

Norfolk County
**Climate Change
Adaptation Plan**





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Leadership commitment.

What are planners saying?

“The Canadian Institute of Planners believes climate change is real and immediate. The impacts of climate change affect and will continue to affect all aspects of our mission to ensure a sustainable future and to shape better communities.”

What are engineers saying?

“Much of Canada’s infrastructure has been in place for many years with designs based on existing climate patterns. With the effects of a changing climate, these designs need to be revisited to improve safety and protection for Canadians.”

What is Canada saying?

“Canada is resilient to a changing climate by successfully adapting to the challenges and opportunities, and ensuring the health, safety, and security of Canadians and Canada’s environmental, social, and economic wealth in a long term and sustainable manner.”

What is Norfolk county saying?

“Residents of Norfolk County have long recognized the value of the natural environment, and the significant impact it has on our everyday lives. As a community of adaptable, resilient people, we know that we must prepare ourselves for the future - and that includes the effects of a changing climate. By adopting climate change mitigation measures now, we’ll ensure that our quality of life remains high and our economy continues to thrive long into the future.”

-Kristal Chopp
Mayor, Norfolk County



Glossary of terms.

The following is a glossary of key terms which is meant to be used as the Norfolk County Climate Change Adaptation Plan is reviewed. The terms have been included in alphabetical order to make it easier to review and use.

Adaptation: Changes to human behaviors, activities, surroundings, and governance to reduce or avoid the negative impacts of observed or expected climate change. Adaptation makes a community more resilient to climate change.

Adaptive capacity: A system's ability to adjust to climate change and avoid or reduce damages while taking advantage of opportunities.

Carbon sequestration: A natural or artificial process by which carbon dioxide is removed from the atmosphere.

Cooling degree-days: The total number of degrees (averaged per day) that are over 18°C in a year. For example, if it is 23°C on a given day that will add 5 degrees days to the measure. This is a measure of how much energy will be needed to cool down a building. The more cooling degree-days there are, the more energy is needed.

Climate: Patterns of variability in atmospheric conditions in each region over an extended period, often decades or longer. This contrasts with *weather* which describes current atmospheric conditions (i.e. it is currently raining or windy).

Climate change: Any significant long-term change in the expected patterns of average weather of a region over a significant period, usually averaged to a minimum of 30 years.

Climate impact: The consequences of a climate risk event on a service, an asset, or a sector of the County.

Coldest minimum temperature: The coldest temperature of the year.

Corn heat units: An agricultural temperature-based index used to estimate if the climate is warm enough, but not too hot, to grow corn.

Critical infrastructure: Systems, facilities, technologies, and services essential to the well-being and safety of the residents of Norfolk County.

Drought: A climate event characterized by exceptionally dry and warm weather conditions. In most definitions, the severity of a drought is assessed by the number of consecutive days without precipitation.

Dry days: The number of days a year without rain or snow.



Exposure: Presence of people, livelihoods, assets, services, resources, or infrastructure in place in a specific region that could be adversely affected by climate change.

Freeze-thaw cycles: The process of water freezing and thawing multiple times during a winter season. This is a problem when water slips into a material, such as a pipe or a road, and then freezes and expands, causing cracking. Each instance of water freezing and then thawing is one freeze-thaw cycle.

Frost-free season: The approximate length of the growing season during which there are no freezing temperatures to kill or damage plants.

Growing degree-days: An index of the amount of heat available for the growth and maturation of plants and insects. Different based temperatures (5°C, 10°C, and 15°C) are used to cover organisms which need different amounts of heat.

Heating degree-days: The total number of degrees (average per day) that are under 18°C in a year. For example, if it is 11°C on a given day that will add 7 degrees days to the measure. This is a measure of how much heating energy will be required to warm a building. The more heating-degree days there are, the more energy is needed to heat buildings.

Heat wave: A period of excessively hot weather, which may or may not be accompanied by high humidity. In southern Ontario, a heat wave occurs when there are 2 consecutive days when the temperatures reach greater than 31°C and do not fall below 20°C or when the humidex is above 40.

Heavy precipitation day: A day when the total precipitation (rainfall, hail, or snow) is above a designated mark (10mm or 20mm) in liquid form.

Humidex: A Canadian meteorological system of measuring how hot a human body feels by combining measurements of air temperature and humidity.

Icing days: The number of days that the temperature does not rise above freezing. This is a good measure of the severity of a winter season.

Inland flooding: Flooding which does not occur as a direct result of sea or lake level rise. Causes may include increased precipitation, greater river levels, and melting snow.

Likelihood: The state of a phenomenon being likely, namely its probability to occur.

Max 1-day precipitation: The largest amount of rain or snow that can be accumulated in a 24h-period once a year. This is an indicator of extreme precipitation.



Max 3-day precipitation: The largest amount of rain or snow that can accumulate in a 3-day period once a year. This is an indicator of extreme precipitation.

Max 5-day precipitation: The largest amount of rain or snow that can be accumulated in a 5-day period once a year. This is an indicator of extreme precipitation.

Mitigation: Efforts to reduce the amount of greenhouse gas emissions into the atmosphere.

Mean annual temperature: The average temperature over the course of one year.

Representative concentration pathway (RCP): A greenhouse gas concentration trajectory adopted by the Intergovernmental Panel on Climate Change for its fifth Assessment Report (AR5) in 2014. Four pathways have been selected for climate modeling and research, which describe different climate futures, all of which are considered possible depending on how much greenhouse gases are emitted in the years to come.

Resilience: The ability of a system to absorb disturbances while keeping the same basic structure and ways of functioning.

Risk: A measure of the expected outcome of an uncertain event, which is estimated by combining an event's likelihood and expected consequences or severity.

Risk rating: The assessment of the level of risk to the community through use of a pre-defined scale. For example, ranking risks as 'low', 'medium', and 'high'.

Scenario: A plausible representation of future climate that has been constructed for explicit use in investigating the potential impacts of climate change.

Sensitivity: The degree to which a system is affected by climatic conditions or a specific climate change impact.

Tropical nights: A night when the temperature does not go below 20°C. These conditions do not allow human bodies to cool down during extreme temperature events and may pose health risks to vulnerable populations.

Vulnerability: The degree to which a service or an asset can cope with a given climate change impact. It is a function of its exposure, its sensitivity, and its adaptive capacity.

Warmest maximum temperatures: The highest temperature of the year.



1

Introduction.





Norfolk County's climate future is dependent on the efforts of staff, stakeholders, and residents.

Norfolk County and communities across southwestern Ontario, Canada, and the world are experiencing a climate crisis. The issue of climate change and the impacts on communities is becoming a necessary and critical issue affecting public health, infrastructure, the economy, and the environment.

Adaptation and mitigation measures are necessary. This adaptation plan, tailored to Norfolk County's unique needs, is built on the foundation of the County's official plan, strategic plan, bylaws, policies and practises.

The intent of chapter 1.0 is to provide a background on adaptation planning and climate data, an overview of the development of this plan, and a summary of the content and intended uses of this plan. Details on the content of each of the sections of this chapter are found to the right.

1.1

SECTION 1.1. BACKGROUND.

An overview of the value and importance of developing an adaptation plan and examples of where it has been done elsewhere.

1.2

SECTION 1.2. DEVELOPMENT.

Highlights of the process that was used to develop the plan and the engagement that was used to support key outcomes.

1.3

SECTION 1.3. CONTENT.

A description of the content of the plan and the intended uses of the document by different groups and agencies.



1.1. Background.

Answering...

What is climate change? (page. 5)

How can climate change be addressed? (page. 7)

Why an adaptation plan for Norfolk County? (page. 8)

What is Norfolk County doing to adapt now? (page. 9)

The impacts of climate change are being felt across the globe. Increases in temperature, changes in precipitation patterns, and a rise in the frequency and severity of storm events are already impacting the most vulnerable people and places. Canada is projected to see a significant and diverse range of impacts due to its northern latitude, generous size, and diverse geography. On average, the country is projected to see double the global increase in temperature with impacts ranging from coastal flooding to increases in the instances and magnitude of forest fires (see Chapter 3.1 for more details on current trends and anticipated shifts).

Action is being taken on all scales to adapt to these changing conditions and increase Canada's climate resilience. Nationally, [a report](#) has been released highlighting observed climate change impacts across the country to multiple sectors. Federal departments have been mandated to conduct climate change risk assessments and create adaptation plans on their services and assets. Provincially, every region, including Ontario, have begun conducting risk assessments and creating adaptation plans to guide future investment and reduce climate change risks.

The biggest effort has been on the municipal scale, where over 350 towns, cities, and counties across the country have begun developing strategies to address these growing concerns and threats focused on their own geographies, experiences of the residents and the political will of the community.



Question. 1. What is climate change?

When we think of climate change, it can be difficult to understand the influence and affects of the slow changes and shifts in climate patterns. The influence on our day to day lives can be minor but it does not mean that we should not be concerned about our physical, health, and environmental future. In the simplest of terms, climate change is...

Any meaningful change to global or regional climate over an extended period of time.

The science of climate change shows that...

Earth exists in an atmospheric bubble held in place by the gravity of the planet. This atmosphere is mostly composed of nitrogen (78%) and the oxygen we breath (21%), but it also contains lesser amounts of what are known as greenhouse gases.

Greenhouse gases, including carbon dioxide, methane, and nitrous oxide, are molecules which can absorb energy being emitted from the Earth and reradiate it back down again, acting as an insulating blanket surrounding the planet and keeping it warm. This is known as the greenhouse effect because it mimics how a glass greenhouse allows heat to enter but not leave. Without greenhouse gas molecules keeping the sun's energy in the atmosphere the average temperature of the Earth would be -18°C .

Human activities have increased the amount of greenhouse gases in the atmosphere. This means that more energy is being trapped around the Earth, leading to a rise in average global temperature. This upsets the balance of the existing climate system and causes shifts in climate patterns including temperature, wind, rain, and snow.

The impacts of these shifting systems are numerous and include droughts, flooding events, more severe storms, sea level rise, melting glaciers and mountain snowpack's, and in the ranges of plant species and animals.

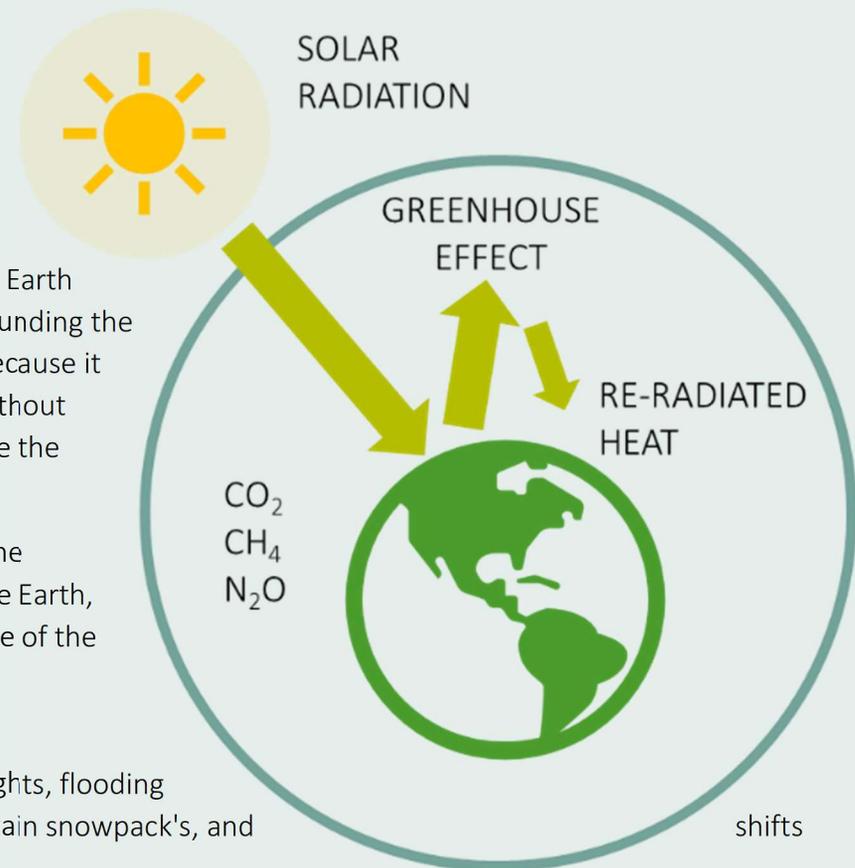


Figure 1. The effects of climate change



When discussing climate change, there can be some confusion around the meaning or misuse of key terms. Often the terms weather, climate, climate change, and global warming are used incorrectly, or in the wrong context, which can lead to some misunderstandings. The following is an overview of the difference and appropriate use for these terms.



weather VS. climate

Climate and weather are often used interchangeably in conversation, but they are quite different. Weather describes the short-term conditions of the atmosphere while climate refers to long-term overall patterns of weather- often over the course of 30 years. If someone says, 'it is raining outside' then they are referring to the weather. If they say, 'Norfolk County is usually rainy in the spring' then they are discussing the climate.

climate change VS. global warming

When climate change was first being introduced to the world it was more commonly referred to as global warming. Global warming describes the long-term warming of the planet but does not encompass the broader range of changes including shifts in precipitation patterns, sea level rise, and accelerated ice melt. Climate change encompasses all changes to the Earth's climate, including global warming, and is the more accurate term.





Question. 2. How can climate change be addressed?

There are two measures which can be used to prevent the impacts of climate change.

Adaptation...

is changing human behavior, habitats, and systems to moderate or avoid the harmful effects of climate change while taking advantage of the benefits. An adaptation plan empowers communities to deal with the impacts and risks posed by a changing climate while taking advantage of any new opportunities.

Measures could include...



Disaster Management



Flood Protection



Infrastructure upgrades

Mitigation...

is reducing the amount of greenhouse emissions in the atmosphere. This includes both reducing the sources of greenhouse gases (i.e. combustion from fossil fuels) or increasing the sequestration of greenhouse gases in the atmosphere (i.e. planting more trees). A mitigation plan aims to reduce the amount of greenhouse gas emissions emitted by a building, corporation, or community.

Measures could include...



Sustainable Transportation



Clean Energy



Energy Efficiency

Adaptation and mitigation measures are not mutually exclusive. Some adaptation measures may also have mitigating effects, and these can be considered as particularly beneficial approaches. Some examples are provided below.



Water Conservation



Complete Communities



Community Forests



Public Education



Question. 3. Why an adaptation plan for Norfolk County?

Both adaptation and mitigation plans can help prevent the impacts of climate change; however, an adaptation plan was selected for Norfolk County because of the additional benefits it can provide. Adaptation planning has greater, immediate and concentrated impacts to the local community. Mitigation, on the other hand, must be a global effort to succeed and the impacts will be dispersed and not seen for decades. Some of the key differences between adaptation and mitigation planning are presented in **Figure 2**.

Norfolk County, with its emphasis on tourism and agriculture, is particularly vulnerable to the effects of climate change. The lake, which is heavily populated, and draws many tourists, is suffering from shore erosion, flooding, and toxic algae blooms. Agriculture is particularly susceptible to extremes of weather such as storms, floods, heat, and droughts (for a more detailed overview of the recent climate trends experienced in Norfolk County please see **section 3.1**). In addition to protecting existing business, [studies](#) have found that for ever dollar invested in adaptation there is a return of four to seven dollars in averted damages.

Norfolk County has a rich history of protecting and living with nature which may be threatened by changing climate conditions and shifts in plant and animal life. In addition, over a third of Norfolk’s population is over the age of 55 and more susceptible to climate-related illnesses such as heat waves and large storm events. An adaptation plan will help the county prepare itself for shifting conditions and protect its people, environment, and economy.



Figure 2 Comparison of mitigation and adaptation plans





Question. 4. What are other municipalities doing?

The number of municipalities developing, adopting and implementing climate related strategies has increased significantly over the past five to ten years. Across the globe, throughout Canada and Ontario climate change is addressed in a range of diverse ways. Building on these examples, their applications and successes has helped to shape the content of the Norfolk County climate change adaptation plan. **Figure 3** supplies a snapshot of the local adaptation related plans developed and adopted throughout Canada. A commitment has been made across the country to strategically reduce the climate emergency that we are all facing through municipally driven, long-term strategic planning initiatives.

Not all plans are made the same. The approach, risks, priorities, and content differ and is tailored to the context in which they are being developed; however, most of the examples can be organized into three adaptation plan types including a full adaptation plan, a topic or risk specific adaptation plan and a partial plan.

These adaptation plan types are described in further detail in **Table 1** with examples of some of the successes that have emerged following their adoption.

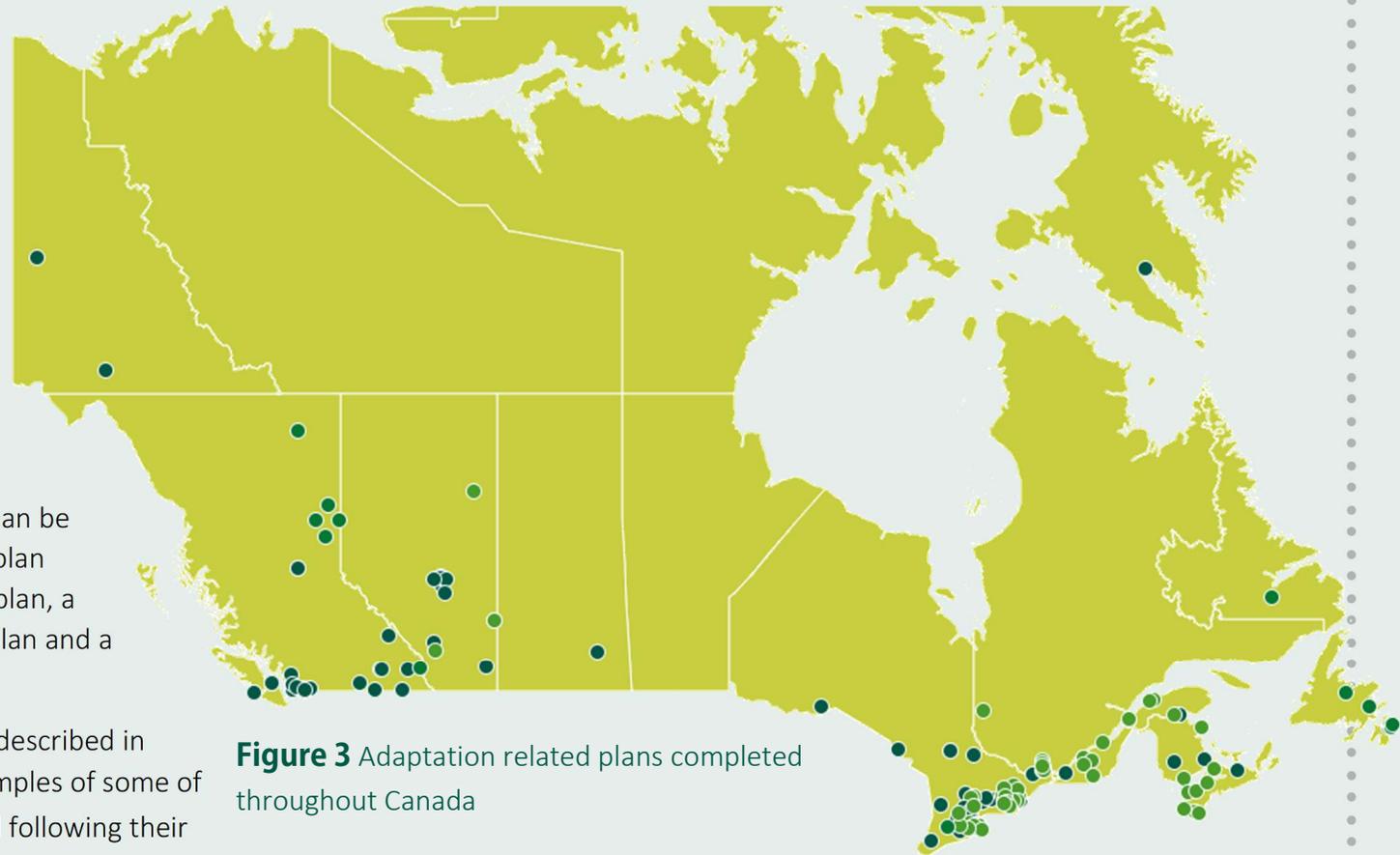


Figure 3 Adaptation related plans completed throughout Canada



Full plan. ★

Description:

A plan which takes a comprehensive approach to avoiding the harmful effects of climate change, considering all parties, sectors, or physical objects impacted.

Examples:

City of Thunder Bay 'Climate-Ready City', City of Kawartha Lakes 'Healthy Environment Plan', City of Cambridge 'Climate Adaptation Plan'

Successes:

- + Created an inventory of departmental extreme weather response communication plans
- + Integrated climate considerations into the Official Plan Review
- + Public engagement and communication through photo contests and forums

Topic specific.

Description:

A plan which focuses on adapting a specific topic or sector, such as agriculture or energy to the changing climate.

Examples:

City of Toronto 'Green Infrastructure and Stormwater Management', City of Montreal 'Urban Heat Islands: A Climate Change Adaptation Strategy', County of Brant Wastewater Management Facility Adaptation'

Successes:

- + Acceptance by council
- + Heat stress vulnerability mapping
- + Opening of pools and cooling centers
- + Mandatory white roofs or green for new buildings/retrofits

Partial plan.

Description:

A plan for which only a vulnerability assessment has been completed; adaptation options are not yet considered.

Examples:

Town of Oakville 'Climate Change Adaptation Initiative', City of Mount Pearl 'Climate Change Report', Town of Port Blandford 'Vulnerability Assessment'

Successes:

- + Completion of adaptation vulnerability assessment
- + Prioritized vulnerabilities and direction for future action

Table 1. Summary of adaptation plans completed within municipalities throughout Canada

For Norfolk County, a full adaptation plan has been developed including the completion of a vulnerability assessment to identify Norfolk specific risks, solutions, and challenges to support implementation. The way in which the plan was developed is described in further detail in the following section.



1.2. Development.

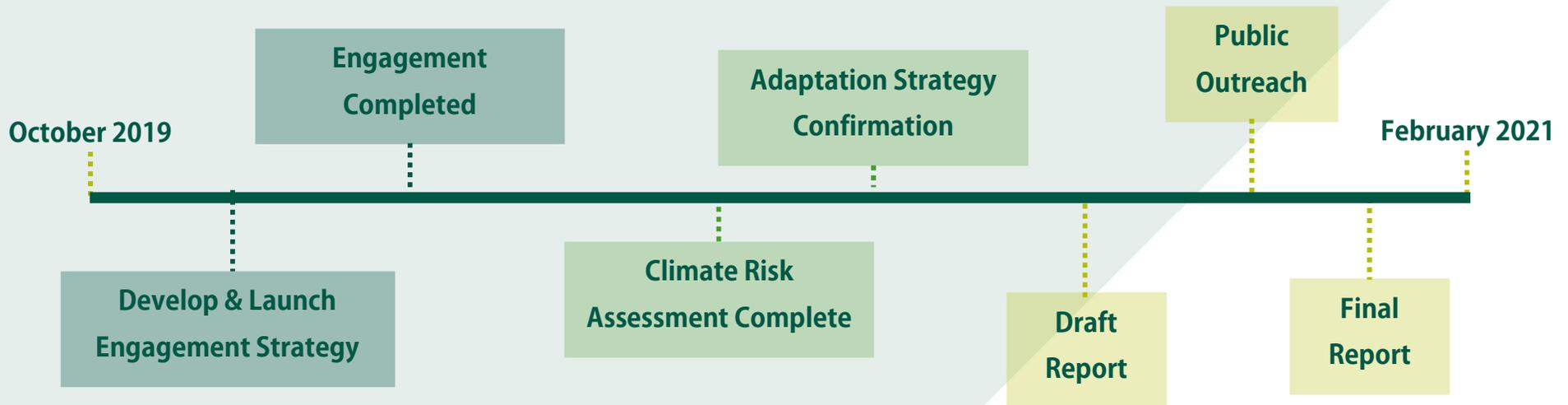
The development of an adaptation plan requires a thoughtful approach that is supported by local knowledge and insight. Identifying and prioritizing climate risks for a community as well as recommended measures to address those risks should be based on a comprehensive set of technical tasks which are informed by staff and stakeholder input and confirmed by committee representatives and decision makers. The Norfolk County Climate Change adaptation plan was completed between October 2019 and September 2020 using a three-phase process. Each of the project phases was informed by project and engagement milestones. The following is an overview of the three-phase approach and the core project milestones that were achieved over the project process.

Phase 1.	Phase 2.	Phase 3.
Scope and planning.	Vulnerability assessment and actions.	Developing the plan.

To identify potential climate change risks and assign each a risk rating based on its likelihood of occurrence and the severity of its consequences on the County and its operations.

To identify potential adaptation actions and to select preferred actions based on County priorities and selection criteria.

To prepare and submit the draft adaptation plan, refine, and confirm content and present to Council for adoption.





Consultation and engagement were used to:

- + **Educate** the audiences of the intents and purposes of the project to allow them to contribute to its development;
- + **Consult** with key audiences on their experiences, preferences and needs;
- + **Involve** decision makers and committee representatives to drive the project process; and
- + **Collaborate** to determine the preferences and recommendations that constitute the adaptation action plan.

A consultation and engagement program was developed at the beginning of the project and used as a guide for all audience interactions and information gathering. The program was established, and tactics were identified based on three target audiences – residents and members of the public, committee representatives and decision makers, and staff and stakeholders. The tactics and milestones that were achieved over the course are presented in **Figure 4**. It is important to note that in 2020 there were significant changes in the way that community and stakeholder engagement could be undertaken. Requirements around social distancing led to a more virtual approach to the final stages of community outreach and engagement. Every effort was made to identify tools and tactics that could effectively and equitably involve members of the public and stakeholders to help shape the report and its recommendations / contents. A summary of the input gathered is provided in **section 2.2**.



Figure 4 Overview of consultation tactics and milestone



1.3. Content.

This document was developed to be a resource, reference, blueprint, and guide for future climate adaptation efforts undertaken by Norfolk County and its partners. The report is a documentation of the process undertaken and the outcomes of that process.

The content has been developed based on the needs of the individuals who will interact with the document once adopted including but not limited to County staff, the Climate Change Adaptation Committee, Norfolk County Council and other interest groups / members of the public. The following is an overview of the content of the report and the intended uses of this report by audience.



who is this intended for?

Members of Council

Staff

Climate Change Committee

Stakeholders

Members of the Public



how it should be used?

as the direction for decisions related to County investment

as information and strategies to guide staff's work plans on an annual basis

as a resource and guide for community outreach and local initiatives

as information on how to coordinate with Norfolk County and its partners

as background information on how the County is addressing the climate emergency.



2

Foundations.





A community adaptation plan specific to Norfolk has taken shape.

Adaptation planning is not a one size fits all process. Every community has unique needs, concerns, challenges and opportunities which shape the work that is being done. The opinions and interests of those who live, work and play within Norfolk County were a key consideration when developing the adaptation plan, and engagement was an important tool in the identification of Norfolk specific experiences, risks and strategies.

The future of earth's climate is uncertain, and its impacts will be unique to different geographies. A vision is the aspiration that a community wishes to work towards, and the goals or pillars help to shape the recommendations.

The intent of chapter 2.0 is to provide an overview of the foundations which informed the development of the Norfolk County adaptation plan. More specifically, the chapter documents the excellent work that is being completed by Norfolk County and its partners, the needs of the community based on public input and the future vision and goals for the future of climate change.

2.1

SECTION 2.1. CLIMATE NEEDS.

An overview of the engagement that was undertaken to support the development of the plan and the community needs identified.

2.2

SECTION 2.2. VISION.

climate adaptation vision for Norfolk County.

2.3

SECTION 2.3. CLIMATE PILLARS.

An overview of the supportive climate pillars that provide greater clarity around the objectives of the adaptation plan.



2.1. Climate concerns and needs.

Most members of the Norfolk County community are aware that climate change is occurring in some capacity; however, the way in which it occurs and the interpretation of the risks, challenges, or opportunities for improvement ranges from geography to geography. The Climate adaptation plan for Norfolk County is the first formal County-wide initiative that addresses the climate challenges experienced in Norfolk and provides a set of recommended approaches and measures to adapt to it. As such, it provides a meaningful and necessary opportunity to embark on more intentional community education.

The focus of the adaptation plan was the identification and confirmation of climate related risks and adaptation strategies specific to Norfolk County. While there have been educational opportunities identified during this process, this document is not intended to be a full education program, but rather the base for further education following the adoption of the plan.

As noted in section 1.2, several community engagement activities were used to support the development of the Norfolk County climate change adaptation plan. The engagement activities were undertaken to answer three questions – as illustrated to the right.

A summary of the input that was provided and the key themes that emerged throughout the undertaking of public, stakeholder and County engagement activities is provided on the following pages. It is organized by the questions that were being asked as opposed to the activities that were undertaken.

What climate events are of most concern in Norfolk County? Where do they occur?

What are the risks from these climate events?

How can Norfolk adapt to these risks?



What are the climate event concerns and where are they occurring?

The online engagement tool was used to gather input on the types of climate events that have or are currently occurring in Norfolk County. Eight climate events were identified, and respondents were asked to rank their top five. There were two ways to understand the ranking, the first is identifying the top five events based on the number of ranks and the second are the highest events based on the ranks that were provided.

Consultation Tactics:
 Online Engagement Tool
 Stakeholder Interviews
 Committee Workshops

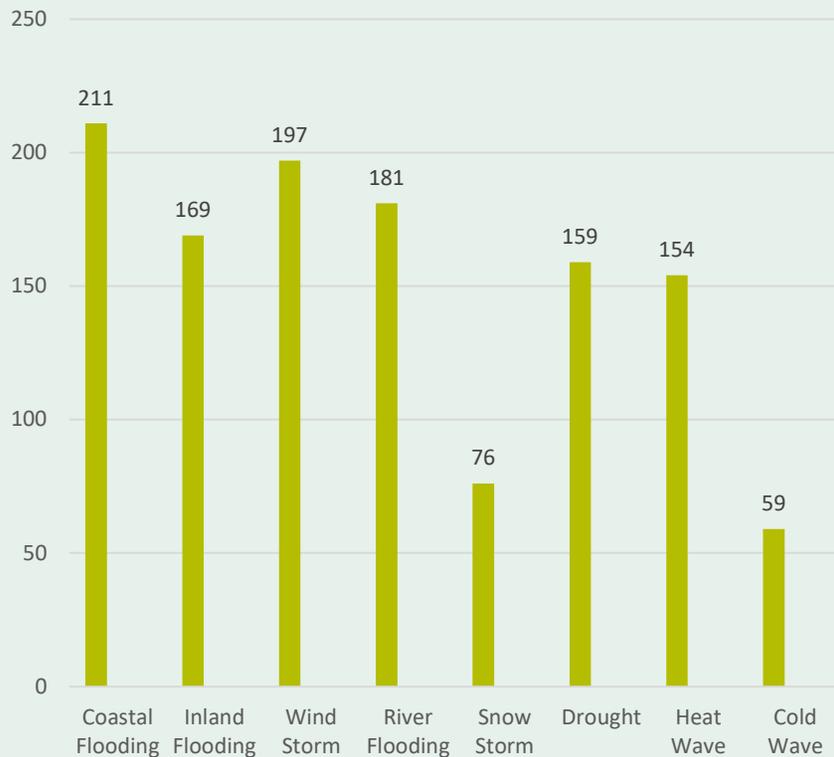


Figure 5 Climate events by number of ranks

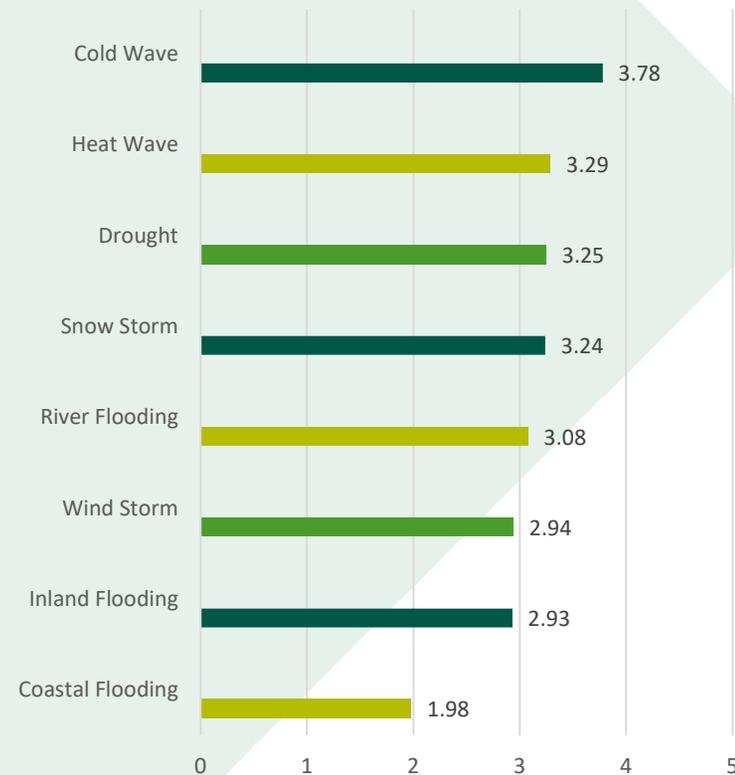


Figure 6 Climate events by ranking score



The online engagement tool also provided a significant amount of input and information on the locations of the different types of events currently being experienced within Norfolk County. The second activity of the online engagement asked respondents to use interactive mapping to identify the locations where events are occurring. Five types of events were identified including drought, wind storm, snow storm, flood and “other” and respondents were asked to place a pin on the map where the event occurred and provide additional information on the context of that event i.e. month of occurrence and the year that it occurred.

550 events

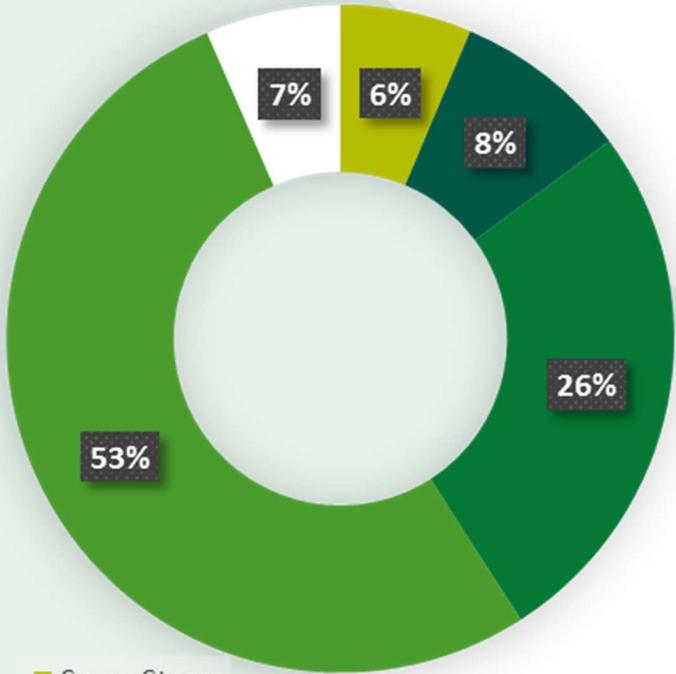
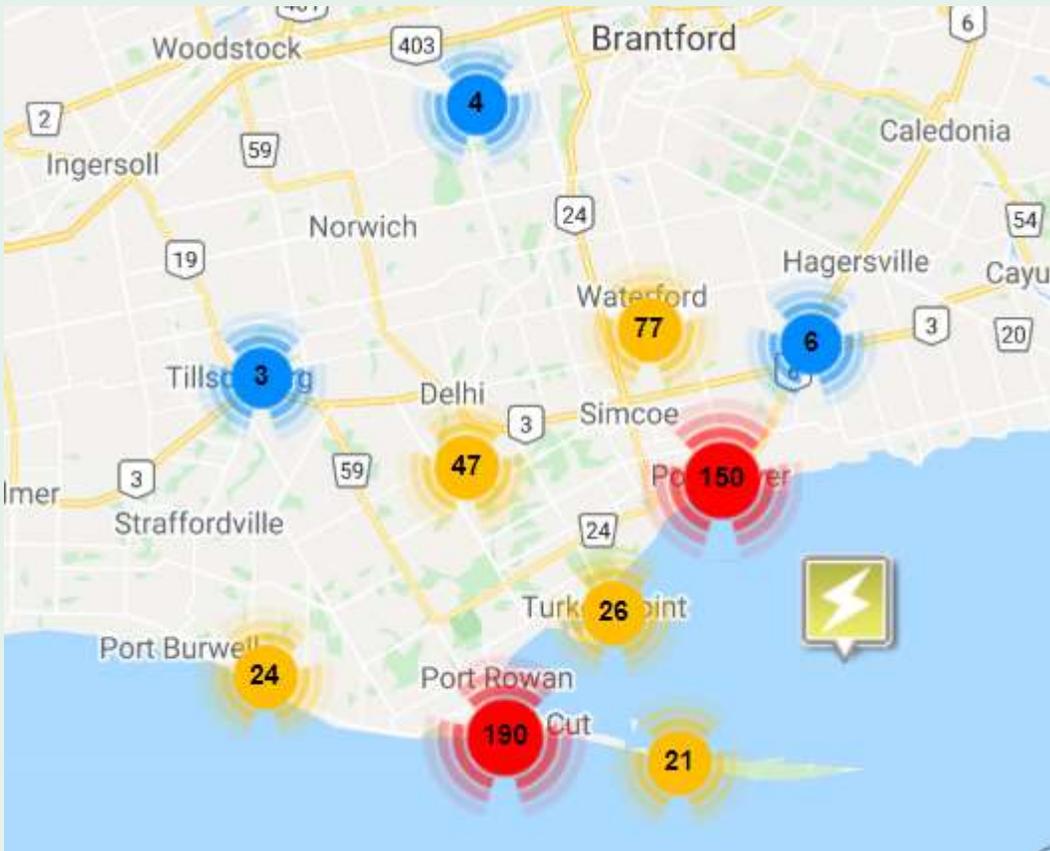


Figure 7 Weather events identified within Norfolk County



What are the risks and what are the community priorities?

Through the committee and stakeholder workshops, attendees were asked to rank and prioritize preliminary risks within the categories of precipitation, heat, winter storm, wind, and drought. Note that these risks are either created or made worse by a changing climate, but they may also be influenced by more than just climate. **Table 2** is a summary of the top preliminary risks of each category based on the input received. The information gathered did not confirm or rank the final risks presented in the plan but helped to guide the final stages of the vulnerability assessment (described in further detail in **section 3.0**).

Consultation Tactics:
Stakeholder Workshop
Committee Workshops

	Precipitation	Snow	Wind	Heat	Drought
Risk #1	Erosion damage to environment and infrastructure	Reduced ability to deliver County services	Power outages	Increase in heat-related illnesses for vulnerable population	Depletion of groundwater and surface water resources.
Risk #2	Flooding of public infrastructure	Increase in cold-related illnesses for vulnerable peoples	Flooding of coastal area structures	Spread of vector-borne diseases	Reduced population access to water
Risk #3	Overflow of stormwater management system	Reduced safety for outdoor staff	Debris endangering population	Increased electricity use and cost	Impact on local agricultural economy
Risk #4	Flooding of interior private properties	Increased maintenance requirements	Debris blocking transportation routes	Overheating of mechanical equipment	Increase forest fire instances
Risk #5	Decrease in safe transportation access	Increased weight and load on buildings	Flooding of coastline ecological zones	Reduction in tourism revenue	Reduced waterfront tourism

Table 2. Summary of input received regarding prioritization of potential risks



What is needed to support adaptation and what are potential measures?

Adaptation strategies can be organized into four measures: social, physical institutional and ecological. The final activity in the online engagement tool asked the public to provide their level of support for the potential measures. Examples of the type of measures, their affordability, effectiveness and community benefit were provided.

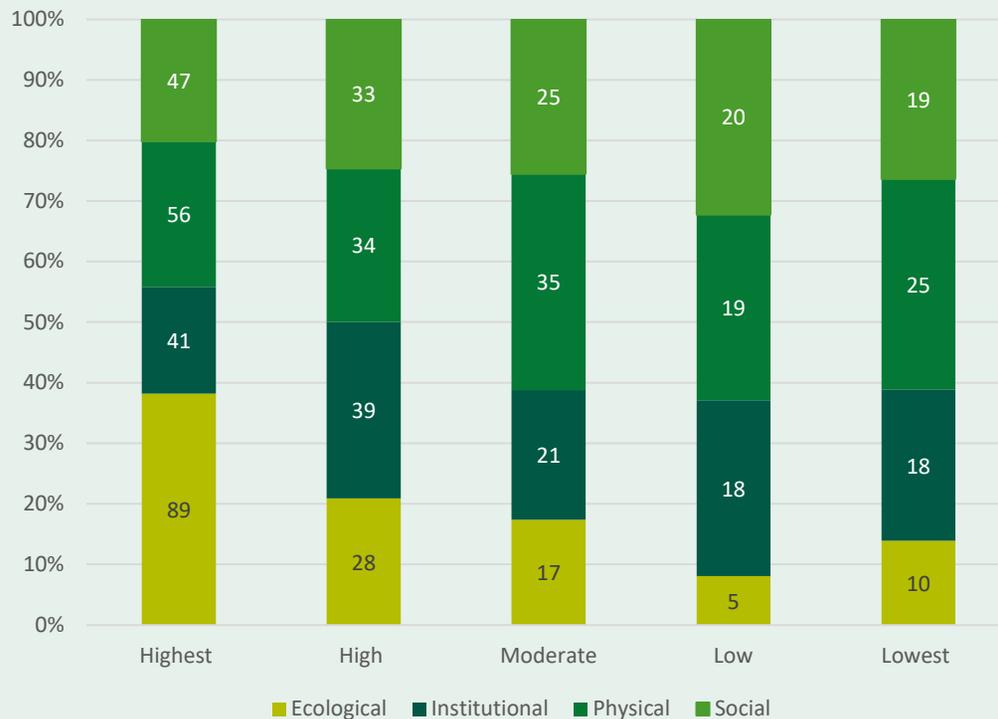


Figure 8 Public input on potential adaptation measures

Consultation Tactics:
 Online Engagement Tool
 Stakeholder workshop
 Committee Workshops

Potential adaptation measures were further reviewed and considered by Norfolk County staff as well as members of the Norfolk Climate Change Committee. At the staff workshop a high-level feasibility assessment was undertaken of some preliminary strategies to determine their local applicability. Increased stormwater structure capacity, hazard and vulnerability mapping, and modifying land zoning laws were some of the more favourable strategies.

At the committee workshop, committee members were asked to undertake a similar exercise of all of proposed strategies based on the refined list of risks. The group worked through each of the potential strategies and removed those that were not considered appropriate for Norfolk County or the objectives / goals of the adaptation plan.



2.2. Adaptation vision.

A strategic planning document is developed and designed to achieve an overall vision or set of goals related to a specific topic within a community. The development of that vision is typically one of the first steps in the development of the plan. It should be reflective of the community challenges and needs and should provide an aspirational statement from which strategies can be identified. The climate adaptation vision statement prepared for Norfolk County was done in collaboration with the Climate Change Adaptation Committee and further refined based on public and stakeholder input. It was designed to reflect the values and priorities of the community and consider / integrate the strategic objectives as adopted by Council. The Norfolk County climate adaptation vision is presented below.

“ Norfolk County is a climate resilient and energy independent municipality that respects its strong history of environmental stewardship and values a thriving and maintainable relationship with nature. Norfolk County balances the need for community and economic growth with sustainable and green adaptation solutions as well as mitigation measures. ”

2.3. Climate pillars for Norfolk County.

The intent is to provide adaptation measures and strategies for Norfolk County's climate risks to ensure that the County's strategic goals are not threatened. When developing the adaptation plan, four climate pillars were identified. These pillars were derived from wider strategic objectives as determined and adopted by Council as well as input from the committee and stakeholders. Norfolk County's strategic plan presents five goals for the community including:

1. **Vibrant and creative communities**
2. **Optimal place for business**
3. **Quality infrastructure**
4. **Focus on service**
5. **Solid Foundation**

Using these strategic plan goals, four environmental pillars were developed. These pillars were the basis for identifying risk and adaptation strategies.

Once confirmed, the pillars were used and considered when identifying the climate risks (see chapter 3.0) to determine the potential threat that needed to be addressed and when identifying potential adaptation strategies (see chapter 4.0) to ensure that the pillars were being maintained.

Figure 9. illustrates the climate pillars which have been adopted by the climate committees and project team as the foundation of the adaptation plan.

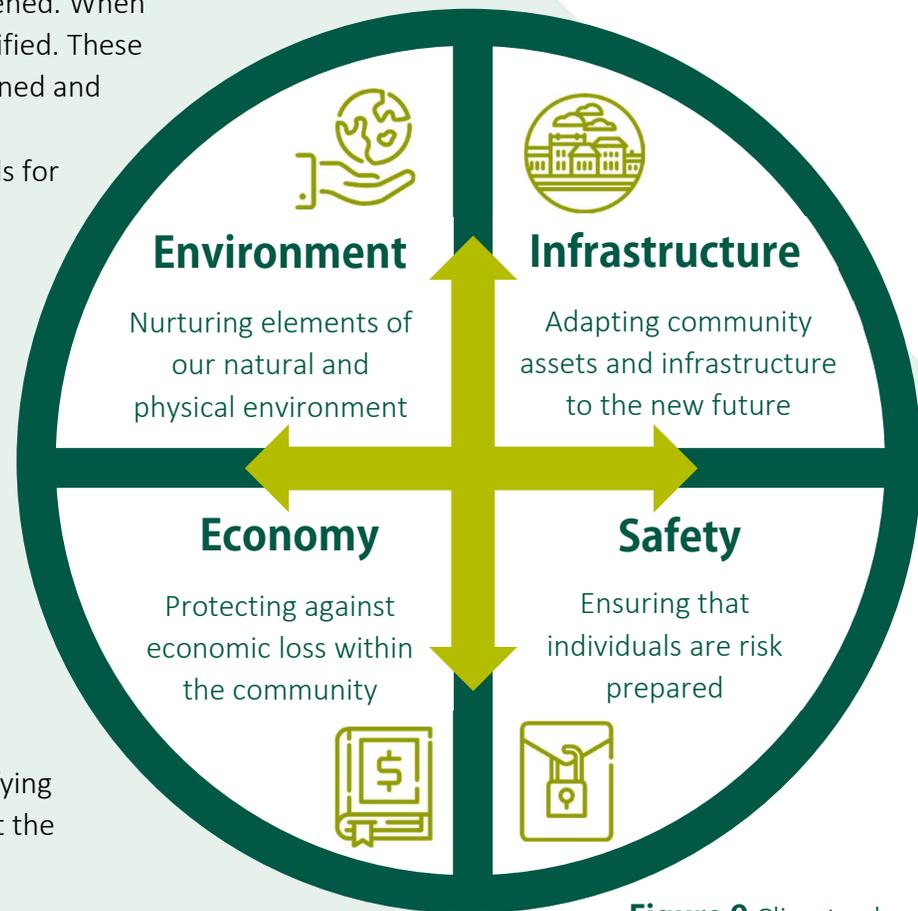


Figure 9 Climate change adaptation plan pillars.

3

Risks.





The current climate conditions have created Norfolk-specific risks.

The foundation of an adaptation plan are the climate related risks that are anticipated to be experienced. Risks are determined by long-term changes in climate activity and past, present, and future anticipated trends. Anecdotal information and records of events gathered through stakeholder and public engagement paints a picture of increasing climate events causing a wider range of individual and community risks. Science and statistical information show us that this is a trend that will continue to worsen if action is not taken.

Together, these information sources can be used to complete a vulnerability assessment for a community. Risks can be widespread and general but can also be site specific depending on the information provided.

The intent of chapter 3.0 is to provide an overview of the vulnerability assessment that was completed for Norfolk County with a focus on clearly describing the process and identifying Norfolk-specific risks.

3.1

SECTION 3.1. CLIMATE.

The vulnerability assessment starts with an understanding of the current conditions. This section provides an overview of the current climate events in Norfolk County.

3.2

SECTION 3.2. PROCESS.

The typically complex process to complete a vulnerability assessment will be distilled down to its core elements for clear explanation.

3.3

SECTION 3.3. OUTCOMES.

The outcomes of the process will be documented including an overview of each of the priority risks and their alignment with specific event types.



3.1 Climate events.

Climate events are groupings of different climate variables which make up Norfolk’s overall climate. As noted in section 2.0, five typical weather events were identified, and information was gathered specific to Norfolk County for each. On the following pages, a climate event specific information sheet has been prepared documenting the key conditions and considerations that are occurring within Norfolk County. The following is a high-level overview of the event types as well as the trends that are being experienced within Norfolk County.



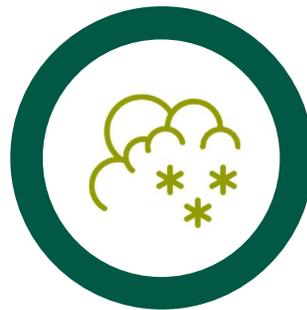
Precipitation

Precipitation is any kind of water that falls from the atmosphere towards the ground including rain, snow, hail and sleet.



Temperature

Temperature is the measure of how hot or cold the air is in a given area. Extremes could include heat waves, tropical nights, etc.



Winter Storm

Winter storms are large precipitation events occurring during cold temperatures. This may include any combination of snow, sleet, and freezing rain.



Wind

Wind is the movement of air in the form of a current. There are two main metrics for wind. A wind gust is a brief increase in the speed of wind. Sustained wind is the average wind speed over multiple minutes.



Drought

Drought is an extended period of abnormally low rainfall which results in a shortage of water. In Ontario, drought can be assigned one of three levels.

Where did this data come from?

There are two types of climate data presented in the following section. **Today** data indicates historic climate data up to and including the present. The historic climate data is taken from peer reviewed sources and station data validated by Environment and Climate Change Canada. The time period for historical averages is 1974-2005 represent recent trends in Norfolk County's climate and to ensure consistency with the Climate Atlas of Canada. **Tomorrow** data is climate projection data, showing the outputs of computer-generated information.

Today.

- Historical data was taken from several sources including:
- + Environment and Climate Change Canada's Canadian Climate Normals
 - + Natural Resources Canada public resources
 - + Norfolk County website
 - + Local and global news media, such as the Simcoe Reformer, The Reader, and Global News
 - + Academic papers in published journals
 - + Long Point Region Conservation Authority materials, and
 - + County and public engagement data.

Tomorrow.

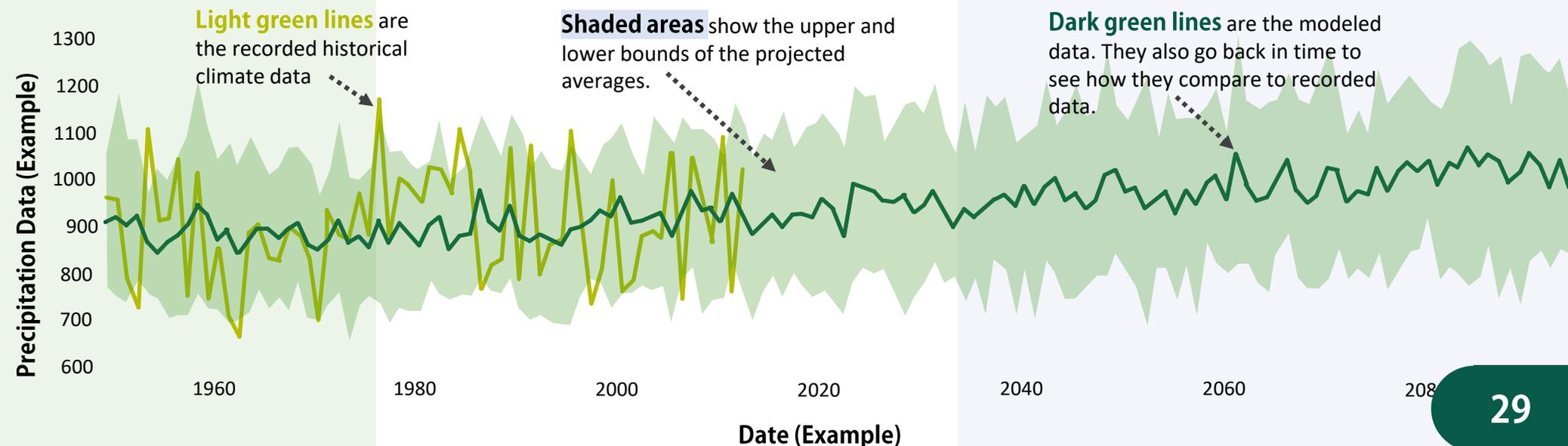
- Projection data was derived from several sources including:
- + Climate Atlas of Canada
 - + National Resources Canada
 - + USA Environmental Protection Agency
 - + Ontario Ministry of Environment, Conservation, and Parks
 - + Academic papers in published journals.

Unless otherwise stated, all projection data has used RCP8.5 and is projected to the middle of the century (2050s).

How to read the data?

Because climate data looks at the long term averages of weather, all the data presented below shows the average weather over a 30 year period. That means that the **today** data is showing the average of the last 30 years of complete and verified weather information (1974-2005) and that the **tomorrow** data is showing the average projections of 30 years up to 2050 (2051-2050). This is done to avoid outliers, or points of information that differs significantly from the trend.

When appropriate within this section there are graphs like the one below to present climate projection data. There are three types of data presented here.

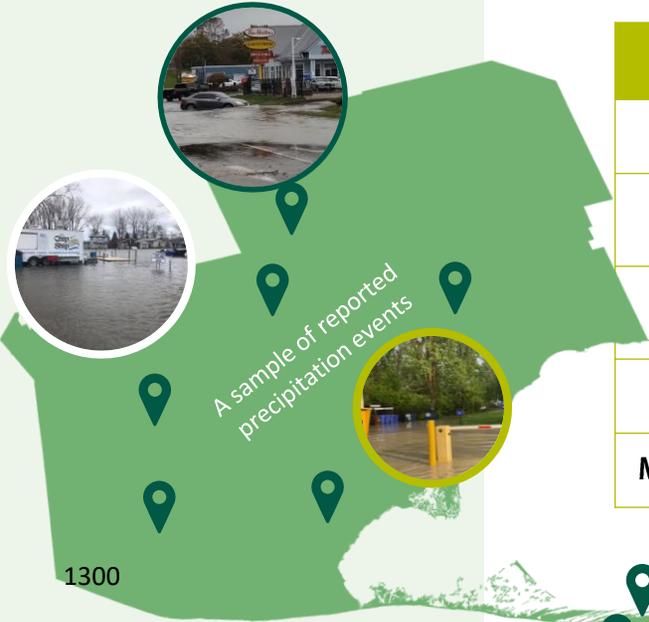


Precipitation.

What is precipitation?

Precipitation is any kind of water that falls from the atmosphere towards the ground. This includes:

● Rain
 ❄ Snow
 ⦿ Hail
 /// Sleet



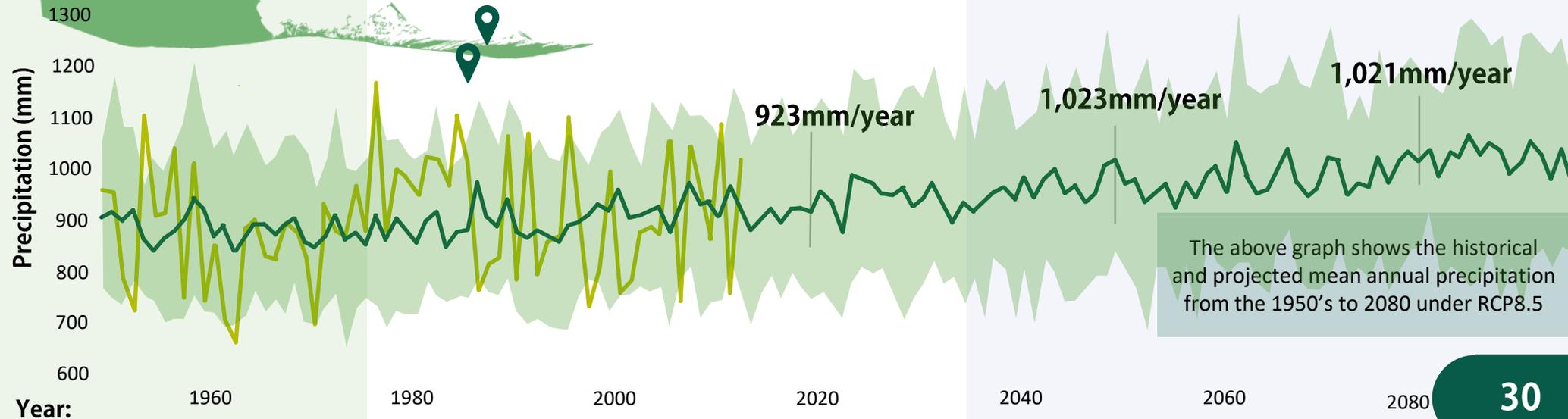
Today.

Norfolk County has historically enjoyed ample precipitation year-round, with the wettest seasons occurring during the summer and fall. Most of this precipitation falls as rain, with the exception of the months of December, January, and February which are the most likely to see snow.

Tomorrow.

Over the next 30 years (2021-2050) Norfolk County is projected to see a year-round increase in precipitation. This will include both an increase in average precipitation, and an increase in the frequency and duration of large precipitation events, such as storms. While data is limited, it is likely that as winter temperatures increase more snow will begin to fall as rain, though winter storms are still projected to increase in intensity.

	Today	Change	2050s
Annual precipitation	904mm	+57mm	961mm
Heavy precipitation days (10mm)	27.7days	+2.2days	29.9days
Heavy precipitation days (20mm)	7.4days	+1.5days	8.8days
Dry days	154.8 days	+0.7 days	155.5days
Max 1-day precipitation	45mm	+2mm	47mm



Temperature.

What is temperature?

Temperature is the measure of how hot or cold the air temperature is in a given area.

Heat waves: Three consecutive days when the temperature reaches over 30 °C.

Tropical nights: Nights when the temperature does not drop below 20 °C.

Annual daily maximum/minimum temperature: the average of all the daily high and daily low temperatures over the course of a year.

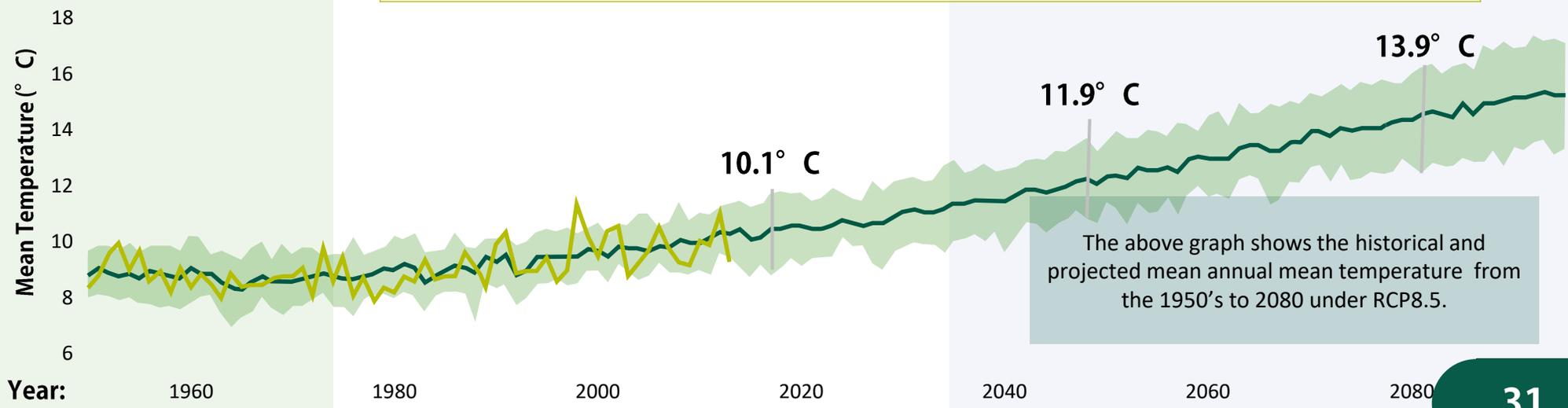
Today.

Norfolk County is a continental climate which means it has historically had significant variations in seasonal temperature between summer and winter. It is also located near a large body of water which helps regulate that temperature during the hottest and coldest months, as compared to neighbouring regions that are further from the lake.

Tomorrow.

Over the next 30 years (2021-2050) Norfolk County is projected to see a year-round increase in both average and extreme temperatures. There is a notable increase in days above 30°C (+43.7) and tropical nights (+18), indicating a significant increase in extreme temperatures, which can be hazardous to human health.

	Today	Change	2050s
Mean temperature	8.8°C	+2.1°C	10.9°C
Days over 30° C	22.0 days	+43.7days	65.7 days
Heat waves	1.4	+2.9	4.3
Tropical nights	11.5	+18.8	30.3
Annual daily maximum temperature	12.9°C	+2.1°C	15.0°C
Annual daily minimum temperature	4.7°C	+2.1	6.8°C



Winter storms.

What are winter storms?

Winter storms are large precipitation events occurring during cold temperatures. This may include any combination of snow, sleet, and freezing rain.

Freezing degree days:

Freezing degree days are a measure of how cold a winter has been and is the cumulation of the average daily degrees below 0 °C.

Frost days: Days on which the coldest temperature of the day reaches below 0 °C.

Freeze thaw cycle: Number of days where the daily temperature fluctuates above and below 0°C.

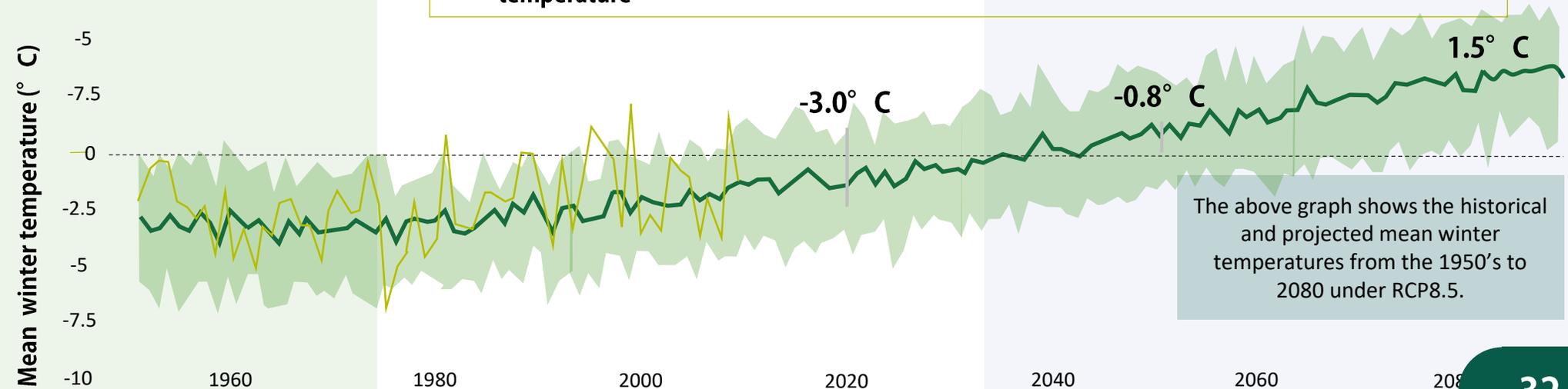
Today.

Norfolk County has a humid continental climate, with cold and snowy winters. From 1981-2010 the average annual snowfall was 129.5 cm, fairly evenly distributed throughout December, January, and February. During those years, January had on average the highest number of days with snowfall (10.3) while February had the largest accumulated snow depth. The largest accumulated snowfall recorded was 55cm in 1982 while the largest confirmed daily snowfall was 29cm in 1993.

Tomorrow.

Mean winter precipitation in Norfolk county is projected to increase by 10%. However, as shown on the graph below, mean winter temperatures are also projected to increase by 2.3°C, with mean temperatures eventually escalating past the freezing mark. This indicates that winter precipitation will shift from snow and ice towards rain, with provincial research showing that snow is likely to be replaced by freezing rain. Note, that the intensity and frequency of winter snow storms is still projected to increase, at least for the short term.

	Today	Change	2050s
Freezing degree days	418	-165	253.4
Freeze-thaw cycle	85.2	-35.3	49.9
Frost days	119.8	-25.2	94.6
Winter mean precipitation	211mm	+21mm	232mm
Winter mean temperature	-3.0°C	+2.2°C	-0.8°C



The above graph shows the historical and projected mean winter temperatures from the 1950's to 2080 under RCP8.5.

Wind.

What is wind?

Wind is the movement of air in the form of a current. There are two main metrics for wind.

A **wind gust** is a brief increase in the speed of wind, usually lasting less than 20 seconds.

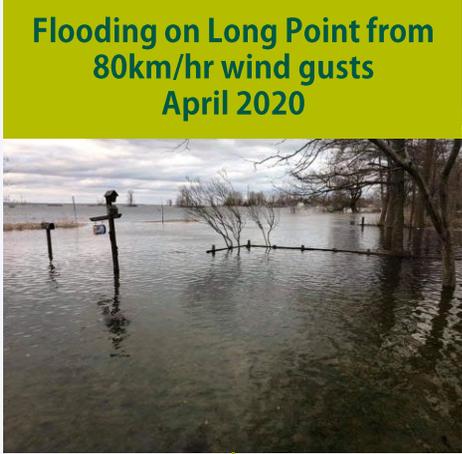
Sustained wind is the average wind speed calculated over multiple minutes.

Today.

Norfolk County has historically seen severe wind storms coming from Lake Erie which, in addition to causing direct damage, have pushed water up from the lake and on to the land, causing significant flooding. During these events wind gust speed have been known to reach over 100km/hr, with sustained hourly speeds reaching over 50km/hr.

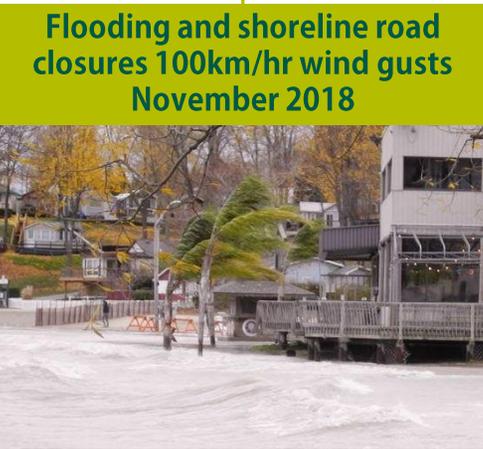
Tomorrow.

General wind data for the region projects an increase in the intensity and frequency of large storm events, including wind. However, it should be noted that there is a high uncertainty in wind projections due to their complexity and lack of data. As the County already experiences large wind events, they will likely continue to be a concern in the future.



2015

2020



Note: The timeline presented to the right represents recent large wind storm events. It is not comprehensive, but rather shows a sample of events for which there was significant coverage or damage.

Drought.

What is drought?

Drought is an extended period of abnormally low rainfall which results in a shortage of water. In Ontario, drought can be assigned one of three levels:

- 1. Level 1:** the potential for water supply problems is identified
- 2. Level 2:** Minor water supply issues are encountered
- 3. Level 3:** Supply may no longer meet demand, and social and economic impacts are anticipated

Impacts of drought

In 2016 Norfolk County had a 60% deficit in normal precipitation activity. This was in combination with both high summer and fall temperatures. By the end of the summer potato farmers reported 35-50% decreases in yield, even in irrigated fields.

Today.

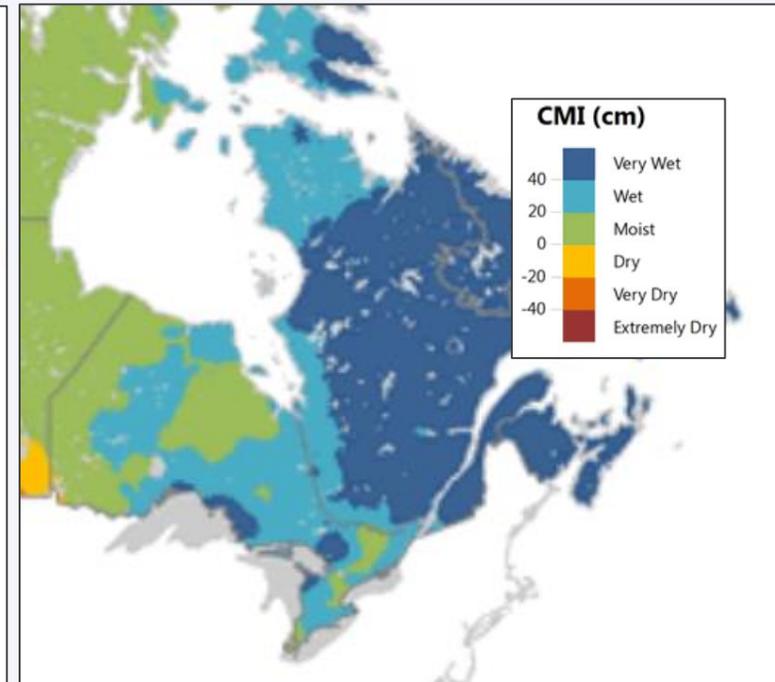
Norfolk County, along with the rest of southern Ontario, experiences relatively infrequent, smaller, and shorter droughts. Under the Climate Moisture Index, which calculates the difference between annual precipitation and potential evapotranspiration, it is considered to experience 'wet' conditions. Historically, there have been significant drought conditions in Ontario in the 1930's, 1960s, later 1990's, and most recently in 2016. During the 2016 drought Norfolk County saw 35% of their normal precipitation amounts from May to July, which led to requests to reduce fishing and cancel horticultural events.



Tomorrow.

Drought is a combination of higher summer temperatures and lower precipitation. While projections show a mean summer increase in precipitation of 2mm, they also show an increase in summer temperatures of 2.1°C, which may offset some of those gains. Studies done on future projected drought show Norfolk County going from a 'very wet' to a 'wet' climate moisture index.

General global trends suggest that droughts will not only become more frequent but also more severe and longer lasting.

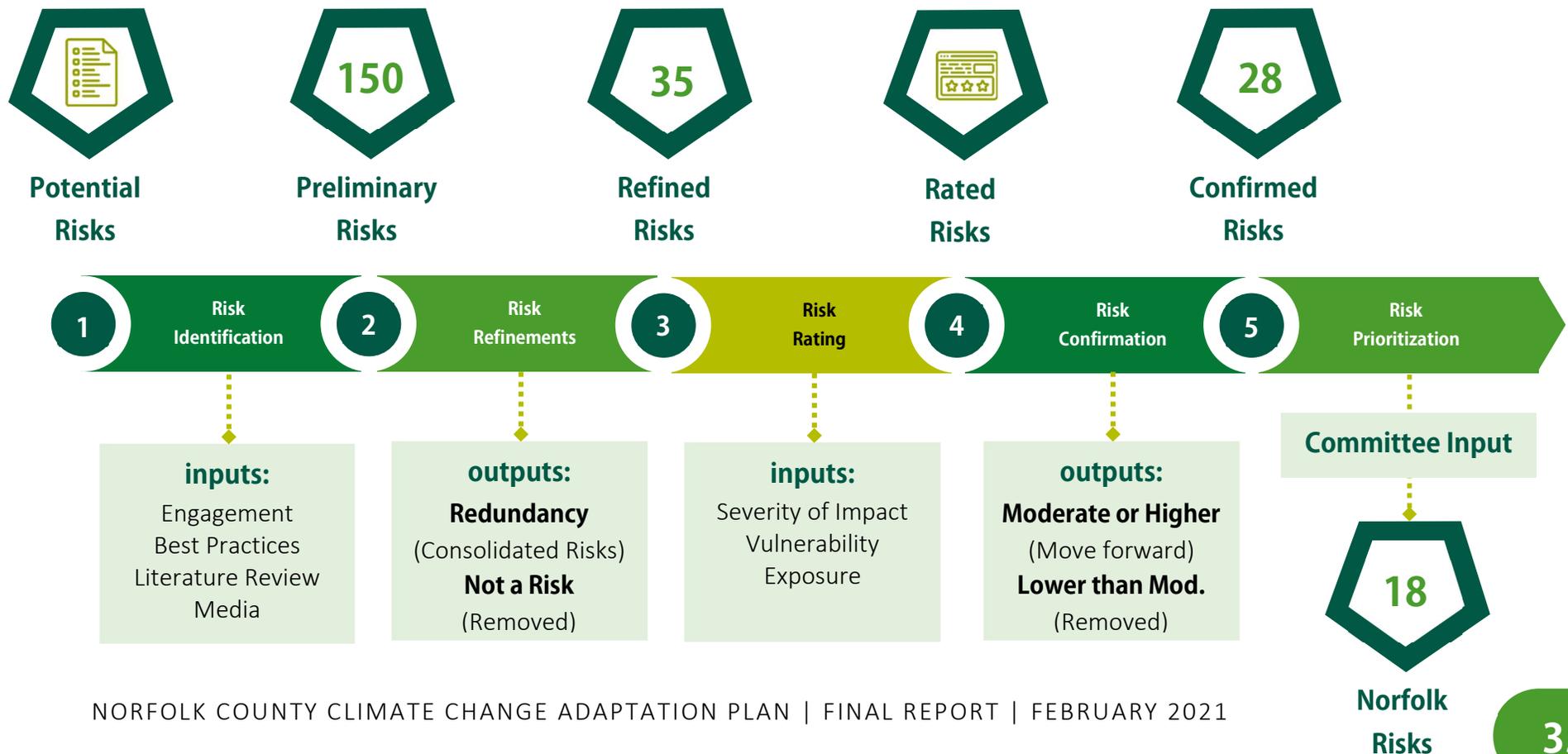


Climate moisture index for Ontario showing the current baseline (1981-2010) (left) compared to projected climate conditions for 2041-2070. As shown, Norfolk is currently considered a 'very wet' region, while projections show it heading towards only a 'wet' region.



3.2 Vulnerability assessment process.

Prior to identifying adaptation measures, the climate vulnerability and risks must be identified. There are a significant number of potential risks that could emerge for any given community. It is important to clearly communicate the process by which those risks are identified and assessed so that priorities can be strategically selected. The assessment completed was based on the International Organization for Standardization’s ISO31000: Risk Management and the Intergovernmental Panel on Climate Change’s (IPCC) Fifth Assessment (AR5) Report Risk Assessment approach – both nationally and internationally recognized processes to complete risk assessments. A five-step process was used which integrated quantitative and qualitative information to identify, refine, rate, confirm and prioritize risks for Norfolk County.





3.3 Risk outcomes and overview.

As noted in section 3.2, a total of 18 priority risks have been identified for Norfolk County. Each of those risks made it through the vulnerability assessment and has been selected by the consultant team and committee members with staff input as the key risks upon which the adaptation plan has been developed.

The 18 risks that were ultimately selected are presented on the following pages. Included for each risk is a(n):

- + Detailed description of the risk
- + Rationale as to why this is considered a risk for Norfolk County
- + The risk “level” or rating as determined through step 3 of the process (risk rating));
- + Overview of the climate factors that cause or exacerbate the risk to the community; and
- + Overview of the potential climate pillar threats that could be caused if adaptation measures are not implemented.

It is important to note that the risks have not been presented in order of priority. The order of the risks has been determined by the risk rating that was identified in step 3 (risk rating) with the highest ranked risks presented first. The prioritization of risks will be considered by the Committee once additional public and stakeholder engagement is undertaken.

The following are recommendations on how to use the information provided on the following pages:

1. The overview of risk contained within the adaptation plan should be used as a communication tool by the committee and County staff to articulate the climate risks and impacts to the community.
2. Through future public and stakeholder engagement Norfolk County should consider the prioritization of the climate risks to determine where staff should focus their implementation efforts.
3. As the committee supports the implementation of the adaptation plan, the risks should be reviewed to determine if there are specific priorities that can shape the work plan of staff and the committee.



Risk 1: Flooding of privately-owned residential properties

Heavy precipitation events and windstorms which push water from Lake Erie may cause flooding to privately-owned residential properties, such as homes and seasonal properties, resulting in expensive damages, costs, and potential environmental hazards from fuel and waste spills.



VERY HIGH

Rationale:

Private property damage from Lake Erie is a common and reoccurring occurrence in Norfolk County, notably in the low-elevation areas surrounding the lake such as Long Point, Port Dover, and Turkey Point. There are several properties located in a hazardous zone, and access has previously been cut off from certain communities due to causeway flooding. Projection data shows an increase in the number and intensity of storm events, potentially greater windstorms, and an increase in precipitation.

Climate factors:



Precipitation



Wind

Climate pillars threatened:



Infrastructure



Safety



Economy

Risk 2: Delay of first responder services

Adverse weather events such as rain, wind, and snowstorms may delay the response times of first responders such as fire, police, and paramedics. Delays in these services may result in increased injuries, deaths, and property damage.



VERY HIGH

Rationale:

Norfolk Count covers a large area consisting of both rural and urban communities with varying degrees of connection and proximity to first responders. Studies across the country have shown there is a correlation between first responder delays and deaths, with weather directly impacting travel time. Projection data shows increases in the intensity of storms events such as snow, wind, and rain, which may increase the delays in first responder services.

Climate factors:



Precipitation



Wind



Winter Storm

Climate pillars threatened:



Safety



Risk 3: Greater demand on municipal water supply and depleted ground water resources

Decreases in the amount and consistency of precipitation may decrease the amount of groundwater available for public and private use. This may put stress on existing systems and reserves.



VERY HIGH

Rationale:

A [previous report](#) has noted some limitations in the existing water supply. In addition, several rural and shoreline regions in the County rely on well water as a primary source, increasing their vulnerability. Projections show increases in summer temperatures and drought events with only minimal increases in summer precipitation, which may lead residents and businesses to stress existing resources.

Climate factors:



Precipitation



Wind

Climate pillars threatened:



Environment



Safety



Economy

Risk 4: Increase in vector-borne diseases

Shifts in precipitation and temperature patterns are shifting the ranges of disease-carrying vectors such as mosquitos and ticks. These vectors can infect humans and threaten the health and safety of residents.



VERY HIGH

Rationale:

Norfolk County has already begun to see an increase in vectors carrying diseases such as ticks carrying Lyme disease. The County's relatively southern location exposes it to vectors moving northward, as does its multiple ecosystems and planted areas. This is consistent with other municipalities and areas along Canada's Southern border.

Climate factors:



Precipitation



Heat

Climate Pillars threatened:



Safety



Risk 5: Supercharging and flooding of stormwater management systems

Increase in heavy precipitation events as well as an increase in total precipitation may cause stormwater management systems such as ponds, street storm drains, and culverts to exceed their capacity and increase the likelihood of flooding.



HIGH

Rationale:

An assessment of the stormwater systems of the County concluded that they do not meet current provincial and regional stormwater engineering standards. This is consistent with views expressed during engagement, as well as recommendations for upgrading the system provided during the last sustainable master plan. Projections show an increase in heavy precipitation events as well as total precipitation which may stress the system further.

Climate factors:



Precipitation



Wind

Climate pillars threatened:



Infrastructure



Safety



Economy

Risk 6: Decreased agricultural output and productivity

Increases in drought conditions as well as changes in temperature and precipitation patterns may reduce agricultural output or require changes to existing practices.



HIGH

Rationale:

Norfolk County has a large and diverse agricultural economy, and impacts will be diverse. Projections show a potential increase in summer droughts as well as an increase in summer temperatures. Crops which rely heavily on consistent precipitation as well as multi-year plants may also be affected by shifting precipitation regimes, though summer is projected to see an increase in overall precipitation.

Climate factors:



Precipitation



Heat

Climate pillars threatened:



Economy



Risk 7: Contamination and flooding of drinking water systems

Increase in heavy precipitation events and windstorms which push surface materials into water sources increase the likelihood of the flooding and contamination of drinking water systems. In addition to the public health threat, this may also require additional spending to fix in the form of testing and health spending.



HIGH

Rationale:

Long Point and rural areas use septic systems, which increase contamination risk during a flood event, notably in areas which directly intake water. High-level flooding in the wet well of water treatment plants has been noted as a concern during public engagement. Projections show an increase in the intensity of storm events such as rain, snow, and wind which may increase the likelihood of contaminants entering the water system.

Climate

factors:



Precipitation



Wind

Climate pillars

threatened:



Safety



Economy

Risk 8: Algal blooms impacting tourism

Increase in the size and frequency of algal blooms on Lake Erie from warming temperatures may reducing the safety and aesthetic appeal of the lake and decrease the tourism value.



HIGH

Rationale:

Lake Erie is already experiencing algal bloom events which impact the quality and aesthetics of the water. Projections show year-round increases in temperature, in conjunction with excess nutrient runoff, may increase the growth of algal blooms in Lake Erie.

Climate

factors:



Precipitation



Heat

Climate pillars

threatened:



Environment



Safety



Economy



Risk 9: Flooding of Publicly Owned Buildings and Infrastructure, Including Marinas

Increase in heavy precipitation events and windstorms which push water inland from Lake Erie may cause flooding to publicly owned buildings resulting in damage and requiring additional repair costs. In addition, residents and staff within the public buildings may be at risk of harm during events



HIGH

Rationale:

Norfolk County has had many historical instances of flooding, notably from Lake Erie. These have caused damage to both public infrastructure and public and private buildings close to the shoreline. Projections data shows an increase in the number and intensity of heavy rain events, as well as rain and windstorm events, indicating this problem may increase in the future.

Climate

factors:



Precipitation



Wind

Climate pillars

threatened:



Safety



Economy

Risk 10: Health impacts from heat waves

Extended periods of extremely warm temperatures may pose a risk to the health and safety of vulnerable populations, notably those with pre-existing conditions as well as the homeless.



HIGH

Rationale:

Projections show that heat waves may become more frequent, intense, and last longer in the future. Heat waves disproportionately impact those who are socially vulnerable, the elderly, and those with pre-existing conditions. About a fifth of Norfolk County’s population is over the age of 65, and over a tenth of the population can be considered under the low-income line, which increases their vulnerability to warmer temperatures.

Climate factors:



Heat

Climate pillars

threatened:



Safety



Risk 11: Reduced business revenue

Shifts in climate may have a wide range of cascading effects that can impact certain businesses who rely on consistent and current conditions.



HIGH

Rationale:

In addition to agriculture, Norfolk County businesses include tourism such as beach-related visitors, wineries, and outdoor activities. Projection show increases in the number of heat waves and extremely hot days which may discourage outside visitors and impact agriculture and wineries. In addition, studies have shown that heat, in conjunction with excess nutrient runoff, can increase the growth of algal blooms in Lake Erie, reducing the appeal to visitors.

Climate factors:



Precipitation



Heat



Drought

Climate pillars threatened:



Economy

Risk 12: Coastal erosion

Increases in precipitation and wind-based flooding events combined with higher lake levels and storm surges may increase the rate of erosion along the coastline of Lake Erie



HIGH

Rationale:

Beachfront erosion has been noted as an existing and ongoing problem in Norfolk County through existing records, hazard studies, and public engagement. Projections show an increase in storm events, including winter, rain, and wind, as well as a potential increase in lake levels, though the data is not conclusive. These factors, in tandem with existing conditions, may lead to an increase in coastal erosion.

Climate factors:



Precipitation



Wind

Climate pillars threatened:



Infrastructure



Environment



Economy



Risk 13: Power outages

Adverse weather events such as snow and windstorms may increase the likelihood of power transmission and generation failure.



HIGH

Rationale:

Much like most of Southern Ontario, Norfolk County has previously experienced localized power outages due to storm events. Projections show increases in the intensity of wind events, and large winter storm events, which may result in an increase of power failures and outages.

Climate factors:



Winter Storm Wind

Climate pillars threatened:



Infrastructure Safety Economy

Risk 14: Disruption of garbage/recycling collection services

Adverse weather events such as snow and windstorms may delay the County’s ability to safely pick up waste/recycling. Improperly disposed of waste may become an environmental pollutant as well as a public health and safety concern.



MODERATE

Rationale:

Engagement has indicated that there has been some prior weather-related disruption to garbage and recycling service collection, which is consistent with other municipalities in the country. Projections show a potential increase in the intensity of wind events, and large winter storm events, which may increase the likelihood of these events.

Climate factors:



Precipitation Heat Drought

Climate pillars threatened:



Environment Economy



Risk 15: Health impacts from cold waves

Extended periods of extremely cold temperature may pose a risk to the health and safety of vulnerable populations, notably those with pre-existing conditions as well as the homeless.



MODERATE

Rationale:

Studies suggest that cold waves account for over half of weather-related deaths and may put additional strain on the health care system. While on average temperatures will increase, fluctuations in the global climate may still be responsible for extreme periods of cold in the winter.

Climate factors:



Winter Storm

Climate pillars threatened:



Safety

Risk 16: Damage to the environment including reduction in biodiversity and damage to trees

Extreme weather events as well as more gradual changes to local climate may harm or destroy the existing environment including forests and wetlands.



MODERATE

Rationale:

Historically, there has been some damage to trees from wind as well as storm events. Projections indicate shifts in temperature and precipitation patterns as well as an increase in extreme weather events such as storms, which may both acutely and gradually cause harm to delicate ecosystems.

Climate factors:



Winter Storm

Climate pillars threatened:



Environment



Risk 17: Decreased transportation safety and access

Adverse weather events such as snow, rain, and windstorms may decrease the safety of road travel for residents and visitors of Norfolk County.



MODERATE

Rationale:

There have historically been recorded instances of flooding reducing road access in Norfolk County, notably in areas adjacent to Lake Erie, as well as instances of decreased travel safety due to winter storms. Norfolk County covers a large area with both rural and agricultural areas, which may have less transportation options. Projections show potential increases in the intensity of storm events which may increase road hazards and decrease the safety of transportation.

Climate factors:



Winter Storm



Wind



Precipitation

Climate pillars threatened:



Safety

Risk 18: Grass and bush fires

Increases in drought conditions and summer temperatures may create conditions favorable to grass and bush fires which pose a danger to the health and safety of residents as well as nearby infrastructure, property, and the environment.



MODERATE

Rationale:

Engagement has indicated a minor history of environmental fires within Norfolk County. Projections show a potential increase in summer droughts as well as an increase in summer temperatures, which may exacerbate these risks.

Climate factors:



Winter Storm



Wind



Precipitation

Climate pillars threatened:



Safety



Environment



Infrastructure



4

Adaptation.





Adaptation strategies designed for Norfolk County and its climate risks.

A strategic planning document is typically designed to build upon the related work that has already been undertaken and to respond to the needs of the community. There are several initiatives that Norfolk County has implemented which either directly or indirectly have a climate change mitigation or adaptation outcome. Norfolk County has implemented several initiatives which have some climate mitigation or adaptation effects. However significant risks remain and required focused efforts.

The success of an adaptation plan is defined by the ability to implement the proposed strategies. The feasibility of adaptation strategies was considered early in the process by key county staff and professionals, which led to the selection of preferred solutions.

Chapter 4.0 provides an overview of how adaptation strategies were identified for Norfolk County, the preferred strategies that emerged, implementation considerations, and recommendations to facilitate next steps.

4.1

SECTION 4.1. IDENTIFYING.

A description of the process that was used to identify and select the preferred adaptation strategies.

4.2

SECTION 4.2. EXISTING ACTIONS.

An overview of the current work that is being undertaken by Norfolk County which could have an impact on adaptation.

4.3

SECTION 4.3. PROPOSED STRATEGIES.

An overview of the proposed adaptation strategies as selected by staff and the committee based on priority risks.

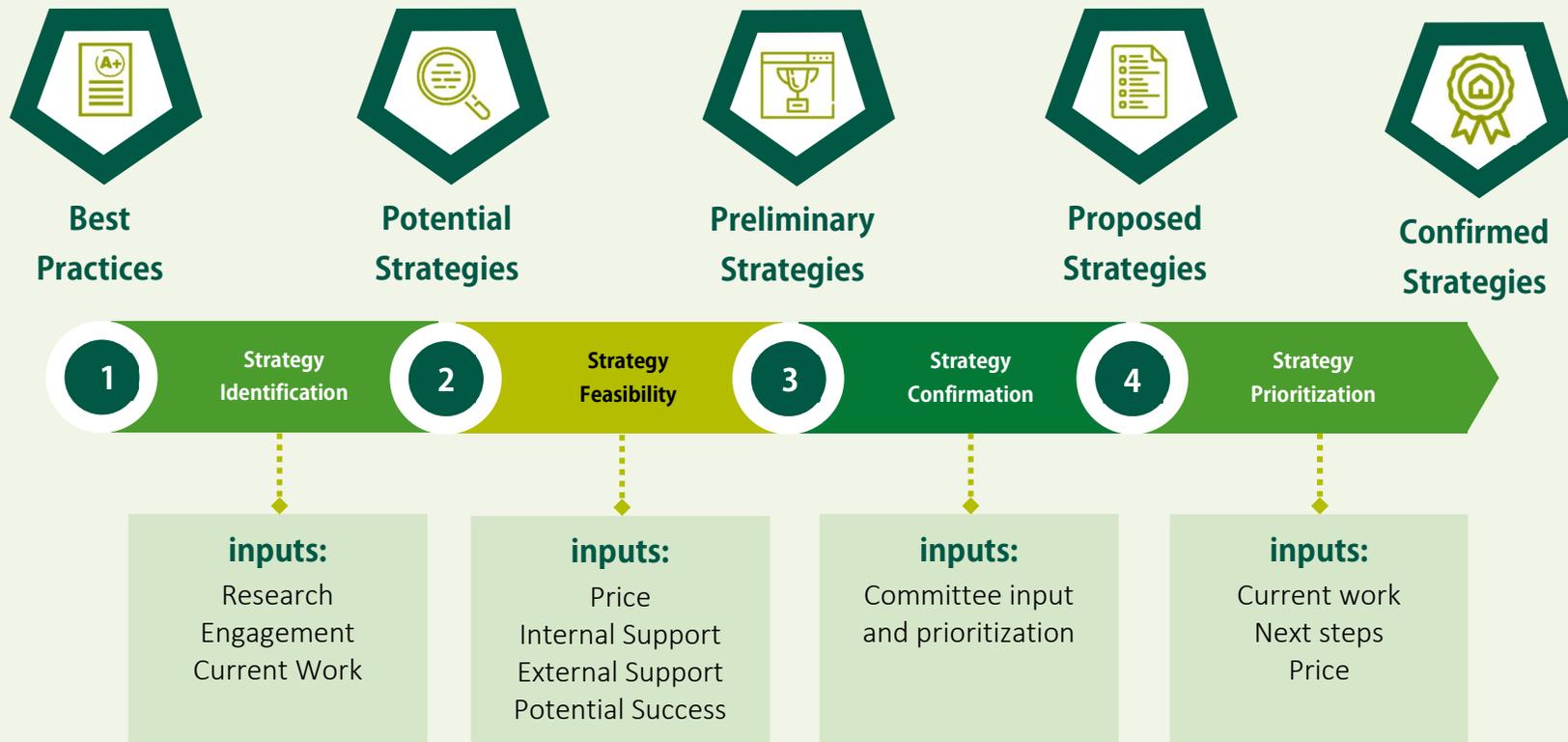
4.4

SECTION 4.4. IMPLEMENTATION.

An overview of implementation for different strategy types including planning, processes, programming and physical actions.

4.1 Identifying adaptation strategies.

Similar to the vulnerability assessment, a process was used to identify the proposed adaptation strategies for Norfolk County. The first step of the process was to gather information including: best practices from comparable geographies, research and current adaptation related work that is being undertaken by Norfolk County. The second step was a high-level feasibility assessment followed by confirmation by the committee. The recommended strategies address the eighteen priority risks identified within chapter 3.0. They are not meant to be prescriptive but should provide Norfolk County with the foundation from which future adaptation initiatives and strategies can be considered and implemented throughout the County.





4.2 Existing actions for Norfolk.

The intent is for this plan to build upon the work that Norfolk County staff and its partners have already pursued and implemented or are currently exploring. As noted above, adaptation can take many forms, Norfolk County's operations have already begun integrating measures which will make the County, its assets, and its residents more resilient to climate change.

Current adaptation practices range from procedures during extreme climate events such as opening cooling and warming stations during heat waves and cold snaps, protecting the natural environment through protection acts and management plans, and communicating important climate information to residents including road conditions and closures.

To better understand the adaptation work that is currently being completed by Norfolk County, the consultant team engaged staff through a comprehensive online survey followed by a facilitated workshop session. A comprehensive database of current practices was developed to support the identification of additional adaptation measures.

Table 3 provides a non-exhaustive summary of the current actions Norfolk County is taking that will help it adapt to climate change. These measures were not necessarily implemented specifically for climate change, but by nature do increase the County's resilience. The information demonstrates a wide-reaching commitment at all departmental levels to address and where possible manage climate change through adaptation. These efforts are the foundation upon which this adaptation plan has been developed.



Table 3. Existing Norfolk County actions that adapt to climate change

Risk	Divisions	Existing Norfolk County actions
Flooding of Public Buildings	Community Services	<ul style="list-style-type: none"> + Library staff are instructed to check facilities for leaks and flooding in the event of large rain and coastal flooding events. + Areas of concern are monitored during rain events by the community safety officer. + The community safety officer has policies to deal with flooding including monitoring of the event and liaising with LPRCA. + The fire department has an emergency preparedness plan in case of major emergencies including weather-related emergencies. + During large rain events the public is coordinate with as well as fire and safety patrol. + Flood levels are monitored during high rains and reported. + Slew-way door opening at the Simcoe Quance Dam is opened in anticipation of large potential rain events. + There is a policy of not serving fuel during storm and lightening events. + During large windstorms fuel racks and pumps are removed from the fuel doc and chains are checked to ensure enough slack. + Prior to snow events there is pre-planning to increase critical infrastructure. + Storm events are logged
	Planning & Development	<ul style="list-style-type: none"> + Information is balanced on social media feeds so that tourists are not unduly deterred from visiting Norfolk County. + During winter storms consulting engineers are notified of any problems.
	Health & Social Services	<ul style="list-style-type: none"> + If significant enough, community partners are worked with to provide emergency responses.
Overwhelming of stormwater systems	Community Services	<ul style="list-style-type: none"> + Storm events are logged
	Public Works	<ul style="list-style-type: none"> + High wet well levels are controlled by low lift pumps, unless overwhelmed.
Private Building Flooding	Community Services	<ul style="list-style-type: none"> + Flooding levels are monitored during large events.



Table 3. Existing Norfolk County actions that adapt to climate change

Risk	Divisions	Existing Norfolk County actions
Disruption of Garbage Collection	Public Works	<ul style="list-style-type: none"> + Residents are asked to hold their materials for delayed collection during snowstorm events. + During wind events residents can drop off garbage at transfer sites. + Brush may be cleared for free based on severity of damage.
Delay of First Responder Services	Community Services	<ul style="list-style-type: none"> + There is an emergency response plan in place in case of major emergencies, include weather-based emergencies.
Damage to the Environment	Community Services	<ul style="list-style-type: none"> + Newly planted trees have increased watering. + Trees are planted with consideration of climate change with the aim to plant trees robust enough to withstand extreme weather events. This includes sourcing trees from more southern seed zones, adept to a warming environment. + There exists a tree planting program aimed at maintaining or increasing urban forest canopy. Trees removed for maintenance or damage are replaced. + Staff are on stand-by for tree failures during events and conduct assessment of county forests after the event. + Logging operations on County lands are inspected to ensure no excess damage. + There is an existing forest management plan. Norfolk manages its forests sustainably with regards to species diversity, increasing invasive pest control, and recognizing that some species do better in warm climates than others. + Trees are planted with consideration of climate change with the aim to plant trees robust enough to withstand extreme weather events. This includes sourcing trees from more southern seed zones, adept to a warming environment. + There is an existing forest management plan. Norfolk manages its forests sustainably with regards to species diversity, increasing invasive pest control, and recognizing that some species do better in warm climates than others.





Table 3. Existing Norfolk County actions that adapt to climate change

Risk	Divisions	Existing Norfolk County actions
Contamination of Drinking Water	Community Services	+ Fuel tanks in marinas are moved to higher elevation and secured during storm events.
	Public Works	+ As per the Safe Drinking Water Act Norfolk has to have a Drinking Water Quality Management System in place to run the drinking water systems. Through this they are required to consider various factors some of which are Climate Change. They have to consider how an event related to climate change may affect our drinking water systems, the likelihood of it happening and what they have in place to mitigate this or deal with it if it does happen.
Decreased Transportation	Community Services	+ Libraries have a service disruption policy. If school buses do not run, then there is a checklist followed to determine if it is safe for the library to open and programs to be run.
	Public Works	+ During winter storm events winter control locations are pre-treated with salt and areas are checked to ensure safety from sloping on ice/snow. Continuously checked during event. + Preventative maintenance is ensured, and batteries charged. + Road departments are liaised with to monitor road conditions.
Health Impacts from Cold	Community Services	+ Staff liaise with OPP and local health units in regard to opening warming stations. + Libraries serve as warming centers during extreme cold.
Health Impacts from Heat	Community Services	+ Staff will communicate with the public health department and the OPP. + Water and air conditioning are offered free of charge at libraries during heat waves. + Pools and cooling stations are opened to the public during heat events. + Community safety officer cancels services and events as needed.



Table 3. Existing Norfolk County actions that adapt to climate change

Risk	Divisions	Existing Norfolk County actions
Increase in Vector-Borne Diseases	Health and Social Services	<ul style="list-style-type: none"> + Provincially and federally run programs including notification centers, surveillance, mapping, and health guidelines are available. Haldimand-Norfolk Health Services tracks and posts instances of Lyme disease and provides advice to reduce risks. + Norfolk Health Units are already aware of this as it is a current problem in the area, and there is active tick surveillance.
Reduced Business Revenue	Community Services	<ul style="list-style-type: none"> + Norfolk libraries are planning to launch information sessions on climate change to educate the public including business owners.
Power Outages	Community Services	<ul style="list-style-type: none"> + When hydro is out libraries and other public buildings may be closed to the public. Staff will assist the public to leave, calls are made to providers or renters about the outages, and the media is contacted. + There is an established emergency preparedness plan.
Grass & Bush Fires	Community Services	<ul style="list-style-type: none"> + Burning bans are instituted during dry conditions
Greater Demand on Water Supply	Community Services	<ul style="list-style-type: none"> + Water is recycled when able. + Grass cutting is minimized during drought conditions. + Use of water is reduced during drought conditions.
	Public Works	<ul style="list-style-type: none"> + Water hauling stations are closed during drought conditions. + The outdoor watering by-laws are enforced.



Table 3. Existing Norfolk County actions that adapt to climate change

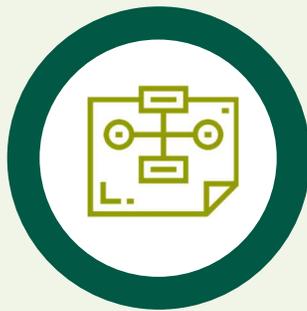
Risk	Divisions	Existing Norfolk County actions
Algal Blooms Impact on Tourism	Corporate Services	+ Communication tries to balance information from social media feeds to ensure that visitors are not unduly deterred from visiting Norfolk.
Coastal Erosion	LPRCA	+ Hazardous Lands are regulated by the Long Point Region Conservation Authority.

Table 3. Examples of adaptation strategies already adopted and implemented by Norfolk County related to Climate Risks identified



4.3 Norfolk proposed climate actions.

Building upon the existing adaptation actions outlined in section 4.2, a set of additional strategies were identified for each of the eighteen risks. To support the implementation of these strategies a suggested dollar value range has been identified ranging from low to high. Further, climate actions can be organized into four categories. These categories represent different implementation requirements should Norfolk County select to implement the strategy. The implementation process and directions are provided in section 4.3. A high-level description of each is provided below.



Planning

Planning pertains to any strategy that would have an impact on the planning process under the Planning Act or would require updates to be made to existing policies as adopted by Norfolk County.



Process

Process pertains to any strategy that would influence or impact a current municipal process or would require a new process to be established to support future initiatives.



Communication

Communication pertains to any strategy that would require public facing communication or would provide direction how to communicate key issues or topics as a result of the plan.



Physical

Physical pertains to any strategy that requires the construction of new infrastructure or supportive assets.



Planning



Process



Communications



Physical



Risk 1: Flooding of Publicly Owned Building & Infrastructure

1.	During regular maintenance, lease renewal, and building asset-management/long-term capital planning evaluate the resilience of individual buildings and the cost effectiveness of retrofitting vs relocating.	\$\$		
2.	Evaluate the current and projected vulnerability of publicly owned buildings and infrastructure to coastal flooding.	\$\$		
3.	Review and communicate existing flooding plan with relevant staff and the public.	\$		
4.	Determine what marina response actions are triggered by a storm alert. Assign responsibility to a team member to monitor and communicate these risks.	\$		
5.	Where possible/feasible, move potentially dangerous equipment (i.e. Fuel tanks) to higher elevation or improve storm proofing.	\$		
6.	Detailed vulnerability assessment of County infrastructure surrounding Lake Erie.	\$\$		
7.	Encourage the completion of climate change resiliency studies and certifications, such as Infrastructure Canada's Climate Lens, LEED, and others on new and retrofitted infrastructure.	\$\$		
8.	Mandate the completion of climate change resiliency studies for County infrastructure in sensitive areas and/or projects that will be potentially applying for provincial or federal funding.	\$\$		
9.	Mandate use of the upcoming 2025 Canadian Building Code for new construction and major renovations of County facilities.	\$		
10.	Promote the use of naturalized options including gabion structures, rip rap, wooden posts, and bankside vegetation, native vegetation, and rain gardens to soak up excess water and prevent bank disruption.	\$		
11.	Initiate pilot project using porous pavement and encourage permeable surfacing.	\$\$		
12.	Accommodating existing residents through flood protection measures such as raising building foundations.	\$		



Planning



Process



Communications



Physical



Risk 2: Supercharging and Flooding of Stormwater Management System

1.	Integrate climate change projections and considerations into long-term capital planning/asset management and regular review/maintenance.	\$	
2.	Keep formalized logbook of incidents for future assessments.	\$	
3.	Incorporate Low Impact Development technologies and designs into municipal design standards and requirements.	\$\$	
4.	Promote the use of a permeable paving pilot project on County property.	\$\$	
5.	Retrofit existing trenches to stormwater tree trenches to store and filter stormwater runoff and reduce runoff during large flooding events (i.e. rains, snowmelt, and windstorms).	\$\$	
6.	Solidify, renew, and enhance protections of wetlands.	\$	
7.	Consider monetization/valuation of existing wetlands for inclusion into asset management.	\$\$	
8.	Increase tree planting in public spaces.	\$	
9.	Launch public education strategies regarding the use of backwater valve installations.	\$	
10.	Investigate the option of subsidizing backwater valve installations.	\$	
11.	Encourage and subsidize tree planting on private property.	\$	
12.	Promote the use of rain barrels and rain gardens and educate the public on their benefits and availability.	\$	
13.	Educate and promote to the public the environmental and financial benefits of disconnecting downspouts and redirecting water from properties.	\$	
14.	Review and communicate existing flooding plan with relevant staff and the public.	\$	



Planning



Process



Communications



Physical



Risk 3: Flooding of Privately-Owned Residential Properties

1. Continue to support Norfolk County's Official Plan, Zoning Bylaw and LPRCA Regulations.
2. Produce policy guidelines, standards, and best practices around flood barriers for use by private landowners in high-flood risk areas.
3. Encourage the floodproofing of high-risk dwellings through passive techniques such as raising the dwelling above flood levels.
4. Allow temporary and seasonal flood protection measures by owners in high-risk and environmentally sensitive areas (i.e. quick dam flood bags, raised equipment, and temporary cofferdams) to protect home without permanently impacting the surrounding environment.
5. Mandatory disclosure of flood risk to future buyers and active sharing of risk projections with insurance and mortgage industries.
6. Explore the feasibility of flood protection structures.
7. Floodproof critical assets and buildings by elevating or placing them within waterproof containers (i.e. generators and fuel tanks).
8. Continue to study and protect nearby wetland for storm surge events.

Cost and category indicators for Risk 3 strategies:

- Strategy 1: \$\$ (Planning icon)
- Strategy 2: \$\$ (Communications icon, Process icon)
- Strategy 3: \$\$ (Physical icon)
- Strategy 4: \$ (Process icon)
- Strategy 5: \$ (Communications icon)
- Strategy 6: \$\$\$ (Physical icon)
- Strategy 7: \$\$ (Physical icon)
- Strategy 8: \$ (Process icon)

Risk 4: Disruption of Garbage / Recycling Collection Service

1. Evaluating the County's waste and recycling programs to ensure it can be scaled up to handle disaster-related wastes.
2. Develop strategies to decrease dispersal of recycling items in high wind areas (i.e. new containers with hinged lids, providing or allowing for the use of stretched mesh covers for recycling containers, etc.)
3. Communicate with the public and businesses prior to, during, and after an event which disrupts garbage/recycling services to encourage adaptive behaviour.
4. Develop and formalize waste management contingency plans.

Cost and category indicators for Risk 4 strategies:

- Strategy 1: \$ (Process icon)
- Strategy 2: \$ (Process icon, Physical icon)
- Strategy 3: \$ (Communications icon)
- Strategy 4: \$ (Planning icon, Process icon)



Planning



Process



Communications



Physical



Risk 5: Delay of First Responder Services

1. Establish a voluntary vulnerable person’s registry to guide first responses during emergency events.
2. Encourage upkeep of household emergency kits.
3. Educate public on at-home emergency preparedness.
4. Continue to update existing municipal and regional emergency preparedness and response plans with increased emphasis on protecting, communicating with, and helping vulnerable populations during weather-related emergencies.
5. Determine which municipal roads have safe access and egress routes during times of flooding.
6. Define criteria under which municipal staff can traverse during adverse weather conditions and events.

\$\$



\$



\$



\$



\$



\$





Planning



Process



Communications



Physical



Risk 6: Damage to the Environment Including Reduction in Biodiversity

1.	Avoid planting County-owned young trees during historical and projected storm and drought seasons.	\$	
2.	Evaluate, adapt, and promote planted tree species for climate change. This may include identifying well-adapted species after large events and chronic events.	\$	
3.	Evaluate, promote, and maintain current and future species diversity.	\$	
4.	Develop contingency plans for storm (ice, wind, winter, etc.) damage and avoid planting vulnerable species in high risk areas.	\$	
5.	Evaluate and prevent the establishment of invasive species.	\$\$	
6.	Evaluate and adapt local conservation priorities and plans to respond to a changing climate.	\$	
7.	Identify and protect areas most vulnerable to changing climate conditions (excess precipitation, drought, temperature increases, etc.)	\$	
8.	Reduce the impacts of land use on the environment and establish landscape features such as headlands and hedgerows to enhance species dispersal.	\$\$	
9.	Evaluate and protect ecological networks through habitat restoration and creation.	\$	
10.	Increase diversity of native planting of various types through direct county-planting and educating the public on benefits of diversifying private gardens.	\$	
11.	Identify and restore areas most favourable for the expansion of existing habitats and/or buffer areas.	\$	
12.	Implement measures, within management plans and frameworks, that allow the natural development of coasts and rivers and ensure strict planning scrutiny.	\$	
13.	Promote use of porous landscapes, turf grass alternatives, planting of native grasses, and reduced mowing schedules to encourage biodiversity and increase animal habitats.	\$	



Planning



Process



Communications



Physical



Risk 7: Contamination and Flooding of Drinking Water Systems

1. Relocate critical assets to high elevations (i.e. septic systems, power systems, filtration system).
2. During regular maintenance and capital review mandate inclusion of climate change considerations including flood and erosion levels.
3. Communicate with the public and businesses the signs / risks of contaminated water after large events and actions to take.

\$\$



\$



\$



Risk 8: Decreased Transportation Safety and Access

1. Promote and communicate working from home initiatives with staff, local businesses and the public during dangerous events. Highlight initiatives through communication channels prior to large events.
2. Increased workplace messaging of hazards of travel during events and safety precaution information.
3. Update emergency and transportation response plans to consider increased frequency of extreme weather events. This may include preparation of alternative routes.
4. Evaluate and update communications protocols to the general public and businesses to reduce traffic to effected areas.
5. Communicate dangers of travel prior to and during large events.

\$



\$



\$



\$



\$



Risk 9: Health Impacts from Cold Waves

1. Encourage home weatherization through communication of options and available grants and subsidies.
2. Advocate the province for standard thresholds and actions for cold waves in Ontario.
3. Investigate and communicate household energy assistance programs for low income households.
4. Determine the cold waves response actions that are triggered by a cold alert. This may include opening and communicating open public centers, offering warm blankets, advertising shelters, etc.

\$



\$



\$



\$





Planning



Process



Communications



Physical



Risk 10: Health Impacts from Heat Waves

- | | | | |
|----|---|------|--|
| 1. | Communicate with the public, and work with businesses employing vulnerable workers to raise awareness about the heat risk and ways to mitigate it. | \$ | |
| 2. | Provide fountains and refill stations outside public buildings adjacent to parks and trails in the summer. | \$\$ | |
| 3. | Enter into partnerships to provide splash pads in appropriate areas. | \$\$ | |
| 4. | Evaluate and update Norfolk-specific heatwave response actions that are triggered by a heat alert. | \$ | |
| 5. | Encourage behavioural changes to reduce the risk of heat stress. | \$ | |
| 6. | Develop early warning systems. | \$ | |
| 7. | Encourage resilient buildings and infrastructure by providing knowledge of grants (i.e. Climate Lens) and technical assistance for County and large private projects. | \$\$ | |
| 8. | Increase diversity of native planting of various types through direct county-planting as well and educate the public on benefits of diversifying private gardens. | \$ | |
| 9. | Increase tree planting in frequented public areas, especially diverse native species, to provide a cooling effect. | \$\$ | |

Risk 11: Increase in Vector-Borne Diseases

- | | | | |
|----|---|------|--|
| 1. | Communicate with the public and health units to develop a strong communications strategy on risk reduction (public) and treatment and diagnosis (health units). | \$ | |
| 2. | Communicate with provincial and federal agencies and review their monitoring of vector-borne diseases in Norfolk County. | \$ | |
| 3. | Invest in environmentally conscious methods of pest control such as increased bird and amphibian habitats. | \$\$ | |



Planning



Process



Communications



Physical



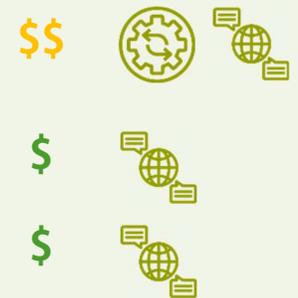
Risk 12: Decreased Agricultural Output and Productivity

1. Connect farmers with existing climate change and agriculture resources (i.e. OMAFRA and Agriculture and Agri-Food Canada).
2. Connect farmers with climate change specific agricultural funding sources.
3. Create a county-wide community of practice to study, test, and advance new agricultural opportunities that are suited to our projected future climate.



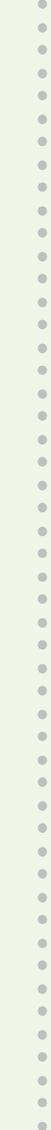
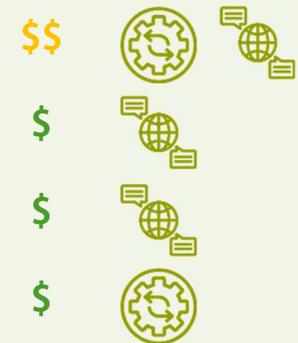
Risk 13: Reduced Business Revenue

1. Facilitate scaling up private sector investments for resilience. This may include providing technical assistance, concessional loans, match funding, tax credits for strategic adaptation investments, grants or subsidies, or extension of credit lines.
2. Make available actionable information on climate change to local small businesses.
3. Facilitate sharing and communication of adaptation methods and funding sources among businesses.



Risk 14: Power Outages

1. Create and formalize procedures to check on vulnerable communities during power outages. This may include creating a voluntary list of vulnerable citizens and determining communication thresholds.
2. Encourage upkeep of household emergency kits.
3. Investigate and communicate provincial and federal rebate programs for back up battery storage, power generators, and sump-pumps.
4. Evaluate and formalize contingency and emergency plans.





Planning



Process



Communications



Physical

CHAPTER 4. ADAPTATION STRATEGIES.



- 5. Identify opportunities for increased solar energy generation projects for critical buildings and shelters and encourage collaboration and information sharing between solar businesses and private owners.
- 6. Advocate for increased adoption of solar panels by the public and micro grids with provincial power authorities.



Risk 15: Grass and Bush Fires

- 1. Communicate and enforce safety measures such as additional watering, and reduced use.
- 2. Communicate with farmers regarding pausing the use of equipment during very dry conditions.



Risk 16: Greater Demand on Municipal Water Supply

- 1. Evaluate the need for new built infrastructure such as aquifer storage. If necessary, increase water storage capacity.
- 2. Review the use of municipally treated water for irrigation, boat air-conditioning, and boat washing during drought conditions.
- 3. Promote and facilitate municipal and household-level systems to recycle water.
- 4. Educate the public about household-level water conservation strategies and options such as increasing grass height during hot periods and replacing lawns with drought tolerant species.
- 5. Diversify options of water supply and expand current sources.
- 6. Model projected conditions and demand.
- 7. Update drought contingency plans.
- 8. If necessary, retrofit intakes to accommodate for lower flow or water levels.
- 9. Practice water conservation and demand management.





Planning



Process



Communications



Physical



Risk 17: Algal Blooms Impacting Tourism

- | | | | |
|----|--|------|--|
| 1. | Support initiatives to reduce phosphorus leading into Lake Erie water supplies. | \$\$ | |
| 2. | Promote policy to protect wetlands and natural barriers surrounding farmland, rivers, and the Lake. | \$ | |
| 3. | Increase public awareness on the links between fertilizer use, for example on lawns, and toxic algae and the effects of toxic algae on humans, the economy, and the environment. | \$ | |
| 4. | Communicate with the local and visiting public during algae bloom events to reduce risks to public health and decrease negative impacts to tourism. | \$ | |

Risk 18: Coastal Erosion

- | | | | |
|----|---|--------|--|
| 1. | Relocate buildings, infrastructure, and development outside of the hazardous lands where possible. | \$\$ | |
| 2. | Long-term beach nourishment programs. | \$\$\$ | |
| 3. | Integrate erosion risk information into Norfolk County's Official Plan and Zoning Bylaw. | \$ | |
| 4. | Increase knowledge of climate hazards to better assess sensitive zoning and security margin. | \$ | |
| 5. | Follow the new principle from the Ministry of Environment, Conservation, and Parks on climate change evaluation and management. | \$ | |
| 6. | Ensure future buyers be made aware of risks. | \$ | |



4.4 Implementation considerations.

The Climate Change Adaptation Plan is a long-range strategy which is meant to provide Norfolk County and its partners with the support and tools needed to make Norfolk County a climate resilient community. The adaptation plan, unlike some other strategic planning documents, does not have a specific timeline for implementation. The content of section 4.4 is meant to provide suggested processes and approaches to facilitate the implementation of the proposed strategies in section 4.3. It has been designed as a flexible guide for Norfolk County and its partners to reference as they proceed with the implementation of the plan and to adapt as needed to fit with current practices, protocols, and available budget to work towards a more resilient climate future. The information contained within section 4.4 provides the following:

- + An overview of three potential approaches to facilitate implementation of the plan;
- + Suggested implementation steps for each of the four types of adaptation strategies;
- + Recommended roles and responsibilities for those who are anticipated to be involved in the implementation of the plan; and
- + Internal and external funding sources which could be explored to support next steps.



Determining implementation approach.

It can be a challenge to prioritize the implementation of recommended strategies. The preferred implementation approach will need to be determined following the adoption of the plan. To guide this next decision, three implementation options have been identified and are presented below. **Table 4** provides a description of the approach and the benefits of each of the approaches. It is important to note that once the adaptation plan has been adopted the committee should work with staff to identify the preferred option to facilitate implementation. Once this option has been adopted, it will determine how staff and the committee will approach their climate adaptation work plan for that year. Depending on the outcomes of the implementation approach, staff and the committee may elect to use an alternate approach for the following year. Budget considerations for each approach are identified on page 75.

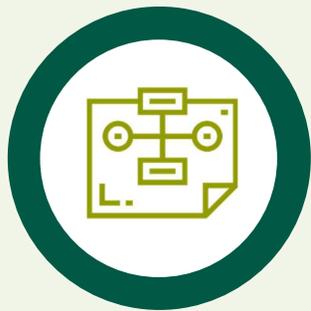
Option 1. Fixed Annual Budget.	Option 2. Risk Based approach.	Option 3. Community Preferences.
<p>DESCRIPTION:</p> <p>A set budget for implementing the adaptation plan would be identified in perpetuity and strategies would be selected accordingly based on available budget.</p> <p>BENEFITS:</p> <ul style="list-style-type: none"> + Predictability of budget allocation allows for the development of an annual work plan + Does not require an annual request for budget as it is already integrated into accepted budget considerations + Opportunities for additional funding or external funding based on clarity around work plan or demonstrated commitments by Council 	<p>DESCRIPTION:</p> <p>The risk-based approach would focus on implementing strategies on a risk by risk basis working through the recommended strategies within one risk “area” prior to moving onto the next.</p> <p>BENEFITS:</p> <ul style="list-style-type: none"> + Focused strategic efforts that can be easily monitored to assess impact + Easy to develop work plan that has common themes and objectives + Opportunities for additional funding based on clarity around work plan 	<p>DESCRIPTION:</p> <p>The community preferences option uses a more collaborative approach to selecting and implementing initiatives. Using the proposed strategies, County staff would work with the committee to identify their preferences on an annual basis.</p> <p>BENEFITS:</p> <ul style="list-style-type: none"> + Establishes a greater level of buy-in to the overall process + Encourages collaboration between Council, staff and committee + Could have reporting built into the process to determine the successes achieved as well as potential challenges and solutions + Provides greater budget flexibility

Table 4. Summary of recommended implementation approach alternatives



Implementation steps.

The proposed strategies can be organized into four categories. Due to the nature of what is being recommended and the impact of those strategies on day to day work, each type of strategy should and will have its own implementation expectations and assumptions. Once the implementation approach has been confirmed and staff and the committee move forward with the identification and implementation of specific strategies, the following implementation steps should be used to guide next steps.



Planning

The planning implementation steps would be triggered by the need for the development of a new planning policy document or the review of an existing planning policy due to changes in the way traditional land use or related planning is approached.

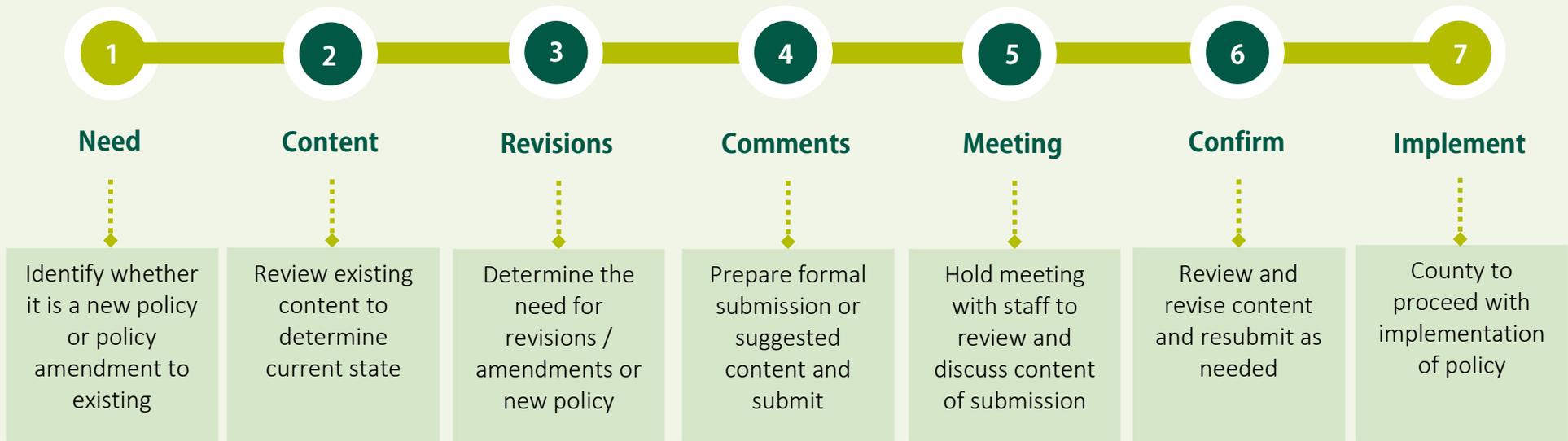


Figure 10 Overview of planning implementation steps



Process

The process implementation steps would be triggered by the need for a review or revision / update to an existing process which was previously adopted and utilized by Norfolk County staff or its partners. The steps that have been identified below are consistent with a typical change management process. This is typically organized into the five implementation enablers which should be supported by leadership, stakeholder engagement, change readiness and communication and training on how to implement the process or make the necessary change.

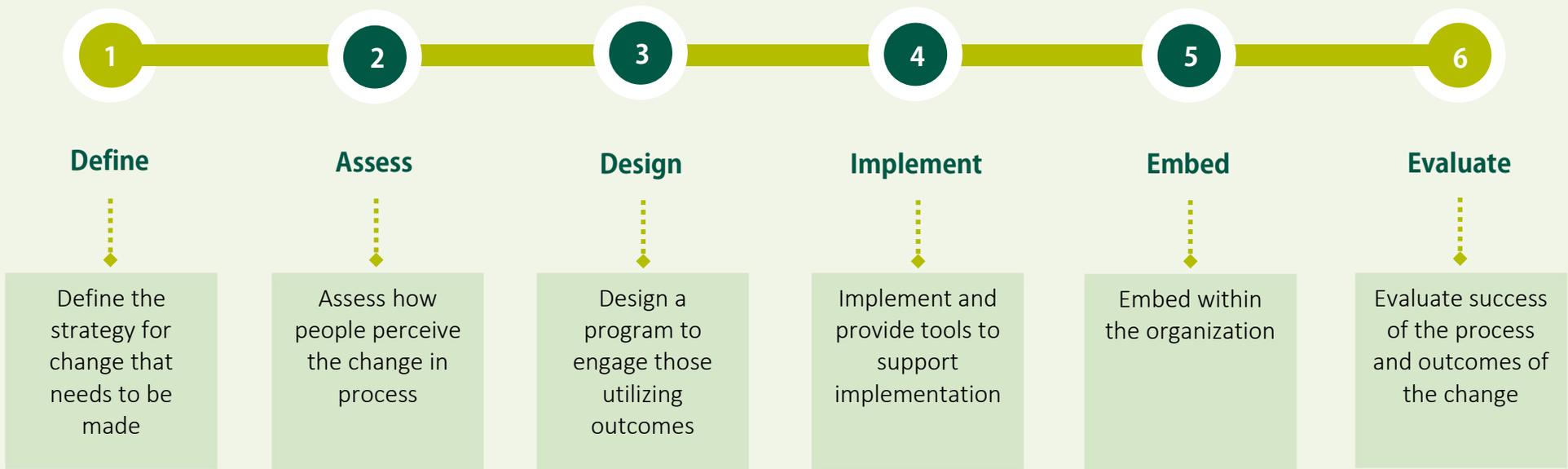


Figure 11 Overview of process implementation steps



Physical

The physical implementation steps would be triggered by the need for a new piece of infrastructure to be built which in turn triggers the design and construction process. The process that is presented below is consistent with provincially accepted guidelines and standards and integrates / considers required elements of the Municipal Class Environmental Assessment.

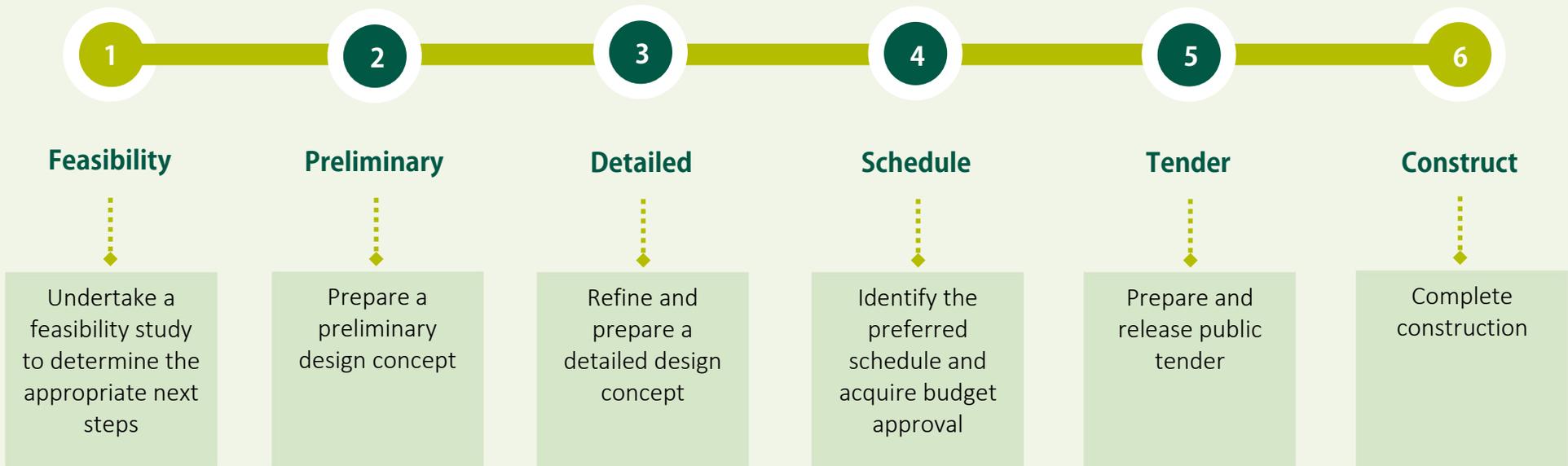


Figure 12 Overview of process implementation steps



Communication

The communication implementation steps would be triggered by the need for the design and implementation of an outreach campaign which would be associated with the adaptation plan or related topics. The process has been developed based on typical steps and stages identified to complete community based social marketing and audience specific outreach.

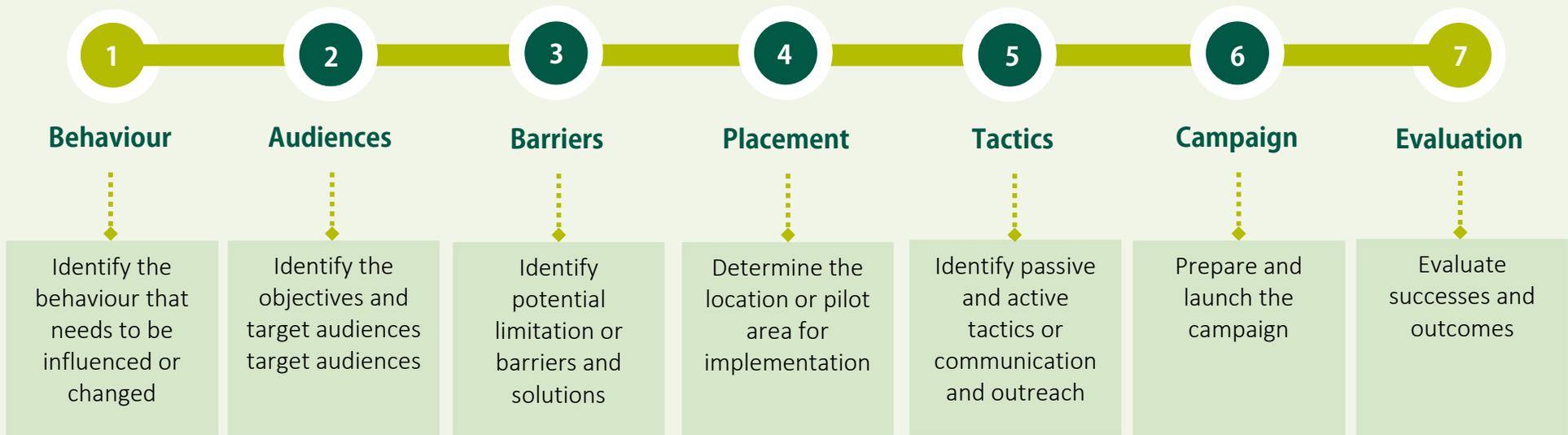


Figure 13 Overview of planning implementation steps



Roles and responsibilities.

Implementation of the recommendations and strategies contained in the Norfolk County Climate Change Adaptation Plan will require on-going coordination between County staff, the Climate Change Adaptation Committee and its partners. It is important to establish an understanding of the roles and responsibilities of each partner to facilitate the implementation of the Plan. Based on discussions with County staff it has been assumed that Norfolk County's Public Works Division will lead the implementation of the adaptation plan with guidance from the Climate Change Adaptation Committee. Following the adoption of the plan by Council it is recommended that:

- + Norfolk County identify an adaptation plan implementation coordinator – outside of the existing staff liaison role – who will be responsible for monitoring and evaluating the implementation of the plan; and
- + Norfolk County review and amend the committee terms of reference and work plan to better align with the outcomes and recommendations of the adaptation plan.

Together the liaison, coordinator and the committee will be the primary coordinators / contributors responsible for leading the implementation of the plan. Together they will:

- + Determine the preferred approach for implementation;
- + Engage with other partners, as needed, to facilitate the implementation of specific strategies;
- + Provide reports and recommendations to Council on an annual basis to support budget discussions;

- + Provide reports on work completed to date and status updates on the plan; and
- + Hold the role of community liaison for additional public outreach and communication.

These “other partners” are known as secondary contributors. Secondary contributors could include representatives from organizations such as local interest groups, clubs and agencies, surrounding municipalities (both upper and lower-tier), provincial agencies, business improvement areas and economic representatives, tourism organizations, etc. These individuals will be responsible for:

- + Communicate with community members and network for support with the distribution of information;
- + Provide input about context specific conditions and considerations;
- + Support the acquisition of funding or external support from a volunteer or financial perspective;
- + Host or provide support for events within specific communities or for unique target areas.

The roles identified in this section are not meant to be prescriptive. They are meant to encourage continued coordination and collaboration on the topic of climate adaptation to support the County in its implementation of this plan. Once the plan has been adopted, the committee should monitor their network of partners on an annual basis to determine the commitments or need for additional involvement.



Funding.

A strategic plan of this nature will require an ongoing commitment from County Council and its partners not only in time and effort, but also from a budgetary perspective. As noted in section 4.2, the strategies that have been identified require a range of budget commitments from relatively low to relatively high. Like any strategic planning document, the information contained within this plan is meant to be a high-level identification of potential budget impacts and not a prescriptive overview of assumed costs and a phased approach to budget impacts / implementation. Norfolk County is encouraged to continue exploring both internal and external opportunities for climate change adaptation funding to facilitate implementation and continue the work that has been undertaken for this assignment.

For internal funding, the amount needed to facilitate implementation will be determined by the implementation approach that is selected. Budget considerations have been identified for each of the implementation approaches noted on page 69. As noted previously, the approach is not meant to be prescriptive or be applied in perpetuity. Climate change adaptation has been found to have a rate of return on investment of four to seven dollars in disasters averted for each dollar spent, which may help increase the business case for funding.

Option 1. Fixed Annual Budget.	Option 2. Risk Based approach.	Option 3. Community Preferences.
<p>BUDGET:</p> <p>A fixed annual budget would be allocated to CCAP strategies as determined by Council and staff. \$50,000 - \$100,000 (or approximately 0.05 to 0.1% increase in municipal levy) could be appropriate to start working through some of the strategies with the number and type of initiatives to be determined on an annual basis depending on community input.</p>	<p>BUDGET:</p> <p>The budget identified would be determined based on the number and type of strategies that are identified. For the risks with a high number of lower cost strategies there may be opportunities to achieve quick wins to demonstrate commitment to the adaptation plan process.</p>	<p>BUDGET:</p> <p>For this option, the budget would be determined on an annual basis by members of the committee, Council and staff depending on what is considered feasible and supported by the community. The preferred strategies would be determined, and a budget would be identified for consideration and adoption.</p>

Table 5. Summary of potential budget considerations by implementation approach



The budget requirements will also be determined based on the implementation “type” of the strategy. For example:

- + **Planning** – minimal budget impacts beyond staff time would be required for this type of project. Through this project it has been assumed that any planning strategies be completed at the time the plan comes up for review / amendment / update or if Norfolk County proceeds with the development of a new plan with budget previously identified.
- + **Process** – minimal budget impacts beyond staff time would be required for this project type. Through this project it has been recommended that any process strategies be completed at the time that there is organizational review or if there is a management process that is undertaken related to the topic.
- + **Physical** – the highest budget impact is associated with physical strategies. Typically, infrastructure projects require the highest amount of monies to support implementation; however, economies of scale could be identified should the strategies be implemented at the time of larger scale infrastructure projects.
- + **Communication** – communication strategies have the widest potential range of budget requirements, varying by scale and breadth of audience. It may be appropriate to roll out some of these strategies as part of County-wide strategic planning initiatives or piloted it at a smaller scale in the initial stages.

With regarding to external funding sources, there are both provincial and federal funding streams that could be explored to support implementation. The funding programs highlighted were available at the time the adaptation plan was prepared, however, they are subject to change, therefore potential funding programs should be monitored regularly. It is important for Norfolk County to seek a diverse range of funding sources for the various initiatives and programs highlighted in this strategy. External funding is an effective way to reduce the County’s costs and can be an opportunity to find and develop new partners for the implementation of this plan.

Smart Cities Challenge	Environmental Funding from Federal	Gas Tax Funding	Clean Technology Programs	Home Flood Protection
For more information: http://www.infrastructure.gc.ca/cities-villes/index-eng.html	For more information: https://www.canada.ca/en/services/environment/conservation/funding.html	For more information: http://www.infrastructure.gc.ca/plan/gtf-fte-eng.html	For more information: http://www.ic.gc.ca/eic/site/099.nsf/eng/home	For more information: https://www.intactcentrecclimateadaptation.ca/wp-content/uploads/2019/04/Home-Flood-Protection-Program-Report-1.pdf



Monitoring and evaluation.

A monitoring plan is an important component any strategic planning process. As noted in many of the implementation steps noted above, evaluation is critical to the assessment of lessons learned through implementation and to evaluate how successful the strategies or initiatives have been in achieving the overall climate adaptation vision for Norfolk County. Establishing measures to assess progress can help prioritize future strategies, rationalize investments and appropriately allocate resources. Research indicates that meaningful performance measures can help to:

- + Demonstrate the value to citizens and elected officials;
- + Track the success of a plan or strategy;
- + Facilitate smarter investments through data-driven measures of success;
- + Comply with funding requirements at varying levels of government;
- + Produce a healthier and more sustainable environment;
- + Provide information to engage a broad set of stakeholders; and
- + Capture the value of new and innovative datasets and data collection methods.

The type of performance measures applied by municipalities can vary depending on desired outcomes and data available. As performance measures become more widely used by municipalities, the need to incorporate them into municipal planning processes becomes more important, especially to help support the annual budgeting process to leverage increased capital investments.

For climate related strategic planning documents, it can be a challenge to identify monitoring indicators. It takes a number of years to fully appreciate and track the changes that are made to climate levels and even more of a challenge to demonstrate how those are related to the various adaptation measures and strategies that are implemented. As such, the intent of the monitoring and evaluation strategy is to provide suggested indicators which could be used to assess the success of the adaptation plan from an implementation, behaviour and culture shift perspective.

These could include but are not limited to:

- + Number of strategies implemented from the adaptation plan;
- + Changes to the committee terms of reference;
- + Identification of climate adaptation specific budget as identified by Council;
- + Presence of climate related information on Norfolk County's webpage;



- + Presence of a dedicated climate adaptation page on the County's webpage;
- + Presence and amount of climate related conversation provided on existing social media platforms;
- + Outreach from additional stakeholders to support the implementation of the plan;
- + Integration of the plan into day to day work of Norfolk County staff;
- + Use of the adaptation plan document by Council and senior management;

The first step towards developing a monitoring plan is to review the indicators and confirm the preferred indicators and methods of information gathering with the committee members.

After this has been confirmed the committee would work together to identify key stakeholders that are able to collect and compile the performance measures. Norfolk County staff are encouraged to track the measures on a yearly basis and create a report that summarizes the indicators as it relates to the pillars of the adaptation plan.

This annual report could be used to demonstrate influence and value of a climate change adaptation plan and other associated improvements and to publicly demonstrate return on investment. Through the life cycle of the plan, the performance measures should be re-evaluated on a regular basis, and the data used to guide future improvements.



4.5 Conclusion.

The Norfolk County Climate Change Adaptation Plan has been developed with the goal of creating a climate friendly, resilient and community focused strategy which addresses the long-term needs of Norfolk County residents, visitors, businesses and agencies. The Plan will provide staff and decisions makers with the tools needed to integrate adaptation into day to day work and provide stakeholders and interest groups with a document to guide community engagement, outreach and communication.

The Plan will be a long-term planning document which will need to be prioritized, implemented, managed, maintained, and evaluated as behaviours and community patterns shift. Norfolk County should continue the work that it is already in progress to identify context specific solutions which are based on best practices and lessons learned from similar municipalities. The committee is encouraged to continue its leadership within the community and enhance internal collaboration to bring the opinions, interest and values of people who live, work and play within the community to ensure that the solutions and strategies are made-in and built-for Norfolk County.