022 HMP. See Data Sources and Notes.³⁷

Climate Vulnerabilities

Environmental Areas

Environmental areas and open spaces provide diverse ecosystem functions to mitigate against climate hazards. Wetlands help capture storm water and prevent flooding, open spaces and vegetation in urban areas mitigate the urban heat island effect during extreme heat. Open spaces play a vital role for all communities, and especially help in the mitigation of hazard impacts. Open spaces include public parks, undeveloped wilderness areas on vacant lots, and protected wildlife refuges, wetlands, or conservation easements.

Climate change presents risks for North Tonawanda’s natural environment. Increasing seasonal temperatures, precipitation, and extreme events can negatively affect a variety of species, threaten biodiversity, and make natural ecosystems more susceptible to hazards like floods and extreme heat, limiting resilience for the entire City.

City of North Tonawanda, Environmental Areas, 2021

- Elevation Contours (meters)
- Parks and Open Spaces
- Forests
- Open grass/shrublands
- Conservation Easements
- Wetlands



Sources: NYS GIS Program Office and Niagara County 2022 Hazard Mitigation Plan. See Data Notes.³⁸

Climate Vulnerabilities

Recent and Future Development

While North Tonawanda is mostly urbanized, it has thousands of acres of wetlands, parks, and other natural spaces. Parts of the City remain undeveloped, and many of these undeveloped areas lie near natural lands, parks and shorelines.³⁹ Development pressures may threaten open spaces, increase hazard risks, and alter City priorities for hazard mitigation. Developments add pressures on infrastructure and the environment and may increase hazard risks, such as flooding potential.

This plan must consider how future development will affect the people, properties, and infrastructure at risk to future climate hazards. Recently constructed properties and ongoing development projects may point to where future development trends could lead. Vacant land and parcels where the value of the structures are low relative to the value of the land may be susceptible to development, which would add infrastructure costs, and may present hazard risks if located near shorelines or hazard-prone areas. Urban revitalization efforts and redevelopment projects have successfully renovated vacant buildings in the City. Projects to adaptively reuse vacant buildings can help save on future infrastructure costs and avoid adding new hazard vulnerabilities.

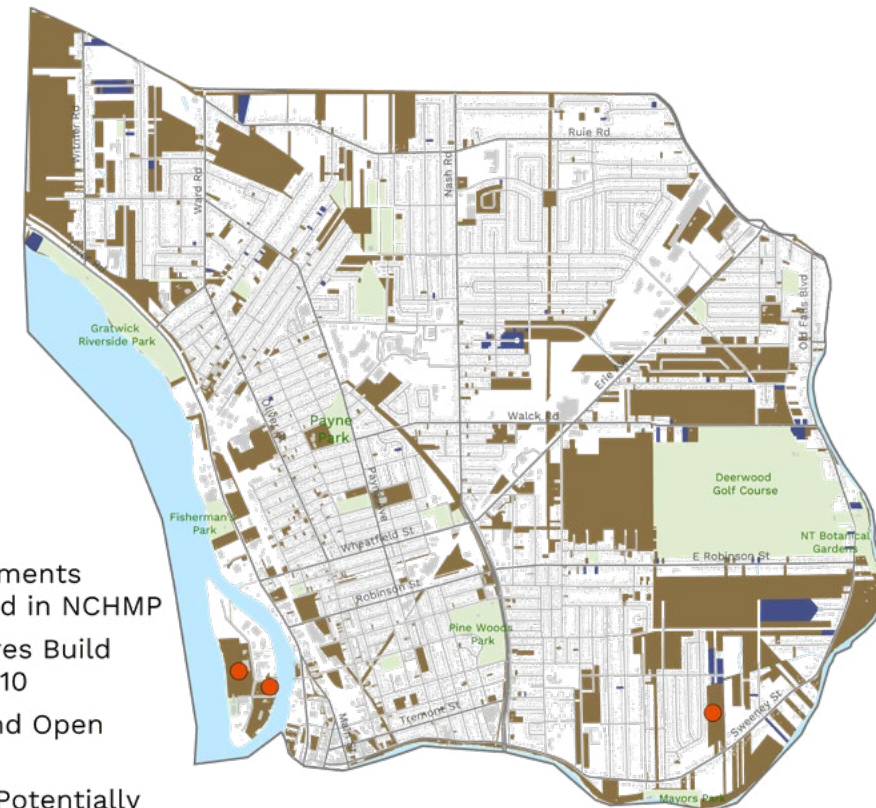
NORTH TONAWANDA ENVIRONMENTAL AREAS

Developed Area	5.7 sq. miles
% Impervious Surfaces	27.4%
Wetlands	1,141 acres
Parks and Open Spaces	544 acres
Vacant Land	823 acres
# of trees	12,927
Shoreline	9.97 miles

Sources: Various sources, see data notes.⁴⁰

Recent and Potential Development

- Current developments identified in NCHMP
- Structures Build After 2010
- Parks and Open Spaces
- Vacant/Potentially Underutilized Parcels



Sources: Niagara County Parcel Data, 2022 and Niagara County 2022 HMP. See Data Notes.⁴¹

Community Engagement Process Overview

The planning team and Task Force established and guided the engagement process through 8 meetings from May through October 2023. Engagement focused on collecting feedback from the community and stakeholders. Their local insights helped to shape hazard concerns and vulnerability assessment findings, create the community vision, and develop plan recommendations.

The community survey was the foundational engagement piece for this plan. The 141 survey responses led to the plan vision and informed resilience strategies. Survey feedback fed into the community resilience workshop where local stakeholders helped identify, prioritize, and detail resilience strategies for North Tonawanda. The community was brought together in a public meeting to review the draft plan and provide feedback on draft strategies and plan findings. This feedback was incorporated into the final plan which was presented to the North Tonawanda Common Council who passed a resolution to adopt the plan in November 2023.



8 Meetings with the **Climate Smart Task Force**



141 Responses to the **Community Survey**



22 Stakeholders Provided Feedback in the **Community Resilience Workshop**



Community Members **reviewed the plan at a Public Meeting**

Community Vision

VISION STATEMENT:

“North Tonawanda will be prepared for climate change when we understand our potential climate risks and have a plan to mitigate these impacts so our communities, economy, and environment can be resilient to any future climate hazard.”

The vision statement for this plan was developed primarily through responses to a question on the community survey asking community members to complete this sentence: “North Tonawanda will be prepared for climate change when...” The planning team synthesized responses to uncover common trends and create a unified vision statement. The Task Force, stakeholders, and community reviewed the vision statement.

The community called for an increased awareness of climate-related hazard impacts. Respondents also spoke to a need for both households and the City itself to enhance emergency preparedness to prepare for an increased risk of severe winter weather and extreme events. Many respondents stressed a need to adapt aging infrastructure to handle a wider variety of extreme weather, particularly updating sewer infrastructure to handle more intense rainfall and prevent neighborhood flooding.

“North Tonawanda will be prepared for climate change when...”

“The citizens are regularly informed about the pattern of climate change and the potential impact it will have on us in our community.”

“Residents and community leaders are well informed on climate change and willing to take action to mitigate the risks.”

“...ease the burdens of issues that may arise via climate change.”

“We have a complete understanding of the climate risks that may impact the community and a plan to mitigate the effects of the potential impacts.”

“... we update our infrastructure to deal with additional rainfall... and prepare for additional snowfall.”

“...water management systems have been bolstered to handle extreme water conditions.”

“We understand the impacts and have mitigation strategies and emergency plans in place.”

Quotes from community responses to the North Tonawanda Climate Resilience Survey, 2023.

Community Survey Findings

The planning team developed a community survey to identify climate hazard concerns and priorities for potential adaptation strategies, and to help establish the community vision. The Task Force helped review and finalize the survey while the planning team developed promotional materials for the survey, and helped promote and distribute the community survey by handing out palm cards and flyers at the North Tonawanda Farmer’s Market, public library, City Hall, and other community centers. The Mayor shared the survey through email in a newsletter. The results from the community survey were reviewed by the planning team and task force and were used to establish the format and content of the stakeholder workshop.

The survey received over 140 responses in total. Compared to the City population as a whole respondents were more likely to be white, female, above the age of 55, and to have a college degree.⁴²

Most respondents (71%) said they are moderately or extremely well informed on climate change impacts in NT. An even greater majority (81%) think that climate change will impact them personally. About a third of respondents (32%) say their home/business was significantly damaged by past hazard events. The climate hazards they are most concerned about include snow, extreme temperatures, severe winds, and flooding.⁴³

While respondents were aware of climate impacts and had experience with past hazard events, a smaller portion said they were prepared for climate impacts. Most have taken basic household hazard preparedness measures, such as installing smoke detectors, and storing flashlights, fire extinguishers, and medical supplies. However, just 38% say their household is moderately or very well prepared to go

without heat or electricity for more than one day. 20% say they don’t know where to go in the event of an emergency. When asked where they would go in the event of an emergency, more than half (56%) said they’d go to a neighbor, family or friend and 21% to a shelter. Only 16% had an emergency plan for their household.⁴⁴

When asked what they would do if their home was repeatedly damaged by hazards, 66% said they’d consider selling their property and moving. Financial support would be the most effective incentive for the community to make structural improvements to mitigate hazards. 76% said loans and 38% said low cost loans would help them make improvement to their properties.⁴⁵

Respondents also weighed in on potential strategies the City could take to become more resilient to climate hazards. The resilience strategies that received the strongest support included preserving natural areas and using vegetation and green infrastructure to protect against flooding and other hazards. The majority also supported constructing new sewer infrastructure, ensuring backup emergency power for shelters and restricting development in flood prone areas. The majority of respondents said delivering emergency supplies 66%, and proactive outreach to promote awareness and preparedness (63%) would help protect vulnerable populations from hazards.⁴⁶

These findings were an essential input to the formation of this plan’s recommended strategies.

Who took the survey?

141 responses

88% live in North Tonawanda

76% own a home in North Tonawanda

11 North Tonawanda business owners

67% Female

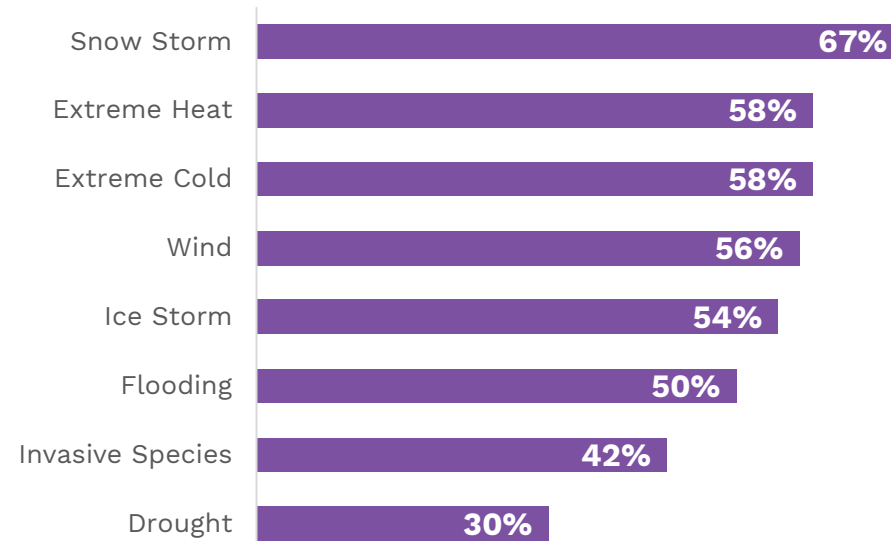
95% white

61% have a Bachelor's degree or higher

56% above age 55

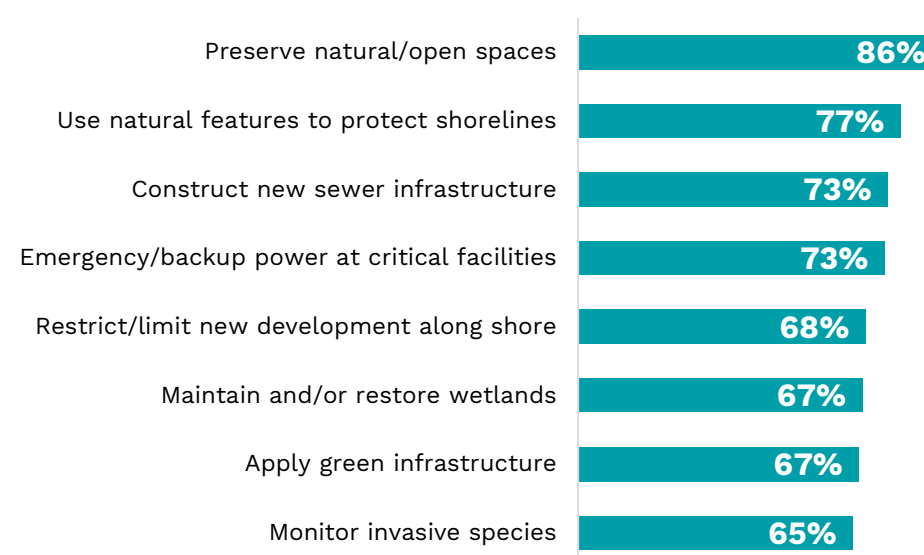
18% under 35

Top Climate Hazard Concerns



Represents percentage of respondents who said they were strongly concerned about the future climate impacts of each hazard type. n=139

Top Climate Resilience Strategies



Represents percentage of respondents who said they would support the community implementing each climate resilience strategy. n=132

Source: North Tonawanda Climate Resilience Survey, June-September, 2023.

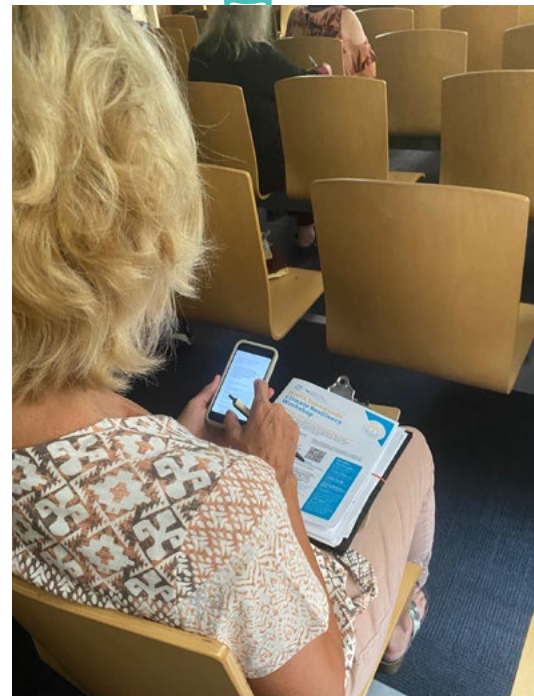
Stakeholder Input on Climate Resilience Strategies

Stakeholders from within the City of North Tonawanda were engaged to help prioritize and contextualize the most appropriate approaches to building climate resilience in North Tonawanda. Stakeholders were invited to a community resilience workshop in August 2023. In total, twenty-two participants attended, including City representatives from various departments, as well as the Chamber of Commerce, Climate Smart Task Force, Lumber City Development Corporation, City Police and Fire Departments, and State Assembly.

The planning team reviewed past plans to develop nine potential approaches to climate resilience and presented these to local stakeholders at the workshop. Stakeholders provided feedback on these approaches using a handout during the event and an online follow-up form. They were asked to prioritize strategies and to conceptualize how these approaches could be implemented to adapt to climate hazards in the City. The meeting materials from this stakeholder workshop, including presentation slides, agenda, and feedback handout, can be found in the Appendix.

The planning team used this input to draft resilience strategies, while aligning them with potential funding opportunities and organizations who might lead implementation. The task force reviewed these recommendations and they were presented to the public with the launch of the draft plan in October 2023. Feedback from the community was used to further prioritize and detail these strategies.

Images from the Community Resilience Workshop at North Tonawanda City Hall where stakeholders provided feedback using a paper handout and an interactive poll on their mobile devices.



Key themes from stakeholder feedback at the Community Resilience Workshop reveal needs and opportunities to mitigate flooding, severe winter weather, extreme heat, drought, and other potential climate impacts.

When flooding was discussed, stakeholders underscored the need for storm sewer separation and upgrades. Stakeholders recommended enhancing drainage, utilizing green infrastructure, and preserving wetlands and natural areas to mitigate flooding.

Stakeholders also suggested using green infrastructure to handle extreme heat and drought. Stakeholders recommended enhancing emergency shelters, communications, and community outreach to prepare for and respond to extreme heat events. Funding and outreach could help homeowners make energy-efficiency upgrades to mitigate extreme heat.

Similar strategies were suggested to address severe winter weather, including assisting homeowners with structural upgrades, hazard awareness, emergency notification systems, upgrading emergency shelters, and empowering citizens to help with emergency preparedness and response, by community groups delivering supplies to vulnerable populations, for example.

These key findings from the Community Resilience Workshop led to the development of the plan's recommendations including high priority climate resilience strategies and other strategy considerations.



Recommended Strategies for Climate Resilience in North Tonawanda

Key findings from the Community Resilience Workshop led to the creation of the plan's recommended strategies, which are summarized below. Acquiring **funding is seen as an overarching need** to implement all climate resilience strategies (See page 42).

Upgrading sewer systems to mitigate flooding is a top priority that will require strategic planning, phased implementation, and multiple funding sources. To divert stormwater from sewers, the City can separate stormwater sewer systems, sump pumps, and gutters from entering the sanitary sewer system.

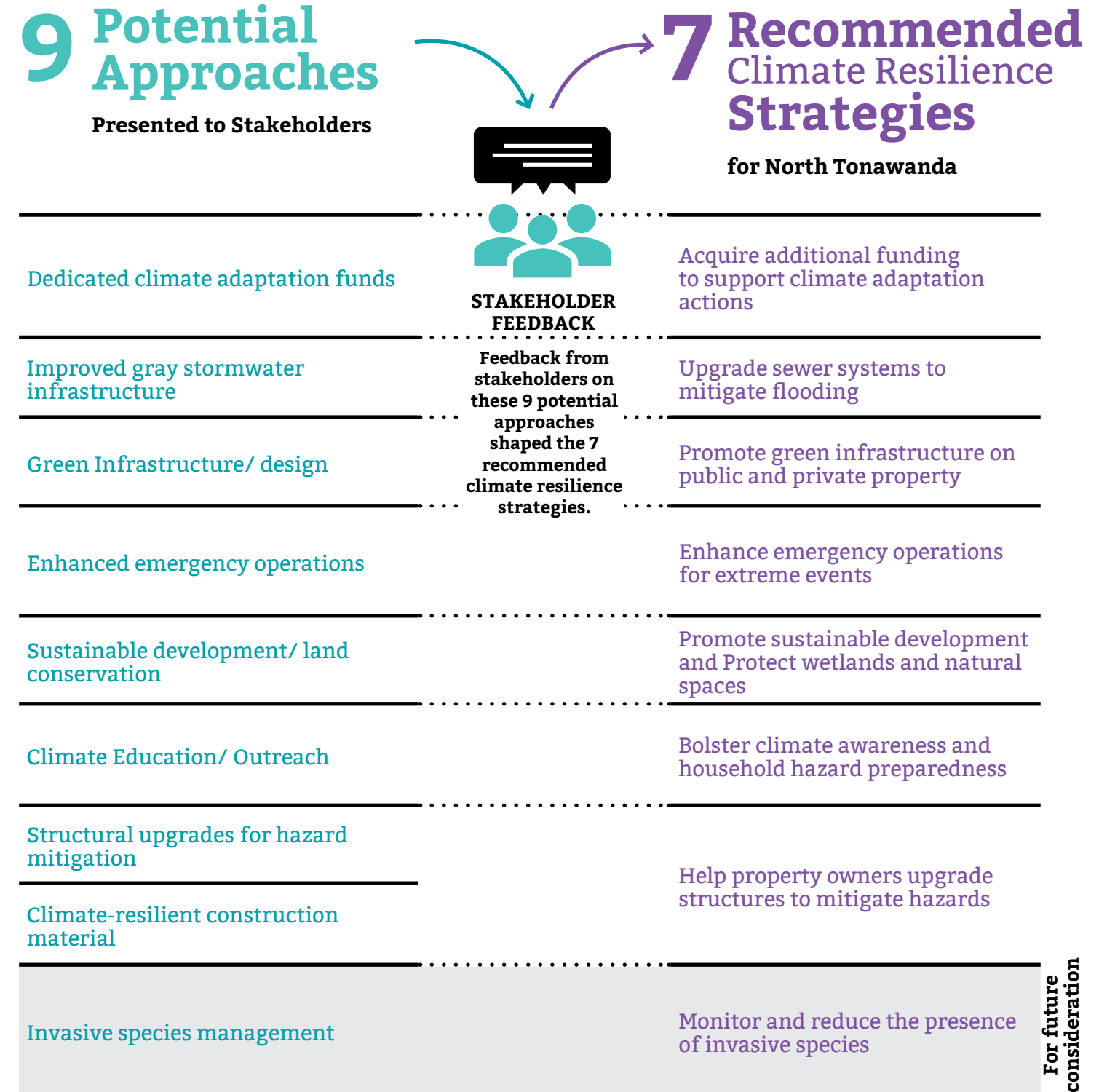
Promoting green infrastructure on public land and private property can mitigate flooding and extreme heat. This work involves public outreach, funds and incentives, updates to the comprehensive plan and zoning code, rain gardens, and planting diverse tree species that are resilient to changing climate conditions.

Enhancing emergency operations for extreme events includes citywide emergency notifications to inform the public of risks and procedures during severe weather. This also involves ensuring that public facilities can serve as heating/cooling centers with adequate cooling/heating, backup power, and supplies.

Promoting sustainable development and protecting wetlands and natural areas can preserve ecological functions to mitigate flooding, extreme heat, and other climate hazards. Adaptive reuse of buildings and infill development, can protect natural areas and limit infrastructure costs.

Community outreach can **bolster climate awareness and household hazard preparedness for climate hazards**. Utilizing neighborhood organizations to help in hazard response and recovery can also play a role, for example, by helping to distribute food and emergency supplies to vulnerable residents.

The City can **help property owners upgrade structures to mitigate hazards** through financial and technical assistance. This can include energy efficiency improvements, like insulation, heating, air conditioning, and backup generators to help people shelter in place during extreme heat or winter weather. Property owners can also use climate-resilient construction materials to mitigate climate impacts, like permeable pavements or white roofs. This strategy requires dedicated funding, community outreach, and education ensure structural upgrades are effectively implemented and maintained.



For future consideration

Climate Resilience Strategy #1:

Acquire additional funding to support climate resilience

Some municipalities have established climate adaptation funds, which set aside funding specifically for implementing climate adaptation strategies within communities. These funds can be tapped to address climate-related emergencies or as part of long-term planning efforts to implement resilience measures. The flexibility and ready availability of these funds provides a distinct benefit for municipalities, and they are inexpensive and relatively simple to administer.

CASE STUDY: The cities of Portland (OR) and Denver (CO) have both passed ballot measures to establish dedicated climate funds, following grassroots campaigns promoting the strategy. Portland funded this effort through a 1% increase on local retail tax on for large businesses. Denver implemented an 0.25% increase in sales tax, which generates \$30 - \$40 million per year to support climate adaptation investments, with a strong emphasis on equitable investment in underserved communities.⁴⁷

WHAT THIS INVOLVES IN NORTH TONAWANDA: Apply City finances from taxes, fees, loans, or innovative financing programs that would dedicate City funds to pay for climate resilience strategies.

Strategically procure additional funding through various State and Federal agencies who offer programs to support climate resilience strategies, which are often ongoing and costly.

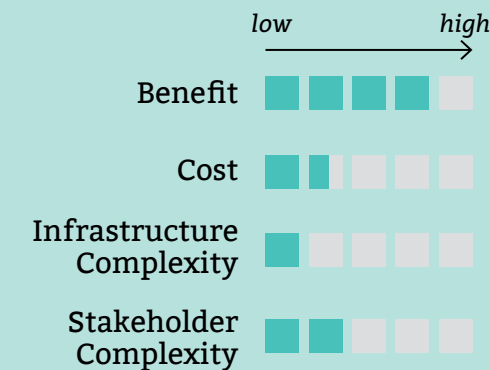
Apply climate resilience funds to finance public infrastructure projects.

Establish programs to allocate dedicated funds to homeowners and other community members to encourage and finance climate resilience strategies on private properties.

Seek funding from other sources, such as philanthropy or public-private partnerships with major employers or property owners.

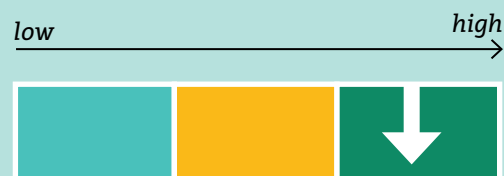
Potential Approach presented for feedback:
Dedicated climate adaptation funds

How this Strategy Performs:⁴⁸



Stakeholder Feedback

Priority Level⁴⁹



See page 42 for more on funding and implementation.

Climate Resilience Strategy #2:

Upgrade sewer systems to mitigate flooding

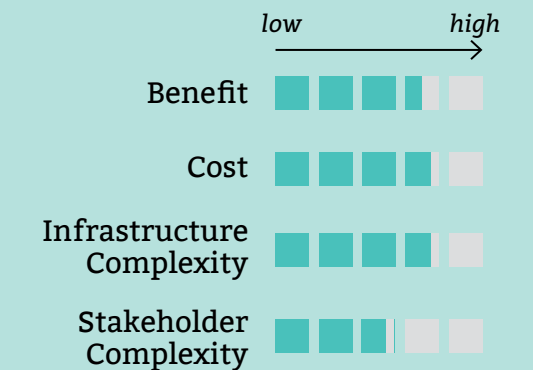
Improvements to “gray” stormwater infrastructure can help municipalities reduce stormwater runoff, flooding, and degraded water quality as extreme precipitation events become more common. Replacing older combined sewer and stormwater systems can be advantageous when possible; other measures may be more cost-effective, such as pumping station upgrades, green infrastructure or artificial barriers and reservoirs to impede stormwater runoff. Infrastructure improvements on this level are inevitably costly and involve complex engineering and in-depth stakeholder engagement but can maintain water quality and minimize flooding

CASE STUDY: Polk County (FL), located between Tampa and Orlando, is a rapidly growing area that faces hurricanes with increasing frequency. Rapid urbanization has left many ‘legacy’ areas of the county in need of infrastructure upgrades. The county consistently tracks frequent flooded areas based on residents’ input, but has perennially lacked adequate funds to address these needs. In 2021 the county was able to apply funds from the American Rescue Plan to address fifteen of its most urgent flooded areas, and to construct a network of stormwater wetlands to control flooding issues.⁵⁰

WHAT THIS INVOLVES IN NORTH TONAWANDA: Remove residential stormwater from entering the sanitary sewer system. Redesign and right-size the sewer infrastructure where necessary. Procure State and Federal funds and other funding sources for system improvements. Develop a strategic plan to determine how to most efficiently carry out additional sewer projects through phased implementation to address the most critical infrastructure needs and capitalize on available funds.

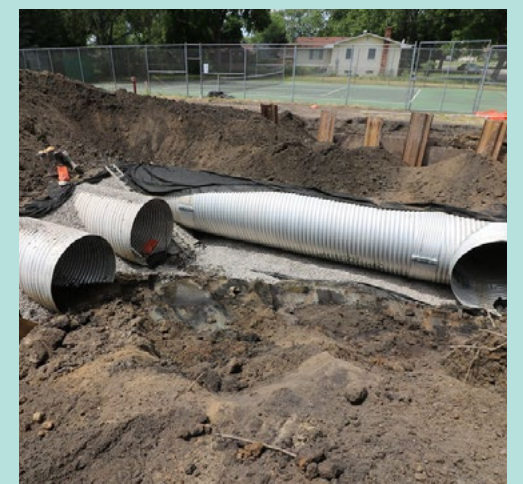
Potential Approach presented for feedback:
Improved gray stormwater infrastructure

How this Strategy Performs



Stakeholder Feedback

Priority Level⁴⁹



Climate Resilience Strategy #3:

Promote green infrastructure on public and private property

Green infrastructure involves materials, technology and design elements to emulate and maintain the function of natural systems. This reduces the impact of climate hazards like flooding and extreme heat. Green infrastructure for flood control includes bioswales, rain gardens, green streets, or pavement removal. Green roofs and walls, urban forestry, and green design can reduce heat island impacts. Implementing green infrastructure can be costly, but can save costs over time by avoiding expensive sewer infrastructure replacements, reducing energy use by cooling buildings, and enhancing the visual appeal of urban areas.

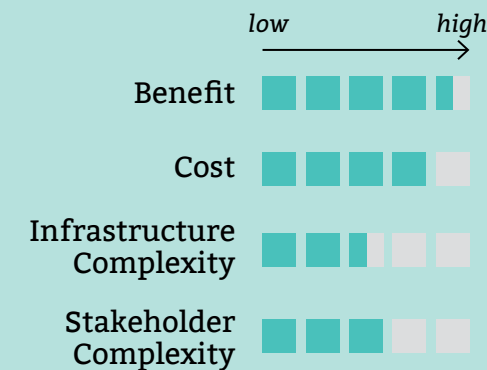
CASE STUDY: In many cities like North Tonawanda, extreme rainfall events can exceed the capacity of the city’s combined sewer/stormwater system resulting in overflow of untreated water into waterways. To limit these combined sewer overflows, the City of Buffalo implemented a Green Infrastructure plan and program called, RainCheck. This involved numerous projects, like the Green Street redesign of Niagara Street, residential downspout disconnection, and rain barrels. Buffalo Niagara Waterkeeper projects that widespread green infrastructure in the City could reduce total stormwater flow by up to 45% during the heavy rains, nearly eliminating the combined sewer overflow events.⁵¹

WHAT THIS INVOLVES IN NORTH TONAWANDA:

- Incorporate strategic plans for green infrastructure (GI) in comprehensive plan.
- Update zoning codes to promote GI use for individuals, neighborhoods and city.
- Adapt citywide tree inventory for increased diversity and climate resilience.
- Demonstration projects for GI with public education components for residences, businesses, and public spaces, and other education on GI practices/opportunities.
- Promote GI for residents and businesses through new incentives, funds or credits.
- Monitoring and outreach to maintain GI practices on private lands.
- Residential /business rain barrel and rain garden programs.

Potential Approach presented for feedback:
Green Infrastructure/ design

How this Strategy Performs



Stakeholder Feedback

Priority Level⁴⁹



Climate Resilience Strategy #4:

Enhance emergency operations for extreme events

Extreme weather events have prompted municipalities to enhance their emergency operations. This can entail new procedures and modernized infrastructure to prepare for extreme events and address deficiencies. Key components of this work include targeted communication to inform the public on emergency procedures, early-warning systems and protocols, and ensuring adequate emergency preparation and back-up power at emergency shelters and critical facilities. These actions have a high potential benefit, but may require considerable costs if when new equipment or programs are needed.

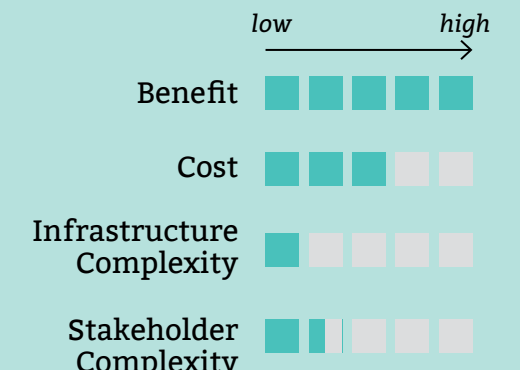
CASE STUDY: After Hurricane Katrina in 2005, the New Orleans’ Office of Homeland Security and Emergency Preparedness implemented a City-Assisted Evacuation program. The program established 17 ‘evacuspots’ for residents to access public transportation to evacuate during hurricanes. After evacuating 18,000 residents through the program during Hurricane Gustav in 2008, the city partnered with Evacuteer.org, a non-profit that trains and deputizes volunteers to assist in evacuation.⁵²

WHAT THIS INVOLVES IN NORTH TONAWANDA:

- Emergency notification system via Mayor/ City to inform/prepare public for hazards, which could include texting, radio, and/ or door-to-door check-ins for vulnerable residents.
- Ensure all city buildings and schools are properly equipped to serve as emergency shelters during extreme heat and cold.
- Upgrade/purchase rescue vehicles for police and fire departments to enable first responders to travel in extreme snowfall events.
- Coordinate emergency plans with nearby municipalities, NY Power Authority, the State, and Niagara County.
- Require or incentivize backup power generator capability for critical services like gas stations, grocery stores, and pharmacies.

Potential Approach presented for feedback:
Enhanced emergency operations

How this Strategy Performs



Stakeholder Feedback

Priority Level⁴⁹



Climate Resilience Strategy #5:

Promote sustainable development and protect wetlands/natural areas

Municipal land use regulations can support climate resilience by preserving natural areas and encouraging development in more suitable locations. Zoning codes can designate natural areas for conservation, and can be complemented by building and infrastructure codes that integrate sustainable development goals in construction materials and operations. Infill development, land conservation, and urban growth boundaries are examples of policies that provide climate resilience benefits. Due to the many stakeholders and property owners impacted by land use decisions, land use regulations and design standards can be procedurally complex to implement, but the potential benefit for climate resilience is high.

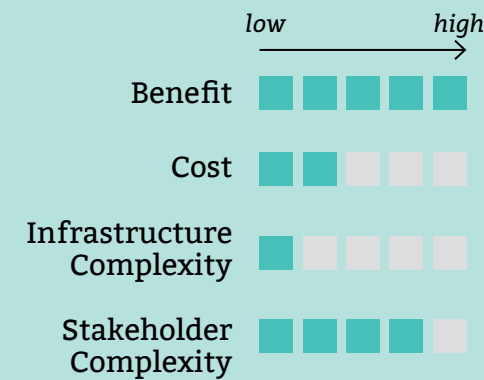
CASE STUDY: The District of Columbia established a “Green Area Ratio (GAR)” for site design to ensure that a portion of the total area is preserved as green space. This helps reduce stormwater runoff, mitigate urban heat, and preserve ecological functions. A building receives an impact score based on its landscape and site design features, and the ratio of green area to the total area of the site. This impact score is used to determine the area of sustainable landscape elements required for the site.⁵³

WHAT THIS INVOLVES IN NORTH TONAWANDA:

- Adapt zoning and engage with local conservation non-profits to protect wetlands and other natural areas
- Formally preserve NT Audubon Nature Preserve (Klydel Wetlands) through City.
- Investigate other land use policies to limit flooding and preserve wetlands, tree cover, parks, and other open spaces.
- Promote adaptive reuse of existing buildings through financial incentives.
- Upgrade zoning and building code requirements to integrate sustainable development goals.
- Limit new development outside of existing sewer system, or require system upgrades as part of any new development that utilizes sewer system.

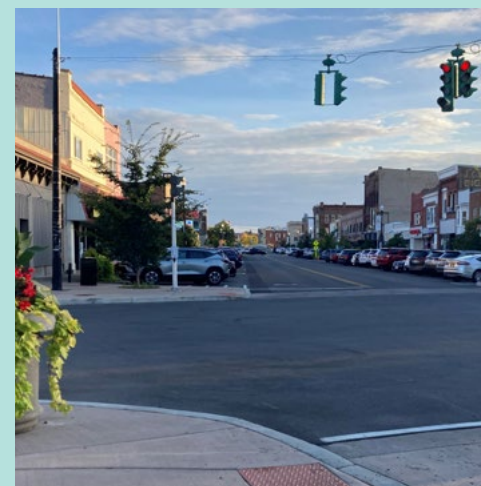
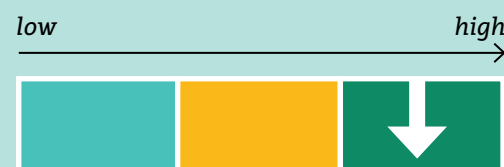
Potential Approach presented for feedback:
Sustainable development and land conservation

How this Strategy Performs



Stakeholder Feedback

Priority Level⁴⁹



Climate Resilience Strategy #6:

Bolster climate awareness and household hazard preparedness

Climate education and outreach helps communities adapt to climate hazards in several ways. Increasing awareness of how the community will be affected by emerging climate impacts may motivate community members to prepare for extreme weather and other potential climate impacts. Outreach and education activities may include: special events and public meetings; training to equip local volunteers; marketing campaigns using radio, TV, social media, and printed resource; surveys; and other public engagement. Climate education and outreach campaigns require considerable planning and coordination, and varying costs depending on scale; however they can be a relatively straightforward way to enhance community resilience at the local level.

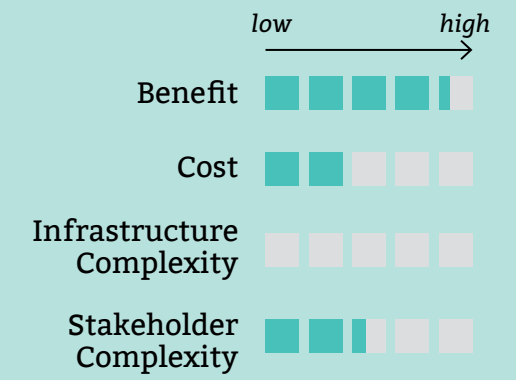
CASE STUDY: The City of Somerville, MA, takes an innovative approach to climate education and outreach that emphasizes building social ties among residents and integrating education with recreational activities. The city hosts a week-long festival leading to Earth Day, and has developed interactive walking tours of renewable energy infrastructure in the community, hosted sustainable cooking classes, and is rolling out a climate ambassadors program to build leadership from within the community.⁵⁴

WHAT THIS INVOLVES IN NORTH TONAWANDA:

- Community outreach and education to promote awareness and preparedness.
- Distribute emergency supplies & resources to enable residents to shelter in place.
- Support the use of community groups to help in response and recovery from events, especially vulnerable populations (e.g., distributing food supplies via snowmobiles).
- Partner with nearby municipalities, County or State to implement/fund strategy.

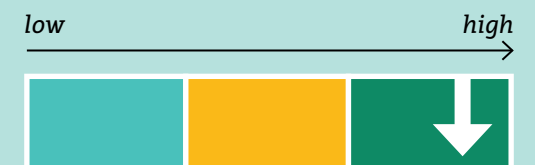
Potential Approach presented for feedback:
Climate Education/ Outreach

How this Strategy Performs



Stakeholder Feedback

Priority Level⁴⁹



Climate Resilience Strategy #7: Help property owners upgrade structures to mitigate hazards

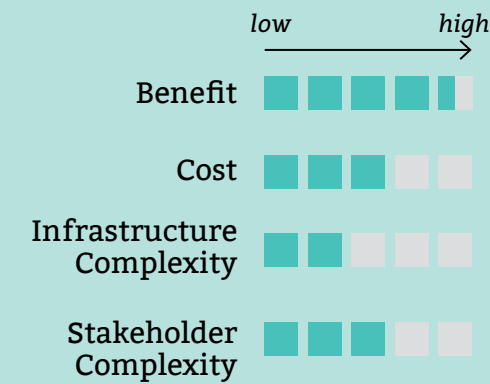
This strategy involves two potential approaches to climate resilience to minimize the damages to buildings, infrastructure, and people during extreme weather events: upgrading structures and incorporating climate-resilient construction materials.

Structural upgrades can maintain a building's electrical or heat supply during extreme temperatures and power outages, enhancing public safety and minimizing economic losses. Structural mitigation measures rely heavily upon engineering solutions, which can translate to high costs and may be complex to implement. Examples of these upgrades can include modular constructions, temporary, or movable features. Installing water-resistant coatings, doors and windows, improved exterior drainage systems and flood retention basins can mitigate flooding. Adding HVAC updates, new doors and windows, insulation, or ventilation systems such as solar attic fans, can enhance the energy efficiency of homes and improve residents' safety during extreme heat and cold.

CASE STUDY: The New York State Energy and Research Agency (NYSERDA) provides weatherproofing information, resources, and incentives for building owners. Programs focus on installing insulation and air-sealing buildings to protect against heat and cold and improve the efficiency of HVAC systems. NYSERDA provides home energy audits through contractors, information on DIY projects, help locating contractors, and weatherproofing incentives through its Comfort Home Program.⁵⁵

Potential Approach presented for feedback:
Structural upgrades for hazard mitigation

How this Strategy Performs



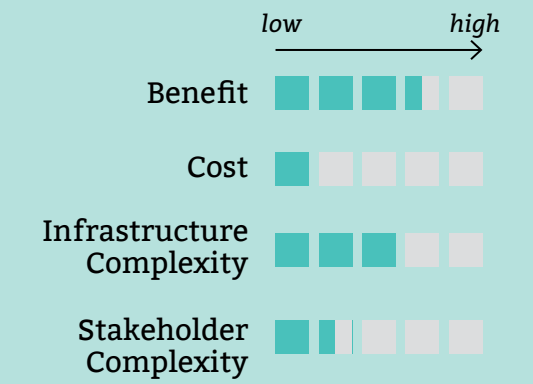
Stakeholder Feedback

Priority Level⁴⁹



Potential Approach presented for feedback:
Climate-resilient construction materials

How this Strategy Performs



Stakeholder Feedback

Priority Level



Climate-resilient construction materials can enhance resilience to climate hazards for buildings and developed areas. Sustainable and lighter-colored materials in buildings exteriors can mitigate urban heat island effects and reduce stormwater runoff. Examples of climate resilient construction materials are white roofs and walls, cool pavement, and permeable pavement. Using climate resilient materials in new construction and renovation projects provides a relatively high benefit at moderate or low cost; such projects are generally fairly simple in terms of the administrative effort and infrastructure required.

CASE STUDY: In 2009, New York City began a program to paint building roofs white to minimize heat absorbed by buildings. The service is provided for free to nonprofits, hospitals, and affordable housing buildings, totaling over 9.2 million square feet of roof area to date. "Cool roofs" save energy on cooling and can help minimize overall heat island effects within urbanized areas by up to 3°F.⁵⁶

WHAT THIS INVOLVES IN NORTH TONAWANDA:

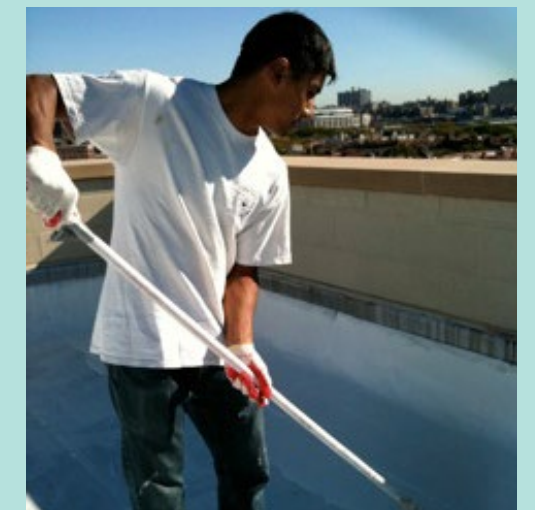
Provide technical and financial assistance to promote home energy saving improvements such as insulation.

Procure and allocate city dedicated funds for climate adaptations and home improvements, such as air conditioning, back up power renewable energy, and climate-resilient construction materials.

Ensure energy efficiency and hazard mitigation measures for new construction.

Educate property owners on the potential uses and benefits of structural upgrades, energy improvements, and climate-resilient construction materials through outreach or demonstration projects.

Promote availability of Property Assessed Clean Energy (PACE) Financing for commercial property owners, which was made available in the City in 2021 for Clean Energy upgrades to facilities.



Future Risks and Opportunities for Climate Resilience

Along with the high priority recommended climate resilience strategies, feedback from the community and local stakeholders also indicated a few other strategies the City can consider to prepare for a range of potential climate impacts. This includes monitoring invasive species, preparing for people displaced by climate hazards, infrastructure improvements, and intermunicipal collaboration.

Through outreach on invasive species and native plantings, the community can **monitor and manage invasive species** to preserve ecological functions for hazard mitigation. Coordinated efforts between the City and community to remove invasive species can tie in with tree plantings and green infrastructure projects.

While the City requires that utility lines are buried for new development projects, the City can work with utility companies to **explore the potential burial of existing electric and telecommunications lines** to minimize damage during high wind or ice storms. This is expensive infrastructure work, so the City can plan strategically in high hazard areas and seek funding.

Preparing for the potential influx of individuals displaced by climate change can be done proactively to help welcome new residents and improve the community. The City can plan with the community on how to provide jobs and housing to welcome new populations in a way that benefits the local economy and community goals.

Implementing this climate resilience plan can put North Tonawanda at the forefront of climate resilience in Niagara County. **Promoting and coordinating this work with neighboring municipalities** can help North Tonawanda achieve its vision for climate resilience while benefiting other communities through coordinated funding, programs, and strategic efforts.

Key Future Risk and Opportunity

Monitor and reduce the presence of invasive species

Shifts in seasonal temperatures and precipitation patterns can cause strain on the plants and animals that are native to an area, creating opportunities for non-native species to proliferate. These invasive species can threaten biodiversity and ecosystem health, causing ecological, economic, and social harms that compound climate impacts. Implementing practices to prevent, mitigate, or eradicate invasive species can be important to climate resilience. Controlling invasive species requires ongoing monitoring across large geographic areas and collaboration between government and community members. These projects are relatively inexpensive to operate and do not require complex infrastructure but may be complex and time-consuming due to the range of stakeholders, including private land owners.

CASE STUDY: WNY PRISM (Partnership for Regional Invasive Species Management) is a partnership of academics, governmental agencies, and concerned community members who manage invasive species in eight counties of Western New York. PRISM collects information on invasive species in WNY and disseminates this information in a prioritized list of species for control. Boot brush installation at hiking locations, watercraft inspections at local boat launches, and volunteer work days help to both control the spread of invasive species and increase public engagement about this issue.⁵⁷

WHAT THIS INVOLVES IN NORTH TONAWANDA:

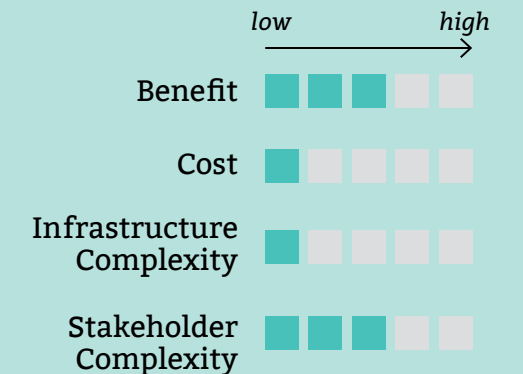
Collaboration between City government agencies, residents, community groups, and conservation agencies to track and limit the spread of invasive species.

Public outreach on identifying invasive species and promoting native plantings.

Incorporating invasive species removal efforts with tree plantings and green infrastructure installations.

Potential Approach presented for feedback:
Invasive species management

How this Strategy Performs



Stakeholder Feedback

Priority Level⁴⁹



Recommended Climate Resilience Strategies

Strategy	The Risk/ Opportunity	Strategy Description	Implementation Leads	Action Steps	Funding Options
Upgrade sewer systems to mitigate flooding	Combined sewer infrastructure is aging and regularly creates flooding issues.	Continue to make cohesive, strategic efforts to maintain, update, and enhance the sewer system to prepare to handle more extreme precipitation events.	City, DPW, Engineering, Water, WNY Stormwater Coalition	Remove residential stormwater from entering the sanitary sewer system. Redesign and right-size the sewer infrastructure where necessary. Procure State and Federal funds and other funding sources for system improvements. Develop a strategic plan to determine how to most efficiently carry out additional sewer projects through phased implementation to address the most critical infrastructure needs and capitalize on available funds.	US EPA, Sewer Overflow and Stormwater Reuse Grants; NYS Environmental Facilities Corporation, Water Infrastructure Improvement Act; Northern Border Regional Commission, State Economic & Infrastructure Development Investment Program, Inflation Reduction Act, Justice40
Promote green infrastructure on public and private property	Climate hazards are projected to cause increased flooding and extreme heat; green infrastructure is a cost-effective but underutilized mitigation measure.	Incentivize the use of green infrastructure for the City, residents, and businesses, through strategic planning, education and outreach, technical assistance, funding, and incentives.	City, DPW Engineering, Property owners, Consultant(s), Planning and Zoning Boards	Incorporate strategic plans for green infrastructure (GI) in comprehensive plan. Update zoning codes to promote GI use for individuals, neighborhoods and city. Adapt citywide tree inventory for increased diversity and climate resilience. Demonstration projects for GI with public education components for residences, businesses, and public spaces, and other education on GI practices/opportunities. Promote GI for residents and businesses through new incentives, funds or credits. Monitoring and outreach to maintain GI practices on private lands. Residential /business rain barrel and rain garden programs.	NYS Environmental Facilities Corporation, Green Innovation Grants; US EPA Great Lakes Restoration Initiative; US EPA Green Streets, Jobs, Towns (G3) Grants; NYS DEC Urban and Community Forestry Grants
Enhance emergency operations for extreme events	City emergency operations must adapt to changing hazards like extreme heat.	Continue to enhance local emergency operations and communications from the City and adapt these systems to changing climate hazards.	City, Police, Fire, and Emergency Mgmt. working with all city departments	Emergency notification system via Mayor/City to inform/prepare public for hazards. Ensure all city buildings and schools are properly equipped to serve as emergency shelters during extreme heat and cold. Upgrade/purchase rescue vehicles for police and fire departments to enable first responders to travel in extreme snowfall events. Coordinat emergency plans with nearby municipalities, NY Power Authority, the State, and Niagara County. Require/incentivize backup power generator capability for critical services.	FEMA Preparedness Grants, FEMA/NYS Department of Homeland Security and Emergency Services, Building Resilient Infrastructure and Communities
Promote sustainable development and Protect wetlands and natural spaces	Development could overextend city infrastructure costs and threaten wetlands and natural areas that are critical to hazard mitigation and climate resilience.	Use land use planning, policies, zoning, and other incentives to encourage development in previously developed areas to conserve and enhance natural areas, limit new infrastructure needs, and mitigate hazards.	City, Community Development, Planning and Zoning Boards, Community non prof-its, Conservation organizations, NY State	Adapt zoning and engage with conservation non-profits to protect wetlands and other designated natural areas. Formally preserve NT Audubon Nature Preserve (Klydel Wetlands) through City. Investigate other land use policies to limit flooding and preserve wetlands, tree cover, parks, and other open spaces. Promote adaptive reuse of existing buildings through financial incentives. Use zoning to encourage development in areas connected to existing sewers. Limit new development outside of existing sewer system, or require system upgrades as part of any new development that utilizes sewer system.	NYS DEC, Freshwater Wetlands Program; NYS Environmental Protection Fund Grants; National Fish and Wildlife Foundation, Acres for America; US EPA Wetlands Protection Development Grants; US FWS North American Wetland Conservation Fund; US EPA and NYS DEC Brownfields Program Grant Funding; NY Main Street Program
Bolster climate awareness and household preparedness	Households can be better prepared to manage climate hazards.	Make households more aware and prepared for climate hazards through strategic education and outreach, technical assistance, and funding.	City, Police, Fire, Emergency Mgmt., DPW, Water, Community Dev., Schools, Library, Youth Dept., Senior Citizens	Community outreach and education to promote awareness and preparedness. Distribute emergency supplies & resources to enable residents to shelter in place. Support community groups to assist in hazard response/recovery, especially vulnerable populations (e.g., distributing food/supplies via snowmobiles). Partner with nearby municipalities, County or State to implement/fund strategy.	US EPA Environmental Justice Small Grants (EJSG) and Greening America's Communities; FEMA Preparedness Grants and Building Resilient Infrastructure and Communities; NYS DEC Climate Smart Communities
Help property owners upgrade structures to mitigate hazards	Older homes and buildings can increase hazard risks for community members.	Provide homeowners with financing, funding, technical assistance, and other supports to encourage improvements to energy efficiency and ability to handle climate hazards.	City, DPW Engineering, Building Inspector, Property owners, Consultant(s)	Provide technical and financial assistance to promote home energy saving improvements such as insulation, and other energy efficiency measures. Procure and allocate city dedicated funds for climate adaptations and home improvements, such as air conditioning, back up power and renewable energy. Ensure energy efficiency and hazard mitigation measures for new construction. Secure and implement funding (grants, low interest loans) to assist property owners in retrofitting their homes and businesses with white roofs and walls. Install demonstration projects for climate resilient materials on City properties.	NYSERDA Home Energy Efficiency/ Performance Programs; US Dept. of Energy, Energy Efficiency and Conservation Block Grant Program; HUD, USACE Floodplain Management Services (FPMS) Program, Tax credits/ abatements, Inflation Reduction Act, NYSERDA Clean Energy Hub (CCE)

Implementation Process

CLIMATE RESILIENCE PROCESS

This document provides a starting point for an ongoing process to promote climate resilience in the City that involves continual learning and adaptation. Resilience strategies should be monitored and evaluated to improve progress toward climate resilience. The City can reassess climate vulnerabilities as hazard concerns and impacts evolve. Lessons learned can be applied to enhance resilience strategies and identify new approaches. This requires continual engagement with the community and impacted stakeholders to ensure that climate resilience strategies reflect community hazard concerns and help achieve community goals.

To minimize community disruption from climate hazards, the community will need to lead climate resilience strategies. As part of this process, this plan and its recommended strategies are intended to inform the City's Comprehensive Plan update and other future planning efforts where the strategies of this plan can be refined and carried out effectively.

UNLOCKING FUNDING TO IMPLEMENT

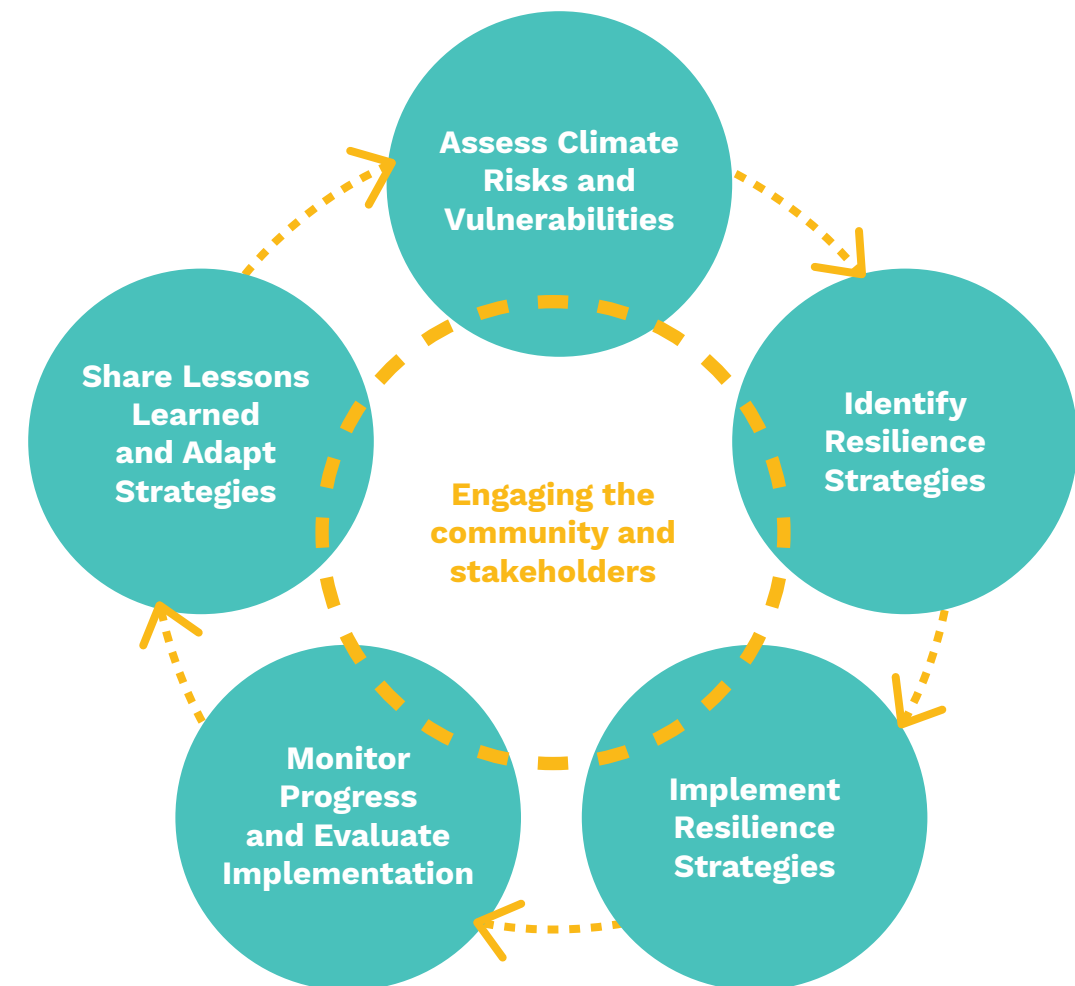
In order to implement the plan's resilience strategies, the City will need to coordinate funding from various sources.

The City can leverage a variety of Federal and State programs to implement strategies. These agencies include the US EPA, Army Corps of Engineers, NYSERDA, NYS DEC, and more. The US EPA administers a network of Environmental Finance Centers to help communities manage the costs of climate resilience actions like stormwater infrastructure improvements through innovative financing options. NYS offers many programs to fund resilience strategies, like the Environmental Bond Act of 2023.

The City can also seek philanthropic funding or public-private partnerships to carry out these strategies. Non-government entities, such as nonprofit organizations, conservation groups, businesses and residents, can also seek funding for structural improvements and green infrastructure installations. In 2021, Property Assessed Clean Energy (PACE) Financing was made available for commercial property owners in the City to make clean energy upgrades to facilities.

Potential grants, loans, and other capital support and technical assistance programs that may be used to implement each strategy are offered in the previous section. Links to these and other resources are included in the Appendix.

Climate Resilience Process



Adapted from the U.S. Global Change Research Program's Fourth National Climate Assessment

Data Sources and Notes

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4. US Census, Center for Economic Studies, Longitudinal Employment-Household Dynamics, Origin-Destination Employment Statistics, 2020. Accessed August, 2023 via <https://onthemap.ces.census.gov/>
5. Ibid.
6. US Census, ACS, 5-year estimates, 2021.
7. Niagara County Tax Parcel Data, 2022. Based on property class codes. Note: Parcels are classified for tax assessment purposes, which may not accurately represent how land and buildings are currently used.
8. US Census, ACS, 5-year estimates, 2021. Note: This is older than the median year built for the US (1979) and Niagara County (1957).
9. Niagara County Tax Parcel Data, 2022.
10. (Critical Assets Map). Bridges: NYS Department of Transportation, 2021; Potential brownfields/chemical waste storage: NYS DEC, Chemical Bulk Storage Facilities program, 2023. Applies to properties that store a hazardous substance that must be registered with DEC; All other Critical Assets (Hospitals, schools, police, fire, libraries, government buildings, wastewater treatment, and electric substations): Niagara Co. Parcel Data, 2022 and Niagara Co. 2022 Hazard Mitigation Plan. Extracted using property class codes.
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14. Notaro, Bennington, and Vavrus, “Dynamically Downscaled Projections of Lake-Effect Snow in the Great Lakes Basin,” *American Meteorological Society, Journal of Climate*, 2014.
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17. U.S. Global Change Research Program, CMRA Assessment Tool using National Climate Assessment LOCA data, 2018. Accessed July 2023 at resilience.climate.gov/
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24. U.S. Global Change Research Program, CMRA Assessment Tool using National Climate Assessment LOCA data, 2018. Accessed July 2023 at resilience.climate.gov/
25. U.S. Global Change Research Program, CMRA Assessment Tool using National Climate Assessment LOCA data, 2018. Accessed July 2023 at resilience.climate.gov/
26. UBRI analysis of FEMA floodplains, Building Footprints from Columbia University’s Center for International Earth Science Information Network (CIESIN) and Niagara County Tax Parcel Data, 2022. Building footprints are overlaid with FEMA floodplains to determine the number of properties impacted and then the associated tax parcel data is used to determine the assessed property values of impacted structures. FEMA does not provide 50-year floodplain data, so lower-lying structures within the 100-year floodplain are used to estimate the properties damaged by the 50-year flood (i.e., structures that have a first floor elevation less than the median of those in the 100-year floodplain).
27. Kayastha, Ye, Huang, and Xue, “Future rise of the Great Lakes water levels under climate change,” 2022; UBRI analysis using the US Geological Survey’s (USGS), National Elevation Dataset, and National Hydrography Dataset, Building Footprints from Columbia University CIESIN, and Niagara County Tax Parcel Data, 2022. Hydrography and elevation data are overlaid to estimate the elevation of North Tonawanda shorelines. The areas within 1 ft elevation of the shoreline are extracted using GIS and overlaid with building footprints and parcel data to estimate the number and value of structures within 1 foot elevation of the shoreline.
28. UBRI analysis of US Department of Agriculture’s Soil Survey Geographic Database (SSURGO), 2022 CIESIN Building Footprints, and Niagara County Tax Parcel Data. Areas with predominant soil types that have a 75% or greater chance of experience ponding are selected from the SSURGO data. Building footprints and tax parcels are overlaid with these areas to determine the number and assessed value of properties that lie in locations that could experience frequent ponding.
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37. (Social Vulnerability Map). Niagara County 2022 Hazard Mitigation Plan. Social vulnerability was measured using 14 socioeconomic and demographic variables gathered at the census block group level from the US Census, American Community Survey (5-year estimates, 2015-2019), including: residents living in poverty, residents living “near” poverty (or on incomes from 1.0 to 2.0 times the federal poverty line), households receiving public assistance, households with no vehicle, households with no internet, residents age 65-74, residents age above 75, residents age 5 or younger, residents age 6-18, individuals with disabilities, people of color, non-English speaking population (age 5+), adults without a high school degree or equivalent (age 25+), single parents, renter households, people living in group quarters. Each variable was normalized on a 0 to 100 scale, and summed together to produce a standardized social vulnerability measure for all census block groups in Niagara County. Block groups were grouped into three social vulnerability classes by a quantile classification.
38. (Environmental Areas Map). Elevation. USGS, National Elevation Dataset; Parks/Open Spaces: Niagara County Parcel Data, 2022. Selected by property class codes. Conservation Easements: U.S. Endowment for Forestry & Communities National Conservation Easement Database, 2023. Forests, grass/shrublands: USGS, National Land Cover Dataset, 2021. Wetlands: NYS DEC, 2022.
39. Ibid.
40. (Environmental Areas Table). Developed Area: USGS, National Land Cover Dataset, 2021. Represents the sum of all areas classified as developed (includes low-, medium-, or high-intensity development). Impervious surfaces: USGS, Impervious Surfaces, 2021. Impervious surface data provides the percent impervious cover for all areas in the US, at a resolution of 30m. This percentage cover is multiplied by the area of each pixel in the data (900m²) and divided by the total land area to determine the overall percent impervious cover in the City. Wetlands: NYS, DEC, Regulated Wetlands; Parks and Open Spaces; Niagara County Tax Parcel Data and National Conservation Easement Database, 2022; Vacant Land: Niagara County Tax Parcel Data, 2022; Trees; City of North Tonawanda, North Tonawanda Community Forest Plan, 2021; Shoreline, UBRI analysis of USGS, National Hydrography Dataset.

Appendices

41. (Recent and Potential Development Map). Stakeholder feedback from the Niagara County 2022 Hazard Mitigation Plan; Niagara County Tax Parcel Data, 2022. Vacant parcels selected by property class codes. Underutilized parcels are those where the value of structures is less than the value of land.

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IMAGE CREDITS

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Page 39: “Invasive Species Removal Project” by Virginia State Parks Staff, May 6, 2011. Licensed under CC BY 2.0

Appendix Materials for this plan are available online at <https://bit.ly/3QdrClP>

Appendix Materials include:

Community Survey Materials

- Community Survey Questionnaire
- Community Survey Summary of Results

Community Resilience Workshop Materials

- Agenda
- Presentation
- Handout
- Attendance Sheet
- Feedback

Public Draft Plan Community Meeting Materials

- Presentation
- Meeting Notes and Transcript
- Feedback

Funding

- List of Potential Funding Sources for Climate Resilience Strategies

Plans

- Links to Existing Plans Referenced in this Plan

