

CASE STUDY

Net Zero Water

JUNE 2026



Wastewater greenhouse gas inventories

MISSION

Quantify the annual greenhouse gas (GHG) emissions from one or more wastewater treatment facilities.

CLIENT

A theoretical municipality conducting its first wastewater GHG emissions inventory.

LOCATION

Canada

ABOUT THE AUTHORS

Benjamin Beelen

Wastewater Process Engineer
GHD

Jeremy Kraemer

Wastewater Technical Director
GHD

Stephanie Andrade

Project Coordinator, Climate
Canadian Water Network (CWN)

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Challenge

Wastewater treatment greenhouse gas (GHG) inventories play a critical role in estimating emissions and justifying mitigation measures that move municipalities towards more sustainable operations.

Although wastewater GHG inventories involve many details and decisions, municipalities do not have to start from scratch. Several practical tools are freely available to guide the process. One of these is the Ontario Water Works Association and Water Environment Association of Ontario [GHG Inventory Tool for Water Utilities \(the “OWWA/WEAO tool”\)](#).

About this case study

This case study reflects the experience many Canadian municipalities face when they conduct a GHG inventory for the first time. It draws on inventory work conducted across Canada and offers a high-level view of what a municipality might experience during its initial inventory effort.

Getting started

A regional council declares a climate emergency and identifies wastewater treatment operations as a significant source of GHG emissions. In response, wastewater operations are tasked with developing a GHG inventory to better understand the magnitude of these emissions and to identify opportunities to reduce them. While the municipality has completed inventories in the past, those efforts focused primarily on electricity and fossil fuel use.

One of the first questions to address is how accurate the inventory needs to be. As the goal is to understand emission magnitudes and identify reduction opportunities, rather than to meet regulatory requirements or support offset accounting, a high-level, desktop-based assessment works well. The inventory relies on data already collected for routine operational and regulatory reporting, without requiring new field measurements.

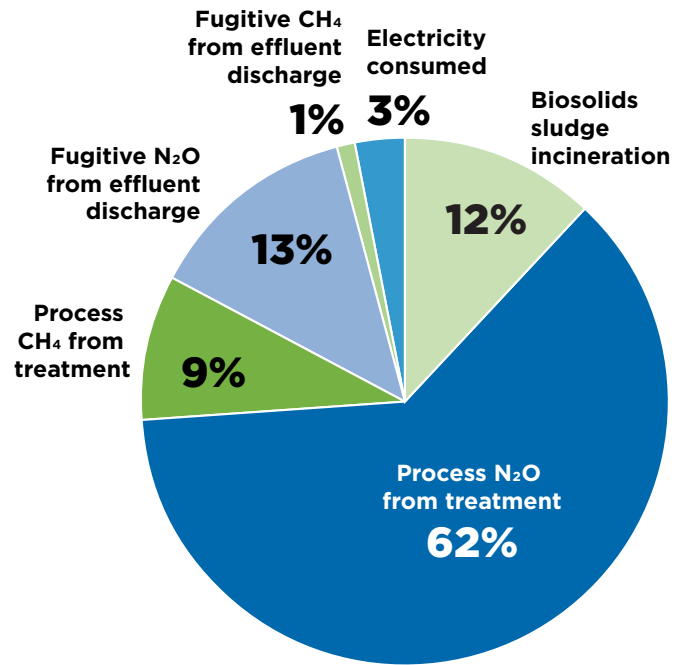
Another key decision is determining what to include and what to exclude. A practical starting point is to include all Scope 1 emissions, which are direct, facility-level emissions. For wastewater treatment plants, these sources include fugitive nitrous oxide and methane emissions from treatment processes, emissions from incineration, and combustion emissions from on-site fuel. Most inventories also include Scope 2 emissions, with total emissions dependent on the carbon intensity of the local electricity grid, which varies by province. Scope 3 emissions are often excluded from a high-level municipal inventory due to data limitations and uncertainty. These may include embodied carbon in construction materials, off-site biosolids management, and emissions associated with chemical production and transport.

Completing the inventory

Municipalities typically choose between using an existing tool or developing a custom calculator. Publicly available tools, such as the OWWA/WEAO tool, offer a practical and efficient option. While a municipality-specific calculator can provide additional flexibility, it often requires more time and effort, especially for a first-pass inventory.

For the OWWA/WEAO tool, most of the data required for a high-level inventory can be sourced from existing annual reports, routine monitoring (such as primary clarifier performance), and records of electricity and fuel consumption. Some parameters may require simple calculations or estimates based on operational knowledge, but extensive new data collection is generally not required.

For a typical 50 ML/d conventional activated sludge plant in Ontario, your emissions inventory can look something like this (dependent of course on specific processes, electricity grid supply, and many other factors):

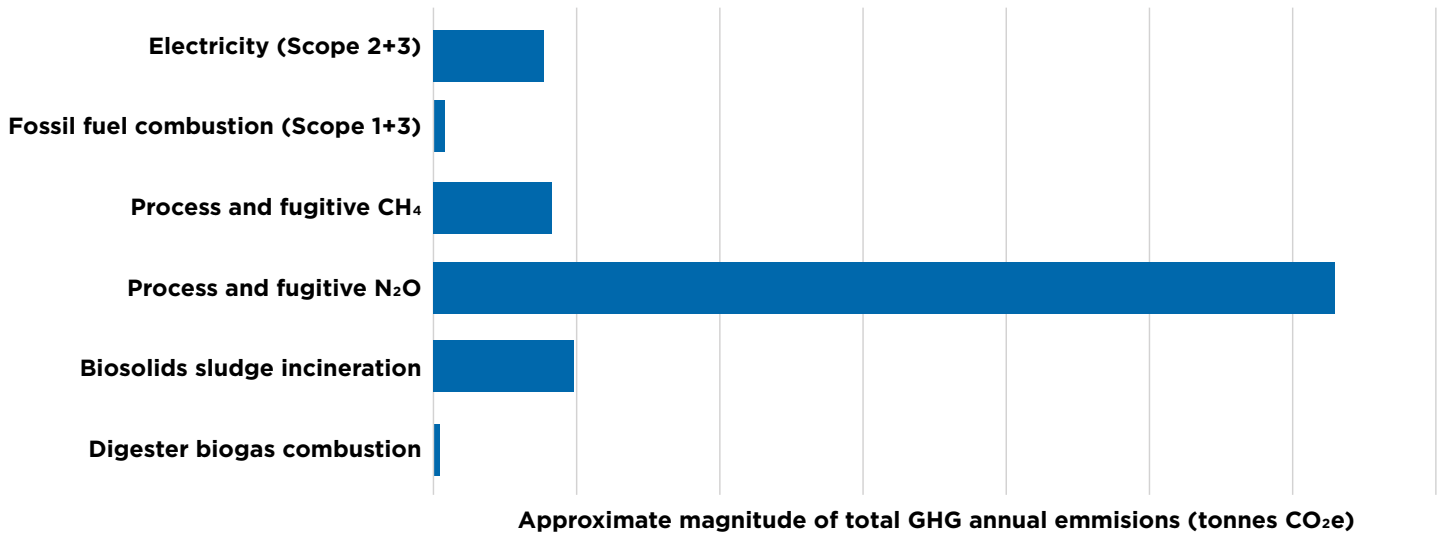


A typical GHG inventory journey

Once the inventory is complete, one result usually stands out: nitrous oxide likely dominates the GHG inventory. These emissions are primarily generated during secondary treatment in aeration basins and are calculated as a percentage of influent total Kjeldahl nitrogen (TKN). While direct measurements or detailed process modelling would refine this estimate, the default approach provides a reasonable starting point for a high-level assessment.

Electricity use often makes up only a small share of total emissions — about three percent in this example. Why is this the case? The inventory calculates electricity emissions using the emissions intensity of the provincial electricity grid. Ontario's largely nuclear-powered grid keeps electricity emissions relatively low. In provinces such as Alberta or Saskatchewan, where fossil fuels play a larger role in electricity generation, electricity could contribute 20-30 percent of total emissions for a similar facility.

Greenhouse Gas Emissions by Source



Note: Ontario's electricity grid used for magnitude of electricity. Other provinces significance of electricity will vary. Also, biosolids sludge incineration can be very significant.

What comes next?

- 1. Preserve your data.** Inventory methods evolve, and municipalities often revisit past inventories as tools and guidance improve. Clearly document data sources, assumptions, and gap-filling calculations, and store them in a place where future teams can easily access them.
- 2. Use the inventory to guide action.** Nitrous oxide should likely be a priority, but other emission sources also matter. Assess digesters and biogas piping for methane leaks, pursue electricity efficiency projects that reduce emissions and operating costs, and look for operational improvements that may deliver meaningful reductions.
- 3. Make the inventory repeatable.** Establish a consistent annual inventory process. Repeating the exercise year over year

strengthens decision making and prevents one unusual year from driving long term conclusions. When possible, complete inventories for past years to build a more robust emissions baseline.

Large wastewater emissions can feel overwhelming at first, but completing an inventory marks a major step forward. Municipalities that take this step position themselves at the forefront of wastewater decarbonization and lay a strong foundation for informed, effective climate action.