Environmental and Energy Action Plan

Julian Burger, Christian Filippini

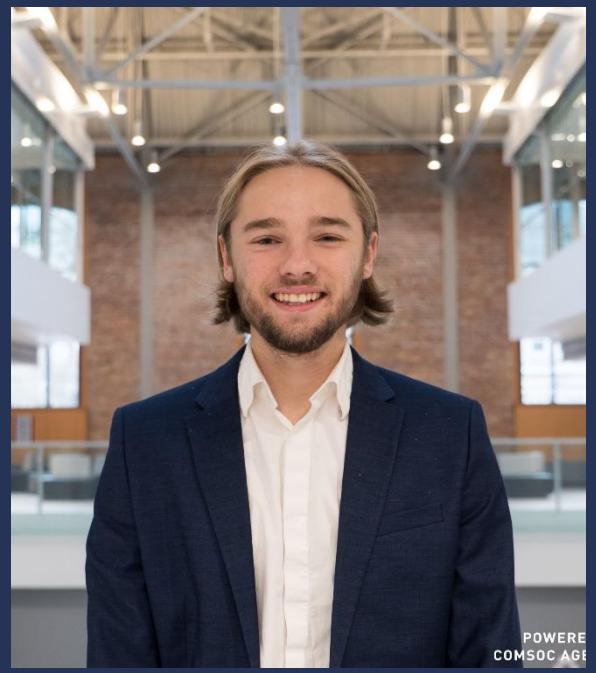
August 19, 2021

Our Team

SBC Consultants

Smith School of Business, Queen's University | Business Consulting

Consultants



Julian Burger
Eng ‘21

Christian Filippini
Comm ‘22

Managing Director

Charlie Mignault

Presentation Overview

Agenda for Today

Smith SCHOOL OF BUSINESS Queen's University | Business Consulting

1. Situation Analysis
2. Emissions Baseline and Projections
3. Core Strategies and Blueprint
4. Governmental Funding Opportunities
5. Next Steps

Why is Climate Planning important for Gananoque?

The Economic and Environmental Benefits of a Climate Action Plan

Smith School of Business, Queen's University | Business Consulting

Local Climate Effects

- Local precipitation expected to increase 7% by 2050 and 15% by 2100[1]
- Increase in average annual temperature of 2.5 C by 2050 and 4 C by 2100[1]
- Future climate risks include increased flooding, cooling demand and healthcare costs

Economic Benefits

- Average annual energy spending in municipalities below 10,000 is as much as $12 million
- Household energy efficiency measures could save up to 25% of annual utilities costs
- More energy efficient and sustainable municipalities reduce the burden on taxpayers over time due to lower life-cycle costs of assets

Role of Municipalities

- Canada is currently not on track to achieve its 30% emissions reduction target by 2030
- Municipalities account for 45% of all emissions in Canada
- Smaller communities face fewer barriers to implementation, however, can still be constrained by lack of resources

Municipal Climate Planning in Canada

The Partners for Climate Protection Program

Smith School of Business, Queen's University | Business Consulting

Partners for Climate Protection Overview

- Program co-led by the Local Governments for Sustainability (ICLEI Canada) and the Federation of Canadian Municipalities
- Guides and provides support to municipalities in reducing their emissions through tools, networking opportunities, events, resources and technical support
- Over 400 members Canada-wide representing over 70% of Canada's population
- Membership is free but the following conditions must be met:
  - A joining resolution be passed through council
  - Move through the 5-step milestone process within 10 years of joining
  - Progress is reported every two years
  - Participation in PCP programs and activities to connect with other network members

ICLEI Local Governments for Sustainability

FCM

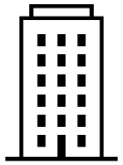
PARTNERS FOR CLIMATE PROTECTION

The 5-Step Milestone Process

Municipal Climate Planning in Canada

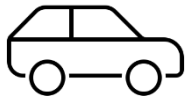
The Five Target Sectors

Smith School of Business, Queen's University | Business Consulting



Buildings & Facilities

- Establish green standards for new and existing buildings
- Improve energy efficiency in buildings
- Transition away from fossil fuel use within buildings
- Install on-site renewable energy generation

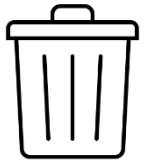


Transportation

- Create better Electric Vehicle Infrastructure including charging station and purchasing agreements
- Improve vehicle efficiencies within municipal fleet
- Incentivize vehicle demand reduction (cycling, carsharing, bus routes etc.)

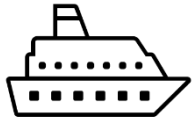
Land Use

- Develop official planning documents for GHG targets, environmental protection and preservation of ecosystems
- Enforce green development standards, urban boundaries and sustainable zoning



Waste

- Target waste prevention over waste diversion (compost, plastics ban etc.)
- Create waste awareness campaigns to promote waste prevention
- Conduct community outreach events such as workshops, farmers markets etc.



Tourism

- Reduce the impact of travel to, from and within the community
- Promote sustainable tourism such as biking or walking tours
- Implement initiatives to promote the sustainability of the community for marketing purposes

Municipal Climate Planning in Canada

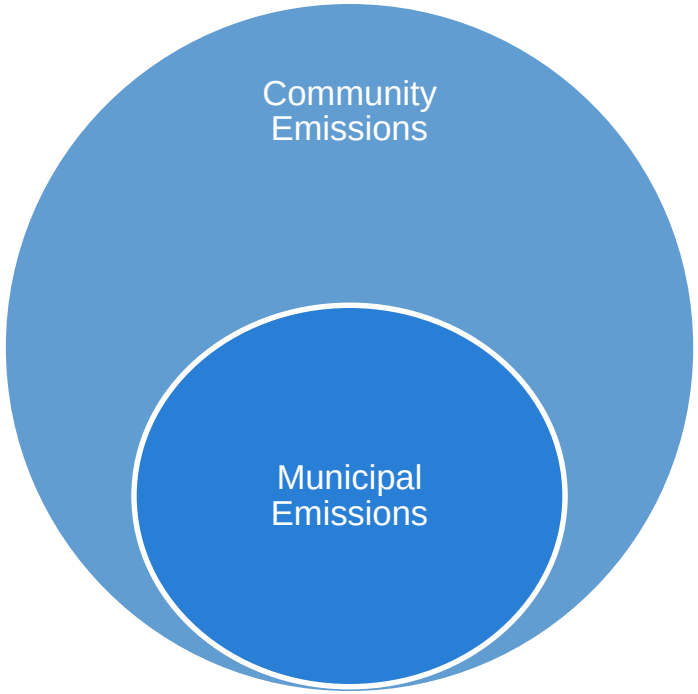
Structure of a Climate Action Plan

Smith School of Business, Queen's University | Business Consulting

Climate Action Plan Structure

Community and Municipal Inventory Relationship

- The Climate Action Plan makes use of the five target sectors to organize strategies within municipal and community plans
- Municipal emissions are those directly from the operations of the municipality and are a subset of the overall community emissions
- Community emissions account for the entire municipality and can be used to describe the overall emissions reduction that contribute to provincial and federal targets
- Due to the difficulty and larger scope of collecting community data, it is advised that a municipal plan be completed first followed by a community plan



Environmental and Energy Action Plan Overview

Structure and Scope of Project

Smith School of Business, Queen's University | Business Consulting

Environmental and Energy Action Plan Structure

Environmental and Energy Action Plan

Buildings, Transportation, Land Use, Waste, Tourism

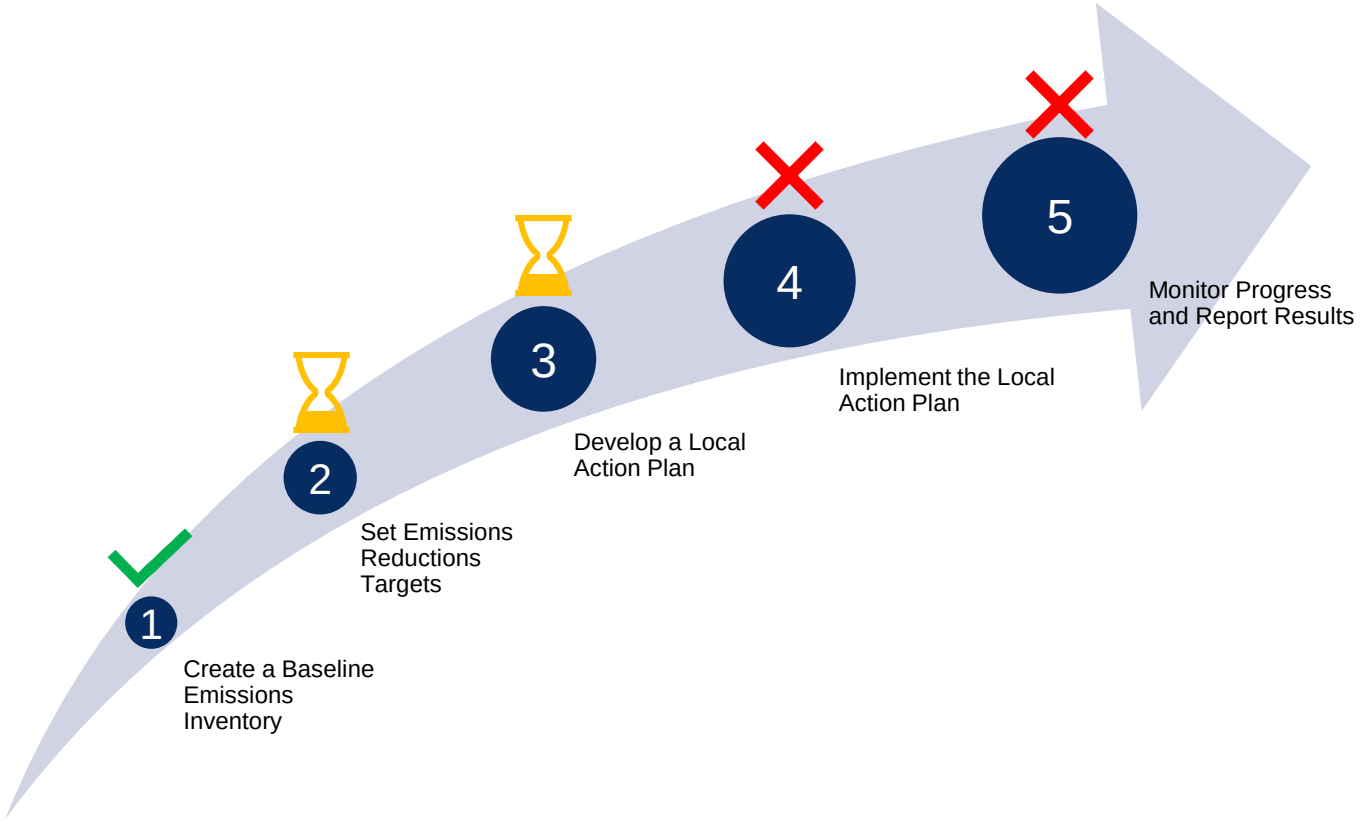
Municipal Plan

- Municipal buildings
- Streetlights
- Water and Sewage Treatment Facilities
- Town Fleet
- Municipal Solid Waste

Community Plan

- Residential, commercial and industrial buildings
- Transportation
- Community waste
- Other land uses

Progress of Environmental and Energy Action Plan Along 5-Step Milestone Process



Based on the time and scope of the project, only the Municipal Plan will be discussed. Collection of data for a community action plan will be detailed in the project next steps.

Situational Analysis

SWOT

Environment and Energy Landscape

Smith SCHOOL OF BUSINESS Queen's University | Business Consulting

Federal/Global Emissions

- **Federal Carbon Tax** set to **quadruple by 2050**, reaching $170 per tonne of CO2
- Temperature of **Lake Ontario** has **increased by 1.8° C** since 1995 and water levels in 2020 were **10cm higher** than the last century's average
- 64% of global tourists are looking to travel sustainably as consumer awareness for eco-friendly leisure rises
- **Federation of Canadian Municipalities** and **Partners for Climate Protection Program** developed a sustainability guidebook for small Canadian towns

Gananoque/Internal Action

- Town has already made a commitment for a **2% benchmark** of energy savings annually
- Implementation of **Environmental Working Group** to develop a Climate Change Adaptation & Mitigation Plan
- Current township emissions at **473 tonnes of CO2** per year
- Town energy consumption and emissions **data contains gaps** that must be addressed to fall in with PCP guidelines

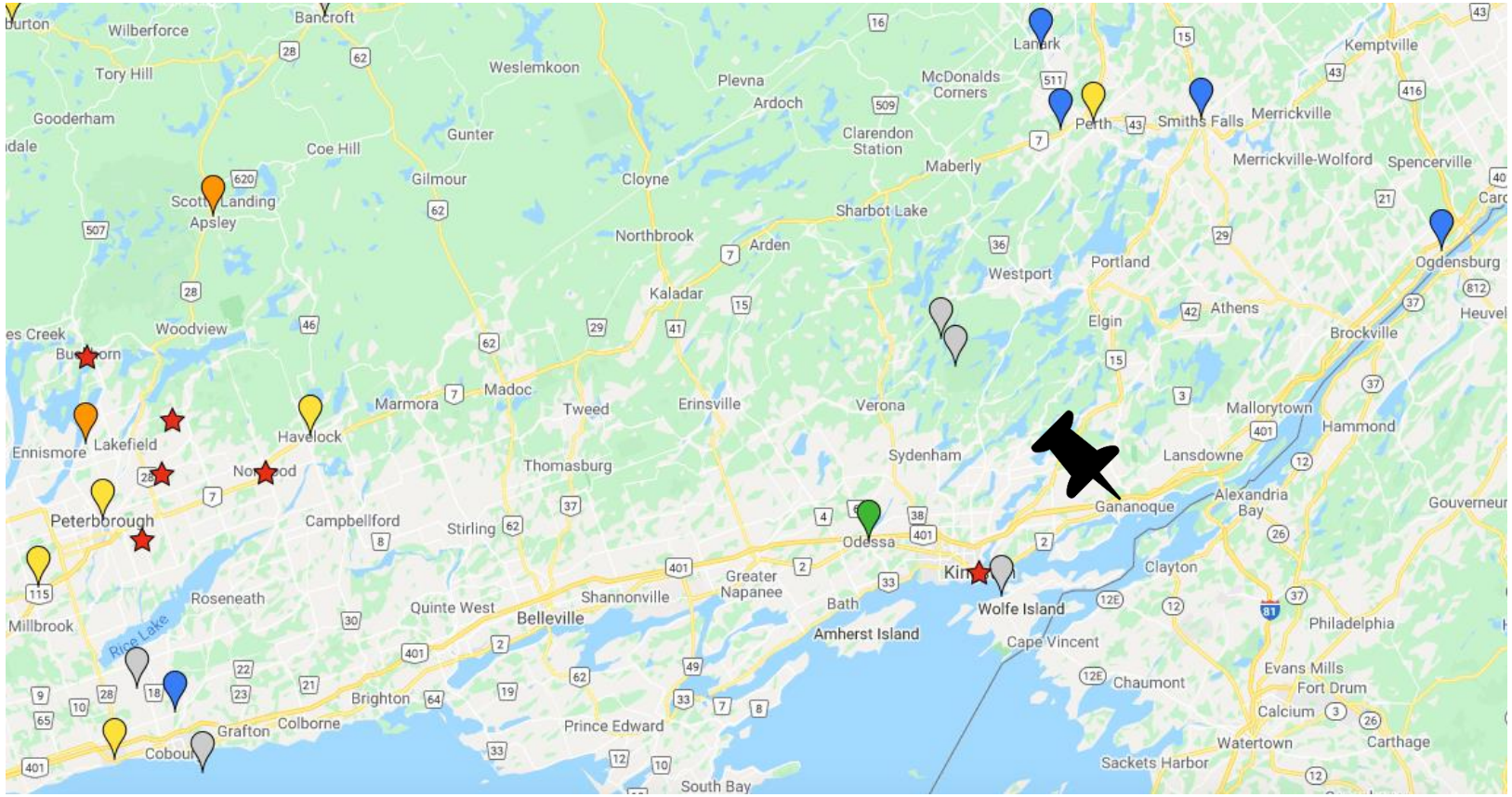
Rising costs for energy usage will be pushed to taxpayers if not mitigated early. There are also further economic and social benefits to creating cleaner communities. These factors encourage rapid response towards more sustainable operations.

Benchmarking Analysis

Other nearby municipalities employing climate action plans

Smith School of Business, Queen's University | Business Consulting

Nearby Municipalities in the Partners for Climate Protection Program



LANARK COUNTY

Heritage PERTH

Tay Valley Township

Loyalist Township

Municipality of Port Hope

sustainable Peterborough

The above municipalities, townships and counties were selected based on proximity, similar population sizes, availability of information and degree of completion through the Partners for Climate Protection 5-step milestone process.

Benchmarking Analysis

Other nearby municipalities employing climate action plans

Smith School of Business, Queen's University | Business Consulting

Benchmarking Analysis Metrics

1. Creation and Quality of Emissions Inventory
   - Recording of all municipally owned corporate emissions and overall community emissions.
   - Creation of an emissions inventory and forecasting of future emissions based on the energy consumption data collected making use of reasonable assumptions when needed to cover data gaps.
2. Ambition of Reductions and Effectiveness of Solutions
   - Establishing and implementation of building and community level strategies and solutions to target emissions reductions within the five outlined sectors (buildings, transportation, land use, waste, and tourism).
3. Community Engagement and Communication of Plan
   - Engaging the community on issues and receiving feedback on new initiatives to ensure inclusivity and fairness.
   - Monitoring and reporting on the success of strategies and solutions through a dedicated website and social media
4. Similarity to Gananoque
   - Similarity in population, geography and authority

Similar Municipalities Overview

Municipality	Population	Distance from Gan	Current PCP Milestone
Lanark County (Including Perth and Tay Valley)	68,698	90km	1
Loyalist Township	16,971	50km	3
Municipality of Port Hope	16,753	180km	4
Greater Peterborough Area	140,000	200km	3-5

Benchmarking Analysis

Other nearby municipalities employing climate action plans

Smith School of Business, Queen's University | Business Consulting

Benchmarking Metrics	Emissions Inventory	Reductions and Solutions	Engagement and Communication	Similarity to Gananoque
Lanark County	3	3	4	3
Loyalist Township	4	4	3	4
Municipality of Port Hope	3	3	2	3
Sustainable Peterborough	4	4	4	2

Benchmarking Analysis

Other nearby municipalities employing climate action plans

Smith School of Business, Queen's University | Business Consulting

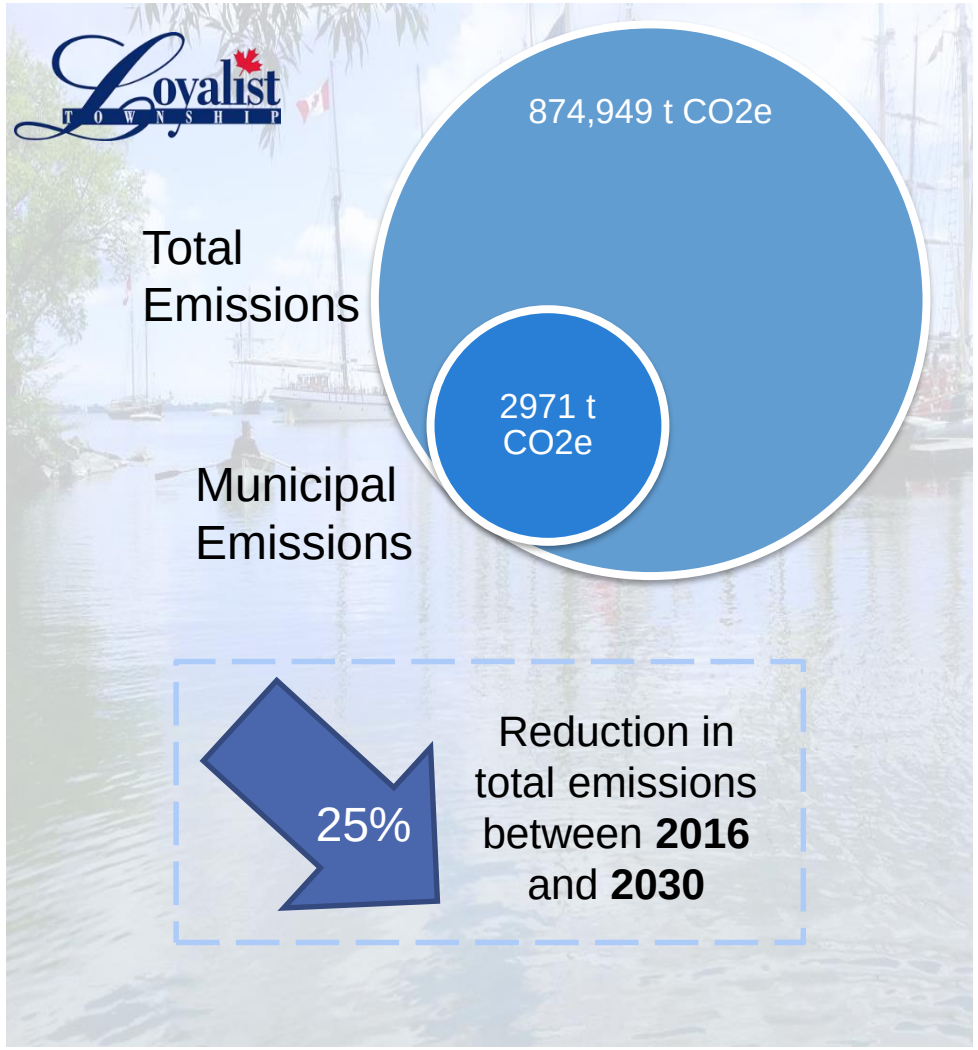
Benchmarking Metrics	Emissions Inventory	Reductions and Solutions	Engagement and Communication	Similarity to Gananoque
Lanark County	3	3	4	3
Loyalist Township	4	4	3	4
Municipality of Port Hope	3	3	2	3
Sustainable Peterborough	4	4	4	2

Benchmarking Analysis

Mini Case Study – Loyalist Township

Smith School of Business, Queen's University | Business Consulting

Emissions Inventory and Reduction Targets



Key Strategies Outlined

Goal: Reduce Energy Usage in Municipal Facilities

Strategy: Monitor-> Optimize -> Enhance -> Replace

Goal: Greening the Municipal Fleet

Strategy: Optimize transportation practices -> Electrify vehicles -> Replace

Goal: Using Nature for Emissions Reductions

Strategy: Tree planting, Pollinator protection, Re-wilding public lands

Goal: Diversion of Waste Away from Landfills

Strategy: Partnerships -> Diversion (Compost, SME collaboration, Energy)

Goal: Develop Green Building Standards

Strategy: Consult local developers -> Incentivize net-zero and high efficiency

Emissions Baseline and Projections

Emissions Inventory

Municipal Emission Baseline Summary

Smith School of Business, Queen's University | Business Consulting

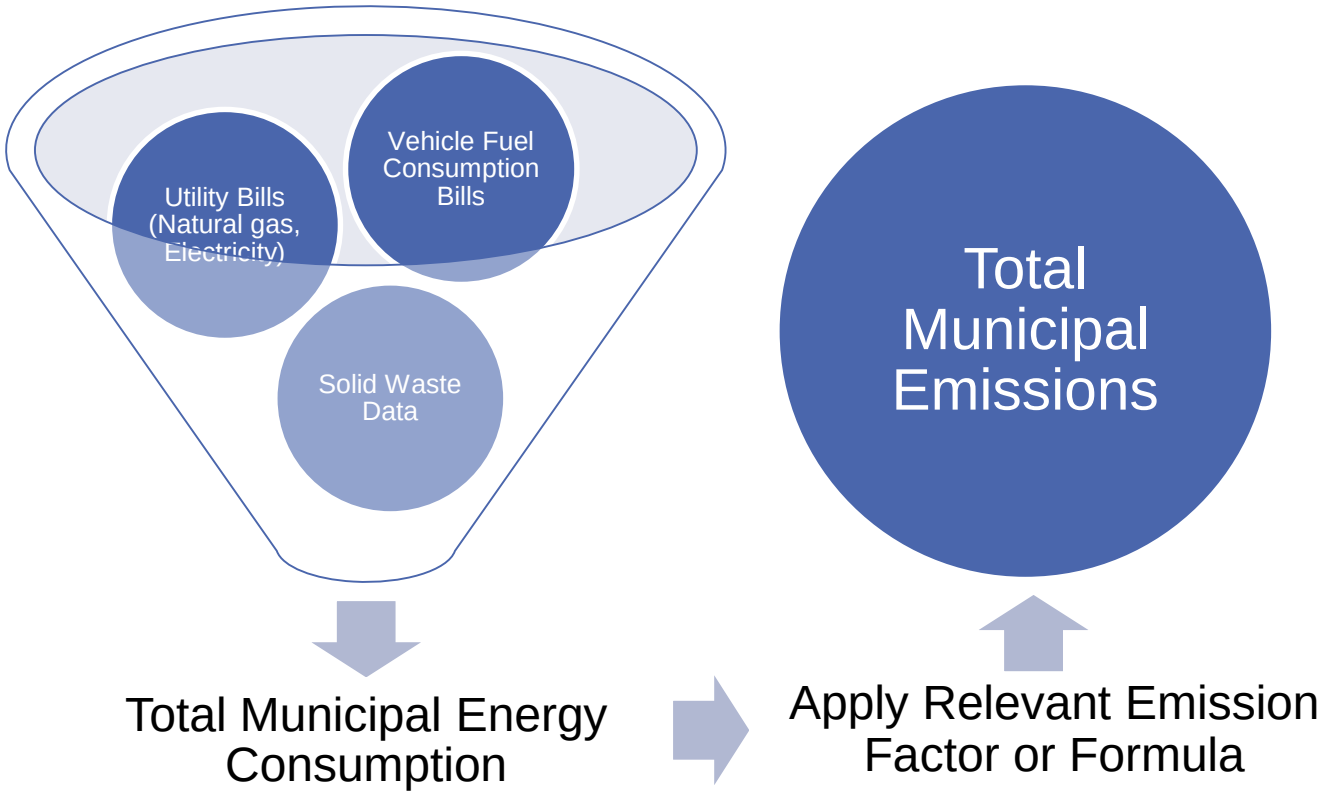
Chosen Baseline Year

- In order to analyse future emissions and track progress, a baseline inventory must be created
- Based on available data, potential data inconsistencies with the COVID-19 pandemic and recency, the year **2019** was selected

Data Collection and Assumptions

- All data collection and emissions calculations were done in accordance with the *PCP Protocol: Canadian Supplement to the International Emissions Analysis Protocol*
- All data used in the municipal emissions inventory was obtained from 2019 with the exception of vehicle fuel records which were only obtainable in **2018**
- Municipal solid waste emissions were obtained through town employees best estimates of the volume of waste produced however are not the most accurate depiction and as such a **waste audit** should be conducted for future inventories
- Inventory assumes correct recording of natural gas, electricity and vehicle fuel within all bills used

Emissions Inventory Creation Process

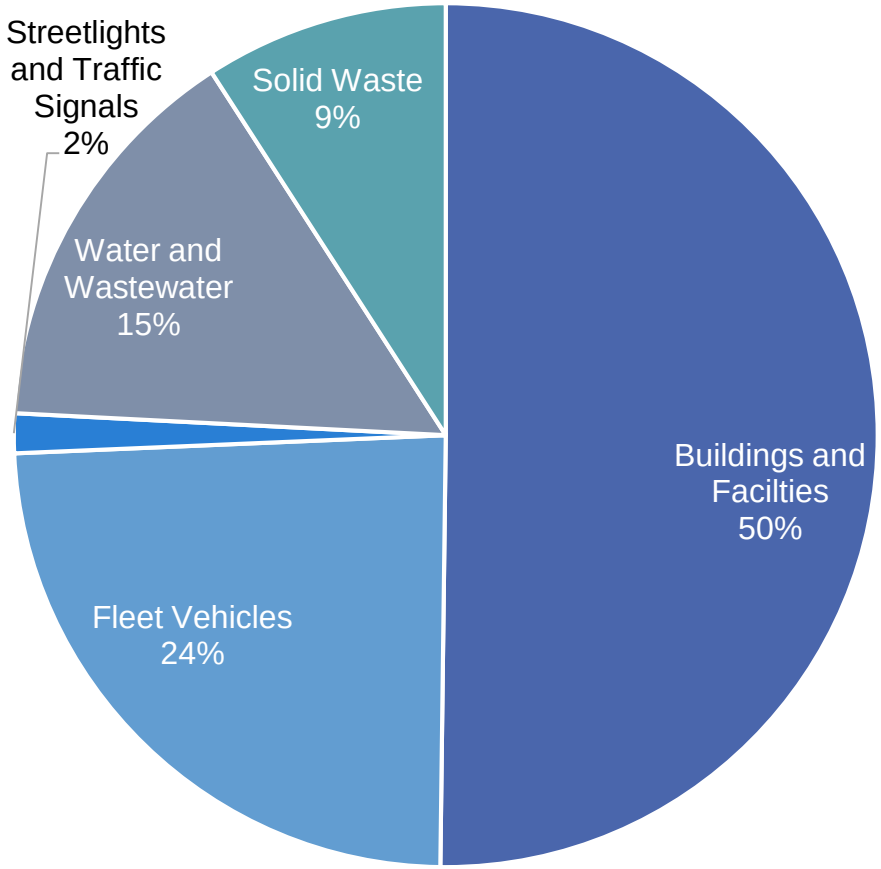


Emissions Inventory

Municipal Emission Baseline Summary

Smith School of Business, Queen's University | Business Consulting

Baseline Emissions by Target Sector (tonnes CO2e)



Baseline Municipal Emissions:

472.9 Tonnes CO2e

Key Takeaways

Buildings are highest priority sector based on impact and potential for easier short-term low hanging fruit

Water and wastewater is second highest priority based on impact and access to lower carbon technology

Fleet Vehicles will continue to contribute until new technology becomes accessible and mainstream

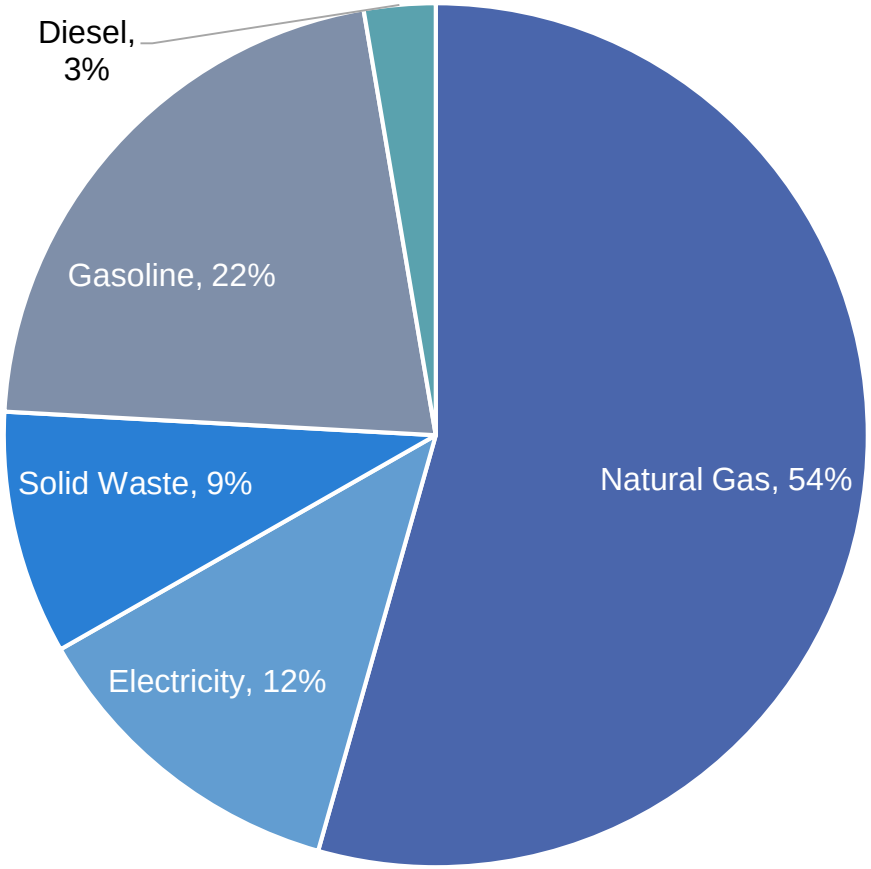
Streetlights and solid waste can be left as longer-term goals

Emissions Inventory

Municipal Emission Baseline Summary

Smith School of Business, Queen's University | Business Consulting

Baseline Emissions by Source (tonnes CO2e)



Baseline Municipal Emissions:

472.9 Tonnes CO2e

Key Takeaways

Biggest impact is the use of natural gas primarily for heating in buildings

Gasoline from vehicle fleet is second largest contributor however is harder to phase out with a lack of affordable low-carbon transportation offerings

Primary priority should be to electrify heating of buildings when possible due to the lower emissions intensity

Emissions Inventory

Municipal Emission Baseline Summary

Smith SCHOOL OF BUSINESS Queen's University | Business Consulting

Largest Contributors to Municipal Emissions

Rank	Asset Name	% of Total Municipal Emissions	Rank	Asset Name	% of Total Municipal Emissions
1	Fleet	24.1	**6**	Cartwright Park (Behind Arena)	4.2
2	Arena	13.3	**7**	Pumphouse	3.7
3	Water Treatment Plant	10.9	**8**	Town Hall	3.1
4	Emergency Services Building	10.8	**9**	Kinsmen Building	2.7
5	Public Works Yard	8.9	**10**	Chamber Office	2.5

Municipal Reduction Target

Using the Emissions Baseline to set Climate Goals

Smith School of Business, Queen's University | Business Consulting

Key Factors	Target Year	Business-as-Usual	Reduction Targets
Recommendations	PCP advises a target year selected between **5-10** years of the baseline. PCP requires completion of five-step process within 10 years of joining.	In a business-as-usual scenario, the emissions of similar sized municipalities is typically around a **10%** increase in **10 years**.	PCP recommends a municipal reduction target of **20%** in 10 years. Ontario has established a **37%** reduction target by 2030 from 1990

Potential Reduction Scenarios

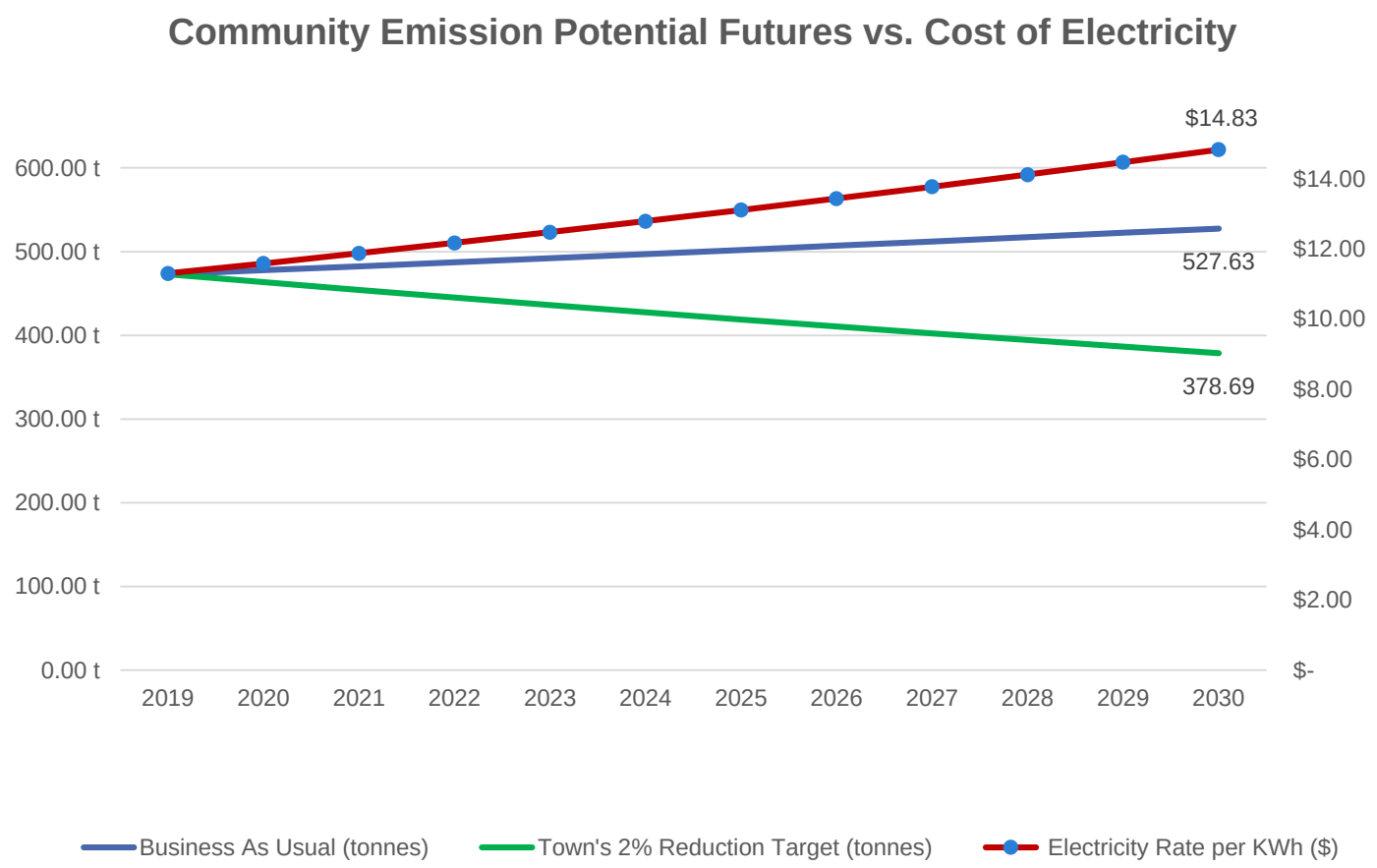
Stagnation: In this scenario the Town would set strategies to offset the roughly 10% expected increase in emissions to maintain its 2019 levels by 2030.
Meeting Recommendations: By adhering to PCP recommendations, the Town would set strategies to reduce its municipal emissions by 20% of 2019 levels by 2030
Overachievement: By setting more aggressive strategies, the Town would reduce more than 20% of its municipal emissions by 2030.

Projected Future Emissions Sample

Utilizing Baseline to predict future changes in energy usage

Smith School of Business, Queen's University | Business Consulting

Quantifying Sustainability Strategy Choices for the Town



Primary Data Insights:

1. Do-Nothing approach would see emissions rise by 1% annually
2. Even if sticking to current goal of 2% annual reduction, the cost of power likely increases at a slightly faster rate (2.5%)
3. By following this 2% goal, the Town could half their emissions by 2053

Community Feedback

Questions for the Gananoque Community

Engaging in Dialogue and Feedback

1	Town Cultural Identity	Which important aspects of Gananoque Culture should be central in our Action Plan? How do we best respect the history and future of this community?
2	Position on the Sustainability Journey	How can we get support from nearby communities further along their sustainabily journey? Where does Gananoque hope to be relative to constraints and to peers in the region?
3	Looking Towards the Future	How do we get youth interested and involved in sustainability initiatives? What do we hope the Green Gananoque of 2050 look like?
4	Working Together in Action	Where are there opportunities for combined efforts between the Town and the community? How can the Town make sustainability easier for the community and vice versa?

Answers from the Community

What we learned listening to Gananoque residents

Smith SCHOOL OF BUSINESS Queen's University | Business Consulting

Town Cultural Identity

- Importance of boating and waterfront
- Desire for EV options in Marina
- How might we incorporate further Indigeneity in our plan?

Sustainability Journey

- Kingston recognized as a local leader in this field
- Replicate their rules and standards for new condo developments such as water catchments

Working Together

- Community wondering how they can do recycling better
- Increased accessibility for Green Box and organic waste disposal

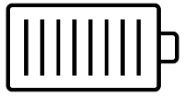
Core Strategies

Core Strategies

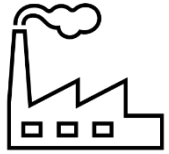
Buildings and Facilities

Smith School of Business, Queen's University | Business Consulting

Overview



16,234 gigajoules/year



234.4 tonnes CO2e/year

Top Emitters
Arena, EMS, PW Garage, Town Hall, Kinsmen Building

Strategies

Integration of Environmental and Energy Action Plan with Other Plans
To align environmental and economic goals, this plan must be integrated with existing plans such as the Asset Management Plan and the Conservation and Demand Management Plan.

Address Low-Hanging Fruit
Easy opportunities for energy savings in building optimization, efficient lighting and behavioral changes should be the first strategies implemented within the building sector.

Retrofit/Upgrade of Top Emitters
Six buildings account for 80% of sector emissions and as such should be targeted first in energy efficiency retrofits. Upgrades to the buildings heating and cooling systems will have the largest impact on energy savings.

Core Strategies

Vehicle Fleet

Smith School of Business, Queen's University | Business Consulting

Overview

1,688 gigajoules/year

114.1 tonnes CO2e/year

Top Emitters
Light-duty vehicles,
Light-duty Trucks,
Heavy-duty Vehicles

Strategies

Asses New Vehicle Purchases for Lower-Carbon Options
Before purchasing new vehicles, performance requirements should be assessed to compare the emissions reduction potential of vehicles. Factors such as size, fuel efficiency and fuel type should all be considered.

Investigate Purchase of First Fleet EV
The life-cycle costs of purchasing a small EV for the fleet are less than that of a traditional gas-powered car and such, if funding is available the town should investigate investing in cheaper EV or hybrid options.

Employee Incentives
The town should investigate offering employee incentives and small contests for reducing vehicle use both during work and for commutes to and from work. Examples could include bike days, carpooling and work-from-home opportunities.

Core Strategies

Streetlights and Traffic Signals, Water and Wastewater and Municipal Solid Waste

Smith School of Business, Queen's University | Business Consulting

Overview

4,518 gigajoules/year

121.3 tonnes CO2e/year

Top Emitters Solid Waste, Water Treatment Plant, Pumphouse

Strategies

Asses Net-Zero Streetlights
Investigate the installation of small-scale solar panels to generate electricity for streetlights, traffic signals and outdoor lighting.

Municipal Waste Audit
To gain a better understanding of municipal waste streams and the actual volume of waste generated a waste audit should be conducted. This will also help target the highest waste contributors and advise future strategies for reduction.

Waste Diversion Incentives
Municipal employees should be incentivized through contests, education and activities to reduce waste produced at municipal buildings.

Capital Retrofit Analysis

Lou Jeffries Arena Emissions Reduction Strategy

Smith School of Business, Queen's University | Business Consulting

Asset Overview

Sector
Buildings & Facilities

Annual Energy Consumption
1878 GJ

Annual Energy Costs
$56,368

Annual GHG Emissions
62.8 tonnes CO2e

Recent Upgrades
Compressor upgrades, addition of outdoor ice pad

Stakeholders Involved

Daltco Electric

CIMCO

Capital Retrofit Proposal

- Retrofits aimed at improving the energy efficiency and performance of the Lou Jeffries Arena refrigeration and lighting systems
- For refrigeration system, look at replacing existing controller and heat exchanger for Zamboni pre-heat
- For lighting system, look at improving overall service level and focusing on greatest efficiency offenders located in the stands and over the ice surface

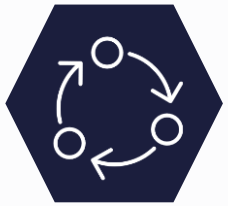
Capital Retrofit Analysis

Possible Thermal Systems Upgrades

Smith SCHOOL OF BUSINESS Queen's University | Business Consulting

Option A: Replace Existing Controller with New High-Efficiency Controller

Capital Investment: est. $60,000
Pay-back Period: est. 11-13 years
Yearly Energy Cost Savings: est. $4,000-6,000

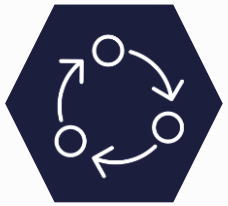


The controller will better optimize use of waste heat within the facility to be used for space heating.

Annual energy reduction: est. 40,000-60,000 kWh
Annual emissions reduction: 1.2-1.8 tonnes CO2e

Option B: Install Plate Exchanger to send Ammonia and Glycol for Zamboni Pre-Heat

Capital Investment: est. $50,000 – 70,000
Pay-back Period: est. 14-47 years
Yearly Energy Cost Savings: est. $1,500-3,000



The heat exchanger will make use of waste heat for the purpose of pre-heating boilers to be used for the Zamboni.

Annual energy reduction: est. 15,000-30,000 kWh
Annual emissions reduction: 0.45-0.9 tonnes CO2e

Capital Retrofit Analysis

Lighting System Upgrades

Smith School of Business, Queen's University | Business Consulting

Replace Ice Surface and Stands Lighting

Capital Investment: est. $11,000
Pay-back Period: est. 0.82 years
Yearly Energy Cost Savings: est. $8,300

Increase ice-level brightness while utilizing a more sustainable options

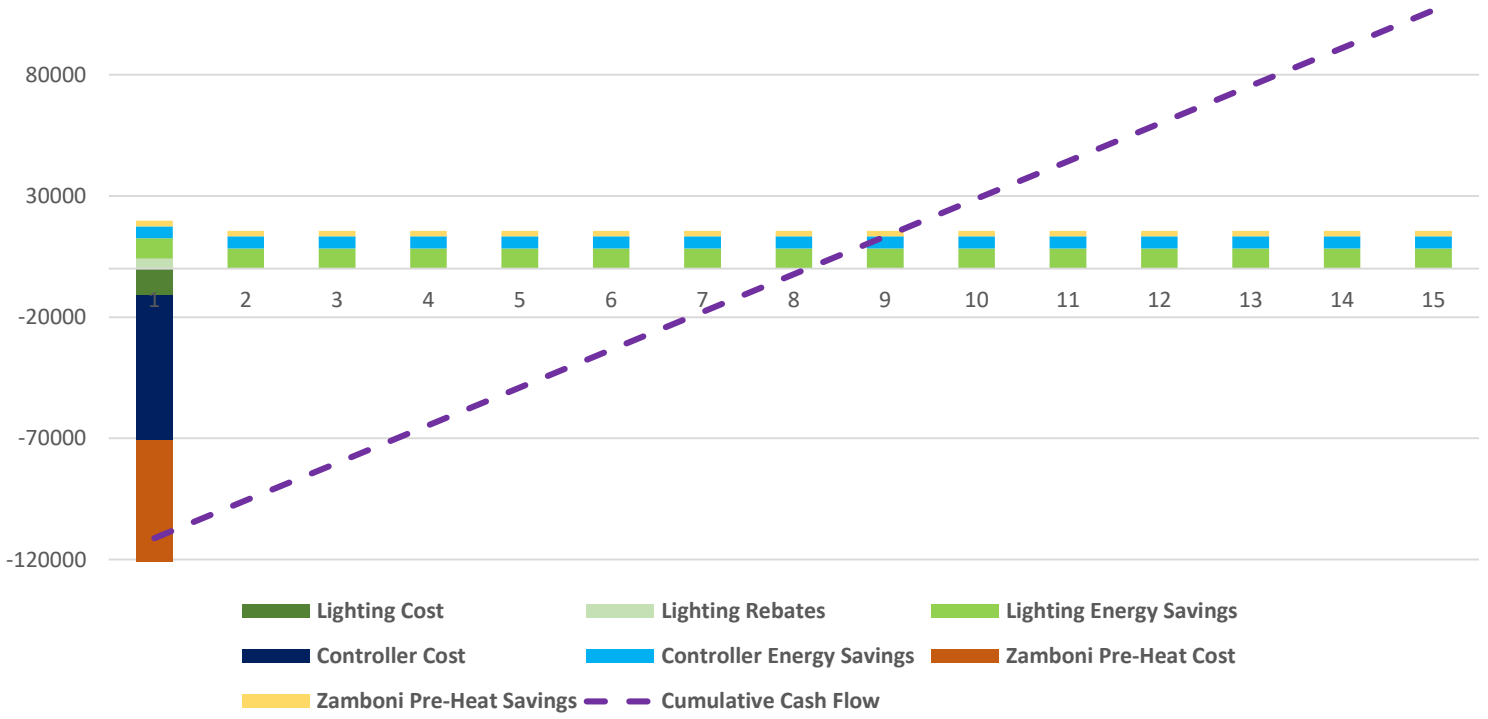
Annual energy reduction: est. 46,175 kWh
Annual emissions reduction: 1.4 tonnes CO2e

Capital Retrofit Analysis

Outcomes of Retrofit and Future Considerations

Smith School of Business, Queen's University | Business Consulting

15 Year Cumulative Cash Flow



Arena Retrofit Summary

- Financial Breakeven in a maximum of 8 years
- Up to 4.1 tonnes of annual CO2 emissions reduction
- Lowers yearly Municipal net emissions by approximately 0.87%

Daltco Electric

CIMCO

Government Funding Opportunities

Federal Government Grant Opportunities

Potential Areas for Funding

Smith School of Business, Queen's University | Business Consulting

Grants Overview

The following grants are all provided through the FCM Green Municipal Fund. The grants are funded by the Federal Government and are aimed at providing municipalities with the resources needed to lower their emissions across the five target sectors: buildings, water, transportation, waste and land use.

Green Municipal Fund / Fonds municipal vert

a program of / Un programme de la FCM — funded by / Financé par Canada

Examples of Grants of interest to the Town of Gananoque

1 Community Buildings Retrofit Initiative

Description

- Includes the following grants for municipally owned buildings
  - Energy monitoring and analysis grant
  - Recommissioning or retrofitting grant
  - GHG reduction feasibility studies grant

Available Funding

- Grants up to 60-80% of total project costs to a maximum of between $25,000 to $5 million depending on the project

2 Reducing Fossil Fuels in Fleets Capital Project

Description

- Funding for capital project which reduces or avoids the use of fossil fuels in municipal vehicles
  - Example: purchasing of an electric or low carbon vehicle for the fleet

Available Funding

- Low interest loan up to $5 million with a grant up to 15% of loan covering 80% of eligible costs

3 Waste Stream Management Study

Description

- Funding for capital project aimed at diverting municipally produced solid waste from landfill
- Feasibility study on initiatives to address waste stream challenges

Available Funding

- Grants up to 50% of total project costs to a maximum of $175,000

4 Energy Recovery

Description

- Implementing thermal energy solutions such as renewable energy generation, energy recovery systems or co-generation
  - Low interest loans and grants available

Available Funding

- Low interest loan up to $5 million with a grant up to 15% of loan covering 80% of eligible costs

Provincial Government Grant Opportunities

Potential Areas for Funding

Smith School of Business, Queen's University | Business Consulting

Grants Overview

These grants are available from the Ontario government and represent components of the province's Green Infrastructure Stream targeted towards small municipalities

Ontario

Green Infrastructure ONTARIO COALITION

Examples of Grants of interest to the Town of Gananoque

1 Ontario Community Environment Fund

Description

- Repurposes money gained via environmental penalties to support small communities
  - Environmental Restoration
  - Increasing Community Resilience

Available Funding

- Approximately 63K available for Eastern Ontario region

2 Great Lakes Action Fund

Description

- Funding for creating positive environmental impact in the Great Lakes and St. Lawrence River Basin
  - Both environmental as well as economic/social benefits are considered in approval process

Available Funding

- $50,000 available for municipalities and other organizations

3 Ontario Community Infrastructure Fund

Description

- The OCIF provides funding for small, rural, and northern communities to develop and renew their infrastructure
  - Need-based assessment tied to overall development level

Available Funding

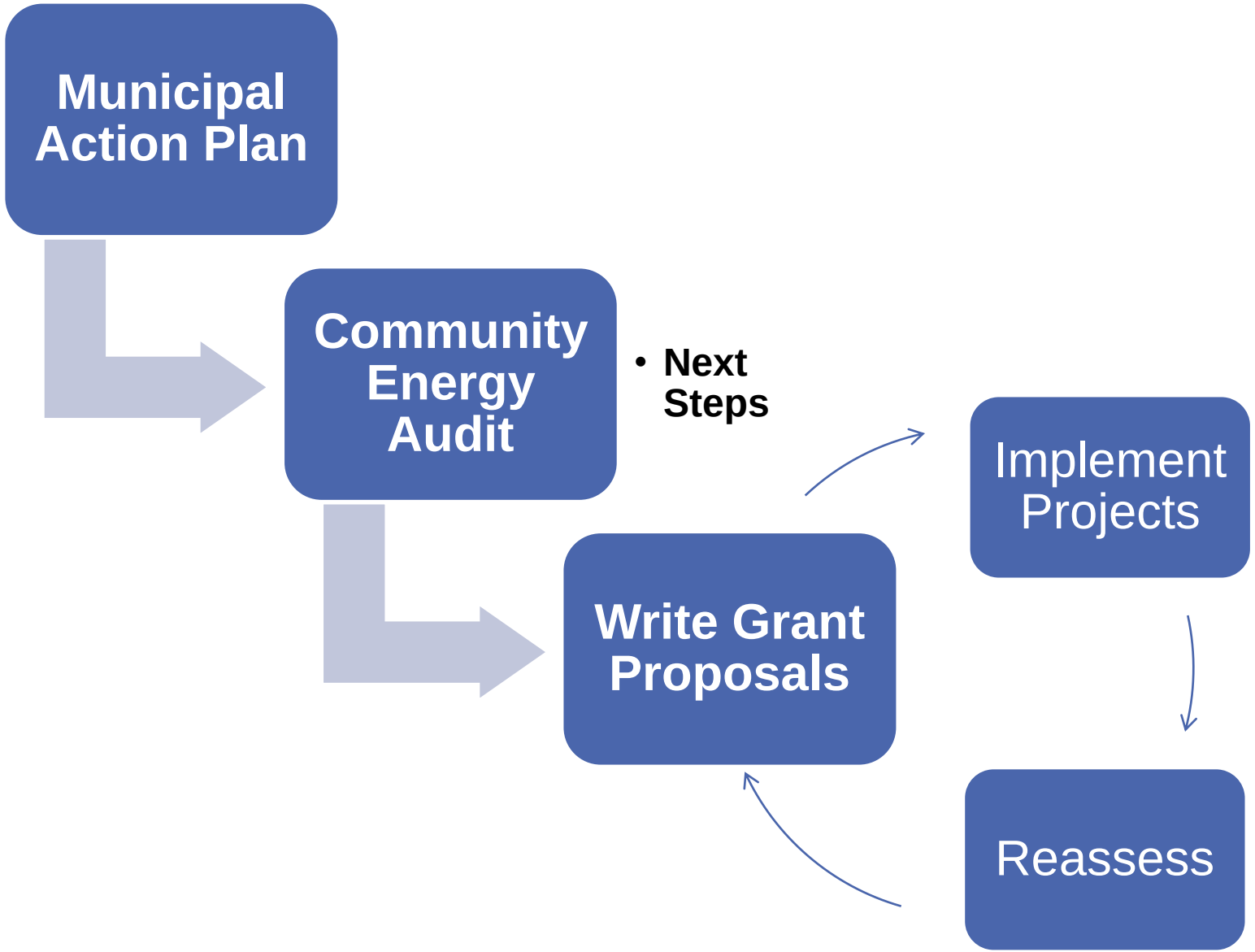
- Funding calculated from formula based off of total infrastructure. For a town Gan's size we could expect about $800,000

Next Steps

Gananoque's Sustainability Journey

Continuous Excellence on Town's Sustainability Goals

Smith School of Business, Queen's University | Business Consulting



Excelling in the Sustainability Success Cycle

- Utilize foundation built here to apply for Membership into the Partners for Climate Protection Program
- Follow examples laid out by municipalities like Loyalist and Lanark
- Get support in grant writing and community analysis

Environmental and Energy Action Plan

Julian Burger, Christian Filippini

August 19, 2021