Peel2041
Regional Official Plan Review

Climate Change

Peel 2041 Discussion Paper

November 2018



Region of Peel
working with you

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Executive Summary

The Intergovernmental Panel on Climate Change has concluded with certainty that rising greenhouse gas (GHG) emissions measured in the atmosphere as well as temperature increases around the world are the result of human influence and that the consequences are significant and detrimental on human and natural systems.

In Canada, observed changes to the climate include increases in temperatures across many parts of the country, changes in precipitation patterns, reduced sea-ice cover, and increased extreme weather events. These projected changes will impact existing ecosystems, infrastructure, the built environment, human health, agriculture, and the local economy. By 2080, Peel Region is predicted to face climate related risks including:

- a rise in average annual temperatures by as much as 5°C from current levels;
- extreme heat days over 30°C increase in frequency from 12 to 62 days, a fivefold increase over current levels; and
- extreme rainfall events will increase by as much as 22%.

The serious impacts and consequences of climate change has prompted the Federal and Provincial governments to develop plans to reduce GHG emissions and adapt to predicted climate change impacts, which has included identifying the role of land-use planning and its influence on how communities can mitigate and adapt to climate change. Recent updates to the *Provincial Policy Statement, 2014* and *Growth Plan for the Greater Golden Horseshoe* (2017) have recognized key action areas including:

- Managing Growth / Supporting Complete Communities
  Promoting intensified and compact forms of development with a mix of land uses (residential, commercial and employment) that efficiently use land, services, infrastructure, and densities which are pedestrian-friendly and transit-supportive to reduce GHG emissions and protect human health.

- Transportation / Transit
  Promoting an efficient and connected transportation system that encourages the use of public transit and active transportation options including walking and cycling.

- Infrastructure
  Reviewing the risk and vulnerability of local infrastructure and the incorporation of low impact development to protect against extreme weather through water / wastewater master plans and stormwater master plans.

- Supporting Agriculture
  Encouraging agricultural uses and developing best practices to support the wide range of needs to protect agricultural lands and ensure local food security.

- Protecting Natural Heritage and Water
  Promoting the protection of water resources and the natural heritage system to improve local air quality and mitigate GHG emissions.

- Conservation of Water, Energy and Reduction of Waste
  Encouraging the reduction of water and energy use through alternative energy sources and conservation efforts, as well as the reduction, reuse, and recycling of products before they reach the landfill.

Efforts to reduce community GHG emissions 80% below 1990 levels by 2050 will be challenging as Peel's population is forecasted to increase to 1,970,000 people by 2041. As Peel continues to grow in population and size, the risks and vulnerabilities to a changing climate identified for the Region will be intensified. Land use planning in key areas including, but not limited to, growth management, transportation, energy, natural heritage, water resources, and agriculture will be essential processes to mitigate and adapt to climate change in the Region.

A review of the Regional Official Plan (ROP) indicates that there are many existing policies in place which deal with different aspects of climate change, including intensification and density, sustainable transportation, natural systems and water resources, agricultural, and energy conservation. However, there is no clear linkage across all of these theme areas on how they are key pieces to addressing the impacts of climate change.

The ROP will need to be updated to reflect Provincial policy direction, as well as Regional interests to reduce GHG emissions, increase community resilience, and adapt to the impacts of climate change. The following summary of climate change policy options based on key theme areas are recommended to be included through a future Regional Official Plan amendment to add and/or strengthen existing policies to further enhance the Region's ability to address the predicted changes to the climate system. It should be noted that the proposed policy directions for the theme areas of Growth Management, Transportation, Water Resources, Natural Heritage, and Agriculture are being comprehensively addressed in additional detail as separate components of the Peel 2041 process.

Region of Peel Official Plan - Proposed Climate Change Policy Direction / Options	
Growth Management	➢ Allocate population and employment growth to 2041 to develop compact and mix-use communities. ➢ Update growth allocations to reflect increased intensification and density targets to build more compact communities, promote transit, and utilize existing infrastructure. ➢ Protect employment lands strategically located near future transportation infrastructure to encourage low-carbon goods movement. ➢ Conceptually identify major transit station areas to achieve minimum gross density targets to support sustainable transportation options.
Transportation	➢ Shift automobile dependency to more sustainable modes of transportation including carpooling, public transit, cycling, and walking. ➢ Improve public health through the promotion of active transportation and improved air quality. ➢ Move goods more efficiently to decrease GHG and air emissions. ➢ Plan for infrastructure to support a sustainable transportation network.
Energy	➢ Work collaboratively to support community and regional energy planning. ➢ Promote energy efficiency and conservation in communities. ➢ Explore feasibility and implementation of district energy systems. ➢ Support opportunities for renewable or alternative energy systems. ➢ Encourage the inclusion of sustainable development guidelines and standards. ➢ Promote hybrid and/or electrical vehicles and infrastructure.
Infrastructure	➢ Design and adapt Regional services and infrastructure to reduce greenhouse gases emissions and climate change vulnerability. ➢ Require risk and vulnerability assessments to enhance infrastructure resilience. ➢ Support comprehensive stormwater management planning, including low impact development and green infrastructure. ➢ Provide direction to undertake watershed planning for water, wastewater, and stormwater masterplans. ➢ Explore opportunities to design water and wastewater services to reduce greenhouse gas emissions. ➢ Consider the location and design of Regional human services facilities to minimize vulnerabilities during operations and emergencies.
Waste	➢ Support full range of opportunities for the reduction, reuse, recycling, composting, diversion, and final disposal of waste. ➢ Encourage the identification and implementation of energy from waste technologies. ➢ Support the adaptive reuse of existing building stock and encourage the

Region of Peel Official Plan - Proposed Climate Change Policy Direction / Options	
	reuse /recycling of building materials in development process, ➢ Support regional scale waste management initiatives, working collaboratively with partners.
Urban Heat Island	➢ Encourage the local municipalities to develop Urban Heat Island mitigation policies (e.g. green / white roofs, urban tree canopy cover). ➢ Work collaboratively with partners to implement UHI mitigation in Regional infrastructure and facilities planning and design. ➢ Encourage and support programs to increase vegetation and tree canopy cover (e.g. *Peel Urban Forest Strategy*).
Water Resources	➢ Protect water resources through watershed and sub-watershed planning. ➢ Inform water, wastewater and stormwater system planning through watershed planning. ➢ Consider the risk and vulnerability of infrastructure and design to withstand future weather projections. ➢ Develop stormwater master plans that incorporate low impact development and green infrastructure approaches.
Natural Hazards	➢ Require watershed and sub-watershed studies to specifically address climate change and impacts regarding surface water, groundwater and flooding. ➢ Require preparation of stormwater master plans that address riverine and overland flooding issues; ➢ Require the implementation of low impact development and green infrastructure stormwater management practices. ➢ Require flood hazard mapping in accordance with provincial requirements and guidelines. ➢ Work jointly with local municipalities and conservation authorities to identify areas vulnerable to overland flooding and develop solutions to improve flood resilience of existing and new developments. ➢ Encourage the use of sustainable development guidelines tools by the local municipalities to promote sustainable development. ➢ Encourage the use of tools for climate change (e.g. sustainable roofs and/or alternative building standards).
Natural Heritage	➢ Require watershed and sub-watershed studies / plans to address climate change and extreme weather on terrestrial and aquatic ecosystems. ➢ Provide for the identification, protection and rehabilitation of a regional natural heritage system. ➢ Maintain, restore, and improve the diversity and connectivity of natural features and for their long-term ecological function.

Region of Peel Official Plan - Proposed Climate Change Policy Direction / Options	
	➢ Support the enhancement of the natural heritage system to public health and community design. ➢ Enhance urban tree canopy cover on public and private lands in urban areas through urban forest strategies to address urban heat island impacts and reduce stormwater runoff.
Agriculture	➢ Identify and protect prime agricultural lands and rural lands for long term use for agriculture. ➢ Support permissions for agriculture, agriculture-related and on-farm diversified uses and innovative practices in agriculture. ➢ Encourage collaboration and food systems planning. ➢ Support programs that support farm operations in adapting to and mitigating the effects of climate change.
Implementation	➢ Add guiding section to the Regional Official Plan on the use of sustainable development guidelines. ➢ Encourage and support local municipalities to develop policies to implement sustainability requirements, guidelines and tools through the local land use planning process. ➢ Provide direction that the Region work collaboratively with the local municipalities and conservation authorities to develop and promote Regional programs and guidance to support the implementation of sustainable development measures that support adaptation to climate and weather extremes.
Glossary	➢ Climate Change, Mitigation, Adaptation, Vulnerability, Resilience, Greenhouse Gas, Low-Carbon Community, Sustainable Development Framework

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1. Introduction

1.1 Climate Change and the Environment Themed Regional Official Plan Amendment (ROPA)

The Region of Peel's Regional Official Plan (ROP) is the long-term policy framework for land use planning decision-making. It sets the Regional context for detailed planning by protecting the environment, managing resources, directing growth and setting the basis for providing Regional services in an efficient and effective manner. The *Planning Act* requires municipalities to update their Official Plan every five years to ensure that the policies remain current and are consistent with Provincial plans and policy statements in order to achieve the stated goals and objectives. The review of the current ROP, referred to as *Peel 2041: Regional Official Plan Review*, is being undertaken with the intent to plan for growth to the year 2041.

Peel 2041 includes a focused review of thirteen focus areas to ensure conformity with a number of recent updates to Provincial Plans and policies. This climate change policy review and corresponding Discussion Paper represents a part of a larger environmental themed review which interconnects related focus areas including Water Resources, Greenlands System, Agriculture, Greenbelt Conformity, and Wildland Fire policy areas.



The ROP is being reviewed for conformity with recent policy amendments to the *Provincial Policy Statement, 2014,* the *Growth Plan for the Greater Golden Horseshoe* (2017), the *Greenbelt Plan* (2017), the *Oak Ridges Moraine Conservation Plan* (2017) and the *Niagara Escarpment Plan* (2017) which provides Provincial direction on the role of land use planning in mitigating and adapting to climate change. It is anticipated that forthcoming Provincial guidance, including guidelines on completing municipal GHG emission inventories, will provide greater direction for integrating energy and emissions planning at the municipal level to address climate change.

1.2 Discussion Paper Purpose

The purpose of this Discussion Paper is to provide background information and identify potential climate change policy options for the ROP as part of the *Peel 2041: Regional Official Plan Review* process. Section 16(1) (a) of the *Planning Act*, *1990*, requires municipal Official Plans to include "goals, objectives and policies established primarily to manage and direct physical change and the effects on the social,

economic, built and natural environment". Initiatives at the international, national, and provincial levels are providing guidance and direction to mitigate and adapt to the impacts of climate change. Through the *Peel 2041 Regional Official Plan Review*, the Region of Peel will be updating its Official Plan to strengthen existing as well as include new policies to address climate change through regional planning and provide direction to support the implementation of relevant land use policies.

This background paper will provide the following:

- A background on greenhouse gas emissions and observed changes in climate;
- A review of risks and vulnerabilities due to climate change;
- An overview of land use planning and how it relates to climate change;
- A summary of existing climate change frameworks and policies at the international, national, Provincial, Regional, and local levels;
- A review of the existing Regional of Peel Official Plan policies related to climate change; and
- Consideration for a policy framework, implementation options and recommendations for updating / strengthening climate change policies in the Official Plan.

This Discussion Paper is meant to inform and engage the Region of Peel's stakeholders, local municipalities and the public. It will identify policy gaps and opportunities as well as identify what must be updated to ensure conformity with provincial plans, policies and guidelines.

2. Background

Climate change is a complicated and interconnected issue which affects the human population and ecosystems at the global, national and local levels. It is a far reaching issue that impacts, or is impacted by, many aspects of society including economic development, population growth, sustainable development, the natural environment, and resource management.

2.1 Climate Change and Its Impacts

The United Nations defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (p. 3).[1]

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by the United Nations Environment Programme as a scientific body to review and assess the most recent scientific, technical and socio-economic information worldwide relevant to the understanding of climate change. The IPCC *Climate Change Synthesis Report* published in 2014 concluded with 95% certainty that "Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems" (p. 2).[2]

Climate change impacts everyone but will differ greatly across vast geographies. The impacts of climate change are becoming evident across the world and at the local level, affecting how people will live and grow in all environments. The evidence of change is certain and although its impacts at the national, regional, and local levels will differ, the transformative alterations expected from climate change require urgent action to respond to these anticipated changes. Countries, regions and municipalities therefore must find and implement solutions to address the impacts of climate change unique to their location.

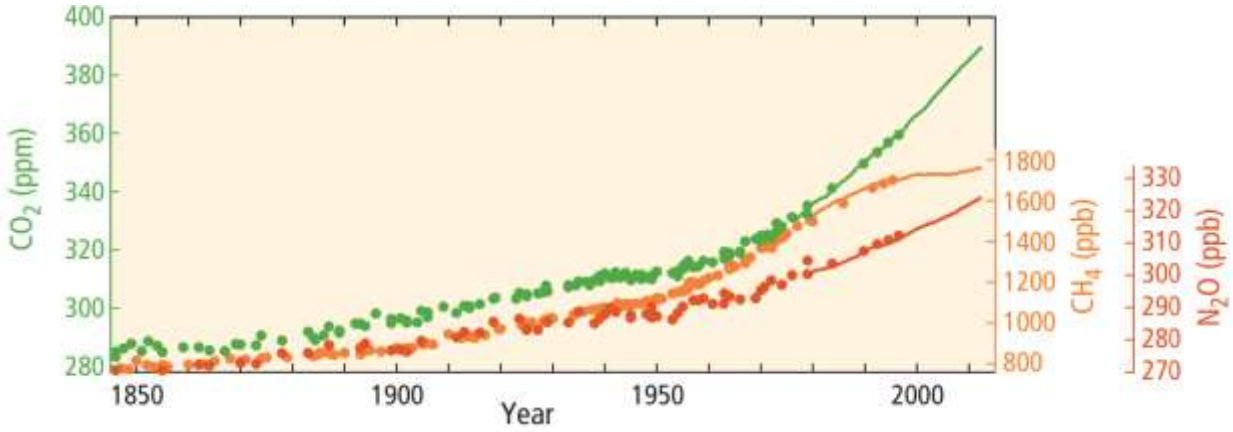
2.2 Greenhouse Gas Emissions and Observed Changes in the Climate System

2.2.1 Global

The 2014 IPCC *Climate Change Synthesis Report* indicated that human generated greenhouse gas (GHG) emissions have increased since the pre-industrial era, primarily driven by worldwide economic and population growth. This growth has led to concentrations of GHGs including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) in the atmosphere that are unprecedented in at least the last 800,000 years.[2] Global emissions of CO_2 have increased by almost 50% since 1990, and emissions grew more rapidly between the years 2000 and 2010 than in each of the three previous decades.[2] The significant amount and rapid increase in atmospheric GHGs, together with other human drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed temperature warming since the mid-20th century. As shown in Figure 2.1, the average concentrations of GHGs in the atmosphere have risen since 1850, with a sharp rise in the 20th century.

[1] United Nations. (1992). *United Nations Framework Convention on Climate Change*
[2] Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014 Synthesis Report*

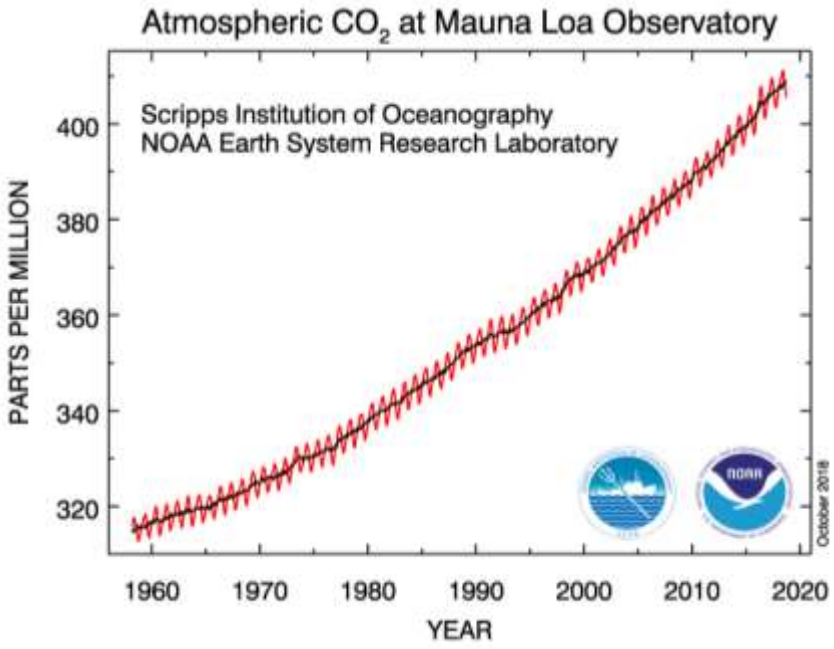
Figure 2.1: Global Average Greenhouse Gas Concentrations (1850-2012)



Source: Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014 Synthesis Report*

Since 2014, monitoring of global CO_2 levels in the atmosphere has shown that they have continued to rise and have now reached over 400 parts per million (ppm) for the first time in recorded history.[3] As shown in Figure 2.2, 2016 was the first year the Mauna Loa Observatory in Hawaii recorded such levels of CO_2, which have continued to rise beyond 400 ppm to present day.

Figure 2.2: Atmospheric CO_2 Gas Concentrations (1958-2018)



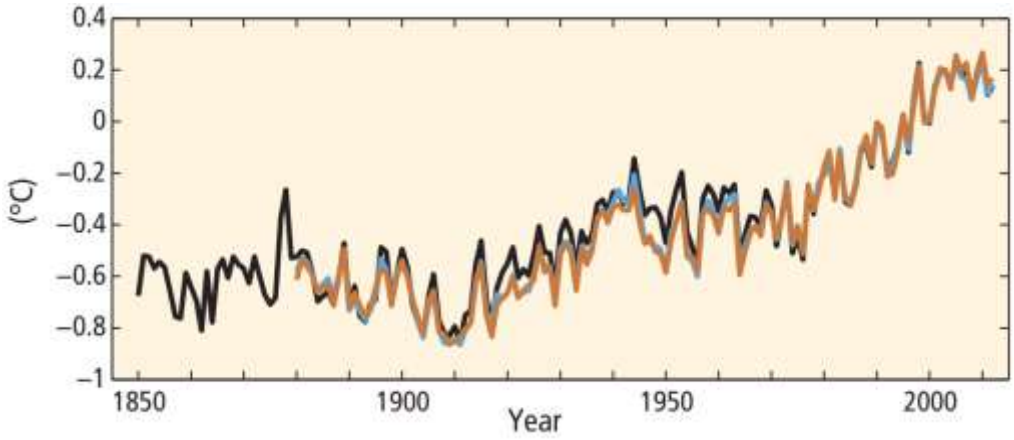
Source: National Oceanic and Atmospheric Administration. (2018). *Full Mauna Loa CO_2 Record*

2016 was also the warmest year ever recorded with the global average temperature reaching over 1°C above pre-industrial levels. There is strong agreement among scientists that warming above 2°C relative

[3] World Meteorological Organization. (2016). *WMO Greenhouse Gas Bulletin (No. 12 |24)*

to the pre-industrial period could lead to potentially catastrophic consequences and they suggest that the world is on course to reach 4°C warming by the end of the century under current emissions scenarios.[2] From 1880 to 2012, the average global temperature increased by 0.85°C.[2] As such, limiting the rate of climate change will require substantial and sustained reductions in GHG emissions, which, together with adaptation, can reduce climate related risks within local communities. As shown in Figure 2.3, the global average annual temperature for both land and oceans shows an average warming over the period of 1850 to 2012.

Figure 2.3: Global Average Combined Land and Ocean Surface Temperature Change (1986 to 2005)



*colours indicate different data sets

Source: Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014 Synthesis Report*

A special report entitled *Global Warming of 1.5°C* was released by the IPCC in October 2018 on the predicted impacts of global temperature rise of 1.5°C above pre-industrial levels; it is anticipated that global warming is likely to reach 1.5°C as early as 2030 if it continues to increase at the current rate.

Data analyzed by the IPCC suggests that significant climate impacts are already occurring in certain parts of the world today in the form of warming temperatures and acidification of the world's oceans, increased sea level rise and erosion, glacier and arctic sea ice retreat, intensified wildfires, heavy precipitation, drought and increased extreme weather events. Climate-related risks to health, food security, water supplies, human security, and economic growth are projected to increase with global warming of 1.5°C and increase further towards 2°C.[4]

The global costs associated with the impacts of climate change will be substantial. A 2014 Organization for Economic Co-operation and Development (OECD) study estimates losses from the result of climate change inaction will be in the range of 0.7% to 2.5% of global gross domestic product (GDP) for a temperature rise of 2.5°C (expected by 2060).[5] This will result in estimated cumulative losses of GDP

[4] Intergovernmental Panel on Climate Change. (2018). *Global Warming of 1.5°C*
[5] The Investor Group on Climate Change. (2017). *From Risk to Return: Investing in Climate Change Adaptation*

from climate impacts from 2015 to 2060 of US$2 trillion to US$72 trillion.[5] If emissions continue to rise after 2060, these losses could reach up to 5% of GDP.[5]

2.2.2 National

Most of the observed temperature increases since the middle of the 20th century have been caused by increasing concentrations of GHG emissions resulting from human activity such as the burning of fossil fuels, population growth and deforestation. The changing climate observed around the world has also been seen in Canada, which has resulted in observed increases in temperatures across many parts of the country, changes in precipitation patterns, reduced sea-ice cover, shifting hydrological conditions and changes in extreme weather events.[6] Table 2.1 provides a brief summary of the changes already observed as well as those expected in Canada due to climate change.

Table 2.1: Climate Change Observations and Impacts in Canada

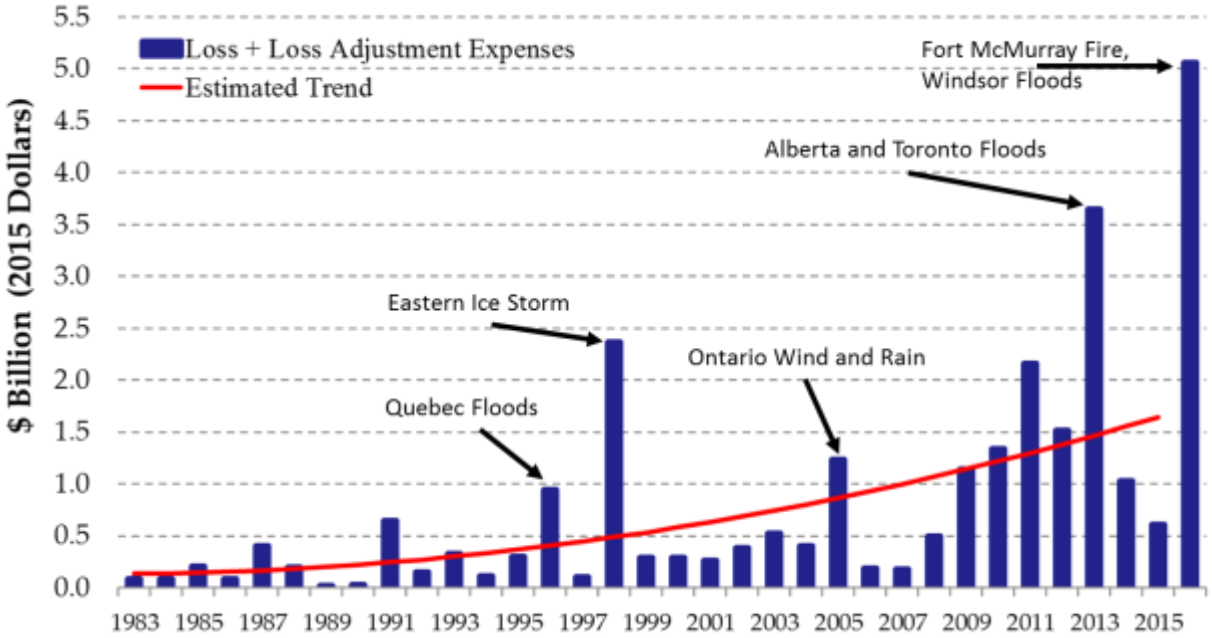
Weather / Event	Climate Change Impact
Temperature	• Canada has warmed 1.3°C since 1948, approximately twice the global average • All regions of Canada have experienced warming, with the greatest temperature increases observed in the Yukon and Northwest Territories • Canada is expected to warm 2°C by 2050 and 4°C by 2080
Precipitation	• Average precipitation across Canada has increased by approximately 12% in the last 50 years • Largest increase in the high Arctic (25-40%), southern Canada and the Prairies has experienced decreases (-5%) • Decline in summer and winter precipitation in southern Ontario; increases in spring and autumn precipitation in British Columbia and southeastern Canada
Sea Level Change	• The rate of sea level rise has doubled along the Atlantic coastline • Areas which are currently seeing the most change (e.g. Beauford Sea coast, Atlantic coastlines and Fraser River Delta) will experience most impacts • Sea level fall of 10 mm/year around Hudson Bay, as well as uplift of land areas due to post-glacial rebound
Extreme Weather Events	• Change in the frequency of extreme temperature and precipitation events from 1950 to 2003 • Most severe and costly impacts in frequency and magnitude projected to be associated with natural disasters including flooding due to high-intensity rainfall and storm surges, ice and wind storms, heat waves and drought

Sources: ICLEI. (2010). *Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation*
Government of Canada. (2014). *Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation*

[6] ICLEI, Changing Climate. (2010). *Changing Communities: Guide and Workbook for Municipal Climate Adaptation*

The increases in the occurrence of heat waves, forest fires, storm-surge flooding, coastal erosion and other climate related hazards will have significant consequences to all areas and of the country. In 2011, the National Round Table on the Environment and the Economy estimated the annual costs to the Canadian economy may reach $21-$43 billion per year in losses by 2050.[7] Figure 2.4 shows how in the last 30 years, there has been an increasing trend of catastrophic insured losses that correspond to significant weather related events across Canada.

Figure 2.4: Catastrophic Insured Losses in Canada (1983-2015)



Source: Presentation by Dianne Saxe, Environmental Commissioner of Ontario, to the Region of Peel. (September 2017). *Making Space for Climate Change* (source data from the Insurance Bureau of Canada, 2015)

The observed changes in climate are increasingly affecting Canada's natural environment, economic sectors, and the health of Canadians, with extreme weather events being a key concern for Canada as there is growing confidence that some types of extreme events will increase in frequency and/or intensity as the climate continues to warm.[8]

2.2.3 Local

Across Ontario, climate change impacts are already being felt. Coldwater fish are losing habitat. Invasive plant species such as Giant Hogweed are flourishing. Disease-carrying pests such as ticks responsible for Lyme disease are spreading. Wildfire risk is increasing. The season for ice fishing and snow sports is

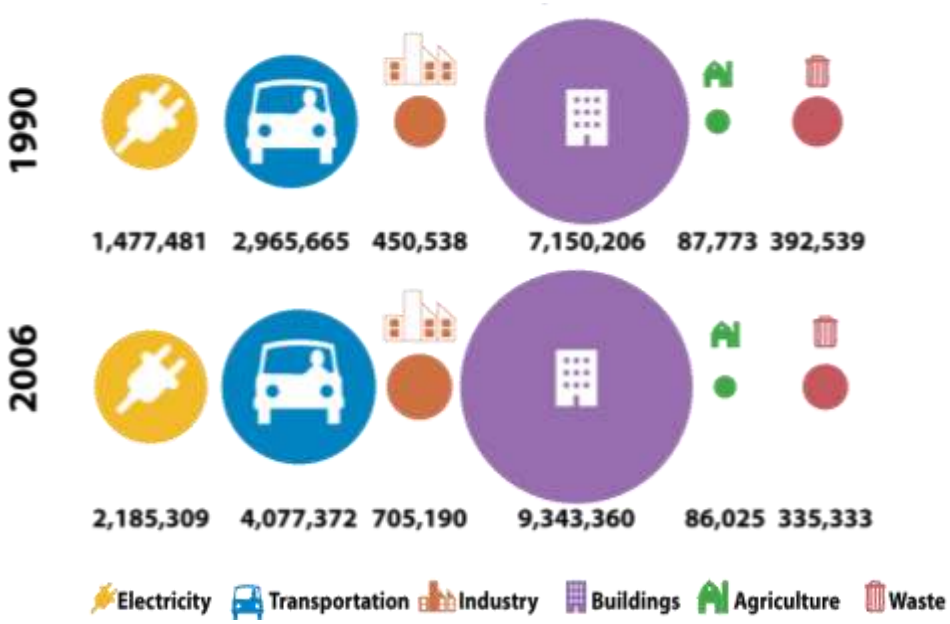
[7] National Round Table on the Environment and the Economy. (2011). *Paying the Price: The Economic Impacts of Climate Change for Canada*

[8] Government of Canada. (2014). *Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation*

shrinking. Heat waves are posing health risks for vulnerable populations. Cities including Toronto, Mississauga, Vaughan, Burlington, Windsor, and Thunder Bay have suffered extreme storms and floods. Severe heat and drought have affected water supplies and damaged crops. Ontario has seen billions of dollars in insured losses due to spring frost, dry summers, tornados and severe winds, ice storms, flooding and thunderstorms, all of which have been increasing in frequency and intensity.

In 2014, the Region of Peel completed the *2006 Community Greenhouse Gas and Criteria Air Contaminant Inventory* which measured the Region's contribution of GHG emissions contained within the geographic boundaries of Peel. This included data gathered from a variety of sources in accordance with well-established inventory protocols to determine the amount of GHGs (as well as criteria air contaminants) emitted from five broad sectors. The inventory was conducted in order to establish a baseline in relation to emission baselines identified in international, national and provincial agreements and commitments. The inventory collected information for 2006 and estimated emissions for 1990 levels. As shown in Figure 2.5, these sectors included stationary sources (e.g. buildings), transportation, industrial, agricultural, and waste and wastewater facilities.

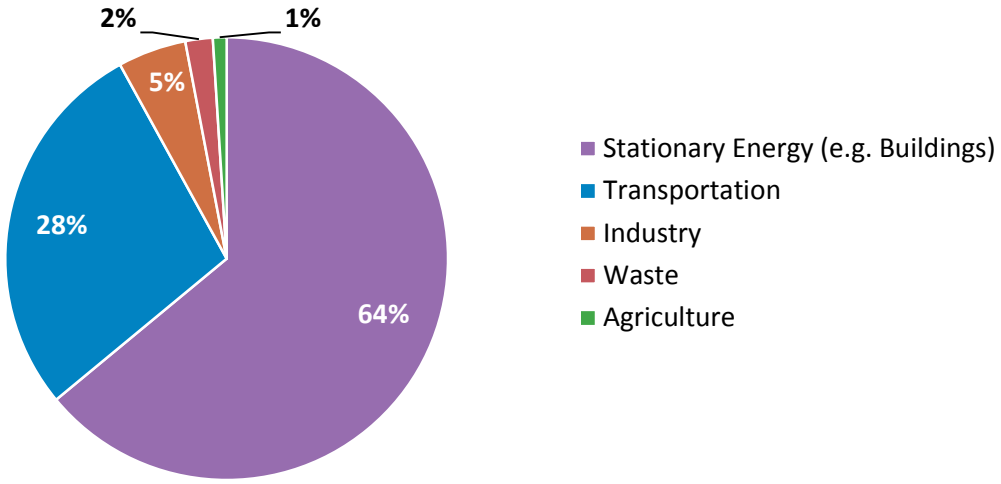
Figure 2.5: Region of Peel Greenhouse Gas Emissions by Sector (tonnes CO_2e)



Source: Region of Peel. (2014). *2006 Community Greenhouse Gas and Criteria Air Contaminant Inventory*

As per Figure 2.6, the inventory found that the main sources of emissions were from building energy use (64%) and transportation sources (28%). The total amount of GHG emissions in 2006 was approximately 15 Mt, which is 73% above 1990 levels (4 Mt), which can be attributed to population and employment growth in the Region.

Figure 2.6: 2006 Region of Peel Greenhouse Gas Emissions by Sector



Source: Region of Peel. (2014). *2006 Community Greenhouse Gas and Criteria Air Contaminant Inventory*

There is strengthening evidence to suggest that Peel will be exposed to gradual warming extending the spring and fall, and increases in extreme heat events and extreme rainfall. Communities in the Region of Peel range from highly urbanized areas near the Lake Ontario shoreline to smaller rural communities in the north, and as such have a diverse set of characteristics including urban/rural features, population size, resources, infrastructure, and land uses. Table 2.2 provides a list of local climate impacts and vulnerabilities expected by years 2050 and 2080 in the Region of Peel.

Table 2.2: Local Climate Change Impacts and Vulnerabilities

By the 2050's	By the 2080's
• Annual mean temperatures in Peel Region will rise as much as 2°C from current levels.	• Annual mean temperatures in Peel Region will rise as much as 5°C from current levels.
• The frequency of extreme heat days over 30°C will double from current levels (12 to 26 days).	• The frequency of extreme heat days over 30°C will increase by as much as 5 times from current levels (12 to 62 days).
• Extreme rainfall events will increase by as much as 8%.	• Extreme rainfall events will increase by as much as 22%.
• The length of the average growing season per year will go up by as much as 15% (169 to 203 days).	• The length of the average growing season per year will go up by more than 20% (169 to 223 days).

Source: Ontario Climate Consortium. (2016). *Climate Trends and Future Projections in the Region of Peel*

This diversity can create challenges but also provides greater opportunities to develop unique solutions to address the impacts of climate change. Based on the evidence from the local *Climate Trends and Futures Report* that draws directly on data from the IPCC, the Region of Peel can expect to face climate related risks including higher temperatures, altered precipitation levels, extreme weather events (e.g.

flooding, wind, storms), and increased water levels along shorelines, which can all impact existing ecosystems, infrastructure, the built environment, human health, and the local economy.[9]

When and where such impacts happen and how severe the consequences will be from these changes remains largely unknown. However, what is known is that with increased global temperatures, the severity and likelihood of these occurring more frequently will increase over time.

2.3 Mitigating and Adapting to Climate Change

Mitigation and adaptation are the core strategies for reducing and managing risks related to climate change. According to the IPCC, "substantial emissions reductions over the next few decades can reduce climate risks in the 21st century and beyond, increase prospects for effective adaptation, reduce the costs and challenges of mitigation in the longer term, and contribute to climate-resistant pathways for sustainable development" (p. 17).[2]

Mitigation is the collective efforts to reduce the sources and emissions of GHGs into the atmosphere to limit the magnitude of climate change. This can include reducing energy use, reducing the use of fossil fuels, and expanding transit use. However, as the global climate system involves many inputs and outputs, the immediate reductions of GHGs will not stop rising temperatures and sea level rise in the near term, but can be stabilized over time through collective action.

Adaptation involves taking pre-emptive action to reduce potential negative risks and/or severity of impacts in areas that may be more vulnerable to impacts and taking advantage of opportunities associated with expected climate change. "Resilience" is a term that is also used interchangeably with adaptation and indicates preparation and readiness to respond to adverse impacts and future challenges. Examples include incorporating low impact development and design into infrastructure projects to reduce flood risk, conserving water, incorporating green roofs or white roofs to reduce urban heat island effects or retain water, enhancing areas from erosion, and improving building standards.

Pathways to limiting global warming to 1.5°C require extensive transitions in a number of areas including energy, land, urban and infrastructure, including transport and buildings, as well as industry.[4] This transition is not only extraordinary in terms of speed and scale, but also "imply deep emission reductions in all sectors, a wide portfolio of mitigation options and a significant upscaling of investments in those options" (pg. SPM-21).[4] As such, mitigating and adapting to climate change are two paths that can assist in reducing the overall impacts, but should not be performed in isolation. Consideration of these two actions in an integrated manner will enhance opportunities to increase the Region's resilience to the changing climate.

[9] Ontario Climate Consortium. (2016). *Climate Trends and Future Projections in the Region of Peel*

3. Climate Change Risks and Vulnerabilities

The changing climate presents significant risks to the Region, and its ability to make decisions to manage the vulnerabilities posed to the people, jobs, and ecosystems will become significantly more important. Identifying and recognizing possible risks associated with climate change will better prepare the Region in its efforts to lessen the impact and adapt to future risks.

3.1 Municipal Risks and Vulnerabilities

Peel Region's community contribution of GHG emissions is understood by gathering data from a variety of sources in accordance with well-established inventory protocols to determine the amount of CO_2 emitted within sectors. Community vulnerability to climate change impacts is determined by assessing community sectors that may be exposed to climate and weather related variables derived from global climate projections. Climate change vulnerability assessment methods and protocols vary according to the sector being assessed. For example, local health vulnerability to climate change was assessed in 2008 using World Health Organization guidelines for assessing public health vulnerability to climate change.

In order to understand and provide a baseline for the municipal risks related to climate change, Vulnerability Assessments were conducted across a number of sectors in the Region of Peel as part of the Peel Climate Change Partnership, including:

1) *Report on Health Vulnerability to Climate Change: Assessing Exposure, Sensitivity, and Adaptive Capacity in the Region of Peel* (2012);
2) *Water Infrastructure Systems Vulnerability to Climate Change in the Region of Peel* (2017);
3) *Community Services and Assets in Peel Region: Port Credit Case Study* (2016);
4) *Natural Systems in Peel* (2017); and
5) *Agricultural Systems in Peel Region* (2016).

The conclusions of the Vulnerability Assessments were that changes to the local climate system were likely to result in:

- detrimental impacts to public health;
- significant loss to key ecosystem services provided by natural systems;
- increased risk from urban flooding;
- nearshore infrastructure and assets potentially impacted from increased algal blooms and risks from flooding and storm damages;
- increased costs and higher demands on local government services from post event recovery and response; and
- increased risks to agricultural production from extreme precipitation causing the flooding of cropland as well as prolonged droughts.

Analyses of the key climate change vulnerabilities in Peel identify extreme heat, extreme precipitation, and drought as the primary weather related risks that pose the greatest range of impacts across sectors.

The following provides a summary of results based on five years of study by the community climate change partnership on Peel's contribution to GHG's and vulnerability to climate change impacts.

3.1.1 Public Health

The public's health may be impacted by a range of climate drivers but particularly extreme heat exacerbated by the Urban Heat Island effect.

Other human health impacts include:

- increased risk of injuries and mortality resulting from extreme weather;
- increased food and water-borne contamination;
- increased incidence of vector-borne illnesses including West Nile Virus and Lyme disease;
- increased risk of temperature-related morbidity and mortality; and
- increased respiratory and cardiovascular conditions exacerbated by poor air quality.

Groups that may be more vulnerable to climate change health impacts include seniors; children; those experiencing social isolation; individuals with chronic conditions, disabilities, or both; and, socially or economically marginalized individuals. Climate change may worsen existing health inequalities by increasing the health burden on vulnerable groups. Peel's existing programs and services will require adjustments to cope with future health impacts from climate change and be supported by program and assistance by other levels of government. Community services will be impacted by a range of weather related impacts that will affect emergency management, planning and public health (e.g. the increased use of municipal buildings to provide warming and cooling shelters during extreme weather events).

3.1.2 Natural Heritage and Water Systems

Natural systems are critical assets that have been shown to increase urban resiliency against extreme weather. Natural systems regulate and clean water, reduce urban heat island effects, clean the air and water, provide opportunities for recreation, and increase property value. The natural system vulnerability assessment found groundwater, aquatic and terrestrial systems to be detrimentally impacted from changes in weather.

The effects of climate change on the groundwater system may include:

- shallow aquifers drying out;
- surface waters warming;
- increased algal blooms;
- higher risk of erosion;
- heat stress to plants; and
- increased exposure to Invasive species.

The effects of climate change on the aquatic system may include:

- warming water temperatures disrupting cool and cold water fish habitat;
- lowering seasonal water levels and summer flows, compromising fish movement and survival;
- increasing stream erosion and urban flooding due to more frequent and intense storms;

- increasing the spread of invasive species, as well as levels of pollutants and nutrients, through changes to flooding patterns;
- promoting favourable conditions for algal blooms, making them more common and intense; and
- altering winter ecology because of warmer and wetter winter conditions, influencing survival of fish and fish eggs, and fish spawning in spring.

The effects of climate change on the terrestrial system may include:

- drying of wetlands (swamps and bogs are believed to be most vulnerable);
- more water flowing overland, leading to increased flooding especially in urban areas;
- increased heat stress for plants;
- increased spread of invasive species and frequency of pest outbreaks;
- shift in tree and plant species from northern to southern species; and
- intensified heat island effect in urban areas.

3.1.3 Built Environment and Infrastructure

Urbanization has changed natural water flow pathways, largely through the increase in impervious surfaces and channelling of water, creating many existing riverine flood vulnerabilities and potentially exposing infrastructure and public assets including roads, bridges and stormwater infrastructure to flooding and erosion impacts. Climate change is predicted to amplify these vulnerabilities and exacerbate impacts. Vulnerability to urban flooding and erosion needs to be understood in light of the reduced ability of the natural system to manage water flow.

Extreme heat and increased storm event runoff may result in algal blooms, while extreme precipitation may put nearshore infrastructure at risk of flooding. Significant infrastructure, including stormwater systems and water treatment facilities built nearshore are vulnerable to these impacts and increased risk.

Extreme wind events could have the potential to cause significant damage to vegetation, built structures, as well as the loss of communication infrastructure which may affect emergency broadcasts and response. These events could also result in loss of electricity to key emergency service providers requiring the need to ensure redundancies are available to limit the impact to during critical situations.

3.1.4 Agricultural Production

Peel has some of the most productive agricultural land in Canada, with 45% of the Region's land base being used for farming. Agriculture depends on predictable weather patterns to ensure proper planning and management of farming activities. Climate change is expected to increase variability and unpredictable conditions making it harder for farmers to forecast how long growing seasons will be, when to plant and when to harvest, impacting crop yield and income. As well, the extreme weather is also expected to impact crop production through increased flooding as well as prolonged droughts, which can have numerous impacts to the agricultural community in Peel, including the additional reliance on ground water for irrigation and the need to deepen wells to access deeper aquifers.

Climate change is expected to produce stronger storms with heavier rainfall, which will affect cash crop farming through:

- water logging and flooding of soils;
- soil erosion and changes to the availability of nutrients; and
- outbreaks of pests and disease.

The duration of drought events that has already been experienced will at least remain similar in frequency:

- limiting growth and development of crops;
- increasing pest and disease outbreaks; and
- exposing plants to extreme heat.

The frequency, intensity and duration of heat waves are expected to:

- reduce photosynthesis;
- scorch leaves and stems;
- kill leaves and seeds;
- reduce pollen production and viability; and
- reduce grain productivity.

3.1.5 Economy

Based on one geographic case study in Peel, the cumulative impact estimates attributed to climate change from freezing rain could reach over $30 million of GDP annually by 2040. Similarly, the cumulative impacts from stormwater flooding could reach $70 million of GDP annually by 2040. Total estimated decadal costs of impacts from these two climate variables could exceed 1 billion dollars by 2040.[10]

[10] Insurance Bureau of Canada. (2015). *Study of Economic Impacts of the Weather Effects of Climate Change*

4. Addressing Climate Change through Land Use Planning

Land use planning is one of the most effective processes to facilitate local adaptation to climate change.[11] Local governments have historically used tools available through the land use planning process including official plans, zoning, and/or development permits to minimize development risks to a municipality from floods, wildfires, landslides and other natural hazards.[11] As Peel continues to grow in population and size, the risks and vulnerabilities to a changing climate identified for the Region will be intensified. Land use planning in key areas will be an essential process to mitigate and adapt to climate change in the Region.

4.1 Approaches to Mitigate and Adapt to Climate Change

The existing land use planning framework in Ontario provides opportunities that can assist in reducing GHG emissions and achieving the long-term goal of low-carbon communities. The following provides a list of key theme areas and some actions that can assist in reducing GHG emissions and increasing community resilience to a changing climate.

4.1.1 Growth Management

There is recognition that meeting or exceeding the Provincial intensification and density targets, and building more compact, complete, and transit supported communities will provide important contributions to reducing GHG emissions. Managing where and how growth is permitted in municipalities will need to integrate and prioritize new practices in land use planning to ensure new and existing communities are more resilient to climate change and assist in the goal of reducing GHG emissions. Growth management measures can include:

- development of compact, mixed-use communities to decrease automobile use, GHG and air emissions;
- intensifying density in appropriate areas to make use of existing infrastructure;
- design and layout of new development areas including subdivisions and business parks;
- locating development outside vulnerable areas (e.g. flood plains);
- expanding tree canopy and promoting green roofs / cool roofs to reduce urban heat island effects;
- reducing stormwater runoff and pollution from urban and rural areas including the incorporation of low-impact development and green infrastructure;
- preserving open space and natural habitats to increase connectivity and functions;
- requiring alternative and renewable energy planning; and
- incorporating sustainable design and building practices in neighbourhood, site and building level approaches.

If growth can be directed towards higher density transit corridors and investments are made in public transit, significant reductions in GHG emissions from transportation and building energy use can be achieved while also creating complete communities that support healthy and active living. Redirecting

[11] Government of Canada. (2012). *Land Use Planning Tools for Local Adaptation to Climate Change*

growth and higher densities will also have the benefit of protecting essential natural heritage, hydrologic, and landform systems, features, and functions while also supporting and enhancing the long-term viability and productivity of agriculture by protecting prime agricultural areas.

4.1.2 Energy

The greatest potential for reducing community GHG emissions is to foster efficient use of energy in homes and businesses and shift from fossil based energy sources (e.g. gas) to renewable sources (e.g. solar and district energy). As previously mentioned, the 2014 Region of Peel *Community Greenhouse Gas and Criteria Air Contaminant Inventory* found that the main sources of emissions in 2006 stemmed from building energy use (64%) and from transportation sources (28%). Requirements for improving energy efficiency in buildings continue to improve with proposed changes to the *Ontario Building Code*, which includes energy retrofits for existing buildings and the encouragement of more stringent energy efficiency requirements for new buildings. The Province of Ontario is also forecasting lower GHG emissions associated with the generation of electricity in future years, which will in turn reduce indirect community GHG emissions in Peel. Some land use infrastructure planning actions that can assist include:

- preparing Community Energy and Emission Reduction Plans;
- promoting the implementation of larger scale district energy systems in new development;
- encouraging residents and business to conserve the amount of energy used;
- requiring or encouraging higher building standards (Energy Star, LEED®);
- incorporating urban heat island mitigation strategies;
- requiring or encouraging the incorporation of green technologies (building design, sustainable roofs, low-impact development, stormwater management, green infrastructure, renewable heat and power); and
- capturing and reusing waste heat and greenhouse gas emissions (e.g. methane) from wastewater treatment plants.

4.1.3 Transportation

Following building energy consumption, the next largest source of GHG emissions in the Region is from transportation sources (28%). In addition to automotive transportation, Peel is also one of the largest goods movement regions moving $1.8 billion in goods in approximately 68,000 vehicles per day.[12] Reducing vehicular transportation based GHG emissions could include measures such as:

- increasing transit ridership through an expansion of public transportation system;
- encouraging different modes of transportation including carpooling;
- modal shifts from road transport to rail and public transport systems; non-motorised transport (cycling, walking) through the development of active transportation networks of trails and pathways;
- developing strategies to encourage low carbon vehicle usage in relationship to goods movement;
- decreasing requirements for minimal parking standards along transit corridors;

[12] Region of Peel. (2017). *Peel Region Goods Movement Strategic Plan 2017-2021*

- encouraging the transition to low carbon vehicles including fuel-efficient vehicles, hybrid vehicles, and cleaner diesel vehicles; and
- installation of electric/plug-in vehicle and cycling infrastructure.

4.1.4 Natural Heritage and Water Systems

Ecosystems, including natural heritage and water systems as well as their components, play an important role including mitigating climate change by removing carbon dioxide from the atmosphere, reducing flooding, supporting biodiversity, and providing clean water. Protecting these areas are key measures for mitigating climate change, which can include:

- integrating natural heritage systems planning into the land use planning process;
- increasing protected natural heritage areas;
- protecting groundwater recharge areas and highly vulnerable aquifers;
- undertaking watershed planning to identify water resource systems;
- implementing stormwater master planning, low impact development, and green infrastructure stormwater measures; and
- protecting shoreline areas from erosion.

4.1.5 Agriculture

The changing climate can have significant influence on the role of agriculture as increased variability and unpredictable conditions will make it more difficult to plan and manage farm activities. As well, agricultural / natural lands play an important role in the release and storage of carbon. The agricultural community will need to adapt to changing conditions as weather events become more frequent and severe, including:

- adjustment of planting dates and crop variety;
- crop rotation;
- improved land management (e.g. erosion control and soil protection through conservation, cover cropping, and tree planting); and,
- livestock and manure management; and
- capturing greenhouse gas emissions (e.g. methane) from livestock and converting to energy.

Land use policy and environmental farm program support responses include:

- protecting the agricultural land base for farming;
- providing supportive policy for on-farm diversification and innovative practices; and
- providing rural water quality and environmental cost-share programming for agri-environmental projects.

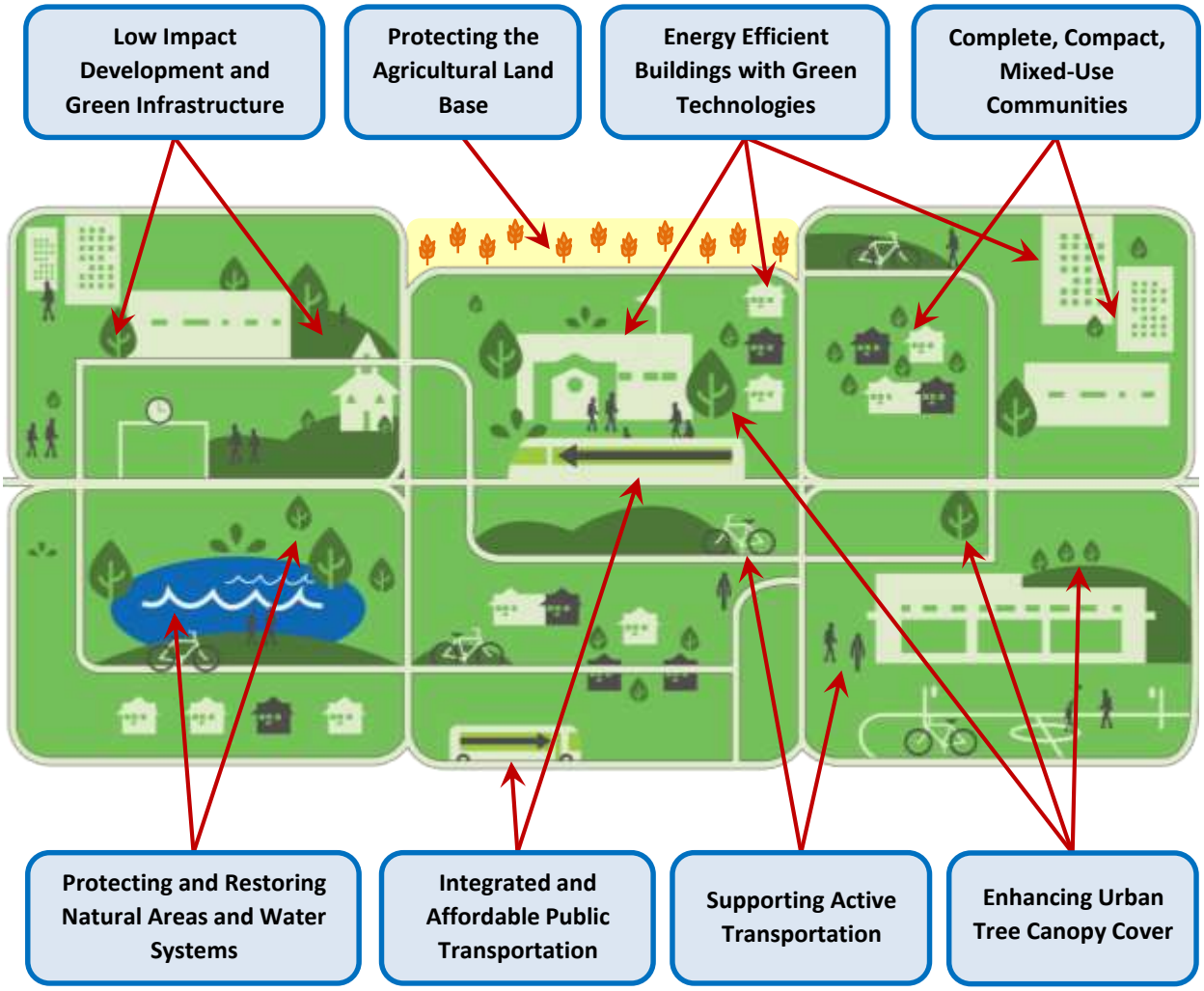
4.2 Building a Resilient Region

The key theme areas and proposed actions that have been identified provides an opportunity for communities to develop a land use planning framework with long-term strategic goals that reduce overall GHG emissions as well as community vulnerabilities to climate change. Within Peel, the Regional Official Plan provides a regional planning policy framework with policy direction for growth and development, environmental protection, and resource use and conservation. An array of new planning approaches at all levels of land use planning from region-wide to subdivision, site and building approvals will be critical to strengthening existing as well as introducing new land use actions that can mitigate risks. A resilient Region also requires a healthy regional environment and varied approaches to address the needs of water resources, natural heritage, climate, and air from a systems perspective as components of a complete Region.

At a high level, it is expected that the urban areas of Peel will experience various forms of denser development, while natural areas are expected to include further protection and enhancement opportunities. Urban centres in Peel, including Downtown Mississauga and Brampton, as well as areas in Caledon, are expected to be developed with more compact development patterns which will support a mix of uses in highly efficient buildings providing opportunities for residents to have access to housing, food, education, health care, arts and recreation. These urban areas are expected to be supported by essential infrastructure and an integrated public transportation network building on the MiWay, Züm and the future Provincial GO Transit and Huontario Light Rail Transit systems, which will allow people convenient and affordable opportunities to travel both within and between urban centres throughout the Region. Compact, walkable communities will assist in decreasing GHG and air quality emissions as well as improve public health.

The natural areas and agricultural lands in Caledon will continue to significantly contribute to the Region's ability to adapt to a changing climate by providing clean air, land, and water. Caledon is the headwaters to major water systems that flow through Peel and its management will impact the water quality and quantity in Mississauga and Brampton downstream. Productive and diverse farming practices on high quality agricultural lands in Caledon are expected to provide healthy, local food for the Region and beyond. This high level overview provides a vision of how the Region can continue to grow and prosper while building resilience to the predicted impacts of a changing climate. Figure 4.1 provides an illustrative example of how the Region and local municipalities can integrate the mitigation and adaption to climate change through land use planning.

Figure 4.1: Opportunities for Regional Mitigation and Adaptation to Climate Change



In addition to updating Regional Official Plan policies to build community resilience to climate change, another key aspect of the land use planning framework will be the development of implementation tools which will provide finer grain details beyond the higher policy level to ensure that the goal of reducing GHG emissions and addressing the impacts of climate change will occur at the community level. Table 4.1 provides an overview of a potential land use planning framework that the Region could employ to build resiliency at different levels of the development process.

Table 4.1: Regional Land Use Planning Framework for Climate Change Resiliency

Planning Tool	Details
Policy Guidance	

Regional Official Plan	• Land use planning policy framework that can assist the Region in mitigating and adapting to climate change through a number of areas including:
	  ○ Growth Management and Complete Communities;
	  ○ Transportation and Public Transit;
	  ○ Energy;
	  ○ Air Quality;
	  ○ Infrastructure (water, wastewater, waste management);
	  ○ Natural Heritage Systems;
	  ○ Agriculture; and
	  ○ Public Health.
	• This document provides guidance to the public and local municipalities on the land use planning direction and support for collaborative efforts in addressing climate change.

Local Municipal Official Plans	• Providing land use planning policy at the local municipal level to mitigate and adapt to climate change in a manner tailored to the needs and priorities of each area.
Tools	
Sustainable Development Guidelines	• Encourage the voluntary incorporation of innovative sustainable design standards as part of local municipal *Planning Act* applications including Official Plan, Zoning By-law, Site Plan, and Draft Plan of Subdivision Applications. • Include aspects related to urban design, site design, building design/materials, transportation, landscaping/natural environment, water conservation/quality, energy, and waste.
Emerging Legislative Tools	• Green roof or alternative roof by-laws; • Tree canopy cover and natural vegetation by-laws; and • Eliminating minimum parking standard requirements.

To build on this framework, a detailed review of the current government policy context as it relates to climate change, the existing Regional Official Plan policies, as well as proposed options to strengthen, enhance, and add policies based on the overall theme of enhancing Regional resiliency to the predicted impacts of a changing climate are found in the remaining sections of this Discussion Paper.

5. Climate Change Policy Context and Frameworks

The recognition of the serious impacts of climate change to the human population and ecosystems at the international level has prompted governments at all levels to begin action on tackling this complicated and far reaching issue. At this time, scientific evidence has created a momentum to accelerate the implementation of plans and policies to mitigate and adapt to climate change.

5.1 International

5.1.1 Paris Agreement

In December 2015, 196 Parties (195 states and the European Union), including Canada, adopted the international Paris Agreement to set a goal of limiting global warming to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.[13] The Paris Agreement also recognized that climate change represents an urgent and potentially irreversible threat to human societies and the planet, and that deep reductions in global GHG emissions will be required in order to achieve this goal. The Paris Agreement also aims to make financial commitments consistent with a pathway towards low GHG emissions and climate-resilient development.

5.1.2 Planners for Climate Action

In November 2017, a new initiative called Planners for Climate Action was launched at the United Nations COP-23 conference under the Marrakesh Partnership in the United Nations Framework Convention on Climate Change.[14] This initiative builds on the Paris Agreement and recognizes that while urban areas account for approximately two-thirds of the world's GHG emissions from global energy use, land use planning practitioners who shape the way cities grow have predominantly been omitted from the conversation on climate change action.[14] It is anticipated that this UN-Habitat lead programme will bring together partners and associations representing more than 80,000 urban and regional planners from around the world to contribute to discussion and decisions on climate action defined within the United Nations' 2030 Agenda for Sustainable Development, Sustainable Development Goals, New Urban Agenda, and the UN-Habitat's Cities and Climate Change Initiative.

5.2 National

5.2.1 Pan-Canadian Framework on Clean Growth and Climate Change

As a Party to the Paris Agreement, the Government of Canada is partnering with provinces and territories to transition towards a lower carbon and resilient economy. Table 5.1 provides a summary of key actions of the framework based on the four pillars as areas of focus:[15]

[13] United Nations / Framework Convention on Climate Change. (2015). *Paris Agreement*

[14] UN Habitat. (2017, November 11). Associations representing more than 80,000 planners globally join forces on climate action [Press release]. Retrieved from https://unhabitat.org/associations-representing-more-than-80000-planners-globally-join-forces-on-climate-action/

[15] Government of Canada. (2016). *Pan-Canadian Framework on Clean Growth and Climate Change*

Table 5.1: Summary of Pan-Canadian Framework Areas of Focus

Area of Focus	Summary
Carbon Pricing	• Ensure carbon pricing systems are implemented throughout Canada by 2018. • Establish the approach to the review of carbon pricing, including expert assessment of stringency and effectiveness that compares carbon pricing systems across Canada, and report back to First Ministers in 2020 and 2022.
Action by Sector	<u>Homes and Buildings</u> • Use Low Carbon Economy Fund and green infrastructure investments to improve building energy efficiency including new standards for building codes, heating equipment and other key technologies <u>Transportation</u> • Cut vehicle emissions, invest in public transit, develop clean fuel standard • Develop national strategy for zero-emission vehicles <u>Electricity</u> • Increase share of clean electricity from 80% to 90% by 2030 • Invest in renewable energy such as wind and solar, as well as energy storage and “smart grid” technologies <u>Industry</u> • Largest source of greenhouse gas emissions in Canada, encourage switch to cleaner fuels, be energy efficient and install cutting-edge clean technologies • Reduce methane emissions from oil and gas sector by 40-45% by 2025 <u>Forestry and Agriculture</u> • Protect and enhance forests, wetlands and agricultural lands, which act as carbon sinks • Encourage greater use of wood products in construction • Expanded production of renewable fuels and bio-products
Adapting to Climate Change	• Establish a centre for climate services and by building regional capacity and adaptation expertise • Invest in climate-resilient infrastructure and integrate climate resilience into building codes and standards • Mitigate hazards and disasters by investing in infrastructure and advancing efforts to protect against flood damage
Clean Technology & Jobs	• Invest in research and technology development in areas with the potential for substantial emission reductions • Purchase clean technologies for government operations

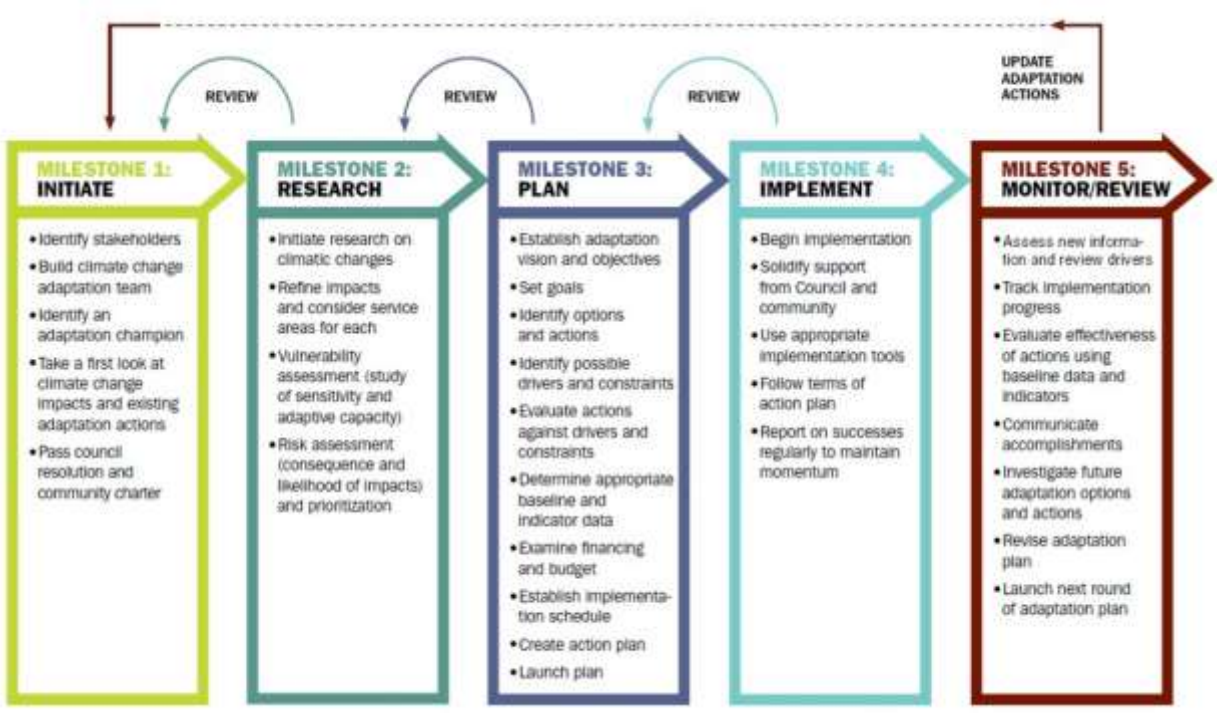
Source: Government of Canada. (2016). *Pan-Canadian Framework on Clean Growth and Climate Change*

This framework to advance action on climate change in Canada was first initiated through the Vancouver Declaration on clean growth and climate change at the Globe Conference on March 3, 2016. The Federal government is working with all provinces and territorial governments to implement the Pan-Canadian Framework on Clean Growth and Climate Change.

5.2.2 International Council for Local Environmental Initiatives - Climate Adaptation Framework

The International Council for Local Environmental Initiatives (ICLEI) Climate Adaptation Framework was developed to assist local governments in the creation of adaptation plans to address the relevant climate change impacts associated with their communities. As shown in Figure 5.1, the ICLEI framework uses a milestone approach for climate change adaptation planning with the following five milestones including Initiate, Research, Plan, Implement and Monitor. Each milestone is a fundamental step in the adaptation planning process, beginning with the initiation of adaptation efforts (including building a team and identifying local stakeholders) and concluding with a monitoring and review process.

Figure 5.1: ICLEI Adaptation Methodology Milestones



Source: ICLEI. (2010). *Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation*

5.2.3 Partners in Climate Protection Framework

The Partners for Climate Protection (PCP) program is a network of municipal governments that have committed to reducing GHG emissions. PCP is a partnership between the Federation of Canadian

Municipalities and ICLEI, and is the Canadian component of ICLEI's Cities for Climate Protection network.[16]

The PCP's 5-Milestone Mitigation Planning Framework (Figure 5.2) guides municipalities to develop GHG emission inventories, set GHG emission reduction targets, develop and carry out local climate action plans, and monitor results. To date, the Framework has been used by over 230 municipalities throughout Canada.

Figure 5.2: PCP Five Step Mitigation Framework to Guide Mitigation Planning



Source: ICLEI. (2017). *Partners for Climate Protection*

5.3 Provincial

5.3.1 Climate Change Strategy

In November 2015, the Province of Ontario released the Climate Change Strategy which set out a clear vision as well as near and long-term goals for fighting climate change and reducing GHG emissions by 80% below 1990 levels by 2050. Five areas of transformation in the strategy include:

- low-carbon economy with leading innovation, science and technology;
- government collaboration and leadership;
- resource-efficient and high productivity society;
- reduce GHG emissions across sectors; and
- adapting and thriving in a changing climate.

[16] Federation of Canadian Municipalities. (2008). *Five-Milestone Framework for Reducing Greenhouse Gas Emissions*

This includes, but is not limited to focusing actions for the investment for low-carbon technologies, building green infrastructure, integrating climate change mitigation and adaptation considerations into government decision-making, developing GHG measuring methods to track progress towards meeting targets, reducing GHG emissions from the transportation and building sectors, and establishing the reduction of GHG emissions in land use planning initiatives.

5.3.2 Climate Change Action Plan

In June 2016, the Province released Ontario's Five Year *Climate Change Action Plan 2016-2020*, which builds on the 2015 *Climate Change Strategy* and sets out several action items the government will execute in key sectors to achieve its GHG emission reduction target of 80% below 1990 levels by 2050, and adapt to impacts. Those action areas include: transportation, buildings & homes, land use planning, industry & business, collaboration with indigenous communities, research & development, government, and agriculture, forests and lands.

Specifically regarding land use planning and adapting to climate change, the *Climate Change Action Plan* includes actions such as the increase of municipal powers under the *Municipal Act* allowing municipalities to pass by-laws related to green standards (in areas other than building construction), requiring electric vehicle charging stations, including climate change as a Provincial interest with updates to the *Ontario Planning Act*, requiring updates to municipal official plans to include climate change mitigation and adaption policies, and the ability to eliminate minimum municipal parking standard requirements.

In support of the *Climate Change Action Plan*, the Province passed the *Climate Change Mitigation and Low-carbon Economy Act* in May 2016, which established GHG reduction targets of 15% below 1990 levels by 2020, 37% below 1990 levels by 2030, and 80% below 1990 levels by 2050, and set out the framework for the cap and trade program which enabled Ontario to enter into agreements with other jurisdictions (i.e. Québec and California). In July 2018, the Provincial government announced that it was no longer participating in the cap and trade program, and that consultations will occur that would cumulate to the release of a new Provincial climate change plan in the fall of 2018.

5.3.3 Climate Change Adaptation Approach

In early 2018, the Ontario Government released a draft document titled *Approach to Climate Change Adaption* which outlined four broad steps the government intended to carry out to help Ontario build resiliency and adapt to a changing climate. The Approach proposes:

- Creating a new climate change adaptation organization to help build local adaptation capacity, enhance networks and take action;
- Undertaking a province-wide risk assessment to climate impacts to better understand vulnerabilities and prioritize actions;
- Developing an all-of-government approach to climate change adaptation; and,
- Raising public awareness by sharing information on how a changing climate will affect communities, humans, and the environment.

The province-wide climate change risk assessment will identify long-term vulnerabilities and risks to public infrastructure, agriculture, ecosystems, public health, businesses, and the financial sector. A key aspect of the *Approach to Climate Change Adaption* is the recommendation to provide a one window access platform to standardized climate science and information for Ontario to support decision making.

It is anticipated that municipal interests in land use planning, infrastructure planning and design, emergency management, as well as other areas will be considered in the implementation of the new *Approach to Climate Change Adaption*.

5.4 Local

The Region of Peel and the local area municipalities of Mississauga, Brampton, and Caledon have completed or in the process of completing documents to help guide mitigation and adaptation actions for climate change.

The Region of Peel's *Strategic Plan (2015-2035)* is a 20-year framework adopted by Council with the ultimate goal of achieving the vision of a 'Community for Life'. To achieve the Region's vision, three focus areas were developed including "Living", "Thriving" and "Leading". The 'Thriving' category envisions a long-term community which is environmentally friendly, having well-managed growth, and a built environment that promotes healthy living. Aligned with the Strategic Plan through Term of Council Priorities, the 'Thriving' category breaks down the overall goals through four-year short-term outcomes, which include:

- adapting and mitigating the effects of climate change;
- increasing waste diversion;
- planning and managing growth; and
- promoting healthy built environments.

The Region of Peel is currently engaged in climate change resiliency in other program areas including the creation of the Office of Climate Change and Energy Management which is tasked with climate change adaptation and mitigation guidance services, supporting energy conservation and renewable energy projects, and the monitoring of corporate greenhouse gas emissions.

In addition, the Region has also prepared a number of supporting documents to guide environmental action including the *Peel Climate Change Strategy* (2011), *Urban Forest Strategy* (2011), *Long Range Transportation Plan Update* (2012), *2006 Community Greenhouse Gas and Criteria Air Contaminant Inventory* (2014), *Corporate Energy Conservation and Demand Management Plan (2014-2019)*, *Region of Peel Official Plan* (2016 Consolidation), as well as five Climate Change Vulnerability Assessments (Public Health, Community Services and Assets in the Region of Peel (Port Credit), Water Infrastructure, Natural Systems, and Agricultural Systems).

5.4.1 Peel Climate Change Strategy

The *Peel Climate Change Strategy* was adopted by Regional Council on June 23, 2011 and aimed to improve coordination of activities related to climate change among the Peel Community Climate Change Partnership (PCCP), a collaborative effort between the Region of Peel, City of Brampton, City of Mississauga, the Town of Caledon, Credit Valley Conservation and the Toronto and Region Conservation Authority. The PCCP was formed in response to 'the urgent need to respond to climate change at the local level' guided by senior representatives from each of the partnering organizations.

As shown in Table 5.2, the *Peel Climate Change Strategy* identified six broad goals under three broad outcomes. Thirty eight separate actions were developed with the aim of achieving those goals and outcomes.

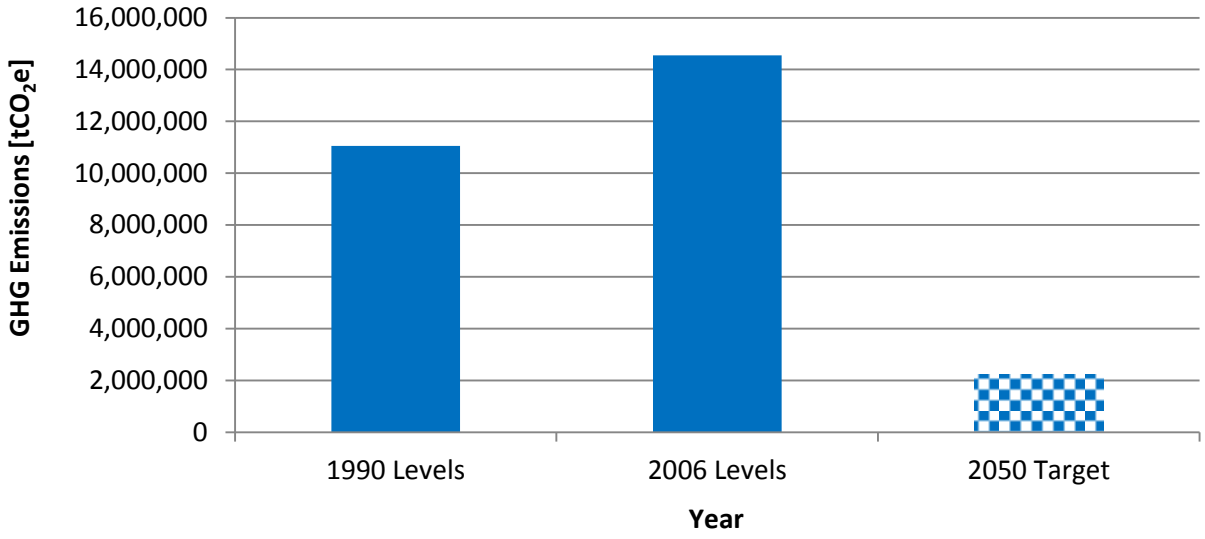
Table 5.2: Peel Climate Change Strategy – Goals and Outcomes

Outcomes	Summary
Reduce Community Greenhouse Gases	• Actions to reduce greenhouse gas emissions • Shifting to a green economy
Reduce Community Vulnerability to Impacts	• Targeted and proactive adaptation actions
Enhance Capacity	• Proactive and responsive planning and leadership • Increasing awareness of, and engagement in, climate issues in Peel • Ongoing research and adaptive risk management

Source: Region of Peel. (2011). *Peel Climate Change Strategy*

As part of the *Peel Climate Change Strategy*, the *2006 Community Greenhouse Gas and Criteria Air Contaminant Inventory* (2014) provided information on community GHG emissions in Peel. As shown in Figure 5.3, community GHG emission levels in Peel increased approximately 32% when compared to 1990 levels. It should be noted that GHG emissions come from many sources, some of which are outside the direct control and influence of municipalities. The PCCP partners are committed to working with other levels of government and the private sector to reach the adopted target of 80% below the 1990 GHG emission levels by the year 2050.

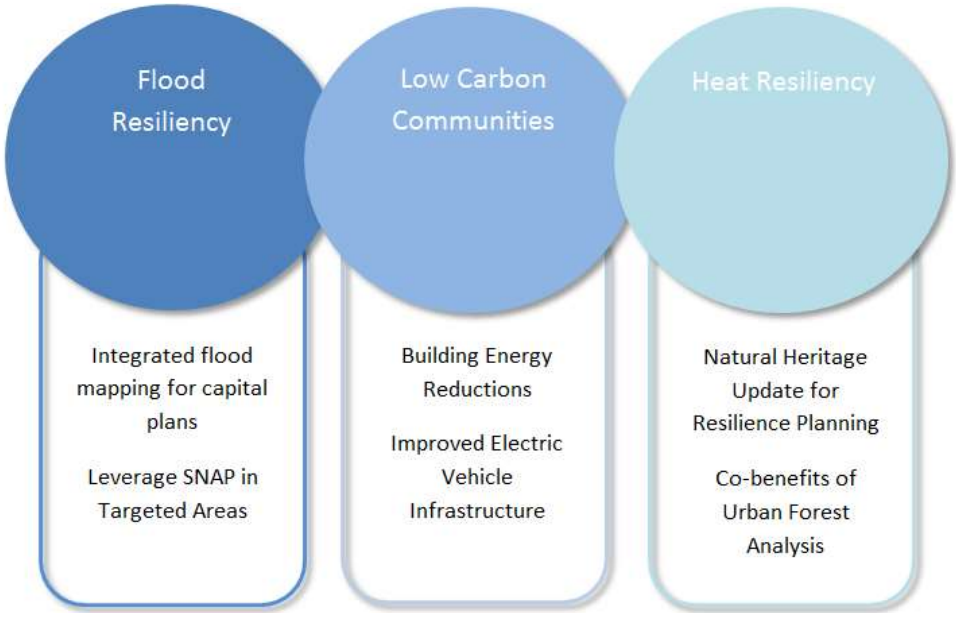
Figure 5.3: Community Greenhouse Gas (GHG) Emissions in Peel



Source: Region of Peel. (2014). *2006 Community Greenhouse Gas and Criteria Air Contaminant Inventory*

In 2017, the PCCP completed an assessment of the current state of the partnership, as well as the original strategy that was coming to the end of its time horizon. As part of a renewal to position the partners to have the greatest collective impact over the next five years, a number of sub-strategies (as shown in Figure 5.4) were developed to reduce community GHG emissions and address vulnerability to extreme heat and flooding. Detailed plans for each of the focus areas are currently being developed.

Figure 5.4: PCCP Focus Areas



Source: Region of Peel (staff report to Regional Council). (September 2017). *Mitigating and Adapting to the Effects of Climate Change*

5.4.2 Local Municipal Climate Change Action

The City of Mississauga is currently undertaking *The Climate Change Project*, which will culminate to the City's first Climate Change Action Plan scheduled for 2019. In September 2017, the City became a member of the Global Covenant of Mayors for Climate and Energy (formerly the Compact of Mayors) that participate and demonstrate global impact municipalities can make to transition to a low emission and climate resilient economy. To address the impacts of climate change, the City has also prepared a number of supporting documents to guide environmental action including the *Waterfront Parks Strategy* (2008), *Cycling Master Plan* (2010), *Living Green Master Plan* (2012), *Credit River Parks Strategy* (2013), *Natural Heritage and Urban Forest Strategy* (2014), *Urban Forest Management Plan* (2014), and *Five Year Energy Conservation Plan (2014-2019).*

In May 2014, Brampton City Council approved *Brampton Grow Green* Master Plan, the City's first Environmental Master Plan that established strategic directions, actions and targets through six core components including people, air, water, land, energy and waste. A number of metrics will be used to collect baseline data and to quantitatively and qualitatively monitor how the City is progressing towards its environmental goals through updated reporting. To address the impacts of climate change, the City has also prepared a number of supporting documents to guide environmental action including the *Transportation and Transit Master Plan* (2009), *Natural Heritage and Environmental Management Strategy* (2016), and *Parks and Recreation Master Plan* (2017).

In 2005, Town of Caledon Council adopted the *Environment Progress Action Plan* which included initiatives to enhance commitments to preserving Caledon's environment. This Plan has been followed up by three progress reports in 2007, 2009 and 2011 which highlight the progress of identified target areas and outlines next steps. In 2010, a multi-stakeholder Community Working Group was established to develop the 2011 *Community Climate Change Action Plan*, which contains a series of proposed GHG reduction actions for the municipality; this plan is currently being updated to include mitigation measures including a residential energy mapping study, and adaptation measures through the identification of risks and vulnerabilities. The Town recently became a member of the Global Covenant of Mayors for Climate and Energy. To address the impacts of climate change, the Town has also prepared a number of supporting documents to guide environmental action including the *Guide to Eco-Business Zone Planning & Development* (2014), *Caledon Environmental Progress Action Plan Update (2014-2019)*, and the *Town of Caledon Corporate Energy Management Plan Update (2014-2019)*.

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6. Land Use Planning Policy Context

In addition to specific climate change related legislation and policy, the Province provides a provincial policy-led framework for land use planning. This section provides information on the current state of land use policy and its implications for mitigating and adapting to climate change.

6.1 Provincial Policy Context

The *Planning Act*, *Provincial Policy Statement*, and *Growth Plan for the Greater Golden Horseshoe* (along with the *Greenbelt Plan*, the *Oak Ridges Moraine Conservation Plan* and the *Niagara Escarpment Plan*) provide high level direction and guidance for land use planning matters in Ontario. Municipalities are required to develop official plans that are consistent with and conform to the legislation in the *Planning Act* and policy direction set out in the *Provincial Policy Statement* and provincial plans which guide and inform local land use planning decisions.

6.1.1 The Planning Act

The *Planning Act* (1990) provides the rules related to land use planning in Ontario and is the basis for municipalities to prepare documents, including official plans that set out a municipality's planning goals and policies that will guide land use within its jurisdiction. Municipalities are required to ensure planning decisions and planning documents are consistent with the *Provincial Policy Statement* and integrate matters of provincial interest. As per Table 6.1, the *Planning Act* contains a number of tools that support development that reduce GHG emissions and contribute towards sustainable and healthier communities.

Table 6.1: Planning Act Provisions Related to Climate Change

Planning Act Section	Planning Act Policy
Sections 16 – 27	Through policies of an Official Plan, municipalities can incorporate climate change policies to identify specific direction, objectives, targets, and actions to be taken to achieve the goal of reducing GHG emissions and establishing sustainable communities. This can include growth management, and policies that promote intensification and higher density greenfield development.
Subsections 22(5), 34 (10.2), 51(18), 53(3)	Municipalities can require specific information, material, or studies as part of a complete development planning application (e.g. Official Plan amendments, etc.). These supporting documents can address matters related to climate change (e.g., district energy feasibility studies, stormwater management plans or transportation demand management plans addressing the reduction of GHG emissions).
Section 28	Community Improvement Plans (CIPs) can target specific areas for development or redevelopment. Upper-tier municipalities can develop plans related to affordable housing, infrastructure and transit corridors, in addition to providing grant and loan incentives to encourage climate change related features (e.g. building efficiency, district energy systems, water conservation systems, etc.).

Additional tools to mitigate and adapt to climate change are available in the *Planning Act* which are more appropriate at the local municipal level including zoning by-laws (Section 34), height and density bonusing (Section 37), site plan control (Section 41), plans of subdivision (Section 51), and parkland dedication (Section 42). All of these tools provide municipalities with a range of options to bring in requirements and set specific standards to address climate change through the land use planning process.

Bill 68, *Modernizing Ontario's Municipal Legislation Act, 2017*, received Royal Assent on May 30, 2017. The Bill amended the rules governing municipalities including those related to climate change by adding a new subsection of the *Planning Act* which requires the Minister, municipal councils, local planning boards and the Municipal Board to have regard to matters of provincial interest including "the mitigation of greenhouse gas emissions and adaptation to a changing climate" (Subsection 2 (s)). As a matter of Provincial interest, the addition of language specifically addressing climate change mitigation and adaptation strengthens the need for municipalities to include climate related policies to form part of the land use planning decision making process.

Bill 68 also clarified that municipalities are permitted to pass climate change by-laws and adopt policies to require green roofs or alternative roof surfaces (in accordance with the *Ontario Building Code*), protect and enhance tree canopy and natural vegetation, as well as participate in long-term energy planning, which can all assist in addressing the impacts of climate change in communities. Recently, the Ministry of Municipal Affairs has begun separate consultation process on updates to the *Ontario Building Code* aimed at reducing GHG emissions for new buildings and retrofits which proposes to include increasing building energy efficiency for homes (e.g. hurricane straps, backwater valves, insulation, air tightness, window/doors, mechanical equipment) as well as large buildings (electrical vehicle charging, green technologies) and retrofits.

Bill 139, *Building Better Communities and Conserving Watersheds Act, 2017*, was also introduced by the Ontario government on May 30, 2017, which recommended updates and changes to the land use planning system in Ontario, including additional policies related to climate change under the *Planning Act*. Bill 139 proposes to amend Section 16 of the *Planning Act*, which sets out the content that must be included in an official plan, requiring local councils or approval authorities to consider climate change related issues. Specifically, the proposed legislation recommends adding subsection 14 requiring official plans to "contain policies that identify goals, objectives and actions to mitigate greenhouse gas emissions and to provide for adaptations to a changing climate, including through increasing resiliency". Municipalities will be required to include language related to climate change goals, objectives and supporting policies related to climate change mitigation and adaption in municipal official plans.

Recent amendments to the *Planning Act* have added climate change as a matter of Provincial interest and have strengthened the consideration of climate change matters as part of the land use planning decision making process.

6.1.2 Provincial Policy Statement

The *Provincial Policy Statement, 2014,* came into effect on April 20, 2014, and provides policy direction on matters of provincial interest related to land use planning and development. The 2014 update emphasized several key areas including the wise use of land, management of resources and protection and public health, and the promotion of integration and coordination of other plans and legislation. As per Table 6.2, new language and policies specifically regarding climate change were added to larger theme areas consisting of settlement areas, infrastructure, energy conservation, air quality, adaptation, and natural hazards.

Table 6.2: Provincial Policy Statement (2014) Policies Related to Climate Change

PPS Section	PPS Policy
Section 1.1.3.2 (a)(3)	Land use patterns within settlement areas shall be based on densities and a mix of land uses which minimize negative impacts to air quality and climate change, and promote energy efficiency;
Section 1.6.1	Infrastructure, electricity generation facilities and transmission and distribution systems, and public service facilities shall be provided in a coordinated, efficient and cost-effective manner that considers impacts from climate change while accommodating projected needs.
Section 1.8.1	Planning authorities shall support energy conservation and efficiency, improved air quality, reduced greenhouse gas emissions, and climate change adaptation through land use and development patterns which: a) promote compact form and a structure of nodes and corridors; b) promote the use of active transportation and transit in and between residential, employment (including commercial and industrial) and institutional uses and other areas; c) focus major employment, commercial and other travel-intensive land uses on sites which are well served by transit where this exists or is to be developed, or designing these to facilitate the establishment of transit in the future; d) focus freight-intensive land uses to areas well served by major highways, airports, rail facilities and marine facilities; e) improve the mix of employment and housing uses to shorten commute journeys and decrease transportation congestion; f) promote design and orientation which: 1. maximizes energy efficiency and conservation, and considers the mitigating effects of vegetation; and 2. maximizes opportunities for the use of renewable energy systems and alternative energy systems; and g) maximize vegetation within settlement areas, where feasible.
Section 3.1.3	Planning authorities shall consider the potential impacts of climate change that may increase the risk associated with natural hazards.

The *Provincial Policy Statement* provides a clear policy direction to address climate change mitigation and adaptation measures in an integrated manner through the design and planning of the built environment and transportation system.

6.1.3 Co-ordinated Land Use Plans Review

In February 2015, the Province began the process of reviewing the *Growth Plan for the Greater Golden Horseshoe*, the *Greenbelt Plan*, the *Oak Ridges Moraine Conservation Plan* and the *Niagara Escarpment Plan*, which together help support land use planning in Ontario. Through a review process which included extensive stakeholder and public consultations, it cumulated in the final release of updates to all four Plans on May 18, 2017. The Plans recognize the existing and potential impacts of climate change and has integrated climate change considerations into all four provincial plans to ensure that land use planning contributes to the reduction of GHG emissions and begins to implement requirements for more resilient communities and infrastructure that are adaptive to the impacts of a changing climate.

The Province supports the role of municipal policy making to identify actions that will reduce greenhouse gas emissions and address climate change adaptation goals aligned with the *Ontario Climate Change Strategy* (2015) and *Climate Change Action Plan* (2016), and the *Provincial Policy Statement*, *2014*. As reflected in Table 6.3, the updated Plans, and specifically under Section 4.2.10 of the Growth Plan (2017), include policies regarding climate change.

Table 6.3: Growth Plan (2017) Policies Related to Climate Change

Growth Plan Section	Growth Plan Policy
4.2.10.1	Upper- and single-tier municipalities will develop policies in their official plans to identify actions that will reduce greenhouse gas emissions and address climate change adaptation goals, aligned with the Ontario Climate Change Strategy, 2015 and the Climate Change Action Plan, 2016 that will include: a) supporting the achievement of complete communities as well as the minimum intensification and density targets in this Plan; b) reducing dependence on the automobile and supporting existing and planned transit and active transportation; c) assessing infrastructure risks and vulnerabilities and identifying actions and investments to address these challenges; d) undertaking stormwater management planning in a manner that assesses the impacts of extreme weather events and incorporates appropriate green infrastructure and low impact development; e) recognizing the importance of watershed planning for the protection of the quality and quantity of water and the identification and protection of hydrologic features and areas; f) protecting the Natural Heritage System and water resource systems; g) promoting local food, food security, and soil health and protecting the agricultural land base; h) providing direction that supports a culture of conservation in accordance with the policies in subsection 4.2.9; and i) any additional policies to reduce greenhouse gas emissions and build resilience, as appropriate, provided they do not conflict with this Plan.
4.2.10.2	In planning to reduce greenhouse gas emissions and address the impacts of climate change, municipalities are encouraged to: a) develop strategies to reduce greenhouse gas emissions and improve resilience through the identification of vulnerabilities to climate change, land use planning, planning for infrastructure, including transit and energy, green infrastructure, and low impact development, and the conservation objectives in policy 4.2.9.1; b) develop greenhouse gas inventories for transportation, buildings, waste management and municipal operations; and c) establish municipal interim and long-term greenhouse gas emission reduction targets that support provincial targets and reflect consideration of the goal of low-carbon communities and monitor and report on progress made towards the achievement of these targets.

With the purpose of promoting a culture of conservation through land use planning, Section 4.2.9 of the Growth Plan (2017) includes policies related to the conserving water and energy use (e.g. water demand management, district energy, and renewable/alternative energy systems), improving air quality, reducing waste (e.g. promoting building conservation, adaptive reuse, and reusing/recycling building materials), and soil management.

Generally, many of the integrated changes in the four plans can be categorized into five main theme areas that can help reduce GHG emissions and increase resiliency, including:

1) Managing Growth
   Through an integrated process of growth forecasting and allocation, that assesses the need for growth and settlement boundary expansions are assessed with an emphasis on allocating growth to strategic growth areas, meeting intensification and density targets, and planning for major transit stations areas.

2) Supporting Complete Communities
   Achieving complete communities through compact mixed-use development, with a focus on urban and local site design, providing for a mix and range of housing, protecting employment areas, and providing transportation infrastructure to reduce GHG emissions.

3) Infrastructure and Climate Change
   Promoting infrastructure planning and delivery in an integrated manner including the requirement for risk and vulnerability assessments, providing specific new climate change policies (as listed above), and development of comprehensive water, wastewater and stormwater masterplans.

4) Supporting Agriculture
   Protecting an agricultural land base and supporting agri-food network assets through the identification of an Agricultural System across the Greater Golden Horseshoe, providing policy permissions for agricultural uses to support the wide range of needs in the agri-food sector, and requiring agriculture impact assessments.

5) Protecting Natural Heritage and Water
   Promoting watershed planning as a basis for protecting water resources and informing land use planning decision making, identifying a Natural Heritage System across the Greater Golden Horseshoe, and updating policies for protection of natural heritage from development in proximity to key natural heritage and hydrologic features.

The *Greenbelt Plan*, *Oak Ridges Moraine Conservation Plan*, and the *Niagara Escarpment Plan* also contain policies related to climate change and the reduction in greenhouse gas emissions that are specific to elements and designations within each Plan, or refer back to policies outlined in the Growth Plan (2017). Municipalities are required to ensure that their official plans conform to the policies found in the updated Plans.

6.1.4 Summary Direction on Climate Change in the Provincial Plans

The policy updates to the provincial plans support the overall goal of reducing GHG emissions by requiring the creation of compact, mixed-use and higher-density communities that are healthy, walkable, and supported by public transit. The integration and coordination of policies related to climate change mitigation and adaptation though all four provincial land use plans provides the opportunity to enhance community resilience through the identification of vulnerabilities and responses that address risks through changes in land use planning, infrastructure, transportation, energy, natural systems, and agriculture. As such, key directions on climate change in the provincial plans include:

- requiring upper-tier and single-tier municipalities to incorporate climate change policies into their official plans;
- encouraging the preparation of municipal GHG emissions inventories, emission reduction strategies, and related targets for reduction;
- increasing intensification targets, higher density targets for greenfield developments, and enhanced policies that support and make transit a sustainable and preferred mode of transportation;
- enhancing policies for agriculture and natural heritage that further protects and restores ecosystem services;
- ensuring comprehensive stormwater management planning that considers the vulnerability of infrastructure from climate change;
- encouraging municipalities to use green infrastructure and require low-impact development stormwater approaches that include integrating green space, natural heritage, and water systems; and
- encouraging a 'culture of conservation' to conserve water and energy, and reduce waste.

6.2 Regional Policy Context

The Region of Peel Official Plan (2016 Consolidation) provides the policy framework for land use planning matters related to growth and development, environmental protection, and resource conservation and use. The policies contained in the Regional Official Plan (ROP) clarify the role and responsibilities of the Region, based on principles that Provincial policy will be implemented through both the ROP as well as local municipal official plans which provide additional detailed policy.

6.2.1 Region of Peel Official Plan

Section 1.3.5 of the ROP outlines the themes embedded throughout the plan including the over-arching theme of 'Sustainability' to provide a holistic approach of integrating environmental, social, economic, and cultural decision making as part of the land use planning context. This approach provides the ability of the ROP to address many areas, including specific issues "such as the impacts of climate change through mitigation and adaptation measures" (pg. 4). Under the environmental theme area, key priorities include reducing GHG emissions and other pollutants, promoting best practices in green development standards, energy and water efficient systems, and protecting the Region's ecosystems. The sustainable development framework enables an integrated approach for the formulation of policy

and reflects the vision of Council as part of the Region's Strategic Plan for a healthy, vibrant, and safe community for life.

The ROP contains a number of objectives and policies in many topic areas that can assist in mitigating and adapting to the changing climate including, but not limited to, the protection and enhancement of natural systems and water resources, resource management, growth management, transit and transportation systems. A detailed review of the existing ROP as well as proposed options to strengthen, enhance, and add policies as they relate to climate change resiliency can be found in Sections 7 and 8 of this Discussion Paper.

6.3 Local Municipal Policy Context

The municipalities of Mississauga, Brampton and Caledon each have local official plans and other supporting documents that govern land use planning and assist in mitigating and adapting to climate change at a local level. Climate change planning by the local municipalities continues to evolve in a manner tailored to the needs and priorities of each area. The following provides a brief summary of some land use related policies and other initiatives that the local municipalities have undertaken in support of mitigating and adapting to climate change at the local level.

6.3.1 City of Mississauga

The Mississauga Official Plan (2012) was adopted by Mississauga Council on September 29, 2010 and partially approved by the Region on September 22, 2011. The Mississauga Official Plan came into effect in 2012 when the Ontario Municipal Board partially approved it on November 14, 2012. The Office Consolidation (2017) includes all policies currently in effect, approved amendments to the Mississauga Official Plan, and the policies still under appeal before the Ontario Municipal Board. As per Table 6.4, Section 6.0 of the Official Plan, 'Value the Environment', has direct policies regarding climate change.

Table 6.4: City of Mississauga Official Plan (2017) Policies Related to Climate Change

Official Plan Section	Official Plan Policy
Section 6.1.7	Mississauga will work with other jurisdictions and levels of government, industries, businesses and the community to address climate change mitigation and adaptation, and to build a resilient city.
Section 6.1.11	Mississauga will consider the impacts of climate change that may increase risks to the city. Mississauga will develop policies on climate change that will: a. promote development and land use patterns that conserve and enhance biodiversity and consider the impacts of a changing climate; b. promote and protect green infrastructure; and c. minimize adverse impacts from a changing climate and consider the ecological benefits provided by nature.
Section 6.1.12	Mississauga will consider the potential impacts of climate change that may increase the risk associated with natural hazard lands.

Section 6.2 of the Official Plan, 'Living Green' provides policies related to promoting sustainable development techniques to integrate design with mitigating climate change impacts. These include, but not limited to, striving to be a leader in sustainable development, encouraging decreasing pollutant discharge, increasing urban forest canopy cover, managing stormwater discharge, encouraging green development technologies, and retrofitting existing buildings. Other sections of the Plan address other areas of climate change and the reduction of GHG emissions through intensification, enhancing transportation/transit, preserving natural heritage systems, and encouraging new development to incorporate green development standards (e.g. LEED®) to improve environmental sustainability.

In addition to the Official Plan, the City of Mississauga has developed and implemented the *Green Development Standards* (2012), which encourages applicants to incorporate sustainable design elements into proposed developments as part of new application submissions to a minimum 'Stage One Standard' requirement. This stage includes guidelines regarding low-impact development and stormwater retention, landscaping, pedestrian and cycling infrastructure, and exterior building design. The City also encourages applicants to pursue higher levels of on-site sustainability beyond the 'Stage One Standard' through the achievement of LEED® Silver or higher certification.

6.3.2 City of Brampton

The City of Brampton Official Plan (2006) was approved in part by the Ontario Municipal Board in October 2008, with a number of resolutions since that time. The Official Plan promotes a sustainable approach, and recognition of the interrelationships between the environment, social, economic and cultural resources. As reflected in Table 6.5, key objectives of the Official Plan include:

Table 6.5: City of Brampton Official Plan (2006) Policies Related to Climate Change

Official Plan Section	Official Plan Policy
Section 2.1	a) Maximize the City's strategic position within the GTAH by developing, managing and enhancing our environmental, cultural, social and economic links with the balance of the GTAH including the development of sustainable infrastructure and a multi-modal transportation system of transit, roads and pathways; b) Conserve and protect the City's natural heritage system and quality of life through sustainable development practices, sound natural hazard management, and a systems-based ecosystem approach to land use planning and development; and c) Fostering a culture of conservation to address water and energy conservation, air quality protection and waste management that will assist to mitigate and adapt to climate change.

Section 3.0 of the Official Plan, 'Sustainable City Concept', recognizes that the foundation of the Official Plan is sustainable development which promotes a balance between economic and community needs as well as environmental and cultural concerns. This includes the Sustainable Planning Framework, which

provides a holistic approach to land use planning and addresses sustainable development through different areas including residential, economic, transportation, natural heritage and the environment, recreation, infrastructure, cultural heritage urban design, and financial considerations. This section also includes policies related to compact and efficient development including growth management (built boundary), major transit areas, intensification corridors, employment areas, and the open and natural heritage system. Other parts of the Official Plan address areas of climate change and the reduction of GHG emissions through enhancing transportation/transit, improving air quality, conserving energy and water, and linking public health and safety.

In addition to the Official Plan, the City of Brampton (in partnership with the City of Vaughan and Town of Richmond Hill) has developed and implemented the *Sustainable Community Development Guidelines* in 2013, which measures the performance of environmental sustainability as part of new development application submissions including block plans, draft plans of subdivision, and site plans. These guidelines provide coordinated metrics and allocate points in various categories including the built environment, natural environment, green infrastructure, and building structures which are used to assess an application's ability to meet sustainable design thresholds and targets established by the municipalities as part of the development approvals process.

6.3.3 Town of Caledon

The Town of Caledon Official Plan (2016 Consolidation) recognizes climate change as a significant challenge and includes a number of objectives and policies in Section 3.1 'Sustainability' to address how the Town will meet these challenges, including those listed in Table 6.6.

Table 6.6: Town of Caledon Official Plan (2016 Consolidation) Policies Related to Climate Change

Official Plan Section	Official Plan Policy
Section 3.1.3.8	Climate change is considered to be one of the most significant challenges facing human society today. Although climate change is global in scale, the Town of Caledon can and should pursue practical and innovative climate change mitigation and adaptation measures within the context of the Town's local land use planning and development approvals functions. Caledon's extensive protected Natural Heritage Systems perform a vital role within the Region of Peel and the Greater Toronto Area, acting as a major carbon sink and moderating extremes in rainfall events and temperatures. Caledon's healthy, connected ecosystems are also more resilient and adaptable to the impacts of climate change. The Town policy approaches to land use planning, energy consumption, transportation and infrastructure systems and the management and wise use of natural resources can all contribute to climate change mitigation and adaptation. The following policies supplement the other policies of this Plan that have positive impacts with respect to climate change.

Sections 3.1.3.1 to 3.1.13.2 of the Official Plan provides further policies related to promoting an integrated approach to sustainable development which can mitigate and adapt to climate change challenges. These include, but not limited to, guiding decision-making through economic, environmental and social/cultural pillars, sustainable patterns of development and design, conserving energy and water, promotion of alternative/renewable energy systems, improving air quality, and environmental/ecosystem management. Other sections of the Plan address other areas of climate change and the reduction of GHG emissions through growth management/compact development, enhancing transportation/transit, preserving natural heritage systems, innovating agricultural stewardship, promoting health and well-being, and resource management to improve overall sustainability.

In addition to the Official Plan, the Town of Caledon's *Green Development Program* is a voluntary and flexible program which provides development charge discounts for new commercial and industrial buildings that integrate green technologies (e.g. solar or innovative stormwater management systems) and/or receive third-party sustainable building certification (e.g. LEED® Certified or higher).

6.4 Conservation Authority Context

In Ontario, Conservation Authorities are responsible for conserving, restoring, and managing natural resources on a watershed level within their respective jurisdictions. Conservation Authorities are governed by the *Conservation Authorities Act (1990)*, which includes flood and erosion control, clean water protection, watershed studies, stewardship/conservation, and overseeing development or alterations within Regulated Areas (e.g. floodplains, valley lands, wetlands, watercourses). With a mandate to protect and enhance the natural environment at a watershed scale, Conservation Authorities play an important role in supporting municipalities increase climate change resiliency.

Conservation Authorities also prepare watershed and sub-watershed plans that inform development within the conservation authority regulated areas and guides the Region and its local municipalities as they update their official plan policies and practices for environmental stewardship. Watershed plans have been prepared for all four of the major watersheds that cross through Peel Region. In addition to watershed plans, the Conservation Authorities undertake monitoring to evaluate the health of the watershed and sub-watershed, therefore evaluating the effectiveness of existing policies and as a basis to make recommendations on new policies. New policy direction on water resources and the renewed emphasis and guidance regarding watershed planning will be the basis for ongoing work by the Conservation Authorities to update the next generation of watershed plans for the Region in collaboration with local municipalities and other stakeholders, agencies and partners.

6.4.1 Toronto and Region Conservation Authority

Within the Region of Peel, the Toronto the Region Conservation Authority (TRCA) provides a number of environmental related services, including those related to land use planning through conservation efforts and development applications affecting Regulated Areas. In addition, the TRCA works in partnership with the Region of Peel to implement the protection and enhancement of natural areas through the Humber River, Mimico Creek, and Etobicoke Creek watersheds.

The TRCA's Strategic Plan, *Building The Living City®* (2013), provides strategic direction between the years 2013–2022 and recognizes "…that climate and weather patterns in the Toronto region will undergo significant change despite current efforts to control and reduce the human causes of global warming" (p. 13). A number of actions are identified in the Plan including the evaluation of the impacts of climate change and supporting environmental management involving the areas of water resources (low-impact development, flooding, stormwater management, and source water) and urban development (research, public and private partnerships, monitoring, and data analysis).

The TRCA's *Living City Policies* (2014) is a leading standard in conservation authority guidance for setting out the principles, goals, objectives and policies for its roles and responsibilities for as part of the planning and development approvals process. This document highlights the TRCA's commitment to a systems approach to managing watersheds within their jurisdiction.

The TRCA's *Terrestrial Natural Heritage System Strategy* (2007) provides an extensive inventory of natural heritage features and animal species which connect to the larger surrounding ecosystem. Based on evidence, this can be used to assist in identifying areas which require a healthy functioning ecosystem and set priorities for protection and restoration, as well as inform planning and development decisions that protect important natural features and functions.

The TRCA's *The Living City® Report Card 2016: A Progress Report on Environmental Sustainability in the Toronto Region* (2016) which provides an update on the progress on both short and long-term environmental targets across the Toronto region based on six themes of carbon, air, water, waste, land use, and biodiversity. This report provides an update from the first report released in 2011, and assesses areas in which success has been achieved and other areas where improvement is needed in order to reduce regional greenhouse gas emissions and address climate change.

In addition, the TRCA has a number of supporting programs guiding environmental action including, but not limited to, the *Humber River Watershed Plan – Pathways to a Healthy Humber*, *Etobicoke-Mimico Watershed Plan*, *Getting to Carbon Neutral: A Guide for Canadian Municipalities*, *Sustainable Neighbourhood Retrofit Action Plan*, *Sustainable Technologies Evaluation Program*, *Partners in Project Green*, and *Living City Campus*.

6.4.2 Credit Valley Conservation Authority

Within the Region of Peel, the Credit Valley Conservation Authority (CVC) provides a number of environmental related services, including those related to land use planning through conservation efforts and development applications affecting Regulated Areas. In addition, the CVC works in partnership with the Region of Peel to implement the protection and enhancement of natural areas including the larger Credit River watershed, and a number of smaller watersheds.

The CVC's Strategic Plan, *Our Future to Shape* (2014), provides strategic direction between the years 2015–2019 and specifically recognizes that climate change is of significant concern. Under Goal One 'Plan for an Environmentally Sustainable Future', the Plan lists a number of outcomes and directions to

take in order to evaluate the impact of climate change and support environmental management through the watershed, sub-watershed, and neighbourhood levels.

The CVC's *Credit River Watershed Natural Heritage System Strategy* (2015) is intended to serve multiple purposes including, but not limited to, the provision of an integrated system of terrestrial and aquatic features and functions leading to better management of the watershed's natural resources. This supports the CVC's Strategic Plan in addition to a number of other watershed management programs, as well as providing partners, including municipalities, with a science-based natural heritage system based on ecological and hydrological principles within a watershed ecosystem context.

The CVC, in coordination with the TRCA, have also developed a series of new guidance documents to assist municipalities and private landowners with implementing green infrastructure and low impact development (LID) best management practices on their properties. Updates by Province on its stormwater management guidance provide better support for the use and implementation of green infrastructure. The CVC and TRCA's new LID guidance material assist in the implementation of green infrastructure to support city-building objectives including environmental sustainability.

The CVC, in partnership with the Region of Peel, is also leading the Region's contribution to the *Municipal Natural Capital Initiative*, which along with other Canadian municipalities, is assessing the opportunities and benefits of incorporating natural assets (e.g. wetlands) that can offset traditional grey infrastructure (e.g. stormwater management ponds). The increased intensity from storms and frequency of flooding due to the changing climate places significant stress on traditional municipal infrastructure and budgets; natural assets provide an opportunity to conserve existing natural features and improve infrastructure resiliency. This research is reviewing two areas including Fletcher's Creek and the East Credit River, which will inform the viability and applicability of the concept to other areas in the Region.

In addition, the CVC has a number of supporting programs guiding environmental action including, but not limited to, various Credit River watershed and sub-watershed plans, the *Fletchers Creek Sustainable Neighbourhood Action Plan*, *Green Cities Program*, *Grassland Bird Recovery Program*, tree planting and habitat restoration services, and countryside stewardship.

6.4.3 Conservation Halton

Within the Region of Peel, Conservation Halton (CH) provides a number of environmental related services, including those related to land use planning through conservation efforts and development applications affecting Regulated Areas. In addition, the CH works in partnership with the Region of Peel to implement the protection and enhancement of natural areas in a small geographical area along the Region's western municipal boundary.

The CH's Strategic Plan, *Metamorphosis* (2016), provides strategic direction to the year 2020 and recognizes the importance of healthy watersheds and resilient natural systems in responding to the impacts of climate change. Key objectives and strategies include the collaboration with municipalities to develop innovative climate change mitigation and adaptation programs to reduce the impact of climate change on the watershed.

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7. Region of Peel Official Plan – Policy Scan and Analysis

Global changes to the climate from GHG emissions will have local impacts in Peel Region. A review of the existing ROP provides a foundation to understand what policies currently exist and which need to be modified, strengthened or added in order to reduce GHG emissions and build more resilient communities.

7.1 Review of Climate Change Policies in the Region of Peel Official Plan

A number of policies addressing the areas of sustainability, energy conservation, and energy efficiency were included in Regional Official Plan Amendment (ROPA) 20, adopted by Regional Council and approved by the Province in May 2009. ROPA 20 contained specific policies and actions that addressed the impacts of climate change prevalent at that time. Since the approval of ROPA 20, climate science, regulations, guidelines, and policies have evolved calling for additional and more specific action to mitigate and adapt to climate change through land use planning.

7.1.1 Existing Climate Change Related Policies in the Region of Peel Official Plan

A review of the existing policies in the ROP as they relate to climate change is found in Table 7.1. These policies have been grouped into general categories as discussed in Chapter 3 (and expanded upon) that are considered key theme areas to building resilient communities and infrastructure that are adaptive to the impacts of a changing climate or that contribute to reducing GHG emissions.

Table 7.1: Summary of Existing ROP Policies Related to Climate Change

Theme Area	Summary of ROP Policies Related to Climate Change
Growth Management / Complete Communities	**Urban System** • Objectives and policies support intensified and compact forms and a mix of land uses in appropriate areas that efficiently use land, services, infrastructure, and densities which are pedestrian-friendly and transit-supportive. **Urban Growth Centres and Regional Intensification Corridors** • Objectives and policies support urban growth centres (with minimum gross density targets) and Regional intensification corridors that are linked by public transit, and include a range and mix of high intensity compact forms. **The Rural System** • Objectives and policies conserve environmental, agricultural and natural resources, direct growth in the Rural System to rural settlements consistent with the policies of the Province and municipal official plans, and achieve sustainable development within the Rural System.

Theme Area	Summary of ROP Policies Related to Climate Change
	Rural Service Centres • Objectives and policies focus growth outside the Urban System within Rural Service Centres, through the design and effective use of the built environment. **Growth Management** • Objectives and policies optimize use of the existing land supply by directing a significant portion of growth to the built-up areas through intensification, establishing intensification and greenfield density targets, and planning for complete communities that are compact, well-designed, and transit-oriented, with a diverse mix of land uses. **Employment** • Objectives and policies contribute to complete communities, promote sustainable development of employment areas, and concentrate higher density employment uses in appropriate locations such as urban growth centres, the Regional Intensification Corridor, mobility hubs, nodes and corridors and in other areas served by transit. **Housing** • Objectives and policies provide for an appropriate range and mix of housing types, densities, sizes and tenure to meet the projected requirements and housing needs, as well as promoting energy conservation and energy efficient housing in existing and new residential development.
Transportation / Transit	**Transportation System in Peel** • Objectives and policies develop and promote a sustainable, safe, efficient, effective and integrated multi-modal transportation system and to promote and encourage the increased use of public transit and other sustainable modes of transportation. **Inter and Intra-Regional Transit Network** • Objectives and policies support and encourage a higher use of public transit, transit-supportive development densities and patterns, particularly along rapid transit corridors and at designated nodes, and an effective, efficient, sustainable transit network. **Transportation Demand Management** • Objectives and policies reduce auto dependency by promoting sustainable modes of transportation. **Active Transportation** • Objectives and policies increase the share of trips made using active transportation including an integrated network of bicycle and

Theme Area	Summary of ROP Policies Related to Climate Change
	pedestrian facilities. **Energy Resources / Environmental Impact** • Objectives and policies encourage the increased use of electric, hybrid and alternative fuel vehicles for Regional operations, improve air quality and reduce the greenhouse gas emissions produced by vehicles, and promote a transportation system that encourages energy conservation.
Energy	**Energy Resources** • Objectives and policies conserve energy through efficient land use and development patterns, efficient transportation, alternative and renewable energy systems, and healthier communities by reducing GHG emissions. **Waste Management** • Objectives and policies recognize the need for the sustainable use of earth's resources, integrate the principle of reduction, reuse, and recycling into decision making, and maximize recovery of resources prior to landfill. **Water / Wastewater** • Objectives and policies promote water conservation measures and stormwater best management practices to support energy conservation.
Air Quality	**Air Quality** • Objectives and policies create healthier and sustainable communities by improving local air quality and reducing greenhouse gas emissions.
Built Environment and Infrastructure	**Growth Management / Employment Areas / Housing / Transportation / Water and Wastewater Services** • Objectives and policies optimize the use of the existing and planned infrastructure and services to support growth in an efficient, cost-effective and compact form. • Specific to transportation systems, develop and utilize asset management systems.
Natural Heritage Systems	**Greenlands System** • Objectives and policies identify, protect, restore and rehabilitate linked ecosystems to strengthen integrity and long-term viability of the natural environment, including identified environmental features and core features based on established criteria and thresholds. **Water Resources** • Objectives and policies require collaboration with local municipalities, Provincial ministries, and conservation authorities promoting watershed

Theme Area	Summary of ROP Policies Related to Climate Change
	and sub-watershed planning, as well as protecting, maintaining, and enhancing groundwater and potable water resources.
Agriculture	• Objectives and policies include protecting the Prime Agricultural Area for economic viability, incompatible uses, increasing local food supply, as well as supporting conservation measures and sustainable farming practices, promoting local markets, and encouraging practices that protect and enhance the natural environment.
Public Health	**Growth Management** • Policies to minimize adverse environmental and human health impacts caused by transportation and support transportation alternatives that foster improved health and well-being. **Public Health and the Built Environment** • Objectives and policies that relate to the health and the built environment and age-friendly planning, including requiring that health assessments as part of the development application process, aging in the community, accessibility including public facilities, and environments for active aging.

7.1.2 Opportunities to Advance Policies Related to Climate Change in the Region of Peel Official Plan

As direction and guidance on climate change continues to take shape at the Federal and Provincial levels, it will be municipalities who will be responsible for implementing and applying the policies at a local level to address climate change. Specifically, the Province's recent climate change policy updates to the *Planning Act, Provincial Policy Statement*, and the Co-ordinated Land Use Plans makes it clear that land use planning in Ontario is required to acknowledge and directly consider the impacts of climate change throughout the planning process. As such, this new emphasis on climate change needs to be reflected in the ROP to ensure consistency and conformity with Provincial requirements.

Based on the review of existing policies in the ROP as they relate to climate change, it is evident that the ROP covers a large range of topic areas that assists in the Region's goal of lowering GHG emissions and adapting to potential extreme weather events in the Region through land use planning. To ensure conformity with recent amendments to Provincial policy, the ROP will need to be updated to ensure consistency with an integrated climate change framework.

In addition to ensuring Provincial conformity, this review will also provide opportunities to further strengthen and enhance policies in the ROP to specifically address as well as mitigate and adapt to the anticipated impacts of climate change in Peel. The Region of Peel and its partners have collaborated on a number of initiatives, strategies, studies and approaches which support climate change planning; these along with emerging approaches and best practices could be used as a basis to address Regional climate change policy needs and priorities.

8. Policy Options and Recommendations

Through the *Climate Change Action Plan* (2016) and Co-ordinated Land Use Plans Review, the Province has set a pathway for how municipalities can assist in lowering GHG emissions and build more resilient communities.

8.1 Approach to Integrating Climate Change Related Land Use Planning Policies

International and Federal frameworks have shaped climate change policy direction, and Provincial legislation and policy has further scoped the extent of climate change policy as it relates to land use planning. As previously discussed, Sections 1 and 3 of the *Provincial Policy Statement*, *2014*, and Sections 4.2.9 and 4.2.10 of the *Growth Plan for the Greater Golden Horseshoe* (2017) contain the primary policies which are the key conformity requirements as they relate to climate change.

A review of the ROP's existing policies indicate that there are many policies already in place which deal with different aspects of climate change, such as intensification and density policies, sustainable transportation policies, natural heritage and water systems policies, and energy conservation policies. However, there is no general guiding policy for climate change planning in the ROP and no clear linkage across all of these theme areas and existing policies as to how they contribute to addressing the impacts of climate change.

Land use planning responsibilities in Peel are shared between the Region and local municipalities. Key considerations of revising or adopting new policies will need to consider the ROP's role in providing high level and strategic policy direction to local municipalities while meeting Provincial level requirements. Table 8.1 provides a list of opportunities that address the risks and vulnerabilities identified in Section 3.0, conform to Provincial requirements in the *Provincial Policy Statement*, *2014* and *Growth Plan for the Greater Golden Horseshoe* (2017), and build on the opportunities in key policy theme areas already contained in the ROP. It is noted that an integrated approach will be required to promote the inclusion amongst all partners for the development of integrated solutions.

The ROP will need to be updated to reflect the climate change policies options discussed to ensure conformity with Provincial policy, as well as Regional interests to reduce GHG emissions, increase resilience, and adapt to the expected impacts of climate change.

Table 8.1: Climate Change Policy Options for the Regional Official Plan

#	Climate Change Policy Options for the Regional Official Plan
1.	Indicate how land use planning is clearly linked to climate change mitigation and adaptation, and include Regional policies at a strategic level that can enable local area municipalities to address climate change more readily in their official plans.
2.	Clearly describe how growth management and the support for complete communities, land use patterns, population and employment densities, compact form, and strategic growth areas minimize the negative impacts of climate change and GHG emissions.
3.	Clearly describe how the Region's transportation system, including transit, active transportation and good movement, can support growth management objectives, decrease congestion and contribute to lowering GHG emissions.
4.	Support the use of zero or low emission (plug-in or hybrid) vehicles to reduce GHG emissions.
5.	Identify the risks to infrastructure and promote infrastructure planning, including stormwater management that addresses vulnerabilities by undertaking risk and vulnerability assessments and encouraging the incorporation of green infrastructure and low impact development.
6.	Promote the continued protection of natural heritage and water systems in the Region as a basis for informing land use planning decisions, including the importance of watershed scale planning to improve resilience to predicted weather events.
7.	Continue the protection of agricultural lands for its role in storing carbon as well as promote the importance of locally produced products and the agri-food sector for food security.
8.	Support and strengthen a 'culture of conservation' through water, energy and waste systems.
9.	Support larger scale community energy planning and encourage opportunities for renewable and alternative energy systems and district energy.
10.	Support the establishment of corporate and community greenhouse gas (GHG) emissions targets to reduce GHG emissions in the Region to improve air quality and address climate change.
11.	Incorporate policies to reduce urban heat island impacts to reduce temperatures and improve public health.
12.	Consider the inclusion of supportive policy for using sustainability guideline tools and provide direction to local municipalities to establish land use policies that encourage the use of adaptive features such as green roofs, cool roofs, renewable energy systems, large scale district energy systems, net-zero ready building design, and water and energy efficient designs, as part of the development application process.
13.	Consider including a policy to support work on climate change decision-support tools including collaborating further with Regional partners to build information and predict likely impacts for Peel (e.g. GHG emission reduction plans, risk and vulnerability assessments, feasibility of renewable and alternative energy systems and mapping, scenario planning, and projections).
14.	Ensuring that new or amended policies include appropriate definitions that are consistent with Provincial policy.

8.2 Where Climate Change Policies Should Be Inserted in the Regional Official Plan

As previously discussed, climate change is a far-reaching issue and encompasses a number of theme areas. As such, there is no one specific area of the ROP that can be updated to address the issue of climate change in its entirety and multiple sections of the plan may need to include new or updated policies within:

- Chapter 1: Introduction;
- Chapter 2: The Natural Environment;
- Chapter 3: Resources;
- Chapter 5: Regional Structure;
- Chapter 6: Regional Services; and
- Chapter 7: Implementation.

In responding to the recent changes to the *Planning Act*, and policy direction in the *Provincial Policy Statement, 2014* and *Growth Plan for the Greater Golden Horseshoe* (2017), it is proposed that the Region consider adding a new policy section to the ROP to guide and support climate change planning activities in the region and as a basis for connecting the related climate change policies that will be needed in key theme areas throughout the Plan. The new policy section will identify goals, objectives and actions to mitigate GHG emissions, promote resiliency, and adapt the region to a changing climate. It will need to acknowledge and be flexible to the emerging science and planning for climate change, establish and respect roles, and set a framework for undertaking further studies, strategies, plans and actions in collaboration and coordination with the local municipalities, agencies and other levels of government.

The Growth Plan's direction to municipalities regarding climate change is embedded throughout its policies in key theme areas in growth management, transportation, infrastructure, natural heritage, natural hazards, agriculture, water resources, energy and waste management. The direction includes both mandatory and encouragement policies with emphasis on mitigation and adaptation planning, the development of strategies, establishment of greenhouse gas inventories, target setting for emissions reduction, monitoring and reporting. Provincial guidance is under development to support the implementation of policy direction related to the completion of community-wide and municipal corporate greenhouse gas inventories, target setting, and the development of strategies to reduce emissions. An upfront policy section on climate change will need to take these directions into consideration along with the current and ongoing work conducted within the Region and with partners through the Peel Climate Change Partnership.

It is proposed that the new section be added to the beginning of Section 2.2 'Large Environmental Systems' as the climate system is arguably the largest of the environmental systems in Peel, with ties to the built environment, the natural environment and the Region's protected landscapes. Potential policy options for the new climate change section include:

- A preamble introduction to climate change indicating how Regional and local land use planning can help address impacts and begin to shift the region towards a more resilient and low carbon community;
- Broad goals and objectives for climate change reflecting provincial policy direction and regional needs;
- Policy direction to undertake climate change mitigation and adaptation planning through strategies, plans and actions in accordance with accepted frameworks and provincial guidance in collaboration with municipal and agency partners;
- Policy direction to undertake GHG emissions inventories and establish municipal interim and long-term GHG emissions reduction targets;
- Policy direction to undertake community sector and infrastructure risk and vulnerability assessments to provide a foundation for adaptation actions;
- Policy direction to support climate change planning through collaborative partnerships with all levels of government, as well as public and private organizations ; and
- Policy direction for monitoring and reporting on climate change objectives in accordance with the performance measurement and monitoring policies of the Plan.

The following section and sub-sections of the Discussion Paper identify climate change policies options related to key theme areas in the ROP that are directly aligned to the achievement of climate change objectives.

8.3 Climate Change Policies Related to Key Theme Areas in the ROP

Through a systematic review of the risk and vulnerabilities to climate change in Peel, methods to address climate change through land use planning, updated policy direction in the Coordinated Land Use Planning process, as well as the structure of the current ROP, key themes areas previously identified continue to be appropriate locations to add and/or strengthen climate change policies in the ROP. These key theme areas serve as a basis of identifying the direction of ROP policy as it relates to the mitigation and adaptation of climate change through land use planning.

8.3.1 Growth Management

Growth Management is fundamental to protecting the Region's environmental and agricultural resources, utilizing existing and planned infrastructure efficiently, and providing densities that support complete mixed use communities with transit. The urban form, as well as transportation, plays a key role in influencing Ontario's GHG emission profile.[17] Increasing densities and supporting the development of compact, mixed-use, transit supportive communities can reduce urban sprawl, improve air quality and reduce transportation related GHG emissions.[17] Recent updates to the *Provincial Policy Statement, 2014* and *Growth Plan for the Greater Golden Horseshoe* (2017) have included policy direction to ensure land use patterns are planned with densities and a mix of land uses that minimize

[17] Ontario Climate Consortium & Toronto and Region Conservation, DeMarco Allan LLP, Ontario Centre for Climate Impacts and Adaptation Resources, and York University. (2016). *Research and Information Gathering on Climate Change Mitigation and Adaptation*

the impacts to air quality, address climate change, and promote energy efficiency. Specific changes and new requirements related to municipal growth in the Growth Plan (2017) includes furthering the aim of developing complete communities, allocating population and employment forecasts, increasing the density and intensification targets, designating employment lands and major transit station areas, and expanding requirements for municipal comprehensive reviews.

The Region's Growth Management Committee (GMC) was established in 2013 to address the key issues associated with managing growth in Peel, including addressing the future funding of infrastructure. The establishment of the GMC and its approach to growth management has been implemented through formal working groups established with local municipal staff and the development industry. The growth management policy review is one of the components to the Peel 2041 review process and reflects a number of the municipal comprehensive review elements related to growth management including the allocation of growth to the local municipalities, establishing density and intensification targets, revising the planning horizon, as well as identifying employment areas, strategic growth areas and major transit station areas. Policy options that may be considered in the ROP include:

- Allocating population and employment growth to 2041 based on land budget methodology that reflects industry best practices and compliance with Growth Plan policies to develop complete, compact, and mix-use communities;
- Updating growth allocations to reflect increased intensification and density targets to build more compact communities, promote transit use, and utilize existing infrastructure;
- Protecting employment lands strategically located adjacent to or in the vicinity of the future goods movement transportation infrastructure to decrease travel times and GHG emissions; and
- Conceptually identifying major transit station areas to achieve minimum gross density targets set out in the Growth Plan (2017) to support increased transit use, sustainable transportation options, and active transportation infrastructure to facilitate the reduction of GHG emissions.

The growth management review will comprehensively address provincial legislative changes in the *Provincial Policy Statement, 2014*, and *Growth Plan for the Greater Golden Horseshoe* (2017). Supporting studies on key themes and proposed policy direction are being developed to facilitate consultation on growth management options for the ROP.

8.3.2 Transportation

Addressing climate change through transportation is a key area that can assist lowering GHG emissions, improve the health of citizens, and maintain economic competitiveness in Peel. As identified in the *2006 Community Greenhouse Gas and Criteria Air Contaminant Inventory* (2014), the transportation sector (28%) is the second largest source (behind building/stationary sources) of GHG emissions in the Region. The integration of transportation planning with climate change will help reduce the vulnerability and risks of respiratory and cardiovascular conditions associated with poor air quality by decreasing the dependence on the automobile and increasing the share of active modes of transportation and transit options.

Recent changes to the *Provincial Policy Statement, 2014*, and *Growth Plan for the Greater Golden Horseshoe* (2017) integrates the improvement of air quality and addressing climate change with the planning for transportation systems through compact mixed-use development, planning for goods movement, establishing major transit station areas, supporting planned transit and active transportation, and emphasizing complete communities with a sustainable approach to infrastructure planning. The *Climate Change Action Plan* (2016) also supports decreasing requirements for minimum parking standards, which in strategic areas and along transit corridors, can encourage greater use of transit, the building of bike lanes, allow for larger sidewalks, and enhance urban tree canopy cover. Although parking standards are generally governed through local municipal zoning by-laws, opportunities exist at the Regional level to encourage local municipalities to review minimum parking standards, especially in key areas to facilitate a modal shift in transportation. Provincial policy direction for transportation planning provides opportunities to comprehensively and fundamentally shift from being automobile dependent to more sustainable modes of transportation (e.g. transit, cycling, walking) through improvements to the Region's overall transportation network.

The ROP currently provides a strong foundation of sustainable transportation policy, and the Region has completed a number of initiatives to guide transportation planning including the *Active Transportation Plan* (2011), *Long Range Transportation Plan* (2012), *Goods Movement Strategic Plan (2017-2021)*, and ongoing Transportation Demand Management. The *Long Range Transportation Plan* is currently in the process of being updated, which includes a *Sustainable Transportation Strategy* component focusing on managing transportation demand by encouraging citizens to walk, cycle, carpool and take transit to meet the goal of a 50% sustainable mode share by 2041. Municipalities will need to focus on improving public health, moving goods efficiently, promoting transit and active transportation, shifting modes of transportation, and providing infrastructure to address the impacts of climate change.

The climate change aspects of transportation planning are an important consideration in the Regional Official Plan Review and are being addressed through the Transportation Policy Review component of Peel 2041. The review will comprehensively address provincial legislative changes related to transportation planning in the *Provincial Policy Statement, 2014*, and *Growth Plan for the Greater Golden Horseshoe* (2017), as well as other key transportation related Provincial policy documents. A discussion paper on key themes and proposed policy direction are being developed to facilitate consultation on transportation policy options for the ROP and will be accompanied by updates to the Region's *Long Range Transportation Plan*.

8.3.3 Energy

Communities account for almost 60% of Canada's energy consumption, and it is anticipated that if no changes are made, community energy use could increase by about 75% by 2050 when compared with 2006, and would significantly affect the ability to meet GHG reduction targets.[18] Conserving resources, which include energy and water, as well as reducing waste, can have a substantial impact on municipal efforts in addressing climate change. In addition to reducing GHG emissions, a 'culture of conservation' and energy planning can have co-benefits including the creation of economic opportunities (new

[18] Council of Energy Ministers. (2009). *Integrated Community Energy Solutions*

markets, jobs, and investment in emerging technologies), improving the physical and social health of citizens (better air quality, active transportation infrastructure, access for the elderly), and providing a reliable municipal energy system (diversity of energy sources, increased resilience to extreme weather events).[19] The topic of energy can be used as both mitigation (e.g. reducing greenhouse gas emissions associated with energy consumption) and adaptation (e.g. ensuring local power systems are resilient to large scale outages) to address the impacts of climate change. In 2017, the Ministry of Energy released the *Long-Term Energy Plan, Delivering Fairness and Choice* (LTEP), which provides a roadmap for the province's energy system for the next 20 years. Specific to climate change planning and land use planning, considerations should be given to the electrification of transportation (including smart charging and electrified transit), district energy and cooling, and near and net-zero carbon emission buildings.

Recent updates to the *Provincial Policy Statement, 2014*, and *Growth Plan for the Greater Golden Horseshoe* (2017) have included policy direction to develop compact communities based on increased densities and a mix of land uses that include the promotion of energy efficiency. As well, there are policies related to conserving energy and water use, and reducing the amount of waste generated. Provincial policy direction for a 'culture of conservation' provides opportunities for municipalities to play a key role in integrated energy planning in Ontario, which can lower municipal spending on energy, decrease GHG emissions, and improve resilience from the predicted impacts of a changing climate. Regarding energy and energy conservation, Provincial policy direction includes the identification of opportunities for energy efficiency and demand management, as well as consideration of district energy production, renewable energy systems, alternative energy systems, as well as community, municipal and regional energy planning. Provincial guidance is currently under development to support the completion of community-wide and municipal corporate greenhouse gas inventories and community emission reduction plans. Policy options that may be considered in the ROP include:

- Working collaboratively with partners to support community and regional energy planning;
- Promoting the integration of energy planning and design in the development patterns of communities;
- Promoting and supporting the feasibility and implementation of district energy systems for the heating and cooling needs of communities;
- Promoting and supporting opportunities to incorporate renewable energy (e.g. solar, wind and heat) or alternative energy systems in new development;
- Promoting the development of sustainable development guidelines for district energy, solar energy, and energy efficiency in new development in collaboration with the local municipalities (e.g. green/white roofs, low-impact development stormwater management, green infrastructure); and
- Promoting the transition to low carbon vehicles, including hybrid and/or electrical vehicles, and supporting the development of associated infrastructure.

[19] Quality Urban Energy Systems of Tomorrow. (2013). *Advancing Integrated Community Energy Planning in Ontario: A Primer*

8.3.4 Infrastructure

As identified in the *Growth Plan for the Greater Golden Horseshoe* (2017), demand for major infrastructure investments is being driven by population growth and the need to renew aging infrastructure, requiring the need to optimize existing assets and make the best use of limited resources. Climate change poses a serious challenge for maintaining existing and planning for new infrastructure.

Building on the *Infrastructure for Jobs and Prosperity Act, 2015*, the Province released O. Reg. 588/17 *Asset Management Planning for Municipal Infrastructure* in December 2017 which regulates asset management planning for municipal infrastructure. Municipalities are required to adopt a strategic asset management policy by January 1, 2019, which must be aligned with the Province's land use planning framework. Considerations for the asset management plan include actions required to address the risks and vulnerabilities to climate change (including operations, level of service, and lifecycle), greenhouse gas emission reduction goals and targets, and disaster planning funding.

The *Provincial Policy Statement* (2014) requires infrastructure, public facilities, and electrical generation facilities, to consider the impacts of climate change when accommodating projected needs including the promotion of green infrastructure and low impact development for stormwater management where possible. Updates to the *Growth Plan for the Greater Golden Horseshoe* (2017) provides a framework for municipalities to integrate land-use planning, the environment, and financial investments to economically deliver the efficient provision of infrastructure needs, decrease GHG emissions, and improve resilience from the predicted impacts of a changing climate. Policy direction includes the requirement to coordinate and integrate land-use planning, infrastructure planning, and infrastructure investment, supported by strategic studies including, but not limited to, master plans, asset management plans, watershed planning, and community energy plans. Municipalities are required to assess infrastructure risks and vulnerabilities, including those caused by the impacts of a changing climate, and identify actions and investments to address these challenges. This includes key infrastructure areas such as transportation, water and wastewater systems, stormwater management, and public service facilities (e.g. police and fire protection, health, and education services). Policy options that may be considered in the ROP include:

- Examining how Regional services and infrastructure can be designed, planned and adapted to reduce greenhouse gases and their vulnerability to a changing climate;
- Requiring risk and vulnerability assessments to identify risks and options for enhancing infrastructure resilience;
- Exploring opportunities to design and implement water and wastewater services to reduce greenhouse gas emissions in accordance with Provincial and Regional objectives;
- Providing direction to undertake watershed planning with objectives to provide guidance, recommendations and targets for water, wastewater, and stormwater masterplans;
- Supporting comprehensive stormwater management planning, including low impact development and green infrastructure, to increase community resiliency to extreme weather; and

- Considering the location and design of Regional human services facilities, including those related to communications, energy, and water infrastructure, to minimize vulnerabilities related to a changing climate.

8.3.5 Waste

Although waste is the second smallest GHG emissions sector in Canada, it is estimated that waste related GHG emissions, mainly from methane released from the decomposition of organic waste (e.g., food, wood waste) in landfills, have risen by approximately 19% since 1990.[20] There is recognition from the Province that sending valuable resources to landfills increases risks to both human and environmental health and that increasing diversion of waste from landfills is a critical to reducing emissions from waste. The Province's 2017 *Strategy for a Waste-Free Ontario: Building the Circular Economy* looks beyond the standard reducing, reusing and recycling processes, including the examination of the full lifecycle of products and packaging, to minimize the use of raw materials, energy and waste generated to address climate change.

As mentioned in Section 8.3.3 of the Discussion Paper, updates to the *Growth Plan for the Greater Golden Horseshoe* (2017) have included policy direction regarding the reduction of the amount of waste generated. Specifically, Provincial policy direction requires an comprehensive plan with integrated approaches to waste management that includes the reduction, reuse, recycling, composting, diversion, and disposal of residual waste, as well as the identification of opportunities for energy from waste where appropriate. Other considerations include building conservation and adaptive reuse, reuse and of recycling of construction materials, as well as the consideration of long-term waste management initiatives in regional planning, in collaboration with area municipalities. Policy options that may be considered in the ROP include:

- Supporting the full range of opportunities for the reduction, reuse, recycling, composting, diversion, and final disposal of waste;
- Encouraging the identification and implementation of energy from waste technologies (e.g. methane capture, gasification, anaerobic digestion) to recover resources from waste;
- Supporting the adaptive reuse of existing building stock and encourage the reuse /recycling of building materials in the development process; and
- Supporting the continuation of regional scale waste management initiatives, working collaboratively with partners.

8.3.6 Urban Heat Island

An Urban Heat Island (UHI) is caused by the ability of urban areas to absorb and amplify solar heat from concrete, asphalt and other dark coloured materials, and can be quite extreme even in the absence from the impacts of climate change.[21] This is further intensified by the modification of the physical and chemical properties of the atmosphere (smog), pollution emitted from road traffic, tall buildings and

[20] Environmental Commissioner of Ontario. (2016). *Facing Climate Change*

[21] Prairie Climate Centre. (2017). *Building a Climate Resilient City: The Built Environment*

narrow streets, and a decrease in vegetation and surface water.[22,23] The impacts of climate change is expected to increase the projected number of heat and extreme heat warnings in the Region which will magnify the UHI effect in urban areas. Municipal populations, especially children, seniors, and people with chronic illness, are at risk from discomfort, respiratory difficulties, exhaustion, heat stroke, or death.[22] Policy options and strategies that may be considered in the ROP to reduce UHI effects in the Region include:

- Encouraging the local municipalities to develop and implement UHI mitigation policies in their official plans to increase the reflectivity of surfaces in urban areas (e.g. green / blue / white roofs, urban tree canopy cover);
- Encouraging local municipalities to minimize the impacts of UHI from surface parking areas through the use of vegetation and light-coloured materials;
- Working collaboratively with partners to implement UHI mitigation in Regional infrastructure and facilities planning and design; and
- Encouraging and supporting programs to increase native vegetation and tree canopy cover in the Region, including the naturalization and planting of trees in urban areas, in support of the *Peel Urban Forest Strategy*.

8.3.7 Water Resources

The recent changes to the *Provincial Policy Statement, 2014*, *Growth Plan for the Greater Golden Horseshoe* (2017), and provincial Greenbelt Plans require a greater level of integration between planning for growth and the protection of the environment. The amendments to the Growth Plan have embedded the consideration of climate change throughout the Plan's themes including updated direction for the planning of water resources. The policies require identification and protection of water resource systems and natural heritage systems, and the integration of growth, land use, infrastructure, and watershed planning. Planning for water, wastewater and stormwater systems will be integrated and informed by watershed planning formally throughout the process and require consideration of the risk and vulnerability of infrastructure to climate changes.

Municipalities are now required to develop stormwater master plans and incorporate low impact development and green infrastructure approaches to stormwater management to protect water quantity and quality. Stormwater master plans will require the consideration of cumulative environmental impacts of stormwater from existing and planned development, including an assessment of how extreme weather events will exacerbate these impacts and appropriate adaptation strategies to manage impacts. Updated guidance is also provided to promote a culture of conservation through municipal planning to support conservation objectives related to water conservation.

There is already a strong foundation of watershed plans and studies in Peel that provide a basis to inform decisions, including recently completed watershed plans for all of the watersheds draining from the Oak Ridges Moraine. The Province is in the process of developing implementation guidance for

[22] Government of Canada. (2010). *The Urban Heat Island Effect: Causes, Health Impacts and Mitigation Strategies*
[23] Region of Peel. (2012). *Urban Heat Island Effect: Causes, Health Impacts and Mitigation Strategies*

watershed planning to support watershed and sub-watershed planning to implement the direction in the provincial land use planning framework and anticipates releasing a comprehensive watershed planning guidance document in 2018. Once guidance is finalized, the Region will be working with its partners to undertake and update studies, plans and mapping in conformity with the updated direction to ensure that planning decisions will be informed by appropriate studies throughout the development approval process.

The climate change aspects of planning for water resources are an important consideration in the Regional Official Plan Review and are being addressed through the Water Resource Policy Review component of Peel 2041. The review will comprehensively address provincial legislative changes related to water resources and planning, policy direction in the *Provincial Policy Statement, 2014* and the Growth Plan (2017). Discussion papers on Roles and Responsibilities, Policy Options and Source Water Protection have been developed to facilitate consultation on water resource policy options for the ROP.

8.3.8 Natural Hazards

Natural hazards associated with climate change and extreme weather is a recognized risk that requires a broad range of initiatives to be considered. Land use policy is an important tool to adapt communities to hazardous events and forms part of the prevention, preparedness, response and recovery framework for disaster management.[24] New policy direction in the *Provincial Policy Statement, 2014*, requires planning authorities to consider the potential impacts of climate change that may increase risk associated with natural hazards. The need to understand and address flooding hazards associated with climate change is important as extreme storm events are predicted to increase in severity and frequency over time. Considerations should extend to managing both riverine and overland flooding risk within and outside of regulatory flood plains.[25]

Provincial policy direction for watershed planning and stormwater management provides opportunities to understand and characterize flood risk comprehensively and generate recommendations on how potential flooding impacts may be managed and reduced. Policy and design best practices for flood resiliency and climate change for both riverine and overland flooding conditions are still emerging and require further investigation and guidance at various planning and program levels.[26] The potential for extreme heat, severe wind and ice storm damages also require consideration. Although land use planning tools can be beneficial, addressing climate related natural hazards requires integrated solutions that extend beyond planning to involve improvements in service delivery, infrastructure programming, *Ontario Building Code* standards, and sustainable community building practices. Policy options that may be considered in the ROP include:

[24] Bajracharya, B., Childs, I., & Hastings, P. (January 2011). *Climate change adaptation through land use planning and disaster management: Local government perspectives from Queensland* (Paper presented at the 17th Pacific Rim Real Estate Society Conference, Queensland, Australia)

[25] Toronto and Region Conservation Authority and Ontario Climate Consortium Secretariat. (2016). *Climate Change Vulnerabilities of Community Services and Assets in the Region of Peel. A Case Study in Port Credit*

[26] Intact Centre on Climate Adaptation, University of Waterloo (prepared for Standards Council of Canada). (2017). *Preventing Disaster Before it Strikes: Developing a Canadian Standard for New Flood-Resilient Residential Communities*

- Requiring watershed and sub-watershed studies and plans to specifically address climate change and extreme weather in the characterization of impacts and in recommendations regarding surface water, groundwater and flooding;
- Requiring the preparation of stormwater master plans jointly with local municipal partners and that stormwater master plans provide integrated solutions and coordination to address riverine and overland flooding issues;
- Requiring the implementation of low impact development and green infrastructure stormwater management practices in accordance with provincial requirements and guidelines;
- Requiring flood hazard mapping to be reviewed and updated in accordance with provincial requirements and guidelines;
- Providing direction for the Region to work jointly with the local municipalities and conservation authorities to identify the extent of areas vulnerable to overland flooding and develop solutions to improve the flood resilience of existing and new development;
- Encouraging and supporting the use of sustainable development guidelines tools by the local municipalities to promote sustainable development and building practices including objectives and metrics related to extreme weather and climate change adaptation; and
- Encouraging and supporting the use of new *Municipal Act* and *Planning Act* authorities and tools for climate change (e.g. Climate Change By-laws requiring green roofs and/or alternative building standards).

8.3.9 Natural Heritage

The natural heritage system of the Region is an important support component of our urban and rural communities and integral to the environmental sustainability of the Region. The natural heritage system could be adversely compromised by the impacts of climate change. Many uncertainties remain about the magnitude of climate change, and whether thresholds of habitat stability, suitability or species tolerances will be crossed. Much will depend on the resiliency of natural systems, that is, their adaptive capacity to cope with climate drivers that are expected to affect fundamental physical, biological and chemical processes which can affect the Region's biodiversity.

The natural heritage system in Peel will be impacted by climate change as Peel is likely to experience hotter summers, and warmer winters which could provide conditions for species migration including the introduction or expansion of invasive species. Conversely through their ecosystem services natural heritage systems can play an important role in ameliorating the effects of climate change, for example GHG emissions can be off-set by natural areas that not only generate oxygen but also act as carbon sinks.

A joint effort is required from the Region, partnering with local municipalities and conservation authorities to effectively address climate change impacts on our natural heritage system. One important mechanism is through the use of land use policy options in the ROP. Policy options that are contemplated in the ROP include:

- Requiring watershed and sub-watershed studies and plans to specifically address climate change and extreme weather in the characterization of impacts and in recommendations regarding terrestrial and aquatic ecosystems;
- Providing support for the identification, protection and rehabilitation of a regional natural heritage system;
- Providing policies that support natural heritage system planning at the local level;
- Maintaining, restoring, and improving the biodiversity and connectivity of natural features, and the long-term ecological function of natural heritage systems;
- Supporting the enhancement of the natural heritage system to recognize the importance of a diverse system to public health and community design;
- Providing direction for the Region to work jointly with the local municipalities and conservation authorities to improve urban tree cover by supporting strategies and plans to address urban heat island impacts and reduce stormwater runoff;
- Encouraging the enhancement of the urban forest through tree planting and restoration of public and private lands in the urban area; and
- Supporting programs to enhance tree canopy and diversity of tree species on regional properties and rights-of-way where feasible, taking into consideration the potential impact on trees and underground infrastructure.

Consultation on policy options for natural heritage will be addressed separately through the Natural Heritage Policy Review component of Peel 2041.

8.3.10 Agriculture

Peel's agricultural sector is part of a larger agricultural system extending throughout the Greater Golden Horseshoe and consists of both the agricultural land base needed to grow crops and raise livestock and the various farm operations, businesses, and infrastructure associated with the production, processing, distribution, marketing, and selling of farm products. These agricultural lands also assist in the capturing and storing of carbon. The Region of Peel has been supporting the sustainability and viability of agriculture with partners through regional food systems planning initiatives in the Golden Horseshoe through the Golden Horseshoe Food and Farming Alliance and implementation of the *Golden Horseshoe Food and Farming Action Plan*.[27] The recent changes to the *Provincial Policy Statement, 2014* and *Growth Plan for the Greater Golden Horseshoe* (2017) support a systems approach to agriculture that recognizes the importance of protecting the land base for agriculture and policy that supports the economic viability of farming.

Regional planning for agriculture and climate change requires both land use policy and program support, both of which are being considered in the ROP Review. Policy options that can support climate resiliency in agriculture include:

- Identifying and protecting prime agricultural lands and rural lands for long term use for agriculture;

[27] Golden Horseshoe Food and Farming Alliance. (2012). *Food and Farming Action Plan*

- Updating policy permissions for agriculture, agriculture-related and on-farm diversified uses and supporting innovative practices in agriculture;
- Supporting collaboration and food systems planning; and
- Supporting programs that support farm operations in adapting to and mitigating the effects of climate change.

Consultation on policy options for agriculture will be addressed separately through the Agricultural Policy Review component of Peel 2041.

8.3.11 Implementation

The Region of Peel recently completed a review of sustainability guidelines and initiatives in Peel and endorsed a framework to collaboratively develop complementary programs and guidance at the Regional level to support local implementation through planning approvals.[28] The *Sustainable Development Framework for the Region of Peel* (2015) identifies Regional policy and program interests relating to transportation, water consumption, GHG emissions, stormwater management, waste management, healthy living and housing, along with a recommended process through which complementary guidance and coordination could be provided. These initiatives address the ROP direction in Section 7.6.2.4 to prepare green development standards in consultation with the local municipalities. The framework is intended to complement and directly support the implementation of sustainable development guidelines policies and tools at the local level through the development approval process.

Policy options are similar to recommendations provided in the Water Resources Policy Review Discussion Papers and include:

- Adding a guiding section to the ROP on the use of sustainable development guidelines to support the development and implementation of sustainable building practices;
- Encouraging and supporting the local municipalities to develop policies to implement sustainability requirements, guidelines and tools through the local land use planning process in collaboration with the Region and other agencies;
- Exploring in partnership with the Province, conservation authorities, and local municipalities to develop guidance and incentives to drive innovation that reduce vulnerability and address climate change impacts; and
- Providing direction that the Region work collaboratively with the local municipalities and conservation authorities to develop and promote programs and guidance that support the development and implementation of sustainable development measures including water efficiency, energy efficiency, renewable and alternative energy systems, and building and development practices that support mitigation and adaptation to climate and weather extremes.

[28] Region of Peel. (2015). *Sustainable Development Framework in the Region of Peel*

8.3.12 Glossary

Terms and definitions in the ROP will be considered where appropriate for consistency with language associated with the mitigation and adaptation of climate change as well as Provincial legislation. Terms and definitions that are contemplated in the ROP include:

- Climate Change;
- Mitigation;
- Adaptation;
- Vulnerability;
- Resilience;
- Greenhouse Gas;
- Low-Carbon Community; and,
- Sustainable Development Framework.

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9. Conclusion and Next Steps

The current ROP serves to comprehensively plan for growth while protecting and maintaining the ecosystem integrity in Peel Region. Supported by the over-arching theme of 'Sustainability', the ROP aims at creating a strong, vibrant, and resilient community that can adapt to changes including specific issues such as the impacts of climate change. As our understanding evolves regarding the growing evidence of the risks and vulnerabilities to the Region, efforts to mitigate and adapt to climate change through land use planning requires that the ROP be reviewed and updated to remain current.

Recent initiatives at the international, national, and provincial levels have provided policy direction for addressing climate change. The Province has specifically updated policies and legislation to address climate change which has been represented in this Discussion Paper. The Region is responsible for implementing provincial direction and ensuring that the ROP conforms to Provincial land use planning policy, which is being completed as part of the Peel 2041 process.

This Discussion Paper has provided a background on climate change and its impacts, risks and vulnerabilities, current legislation, and proposed policy options for adding and/or strengthening the ROP's ability to mitigate and adapt to climate change. Ultimately, through the Peel 2041 policy review and update, Peel Region will be strengthening its ROP policies to conform with provincial plans, legislation and policy statements, as well as reflect current and emerging best practice guidance to address climate change.