# City of Wilmington 2022 Inventory of Government Operations Greenhouse Gas Emissions

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**Produced by the City of Wilmington**

with Assistance from ICLEI – Local Governments for Sustainability USA

## Credits and Acknowledgements

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## Executive Summary

The City of Wilmington recognizes that greenhouse gas (GHG) emissions from human activity are catalyzing profound climate change, the consequences of which pose substantial risks to the future health, wellbeing, and prosperity of our community.

The City of Wilmington set a goal to reduce its greenhouse gas (GHG) emissions 50% by 2030 as compared to 2010 levels. To track progress against that goal, the City has been working with a consultant since 2011 to quantify the City's GHG emissions resulting from its local government operations. Annual GHG emissions inventories have been tracked through The Climate Registry's CRIS tool for the years 2010 through 2018. In 2022 the City of Wilmington joined ICLEI – a global network of local governments devoted to solving the world's sustainability challenges – and began using ClearPath. ClearPath is an industry-standard emissions management tool which the City of Wilmington now uses to track its GHG emissions.

This report provides estimates of greenhouse gas emissions resulting from activities within the City's government operations. A local government has operational control over an operation if the local government has the full authority to introduce and implement its operating policies at the operation. This approach is consistent with the current accounting and reporting practice of many organizations that report on emissions from facilities which they operate (i.e., for which they hold the operating license). Given those boundaries, established emissions sources and activities include:

- City-owned buildings (electricity, natural gas, heating oil consumption)
- Streetlights and traffic signals (electricity consumption)
- Water and wastewater facilities (electricity, natural gas, heating oil, digester gas, landfill gas consumption, and process N2O emissions from wastewater treatment and effluent discharge)
- City's vehicle fleet (gasoline, diesel, ethanol consumption)

## Key Findings

The **total Wilmington government GHG emissions** (in metric tons of CO2e) for 2022 was **28,791** compared to the baseline of 42,206 MT CO2e in 2010 (32% reduction).

Overall, Wilmington continues to work towards its reduction goal. Although the total GHG emissions have increased from the previous year, the last 5 years have shown a consistently lower average total emissions for the local government operations. Previous years' effort in sustainability have resulted in a 32%-40% (or a rolling average of 37% in the last 5 years) reduction between 2010 - 2022, leaving Wilmington 8 years to reduce the emissions by 13% and meet the 50% by 2030 reduction goal.

*Figure 1* shows the afore mentioned trend of local government operations emissions between 2010 and 2022 with indications of how it is broken down per sector. Of the sectors listed in the previous section, the **Water and Wastewater Facilities** sector accounts for a vast majority **(12.4% + 53.9%= 66.3%)** of these emissions. Actions to reduce emissions from this sector will be a key part of any future climate action plan developed by Wilmington. The next largest contributor is the **vehicle fleet (14.2%),** followed by **Streetlights (9.7%) and Buildings and Facilities (9.9%)**.

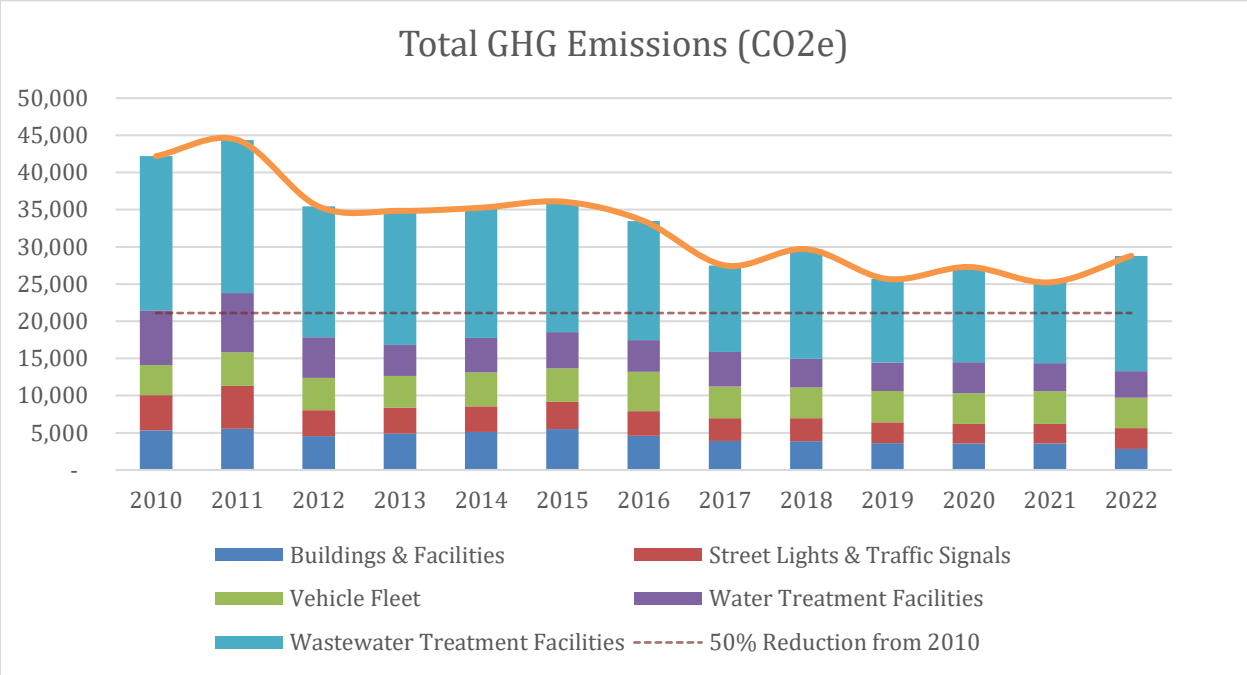


*Figure 1: Total Government Operations Emissions by Sector*

## Introduction to Climate Change

Overwhelming evidence shows that human activities are increasing the concentration of greenhouse gases and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise, threatening the safety, quality of life, and economic prosperity of global communities. Many regions are

already experiencing the consequences of global climate change, and the City of Wilmington is no exception.

Facing the climate crisis requires the concerted efforts of local governments and their partners, those that are close to the communities directly dealing with the impacts of climate change. Cities, towns, and counties are well placed to define coherent and inclusive plans that address integrated climate action — climate change adaptation, resilience, and mitigation.

# Inventory Methodology

## Understanding a Greenhouse Gas Emissions Inventory

As local governments continue to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the Local Government Operations Protocol for Accounting and Reporting Greenhouse Gas Emissions (LGO Protocol) which is described below. To complete this inventory, the City of Wilmington utilized tools and guidelines from ICLEI - Local Governments for Sustainability (ICLEI).

Three greenhouse gases are included in this inventory: carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Many of the charts in this report represent emissions in “carbon dioxide equivalent” (CO2e) values, calculated using the Global Warming Potentials (GWP) for methane and nitrous oxide from the [IPCC 5th Assessment Report]:

*Table 1: Global Warming Potential Values (IPCC, 2014)*

| Greenhouse Gas | Global Warming Potential |
|---|---|
| Carbon Dioxide (CO2) | 1 |
| Methane (CH4) | 28 |
| Nitrous Oxide (N2O) | 265 |

## Local Government Operations (LGO) Protocol

In 2010, ICLEI, the California Air Resources Board (CARB), and the California Climate Action Registry (CCAR) released Version 1.1 of the LGO Protocol.[1] The LGO Protocol serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. The purpose of the LGO Protocol is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory.

[1] ICLEI. 2008. Local Government Operations Protocol for Accounting and Reporting Greenhouse Gas Emissions. Retrieved from http://www.icleiusa.org/programs/climate/ghg-protocol/ghg-protocol

The following activities are included in the LGO inventory:

- Energy and natural gas consumption from buildings & facilities
- Streetlights and traffic signals
- On-road and off-road transportation from vehicle fleet
- Wastewater and water treatment processes

### Quantifying Greenhouse Gas Emissions

Most emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see appendices for a detailed listing of the activity data used in composing this inventory. Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO2/kWh of electricity). For this inventory, calculations were made using ICLEI's ClearPath tool.

## Government Operations Emissions Inventory Results

The emissions can be broken down by sector and source. As previously mentioned, sectors include the buildings, streetlights, vehicles, and water/wastewater treatment plants. Within those sectors are the emissions sources such as electricity and natural gas (purchased from the grid), or digester gas and nitrogen produced by the treatment processes. *Table 2* Shows the breakdown for the 2022 Inventory with respect to those sectors and sources. It also indicates the usage amount that was used to calculate emissions.

*Table 2: Local Governments Operations Inventory*

| Sector | Fuel or source | 2022 Usage | Usage unit | 2022 Emissions ($MTCO_2e$) |
|---|---|---|---|---|
| Buildings & Facilities | Electricity | 6,726 | MWh | 1,970 |
| | Natural Gas or Oil#2 | 15,688 | MMBTU | 773 |
| | | | **Buildings & Facilities total** | **2,837** |
| Streetlights & Traffic Signals | Electricity | 9,072 | MWh | 2,782 |
| | | | **Streetlights & Traffic Signals total** | **2,782** |
| Vehicle Fleet | Gasoline (off-road) | 665 | gal | 6 |
| | Diesel or Ethanol (off-road) | 2,124 | gal | 15 |
| | Gasoline (on-road) | 318,379 | gal | 2,819 |
| | Diesel (on-road) | 122,991 | gal | 1,257 |
| | | | **Vehicle Fleet total** | **4,097** |
| Water and wastewater | Electricity | 27,161 | MWh | 8,329 |
| | Natural Gas or Oil#2 | 119,124 | MMBTU | 4,908 |
| | Digester Gas Flared | 157,640 | MMBTU | 804 |
| | Digester Gas/Landfill Combusted (used for boiler operations) | 170,155 | MMBTU | 44 |
| | Process Nitrogen (by population served) | 148,889 | People | 158 |
| | Nitrogen Discharge | 6,360 | Kg N/day | 4,832 |
| | | | **Water and wastewater total** | **19,075** |
| | | | **Total government emissions** | **28,791** |

*Figure 2* shows the distribution of emissions among the four sectors included in the inventory. As previously stated, Water & Wastewater Treatment Facilities represent the majority of emissions, followed by Vehicle Fleet, Streetlights & Traffic Signals, and Buildings & Facilities.

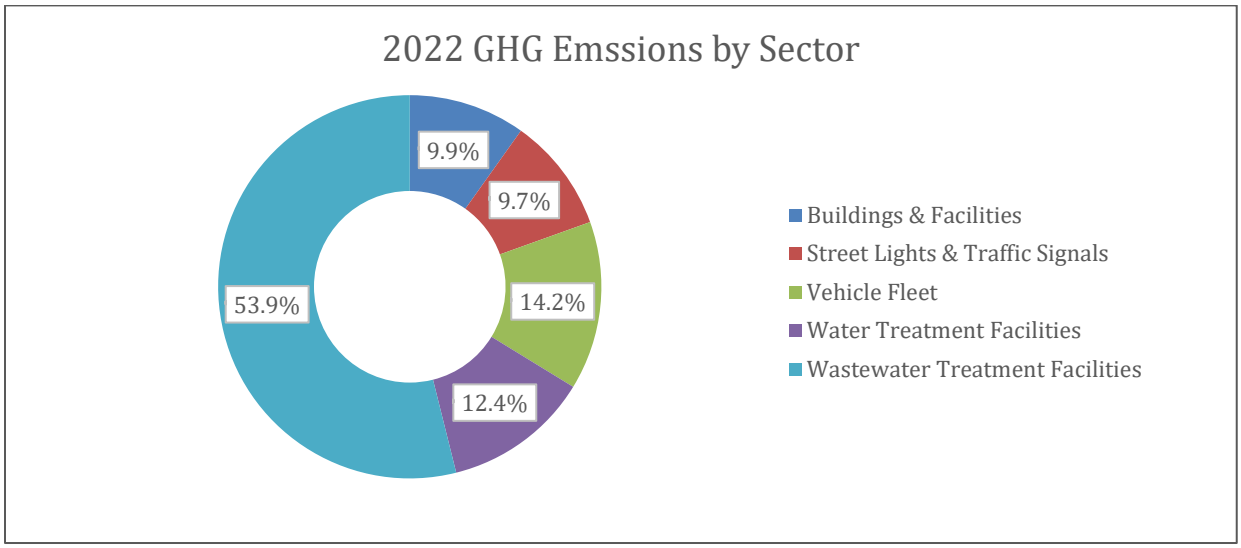


*Figure 2: GHG Emissions Breakdown by Sector*

*Figure 3* displays the breakdown of emissions by process or source. This can be helpful in identifying which processes or fuels have the greatest impact and use in the government's operations. Note that grid electricity makes up almost half of the emissions, pointing to a need for more environmentally friendly electricity sources or more energy efficient equipment inside the buildings and facilities. Natural gas and fuel oil (represented by the "Emissions from Stationary Fuel Combustion") could also be replaced by other fuel sources to reduce their impact. One long-term possibility would be to utilize more of the digester gas (that would otherwise be flared) as a source of fuel, thereby reducing emissions from both sources.

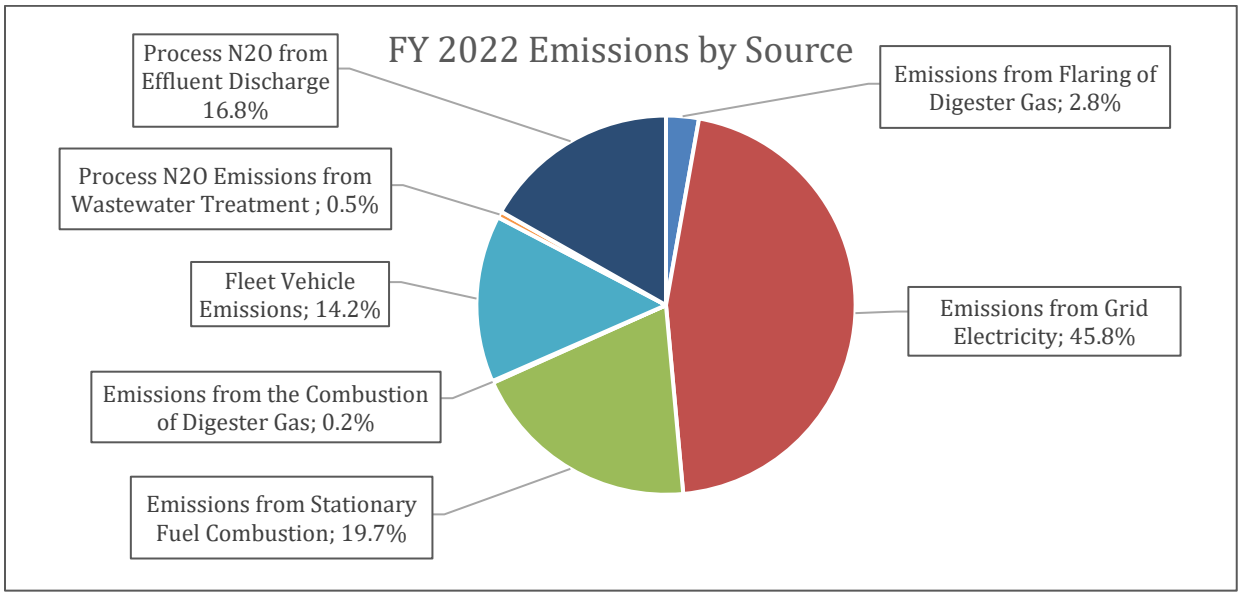


*Figure 3: Government Operations Emissions by Source*

### Next Steps:

The local government operations emissions inventory points to a need for reductions in energy use at the Wastewater Treatment plants, higher vehicle efficiency, as well as any energy saving efforts throughout the government operations. Wilmington has recently applied for an Energy Efficiency and Conservation Block Grant(EECBG) through the Department of Energy. This grant will specifically allow for the development of a comprehensive GHG Reduction Plan. In the meantime, Delmarva has been systematically replacing all streetlights with energy efficient LEDs. As far as the Wastewater Treatment facilities are concerned, there are multiple projects in the works by Wilmington in partnership with Jacobs Engineering who serves as the contracted operator of the plant. The projects include upgrades for aging equipment, replacement for inefficient machinery, and adding automation to processes. As Wilmington tracks the progress towards their 50% goal, the City is also considering emerging technologies and alternative energy options as they become viable for the needs of the facilities. Some of those options would be replacing fleet vehicles with electric or hybrid options or adding solar arrays to facility roofs to offset electricity use.

## Conclusion

Keeping an inventory is just the beginning of Wilmington's continuous efforts to reduce its greenhouse gas emissions. It merely provides a metric to measure progress towards local and global goals of reduction. The next steps are to monitor progress towards the emissions target and build upon the existing Wilmington resilience and energy plans with a more robust climate action plan that identifies specific quantified strategies that can cumulatively meet that target.

In addition, the City of Wilmington will continue to track key energy use and emissions indicators on an on-going basis. This inventory shows grid electricity use, especially at the water and wastewater facilities, to be particularly important to focus on. Through these efforts and others, the City of Wilmington can achieve environmental, economic, and social benefits beyond reducing emissions.

# Appendix: Methodology Details

## Energy

The following tables show each activity, related data sources, and notes.

*Table 3: Energy Data Sources*

| Activity | Data Source |
|---|---|
| Electricity consumption | Delmarva billing data |
| Natural gas consumption | |

*Table 4: Emissions Factors for Electricity Consumption (eGRID, region RFCE)*

| Year | CO2 (lbs./MWh) | CH4 (lbs./GWh) | N2O (lbs./GWh) |
|---|---|---|---|
| 2021 | 829.45 | 73.93 | 11.23 |

## Transportation

*Table 5: Transportation Data Sources*

| Activity | Data Source |
|---|---|
| Government vehicle fleet | Leonard Obohoski, Contracts & Fleet Administrator |

For vehicle transportation, it is necessary to apply average miles per gallon and emissions factors for CH4 and N2O to each vehicle type. The factors used are shown in *Table 6*.

*Table 6: MPG and Emissions Factors by Vehicle Type*

| Fuel | Vehicle type | MPG | CH4 g/mile | N2O g/mile |
|---|---|---|---|---|
| Gasoline | Passenger car | 25.2 | 0.0078 | 0.0061 |
| Gasoline | Light truck | 17.9 | 0.0110 | 0.0073 |
| Gasoline | Heavy truck | 5.389129 | 0.0719 | 0.0611 |
| Diesel | Passenger car | 24.1 | 0.0005 | 0.001 |
| Diesel | Light truck | 17.6 | 0.001 | 0.0015 |
| Diesel | Heavy truck | 6.640241 | 0.0051 | 0.0048 |

## Wastewater & Water Treatment

*Table 7: Wastewater & Water Data Sources*

| Activity | Data Source |
|---|---|
| Nitrogen Discharge | Annual Emissions Inventory (AEI) reports |
| Digester Gas Combustion/Flaring | |
| Energy used in wastewater facilities | Delmarva billing data |
| Energy used in water facilities | Delmarva billing data |

## Inventory Calculations

The FY 2022 inventory was calculated following the US Community Protocol and ICLEI's ClearPath software. As discussed in Inventory Methodology, the [IPCC 5th Assessment] was used for global warming potential (GWP) values to convert methane and nitrous oxide to CO2 equivalent units. ClearPath's inventory calculators allow for input of the sector activity (i.e. kWh or VMT) and emission factor to calculate the final CO2e emissions.