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Enhancing Ontario's Rural Infrastructure Preparedness: Inter-Community Service Sharing in a Changing Climate – Assessment of Ten Rural Municipal Case Studies

Brenda Murphy

Wilfrid Laurier University, bmurphy@wlu.ca

Annette Chrétien

Wilfrid Laurier University, achretien@wlu.ca

Bryce Gunson

Wilfrid Laurier University, bgunson@wlu.ca

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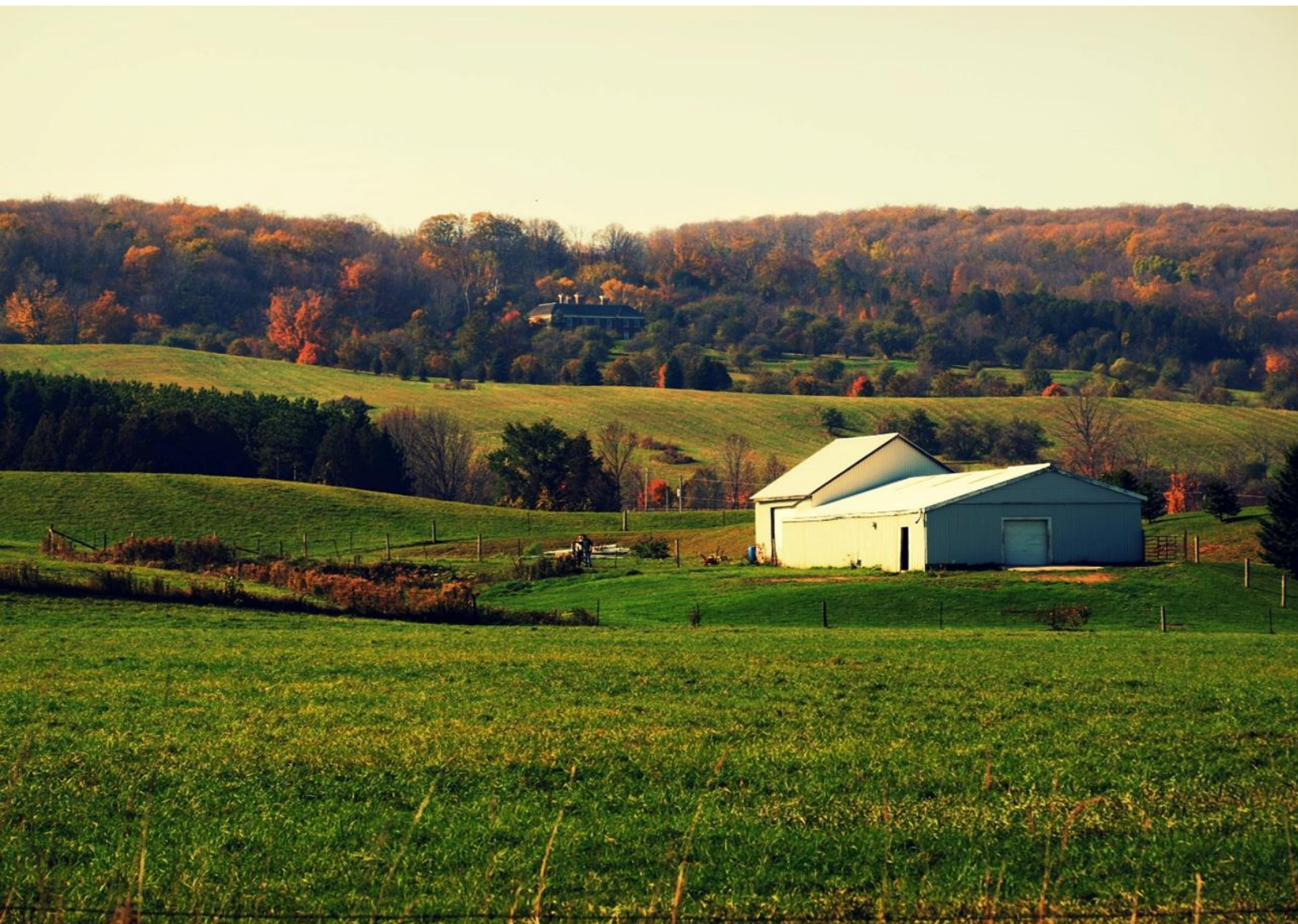
Recommended Citation

Murphy, B., Chrétien, A., & Gunson, B. (2017). Enhancing Ontario's Rural Infrastructure Preparedness: Inter-Community Service Sharing in a Changing Climate. (pp. 1-54, Interim Report 3: Assessment of Ten Rural Municipal Case Studies). Brantford: Wilfrid Laurier University and Resilient Communities Research Collaborative.

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Enhancing Ontario's Rural Infrastructure Preparedness: Inter-Community Service Sharing in a Changing Climate

Assessment of Ten Rural Municipal Case Studies



Dr. Brenda Murphy, Dr. Annette Chrétien,
& Bryce Gunson, Ph.D.(c)
Wilfrid Laurier University





Principal Investigator

Dr. Brenda Murphy,
Associate Professor
Wilfrid Laurier University,
73 George St. Brantford, ON N3T 2Y3
Phone: 519-756-8228 (x5718)
bmurphy@wlu.ca

Project Manager

Mr. Bryce Gunson,
Resilient Communities Research Collaborative,
Wilfrid Laurier University,
73 George St. Brantford, ON N3T 2Y3
Phone: 519-756-8228 (x5405)
bgunson@wlu.ca

Lead Researcher

Dr. Annette Chrétien, Wilfrid Laurier University
achretien@wlu.ca

Research Assistants

Kenzie Pulsifer & Jessica Tymkow

Funders - Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA)
Wilfrid Laurier University

Resilient Communities Research Collaborative
www.resilientresearch.ca

July 2019

Table of Contents

Overview	1
Recommendations	4
Case Studies	6
The City of Barrie	6
The Town of the Blue Mountains.....	10
City of Brantford	15
The Township of East Ferris	19
The Municipality of French River	24
The County of Frontenac	28
The Township of Grand Valley	34
The Township of Lake of Bays.....	39
The Township of Perth South.....	44
City of Waterloo.....	48

Overview

This assessment of ten municipal case studies is a sub-project of a larger three-year Ontario Ministry of Agriculture, Food and Rural Affairs (2016-2019) study. The purpose of the assessment was to i) evaluate the role of inter-community service cooperation (ICSC) in relation to climate change preparedness and asset management planning (AMP) through the presentation of ten case studies, and ii) draw together cross-cutting themes and best practices that have the potential to maximize the climate change (CC) preparedness of rural municipal infrastructure. All project documents are available online from <http://www.resilientresearch.ca/research-publications/>

After receiving approval from Wilfrid Laurier University's Research Ethics Board, the project team identified ten case studies. Nine of the municipalities are lower tier, with one upper tier county. Located across Ontario, south of Sudbury, with a diversity of locations, the municipalities included in the case studies range in population sizes, growth rates, geography size and key economic sectors (Table 1).

Table 1 - Characteristics of case study communities.

<i>Municipality Name</i>	<i>Population (2016 census)</i>	<i>Rate of Growth 2011-16</i>	<i>Size Km²</i>	<i>Average Age (Years)</i>	<i>Key Economic Sectors</i>
Municipality of French River	2,662	+9%	735.48	49.2	Farming, tourism, logging.
Township of Grand Valley	2,956	+8.4%	158.23	39.2	Construction, retail, manufacturing, health.
Township of Lake of Bays	3,167	-8.9%	678	52	Tourism, retail, light manufacturing, green energy.
Township of Perth South	3,810	-4.6%	393.14	41.2	Agriculture, manufacturing.
Township of East Ferris	4,750	0%	155.17	44	Tourism, agriculture, retail, construction, manufacturing.
Town of the Blue Mountains	7,025	+8.9%	287.24	51.8	Tourism, retail, health, construction, professional services.
County of Frontenac	26,677	+5.6%	3336.6	42.8	Agriculture, niche manufacturing, tourism, recreation.
City of Brantford	94,496	+4.1%	72.44	41.2	Manufacturing, film & media, warehousing.
City of Waterloo	104,986	+6.3%	64	39	Insurance, technology, manufacturing, post-secondary education.
City of Barrie	141,134	+5.4%	99.04	39.4	Education, health, construction, food, accommodation.

For each case study the team undertook a review of available secondary data including information posted on municipality websites, official local documents including asset management plans, official plans, emergency plans, etc., newspaper articles and other sources such as consultant reports and Statistics Canada. The information from these sources was deepened by at least one phone interview with a local expert from each municipality. The results from each case study were assembled into a series of ten vignettes organized by the themes outlined in Table 2.

Table 2 - Case study themes.

Background
Characteristics of Cooperative Agreements
Infrastructure and Asset Management Planning
Climate Change Impact on Infrastructure Sectors
Climate Change Preparedness
Climate Change-Prepared Cooperation: Possibilities and Best Practices

Following the definition of key terms and concepts in the literature review, the next sections of the full report outline the case study overview analysis. This executive summary outlines a few key terms before moving directly to the recommendations.

Three hundred and thirty-five (75%) of all municipalities in Ontario are either rural or partially rural. Notable strengths include strong social capital and social networks, strong attachments to community, deep local knowledge and high rates of volunteerism. The challenges confronting rural communities include limited economic resources to meet myriad local needs, less diversified economies, higher reliance on natural resources sectors, isolation and limited access to services including emergency management, less knowledge of climate change impacts and adaptation issues, and less technical capabilities including facilitation of planning processes. Many rural municipalities also face increased outmigration, a lower employment rate and a rapidly ageing population.

In Ontario, CC is already underway and by 2050 an increase in annual average temperature between 2.5-3.7° C is projected. Projections suggest that more frequent and more intense extreme events are likely and that the risk of disruptions to infrastructure is likely to increase. The impacts of CC are already requiring the adaptation of infrastructure designs and plans, such as the retrofit of stormwater infrastructure, and wastewater treatment plants are expected to need significant updates.

All municipalities in Ontario are responsible for the mitigation, preparation, response and recovery from emergencies and disasters. Ontario’s disaster recovery program does not cover all of a municipality’s reconstruction costs nor does it provide mitigation funding in anticipation of future risks.

Municipal preparedness for CC is a function of the range of available options and resources including support from higher levels of government, the organization and characteristics of local infrastructure and the nature of local hazards and vulnerability levels. Preparation for CC is most effective when undertaken within an integrated, multi-level government, multi-sectoral approach within which municipal governments can address local impacts and preparedness can be adapted to unique local circumstances. Because the impacts will be felt across infrastructure sectors, all day-to day

infrastructure planning and management should integrate (mainstream) consideration of CC and all key departments and stakeholders should be consulted in discussing potential preparedness strategies.

Infrastructure includes the physical structures and human systems, resources and processes that support those structures, including AMP. AMP is “the process of making the best possible decisions regarding the building, operating, maintaining, renewing, replacing and disposing of infrastructure assets”. As per Ontario’s Asset Management Planning for Municipal Infrastructure (O. Reg. 588/17), which came into force January 1, 2018, every municipality must have an AMP for its core infrastructure by July 1, 2021 and for all other infrastructure assets by July 1, 2023. Municipal controlled infrastructure most likely impacted by CC includes bridges, roads, sanitary and storm water systems, potable water systems (including dams and reservoirs), fire and emergency services (including emergency response, medical services, social services, police and search and rescue).

Inter-community service cooperation is defined as the sharing, procuring or providing of needed infrastructure services with one or more municipalities or other organizations. Across Canada and internationally, service cooperation is increasing with research suggesting that the careful use of shared services can contribute to cost savings and improved local service provision. Types of ICSC agreements include: verbal agreements (handshake, informal); memorandums of understanding; bylaw approval; and formal contracts. ICSC can include many different characteristics, such as the degree of flexibility or the number of partners and may be undertaken through a variety of mechanisms such as mutual aid agreements or a joint services committee.

In many cases, cooperative agreements between municipalities have evolved over a long period of time, as needed and usually informally. These agreements are based on the deep relationships, trust, mutual reciprocity and social ties that often exist between nearby municipalities. However, should communities choose to adopt a more intentional, formal approach, the following steps are considered important in an ICSC process. It should be noted that this process is not necessarily linear; as new information is available or circumstances change, circling back to an earlier step maybe necessary.

- 1) Undertake AMP and take stock of current needs and opportunities for ICSC;
- 2) Determine which services to purchase, share or provide, who to partner with and who will champion the opportunity;
- 3) Open up discussions with staff, council and stakeholders;
- 4) Establish an inter-municipal working group;
- 5) Determine costs and benefits;
- 6) Set up the cooperative service mechanism;
- 7) Undertake internal changes needed to proceed with new service arrangements; and
- 8) Monitor and evaluate the effectiveness of the ICSC agreement.

The extent to which rural communities successfully engage with service cooperation and asset management planning as a way to undertake CC preparedness is influenced by a range of factors and associated indicators. For instance, ample access to financial resources is thought to encourage AMP and CC preparedness activities but may not provide a strong incentive to undertake service cooperation.

Recommendations

The extent of experiences about cooperative agreements across the case studies demonstrated that there is a rich range and depth of opportunities and knowledge to use these types of arrangements to address the required and/or desired levels of infrastructure service provision across rural Ontario.

Explore the Possible Range of Cooperative Agreements: If cooperative agreements were more directly considered and incorporated into asset management planning processes and if planning for climate change mitigation, adaptation and preparation was more actively pursued across municipality functions, it is likely possible to leverage even more benefits from these agreements while offsetting some of the infrastructure challenges already facing rural Ontario communities.

Customize the Cooperative Agreement Development Process: No one size approach or solution exists to address the distinct infrastructure needs, climate change concerns or cooperative agreement opportunities of each rural municipality. Cooperative agreements emerging from previous relationships through to targeted actions can take the form of informal 'handshake' agreements or more formal contracts. Municipalities should choose the process and outcomes that best work for their community.

Reconsider the Role of Geographic Proximity: Proximity does not have to be a limiting factor for those services and activities that are not tied to physical infrastructure; planning, engineering services, bulk ordering, joint requests for tender, and so on could all be opportunities to increase the efficient and effective delivery of needed local services.

Obtain Detailed Information About Climate Change Impacts: Rural communities might consider obtaining relevant down-scaled climate projections through a cooperative agreement with other jurisdictions within their region or watershed to understand long-term, locally relevant climatic projections and facilitate evidence-based asset management planning.

Embed Climate Change Preparedness and the Option for Cooperative Agreements into Asset Management Planning: Older infrastructure will have a i) higher likelihood of failure especially since it was built to the historic, less stringent assumptions about severe weather risks, and ii) wider gap between previous and current building codes, increasing routine replacement or disaster reconstruction costs. Having service cooperation embedded in asset management plans as a potential option when developing strategies to meet service gaps or to address climate change risks would increase the range of cost effective and efficient opportunities available to local decision-makers.

Adapt Available Best Practices: Municipalities can benefit from reviewing the suite of existing cooperative agreement best practices and adopting the advice that suit their needs. This expertise may be available from municipal staff, neighbouring or higher-level jurisdictions, consultants and from published practitioner and academic sources.

Enhance Rural Municipal Staffing and Training: Additional training related to infrastructure planning, climate change and cooperative agreements can lead towards stronger, evidence-based decision-making for climate change preparedness.

Embed Climate Change Preparedness into Ongoing Municipal Departmental Activities: Climate change and extreme weather events are often being discussed across municipalities through a range of day-to-

day processes and targeted initiatives. Reducing the silos between municipal departments could increase the knowledge about, and opportunities for, effective management of the infrastructure impacts from potential extreme weather threats.

Include Climate Change Preparation When Measuring Infrastructure Service Success: Where services are coordinated with neighboring municipalities or other institutions, 'success' is often measured in terms of cost savings, better efficiency and higher service levels. An additional goal to contemplate is the potential of the cooperative agreement to contribute to extreme weather risk reduction and/or longer-term climate change preparedness.

Increase Climate Change Preparedness Through Redundancy: Increasing infrastructure redundancy is another goal that can work towards reducing longer-term climate change risk and could be considered when undertaking asset management planning. By this is meant the expansion of the range of alternatives available to provide critical infrastructure services during extreme weather events.

Maximize Climate Change Preparedness in the Aftermath of Disasters: The wake of a disaster is a 'window of opportunity' to identify climate change risks through the asset management plan or other processes, embed preparedness thinking across municipal departments, garner staff, council and public support and consider the potential of cooperative agreements to fill any identified service gaps.

Mitigate Risk and Prepare for Infrastructure Damage Through Local Planning and Funding Initiatives: Since municipalities are expected to self-fund repairs from the more routine impacts of some extreme weather events (i.e. frozen pipes) as well as a portion of the costs from other disasters, sufficient contingency funding should be in place. In addition, funding for needed risk mitigation and preparedness projects should also be considered. Cooperative agreements may be a way to undertake needed work cost effectively.

Enhance Climate Change Preparedness through Multi-Level Collaborative Partnerships: To effectively deal with rural infrastructure risks, there is a need for collaborative multi-level, multi-institutional responses including municipal, provincial and federal governments, conservation authorities and key non-government organizations such as the Rural Ontario Municipal Association and the Ontario Good Roads Association.

Consider the Ontario Rural Context when Developing Provincial and Federal Policies: Rural municipalities need separate policy consideration and a supportive suite of funding sources, rules, regulations and laws that directly address the distinctive strengths and challenges facing smaller and sometimes more remote jurisdictions.

Ensure Stable Funding and Grant Opportunities: To allow the long-term planning associated with infrastructure life cycles as well as climatic change, provincial and federal infrastructure funding and policies need to be more regularized and predictable.

Incentivize Climate Change Mitigation and Preparedness Through Targeted Funding Initiatives: It is well documented that municipal government initiatives are Canada's first, and best line of defense against the impacts of climate change as long as adequate funding, pertinent information and a supportive policy structure is in place. Additional, targeted policies and funding should be considered a priority by both provincial and federal authorities.

Case Studies

Below are the completed case study summaries for each community.

The City of Barrie

Background

The City of Barrie is a single-tier city located in Southern Ontario. Barrie has a population of 145,614, an average age of 39.4, growth of 5.4% since 2011 and a geographic size of 890 km² (Statistics Canada, 2019). Four of the main employment industries listed on the City of Barrie (2016) website include: educational services, construction, healthcare and social assistance, and accommodation and food services. Barrie attracts tourism year-round with their winter activities including skiing, snowboarding and ice fishing as well as many summer attractions such as golf courses, beaches and over 90 community parks (City of Barrie, 2016).

Characteristics of Cooperative Agreements

The City of Barrie shares emergency services including ambulance and paramedic response with the County of Simcoe (City of Barrie Participant, 2018). Based on information from the City of Barrie (2017b) website, the Barrie Police and the County of Simcoe work as service partners along with Barrie Fire and Emergency Services to provide services throughout Barrie and Simcoe County. There is also the Barrie-Simcoe Emergency Services Campus that is currently being built and which is a partnership project between the City of Barrie and the County of Simcoe. Once the campus is completed it will house the Barrie Fire and Emergency Service, Barrie Police Service, and Simcoe County Paramedic Services in one location (City of Barrie, 2018a). The campus is an innovative partnership that will help to maximize cost effectiveness and service efficiency for the community (City of Barrie, 2018a).

The City of Barrie does not share services for water, wastewater, garbage or other related services (City of Barrie Participant, 2018). This is notwithstanding the fact that there has been interest particularly from the communities of Innisfil and Springwater to collaborate with Barrie. However, the City does have a protocol in place for neighbouring municipalities such as Innisfil or Springwater to request a service from the City or to request shared services with the City. The City is open to sharing under certain conditions but in order for it to consider cooperation it is necessary that it maintains control of the service, including the quality and costs of the service (City of Barrie Participant, 2018).

Infrastructure and Asset Management Planning

The City created a Corporate Asset Management team in November 2008 in order to prioritize the repair and replacement of their infrastructure assets. The asset management planning (AMP) is divided into seven documents including: Environmental Services, Facilities, Fleet, Recreation & Culture, Storm Water Management Facilities, Transportation and Water (City of Barrie, 2018d). The AMP stated that Barrie was one of 15 municipalities involved in the Ontario Municipal Benchmarking Initiative (OMBI) which is an initiative led by the Chief Administrative Officers (CAOs) and City Managers of the municipalities (City of Barrie, 2018d). The OMBI is “intended to foster a culture of service excellence in municipal

government by creating new ways to measure, share and compare performance statistics and allow experts in participating municipalities to share ideas on operational practices” (City of Barrie, 2018d Corporate Asset Management Plan, p. 19).

Service cooperation with neighbouring communities is mentioned in the Facilities document of the AMP. The section is focused on “Enhancing External Resources and Partnerships” for fire and emergency services (City of Barrie, 2018d). It states that Barrie is the county’s largest fire and emergency service provider, with these expanded levels of service not available in smaller communities. It states: “The department should continue to explore partnerships with other municipalities to provide these lifesaving disciplines on a total cost recovery basis and possible source of revenue through response or training initiatives” (City of Barrie, 2018d, p. 21).

In the OMBI reports, Barrie’s average age of wastewater pipe was 21 years, compared to a range of 18 years in York to 59 years in Toronto (Municipal Benchmarking Network Canada, 2011). Similarly, for water pipes, Barrie’s average age was 20, with a range from 16 years in York to 57 years in Toronto. Older pipes are often in the poorest condition and contribute to blockages and an inflow of groundwater. The City also had the fifth highest population density in its more urbanized areas at 1,400 people/ Km² (with the range from 6 in Muskoka to 4401 in Toronto). For pipes, higher densities are associated with higher maintenance and repair costs. In terms of paved roads, bridges and culverts, Barrie rated among the 7 communities whose roads were reported to be in good to very good condition, whereas the City was rated among the 4 highest for bridge and culvert condition (Municipal Benchmarking Network Canada, 2011).

Climate Change Impact on Infrastructure Sectors

The most likely climate-related hazards for Barrie are severe summer and winter storms, including freezing rain, high winds and tornadoes as well as extreme cold spells and severe heat waves (City of Barrie Emergency Management, 2017). The main hazard vulnerability related to climate change facing the City of Barrie is flooding and the infrastructure most impacted is the storm water system. Flooding is occurring more regularly as the city continues to urbanize (City of Barrie Participant, 2018). For example, flash flooding took place in August 2017 causing over \$100,000 in damages in Barrie and Orangeville (Ward, 2017). There was also significant flooding in February 2018 due to a combination of rain and snowmelt from the warmer temperatures (Ward & Sharpe, 2018). Climate change is assessed as a factor impacting infrastructure in the City of Barrie in both the Environmental Services and Storm Water Management Facilities documents of the asset management plan (City of Barrie, 2018d). In both of these documents it is noted that weather patterns influence the demand for services and that climate change has the potential to influence the long-term demand for assets.

The flooding issues that Barrie experiences can impact their municipal infrastructure and services in a number of ways. The public works infrastructure impacted by flooding includes storm water systems, roads and culverts, and water and wastewater systems. The services that can be interrupted include the water management services, sewage management and water drainage as well as transportation. Flooding and other extreme weather issues also impact emergency management services (City of Barrie Participant, 2018).

Climate Change-Preparedness

The City of Barrie has undertaken a number of preparedness activities related to climate change. The City has a Climate Change Adaptation Strategy in place as well as an Implementation Plan for their adaptation strategy (City of Barrie, 2017a). Barrie began the development plan in 2016 and released the completed plan in early 2017. The Climate Change Adaptation Strategy lists a number of the City of Barrie's climate change mitigation activities. Some of these activities include: the "Barrie in a Changing Climate" Workshop, Municipal Storm Water Management Discussion Group (2010), Solar Panels on Operations Centre Roof, a Landfill Gas Collection System, and a Multi-Modal Active Transportation Master Plan (City of Barrie, 2017a).

The City has a number of infrastructure renewal projects planned for the next year or two (City of Barrie Participant, 2018). An example of this is the restoration of Kidd's Creek in Barrie that includes design elements to relieve flooding issues. It is funded through the National Disaster Mitigation Program (NDMP) which provides funding for flood mitigation projects (City of Barrie Participant, 2018). The City of Barrie (2018d) also introduced the Dedicated Infrastructure Renewal Fund in 2015 to help address their infrastructure gap and to allow for better maintenance of their infrastructure. The fund is used solely for maintaining and rehabilitating Barrie's infrastructure and is funded by 1% of the city's property taxes.

Climate Change-Prepared Cooperation: Possibilities and Best Practices

The City of Barrie does not currently undertake service cooperation with its neighbours and is not planning to do so in the near future. However, the City does plan to update its AMP to incorporate more considerations of climate change impacts (City of Barrie Participant, 2018). There are a number of factors that may contribute to the potential for service cooperation to address changing conditions in the future. One factor is that Barrie is an area of rapid population growth. Its growth rate of 5.4% is above the Ontario provincial average of 4.6% (Statistics Canada, 2019). Another factor might relate to the potential for increasingly severe weather events, as Barrie has already experienced extreme weather events, namely flooding (Ward, 2017).

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The Town of the Blue Mountains

Background

The Town of The Blue Mountains is located in Southern Ontario within the Grey County, and has a population of 7,025, an average age of 51.8 years, a growth of 8.9% since 2011 and a geographic size of 287.24 km² (Statistics Canada, 2019). Approximately 50% of the properties in the Town are owned by part time residents so the fulltime population is near 15,000. The Town is named for the blue hue that can be seen over the Niagara Escarpment. The economy is primarily based on agricultural products and tourism. The Town attracts tourists all year round; during the winter the tourist activities include: skiing, snowboarding, and snowshoeing and in the summer, there is hiking and cross-country biking among other tourist attractions (Blue Mountains Village, n.d.). Roads and related infrastructure as well as bridges and culverts are the infrastructure services that are most impacted by climate change in the Town of the Blue Mountains, (Hemson Consulting, 2014).

Characteristics of Cooperative Agreements

The Town of The Blue Mountains has numerous cooperative agreements in place with its neighbouring communities. The Town shares services with the Municipality of Meaford, the Municipality of Greys Highlands, the Township of Clearview and the Town of Collingwood. There is a formalized cooperative agreement between the Town of The Blue Mountains and the Town of Collingwood for shared transit services (Blue Mountains Participant, 2018). The towns have been sharing transit services since 2014; it started as a pilot project and was extended due to the high number of people using the transit services (Edwards, 2018). The Town also has agreements with the neighbouring municipalities related to the maintenance and improvement of boundary roads, and an agreement to purchase water from Collingwood (Blue Mountains Participant, 2018). The water agreement with the Town of Collingwood is a formal agreement that has been in place for about 15 years. It was created so that The Blue Mountains would have point of water supply on its eastern side.

The boundary road agreements are informal and have been in place for several decades; the sharing of this service is in place as an operational convenience as well as for cost sharing purposes (Blue Mountains Participant, 2018). For the informal boundary road agreements, there are no monitoring and dispute mechanisms in place, instead the agreements are based primarily on a 'gentleman's handshake' (Blue Mountains Participant, 2018). However, the formal water and transit agreements do have more concrete dispute resolution mechanisms through arbitration agreements. Any challenges that arise for the Town and the collaborating communities are dealt with through friendly negotiations. The current agreements were created for the purpose of sharing maintenance and capital expenses, as an operational convenience and in the case of the water agreement, to have another point of water supply. The Town is also looking to expand their water purchasing agreement in the future to enable it to have enhanced supply from Collingwood for redundancy and reliability reasons. (Blue Mountains Participant, 2018).

In most of the cooperative agreements, the council members are the key stakeholders in discussions, however, with the transit system, community members played a larger role because there was a lot of public and industry lobbying to get the transit system implemented (Blue Mountains Participant, 2018). The agreements have been working well for the Town, especially the water service agreements.

Although the transit agreement is also successful, there is always pressure to expand service which must be balanced against the challenge of the economics involved in expansion.

Infrastructure and Asset Management Planning

The Town of Blue Mountains has two asset management plan (AMP) documents. One AMP is from 2014 and addresses assets related to linear infrastructure including roads, sidewalks, street lighting, traffic signals, bridges, culverts, water and wastewater related infrastructures (Hemson Consulting, 2014). The second AMP from 2016 is for non-engineered assets including facilities, vehicles, equipment, land improvement and solid waste related infrastructure (Hemson Consulting, 2016). The infrastructure addressed in the first AMP has a replacement value of \$363.8 million with tax supported assets at \$178.1 million and user rate assets at \$160.9 million. 65% of assets are considered in 'good' condition, while only 4% are considered in 'poor' condition. Key indicators to track service performance, such as the number of wastewater main backups per 100 km/year, show that between 2010 and 2012 service levels remained constant or improved. While the Town has made considerable efforts to address its infrastructure gap, with an extensive asset base relative to the population and the need to increase capital contributions to address current and future infrastructure requirements, the responsibility to maintain infrastructure will continue to be challenging (Hemson Consulting, 2014).

Service cooperation is mentioned in the Cost Reduction Strategies section of the non-engineering assets AMP for the Town of the Blue Mountains (Hemson Consulting, 2016). In the document, it states that the Town shares services in order to share the costs of acquiring and maintaining assets through joint agreements. Climate change is not addressed directly within the AMP, however it will likely be incorporated in future changes to the AMP (Blue Mountains Participant, 2018).

References to green infrastructure and climate change are mentioned in the Town of Blue Mountains Official Plan (2016). The plan states that since tree canopy contributes to improvements in air and water quality and reduces greenhouse gases, its policy is to encourage the planting of tree species that are resilient to climate change and provide high levels of carbon sequestration. The plan also notes that since poor air quality can have health impacts, increase health care costs and are part of climate change, the Town's policy is to meet or exceed all air quality and greenhouse gas emission regulations; to reduce reliance on private automobiles through the development of compact, mixed use and pedestrian friendly communities; and to reduce and/or eliminate idling times.

Climate Change Impact on Infrastructure Sectors

The most likely weather-related hazards across the County include floods, tornadoes, blizzards, ice storms, mud/landslides and fires (Grey County, n.d.). The Town of The Blue Mountains is vulnerable to numerous climate change related hazard vulnerabilities including extreme weather events such as: flooding, tornados and landslides. In 2009, the Town of the Blue Mountains and surrounding communities were hit by a tornado which caused around \$10 million in destruction (Gillick, 2009). There have also been mudslides which have occurred in the past, including one that came down the Niagara Escarpment and required at least two dozen homes to be evacuated in 2012 (Kauri, 2012). The Town of The Blue Mountains does not address these climate change and extreme weather conditions in their current AMP. However, as they move forward and have more discussions regarding levels of service and risk management, they will be considering climate change and extreme weather in more detail (Blue Mountains Participant, 2018).

Based on the information provided in the 2014 AMP for the Town, the public works infrastructure that are most at risk are the roads, bridges and culverts (Hemson Consulting, 2014). However, the infrastructure that is most vulnerable to climate change is the storm water drainage systems (Blue Mountains Participant, 2018). This has become more of an issue with milder winters because ski hill operators have had to make extra snow to make up for the lack of snow fall. This additional water is leading to larger spring freshets adjacent to the ski hills. The larger spring freshets, combined with earlier rainfalls occurring on top of snow that is near the melting temperature has created issues with run-off water that can cause flooding and impact the storm water drainage systems (Blue Mountains Participant, 2018).

Climate Change-Preparedness

In 2006, the Association of Municipalities Ontario (AMO) completed a case study on the sustainability of the Town of The Blue Mountains. The study addressed the growth of the community and the challenges to long-term sustainability, their development of an Integrated Community Sustainability Plan (ICSP) and community outreach to achieve sustainability through their ICSP. The document also notes that they will be working with neighbouring municipalities to build the economic sustainability of their region (Kidd & McMullin, 2006). In 2009, the Town of The Blue Mountains also won an award from the AMO for demonstrating an excellent use of Federal Gas Tax by using solar power to illuminate their town signage (Lambie, 2009).

In 2010, the Town of The Blue Mountains created a community-based Strategic Plan entitled “The Blue Mountains Sustainable Path” which was created to define their path and set goals to achieve a healthy and sustainable community. The Sustainable Path document provided the foundation for the current Strategic Plan for the Town (Town of The Blue Mountains, 2018). The Town also created a sustainability fund which awards funds to projects that improves its environmental performance, fosters sustainability literacy and community engagement, advances climate change adaption and mitigation, and demonstrates the viability of sustainability technologies (Town of The Blue Mountains, 2018).

None of the cooperative agreements that are in place in The Blue Mountain were created specifically to deal with climate change or extreme weather events. However, these agreements still do provide more security and add to the preparedness of the Town for issues that arise related to climate change. According to the Blue Mountains Participant (2018) the agreement increases the Town’s level of preparedness the most is their water agreement. The water agreement with Collingwood would provide them with a water supply in the case of a large storm or infrastructure failure damaging the critical water mains that connect the West and East ends of the town. Reciprocally, as has happened in the past, The Blue Mountains is also able to supplement the Town of Collingwood’s water supply should a water main break or other emergency arise in Collingwood.

Climate Change-Prepared Cooperation: Possibilities and Best Practices

One factor influencing the need to better prepare for climate change is related to demographics; the population has undergone population and economic growth as people from urban areas retire and settle in the Town (Kidd & McMullin, 2006). The Town also has concerns about a changing environment; their economy and the livelihood of much of the community is impacted by warmer temperatures during the winter when there is usually a larger number of tourists (Marowits, 2016). The Town is also

familiar with, and has a positive history of, cooperation with their neighboring communities (Edwards, 2018).

The best practices suggested by the Blue Mountain Participant (2018) for other communities considering cooperation with their neighbors are: to start early, be patient, be aware of changing council priorities and community expectations as it takes time to build initiatives, and sustain the momentum to achieve the desired solution. Further suggestions included developing good business plans, being prepared for slow progress, and building good personal relationships with counterparts in adjacent communities (Blue Mountains Participant, 2018).

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City of Brantford

Background

The City of Brantford is a single-tier city located in Southern Ontario with a population of 134,203, a population decrease of 1% since 2011, an average age of 41.2 years and a geographic size of 1,073 km² (Statistics Canada, 2016b). The City is situated on the Grand River (City of Brantford, 2008). Brantford is also known as the Telephone City as it is where Alexander Graham Bell invented the telephone in 1874 (City of Brantford, 2008). The main sources of employment in the City of Brantford are in service and sales occupations as well as trades, transport and equipment operators and related occupations (Statistics Canada, 2019). The infrastructure services which are most vulnerable in the City of Brantford are roads and road networks as well as the wastewater facilities (City of Brantford, 2017).

Characteristics of Cooperative Agreements

The City of Brantford shares a number of services with the County of Brant (Gray, 2017). The City and County have partnerships for their long-term care facilities and ambulance services. For these shared services the County of Brant manages the contract and the City of Brantford purchases the services from them (City of Brantford Participant, 2018).

The asset management plan (AMP) for the City of Brantford incorporates some information regarding their service sharing with the County of Brant. It discusses a joint strategic transportation study, the inclusion of affordable housing units, and a boundary adjustment agreement between the City and the County (City of Brantford, 2017). According to the City of Brantford Participant (2018), the service sharing between the City of Brantford and the County of Brant is partly related to extreme weather and climate change. Since the Grand River runs through both communities, these jurisdictions have working relationships in place where, in case of emergencies, they can help one another. In addition, the communities have just recently activated a joint emergency response coordinator who is responsible for working with both communities to develop their emergency operations command centres (City of Brantford, 2018).

The City of Brantford and the County have established the Joint City-County Committee to Examine Service Sharing, whereby the different services provided within each jurisdiction are being reviewed to identify opportunities to jointly offer services in a cost saving and efficient manner (City of Brantford Participant, 2018). Depending on the type of agreement, the key stakeholders in the discussions can include members of the city council, the county council as well as community members (City of Brantford Participant, 2018). Sometimes it is not possible to have everyone involved, but the City tries to share as much information as possible and get the community members involved whenever possible (City of Brantford Participant, 2018). Some of the cooperative agreements between the City and the County are formalized and some are informal (City of Brantford Participant, 2018). The mandated services are formal and many of them need to be approved by the province whereas the informal agreements include programs like their Healthy Brantford Task Force or their Age Friendly initiative (City of Brantford Participation, 2018). The City looks after the housing for both its residents and the County of Brant (City of Brantford Participation, 2018). The City has dispute mechanisms written into its agreements with the County. The City is also looking into sharing more services with the County in the future including services related to libraries and transportation.

Infrastructure and Asset Management Planning

The City of Brantford has an asset management plan (AMP, 2017) which includes plans for its public works, parks and recreation and social housing infrastructure (City of Brantford, 2017). The aim of the plan is to summarize the core policies, procedures and principles developed and adopted by the City for the management of its infrastructure (City of Brantford, 2017). In the AMP, it states that the City of Brantford strives to be recognized as a leader in asset management by minimizing risks, maximising the return on infrastructure investments and providing enhanced value to the community members (City of Brantford, 2017). Taking a level of service approach, performance criteria are related to meeting regulatory standards, quality, quantity, reliability, responsiveness, environmental acceptability and cost.

Three types of analysis are provided to develop sustainable infrastructure capital plans and financial strategies. These include the 100-year forecast to cover the entire lifecycle of the assets, the 10 year planning horizon to provide awareness beyond immediate plans to future projects, and the reserve fund forecasts. Currently there are deferred capital investment needs of \$227.5 million across the assets covered by the AMP. The AMP rates the City's bridges and culverts as good, facilities as fair, the road network and transportation as good, stormwater collection and facilities as fair/good and water distribution and facilities as fair/good.

Climate Change Impact on Infrastructure Sectors

The types of hazards typical for Brantford include extreme cold and heat, fire, flooding and storm and winter hazards (City of Brantford, n.d.). The City of Brantford is experiencing numerous issues because a great deal of the infrastructure in the city was not built for the high-volume rains that have been experienced in recent years (City of Brantford Participant, 2018). For example, in February 2018, powerful rainstorms and an early thaw caused significant flooding in the City (Metzger, 2018). The flood, which was the worst event in Brantford in decades, led to approximately 2,200 properties near the river being evacuated for two days while the flooding was at its worst (Flanagan, 2018).

Although the City is experiencing these kinds of issues, climate change and issues related to extreme weather are not addressed directly within the 2017 AMP. However, climate change as well as disaster recovery will be more fully incorporated into the future AMP for the City as it is now a requirement for all municipalities to include this factor in new AMPs (City of Brantford Participant, 2018).

The public works sectors most affected by climate change and extreme weather are the road networks as well as emergency services. Since the City of Brantford is located along the Grand River, when an extreme weather event such as flooding occurs it hits upstream first in the County of Brant, then impacts the City of Brantford and further downstream it will also affect the Six Nations Reserve and other communities (City of Brantford Participant, 2018). Flooding can potentially impact many municipal services, particularly transportation and water management services.

Climate Change-Preparedness

The Environmental Policy Advisory Committee report for Brantford in June 2018 acknowledged that municipalities are on the frontline of climate changes issues (City of Brantford, 2018). The report discussed the possibility of having a dedicated sustainability staff position in order to improve the City's climate change resiliency and sustainability through the implementation of municipal and operational

changes (City of Brantford, 2018). The City of Brantford's Official Plan (1987) states that financial assistance from both the GRCA and the province of Ontario has been provided to establish flood control measures to mitigate the impacts in flood-prone City areas.

The City of Brantford works with the Grand River Conservation Authority (GRCA) to address any issues that occur due to extreme weather events. For example, it is the responsibility of the GRCA to deal with potential flooding, but the City works cooperatively because it owns the lands surrounding the river. It is the responsibility of the GRCA to inform the City regarding its plans to control or mitigate the impact that a flood would have (City of Brantford Participant, 2018). When Brantford experienced severe flooding in February 2018, the City was more prepared because the Emergency Operations Centre team had all received emergency management training (Metzger, 2018). Although there was major damage caused by the flooding, the quick response of the local authorities ensured that no lives were lost (Flanagan, 2018).

Climate Change-Prepared Cooperation: Possibilities and Best Practices

One of the best practices recommended by the Brantford participant when it comes to cooperative agreements is to be open to sharing resources. Particularly when there is a limited amount of resources it is important to remember that all communities are in a similar position and if in close proximity with neighbouring jurisdictions it can be beneficial to look for ways to share services (City of Brantford Participant, 2018). Overall, the City of Brantford reported having a good relationship with the County of Brant but named one of the biggest challenges to the City as being what is expected or accepted at the provincial level.

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The Township of East Ferris

Background

East Ferris is a township located in North Eastern Ontario and is part of the District of Nipissing (Federation of Northern Ontario Municipalities). With a land area of 287 km² in 2016 East Ferris had a total population of 4,750 residents, a stable population base and an average age of 44 years (Statistics Canada, 2019). Like many other smaller communities, East Ferris has an aging population base that will increasingly put pressure on public and private health care services. The outmigration of youth and young adult populations to find seek employment or higher education is prevalent across the wider region, but East Ferris is also experiencing the in-migration of younger families attracted by the lower cost of living. Many of the residents from East Ferris depend on neighboring communities such as North Bay for employment (Stantec, 2013).

Characteristics of Cooperative Agreements

In the asset management plan (AMP, 2014, p. 73) the Township states that it “frequently works together with other area municipalities to pool infrastructure projects and resources”. East Ferris has had an agreement for over a decade with Chisholm, a neighboring community located south of the Township, to manage the South Shore Bridge and the boundary road. This formal agreement consists of splitting construction and capital costs 50/50 and outlines the process of discussion that it goes through when an issue arises around needed construction and maintenance (East Ferris Participant, 2018). If either party identifies something that needs to be looked after, staff will meet in the fall to discuss what they would like to do. After discussion, staff will present their proposals to their respective councils and explain why they would like to spend money on this infrastructure, and why it would be beneficial for both municipalities to undertake this work together.

East Ferris also has decade-old boundary agreements associated with bridges and roads with its other two bordering municipalities – to the East, Bonfield and to the West, Callandar (East Ferris Participant, 2018). It also shares engineering services with its surrounding municipalities. The Director of Engineering and Public Works provides his services, on a fee for service contract basis, when maintenance or upgrades are needed to the roads, bridges and other municipal infrastructures in the adjacent communities (AMP, 2014; East Ferris Participant, 2018).

Infrastructure and Asset Management Planning

In earlier decades, East Ferris undertook needed infrastructure work as budgets and grants would allow, without incurring debt. The Township began developing longer-term asset assessment in 2009. East Ferris released its AMP in 2014 in order to be better equipped for making decisions on “building, operating, maintaining, renewing, replacing, and disposing of infrastructure assets” (AMP, 2014, p. 1). While the AMP will eventually include all depreciable infrastructure assets, the initial plan focuses on

roads, bridges and culverts. In the AMP, most assets were found to be in reasonable condition, with some infrastructure deficits identified (e.g. surface treated roads need improving).

The community's AMP is considered a higher-level document that is used for applications and overall planning and does not include the details and reasoning behind its asset decisions (East Ferris Participant, 2018). As a key policy document, it is integrated with several others related to long-term financial planning and capital funding, debt and reserve fund management, and the capital, five year and operating budgets (AMP, 2014).

East Ferris is using a service level approach to determine required upgrades. Desired levels can be down scaled if deemed to be too costly. Council plans to engage the community to assess desired service levels and ensure asset investments balance new or upgraded infrastructure with asset renewal (AMP, 2014).

Based on the findings of these planning exercises the Township has now undertaken upgrades that have led to substantial debt loads and pressure on financial reserves. Without incurring this debt, the infrastructure deficit would remain unacceptably high and could not be eliminated in the next 30 years. Going forward, East Ferris is likely to have difficulty reaching a sustainable capital funding level (AMP, 2014). The Township will require substantial support through federal and provincial partnerships to attain sustainability. The ability to undertake long-term planning would be substantially improved if the provincial and federal partners established "reliable annual entitlement-based capital grants and more predictable application-based capital grant programs" (AMP, 2014, p. 15).

Climate Change Impact on Infrastructure Sectors

The Township has experienced extreme weather over the years which has led to infrastructure damage particularly to roads and bridges (Dale, 2008). Identified weather related hazards include winter storms and ice, windstorms and tornadoes, flooding and fire (Emergency Management, n.d.). Former East Ferris mayor, Bill Vrebosch was very vocal on the need for funding to upgrade the Township's infrastructure (Municipalities Can't Afford Large Projects Vrebosch, 2017).

At the closest meteorological weather stations at the North Bay Airport and Powassan, Ontario climate change assessments project an annual increase in temperature of about 2.8°C by the 2050s, with winter temperatures increasing between 3.1 and 3.5°C. Precipitation is projected to increase between 58mm and 78mm by the 2050s, with the largest increases occurring in winter and a decline in summer rains after 2020 (Stantec, 2013). Possible changes that could negatively affect local infrastructure include prolonged dry periods, increased water demand, declining water quality, lower water levels, and increased forest fire risk; increased health risks from poorer air quality; West Nile Virus and Lime Disease; increased potential for flooding and erosion and the need to upgrade stormwater management design; increased snow squalls and freezing rain, but lower lake ice depths and less consistent snow coverage; and stress on vital environmental factors that provide water retention and sustain revenue-generating activities such as wetlands, moose, fish, and forests/timber. Overall, local authorities are encouraged to model extreme event scenarios and mitigate impacts, plan for the increased frequency of emergency events, incorporate flash flooding into future project and infrastructure design and adopt adaptive management strategies, as necessary (Stantec, 2013).

Extreme weather has been an issue affecting East Ferris for many years and this has become more intense over the last few years leading the community to request assistance from the federal and

provincial governments for damage repairs (East Ferris Participant, 2018). In particular, East Ferris has suffered through numerous rain events that have resulted in flooding. The flooding has led to road failures and backed up water systems. (East Ferris Participant, 2018). The Welcome Guide for future residents explains that the key risks and hazards experienced by East Ferris include power outages and severe weather, particularly severe rain events and windstorms (East Ferris Township, 2013).

On August 5th, 2008, East Ferris suffered a severe rainstorm that resulted in much damage to the roads and a number of homes. It is estimated that 124mm of rain fell within a 7 hour period (Stantec, 2013). Due to the damage to the local infrastructure and East Ferris not being able to financially handle the damages it endured, it requested financial assistance from the Ontario Disaster Relief Assistance Program. This request resulted in a funding amount of \$1.056 million in 2008 (Adams, 2008).

Interestingly, the 2008 rain event was not recorded at the nearby official meteorological stations, but instead was tracked by a private rain gauge. The main impact zone of this event was restricted to a narrow swath suggesting that increased weather data collection coverage is needed over these areas to assess and document extreme weather events (Stantec, 2013).

Another potential impact from climate change relates to seasonal populations and tourists. As a community within hours of Toronto with recently completed four lane highway access, seasonal properties and tourist influx are common and on the increase. These populations could have different knowledge levels of local weather risks and emergency procedures should accommodate its needs. In the future, it is suggested that these seasonal population fluctuations may be magnified as citizens from more southern parts of Ontario seek refuge from the increasing heat in more northern communities (Stantec 2013).

Climate Change-Preparedness

After the state of emergency in 2008, East Ferris needed replacements of its culverts and water system pipes. The level of funding provided only allowed them to replace the culverts and pipes with the same size rather than rebuilding with larger capacity culverts. The East Ferris Participant felt that the intense rainfall should be a clear indicator that an increase in capacity of the pipes is necessary to prevent future damages to the municipal infrastructure (East Ferris Participant, 2018).

In 2017, East Ferris received a total amount of \$75,000 in funding from the federal and provincial governments to replace and upgrade a 20 metre storm water culvert and a 4.3 kilometre storm water collection system (Newswire, 2017). The water collection system was located in an area that was prone to high beaver dam activity. In this area, a lot of the dams will break during extreme weather events. The goal of this infrastructure upgrade was to increase the capacity of these water systems and prevent future damage (East Ferris Participant, 2018).

Since the AMP is considered a higher-level approach, specific projects are not written into this planning document. Instead, such projects and the issues associated with climate change are addressed in the detailed design stage when applying for funding or any kind of financial assistance (East Ferris Participant, 2018). The AMP notes that the increasing costs of extreme weather is a trend likely to have a significant impact on the Township's ability to meet the identified infrastructure needs. Capital funds have been reallocated to emergency repairs following recent flood and wind events. East Ferris has established an Emergency Capital Reserve Fund in an attempt to prepare for these unexpected expenses (Asset Management Plan, 2014). When infrastructure needs to be replaced, repaired, or upgraded,

these needs are discussed and evaluated by the local council who decide which projects to undertake and allocate the budgets (East Ferris Participant, 2018).

Climate Change-Prepared Cooperation: Possibilities and Best Practices

Ultimately, the reason behind the shared costs and agreement related to South Shore Bridge as well as other roads between East Ferris and its neighbours is due to the location as a boundary bridge and roads (East Ferris Participant, 2018). One of the challenges that arises when sharing services with surrounding communities is whether both municipalities prioritize the same infrastructure needs at a given point in time. If municipalities share a priority, such as needed road work, then joining together is a great idea. If the communities have more important things on their list of projects, then cooperation might not work at that particular moment (East Ferris Participant, 2018).

It can be very challenging for municipalities with small populations to provide the best services for its residents but with service cooperation, local officials can ensure these services will be provided. It is challenging for them to be able to provide each department with a full-time staff member. In order to save money, municipalities may share engineers or building inspectors by having them available on a project-specific basis rather than paying for a full-time employee (East Ferris Participant, 2018).

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The Municipality of French River

Background

The Municipality of French River is a single-tier municipality located in Northern Ontario (Statistics Canada, 2016). 2016 census data shows that French River has a population of 2,662, a population increase of 9% since 2011, an average age of 49.2 years and a geographic size of 735.48 km² (Statistic Canada, 2019). Over the past 15 years the population has grown by 15%, with the demographics reflecting an aging population (KPMG, 2017a). The Municipality of French River is comprised of the communities of Alban, Noëlville, Ouellette, Rutter, Monetville, and North Monetville (Municipality of French River, 2018). The trades, transport and related occupations are the largest occupational groups in French River (Municipality of French River, 2013). There are many lakes, rivers, and islands within the Municipality including Trout Lake, Lake Nipissing and the famous French River (Municipality of French River, 2013). Based on the information provided in the Community Profile for The Municipality of French River (2013a) the municipality is economically centered on farming, tourism and logging industries.

Characteristics of Cooperative Agreements

The Municipality of French River has cooperative service agreements with the neighbouring municipalities of Markstay-Warren, Killarney, and St. Charles (Municipality of French River Participant, 2018). French River along with these municipalities comprise the Sudbury East Planning Board which provides planning services for its member communities (Sudbury East Planning Board, 2017). The communities also work together through the Sudbury East Building and By-law Services (Municipality of French River Participant, 2018). The services shared between French River and the neighbouring municipalities also include Mutual Aid Agreements and Public Library Services (KPMG, 2017b).

One of the main reasons the French River and the neighbouring municipalities started to share services was for cost sharing purposes (Municipality of French River Participant, 2018). Another reason for the shared services is because there is a lack of experienced people to fill job positions. However, this sharing of personnel between communities was also identified as a challenge because it means that there are smaller teams working for the communities. Some department personnel may be spread too thin through the efforts of trying to lower the service costs.

The Municipality of French River as well as the other municipalities that make up Sudbury East took part in a report completed by KPMG to assess the potential opportunities for share services (KPMG, 2017b). The following opportunities were identified: 1) Group purchasing for bulk materials, equipment or professional services, 2) Shared building inspection and bylaw enforcement, 3) Regional training, 4) Adopting a regional approach for the addition of municipal drainage management personnel, 5) The potential creation of engineering/asset management capacity and coordination, and 6) The establishment of a regional approach to equipment maintenance. However, the report warns that implementation of any of these options will most likely result in greater operating efficiency rather than substantive cost savings.

Infrastructure and Asset Management Planning

Between 2011 and 2015, KPMG (2017a) identified that the Municipality invested most heavily into its transportation infrastructure (37%-80% of annual expenditures) followed by solid waste. Across sectors, service levels in fire were consistent and comparable to similar municipalities, while service levels for road maintenance reflect minimum standards. Overall, the Municipality appears to be a low cost provider of services, with service level standards in line with comparator communities.

In the French River asset management plan (AMP, 2013b) roads had the highest net asset value at \$13.5 million, followed by buildings at \$6.6 million and wastewater collection and treatment at \$2 million. The public works infrastructure that is most in need of repair or replacement are roads, culverts, sanitary sewers and storm sewers. When looking at replacement costs, roads were the most expensive to replace at \$58 million followed by municipal drains at \$16.7 million and buildings at \$15.3 million. Approximately \$3 million per year is needed to sustain existing services at appropriate levels of service.

Historically, French River has invested approximately \$1.24 million per year into infrastructure management; a shortfall of \$1.76 million. While this significant shortfall is somewhat exaggerated by the inclusion of a \$2 million reserve fund in the AMP, simply maintaining current service levels into the future will continue to be a challenge, even without considering inflation, the current backlog of needed projects and needed upgrades. The Municipality will need to find additional funds from various sources, including government grants (French River AMP, 2013b).

Climate Change Impact on Infrastructure Sectors

The Municipality of French River is vulnerable to a number of extreme weather events including flooding and forest fires. For example, in July 2018, a severe forest fire, referred to as 'Parry Sound 33', occurred in northeastern Ontario requiring residents of the French River area to be evacuated as well as leading to a number of travel restrictions (Roy, 2018). Flooding, tornadoes, severe summer and winter storms, hail and freezing rain and severe heat are also extreme weather issues that are of concern in the French River area (French River Emergency Plan, 2017; French River Flood, 2017).

Extreme weather events, such as the forest fires or flooding that the municipality has experienced, can impact many infrastructure services related to public works as well as emergency management. The public works infrastructure that could be impacted by extreme weather events in French River includes roads, culverts, storm water and sanitary systems. These events also impact the emergency management infrastructure such as fire and emergency medical services. These impacts on the municipal infrastructure could also lead to many services being interrupted including water systems management, sewage management, water drainage and transportation among others.

Climate Change-Preparedness

Although climate change is not mentioned directly in the French River Emergency Plan (2017), many of the extreme weather events addressed in the plan could be related to, or exacerbated by, climate

change. In 2016, the Ontario and federal governments provided support to the Municipality of French River under the Small Communities Fund (Canadian Underwriter, 2016). The municipality received a little over \$250,000 to construct a storm water management pond in order to reduce the risk of flooding in the community.

According to the Municipality of French River Participant (2018) the cooperative agreements that are in place were not created in order to address extreme weather or climate change. However, the shared services between the French River and the neighbouring municipalities do likely increase the municipality's preparedness in that they are able to share resources with other communities in the case of an emergency.

Climate Changed-Prepared Cooperation: Possibilities and Best Practices

There are several pillars and considerations that enhance the success of service sharing according to the Sudbury East Municipal Shared Services Study by KPMG (2017b) including: trust, communication, mutual benefit and data collection. The best practices for service sharing identified by the Participant were to take the time to work out the agreements and not to rush into trying to share all of the services right away as well as to seek legal opinions regarding the best ways to set up a memorandum of understanding. The municipality has had some challenges with their shared services particularly with knowing who exactly was in charge and in terms of the leadership roles and support from the municipal council. French River will continue to share services and will also consider additional cooperation in the future; specifically they have been discussing the possibility of sharing fire services (Municipality of French River Participant, 2018).

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The County of Frontenac

Background

The County of Frontenac is located in the South Eastern Ontario. This upper tier county has a land area covering 3336.62 square kilometers, a population of 150,475 in 2016, with .056% growth over the last 15 years and an average age of 42.8 years (Frontenac Economic Development – County Profile, n.d.; Statistics Canada, 2019). The County has 4 smaller member municipalities within its borders: North Frontenac, Central Frontenac, South Frontenac, and Frontenac Islands. Frontenac’s key economic sectors are agriculture, local food and beverage, niche manufacturing, trails and recreation (Frontenac Economic Development – County Profile, n.d.). With picturesque small towns surrounded by lakes and trees, Frontenac County attracts many tourists all year round (County of Frontenac – Community Profile, n.d.).

In 2009, the County completed a sustainability guide. The goal relating to infrastructure is worth quoting at length as an example of balancing multiple social, economic and environmental values while promoting inter-community cooperation:

“Long-lasting, efficiently designed and properly maintained infrastructure contributes toward the Frontenac’s vision of sustainability. Strong coordination between the County and Townships ensures that infrastructure provides maximum utility at reasonable cost while ensuring minimized environmental impacts.” (Frontenac County, 2009, p. 31).

Characteristics of Cooperative Agreements

The County supports and works with the Townships to coordinate infrastructure and public service facilities. It may authorize regional level strategy development to support cooperative future capital improvements. The County is working with the villages and hamlets to develop services, particularly a municipal well (County of Frontenac Official Plan, 2014). Frontenac County works with its lower tier municipalities in a several different ways. These include the sharing of a emergency management training, planning services, information technology and services and sharing building space. The County collaborates largely with its member municipalities, rather than other neighboring municipalities (Frontenac County Participant, 2018).

A second way that Frontenac County is combining services is through the sharing of Information Technology (Special Council Meeting, 2015). The County and 4 lower tier municipalities began sharing Information Services (IS) in early 2016. They are served by a single team of IS members “...in an effort to create economies of scale and increase operational efficiencies” (Smits, 2016). At the time, Chief Administrative Officer (CAO) Kelly Pender stated that having the County and its lower tier municipalities combine information services, provides the groundwork for all the other services that are shared between the municipalities (Smits, 2016).

A third way that Frontenac County is combining services is through its planning services department (Ferguson, 2018a). Over the past few years, the County, at the request of participating three municipalities assumed the provision of planning services for three of the four county's municipalities to reduce costs for all (Ferguson, 2018). Due to this change, the workload for the County planning services has increased significantly. The County council members met earlier in 2018 to discuss the hiring of a new planner to minimize the workload for the planning department resulting from increased planning activity in the County (Ferguson, 2018a). One of the challenges that the townships and the County are facing is financial difficulties. A promise was made to member townships prior to the merge that the price of planning services would remain the same. However, the proposed new hire of a planner would ultimately increase the cost for planning services for all involved (Ferguson, 2018a).

Fourth, service cooperation for a shared headquarters building was proposed earlier this year giving the partners the ability to save money and land space (Ferguson, 2018b). The Frontenac County Participant (2018) stated that three partners are considering working together – the County, the Conservation Authority, and South Frontenac Township. If each partner were to open its own headquarters building, it would require 10,000 square feet each. By joining together, they only require 24,000 square feet in total (Frontenac County Participant, 2018). The joint venture will save on construction costs as well as ongoing expenses such as heating and utilities. It would also reduce staffing costs and related expenses such as using a common reception area and staff room and reducing the needed support from Frontenac Council members.

So far this planning process has been going well and is moving forward. In late summer 2018 the three parties were to meet to commit to the agreement. The next step will include drawing up sketches, designing the floor plans, searching for a property for this building and developing a protocol outlining how the partners will effectively work together (Frontenac County Participant, 2018). This step in the process is estimated to take a few months and is expected to be completed in late 2018. At this stage in the process, there is no community involvement, but the proposal has been reported intensively in the press. All meetings that are held to discuss this process are reported by the media. The public will be involved further on in the process (Frontenac County Participant, 2018).

The County has experienced two challenges in the process of building a shared headquarters building. When the three partners join together, there is the concern over maintaining each organization's brand or identity. The Conservation Authority, at the moment, has its own headquarters building. The concern here is related to community perceptions since conservation and municipal goals may be different. The Conservation Authority's main goal is in the protection of the environment, while the County and the Township of South Frontenac must balance environmental concerns with their primary goals related to social and economic sustainability (Frontenac County, 2009; Frontenac County Participant, 2018). The other challenge that these partners are facing is to find a suitable location for the headquarters building. Each partner is based in different areas of the County. They have located a potential location 10 minutes away from Highway 401 that could work for all three partners (Frontenac County Participant, 2018).

Infrastructure and Asset Management Planning

The Frontenac County Official Plan (2014) states that planning for infrastructure and public service facilities must be coordinated cost-efficiently and effectively in a way that considers the impacts of climate change. Infrastructure planning must consider financial viability over the life cycle as demonstrated through the AMP process and must meet current and projected needs.

Frontenac County's most recent Asset Management Plan (AMP) was completed in 2013. The report states:

"The performance of a community's infrastructure provides the foundation for its economic development, competitiveness, prosperity, reputation and the overall life for its citizens. Reliable and well-maintained infrastructure assets are essential for the delivery of critical core services for the citizens of a county." (Public Sector Digest, 2013, p. 4).

The AMP focuses on vehicles, buildings, machinery and equipment, and land improvements with a noted total annual deficit of \$851,000. On the overall assessment of the County's state of its infrastructure and financial capacity to fund average annual requirements, the County received a cumulative grade of D+ on its infrastructure report card. Machinery and equipment were assessed as being most in need of replacement, with other asset classes receiving "B" and "C" ratings (Public Sector Digest, 2013).

In response, County Council approved a plan to add an incremental 0.65% tax increase each year for ten years to achieve sustainability. 2019 is year five of ten (Frontenac County Participant, 2018).

Climate Change Impact on Infrastructure Sectors

As outlined in the County of Frontenac's Emergency Management Program (n.d.), the most likely hazards related to extreme weather events are snowstorms, blizzards, ice, sleet and hail; brush and wildland-urban interface fires; and tornadoes/wind. Possible hazards include drought, floods and water emergencies. The interview Participant for Frontenac County explained that Frontenac has recently experienced more and more water level fluctuations. Water levels have been both extremely low and high, which some suggest is a result of beaver dam activity. This sort of activity is not something the County had experienced before. Due to beavers entering new areas of the County, additional strain is being put on local infrastructure. Roads are experiencing flooding, while culverts are bursting. This is a result of not enough capacity for the water that is coming from beaver dam blow outs (Frontenac County Participant, 2018).

In 2017, Lake Ontario and the St. Lawrence River rose to historic high levels (State of emergency in Frontenac Islands due to flooding, 2017). Due to these high-water levels, compounded by heavy rainfall in the early months of 2017, Frontenac County declared a state of emergency. Residents were given

sandbags to prevent their homes from experiencing extreme damage from the water. The ferry from Frontenac Islands was closely monitored to assess the conditions and potential shut down of services (State of emergency in Frontenac Islands due to flooding, 2017).

The heavy rainfall led to road washouts and caused beaver dams to burst in South Frontenac and Central Frontenac. While there was minimal damage to the roads and other infrastructures, the Townships were expecting a lot worse. According to Mark Segsworth, the Public Works manager of South Frontenac, “The structural integrity of the road is still there”, so many roads were closed only for a short period while clean up and minimal repairs were conducted (Stafford, 2017). He also mentioned that the minimal damage to the roads after such a heavy rainfall could be the result of drainage improvements that have been completed within the County (Stafford, 2017). Another extreme rain event occurred later in 2017 leading to a culvert collapsing on the Trans Canada Trail. Following the collapse, two roads were closed while an engineer from the Township’s Public Works Department was brought in to assess the roadways (Stafford, 2017).

Climate Change Preparedness

The County’s Official Plan addresses climate change in several key places. It states that all infrastructure “...shall be provided in a coordinated, efficient and cost-effective manner that considers impacts from climate change while accommodating projected needs” (Frontenac County Official Plan, 2014, 32-33). Financial viability over the infrastructure life cycle will also be critical, as may be demonstrated through asset management planning. The Plan also states that: 1) Protecting biodiversity is important to ensure the sustainability of the County’s rich natural heritage and help mitigate the impacts of climate change; and 2) The County and Townships shall consider potential climate change impacts that may increase natural hazard risks.

The current version of the AMP does not offer information about climate change or extreme weather events (Public Sector Digest, 2013). However, according to the interview Participant, a new section focusing on the overall condition of bridges will be introduced soon. The new section will also be assessing the impact of climate change on a range of infrastructure including bridges and culverts. Another section will be assessing the County’s trail systems. Specific climate change factors will include flooding and wash outs and areas that have the potential to experience high and low water levels (Frontenac County Participant, 2018).

Climate Change-Prepared Cooperation: Possibilities and Best Practices

The Participant for Frontenac County stated that one of the main advantages of having an AMP in place is that the municipality is able to connect infrastructure management with the 10-year financial plan. The County is also able to foresee potential costs for the future, estimate costs and commit tax dollars towards infrastructure projects. When there are fewer infrastructure projects in a given year, but the AMP forecasts several upcoming projects in subsequent years, the County can plan ahead for those costs. By consistently putting money into the reserve through taxation or other sources and being

aware of upcoming cost requirements, the County can efficiently undertake needed work (Frontenac County Participant, 2018).

The AMP also provides a tool that demonstrates the longer-term benefits of making an upgrade or repairing infrastructure to the County Council (Frontenac County Participant, 2018). The council is able to see the value of consistently contributing tax dollars to the reserve, how money was spent in the past and how much future infrastructure upgrades might cost (Frontenac County Participant, 2018). Another advantage of having an AMP in place is that it operationalizes large capital expenditures.

One of the challenges that arises with having an AMP process is having council members fully understand the goals for specific upgrades or replacements since it can be challenging to fully explain such a complicated topic (Frontenac County Participant, 2018). It was also suggested that if grants were more closely tied to the needs in the AMP, then council members would focus more on meeting these requirements for funding. By having funding applications tied to the AMP, the applications would gain more consideration from council and would be stronger and potentially more successful grant applications (Frontenac County Participant, 2018).

The Participant for Frontenac County was asked for any words of advice to future communities looking to start or further advance service cooperation with its neighbors. The Participant stated that the best thing to do first is to start small and work up to bigger problems that the community is facing. Starting small builds confidence and experience. In the long run this approach will benefit the community by further developing service cooperation agreements as knowledge increases. Also by starting small, council members are able to gain a better understanding of what service cooperation involves and how they could benefit from such agreements (Frontenac County Participant, 2018).

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The Township of Grand Valley

Background

The Town of Grand Valley, located in southern Ontario, is known for being “Nature’s Playground” (Grand Valley, Ontario, 2018). The Town was amalgamated from the former Township of East Luther and the former Village of Grand Valley in 1995. It is a lower tier municipality that is part of Dufferin County (Grand Valley, Ontario, 2018). Dufferin County is comprised of 7 smaller communities, the Townships of Amaranth, East Garafraxa, Melancthon, Mulmur and the Towns of Grand Valley, Mono, Orangeville and Shelburne. In 2016, its population was 2956, which is an 8.4% increase since 2011, with an average age of 39.2 years and a land area of 158.23 km² (Statistics Canada, 2019). Agriculture is a key economic activity in the region with the top employment industries consisting of construction, manufacturing, retail and health (Dufferin Board of Trade, n.d.).

Characteristics of Cooperative Agreements

Grand Valley shares a few infrastructure services with its neighboring communities. Mainly it share roads and bridges that border the two municipalities (Grand Valley Participant, 2018). The Grand Valley & District Fire Department, established in 1952, supplies fire services to 3 municipalities – Amaranth, Grand Valley and East Garafraxa (Grand Valley and District Fire Department, n.d.). While the building and the land are owned by the Town of Grand Valley, the service is shared equally between the three municipalities (Grand Valley Participant, 2018).

Grand Valley coordinates needed infrastructure repairs with its upper tier municipality Dufferin County. When a construction company is working on county roads, Grand Valley will coordinate with the same construction company to undertake needed repairs or upgrades on the Town roads as well. The Town saves money by getting a better deal with the construction company. The companies are able to work more cost effectively because they do not have to pack up and change locations multiple times (Grand Valley Participant, 2018).

Dufferin County recently hired a new Economic Development Coordinator. This new hire opens up the possibility for future inter-community cooperation. This cooperation could help the lower tier municipalities with future economic development (Grand Valley Participant, 2018).

Infrastructure and Asset Management Planning

In 2006, Grand Valley was funded by the provincial and federal governments to upgrade and replace important infrastructure that would ensure “strong and sustainable communities” (Ministry of Agriculture, Food and Rural Affairs, 2006). The Ontario and Canadian governments invested \$2,962,500 in Grand Valley to build a new water pollution control plant. The project cost upwards of \$8 million. The control plant contained “a new pumping station and force-main, a head works building, tertiary sand

filtration and ultraviolet disinfection, and biosolids digestion and storage facilities” (Ministry of Agriculture, Food and Rural Affairs, 2006). Then Mayor John Oosterhof stated that with this upgrade to the plant, Grand Valley would be able to more efficiently process wastewater (Ministry of Agriculture, Food and Rural Affairs, 2006). Ultimately, this new facility was expected to have a huge positive impact on the environment. An additional investment was made to replace 3 of Grand Valley’s bridges that had reached the end of their life span and needed immediate replacement (Ministry of Agriculture, Food and Rural Affairs, 2006; Grand Valley Participant, 2018).

In the earlier 2013 version of the asset management plan (AMP), climate change was not addressed. The 2013 AMP only mentioned environmental impacts but did not provide any specific details (Burnside & Associates Limited, 2013). The recently updated AMP includes roads, facilities, vehicles, drinking, waste and storm water, equipment and machinery, land improvements, and software and hardware (Burnside & Associates Limited, 2018). Overall, asset types were rated at the average or good level, with several wastewater components rated as very good. The current AMP for Grand Valley has incorporated climate change into its budgeting for any future damages that might occur to infrastructure as a result of extreme weather events (Grand Valley Participant, 2018).

A key strength in Grand Valley is the awareness of the Town’s current infrastructure condition and clear plans to meet future needs. Even with the small population size, it has been possible to gather the necessary information and work with the appropriate people to undertake what needs to be done to the infrastructure (Grand Valley Participant, 2018). The Town has a good understanding of the life span of their infrastructures and has put aside funds for future repairs and replacements. Unfortunately for Grand Valley, as well as many other small municipalities, a key weakness is that adequate financial capacity to meet infrastructure needs is always an issue (Grand Valley Participant, 2018).

Climate Change Impact on Infrastructure Sectors

The County of Dufferin Emergency Response Plan, created for all its member municipalities, identifies the following as key weather-related hazards: severe summer and winter storms, ice storms, tornadoes and high winds, extreme heat and cold, flooding, drought and forest fires (County of Dufferin, 2017). In the Town’s Official Plan (2006, 4), one objective is: “To manage growth so that the existing and future residents will enjoy a quality of life that is not adversely affected by growth, incompatible land uses or hazardous conditions.” Flooding, erosion, unstable soils and steep slopes are identified as key natural hazards.

As the Grand River runs through Grand Valley and the community is located within Ontario’s “tornado alley”, the Town has had experiences with flooding and tornadoes in past years. On May 31st, 1985 Grand Valley faced an EF4 tornado. This tornado devastated the community by destroying much of the Town’s infrastructure. The needed reconstruction caused financial strain on the municipality (Grand Valley, Ontario, 2018).

In 2016, it became evident that Grand Valley had a serious problem with its sewer system due to storm water overflows into the wastewater system and other infiltration issues. A significant amount of non-wastewater was getting into the sewer system putting an unnecessary strain on the Town’s water

treatment plant (Halliday, 2016). The sewer system problem is a result of past sewer system designs that allowed non-wastewater to enter the system (Grand Valley Participant, 2018). Until the Town addresses this problem, future population growth could be hampered (Halliday, 2016).

In 2017, the Town experienced some of the worst flooding it had seen in the past 20 years (Halliday, 2017). After the unfortunate incident of a child being swept away during spring ice jam flooding, residents of the nearby Township of Amaranth requested three things from its council members - roads to be better lit, guardrails along the Grand River and road closure signs to be more visible. This window of opportunity led residents to demand changes from council to ensure the protection of the community and to implement future preventative measures (Carcasole, 2018).

Climate Change-Preparedness

Grand Valley has long suffered from the effects of flooding, dating back to the first settlers. Due to land clearing and the establishment of towns near rivers, communities within the watershed have always been highly vulnerable to heavy flooding from the Grand River (Grand River Conservation Authority, n.d.,a). Flooding occurs all year long; from heavy rainfall in the summer to the ice jams in the winter (Grand River Conservation Authority, n.d.,b). Since flooding has been so common, the Town finds it difficult to discuss how climate change may be affecting these historic trends (Grand Valley Participant, 2018).

Grand Valley's current AMP addresses the impact of extreme weather on several key assets. Grand Valley has set aside funds for future road and related assets repairs and maintenance that could be required due to climate change and extreme weather events. The cost is estimated at \$50,000 (Burnside & Associates Limited, 2018). Every year some crossroad culverts must be replaced because the assets have reached the end of their life cycle and/or due to extreme weather events. The annual cost for such replacements is estimated at \$100,000 a year (Burnside & Associates Limited, 2018). The new AMP also assesses the impact of flooding from extreme weather on storm water management with the costs estimated at \$10,000 (Burnside & Associates Limited, 2018).

Climate Change-Prepared Cooperation: Possibilities and Best Practices

One of the challenges that arises from sharing services is that problems with one municipality flow over to neighboring communities. Since Amaranth and East Garafaxa share services with municipalities other than Grand Valley, it becomes a challenge when priorities across several municipalities differ. Decision-making on shared services becomes challenging when all municipalities do not have the same specific services at the top of their priority lists (Grand Valley Participant, 2018).

According to the Participant for Grand Valley, when the opportunity arises to collaborate on services, it is a great idea. If a community has the ability to collaborate and is able to give better services to its residents by doing so, then it is certainly worth the effort. It was also mentioned that changes in provincial governments can open up both new opportunities and new disadvantages at the municipal

level. For instance, the ability of municipalities to apply for and receive funding can potentially change and policies that govern services and infrastructure may also be altered. Depending on the path that the provincial government takes, it may put more financial strain on communities or may make it easier for them (Grand Valley Participant, 2018).

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The Township of Lake of Bays

Background

The Township of Lake of Bays is located in the District Municipality of Muskoka where it is one of six lower tier municipalities, including the Townships of Muskoka Lakes and Georgian Bay and the Towns of Bracebridge, Huntsville and Gravenhurst (Lake of Bays, 2018; District Municipality of Muskoka, 2018). It occupies a land area of 678 km². In 2016 the Township population was 3,167, a 8.9% decrease from 2011 (Statistics Canada, 2019). It had also experienced a previous decrease of 1.8% between 2006 and 2011. With the average age of 52 years in 2016, it is identified as having an aging population (Township of Lake of Bays, 2016; Statistics Canada, 2019). Key economic sectors include tourism, light manufacturing, construction, food and accommodation, retail trade and green energy (Township of Lake of Bays, 2016). The Township is made up of 4 small communities: Dorset, Hillside, Dwight and Baysville (Young, n.d.). This lower tier Township is located near several bodies of water which gives Lake of Bays the ability to provide “a year-round vacation paradise” to its tourists (Young, n.d., para. 2). Its vision is worth quoting at length, as it connects infrastructure with the economy and the natural environment:

“To have a strong and diverse economy with the community assets, infrastructure and people required to provide a high quality of life and employment opportunities within the Township of Lake of Bays without compromising the natural environment.”
(McSweeney & Associates, 2017, 2)

Characteristics of Cooperative Agreements

Lake of Bays collaborates with several of its neighbours. As depicted in Figure 1, there is joint management of several assets and services across the District Municipality of Muskoka, as well as provincially managed infrastructure (Figure 1).

The Lake of Bays Community-Based Strategic Plan identified that working in cooperative partnerships is a key goal to help the whole community afford the programs and services that people need. Cooperation helps achieve the Township’s vision and ensure quality of life for all residents (Miller, Hume-McKenna & Parrott, 2009).

There are quite a few roads that run through all six of the lower tier municipalities which creates opportunities for service sharing (Lake of Bays Participant, 2018). Lake of Bays also shares services with the Township of Algonquin Highlands. These services include a museum, a community ice rink and community policing. Many of the agreements that were put into place in the past were informal, “handshake” agreements rather than formal written agreements (Lake of Bays Participant, 2018).

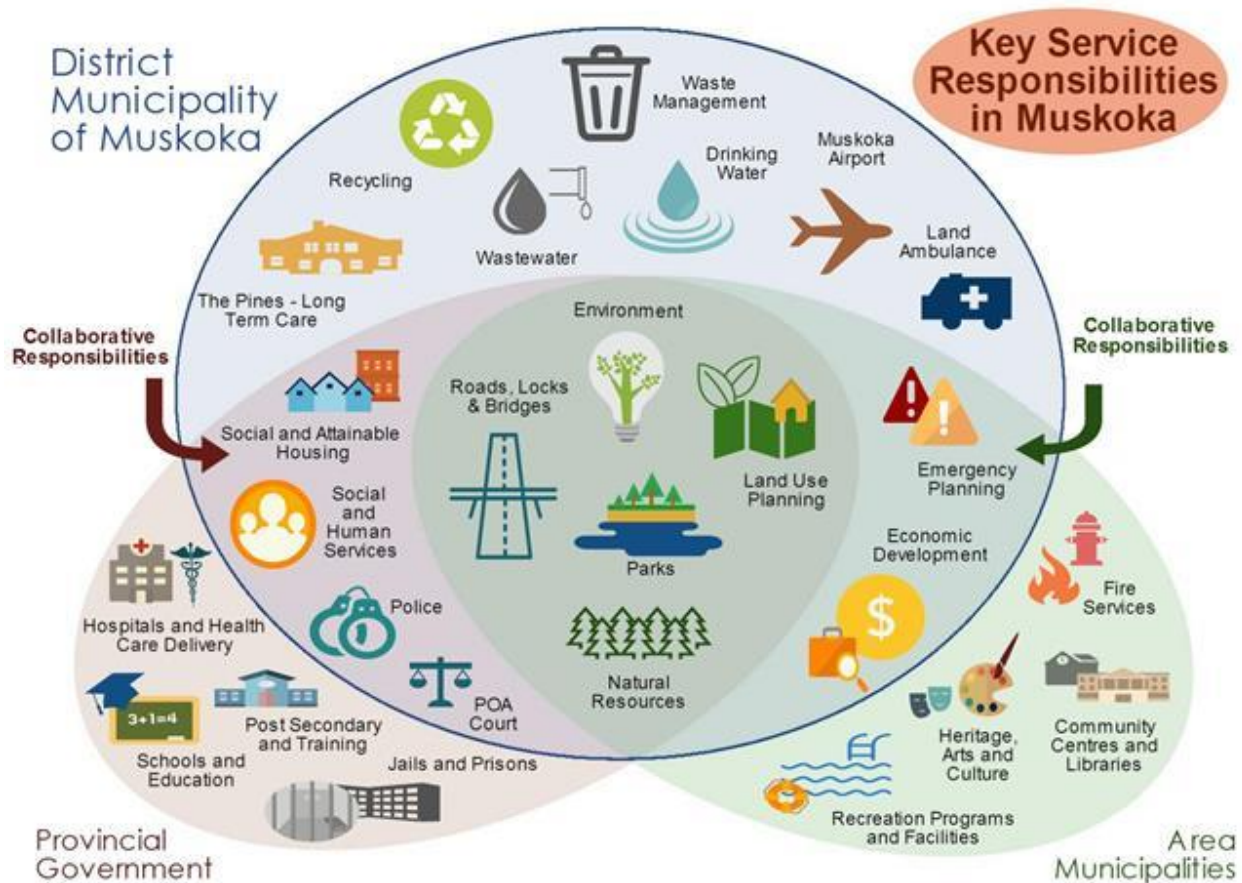


Figure 1: Upper and Lower Tier District and Provincial Service Provision (District Municipality of Muskoka, 2015-16)

The Township’s main service sharing partner is Huntsville. Both of these municipalities share the same extreme weather problems such as flooding and heavy rainfall (Lake of Bays Participant, 2018). The communities share fire services in order to save money. While each community has their own volunteer fire fighters, the long-standing agreement is that the Huntsville Fire Chief serves both communities and that they also share administration needs. (Lake of Bays Participant, 2018).

While the agreement between these two municipalities used to be informal, it has recently been updated to be more formal. This change was put into place as a result of updates to the agreement that increased the costs of the service. As a result of a Fire Services Review it was determined that administrative and training needs were lacking which resulted in reorganization and an additional staff member. At this time a more formal agreement for services was put in place (Lake of Bays Participant, 2018).

Infrastructure and Asset Management Planning

In its economic development strategy the Township identifies that community infrastructure has a direct impact on the growth of the local economy and is a building block for a vibrant and strong community. The strategy recommends that the Township develop a climate change adaptation and mitigation plan that addresses how it can be better prepared to deal with potential impacts on its infrastructure assets (McSweeney & Associates, 2017). This goal is echoed in the Township of Lake of Bays Official Plan (2016) where one goal is to plan for the reduction of greenhouse gases and the impacts of climate change. The plan also states that the design and the installation of infrastructure will respond to the potential effects of climate change.

The Township of Lake of Bays updated its 2013 asset management plan (AMP) in 2017 (The Township of Lake of Bays, 2017a). The overall goals for updating the AMP were to be better qualified to receive provincial and federal funding and to better plan and budget future spending within the next 10 years. The AMP process is mostly developed and administered by Township staff. Since the AMP details can be complex, council relies on staff to interpret the data and present the recommendations (Lake of Bays Participant, 2018).

Roads, bridges, culverts, buildings, equipment, vehicles, ramps, docks, land and land improvements are covered in the AMP with an overall rating of fair to good. Over the next 10 years, with significant debt financing and other sources of income including grants, the Township expects to be able to address its infrastructure needs. In a recent focus group, local residents maintained that good roads and the capacity of the hamlets to pool resources were key Township strengths (McSweeney & Associates, 2017).

Climate Change Impact on Infrastructure Sectors

The Township's hazard identification and risk assessment process determined that the top weather-related hazards are: blizzard, lightning, 100-year flood, and forest fire (Township of Lake of Bays, 2017b).

In 2013, the community endured severe flooding that occurred as a result of melting snow and heavy rain (Lake of Bays Participant, 2018). Impacts included road wash outs and culvert failure. In August of 2017, Lake of Bays experienced an EF-1 tornado that damaged a few private cottages, as well as some treed and open land areas (Canadian Press, 2017; Lake of Bays Participant, 2018). Other severe weather in 2017 included beaver dam wash outs and flooding events.

In 2017, Stephen Hernen, Director of Operations and Protective Services for nearby Huntsville stated that there is no doubt "global warming is here" (Cilliers, 2017). The weather patterns that are occurring are unlike anything these communities have dealt with before with tornados and flooding getting worse over time. While the provincial and federal governments have made efforts in reducing carbon emissions and finding ways to deal with the negative effects of climate change, the Muskoka region is already dealing with these impacts. The water systems of the townships cannot handle the extreme

weather impacts that climate change is bringing leading to overflowing culverts, flooded businesses and washed out roads (Cilliers, 2017).

Climate Change-Preparedness

Many of the problems that Lake of Bays faces with extreme weather and climate change are beyond local control. For instance, water levels in the watershed are controlled by the Ontario Ministry of Natural Resources. While the community must deal with the impacts as they occur and the AMP and other Township documents specifically reference climate change, needed infrastructure upgrades and replacement are not typically labeled as climate change-related. Instead, it's just the Township dealing with a needed repair or upgrade (Lake of Bays Participant, 2018).

The updated AMP notes that climate change is an external trend that may affect the expected levels of service within the Township. It also states that this challenge is also being addressed through strategic planning processes (e.g. Emergency Response), in alignment with the District's and Township's Official Plans (Township of Lake of Bays, 2017b).

Needed upgrades are more likely to be spurred by an extreme weather event rather than preparing for climate change. In 2013, after Lake of Bays experienced heavy rain fall and melting snow, the Township become much more aware of the need to prepare for future extreme weather events. It addressed some of these issues by enhancing the culvert system and diverting water away from problem areas (Lake of Bays Participant, 2018). Since the changes were made to the water systems, minimal damage has occurred (Lake of Bays Participant, 2018).

Across the District, other strategies that are being undertaken include the implementation of flood resistant building code upgrades and the development of a severe weather reserve fund (Cilliers, 2017).

Climate Change-Prepared Cooperation: Possibilities and Best Practices

In relation to the cooperation around future services and dealing with climate change a major problem is the lack of fresh ideas. Many council members and residents of Lake of Bays are still in the mind set of doing things in the same way as they always have and have not begun to understand that climate change should be a crucial factor for decision-making in these communities (Lake of Bays Participant, 2018).

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The Township of Perth South

Background

The Township of Perth South, also known as “Ontario’s Food Basket”, is a lower tier township within the County of Perth located in the South West part of Ontario (Perth South, 2018). It has a geographic area of 393.14 km² and in 2016 it had a population of 3,810, an average age of 41.2 years, with a population decrease of 4.6% since the 2011 census (Statistics Canada, 2019). The Township mainly consists of agricultural land and the main sources of employment are agriculture and manufacturing (Perth South, 2018). The Township of Perth South includes the villages of Sebringville and Kirkton. The Township was formed through the amalgamation of Downie and Blanshard County in 1998 (Perth South, 2017).

Characteristics of Cooperative Agreements

Perth South has amalgamated both its emergency management services and its official plan with the County of Perth (see County of Perth, 2017a and 2017b). Perth South does not have its own fire services. Instead it is served by three different fire services from surrounding municipalities: Granton, Sebringville and St. Mary’s (Fire – Township of Perth South, 2017). According to the Township of Perth South Participant, this arrangement has been in place for many years. For Granton, Perth South owns 50% of all the assets and pays 50% of the budget that comes out of these fire services. For Sebringville, Perth South owns 50% of the land on which the fire department building is located, but they do not own any of the equipment within that building. In St. Mary’s, they have no form of ownership, instead the Township purchases the required fire services on an as need basis (Perth South Participant, 2018).

Other services that are shared with Perth South are as follows – West Perth provides a service to the Township by cleaning the municipal office, Perth East provides planning services to South Perth, as well as the other lower tier municipalities within Perth County, and South Huron shares a community center and a community swimming pool with Perth South. For the agreement with South Huron, Perth South owns 50% of the building and services and shares the budget of the building 50/50. With North Perth, South Perth has recently terminated an agreement that had the Township contract out its drainage superintendent services (Perth South Participant, 2018). Another agreement that Perth South procures is police services. Starting in late 2018, Perth South was to be served by policing from Stratford after terminating their agreement with Ontario Provincial Police. This termination was due to cost restrictions (Perth South Participant, 2018).

Many of the agreements that Perth South has with surrounding municipalities were formed because of financial constraints. Due to the small population in Perth South, it was more cost efficient to share or purchase fire services. Through these agreements, Perth South is able to provide better fire services to their residents (Perth South Interview Participant, 2018).

For Perth South all of the agreements are formalized. Each agreement is structured according to the type of service that is being procured or shared. In agreements where Perth South owns a portion of the assets, the Township covers the associated operational and capital costs. If procuring a personnel-

related service such as cleaning, the agreement outlines the employee hourly wage rate. For the new policing services agreement with the City of Stratford, the Township will be paying solely for the resources used – for instance the number of police officers or vehicles deployed (Perth South Participant, 2018).

Infrastructure and Asset Management Planning

The Township's asset management plan (AMP, 2013) focused on roads, bridges, culverts, water and storm water infrastructure. According to the Perth South Participant (2018), when developing the AMP with the assistance of a consultant, the Township opted for a stream-lined, less expensive document to meet the requirements needed to apply, qualify and receive Ontario provincial government funding. The plan identifies that there are average annual funding shortfalls particularly with regards to the road network (\$1.2 million) and bridges and culverts (\$370,000), with a total annual deficit of \$1.6 million. While asset performance grades were rated between "B" and "C", the lack of adequate funding resulted in overall grades across the 4 asset categories between "C" and "D". Only the water network was identified as being in poor condition (Township of Perth South AMP, 2013).

Climate Change Impact on Infrastructure Sectors

According to Perth County's hazard identification and risk assessment study, the most likely severe weather includes severe thunderstorms, tornadoes, hail windstorms, heavy rain, spring flooding, snow, freezing rain, ice storms, extreme hot temperatures and potential for low water conditions. The study also identified the following as the most likely infrastructure failures: extended power outages and resulting fuel and food shortages; communications and network interruptions; bank system failures; and water system outage or contamination (County of Perth, 2017). In the early months of 2018, Perth South was affected by heavy rain and melting snow from surrounding rivers, however, no evacuations due to flooding were required (CBC News, 2018).

In 2016, the Ontario and Canada government funded numerous municipalities to ensure residents were provided with dependable water services. Perth South was granted \$50,000 from the Federal government and \$25,000 from the Ontario provincial government. This funding was used to upgrade their pump house (Better wastewater and water infrastructure for Kitchener residents, 2017). This funding gave Perth South the opportunity to upgrade the current water system without increasing the capacity. Since the municipality is not experiencing growth, there was no need to expand the potable water system (Perth South Participant, 2018).

In 2015, Trafalgar Bridge that connected West Perth to South Perth was removed partly due to low traffic flow (Thompson, 2015). An additional factor was that the bridge, built in 1905, needed extensive repairs and upgrades. The financial burden of meeting current, more stringent building codes left both municipalities with no choice but to remove the bridge. Climate change concerns ultimately led to the removal decision since the refurbished bridge would have been required to have the capacity to handle the high-water flows associated with projected extreme weather events (Perth South Participant, 2018).

Climate Change-Preparedness

According to the Township of Perth South July 11th, 2017 agenda, many parts of Eastern Ontario, which includes Perth South, are experiencing extreme weather and flooding. Due to these flooding concerns there have been discussions about what is the best way to mitigate and prepare for the associated hazards (Township of Perth South Agenda, 2017).

More recently, as the Ontario provincial government AMP standards evolve to include climate change, rural municipalities are beginning to assess these threats and better prepare for extreme weather. Perth South is in the process of updating their AMP due to this change in standards (Perth South Participant, 2018). Perth South is always looking for service cooperation when repairs and upgrades are needed for municipal infrastructure. They meet regularly with all of the Chief Administrative Officers (CAOs) that are part of Perth County to discuss what each township needs and if there is a potential to collaborate for needed services (Perth South Participant, 2018).

While Perth South has had some experience with flooding and other extreme weather events, with acres and acres of agricultural land, the Township has not had to deal with the severe climate change impacts experienced by more urbanized spaces. For South Perth, the key challenge associated with climate change is the additional costs associated with the increasingly stringent design standards needed for infrastructure replacements and upgrades. Unfortunately, the more advanced design standards translate into higher costs for rural communities (Perth South Participant, 2018).

Climate Change-Prepared Cooperation: Possibilities and Best Practices

According to the Perth South Participant the first step towards establishing service cooperation is to clearly identify service needs and then communicate with neighbouring municipalities to assess the possibility of partnering to produce more efficient and effective services for all residents (2018). If the communities do not have a history of cooperation it is useful to have an expert or someone with experience from a nearby community to help the potential partners assess their current and future needs as well as the value of undertaking a cooperative agreement (Perth South Participant, 2018).

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City of Waterloo

Background

The City of Waterloo is located in Southern Ontario and is the smallest of three cities in the Regional Municipality of Waterloo. The City has a population of 104,986, a growth of 6.3% since 2011, an average age of 39 years and the geographic size is 64 km² (Statistics Canada, 2016). The City has a diverse economy and is known for having a prominent insurance industry, a growing manufacturing sector, a notable technology center and world-renowned academic and research institutions. The University of Waterloo, Wilfrid Laurier University and Conestoga College are all located in the City of Waterloo and offer some of the best education programs in the world (We Are Waterloo, 2013). The infrastructure that is most impacted by climate change in the City are their roads, bridges and sidewalks (City of Waterloo, 2016).

Characteristics of Cooperative Agreements

The City of Waterloo shares a number of services with its neighboring communities. The City has been working with the Region of Waterloo and other municipalities since the 1970s-1980s to better manage different aspects of their shared borders. The City has a lengthy history of working with the City of Kitchener on numerous projects and initiatives with the goal of providing the residents of both cities with the most efficient municipal services (City of Waterloo, 2015a). The City also shares boundary roads with the nearby townships and the City of Kitchener (City of Waterloo, Participant, 2018). There are three basic principles that must be considered for shared projects between the two cities: accessibility, accountability and affordability (City of Waterloo, 2015a).

The City has a joint services initiative with the City of Kitchener which the City staff have been working to formalize since 2004 (City of Waterloo, 2015). The goal of the cooperation is to provide residents in the two cities with more efficient municipal services (City of Waterloo, 2015). Some of the services they share include: 20 shared roads, snow and ice removal services, a drinking water quality management system and mutual aid (City of Waterloo, 2015). The City has both formal and informal agreements in place. The agreements on the operational side with the townships are generally formal, where one municipality will do the winter maintenance and the other will do the summer maintenance (City of Waterloo Participant, 2018). However, the City works under a shared service umbrella with the City of Kitchener and this is not a formal agreement. One service that is guided by a formal agreement between the City of Waterloo and the City of Kitchener involves their water services (City of Waterloo Participant, 2018).

Additionally, the City also works cooperatively with the Region of Waterloo to provide potable water and wastewater services. Potable water treatment is handled by the Region, while the City and manages water distribution. Wastewater is collected by the City but is treated by the Region.

The key stakeholders in the discussions related to the cooperative agreements are the operational areas that provide the services. For example, for road-related services the transportation and engineering services would work together to decide what needs to be done and then reach out to the City of

Kitchener. Climate change did not have any role in how or why the shared services were put in place (City of Waterloo Participant, 2018).

Infrastructure and Asset Management Planning

The City of Waterloo has an asset management plan (AMP) from 2016. This third AMP includes all assets owned by the municipality (AMP, 2016). The cost to replace all infrastructure is estimated at \$1.6 billion, with transportation, facilities and sanitary sewer collection as the three most costly asset categories. It states that the availability and quality of information available across the assets is variable and that increasing the 'maturity' of the data will enhance confidence in the outcomes of the analysis. Although the City has a history of responsible asset management, the AMP notes a shortfall between the current planned expenditures and the levels of service likely to be acceptable to stakeholders. According to Nick Larson (AMP, 2016, 4) "The infrastructure challenges facing Waterloo did not materialize overnight, they grew from decades of making decisions about how our infrastructure systems were developed without a comprehensive plan to maintain the systems over the long term". Tax supported assets require an additional annual funding of \$14-17 million while rate funded assets require \$3 million. A long-term financial plan is being developed to address shortfalls. The plan will include infrastructure levies, property taxes, debt, grants and user fees (AMP, 2016). In the Appendix outlining specific projects, the City undertook 5 environmental planning and management projects addressing climate change, vulnerability assessment, and adaptation.

The AMP for the City of Waterloo is custom built to ensure that it can integrate with the existing City software processes and has the needed predictive ability. For instance, for different levels of investment bar graph outputs can provide useful feedback regarding the infrastructure impact within the asset class over the following 20 to 30 years. The City reported that having the AMP in place has facilitated cooperation and decision-making within its own asset management department in a number of ways. The AMP has helped the City meet the requirements for funding opportunities because having an AMP is required to apply for many grants. The plan also allows for more effective conversations with the public and with council about what assets are, what the City's needs are, how to maintain infrastructure and what the City needs going forward (City of Waterloo Participant, 2018). Although the City shares many services with the City of Kitchener and other nearby communities, they do not discuss these shared services within their 2016 AMP. It will be adding more information regarding extreme weather in an upcoming revision to the AMP because under the new provincial legislation for asset management consideration of extreme weather and climate change is required (City of Waterloo Participant, 2018).

In May 2017, the City's AMP won the Canadian Network of Asset Managers (CNAM) Tereo Award for their excellence in developing and implementing asset management approaches and improvements in business performance through the use of AMP techniques (City of Waterloo, 2017). In addition, the City received the Association of Municipalities of Ontario Gas Tax Award in August 2017 for their asset management system (City of Waterloo, 2017). The City invested \$700,000 from the Gas Tax Fund into their asset management system to help guide their infrastructure investment and maintenance over the next 25 years (Federal Gas Tax Fund, 2017).

Climate Change Impact on Infrastructure Sectors

The Region of Waterloo website includes a section on climate change and extreme weather which indicates that the region recognizes the effects of climate change, severe weather and poor air quality on their community (Region of Waterloo, 2018a). The community expects to be affected by climate change including changes to temperature, rain, snow, and extreme weather (Region of Waterloo, 2018a). Some of the recent events that have affected the City and Region of Waterloo have included: extreme cold temperatures in December 2017 which caused increased water main breaks and broke records for the coldest temperature ever recorded in the Waterloo Region; significant flooding in February 2018 which was caused by unusually warm weather and an extended rain event; and wind gusts up to 122km an hour in May 2018 which damaged trees and street lights and caused thousands of power outages (Region of Waterloo, 2018a). The City has also experienced ice storms which caused damage to the trees and power lines (City of Waterloo Participant, 2018).

The information that is provided within the AMP for the City indicates that roads, bridges and sidewalks are the public works infrastructure most vulnerable to climate change hazards (City of Waterloo, 2016). The uptown portion of the City is also in the flood zone because Laurel Creek runs under the Town Square, so in the case of an extreme weather event that is also a major consideration (City of Waterloo Participant, 2018). The services that could be interrupted by flooding, and other extreme weather events are transportation, water management services and emergency management services.

Climate Change-Preparedness

The City of Waterloo is also currently in the process of completing their climate adaptation plan and the plan will be finished in 2019 (City of Waterloo Participant, 2018). The plan will further assess the risks to their infrastructure related to changing climate. Once the climate adaptation plan is completed it will be used to embed information related to climate change and extreme weather into the City's AMP (City of Waterloo Participant, 2018).

The City of Waterloo has worked with the Region of Waterloo as well as with two other cities, four townships and community members to prepare a Community Energy Investment Strategy for the next 20 to 25 years (Region of Waterloo, 2018b). The strategy was created to improve energy performance, manage energy costs and promote environmental sustainability (Region of Waterloo, 2018b). The strategy helps residents and employers save on energy, benefits the local economy by creating new jobs and benefits the quality of life and environment in the City (Region of Waterloo, 2018b).

Climate Change-Prepared Cooperation: Possibilities and Best Practices

There are a number of factors which influence the potential for cooperation in the City of Waterloo. One factor has to do with the increasing population in the City, as it is one of the fastest growing urban areas in Ontario (Region of Waterloo, 2018b). In terms of municipal factors, the City has experience with extreme weather events, has familiarity with cooperation, and has an existing AMP in place. In relation

to agreement/decision-making factors, the City also has some flexible and informal agreements in place with the City of Kitchener (City of Waterloo Participant, 2018).

A best practice for undertaking and integrating cooperation suggested by the City of Waterloo Participant is to have operational members as well as management on board to ensure that everyone is aware of what is going on and so that they can have supportive and effective discussions between all levels of government that are working together (City of Waterloo Participant, 2018). The City also shares information with the City of Kitchener and they learn from each other's best practices (City of Waterloo, 2015a). The City is always open to discussing new sharing opportunities that come up with their neighbors (City of Waterloo Participant, 2018).

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