ONTARIO SUSTAINABLE COMMUNITY (OSC)

Project title	Ontario Sustainable Community (OSC)
Project ID	3004
Crediting period	01-January-2026 to 31-December-2032
Original date of issue	08-December-2025 is the date the project description was completed following the completion of the audit
Most recent date of issue	30-March-2026 is the date on which the document was most recently submitted
Version	1.5
***VCS Standard* Version**	4.7
Prepared by	Martin Clermont, President Will Solutions Inc

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The Ontario Sustainable Community (OSC) Project Document was prepared by Will Solutions Inc. ("WILL"), to allow WILL as the unique project proponent (Sustainable Community Service Promoter (SCSP)), to quantify and generate GHG emission reductions in conformance with the VCS Methodology VM0018 Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community (Version 1.0).

This is a grouped project that generates emission reduction through the aggregation of implemented project activity instances (PAI) that reduce emissions via reduced energy demand and methane avoidance from waste diversion.

Each implemented PAI will adhere to the definition of Project Activity Instances as per the VCS Program Definition and is categorized according to 8 Generic PAI listed in section 1.11 which encapsulates the types of technologies or measures eligible to the OSC.

The scenarios existing prior to the implementation of the PAIs grouped under this project activity vary by sectoral scope. In instances associated with sectoral scope 3, the scenarios existing prior to implementation can vary significantly, but generally involve higher energy use or demand for fossil fuels used to power different equipment or processes within a facility. For sectoral scope 13 instances, the scenarios existing prior to implementation involve waste disposal in landfills, where decomposition conditions lead to methane generation.

This grouped project is intended to stimulate and finance owners and operators of ICI (Industrial, Commercial, and Institutional) buildings, referred to as "Client Facilities" – medium and small – located in the Province of Ontario, Canada, in their voluntary efforts to reduce GHG emissions. By providing access to the voluntary carbon credit markets[1] beyond any regulated compliance, the grouped project enables small and medium emitters, for whom participation in carbon markets would otherwise be financially unfeasible[2]. The grouped project includes one initial Client Facility and one initial PAI. The PAI consists in the installation of solar panels to reduce reliance on grid electricity and lower diesel consumption from on-site generator use (Generic PAI VIII). The baseline scenario of this PAI is the continuation of the use of grid electricity and diesel to fuel the on-site generator to meet its energy needs.

This group project aims to form a "Sustainable Community" or cluster of over 1,200 Client Facilities in Ontario, Canada targeting a total estimated GHG emission reduction of 21,259,926 tCO_2e for the period 2026-2032, with an estimated annual average reduction of 3,037,132 tCO_2e.

[1] As described by the TSVCM: https://www.iif.com/Portals/1/Files/TSVCM_Summary.pdf

[2] Our Business Model: https://solutionswill.com/en/our-community/

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation/ verification	01-January-2026--31-December-2032	VCS	Earthood Services Limited	7 years

1.3 Sectoral Scope and Project Type

Sectoral scope[3]	Sectoral scope 3 and sectoral scope 13
Project activity type	Energy demand; Waste handling and disposal

1.4 Project Eligibility

1.4.1 General eligibility

The scope of the VCS Program includes*:*

1) The seven Kyoto Protocol greenhouse gases: The project aims to avoid greenhouse gas emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) which are designated by the Kyoto Protocol.

2) Ozone-depleting substances (ODS): Not applicable for this project.

3) Project activities supported by a methodology approved under the VCS Program through the methodology development and review process: The applied methodology VM0018 version 1.0 of the project is an active methodology approved under the VCS Program as of 20 February 2012.

   As required by the methodology, each Project Activity Instance (PAI) or project unit will achieve less than 5,000 tCO_2e in annual emission reductions. Each PAI will be a distinct activity that is not a fragmented part of a larger project and no cluster of PAIs will exceed the capacity limit of the methodology. In cases where the annual emission reductions of any single PAI exceed the applicable threshold, that PAI will be excluded from the group project.

4) Project activities supported by a methodology approved under an approved GHG program, unless explicitly excluded: Not applicable for this project.

5) Jurisdictional REDD+ programs and nested REDD+ projects as set out in the Jurisdictional and Nested REDD+ (JNR) Requirements: Not applicable for this project.

[3] *Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes*

The group project is not a project that can be reasonably assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal, or destruction.

In addition, this group project will not include project activity instances which are excluded from the VCS Program, as listed in section 2.1, Table 1 of the VCS Standard 4.7.

Compliance with the VCS Standard v4.7 Sections 3.6.10 to 3.6.15

The grouped project complies with the requirements of Sections 3.6.10 to 3.6.15 of the VCS Standard v4.7.

- The geographic area of the grouped project is defined in Section 1.13 of the PD using a geodetic polygon, and the initial PAI will be located within this geographic area (in line with Section 3.6.10).
- Future PAIs may be added only if they are located within the same defined geographic area and meet the eligibility requirements outlined in Section 1.4.1 and Section 1.5.1. This also includes that their baseline scenario aligns with the baseline practices defined in Section 3.4 of the PD, and that the additionality criteria in Section 3.5 are satisfied. PAIs located outside the geographic area will not be eligible for inclusion.

Eligibility criteria have been designed to ensure consistent application across the defined geographic area. As such, all future PAIs will be assessed against the same baseline conditions and additionality assessment applied to the initial PAI (in line with Sections 3.6. to 3.6.14).

Factors relevant to the baseline determination and additionality – such as common practice, barriers, regulatory context, and applicable emission factors – are assessed at the geographic-area level in Appendix 3 of the PD, ensuring alignment with Section 3.6.15 of the VCS Standard v4.7.

Therefore, this group project, the Ontario Sustainable Community, is eligible under the scope of the VCS Program and VCS Standard version 4.7, 16 April 2024.

Deadline Requirements

This non-AFOLU project meets deadline requirements since it was listed early on 30 June 2022.

In addition, since this project uses a standardized method for determining additionality (i.e. Common Practices), it falls under the exception in Section 3.8.7 of the VCS Standard v.4.7, meaning validation does not need to be completed before the project start date - only by the first verification.

1.4.2 AFOLU project eligibility

This project is not an AFOLU project.

1.4.3 Transfer project eligibility

This project is not a transfer project.

1.5 Project Design

☐ Single location or installation

☐ Multiple locations or project activity instances (but not a grouped project)

☒ Grouped project

1.5.1 Grouped project design

The project is a grouped project, which aims to pool the efforts and GHG reductions from the PAIs of Client Facilities that voluntarily join the OSC, in accordance with the VM0018 v.1.0 methodology.

All the ICI buildings (Client Facilities) will be exclusively located in the province of Ontario, Canada.

Eligibility Criteria

In accordance with VCS Standard v.4.7, section 3.6.16 and 3.6.17, this grouped project will apply one set of eligibility criteria for the inclusion of every new project activity instance. The new project activity instances must conform to all the following eligibility criteria:

Criteria	Justification and Requirement Association
1) Must meet the applicability conditions set out in the methodology applied to the project.	For each new PAI, the applicability conditions detailed in section 3.2 will be met. This criteria addresses the requirement 1) in section 3.6.16 of the VCS Standard v.4.7.
2) Must be located within the designated geographic area of the province of Ontario, Canada, as defined in section 1.13 of the PD.	Each PAI added to the grouped project must be located within the boundary of the Province of Quebec. KML files will be provided as evidence. This criteria addresses the requirement 1) in section 3.6.17 of the VCS Standard v.4.7.
3) Must have a start date that is the same as or later than 01-January-2026.	Each PAI will have a start date that is the same or after the group project start date of 01-January-2026. Evidence of start date will be provided for each new PAI. This criteria addresses the requirement 5) in section 3.6.17 of the VCS Standard v.4.7.
4) Only be eligible for crediting from the later of start date of the project activity instance or the start date of the	For each PAI, the crediting period will begin on the later of the start date of the instance or the start of the verification period in which they

verification period in which they were added to the grouped project, through to the end of the total project crediting period.	were added to the project. Crediting will continue through the end of the total project crediting period. This criteria addresses the requirement 6) in section 3.6.17 of the VCS Standard v.4.7.
5) Must sign an adhesion contract as a member of the OSC grouped project to demonstrate right of use in respect of the project's GHG emission reductions.	Each PAI added to the grouped project must sign an adhesion contract to ensure the right to operate and the transfer of the right to reductions to the project proponent. Signed contract will be provided as evidence (see section 1.8). This criteria addresses the requirement 4) in section 3.6.17 of the VCS Standard v.4.7.
6) The project activity instances must be included in the monitoring report with sufficient technical, financial, geographic, and other relevant information to demonstrate conformance with the applicable set of eligibility criteria and enable evidence gathering by the VVB.	For inclusion in monitoring reports, each new PAI added to the grouped project will provide sufficient information and supporting evidence to demonstrate conformance with the set of eligibility criteria. This criteria addresses the requirement 3) in section 3.6.17 of the VCS Standard v.4.7.
7) Each project activity instances shall not be or have been enrolled in another VCS project.	Each PAI added to the grouped project will not be or have been enrolled on another project registered with the VCS Program. This criteria addresses the requirement 7) in section 3.6.17 of the VCS Standard v.4.7.
8) Must adhere to the capacity limit of annual emission reductions of 5,000 tCO_2e per project activity instances. Each PAI that exceeds one percent of the capacity limit (i.e. 5,050 tCO_2e) shall be identified and divided into clusters as per the clustering requirements of the VCS Standard.	Each new PAI added to the grouped project will not exceed the 5,000 tCO_2e annual capacity limit and adhere to the clustering requirements of the VCS Standard when applicable. This criteria addresses the requirement 8) in section 3.6.17 of the VCS Standard v.4.7.
9) Each new PAI must apply or use technologies or measures, and demonstrate characteristics consistent with an associated Generic PAI under the relevant sectoral scope (3 and 13),	Each new PAI must be associated to a generic PAI, which are standardized project categories that share common characteristics, technologies or measures. This criteria addresses the requirements 2), 3), 4) and 5) in section 3.6.16 of the VCS Standard v.4.7.

10) The baseline scenario must be determined for all new project activity instances based on the same approach as the initial PAI included at validation, as described in section 3.4 of the PD.	This criteria addresses the requirement 4) in section 3.6.16 of the VCS Standard v.4.7.
11) Additionality of each new project activity instances must be assessed with the same approach as the initial PAI included at validation, as described in section 3.5 of the PD.	This criteria addresses the requirement 5) in section 3.6.16 of the VCS Standard v.4.7.

In addition, in alignment with the Section 3.6.18 of the VCS Standard v4.7, where inclusion of a new PAI necessitates the addition of a new project proponent to the project, such instances will be included in the grouped project description within two years of the PAI start date, and as per the procedure set out in the *Registration and Issuance Process*.

1.6 Project Proponent

Organization name	Will Solutions Inc
Contact person	Martin Clermont
Title	President
Address	Beloeil, Quebec, Canada, J3G 5Z5
Telephone	1 438 897-8009
Email	mclermont@solutionswill.com

1.7 Other Entities Involved in the Project

The only project proponent is Will Solutions Inc.

1.8 Ownership

The ownership of each verified GHG reduction belongs exclusively to the project proponent, Will Solutions Inc. Through a standard contract with each Client Facility, the rights to the eligible GHG reductions are transferred to Will Solutions as specified in item 1.7 of the contract. In return, Will Solutions is obligated to remit a percentage of the proceeds from each VCU sale to the Client Facility. The standard contract is available in Appendix 5.

1.9 Project Start Date

Project start date	01-January-2026
Justification	This project start date is an estimate based on current planning; however, it remains subject to adjustment due to growing economic and political uncertainties in Canada. In particular, the ongoing tariff war with the United States is having unprecedented impacts on multiple sectors in Canada, forcing businesses, especially SMEs, to reevaluate economic decisions and investment timelines.

1.10 Project Crediting Period

Crediting period	☒ Seven years, twice renewable ☐ Ten years, fixed ☐ Other
Start and end date of first or fixed crediting period	01-January-2026 to 31-December-2032

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

☐ < 300,000 tCO2e/year (project)

☒ ≥ 300,000 tCO2e/year (large project)

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO_2e)
01-January-2026 to 31-December-2026	167,418
01-January-2027 to 31-December-2027	334,818
01-January-2028 to 31-December-2028	669,618
01-January-2029 to 31-December-2029	1,339,218
01-January-2030 to 31-December-2030	2,678,418
01-January-2031 to 31-December-2031	5,356,818
01-January-2032 to 31-December-2032	10,713,618

Total estimated ERRs during the first or fixed crediting period	21,259,926
Total number of years	7
Average annual ERRs	3,037,132

1.12 Description of the Project Activity

The project activity instances to be included in this grouped project are categorized according to 8 generic PAIs. Similarly to a positive list of technologies, generic PAIs serve as standardized categories of project activities that share common objectives, technologies, measures, and eligibility criteria. These generic PAIs are designed to streamline the assessment of projects by providing a consistent framework that reflects shared characteristics across similar activities.

Generic PAIs are identified through a rigorous process that includes analyzing uncommon practices, evaluating barriers to implementation, and considering relevant regulations within the defined territory. Each Generic PAI is researched, described, and detailed in Appendix 3.

	Generic PAI	Sectoral Scope
I	Biomass Energy Project	3
II	Methane Emission Avoidance	13
III	Land Application of Biosolids	13
IV	Saving Energy on Recycling Activities	3
V	Heat Recovery	3
VI	Energy Efficient Buildings –New Building or Major Renovation	3
VII	Energy Efficiency – Demand Side	3
VIII	Energy Conversion – Demand Side	3
	Total:	**8**

The initial list of generic Project Activity Instances (PAI) is described in Appendix 3. More generic PAIs may be documented and added at a later stage and after their verification by a recognized VVB under the VCS program. These new generic PAIs will follow the same attributes – consistent financial, technical and/or other parameters, or face the same technological and/or other barriers - as the initial PAIs, and once they are completed, they will be integrated in the same way as the initial generic PAIs used in the first period 2026-2032.

Implementation Schedule of Project Activities

This is a grouped project under the VCS Program, in which individual PAIs are added over time, including on an ex-post basis. As the grouped project serves as an umbrella framework, the

implementation of individual PAIs is not centrally coordinated by the Project Proponent and is therefore not subject to a unified or predefined implementation schedule. Each PAI is implemented independently by its respective Client Facility, based on their own timelines and operational decisions.

Initial PAI Description

There is one project activity instances from one Client Facility (CF) initially included in this grouped project:

1) Installation of solar panels on the rooftops of existing storage buildings to reduce reliance on grid electricity and lower diesel consumption from on-site generator use (Generic PAI VIII). The generator powers the grain elevator that transport grain between drying and storage units.

   The project is not yet implemented, and specific details regarding equipment specifications and efficiencies are not available at this stage. However, the project will include at minimum the following equipment:

   - Solar panels (estimated at 204 panels)
   - Inverters
   - Mounting structures
   - Metering equipment and control system

   Once the equipment is selected, manufacturer specifications, installed capacity and efficiencies will be determined based on industry standards and supplier data. The average lifetime of panels is 30 years[4].

1.13 Project Location

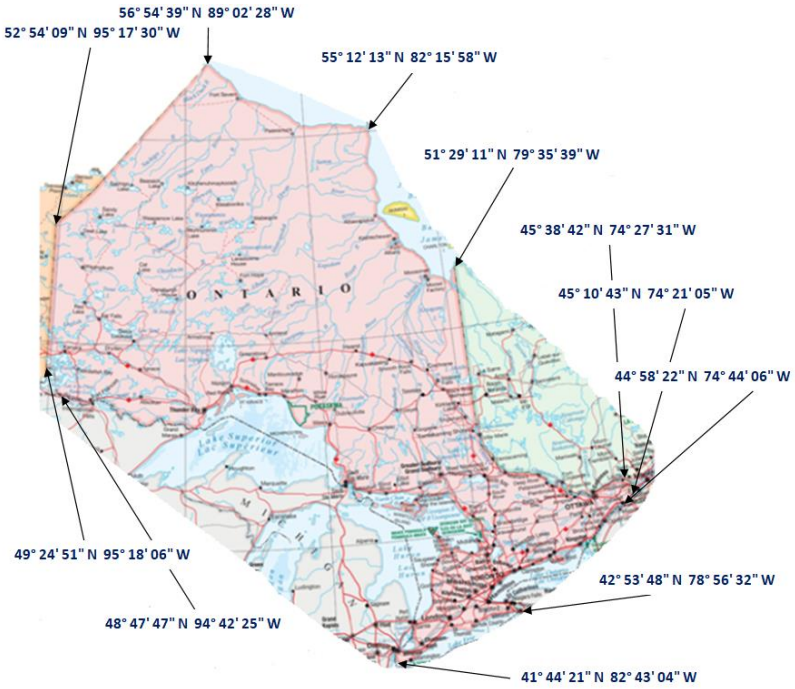
All ICI Client Facilities associated to the project will be located in the Province of the Ontario's territory in Canada. This grouping of Client Facilities binds them to a common geographic cluster (the territory of the Province of Ontario), where regional conditions (i.e. electricity source, climate, waste processing schemes, etc.) and regulations (i.e. waste and emission regulations, etc.) are similar for the different Client Facilities.

The geographical map[5] shown below represents the Province of Ontario and its territory. The province shares more than 12,000 km of lands, rivers and maritime boundaries with Quebec, Manitoba, and the United States. The 11 geodesic coordinates on the map represent the limit

[4] IRENA and IEA-PVPS (2016), "End-of-Life Management: Solar Photovoltaic Panels," International Renewable Energy Agency and International Energy Agency Photovoltaic Power Systems. https://iea-pvps.org/wp-content/uploads/2020/01/IRENA_IEAPVPS_End-of-Life_Solar_PV_Panels_2016.pdf

[5] https://ontheworldmap.com/canada/province/ontario/map-of-ontario-with-cities-and-towns.jpg

of the polygon covering the territory of the Province of Ontario. All client facilities shall be located inside this polygon.



The location of the initial PAI is provided in a KML file.

1.14 Conditions Prior to Project Initiation

Total GHG emissions in Ontario (more specifically in the energy and waste categories) since 2017[6], which are around 75.1 Mt of GHGs/year, have remained stable without significant decreases. This group project has not been implemented to generate GHG emissions for subsequent reduction, removal, or destruction. The baseline scenario of this group project and the initial PAI is defined in section 3.4.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project follows all relevant local, regional, and national laws, statutes, and regulatory frameworks. See the detailed analysis of this review applied to each generic PAI in Appendix 3.

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

[6] Table A11-12 GHG Emissions Summary for Ontario, Selected Years (Mt CO_2 eq) En81-4-2022-3-eng.pdf

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.16.2 Registration in Other GHG Programs

Has the project registered under any other GHG programs?

☐ Yes ☒ No

Is the project active under the other program?

☐ Yes ☒ No

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, "Carbon credits may be issued through Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities]."

☐ Yes ☒ No

1.18 Sustainable Development Contributions

The Sustainable Community (SC) Solution, developed by Will Solutions, stimulates, recognizes and finances active and inclusive participation in the circular economy as well as the positive economy. The SC solution is primarily focused on reducing the "Demand side". The monetization, on the voluntary carbon markets (VCM), of conscious efforts to reduce energy consumption and virgin resources reconfirms the close relationship between Development, Environment, and Humanity.

The SC solution also reinforces conscious human actions, emphasizing the behavioral change that guides the selection and integration of green technologies. The SC solution plays a catalytic role in achieving these objectives and in several United Nations (UN) Sustainable Development Goals (SDGs): the SDG 9, 11, 12, and 13.

SDG 9: Industry, Innovation, and Infrastructure

SDG Target	9.3
Target Indicator	**Number of client facilities with access to financial services**
	The Sustainable Community project and solution financially rewards local communities, SMEs and municipalities that are directly focused on reducing GHG emissions and improving sustainable development. By targeting energy conversion and efficiency, and methane avoidance projects, the Sustainable Community model plays a direct role in financing new infrastructure to support the transition to a low-carbon economy.
Monitoring and quantification processes	1- Percentage of Ontario's population associated to PAIs through their organizations (SME, municipalities, and NGOs). 2- Number of PAIs realized under the OSC project. 3- Number of regions in Ontario where projects are involved. 4- Amount in CAD$ paid to OSC client facilities for implementing PAIS.

SDG 11: Sustainable Cities and Communities

SDG Target	11.A
Target Indicator	**Support positive economic, social, and environmental links between urban and peri-urban and rural areas by strengthening national and regional development planning.**
	The Sustainable Community helps to strengthen links between different geographical areas by promoting local initiatives to reduce GHG emissions. In this way, it enables exchanges between different communities on projects and methods for meeting the climate challenge and financing the energy transition across all territories. The Sustainable Community also pays particular attention to waste management measures in municipalities.
Monitoring and quantification processes	Percentage of Ontario's municipalities, located mainly in remote areas, that are participating to this group project. This will include intermunicipal management boards.

SDG 12: Responsible Consumption and Production

SDG Target	12.5
Target Indicator	**Reduce waste generation through prevention, reduction, recycling and reuse**
	The Sustainable Community project reduces waste generation through reduction, recycling and reuse. Project activity instances will divert materials from landfills by recovering and recycling or reusing waste, helping to minimize overall waste generation and promote a circular economy.
Monitoring and quantification processes	Tons of material recycled an/or reused and tCO_2e reduced from sectoral scope 13 PAIs,

SDG 13: Climate Action

SDG Target	13.0
Target Indicator	**Number of tCO_2e of greenhouse gas emission (GHG) avoided and reduced.**
	The Sustainable Community's main mission is to support local players in their GHG reduction initiatives. The Sustainable Community project and solution works and rewards directly members which contributes to raise awareness on climate change mitigation and further reduce GHG emissions.
Monitoring and quantification processes	Number of tCO_2e of greenhouse gas emission (GHG) avoided and reduced.

Will Solutions Inc. (WILL), the project proponent and a certified B Corp[7], operates as a social entrepreneur, dedicated to providing innovative business solutions and models that measure the environmental performance of individuals, companies, and communities. WILL rewards those who advocate for sustainable development and has been carbon neutral since 2007. Committed to having a positive impact, WILL aims to allocates 10% of its net benefit to community projects and initiatives to support sustainable development[8], aligning with the principles of a circular and positive economy.

1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

At the grouped project level, leakage emissions are calculated as the sum of all leakage emissions caused by project activity instances (PAIs).

At the PAI level, the likelihood of leakage emissions based on the specific project activity type must be assessed as required by the VM0018 methodology.

The project proponent will quantify GHG emissions sources occurring outside the project boundary due to implementation of the project activities that are expected to contribute more than 1% of the overall average emission reductions.

1.19.2 Commercially Sensitive Information

The following information has been excluded from the public version of the project description:

- Client Facility names are anonymized and replaced by Client Facility ID numbers.

Justification for why the information is commercially sensitive is provided in Appendix 1.

1.19.3 Further Information

No further information.

[7] https://www.bcorporation.net/en-us/find-a-b-corp/company/solutions-will

[8] WILL Solutions Sustainability Report 2022-2023: https://solutionswill.com/wp-content/uploads/2023/07/Sustainable-Development-Report-2022-2023-Will-Solutions-EN-July-2023.pdf

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	The stakeholder identification process for the group project, and the initial PAI each began with a review of the project's context, scale, and potential impacts. The following approach was used: Step 1: Project Context Analysis – Identifying all potential stakeholders who may have an impact on or be affected by the project. Step 2: Impact Assessment – Evaluating the extent to which each identified stakeholder may be affected by the project. Individuals or groups with minimal or infrequent impact are not considered as stakeholders. Step 3: Influence Assessment – Evaluating the influence and importance of each potential stakeholder individual or group. Step 4: Determining the list of the identified stakeholders. If any individual or group believes they should be considered a stakeholder, they may contact the project proponent directly for consultation. At the group project level, the stakeholders identified are as follow: • The project proponent (PP), Will Solutions Inc. • The Client Facility (Operator): small to medium companies, business units, building owners and non-profit organizations from diverse sectors that contract PP to manage the MRV process. • Local Partners and Collaborators (if any): organizations from diverse sectors, united in their commitment to sustainable development, are invited to join as partners and collaborators in this group project. Their role as intermediaries and valuable resources will enhance Client Facility recruitment efforts.

	At the initial PAI level, the stakeholders identified are as follow: • The Client Facility – Since the initial PAI will be implemented on their site, and they are the sole operator. • Workers & Employees at CFs – Those involved in operations or maintenance should be aware of potential impacts, if any. • The project proponent, Will Solutions Inc. – Oversees the grouped project, supports Client Facilities, and manages the MRV and carbon crediting process.
Legal or customary tenure/access rights	Not applicable. At the group project level, the purpose is to aggregate project activity instances from Client Facilities – small to medium companies and organizations– who are owners of the sites and buildings involved in the PAIs. At the initial PAI level, the Client Facility is the owner of the site, buildings, and equipments involved with the PAI.
Stakeholder diversity and changes over time	At the group project level, the project proponent is one entity and will remain the same over time. However, the Client Facilities included in the group project are expected to be highly diverse, since the project targets small and medium-sized enterprises (SMEs) across all industrial, commercial, and institutional (ICI) sectors. This results in a wide range of economic activities from manufacturing and retail to education, agriculture, and healthcare. Over time, the composition of this stakeholder group will evolve as new SMEs join the group project, bringing additional diversity in economic sectors. Interactions between stakeholders will primarily be limited to their participation in the grouped project, since each Client Facility operates independently. Nonetheless, all stakeholders share common interest in reducing environmental impacts and benefiting from the opportunities associated with participation in the grouped project.
Expected changes in well-being	Changes in well-being and to ecosystem services are likely to be minimal given the small-scale nature of the PAIs.
Location of stakeholders	All Client Facilities will be located within the Province of Ontario, Canada territory, as explained in section 1.13.

	The initial Client Facility is located in the Province of Ontario, and no areas outside the project area will be impacted by the initial PAI.
Location of resources	Not applicable. The group project and the project activity instances included in this group project are not involved in territories, resources and customary rights.

2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	29-June-2023
Stakeholder engagement process	**At the group project level:** The launching of the Ontario Sustainable Community was announced through a press release on 25-January-2023[9], followed by announcements on the project proponent's social media platforms and website[10] in both French and English on 26-January-2023. By using publicly accessible communication channels, the project ensured that all stakeholders, including individuals of all genders and backgrounds, are invited to engage with the project on an equal basis. **At the initial Client Facility level:** To ensure the initial Client Facility was well-informed about the OSC project, the project proponent organized a presentation meeting and consultation via videoconference, prior to the CF joining. The presentation meeting proceeded as follows: • Representatives from the CF, including the owner and employees, as well as close collaborators were invited to attend on a voluntary basis. • The business model of the OSC project, including its objectives, risks, costs, and benefits are explained. • The benefit sharing scheme and carbon revenue redistribution processes is explained. • The VCS validation and verification process is explained.

[9] Press Release, 25 January 2023: https://www.newswire.ca/news-releases/a-new-solution-to-support-stimulate-and-finance-the-actions-of-ontario-organizations-and-businesses-in-the-decarbonization-of-their-activities--829557505.html

[10] https://solutionswill.com/en/the-second-sustainable-community-will-soon-open-its-doors-in-ontario/

	• The project proponent remained available to address questions and comments from the CF during and after the presentation. A representative from the project proponent's team attended to document the consultation outcomes, collaborators of the CF were also present to ensure the meeting was conducted appropriately. Throughout the process, stakeholders were informed of meetings through timely and clear communication via their preferred channels, including email and videoconferences. All communications were conducted in French to respect the Client Facility's preferred language. The approach was designed to be respectful, accessible, and culturally appropriate, with attention to inclusive communication regardless of gender. Meeting attendance, key discussion points and stakeholder feedback were documented. Follow-up communications, including emails and responses to inquiries were also recorded.
Consultation outcome	**At the group project level:** During the consultation, the project proponent provided a detailed explanation of the Ontario Sustainable Community group project and the VCS validation and verification process to the Client Facility. The Client Facility expressed strong interest and enthusiasm towards the group project and officially joined in August 2023. **At the initial Client Facility level:** The Client Facility, a small family-owned organic farm, is fully responsible for the design and implementation of the PAI. During the consultation, the facility owner expressed strong interest and support for the project activity, expressing alignment with their sustainability goals. Given the small scale of the project activity and its direct management by the CF, broader consent discussions were not required. Concerns were raised by an employee regarding the high costs relating to the implementation of the projects, as well as current economic uncertainties, but recognized the benefits from the project and the carbon credits.

	Since all categories of stakeholder were present, i.e. the CF owner and operator, an employee, two collaborators and the project proponent (WILL), no additional outreach was necessary.
Ongoing communication	Stakeholders can provide at any time their input or concerns over this group project and the PAIs included through email correspondence or phone calls. A contact form is also available on the project proponent's website[11]. The quantification manager and the sales manager are responsible for collecting and addressing the inputs and concerns.
Stakeholder input	All stakeholder input received during the consultation was reviewed and considered. At the group project level, PP did not receive any major negative feedback, and no updates to the project design were necessary. At the initial PAI level, since the project is located on a privately owned site with minimal external impact, stakeholders did not raise concerns requiring modifications. Moving forward, any comments or concerns received will be addressed by the project proponent as appropriate.

2.1.3 Free Prior and Informed Consent

Obtaining consent	The Client Facilities and the PAIs included in the group project are small-scale and do not affect or involve IPs, LCs, property rights, usage, or resources. Each Client Facility retains full ownership of its facilities and resources when joining the group project. The group project does not alter or infringe upon ownership rights in any way. The role of the PP is limited to coordinating the group project, without any claim or control over the properties or operations of the participating Client Facilities. In this regard, the PP has a written internal procedure in place to ensure that the adhesion of all CFs to the grouped project is carried out with FPIC's underlying principles – transparency, informed decision-making, and ongoing engagement.

[11] Will Solutions Contact Us webpage: https://solutionswill.com/en/contact-us/

	The scope of this grouped project does not include natural resources extraction, land development, or other activities that may impact LPs and LCs rights, land, or livelihoods.
Outcome of FPIC	The outcome of the FPIC process is the signature of a contractual agreement between the Client Facility and the project proponent which confirms all parties have voluntarily joined the grouped project. The scope of this project does not include natural resources extraction, land development and other activities that may impact LPs and LCs rights, and therefore the group project and all PAIs will not encroach on land, relocate people without consent, or force physical or economic displacement.

2.1.4 Grievance Redress Procedure

Development process	Stakeholders can submit grievances via email or phone to the project proponent. Contact information is provided during consultation meetings and is also available on Will Solutions contact web page[12]. Every grievance is acknowledged within a reasonable timeframe, typically within 3 to 5 business days and in the preferred language. The procedure is accessible and ensures stakeholders feel heard and that any concerns are addressed promptly and appropriately.
Grievance redress procedure	The project proponent reviews the grievance, engages with the concerned stakeholder to understand the issue, and works towards an effective and appropriate resolution. A formal response is then provided via email to ensure clear documentation and tracking, outlining any actions taken, points discussed, or agreements reached. If the stakeholder is unsatisfied with the resolution, further discussions can be arranged, or the grievance may be escalated to an independent body if necessary.

[12] Project Proponent 'Contact Us' web page: https://solutionswill.com/en/contact-us/

2.1.5 Public Comments

This project was open for public comment from 02-August-2022 to 01-September-2022. No comments were received.

Comments received	Actions taken
N/A	N/A

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

The project proponent, WILL, leads a group project focused exclusively on ex-post source reduction activities, with participating Client Facilities who are the project developers implementing reduction initiatives directly impacting their own operations or the physical locations they operate. Given the nature and small-scale of these projects – such as on-site boiler conversions or landfill avoidance of organic waste – the eligible activities do not pose adverse impacts to surrounding communities or stakeholders.

WILL's management team, with over 10 years of experience in carbon accounting, has been actively supporting the implementation of project activity instances since 2010. Each team member is well-trained and experienced, having completed ISO-14064-1 and ISO-14064-2 training.

For technical aspects of the projects, such as boiler replacements for example, Client Facilities as project developers engage specialized experts to ensure the highest level of technical accuracy and compliance.

2.2.2 Risk Assessment

The project proponent has implemented proactive strategies to mitigate risks. As a certified B Corporation for the period 2022-2025[13], the project proponent has earned commendable ratings for their contributions to employee welfare, customer satisfaction, community engagement, and environmental stewardship.

	Risks identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to	No risk identified	No risks to stakeholders' well-being have been identified, as the grouped

[13] See section on Community https://www.bcorporation.net/en-us/find-a-b-corp/company/solutions-will/

stakeholders' wellbeing		project consists of small-scale PAIs with minimal environmental and social impact.
Risks to stakeholder participation	No risk identified	No risks to stakeholders' participation have been identified, as engagement in the group project is entirely voluntary and designed to be accessible. Stakeholders are informed through accessible channels (i.e. emails, newsletters, videoconferences) to maintain and encourage participation.
Working conditions	No risk identified	No risks to working conditions have been identified. The group project and the PAIs do not create significant changes to employment conditions, as the PAIs are implemented and operated within and by existing Client Facilities. The project adheres to all applicable labor laws and safety regulations.
Safety of women and girls	No risk identified	No risks to the safety of women and girls have been identified, as the project consists of small-scale activities that do not involve significant workforce changes or community disruptions. The grouped project and PAIs will be implemented in Ontario, Canada, where gender equality and non-discrimination are protected under strict federal and provincial laws. Given this context, the risk of gender-based violence or discrimination is considered low. While Client Facilities are ultimately responsible for their own legal compliance, WILL ensures that project participation is conditional on operating within applicable Canadian laws and regulations.

		During onboarding, CF's are informed of these expectations and confirm they are in good standing with relevant legal requirements,
Safety of minority and marginalized groups, including children	No risk identified	No risks to the safety of minorities and marginalized groups, including children, have been identified, as the activities are small-scale in nature and do not impact the safety of minorities and marginalized groups. The grouped project and PAIs will be implemented in Ontario, Canada, where strong provincial and federal legal protections against discrimination and child labor are in place. Given this context, the risk of negative social impacts on these groups is considered low. While Client Facilities are responsible for their own legal compliance, WILL ensures that project participation is conditional on operating within applicable Canadian laws and regulations. During onboarding, CF's are informed of these expectations and confirm they are in good standing with relevant legal requirements.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	No risk identified	No risks identified regarding pollutants, The project proponent of the group project is not in charge of implementing or operating each individual project at Client Facilities. Since PAIs added to the grouped project are low-impact and small-scale, no EIA is required. However, in parallel, to ensure each PAI added to the grouped project meet all Canadian federal and provincial requirements, standards, and

		regulations, they undergo the steps summarized below: • A signed declaration from the Client Facility that confirms that their project activity instances have (1) not received environmental sanctions or convictions, and (2) meet all Canadian federal and provincial requirements, standards, and regulations. Failure to comply with this declaration will result in the withdrawal of the Client Facility from the Ontario Sustainable Community grouped project. • A member of the PP team will be responsible for monitoring various public information sources such as the Government of Canada's Environmental Offenders Registry[14] and news sources to monitor the environmental integrity of each Client Facility.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified[15]	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	The federal laws in Canada, namely the "Employment Equity Act

[14] Government of Canada's Environmental Offenders Registry: https://environmental-protection.canada.ca/offenders-registry

[15] The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

		(1995)[16]", the "Canadian Human Rights Act (1977)[17]" and "Canadian Charter of Rights and Freedoms (1982)[18]", prevent risks associated with discrimination by protecting individuals from unfair treatment from government entities and employers. The project strictly abides by the laws in place and does not involve and is not complicit in any form of discrimination.
Sexual harassment	No risk identified	The federal laws in Canada, namely the "Canadian Human Rights Act (1977)", the "Criminal Code of Canada (1985, c. C-46)[19], and "Canada Labour Code (1985, c. L-2)[20]", prevent risks associated with sexual harassment by protecting individuals from unfair treatment from government entities and employers. The project strictly abides by the laws in place and does not involve and is not complicit in any form of sexual harassment.
Equal pay for equal work	No risk identified	The federal laws in Canada, namely the "Canadian Human Rights Act (1977)", the "Canada Labour Code (1985)", and "Pay Equity Act (2018)[21]", prevent risks associated with wage discrimination and ensures equal pay for equal work by protecting individuals from unfair treatment from government entities and employers. The project strictly abides by the laws in place and does not involve and is

[16] Canada's Employment Equity Act (1995): https://laws-lois.justice.gc.ca/eng/acts/e-5.401/

[17] Canadian Human Rights Act (1985): https://laws-lois.justice.gc.ca/eng/acts/h-6/

[18] Canadian Charter of Rights and Freedoms (1982): https://laws-lois.justice.gc.ca/eng/Const/page-12.html

[19] Canada's Criminal Code (1985, c. C-46): https://laws-lois.justice.gc.ca/eng/acts/c-46/

[20] Canada Labour Code (1985, c. L-2): https://laws-lois.justice.gc.ca/eng/acts/l-2/

[21] Canada's Pay Equity Act (2018): https://laws-lois.justice.gc.ca/eng/acts/p-4.2/page-1.html

		not complicit in any form of wage discrimination.
Gender equity in labor and work	No risk identified	The federal laws in Canada, namely the “Employment Equity Act (1995)”, the “Canadian Human Rights Act (1977)”, and “Canada Labour Code (1985, c. L-2)”, prevent risks associated with gender-based discrimination in employment by protecting individuals from unfair treatment from government entities and employers. The project strictly abides by the laws in place and does not involve and is not complicit in any form of gender-based discrimination.
Forced labor	No risk identified	The federal laws in Canada, namely the “Criminal Code of Canada (1985)”, criminalize forced labor and protect workers from exploitation from government entities and employers. The project strictly abides by the laws in place and does not involve and is not complicit in any form of forced labor.
Child labor	No risk identified	The federal laws in Canada, namely the “Criminal Code of Canada (1985)”, and the “Canada Labour Code (1985)”, strictly regulate child labor to protect children from exploitation from government entities and employers. The project strictly abides by the laws in place and does not involve and is not complicit in any form of child labor.
Human trafficking	No risk identified	The federal laws in Canada, namely the “Criminal Code of Canada (1985)”, criminalizes human trafficking. The project strictly abides by the laws in place and does not involve and is not complicit in any form of human trafficking.

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The Client Facilities and the PAIs included in the group project are small-scale and do not affect or involve IPs, LCs, property rights, usage, or resources. In addition, the PP and Client Facilities strictly abide to the "Canadian Human Rights Act (1977)" and the "Canadian Charter of Rights and Freedoms (1982)", and the United Nations Declaration on the Rights of Indigenous Peoples and ILO Convention 169 on Indigenous and Tribal Peoples.

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified	The Client Facilities and the PAIs included in the group project are small-scale and do not affect or involve IPs, LCs, property rights, usage, or resources. In addition, the PP and Client Facilities strictly abide to the "Canadian Human Rights Act (1977)" and the "Canadian Charter of Rights and Freedoms (1982)", and the United Nations Declaration on the Rights of Indigenous Peoples and ILO Convention 169 on Indigenous and Tribal Peoples.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The Client Facilities and the PAIs included in the group project are small-scale and do not affect or involve IPs, LCs, property rights, usage, or resources. Each Client Facility retains

	full ownership of its facilities and resources when joining the group project.

2.3.5 Benefit Sharing

Process used to design the benefit sharing plan	The benefit-sharing agreement plan was developed by the project proponent. Before signing, Client Facilities are provided a copy of the adhesion contract for review to enable an informed, consensual, and voluntary participation to the group project. The project proponent remains available to address any questions or requests to ensure an informed decision prior to contract signature.
Summary of the benefit sharing plan	The Project Proponent (WILL Solutions) is a Canadian entity that produces high-quality greenhouse gas (GHG) reduction converted into carbon credits. Will Solutions guides its members (i.e. Client Facilities) (mainly SME, municipalities and NPOs) free of charge on a customized GHG reduction journey, recommending and qualifying PAIs in energy efficiency and waste management. Once implemented, WILL measures the resulting GHG reductions and converts them into high-quality, measurable, and auditable carbon credits available for sale, with 45% of the proceeds returned to Client Facilities.
Approval and dissemination of benefit sharing plan	By signing the adhesion contract, Client Facilities agree to the benefit sharing of carbon credit revenues. A digital copy of the signed adhesion contract is provided to the Client Facility, and another copy is safely kept in the project proponent's internal record.

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure(s) taken
Impacts on biodiversity and ecosystems	No risk identified	This group project includes small-scale PAIs associated to the sectoral scopes 3 and 13. PAIs are always implemented within buildings or close to existing infrastructure which leads to minimal to no disruptive impacts on biodiversity and ecosystems.
Soil degradation and soil erosion	No risk identified	This group project includes small-scale PAIs associated to the

		sectoral scopes 3 and 13. PAIs are always implemented within buildings or close to existing infrastructure which leads to minimal to no impacts on soil such as degradation and soil erosion.
Water consumption and stress	No risk identified	This group project includes small-scale PAIs associated to the sectoral scopes 3 and 13. PAIs included in this group project, from both sectoral scopes, do not lead to significant increase in water consumption and stress.

2.4.1 Rare, Threatened, and Endangered Species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☐ Yes ☒ No

Species and habitat	N/A
Areas needed for habitat connectivity	N/A

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	N/A	N/A
Areas for habitat connectivity	N/A	N/A

2.4.2 Introduction of Species

This grouped project is not involved with planting or species introduction; therefore, this section is not applicable.

Species introduced	Classification	Justification for use	Adverse effects and mitigation
N/A			

N/A			
N/A			

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
N/A	
N/A	
N/A	

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species	N/A	N/A

2.4.3 Ecosystem Conversion

Not applicable. The grouped project is not an ARR, ALM, WRC or ACoGS project.

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	N/A	N/A

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0018	Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community	1.0

3.2 Applicability of Methodology

All project activity instances (PAI) of this group project meet each of the applicability conditions of the VM0018 methodology applied by this group project. The project activities covered by this

group project are included in sectoral scopes 3 and 13 and are defined within a homogeneous jurisdictional territory.

Methodology ID	Applicability condition	Justification of compliance
VM0018	1) This methodology is applicable for grouped projects for the quantification of direct and indirect reductions of GHG emissions arising from energy efficiency and waste management project activity instances at client facilities.	The Ontario Sustainable Community (OSC) is a grouped project aimed to quantify direct and indirect GHG reductions arising from energy and waste management project activity instances located at client facilities.
	2) The requirements of this methodology have been designed to meet micro energy efficiency and/or waste diversion project units where the maximum emission reductions from an individual project unit is 5,000 tCO_2e/year. Therefore, through a combination of energy efficiency and waste management activities, project units within a grouped project could have a maximum combined abatement threshold of 10,000 tCO_2e/year. While each client facility, or project unit, may only contribute a modest abatement (10,000 tCO_2e/year or less), the total sum of abatement from all project units within this entire grouped project may exceed the combined threshold of 10,000 tCO2e/year.	The annual emission reductions from energy and waste diversion project activity instances included in this grouped project shall respect the maximum emission reductions of 5,000 tCO_2e/PAI, otherwise they will be either capped, or disqualified and excluded from the grouped project. This grouped project shall respect the maximum combined abatement threshold of 10,000 tCO_2e/year/project units or client facility The grouped project is expected to exceed the combined threshold of 10,000 tCO_2e/year.
	3) Projects can be located in residential, commercial,	Project activity instances will be located at residential,

	institutional or industrial buildings/facilities.	commercial, institutional, and/or industrial buildings/facilities.
	4) The project proponent must demonstrate right of use in respect of the project's GHG emission reductions, which may, for example, entail securing right of use from client facilities.	WILL Solutions secures the of use of GHG emission reductions through the signature of the member contract for each client facility. *(see member contract template in* Appendix 5*)*
	5) This methodology is applicable to ECMs where the project activity is the construction of new facilities, the retrofit of existing facilities, or process/management changes of existing facilities that result in a reduction of energy use per unit of productivity. The ECMs must occur in conjunction with the following: • Building envelope modifications • Heating, ventilation and air conditioning (HVAC) • Heat generation • Chilling/cooling systems • Lighting and lighting control • Building mechanical infrastructure • Appliances and industrial processes (including heating and cooling requirements and process modification) • Electric motor • Equipment optimization	This grouped project will include PAIs associated with ECMs involving the construction of new facilities, the retrofit of existing facilities, or process/management changes of existing facilities that result in a reduction of energy use per unit of productivity (see Generic PAI in Appendix 3). PAIs related to sectoral scope 3 and energy efficiency will occur in conjunction with the type of interventions listed left.
	6) The project proponent must document the useful life of the ECMs and the remaining useful life of the existing baseline	The PP will document the useful life of the ECMs and the remaining useful life of the existing baseline equipment and

	equipment and ensure that the project unit(s) is not credited beyond the useful life of the ECM or remaining useful life of the existing technology in the baseline scenario	ensure that the project unit(s) is not credited beyond the useful life of the ECM or remaining useful life of the existing technology in the baseline scenario, when possible.
	7) Applicable projects will reduce GHG emissions associated with the conversion of primary energy sources to secondary forms of energy.	This grouped project will include PAIs that are associated with the conversion of primary energy sources to secondary forms of energy (see Generic PAI in Appendix 3).
	8) This methodology is also applicable to activities generating GHG emission reductions related to improvements in combustion efficiency. This applies to projects involving switching from one energy generation method to a less GHG-intensive energy generation method.	This grouped project will include PAIs that are associated with improvements in combustion efficiency involving switching from one energy generation method to a less GHG-intensive energy generation method (see Generic PAI in Appendix 3).
	9) Only small on-site power sources, with emission reductions within the threshold limit of this methodology, are applicable for inclusion within the methodology.	The Sustainable Community grouped project only targets small-scale and on-site power sources, that falls within the emission threshold outlined within the methodology.
	10) Biological or chemical components of the operation must not yield any increase in non-biogenic greenhouse gas emissions compared to the baseline scenario, unless these are accounted for under the applicable flexibility mechanisms as indicated by an affirmation from the project proponent.	Project activity instances will not increase non-biogenic emissions compared to the baseline scenario, otherwise they will be disqualified and excluded from the grouped project.

	11) This methodology is applicable where the project activity is the diversion of waste for other productive uses and alternative disposal options. This methodology is only applicable to quantify emission reductions associated with methane avoidance. This methodology is not approved for quantifying emission reductions associated with landfill gas flaring or electricity/energy production. This methodology is applicable to the following activities: - Cardboard recycling - Organic composting - Aerobic decomposition	This grouped project will include PAIs where the project activity involves the diversion of waste from landfill to alternative productive uses, such as organic composting and cardboard recycling. These activities are implemented specifically to avoid methane emissions that would have occurred from anaerobic decomposition in landfills. The project is not involved with landfill gas flaring or energy production, and emission reductions are only quantified for methane avoidance.

Therefore, the Ontario Sustainable Community (OSC) group project is applicable to the VM0018 methodology.

Other tools used:

- *TOOL02: Combined Tool to Identify the Baseline Scenario and Demonstrate Additionality (Version 7.0)*

Methodology ID	Applicability condition	Justification of compliance
CDM Tool 02 (v.7.0)	The tool is applicable to all types of proposed project activities. However, in some cases, methodologies referring to this tool may require adjustments or additional explanations as per the guidance in the respective methodologies.	The tool will be applied to all sectoral scope 3 and 13 PAIs from this grouped project.

- *TOOL 04: Emissions from solid waste disposal sites*

Methodology ID	Applicability condition	Justification of compliance
CDM Tool 04 (v.8.1)	3. The tool can be used to determine emissions for the following type of application: (a) Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS. Methane emissions are mitigated by capturing and flaring or combusting the methane (e.g. "ACM0001: Flaring or use of landfill gas"). The methane is generated from waste disposed in the past, including prior to the start of the CDM project activity. In these cases, the tool is only applied for an ex ante estimation of emissions in the project design document (CDM-PDD). The emissions will then be monitored during the crediting period using the applicable approaches in the relevant methodologies (e.g. measuring the amount of methane captured from the SWDS) (b) Application B: The project activity avoids or involves the disposal of waste at a SWDS. An example […] in a SWDS. The methane is generated from waste disposed or avoided from disposal during the crediting period. In these cases, the tool can be applied for both ex ante and ex post estimation of emissions. These project activities may apply the simplified approach detailed in 0 when calculating baseline emissions. 4. These two types of applications are referred to in the tool for determining parameters.	Applicable. 3. The project activity includes PAIs that involve the avoidance of waste disposal at landfills (or SWDS). Specifically, ex post projects that divert multiple types of residual waste that would otherwise have been landfilled, and treats it through alternative methods such as composting, anaerobic digestion, or recycling. Therefore, Application B (point 3b) is applicable. 4. As the project falls under Application B, the parameters required for estimating methane emissions will be determined in accordance with the relevant sections of the tool when necessary. 5. The project involves the avoidance of disposal of multiple types of residual waste, including both municipal solid waste and other specific waste streams.

	5. In the case that: (a) different types of residual waste are disposed or prevented from disposal; or that (b) both MSW and residual waste(s) are prevented from disposal, then the tool should be applied separately to each residual waste and to the MSW.	

3.3 Project Boundary

The grouped project boundary is the territory of the Province of Ontario, Canada as defined in section 1.13, according to the limit of the geodesic polygon.

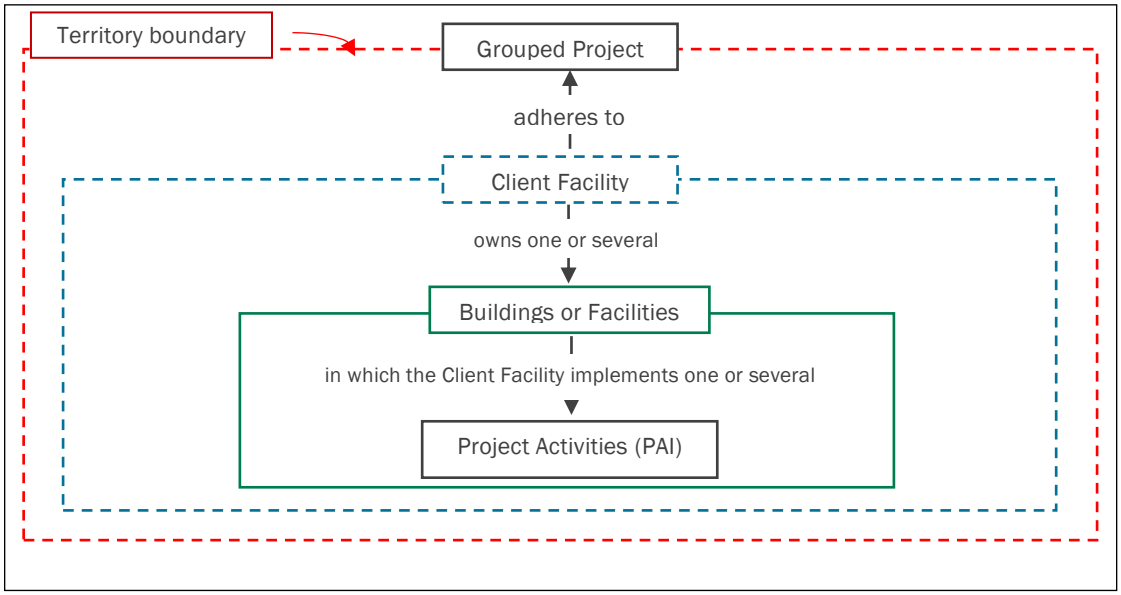


Figure 1 Diagram of the grouped project boundary

1) The PAI must be located within the grouped project boundary, i.e. within the territory of the Province of Ontario, Canada.

2) Since the VM0018 methodology can be applied to various types of project activities, the different buildings and/or systems within a facility may or may not be influenced by a project activity. Hence, the project activity boundary may be determined by one of the following two options:

   A. Isolation Parameter Measurement

   B. Whole Facility Measurement

Option A: Isolation Parameter Measurement

This option allows the PP to determine emission reductions by measuring the project-affected system, rather than the entire building. As such, the chosen boundary is the project-influenced system. In this case, clear justification must be provided that the project-influenced system would have no material impact on the operation and emissions of the whole or remaining facility. Functional equivalence and unit of productivity adjustments for the project-influenced system must be made to the baseline of the system where applicable.

Option B: Whole Facility Measurement

This option requires the inclusion of emissions from the whole facility. Therefore, the boundary is the entire facility. In this case, clear justification must be provided by the PP that the entire building's baseline meets functional equivalence and has been adjusted by units of productivity. This option is mandatory for projects that affect the entire facility's energy consumption, and for projects that affect the entire facility's waste production.

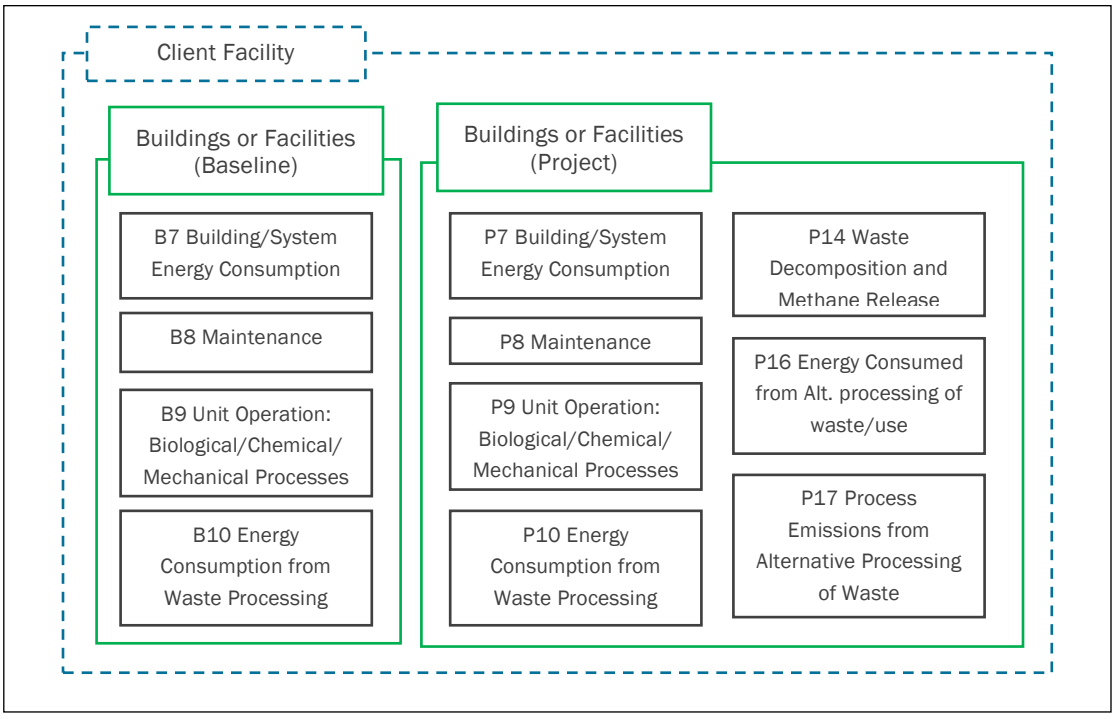


Figure 2 Diagram of project activity boundary

Table 1 describes the greenhouse gases sources identified in Figure 2, included in or excluded from the project boundary.

Table 1 GHG sources included in and excluded from the project activities boundary

Source		Gas	Included?	Justification/Explanation
Baseline	B1 Development and Processing of Unit Material Inputs	CO_2	Excluded	Excluded as they must be functionally equivalent to allow for the application of the methodology element.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	B2 Building Equipment	CO_2	Excluded	Excluded since emissions from equipment building are expected to be negligible over the lifetime of the project.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	B4 Commissioning of Site	CO_2	Excluded	Excluded since emissions from site development are expected to be insignificant over the lifetime of the project.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	B5 Fuel Production & Delivery	CO_2	Excluded	Excluded since emissions from fuel production and delivery are expected to be greater under the baseline condition.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	B6 Electricity Generation and Delivery	CO_2	Excluded	Excluded since emissions from electricity generation and delivery are expected to be greater under the baseline condition.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	B7 Building/System Energy Consumption (without ECMs)	CO_2	Included	Must be included as part of the baseline if Energy Efficiency (EE) actions are included in the project activity since this SS in fundamental to quantifying the baseline for EE emission reductions under this methodology.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	B8 Maintenance	CO_2	Included	
		CH_4	Included	

Source		Gas	Included?	Justification/Explanation
		N_2O	Included	Can be excluded if pre and project operations involve immaterial difference in energy consumed for maintenance activities.
		Other	Included	
	B9 Unit Operation: Biological/Chemical/ Mechanical Processes	CO_2	Included	It can only be excluded if prescribed to be functionally equivalent.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	B10 Energy Consumption from Waste Processing	CO_2	Included	Can only be excluded if the facility or group of facilities is not quantifying emission reductions associated with waste diversion activities and if the ECM activities would not affect the energy consumed for waste processing at the Territory level.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	B11 Disposal of equipment	CO_2	Excluded	Excluded since emissions from disposal of equipment are expected to be insignificant.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	B12 Development and Processing of Unit Material Outputs	CO_2	Excluded	Excluded as they must be functionally equivalent to allow for the application of the methodology element.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	B14 Waste Decomposition and Methane Release	CO_2	Included	Can only be excluded if the facility or group of facilities is not quantifying emission reductions associated with waste diversion activities and if the ECM activities would not affect the amount of methane emitted from decomposition.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	B15 Decommissions of Site	CO_2	Excluded	Excluded since emissions from equipment disposal are expected to be negligible.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
Project	P1 Development and Processing of Unit Material Inputs	CO_2	Excluded	Excluded as they must be functionally equivalent to allow for the application of the methodology element.
		CH_4	Excluded	
		N_2O	Excluded	

Source		Gas	Included?	Justification/Explanation
		Other	Excluded	
	P2 Building Equipment	CO_2	Excluded	Excluded since emissions from building of the equipment are expected to be negligible over the lifetime of the project.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	P4 Commissioning of Site	CO_2	Excluded	Excluded since emissions from site development are expected to be negligible given the minimal site development typically required.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	P5 Fuel Production & Delivery	CO_2	Excluded	Excluded since emissions from fuel production and delivery are expected to be greater under the baseline condition.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	P6 Electricity Generation & Delivery	CO_2	Excluded	Excluded since emissions from fuel production and delivery are expected to be greater under the baseline condition.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	P7 Building/System Energy Consumption	CO_2	Included	Must be included as part of baseline if Energy Efficiency action are included in the project activity.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	P8 Maintenance	CO_2	Included	Can be excluded if pre and project operations would involve immaterial difference in energy consumed for maintenance activities. If however maintenance activities included major overhauls that would not have been included in the baseline scenario, evidence must be provided by the project proponent to show the SS is below the negligible emissions threshold.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	P9 Unit Operation: Biological/Chemical/ Mechanical Processes	CO_2	Included	Can only be excluded if prescribed to be functionally equivalent.
		CH_4	Included	
		N_2O	Included	

Source		Gas	Included?	Justification/Explanation
		Other	Included	
	P10 Energy Consumption from Waste Processing	CO_2	Included	Can only be excluded if the facility or group of facilities is not quantifying emission reductions associated with waste diversion activities and if the ECM activities would not affect the energy consumed for waste processing.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	P11 Disposal of Equipment	CO_2	Excluded	Excluded since emissions from disposal of equipment are expected to be negligible.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	P12 Development and Processing of Unit Material Outputs	CO_2	Excluded	Excluded as they must be functionally equivalent to allow for the application of the methodology element.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	
	P14 Waste Decomposition and Methane Release	CO_2	Included	Can only be excluded if the facility or group of facilities is not quantifying emission reductions associated with waste diversion activities and if the ECM activities would not affect the amount of methane emitted from decomposition.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	P16 Energy Consumed from alternative processing of waste/use	CO_2	Included	Can only be excluded if the facility or group of facilities is not quantifying emission reductions associated with alternative processing of waste/use in the project scenario at the Territory level.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	P17 Process Emissions from Alternative Processing of Waste	CO_2	Included	Can only be excluded if the facility or group of facilities is not quantifying emission reductions associated with the alternative processing of waste at the Territory level.
		CH_4	Included	
		N_2O	Included	
		Other	Included	
	P18 Decommission of Site	CO_2	Excluded	Excluded since emissions from decommissioning are not expected to differ highly between the baseline and project conditions.
		CH_4	Excluded	
		N_2O	Excluded	
		Other	Excluded	

3.4 Baseline Scenario

The following section addresses the baseline scenario at the Client Facility and PAI level.

Baseline Scenario Determination – Generic Description at the PAI Level

This is a grouped project that will gradually include PAIs ex-post. As such, while the specific baseline conditions of each PAI cannot be defined at this stage, the baseline scenario is described in generic terms based on the expected types of activities to be included and the applicable geographic and regulatory context of Ontario, Canada. In accordance with the VM0018 and the *CDM TOOL02: Combined Tool to Identify the Baseline Scenario and Demonstrate Additionality Version 7.0*, the baseline scenario will be determined for each PAI by identifying, analyzing and documenting, at a minimum – but not limited to – the relevant potential alternatives.

1. Baseline Scenario – Energy Demand (Sectoral Scope 3)

For all PAIs falling under sectoral scope 3, the baseline scenario typically reflects the continuation of existing energy use practices by client facilities. In the absence of the project activity, facilities are expected to continue operating their existing equipment or infrastructure with no changes to energy intensity per production unit. This may include the continued use of outdated or less efficient technologies.

According to the VM0018, potential alternatives that may be considered when determining the baseline scenario for sectoral scope 3 PAIs may include:

a) Client Facilities and their PAIs may exceed current regulations and implement energy efficiency measures, including early replacement of equipment before its natural turnover, without relying on carbon financing.

b) Government or industrial enforcement of minimum building codes may lead to improved energy efficiency independent of the project.

c) The continuation of the current situation (i.e. no project activity or other alternatives are undertaken), maintaining constant energy intensity per production unit without any intervention.

Current Ontario regulations do not require such conversions or improvements, particularly at small or medium-sized industrial, commercial or institutional facilities. Additional information on laws and regulations can be found by generic PAI in Appendix 3.

2. Baseline Scenario - Waste Handling and Disposal (Sectoral Scope 13)

For all PAIs under sectoral scope 13, the baseline scenario commonly involves the anaerobic decomposition of waste in landfills. While the Province of Ontario promotes alternative waste

management methods to landfilling, these are not mandatory or enforced uniformly across small or medium-sized industrial, commercial or institutional facilities. As such, the continuation of landfill disposal without diversion or additional treatment measures remains the most plausible baseline in most cases.

As per VM0018, potential alternatives that may be considered when determining the baseline scenario for sectoral scope 13 PAIs may include:

a) Client facilities and their PAIs may adopt alternative waste treatment or diversion methods to treat or manage waste differently than anaerobic decomposition in a landfill - such as composting or recycling - without carbon financing.

b) Regulatory requirements or industry standards may enforce minimum waste handling practices that achieve emission reductions independently.

c) The continuation of current landfilling disposal methods may remain the most plausible scenario without the project.

Additional information on laws and regulations can be found per generic PAI in Appendix 3.

Baseline Scenario of the Initial PAI

For the initial PAI included in the grouped project, the baseline scenario was identified as follows:

1) Installation of solar panels to reduce reliance on grid electricity and lower diesel consumption from on-site generator use (Generic PAI VIII):

   The baseline scenario of this PAI is the continuation of the current practice, where the facility continues to use grid electricity and diesel to fuel the on-site generator to meet its energy needs. This scenario results in higher grid electricity and fossil fuel consumption, thus leading to higher GHG emissions.

3.5 Additionality

3.5.1 Regulatory Surplus

Is the project located in an UNFCCC Annex 1 or Non-Annex 1 country?

☒ Annex 1 country ☐ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☐ Yes ☒ No

3.5.2 Additionality Methods

In accordance with the methodology VM0018, the project proponent demonstrates and assesses the additionality of the grouped project according to the CDM TOOL02: *Combined Tool to Identify the Baseline Scenario and Demonstrate Additionality Version 7.0*. This CDM tool comprises the following four steps:

a) STEP 0. Demonstration that the proposed project activity is the first-of-its-kind (optional);

b) STEP 1. Identification of alternative scenarios;

c) STEP 2. Barrier analysis;

d) STEP 3. Investment analysis;

e) STEP 4. Common practice analysis.

Step 0. Demonstration that a proposed project activity is the first-of-its-kind (optional)

The Ontario Sustainable Community (OSC) grouped project is the first-of-its-kind in the Ontario jurisdiction[22]. In Canada, jurisdictional responsibility for environmental and climate-related laws and regulations fall under provincial authority.

The generic PAI categories to be included in this grouped project are, however, not first-of-their-kind since they are recognised measures.

Step 1. Identification of alternative scenarios

Step 1a: Define alternative scenarios

S1: The proposed project activity undertaken without being registered as a VCS project

This scenario would involve implementing the OSC grouped project without carbon finance. This scenario is not feasible since without carbon revenues, the project proponent has no viable business model to operate the group project. The grouped project, by design, relies on the aggregation of small GHG reductions project activities, none of which are financially viable on their own.

S2: Where applicable, no investment is undertaken by the project participants, i.e., the same output can be provided by other entities.

As of today, no other project or organization has implemented or is developing a similar cross-sectoral, multi-client facility aggregated grouped project for the selected geographic area and

[22] https://solutionswill.com/en/berkeley-database-analysis-of-global-trends-in-voluntary-projects/

the level of emissions is in line with productivity output (see Appendix 4 for the analysis on Ontario GHG emissions trends). Therefore, this alternative is not applicable.

S3: Where applicable, the continuation of the current situation, not requiring any investment or expenses to maintain the current situation.

In this scenario, the same output as the proposed grouped project is not achieved. This continuation of the current situation is a highly plausible and credible alternative scenario. It does not require investment from the project proponent and leads to a continuation – and potentially worsening – of GHG emissions in Ontario. It represents the baseline scenario for the grouped project as it reflects what would occur in the absence of the grouped project and carbon finance.

S4: Where applicable, the continuation of the current situation, requiring an investment or expenses to maintain the current situation.

In this scenario, the proponent might still incur basic operational expenses to maintain its company or consulting activities, but it does not lead to the delivery of the same output as the grouped project – namely the quantification, verification, and issuance of carbon credits from aggregated PAIs under a program. Therefore, this scenario does not result in the same output as the proposed grouped project, and as such, is not considered a valid alternative.

S5: Other plausible and credible alternatives, including common practices

There are no other plausible or credible alternative scenarios that achieve the same outcome as the grouped project. Grouped projects, which aggregate project activity instances associated to more than one sectoral scope is not a common practice in the Province of Ontario.

S6: Where applicable, the "proposed project activity undertaken without being registered as a VCS project activity" to be implemented at a later point in time.

Delayed implementation of the grouped project is not a credible or feasible alternative scenario for several reasons:

- There are currently no regulatory signals or credible policy trajectories in Ontario that would mandate or strongly encourage the implementation of the types of GHG mitigation measures included in the grouped project (see Appendix 4).
- Ontario's climate policy environment has weakened since 2018, following the cancellation of the provincial cap-and-trade system (see Appendix 4).

Alternative Scenarios for Individual PAIs

Since this is a grouped project that will progressively include PAIs from several client facilities on an ex-post basis, the specific alternative scenario for each individual PAI cannot be

determined at this stage, The applicable alternative scenario will be assessed and defined as each new PAI is added to the grouped project.

Step 1b: Consistency with mandatory applicable laws and regulations

There are no mandatory laws or regulations in Ontario requiring the implementation of the grouped project. Likewise, none of the alternative scenarios identified in Step 1a violate any applicable legal or regulatory requirements. Therefore, all alternative scenarios comply with applicable laws and regulations and are retained.

Step 2. Barrier analysis

This step serves to identify barriers and to assess which alternative scenarios are prevented by these barriers.

Step 2a: Identify barriers that would prevent the implementation of the group project

The OSC grouped project faces significant barriers, including:

- Financial barriers: Individual Client Facilities are typically SMEs or small municipalities with limited access to capital. The transaction costs and technical requirements to access the VCM are prohibitively high for them without aggregation and support from the PP.
- Institutional barriers: There is a lack of institutional mechanisms in Ontario to support aggregation and monetization of emission reductions from small-scale projects.
- Market barriers: the absence of a cap-and-trade or compliance market in Ontario has left a policy vacuum. Voluntary carbon finance remains an important incentive to implement low-carbon activities.

Step 2b: Eliminate alternative scenarios which are prevented by the identified barriers.

For the proposed grouped project, only one alternative scenario, remained from Step 1:

S3: Continuation of the current situation, not requiring any investment or expenses.

This alternative scenario is not prevented by any barrier, as it reflects the business-as-usual course of action that would continue without any project intervention.

Furthermore, the output of the proposed grouped project, namely, the aggregation, monitoring, and verification of GHG emission reductions from small-scale activities, can only be delivered by the project proponent.

In accordance with the Tool 02, when there is only one remaining alternative scenario that is not prevented by any barrier, and the output can only be provided by the project proponent, then this alternative is identified as the baseline scenario.

Step 3. Investment analysis

With Carbon Streaming's investment made in June 2022[23], it has become possible for the project proponent to open the OSC. Without this investment, the OSC cannot be developed and/or operated.

It is noteworthy that, without the cost sharing and the Business model of the project proponent, it would be impossible for each of the grouped Client Facilities to submit individually any of their eligible GHG emission reductions to the voluntary carbon markets (VCM). It is simply not affordable for individual small scale Client Facilities and for each of their different PAIs to access the voluntary carbon market. Accordingly, an investment analysis (IRR) will be provided for each new PAI added to the grouped project.

In addition, at the project proponent level, the grouped project is additional, based on the business model, since without carbon revenues, the grouped project cannot be fully initiated and operated. By sharing these revenues, the business model enables client facilities to finance both the implementation and the ongoing operation of all eligible activities.

Step 4. Common practice analysis

Since the grouped project is not the first-of-its-kind, the project proponent, WILL Solutions Inc. has conducted a thorough territory-based common practice analysis in accordance with the CDM TOOL24: Common Practice Version 3.1 to ensure project activity instances (PAI) are not mandated by any law, statute, or any other regulatory framework. Due to its large volume, the information gathered and analyzed to complete the common practice analysis can be found in the Appendix 3.

As a conclusion of this analysis, the project proponent has identified 8 Generic PAIs, which are project categories that are additional (see list of Generic PAIs in section 1.12). Through an analysis of common practices in Ontario, these 8 generic PAIs were found to be uncommon practices. The 8 generic PAIs have processes/outcomes which go beyond business-as-usual (BAU) practices and are defined as more efficient when compared to common practices. Therefore, any new PAI added in the Ontario Sustainable Community group project is recognized as additional if they can be associated with a generic PAI. In addition, the project proponent will consider the emergence of new practices, as generic PAIs, in the field of behavioral change and clean technologies, and will qualify them, at each monitoring report.

Other

The role of the project proponent is key to the achievement of the present project since it is taking place in an unfavorable environment:

[23] Carbon Streaming investment press release: https://solutionswill.com/wp-content/uploads/2022/06/Solutions-Will-Carbon-Streaming-Corporation-PR-2022-06-Investment-20-Millions-US-EN.docx.pdf

1. The price of energy, specifically electricity, being quite low (at 0.130$CDN/kWh)[24] is a barrier to the adoption and promotion of energy efficiency measures.
2. Ontario's vast geography and low population density (just 14.1 persons/km^2) present significant barriers to the implementation of alternative waste management such as recycling, composting, reuse and valorisation, especially in remote regions. Currently, over 70% of all end-of-life products, packaging, and other waste in Ontario are sent to landfills or incinerators, with diversion rates stagnating below 30% for total waste streams. The ICI sectors contribute significantly to this situation: only about 15% of ICI waste is diverted[25]. Consequently, in many areas, especially sparsely populated or remote zones, landfilling remains the most feasible and often default disposal option. In this context, the leadership role of WILL, the project proponent, is to consistently promote the need to address climate change to reduce fossil fuels consumption and the possibility to improve project profitability with the revenues generated by the sale of verified carbon credits.
3. On July 3, 2018, the Ontario cap and trade regulation was abruptly cancelled leaving several parties, especially small, local companies unhappy and with few options. Green initiatives were also put on hold or cancelled as a result.
4. Since 2016, WILL Solutions, the project proponent has been receiving growing interest in opening a Sustainable Community in Ontario from various potential stakeholders (i.e. Client Facilities, VCU buyers, partners, collaborators, etc.).

The additionality of the initial PAI included in this group project, is demonstrated in Appendix 2 according to the step-wise approach of the CDM TOOL02: *Combined Tool to Identify the Baseline Scenario and Demonstrate Additionality Version 7.0*.

3.6 Methodology Deviations

There is no methodology deviation.

[24] https://www.energyhub.org/electricity-prices/Ontario-monthly-usage-of-kWh.

[25] https://www.auditor.on.ca/en/content/annualreports/arreports/en21/ENV_ICI_en21.pdf

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

At the group project level, the total baseline emissions (**BE_y**, in tCO_2e) for all PAIs shall be determined by adding up the product of the baseline emissions factor (**EF_3**, in tCO_2/unit of energy type and **EF_{13}** tCO_2/Mt of waste stream) and the energy consumption (**FF**) used before project and the waste stream (**WS**) before it is diverted from landfill management.

At the group project level, the baseline emissions are calculated as follows:

Equation (1)

$$BE_y = \sum[(Emissions_{\ Adjusted\ Baseline\ EE}) ; (Emissions_{\ Adjusted\ Baseline\ Waste})]$$

Where:

BE_y	=	Baseline emissions in year y (tCO_2e)
$Emissions_{\ Adjusted\ Baseline\ EE}$	=	The energy efficiency activities related baseline emissions plus any adjustments needed to adjust to the conditions of the monitoring period
$Emissions_{\ Adjusted\ Baseline\ Waste}$	=	The waste related baseline emissions plus any adjustments needed to adjust to the conditions of the monitoring period

Or detailed as:

Equation (2)

$$BE_y = \sum[(FF_{BL,y} * EF_3) ; (WS_{BL,y} * EF_{13})]$$

Where:

BE_y	=	Baseline emissions in year y (tCO_2e)

$FF_{BL,y}$ = Volume of energy consumption without or before the project in year y

$WS_{BL,y}$ = Volume of waste material type sent to landfill in year y

EF_3 = CO_2e emission factor of the energy type (tCO_2e)

EF_{13} = CO_2e emission factor of the waste material type is selected with consideration for the different landfill management scenario, regarding the flaring or no flaring of methane (biogas) and/or its use or not for energy recovery (tCO_2e).

This group project includes project activity instances from sectoral scope 3 and 13. Thus, the procedure for each sectoral scope at the PAI level is presented separately below.

At the PAI level – Sectoral scope 3

The baseline scenario for sectoral scope 3 is the energy consumption per type of fuel or electricity prior to or in the absence of the project activity instance. Baseline emissions are determined in three steps:

1) Determination of the volume of energy type consumption

   In accordance with the VM0018 methodology, the volume for each type of fuel combusted or electricity consumed from the grid is determined by third party invoices consolidated monthly or annually provided by Client Facilities.

2) Selection of the emission factor of the energy type

   In accordance with the VM0018 methodology, the project proponent identified the most appropriate emission factors for thermal energy, fuel type and electricity. The emission factors will be sourced from:

   a) Government of Canada: *National Inventory Report 1990-2022* (2024). The emission factors shall be updated annually during monitoring with the most recent version available. For more information regarding sectoral scope 3 emission factors, see Table 1 below.

   b) In the absence of regional data, IPCC defaults can be used from the most recent version of the *IPCC Guidelines for National Greenhouse Gas Inventories* providing they are deemed to reasonably represent local circumstances.

Table 1 : Energy emission factors for sectoral scope 3

Energy type	Unit	GHG Emissions in tCO_2e/Unit	Source
Butane	L	0.00177629	NIR 1990-2022-2, 2024
Coke (Coal coke)	kg	0.00317914	NIR 1990-2022-2, 2024
Diesel	L	0.00268901	NIR 1990-2022-2, 2024
Ethane	L	0.00101529	NIR 1990-2022-2, 2024
Fuel oil no. 1 and 2	L	0.00276194	NIR 1990-2022-2, 2024
Fuel oil no. 5 and 6	L	0.00317456	NIR 1990-2022-2, 2024
Gasoline (Automotive)	L	0.00231510	NIR 1990-2022-2, 2024
Kerosene	L	0.00256894	NIR 1990-2022-2, 2024
Natural gas	m^3	0.00193131	NIR 1990-2022-2, 2024
Propane	L	0.00154429	NIR 1990-2022-2, 2024
Wood waste (dry, 0% moisture)	kg	0.00002135	NIR 1990-2022-2, 2024

Source: National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024, Part 2, Table A6.1-1 to Table A6.1-12, 2022 values.[26]

Table 2 : Grid electricity emission factor for sectoral scope 3

Energy type	Unit	GHG Emissions in tCO_2e/Unit	Source
Electricity (grid generation)	kWh	0.000038	NIR 1990-2022-3, 2024

Source: National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024, Part 3, Table A13-7, 2022 value.[27]

Table 32: Thermal energy emission factor for sectoral scope 3

Energy type	Unit	GHG Emissions in tCO2e/Unit	Source
Thermal energy (Steam/Heat)	GJ	0.070050	EPA, June 2024[28]

3) Determination of baseline emissions

Baseline emissions (BE_y) are calculated as follows:

[26] National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024 , Part 2, Environment and Climate Change Canada: En81-4-2022-2-eng.pdf

[27] National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada, Part 3, Table A13-7: En81-4-2022-3-eng.pdf

[28] Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories, version 5 June 2024, Table 7: https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Equation (3)

$$BE_y = Vol.Fuel\ i \times EF\ Fuel\ i\ CO_2e$$

Where:

BE_y	=	Baseline emission in a year y (tCO_2e)
$Vol.Fuel\ i$	=	Baseline volume of energy or fossil fuel consumption for fuel type *i* (*L,* m^3, kg, or kWh
$EF\ Fuel\ i\ CO_2e$	=	Emission factor of the energy type *i* (tCO_2e/L, m^3, kg, or kWh)

Or, as detailed in the VM0018:

Equation (4)

$$BEy = \sum [(Vol.Fuel\ i \times EF\ Fuel\ i\ CO_2);\ (GWPCH_4 \times Vol.Fuel\ i \times EF\ Fuel\ i\ CH_4);\ (GWP\ N_2O \times Vol.Fuel\ i \times EF\ Fuel\ i\ N_20)] + [Electricity \times EF\ Grid\ CO_2e] + [Thermal\ Energy \times EF\ Thermal\ Energy\ CO_2e]$$

Where:

BE_y	=	Baseline emission in a year y (tCO_2e)
$Vol.Fuel\ i$	=	Baseline volume of energy or fossil fuel consumption for fuel type *i* (L, m^3, kg, or kWh)
$EF\ Fuel\ i\ CO_2$	=	Emission factor of CO_2 of the energy type *i* (per L, m^3, kg, or kWh)
$GWPCH_4$	=	Global warming potential of methane
$EF\ Fuel\ i\ CH_4$	=	Emission factor of CH_4 of the energy type *i* (per L, m^3, kg, or kWh)
$GWP\ N_2O$	=	Global warming potential of nitrous oxide
$EF\ Fuel\ i\ N_20$	=	Emission factor of N_2O of the energy type *i* (per L, m^3, kg, or kWh)
$Electricity$	=	Quantity of electricity from the grid in kWh
$EF\ Grid\ CO_2e$	=	Emission factor of electricity from the grid in tCO_2e/kWh
$Thermal\ Energy$	=	Quantity of thermal energy in GJ
$EF\ Thermal\ Energy\ CO_2$	=	Emission factor of thermal energy in tCO_2e/GJ

Adjustments

As per the VM0018 methodology, the project proponent may conduct emission adjustments for measuring functional equivalence as well as unit of productivity. Baseline scenarios identified for the projects using the VM0018 may require adjustments to ensure functional equivalence with the project.

For this comparison between the project scenario and baseline scenario to be meaningful, the project and the baseline must provide the same function and quality of products or services. This consistency in metrics and units of production provides an ability to quantify actual emissions reductions achieved in the project scenario.

The equation for the baseline component of the comparison is:

Equation (5)

$$Emissions_{Maintenance/Unit\ Operation} = \sum [(Vol.Fuel\ i\ \times EF\ Fuel\ i\ CO2)\ ;\ (GWP_{CH4} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{CH4})\ ;\ (GWP_{N2O} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{N2O})\ ] + [Electricity\ \times\ EF\ Grid\ CO_2e] + [Thermal\ Energy\ \times\ EF\ Thermal\ Energy\ CO_2e]$$

The unit of productivity must be used by the project proponent as a basis for incorporating functional equivalence within the calculation methodology. Examples of units of productivity are: energy requirements for residential buildings, per square foot of front of house commercial space, per kg/L/m2/m3 of output from manufacturing facilities, etc. The unit of productivity shall be defined to account for any non-production sensitive components. In all cases the project proponent must justify the selection of data used for deriving the unit of productivity.

At the PAI level – Sectoral scope 13

The baseline scenario for sectoral scope 13 is the waste stream or waste type being sent to the landfill as the management scenario. The baseline emissions are calculated using one of the two following options:

Option 1

Baseline emissions for option 1 are determined in three steps:

1. Determination of the amount of waste type sent to landfill

   In accordance with the VM0018 methodology, the amount for each type of waste material diverted from conventional landfill disposal may be measured by continuous metering

and/or invoice reconciliation provided by the Client Facility. The amount of waste material sent to landfill may be measured upon departure from the waste management site. It must be ensured that no material is then diverted to landfill without being accounted for.

2. Selection of the emission factor of the waste type and landfill scenario

   An emission factor from the U.S. Environmental Protection Agency Waste Reduction Model (EPA WARM) shall be selected according to the waste type and the landfill scenario. PP shall use the most recent version available of the WARM tool at the time of quantifying emission reductions for each monitoring period. For more information regarding sectoral scope 13 emission factors, see Table 4 below.

Table 4 : Emission factors for landfill scenario

Waste type	Unit	GHG Emissions per Ton of Material Landfilled ($MTCO_2e$)
Corrugated container/cardboard	MT	0.094538
Office paper	MT	1.239428
Mixed paper (general)	MT	0.024875
Food waste	MT	0.524405
Grains	MT	1.425892
Yard trimmings	MT	-0.188297
Branches	MT	-0.388957
Mixed plastics	MT	0.022320
Dimensional lumber	MT	-1.017370
Mixed recyclables	MT	-0.009341
Mixed organics	MT	0.187224

Source: U.S EPA WARM, version 16 (December 2023)[29]

The emission factors from the WARM have the following settings selected in order to reflect more closely the conditions of the geographic area:

- "National Average" is selected to calculate emissions from landfilling based on the estimated proportions of landfills with LFG control.
- "Flare" is selected to assume that the baseline scenario for landfilling always includes the flaring of landfill gas to remain conservative.
- "Typical operation – DEFAULT" is selected to represent the average landfill in terms of gas recovery efficiency, which represents an oxidation factor (OX) of 0.2.

[29] U.S. EPA WARM version 16 (December 2023): https://www.epa.gov/warm/versions-waste-reduction-model#v16

- "Moderate (k = 0.04)" is selected to represent the decay rate of the Ontario province, based on an average annual precipitation rate of 32 inches[30]. A moderate decay rate is associated with a precipitation rate of 20 to 40 inches of precipitation per year[31].

The EPA WARM is a model that is based on rigorous scientific research and has been peer-reviewed. More information can be found in the WARM background documentation.

3. Determination of baseline emissions

Baseline emissions (BEy) are calculated as follows:

Equation (6)

$$BE_y = WS_{BL,y} \times EF_{13}$$

Where:

BE_y	=	Baseline emission in a year y (tCO_2e)
$WS_{BL,y}$	=	Volume of waste material type sent to landfill in year $_y$ (t)
EF_{13}	=	Emission factor of the waste material type is selected with consideration for the different landfill management scenario (tCO_2e).

Option 2

Baseline emissions for option 2 are determined with the following:

$Emissions_{Adjusted\ Baseline\ WASTE}$ = $Emissions_{Adjusted\ Waste\ decomposition\ and\ methane\ release}$ + $Emissions_{Adjusted\ Energy\ consumption\ from\ waste\ processing}$

To determine "$Emissions_{Adjusted\ Waste\ decomposition\ and\ methane\ release}$":

[30] Environment and Natural Resources, Government of Canada. Canadian Climate Normals 1991-2020 Data : https://climate.weather.gc.ca/climate_normals/results_1991_2020_e.html?searchType=stnProv&lstProvince=ON&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=207000000&dispBack=0

[31] U.S. EPA Documentation Chapters for Greenhouse Gas Emission, Energy and Economic Factors Used in the Waste Reduction Model, Management Practices Chapters. December 2023, page 6-9: https://www.epa.gov/system/files/documents/2024-01/warm_management_practices_v16_dec.pdf

Equation (7)

$$Emissions_{\,Waste\ Decompostion\ and\ Methane\ Release} = 1000 \times \varphi \times (1-f) \times GWP_{CH4} \times (1-OX) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_{x=1}^{y} \sum_{j} \times (W_{j,x} \times DOC_j \times e^{-kj \times (y-x)} \times (1-e^{-kj})$$

Where:

φ	=	Model correction factor to account for model uncertainties
f	=	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents methane emissions
GWP_{CH4}	=	Global Warming Potential of methane
OX	=	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
F	=	Fraction of methane in the SWDS gas (volume fraction)
$DOC_{f,y}$	=	Fraction of degradable organic carbon (DOC) that can decompose
MCF_y	=	Methane correction factor
$W_{j,x}$	=	Mass of Waste Material type j Sent to Landfill in the year x (tons)
DOC_j	=	Fraction of degradable organic carbon (by weight) in the waste type j
k	=	Decay rate for the waste type j
j	=	Waste type category (index)
y	=	Year for which methane emissions are calculated

To determine "Emissions Adjusted Energy consumption from waste processing":

Equation (8)

$$Emissions_{\text{Adjusted Energy consumption from waste processing}} = \sum [(Vol.Fuel\ i \times EF\ Fuel\ i\ CO2)\ ;\ (GWP_{CH4} \times Vol.Fuel\ i \times EF\ Fuel\ i_{\ CH4})\ ;\ (GWP_{N2O} \times Vol.Fuel\ i \times EF\ Fuel\ i_{\ N2O})\ ] + [Electricity \times EF\ Grid\ CO_2e] + [Thermal\ Energy \times EF\ Thermal\ Energy\ CO_2e]$$

The calculation of the baseline emissions of the initial PAI included in this group project, is detailed in Appendix 2.

Baseline Emissions Estimation

As the project involves ex-post recruitment of PAIs, actual GHG emission reductions will be calculated during each monitoring period based on real and verifiable data. However, for the purpose of estimating expected baseline emissions over the crediting period, the following set of assumptions was applied:

a) **Estimated CF recruitment over the crediting period**

The project proponent estimates the recruitment capacity of 20 Client Facilities in the first monitoring period, assuming a doubling of capacity each subsequent period. The table below presents the estimated growth:

Year	Initial CF	Estimated CFs recruited	Total CFs
Year 2026	1	20	21
Year 2027	1	40	41
Year 2028	1	80	81
Year 2029	1	160	161
Year 2030	1	320	321
Year 2031	1	640	641
Year 2032	1	1,280	1,281

b) **Estimation of average PAIs per CF**

The average number of PAIs per CF is derived from historical data from project VCS ID929, implemented under the same methodology. The data below summarizes the relevant monitoring periods:

	MP1	MP2	MP3	MP4	MP5	MP6	MP7
Total number of PAI	802	820	818	818	689	2,534	2,645
Total number of CF	84	84	83	83	83	87	91
Number of PAIs / CF	10	10	10	10	8	29	29
					Average number of PAIs per CFs		**15**

c) **Estimated PAI recruitment over the crediting period**

The number of PAIs was calculated by multiplying the estimated number of CFs by the average number of PAIs per CF:

Year	Estimated PAI recruited
Year 2026	300
Year 2027	600
Year 2028	1,200
Year 2029	2,400
Year 2030	4,800
Year 2031	9,600

Year 2032	19,200

d) **Average baseline emissions per PAI**

Based on historical data from project VCS ID929, the average baseline emissions per PAI were calculated as 608 tCO_2e. Supporting calculations were provided to the VVB in a separate Excel sheet.

e) **Estimated total baseline emissions**

Baseline emissions for each year were estimated using the average BE per PAI (608 tCO_2e) and the projected number of PAIs. The following formula was applied:

BEy = (Estimated PAIs x 608 tCO_2e) + 21 tCO_2e

Where 21 tCO_2e corresponds to the baseline emissions of the initial PAI (see Appendix 2).

For example, in 2026:

BE_{2026} = (300 x 608 tC02e) + 21 tC02e

BE_{2026} = 182,421 tCO_2e

Table 5 : Estimated baseline emissions of the proposed project activity

Year	Estimated baseline emissions (tCO_2e)
Year 2026	182,421
Year 2027	364,821
Year 2028	729,621
Year 2029	1,459,221
Year 2030	2,918,421
Year 2031	5,836,821
Year 2032	11,673,621
Total	**23,164,947**

4.2 Project Emissions

At the group project level, the total project emissions (**PE_y**, in tCO_2e) for all PAIs shall be determined by adding up the product of the project emission factor (**EF_3**, in tCO_2/unit of energy type and **EF_{13}** tCO_2/Mt of waste material type stream) and the energy consumption (**FF**) used by the project and the (**WS**) waste management by the reuse, the recycling or the composting of the waste material type stream (**WS**).

At the group project level, the project emissions are calculated as follow:

Equation (9)

$$PE_y = \sum[(Emissions_{Project\ EE}) ; (Emissions_{Project\ Waste})]$$

Where:

PE_y	=	Project emissions in year y (tCO_2e)
$Emissions_{Project\ EE}$	=	Sum of the energy efficiency related emissions under the project scenario
$Emissions_{Project\ Waste}$	=	Sum of the waste related emissions under the project scenario

Or detailed as:

Equation (10)

$$PE_y = \sum[(FF_{P,y} * EF_3) ; (WS_{P,y} * EF_{13})]$$

Where:

PE_y	=	Project emissions in a year y (tCO_2e)
$FF_{P,y}$	=	Volume of energy consumption used by the project
$WS_{P,y}$	=	Volume of waste material type with alternative processing
EF_3	=	CO_2e emission factor of the energy type
EF_{13}	=	CO_2e emission factor of the waste stream that considers the different management scenario that diverts waste from landfill, regarding the flaring or no flaring of methane (biogas) and/or its use or not for energy recovery.

This group project includes project activity instances from sectoral scope 3 and 13. Thus, the procedure for each sectoral scope at the PAI level is presented separately below.

At the PAI level – Sectoral scope 3

The project scenario for sectoral scope 3 is the energy consumption per type of fuel or electricity after the project activity instance implementation. Project emissions are determined in three steps:

1. Determination of the volume of energy type consumption

In accordance with the VM0018 methodology, the volume for each type of fuel combusted or electricity consumed from the grid is determined by third party invoices consolidated monthly or annually provided by Client Facilities.

2. Selection of the emission factor of the energy type

   In accordance with the VM0018 methodology, the project proponent identified the most appropriate emission factors for thermal energy, fuel types, and electricity. The emission factors will be sourced from:

   a) Government of Canada: *National Inventory Report* 1990-2022 (2024). The emission factors shall be updated annually during monitoring with the most recent version available. For more information regarding sectoral scope 3 emission factors, see Table 6 below.

   b) In the absence of regional data, IPCC defaults can be used from the most recent version of the *IPCC Guidelines for National Greenhouse Gas Inventories* providing they are deemed to reasonably represent local circumstances.

Table 6 : Energy emission factors for sectoral scope 3

Energy type	Unit	GHG Emissions in tCO_2e/Unit	Source
Butane	L	0.00177629	NIR 1990-2022-2, 2024
Coke (Coal coke)	kg	0.00317914	NIR 1990-2022-2, 2024
Diesel	L	0.00268901	NIR 1990-2022-2, 2024
Ethane	L	0.00101529	NIR 1990-2022-2, 2024
Fuel oil no. 1 and 2	L	0.00276194	NIR 1990-2022-2, 2024
Fuel oil no. 5 and 6	L	0.00317456	NIR 1990-2022-2, 2024
Gasoline (Automotive)	L	0.00231510	NIR 1990-2022-2, 2024
Kerosene	L	0.00256894	NIR 1990-2022-2, 2024
Natural gas	m^3	0.00193131	NIR 1990-2022-2, 2024
Propane	L	0.00154429	NIR 1990-2022-2, 2024
Wood waste (dry, 0% moisture)	kg	0.00002135	NIR 1990-2022-2, 2024

Source: National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024, Part 2, Table A6.1-1 to Table A6.1-12, 2022 values.[32]

[32] National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024 , Part 2, Environment and Climate Change Canada: En81-4-2022-2-eng.pdf

Table 7 : Grid electricity emission factor for sectoral scope 3

Energy type	Unit	GHG Emissions in tCO_2e/Unit	Source
Electricity (grid generation)	kWh	0.000038	RIN 1990-2022-3, 2024

Source: National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024, Part 3, Table A13-7, 2022 value. [33]

Table 8: Thermal energy emission factor for sectoral scope 3

Energy type	Unit	GHG Emissions in tCO_2e/Unit	Source
Thermal energy (Steam/Heat)	GJ	0.070050	EPA, June 2024[34]

3. Determination of project emissions

Project emissions (PE_y) are calculated as follows:

Equation (11)

$$PE_y = Vol.Fuel\ i\ \times\ EF\ Fuel\ i\ CO_2e$$

Where:

PE_y = Project emission in a year y (tCO_2e)

$Vol.Fuel\ i$ = Project volume of energy or fossil fuel consumption for fuel type *i (L,* m^3, kg, or kWh)

$EF\ Fuel\ i\ CO_2e$ = Emission factor of the energy type *i* (tCO_2e/L, m^3, kg, or kWh)

Or, as detailed in the VM0018:

Equation (12)

$$PE_y = \sum[(Emissions_{Building/System\ Energy\ Consumption\ with\ ECM}) + (Emissions_{Maintenance}) + (Emissions_{Unit\ Operation})]$$

[33] National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada, Part 3, Table A13-7: En81-4-2022-3-eng.pdf

[34] Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories, version 5 June 2024, Table 7: https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

To determine:

Equation (13)

Emissions Building/System Energy Consumption with ECM

$$= \sum [(Vol.Fuel\ i\ \times EF\ Fuel\ i\ CO2)\ ;\ (GWP_{CH4} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{CH4})\ ;\ (GWP_{N2O} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{N2O})\ ] + [Electricity\ \times\ EF\ Grid\ CO_2e] + [Thermal\ Energy\ \times\ EF\ Thermal\ Energy\ CO_2e]$$

Equation (14)

Emissions Maintenance

$$= \sum [(Vol.Fuel\ i\ \times EF\ Fuel\ i\ CO2)\ ;\ (GWP_{CH4} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{CH4})\ ;\ (GWP_{N2O} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{N2O})\ ] + [Electricity\ \times\ EF\ Grid\ CO_2e] + [Thermal\ Energy\ \times\ EF\ Thermal\ Energy\ CO_2e]$$

Equation (15)

Emissions Unit Operation

$$= \sum [(Vol.Fuel\ i\ \times EF\ Fuel\ i\ CO2)\ ;\ (GWP_{CH4} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{CH4})\ ;\ (GWP_{N2O} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{N2O})\ ] + [Electricity\ \times\ EF\ Grid\ CO_2e] + [Thermal\ Energy\ \times\ EF\ Thermal\ Energy\ CO_2e]$$

Where:

PE_y	=	Project emission in a year y (tCO_2e)
$Vol.Fuel\ i$	=	Project volume of energy or fossil fuel consumption for fuel type *i* (L, m^3, kg, or kWh)
$EF\ Fuel\ i\ CO_2$	=	Emission factor of CO_2 of the energy type *i* (per L, m^3, kg, or kWh)
$GWPCH_4$	=	Global warming potential of methane
$EF\ Fuel\ i\ CH_4$	=	Emission factor of CH_4 of the energy type *i* (per L, m^3, kg, or kWh)
$GWP\ N_2O$	=	Global warming potential of nitrous oxide
$EF\ Fuel\ i\ N_20$	=	Emission factor of N_2O of the energy type *i* (per L, m^3, kg, or kWh)
$Electricity$	=	Quantity of electricity from the grid in kWh
$EF\ Grid\ CO_2e$	=	Emission factor of electricity from the grid in tCO_2e/kWh
$Thermal\ Energy$	=	Quantity of thermal energy in GJ

$EF\ Thermal\ Energy\ CO_2e$ = Emission factor of thermal energy in tCO_2e/GJ

At the PAI level – Sectoral scope 13

The project scenario for sectoral scope 13 is the waste stream or waste type avoided from landfill and treated through an alternative management scenario such as recycling or composting. The project emissions are calculated using one of the two following options:

Option 1

Project emissions for option 1 are determined in three steps:

1. Determination of the amount of waste type diverted from landfill

   In accordance with the VM0018 methodology, the amount for each type of waste material diverted from conventional landfill disposal may be measured by continuous metering and/or invoice reconciliation provided by the Client Facility. The amount of waste material diverted from landfill may be measured upon departure from the waste management site. It must be ensured that no material is then sent to landfill without being accounted for.

2. Selection of the emission factor of the waste type an management scenario

   An emission factor from the U.S. Environmental Protection Agency Waste Reduction Model (EPA WARM) shall be selected according to the waste type and the management scenario other than landfill. PP shall use the most recent version available of the WARM tool at the time of quantifying emission reductions for each monitoring period. For more information regarding sectoral scope 13 emission factors, see Table 9 below.

Table 9 : Emissions factors for sectoral scope 13

Waste type	Unit	GHG Emissions per Ton of Material Recycled ($MTCO_2e$)	GHG Emissions per Ton of Material Composted ($MTCO_2e$)
Corrugated container/cardboard	MT	-3.455141	N/A
Office paper	MT	-3.155848	N/A
Mixed paper (general)	MT	-3.907167	N/A
Food waste	MT	N/A	-0.167653
Grains	MT	N/A	-0.167653
Yard trimmings	MT	N/A	-0.116709
Branches	MT	N/A	-0.116709
Mixed plastics	MT	-1.019927	N/A
Dimensional lumber	MT	-1.828853	N/A
Mixed recyclables	MT	-3.086648	N/A

Mixed organics	MT	N/A	-0.143709

Source: U.S EPA WARM, version 16 (December 2023)[35]

The emission factors from the WARM have the following settings selected in order to reflect more closely the conditions of the geographic area:

- "National Average" is selected to calculate emissions from landfilling based on the estimated proportions of landfills with LFG control.
- "Flare" is selected to assume that the baseline scenario for landfilling always includes the flaring of landfill gas to remain conservative.
- "Typical operation – DEFAULT" is selected to represent the average landfill in terms of gas recovery efficiency, which represents an oxidation factor (OX) of 0.2.
- "Moderate (k = 0.04)" is selected to represent the decay rate of the Ontario province, based on an average annual precipitation rate of 32 inches[36]. A moderate decay rate is associated with a precipitation rate of 20 to 40 inches of precipitation per year[37].

The EPA WARM is a model that is based on rigorous scientific research and has been peer-reviewed. More information can be found in the WARM background documentation.

3. Determination of project emissions

Project emissions (PEy) are calculated as follows:

Equation (16)

$$PE_y = WS_{BL,y} \times EF_{13}$$

Where:

PE_y = Project emissions in a year y (tCO_2e)

$WS_{BL,y}$ = Volume of waste material type diverted from the landfill in year $_y$ (t)

[35] U.S. EPA WARM version 16 (December 2023): https://www.epa.gov/warm/versions-waste-reduction-model#v16

[36] Environment and Natural Resources, Government of Canada. Canadian Climate Normals 1991-2020 Data : https://climate.weather.gc.ca/climate_normals/results_1991_2020_e.html?searchType=stnProv&lstProvince=ON&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=207000000&dispBack=0

[37] U.S. EPA Documentation Chapters for Greenhouse Gas Emission, Energy and Economic Factors Used in the Waste Reduction Model, Management Practices Chapters. December 2023, page 6-9: https://www.epa.gov/system/files/documents/2024-01/warm_management_practices_v16_dec.pdf

EF_{13} = Emission factor of the waste type is selected with consideration for the different management scenario (tCO_2e).

Option 2

Project emissions for option 2 are determined with the following:

Equation (17)

$$Emissions_{Project\ WASTE} = Emissions_{Waste\ decomposition\ and\ methane\ release} + Emissions_{Energy\ consumption\ from\ waste\ processing} + Emissions_{Energy\ consumed\ from\ alternative\ waste\ processing/use} + Emissions_{Process\ emissions\ from\ alternative\ processing\ of\ waste}$$

To determine "$Emissions_{Waste\ decomposition\ and\ methane\ release}$":

Equation (18)

$$Emissions_{Waste\ Decompostion\ and\ Methane\ Release} = 1000 \times \varphi \times (1-f) \times GWP_{CH4} \times (1-OX) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_{x=1}^{y} \sum_{j} \times (W_{j,x} \times DOC_j \times e^{-kj \times (y-x)} \times (1-e^{-kj})$$

Where:

φ	=	Model correction factor to account for model uncertainties
f	=	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents methane emissions
GWP_{CH4}	=	Global Warming Potential of methane
OX	=	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
F	=	Fraction of methane in the SWDS gas (volume fraction)
$DOC_{f,y}$	=	Fraction of degradable organic carbon (DOC) that can decompose
MCF_y	=	Methane correction factor
$W_{j,x}$	=	Mass of waste material type j sent to landfill in the year x (tons)
DOC_j	=	Fraction of degradable organic carbon (by weight) in the waste type j
k	=	Decay rate for the waste type j
j	=	Waste type category (index)
y	=	Year for which methane emissions are calculated

To determine:

Emissions Energy consumption from waste processing

$$= \sum [(Vol.Fuel\ i\ \times EF\ Fuel\ i\ CO2)\ ;\ (GWP_{CH4} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{CH4})\ ;\ (GWP_{N2O} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{N2O})\ ] + [Electricity\ \times\ EF\ Grid\ CO_2e] + [Thermal\ Energy\ \times\ EF\ Thermal\ Energy\ CO_2e]$$

Equation (19)

Emissions Energy consumed from alternative waste processing/use

$$= \sum [(Vol.Fuel\ i\ \times EF\ Fuel\ i\ CO2)\ ;\ (GWP_{CH4} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{CH4})\ ;\ (GWP_{N2O} \times Vol.Fuel\ i\ \times EF\ Fuel\ i\ _{N2O})\ ] + [Electricity\ \times\ EF\ Grid\ CO_2e] + [Thermal\ Energy\ \times\ EF\ Thermal\ Energy\ CO_2e]$$

Equation (20)

Emissions Process emissions from alternative processing of waste

$$= \sum [(Mass\ _{CO2})\ ;\ (Mass\ _{CH4})\ ;\ (Mass\ _{N2O})\ ]$$

Equation (21)

Where:

$Mass\ _{CO2}$ = Mass of CO2 emitted as process emissions

$Mass\ _{CH4}$ = Mass of CH4 emitted as process emissions

$Mass\ _{N2O}$ = Mass of N2O emitted as process emissions

The calculation of the project emissions of the initial PAI included in this group project, is detailed in Appendix 2.

Project Emissions Estimation

As the project involves ex-post recruitment of PAIs, actual GHG emission reductions will be calculated during each monitoring period based on real and verifiable data. However, for the purpose of estimating expected project emissions over the crediting period, the following set of assumptions was applied:

a) **Estimated CF recruitment over the crediting period**

The project proponent estimates the recruitment capacity of 20 Client Facilities in the first monitoring period, assuming a doubling of capacity each subsequent period. The table below presents the estimated growth:

Year	Initial CF	Estimated CFs recruited	Total CFs
Year 2026	1	20	21
Year 2027	1	40	41
Year 2028	1	80	81
Year 2029	1	160	161
Year 2030	1	320	321
Year 2031	1	640	641
Year 2032	1	1,280	1,281

b) **Estimation of average PAIs per CF**

The average number of PAIs per CF is derived from historical data from project VCS ID929, implemented under the same methodology. The data below summarizes the relevant monitoring periods:

	MP1	MP2	MP3	MP4	MP5	MP6	MP7
Total number of PAI	802	820	818	818	689	2,534	2,645
Total number of CF	84	84	83	83	83	87	91
Number of PAIs / CF	10	10	10	10	8	29	29
	Average number of PAIs per CFs						**15**

c) **Estimated PAI recruitment over the crediting period**

The number of PAIs was calculated by multiplying the estimated number of CFs by the average number of PAIs per CF:

Year	Estimated PAI recruited
Year 2026	300
Year 2027	600
Year 2028	1,200
Year 2029	2,400
Year 2030	4,800
Year 2031	9,600
Year 2032	19,200

d) **Average project emissions per PAI**

Based on historical data from project VCS ID929, the average project emissions per PAI were calculated as 50 tCO_2e. Supporting calculations were provided to the VVB in a separate Excel sheet.

e) **Estimated total project emissions**

Project emissions for each year were estimated using the average PE per PAI (50 tCO_2e) and the projected number of PAIs. The following formula was applied:

PEy = (Estimated PAIs x 50 tCO_2e) + 3 tCO_2e

Where 3 tCO_2e corresponds to the project emissions of the initial PAI (see Appendix 2).

For example, in 2026:

PE_{2026} = (300 x 50 tCO2e) + 3 tCO2e

PE_{2026} = 15,003 tCO_2e

Table 10 : Estimated project emissions of the proposed project activity

Year	Estimated project emissions (tCO_2e)
Year 2026	15,003
Year 2027	30,003
Year 2028	60,003
Year 2029	120,003
Year 2030	240,003
Year 2031	480,003
Year 2032	960,003
Total	**1,905,021**

4.3 Leakage Emissions

At the project unit level, leakage is *de minimus*, thus Ley = 0.

As specified in section 1.19.1, leakage emissions will be assessed and calculated at the PAI level, when new PAIs are added to the group project. Leakage emissions for the initial PAI have been assessed in Appendix 2, The assessment concluded that there is no material leakage risk that could undermine its emissions reduction benefits. Therefore, leakage for this initial PAI is 0 tCO_2e.

4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

The Emission Reductions (ER) are calculated by subtracting the Project Emissions from the Baseline Emissions, according to the following formula:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in a year y (tCO_2e)

BE_y = Baseline emissions in a year y (tCO_2e)

PE_y = Project emissions in a year y (tCO_2e)

LE_y = Leakage emissions in a year y (tCO_2e)

Vintage period	Estimated baseline emissions (tCO_2e)	Estimated project emissions (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated reduction VCUs (tCO_2e)	Estimated removal VCUs (tCO_2e)	Estimated total VCUs (tCO_2e)
01-Jan-2026 to 31-Dec-2026	182,421	15,003	*0*	*167,418*	*0*	*167,418*
01-Jan-2027 to 31-Dec-2027	364,821	30,003	*0*	334,818	0	334,818
01-Jan-2028 to 31-Dec-2028	729,621	60,003	*0*	669,618	0	669,618
01-Jan-2029 to 31-Dec-2029	1,459,221	120,003	*0*	1,339,218	0	1,339,218
01-Jan-2030 to 31-Dec-2030	2,918,421	240,003	*0*	2,678,418	0	2,678,418
01-Jan-2031 to 31-Dec-2031	5,836,821	480,003	*0*	5,356,818	0	5,356,818
01-Jan-2032 to 31-Dec-2032	11,673,621	960,003	*0*	10,713,618	0	10,713,618
Total	**23,164,947**	**1,905,021**	*0*	**21,259,926**	0	**21,259,926**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	EF Thermal Energy $_{CO2e}$
Data unit	Kg CO_2e per GJ
Description	CO_2e emissions factor for local generation of thermal energy
Source of data	For the Territory of interest, the project proponent identified the most appropriate CO_2e emission factor for thermal energy (heat and steam) used under the project scenario. The source of the data is the U.S. Environmental Protection Agency's (EPA) Emission Factors for Greenhouse Gas Inventories, version 5 June 2024, Table 7. PP shall use the most recent version available of this source. Otherwise, IPCC defaults must be used from the most recent version of IPCC Guidelines for National Greenhouse Gas Inventories providing they are deemed to reasonably represent local circumstances. The project proponent must choose the values in a conservative manner and justify the choice.
Value applied	70.050022 kg CO_2e/GJ or 0.070050022 tCO_2e/GJ
Justification of choice of data or description of measurement methods and procedures applied	The emission factor for thermal energy from the EPA's Emission Factors for Greenhouse Gas Inventories (June 2024)[38] was identified as most conservative in comparison with the EIA-1605. The emission factor from the EPA also allowed for the application of the AR5 GWPs as required by the VCS Standard v.4.5.
Purpose of data	The EF Thermal Energy are used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	EF Fuel $_{i\ N20}$
Data unit	Kg N_2O per L, m^3, or other

[38] Environmental Protection Agency (EPA) Emission Factors for Greenhouse Gas Inventories, version 5 June 2024, Table 7: https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Description	N_2O emissions factor for combustion of each type of fuel (EF Fuel i N_2O)
Source of data	For both mobile and stationary fuel combustion for the Territory of interest, the project proponent must identify the most appropriate emission factors used under the project condition. Regional data (for example: EPA's AP 42, Compilation of Air Pollutant Emission Factors) shall be used. In its absence, IPCC defaults must be used from the most recent version of IPCC Guidelines for National Greenhouse Gas Inventories providing they are deemed to reasonably represent local circumstances. The project proponent must choose the values in a conservative manner and justify the choice. **Initial PAI:** Diesel: the source of the value applied for the initial PAI is: National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024, Part 2, Table A6.1-1 to Table A6.1-12, 2022 values.
Value applied	All emission factors (EF) required and used for the calculation of this item are described for each generic project activity instance of this project. These EF are taking account of the CH_4, N_2O and CO_2 emissions. **Initial PAI:** Diesel: the value applied for the initial PAI is 0.022 g N_2O/L.
Justification of choice of data or description of measurement methods and procedures applied	This is one of the most comprehensive fuel emission factor databases available.
Purpose of data	The EF Fuel is used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	EF Fuel $_{i\ CH4}$
Data unit	Kg CH_4 per L, m^3, or other
Description	CH_4 emissions factor for combustion of each type of fuel (EF Fuel $_{i\ CH4}$)
Source of data	For both mobile and stationary fuel combustion for the Territory of interest, the project proponent must identify the most appropriate emission factors for the source of thermal energy used under the project scenario. Regional data (for example: EPA's AP 42, Compilation of Air Pollutant Emission Factors) shall be used. In its absence, IPCC defaults can be used from the most recent version of IPCC Guidelines

	for National Greenhouse Gas Inventories providing they are deemed to reasonably represent local circumstances. The project proponent must choose the values in a conservative manner and justify the choice. **Initial PAI:** Diesel: the source of the value applied for the initial PAI is: National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024, Part 2, Table A6.1-1 to Table A6.1-12, 2022 values.
Value applied	All emission factors (EF) required and used to the calculation of this item are described for each generic project activity instance of this project. These EF are taking account of the CH_4, N_2O and CO_2 emissions. **Initial PAI:** Diesel: the value applied for the initial PAI is 0.078 g CH_4/L.
Justification of choice of data or description of measurement methods and procedures applied	This is one of the most comprehensive fuel emission factor databases available.
Purpose of data	The EF Fuel are used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	EF Fuel $_{i\,CO2}$
Data unit	Kg CO_2 per L, m^3, or other
Description	CO_2 Emissions Factor for combustion of each type of fuel (EF Fuel $_{i\,CO2}$)
Source of data	For both mobile and stationary fuel combustion for the Territory of interest, the project proponent must identify the most appropriate emission factors for the source of thermal energy used under the project scenario. Regional data (for example: EPA's AP 42, Compilation of Air Pollutant Emission Factors) shall be used. In its absence, IPCC defaults can be used from the most recent version of IPCC Guidelines for National Greenhouse Gas Inventories providing they are deemed to reasonably represent local circumstances. The project proponent must choose the values in a conservative manner and justify the choice. **Initial PAI:** Diesel: the source of the value applied for the initial PAI is: National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024, Part 2, Table A6.1-1 to Table A6.1-12, 2022 values.

Value applied	All emission factors (EF) required and used to the calculation of this item are described for each generic project activity instance of this project. These EF are taking account of the CH_4, N_2O and CO_2 emissions. **Initial PAI:** Diesel: the value applied for the initial PAI is 2681 g CO_2/L.
Justification of choice of data or description of measurement methods and procedures applied	This is one of the most comprehensive fuel emission factor databases available.
Purpose of data	The EF Fuel are used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	ø
Data unit	-
Description	Model correction factor to account for model uncertainties
Source of data	This factor is determined using the CDM's methodological tool 04 "Emissions from solid waste disposal sites (Version 08.1)" (CDM, 2017).
Value applied	0.85
Justification of choice of data or description of measurement methods and procedures applied	The CDM's methodological tool 04 is the most used tool for calculation landfill gas emission reductions. The default value selected was chosen because it corresponds to a humid/wet climate condition, and the "Application B" defined by the tool. Ontario, particularly in its southern and central regions, is classified under the humid continental climate zone (Köppen Dfa/Dfb), and its in northern regions is classified under the sub-Arctic climate zone (Köppen Dfc) [39]. These climate zones are characterized by no dry seasons, sufficient to abundant precipitation annually, and humid summers. According to Environment and Climate Change Canada's datasets, annual precipitation in Ontario commonly exceeds 800-1,000 mm. For example, Toronto has an average total annual precipitation of 822.7

[39] Canada's Climatic Regions, Government of Canada: https://ftp.geogratis.gc.ca/pub/nrcan_rncan/raster/atlas_3_ed/eng/environment/climate/030.pdf

	mm[40], and Ottawa receives an average total annual precipitation of 938.1 mm[41]. In addition, for this group project, the amounts of waste types will be monitored and calculated through sampling.
Purpose of data	The ø *i*s used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	GWP_{CH4}
Data unit	t CO_2e/t CH_4
Description	*Global Warming Potential of methane*
Source of data	IPCC Fifth Assessment Report
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	The default value selected was chosen because it corresponds to the VCS Standard v.4.7, section 3.15.4, Table 2 requirements.
Purpose of data	The GWP_{CH4} factor is used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	OX
Data unit	-
Description	Default value for the oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)

[40] 1991 to 2020 Canadian Climate Normals Data: City of Toronto, Government of Canada

[41] 1991 to 2020 Canadian Climate Normals Data: Ottawa, Government of Canada

Source of data	This factor is determined using the CDM's methodological tool 04 "Emissions from solid waste disposal sites (Version 08.1)" (CDM, 2017). Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas inventories.
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	The value applied is the default value determined by the CDM Tool 04, which is the most used tool for the calculation of landfill gas emission reductions.
Purpose of data	The OX factor is used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	F
Data unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	The value applied is the default value determined by the CDM Tool 04, which is the most used tool for the calculation of landfill gas emission reductions.
Purpose of data	The F factor is used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	DOC_f
Data unit	Weight fraction
Description	Default value of the fraction of degradable organic carbon (DOC) that can decompose

Source of data	This factor is determined using the CDM's methodological tool 04 "Emissions from solid waste disposal sites (Version 08.1)" (CDM, 2017). IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	The value applied is the default value determined by the CDM Tool 04, which is the most used tool for the calculation of landfill gas emission reductions.
Purpose of data	The DOC factor is used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	MCF
Data unit	-
Description	Methane correction factor
Source of data	This factor is determined using the CDM's methodological tool 04 "Emissions from solid waste disposal sites (Version 08.1)" (CDM, 2017). IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	The value applied is the following default value: 1.0 for anaerobic managed solid waste disposal sites. These must have controlled placement of waste (i.e. waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) levelling of the waste;
Justification of choice of data or description of measurement methods and procedures applied	The value applied is the default value for anaerobic managed solid waste disposal sites (SWDS) determined by the CDM Tool 04, which is the most used tool for the calculation of landfill gas emission reductions. This default value 1.0 for anaerobic managed solid waste disposal sites is selected since it aligns with Ontario regulations [42,43]: • Deposition areas: R.R.O 1990 Reg. 347 (under the Environmental Protection Act), section 11, prescribes that waste must be

[42] R.R.O 1990, Reg. 347: General – Waste Management, under Ontario's Environmental Protection Act: https://www.ontario.ca/laws/regulation/900347#act-verion

[43] O. Reg 232/98: Landfilling Site, under Ontario's Environmental Protection Act: https://www.ontario.ca/laws/regulation/980232#BK7

	deposited exclusively in an orderly manner in designated fill areas and that site access is restricted to authorized personnel. • Scavenging control: R.R.O 1990 Reg. 347 (under the Environmental Protection Act), section 11, indicates that scavenging is not permitted. • Degree of control fires: O. Reg. 232/98 (under the Environmental Protection Act), section 22, indicates that the owner and operator of a landfilling site must ensure that no municipal waste is burned as part of the landfilling operation. An exception exists only for clean wood and brush, which may be burned during daylight hours under controlled and supervised conditions in a segregated area of the site. • Cover material and compacting: O. Reg. 232/98 (under the Environmental Protection Act), section 28 indicates that all waste accepted for disposal must be placed in the designated waste fill zone and covered at the end of each working day with daily cover material. The daily cover may consist of soil, foundry sand, wood chips, compost, or other approved materials. R.R.O. 1990, Reg. 347, section 11 also requires that waste be deposited in an orderly manner, compacted adequately in to cells, and covered, using proper equipment as part of standard landfill operations. • Levelling of waste: Although not always explicit, R.R.O. 1990, Reg. 347, Parts III and V, governs the design of landfill sites, including final slope, daily cover, groundwater protection, etc., which indicate that levelling of waste is taken into consideration in the design and operations of landfill sites.
Purpose of data	The MCF factor is used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	DOC_j
Data unit	-
Description	Fraction of degradable organic carbon in the waste type *j* (weight fraction)
Source of data	This factor is determined using the CDM's methodological tool 04 "Emissions from solid waste disposal sites (Version 08.1)" (CDM, 2017). IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied	For MSW, the following values for the different waste types *j* should be applied:

	Default values for DOC_j **Waste type *j*** / ***DOC_j (% wet waste)*** Wood and wood products: 43 Pulp, paper and cardboard (other than sludge): 40 Food, food waste, beverages and tobacco (other than sludge): 15 Textiles: 24 Garden, yard and park waste: 20 Glass, plastic, metal, other inert waste: 0 For the following residual waste types, the default values may be used or derived, as follows: (a) For empty fruit brunches (EFB), as their characteristics are similar to garden waste, the value for garden, yard and park waste may be used as a default. (b) For industrial sludge, either a value of 9 percent (% wet sludge) may be used as a default, assuming an organic dry matter content of 35 percent, or alternatively, if the percentage of organic dry matter content is known, then the DOC value may be calculated as follows: DOCj (% wet sludge) = 9 * (% organic dry matter content/35) (c) For domestic sludge, either a value of 5 per cent (% wet sludge) may be used as a default, assuming an organic dry matter content of 10 per cent, or alternatively, if the percentage of organic dry matter content is known, then the DOC value may be calculated as follows: DOCj (% wet sludge) = 5 * (% organic dry matter content/10). If a waste type is not comparable to MSW and cannot clearly be described as a combination of waste types in the table above or if a default value is not available or if the project participants wish to measure DOCj, then project participants should measure DOCj in an ignition loss test according to the procedure in EN 15169 or similar national or international standards. This measurement is only required once for each waste type j and the value determined for DOCj remains valid during the crediting period.
Justification of choice of data or description of measurement methods and procedures applied	The values applied are the default values determined by the CDM Tool 04, which is the most used tool for the calculation of landfill gas emission reductions.
Purpose of data	The DOC factor is used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

Data / Parameter	k_j
Data unit	1/yr
Description	Decay rate for the waste type *j*
Source of data	This factor is determined using the CDM's methodological tool 04 "Emissions from solid waste disposal sites (Version 08.1)" (CDM, 2017). IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)

Value applied	Apply the following default values for the different waste types j.
	
	Boreal and Temperate – Wet (MAP/PET > 1)
	
	• **Slowly degrading waste**
	  ○ Pulp, paper, cardboard (other than sludge), textiles → **0.06**
	  ○ Wood, wood products and straw → **0.03**
	• **Moderately degrading waste**
	  ○ Other (non-food) organic putrescible garden and park waste → **0.10**
	• **Rapidly degrading waste**
	  ○ Food, food waste, beverages and tobacco (other than sludge) → **0.185**
	
	Climate conditions in Ontario meet the criteria for the Boreal and Temperate – Wet (MAP/PET > 1) category.
	
	Mean annual temperatures (MAT) range from -0.5°C to 10.6°C, all well below the 20°C threshold. Mean annual precipitation (MAP) varies across the province from approximately 600 mm to 1,100 mm.
	
	For this analysis, climate data from the 1991-2020 period[44] were used for five representative locations, selected to capture the range in MAP and MAT observed across the province:
	
	• Kenora: 697 mm / -0.5°C
	• Toronto: 897 mm / 9°C
	• Ottawa: 999 mm / 7°C
	• Norfolk: 1,008 mm / 9.2°C
	• Chatsworth: 1,112 mm / 7.3°C
	
	Using the average MAP and MAT from these locations and applying the Thornthwaite method, the estimated MAP/PET ratio of 1.92. This exceeds the threshold value of 1, confirming that Ontario's climate fits within the Boreal and Temperate – Wet (MAP/PET > 1).

[44] Data were obtained from ClimateData.ca under the CMIP6 projections for the SSP1–2.6 scenario. The data reflect the 1991–2020 period and uses the median values for mean annual temperature and total annual precipitation at each location. (ClimateData.ca, accessed August 2025)

Justification of choice of data or description of measurement methods and procedures applied	NB: MAT – mean annual temperature, MAP – Mean annual precipitation, PET – potential evapotranspiration. MAP/PET is the ratio between the mean annual precipitation and the potential evapotranspiration. The climatic conditions of the Ontario Province are boreal and temperate, with a wet climate (>1), Therefore, PP should use the default values accordingly. If a waste type, prevented from disposal by the proposed project activity, cannot clearly be attributed to one of the waste types in the table above, PP shall choose among the waste types that have similar characteristics that waste type where the values of DOCj and k_j result in a conservative estimate (lowest emissions).
Purpose of data	The k_j factor is used for: • The Calculation of baseline emissions • The Calculation of project emissions
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	Volume or Quantity of $Fuel_i$
Data unit	L, m^3, kg or MT
Description	Volume or weight of each type of fuel combusted. This volume or weight of fuel is adjusted for both functional equivalence and units of productivity.
Source of data	The volume of fuel is determined by supplier meters (which are regularly calibrated) and reported on bill of lading and invoices, consolidated monthly or at each tanking.
Description of measurement methods and procedures to be applied	The Bill of Lading and the invoices of each Fuel delivery is consolidated. End of period residual Fuel volume evaluation could be estimated.
Frequency of monitoring/recording	At each delivery, or a monthly basis, the volume or quantity of Fuel is measured and recorded. Evidence will be recorded in the Bill of Lading and Invoices.
Value applied	Available in individual quantification sheet of each Client Facility
Monitoring equipment	The monitoring equipment includes:

	• Flow meters installed on tanker. By law, such flow meters are to be calibrated regularly. Supplier sealed flow meters installed at Client Facility, such as gas meter. The calibration of fuel meters in Ontario is regulated through federal oversight by Measurement Canada's *Electricity and Gas Inspection Act.*
QA/QC procedures to be applied	The SPSC system applies the following QC/QA procedures: • Data comparison with past performance • Data comparison with similar Project Unit • Data comparison with standard benchmark (Ashrae 90.1, Model National Energy Code for Building MNECB) • Data comparison with sector association. • Project Unit Investigation for root cause analysis of data profile if outside range Project Unit Physical audit to validate the measurement devices conditions and collect related evidence.
Purpose of data	• Calculation of baseline emissions • Calculation of project emissions
Calculation method	In case where fuels are tanked, end of period adjustment would be assessed with Client Facility internal gauge: the incertitude linked to this assessment is reduced by the number of times the tank is filled during the period. In case Project Unit is supplied by Client Facility tank, the portion is justified by evidence.
Comments	-

Data / Parameter	Electricity
Data unit	kWh
Description	The amount of electricity consumed from the grid.
Source of data	The amount of electricity consumed from the grid is determined by the supplier calibrated kWh meter and invoices, consolidated monthly or bimonthly.
Description of measurement methods	Monthly or bimonthly invoices are filed for verification.

and procedures to be applied	
Frequency of monitoring/recording	Monthly or bimonthly, with consumption statement. Evidence will be recorded on Invoices.
Value applied	Available in individual quantification sheet of each client facility
Monitoring equipment	The monitoring equipment includes: • Electricity meters installed at the entry of Client Facility/Project Unit electricity supply. The calibration of electricity meters in Ontario is regulated through a combination of federal oversight by Measurement Canada's *Electricity and Gas Inspection Act* and provincial regulations under the *Electricity Act, 1998*. They collectively ensure that electricity meters provide accurate readings. Under Measurement Canada, reverification periods for electricity meters and metering installations is generally 8 years[45].
QA/QC procedures to be applied	The SPSC system applies the following QC/QA procedures: • Data comparison with past performance • Data comparison with similar Project Unit • Data comparison with standard benchmark (Ashrae 90.1, Model National Energy Code for Building MNECB…) • Data comparison with sector association. • Project Unit Investigation for root cause analysis of data profile if outside range Project Unit Physical audit to validate the measurement devices conditions and collect related evidence.
Purpose of data	• Calculation of reduction emissions
Calculation method	If internal meters are required for the Isolation Parameter Measurement option, electrical consumption is determined by meters which are calibrated as per the manufacturer's schedule. Alternatively, the energy consumed by the related electrical devices will be equal to the nominal power of the devices over the time of operations.
Comments	-

Data / Parameter	EF Grid CO_2e
Data unit	Kg CO_2e per kWh

[45] Electricity and Gas Inspection Act, Measurement Canada, section 12(1) (a): https://laws-lois.justice.gc.ca/eng/acts/e-4/FullText.html

Description	CO_2e Emissions Factor for electricity from the grid
Source of data	The source of data is the National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada 2024, Part 3, Table A13-7. PP shall use the most recent version available of this source.
Description of measurement methods and procedures to be applied	N/A; this is an emission factor
Frequency of monitoring/recording	N/A; this is an emission factor
Value applied	0.038 kg CO2e/kWh or 0.000038 tCO_2e/kWh
Monitoring equipment	N/A; this is an emission factor
QA/QC procedures to be applied	N/A; this is an emission factor
Purpose of data	• Calculation of baseline emissions and project emissions
Calculation method	N/A; this is an emission factor
Comments	-

Data / Parameter	Thermal Energy
Data unit	GJ
Description	Thermal energy consumed at the client facility. This amount is adjusted for both functional equivalence and units of productivity.
Source of data	Thermal energy crossing the boundary is measured with monthly invoices. If the thermal energy crosses the boundary without a custody caliber meter, only calibrated internal meters is relied upon. Calibration records must be made available during verification.
Description of measurement methods and procedures to be applied	Continuous metering or invoice reconciliation
Frequency of monitoring/recording	Frequency of metering and reconciliation is monthly or most frequently as possible
Value applied	To be determined for each PAI and be made available in each individual Client Facility data sheet.

Monitoring equipment	Calibrated internal meters
QA/QC procedures to be applied	Cross-checked with the quantity of heat invoiced if relevant.
Purpose of data	• Calculation of baseline emissions and project emissions
Calculation method	N/A
Comments	-

Data / Parameter	Quantity of waste $W_{j,x}$
Data unit	Kg or MT
Description	Total amount of waste by weight, which is sent to or diverted from landfill in year x
Source of data	Direct measurement of waste sent to disposal.
Description of measurement methods and procedures to be applied	The weight is determined by scale at recycling premises and/or at Project Unit. The weight is reported on the Bill of Lading for each shipment provided by the Client Facility.
Frequency of monitoring/recording	The weight of waste is reported on the Bill of Lading and/or the Invoice of each shipment provided by the Client Facility and aggregated.
Value applied	Continuously, at each shipment or a monthly basis aggregated annually for year x. Evidence will be recorded on Invoices.
Monitoring equipment	The monitoring equipment includes: Weighting balance.
QA/QC procedures to be applied	The SPSC system applies the following QC/QA procedures: • Data comparison with past performance • Data comparison with similar Project Unit • Data comparison with Data comparison with sector association. • Project Unit Investigation for root cause analysis of data profile if outside range Project Unit Physical audit to validate the measurement devices conditions and collect related evidence.
Purpose of data	• Calculation of project emissions

Calculation method	Waste weight could be expressed in other than SI units, such as ST, Lbs: conversion is made to have waste weight expressed in Kg or MT.
Comments	-

Data / Parameter	f
Data unit	-
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevent the emissions of methane to the atmosphere in year y
Source of data	This factor is determined using the CDM's methodological tool 04 "Emissions from solid waste disposal sites (Version 08.1)" (CDM, 2017). The data used to determine the default value for the fraction of methane at the SWDS is based on the average percentage of LFG volume collected and flared at SWDS in Ontario. The data is sourced from datasets available on the Government of Ontario Data Catalogue (version 27 January 2025)[46]. The data used is the most recent available, from 2021.
Description of measurement methods and procedures to be applied	The average percentage of landfill gas (LFG) volume collected and flared at solid waste disposal sites in Ontario is calculated based on the sum of the averages from all landfills in the province.
Frequency of monitoring/recording	The most recent data available shall be used.
Value applied	0.5694
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	• Calculation of baseline emissions and project emissions
Calculation method	N/A
Comments	-

Data / Parameter	Mass CO_2

[46] Government of Ontario, Data Catalogue: Landfill Gas (17 January 2024): https://data.ontario.ca/dataset/landfill-gas-collection-use-and-destruction/resource/569fad95-7b96-49e2-8fa8-fd293c80ce1d

Data unit	Kg
Description	Mass of CO_2 emitted as a process emissions
Source of data	Measured or estimated
Description of measurement methods and procedures to be applied	This variable can be either measured or estimated. Measured process emissions would be conducted via a continuous monitoring system that records both the flow rate of the gas and the percent composition of CO_2. This would allow a mass to be accurately determined. If measurement is in place, calibration schedules and records must be provided in the project document. If estimation is used in absence of a continuous monitoring system, the details of the mass balance must be provided in the project document. The mass balance must include the justification around an average waste composition used in the mass balance.
Frequency of monitoring/recording	Continuous measurement or hourly estimations
Value applied	To be determined when applicable for each PAI and be made available in each individual Client Facility data sheet.
Monitoring equipment	To be determined when applicable for each PAI
QA/QC procedures to be applied	If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements or cross checking with other reported values.
Purpose of data	• Calculation of baseline emissions and project emissions
Calculation method	N/A
Comments	-

Data / Parameter	Mass N_2O
Data unit	Kg
Description	Mass of N_2O emitted as a process emissions
Source of data	Measured or estimated
Description of measurement methods and procedures to be applied	This variable can be either measured or estimated. Measured process emissions would be conducted via a continuous monitoring system that records both the flow rate of the gas and the percent composition of N_2O. This would allow a mass to be accurately determined. If measurement is in place, calibration schedules and records must be provided in the project document. If estimation is used in absence of a continuous monitoring system, the details of the mass balance must be provided in the project document. The mass balance must include the

	justification around an average waste composition used in the mass balance.
Frequency of monitoring/recording	Continuous measurement or hourly estimations
Value applied	To be determined when applicable for each PAI and be made available in each individual Client Facility data sheet.
Monitoring equipment	To be determined when applicable for each PAI
QA/QC procedures to be applied	If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements or cross checking with other reported values.
Purpose of data	• Calculation of baseline emissions and project emissions
Calculation method	N/A
Comments	-

Data / Parameter	Mass CH_4
Data unit	Kg
Description	Mass of CH_4 emitted as a process emission
Source of data	Measured or estimated
Description of measurement methods and procedures to be applied	This variable can be either measured or estimated. Measured process emissions would be conducted via a continuous monitoring system that records both the flow rate of the gas and the percent composition of CH4. This would allow a mass to be accurately determined. If measurement is in place, calibration schedules and records must be provided in the project document. If estimation is used in the absence of a continuous monitoring system, the details of the mass balance must be provided in the project document. The mass balance must include the justification around an average waste composition used in the mass balance.
Frequency of monitoring/recording	To be determined when applicable for each PAI and be made available in each individual Client Facility data sheet.
Value applied	To be determined when applicable for each PAI
Monitoring equipment	Continuous measurement or hourly estimations
QA/QC procedures to be applied	If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements or cross checking with other reported values.

Purpose of data	• Calculation of baseline emissions and project emissions.
Calculation method	N/A
Comments	-

5.3 Monitoring Plan

The monitoring plan for this grouped project is applied in accordance with the VM0018 methodological requirements. The monitoring plan is described in more details below.

Organizational Structure and responsibilities

The project proponent adheres to the guidelines set out in this monitoring plan to ensure the monitoring is credible, transparent, and conservative.

The responsibilities of the monitoring team are as follow:

- GHG Quantification Manager: Responsible for supervising the monitoring process, data management and filling and compiling the monitoring report.
- Auditing and Quantification team: Responsible for collecting data, cross-checking, conducting audits, and filling individual data sheets and perform calculations for each Client Facility and PAIs.

1. Data Collection

At the time of registration of the project unit (PAI), an audit of the site of the Project Unit takes place, and physical evidence necessary to support the PAI start date and determine the baseline scenario is collected. The data and documentation collection and storage are centrally controlled and administered. Additional information on the procedure is detailed in the Table 11 and Figure 3. The data collected shall be of sufficient quality to fulfill the quantification requirements and be substantiated by client facility records for the purpose of verification.

Further information on the data monitored for each individual project Unit will be available upon request in individual data sheets per client facility.

2. Data Management System

To keep safely all documents and records collected during the monitoring, the record keeping include the following practices:

- Electronic recording of values of logged primary parameters for each measurement interval.
- Offsite electronic back-up of all logged data.
- Storage of all documents and records will be kept in a secure and retrievable manner for at least two years following the end of the project crediting period.

3. Monitoring Report

After the data and physical evidence is collected and sorted, the monitoring report is prepared by the GHG Quantification Manager. It is also ensured that the format and content of the monitoring report are consistent with the monitoring template.

4. Quality Assurance and Quality Control (QA/QC)

The QA/QC is applied to add confidence that all measurements and calculations have been made correctly. The procedures include, but are not limited to:

- At each entry in the Sustainable Community Service Promoter (SCSP) system, controls are run to compare entry to historical data, sectoral and external benchmarks (manual assessment, comparing redundant metered data, and detection of outstanding data/records);
- Investigation may be necessary to get physical evidence of the data entered into the SCSP system;
- Impact of a potential recurring issue will be looked at for all the concerned Project Units;
- Performing recalculations to ensure no mathematical errors have been made.

5. Sampling Approach

In accordance with the VM0018 methodology, confidence interval shall be set to 95%. Project Units in Ontario, Canada will be applicable for sampling if the data collected is stored in Will Solutions system, which is centrally controlled and administered. Since there is no specific guidance in the applied methodology, a 10% precision level shall be used as is recommended in the *Standard: Sampling and surveys for CDM project activities and programmes of activities* (version 09.0) for grouped projects.

For each monitoring period, which consists of one calendar year, a random sample of Project Units will be audited. The sample size will be the square root of the number of Project Units participating to the SCSP system, rounded to the upper whole number. Evidence of the audit are kept, and discrepancies will be analyzed as well as potential impact on related Project Units.

The project proponent will have a documented procedure for determining the sample to be taken when verifying Project Units which will be provided to the VVB for guidance. When necessary, stratified random sampling shall be conducted on homogenous sub-populations, based on an

official territory authority classification or an internationally recognized equivalent such as the North American Industry Classification System (NAICS).

Sample Defect requirements:

- The sample size shall be enlarged to a maximum of 160% of the initial size if the reported values for one or more GHG reduction activities is beyond the acceptable range (defect) and the number of defects exceeds the acceptable quality level.
- The sample size shall be reduced to a maximum of 60% of the initial size if all client facilities reported values are within the acceptable range (no defects) for five consecutive samplings.

6. Non-Conformance Procedure

The project takes an adaptive approach to monitoring plan procedures, altering or adding additional requirements when necessary. The project proponent and the Client Facility documents issues that arise in monitoring and reporting and will adapt procedures to rectify any gaps or inconsistencies in the monitoring plan. This allows for a dynamic and accurate monitoring plan that constantly builds upon and improves previous procedures.

Non-conformances are recorded as separate events, and associated data **is excluded** from eligibility for crediting. In the instance that there are repeated non-conformances, the project proponent applies an adaptive approach to rectifying the situation. Individuals involved in the non-conformance will be contacted, and the reason for the non-conformance will be identified. The procedure will then be adapted in order to ensure the avoidance of similar non-conformances in the future.

Table 11 Data Collection Procedures

			Baseline	Project					
Category	**Activity**	**Measure Option**	**Adjustment**	**Parameter**	**Instrument**	**Frequency**	**Incertitude**	**Impact on reduction**	**Adjustment**
Fuel switching	Biomass boiler	Option B		Mass of processed biomass	Loader bucket	Consolidation every week	Estimate of the average mass in the bucket	None	Process yield
Energy efficiency	Heat recovery: process	Option A	Process yield	Volume of fuel	Volume / quantity on invoice*	Continuous	Negligible as measure devices calibrated	None	
	Heat recovery: process	Option B	Process yield	Temperature and debit (enthalpy)	Thermometer / Debit meter	Continuous	Negligible as measure devices calibrated	None	
	Heat recovery: process	Option A		Volume of fuel	Volume / quantity on invoice* when tanking	Transaction based	Residual inventory at the end of the period	Materiality, decrease with tank filling turnover, compensate on the next period	
	Energy efficiency: building heating	Option A	Unit of productivity	Volume of fuel	Volume / quantity on invoice*	Continuous	Negligible as measure devices calibrated	None	Commercial building: unit of productivity
	Energy efficiency: building HVAC	Option A/ Option B	Unit of productivity	Volume of fuel / energy	Volume / quantity on invoice*	Continuous	Negligible as measure devices calibrated	None	Commercial building: unit of productivity
	Energy efficiency: envelope enhancement	Option A	Unit of productivity	Volume of fuel / energy	Volume / quantity on invoice*	Continuous	Negligible as measure devices calibrated	None	Commercial building: unit of productivity
	Energy efficiency: envelope enhancement	Option B	Unit of productivity	Volume of fuel	Volume / quantity on invoice* when tanking	Transaction based	Residual inventory at the end of the period	Materiality, decrease with tank filling turnover, compensate on the next period	Commercial building: unit of productivity
	Energy efficiency: building lighting	Option A	Light intensity	Nominal Wattage	Manufacturer technical data	At the time installation	Negligible as measure devices calibrated	None	
Waste	Waste diversion	Option B		Waste mass / volume	Mass: balance Volume: container	Transaction based	Weight calculation from volume	Materiality as company charged on container	
	Waste reduction: substitution of single wood pallets by reusable cardboard palette	Option B		Number of palettes and reusage	Number of travels written on palette/ Bill of lading	Monthly consolidation	Wood palette end of life at point of destination	Max: Energy substitution if burn	

The figure below provides the SCPC validation/verification data workflow:

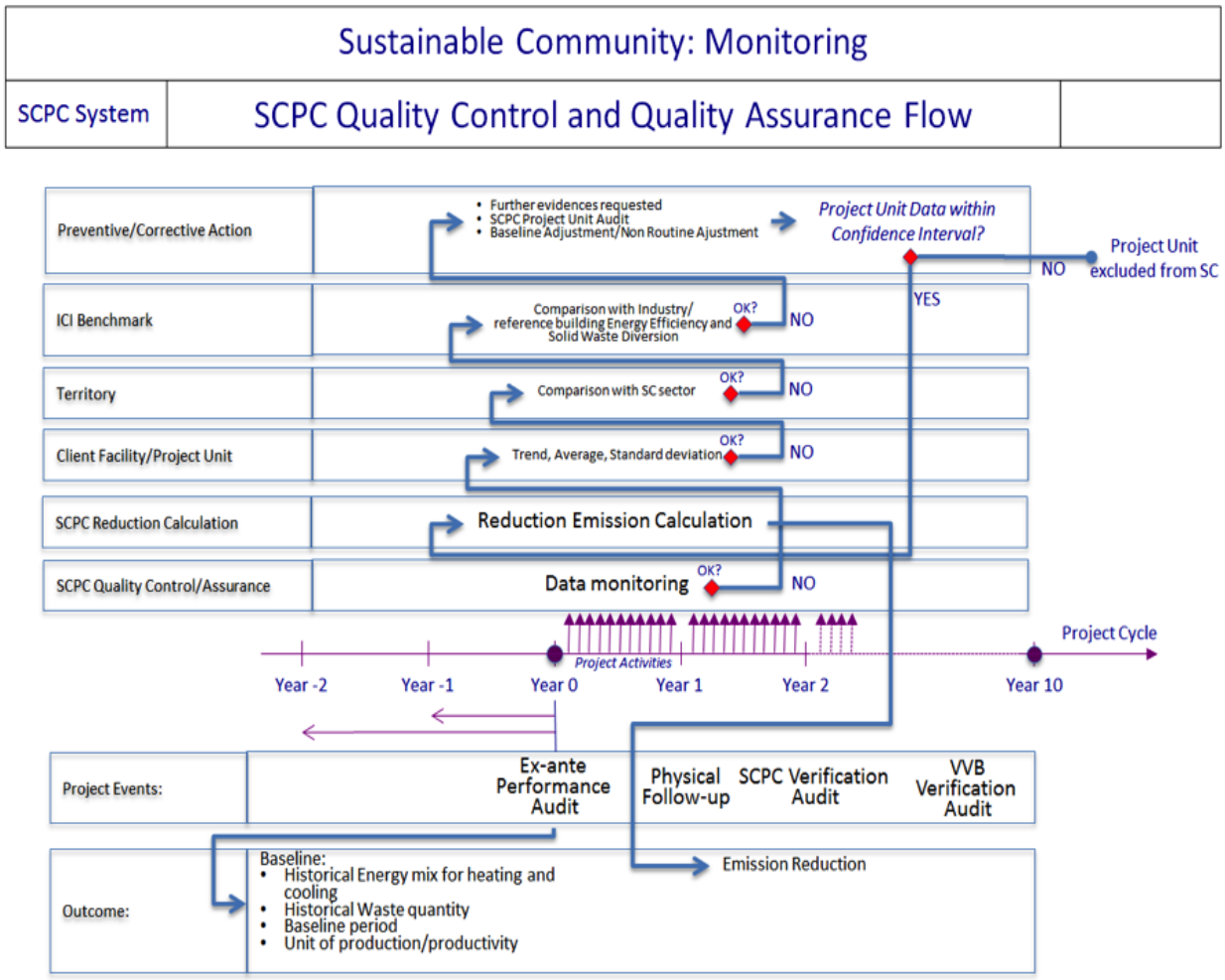


Figure 3 Monitoring, Quality Control and Quality Assessment Flow

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

The table below describes the commercially sensitive information included in the project description to be excluded in the public version.

Section	Information	Justification
All	Client Facility names are anonymized and replaced by Client Facility ID numbers	1) Protecting Client Facility Privacy: Anonymizing client facility names safeguards their privacy, ensuring that sensitive information (e.g. financial and commercial) remains confidential. 2) Mitigating Legal Risks: Anonymizing client facility names ensures that the company adheres to the confidentiality clause outlined in adhesion contract signed with Client Facilities (see clause 9 in adhesion contract). 3) Maintaining Competitive Advantage: Anonymizing Client Facility names prevents competitors from gaining insights into the Project Proponent's client base, strategies, or market positioning. Enhancing Trust and Professionalism: Anonymizing client facility names demonstrates a commitment to professionalism and discretion, fostering trust between the company and its clients (ie. Client Facilities).

APPENDIX 2: INITIAL PAI

The following section details the eligibility, the demonstration of additionality, and the calculation of the baseline and project emissions of the initial PAI included in the group project.

Description and Conditions Prior to Project Initiation

The initial PAI consist in the installation of solar panels on the rooftop of existing storage buildings to reduce reliance on grid electricity and lower diesel consumption from on-site generator use. The diesel generator, housed in a small shed, provides three phase electricity to the grain elevators that transport grain between drying and storage silos.

Eligibility according to section 1.5.1 of the PD

A. Meet the applicability conditions set out in the methodology applied to the project.

Applicability Condition	Justification
1) This methodology is applicable for grouped projects for the quantification of direct and indirect reductions of GHG emissions arising from energy efficiency and waste management project activity instances at client facilities.	The PAI is included in a grouped project to quantify the direct and indirect GHG emission reductions from energy efficiency measures at a client facility.
2) The requirements of this methodology have been designed to meet micro energy efficiency and/or waste diversion project units where the maximum emission reductions from an individual project unit is 5,000 tCO_2e/year.	Covered by eligibility criteria #8 below. The PAI is expected to generate 18 tCO_2e per year in emission reductions, which does not exceed the 5,000 tCO_2e per year capacity limit.
3) Projects can be located in residential, commercial, institutional or industrial buildings/facilities.	The PAI will be located in an industrial facility.
4) The project proponent must demonstrate right of use in respect of the project's GHG emission reductions, which may, for example, entail securing right of use from client facilities.	Covered by eligibility criteria #5 below. The Client Facility signed the adhesion contract on 9 August 2023.
7) Applicable projects will reduce GHG emissions associated with the conversion of primary energy sources to secondary forms of energy.	The initial PAI will reduce GHG emissions associated with the conversion of primary energy sources to secondary forms of energy.
9) Only small on-site power sources, with emission reductions within the threshold limit of this	This PAI involves a small-site power source with emission reductions within the capacity limit of the methodology.

methodology, are applicable for inclusion within the methodology.	
10) Biological or chemical components of the operation must not yield any increase in non-biogenic greenhouse gas emissions compared to the baseline scenario, unless these are accounted for under the applicable flexibility mechanisms as indicated by an affirmation from the project proponent.	The PAI will not increase non-biogenic emissions compared to the baseline scenario.

B. Meet the set of eligibility criteria for the inclusion of new PAIs as per Section 1.5.1 in the PD

Eligibility Criteria	Justification
1) Meet the applicability conditions set out in the methodology applied to the project.	See above table
2) Occur within the designated geographic area of the province of Ontario, Canada, as defined in section 1.13 of the PD.	The geodetic coordinate: 45.283890, -75.199896
3) Have a start date that is the same as or later than 01-January-2026	The PAI is not yet implemented but is expected for 1 January 2026 or after.
4) Only be eligible for crediting from the later of start date of the project activity instance or the start date of the verification period in which they were added to the grouped project, through to the end of the total project crediting period.	The PAI will only be eligible for crediting from the later of start date of the project activity instance or the start date of the verification period in which they were added to the grouped project, through to the end of the total project crediting period.
5) Be registered as a member of the OSC grouped project to demonstrate right of use in respect of the project's GHG emission reductions.	The Client Facility signed the adhesion contract on 9 August 2023.
6) The project activity instance must be auditable, and verifiable as to provide sufficient and relevant information to demonstrate conformance with the set of eligibility criteria and enable evidence gathering.	The PAI is auditable and verifiable and has provided sufficient and relevant information to demonstrate conformance with the set of eligibility criteria and enable evidence gathering.
7) Each Client Facility and their PAIs shall not be or have been enrolled in another VCS project.	The Client Facility and this PAI are not enrolled in another VCS project.
8) Maximum emission reductions from an individual PAI is 5,000 tCO_2e per year.	The PAI is expected to generate 18 tCO_2e per year in emission reductions, which does not exceed the 5,000 tCO_2e per year capacity limit.
9) Each new PAI must apply or use technologies or measures, and demonstrate characteristics	The PAI aligns with the definition of the generic PAI VIII: *Fuel Switch – Demand Side.* It reduces the

consistent with an associated Generic PAI under the relevant sectoral scope (3 and 13),	demand for and consumption of grid electricity within an existing building while also shifting the primary energy source from fossil fuels (i.e. diesel) to a cleaner form of energy (i.e. solar panels), thereby lowering GHG emissions. This project specifically addresses the energy needs of the grain elevator, which is currently supplied by an on-site diesel generator.
10) For these project activities, the baseline will be determined ex-ante or ex-post, with each project activity considered additional in reference to all PAIs defined in Appendix 3.	Since the PAI is not yet implemented, the baseline has been determined ex-ante. Additionality is demonstrated below.

Baseline Scenario

For the initial PAI included in the grouped project, the baseline scenario was identified as follows:

The baseline scenario of this PAI is the continuation of the current practice, where the facility continues to use grid electricity and diesel to fuel the on-site generator to meet its energy needs. This scenario results in higher grid electricity and fossil fuel consumption, thus leading to higher GHG emissions.

Demonstration of Additionality (CDM Tool 02)

STEP 1. Identification of alternative scenarios (Baseline Determination)

S1: The proposed PAI undertaken without being registered under the VCS Program (i.e., without carbon financing).

S2: The continuation of the current situation, not requiring any investment to maintain the current situation, where the facility continues to use grid electricity and diesel to fuel the on-site generator to meet its energy needs.

S2 is selected as the baseline scenario, since this PAI will be considered as an ex-post GHG reduction project activity where real monitored data is available for the pre-project situation.

STEP 2. Barrier analysis

The barrier analysis for all generic PAIs is provided in Appendix 3.

STEP 3. Investment analysis

The project proponent has carried out an investment analysis using the internal rate of return (IRR) as the financial indicator for the PAI. The analysis was conducted for a 10-year period, with an average benchmark of 16%. The IRR calculations included the gross margin, EBITDA, and PAT.

The PAI yielded a negative IRR, with and without carbon credit revenues, indicating that it is a loss-making project activity. This rate is well below the average benchmark IRR of 16%, underlining the project's lack of financial attractiveness in the absence of additional incentives. The IRR highlights the importance of carbon credit revenues in improving the project's financial performance and offsetting its high costs of ownership, demonstrating clear financial additionality.

In addition, the client facility commissioned a cost analysis from a third party to assess the annual cost savings and payback periods associated with installing a solar energy system. The results from this analysis yielded a minimum payback period of 8 years and a maximum payback period of 23 years, which reinforces the financial additionality of this PAI.

STEP 4. Common practice analysis

The common practice analysis for all generic PAIs is provided in Appendix 3. Fuel switching – demand side (VIII) was found to be an uncommon practice within the Province of Ontario.

Baseline and Project Emissions Calculations

Baseline Emissions

The baseline scenario is the energy consumption per type of fuel and grid electricity in the absence of the project activity instance.

i. Determination of the volume of energy type consumption

The volume of diesel and grid electricity consumed is provided by the Client Facility from an energy audit report that retrieved fuel quantities from fuel receipts for the period 01-01-2024 to 31-12-2024.

Energy type	Unit	Volume
Diesel	L	6,751.1
Grid electricity	kWh	91,831

ii. Selection of the emission factor of the energy type

The emission factors selected are as presented below:

Energy type	Unit	GHG Emissions in tCO_2e/Unit	Source
Diesel	L	0.00268901	NIR 1990-2022-2, 2024
Grid Electricity	kWh	0.000038	NIR 1990-2022-3, 2024

iii. Determination of baseline emissions

The baseline emissions (BE_y) for this PAI are calculated as follows:

$$BE_y = Vol.Fuel\ i\ \times\ EF\ Fuel\ i\ CO_2e$$

$$= (6{,}751.1\ L\ \times\ 0.00268901\ tCO2e/L) + (91{,}831\ kWh\ \times 0.000038\ tCO2e/kWh)$$

$$= 21.64\ tCO2e$$

Project Emissions

The project emissions scenario is the energy consumption per type of fuel and grid electricity in the absence of the project activity instance. Energy produced by the solar panels do not emit GHGs once operational, therefore emissions are considered to be 0.

i. Determination of the volume of energy type consumption

The Client Facility has confirmed that the solar panels are expected to replace 100% of diesel consumption, resulting in 0 liters of diesel used in the project emissions scenario. Additionally, the solar panels are expected to replace a portion of grid electricity consumption; however, in the absence of operational data at this stage, a conservative assumption of 0% grid displacement is applied.

Energy type	Unit	Volume
Diesel	L	0
Grid electricity	kWh	91,831

ii. Selection of the emission factor of the energy type

The emission factors selected are as presented below:

Energy type	Unit	GHG Emissions in tCO_2e/Unit	Source
Diesel	L	0.00268901	NIR 1990-2022-2, 2024
Grid Electricity	kWh	0.000038	NIR 1990-2022-3, 2024

iii. Determination of project emissions

The project emissions (PE_y) for this PAI are calculated as follows:

$$PE_y = Vol.Fuel\ i\ \times\ EF\ Fuel\ i\ CO_2e$$

$$= (0\ L\ \times\ 0.00268901\ tCO2e/L) + (91{,}831\ kWh\ \times 0.000038\ tCO2e/kWh)$$

$$= 3.49\ tCO2e$$

Leakage

In accordance with the VM0018 methodology, the project proponent has assessed the likelihood of material leakage for this specific project activity. In the context of the small-scale project activity, the material leakage that could be involved is identified and assessed below:

- Displacement of diesel generator; the Client Facility does not intend on selling the generator and keeping it as backup equipment. Despite that, since the project is small-scale, a single unit's resale would not significantly impact market demand.
- The production of solar panels raw material extraction: the project activity involves the installation of a small number of panels (i.e., ≥ 204 panels) on a single small farm. Its contribution to material demand is negligible in the global supply chain.
- Land Use Change: the project activity will be installed on the rooftop of existing buildings, owned by the Client Facility, meaning it does not lead to environmentally disruptive land-use changes.

In conclusion, since this project activity is small-scale, site-specific, and involves minimal equipment changes, there is no material leakage risk that could undermine its emissions reduction benefits. Leakage for this project activity is therefore considered 0 tCO_2e.

Estimated GHG Emission Reductions

The Emission Reductions (ER) are calculated by subtracting the Project Emissions from the Baseline Emissions, according to the following formula:

$$ER_y = BE_y - PE_y - LE_y$$

$$= 21.64 - 3.49 - 0$$

$$= 18.15\ tCO2e$$

ERy value has been rounded down for conservativeness.

The estimated GHG emission reductions RE_y = 18 tCO_2e

APPENDIX 3: COMMON PRACTICES, REGULATIONS AND BARRIERS ANALYSIS

A3-1 Summary List of 8 Generic PAIs Identified as Uncommon Practices in Ontario

Similarly to a positive list of technologies, generic project activity instances (PAI) serve as standardized categories of project activities that share common objectives, technologies, measures, and eligibility criteria. These generic PAIs are designed to streamline the assessment of projects by providing a consistent framework that reflects shared characteristics across similar activities.

#	Name	Short Description	Sectoral Scope
I	Biomass Energy Project	Thermal conversion process using heat as the dominant mechanism to convert biomass into energy.	3
II	Methane Emission Avoidance	Waste management approaches that avoid landfilling and reduces emissions through the recovery of residual waste (e.g., recycling and composting).	13
III	Land Application of Biosolids	Waste management approaches that avoid landfilling through the recovery of residual materials such as residues and sludge, dry biomass residues, and biochar.	13
IV	Saving Energy on Recycling Activity	Energy savings made through recycling activities of materials that are not currently recycled or recycled in small quantities.	3
V	Heat Recovery	The recovery and reuse of thermal discharge to fulfill other energetic purposes.	3
VI	Energy Efficiency – New Buildings or Major Renovations	Sustainable design for new buildings and major renovation projects resulting in improved energy efficiency.	3
VII	Energy Efficiency – Demand Side	Reduction in energy demand and consumption in new and existing ICI buildings.	3
VIII	Energy Conversion – Demand Side	Switching fossil fuels to a cleaner form of energy that emits less GHG emissions.	3

A3-2 Common Practices Analysis Methodology

In accordance with the applied methodology, the project proponent has conducted an analysis to determine whether the measures are common practice in the Province of Ontario. Since the proposed project activity will include measures that are listed in the definitions section of the CDM Tool 02: *Combined Tool to Identify*

the Baseline Scenario and Demonstrate Additionality Version 7.0, the latest version of the CDM methodological Tool 24: Common Practice Version 3.1 was applied. "Common practice" is defined as greater than 20% adoption.

The CDM methodological Tool 24 provides a step-wise approach for the analysis of the extent to which a proposed project type (i.e. technology or practice) has already diffused in the applicable area and for applicable buildings.

In the context of a grouped project encompassing a diverse range of project activity instances across two sectoral scopes, the project proponent applied the stepwise approach of Tool 24 to each generic PAI with additional adjustments and explanations. Given the small-scale of the project activity instances and the large number of buildings, it would be impractical and unreasonable to attempt a precise identification and assessment of whether each project activity instance is exactly duplicated - in terms of measures and technologies – across different buildings.

Stepwise Approach for Common Practice (Tool 24)

STEP 1: Calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.

Calculating a comparable range based on the total design capacity or output of the proposed project activities is not feasible due to the significant variability in project sizes targeted by this grouped project. For example, biomass energy projects (generic PAI I) may range from small-scale on-site installations operating less than 100 kW with only a few hundred kilograms of biomass annually to larger-scale on-site systems operating below 2 MW with several thousand kilograms of biomass per year. Similarly, methane emission avoidance projects (generic PAI II) may vary from small-scale on-site composting operations treating less than 2 tons of organic waste per year to larger-scale on-site facilities handling over 2,000 tons of organic waste annually.

Given this substantial variability, the project proponent has conducted an analysis that considers a broader perspective, focusing on the overall distribution of similar projects and measures within the applicable geographical area. This approach ensures a more inclusive and representative assessment, rather than applying a rigid capacity or output-based range of +/- 50% that may not adequately reflect the diversity of project activity instances.

STEP 2: Identify similar projects which fulfil all the conditions listed in Tool 24.

As part of this analysis, the project proponent has reviewed 25 carbon credit program registries to identify projects that meet all the conditions outlined in CDM Tool 24. This review found no similar projects registered under these programs. Among the registries examined, only four projects were located within the applicable geographical area, the Province of Ontario, Canada, but none of these projects implemented the same measures as the proposed project activities in this grouped project.

Given these findings, the PP has expanded the analysis to take a broader perspective, assessing the overall distribution of similar projects and measures not registered in a carbon credit program within the applicable geographical area. The results of this analysis are included in Appendix 3, section A3-4 for each generic PAI. This approach ensures a more comprehensive evaluation of common practice, capturing real-world implementation trends beyond formal crediting mechanisms.

STEP 3: Within the projects identified in Step 2, identify those that are neither registered nor submitted for registration, nor undergoing validation. Note their number N_{all}.

Given that the analysis of similar projects and measures not registered in a carbon credit program did not identify single, standalone projects that fulfill all conditions of Tool 24. Instead, it examined sector-wide trends using grey literature, governmental reports, industry publications, and other relevant sources. This approach allowed for a more representative understanding of how similar measures have been implemented across the applicable geographical area, rather than relying on isolated case studies.

STEP 4: Within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

IDEM Step 3.

STEP 5: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of similar projects using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

IDEM Step 4. See following section A3-3 for additional adjustments and explanations to the common practice analysis used for this grouped project.

A3-3 Methodology to Estimate the Number of Eligible ICI Buildings

To complete this analysis, we first identified the number of potentially eligible buildings in Ontario. We referenced latest available data from Innovation, Science and Economic Development Canada, which reported that in 2023 there were 407,428 small businesses, 6,728 medium-sized businesses, and 1,497 large businesses in the province of Ontario[47]. This amounts to approximately 415,653 businesses in total.

Based on the grouped project proponent's audit observations and internal data from client facilities, we found that business sites often comprise more than one building. As such, a conservative multiplication factor of 2 was applied, resulting in an estimated 831,306 buildings

415,653 x 2 = 831,306 buildings.

[47] Key Small Business Statistics 2024. Government of Canada, (1 April 2025): https://ised-isde.canada.ca/site/sme-research-statistics/en/key-small-business-statistics/key-small-business-statistics-2024#s1.1

Considering this data, along with our analysis and reasonable assumptions, we estimate that there are approximately 831,306 eligible non-residential buildings in Ontario for the purpose of common practice calculations. Accordingly, applying the 20% threshold implies that a generic PAI implemented in more than 166,261 buildings would be deemed common practice.

A3-4 Generic PAI Additionality Assessment

This section presents the results of the research conducted to assess additionality at the generic PAI level. For each generic PAI, the analysis includes a description of the category and an assessment of applicable laws and regulations, barriers, and common practice. These analyses are adjusted to examine sector-wide trends through a comprehensive review of grey literature, government reports, industry publications, and other relevant sources. Given the nature of the generic PAIs within the context of a grouped project, adjustments to the proposed stepwise approach of the CDM Tool 24 were necessary to carry out a rigorous and context-appropriate common practice analysis.

Investment analysis will be carried out on a case-by-case basis considering the diversity in terms of scale and characteristics of project activity instances to be included in the group project.

Generic PAI I: Biomass Energy Project

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1. Description of the generic PAI I

This project category includes activities that replace fossil fuel use with renewable biomass for thermal energy or electricity generation. It covers on-site applications such as space heating, water heating, or other energy needs using thermal conversion technologies like boilers, furnaces, or other fixed or mobile equipment located at the client facility.

Eligibility under this category requires that the biomass feedstock be classified as renewable[48], or originates from agro/forest residues in waste streams that are otherwise sent to landfills.

Project activities generating electricity and/or thermal energy for industrial use through the combustion of non-renewable biomass, including but not limited to agro-residue biomass or forest residue biomass that does not meet renewable sustainability criteria are excluded from eligibility under this category. Grid-connected biomass power plants where >50% of total generation is exported to a national or regional grid is also excluded from eligibility under this generic PAI.

Examples of projects eligible under this category include, but are not limited to:

- Biomass-fired boilers and furnaces for space heating, water heating, or process heat, fueled by sustainably sourced wood chips, wood pellets, biofuels or other renewable biomass.

[48] UNFCCC, EB 23 Annex 18: Definition of Renewable Biomass. https://cdm.unfccc.int/EB/023/eb23_repan18.pdf

- Mobile biomass heating units for heating in off-grid applications (e.g. construction, agriculture, resort, etc.) fueled by sustainably sourced biomass.

2. Alternative Scenarios

Since this is a grouped project that will progressively include PAIs from several client facilities on an ex-post basis, the specific alternative scenario for each individual PAI cannot be determined at this stage, The applicable alternative scenario will be assessed and defined as each new PAI is added to the grouped project following the same approach as the initial PAI, described in section 3.4 of the PD.

3. Barrier Analysis

Barriers that would prevent the implementation of biomass energy projects are generally, but not limited to, the following:

Type of barrier	Description
Investment barriers	1) Initial investment costs: cost of purchasing and installing biomass boilers, fuel storage systems, fuel handling equipment and emission control technologies can be significant. 2) Storage and handling infrastructure costs: biomass heating systems often need dedicated fuel storage, such as silos or bunkers, which may require construction or modifications to existing facilities. Additional costs may also include fuel handling systems like conveyors to ensure delivery to the combustion system. 3) Operating and maintenance costs: biomass systems require regular upkeep, such as cleaning heat exchangers, removing ash, and inspecting equipment, which can increase costs. 4) Fuel cost and availability: biomass prices vary with type, local supply, and transport costs. Price fluctuations can affect the long-term cost stability of biomass heating. [49]
Technological barriers	1) Lack of infrastructure: may require modifications to existing heating systems, including distribution networks, exhaust systems, and monitoring and control systems, to ensure compatibility, optimum performance, and proper integration.[50] 2) Equipment shortage: shortage of high-quality boilers and furnaces in Canada due to a complex regulatory process for certifying boilers manufactured outside the country for installation.[51]

[49] Biomass for Power Generation, IRENA. June 2012: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2012/RE_Technologies_Cost_Analysis-BIOMASS.pdf

[50] Refer to: https://publications.gc.ca/collections/Collection/M92-252-2002F.pdf

[51] Eliminating boiler barriers in Canada, Canadian Biomass. March 7, 2019: https://www.canadianbiomassmagazine.ca/eliminating-boiler-barriers-in-canada-7277/

4. Investment Analysis

Since this is a grouped project that will progressively incorporate PAIs from multiple client facilities on an ex-post basis, a detailed investment analysis for each individual PAI will be performed as they are added to the grouped project, ensuring that financial evaluations are based on the most accurate and current project-specific data.

The investment analysis for each PAI will be performed using the internal rate of return (IRR) as the financial indicator, applying a benchmark IRR of 16% for a 10-year period. The analysis may take into account, among other factors, and when applicable, the following information:

- Net income generated by the project (e.g. energy cost savings)
- Purchase cost of the facilities and/or equipment associated with the project
- Fixed annual costs for operation and maintenance
- Administrative costs associated with the project (e.g. management, marketing, etc.)
- Weighted average cost of capital
- Tax rate

5. Regulations, Government Policies, and Laws Analysis

Biomass energy projects in Ontario and Canada operate within a framework of environmental, energy, and waste management regulations. These laws do not require the adoption of biomass systems but establish conditions under which such systems may be developed and operated. The most relevant laws and their applicability to the scope of this grouped project and PAIs are summarized in Table 1.

At the federal level, the Clean Fuel Regulations (SOR/2022-140), establishes sustainability and traceability requirements for forest biomass used as a fuel feedstock. For example, section 52 requires forest biomass harvesting to comply with an approved forest management plan that qualify under the regulation.[52] These provisions are of *medium relevance* to the project because they directly affect eligibility of biomass feedstocks, but they do not regulate or mandate the operation of on-site boilers themselves.

At the provincial level, two regulations stand out for their broader applicability. O. Reg 419/05 has *high relevance* since any biomass boiler produces air contaminant emissions, and this regulation governs permitting requirements, dispersion modelling, and air contaminant emission limits. R.R.O. Reg. 347 has *medium relevance* since it regulates how wood waste, residues, and other potential biomass feedstocks are classified, handled, and disposed. While it does not mandate energy recovery, some restrictions could make biomass reuse more attractive.

[52] Clean Fuel Regulations: https://laws-lois.justice.gc.ca/eng/regulations/SOR-2022-140/page-6.html#h-1359334

Table 1 Summary of regulations relevant to biomass energy projects

Laws and Regulations	Relevance	Description
O. Reg 419/05 Air Pollution – Local Air Quality	High	Applies to biomass boilers, regulating air contaminants, permitting, and dispersion thresholds.
SOR/2022-140 Clean Fuel Regulations	Medium	Sets sustainability and traceability standards for forest biomass feedstock.
R.R.O. 1990, Reg. 347 General -Waste Management	Medium	Regulates waste classification, handling, and disposal of wastes. Encourages diversion but does not mandate biomass-to-energy recovery.
O. Reg. 79/15 Alternative Low-Carbon Fuels	Medium-Low	Governs the use of alternative fuels in specific energy-intensive industries (i.e. cement, lime, iron and steel manufacturing facilities) to reduce reliance on coal and other high-emission fuels. Limited relevance.
O. Reg. 359/09 Renewable Energy Approvals	Low	Applies to grid-connected renewable electricity generation projects.
O. Reg 267/03 Nutrient Management Act	Low	Applies to on-farm boilers connected to anaerobic digesters and setts nutrient management requirements such as handling and storage to prevent harmful impacts on the environment.

Source: Ontario E-Laws. Retrieved August 2025: https://www.ontario.ca/laws

Overall, while these regulations define compliance obligations for biomass projects, there are currently no provincial, federal or municipal regulations or laws mandating the conversion of fossil fuel-based systems to biomass energy.

Policy Context and Incentives

Beyond regulations, several policy initiatives demonstrate provincial interest in biomass but stop short of requiring its adoption. In 2018, the Province of Ontario proposed an environmental plan[53] that was not fully implemented and was later replaced in March 2022 with new emission reduction projections to meet 2030 greenhouse gas emissions target. During the same period, the Ontario government released the Forest Biomass Action Plan (FBAP)[54], which recognizes the underutilization of biomass and promotes the development and expanded use of forest biomass, including applications in renewable energy. With its Forest Biomass Program[55], the government funded multiple projects related to biomass.

[53] A Made-in-Ontario Environment Plan, Environmental Registry of Ontario. November 29, 2018: https://ero.ontario.ca/notice/013-4208

[54] Forest Biomass Action Plan. Ministry of Northern Development, Mines, Natural Resources and Forestry, March 2022: https://files.ontario.ca/ndmnrf-forest-biomass-action-plan-en-2022-03-28.pdf

[55] Forest Biomass Program, Government of Ontario. May 26, 2023: https://www.ontario.ca/page/forest-biomass-program

Other programs and incentives[56] in Ontario and Canada support energy transition efforts, some of which assist IC&I organizations in partially or fully transitioning to renewable energy. However, these initiatives primarily highlight technologies such as solar, wind, geothermal, and energy storage, and few explicitly mention biomass as an energy source. For instance, the Ontario Net Metering program[57] lists bioenergy among the eligible renewable energy sources. Although the program explicitly highlights solar, wind, or hydroelectric power, biomass-based systems may qualify under the broader category of bioenergy[58]. Importantly, while the Net Metering program is established under a regulatory framework, it targets electricity distributors, requiring them to offer net metering arrangements to eligible customers. Participation remains voluntary for customers, including those using bioenergy. Therefore, this regulation does not mandate a switch to biomass as an energy source.

Recognizing that legislations and regulations imply constraints, based on the research conducted, there are no provincial, federal, or municipal regulations or legislations in Ontario requiring any project or organization to switch from fossil fuels to biomass energy. Although certain government initiatives may gradually influence energy consumption patterns in IC&I buildings, all measures to support renewable energy adoption remain voluntary. Therefore, any shift from fossil fuels to renewable biomass is not mandated by regulation or legislation in the Province of Ontario.

6. Common Practice Analysis of Generic PAI I

This section attempts to evaluate the prevalence of biomass-to-energy systems used for on-site space and water heating or other energy needs in Ontario, rather than for large grid-connected electricity generation systems.

6.1. Biomass Energy Generation in Ontario

An important point to clarify beforehand is that biomass is often categorized under the broader labels of bioenergy, a clean and renewable type of energy derived from various sources, including forestry and agricultural waste, food processing by-products, and waste from municipal landfills, compost, and water treatment facilities[59].

While bioenergy has some presence in Ontario's energy mix, it remains a marginal contributor. According to the Canada Energy Regulator (formerly National Energy Board), Ontario's biomass electricity capacity has increased from 209 MW in 2005 to 698.62 MW in 2021 (see Table 3), representing only 0.6% of total installed capacity. Over the same period, electricity generation from biomass saw only a modest

[56] Refer to Renewable Energy Tax Savings Available Across Canada: https://www.vadimap.com/blog/what-incentives-are-available-for-businesses-in-ontario-canada-to-help-the-transition-to-renewable-energies-a17

[57] O. Reg 541/05: Net Metering. July 1, 2022: https://www.ontario.ca/laws/regulation/050541

[58] Save on your energy bill with net metering. Government of Ontario. June 07, 2024: https://www.ontario.ca/page/save-your-energy-bill-net-metering

[59] Refer to IESO Biofuel definition: https://www.ieso.ca/en/Learn/Ontario-Electricity-Grid/Supply-Mix-and-Generation

increase, rising from 1,108 GWh in 2005 to 1,128 GWh in 2016, maintaining a steady share of only 0.7% of total generation[60]. More recent data from the Canada Energy Regulator, which combines biomass and geothermal together, shows that by 2021, electricity generation reached 1,195 GWh, still under 1% of the province's total. In contrast, nuclear (55%) and hydro (23%) remained dominant. Table 2 below shows electricity generation by fuel type in Ontario for the years 2005, and 2016 to 2021[61].

Table 2 Electricity Generation in Ontario by Fuel Type (GWh) in the Current Measures Scenario

	2005	2016	2017	2018	2019	2020	2021
Hydro	35,480	36,513	40,016	38,281	36,210	39,005	35,233
	23%	23%	26%	25%	24%	25%	24%
Wind	26	10,758	10,464	11,922	10,957	13,169	12,420
	0%	7%	7%	8%	7%	8%	8%
Biomass / Geothermal	808	1,444	962	1,311	1,249	1,100	1,195
	1%	1%	1%	1%	1%	1%	1%
Solar	-	1,776	1,998	2,163	2,168	5,636	5,726
	0%	1%	1%	1%	1%	4%	4%
Uranium	77,969	91,142	90,445	90,155	90,454	87,845	82,281
	50%	58%	59%	58%	59%	56%	55%
Petroleum	29,044	544	378	460	409	85	93
	18%	0.3%	0.2%	0.3%	0.3%	0.1%	0.1%
Natural Gas	13,283	14,862	8,379	11,831	11,504	11,039	11,386
	8%	9%	5%	8%	8%	7%	8%
Total (GWh)	**156,609**	**157,040**	**152,642**	**156,123**	**152,952**	**157,880**	**148,334**

Although the data presented relate to grid-connected electricity generation and capacity, they remain useful as indirect evidence in assessing the commonality of biomass-to-energy systems in Ontario. Even at the utility scale, where projects benefit from economies of scale, government support, and grid integration, the contribution of biomass to the province's overall energy mix remains marginal (<1%).

Table 3 Biomass and Geothermal Electricity Capacity in Ontario in MW under the Current Measures Scenario

	2005	2014	2015	2016	2017	2018	2019	2020	2021
Biomass / Geothermal	209	592	465.4	801.3	692.7	692.7	492.7	698.62	698.62

This limited presence at the large scale suggests that adoption at the small-scale, on-site systems for space and water heating or other energy needs, which face greater economic and logistical barriers, may

[60] Refer to Table 6 in Canada's Renewable Power Landscape (2017): https://www.cer-rec.gc.ca/en/data-analysis/energy-commodities/electricity/report/archive/2017-canadian-renewable-power/2017cndrnwblpwr-eng.pdf

[61] Refer to Ontario Energy Profile, Canada Energy Regulator: https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-ontario.html

be even less common. As such, the use of biomass for on-site energy applications is likely to represent a minimal share of the provincial energy landscape.

6.2. Biomass Energy Consumption in Ontario

In recent years, biofuels and other emerging energy sources have accounted for only a small share of Ontario's total energy use for the commercial and industrial sectors. In 2015, these sectors consumed 1,648 PJ of energy, of which 62.5 PJ (3.8%) came from biofuels such as wood pellets, biogas, ethanol, and biodiesel. By 2020, total energy use had decreased to 1,496 PJ, with biofuel consumption also decreasing slightly to 61.1 PJ. In 2022, the industrial and commercial sectors together consumed 1,532 PJ of energy, with biofuels increasing slightly to 76.9 PJ (5%) of that amount (see Table 4).

Table 4 Ontario's Energy End-Use Demand by fuel type for the Commercial and Industrial Sectors[62]

	2015	2020	2021	2022
Total End-Use (PJ)	1648.06	1495.56	1478.57	1532.28
Electricity	324.57	330.96	323.58	343.83
Natural Gas	546.51	543.69	524.48	547.02
RPP	605.58	459	460.29	464.73
Biofuels & Emerging Energy	62.51	61.18	70.38	76.95
Hydrogen	0	0	0.03	0.03
Other	108.9	100.73	99.81	99.73

Source: Canada Energy Regulator. Canada's Energy Future Data Appendices. DOI: https://doi.org/10.35002/zjr8-8x75

Despite minor fluctuations, the data from Canada's Energy Regulator show that biofuels and emerging energy sources remain a marginal contributor to the overall energy demand of the commercial and industrial sectors.

6.3. Biomass-to-energy Projects in Ontario

The Canadian Bioheat Database (CBD) offers insight into the prevalence of biomass-to-energy systems used for heating in Canada. According to this source, 646 bioheat systems were implemented across Canada between 2003 and 2023, of which only 58 were located in Ontario, representing less than 9% of the national total[63]. This is a relatively low number given the 20-year period and the size of the province.

Applying the steps outlined in CDM Tool 24, we excluded 18 of the 58 Ontario projects from our analysis. According to the Bioheat Database, these projects rely on sylviculture as a biomass feedstock, which

[62] The data, retrieved from the Canada Energy Regulator, uses the following parameters: Report version is Canada's Energy Future 2023, End Use Demand Appendices, and Current Measures Scenario for the Ontario region.

[63] 2023 Canada Bioheat Database: https://torchlightbioresources.com/canadian-bioheat-database

would render them ineligible for inclusion in our group project, as sylviculture may involve the harvesting of trees specifically for energy use.

It is important to note that, while not registered in the CBD, the Atikokan Generating Station is the largest biomass-fueled power plant in North America. Converted from coal in 2014, it has a capacity of 205 MW and an annual biomass consumption of 90,000 metric tons[64]. Although it has contributed to Ontario's overall biomass capacity, it is a utility-scale power plant making it an outlier: its scale and output far exceed the scale and conditions of the small, on-site systems that will be considered in the group project. For this reason, the Atikokan Generating Station is excluded from the present analysis.

Among the remaining 40 projects, insufficient data is available regarding the specific technologies used. As a result, it is not possible to determine the number N_{diff} necessary to apply the equation in Step 5 of the CDM Tool 24, which requires this level of technical detail to determine the share of similar projects that apply different technologies. According to the CBD, all 40 identified biomass projects indicate being connected to only one building each. When applying the methodology outlined in Appendix A3-2 and considering that there are approximately 831,806 ICI buildings in Ontario, this corresponds to only 0.004% of buildings having such projects.

Furthermore, current biomass-to-energy projects are largely concentrated in specific sectors. For example, a report by the Government of Ontario, published in August 2020, states that Ontario's forestry companies often use mill by-products such as bark, sawdust, and wood shavings to meet their own energy needs. The CBD, on the other hand shows 47.5% of implemented bioheat projects in Ontario are in agricultural facilities, followed by institutional (20%) and light industrial facilities (17.5%). Outside of these specialized operations, evidence of biomass energy use in Ontario is limited.

Table 5 Number of projects per sector from the Canadian Bioheat Database

Project Facilities Sector	Number of projects	% of projects
Agricultural	19	47,5%
Institutional	8	20,0%
Light Industrial	7	17,5%
Commercial	6	15,0%
Multi Unit Residential	0	0,0%
Total	**40**	**100%**

Source: Data is from the Canadian Bioheat Database, calculations are from the project proponent.

6.4. Synthesis of Common Practice Findings

Applying the methodological steps outlined in CDM Tool 24 with the adjustments specified in Appendix A3-2, the available data confirms that biomass-to-energy systems remain a marginal practice in Ontario.

According to the Canadian Bioheat Database, only 40 projects across the province partially meet the eligibility conditions of this category, representing approximately 0.004% of the 831,806 ICI buildings in

[64] Bioenergy Success Stories: Ontario Power Generation, Canada. IEA Bioenergy. February 2018: https://www.ieabioenergy.com/wp-content/uploads/2018/02/9-OPG-Coal-to-biomass_CA_Final.pdf

the province. This extremely limited adoption rate indicates that biomass systems remain rare across the province.

At the provincial energy systems level, biomass accounts for less than 1% of total electricity generation, despite the presence of large-scale outliers such as the Atikokan Generating Station. In the IC&I sector, bioenergy represents in 2022 only 5% of total final energy demand, which remains well below the 20% benchmark established for common practice analysis.

Taken together, the available data demonstrates that the adoption of biomass-to-energy systems in Ontario remains minimal, both in absolute and relative terms. The adoption levels are consistently and substantially below the 20% threshold. It can therefore be concluded that biomass-to-energy projects do not constitute common practice in Ontario.

7. Conclusion

Based on the comprehensive analysis undertaken, biomass energy projects are not common practice in Ontario. The data demonstrates that:

- Biomass contributes less than 1% of total provincial electricity generation;
- In the ICI sector, bioenergy, including biomass, represents 5% of total energy demand;
- At the facility level, only 0.004% of ICI buildings have implemented biomass heating systems.

Each of these indicators are well below the 20% threshold defined by the applied methodology. Furthermore, provincial and federal regulation do not require the adoption of biomass energy systems, and existing policies provide only voluntary or indirect support, reinforcing the limited uptake of this type of measure.

Accordingly, it is concluded with confidence that biomass energy projects in Ontario are not common practices within the meaning of the methodology. Additionality for this generic PAI is therefore demonstrated, conditional on individual PAIs obtaining an internal rate of return (IRR) below the 16% benchmark in the investment analysis.

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Generic PAI II: Methane Emission Avoidance

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1. Description of the Generic PAI II

The PAI II covers waste management approaches that avoid landfilling and therefore methane emissions through the recovery of waste materials. This type of project involves recovery, reuse, recycling and composting of organic matter. Organic matter can be diverted from landfill through reuse, recycling, composting or biomethanization (anaerobic digestion), thereby avoiding methane emissions into the atmosphere.

This project category does not include waste-to-energy projects. Projects whose primary purpose is to generate energy from waste, such as methane capture, landfill gas flaring, incineration, or the combustion of waste-derived-fuels, are excluded from eligibility. In cases where recovered materials are later used for energy purposes, no GHG emission reductions are claimed for the energy generation; crediting is limited to the avoided methane emissions from landfill diversion.

Examples of projects eligible under this category include, but are not limited to:

- A food processing facility sending its organic residues to an anaerobic digester for treatment.
- Implementation of a curbside bin collection program for composting organic waste in a small municipality or community.
- Recycling of a company's paper and cardboard waste for the production of new paper.

- Landfill avoidance through the reuse of biomass residues for the production of wood pellets.

Moreover, methane flaring is commonly used at landfills in Ontario. As calculated in the Appendix in Table 1, 97% of the landfills collect landfill gas and 57% of the total gas is flared. As mentioned in sections 4.1. and 4.2 of the PD, we therefore conservatively assume that the baseline scenario for landfilling always includes flaring.

2. Alternative Scenarios

Since this is a grouped project that will progressively include PAIs from several client facilities on an ex-post basis, the specific alternative scenario for each individual PAI cannot be determined at this stage, The applicable alternative scenario will be assessed and defined as each new PAI is added to the grouped project following the same approach as the initial PAI, described in section 3.4 of the PD.

3. Barrier Analysis

Barriers that would prevent the implementation of methane emission avoidance projects are generally, but not limited to, the following:

Type of barrier	Description
Financial Barrier	1) Initial investment cost: Requires high upfront investment for the infrastructure installation for example for biomethanization projects (Canadian Biogas Association, 2022). 2) Operating and maintenance costs: Involves significant capital investment and ongoing operational costs (labor, maintenance, energy) for instance for composting and recycling operations.
Technical Barrier	1) Logistics: Logistical difficulties in transporting organic waste to processing facilities. 2) Variation in raw materials: The quantity available can fluctuate. Also, public participation and source separation compliance can be low.
Regulatory Barrier	1) Authorization process: Slow down the start of the project and may prevent a project from starting. Most of the projects require authorizations such as for example biomethanization[65] and composting facilities.[66] 2) Regulatory constraints: Regulations surrounding for example compost and recycling facilities and as well agri-food residue recycling can increase complexity.

[65] Canadian Biogas Association. (2012, July). *Farm to fuel: Developers' guide to biomethane*. https://biogasassociation.ca/images/uploads/documents/2012/reports/Developers_Guide_to_Biomethane.pdf

[66] Ontario Ministry of the Environment, Conservation and Parks. (2021, July 15). *Ontario compost quality standards* (Published April 20, 2016). Government of Ontario. https://www.ontario.ca/page/ontario-compost-quality-standards

4. Investment Analysis

Since this is a grouped project that will progressively incorporate PAIs from multiple client facilities on an ex-post basis, a detailed investment analysis for each individual PAI cannot be conducted at this stage. The investment analysis will be performed and refined as each new PAI is added to the grouped project, ensuring that financial evaluations are based on the most accurate and current project-specific data.

The investment analysis for each PAI will be performed using the internal rate of return (IRR) as the financial indicator, applying a benchmark IRR of 16% for a 10-year period. The analysis may take into account, among other factors, and when applicable, the following information:

- Net income generated by the project (e.g. income from waste)
- Purchase cost of the facilities and/or equipment associated with the project
- Fixed annual costs for operation and maintenance
- Administrative costs associated with the project (e.g. management, marketing, salaries, etc)
- Weighted average cost of capital
- Tax rate

5. Regulations, Government Policies, and Laws Analysis

Over the past two decades, Ontario has introduced a wide range of environmental protections and waste management measures through policies, legislation, and regulatory instruments. Since 2018, the province's environmental plan[67] has been in effect, with a key objective of reducing litter and waste in communities. A major goal of this plan is to divert residual waste from landfills to limit greenhouse gas (GHG) emissions.

The Ontario government also released its Strategy for a Waste-Free Ontario in 2017. This strategy set an ambitious long-term target: reducing overall waste generation by 80% by 2050.[68] To support this goal, the province committed to a series of actions aimed at improving waste reduction and diversion, with a particular focus on the industrial, commercial, and institutional (IC&I) sector.

In 2019, Ontario introduced the Food and Organic Waste Policy Statement, which sets out specific waste reduction and resource recovery targets. These include requirements for municipalities and IC&I facilities to reduce organic waste by either 50% or 70% by 2025, depending on the type of facility.[69]

[67] Ontario Ministry of the Environment, Conservation and Parks. (2018, November 29). *Made-in-Ontario Environment Plan*. Government of Ontario. https://www.ontario.ca/page/made-in-ontario-environment-plan

Ontario has also gradually transitioned its existing waste diversion programs to a producer responsibility model since July 2020 to improve recycling.[70] Producers that exceed certain revenue levels or distribute more material on the market than an established threshold, are now responsible for managing the full life cycle of their packaging and products. Under the new model, responsibility for the municipal Blue Box program—covering plastics, paper, glass, aluminum, and steel—is shifting from municipalities to producers, who must pay Producer Responsibility Organizations (PROs) based on the weight of materials they place on the market.

Table 1 outlines the main legislation and regulations relevant to methane emission avoidance projects. It should be noted that municipal and IC&I recycling and composting are mandatory under certain conditions outlined in Table 2 and Table 3 in the Appendix.

Table 1 Laws and regulations relevant to methane emission avoidance projects

Main project types	Relevant Laws and Regulations
Can be applied to multiple projects of methane emissions avoidance	• Environmental Protection Act (EPA) • Waste-Free Ontario Act, 2016 (includes Resource Recovery and Circular Economy Act and Waste Diversion Transition Act) • Nutrient Management Act
On-site Anaerobic Digestion (Biomethanization)	• Technical Standards and Safety Authority (TSSA) Regulations
Composting & Recycling	• Ontario Compost Quality Standards (OCQS) • O. Reg. 101/94 – Recycling and Composting of Municipal Waste • O. Reg. 102/94 – Waste Audits and Waste Reduction Work Plans • O. Reg. 103/94 – Industrial, Commercial and Institutional Source Separation Programs • O. Reg. 104/94 – Packaging Audits and Packaging Reduction Work Plans • O. Reg. 391/21 – Blue Box
Agri-food Residue Recycling	• Health Protection and Promotion Act (HPPA) • Safe Food for Canadians Regulations • Food Premises Regulation (under HPPA, for food recovery/donation)

Source: Ontario E-Laws. Retrieved August 2025: https://www.ontario.ca/laws

According to the Auditor General of Ontario (2021), several initiatives and programs have either not been implemented or have failed to meet their objectives. For instance, the 2020 target of achieving a 30% waste diversion rate was not met, with the actual rate stalling at around 25% (Environment and Climate Change Canada, 2023). Furthermore, despite existing regulations for the IC&I sector, implementation

[70] Ontario Ministry of the Environment, Conservation and Parks. (2019, November 20). *Producer responsibility for Ontario's waste diversion programs*. Government of Ontario. https://www.ontario.ca/page/producer-responsibility-ontarios-waste-diversion-programs

has been limited: fewer than 2% of IC&I establishments in Ontario are currently subject to these regulations (Auditor General of Ontario, 2021). A detailed breakdown is available in Table 4 of the Appendix. This reflects a significant enforcement and compliance gap, raising concerns about the overall effectiveness of Ontario's current regulatory framework in reducing methane emissions from waste.

6. Common Practice Analysis on Generic PAI II in Ontario

This section evaluates the prevalence of waste management alternatives to landfilling in Ontario, such as recycling and reuse, composting, and anaerobic digestion.

6.1 Waste Generation and Composition in Ontario

Ontario generates approximately 12 to 15 million tonnes of non-hazardous waste annually, consisting primarily of cardboard and paper, food waste, and non-paper packaging (Auditor General of Ontario, 2021). In 2018, the estimated composition of Ontario's waste stream was as follows:

Table 2 Composition of the Waste in Ontario in 2018

Waste Category	Percentage (%)
Paper products (cardboard, printed paper, etc.)	40%
Organic waste (food scraps)	30%
Construction, renovation, and demolition debris	9%
Non-paper packaging (plastic, glass, metal)	11%
Other types of waste	10%

Source: Auditor General of Ontario, 2021

These figures illustrate that organic waste represents nearly one-third of the total waste stream, while recyclable materials (paper products and non-paper packaging) together account for more than half of Ontario's waste stream, indicating that more than half of Ontario's waste is potentially recoverable through recycling or reuse.

Waste disposal overall has been steadily increasing in Ontario. According to Statistics Canada (2024), landfilled waste increased from 5,67 million tonnes in 2014 to over 7 million tonnes in 2022—representing a significant increase of 23.6% over the period. The Office of the Auditor General of Ontario (2021), reports that nearly 60% of this waste comes from the IC&I sector, which includes approximately 1.6 million businesses and institutions. The residential sector, by contrast, is responsible for the remaining 40%. Despite being the largest waste generator, the IC&I sector performs significantly worse in terms of waste diversion performance. In 2018, only an estimated 15% of IC&I waste was diverted, a decline from 17% in 2002.

The performance gap is driven by regulatory limitations, as O. Reg 103/94: Industrial, Commercial and Institutional Source Separation Programs applies to less than 2% of IC&I facilities (see Table 4 of the Appendix). As a result, waste materials from small and medium businesses, warehouses, and other non-

residential establishments lack diversion requirements, and easily recoverable materials continue to be landfilled.

6.2 Composting and Anaerobic Digestion in Ontario

Organic waste represents the second largest opportunity for diversion in Ontario after recyclables, but landfill disposal remains dominant. While no province-wide statistics is available on the percentage of waste composted, Ontario data indicate that between 15% and 25% of total waste is diverted from landfill annually. More specific figures show that in 2019, approximately 1.8 million tonnes of organic waste were processed into digestate or compost in Ontario, of which 609,780 tonnes (34%) were composted and 496,418 tonnes (27%) treated through anaerobic digestion (AD) (EREF-Canada, 2021).

By comparison, the IC&I sector alone generated 7 million tonnes of waste in 2022. Even if all the 1.1 million tonnes processed through composting and AD were attributed to IC&I sources—which is an overestimate since residential organics are also included—this would represent about 15.7% of total IC&I waste. Against Ontario's overall waste generation of 12-15 million tonnes annually, the share treated through composting and AD falls further, to well below 10%.

Furthermore, access to organic waste processing infrastructure is limited in Ontario's smaller municipalities. Communities with fewer than 50,000 residents are not required to offer curbside organic waste collection, unlike larger urban centers. This regulatory exemption, combined with challenges such as low waste volumes and high transportation costs, makes it difficult for small municipalities to establish composting systems. Additionally, there is a lack of reliable data regarding composting activities in these areas, making it hard to evaluate or improve their performance. As a result, composting remains uncommon in smaller communities, leading to increased reliance on landfilling and missed opportunities to mitigate climate change through organic waste diversion.

6.3 Recycling and Reuse in Ontario

Recyclable materials consisting of paper products and cardboard account for 40% of Ontario's waste stream. However, recycling performance varies greatly between the residential and the IC&I sectors.

In the residential sector, recycling is well established and supported by the province's Blue Box program. Recovery rates for paper-based packaging are particularly high: corrugated cardboard is recovered at a rate of 98%, and boxboard at 47%. With nearly universal household access to recycling programs[71], these figures clearly indicate that residential recycling of paper products can be considered common practice in Ontario.

The situation is markedly different in the IC&I sector. Despite generating close to 60% of Ontario's waste, diversion in this sector remains very low, with only 15% of waste diverted in 2018 (Auditor General of Ontario, 2021). This indicates that the vast majority of IC&I waste continues to be landfilled, with a large

[71] The Latest Ontario Blue Box Recycling Data for Paper-based Packaging. The Paper and Paperboard Packaging Environmental Council, March 2, 2022: https://ppec-paper.com/the-latest-ontario-blue-box-recycling-data-for-paper-based-packaging/

share consisting of recycling materials. As a result, recycling and reuse remain marginal practices in the IC&I sector, and diversion rates are below the 20% threshold defined in the applied methodology.

6.4 Synthesis of Common Practice Findings

The analysis above demonstrates that methane emission avoidance through waste diversion is not common practice in Ontario in specific instances. Organic waste makes up 30% of the provincial waste stream, yet only a small fraction is treated through composting or anaerobic digestion. In 2019, approximately 1.1 million tonnes of organics were processed through these methods, which represents less than 20% of IC&I waste generated in 2022 and less than 10% of Ontario's total annual waste generation. This clearly places both composting and anaerobic digestion below the 20% threshold defined by the applied methodology.

Similarly, while residential recycling programs such as the Blue Box have achieved strong recovery rates for paper products, the IC&I sector—which produces nearly 60% of Ontario's waste— diverts only about 15% of its materials. This means that the vast majority of recyclable materials, including paper, cardboard, plastics, glass, and metals, continue to be disposed of in landfills. With diversion levels consistently under 20%, recycling and reuse in the IC&I sector also fail to meet the threshold required to be considered common practice.

7. Conclusion

Based on the comprehensive common practice analysis undertaken, methane emission avoidance and waste diversion practices remain uncommon in Ontario under the following conditions :

- IC&I Sector Composting and Anaerobic Digestion: Although this sector generates nearly 60% of the province's waste, the combined share of organics treated through composting and anaerobic digestion is at most 15,7%.
- IC&I Sector Recycling: Diversion of recyclables in the sector remains at approximately 15%, meaning that the vast majority continue to be disposed of in landfills.
- Composting in Small Municipalities: Municipalities with populations under 50,000 lack mandatory curbside organic collection programs and face logistical barriers, such as smaller waste volumes and high transport costs, leading to limited composting activities outside major urban centres.

Each of these conditions fall below the 20% threshold defined by the applied methodology. Furthermore, provincial and federal regulations do not require the adoption of landfill diversion, and existing policies or programs cover only a small portion (< 2%) of IC&I establishments, reinforcing the limited uptake of this type of measure.

Accordingly, it is concluded with confidence that methane emission avoidance and waste diversion practices in Ontario are not common practices within the meaning of the methodology. Additionality for this generic PAI is therefore demonstrated, conditional on individual PAIs obtaining an internal rate of return (IRR) below the 16% benchmark in the investment analysis.

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9. Appendix

Table 1. Landfill gas collection (LFG) volume collected that is flared, Ontario 2021

Landfill Site Name	Is LFG collected (yes/no)	% of LFG volume collected that is flared
Sudbury Landfill	Yes	4,90%
Halton Regional Landfill - Milton	Yes	41,90%
Essex-Windsor Regional Landfill Site	Yes	100,00%
Ridge Landfill - Chatham-Kent	Yes	100,00%

Petrolia Landfill Site	Yes	0,00%
Twin Creeks Environmental Centre - Warwick	Yes	100,00%
W12A Landfill - London	Yes	100,00%
Green Lane Landfill Site - Southwold	Yes	100,00%
Oxford County Waste Management Facility	Yes	100,00%
Mohawk Street Landfill - Brantford	Yes	0,00%
Tom Howe Landfill - Haldimand	Yes	100,00%
Niagara Waste Systems Limited - East Landfill	Yes	44,30%
Walker South Landfill - Niagara Falls (LFG combined with Niagara Waste Systems)	Yes	44,30%
Humberstone Landfill Site - Welland	Yes	100,00%
Glanbrook Landfill - Hamilton	Yes	0,00%
Waterloo Landfill Site	Yes	1,40%
Stratford Landfill	Yes	99,00%
Barrie Landfill Site	Yes	100,00%
Lindsay-Ops Landfill Site - Kawartha Lakes	Yes	1,00%
Bensfort Road - Peterborough	Yes	9,60%
Richmond Landfill - Greater Napanee	Yes	100,00%
Ottawa Valley Waste Recovery Centre	Yes	100,00%
Eastern Ontario Waste Handling Facility - North Stormont	Yes	64,00%
Navan Landfill - Ottawa	Yes	100,00%
West Carleton Environmental Centre - Ottawa	Yes	1,50%
Trail Road Waste Facility - Ottawa	Yes	52,90%
Cornwall Landfill	Yes	100,00%
Merrick Landfill Site	Yes	0,00%
Sault St. Marie Landfill	Yes	100,00%
Deloro Landfill Site - Timmins	No	0,00%
Thunder Bay Solid Waste and Recycling Facility	Yes	0,40%
Average	**96,8%, Yes**	**56,94%**

Source: Ontario Ministry of the Environment, Conservation and Parks, 2021

Table 2. Summary of the Conditions of the Municipalities to be under Ontario Regulation 101/94: and Food and Organic Waste Policy Statement

Conditions	Requirements
Population of at least 5,000	Shall establish, operate and maintain a leaf and yard waste system (O. Reg. 101/94)

Southern Ontario single-family homes in urban areas with a population greater than 50,000 and a density greater or equal to 300/km²	Shall provide curbside collection of food and organic waste (Food and Organic Waste Policy Statement)
Southern Ontario single-family homes in urban areas with a population greater than 50,000 and the population density of the local municipality is less than 300/km²; or The population of the local municipality is greater than 20,000 but equal to or less than 50,000 and the population density of the local municipality is greater than or equal to 300/km²,	Collection of food and organic waste, not curbside (Food and Organic Waste Policy Statement)
Southern Ontario single-family homes in urban areas with a population with at least 10, 000 and a density of at least100/km²	Food and organic waste collection, not curbside and method of collection can be flexible (Food and Organic Waste Policy Statement)
Northern Ontario single-family homes in urban areas with a population greater than 50,000 and a density of greater or equal to 300/km²	Shall provide curbside collection of food and organic waste (Food and Organic Waste Policy Statement)

Table 3. Summary of the Conditions for IC&I to be Under the Ontario Regulations 103/94: Industrial, Commercial and Institutional Source Separation Programs , 02/94: Waste Audits and Waste Reduction Work Plan, and Food and Organic Waste Policy Statement

Conditions	Requirements
Office buildings with a surface of at least 10,000 m²	Source separation program for the waste generated (O. Reg. 103/94)
	Written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated by the operation (O. Reg. 102/94)
Retail Shopping Establishments/complex with a surface of at least 10,000 m²	Source separation program for the waste generated (O. Reg. 103/94)
	Written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated by the operation (O. Reg. 102/94)

Construction demolition of buildings with a total floor area of at least2,000 m²	Source separation program for the waste generated (O. Reg. 103/94)
	Written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated (O. Reg. 102/94)
Multi-Unit Residential with at least 6 dwelling units	Source separation program for the waste generated (O. Reg. 103/94)
Hotels/Motels with at least 75 units	Source separation program for the waste generated (O. Reg. 103/94)
	Written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated by the operation (O. Reg. 102/94)
Restaurant which within two preceding calendar years at least one year in which the gross sales for all restaurants operated by the owner in Ontario equalled or exceeded $3,000,000	Source separation program for the waste generated (O. Reg. 103/94)
	Written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated by the operation O. Reg. 102/94)
Hospital with at least 100 beds	Source separation program for the waste generated (O. Reg. 103/94)
	Written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated by the operation O. Reg. 102/94)
	Shall source separate food and organic waste (Food and Organic Waste Policy Statement)
Education institutions with at least 350 students	Source separation program for the waste generated (O. Reg. 103/94)
	Written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated by the operation O. Reg. 102/94)
	Shall source separate food and organic waste (Food and Organic Waste Policy Statement)

Large Manufacturing Establishments which within the two preceding calendar years there was at least one calendar month in which the hours worked by the persons employed at the site exceeded 16,000 hours	Source separation program for the waste generated (O. Reg. 103/94)
	Written waste reduction work plan, based on the waste audit, to reduce, reuse and recycle waste generated by the operation O. Reg. 102/94)
Retail shopping establishments, retail shopping complexes, restaurants, hotels and motels and food processors that are large manufacturing establishments that generate more than 300 kg of food waste per week	Identify where food waste occurs in their operations, conduct regular food waste audits to quantify the amount and type of food waste and take measures to prevent and reduce the amount of food waste (Food and Organic Waste Policy Statement)
Retail shopping establishments, retail shopping complexes, office buildings, restaurants, hotels and motels and large manufacturing establishments that generate more than 300 kg of food waste per week	Shall source separate food and organic waste (Food and Organic Waste Policy Statement)

Table 4: Estimated Portion of Establishments Regulated under Industrial, Commercial, and Institutional (IC&I) Waste Regulations in 2019

Subsector	Total number of Establishments	Number of regulated Establishments	Portion of Establishments that are Regulated (%)
Construction and demolition	140,500	100 - 600	<1
Restaurants	32,500	400 – 2,500	1 – 6
Retail (Stores and malls)	80,000	1,500 – 4,000	2 – 5
Manufacturing	36,500	1,500	4
Office buildings	93,000	7,000	8
Hospitals	500	100	20
Hotels and motels	2,500	800	32
Educational institutions	8,000	3,000	40
IC&I establishments in designated sectors	393,500	14,500 – 19,500	4 – 5
IC&I establishments (including all sectors)	1,580,000		<2

Source: Office of the Auditor General of Ontario, 2021

Generic PAI III: Land Application of Biosolids

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1. Description of the Generic PAI III

The generic PAI III covers waste management practices that avoid landfilling by recovering organic residues such as municipal biosolids, paper mill sludge, biomass residues, and biochar. These materials are reused primarily through land application as soil amendments, substituting for chemical fertilizers, restoring degraded lands, and improving soil quality.

Biosolids and paper mill sludge provide organic matter and nutrients making them reliable fertilizer to enhance soils. Similarly, biochar, a carbon-rich material made by thermally degrading biomass with little or no oxygen, also improves soil structure and nutrient retention. Applied directly, these practices offer an effective means of recycling organic waste, reducing reliance on landfills or incineration, and mitigating greenhouse gas emissions.

This category of project is limited to the life cycle of these waste residues, from collection through composting or treatment, to final application on soils, Emission reductions are quantified by comparing the project scenario, diversion of residues from landfill and substitution of synthetic fertilizers, with a baseline scenario of landfilling. Reductions linked to improved agricultural practices are excluded, as they fall under sectoral scope 14.

Examples of projects eligible under this category include, but are not limited to:

- Agricultural land application using treated municipal biosolids to replace synthetic fertilizers on cropland
- Spreading of Biochar for improving soil fertility on agricultural land
- By-product of pulp and paper production for soil amendments

2. Alternative Scenarios

Since this is a grouped project that will progressively include PAIs from several client facilities on an ex-post basis, the specific alternative scenario for each individual PAI cannot be determined at this stage, The applicable alternative scenario will be assessed and defined as each new PAI is added to the grouped project following the same approach as the initial PAI, described in section 3.4 of the PD.

3. Barrier Analysis

Barriers that would prevent the implementation of this project activity are generally, but not limited to, the following:

Type of Barriers	Description
Reglementary barrier	1) NASM Classification & Testing Requirements: Biosolids are regulated as Category 3 Non-Agricultural Source Material (NASM) under Ontario's Nutrient Management Act (NMA) and O. Reg. 267/03. This classification triggers stringent testing requirements for nutrients, pathogens, metals, and other specific parameters when specified. (Government of Ontario, 2023)
Social barrier	1) Social acceptance: Public perception of health and environmental risks and odour pollution can lead to local resistance to land application, making it more difficult to adopt this practice (McCarthy & al., 2015) 2) Emerging Contaminant Anxiety: Public anxiety over "forever chemicals" in biosolids continues to grow, even as research and policy responses evolve[72].
Financial barrier	3) High Operational Costs: Expenses related to transport, storage infrastructure, testing, permitting, and plan development can be substantial.
Logistical barrier	1) Limited Suitable Land & Transport Costs: Urban growth reduces nearby farmland availability, necessitating longer-distance hauling and increasing costs, emissions, and scheduling complexities. 2) Composting or processing facilities must incorporate odour-control systems and be located away from sensitive receptors. [73]

[72] Biosolids and PFAS. Ontario Biosolids Council. (24 March 2023): https://www.ontariobiosolidscouncil.ca/post/biosolids-and-pfas

[73] Online Consultation: Biosolids Composting Facility Municipal Class Environmental Assessment Study. Halton Region. (2024): https://www.halton.ca/For-Residents/Opportunities-to-Participate/Biosolids-Composting-Facility

4. Investment Analysis

Since this is a grouped project that will progressively incorporate PAIs from multiple client facilities on an ex-post basis, a detailed investment analysis for each individual PAI will be performed as they are added to the grouped project, ensuring that financial evaluations are based on the most accurate and current project-specific data.

The investment analysis for each PAI will be performed using the internal rate of return (IRR) as the financial indicator, applying a benchmark IRR of 16% for a 10-year period. The analysis may take into account, among other factors, and when applicable, the following information:

- Net income generated by the project (e.g. organic matter sale and/or savings)
- Purchase cost of the facilities and/or equipment associated with the project
- Fixed annual costs for operation and maintenance
- Administrative costs associated with the project (e.g. management, marketing, etc.)
- Weighted average cost of capital
- Tax rate

5. Government Policies, Regulations, and Law in Ontario

Since 2018, the province's environmental plan[74] has been in effect, with a key objective of reducing litter and waste in communities. A major goal of this plan is to divert residual waste from landfills to limit greenhouse gas (GHG) emissions.

The Ontario government also released its Strategy for a Waste-Free Ontario in 2017. This strategy set an ambitious long-term target: reducing overall waste generation by 80% by 2050. To support this goal, the province committed to a series of actions aimed at improving waste reduction and diversion, with a particular focus on the industrial, commercial, and institutional (IC&I) sector. Supporting legislation includes the *Waste-Free Ontario Act*, *2016*, the *Resource Recovery and Circular Economy Act, 2016,* the *Environmental Protection Act,* and the *Food and Organic Policy Statement.*

With respect to land application of biosolids, the principal legislative framework is the Nutrient Management Act, 2022 (NMA) and its regulation O. Reg. 267/03. Under this framework, sewage biosolids are classified as Non-Agricultural Source Materials (NASM). Land application of NASM is subject to strict requirements regarding:

- Testing for nutrients, pathogens, metals, and other parameters to ensure agronomic and environmental safety.

[74] Ontario Ministry of the Environment, Conservation and Parks. (2018, November 29). *Made-in-Ontario Environment Plan*. Government of Ontario. https://www.ontario.ca/page/made-in-ontario-environment-plan

- Application standards, including maximum nutrient loading rates, setback distances from wells and watercourses, slope and soil restrictions, and seasonal limitations (e.g., prohibitions on frozen or snow-covered soils)
- Planning and approval, with the requirement for a site-specific NASM Plan prepared by a certified professional and approved before application.
- Handling and transport, including storage rules, odor management categories, and Environmental Compliance Approvals or registrations for transportation (Government of Ontario, 2023).

Other important regulations are listed in the table below.

Regulation	Level of Relevance	Relevance for Biosolids Land Application
Nutrient Management Act, 2022 & O. Reg. 267/03	High	Primary regulatory framework governing biosolids as Non-Agricultural Source Materials (NASM). Establishes testing, application standards, site-specific NASM Plans, and handling/transport requirements.
Ontario Water Resources Act (OWRA), R.S.O. 1990	Medium	Protects surface water and groundwater from contamination. Relevant to biosolids projects due to setback distances, runoff management, and protection of water sources near application sites.
Environmental Protection Act (EPA), R.S.O. 1990	Medium	Provides the overarching framework for waste management and environmental protection in Ontario. Biosolids storage, transportation, and processing facilities may require Environmental Compliance Approvals (ECAs). While important, its role is broader and less specific to biosolids land application compared to the NMA.
Fertilizers Act & Fertilizers Regulations (federal)	Low-Medium	Federal framework regulating the sale and marketing of fertilizers and supplements in Canada. Applies mainly to processed biosolids marketed as fertilizer products (e.g., pelletized biosolids), but not to land-applied NASM under the NMA. Relevance depends on whether biosolids are marketed or directly applied.

These rules regulate the safe substitution of biosolids for chemical fertilizers on agricultural land, focusing on soil health and environmental protection. However, they do not create any obligation for municipalities or farmers to apply biosolids, nor do they establish mandatory replacement of synthetic fertilizers as a waste management practice. The use of biosolids remains voluntary and is primarily determined by generator, hauler, and landowner interest, subject to regulatory approval.

6. Common Practice Analysis of Generic PAI III

As a reminder, this generic PAI focuses on the recycling of municipal wastewater sludge and residues, pulp and paper mill sludge (PPMS) and residues, as well as other carbon-rich organic residues that can be used for land application, soil remediation, and even animal nutrition such as biochar. The sectors targeted here remain the IC&I sectors, including municipalities.

6.1 Organic Waste Generation and Handling in Ontario

Ontario continues to generate large volumes of waste, most of which ends up in landfills. In 2018, the province produced approximately 13.2 million tons of waste, of which almost 10.1 million tons were landfilled and approximately 3.1 million tons were diverted from landfill for a diversion rate of 23% (Office of the Auditor General of Ontario, 2021). Analysis indicates that roughly 79% of this landfilled material (40% paper, 30% organic waste, 9% CRD debris) could have been recycled or recovered.

Table 3.2 Composition of the Waste in Ontario in 2018

Waste Category	**Percentage** (%)
Paper products (cardboard, printed paper, etc.)	40%
Organic waste (food scraps)	30%
Construction, renovation, and demolition debris	9%
Non-paper packaging (plastic, glass, metal)	11%
Other types of waste	10%

Source: Auditor General of Ontario, 2021

The IC&I sector is a major contributor to this trend. In 2018, IC&I diversion was just 15%, a decline from 17% in 2002. This disparity explains Ontario's modest overall diversion performance. At the same time, non-residential waste disposal increased by 7.6% between 2014 and 2018, from 5.67 million tons to 6.10 million tons (Statistics Canada, 2020).

In summary, Ontario's waste profile is characterized by rising total disposal, low diversion rates in the IC&I sector, and a large proportion of recyclable or compostable materials being landfilled. These conditions highlight the limited uptake of recovery practices, especially in the non-residential sector, which is central to the common practice analysis.

6.2 Municipal Residues and Sludge

Each year, it is estimated that Ontario generates approximately 250,000 dry tons of municipal sewage biosolids. Some 55% are used for agricultural land or land reclamation, remaining 45% is either incinerated or landfilled (OSCIA, 2019). Biosolids represent only a very small fraction of the total nutrients and organic amendments applied to agricultural land in Ontario. Ontario has several instruments and frameworks in place that promote biosolids production, including the *Food and Organic Waste Policy*

Statement[75] and the *Food and Organic Waste Framework*[76]. In these two documents released in 2018 and updated in 2021, the Ontario government encourages municipalities to plan for the beneficial management and use of biosolids and to consider new and improved biosolids treatment technologies to promote volume reduction and nutrient recovery.

In addition, a search of the websites of various municipalities in Ontario reveals that for the most part, the conversion of municipal sludge into agriculturally usable biosolids is a recent practice. For example, the City of Toronto[77] introduced the concrete idea of such a project in late 2015, when they discussed options for the beneficial use of biosolids from the Highland Creek Wastewater Treatment Plant. In recent years, several Ontario municipalities developed biosolids management plans for environmental sustainability and growth. One example is Waterloo, which released the draft of its biosolids master plan in April 2018.[78]

Given the years of recent publication of these documents and the non-binding legislative nature of these practices, it is apparent that these practices are not common. Biosolids also represent only a very small fraction of the total nutrients and organic amendments applied to agricultural land in Ontario.

6.3 Biochar

Biochar has gained increasing international attention, with applications in both agriculture (soil amendment) and energy (syngas, bio-oil). A growing body of scientific articles demonstrates its potential benefits, and the Intergovernmental Panel on Climate Change (2019) has identified biochar as a promising technology for large-scale carbon sequestration in its special 2018 report on global warming.

Biochar is defined by the International Biochar Initiative (2015) as: « a solid material obtained from the thermochemical conversion of biomass in an oxygen-limited environment. Biochar can be used as a product itself or as an ingredient within a blended product, with a range of applications as an agent for soil improvement, improved resource use efficiency, remediation and/or protection against environmental pollution, and as an avenue for GHG mitigation ».

In practice, biochar is a form of charcoal produced from biomass residues. For example, bark removed at wood processing plant is often burned for heat generation, but when converted into biochar, it can serve as a soil amendment, filtration medium, or long-term carbon sink. Despite its potential, the technology remains emerging, with limited marker adoption.

[75] Ontario Ministry of the Environment, Conservation and Parks. (2018). *Food and Organic Waste Policy Statement*. Government of Ontario. https://www.ontario.ca/page/food-and-organic-waste-policy-statement

[76] Ontario Ministry of the Environment and Climate Change. (2017). *Ontario's food and organic waste framework*. Ontario Ministry of the Environment and Climate Change. https://files.ontario.ca/food_and_organic_waste_framework.pdf

[77] Toronto Public Health. (2015, October 7). *Health impact assessment of biosolids management plan for Highland Creek Waste Water Treatment Plant*. City of Toronto. https://www.toronto.ca/legdocs/mmis/2015/hl/bgrd/backgroundfile-84595.pdf

[78] Region of Waterloo. (2018, April). *2018 Biosolids Strategy at a Glance*. https://www.regionofwaterloo.ca/en/living-here/resources/Documents/water/projects/wastewater/biosolids/At-a-Glance-document.pdf

In Ontario, several research projects are being conducted by universities and private organizations to study the benefits of biochar in agriculture. For instance, McDonald et al. (2019) assessed soil impacts of biochar application and its potential as a soil amendment. On the industrial side, the Government of Ontario (2025) invested over CAD 4 million in *Haliburton Forest Biochar* to support new technology enabling greater and more efficient biochar production. This was the only biochar project funded among five research and modernization projects in the forest sector, highlighting both government interest and the scarcity of commercial projects. At present, very few biochar projects exist in Ontario or across Canada, reinforcing its status as a nascent technology.

7. Conclusion

Based on current research, the recycling and reuse of organic materials—such as paper mill residues and sludge, municipal sewage treatment residuals, dry biomass residues, and biochar—are not widely practiced in Ontario, particularly within the industrial, commercial, and institutional (IC&I) sector.

This indicates that the potential environmental benefits of these materials, including greenhouse gas mitigation and soil enhancement, are largely untapped in the province. The following gap and opportunities have been identified:

- General Waste: Only 15% of waste generated by the IC&I sector, including municipalities is diverted from landfills, despite ICI&I producing 60% of the total waste.
- Municipal Residues and Sludge: about 45% of the municipal sewage is either incinerated or landfilled, biosolids application on agricultural land represent only a very small fraction of the total nutrients and organic amendments applied.
- Biochar: it is still in the exploratory phase. Although it is used and produced by some companies, its use is not yet a common practice.

Each of these conditions fall below the 20% threshold defined by the applied methodology. Furthermore, provincial and federal regulations do not require the adoption of landfill diversion of biosolids and their application in replacement of chemical fertilizers.

Accordingly, it is concluded with confidence that land application of biosolids and biochar practices in Ontario are not common practices within the meaning of the methodology. Additionality for this generic PAI is therefore demonstrated, conditional on individual PAIs obtaining an internal rate of return (IRR) below the 16% benchmark in the investment analysis.

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9. Appendix

Table 4 : Biochar's contributions to GHG emission reductions

GHG reduction	Description	GHG	% of Reductions
Carbon sequestration	Photosynthesis sequesters carbon in biomass as it grows. When this biomass decomposes, it releases the carbon back into the atmosphere. If the biomass is instead converted through pyrolysis into biochar, the carbon originally sequestered in the biomass will be stored for a much longer time – for hundreds or thousands of years depending on the characteristics of the biochar and the environment into which it is incorporated. This is because biochar is significantly more resistant to decomposition than the biomass used to produce it. Pyrolysing biomass therefore enhances carbon sequestration.	CO_2	50-65%
Renewable energy	The energy which can be produced from the gases and oils generated by pyrolysis can replace the combustion of fossil fuels. Pyrolysis could produce electricity (which would offset fossil-fuelled power plants) or heat (which could replace thermal demand at or near the pyrolysis plant previously supplied with fossil fuels).	CO_2	20-40%
Waste diversion	Many feedstocks, including rice residues, green waste sent to landfills and manure, are left to decompose without oxygen in rice paddies, landfills and lagoons. This anaerobic decomposition emits methane (CH_4). Collecting and pyrolysing feedstocks that would otherwise anaerobically decompose avoids CH_4 emissions.	CH_4	0-20%
Reduction in soil emissions	Applying biochar to soils may reduce soil emissions of nitrous oxide (N_2O) and increase the ability of soils to uptake CH_4. These reductions are highly variable and the precise mechanism through which they occur is not yet fully understood.	N_2O, CH_4	0-5%
Reduction in fertilizer manu-facturing	Applying biochar to fields may reduce the need to apply other conventional fertilizers. Many conventional fertilizers are energy intensive to manufacture. Reducing the demand for fertilizers reduces its manufacture, thereby reducing CO_2-emissions. When nitrogen fertilizers are applied to field, a small percentage of the nitrogen is emitted as N_2O. Reducing nitrogen fertilizer applications also reduces N_2O emissions	CO_2, N_2O	Not quantified

Source: Based on ranges reported in (Woolf, 2010) and (Roberts, 2010)[12]

Source : Van der Gaast and Spijker (2013)

1. Appendix 2: Emission factors for PPMS and residues

Scientists from research institutions, including the UQAC Eco-counselling Chair, have conducted several laboratory and field studies on the emissions and factors to be considered in calculating GHG emissions from the management of paper mill biosolids. Tables 5 and 6 present the different scenarios studied, including landfilling, land application, combustion, and composting. However, the emission factors presented in these publications can only be used where the standards allow, as the studies were conducted on a pilot scale. Additional research is therefore required to quantify direct GHG emissions at the industrial scale and confirm the importance of N_2O emissions in the carbon footprint associated with PPMS landfill.

Furthermore, on its site, the NCASI (National Council for Air and Stream Improvement) is putting forward tools for calculating GHG emissions related to the management of paper mill sludge and residues. These include three documents (Excel files) that were revised in 2020. The first document, ICFPA/NCASI

Spreadsheets for Calculating GHG emissions from pulp and paper manufacturing Version 3.3.a, is for the Canadian Mandatory Reporting Program (Large Final Emitters program). The second document is the « Spreadsheets for Calculating GHG Emissions from Pulp and Paper Manufacturing Under the Canadian GHG Reporting Program (GHGRP) Version 4.0 » and the third is the « Spreadsheets for Calculating GHG Emissions from Pulp and Paper Manufacturing Under the Output-Based Pricing System (OBPS) Regulations : SOR/2019-266 ».

Table 5 : Pulp and paper mill biosolids emissions (N2O and CH4)

	Specification of PPMS	GHG emissions in ton of dry matter in CO2e (t CO2e t-1 dry PPMS)	References	Observation
Landfilling	Primary Mixed (primary-secondary)	0,017 0,90	Faubert and al. (2015)	Most of the sludge produced by the pulp and paper industries in Quebec is **mixed sludge** (**primary + secondary**).
Land application	Mixed (primary-secondary)	0,12	Faubert and al. (2015)	
Combustion	Mixed (primary-secondary) primary dominated Primary-secondary-deinking Mixed (primary-secondary)	0,13 0,00057 0,014	Faubert and al. (2015)	
Composting	/	GHG emission factors need to be evaluated for PPMS composting (Faubert et al. (2016)		

Landfilling

The NCASI model that has just been revised in May 2020, an Excel document available on its site called « GHG Reporting Requirements in Canada, Version 3.3a, last updated May 2020 », provides, in its « other - Waste Management » sheet, three scenarios (methods) for calculating CH_4 emissions from landfilling. This model can therefore be used to find emissions or emission factors according to the specificities of our clients. These methods can also be used for municipal sludge and wastewater.

Table 6 : GHG emission factors from the management of PPMS by landfilling and land application

	Specification of PPMS	Study description and soil type		EF in CO_2e (Mg CO_2eMg^{-1} dry PPMS)	References	Observation
Landfilling	Undifferentiated	GHG included in the emission factors in CO_2e is CH_4	Default parameter values • L_0=100 m^3 Mg^{-1} dry PPMS • k=0.03 y^{-1} • OX=0.1	1.5	NCASI (2005, 2013); Heath et al. (2010)	The majority of sludge produced by the pulp and paper industries in Quebec is mixed sludge (primary + secondary).
			Other recommended parameter values	0.94		

			• L_0=80.5 m^3 Mg^{-1} dry PPMS • k=0.013 y^{-1} • OX=0.1			
	Low-ash	Theoretical estimation		6	Buswell and Mueller (1952); Likon and Saarela (2012); Likon and Trebše (2012)	
Land application	Unspecified	GHGs included in the emission factors in CO_2e are CH_4 and N_2O/Direct N_2O emission measurements from agricultural soils	• Site location : eastern Scotland • Soil type: sandy loam • Crop : calabrese •Application rate : 44.4 Mg dry PPMS ha^{-1}	0.069	Baggs et al. (2002)	
	Mixed (primary-secondary) / De-inking	GHG included in the emission factors in CO_2e is N_2O/Time frame of the emission factors: one snow-free season (May-October) following a single application and repeated on two sites over two consecutive seasons/ Direct N_2O emission measurements from agricultural soils	•Site location : eastern Canada •Soil types: clay and silty clay •Crop: Silage corn •C:N : 17–21 • Mixed PPMS • Application rates : 4.89–6.90 Mg dry PPMS ha^{-1} •De-inking PPMS •C:N : 61–71 •Application rates : 25.9–38.1 Mg dry PPMS ha^{-1}	0.085 – 0.12 -0.016 – -0.0038	Chantigny et al. (2013)	• EF year 1 : 0.085 • EF year 2 : 0.12 •EF year 1 : -0.016 •EF year 2 : -0.0038

	Mixed (primary-secondary)	GHG included in the emission factors in CO_2e is N_2O/Time frame of the emission factors: one snow-free season (July-October) following a single application and repeated on two sites over two consecutive seasons/Direct GHG emission measurements from nonacidic mine tailings site prior to reforestation	•Site location: eastern Canada •Soil type : technosol •LPPMS • C:N : 18.7–23.3 Treatments • Applications of 0, 50 or 100 Mg dry LPPMS ha^{-1} combined with absence or presence of white clover Treatments • 50 Mg dry LPPMS ha^{-1} •100 Mg dry LPPMS ha^{-1}	0.058 – 0.077 0.071 – 0.17	Faubert et al. (2017a)	•EF year 1 : 0.058 •EF year 2 : 0.077 •EF year 1 : 0.071 •EF year 2 : 0.17
		GHGs included in the emission factors is CO2e are N2O and CH4/Time frame of the emission factors : one snow-free season (May/June-October) following a single application and repeated on two sites over two consecutive seasons/Direct GHG emission measurements from agricultural soils	•Site location: eastern Canada •Soil type: clay loam •Crop: wheat •Mixed PPMS • C:N : 17.2–17.8 • Application rates : 7.36–32.0 Mg dry PPMS ha−1 Treatments • Crop N requirements (90–120 kg ha−1) supplied by a PPMS : Urea mixture, with 0, 25, 50, 75 and 100% of N derived from PPMS	0.09 – 0.48	Faubert et al. (2017 b)	•EF year 1 : 0.09 •EF year 2 : 0.48

Combustion	/	/	/	Faubert et al. (2016)	No GHG emission factor is yet available for the combustion of PPMS
Composting	/	/	/	Faubert et al. (2016)	**No GHG emission factors were specifically found for PPMS composting**
Method of the first order of decay, parameters • L0 : CH4 generation potential (m3 Mg−1 dry PPMS)/ • k : reaction rate constant (y−1)/ • OX : CH4 oxidation factor (fraction) Note: 1 Mg = 1 Megagram= 1 Ton					

Source : Faubert et al. (2019)

However, the default emission factor, 1.5 Mg CO_2e Mg-1 dry PPMS, from Table 6 that was determined with the calculations for the default model conditions could probably be suitable.

Land application

Emission factors are variable depending on certain conditions such as regional temperature and soil composition. Chapter 11 of Volume 4 provides emission factors for IPCC 2019 methods for mineral and organic fertilizer application. The default aggregate emission factor is 0.010 Kg N20–N (kg N-1), with values varying within the uncertainty range of 0.010 to 0.018. Details are provided in Table 7.

Table 7 : Default emission factors to estimate direct N_2O emissions from managed soils

Emission factor	Aggregated		Disaggregated		
	Default value	Uncertainty range	Disaggregation[4]	Default value	Uncertainty range
EF_1 for N additions from synthetic fertilisers, organic amendments and crop residues, and N mineralised from mineral soil as a result of loss of soil carbon[1] [kg N_2O–N (kg N)$^{-1}$]	0.010	0.001 – 0.018	Synthetic fertiliser inputs[5] in wet climates	0.016	0.013 – 0.019
			Other N inputs[6] in wet climates	0.006	0.001 – 0.011
			All N inputs in dry climates	0.005	0.000 – 0.011
EF_{1FR} for flooded rice fields[2,7] [kg N_2O–N (kg N)$^{-1}$]	0.004	0.000 – 0.029	Continuous flooding	0.003	0.000 – 0.010
			Single and multiple drainage	0.005	0.000 – 0.016
$EF_{3PRP, CPP}$ for cattle (dairy, non-dairy and buffalo), poultry and pigs[3] [kg N_2O–N (kg N)$^{-1}$]	0.004	0.000– 0.014	Wet climates	0.006	0.000 – 0.026
			Dry climates	0.002	0.000 – 0.006
$EF_{3PRP, SO}$ for sheep and 'other animals'[3] [kg N_2O–N (kg N)$^{-1}$]	0.003	0.000 – 0.010	-	-	-

Source : IPCC (2019), 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories : Chapter 11

Combustion

NCASI suggests factors for fuel and wood waste combustion in its Excel file mentioned above. The factors are in the « Stationary Combustion » sheet on lines 107 and 108 for Wood fuel/Wood waste and Pulping liquors, respectively. For Wood fuel/Wood waste, the emission factors are 0.00016 kg/kg (CH4) and 0.0001 kg/kg (N2O). For Pulping liquors, the emission factors are 0.000033 kg/kg (CH4) and 0.000027 kg/kg (N2O)

Generic PAI IV: Saving Energy on Recycling Activity

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1. Description of the Generic PAI IV

The generic PAI IV consists of the recovery and recycling of materials with the objective of reintroducing them into productive use as secondary materials. Eligible materials typically include ferrous and non-ferrous metals, plastics, paper, glass, food and organic waste and other industrial or post-consumer materials that can undergo processes such as collection, sorting, mechanical or chemical reprocessing, and remanufacturing.

This category of project is limited to the material recovery and recycling activities, and the emissions impact is assessed by comparing the energy required to produce goods from recycled inputs (i.e. secondary materials) against the higher energy demand associated with the production of equivalent goods from virgin materials.

In this context, the principal source of emission reductions arises from the avoided energy use in primary material extraction and processing. It is important to note that this project category does not consider avoided emissions from waste disposal (e.g. landfilling or incineration) as part of its accounting boundary.

Examples of projects eligible under this category include, but are not limited to:

- Recycling printer cartridges to recover the plastics and metals for reuse
- Recovery of titanium scrap into ferroalloys or refined ingots for industrial use

- Recycling of industrial food waste to create animal feed or bioproducts

2. Alternative Scenarios

Since this is a grouped project that will progressively include PAIs from several client facilities on an ex-post basis, the specific alternative scenario for each individual PAI cannot be determined at this stage, The applicable alternative scenario will be assessed and defined as each new PAI is added to the grouped project following the same approach as the initial PAI, described in section 3.4 of the PD.

3. Barrier Analysis

Barriers that would prevent the implementation of this project type are generally, but not limited to, the following:

Type of barriers	Description
Financial barriers	• High capital investment: in specialized recycling equipment and infrastructure. For instance, the recycling process of plastic is not always economically viable due to sorting and separation challenges (Schyns & Shaver, 2021). • Uncertain market value: Future revenues from recycling are unpredictable which make investment difficult to acquire. There are uncertainties financial profitability of recovered materials, especially when virgin materials are cheap (King & al., 2023).
Technical barriers	• Complexity of material separation: Often single technology cannot achieve the purpose of fine separation and recycling, for example for e-waste (Liu & al., 2023). A large amount of valuable raw materials is lost such as unique scarce metal for cars. (Andersson et al., 2019) • Purity and quality control issues: Products such as plastic become too contaminated to be recycled (Schirmeister, 2022).

4. Investment Analysis

Since this is a grouped project that will progressively incorporate PAIs from multiple client facilities on an ex-post basis, a detailed investment analysis for each individual PAI will be performed as they are added to the grouped project, ensuring that financial evaluations are based on the most accurate and current project-specific data.

The investment analysis for each PAI will be performed using the internal rate of return (IRR) as the financial indicator, applying a benchmark IRR of 16% for a 10-year period. The analysis may consider, among other factors, and when applicable, the following information:

- Net income generated by the project (e.g. income from waste)
- Purchase cost of the facilities and/or equipment associated with the project
- Fixed annual costs for operation and maintenance
- Administrative costs associated with the project (e.g. management, marketing, etc.)
- Weighted average cost of capital
- Tax rate

5. Government Policies, Regulations, and Laws Analysis

Ontario and Canadian legislations provide frameworks that encourage recycling and waste diversion, often through Extended Producer Responsibility (EPR) and circular economy initiatives. These regulations create the conditions for material recovery but do not mandate the transformation of waste into secondary materials, leaving the decision to adopt such practices on a voluntary basis.

At the provincial level, the Resource Recovery and Circular Economy Act, 2016 (RRCEA), establishes the framework for waste management, recovery, and diversion in Ontario. One of the most significant measures under the RRCEA is the transition of the Blue Box program (O. Reg. 391/21) into an EPR program, introduced in 2021. The Blue Box program, which has long been central to household recycling in Ontario, was restructured so that producers assume full responsibility for the collection, processing, and recovery of their products and packaging. [79]

The transition shifts the end-of-life management obligation away from municipalities, ensuring that producers are accountable for the entire life cycle of their products and packaging. The phased transfer of responsibilities began on January 1, 2023 and is expected to be fully implemented by December 31, 2025 (Government of Ontario, 2019). Beyond packaging and paper, the EPR program also covers since January 1, 2021, the reuse or recycling of electrical and electronic equipment (e.g. computers, printers, monitors, cell phones, cameras, etc.)[80], creating further opportunities for material recovery and circular innovation.

In addition to the RRCEA, other provincial regulations support recycling and waste diversion in Ontario. For municipalities, O. Reg. 101/94: Recycling and Composting of Municipal Waste, requires municipalities with a population greater than 5,000 to implement recycling programs. For the purposes of this generic PAI, the relevant materials include aluminum foil, plastic films and rigid plastic containers under certain conditions.

In the IC&I sector, recycling obligations are established under the Ontario Regulation 102/94: Waste Audits and Waste Reduction Work Plans and the Ontario Regulation 103/94: Industrial, Commercial and Institutional Source Separation Programs. These regulations require specific types of facilities to prepare

[79] For the list of Blue box materials, refer to O. Reg. 391/21, Part I, section 2 : https://www.ontario.ca/laws/regulation/210391#BK2

[80] Refer to O. Reg. 522/20 Electrical and Electronic Equipment: https://www.ontario.ca/laws/regulation/r20522

a written waste reduction plan and to implement a source separation program. The types of facilities subject to these regulations, along with the applicability conditions for each, are specified in Table 1 of the Appendix.

Despite the presence of several regulations in Ontario that support waste diversion, it must be reiterated, as mentioned in the generic PAI II, that the Office of the Auditor General of Ontario (2021) report indicates that under the Resource Recovery and Circular Economy Act, 2016, the regulations surrounding source separation programs, waste audits and waste reduction plans are applied to only a small portion of Ontario's IC&I; 2% of the total sector.

It should also be noted that in 2022, the Ontario government released its Critical Minerals Strategy 2022-2027. As part of this strategy, the Mining Act was amended to introduce a new recovery permit, to promote the recovery of strategic critical minerals for the manufacture of electric vehicle batteries.

Table 1 Summary of regulations relevant to energy savings through recycling projects

Laws and Regulations	Relevance	Description
RRCEA, 2016	Medium	Enables EPR programs and sets framework for municipal and producer recycling systems; does not mandate secondary material production.
O. Reg. 102/94 Waste Audits and Waste Reduction Work Plans	Low	Waste audits and reduction plans for large ICI establishments. Encourages reduction and recycling; does not require secondary material conversion.
O. Reg. 103/94 Industrial, Commercial, and Institutional Source Separation Programs	Medium	Source separation of designated recyclables at specific ICI establishments; does not mandate secondary material conversion.
O. Reg. 174/23 Blue Box	Medium	Producer responsibility for residential recycling and encourages material diversion; end-use into secondary materials is not mandated.

At the federal level, no regulations were identified as having significant relevance for the project category of saving energy through recycling activities. This outcome is consistent with the division of powers in Canada, where waste management, recycling, and material diversion fall predominantly under provincial and municipal jurisdiction. Federal instruments such as the Canadian Environmental Protection Act, 1999 (CEPA) provide enabling authority for managing toxic substances, transboundary waste movements, and pollution prevention[81], which is outside the scope of this generic PAI.

[81] Municipal Solid Waste: a shared responsibility. Government of Canada, 28 January 2022: https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/municipal-solid/shared-responsibility.html

Lastly, regarding food and organic waste, while Ontario has signaled since 2017 its intention to ban the landfilling of organics through strategies and consultations[82], this commitment has yet to be translated into binding regulation. In the meantime, the Ontario government issued the Food and Organic Waste Policy Statement (2018), which provides guidance to provincial ministries, municipalities, and IC&I establishments to increase waste reduction and resource recovery of organic waste. As such, the statement functions solely as a policy tool supporting these objectives and does not carry the force of law.

6. Common Practice Analysis on Generic PAI IV

This section evaluates the prevalence of recycling activities resulting in reuseable secondary materials in Ontario.

6.1 Plastic Waste in Canada and Ontario

According to Statistics Canada, in 2021, the amount of plastic in products produced for Canadian consumption was 7 112 kilotonnes (kt), mostly in packaging, vehicles, and construction materials (Statistics Canada, 2025). According to that same source, that same year, Canadians permanently disposed of 4 594 kt of plastic, an increase of 1.7% from 2020. Of this total, almost four-fifths (79%) went directly to landfill or incineration without diversion, while the remaining 21% was residual waste from primary and final recycling processors — material that had entered recycling facilities but could not be turned into usable products.

Just over one-quarter (26.5%) of all discarded plastic in Canada — 1 319 kt — was diverted for material recovery in 2021. Diversion represents plastic collected for recycling, but not all of it is successfully recycled. In fact, Canadian recyclers produced only 365 kt of recycled plastic resins ready for use by manufacturers, a small fraction of the total plastic produced for Canadian consumption that year (about 5%).

In 2016, 86% of the plastic waste was sent to the landfill, 1% ended up in the environment and 4% incinerated for energy recovery. It estimated that only 9% was recycled; 8% mechanically and 1% chemically (Environment and Climate Change Canada, 2019). In the same study, plastic recycling rate by sector were analyzed and are summarized in table 2; very low recycling rate by sector ranged from 0% to 15%.

Table 2: Plastic Diversion rate by sector in Canada, 2016

Sector	Discarded plastics (kt)	Diversion rate (%)	Recycling rate (%)	Value recovery rate (%)	Plastics recovered (kt)
Packaging	1542	23	15	21	327
EEE	214	16	13	15	33

[82] CBC News reported in October 2019 about Ontario's " ban on all organic waste from landfills by 2022 ": https://www.cbc.ca/news/science/landfill-ban-organics-ontario-1.5282881

Agriculture	45	9	5	10	5
Car	309	100	0	0	0
White goods	130	64	0	5	7
Construction	175	11	1	6	11
Textiles	235	5	0	7	17
Other plastics	671	0	0	7	43
Total	3268	25	8	13	442

Source : Environment and Climate Change Canada, 2019, p.12
https://publications.gc.ca/collections/collection_2019/eccc/En4-366-1-2019-fra.pdf

Reliable provincial data on recycled resin quantities is limited. According to Statistics Canada (2022), only about 10% of discarded plastics in Ontario were sorted and baled in 2018. However, this figure does not necessarily reflect actual recycling rates, as not all sorted and baled plastics are ultimately recycled.

6.2 Metals, Electronics and Critical Minerals Recycling Market in Canada and Ontario

In Canada, metal recycling is a well-established practice for a limited number of materials, though overall prevalence varies significantly by metal type and application. Aluminum, for example—an infinitely recyclable material—achieves a 90% recycling rate in the automotive and construction sectors in Canada[83]. Similarly, steel scrap and copper are recovered in substantial quantities through well-developed collection and processing systems[84,85]. These three metals can therefore be considered common practice in Canada.

In contrast, recycling rates for most other metals and minerals remain low or highly uncertain. This is particularly evident for e-waste, which contains a complex mix of materials. According to the Association of Municipalities of Ontario (2023), the amount of electrical and electronic equipment (EEE) recycled in Ontario has declined significantly since 2013, despite a sharp increase in the generation of e-waste overall. A recent study by the University of Waterloo found that e-waste volumes have nearly tripled in Canada over the last two decades (Habib & al., 2023). However, a study by Kumar & Holuszko (2016) estimated that only about 20% of total e-waste generated in Canada was collected in 2014, and collection does not equate recovery into secondary materials. A substantial share of collected e-waste is either exported with limited traceability, landfilled due to contamination or hazardous components, or stockpiled awaiting viable recycling pathways. Persistent challenges — including the complexity of material composition, hazardous additives, high processing costs, and gaps in domestic recycling infrastructure — further constrain recovery.

[83] Aluminum facts. Government of Canada, 24 February 2025: https://natural-resources.canada.ca/minerals-mining/mining-data-statistics-analysis/minerals-metals-facts/aluminum-facts#a8

[84] Copper facts. Government of Canada, 31 January 2025: https://natural-resources.canada.ca/minerals-mining/mining-data-statistics-analysis/minerals-metals-facts/copper-facts#L6

[85] Iron Ore facts. Government of Canada, 31 January 2025: https://natural-resources.canada.ca/minerals-mining/mining-data-statistics-analysis/minerals-metals-facts/iron-ore-facts#L6

The recycling of critical minerals is even more constrained, given the technical complexity and costs of recovering elements such as lithium, cobalt, nickel and rare earth elements from end-of-life products. While some capacity exists — such as three lithium recycling facilities in Canada, only one of which is in Ontario[86] — recycling of critical minerals remains at the pilot or early commercialization stage. Federal and provincial governments have released (e.g. Canada's Critical Minerals Strategy, 2022; Ontario's Criticial Minerals Strategy 2022-2027)[87], which highlight the importance of recycling to secure supply for clean technologies. However, in practice, recovery is limited to a few initiatives and is not widespread.

Globally, only about 1% of rare earth elements and critical metals are estimated to be recycled (Jowitt & al., 2018; Nassar, 2024). At the same time, according to the International Energy Agency (2023), global demand for critical minerals is projected to grow rapidly, reaching over three times current levels by 2030. Currently, except for aluminum, copper and steel, where recycling volumes are high, the amount of other metals and critical minerals from e-waste and other critical applications remains minimal. As such, except for these three metals, recycling cannot be considered common practice in Ontario.

6.3 Industrial Food Recycling

According to the Government of Ontario (2015), about 75% of food and organic waste generated in the IC&I sector continues to be landfilled. Despite government efforts over the past decade to promote diversion through composting, landfilling remains the dominant outcome for this waste stream. While data on reuse pathways is limited, it is reasonable to conclude that only a small share of food and organic waste is recovered for higher-value applications, such as conversion into animal feed or bioproducts, making reuse beyond composting uncommon practice.

6.4 Synthesis of Common Practice Findings

Applying the methodological steps outlined in CDM Tool 24 with the adjustments specified in Appendix A3-2, the assessment of recycling practices leading to energy savings in Ontario demonstrates a clear divide between a limited number of materials that are widely recycled and the majority of materials where recovery remain marginal.

Recycling of aluminum, copper and steel is well established, supported by mature collection system and stable markets. These three materials are therefore considered common practice in Ontario and cannot be included in the group project.

In contrast, recycling of plastics, e-waste, critical minerals, and food and organic waste remains limited and cannot be classified as common practice. Plastics show very low actual recycling rates, with only a fraction of collected material ultimately re-entering the market as usable resins or other secondary materials. E-waste recycling is declining despite rapidly increasing generation, with only small share of

[86] Lithium Facts. Government of Canada, 12 March 2025: https://natural-resources.canada.ca/minerals-mining/mining-data-statistics-analysis/minerals-metals-facts/lithium-facts#L6

[87] Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry. (2022). *Ontario's Critical Minerals Strategy 2022–2027: Unlocking potential to drive economic recovery and prosperity*. Government of Ontario. https://www.ontario.ca/page/ontarios-critical-minerals-strategy-2022-2027-unlocking-potential-drive-economic-recovery-prosperity

devices collected and even fewer processed into secondary materials. For critical minerals, recovery is still at the pilot or early commercialization stage, with only a handful of facilities operating in Canada. Food and organic waste in the IC&I sector continue to be predominantly landfilled, with composting only partially adopted and higher-value reuse pathways largely absent.

Taken together, the findings confirm that, aside from the established recovery of aluminum, copper, and steel, recycling leading to energy savings remains a marginal practice in Ontario. The results underscore the significant potential for expanding recycling and material recovery in sectors that are not yet mature, particularly plastics, e-waste, critical materials and food waste.

7. Conclusion

The analysis confirms that recycling practices in Ontario vary significantly by material type, as well as by sector. Aluminum, copper, and steel are the materials that were found to have well-established recycling systems, supported by mature markets and widespread recovery infrastructure. These metals are therefore considered common practice and excluded from eligibility to this grouped project.

In contrast, recycling of other material streams remains limited and cannot be regarded as common practice in Ontario:

- Plastics: Diversion rates are low, with only 10% of discarded plastics sorted and baled in Ontario in 2018.
- Critical minerals: Recovery is still at an early stage with only a handful of facilities in Canada, with minimal capacity in Ontario.
- E-waste: In 2014, the total amount of e-waste collected in Canada is approximately 20%. Ontario has seen its amount of recycled e-waste decreased in the last decade while the Canadian e-waste generation has tripled during the last two decades.
- Food and organic waste: About 75% of food waste continues to be landfilled in the IC&I sector. Composting is only partially adopted, and higher-value reuse pathways are rare.

Each of these indicators falls at or below the 20% threshold defined by the applied methodology. Moreover, neither provincial and federal regulation require the adoption of recovery and recycling of materials with the objective of reintroducing them into productive use as secondary materials, and existing policies provide only voluntary or indirect support, which further reinforces the limited uptake of such measures.

Accordingly, it is concluded with confidence that energy savings through recycling activities in Ontario are not common practice within the meaning of the methodology. Additionality for this generic PAI is therefore demonstrated, conditional on individual PAIs obtaining an internal rate of return (IRR) below the 16% benchmark in the investment analysis.

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9. Appendix

Table 1. Summary of the Conditions for IC&I to be under the Ontario Regulations 103/94: Industrial, Commercial and Institutional Source Separation Programs and 102/94: Waste Audits and Waste Reduction Work Plans

Conditions	Deliverables
Office buildings with a surface of at least 10,000 m²	• Source separation program (O. Reg. 103/94) • Waste audit and waste reduction work plan (O. Reg. 102/94)
Retail stores/complex with a surface of at least 10,000 m²	• Source separation program (O. Reg. 103/94) • Waste audit and waste reduction work plan (O. Reg. 102/94)
Construction demolition of buildings with a total floor area of at least2,000 m²	• Source separation program (O. Reg. 103/94)

	• Waste audit and waste reduction work plan (O. Reg. 102/94)
Multi-Unit Residential with at least 6 dwelling units	• Source separation program (O. Reg. 103/94)
Hotels/Motels with at least 75 units	• Source separation program (O. Reg. 103/94) • Waste audit and waste reduction work plan (O. Reg. 102/94)
Restaurant which within two preceding calendar years at least one year in which the gross sales for all restaurants operated by the owner in Ontario equalled or exceeded $3,000,000	• Source separation program (O. Reg. 103/94) • Waste audit and waste reduction work plan (O. Reg. 102/94)
Hospital with at least 100 beds	• Source separation program (O. Reg. 103/94) • Waste audit and waste reduction work plan (O. Reg. 102/94)
Education building with at least 350 students	• Source separation program (O. Reg. 103/94) • Waste audit and waste reduction work plan (O. Reg. 102/94)
Large Manufacturing Establishments which within the two preceding calendar years there was at least one calendar month in which the hours worked by the persons employed at the site exceeded 16,000 hours	• Source separation program (O. Reg. 103/94) • Waste audit and waste reduction work plan (O. Reg. 102/94)

Generic PAI V: Heat Recovery

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1. Description of the Generic PAI V

Energy systems and industrial processes release significant amounts of heat that would otherwise be wasted. This heat can be recovered and reused for other purposes such as power generation, space heating in buildings, or as input into other industrial processes. By recovering and reusing waste heat, overall energy consumption can be reduced.

The PAI V category is therefore defined as the recovery of waste heat from one system to supply energy to another. It covers all non-common practice activities where waste heat is captured and reused to meet current or additional energy needs in existing facilities

The scope of this generic PAI focuses on the IC&I (Industrial, Commercial, and Institutional) building sector. Industrial facilities offer the greatest recovery potential as many processes generate recoverable heat streams. For commercial and institutional buildings, heat recovery technologies are used to preheat the incoming air from outside.

Project activities recovering waste heat for combined cycle electricity generation, or to heat/cool via cogeneration or trigeneration are excluded from eligibility under this category, unless they specifically involve waste gas recovery or electricity generation from waste heat recovery outside of combined cycle applications.

Examples of projects eligible under this category include, but are not limited to:

- Heat recovery from dust collector in a sawmill

- Installation of a heat recovery system in an arena to reduce propane and electricity consumption

This PAI is limited to heat recovery projects activities only. Other types of energy efficiency projects fall under the generic PAI VII.

2. Alternative Scenarios

Since this is a grouped project that will progressively include PAIs from several client facilities on an ex-post basis, the specific alternative scenario for each individual PAI cannot be determined at this stage, The applicable alternative scenario will be assessed and defined as each new PAI is added to the grouped project following the same approach as the initial PAI, described in section 3.4 of the PD.

3. Barrier Analysis

Barriers that would prevent the implementation of heat recovery projects are generally, but not limited to, the following:

Type of barriers	Description
Financial barriers	1) High investment upfront: High capital costs for specialized equipment, systems, and infrastructure (Hamilton Chamber of Commerce, 2021).
Technical barriers	1) Variability of heat availability: It is hard to ensure sufficient and reliable streams of industrial waste heat (Hamilton Chamber of Commerce, 2021).

4. Investment Analysis

Since this is a grouped project that will progressively incorporate PAIs from multiple client facilities on an ex-post basis, a detailed investment analysis for each individual PAI will be performed as they are added to the grouped project, ensuring that financial evaluations are based on the most accurate and current project-specific data.

The investment analysis for each PAI will be performed using the internal rate of return (IRR) as the financial indicator, applying a benchmark IRR of 16% for a 10-year period. The analysis may take into account, among other factors, and when applicable, the following information:

- Net income generated by the project (e.g. energy cost savings)
- Purchase cost of the facilities and/or equipment associated with the project
- Fixed annual costs for operation and maintenance
- Administrative costs associated with the project (e.g. management, marketing, etc.)
- Weighted average cost of capital
- Tax rate

5. Government Policies, Regulations and Laws Analysis

Under the Electricity Act, 1998, O. Reg. 25/23: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans requires public agencies—such as municipalities, public hospital and school boards—to prepare and submit energy conservation and demand management plans. Therefore, regulation does not apply to commercial and industrial facilities, which are mostly private institutions. As a result, there are currently no regulations requiring commercial, industrial, or non-prescribed institutional facilities, to implement energy conservation or efficiency measures.

That said, all projects must still comply with the Ontario Building Code (O. Reg. 163/24) where applicable. While not specifically targeting waste heat recovery, the Code includes provisions for ventilation systems and related mechanical installations, such as requirements for heat recovery ventilators (HRVs) and energy recovery ventilators (ERVs).

Table 1 Summary of regulation relevant to heat recovery projects

Laws and Regulations	Relevance and description
O. Reg. 25/23: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans	High – Requires prescribed public agencies such as municipalities, municipal service boards, public hospitals, school boards, to prepare and submit an energy conservation and demand management plan and ultimately reduce energy consumed. Not applicable to most IC&I facilities.
O. Reg. 163/24: Building Code	Medium – Contains requirements relevant to heat recovery ventilators (HRVs) or energy recovery ventilators (ERVs) equipment installation, mechanical room design, etc., though these do not directly mandate heat recovery adoption.

Source: Ontario E-Laws. Retrieved August 2025: https://www.ontario.ca/laws

In summary, while these regulations establish compliance obligations for energy efficiency, there are currently no provincial, federal or municipal regulations or laws mandating the installation of heat recovery systems in Ontario's commercial and industrial facilities, nor in institutional buildings outside the scope of O. Reg. 25/23.

Programs and Incentives

Although no regulations mandate the adoption of heat recovery, several voluntary programs that provide financial incentives to encourage energy efficiency improvements in businesses.[88] Currently, there is an electricity-related *Save On Energy Program* that is responsible for administering these financial incentive programs offered by the Independent Electricity System Operator (IESO) for businesses to invest in energy

[88] Independent Electricity System Operator. (2025). Energy efficiency for business. https://ieso.ca/Get-Involved/Energy-Efficiency/Energy-Efficiency-for-Business

efficient equipment. These programs are available to businesses in all sectors, including greenhouses, schools, real estate companies, complex industrial projects, underground fleets and heavy equipment. Examples include:

- Retrofit Program : Provides incentives to upgrade equipment with more energy-efficient alternatives (e.g., lighting, manufacturing, and other equipment, etc.).
- Industrial Energy Efficiency Program : Supports large industrial companies for major projects that reduce energy consumption.
- Energy Performance Program : Offers performance-based financial incentives for energy efficiency measures and equipment upgrades related to sustainable operations and maintenance.

Government regulations or legislations in Ontario do not require IC&I facilities to adopt heat recovery technologies. While O. Reg. 25/23 and O. Reg. 163/24 impose obligations on certain public-sector organizations and set technical standards for buildings, respectively they do not mandate heat recovery. Although certain government initiatives and programs may gradually influence energy efficiency adoption in IC&I buildings, measures to support heat recovery adoption remain voluntary.

6. Common Practice Analysis on the Generic PAI V

6.1 Ontario's Energy Profile and Opportunity for Heat Recovery

In Canada, space heating accounts for 56.6% of the energy used in commercial and institutional operations (Natural Resources Canada, 2017). In the industrial sector, the dominant end use is process heat, which consumes 75 % of all industrial energy (Canada Energy Regulator, 2010).

In Ontario, natural gas and other fossil fuels used for heating and industrial processes represented 36% of the province's total energy use in 2016 (Environmental Commissioner of Ontario, 2019). More recent figures show that in 2020 the industrial sector accounted for 36% of total end-use energy demand, while the commercial sector accounted for 18%, bringing the combined IC&I share to approximately 54% of the province's energy use.[89] Within the energy mix, RPPs and natural gas are the dominant fuel types, and the industrial and commercial sector alone consumed more than half of all natural gas used in Ontario in 2023 (Canada Energy Regulator, 2023).

Additional data from Natural Resources Canada indicate that natural gas is the largest secondary energy use source for Ontario's IC&I sector, representing 54% of commercial and institutional energy use and 37% of industrial energy use (See table 1 and 2 in the Appendix).

Overall, these figures underscore the central role of fossil fuels in energy use by the IC&I sector and signals to a significant opportunity for energy efficiency improvements. Since natural gas is primarily used for heating purposes, heat recovery projects represent an important pathway for reducing both energy consumption and GHG emissions in Ontario's IC&I sector.

[89] See Figure 6: End-Use Demand by Sector (2020) : https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-ontario.html

6.2 Heat Recovery Projects in Ontario

It should be noted at the outset that there are no comprehensive database documenting heat recovery projects in Ontario. In the absence of centralized data, the analysis relies on identifying similar measures for which information was available from public reports, incentive programs, case studies, and company-specific records to assess the level of adoption.

Available evidence shows that heat recovery measures, including heat recovery ventilators (HRVs), energy recovery ventilators (ERVs), and other industrial waste heat recovery systems, have been implemented in Ontario in a limited number of facilities. Documented examples include municipal arenas, recreation centres, and public-sector buildings such as the Civic Centre, Nepean Sportsplex[90], and Red Lake MNR Building[91]. Additional instances include four pilot projects in the food service sector (e.g., HARvEST Systems' fryer heat recovery units)[92] and demonstration projects in industrial settings such as greenhouses and sawmills. These examples confirm that heat recovery measures are technically feasible within Ontario's IC&I sector.

Further insight from projects completed by HTS, the largest independent built-to-order commercial and industrial HVAC (Heating, ventilation, and air conditioning) distributor in North America. Out of the 352 projects conducted by HTS in Ontario, 100 explicitly involved heat recovery.

Beyond Ontario, some organizations are beginning to explore initiatives, but these remain uncommon. For instance, Bell Canada has shown a strong interest in heat recovery at its Kamloops, British Columbia data centre to supply energy to nearby university buildings (DediRock, 2025), expected to be in 2026. While this project illustrates growing interest, such initiatives are recent, geographically limited, and not indicative of prevailing practice in Ontario.

Program-level data provide another perspective. According to the IESO (2021), for 2019 and 2020, 11,128 projects were supported by the Retrofit program, 22 facilities by the Energy Performance program and 106 projects by the Process and System Upgrade program[93]. The latter two programs, appear to be more focused on the industrial sector and are inclined toward process heat recovery associated with the generic PAI V under assessment. Since these figures represent a two-year period, whereas the incentive program was in place for approximately five years. To approximate the total number of projects across the full program duration, the two-year count was scaled by the ratio of program duration to reporting years (factor 2.5). On this basis, an estimated 28,140 projects may have been supported under these programs.

[90] Nepean Sportsplex Pool HVAC Upgrade. HTS. (N.d.): https://www.hts.com/projects/nepean-sportsplex-pool-hvac-upgrade/

[91] Red Lake Northern Ontario, Canada. Tempeff. (N.d): https://www.tempeff.com/case-studies/red-lake/

[92] NGIF Accelerator Continues to Support HARvEST Systems in Developing Commercial Waste Heat Recovery. NGIF Accelerator (7 February 2025): https://www.ngif.ca/ngif-accelerator-continues-to-support-harvest-systems-in-developing-commercial-waste-heat-recovery-technology/

[93] IESO Energy Efficiency Report 2019-2020. IESO. (14 October 2021): https://www.ieso.ca/en/Sector-Participants/IESO-News/2021/10/IESO-Energy-Efficiency-Report-2019-2020

Considering this data, along with documented case studies and reasonable assumptions, it is possible to approximate an adoption rate. Specifically, if the 28,140 projects supported by incentive programs, combined with identified 107 case study projects, are assumed to cover approximately 56,500 buildings in Ontario (allowing for cases where multiple buildings may be associated with a single project),[94] then out of an estimated 831,306 buildings in Ontario, only about 7% could reasonably be considered to have implemented some form of waste heat recovery.

Since the information on identified projects is scarce, it is not possible to fully differentiate whether these measures apply technologies different from those considered under this project category, and therefore a precise application of the CDM Tool 24 factors is not feasible. Accordingly, the analysis relies on a mostly qualitative and conservative quantitative approach.

7. Conclusion

Based on the comprehensive analysis undertaken, waste heat recovery projects are not common practice in Ontario. The data demonstrates that:

- Ontario's energy profile is dominated by natural gas use for heating in IC&I sectors, which are also among the largest and fastest-growing GHG emitters.
- It is estimated that 7% of ICI buildings have implemented waste heat recovery projects. This figure is largely overestimated, as the underlying data reflects all energy efficiency projects supported under relevant programs, rather than projects specifically targeting waste heat recovery.

The adoption rate of this project type is well below the 20% threshold defined by the applied methodology. Furthermore, provincial and federal regulation do not require the adoption of waste heat recovery systems, and existing policies provide only voluntary or indirect support, reinforcing the limited uptake of this type of measure.

Accordingly, it is concluded with confidence that waste heat recovery projects in Ontario are not common practice within the meaning of the methodology. Additionality for this generic PAI is therefore demonstrated, conditional on individual PAIs obtaining an internal rate of return (IRR) below the 16% benchmark in the investment analysis.

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[94] To ensure consistency with the methodology in Appendix A3-3, it was assumed that each project corresponds to 2 buildings. The resulting estimate was then conservatively rounded down to the nearest thousand.

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9. Appendix

Table 1: Commercial/Institutional, Secondary Energy Use by Energy Source, Ontario 2021

Secondary Energy Source	Shares (%)
Electricity (94% green; 34% renewable)	42,2
Natural Gas	53,8
Light Fuel Oil and Kerosene	0,7
Heavy Fuel Oil	0,0
Steam	0,1
Other (coal & propane)	3,1

Source: Natural Resources Canada – Office of Energy Efficiency, 2022a

Table 2: Industrial Sector, Secondary Energy Use by Energy Source, Ontario 2021

Secondary Energy Source	Shares (%)
Electricity (94% green; 34% renewable)	20,4
Natural Gas	37,3
Diesel Fuel Oil, Light Fuel Oil and Kerosene	6,0
Heavy Fuel Oil	0,4
Still Gas and Petroleum Coke	12,3
LPG and Gas Plant NGL	1,3
Coal	1,9
Coke and Coke Oven Gas	13,2
Wood Waste and Pulping Liquor	5,9
Other (steam and waste fuels from the cement industry)	1,2

Source: Natural Resources Canada – Office of Energy Efficiency, 2022b

Generic PAI VI: Energy Efficient Buildings – New Building or Major Renovation

Table of Contents

1. Description of the Generic PAI VI

The PAI VI focuses on sustainable building design for both new construction and major renovations aiming to avoid significant greenhouse gas emissions through improved energy efficiency. In recent years, green buildings[95] architectural trends that are emphasizing environmentally responsible designs have emerged. New buildings are conceived to minimize environmental impacts across their lifecycle—space use, construction, and operation—especially with regards to energy consumption. To demonstrate these commitments, many projects also seek third-party certifications such as LEED®, BOMA BEST®, Zero Carbon Building Standard (CaGBC), or Energy Star®, which provide recognized frameworks for sustainable performance.

Similarly, renovating existing buildings with sustainable materials while optimizing energy performance and space utilization can generate substantial efficiency gains.

Thus, by reducing energy demand and minimizing environmental impacts, both sustainable new builds and renovations represent important sources of GHG reductions. These activities are covered under the generic PAI VI on energy efficiency in new buildings or in buildings with major renovations.

[95] What is Green Building. Green Building Canada. (n.d.) https://greenbuildingcanada.ca/green-building-guide/what-is-green-building/

For new buildings, the baseline scenario is defined by the standard energy performance, and with respect to the minimum energy efficiency requirements on the Ontario Building Code. This represents a conservative benchmark against which project-specific improvements in energy efficiency are measured.

Examples of projects eligible under this category include, but are not limited to:

- Construction of a new office building with LEED® certification or its equivalent.
- Major renovations of an existing building carried out by opting for energy efficiency measures that exceed building code requirements.

2. Alternative Scenarios

Since this is a grouped project that will progressively include PAIs from several client facilities on an ex-post basis, the specific alternative scenario for each individual PAI cannot be determined at this stage, The applicable alternative scenario will be assessed and defined as each new PAI is added to the grouped project following the same approach as the initial PAI, described in section 3.4 of the PD.

3. Barrier Analysis

Barriers that would prevent the implementation of the projects are generally, but not limited to, the following:

Type of barrier	Description
Financial barrier	1) Higher upfront capital costs: Energy-efficient technologies, advanced materials, and certification processes often require significant initial investment and result in long payback periods (Pacific Northwest National Laboratory, 2011).
Technical barrier	1) Lack of skilled workforce and knowledge gaps: Ontario faces a shortage in low-carbon construction skills across the board, from designers to tradespeople, which hampers proper implementation of sustainable building features (CAGBC, 2019) 2) Complex systems: Complexity of integration, installation or access of advanced systems and controls vary dramatically and may create risk of delays, errors, or underperformance (Pacific Northwest National Laboratory, 2011).

4. Investment Analysis

Since this is a grouped project that will progressively incorporate PAIs from multiple client facilities on an ex-post basis, a detailed investment analysis for each individual PAI will be performed as they are added

to the grouped project, ensuring that financial evaluations are based on the most accurate and current project-specific data.

The investment analysis for each PAI will be performed using the internal rate of return (IRR) as the financial indicator, applying a benchmark IRR of 16% for a 10-year period. The analysis may take into account, among other factors, and when applicable, the following information:

- Net income generated by the project (e.g. energy cost savings)
- Purchase cost of the facilities and/or equipment associated with the project
- Fixed annual costs for operation and maintenance
- Administrative costs associated with the project (e.g. management, marketing, etc.)
- Weighted average cost of capital
- Tax rate

5. Government Policies, Regulations, and Laws Analysis

Ontario's building framework is governed by the Building Code Act, 1992, (S.O. 1992, c. 23), supported by regulations such as O. Reg. 163/24: Building Code. The Code has been updated several times, most recently in 2020, when Ontario introduced administrative changes to align more closely with the National Building Code of Canada. While the Ontario Building Code establishes requirements for safety, construction standards, air quality, thermal resistance, temperature, and energy efficiency, it does not explicitly reference "green buildings".

At the federal level, energy-related requirements are set by the Energy Efficiency Act (S.C. 1992, c. 36) and the Energy Efficiency Regulations 2016 (SOR/2016-311), which govern minimum performance standards for energy-using products, but do not impose mandatory requirements on provinces or individual projects.

Table 1 Summary of regulations relevant to the construction of new buildings or to major renovations of existing buildings

Laws and Regulations	Relevance and description
O. Reg. 163/24: Building Code	High - Establishes minimum building performance and energy requirements.
O. Reg. 509/18: Energy and Water Efficiency – Appliances and Products	Medium - Sets efficiency standards for appliances and products.

Source: Ontario E-Laws. Retrieved August 2025: https://www.ontario.ca/laws

At the municipal level, however, some jurisdictions have adopted higher performance standards. For example, the Toronto Green Standard (TGS)[96] goes beyond the Ontario Building Code by requiring

[96] Toronto Green Standard: Overview. City of Toronto. (n.d.): https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/toronto-green-standard-overview/

improved energy efficiency, GHG reduction measures, and sustainable site design for new developments. Similar frameworks exist in other cities, though adoption is uneven across the province,

Importantly, both the Ontario and National Building Codes (Canada) establish baseline standards, while allowing flexibility for designs that exceed minimum requirements and deliver higher energy efficiency. Since the project category focuses on building construction, all eligible projects must comply with Canadian and Ontario building codes. However, to deliver measurable GHG reductions, the objectives of this project category are to go beyond the minimum requirements—aligning with best practices such as LEED® design standards or equivalent—to achieve additional energy savings and emission reductions.

Programs and Incentives

At the national level, the Canada Green Buildings Strategy (2024) encourages retrofits and new construction to be green buildings (NRCan, 2024). The strategy outlines various initiatives and funding opportunities; however it does not impose mandatory requirements on existing or new constructions.

At the provincial level, Ontario offers incentive programs to support sustainable building practices:

- Retrofit Program : Helps companies upgrade old equipment to make it more energy efficient (lighting, manufacturing, and other equipment, etc.).
- Industrial Energy Efficiency Program : Provides funding to Ontario's large industrial companies for major projects that reduce energy consumption to the amount needed to operate.
- Energy Performance Program : Offers performance-based financial incentives for energy efficiency measures and equipment upgrades related to sustainable operations and maintenance.

Recognizing that legislations and regulations imply constraints, research indicates that—with the exception of the Toronto Green Standard—there are no provincial, federal, or municipal regulations in Ontario mandating the construction of green buildings or the retrofit existing buildings into green standard. Although certain government initiatives may gradually influence the adoption of green building practice, all measures supporting new construction or major renovations remain voluntary.

6. Common Practice Analysis on the Generic PAI VI

6.1 Ontario’s Energy Consumption Profile

For Ontario's IC&I sector, natural gas consumption, which accounts for nearly 54% of energy consumption, has increased from 2013 to 2020 from 219,650 to 299,981 terajoules (TJ); see Table 1 and 2 in the Appendix. Combined with other fossil fuels, 58% of commercial and institutional sector and 72% of the industrial sector secondary energy use came from fossil fuels; see table 2 and 3 in the Appendix.

In addition, the results of GHG emissions analyses show that emissions from IC&I buildings have been steadily increasing for several years, despite the temporary decrease in emissions in Ontario in 2020. Buildings (residential and commercial) emitted almost 25% of the province's total GHGs, ranking second

behind transportation, followed by the industrial and manufacturing sector, which emitted 23% (Canada Energy Regulator, 2020). There is therefore significant potential to reduce energy consumption and GHG emissions by undertaking major renovations in buildings that require them to implement energy efficiency systems.

6.2 Energy Efficient and Green Building Projects in Ontario

The online database of the Canada Green Building Council (CAGBC) reports 2,852 LEED-certified buildings in Ontario as of August 2025. According to the BOMA BEST National Green Building Reports, the number of certified buildings in Ontario was 278 in 2021[97], 236 in 2020[98], 231 in 2019[99], and 295 in 2017[100]. In addition, the Natural Resources Canada Energy Star registry indicates 222 certified buildings in the province[101].

Table 3 Number of buildings with sustainability or green building certifications in Ontario

Certification Program	Number of certified buildings
LEED	2,852
BOMA BEST	1,040
ENERGY STAR	222
Zero Carbon Building Standard (CaGBC)	261
Investor Ready Energy Efficiency (IREE)	59
Total Resource Use and Efficiency (TRUE)	22
Total	**4,456**

Source: CAGBC Project Database. Retrieved August 2025 from https://leed.cagbc.org/LEED/projectprofile_EN.aspx

Based on these figures, along with reasonable assumptions, it is possible to approximate the adoption rate of energy-efficient building projects. If the 4,456 certified buildings identified from various database (Table 1) are considered relative to an estimated 831,306 buildings in Ontario, less than 1% of buildings can reasonably be considered to meet high sustainability and energy-efficiency standards through recognized certifications.

This analysis supports the conclusion that energy efficiency in certified new construction and major renovations by Ontario IC&I organizations is not a common practice.

7. Conclusion

[97] https://bomabest.org/wp-content/uploads/2023/04/BOMA-NGBR-2021-English-v2-2.pdf

[98] https://bomabest.org/wp-content/uploads/2023/04/BOMA-NGBR-2020-Technical-Report-ENG-v6-2.pdf

[99] https://bomabest.org/wp-content/uploads/2023/04/BOMA-2019-NGBR-Key-Findings-Eng-ART-Dec17-2.pdf

[100] https://bomabest.org/wp-content/uploads/2023/04/2017-NGBR-Full-Report.pdf

[101] https://natural-resources.canada.ca/energy-efficiency/energy-star/buildings/registry-energy-star-certified-buildings-canada

The analysis of demonstrates that new construction and major renovations implementing high energy efficiency standards—beyond current Building Codes—are not common practice in Ontario, with less than 1% of eligible buildings meeting these standards, well below the 20% threshold defined by the applied methodology. Similarly, an analysis of generic PAI VII: Energy Efficiency – Energy Demand also confirms that energy efficiency measures overall are also not common practice in the province.

Furthermore, provincial and federal regulation, with the exception of the Toronto Green Standard, do not require buildings to be energy efficient, and existing policies provide only voluntary or indirect support, further slowing adoption.

Accordingly, it can be concluded with confidence that energy efficiency in new construction or major renovation projects in Ontario is not common practice within the meaning of the methodology. The additionality for this generic PAI is therefore demonstrated, conditional on individual PAIs obtaining an internal rate of return (IRR) below the 16% benchmark in the investment analysis.

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9. Appendix

Table 1: Ontario Commercial, institutional and public administration Energy end-use (TJ)

Energy Type	2013	2014	2015	2016	2017	2018	2019	2020
Diesel fuel oil	11,263	9,709	12,927	16,265 3.35 %	21,812 4.49 %	30,520 5.83 %	30,877 5.65 %	26,087 4.84 %
Gas plant natural gas liquids (NGL'S) %	13,057	11,810	11,661	16,193 3.33%	16,338 3.37%	12,054 2.3%	12,184 2.23 %	12,351 2.3 %
Heavy fuel oil %	556	527	416	58	49	77	86 0.015 %	60 0.01 %
Kerosene and stove oil %	972	4,288	3,488	3,618 0.75 %	3,025 0.62 %	3,182 0.6%	2,643 0.48 %	2,587 0.48%
Light fuel oil %	1,678	1,801	1,380	588	482	807	696 0.13 %	472 0.09 %
Motor gasoline %	5,973	4,803	4,246	6,305 1.3 %	6,227 1.28 %	7,532 1.44 %	7,885 1.44 %	8,155 1.51 %
Natural gas	219,650	240,762	231,249	235,356 48.5%	245,406 50.57%	272,004 51.9%	297,011 54.4%	299,981 55.75%
Primary electricity, hydro and nuclear %	162,979 38.89%	169,423 38.05 %	170,309 38.72 %	165,766 36.9%	187,449 38.6%	193,655 37%	191,818 35.1%	185,410 34.46%
Steam %	268	529	2,260	1,954	1,444	1,304	292 0.05	425 0.08
Total Ontario	419,097	445,211	439,810	449,255	485,254	523,341	546,168	538,023

Source : Canadian Centre for Energy Information, 2022

Table 2: Commercial/Institutional, Secondary Energy Use by Energy Source, Ontario 2021

Secondary Energy Source	Shares (%)
Electricity (94% green; 34% renewable)	42,2
Natural Gas	53,8
Light Fuel Oil and Kerosene	0,7
Heavy Fuel Oil	0,0
Steam	0,1
Other (coal & propane)	3,1

Source: Natural Resources Canada – Office of Energy Efficiency, 2022a

Table 3: Industrial Sector, Secondary Energy Use by Energy Source, Ontario 2021

Secondary Energy Source	Shares (%)
Electricity (94% green; 34% renewable)	20,4
Natural Gas	37,3
Diesel Fuel Oil, Light Fuel Oil and Kerosene	6,0
Heavy Fuel Oil	0,4
Still Gas and Petroleum Coke	12,3
LPG and Gas Plant NGL	1,3
Coal	1,9
Coke and Coke Oven Gas	13,2
Wood Waste and Pulping Liquor	5,9
Other (steam and waste fuels from the cement industry)	1,2

Source: Natural Resources Canada – Office of Energy Efficiency, 2022b

Generic PAI VII: Energy Efficiency Demand Side

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1. Description of the Generic PAI VII

The activities considered under PAI VII encompass energy efficiency measures designed to reduce overall energy demand and consumption in new and existing buildings in the IC&I (institutional, commercial, and industrial) sectors. Eligible measures include a wide range of improvements to building envelopes, heating and cooling systems, appliances, industrial processes, and other technologies that directly lower energy consumption.

Examples of projects eligible under this category include, but are not limited to:

Sector	Examples of measures
Industrial buildings	• Upgrading process equipment to high-efficiency models • High-efficiency boilers and chillers • Improved insulation for process equipment and distribution systems • Advanced process controls and automation for energy optimization

Commercial and Institutional Buildings	• Efficient heating, ventilation, and cooling (HVAC) systems • High efficiency appliances and equipment (e.g., refrigerators, stoves, heaters, etc.) • Smart energy tools and management systems (e.g., software, sensors) • Improved insulation of building envelopes (e.g., windows, doors, walls) • Efficient water heating systems.

By contrast, certain measures are explicitly excluded from this category. Projects limited to the replacement of lighting with more energy-efficient electric lighting, such as the replacement of incandescent electrical bulbs with compact fluorescent lights or light emitting diodes (LEDs). In addition, projects involving waste heat recovery are not eligible under this category and are addressed separately under the generic PAI V.

2. Alternative Scenarios

Since this is a grouped project that will progressively include PAIs from several client facilities on an ex-post basis, the specific alternative scenario for each individual PAI cannot be determined at this stage, The applicable alternative scenario will be assessed and defined as each new PAI is added to the grouped project following the same approach as the initial PAI, described in section 3.4 of the PD.

3. Barrier Analysis

Barriers that would prevent the implementation of this type of projects are generally, but not limited to, the following:

Type of barriers	Description
Financial barriers	1) Initial investment: The cost upfront for the upgrade is important and there is limited capital and competition for resources (Pacific Northwest National Laboratory, 2011). 2) Disrupt activities: The construction can disrupt the building occupants and their commercial activity.
Technical barriers	1) Technical uncertainty: A lack of specific methods to achieve deep retrofits creates technical uncertainty. Shortage of actionable cost and energy savings.

4. Investment Analysis

Since this is a grouped project that will progressively incorporate PAIs from multiple client facilities on an ex-post basis, a detailed investment analysis for each individual PAI cannot be conducted at this stage.

The investment analysis will be performed and refined as each new PAI is added to the grouped project, ensuring that financial evaluations are based on the most accurate and current project-specific data.
The investment analysis for each PAI will be performed using the internal rate of return (IRR) as the financial indicator, applying a benchmark IRR of 16% for a 10-year period. The analysis may take into account, among other factors, and when applicable, the following information:

- Net income generated by the project (e.g. energy savings)
- Purchase cost of the facilities and/or equipment associated with the project
- Fixed annual costs for operation and maintenance
- Administrative costs associated with the project (e.g. management, marketing, salaries, etc.)
- Weighted average cost of capital
- Tax rate

5. Government Policies, Regulations, and Laws Analysis

Under the Electricity Act, 1998, O. Reg. 25/23: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans requires public agencies—such as municipalities, public hospital and school boards—to prepare and submit energy conservation and demand management plans. Therefore, this regulation does not apply to commercial and industrial facilities, which are mostly private institutions.

In addition, while all projects must comply with provincial regulations, including O. Reg. 509/18: Energy and Water Efficiency – Appliances and Products and O. Reg. 163/24: Building Code, these regulations primarily set minimum efficiency standards rather than mandate proactive energy efficiency measures. Specifically, O. Reg. 509/18 sets baseline efficiency standards for appliances and equipment. O. Reg. 163/24 establishes energy performance requirements for new construction or major renovations. Although these regulations ensure compliance with efficiency standards, they do not require IC&I facilities to implement energy efficiency measures.

Table 1 Summary of regulations relevant to energy efficiency projects in Ontario

Laws and Regulations	Relevance and description
O. Reg. 25/23: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans	Medium - Energy conservation and demand management plan for the public sector. Do not apply to industrial and commercial facilities.
O. Reg. 509/18: Energy and Water Efficiency – Appliances and Products	Medium - Sets minimum efficiency standards for a wide range of appliances and products, such as heating/cooling equipment, water heaters, refrigeration units, and other appliances.
O. Reg. 163/24: Building Code	Medium - Establishes minimum building performance and energy requirements in new construction and major renovations.

Source: Ontario E-Laws. Retrieved August 2025: https://www.ontario.ca/laws

Programs and Incentives

There are several energy efficiency programs for businesses in Ontario. Currently, the Save On Energy programs, administered by the IESO, offers a variety of programs and incentives to help homes and businesses implement energy efficient retrofits and equipment[102]. These programs are available to organizations from a wide range of sectors, including commercial spaces, industrial facilities, municipal buildings and institutional buildings. Under this mandate, multiple programs are available to small and large businesses such as the following:

- Retrofit Program : Offers incentives for equipment upgrades, including but not limited to: lighting controls, HVAC, automation, etc.
- Industrial Energy Efficiency Program : The program provides funding to Ontario's large industrial companies for major projects that reduce energy consumption to the amount needed to operate.
- Energy Performance Program : Provides performance-based financial incentives for energy efficiency measures and equipment upgrades related to sustainable operations and maintenance.
- Existing Building Commissioning Program: Helps owners of commercial and institutional buildings through facility tuning and operational improvements.

In addition, Enbridge Gas delivers custom utility-delivered incentive programs to IC&I organizations for efficiency upgrades such as controls, ventilation, boiler optimization, and heat recovery. Additional programs, like Savings by Design, have supported high-performance new construction that exceeds building code requirements.

These programs and incentives collectively support uptake of energy efficiency measures across Ontario's IC&I sector, though adoption remains largely influenced by program availability, eligibility, and organizational capacity.

6. Common Practice Analysis on the Generic PAI VII

This section evaluates the prevalence of energy efficiency activities reducing energy demand and consumption in new and existing buildings in the IC&I sectors in Ontario.

6.1 Ontario's Energy Consumption Profile

[102] Independent Electricity System Operator. (2025). Energy efficiency for business. https://ieso.ca/Get-Involved/Energy-Efficiency/Energy-Efficiency-for-Business

Ontario's IC&I sector represents a significant share of the province's overall energy demand. In 2020, the industrial sector accounted for 36% of total end-use energy demand, while the commercial sector accounted for 18%, bringing the combined IC&I share to about 54% of the province's energy use.[103]

Within the energy mix, natural gas and refined petroleum products (RPP) are the dominant fuels. In 2021, natural gas represented 53.8% of secondary energy use in the commercial and institutional sector, and 37.3% in the industrial sector (NRCan, 2022a; NRCan, 2022b). These fuels are primarily consumed for heating, hot water, and industrial process energy. Electricity represented 42.2% of commercial and institutional use and 20.4% of industrial use, with the balance made up of smaller shares of oil products, coal, and biomass (see Table 1 and 2 in the Appendix).

Looking ahead, the IESO's 2024 Annual Planning Outlook, projects that provincial electricity demand will increase by nearly 60% over the next 25 years, driven by electrification and economic growth.[104] The rising demand, combined with Ontario's continued dependence on fossil fuels, underscores the scale of the challenge.

Overall, the IC&I sector continues to rely on hydrocarbons for core operations, and fossil fuels still account for the majority of its energy consumption. This dependence highlights both the significant GHG emissions profile of the sector and the opportunity for energy efficiency measures that directly reduce energy demand.

Despite the central role of fossil fuels in Ontario's IC&I energy profile, the adoption of energy efficiency measures has not kept pace with this demand. Current evidence suggests that a small fraction of buildings undergo retrofits each year, leaving a significant gap between technical potential and actual practice. The following section examines energy efficiency and retrofits activities in Ontario more closely to assess whether such measures can be considered common practice.

6.2 Energy Efficient and Green Building Projects in Ontario

A study conducted by the Environmental Commissioner of Ontario (2019) found that Ontario still has significant potential for energy efficiency in both electricity and natural gas. For example, the report concludes that Ontario needed to make energy efficiency savings and that there is potential to reduce electricity consumption by 31% and natural gas consumption by 26.5% over the next two decades.

Another study made in 2021 in collaboration with Efficiency Canada and the University of Carleton estimated that in Canada 0.6% of buildings and 1.4% of floor area of the commercial sector was retrofitted per year. In the same document, it was estimated that with the same rate it would take nearly 71 years to retrofit all commercial floor area (Haley & Torrie, 2021). It shows that, despite the strong push through incentive programs, energy efficiency remains an uncommon practice. Moreover, Canada Green

[103] See Figure 6: End-Use Demand by Sector (2020) : https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-ontario.html

[104] Six Graphs and a Map: 2024 Annual Planning Outlook and Emissions Update. IESO. (19 March 2024): https://www.ieso.ca/Powering-Tomorrow/2024/Six-Graphs-and-a-Map-2024-Annual-Planning-Outlook-and-Emissions-Update

Building Council (2022) highlighted in a study that Ontario is the province with the largest inventory of building stock targeted for retrofit.

Similarly to other sectoral scope 3 generic PAIs, there are no comprehensive database documenting energy efficiency projects in Ontario. Due to this lack of centralized data, the analysis focused on the number of organizations that have received subsidies through energy efficiency programs. According to the IESO (2021), for 2019 and 2020, 11,128 projects were supported by the Retrofit program, 6,826 projects by the Small Business Lighting Program, 22 facilities by the Energy Performance program and 106 projects by the Process and System Upgrade program[105].

Since these figures represent a two-year period, whereas the incentive programs were in place for approximately five years. To approximate the total number of projects across the full program duration, the two-year count was scaled by the ratio of program duration to reporting years (factor 2.5). On this basis, an estimated 45,205 projects may have been supported under these programs.

Considering this data, along with reasonable assumptions, it is possible to approximate an adoption rate of energy efficiency projects. Specifically, if the 45,205 projects supported by incentive programs are assumed to cover approximately 90,410 buildings in Ontario (allowing for cases where multiple buildings may be associated with a single project),[106] then out of an estimated 831,306 buildings in Ontario, only about 10.9% of buildings could reasonably be considered to have implemented some form of energy efficiency measure.

Since there is not specific information on identified projects available, it is not possible to fully differentiate whether these measures apply technologies different from those considered under this project category, and therefore a precise application of the CDM Tool 24 factors is not feasible. Accordingly, the analysis relies on a mostly qualitative and conservative quantitative approach.

In line with the CDM Tool 24, since the estimated adoption rate of approximately 10.9% is below the 20% threshold, energy efficiency to reduce energy demand projects cannot be considered common practice in Ontario's IC&I sector.

6.3 Energy Efficient and Green Building Projects in Ontario

Applying the methodological steps outlined in CDM Tool 24 with the adjustments specified in Appendix A3-2, the assessment indicates that activities reducing energy demand in new and existing buildings in the IC&I sector in Ontario remain marginal.

Evidence shows that energy efficiency activities are far below potential: only 0.6% of buildings and 1.4% of floor area of the commercial sector in Canada are retrofitted per year (Haley & Torrie, 2021), implying

[105] IESO Energy Efficiency Report 2019-2020. IESO. (14 October 2021): https://www.ieso.ca/en/Sector-Participants/IESO-News/2021/10/IESO-Energy-Efficiency-Report-2019-2020

[106] To ensure consistency with the methodology in Appendix A3-3, it was assumed that each project corresponds to 2 buildings. The resulting estimate was then conservatively rounded down to the nearest thousand.

that it would take decades to address the full building stock. In Ontario, the province with the largest inventory of buildings in need of retrofit, this gap is even more pressing.

Moreover, despite programs and incentives, adoption rates remain limited. An estimated 10.9% of Ontario buildings have undertaken some form of energy efficiency measure under incentive programs—well below the 20% threshold set by the applied methodology to determine common practice. At the same time, IC&I buildings remain highly dependent on fossil fuels, which account for most of their energy use.

Together, these findings confirm that while technical and economic potential is significant, actual implementation is limited, and energy efficiency retrofits cannot be considered common practice.

7. Conclusion

The analysis demonstrates that energy efficiency measures in Ontario's IC&I sector do not qualify as common practice. The data shows that:

- Only 0.6% of buildings and 1.4% of commercial floor area is retrofitted per year (Haley & Torrie, 2021).
- The potential for energy efficiency remains substantial, with opportunities to reduce electricity use by 31% and natural gas by 26.5% over the next two decades (Environmental Commissioner of Ontario, 2019).
- Incentive programs have reached an estimated 10.9% of Ontario's building stock, below the 20% threshold required to be considered common practice.

Each of these indicators support that these practices are well below the 20% threshold defined by the applied methodology. Furthermore, provincial and federal regulation do not require building to be energy efficient, and existing policies provide only voluntary or indirect support, reinforcing the limited uptake of this type of measure.

Accordingly, it is concluded with confidence that energy efficiency projects in Ontario are not common practice within the meaning of the methodology. Additionality for this generic PAI is therefore demonstrated, conditional on individual PAIs obtaining an internal rate of return (IRR) below the 16% benchmark in the investment analysis.

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9. Appendix

Table 1: Commercial/Institutional, Secondary Energy Use by Energy Source, Ontario 2021

Secondary Energy Source	Shares (%)
Electricity (94% green; 34% renewable)	42,2
Natural Gas	53,8
Light Fuel Oil and Kerosene	0,7
Heavy Fuel Oil	0,0
Steam	0,1
Other (coal & propane)	3,1

Source: Natural Resources Canada – Office of Energy Efficiency, 2022a

Table 2: Industrial Sector, Secondary Energy Use by Energy Source, Ontario 2021

Secondary Energy Source	Shares (%)
Electricity (94% green; 34% renewable)	20,4
Natural Gas	37,3
Diesel Fuel Oil, Light Fuel Oil and Kerosene	6,0
Heavy Fuel Oil	0,4

Still Gas and Petroleum Coke	12,3
LPG and Gas Plant NGL	1,3
Coal	1,9
Coke and Coke Oven Gas	13,2
Wood Waste and Pulping Liquor	5,9
Other (steam and waste fuels from the cement industry)	1,2

Source: Natural Resources Canada – Office of Energy Efficiency, 2022b

Generic PAI VIII: Energy Conversion

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1. Description of the Generic PAI VIII

This project category is defined as energy conversion or fuel switching. This generic PAI includes activities that replace fossil fuels with non-fossil energy sources to meet the same energy need, either for thermal energy or electricity generation. It covers on-site applications such as space heating, water heating, or other energy needs using equipment such as boilers, furnaces, or other fixed or mobile equipment located at the client facility.

Project activities that are not eligible or applicable under this generic PAI include:

- Activities generating electricity and/or thermal energy using fossil fuels, and activities that involve switching from a higher to a lower carbon content fossil fuel.
- Grid-connected renewable electricity generation (i.e. grid-connected means more than 50% of total generation is exported to a national or regional grid).
- Activities involving the switching of fossil fuels with renewable biomass for thermal energy or electricity generation should fall under the generic PAI I: Biomass Energy Project category.

Examples of projects eligible under this category include, but are not limited to:

- Switching fuel oil boilers or furnaces used for heating to a renewable energy source such as hydroelectricity, solar, wind, wastewater or geothermal
- Switching the diesel generator for an electric generator.
- Replacing propane forklifts to electric forklifts.
- Switching fuel from natural gas to new renewable natural gas (RNG)

2. Alternative Scenarios

Since this is a grouped project that will progressively include PAIs from several client facilities on an ex-post basis, the specific alternative scenario for each individual PAI cannot be determined at this stage, The applicable alternative scenario will be assessed and defined as each new PAI is added to the grouped project following the same approach as the initial PAI, described in section 3.4 of the PD.

3. Barrier Analysis

Barriers that would prevent the implementation of this type of projects are generally, but not limited to, the following:

Type of barriers	Description
Financial barriers	1) High Upfront Capital Costs: This type of project can require important infrastructure investment as a starting point, for instance for fuel to geothermal system or electricity. 2) Rentability uncertainty: For some projects rentability can be volatile, for instance solar panels depend on sunlight.
Technical barriers	1) Incompatibility due to obsolete buildings: Some sites are not easily compatible with the new energy technologies. 2) Lack of availability: Renewable natural gas, for instance, is a limited resource inclined to competition (Murphy & al., 2023).

Reglementary barriers	1) Subject to regulations: Some conversions (e.g., geothermal[107] or biomass systems, used fuel) require approvals and have strict regulations.

4. Investment Analysis

Since this is a grouped project that will progressively incorporate PAIs from multiple client facilities on an ex-post basis, a detailed investment analysis for each individual PAI will be performed as they are added to the grouped project, ensuring that financial evaluations are based on the most accurate and current project-specific data.

The investment analysis for each PAI will be performed using the internal rate of return (IRR) as the financial indicator, applying a benchmark IRR of 16% for a 10-year period. The analysis may take into account, among other factors, and when applicable, the following information:

- Net income generated by the project (e.g. energy cost savings)
- Purchase cost of the facilities and/or equipment associated with the project
- Fixed annual costs for operation and maintenance
- Administrative costs associated with the project (e.g. management, marketing, etc.)
- Weighted average cost of capital
- Tax rate

5. Government Policies, Regulations and Laws in Ontario

There are currently no Ontario or federal regulations that require industrial, commercial, or municipal entities to switch from fossil fuels to renewable energy sources.

Measures currently in place may influence consumption patterns, such as O. Reg. 25/23[108] which requires broader public sector organizations to develop and report on energy conservation and GHG reduction plans. While focused on public operations, it indirectly supports energy conversion projects by encouraging adoption of renewable technologies, giving *medium* relevance to such initiatives. Otherwise, energy conversion from fossil fuel systems to renewable energy sources in Ontario remains a voluntary initiative.

Table 1 Summary of regulations relevant to energy conversion projects

[107] Government of Ontario. (2017, February 26). *Earth energy systems in Ontario* (updated September 13, 2023). https://www.ontario.ca/page/earth-energy-systems-ontario#section-2

[108] O. Reg. 25/23. Ontario E-Laws. https://www.ontario.ca/laws/regulation/r23025

Laws and Regulations	Relevance and description
O. Reg. 163/24: Building Code	Medium - Establishes minimum building performance and energy requirements. While it does not mandate renewable energy, it allows on-site renewable generation to be counted toward meeting building energy performance requirements.
O. Reg. 25/23 Broader Public Sector: Energy Reporting And Conservation And Demand Management Plans	Medium – Requires post-secondary institutions to develop, implement, and make public their energy conservation and demand management plans.
O. Reg. 541/05 Net Metering	Low – Requires electricity distributors to offer net metering to customers who generate renewable electricity. The program enables participation but does not mandate renewable generation.
O. Reg. 509/18: Energy and Water Efficiency – Appliances and Products	Low - Sets efficiency standards for compliant boilers, furnaces, water heaters, etc. While it is not a "renewable energy" regulation, it may affect renewable system adoption.
O. Reg. 122/19 Renewable Energy Approvals (REA)	N/A – Applies to renewable energy or electricity generating facilities, which are outside the scope of this project category.

Programs and Incentives

In 2018, the Province of Ontario proposed an environmental plan[6] that was not fully implemented and was later replaced in March 2022 with new emission reduction projections to meet 2030 greenhouse gas emissions target. As a result, very few programs and incentives currently exist in Ontario to support energy conversion in IC&I organizations, whether through partial or full transitions to renewable energy.

One example is the Retrofit Program, which includes limited support through the *Photovoltaic Distributed Energy Resources Incentives* for solar PV systems conversions.[109] In addition, Ontario's Net Metering program[10] established under O. Reg. 541/05, recognizes solar, wind, hydro, and geothermal as eligible renewable energy sources. However, this regulation and incentive apply primarily to electricity distributors, requiring them to offer net metering arrangements to eligible customers. Participation remains voluntary, and importantly, they do not mandate or directly incentivize a switch to renewable energy.

[109] Retrofit Program. Save on Energy. (n.d.): https://www.saveonenergy.ca/For-Business-and-Industry/Programs-and-incentives/Retrofit-Program

Beyond these measures, no other significant incentives or programs in Ontario are designed to encourage energy conversion. Existing supports are largely focused on energy savings, rather than reducing fossil fuel reliance through fuel switching or renewable energy adoption.

6. Common Practice Analysis of Generic PAI VIII

This section evaluates the prevalence of project activities that replace fossil fuels with non-fossil energy sources to meet the same energy need.

6.1 Common Practice Analysis of Generic PAI VIII

Ontario's IC&I sector accounts for over half of the province's energy consumption. In 2020, the industrial sector represented 36% of total end-use energy demand, while the commercial sector accounted for 18%, bringing the combined IC&I share to approximately 54% of the province's energy use.[110]

Within the energy mix, fossil fuels remain dominant. In 2021, natural gas represented 53.8% of secondary energy use in the commercial and institutional sector, and 37.3% in the industrial sector (NRCan, 2022a; NRCan, 2022b). Refined petroleum products also play a significant role, particularly in industrial operations and heating.

Electricity ranks as the third largest energy source for Ontario. In 2021, Ontario generated 148,3 TWh of electricity for all sectors combined, of which approximately 94% was classified as green energy (55% nuclear, 24% hydroelectricity, 5% solar, 8% wind, 0.8% biofuel). Given that nuclear is non-renewable but low-emission, only 34% of Ontario's grid-connected electricity generation came from renewable sources in 2021 (Canada Energy Regulator, 2025).

When these electricity proportions are applied to sectoral energy use, secondary energy use for the commercial and institutional sectors can be estimated at 40% green and 14% renewable, with the majority still supplied by natural gas. In the industrial sector, the contribution of grid electricity translates to roughly 25% green and 13% renewable of total secondary energy use, again outweighed by natural gas (See table 2 and 3 in the Appendix).

These figures demonstrate that while Ontario benefits from a relatively clean electricity grid, the IC&I sector remains reliant on fossil fuels. As a result, the actual share of renewable energy in IC&I consumption is comparatively low, underscoring the limited penetration of renewable in practice.

6.2 Fuel Switch and Renewable Energy Projects in Ontario

Similarly to other sectoral scope 3 generic PAIs, there are no comprehensive database documenting fuel switch projects in Ontario. In the absence of centralized data, this analysis relies on identifying similar measures for which information was available from public reports, incentive program records, and case studies.

[110] See Figure 6: End-Use Demand by Sector (2020) : https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-ontario.html

Fuel switching projects, involving the replacement of fossil fuel systems with electric heat pumps or other low-carbon technologies, have been implemented in Ontario in a number of facilities. Documented examples include Toronto Western Hospital's wastewater energy transfer system, which displaces natural gas heating with sewage-heat recovery and industrial heat pumps[111]; McMaster University campus buildings, where two electric boilers were installed to reduce natural gas consumption[112]; and the Toronto Pearson airport, deploying ten electric boilers to offset natural gas boilers[113]. In addition, the Toronto District School Board has installed solar PV systems on 358 buildings[114]. These examples confirm that fuel switching measures are present in Ontario, particularly across institutional and public-sector buildings, in part due to O. Reg. 25/23.

Additional insight is available from Ontario's Renewable Energy Approval (REA) process, which lists 232 projects, of which 196 were approved, 22 were in completeness review, 4 in technical review, 2 were rejected, and 8 were returned (Government of Ontario, 2022). However, progress in renewable energy deployment has been tempered by policy shifts. In 2018, the elected government cancelled 750 renewable energy contracts and scaled back several related incentive programs (Buchanan, 2020).

Considering the renewable energy project statistics, the political context, and fuel end-use trends, it appears that a minority of Ontario facilities are undertaking cleaner energy conversion projects. Many organizations remain reluctant to significantly alter their practices or invest in low-carbon energy. Nonetheless, there is evidence of increasing participation from colleges and universities as early adopters of GHG reducing initiatives in Ontario, however not in commercial, industrial and other institutional buildings.

Considering the information from documented case studies, as well as the number of organizations that have received subsidies through energy efficiency programs, and reasonable assumptions, it is possible to approximate an adoption rate. Specifically, if the 28,140 projects supported by incentive programs, combined with 362 identified case study projects and 232 projects under REA process, are assumed to cover approximately 58,000 buildings in Ontario (allowing for cases where multiple buildings may be associated with a single project),[7] then out of an estimated 831,306 buildings in Ontario, only about 7% could reasonably be considered to have implemented some form of energy conversion project.

6.3 Synthesis of Common Practice Findings

Applying the methodological steps outlined in CDM Tool 24 with the adjustments specified in Appendix A3-2, the available evidence shows that fuel-switching projects are not common practice in Ontario.

[111] The Toronto Western Hospital WET™ Project. Noventa. (N.d.): https://noventa-v1.squarespace.com/toronto-western-hospital

[112] New electric boilers will reduce campus carbon emissions 23 per cent. McMaster University. 13 July 2023: https://dailynews.mcmaster.ca/articles/new-electric-boilers-will-reduce-campus-carbon-emissions-23-per-cent/

[113] Toronto Pearson installs electric boilers to decarbonize heating and add resiliency. Partners in Project Green. (24 July 2024): https://partnersinprojectgreen.com/resources/toronto-pearson-installs-electric-boilers-to-decarbonize-heating-and-add-resiliency/

[114] Solar Schools. Toronto District School Board. (N.d): https://www.tdsb.on.ca/environment/Home/Environmental-Leadership/Solar-Schools

The IC&I sector remains highly dependent on fossil fuels, with natural gas supplying over half of commercial and institutional energy use and more than a third in industry. Although Ontario's electricity grid is relatively clean, only 13-14% of IC&I energy use comes from renewable sources.

Documented, fuel switch examples—such as electric boilers at McMaster University and Toronto Pearson Airport, heat pumps at Toronto Western Hospital, and solar PV on Toronto District School Board buildings—are concentrated in institutions. Broader adoption is hindered by the absence of mandatory policies and the cancellation of a large number of renewable energy contracts.

Even under generous assumptions, combining 28,140 incentive-supported projects and 594 case studies to approximate 58,000 buildings, this accounts for only about 7% of Ontario's 831,306 buildings, well below the 20% threshold. While colleges and universities are emerging leaders, their initiatives remain the exception due to O. Reg. 25/23, confirming that energy conversion projects are not common practice.

7. Conclusion

The analysis confirms that energy conversion projects in Ontario are not common practice:

- IC&I sector remains dominated by fossil fuel use, particularly natural gas.
- Documented cases of fuel switching—such as electric boilers at universities and airports, heat pumps at hospitals, and solar PV on school buildings—are isolated examples rather than widespread adoption.
- Policy reversals in 2018, including the cancellation of 750 renewable energy contracts, further limited uptake.

Quantitative estimates reinforce this conclusion: even under generous assumptions, only 7% of Ontario's 831,306 buildings can reasonably be considered to have implemented some form of energy conversion project, far below the 20% threshold set by the applied methodology.

Accordingly, it is concluded with confidence that energy conversion projects in Ontario are not common practice within the meaning of the methodology, with the exception of post-secondary institutions. Additionality for this generic PAI is therefore demonstrated, conditional on individual PAIs obtaining an internal rate of return (IRR) below the 16% benchmark in the investment analysis.

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9. Appendix

Table 1. Total Energy End-Use in Terajoules by Sector in Ontario

Sector	2021	2022	2023
Residential	499,041	500,696	474
Commercial and other institutional	457,572	474,504	473
Public administration	23,818	24,818	23,8
Total transportation	723,933	783,387	806
Agriculture, fishing, hunting and trapping	66,546	69,822	69,4
Total industrial	569,157	580,244	585
Producer consumption	113,634	118,007	117
Non-energy use	251,938	267,404	272

Source: Canadian Centre for Energy Information, 2025

Table 2: Commercial/Institutional, Secondary Energy Use by Energy Source, Ontario 2021

Secondary Energy Source	Shares (%)
Electricity (94% green; 34% renewable)	42,2
Natural Gas	53,8
Light Fuel Oil and Kerosene	0,7

Heavy Fuel Oil	0,0
Steam	0,1
Other (coal & propane)	3,1

Source: Natural Resources Canada – Office of Energy Efficiency, 2022a

Table 3: Industrial Sector, Secondary Energy Use by Energy Source, Ontario 2021

Secondary Energy Source	Shares (%)
Electricity (94% green; 34% renewable)	20,4
Natural Gas	37,3
Diesel Fuel Oil, Light Fuel Oil and Kerosene	6,0
Heavy Fuel Oil	0,4
Still Gas and Petroleum Coke	12,3
LPG and Gas Plant NGL	1,3
Coal	1,9
Coke and Coke Oven Gas	13,2
Wood Waste and Pulping Liquor	5,9
Other (steam and waste fuels from the cement industry)	1,2

Source: Natural Resources Canada – Office of Energy Efficiency, 2022b

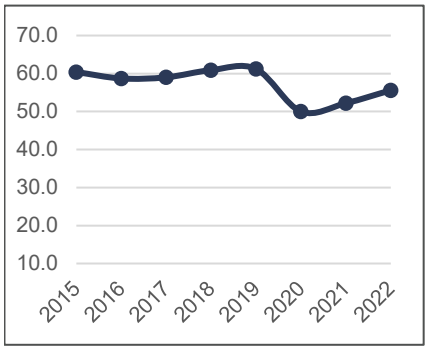
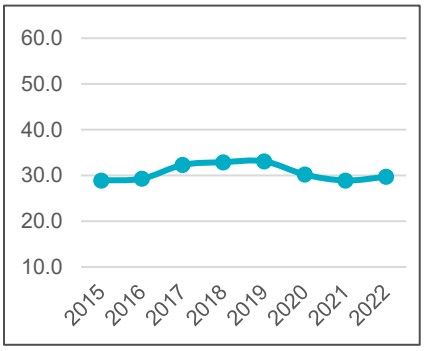
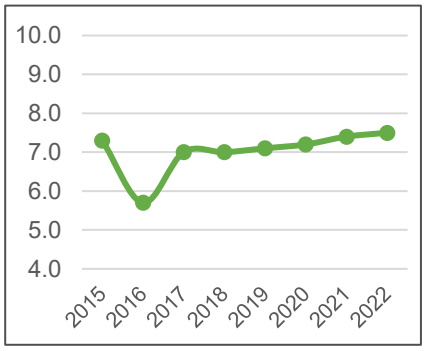
APPENDIX 4: ANALYSIS OF ONTARIO'S GHG EMISSIONS OF 2015-2022

This section presents the 2015-2022 greenhouse gas (GHG) emissions trajectory for Ontario, Canada's second largest emitter. Ontario is one of ten provinces in Canada.

Summary

Emissions from transportation remained relatively stable from 2015 to 2022, while emissions from manufacturing, commercial, and institutional buildings increased over the same period. In contrast, emissions from waste decreased from 2015 to 2016, then gradually increased between 2017 and 2022.

GHG emissions curves in Ontario from 2015 to 2022

Transportation-related emissions (Mt CO_2e)	Manufacturing, commercial and institutional buildings (Mt CO_2e)	Emissions related to waste (Mt CO_2e)
		

Ontario's total GHG emissions were 165 Mt CO_2e in 2019 and decreased to 157 Mt CO_2e in 2022[115]. In 2017, total emissions amounted to 158 Mt CO_2e, with the transportation category being the largest contributor at 59 Mt CO_2e, or 37% of the total[116]. Between 2018 and 2022, the province's largest emitting sector shifted to stationary combustion sources, with emissions ranging from 57,5 Mt CO_2e and 62,5 Mt CO_2e. Within this category, the commercial and institutional sector contributed 16.6 Mt CO_2e (27%) and the manufacturing industries sector contributed 16,3 Mt CO_2e (26%), together accounting for 53% of

[115] National Inventory Report 1990-2022: Part 3 – 2024: En81-4-2022-3-eng.pdf

[116] National Inventory Report 1990-2023: Executive Summary – 2025: En81-4-1-2023-eng.pdf

emissions from stationary combustion. Transportation remained a close second, with emissions varying between 50 Mt CO_2e and 61,2 Mt CO_2e during the same period.

Total GHG emissions in Ontario from 2015 to 2022

Available GHG emissions data shows that Ontario experienced a significant increase in emissions in 2018. After nearly 10 years of declining emissions, emissions increased sharply in both 2018 and 2019 compared to 2017. However, in 2020, emissions abruptly declined across Ontario, mirroring trends observed throughout Canada, primarily due to government restrictions during the Covid 19 pandemic.

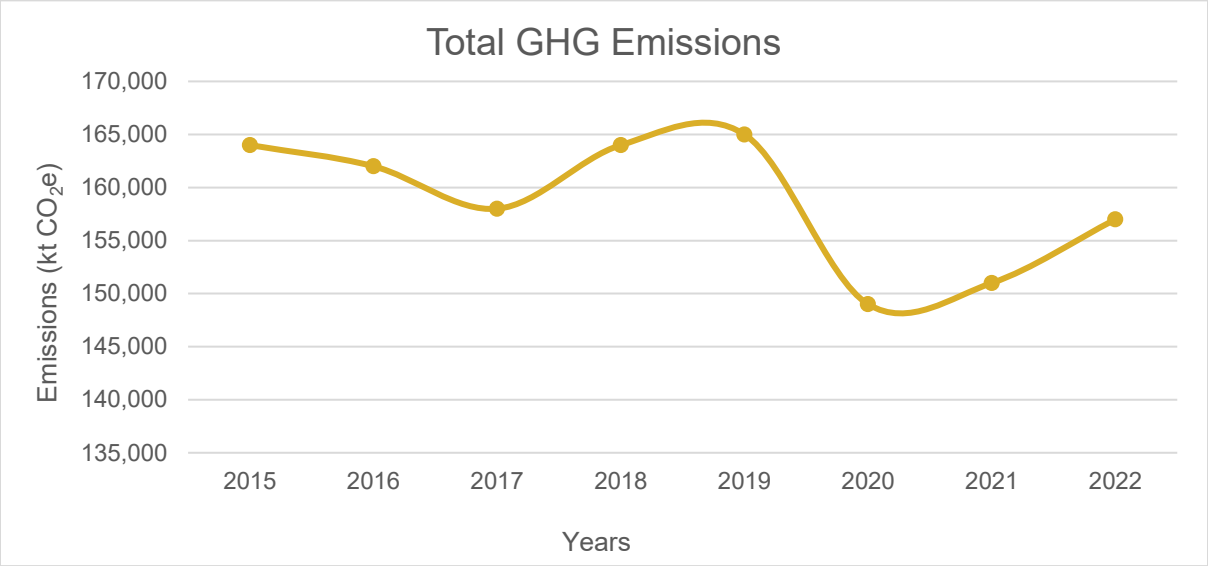


Figure 4 Ontario's GHG emissions (2015-2022)

From 2015 to 2022, Ontario's GHG emissions showed an irregular evolution, with fluctuations from 2015 to 2019 and an abrupt decrease in 2020, as shown in Figure 4. Indeed, with the iterative implementation of policies and programs aimed at reducing GHGs and supporting green initiatives, Ontario's annual emissions had already been on a downward trend since 2012. This decline continued through 2015, resulting in a decrease in emissions from 164,000 kt CO_2e in 2015 to 158,000 kt CO_2e in 2017, a decrease of approximately 3%. In 2018, however, emissions increased significantly by 5% to 164,000 kt CO_2e, which is similar to the 2013 emissions level[117]. In 2019, emissions remained elevated, standing 7,000 kt CO_2e higher compared to 2017. Finally, in 2020, Ontario recorded its lowest GHG emissions level, reflecting the widespread impact of the COVID-19 pandemic.

Several official sources indicate that the largest reductions during this period (2013-2017) are related to the electricity and industry sectors' gradual phase-out of coal in power generation and energy efficiency

[117] National Inventory Report, 2020 – Part 3, Table A11-12: En81-4-2018-3-eng.pdf

improvements and official structural changes[118]. In contrast, the increase since 2018 is due to rising emissions in the transport, buildings, and industry sectors. Finally, the large decrease in emissions in 2020 is due to plant closures, business interruption, and travel restrictions during the Covid 19 pandemic.

GHG emissions from transportation

According to the statistics, transportation in Ontario has most often been the largest source of emissions, accounting for an average of 37% of all emission sources. Furthermore, emissions from this sector have steadily increased from 2016 to 2019, as shown in Figure 2.

In 2015, transportation related GHG emissions were 60,400 kt CO_2e, or 37%. In 2017, 2018, and 2019, the share of transportation-related GHG emissions remains the largest, accounting for slightly more than one-third of the province's emissions, at 59,000 kt CO_2e (38%), 60,900 kt CO_2e (38%), and 61,200 kt CO_2e (38%), respectively. As can be seen, from 2017 to 2019, GHG emissions from the transportation sector stabilized, which remains high. In 2020, the decrease in emissions across the province caused by the pandemic appears to have benefited more to the transportation sector. However, this sector remains the largest emitter in the province, responsible for 35% of emissions, or 50,000 kt CO_2e. This is the result of an increase in the number of vehicles, particularly SUVs and light trucks, an increase in heavy-duty diesel trucks, and the removal of the cap-and-trade system for carbon emissions[119]. This information illustrates the importance of the transportation sector's contribution to the province's GHG emissions.

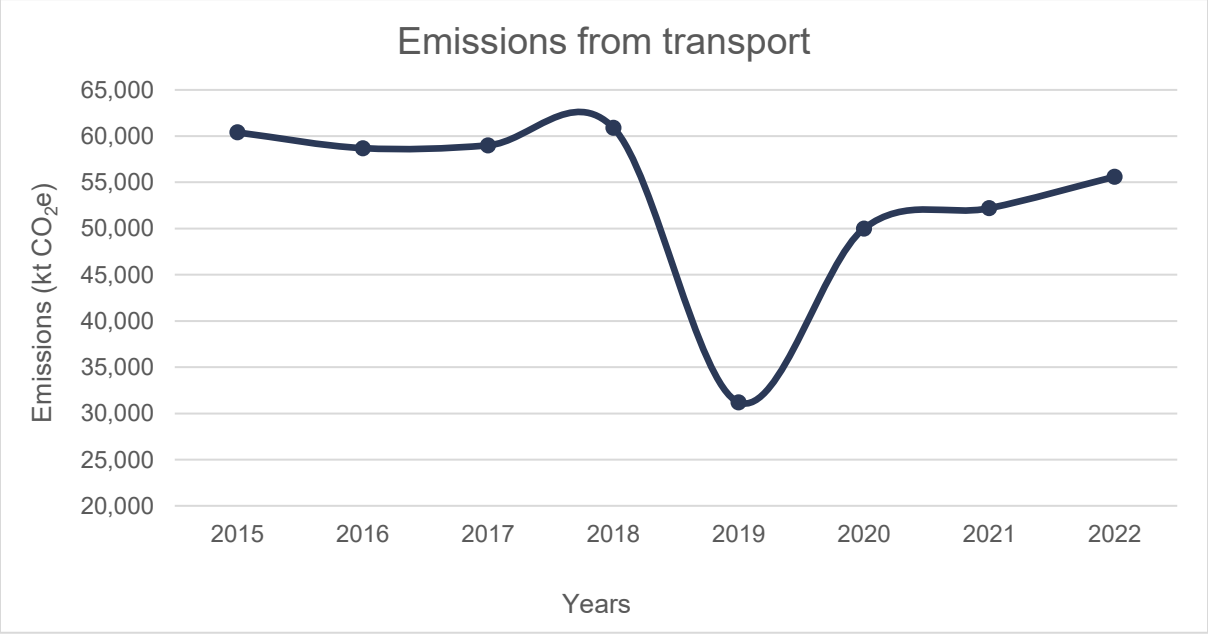


Figure 5 Ontario's transport GHG emissions (2015-2022)

[118] State of Ontario's Biodiversity | Changes in Greenhouse Gas Emissions - State of Ontario's Biodiversity (sobr.ca)

[119] https://environmentaldefence.ca/2020/04/21/ontarios-greenhouse-gas-emissions-going-instead/

Emissions from commercial and institutional buildings

Like the transportation sector, GHG emissions from commercial and institutional buildings have steadily increased since 2015, rising from 12,700 kt CO_2e to 17,000 kt CO_2e in 2019, an increase of approximately 34%. In contrast, emissions from the manufacturing industries sector have remained stable, fluctuating around 16,000 kt CO_2e. Even in 2022, despite an overall decrease in provincial emissions, emissions from both sectors remained steady, as shown in Figure 6. The increase since 2015 appears to be driven by the consumption of fuels for space heating in buildings, particularly natural gas. For example, in 2019, natural gas end-use demand in Ontario accounted for 30% of the province's total fuel demand, and in 2020, it represented 24% of Canada's total natural gas demand[120].

While GHG emissions have decreased in Ontario since 2015, emissions from buildings (manufacturing, commercial, and institutional) have increased. In 2018, this increase was partly the result of a very cold winter[121]. Indeed, in 2019, Toronto's emissions decreased by 38% from 1990 levels[122]. However, residential, commercial, and industrial buildings were the largest source of emissions, accounting for 57% of the community's total emissions, with natural gas being the primary energy source used to heat buildings and therefore the largest source of emissions in the province.

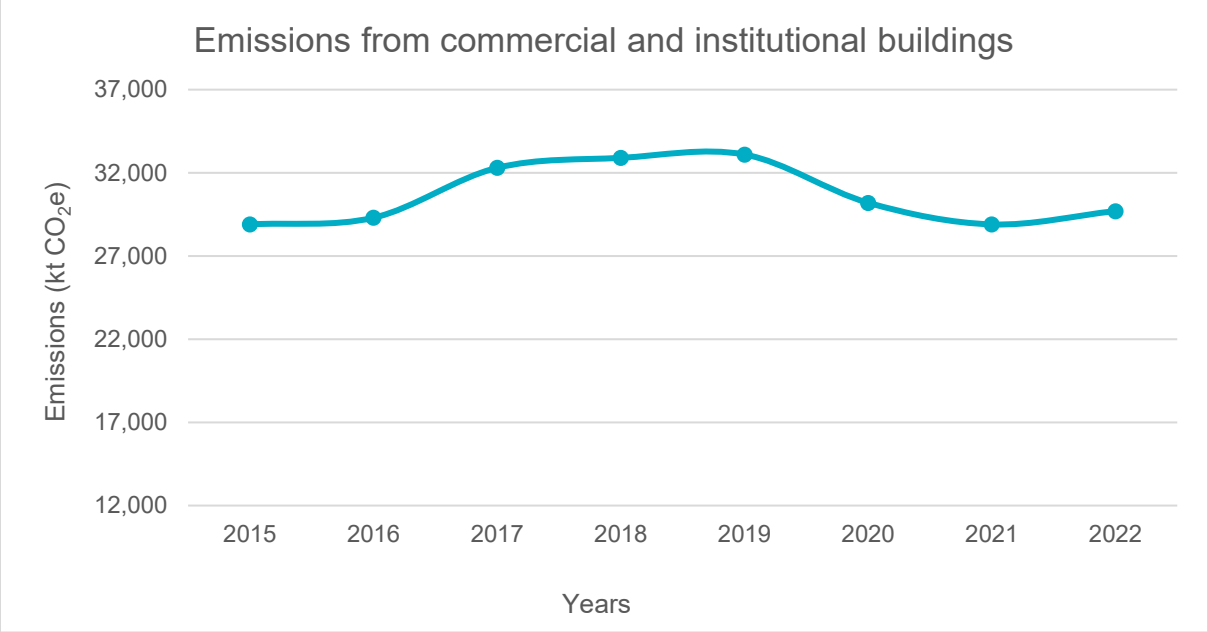


Figure 6 Ontario's GHG emissions from commercial and institutional buildings (2015-2020)

[120] https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-ontario.html

[121] State of Ontario's Biodiversity | Changes in Greenhouse Gas Emissions - State of Ontario's Biodiversity (sobr.ca)

[122] https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/torontos-greenhouse-gas-inventory/

Emissions from waste

GHG emissions generated by the waste sector, including emissions from landfills, organic and yard waste, and wastewater treatment processes, decreased from 7,300 kt CO_2e in 2015 to 5,700 kt CO_2e in 2016. However, starting in 2017, emissions began to rise gradually, increasing to between 7,000 kt CO_2e to 7,500 kt CO_2e in 2022.

While these emissions rank far behind transportation and buildings, averaging 5% of total GHG emissions, they also represent one of the largest sources of GHGs in Ontario that must be eliminated if we are to move towards a net zero carbon target by 2030. This 5% is primarily generated by landfill emissions, which account for an average of 81% of GHG emissions from waste in Ontario.

Figure 7 Ontario's residual materials GHG emissions (2015-2022)

Conclusion

The decline in GHG emissions for Ontario and the rest of Canada in 2020 is a result of the economic slowdown and travel restrictions caused by the pandemic. Therefore, it is relevant to focus on the 2015-2019 emissions. Since 2015, emissions from the waste management sector, as well as transportation and institutional and commercial buildings, are essentially on an ascending curve. Several sources of information consulted still project an increase in GHG emissions in the province, especially in transportation and buildings, due to the removal of government measures, such as Ontario's cap-and-trade system to reduce GHG emissions from businesses in certain industries, and the increase in the use of natural gas as an energy source. This raises concerns about future evolution of GHG emissions in the province of Ontario.

APPENDIX 5: STANDARD ADHESION CONTRACT

Example of the contract can be found in the following pages.

MEMBERSHIP CONTRACT TO THE SUSTAINABLE COMMUNITY OF WILL SOLUTIONS INC.

Whereas: Will Solutions Inc.'s Sustainable Community solution ("**SC-solution**") is used to reward a community member who subscribes to its program for its Green House Gas ("**GHG**") reduction efforts in order to stimulate sustainable actions. The SC-solution is based on a new and unique methodology, VM0018 that allows for the quantification and verification of GHG reduction efforts in order to aggregate and to sell the GHG reductions on the voluntary carbon market (VCM) (the "**Methodology**").

Whereas: This Methodology is the cornerstone of the SC solution. Will Solutions Inc. developed it under the Verified Carbon Standard (the "VCS Standard") which certified it in 2012. The purpose of this is to provide access to voluntary carbon markets to the millions of small final emitters who are not subject to regulated pricing of GHG emissions. The SC solution thus enables small final GHG emitters to monetize their emission reductions through conversion and energy efficiency improvement projects and management measures allowing the diversion of waste from the landfill sector (the "Reductions of eligible GHGs") and on a next step, GHG reductions related to measures applied to the transportation of people and goods. On June 20, 2022, Will Solutions obtained non-dilutive financing which will allow it to optimize its traceability platform in cloud computing mode and to modify the VM0018 methodology in order to add the transport component (sectoral scope 7). For each territory identified by Will Solutions Inc., a project description ("PD") is developed in accordance with the Methodology and is validated by a third party, namely a validation and verification entity (Validator Verificator Body – "VVB Entity")) recognized by the VCS Standard in order to be serialized in the Verra registry.

Whereas: For the province of Quebec (a Canadian province), Will Solutions Inc. has developed, presented and certified its first PD entitled "Energy Efficiency and Solid Waste Diversion Activities within the Quebec Sustainable Community". The success of this 1st project was confirmed by the filing of nine (9) Monitoring Reports (MR) which were all verified by a VVB, which made it possible to serialize millions of carbon credits under the Verra registry. The project was renewed under the Verra registry, in May 2021, for an additional period of 10 years, from January 1, 2020 to December 31, 2029. A second Sustainable Community, covering the entire province of Ontario, is registered as of August 2022 in the Verra registry as being under development based on the VM0018 methodology and will cover the period from January 1, 2026, to December 31, 2032..

Member

Whereas: Outside the province of Quebec, Will Solutions Inc. intends to operate its SC Solution through franchises by granting a franchise license to at least one franchisee (the "Franchisee") for a defined territory (the "Franchise Territory"). If a franchise is implemented under this Agreement, any right and obligation of Will Solutions Inc. described below may, at Will Solutions Inc.'s discretion, be exercised either by Will Solutions Inc. or by the Franchisee (hereinafter collectively referred to as "Will").

The Member, on its behalf and on behalf of its affiliates, its agents and subcontractors (collectively the "**Member**"), hereby agrees to be bound by the present agreement (the "**Agreement**").

Member Number :	
Name of the Member :	
Address :	
City :	
Postal Code:	
Phone Number :	
Email :	
Name of Member's Representative :	
Title of Member's Representative :	
Name of Will Solutions Inc.'s Representative :	

The Member hereby confirms that the following sites are subject to this Agreement ("**Sites**") (the location where the Sites are established being the "**Member's Territory**"). The Member represents to Will (collectively the "**Parties**" and individually the "**Party**") that these Sites are all the sites owned or leased by the Member in the Franchise's Territory for which reduction efforts are made by the Member. Any additional site owned or leased by the Member from time to time in the Franchise's Territory for which reduction efforts will be made by the Member shall be included on this list and shall automatically be part of the Sites covered by the definition herein. The definition of Sites shall exclude any Site disposed of or which the Member ceases to lease from time to time.

Number of Sites	Description	
	All Sites to be part of the Agreement across the Members' Territory *[List to be provided by the Member].*	**No fees**

Signature Date :

Representative of Will Solutions Inc. (dd-mm-yyyy)

Signature Date :

Member's Representative (dd-mm-yyyy)

Signature Date :

Compliance Verification of Will Solutions Inc. (dd-mm-yyyy)

Terms and Conditions for Subscribing to the Sustainable Community Solution

1. Member's Obligations

1.1 There are no fees payable by the Member for its subscription and participation to the SC-Solution.

1.2 The Member shall, for the whole Term and Renewal Period (as defined under Section 6.1), make commercially reasonable efforts to reduce its GHG emissions for the purpose of allowing their conversion into Verified Carbon Units (VCCs) under this Agreement and, upon request of Will and at least once a year, provide truthful and detailed evidence of such reductions.

1.3 The Member agrees to provide the information requested by Will to allow the identification and geolocation of all Sites, as well as the determination of the reference scenario of GHG emissions by Site.

1.4 The Member shall also supply Will upon request and at least once a year, detailed Eligible GHG Reductions information and evidence for each Site to the satisfaction of Will and a VVB.

1.5 The Member agrees to provide Will and a VVB access to the Member's place of business and Sites, following a seventy-two (72) hours' prior notice, during normal business hours, to allow for the verification of the SC-solution process and the information provided to Will and a VVB;

1.6 The Member agrees to participate, upon Will's reasonable request, to the promotion of the SC-solution and the Member's own GHG reductions' projects, including without limitation, the Member's participation to various media communications, interviews, testimonies, videos and events.

1.7 The Member also agrees to assign and transfer to Will all its rights, title, and interest in all benefits arising from any GHG reductions arising from the Sites and identified as Eligible GHG Reductions by Will:

1.7.1 The Member undertakes to do everything and sign any document or form required by Will from time to time, in order to give effect to this Agreement;

1.7.2 Upon transfer of the Eligible GHG Reductions, the Member acknowledges and confirms that it will, at all times from the date hereof, be the sole owner of the Eligible GHG Reductions relating to the Sites, free of any security interest, mortgage, or other encumbrance..

1.8 If Will were to avail himself of the provisions of Article 6.2.3 of this Agreement, the Eligible GHG Reductions would then be remitted to the members to which they belong.

1.9 The Member agrees and undertakes that all Eligible GHG Reductions shall be additional to any reduction made in the Member's normal course of business if the Eligible GHG Reductions had not been carried out and that the GHG reduction efforts shall be maintained for the Term and the Renewal Period, if any.

1.10 The Member agrees to provide their bank details necessary for receiving payment from Will, to the lawyer appointed by Will and to the trust mentioned in Article 2.5 of this contract upon request. It is also possible to proceed by issuing checks payable to the Member.

2. Will's obligations

2.1 Will agrees to use commercially reasonable efforts to convert the Member's Eligible GHG Reductions into VCCs, using the VCS Standard, and to agglomerate these VCCs in order to sell them;

2.2 Will agrees to define the baseline reference GHG emission scenario for each Site;

2.3 At least once a year, Will will collect and validate the information and evidence provided by the Member to determine the Eligible GHG Reductions for each Site in accordance with this Agreement.

2.4 Will plans to create an electronic account for each Member and register that account on its information technology traceability platform (the "ITP") in order to track, collect from the Member, and document information and evidence relating to the Member's buildings' eligible GHG reductions, as required by a VVB Entity.

2.5 Will converts Qualifying GHG Reductions into VCCs, subject to the authorization of the VCS Standard to register them in a recognized VCS registry. Will transfers and maintains in a separate account the Member's share of the proceeds from the sale of carbon credits indicated in article 2.7. Will will set up, as soon as the number of members in his Sustainable Communities warrants, an escrow agreement with a reputable Canadian escrow agent. Member agrees that its share of the proceeds from the sale of carbon credits referred to in Section 2.7 shall be held by such escrow agent until distributed to Member pursuant to Section 2.8. If Will were to avail himself of the provisions of Section 6.2.3 of this Agreement, the VCCs held in trust would then be returned to the Members to whom they belong.

2.6 Will agrees to use commercially reasonable efforts to sell the VCCs during the year following their date of conversion, provided that the price and market conditions are satisfactory to Will. In the event that Will is not satisfied with the price and market conditions, Will will sell the VCCs when the price and market conditions will be satisfactory to Will;

2.7 Will agrees to share with the Member the net proceeds of the sale of the VCCs received by Will, excluding applicable sales taxes, as follows: (i) 50% to the Member; and (ii) 50% to Will;

2.8 Will agrees to distribute the proceeds of the sale of the VCCs received by Will, excluding applicable sales taxes, to Members in a territory once 250,000 VCCs have been sold in that territory and up to twice a year. Will reserves the right to adjust the frequency of distributions according to market conditions and the company's financial resources. Will will maintain an up-to-date Carbon Asset Portfolio (CAP) which will contain the balance of unsold and verified carbon credits, and which will be distributed to Members, following each verification of a quantification cohort.

2.9 Will deposits the Member's share of the net proceeds of the sale of the VCCs received by Will, excluding applicable sales taxes, in a separate account containing the Member's shares only. Will intends to enter into an escrow agreement with a reputable Canadian escrow agent who will hold and administer these sums. The Member hereby consents to monies held being transferred to an independent escrow agent. If Will were to avail himself of the provisions of Article 6.2.3 of this Agreement, the sums held in trust or in trust would then be returned to the Members to whom they belong.

2.10 Will agrees to provide support (accompaniment) to the Member for the collection and validation of its Eligible GHG Reductions.

3. Payment

Will or the escrow agent shall pay the member its share, if applicable, of the net annual proceeds from the sale of VCCs generated by the Member and collected by Will, excluding applicable sales taxes. This payment will be made once 250,000 VCCs have been sold and up to twice per year, starting on December 31 following the first anniversary of the signing of the Agreement. These payments will be made in accordance with sections 2.7 and 2.8. However, the Member will not receive any payment until the VCCs they generate have been sold and Will has received payment. Payment to the member will be made in Canadian dollars via direct deposit, provided they provide all relevant banking information. In the absence of banking information, a check will be mailed to the Member's address as set forth in this agreement. Payment will be made from the lawyer's trust or escrow account, as applicable. Within ninety (90) days of each payment to the Member, Will will provide the Member with a statement of the eligible greenhouse gas (GHG) reductions and carbon credits (VCCs) generated by the Member through the SC Solution.;

4. Assignment Prohibited

The Member cannot assign its rights or obligations under this Agreement without Will's prior written consent. Will may assign its rights or obligations under this Agreement without the Member's consent.

5. Representations

5.1 Will represents that it owns the SC-Solution and that it has the authority to grant the Member the right to participate to the SC-solution. Will does not guarantee to the Member in any way the results obtained from participating to the SC-solution nor the quality or scope of such results. The Member is solely responsible for the data that is supplied by the Member to Will to be used in the SC-solution and of the results obtained. The Member assumes all risks related to the use of the data and the results obtained;

5.2 These representations replace all other representations, conditions, verbal or written warranties, express or implicit, concerning the participation to the SC-solution. Will does not warrant the accuracy, the integrity, the timeliness or the fair market value of the information or results obtained from the Member's participation to the SC-solution, nor the fact that these information or results are conceived or used for a particular goal. It is the Member's responsibility to verify and provide all necessary data to Will to be used in its SC-solution account.

5.2.1 In no event shall Will be liable for any expense, liability, claims, demands, taxes, damages, losses or penalties relating to the execution of its obligations under this Agreement (including, without limitation, services such as supply, compilation, interpretation, transcription, reproduction or delivery of any information obtained by means of the SC-solution or participation to the SC-solution), unless it was judicially determined to be caused by fraud, intentional fault or gross fault by Will, its officers, employees or agents.

5.2.2 All investments made in the carbon voluntary market are subject to market risks, including, without limitation, risks related to the territory, the nature and the origin of the VCCs, or the year they were created. Will does not in any way guarantee the outcome and is not liable for any diminution in the value of the VCCs, which may go up or down based on market conditions. Past performance should not be taken as an indication or guarantee of future performance and no representation or warranty, express or implied, is made regarding future performance.

5.3 The Member represents and warrants to Will that neither he nor any of his directors, officers or shareholders is subject to sanctions. The word sanction means any commercial, economic or financial sanction or embargo or any restrictive measure promulgated, imposed, administered or applied from time to time by a governmental body.

5.4 The Parties shall not be liable for delays or default under this Agreement as a result of an event of force majeure, including without limitation, fire or other casualty, act of God, strike or labour dispute, war or other violence, political instability, or any law, order or requirement of any governmental agency or authority.

6. Term and Termination

6.1 This Agreement is for a period of three (3) years from the date of signature (the "Term"). It will end no later than December 31, 2029.

6.1.1 The Agreement will be automatically renewed for one (1) term of three (3) years (the "Renewal Period"), unless either Party sends a non-renewal written notice to the other Party, no less than twelve (12) months prior to the end of the Term. The Term cannot exceed December 31, 2029.

6.2 The Agreement can be terminated as follows:

6.2.1 By Will upon ninety (90) days prior written notice, for convenience without obligation;

6.2.2 By a Party, at the expiration of a ninety (90) days prior written notice, if the other Party fails to remedy or cure a breach of any provision of this Agreement;

6.2.3 By a Party, forthwith and without notice, if (i) the other Party voluntarily enters into proceedings in bankruptcy or insolvency, (ii) the Member makes an assignment for the benefit of creditors, (iii) a petition is filed against the other Party under a bankruptcy law, a corporate reorganization law, or any other law for relief of debtors or similar law and

such petition is not discharged within thirty (30) days after such filing, (iv) the other Party ceases to actively conduct business or enters into liquidation or dissolution proceedings; or (v) the other Party or one of its leaders is subject to criminal charges.

6.3 Will reserves all rights and recourses as to any damages that can result from any default by the Member under this Agreement.

6.4 Upon expiration or termination of this Agreement, **unverified** Eligible GHG reductions shall be returned by Will to the Member. The remaining VCCs will be sold by Will in accordance with the terms and conditions of this Agreement and the net proceeds will be shared in accordance with article 2.7. However, if the Agreement has been terminated by Will in accordance with sections 6.2.2 and 6.2.3, Will shall, notwithstanding section 2.7, keep the full proceeds from the sale of the remaining VCCs.

6.5 Section 6.4 and articles 7, 8 and 9 shall survive the termination of the Agreement.

7. Indemnification

Should a legal proceeding or claim arising out of the Member's conduct or negligence or the execution of its obligations herein be brought against Will, the Member agrees to indemnify, defend and hold Will and its respective directors, officers and personnel harmless from and against all losses, costs, damages, expenses, penalties and liabilities whatsoever (including reasonable legal fees) which may be suffered or incurred by Will arising out of or as a result of or relating in any manner whatsoever to this Agreement. Will shall advise the Member of such claim within thirty (30) days of knowledge of the event.

8. Ownership's Right on SC Solution

8.1 The Parties agree that (i) the Will trademark, including the logos depicted in Schedule A, (the "TradeMark"), the SC-solution and its content, Will's business model, the ITC Platform as well as all intellectual property rights relating thereto, including copyright and rights in patent applications and patents, are owned or controlled by Will, and (ii) no right, title or interest in and to the SC-solution, the Methodology and the ITC Platform as well as in all intellectual property rights relating thereto, including copyright and rights in patent applications and patents, is transferred to the Member, except for the limited right to participate, use and access as specifically mentioned herein.

8.2 The Member is granted a limited, personal, non-transferable and revocable right to reproduce the Trademark in promotional material preapproved in writing by Will at its sole and entire discretion. It is understood and agreed that such promotional material (i) shall include a legend stating that WILL is a registered Trademark of Will, and (ii) shall only be used in the Member's Territory for the purposes contemplated in this Agreement.

8.3 Without limiting the foregoing, the Member is allowed to use the Trademark in the form of the certificate(s) attached under Schedule B.

9. Confidentiality

9.1 Each Party expressly undertakes to retain in confidence all information supplied by one Party (the "Disclosing Party") to the other Party (the "Receiving Party"), including, but not limited to, (i) all technical or commercial information disclosed orally or in writing by Will to the Member; (ii) the data supplied by the Member to Will; and (iii) any information that by its nature or by the nature of the circumstances surrounding the disclosure, ought in good faith to be treated as proprietary and/or confidential by one Party or both (hereinafter referred to as "Confidential Information");

9.1.1 Each Party shall, and shall ensure that it and its affiliates, franchisees, subcontractors, agents and their respective officers, directors, employees and agents shall keep and maintain completely confidential and not publish, distribute, disseminate or otherwise disclose and not use for any purpose, except as expressly permitted hereunder, any Confidential Information disclosed to it by the other Party or its affiliates, franchisees, subcontractors, agents or their respective officers, directors, employees or agents pursuant to this Agreement;

9.1.2 Each Party shall ensure that it and its affiliates, franchisees, subcontractors, agents and their respective officers, directors, employees and agents have access to such Confidential Information only for the purpose of performing their duties under this Agreement;

9.1.3 Confidential Information shall not include any information: (i) that becomes generally available to the public other than as a result of unauthorized disclosure by the Party receiving the Confidential Information; (ii) that was available to the Receiving Party on a non-confidential basis prior to receipt from the Party disclosing Confidential Information or is

received thereafter from a third Party without restriction and without breach of any duty of confidentiality; (iii) that is independently developed by the Receiving Party without the use of or reference to any Confidential Information from the Disclosing Party, as demonstrated by documented evidence prepared contemporaneously with such independent development; or

9.1.4 The Receiving Party shall be permitted to disclose Confidential Information if forced to do so pursuant to an order of a court or government agency, provided that, prior to such disclosure, the Receiving Party notifies the Disclosing Party of such order or upcoming order and cooperates with the Disclosing Party in seeking an appropriate protective order for such Confidential Information. The Receiving Party shall limit disclosure of such Confidential Information to the minimum disclosure permitted under the applicable order.

9.2 Upon the request of a Party, upon termination or expiration of this Agreement, each Party shall promptly cease use of and return to the other Party or destroy and certify destruction of all of the other Party's Confidential Information, including all copies, excerpts or summaries thereof, in whatever form or medium, and thereafter shall not make any use of any such Confidential Information of the other Party, in each case except as expressly permitted hereunder; provided that no Party shall be obligated to return or destroy Confidential Information that has become integrated with other business records of such Party; provided, further, that such Party shall continue to be bound by the confidentiality obligations under this Agreement with respect to any such Confidential Information that is not so returned or destroyed.

9.3 Notwithstanding all of the above, the Member expressly agrees that the data supplied to Will pursuant to this Agreement, and the results of any calculation executed through the SC-solution, may be compiled, used and made available by Will for statistical and analytical or research purposes, provided that the Member is not identified or personally associated with such data in any manner. In addition, the Member also acknowledges and recognizes that Will is authorized to use the Confidential Information in order to comply with its obligations set forth herein.

9.4 In the event that a Party or its affiliates, franchisees, subcontractors, agents or their respective officers, directors, employees or agents breaches such terms, such Party shall be jointly and severally liable to the other Party for any damage incurred by the other Party and resulting from such breach.

10. Miscellaneous

10.1 Will may change the conditions, the fees and the methods used to allow the Member to participate to the SC-solution by giving the Member a reasonable written notice with respect to the nature of the modifications and the date they come into force;

10.2 The provisions of this Agreement and their interpretation shall be governed by the laws applicable in the Province of Quebec, including the laws of Canada applicable therein. If any provision of this Agreement is declared invalid by a Court of law or is unenforceable under any applicable statute or rule of law, it is so only to that extent to be deemed non-essential and omitted from this Agreement, which will continue to bind the Parties in all its other provisions;

10.3 This Agreement, including its schedules which are incorporated and made a part hereof, sets forth the entire understanding between the Parties and replaces any other agreement, verbal or written;

10.4 The Parties agree in the district of Montreal, Quebec, Canada.

11. Notices

11.1 All notices in connection with this Agreement must be in writing and shall be given by registered mail, e mail, courier service, or other means offering a proof of delivery to the addresses mentioned below, or at any other address notified in writing by a Party;

11.2 Notices shall be given at the following addresses:

For :	**Will Solutions Inc.**	**For :**	
Attention :		Attention :	
Phone :		Phone :	
Email :		Email :	

ANNEX A

Sustainable Community

ANNEX B