Township of Mapleton

GHG Inventory for the Community

Mapleton GHG Inventory

M06664A - GREENHOUSE GAS (GHG) INVENTORY REPORT

CIMA+ file number: M06664A
03 01 2023

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Prepared by:

Aleksandra Lazarevic, MES, LEED GA
Sustainable Development Professional

Christophe Jenkins, LEED AP BD+C, M. Sc.
Sustainability Professional

Verified by:

Julie Hardy, LEED AP BD+C, WELL AP, ENV SP
Associate Partner, Director of Sustainability

CIMA+

900–101 Frederick Street, Kitchener, ON N2H 6R2

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Confidentiality and ownership

Executive Summary

The Township of Mapleton is a rural agricultural-based community within the County of Wellington, with a population size of approximately 10,839 residents. It is evident that climate change is impacting our planet, both on a globalized and local scale. Through tools like the Climate Atlas of Canada, we are able to forecast and report on various indicators like the change in mean temperatures over time, viewing that as more greenhouse gases are emitted into the atmosphere, the world is warming at a much more rapid rate. These changes are impacting our surrounding ecosystems, through biodiversity loss, increase in precipitation and flooding frequencies, along with impacts to arable land and soil fertility.

With cities globally accounting for 73% of the overall greenhouse gas emissions on the planet, it is imperative to implement change within our local municipalities. Ambitious federal targets have been set by the Government of Canada in attaining net zero emissions by 2050, and 45% reduction in 2005 emissions levels by the year 2030, which has set the playing field for many municipal governments to follow suit. In turn, the County of Wellington's Future Focused climate action developed targets in reducing community GHGs by 6% from 2019 levels by 2030, in addition to reducing corporate emissions by 10% over the same period.

With a vision and mission in fostering sustainable and resilient communities, the Township of Mapleton has conducted their own GHG Inventory of the 2021 Baseline year to ensure that they were on track with both provincial and federal mandates, while supporting a vibrant and diverse community through tailored actions and strategies. The reduction of emissions achieved by the Township will contribute to reaching national targets in alignment with the Paris Agreements mission in maintaining global temperature rise below 1.5 degrees, coinciding with the United Nations Sustainable Development Goal number 13, on 'Climate Action'.

The Global Covenant of Mayors and the Federation of Canadian Municipalities promotes the use of the Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC Protocol) as a standardized way for municipalities to collect and report their actions on climate change, developed by the World Resources Institute, C40 Cities Climate Leadership Group and ICLEI – Local Governments for Sustainability (ICLEI). CIMA+ utilized the GPC 1.1 guidelines in developing the Township's 2021 GHG Inventory, which provides cities and municipalities with a globally recognized and accepted framework to identify, calculate and report on greenhouse gas emissions within a specified boundary. CIMA+ has pursued the highest level of GPC reporting being BASIC+, harnessing all Scope 1, 2 and 3 emissions released within the project boundary. BASIC and BASIC+ emissions are reported separately in this report, as all emissions associated with the Agriculture Forestry and Other Land Use (AFOLU) sector of BASIC+ are biogenic sources.

The methodology pursued for calculating all emissions sources within the Township consisted of multiplying the data from GHG-emitting activities by the appropriate emissions factor. All activity data is derived from official documentation such as Statistics Canada and National Inventory Reports, primary utility providers, as well as information provided by the Township of Mapleton or the County of Wellington.

Key results

- Emissions for the BASIC GPC level reporting baseline year (2021) were 97,467 tons of CO_2 equivalent. Most of these emissions fall under Scope 1 (95%), resulting in a per capita emission of 8.9 tons of CO_2e/capita;
- Emissions for the BASIC+ GPC level reporting for AFOLU baseline year (2021) were 241,211 tons of CO_2 equivalent. All of these emissions fall under Biogenic Sources (100%).

Table ES-1: BASIC Level Reporting: Summary of Results in CO_2e (t)

Sector	Category	Scope 1	Scope 2	Scope 3	Total (CO2e(t))
I - Stationary energy	Residential	7,801	1,459	146	9,406
	Commercial	11,423	1,269	59	12,751
	Manufacturing	14,586	957	46	15,589
	Energy	0	0	0	0
	Agri, Forestry & Fishing	13,536	0	0	13,536
					51,282
II - Transportation	On-road	44,289	0	0	44,289
					44,289
III - Waste	Solid	0	0	983	983
	Biological	0	0	41	41
	Wastewater treatment and discharge	872	0	0	872
					1,896
Total 2021 BASIC Emissions					**97,467**

Table ES-2: BASIC+ Level Reporting: Summary of Results in CO_2e (t)

Sector	Category	Scope 1	Scope 2	Scope 3	Total (CO2e(t))
IV - Industrial processes	Processes	0	0	0	0
	Product use	0	0	0	0
					0
V - Agriculture, forestry and other land use	Livestock	184,631	0	0	184,631
	Land	55,564	0	0	55,564
	Aggregate sources and non-CO2	1,016	0	0	1,016
					241,211
VI - Other scope 3	Other scope 3	0	0	0	0
Total 2021 BASIC+ Emissions					**241,211**

As shown in Figure ES-1, the majority of the Communities emissions are derived from fossil fuel combustion within the transportation and buildings sectors.

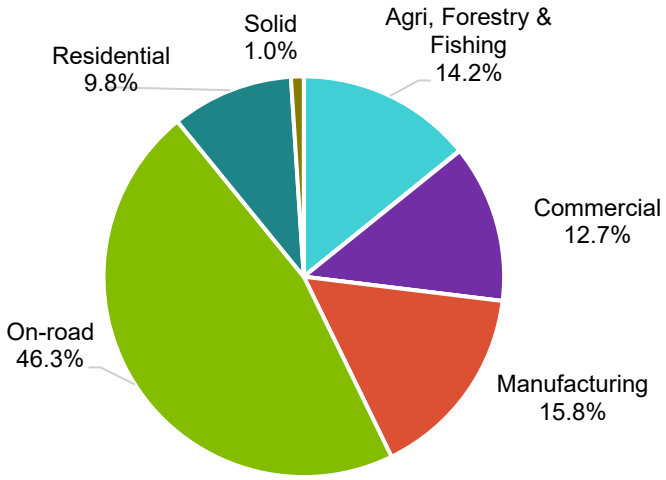

Figure ES-1. Township of Mapleton's 2021 BASIC Level GHG Emissions (t) CO_2e

Figure ES-2 showcases that majority of the biogenic sources derived from the AFOLU sector are related to Enteric Fermentation, commonly known as livestock farming.

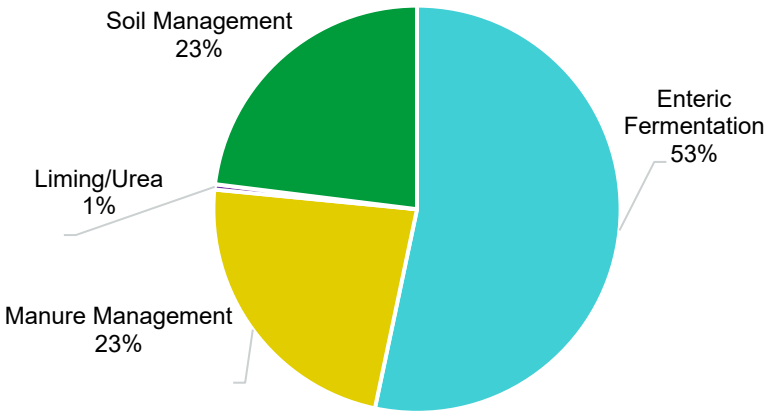

Figure ES-2. Township of Mapleton's 2021 BASIC+ Level GHG Emissions (t) CO_2e

Decreasing and mitigating greenhouse gas emissions is not only fundamental for the environment, but also leads to financial betterment, infrastructure resiliency and process efficiencies for both the municipal/corporate sector and the community at large. Upon conducting focus groups with varying community groups, and corporate council members, the following recommended GHG emission reduction targets were developed in alignment with provincial and federal mandates.

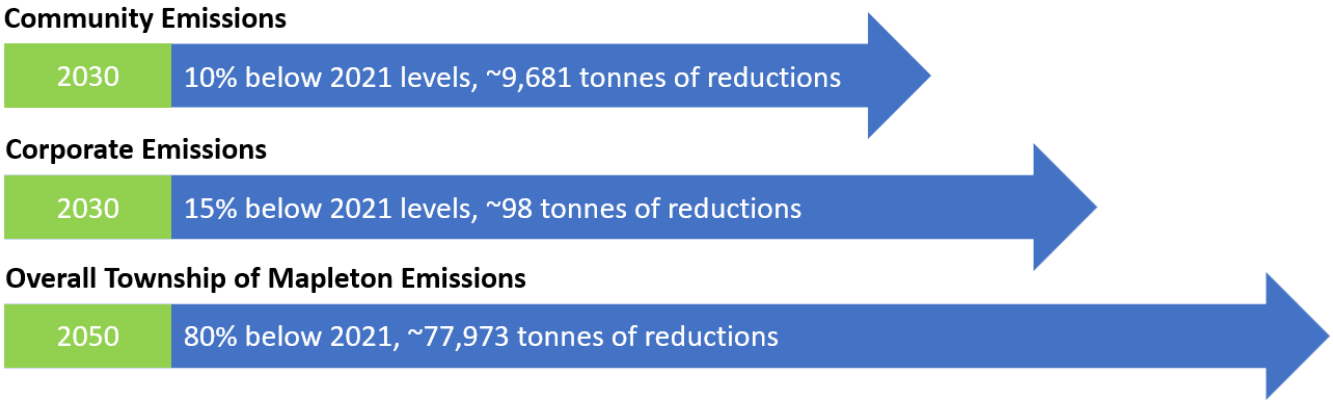

Figure ES-3: Township of Mapleton's 2030 and 2050 Proposed GHG Reduction Targets (BASIC)

We all have a role to play in leaving our earth as we found it for future generations to come. Sustainability is an essential part of the growth within the Township of Mapleton, and is embedded within their vision and mission, in '***rooted in tradition, growing for the future***'.

Glossary of Terms (Taken from the GPC)

Activity data A quantitative measure of a level of activity that results in GHG emissions. Activity data is multiplied by an emission factor to derive the GHG emissions associated with a process or an operation. Examples of activity data include kilowatt-hours of electricity used, quantity of fuel used, output of a process, hours equipment is operated, distance travelled, and floor area of a building.

Allocation The process of partitioning GHG emissions among various outputs.

Base year A historical datum (e.g., year) against which a city's emissions are tracked over time.

BASIC An inventory reporting level that includes all scope 1 (territorial) sources except from energy generation, imported waste, IPPU, and AFOLU, as well as all scope 2 sources.

BASIC+ An inventory reporting level that covers all BASIC sources, plus scope 1 (territorial) AFOLU and IPPU, and scope 3 in the Stationary Energy and Transportation sectors.

Biogenic emissions (CO_2(b)) Emissions produced by living organisms or biological processes, but not fossilized or from fossil sources (i.e., biofuel).

Carbon Credit A carbon credit represents a metric ton of CO_2 equivalent that is avoided or sequestered outside the GHG accounting boundary, which can be used to compensate for a metric ton of residual GHG emissions occurring within the accounting boundary.

Carbon Dioxide Removal (CDR) Carbon dioxide removal measures refer to processes that remove CO_2 from the atmosphere by either increasing biological sinks of CO_2 or using chemical processes to directly bind CO_2. City Used throughout the GPC to refer to geographically discernable subnational entities, such as communities, townships, cities, and neighborhoods.

City boundary See geographic boundary.

CO_2 equivalent The universal unit of measurement to indicate the global warming potential (GWP) of each GHG, expressed in terms of the GWP of one unit of carbon dioxide. It is used to evaluate the climate impact of releasing (or avoiding releasing) different greenhouse gases on a common basis.

Direct reduction Decrease of gross emissions as a result from a lowered emission activity

Double counting Two or more reporting entities claiming the same emissions or reductions in the same scope, or a single entity reporting the same emissions in multiple scopes.

Emission The release of GHGs into the atmosphere.

Emission factor(s) A factor that converts activity data into GHG emissions data (e.g., kg CO_2e emitted per litre of fuel consumed, kg CO_2e emitted per kilometre travelled, etc.).

Geographic boundary A geographic boundary that identifies the spatial dimensions of the inventory's assessment boundary. This geographic boundary defines the physical perimeter separating in-boundary emissions from out-of-boundary and transboundary emissions.

Global warming potential A factor describing the radiative forcing impact (degree of harm to the atmosphere) of one unit of a given GHG relative to one unit of CO_2.

Greenhouse gas inventory A quantified list of a Municipality's GHG emissions and sources.

Greenhouse Gases (GHG) For the purposes of the GPC, GHGs are the seven gases covered by the UNFCCC: carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); sulphur hexafluoride (SF_6); and nitrogen trifluoride (NF_3).

Gross Emissions Gross emissions include all relevant emissions within a GHG accounting boundary in all covered scopes (e.g., BASIC or BASIC+), and do not take into account any GHG emissions reductions from carbon credits purchased or sold.

In-boundary Occurring within the established geographic boundary.

Inventory boundary The inventory boundary of a GHG inventory identifies the gases, emission sources, geographic area, and time span covered by the GHG inventory.

Negative Emissions Negative emissions can be achieved through the removal of GHGs from the atmosphere by deliberate human activities

Negative Emissions Technologies (NETs): Negative emissions technologies remove CO_2 from the atmosphere

Net Emissions Net emissions are gross emissions minus all applicable GHG emissions reductions claimed from carbon credits purchased outside the boundary and adding GHG emissions from sold carbon credits resulting from projects within the boundary.

Carbon neutrality A state where annual GHG emissions are completely cancelled out or removed through offsetting or carbon dioxide removal (CDR) or emissions removal measures.

Offsetting A mechanism for cancelling out GHG emissions by developing, funding, or financing carbon credit projects that avoid or sequester GHG emissions outside of the city GHG accounting boundary

Out-of-boundary Occurring outside of the established geographic boundary.

Proxy data from a similar process or activity that is used as a stand-in for the given process or activity without being customized to be more representative of that given process or activity

Renewable Energy Credits (RECs) A type of energy attribute certificate used in several countries. In the U.S., a REC is defined as representing the property rights to the generation, environmental, social, and other non-power attributes of renewable electricity generation. RECs are a different tool from carbon credits and the two should neither be conflated nor considered interchangeable.

Reporting Presenting data to internal and external users such as regulators, the general public or specific stakeholder groups.

Reporting year The year for which emissions are reported.

Scope 1 (territorial) emissions GHG emissions from sources located within the city boundary.

Scope 2 emissions GHG emissions occurring as a consequence of the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary.

Scope 3 emissions All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary.

Transboundary emissions from sources that cross the geographic boundary.

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1. Introduction

The Township of Mapleton awarded a contract to CIMA+ to provide consulting services for the GHG inventory efforts as the Township transitions towards a sustainable way of living and contributes to the development of an economy based on the fight against climate change. CIMA+ developed the 2021 GHG inventory, created the tools for the municipality's use, and provided guiding principles, best practices and recommendations towards mitigation, and reduction strategies in terms of climate change impacts for future generations to come.

The Township of Mapleton is one of seven (7) municipalities that form the County of Wellington, with the Township mainly supporting a population of 10,839 rural and agriculturally based residents (Government of Canada, 2021). Sustainability is of high significance and importance to all decision-making within the Township, and conserving its varying parks, trails, grasslands and conservation areas like the Conestogo Lake Conservation Area that occupies over 5,750 acres of land.

It is evident that climate change, and global greenhouse gas emissions are on the rise. The Federal Government has set ambitious goals of reaching net-zero by the year 2050 along with 45% reductions in 2005 emissions levels by 2030. In alignment with the Government of Canada's goals, the Township has developed a GHG inventory of its baseline year of 2021 in order to develop specific, attainable and ambitious targets, for the years to come. Through the implementation of strong resilient economies and climates, clean air, community engagement and awareness along with many others, the Township will successfully lead the way for other municipalities within the region by conducting a comprehensive GHG Inventory, and work alongside the County of Wellington's existing Future Focused goals in its Pathway of reaching Canadas 2030 reductions as showcased below.

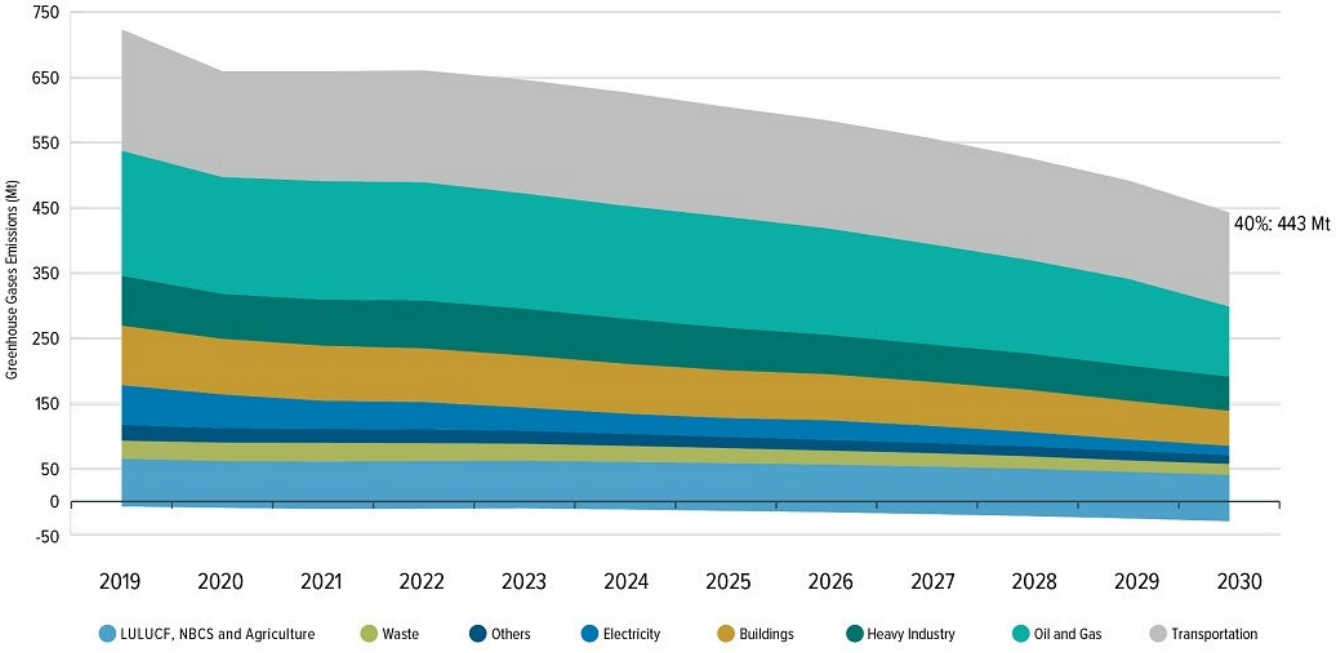

Figure 1. Canada's Pathway to 2030 (Environment and Climate Change Canada, 2022)

With cities representing 75% of global energy-related CO_2 emissions, it is of high importance to work with stakeholders, businesses, residents, and communities at large in setting achievable targets to meaningfully decrease carbon emissions globally (Greenhouse Gas Protocol, n.d.). It is critical for municipalities to take a step back, develop an inventory of the existing operations and workings within the geographic boundary and make note of the various GHG emitting activities and the challenges and opportunities for implementing reduction measures. In order to provide a common framework for municipalities, the World Resources Institute, C40 Cities Climate Leadership Group and ICLEI – Local Governments for Sustainability (ICLEI) created a strategic partnership and as a result developed the Global Protocol for Community-Scale Greenhouse Gas Inventories, the reference guideline utilized by CIMA+ for developing the Township's GHG inventory (World Resource Institute et al., 2020).

Through the use of the Climate Atlas of Canada, CIMA+ was able to explore the current climate science analysis of the region of Conestogo, of which the Township falls within, and the current issues that the region is experiencing as a direct result of climate change. The Atlas is a tool used within the country that combines science, mapping and storytelling to showcase what this change means to local communities. Below are those results extrapolated from the tool, showcasing the significance and importance of implementing reduction measures in aims of mitigating the impact on surrounding ecosystems (Climate Atlas of Canada, 2022).

The Conestogo Region, had been selected by the small grid region type within the tool, as outlined within the figure to follow. This graph shows the Representative Carbon Pathway's (RCPs) through future GHG concentrations, such as the High Carbon scenario of RCP 8.5, assuming the region continues to emit very large amounts of carbon dioxide. Therefore, the graphic tells the story of the rapidly increasing annual mean temperature through RCP 8.5, which would in turn impact local communities, ecosystems, arable land, and much more.

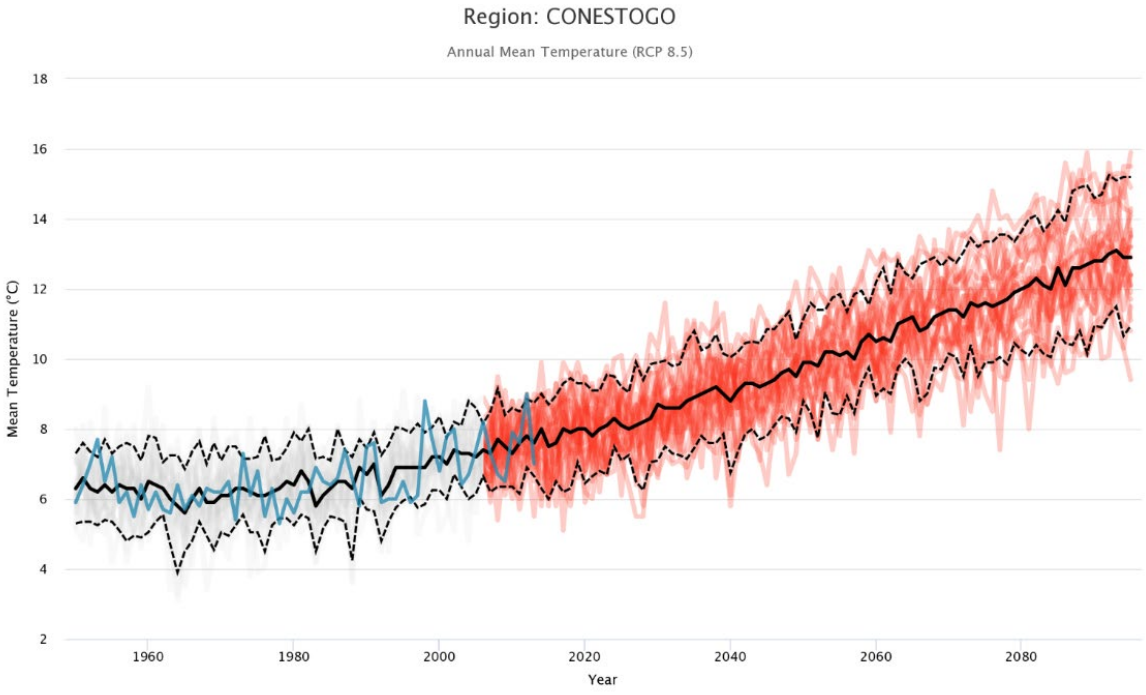

Figure 2: Climate Atlas Annual Mean Temperature for RCP 8.5 within Conestogo Region (Climate Atlas of Canada, 2022)

However, through the integration of community-based targets and measures in reducing GHG emissions within the Township, this steady incline can be lessened, decreased and reach a period of stability in the mean average temperature.

The Global Protocol for Community-Scale Greenhouse Gas Inventories 1.1 (GPC 1.1) provides cities and municipalities with a globally recognized and accepted framework to identify, calculate and report on greenhouse gas emissions within a specified boundary. This robust and transparent framework has been built to echo the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

The objectives of the Township's Inventory developed in compliance with the GPC 1.1 framework are to:

- develop a comprehensive and robust GHG inventory to better understand the emissions contributions of different activities in the community,
- establish a base year GHG emissions inventory, set GHG reduction targets and track performance,
- ensure consistent and transparent measurement and reporting of GHG emissions, and
- provide data for benchmarking purposes of comparable GHG data with other Canadian Municipalities and Cities.

Under the Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC), a city has the option of reporting GHG emissions under two different levels:

- **GPC BASIC** — An inventory reporting level that includes all scope 1 (territorial) sources except from energy generation, imported waste, Industrial Process and Product Use (IPPU), and Agriculture, Forestry, and Other Land-Use (AFOLU), as well as all scope 2 sources.
- **GPC BASIC+** — An inventory reporting level that covers all BASIC sources, plus scope 1 (territorial) AFOLU and IPPU, and scope 3 in the Stationary Energy and Transportation sectors. Specifically, it expands the reporting scope to include emissions from Industrial Process and Product Use (IPPU), Agriculture, Forestry, and Other Land-Use (AFOLU), and transboundary transportation. The sources covered in BASIC+ also aligns with sources required for national reporting in IPCC guidelines.

For the purpose of this GHG Inventory, CIMA+ has pursued the highest level of GPC reporting being **BASIC+**, harnessing all Scope 1, 2 and 3 emissions released within the Township of Mapleton.

The GHG inventory and tool created will not only aid in understanding the GHG emitting activities but will provide a framework for implementing mitigation measures to address the climate impact that the Township of Mapleton has on surrounding ecosystems, and continually assess the GHG reductions year over year. Moreover, from a global lens, the reduction of emissions achieved by the Township will contribute to meeting national targets in aligning with the Paris Agreements mission in maintaining global temperature rise below 1.5 degrees, coinciding with the United Nations Sustainable Development Goal number 13, on 'Climate Action'.

1.1 About CIMA+

CIMA+ is a multidisciplinary Canadian firm that specializes in consulting engineering and project management allowing for a full range of services in municipal infrastructure, water, transportation, building engineering, industry, energy, communications systems, environment, and sustainability. Founded in 1990, CIMA+ was created through the merger of several well-established consulting engineering firms. Today, with over 30 offices across Canada,

Engineering for **people**

CIMA+ employs more than 2,800 people, over half of whom share ownership in the company.

At CIMA+ we believe that engineering exists to enhance the lives around us. Sustainable solutions inspired by engineering help to meet the many challenges of today and tomorrow. Because when you engineer for people, you also engineer for a better world.

Sustainability is a priority for us and a real business philosophy. We therefore put the talent and know-how of our people at the service of our customers and our communities. Our expertise is grouped into four categories of services: Active and sustainable mobility, Climate change resilience and carbon management, Renewable energy and Sustainable design and performance for infrastructure assets.

We understand that our activities bear significant economic, social, and environmental impact. CIMA+ is committed to becoming a leader in the development of innovative and sustainable projects that meet the needs of our business partners and contribute positively to local communities while minimizing environmental impacts. In order to meet this commitment, a Centre of Excellence in Sustainability has been created and provides leadership, best practices, research, support and training for sustainable development to all employees.

The Centre of Excellence in Sustainability (CES) provides a harmonized sustainability and social responsibility approach throughout our offices and sectors, based on three strategic pillars:

- Engineering for future generations
- Empowering our people and communities
- Leading a sustainable business

Moreover, as part of our sustainable operations, CIMA+ has implemented a plan to measure, reduce and offset greenhouse gas emissions from all our offices and fleet of vehicles with incremental objectives over subsequent years. The base year for the GHG inventory is 2019 and the emissions calculated from these data will then serve as the base year data, against which emissions will be compared over time.

CIMA+ is thrilled to once again have the opportunity to work alongside the Township of Mapleton's team on the delivery of the GHG Inventory for 2021, after having worked with the Township for many years on projects ranging from the Drayton and Moorefield Wastewater Treatment Plants to Master Planning for years to come.

1.2 Greenhouse gas emissions for communities

The objectives of the GHG Inventory developed in compliance with the GPC Protocol are to:

- develop a comprehensive and robust GHG inventory to better understand the emissions contributions of different activities in the community,
- establish a base year GHG emissions inventory, set GHG reduction targets and track performance,
- create more targeted climate action plans,
- ensure consistent and transparent measurement and reporting of GHG emissions, and
- provide data for benchmarking purposes of comparable GHG data with other Canadian Municipalities and Cities. Detailed examples have been provided within section **8 Reporting and Disclosure** of our report.

1.3 Township of Mapleton and future focused County of Wellington

As previously indicated, the Township of Mapleton is a rural population of 10,839 residents, mainly agriculturally driven with a mission of 'rooted in tradition, growing for the future' (Government of Canada, 2021). This Township is comprised of three (3) communities, being Drayton, Moorefield and Alma. The County of Wellington is a two-tier municipality with the County serving the higher tier function and seven member municipalities (Erin, Guelph-Eramosa, Center Wellington, **Mapleton**, Minto, Puslinch, Wellington North) as the lower tier, or local, function. With the Township of Mapleton being a division of the County of Wellington, the Township follows in the County's footsteps in being committed to conserving the natural heritage and supporting various programs aimed at increasing awareness, education and mitigation efforts of global warming and the climate crisis. The County of Wellington's local GDP is $4,073M with the total land area of the Township of Mapleton being 535.6 km^2.

In 2020, the County of Wellington released '2022-2030 Future Focused', a climate change mitigation plan for the County, outlining Wellington's journey and targets toward achieving a sustainable future (County of Wellington, 2020). The plan was developed following the Partners for Climate Protection (PCP) Milestone Framework, an organization built on the partnership between the Federation of Canadian Municipalities (FCM) and ICLEI – Local Governments of sustainability. Sharing a common goal in lowering carbon emissions and working towards carbon neutrality across Canada is important as well as incorporating systems thinking and setting ambitious yet achievable targets through a micro and macro lens across our communities and regions. Canada is currently one of the world's largest per capita greenhouse gas emitters, scoring a "D" grade, the worst category in GHG emissions per ton of CO_2/capital, as shown within the following figure.

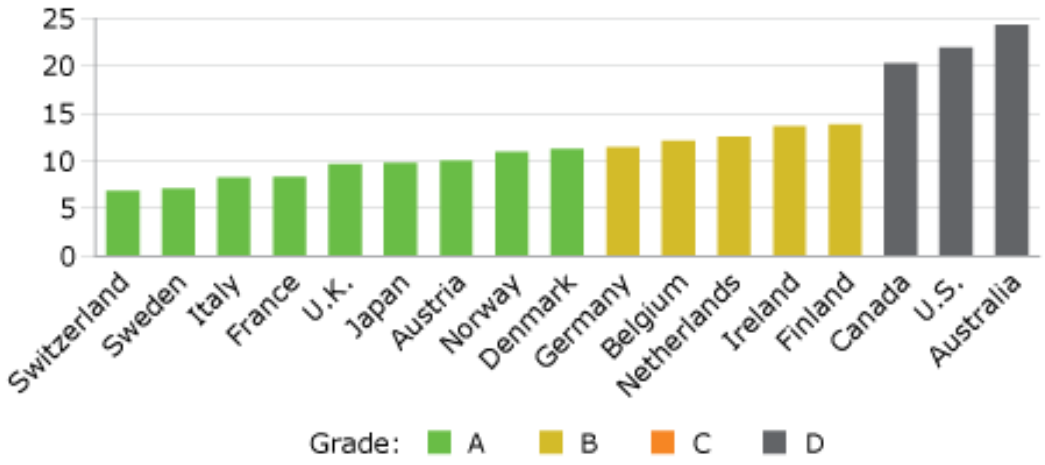

Figure 3. Tons of CO_2e per Capita in 2010 (The Conference Board of Canada, 2022)

In 2010, Canada's GHG emissions were 20.3 tons/capita, of which is significantly higher than the average of all 17 countries outlined in the figure, being 12.5 tons/capita, being nearly three times larger than the top performer within the Grade A category, Switzerland. Ontario's per capita emissions were 12.6 tons/capita in 2010 (Boothe & Boudreault, 2016). Since then, ten years later in 2020, Ontario's emissions lowered to 10.1 tons per capita (CER, 2022).

Therefore, it is of utmost importance to follow suit with the County of Wellington's Future Focused vision in aiming to reduce the community GHGs by 6% from 2019 levels by 2030, in addition to reducing corporate emissions by 10% over the same period. The study indicates that in 2009, 44% of Canada's GHG emissions were either point source or derived directly from municipalities.

As previously indicated, Canada is committed and is aiming in achieving net-zero emissions by 2050. To date, the County of Wellington has already implemented varying program, plans and policies in alignment with the Government of Canada's goal in becoming net-zero. Below are just a few of these examples from Wellington County's 'Future Focused' report (County of Wellington, 2020).

- Strategic Action Plan.
- Municipal Operational Service Efficiency Review.
- Conservation and Demand Management Plan.
- Purchasing Policy.
- Asset Management Program and Policy.
- Smart Cities – Our Food Future.
- Taste Real.
- Fleet Inspection and Performance Program.
- Ride Well.
- Green Legacy Building Guidelines.
- Green Legacy Program.
- Housing and Homelessness Plan.
- Waste Management Fleet Conversion to Compressed Natural Gas.
- Solid Waste Services Strategy.
- Active Transportation Plan.
- County Trail System.
- Community Improvement Program Fund.
- Wellington Rural Water Quality Program.

Legislatively, the Ontario government encourages municipalities to undertake greenhouse gas emissions inventories and strategies to reduce greenhouse gas emissions from transportation, buildings, waste management and municipal operations through A Place to Grow - Growth Plan for the Greater Golden Horseshoe (Government of Ontario, 2020). This plan developed in 2020, was built on the framework and purpose of protecting the use of finite resource within the Greater Golden Horseshoe (GGH) region, establishing a unique land use planning framework in partnership with local organizations, government bodies, indigenous communities and varying stakeholders in order to achieve complete communities, a clean and health environment, and social equity (Government of Ontario, 2020).

1.4 Township of Mapleton Inventory

This report has been prepared to represent the GHG inventory for the year 2021, serving as the baseline year for the Township's GHG Inventory initiatives moving forward on an annual basis. This is the beginning point in the Township's journey in formulating ambitious, attainable and transformative goals in mitigating and decreasing emissions from the Township. This annual monitoring and reporting will be released publicly as an act of transparency and accountability as an industry leading municipality.

The inventory covers the following **geographic boundary** of the Township of Mapleton, as indicated within the ArcGIS map below, serving an approximate land area of 535.6 km^2.

Figure 4. Map of Township's Reporting Boundary

All scope 1, 2 and 3 emissions are included in this report and the methodologies in accessing and calculating the data is presented in *Table 2*: Summary of Data Collection, of section **3.2 Data collection and quantification method** of this report.

1.5 Compliance

The Township of Mapleton's inventory has been prepared in accordance and compliance with ISO 14064-1 standards, in addition to the framework following closely to that of the Greenhouse Gas Protocol for Community-Scale Greenhouse Gas Inventories, an Accounting and Reporting Standards for Cities Version 1.1., prepared by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI).

Consequently, the inventory has been prepared in alignment with the following five principles of the ISO standard:

1. Relevance: Preparation of an inventory that meets the information needs of users making decisions internally or externally;
2. Completeness: Preparation of an inventory that takes into account all sources of GHG emissions within the perimeter selected, and justification for any exclusions;
3. Consistency: Use of methodologies that allow for year-to-year comparison of the results and clear communication of any changes in methodology over time;

4. Accuracy: Assurance that there is neither systematic over- or under-estimation of GHG emissions, and that the degree of accuracy is adequate for the intended use of the final results;
5. Transparency: Coverage of all the points and themes required while disclosing all assumptions, calculations and sources used.

The inventory for 2021 follows the location-based evaluation methodology (Location-Based Method) for Scope 2, as set out in GHG Protocol Scope 2 Guidance – An amendment to the GHG Protocol Corporate Standard.

The inventory also complies, either in whole or in part, with the following guidelines:

- Scope 1 & 2 GHG Inventory Guidance – Use to prepare a GHG inventory and quantify emissions (2021);
- Technical Guidance for Calculating Scope 3 emissions;
- GHG Protocol guidance on uncertainty assessment in GHG inventories and calculating statistical parameter uncertainty.

2. Description of the inventory

2.1 Reporting period covered

This GHG emissions inventory has been prepared for the year 2021, established as the baseline year, which provides guidance and a starting point for future targets and comparisons in emissions reductions for the Township. CIMA+ and the Township understand that the year 2021 can showcase abnormal trends within the inventory due to the pandemic impacting operations and typical daily routines for residents and the community more broadly within Mapleton. Through time in annual reporting within the tool created and provided for the community, the Township will view trends and be able to compare to normalized years ahead. Moreover, a limitation occurred with accessing data prior to 2019, and posed as a challenge which would have in turn led to assumption and estimation-based results due to inaccessible and unattainable data. With approval from the Municipality Council and the availability of data, this inventory reflects the 2021 fiscal year, running from January 1, 2021, to December 31, 2021.

2.2 Greenhouse gases included and their global warming potentials

This inventory covers all the gases listed in section 3.3 Greenhouse Gases of the GPC, in alignment with the Kyoto Protocol. The global warming potential attributed to each gas listed below is taken from the IPCC's Fifth Assessment Report on climate science. More specifically, the following gases, and their global warming potential, have been found to be in use in the inventory's various emission sources:

- Carbon dioxide (CO2), with a global warming potential of 1;
- Methane (CH4), with a global warming potential of 28;
- Nitrous oxide (N2O), with a global warming potential of 265;
- Hydrofluorocarbons (HFCs), various GWP's;
- Perfluorocarbons (PFCs), various GWP's;
- Sulfur hexafluoride (SF6), with a global warming potential of 23,500;
- Nitrogen trifluoride (NF3), with a global warming potential of 16,100.

GHG emission sources are divided into three categories called "Scopes", which serve to distinguish between direct and indirect emissions. These Scopes also help reduce the risk of double counting of emissions between parties.

- Scope 1: GHG emissions from sources located within the city boundary
- Scope 2: GHG emissions occurring as a consequence in the use of grid-supplied electricity, heat, steam and/or cooling within the city boundary
- Scope 3: All other GHG emissions that occur outside the city boundary as a result of activities taking place within the city boundary

2.3 **Municipal boundary**

The Municipal boundary was defined according to the zoning and municipal boundary of the Township of Mapleton, including all emission scopes: 1, 2 and 3. The following figure demonstrates the inventory boundaries and the sources of emissions found within each of them.

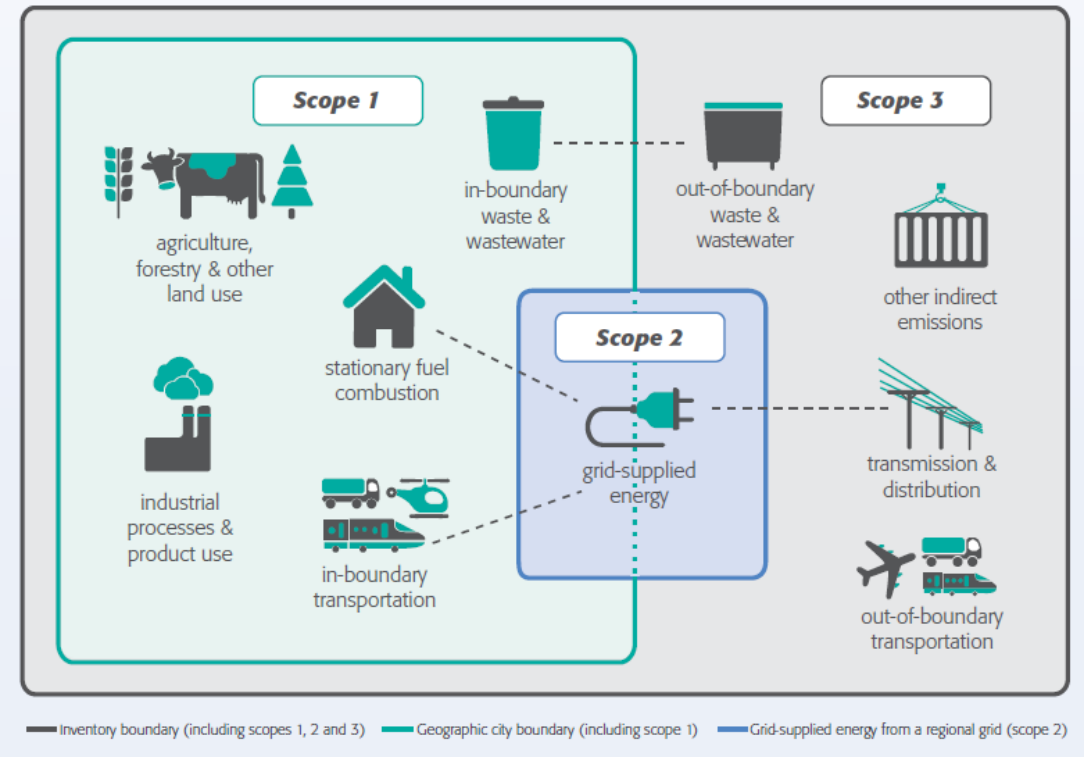

Figure 5. Sources and Boundaries of City GHG Emissions (Greenhouse Gas Protocol, n.d.)

Collection of data is an integral part of developing a GHG inventory and limitations in data availability and applicability are common place. The following notation Keys are used to provide justification for exclusions or partial accounting of GHG emission sources:

- IE: Included Elsewhere. GHG emissions for this activity are estimated and presented in another category of the inventory. That category shall be noted in the explanation.
- NE: Not Estimated. Emissions occur but have not been estimated or reported; justification for exclusion shall be noted in the explanation.
- NO: Not Occurring. An activity or process does not occur or exist within the city.
- C: Confidential. GHG emissions which could lead to the disclosure of confidential information and can therefore not be reported.

Of the 27 Scope 1 emissions sources outlined within the GHG Emissions Report in **Appendix B** of this report, a total of 9 of these emissions sources were occurring within the Township's boundary: The use of vehicle fleet (including fire trucks), street lighting and the fossil energy consumption of publicly owned buildings within the Township from a variety of categories including the arena and the wastewater treatment plants, to name a few. Those excluded are either as a result of Not Occurring (NO), or Not Estimated (NE) Key Notations. Furthermore, emissions from refrigerants found in air conditioning equipment are not included within the inventory, as no data was available.

Of the 11 Scope 2 emissions that are listed within Appendix B, the Township currently has 6 of these sources occurring within its boundaries, some of which being electrical power consumption for all municipal buildings and infrastructure assets. Some of these sources have been Included Elsewhere (IE) as outlined in the Key Notation, indicating they have been accounted for in a separate part of the inventory.

The emissions to be reported under Scope 3 must include all significant sources occurring outside the city boundary as a result of those activities within the city boundary for which we are able to obtain data and in turn pursue the BASIC+ rating. This being the first iteration of the inventory, additional categories may be added as procedures are developed for internal data collection within the Municipality. The Township's GHG inventory 2021 includes the following Scope 3 GHG emissions:

- Indirect emissions
- Transmission and distribution
- Out-of-boundary waste and wastewater

Such sources of emissions are showcased within **Table 1** to follow, taken from the GPC's reporting guide.

3. Methodology

The approach for the development of the GHG inventory is aligned with industry best standards and protocols, such as those previously indicated in section **1.5 Compliance** of this report. The main steps toward successfully conducting a thorough analysis and inventory of GHG emissions within an identified project boundary are outlined to follow:

1. Identifying emission sources
2. Selecting methodologies of quantification for each source
3. Selecting and collecting activity data
4. Selecting local emission factors
5. Calculating GHG emissions

The GHG inventory is primarily based on multiplying the data from GHG-emitting activities by the appropriate emissions factor. All activity data is derived from official documentation such as Statistics Canada and National Inventory Reports, or from primary utility providers, such as HydroOne and Enbridge, as well as specific information provided by the Township of Mapleton or the County of Wellington.

This inventory has not been audited by an external party.

3.1 Identification of GHG sources

All of the Township's emission sources are listed below within Table 1, with the term "included" to identify those emissions that were included within the inventory, with a detailed version located in **Appendix B**. This table also provides insight into those emissions that are included within BASIC and BASIC+ level reporting, as shown within the legend and colour coding to follow.

Table 1: Sources of GHG Emissions (Greenhouse Gas Protocol, n.d.)

Sectors and sub-sectors	Scope 1	Scope 2	Scope 3
Stationary Energy			
Residential buildings	Included	Included	Included
Commercial and institutional buildings & facilities	Included	Included	Included
Manufacturing industries and construction	Included	Included	Included
Energy industries	N/A	Included	N/A
Energy generation supplied to the grid	N/A		
Agriculture, forestry, and fishing activities	Included	N/A	N/A
Non-specified sources	N/A	N/A	N/A
Fugitive emissions: mining, processing, storage, transportation of coal	N/A		N/A
Fugitive emissions from oil & natural gas systems	N/A		N/A
Transportation			
On-road	Included	N/A	N/A
Railways	N/A	N/A	N/A
Waterborne navigation	N/A	N/A	N/A
Aviation	N/A	N/A	N/A
Off-road	N/A	N/A	N/A
Waste			
Disposal of solid waste generated in the city	N/A		Included
Disposal of solid waste generated outside the city	N/A		
Biological treatment of waste generated in the city	N/A		Included
Biological treatment of waste generated outside the city	N/A		
Incineration and open burning of waste generated in the city	N/A		N/A
Incineration and open burning of waste generated outside the city	N/A		
Wastewater generated in the city	Included		N/A

Sectors and sub-sectors	Scope 1	Scope 2	Scope 3
Wastewater generated outside the city	N/A		
Industrial Processes and Product Use (IPPU)			
Industrial processes	N/A		N/A
Product use	N/A		N/A
Agriculture, Forestry and Other Land Use (AFOLU)			
Livestock	Included		N/A
Land	Included		N/A
Aggregate sources and non-CO_2 emission sources on land	Included		N/A
Other Scope 3			
Other Scope 3			N/A

✓ Sources covered by the GPC
● + ● Sources required for BASIC+ reporting
● Sources included in Other Scope 3
● Sources required for BASIC reporting
● Sources required for territorial total but not for BASIC/BASIC+ reporting (*italics*)
● Non-applicable emissions

*No activity related to carbon sinks has been reported within this inventory.

3.2 Data collection and quantification method

This section presents the data sources and confidence levels for the various emission categories. The conversion for emissions of GHGs other than CO_2 into CO_2 equivalents was accomplished by applying the global warming potentials for each GHG using the Global Warming Potential from the IPCC's Fifth Assessment Report.

The detailed **Table 2: Summary of Data Collection**, can be found within **Appendix A – Reporting Methodology** of this report.

Supporting information and assumptions:

Stationary Energy:

- For Enbridge data, we assume the data provided is accurate and that agriculture residential building consumption is included in residential.

Waste:

- Biological waste was all assumed to be “wet” waste, including all yard, brush and leaf. All organic waste is composted and not bio digested.
- Since only the wastewater is treated inside the project boundary, it is the only scope 1 emission reported within the ‘Waste’ category. The rest is considered scope 3, being treated outside the boundary.

Agriculture, Forestry and Other Land Use (AFOLU):

- Manure Management: EF developed in the national inventory report are based on the equations from the GPC and they were used for this inventory.
- There are no rice cultivation practices in Mapleton.
- There are no biomass burning practices in Mapleton.
- The land within the project boundary is all considered managed.

4. GHG inventory results

4.1 Year 2021 results summary

The methodology pursued above, in combination with the GPC, ISO and IPCC standards and recommended reporting procedures were referenced in the completion of the 2021 GHG Inventory for the Township of Mapleton. Table 3 below presents the summary of the GHG emissions within the project boundary, with a total of 97,467 tons of CO_2e for BASIC level reporting and 241,211 tons of CO_2e for BASIC+.

Table 2: BASIC Level Reporting: Summary of Results in CO_2e (t)

Sector	Category	Scope 1	Scope 2	Scope 3	Total (CO2e(t))
I - Stationary energy	Residential	7,801	1,459	146	9,406
	Commercial	11,423	1,269	59	12,751
	Manufacturing	14,586	957	46	15,589
	Energy	0	0	0	0
	Agri, Forestry & Fishing	13,536	0	0	13,536
					51,282
II - Transportation	On-road	44,289	0	0	44,289
					44,289
III - Waste	Solid	0	0	983	983
	Biological	0	0	41	41
	Wastewater treatment and discharge	872	0	0	872
					1,896
Total 2021 BASIC Emissions					**97,467**

Table 3: BASIC+ Level Reporting: Summary of Results in CO2e (t)

Sector	Category	Scope 1	Scope 2	Scope 3	Total (CO2e(t))
IV - Industrial processes	Processes	0	0	0	0
	Product use	0	0	0	0
					0
V - Agriculture, forestry and other land use	Livestock	184,631	0	0	184,631
	Land	55,564	0	0	55,564
	Aggregate sources and non-CO2	1,016	0	0	1,016
					241,211
VI - Other scope 3	Other scope 3	0	0	0	0
Total 2021 BASIC+ Emissions					**241,211**

A detailed overview of the total GHG emissions by sector, emission type and scope have been provided within **Appendix B** of the report.

4.1.1 2021 Reporting Year Disclaimer

The Township has established 2021 as the baseline year for tracking community wide and corporate GHG reductions. In the instance of significant changes or outliers occurring over time that will hinder the progress of striving toward 2030 and 2050 targets, the Township may retroactively recalculate baseline and base year emissions. This recalculation may be done for significant changes to the data, inventory boundary, methodologies, or other relevant factors.

The following are examples of scenarios that can influence the recalculation of the baseline:

- Changes in status of owned or leased assets (i.e., selling or purchasing a community center)
- Improvement of accuracy or adjustment in calculation methodology of data or emissions factors
- Discovery of significant errors

4.2 Community Wide Emissions

The 2021 GHG Inventory concluded that the overall Mapleton community wide GHG emissions equated to 97,467 tons of CO_2e for BASIC level reporting and 241,211 tons of CO_2e for BASIC+ for a population size of 10,839 civilians (Government of Canada, 2021).

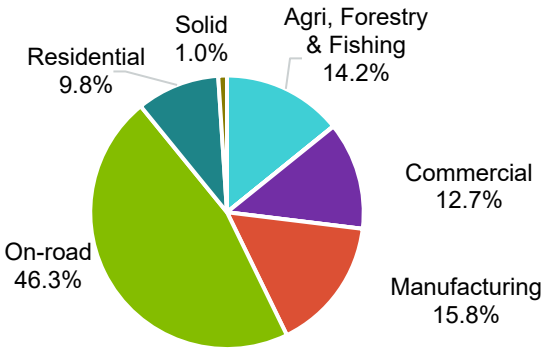

Figure 6. Township of Mapleton's 2021 BASIC Level GHG Emissions (t) CO_2e

Taking a closer look at the above graph, fossil fuel related emissions account for 98.9% of the community's emissions, being categorized through on-road activities and transportation, manufacturing, commercial buildings, residential buildings and emissions related to the fossil fuels from agricultural, forestry and fishing stationary buildings.

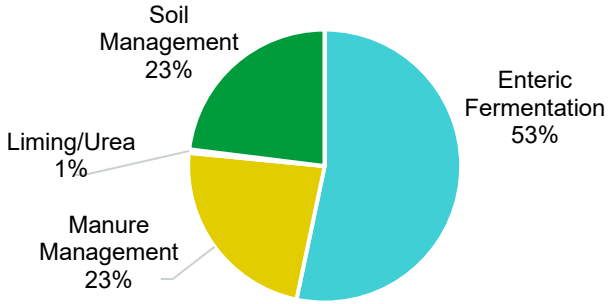

Figure 7. Township of Mapleton's 2021 BASIC+ Level GHG Emissions (t) CO_2e

BASIC+ reporting includes those emissions from IPPU and AFOLU, however for the year 2021, there are no IPPU sources to report. Therefore, of the total biogenic AFOLU sources, Enteric Fermentation emissions account for 53% of the total BASIC+ emissions reporting within Mapleton, of which, the total agricultural emissions are split by a quarter from land derived emissions (such as soil management), whereas the remaining quarter is derived from manure management activities. Liming and Urea application account for 1% of the overall BASIC+ level reporting.

4.3 Biogenic sources and AFOLU

Biogenic sources are those that are derived from natural sources like living organisms that eventually circle back into the atmosphere. Biogenic sources typically emit the following GHG gases: CO_2, CH_4 and N_2O. However, other than CO_2, GHG gases like CH_4 and N_2O are still included in the emissions inventory. The gases from biogenic sources would eventually make their way back into the earth's natural cycle through carbon sequestration of plant and flora, of which livestock and farming are found to be a part of this closed-loop system.

Biogenic CH_4 is accounted for in the inventory. This is because even if the gas is transformed back to CO_2 (in approximately 12 years), it has a higher global warming potential during its time as CH_4 (refer to section 2.2 of this report). Therefore, this is why the IPCC and global community is focused on reducing CH_4 emissions of higher urgency, compared to CO_2.

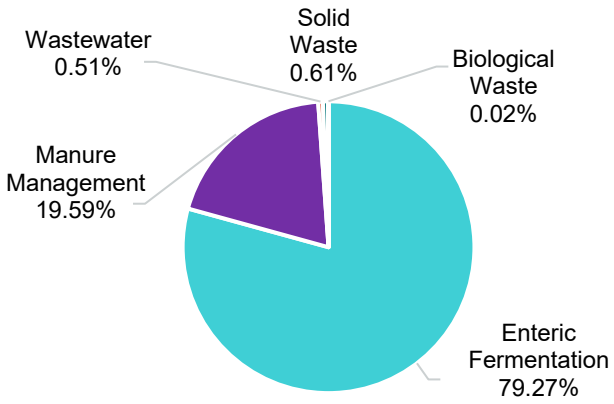

Figure 8. Total Biogenic Emissions (CO_2, CH_4, N_2O and Biogenic CO_2) by Source

As previously outlined, sources such as wastewater emissions, solid waste, composting, ethanol fleet vehicles and agricultural practices like enteric fermentation and manure management, are all accounted within the process of biogenic sources.

Figure 9 outlines the total biogenic GHGs from those sources previously identified, and as shown, Enteric Fermentation and Manure Management release the highest amounts of methane (CH_4), while Liming and Urea application produce mainly CO_2 as identified through the IPCC reporting standards.

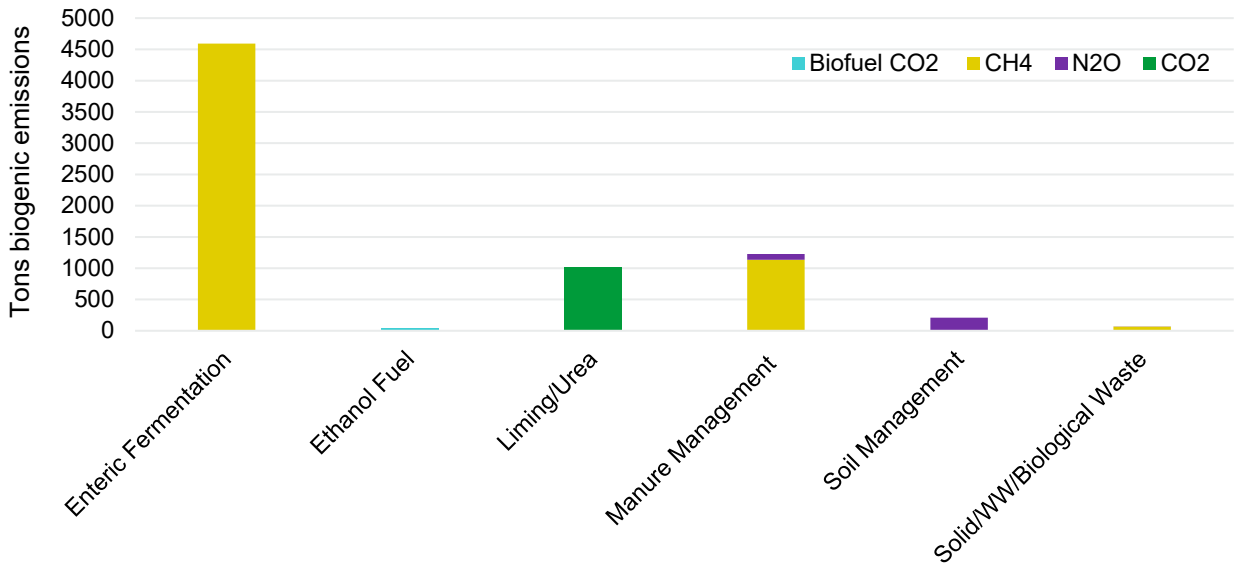

Figure 9. Total Emissions by Greenhouse Gas from AFOLU Sources

4.4 Township of Mapleton corporate emissions

In 2021, the Commercial and Institutional building sector within the Township accounted for just under 4% (per Figure 6) of the total GHG emissions within Mapleton, of which, a small portion of this total tonnage had been derived from municipal corporate emissions.

Figure 10 details the total carbon dioxide equivalent commercial and industrial buildings emissions associated to the Private versus the Public sector within the Township of Mapleton. The public sector being the municipally owned buildings and facilities. It is therefore evident that the private sector is accountable for 98% of the total CO_2e from building energy within the project boundary, leaving the public buildings to account for 2%.

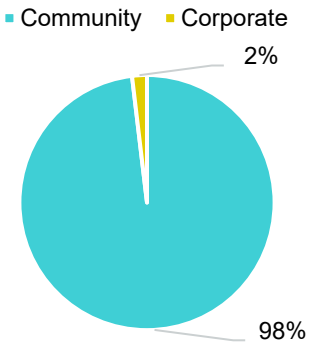

Figure 10. Total Public and Private Commercial and Industrial Building CO_2e Emissions (tons)

Waste is currently not reported by the municipality and county and is therefore not included in the Municipal emissions. A recommendation for this within section **7 Setting Targets** of our report has been provided, to aid in tracking waste and increase diversion rates. The Figure 11 graphs do however tell a story indicating that corporate vehicle fleet account for a larger majority of corporate emissions compared to building fossil fuel emissions. As shown on the right pie chart, of the total corporate emissions more than half of them are derived from diesel fuel sources (municipal fleet and fire trucks), followed by natural gas and electricity (building energy use) fuel sources. Ethanol is not shown in the above graph as it is utilized to fuel both municipal fleet and fire trucks, being considered a biogenic source as previously outlined.

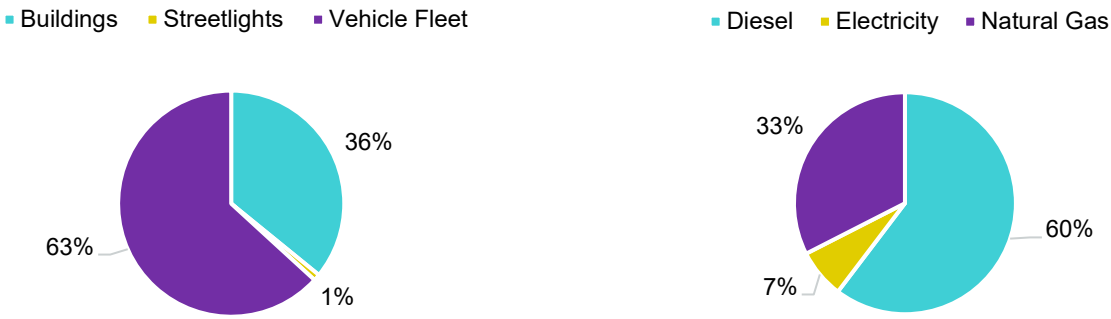

Figure 11. Municipal Emissions by Category and Source

To take a deeper look into the associated emissions from the public sector, the highest nine (9) emitting buildings in CO_2e measured in tons, by the total size of the building to be able to view the overall impact of the buildings envelope and footprint. Figure 12 therefore shows that the Main Road Shop, is the largest emitter, emitting ~90 tons of CO_2e per year, with a square footage area of 8,590. To follow, the Moorefield Community Centre also emits largely compared to its building's footprint, of 18.8 CO_2e for a total building area of 1,076 sq. Ft. On the other end, buildings such as the PMD Arena, Mapleton Health Centre and Maryborough Fire Hall are deemed to be more energy efficient.

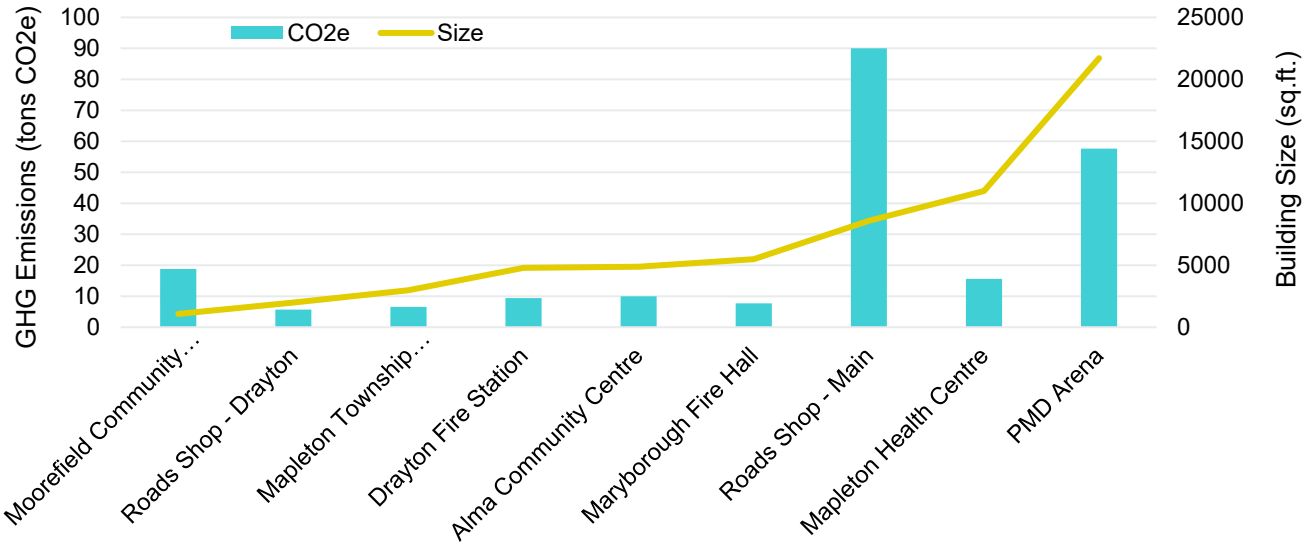

Figure 12. Total Scope 1 & 2 CO_2e vs. Size of Building (Public)

Figure 13 provides a detailed outlook into the footprint of the Main Road Shop and Moorefield Community Centre previously discussed in Figure 12. The Moorefield Community Centre is shown to have the highest building carbon intensity of all the Township's owned buildings, outlining the highest amount of kg of CO_2e per building square footage for the size of the building, with the Main Road Shop to follow. Therefore, the Moorefield Community Centre is deemed to have one of the smaller building footprints by area, however the highest emitting carbon impact.

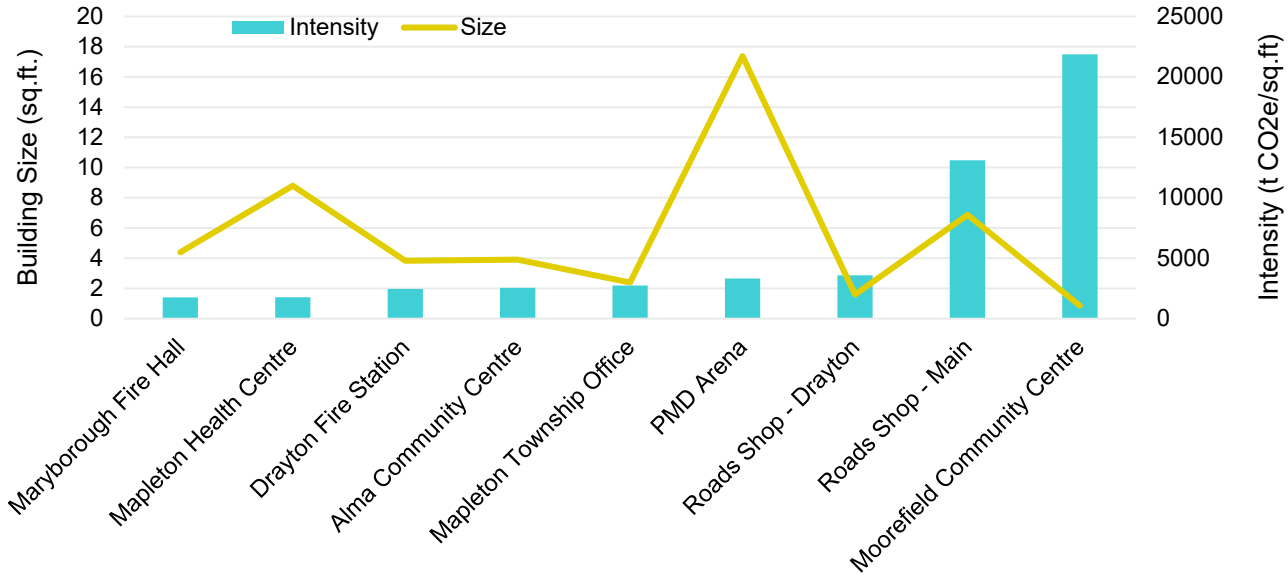

Figure 13. Scope 1 & 2 CO_2e Intensity vs. Size of Building (Public)

4.4.1 Stationary energy

The 2016 Transportation Tomorrow Survey (TTS) states households in the County of Wellington were comprised of 87% houses, 4% townhouses, 9% apartments. Mapleton has 3,245 dwellings. 2,845 detached homes, 160 semi-detached houses, 35 row houses, 150 apartments and 55 other dwellings (Government of Canada, 2021).

It is shown in Figure 14 that Natural Gas has the highest total carbon dioxide equivalent emissions (CO_2e) within the year 2021, from within the Township's residential building sector. This figure is approximately six times the total amount of the total CO_2e from the Electricity energy type.

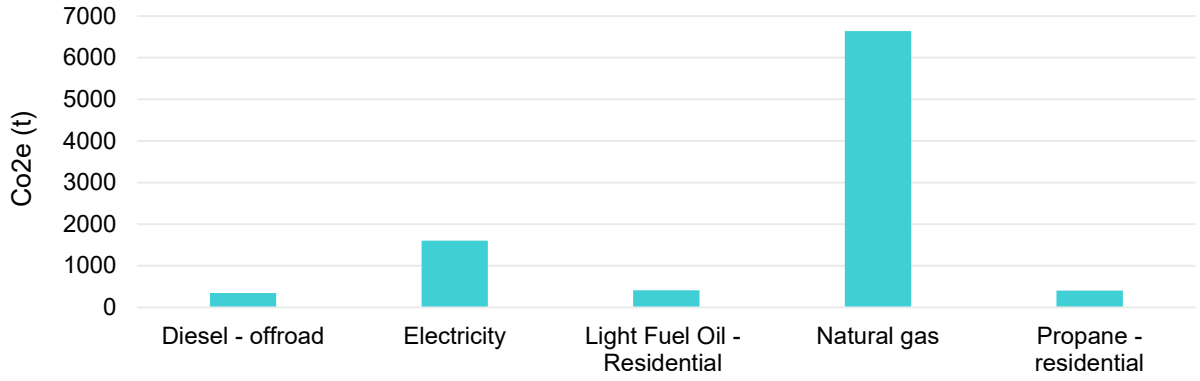

Figure 14. Stationary Residential CO_2e (tons) Emissions by Energy Type

The total manufacturing emissions measured in tons of CO_2e within Mapleton as outlined in Figure 15, state that the highest contributor is Natural Gas fuel usage within buildings, being 73% of the total emissions. To follow, off-road vehicle use (such as those used on site at such operations, manufacturing, mining, and construction) at 18% from diesel usage and thirdly Electricity.

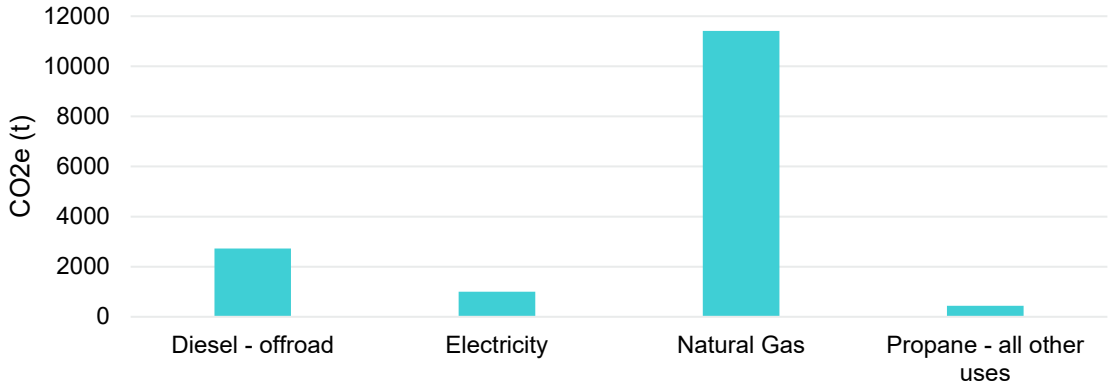

Figure 15. Total Manufacturing Emissions (Tons CO_2e)

Within Figure 16, it is clear that the highest total emissions from within the Manufacturing sector are derived from Scope 1 emissions, being those emissions occurring physically within the Township's boundary such as natural gas, propane usage and off-road vehicle usage (diesel).

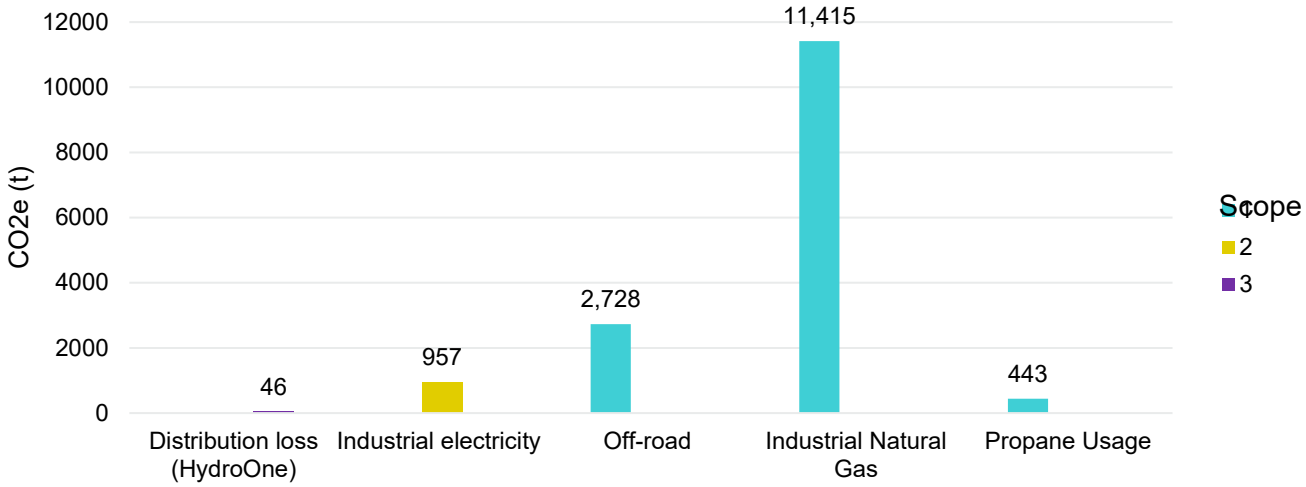

Figure 16. Total Manufacturing Emissions Scope 1,2, and 3

Table 4 indicates the total CO_2e in Tons associated with the powering of all wind turbines within the project boundary. Upon speaking with the local renewable energy generator on the wind turbine project within the township's boundary (ten turbines), there are no scope 1 emissions, only scope 2 emissions in which the local generator provided the information for. This would include the consumption for both the O&M buildings on site and all ten turbines as a total. All of the power harnessed the clean energy is returned back into the grid.

Table 4: Stationary Energy Supplied to the Grid from Local Renewable Energy Generator

Energy Source	Wind Power
Scope	2
Number of Wind Turbines	10
CO_2e (Tons)	0.14

Table 5 above outlines the total tons of CO_2e resulting from the Stationary Agricultural emissions, being 13,536 tons. These emissions are all categorized as scope 1, mainly associated with offroad vehicle use on such properties and the propane utilized for mainly residential heating sources. All Enbridge and HydroOne data associated with fuel use within households has been accounted for within the stationary residential portion of the inventory.

Table 5: Total CO_2e for Stationary Agriculture Emissions (Tons)

Source of Emissions	**Fuel**	**CO_2e (tons)**
Off-road Vehicles and Machinery	Diesel - offroad	11,297
Propane Use	Propane - all other uses	2,239
*All scope 1		**13,536**

4.4.2 Transportation

Total transportation emissions within the community account for 41% of the total footprint. Of this, the majority of these emissions are resulting from private emissions and household vehicle usage. One percent of the total on-road transportation emissions are from corporate municipal transportation.

Within Figure 17, corporate fleet emissions account for all on-road sources from fleet vehicles, curbside waste pick-up and fire trucks (run off of diesel fuel). It is important to note that of the municipal fleet, many firetrucks and vehicles are also powered by ethanol from the local fleet pump which is decreasing the overall amount by 45.8 tons of biofuel CO_2. Therefore, ethanol vehicles do not add to the overall inventory for 2021. The municipal waste collection trucks run on compressed natural gas (CNG).

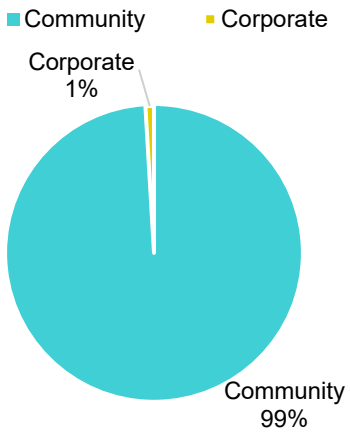

Figure 17. Total Tons CO_2e for On-road Transportation

Of the 99% of private on-road transportation emissions, 33,425 tons of CO_2e are resulting from gas powered vehicles (Cars, Vans, Trucks), whereas 2,049 tons of CO_2e are a result of diesel-powered vehicles. As natural gas and propane powered vehicles are not a significant total amount of CO_2e, they have not been shown in the following graph.

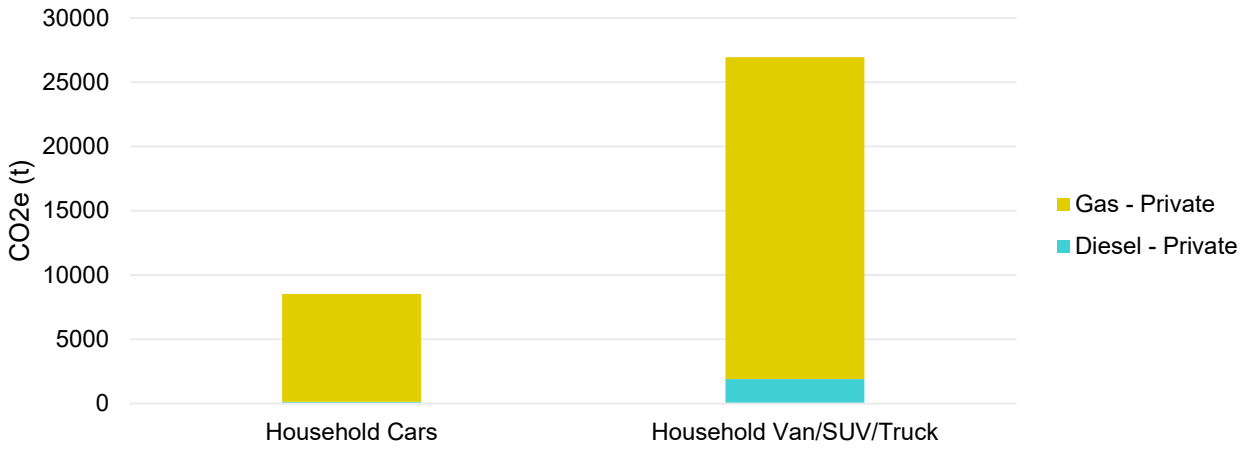

Figure 18. Total Tons CO_2e from Household Vehicle Use

4.4.3 Waste

The Township's waste sector accounts for just under 2% of the overall emissions profile, accounting for biological (compost), solid (buried) and wastewater waste streams. The total tons of carbon dioxide equivalents from waste in 2021 was 1,896 tons.

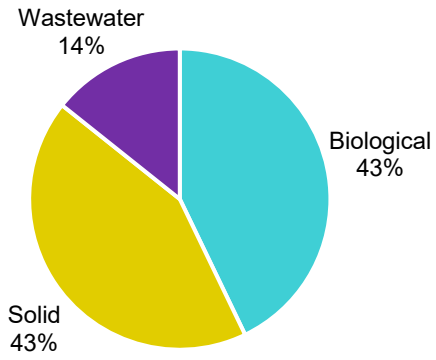

Figure 19. Total Tons of CO_2e from Waste Sector

Of this two percent, majority emissions were derived from solid and biological waste streams. It is important to note that waste emissions are biogenic sources, being CH_4 and N_2O, meaning that of the total 1,896 tons of GHGs emitted, none are adding to the overall community profile, and in fact decreasing community emissions being a part of the natural biogenic cycle by current waste management practices and techniques within such facilities.

5. Conclusion and next steps

In collaboration with the Township of Mapleton, County of Wellington, CIMA+ and other unique parties and service providers, this concludes the GHG Inventory for the 2021 baseline year for the Township of Mapleton in compliance with those standards outlined in **Section 1.5 Compliance** of this report.

The next steps and actions set out for the Township are provided in the section to follow.

6. Incentive and funding programs

Several incentive and funding programs exist for Community building retrofits and energy/GHG reduction measures. Here are a couple of examples that could be applicable to the Township listed from a broad lens to a localized scale:

- Government of Canada: *Financial incentives by province (nrcan.gc.ca)*
- Federation of Canadian Municipalities (FCM): Green Municipal Fund
- Environment and Climate Change Canada (ECCC): ECCC funding programs - Canada.ca
- Infrastructure Canada: Funding Delivered under the Investing in Canada Plan
- Transportation Canada: Incentives for purchasing zero-emission vehicles
- Independent Electricity System Operator: i.e. Save on Energy: Energy Affordability Program
- Enbridge: Home Efficiency Rebate
- HydroOne: Ontario Electricity Rebate
- Ontario Soil and Crop Improvement Association (including webinars): Programs | OSCIA
- GRCA – Rural Water Quality Program: Wellington - Grand River Conservation Authority

7. Community consultation and engagement

It is imperative to incorporate Community Consultation and Engagement while crafting the Municipality's overall Climate Action Plan. With the Township comprised of varying communities, stakeholders, ecosystems and businesses, considering all parties' concerns, ideas and priorities toward the climate crisis and mitigation measures to be implemented within the community is important to create real change. Working toward a goal in combatting climate change on a community scale, can only effectively be achieved with all minds working in unison toward the same goal.

CIMA+ conducted a Community Engagement and facilitation seminar with varying community members within the Township of Mapleton on December 6th and 7th, 2022 consisting of members such as farmers, business owners, municipal staff, residents, educators, and much more. The main objective of these sessions was to present our preliminary findings and gain understanding of the perspective within the community, and what they believe would be the best approach in decreasing the emission identified by the inventory in reaching the goal of GHG reduction for future years to come. Of which, many of the key takeaways consisted of greening infrastructure, electrification of transportation, increased inclusion of public transit, agriculture based GHG emission reduction efforts, conservation of lands and lastly increase of education on the importance of climate resiliency. The key takeaways aligned heavily with those results from the County of Wellington's Future Focused Report.

The following sections presents the key comments and ideas captured within these sessions, split by the following sectors: Residential, Corporate/Municipal and Agricultural/Commercial Institutional/ Manufacturing.

7.1 Residential

Table 6: Residential Community Engagement Discussion

Date: December 6th, 2022, from 6p.m. to 8p.m.
Turnout: Approximately 9 residents

Buildings	Transportation	Waste	Agriculture and Natural Assets	Education and Awareness
Interest in installing solar panels Request for building denser neighbourhoods Interest in tiny home developments and adding onto existing buildings Discussion on simple steps to reduce energy consumption: - weather stripping of windows and doors to increase home efficiency -decrease home heating and cooling use -remember to turn off lighting	Combine trips to town (less fuel use) Purchase Electric/ Hybrid vehicles and bicycles as there is demand Walk to work (sidewalks are well maintained) Attendees had recommended the Township integrate public transit networks Interest in the Township offering car sharing and EV charging stations Interest in conducting residential energy audits Convert homes to electric (i.e., upgrading appliances)	Recommendation for increasing education around green bin/compost use to aid in adoption Residents are utilizing homegrown produce and backyard chickens Some residents are producing 1 garbage bag of trash /month	Increase the preservation/ conservation of existing lands (Concerns with Bill 23) Would like an increase in awareness around Trees for Mapleton Committee Request for the development of more strategies for roadside trees and edge rows (decreasing soil erosion)	Focus on increasing awareness/ education within schooling Residents mention they require more collective action Attendees would like to see the Township develop a committee/ team on sustainability

7.2 Corporate/Municipal

Table 7: Corporate/Municipal Community Engagement Discussion

Date: December 7th, 2022, from noon to 4p.m. Turnout: 11 council members				
Buildings	**Transportation**	**Waste**	**Agriculture and Natural Assets**	**Education and Awareness**
Mapleton is publishing a new 2024 Asset Management plan Building Condition Assessments (BCAs) are taking place Township to plan to retrofit buildings and conducting onsite audits Township to consider replacing/upgrading HVAC and Mechanical Township to integrate lighting efficiency measures Pursue 'Gentle' densification within planning efforts Consider solar panels for various buildings Decrease reliance on natural gas To develop and implement Energy Demand Management plans	Electrification of Fleet – installing 4 charging stations, early 2023 Look into EV firetrucks Evaluate the consumption patters of current corporate fleet and snow plots	Recommend the Township begin tracking waste consumption and diversion within the municipality/ corporate Aim to increase the presence of compost within municipal / corporate buildings	Township to create change through planning and preservation initiatives	Mapleton to increase education and awareness on sustainable buildings and how individuals can make change (content on website) Recommend the website provide information to community on incentives/ loans available in addition to case studies/success stories Aim in increasing collaboration with community and council to strive toward change and targets Township to work toward increasing education for youth

7.3 Agricultural/Commercial Institutional/Manufacturing

Table 8: Agricultural/Commercial Institutional and Manufacturing Community Engagement Discussion

Date: December 7th, 2022, from 6p.m. to 8p.m.
Turnout: 40 members from the farming community

Buildings	Transportation	Waste	Agriculture and Natural Assets	Education and Awareness
Currently, some farms are installing solar panelling within their dwellings Environmental Farm Plans are being conducted (voluntary)	Farming community is considering efficient motors on equipment	Recommend that the community increases compost and diversion of waste within barns and single home dwellings	Community would benefit from training on carbon sequestration tool Increase preservation of natural spaces and farmland Municipality to aid farming community in creating a benchmark Work toward conducting local surveys to gain more insight into local data – possibly work with County of Wellington Decrease plowed and tilled soil Create awareness around biogenic cycle and understanding that farmers are the solution Work toward increasing piloting and research studies Review AgriSuite Calculator tool for GHG inventories and specific soil nutrient plans Increase wind breaks and decreasing soil erosion Decrease fertilizer usage	Require more incentives or increased awareness on what is available to community members Eager to view case studies and success stories or resources available on the Municipal site Increase and sharing knowledge amongst community

8. Recommendations

The following section has been developed to provide best practices and recommendations toward GHG emission reductions through all sectors accounted for within the 2021 inventory.

8.1 Setting targets for the Township of Mapleton

With the 2021 inventory year being the benchmark for the Township, it is imperative to set targets to provide guidance on the progress of Mapleton's decarbonization journey for years to come. This will in turn aid in goal setting, increased performance, actionable priorities and opportunity for climate action planning towards proactive and ambitious yet achievable GHG reduction targets in alignment with federal, provincial and county based pathways.

The Township has already implemented sustainable measures and practices in aims of fostering a sustainable transition with existing processes, such as a ten (10) wind turbine solar farm implemented by the local provider, bringing 5,50kWh of clean energy back into the Township's local grid, along with the planned implementation of four (4) electric vehicle charging stations for community use located throughout the Township in 2023.

Canada is committed to reducing GHG emissions below 2005 levels by 2030, being 30%, with the Provincial Ontario government aligning with equal targets. The Federal government has committed to achieving net zero emissions by 2050 (Environment and Climate Change Canada, 2022). Utilizing the Partners in Climate Protection framework, the County of Wellington has set targets for 20% reduction of community emissions and 6% reduction of corporate emissions by 2030, with the overall target supporting the federal net-zero target for 2050 (County of Wellington, 2020).

Sharing a common goal in decarbonization throughout our country, it is proposed that the Township of Mapleton utilize the Partners in Climate Protection framework to develop both aspirational (reflecting the need for specific climate action) and pragmatic (realistic and achievable) targets based on a bottom-up approach (Partners for Climate Protection, 2021). The following proposed targets have been developed for the Township of Mapleton for the years 2030, and overall, 80% reduction for 2050.

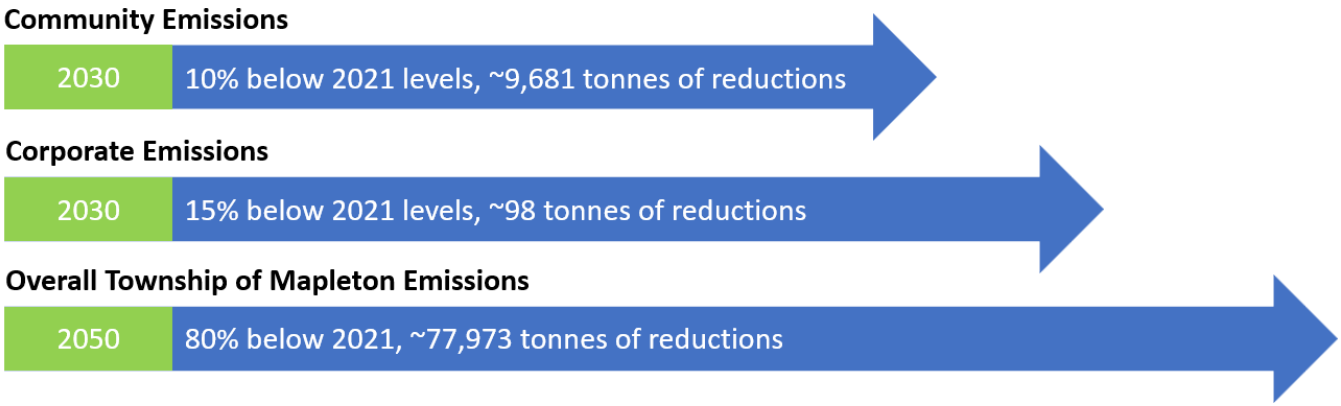

Figure 20: Township of Mapleton's 2030 and 2050 Proposed GHG Reduction Targets (BASIC reporting)

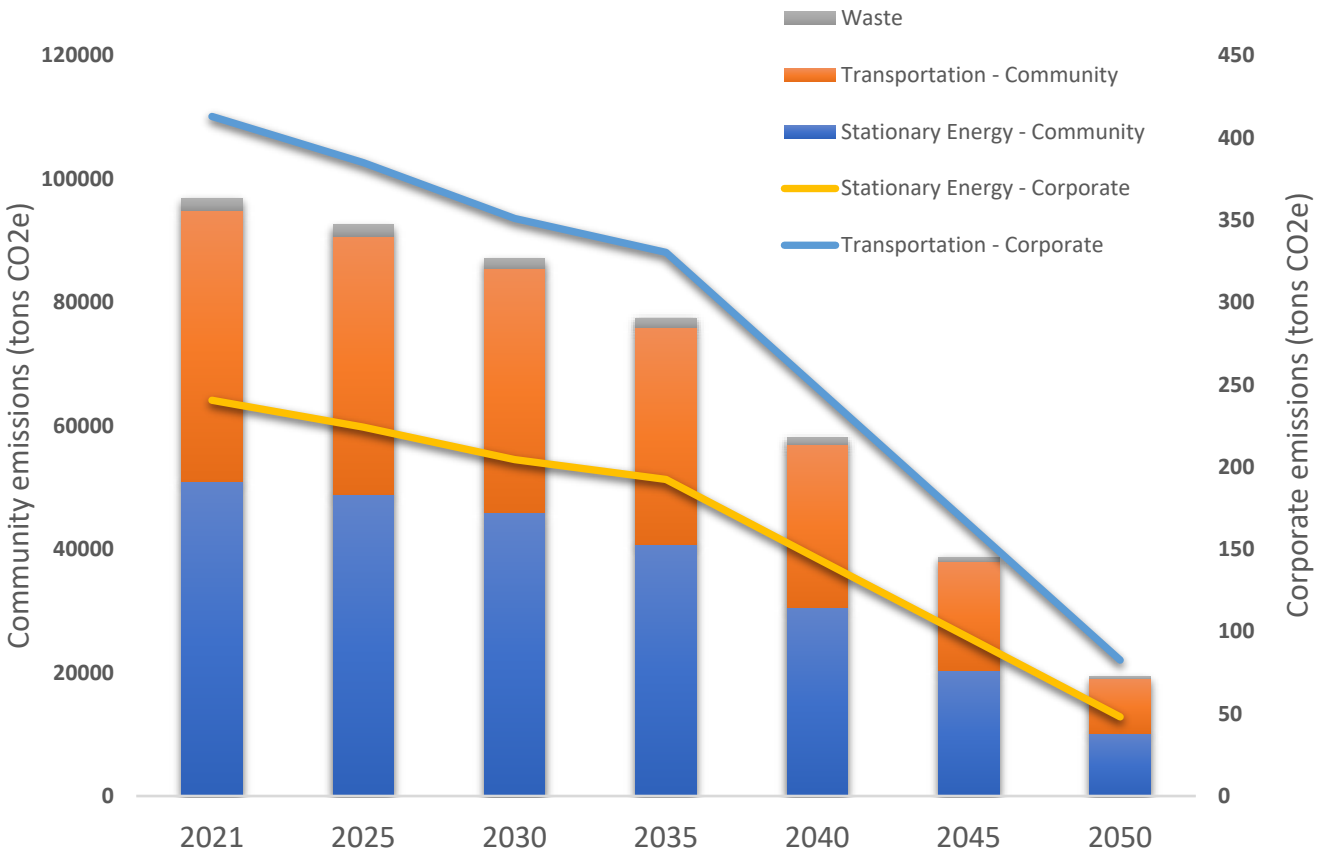

Figure 21: Township of Mapleton's Proposed Journey to GHG Reduction (BASIC Reporting)

As shown in Figure 21, it is important to begin with smaller yet significant changes within reduction setting for both corporate and community emissions, to begin impactful change. As seen between years 2021 to 2030, such changes to corporate and community stationary energy sectors as an example will strongly aid in reaching the first recommended reductions in 10% for corporate and 15% for community by 2030. For the following 20 years between 2030 and 2050, it is recommended that the Township decrease emissions by 80%, through possible mitigation efforts like those identified in the following sections.

8.2 Education and Awareness

Achieving real reductions in community-based emissions will become a success through collective action and leadership. It is recommended that the **Township develop a Sustainability Committee** and nominate a lead from the Municipal council to aid in spearheading this initiative, setting up meetings with the community to discuss the road and path ahead. Coupled with the Sustainability Committee, it is recommended to **publicize more content to the public on the actions that can be taken on an individual level and to include a point of contact** for inquiries and suggestions to aid in knowledge sharing amongst all community members.

The Township's website is a useful and crucial tool for knowledge sharing, and therefore it is suggested that the **Township outline those incentive programs that might be useful to its community through event boards and social media platforms**, incentivising individuals to create change on an individual level through those funds and loans available to them (i.e., Electric Vehicle grants). Through **developing**

and publishing local case studies of individual success stories on ways in which residents decrease their carbon footprints (whether it be within their residential dwelling, farmland, or daily commuting), this will inspire those around them to create similar change and a long-lasting impact.

Moreover, it is vital to **educate youth and increase awareness** of such topics, as they are the leaders of tomorrow. Sharing knowledge to younger generations by integrating such topics within the district school boards and curriculum will lead to positive change within the community and create sustainability champions for generations to follow.

Lastly, to continually report on the community's GHG emissions and its progress on its climate action plan, it is important to nominate an internal corporate staff to update the inventory on an annual, and five-year basis (depending on the updating frequency of varying data sources).

8.3 Buildings

With buildings stationary energy and fossil fuel usage accounting for half of the Township's GHG emissions (excluding AFOLU), it imperative to understand the usage patterns of such buildings (i.e., residential, municipal, industrial, institutional), in order to provide aid and incentives towards retrofits, electrification and upgrades of equipment, to name a few. As a start, the GHG reduction measures should be based on the following tiered approach:

1. **Reduce** energy use/optimize envelope performance of facilities
2. **Improve** the use of energy/increase energy efficiency/manage peak demand
3. **Switch** from the use of carbon-intensive fuels to less or zero carbon intensive fuels
4. **Generate** energy through on-site renewable energy

For the residential sector**,** it is recommended that the Township work alongside the County of Wellington **to gain insight into the behaviours and patterns collected from residential home energy audits** conducted by a third-party organization through November to December 2022. Encouraging the **shift toward electrification of home appliances, HVAC and Mechanical systems** will aid in decreasing the majority of Scope 1 emissions associated with stationary energy within the Township. In addition, it is proposed that the Township **provide resources on its website for local residents on the opportunities for photovoltaic (solar) panel installations** and the pre-requisites and steps required in order to instal such renewable sources to existing building structures. The topic area has been identified as an area of interest from the community engagement sessions.

For the corporate municipal buildings, **regularly scheduled Building Condition Assessments (BCAs)** will aid in gaining insight into existing energy usage, opportunities for improvement and energy efficiency upgrades. The BCAs provide a systematic way of integrating GHG reduction measures over the long-term for high carbon intensive buildings such as the Main Roads Shop, and Moorefield Community Centre. It is suggested that the Township continue to produce and **update the Energy Conservation and Demand Management (CDM) Plan** every five (5) years, that will aid in managing energy and water use, reduce corporate greenhouse gas emissions, identify opportunities for optimization and comply with Ontario's Regulation 507/18 of the Electricity Act 1988.

Potential measures that can be explored for the municipality-owned buildings:

- Building Envelope
  - Increase effective insulation level of the roof;

  - Improve glazing and framing for doors and windows (low-emissivity coatings, triple-glazing, reduced thermal bridging, etc.);
  - Foundation wall insulation upgrades;
  - Air tightness improvement.

- User-drive Loads
  - Lighting controls upgrade (daylighting sensors, dimming and occupancy-based controls, etc.);
  - LED lighting upgrades.

- HVAC
  - Improve HVAC space zoning for efficient air delivery and variable air volume systems;
  - Improve insulation for system piping and ductwork;
  - Demand control ventilation system;
  - Energy recovery system integration;
  - Solar thermal pre-heat of ventilation systems;
  - Natural ventilation system integration;
  - Wider adoption / implementation of DDC and BAS for sequencing and control of systems.

- HVAC – Plant
  - Multi-stage condensing furnaces/boilers;
  - Air-source heat pumps;
  - Variable speed pumping systems.

- Domestic Water
  - Electrification of storage water heaters;
  - Solar water heating / pre-heating;
  - Heat pump water heating;
  - Drain / wastewater heat recovery.

- Process Load
  - Building automation system to include dehumidifiers, exhaust fans, roof top units and boilers;
  - A heat reclaim system that captures waste heat from the chiller and uses the recovered heat for space heating, domestic water heating;
  - Replacement of ice resurfacing machine with electrical equivalent (for arenas).

- On-site Renewable Energy Systems
  - Photovoltaic solar power where appropriate (roof photovoltaic panels, parking awning, etc.);
  - Solar panel or solar wall for heat exchange;
  - Biofuel and/or biomass boilers;
  - Battery storage systems for peaking shifting.

- Carbon Storage/Sequestration
  - Bio-based/carbon storing insulation materials;
  - FSC-certified wood structural materials.

As the 2021 baseline year did not include those emissions from refrigerant usage within the municipality, it is recommended that such usage be tracked for subsequent years to follow.

8.4 Transportation

Building smart cities, and increasing densification is a crucial primary step toward sustainable planning, in addition to incorporating infrastructure frameworks that support public transit, bicycle pathways and walking trails, whilst decreasing the urban heat island effect. Integrating **smart city transportation planning will aid in providing pathways for walking and biking, and in fostering an increased sense of active mobility and sustainable transit within the community**, with the opportunity for a public transportation network development in years to come.

Living within a rural zone, there is a high dependency on vehicles for daily routines and travel, however simple gestures have been suggested within the community engagement sessions, such as combining trips when utilizing their household vehicles for such uses. Moreover, residents have expressed their interest in purchasing electric vehicles, with some currently owning them within their dwellings. Therefore, in addition to the four (4) electric vehicle stations being installed by the Township in the upcoming quarter, it is recommended that the Township **consider and research the interest for the implementation of a higher number of recharge stations or a car share program**.

With on-road transportation emissions totaling 46% of the community's GHG emissions profile (excluding AFOLU), it is recommended that that the township **evaluate the consumption patterns** of existing corporate fleet, snowplows and firetrucks to gain an understanding of the vehicles that have a higher fuel consumption in order to implement next steps. **The community and municipality should continually review the incentive programs provided provincially and federally to optimize and electrify vehicle fleets**.

Currently, 19% of on-road transportation emissions are associated with Heavy Trucks within the Township, due to hauling demands for agricultural and industrial services and sectors. **The use of biodiesel (B5) or ethanol-based fuel throughout warmer months of the year has the potential to greatly decrease GHG emissions**, similarly to those current practices of the municipal fire truck fleet. An anti-idling campaign could also be introduced within the community to encourage drivers to turn off their engines whenever possible.

8.5 Waste

Currently the data associated to the waste sector for solid and biological waste is being provided as total tonnage per category of waste, rather than being divided further into the total tonnage per sector of activity. It is therefore **recommended that the Township work with the County to develop a framework in order to gain an understanding of the total tonnage per sector's curbside pick-up** (i.e., corporate, residential), in order to set actionable diversion targets and reduction measures.

A large portion of the waste currently being sent to landfill, is comprised of food waste. This waste in the landfill can be problematic by adding heavily to the footprint of this sector, and the methane emissions into the atmosphere. **Through the application of marketing campaigns, educational signage, and providing residential single home dwellings and existing commercial and industrial spaces with compost bins, this will aid in decreasing the volume of food waste entering into the solid waste stream and increase diversion.**

Agriculture and Agri-Foods Canada has created a variety of programs and incentives through Cleanfarms, in aims of **providing community members with context and awareness around the 'know how's' of recycling varying farming materials and associated wastes**. The 'Materials at a Glance' campaign outlines those items that can be discarded and recycled on a provincial level, such as animal/equine medications, bale wrap, grain totes and silage film (Cleanfarms, 2022).

8.6 Agriculture and Natural Assets

It is recommended that the Township of Mapleton continue to publicize the activities of the Trees for Mapleton committee to aid in planting more roadside trees, edge rows and snow fences throughout the region, and as a result increasing biodiversity, and carbon sequestration, along with decreasing soil erosion.

Farmers are the solution within our fight against climate change. They are the individuals that are aiding in preserving our spaces, and sequestering carbon through agricultural activities and landscapes. As previously outlined, the AFOLU category consists of biogenic emissions, those emissions that are naturally occurring and eventually make their way into the environments carbon cycle. However, it is still imperative to strive toward increasing the preservation and sequestering potential through land use practices, and the management of soil. **Environmental Farm Plans are a useful resource for farmers to gain insight into the environmental strength, and areas for concern and improvement on their farms** (OMAFRA, 2022). This is a voluntary program provided by the province of Ontario, funded through the Canadian Agricultural Partnership and supported by Agriculture and Agri-Food Canada (AAFC) and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). The program can aid farmers in increase competitiveness, cost savings and strengthen the agricultural sector.

Moreover, the Ontario Government partnered with the Canadian Agricultural Partnership to develop a free tool, **AgriSuite to aid farmers and community members alike in crop management, nutrient management and minimum distance separation while calculating the Greenhouse Gas emissions associated to current practices**, in real time (OMAFRA, n.d.). This tool can act as a detailed snapshot of the current practices per farm, and those areas for improvement within such categories as land use, fertilizer use, soil nutrient planning, enteric, and management and unmanaged soil practices.

Collaboration amongst the County of Wellington and the Township of Mapleton can lead to increased knowledge sharing, pilot program and research study development and local data sharing, with the County developing a similar larger-scale community GHG inventory, being the Future Focused report.

The following table presents a listing of Global Mitigation Measures and associated opportunities and barriers, provided by the IPCC within the most recent AR6 Mitigation Report, Chapter 7: Agriculture, Forestry and Other Land Uses (AFOLU), that can be adapted on a localized level (Nabuurs, G-J., et al., n.d.). This is not an exhaustive listing.

Table 9: AFOLU Global Mitigation Measures - IPCC AR6 Mitigation Report: CH. 7 (Nabuurs & all, 2022)

Activity	Mitigation Measures
Soil Carbon Management: Increasing Soil Organic Matter in Croplands and Grasslands	**Opportunities:** - Improved crop varieties and diversification - Crop rotation - Use of cover crops - Perennial cropping (including agroforestry) - Integrated production systems and biotechnology - Nutrient management (fertilization with organic amendments/green manures) - Decrease tillage intensity and residue retention - Improved water management of waterlogged mineral soils
Biochar Application	**Benefits:** - Reduction in nitrogenous fertilizer requirements (decreasing nitrogen leaching & volatilization from soils) - Increase in soil water holding capacity - Reduction in enteric CH_4 emissions when fed to livestock **Barriers:** - Difficulty in monitoring and verification following implementation - Limited knowledge, standardization and quality control
Agroforestry	**Benefits:** - Integrating trees and shrubs with crops/livestock (i.e. windbreaks) - Increase in land productivity and water quality, decrease in soil erosion and crop heat stress **Barrier:** - Potential affects on food production, biodiversity, local hydrology and soil inequality
Enteric Fermentation	**Opportunities:** - Commercial availability increasing for chemically synthesized inhibitors - Ongoing research focused on breeding low emitting animals
Crop Nutrient Management	**Opportunities:** - Optimization of fertilizer application and delivery – enhancing nutrient uptake and decreasing N_2O - Utilization of different fertilizer types (i.e. organic manures, composts, and synthetic forms) - Intercropping, decreased tillage, cover crops, manure/bio-fertilizer application, soil testing and nitrogen management plans - Utilization of slow/controlled-released fertilizers/nutrification inhibitors
Manure Management	**Opportunities:** - Anaerobic digestion and composting - Application of nutrification/urease and additions of inhibitors to stored manure/urine patches - Grazing practices and alteration of livestock diets, decreasing nitrogen excretion

9. Reporting and disclosure

One of the most critical milestones of conducting GHG inventories and targeting, is the reporting and disclosure of the data gathered, aiding in the accountability of the party reporting on their carbon reduction and mitigation efforts, in aims of increasing transparency, responsibility, performance and fostering a sense of climate resiliency within the region. Below, CIMA+ has outlined in further detail the reporting and disclosure organizations that also provide support, guidance and overall insights through the Township's journey in showcasing their environmental leadership within the region.

1. **Carbon Disclosure Project (CDP) |** CDP

   Example Cities utilizing the framework: City of Kitchener, City of Toronto

   The carbon disclosure project is a not-for-profit charity that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts. Currently, approximately 90 countries disclosure of their CDP on an annual basis (Carbon Disclosure Project, 2022). Below you will find an outline on those specified services that the CDP provides to its members:

Figure 22: Carbon Disclosure Project Service Listing (Carbon Disclosure Project, 2022)

2. Global Covenants of Mayors | Global Covenant of Mayors | Data Portal for Cities

Example Cities utilizing the framework: City of Waterloo, Durham Region, City of Guelph

This is the largest global alliance for City climate leadership, on a global scale. The Global Covenant of Mayors (GCOM) is built upon the commitment of over 11,500 cities and local governments, spanning 6 continents, 142 countries, representing over 1 billion civilians. The organizations support sectors where cities can have most significant impact, where cities register, implement and monitor their strategic action plans and craft information on their efforts and results publicly available (Global Covenant of Mayors, n.d.). Through the development of the Data Portal for Cities, the GCOM did just that, in providing a user-friendly database, allowing individuals to view a snapshot of demographics of the city, GHG emissions, and facts pertaining to which sectors of the region are developing the highest emissions, with all data available for download, see below.

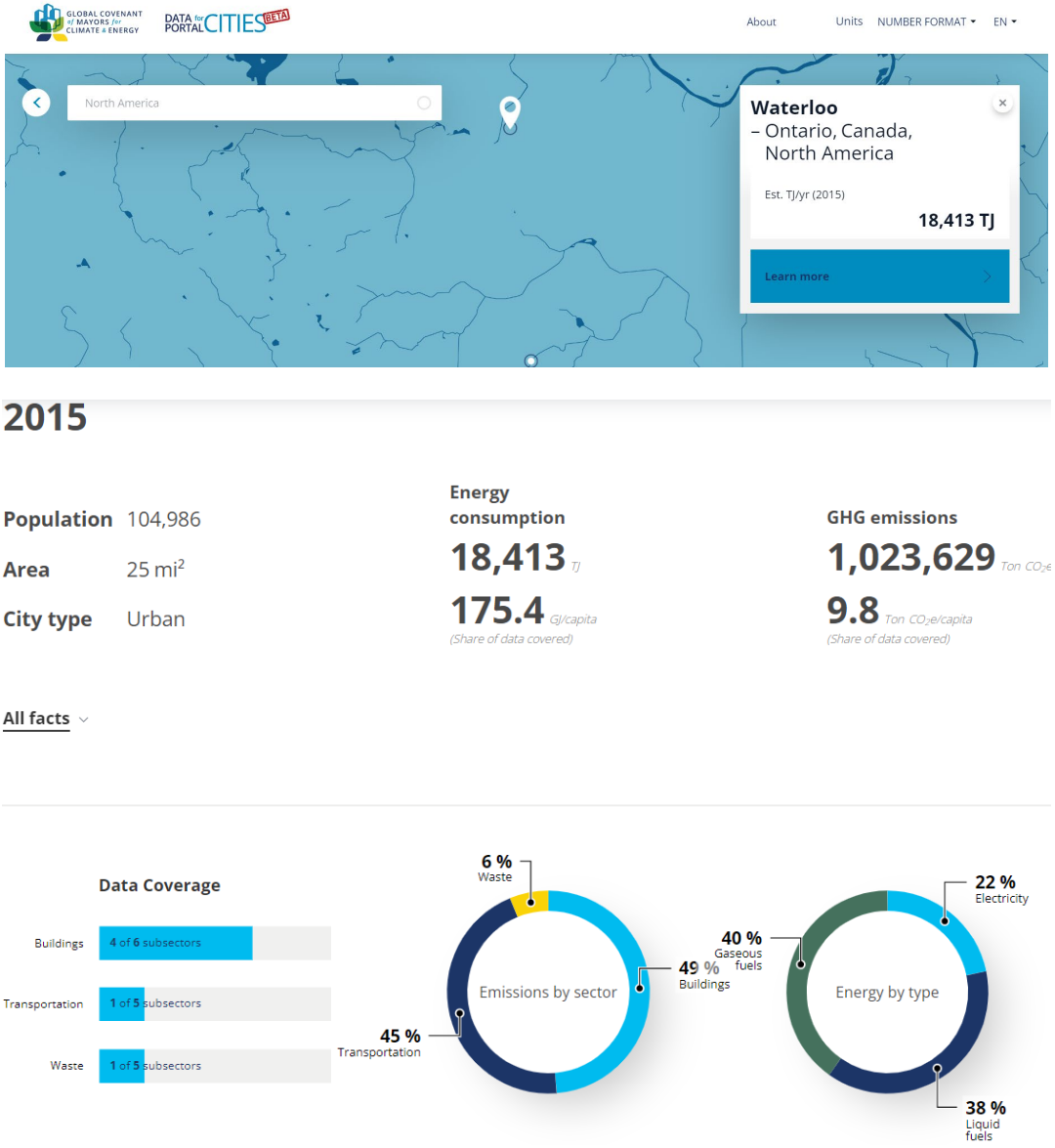

Figure 23: City of Waterloo 2015 GHG GCOM Reporting (Global Covenant of Mayors, n.d.)

3. Partners for Climate Protection | Partners for Climate Protection

The Partners for Climate Protection (PCP) was created from the Local Governments for Sustainability ICLEI Canada and the Federation of Canadian Municipalities (FCM) in aims of motivating municipalities to do their part. The program consists of a five (5) step Milestone Framework as shown to follow, guiding the municipality to take action against climate change and reduce emissions on a community scale (Partners for Climate Protection, 2021). This program receives funding from the FCMs Green Municipal fund and ICLEI Canada.

1. Creating a baseline emissions inventory
2. Set emissions reduction targets
3. Developing a local climate action plan
4. Implementing a local climate action plan
5. Monitoring and reporting results

Members of the program gain insight into a proven approach to reducing GHG emissions and are provided with support in achieving success through set targets. Being an active member of the program provides municipalities with the chance to become leaders by taking systematic and organized action on climate change, while gaining access to the following tools and resources along the way:

- Support and guidance, through the PCP Milestone Framework, to help members reduce GHG emissions.
- Access via the PCP Hub to a network of over 350 local governments across Canada that are acting on climate change and can help your community succeed by offering their experience and examples.
- Technical support tools, including the PCP Milestone Tool and PCP Protocol.
- Information and access to funding opportunities, such as those offered by FCM's Green Municipal Fund.
- Capacity-building resources, including workshops, case studies and training opportunities.
- Awards and recognition for milestone achievements and for reported measures.

Members of the PCP program have the following responsibilities:

- Move through the Milestone Framework within 10 years of joining
- Report on progress at least once every two years, with PCPs support
- Email support if your contact information changes
- Actively participate in program activities and share experiences with other network members

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A

Appendix A
Reporting Methodology

CIMA+

Table 1: Summary of Data Collection

Sector	Scope	Energy/ Fuel Type	Data Source	Confidence Level	EF Source
Residential Buildings	2	Fuel: Electricity	HydroOne	High	2022 NIR Part 3 Table A13-7
	1	Fuel: Natural Gas	Enbridge	High	2022 NIR Part 3 Table A6.1-1 and A6.1-3
	1	Fuel: Propane	Statistics Canada	Medium	2022 NIR Part 2 Table A6.1-4
	1	Fuel: Light Fuel Oil	Statistics Canada	Medium	2022 NIR Part 2 Table A6.1-5
	1	Off-road Vehicle Use: Diesel	Statistics Canada	Medium	2022 NIR Part 3 table A11-13
	3	Line Losses: Electricity	HydroOne	High	2022 NIR Part 3 Table A13-7
Commercial and Institutional Buildings	2	Public Fuel – Electricity	Township of Mapleton	High	2022 NIR Part 3 Table A13-7
	1	Public Fuel: Natural Gas	Township of Mapleton	High	2022 NIR Part 3 Table A6.1-1 and A6.1-3
	2	Private Fuel: Electricity	HydroOne	High	2022 NIR Part 3 Table A13-7
	1	Private Fuel: Natural Gas	Enbridge	High	2022 NIR Part 3 Table A6.1-1 and A6.1-3
	1	Private Fuel: Propane	Statistics Canada	Medium	2022 NIR Part 2 Table A6.1-4
	1	Private Off-road Vehicle Use: Diesel	Statistics Canada	Medium	2022 NIR Part 3 table A11-13
	3	Private Line Losses: Electricity	HydroOne	High	2022 NIR Part 3 Table A13-7
	2	Fuel: Electricity	HydroOne	High	2022 NIR Part 3 Table A13-7

Sector	Scope	Energy/ Fuel Type	Data Source	Confidence Level	EF Source
Manufacturing Industries & Construction	1	Fuel: Natural Gas	Enbridge	High	2022 NIR Part 3 Table A6.1-1 and A6.1-3
	1	Fuel: Propane	Statistics Canada	Medium	2022 NIR Part 2 Table A6.1-4
	1	Off-road Vehicle Use: Diesel	Statistics Canada	Medium	2022 NIR Part 3 table A11-13
	3	Line Losses: Electricity	HydroOne	High	2022 NIR Part 3 Table A13-7
Energy Industries	2	Fuel: Electricity	Local renewable energy generator	High	2022 NIR Part 3 Table A13-7
Agriculture, Forestry & Fishing Activities	1	Fuel: Propane	Statistics Canada	Medium	2022 NIR Part 2 Table A6.1-4
	1	Off-road Vehicle Use: Diesel	Statistics Canada	Medium	2022 NIR Part 3 table A11-13
Transportation: On-Road	1	Public Fuel – Diesel and Ethanol	Township of Mapleton	High	2022 NIR Part 2 Table A6.1-14 and LDDTs advanced control
	1	Private Fuel – Diesel	Statistics Canada Sources and 2021 Canadian Census Transportation Canada National Inventory Report Transportation Tomorrow Survey	Low	2022 NIR Part 2 Table A6.1-14 LDDTs advanced control
	1	Private Fuel – Gas	Statistics Canada National Inventory Report	Low	2022 NIR Part 2 Table A6.1-14 Tier 2
	1	Private Fuel – Propane	National Inventory Report Statistics Canada	Low	2022 NIR Part 2 Table A6.1-14
	1	Private Fuel – Natural Gas	Statistics Canada	Low	2022 NIR Part 3 Table A11-13

Sector	Scope	Energy/ Fuel Type	Data Source	Confidence Level	EF Source
	1	Public Fuel – Natural Gas – Curbside Waste Collection	County of Wellington Canadian Natural Gas Vehicle Alliance	Medium	2022 NIR Part 3 Table A6.1-1 and A6.1-3
Solid waste	3	Buried Waste	County of Wellington	High	Not applicable.
Biological waste	3	Residential Compost	County of Wellington	High	Not applicable.
Wastewater Treatment Plants	1	User Supplied Data	CIMA+ Engineers	High	Not applicable.
Agriculture, Forestry and Other Land Use (AFOLU)	1	Livestock: Enteric Farming	Statistics Canada - Census of Agriculture: Mapping Tool	Medium	2022 NIR Part 2 Table A6.4-2
	1	Livestock: Manure Management	Population-based ratio Statistics Canada National Inventory Report	Medium	2022 NIR Part 2 Table A6.4-11, 12, 13, 15
	1	Aggregate Sources and Non-CO_2 Emission Sources on Land: Manure Management	Population-based ratio National Inventory Report Statistics Canada - Census of Agriculture: Mapping Tool	Medium	2022 NIR Part 3 Table A11-13
	1	Land: Agricultural Soils Direct & Indirect	Population-based ratio Statistics Canada National Inventory Report	Medium	2022 NIR Part 3 Table A11-13
	1	Aggregate Sources and Non-CO_2 Emission Sources on Land: Harvested Wood Products	GPC IPCC Guidelines	High	GPC

Sector	Scope	Energy/ Fuel Type	Data Source	Confidence Level	EF Source
Private: private sector within Township of Mapleton Public: public sector within Township of Mapleton (corporate/municipal emissions) NIR: National Inventory Report			High Confidence: Primary source of organizational data based, on a localized lens Medium Confidence: Primary and population-based data, on a semi-localized lens Low Confidence: Assumption-based calculation methods, not on a localized lens		

B

Appendix B
GHG Emissions Report

CIMA+

+ Requirements for BASIC+ reporting
Requirements for BASIC reporting
Required for territorial total but not BASIC/BASIC+ reporting
Other scope 3 is optional and not covered by GPC

IE Included Elsewhere
NE Not Estimated
NO Not Occurring
C Confidential

High
Medium
Low

GPC ref #	Scope	GHG Emissions Source (By Sector and Sub-sector)	Key notations	Gases (in tonnes)									Data Quality	
				CO2	CH4	N2O	HFC	PFC	SF6	NF3	Total CO2E	CO2(b)	AD	EF
I		STATIONARY ENERGY		50480.51	4.47	1.19	0	0	0	0	51281.03	0		
I.1		Residential buildings		9167.94	1.21	0.21	0	0	0	0	9405.67	0		
I.1.1	1	Emissions from fuel combustion within the city boundary		7734.95	0.86	0.16					7800.73		H	H
I.1.2	2	Emissions from grid-supplied energy consumed within the city boundary		1302.47	0.31	0.05					1458.76		H	H
I.1.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption		130.52	0.03	0.01					146.19		H	H
I.2		Commercial and institutional buildings and facilities		12494.06	2.01	0.30	0	0	0	0	12750.91	0		
I.2.1	1	Emissions from fuel combustion within the city boundary		11308.36	1.72	0.25					11422.94		H	H
I.2.2	2	Emissions from grid-supplied energy consumed within the city boundary		1133.19	0.27	0.05					1269.17		H	H
I.2.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption		52.50	0.01	0.00					58.80		H	H
I.3		Manufacturing industries and construction		15357.94	0.91	0.43	0	0	0	0	15588.30	0		
I.3.1	1	Emissions from fuel combustion within the city boundary		14462.97	0.70	0.39					14585.93		H	H
I.3.2	2	Emissions from grid-supplied energy consumed within the city boundary		854.04	0.20	0.03					956.53		H	H
I.3.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption		40.93	0.01	0.00					45.84		H	H
I.4		Energy industries		0.13	0.00	0.00	0	0	0	0	0.14	0		
I.4.1	1	Emissions from energy used in power plant auxiliary operations within the city boundary	NO											
I.4.2	2	Emissions from grid-supplied energy consumed in power plant auxiliary operations within the city boundary		0.13	0.00	0.00					0.14		H	H
I.4.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption in power plant auxiliary operations	NE											
I.4.4	1	Emissions from energy generation supplied to the grid	NO											
I.5		Agriculture, forestry and fishing activities		13460.45	0.34	0.25	0	0	0	0	13536.01	0		
I.5.1	1	Emissions from fuel combustion within the city boundary		13460.45	0.34	0.25					13536.01		M	H
I.5.2	2	Emissions from grid-supplied energy consumed within the city boundary	IE											
I.5.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption	IE											
I.6		Non-specified sources		0	0	0	0	0	0	0	0	0		
I.6.1	1	Emissions from fuel combustion within the city boundary	NO											
I.6.2	2	Emissions from grid-supplied energy consumed within the city boundary	NO											
I.6.3	3	Emissions from transmission and distribution losses from grid-supplied energy consumption	NO											
I.7		Fugitive emissions from mining, processing, storage, and transportation of coal		0	0	0	0	0	0	0	0	0		
I.7.1	1	Emissions from fugitive emissions within the city boundary	NO											
I.8		Fugitive emissions from oil and natural gas systems		0	0	0	0	0	0	0	0	0		
I.8.1	1	Emissions from fugitive emissions within the city boundary	NO											
II		TRANSPORTATION		43910.34	2.29	1.19	0.00	0.00	0.00	0.00	44288.72	45.77		
II.1		On-road transportation		43910.34	2.29	1.19	0.00	0.00	0.00	0.00	44288.72	45.77		
II.1.1	1	Emissions from fuel combustion on-road transportation occurring within the city boundary		43910.34	2.29	1.19					44288.72	45.77	L	H

II.1.2	2	Emissions from grid-supplied energy consumed within the city boundary for on-road transportation	IE												
II.1.3	3	Emissions from portion of transboundary journeys occurring outside the city boundary, and transmission and distribution losses from grid-supplied energy consumption	IE												
II.2		Railways		0	0	0	0	0	0	0	0	0			
II.2.1	1	Emissions from fuel combustion for railway transportation occurring within the city boundary	NO												
II.2.2	2	Emissions from grid-supplied energy consumed within the city boundary for railways	NO												
II.2.3	3	Emissions from portion of transboundary journeys occurring outside the city boundary, and transmission and distribution losses from grid-supplied energy consumption	NO												
II.3		Waterborne navigation		0	0	0	0	0	0	0	0	0			
II.3.1	1	Emissions from fuel combustion for waterborne navigation occurring within the city boundary	NO												
II.3.2	2	Emissions from grid-supplied energy consumed within the city boundary for waterborne navigation	NO												
II.3.3	3	Emissions from portion of transboundary journeys occurring outside the city boundary, and transmission and distribution losses from grid-supplied energy consumption	NO												
II.4		Aviation		0	0	0	0	0	0	0	0	0			
II.4.1	1	Emissions from fuel combustion for aviation occurring within the city boundary	NO												
II.4.2	2	Emissions from grid-supplied energy consumed within the city boundary for aviation	NO												
II.4.3	3	Emissions from portion of transboundary journeys occurring outside the city boundary, and transmission and distribution losses from grid-supplied energy consumption	NO												
II.5		Off-road transportation		0	0	0	0	0	0	0	0	0			
II.5.1	1	Emissions from fuel combustion for off-road transportation occurring within the city boundary	NO												
II.5.2	2	Emissions from grid-supplied energy consumed within the city boundary for off-road transportation	NO												
III		**WASTE**		**0**	**65.83**	**0.20**	**0.00**	**0.00**	**0.00**	**0.00**	**1895.63**	**0**			
III.1		Solid waste disposal			35.09						982.65	0			
III.1.1	1	Emissions from solid waste generated within the city boundary and disposed in landfills or open dumps within the city boundary	NO												
III.1.2	3	Emissions from solid waste generated within the city boundary but disposed in landfills or open dumps outside the city boundary			35.09	0.00					982.65	0.00	H	H	
III.1.3	1	Emissions from waste generated outside the city boundary and disposed in landfills or open dumps within the city boundary	NO												
III.2		Biological treatment of waste		0	0.94	0.06	0	0	0	0	41.09	0			
III.2.1	1	Emissions from solid waste generated within the city boundary that is treated biologically within the city boundary	NO												
III.2.2	3	Emissions from solid waste generated within the city boundary but treated biologically outside of the city boundary			0.94	0.06					41.09		H	H	
III.2.3	1	Emissions from waste generated outside the city boundary but treated biologically within the city boundary	NO												
III.3		Incineration and open burning		0	0	0	0	0	0	0	0	0			
III.3.1	1	Emissions from solid waste generated and treated within the city boundary	NO												
III.3.2	3	Emissions from solid waste generated within the city boundary but treated outside of the city boundary	NO												
III.3.3	1	Emissions from waste generated outside the city boundary but treated within the city boundary	NO												

III.4		Wastewater treatment and discharge		0.00	29.80	0.14	0.00	0.00	0.00	0.00	871.89	0		
III.4.1	1	Emissions from wastewater generated and treated within the city boundary			29.80	0.14					871.89		H	H
III.4.2	3	Emissions from wastewater generated within the city boundary but treated outside of the city boundary	NO											
III.4.3	1	Emissions from wastewater generated outside the city boundary but treated within the city boundary	NO											
IV		**INDUSTRIAL PROCESSES and PRODUCT USES (IPPU)**		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0**		
IV.1	1	Emissions from industrial processes occurring within the city boundary	NO											
IV.2	1	Emissions from product use occurring within the city boundary	NO											
V		**AGRICULTURE, FORESTRY and OTHER LAND USE (AFOLU)**		**1016.44**	**5728.08**	**301.16**		**0.00**	**0.00**	**0.00**	**241211.22**	**0**		
V.1	1	Emissions from livestock within the city boundary			5728.08	91.49					184630.92		H	H
V.2	1	Emissions from land within the city boundary				209.68					55563.86		M	H
V.3	1	Emissions from aggregate sources and non-CO2 emission sources on land within the city boundary		1016.44							1016.44		M	H
VI		**OTHER SCOPE 3**												
VI.1	3	Other Scope 3	NO											