



The City of Largo

2019 Inventory of Government Operations Greenhouse Gas Emissions

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ICLEI-Local Governments for
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Tables and Figures

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Executive Summary

The City of Largo 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.

As such, the City of Largo continues to make significant progress to reduce emissions within the organization and the community. This includes the following goals and programs:

1. **Ready for 100:** The City of Largo became the 75th City in the nation, and 4th in Florida, to commit to transition to 100 percent renewable energy, both for the organization and the community, by 2035 and 2050 respectively
2. **Building Energy Usage:** The City of Largo has a goal to reduce building energy use by 20% by 2030 and is in the process of developing a city-wide internal facility Energy and Solar Analysis; The City continues to explore ways to expand its energy tracking process and address metering flaws and opportunities moving forward
3. **Alternative-Fuel Fleet:** The City has begun to transition to a 100% alternative-fuel, light duty fleet by 2030. This includes expanding its charging station infrastructure and purchasing new vehicles, such as the first all-electric Police Motorcycle to be revealed this Spring
4. **Electric Vehicle Charging Stations:** The City has committed to provide the community with 10 EVSE by 2025. Currently there is one Level 3 and six Level 2 charging stations that are available free of charge
5. **City Facilities:** The City has made a strategic decision to maximize renewable energy generation on all new City-owned facilities to the greatest extent possible as well as ensure buildings are extremely energy efficient
6. **Duke Clean Energy Connection Program:** The City of Largo is excited to partner with Duke Energy for the new program focused on dramatically expanding the City's current use of renewable energy. Once fully established, the City of Largo will source approximately 40% of its total energy from renewable energy through this program
7. **WWTF Operations Building-** The newest City of Largo facility that is slated to open in June of 2021 is the 13,187 square foot wastewater treatment operations building with a construction cost of \$8,022,671. It will be the City's first category-five hurricane rated building to and is elevated 23.5-feet above sea level to protect from storm surge

ii. External Programs-

1. [EV and EVSE Resource Hub](#): A centralized resource to residents, workers, business owners, and developers to learn more about EVs and EVSEs.
2. City EVSE Ordinance: The City has adopted minimum requirements to install EVSEs for new developments within several of the City's activity centers.
3. [Housing Rehabilitation Program](#): The City of Largo supports energy efficiency for homeowners through the [Housing Rehabilitation Program](#), which offers income-eligible homeowners with home repair financing and energy efficiency improvements.
4. Solar Co-ops: When possible, the City of Largo promotes solar cooperative groups to Largo residents, to encourage the adoption of renewable energy within the community
5. Community Engagement: The City actively shares information with residents, workers, and businesses via a number of channels (Social media, news articles, in-person events, etc) in order to promote the adoption of renewable energy within the community. The City also provides resources for local businesses to be more sustainable and resilient, such as the [Largo Sustainable Business Guide](#)

This report provides estimates of greenhouse gas emissions resulting from activities within the City's government operations in order to assist with emission reduction planning that aligns with these goals and programs.

Key Findings

Figure 1 shows local government operations emissions. The Buildings and Facilities sector accounts for a vast majority (77%) of these emissions. It is important to note that this does include electricity consumption related to the operations of the Waste Water Treatment Facility. The next largest contributor is vehicle fleet (14%), followed by employee commute (5%). Actions to reduce emissions from these sectors will be a key part of any future climate action plan developed by the City of Largo. Water and Wastewater Facilities, Solid Waste Facilities, and Street Lights/Traffic Signals were responsible for the remainder (less than 7%) of local government operations emissions.

The Inventory Results section of this report provides a detailed profile of emissions sources within the City of Largo; information that is key to guiding local reduction efforts. These data will also provide a baseline against which the city will be able to compare future performance and demonstrate progress in reducing emissions.

CO2e By Category

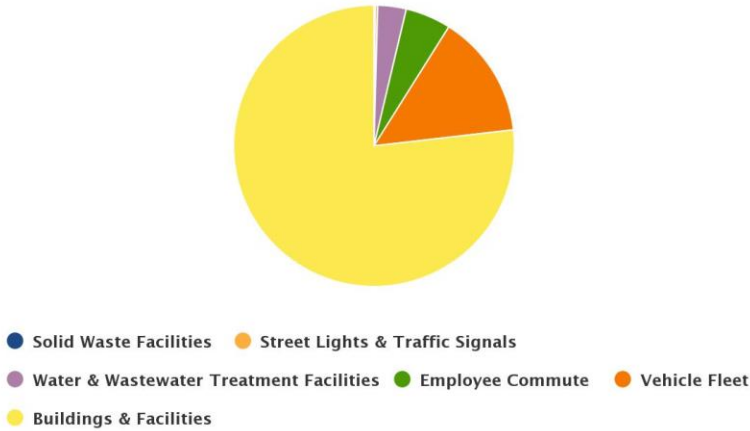


Figure 1: Government Operations Emissions by Sector

Introduction to Climate Change

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. 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. Although the natural greenhouse effect is needed to keep the earth warm, a human enhanced greenhouse effect with the rapid accumulation of GHG in the atmosphere leads to too much heat and radiation being trapped. The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report confirms that human activities have unequivocally caused an increase in carbon emissions¹. Many regions are already experiencing the consequences of global climate change, and the City of Largo is no exception.

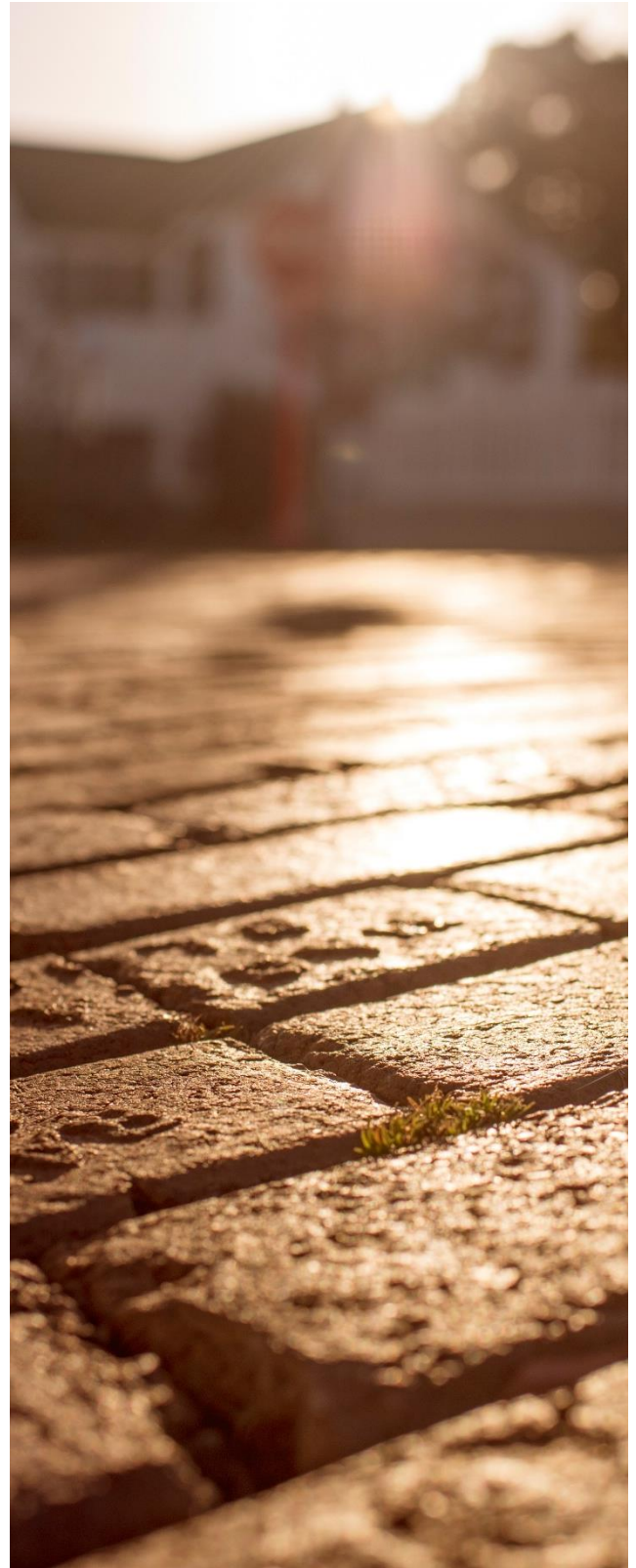
Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C. Global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate. (high confidence) Warming from anthropogenic emissions from the pre-industrial period to the present will persist for centuries to millennia and will continue to cause further long-term changes in the climate system, such as sea level rise, with associated impacts (high confidence), but these emissions alone are unlikely to cause global warming of 1.5°C (medium confidence). Climate-related risks for natural and human systems are higher for global warming of 1.5°C than at present, but lower than at 2°C (high confidence). These risks depend on the magnitude and rate of warming, geographic location, levels of development and vulnerability, and on the choices and implementation of adaptation and mitigation options (high confidence)².

¹IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

²IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

According to the 2018 [National Climate Assessment](#), the southeast U.S. will experience potentially devastating impacts from seasonal changes and hazards occurring at unprecedented magnitudes. Southeast Florida, including the City of Largo, is at particular risk for coastal hazards, such as flooding, erosion, and hurricanes that will continue to intensify with sea-level rise. So many people visit and move to this region to enjoy the beautiful coast, but its seaside location also puts it at extreme risk. In addition, climate change will continue to produce warmer seasons and extreme temperatures that threaten many sectors within the City of Largo and the greater region, most notably tourism, public health, and agriculture³.

Many communities in the United States have started to take responsibility for addressing climate change at the local level. Reducing fossil fuel use in the community can have many benefits in addition to reducing greenhouse gas emissions. More efficient use of energy decreases utility and transportation costs for residents and businesses. Retrofitting homes and businesses to be more efficient creates local jobs. In addition, when residents save on energy costs, they are more likely to be spend at local businesses and add to the local economy. Reducing fossil fuel use improves air quality, and increasing opportunities for walking and bicycling improves residents' health.



³ U.S. Global Change Research Program. 2018. National Climate Assessment – Ch 19: Southeast. Retrieved from <https://nca2018.globalchange.gov/chapter/19/>

Greenhouse Gas Inventory as a Step Toward Carbon Neutrality

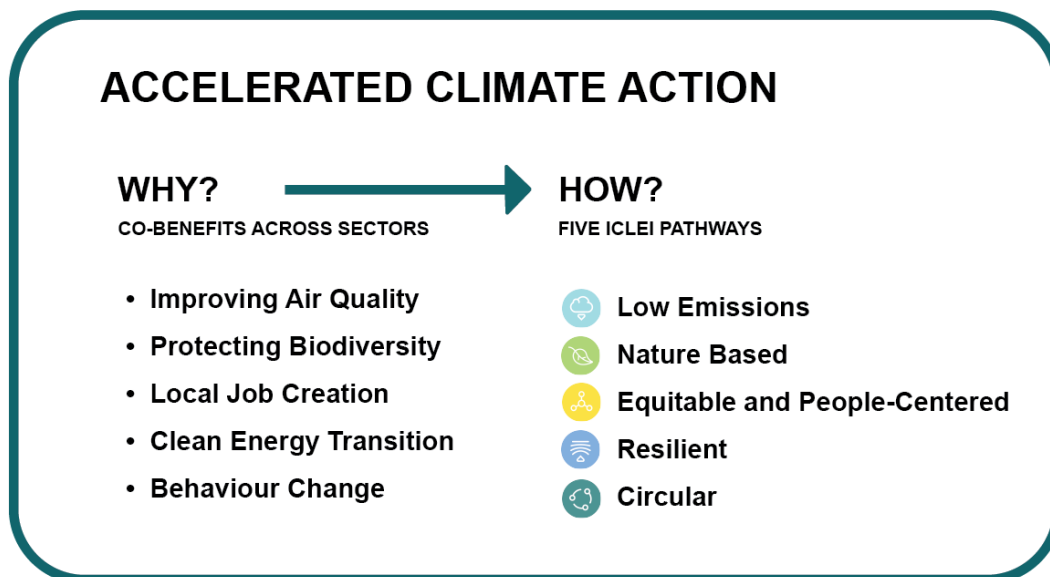
Facing the climate crisis requires the concerted efforts of local governments and their partners, those that are close to the communities directly dealing with the impacts of climate change.

Cities, towns and counties are well placed to define coherent and inclusive plans that address integrated climate action — climate change adaptation, resilience and mitigation. Existing targets and plans need to be reviewed to bring in the necessary level of ambition and outline how to achieve net-zero emissions by 2050 at the latest. Creating a roadmap for climate neutrality requires the City of Largo to identify priority sectors for action, while considering climate justice, inclusiveness, local job creation and other benefits of sustainable development.

To complete this inventory, the City of Largo utilized tools and guidelines from ICLEI - Local Governments for Sustainability (ICLEI), which provides authoritative direction for greenhouse gas emissions accounting and defines climate neutrality as follows:

The targeted reduction of greenhouse gas (GHG) emissions and GHG avoidance in government operations and across the community in all sectors to an absolute net-zero emission level at the latest by 2050. In parallel to this, it is critical to adapt to climate change and enhance climate resilience across all sectors, in all systems and processes.

To achieve ambitious emissions reduction, and move toward climate neutrality, the City of Largo will need to set a clear goal and act rapidly following a holistic and integrated approach. Climate action is an opportunity for our community to experience a wide range of co-benefits, such as creating socio-economic opportunities, reducing poverty and inequality, and improving the health of people and nature.



ICLEI Climate Mitigation Milestones

In response to the climate emergency, many communities in the United States are taking responsibility for addressing emissions at the local level. Since many of the major sources of greenhouse gas emissions are directly or indirectly controlled through local policies, local governments have a strong role to play in reducing greenhouse gas emissions within their boundaries, as well as influencing regional emissions through partnerships and advocacy. Through proactive measures around land use patterns, transportation demand management, energy efficiency, green building, waste diversion, and more, local governments can dramatically reduce emissions in their communities. In addition, local governments are primarily responsible for the provision of emergency services and the mitigation of natural disaster impacts.

ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along Five Milestones, also shown in Figure 2:

1. Conduct an LGO inventory and forecast of local government greenhouse gas emissions;
2. Establish a greenhouse gas emissions target;
3. Develop an LGO climate action plan for achieving the emissions reduction target;
4. Implement the climate action plan; and,
5. Monitor and report on progress.

This report represents the completion of ICLEI’s Climate Mitigation Milestone One, and provides a foundation for future work to reduce greenhouse gas emissions in the City of Largo.



Figure 2: ICLEI Climate Mitigation Milestones

Inventory Methodology

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in the community. This report presents emissions from operations of the City of Largo government. The government operations inventory is mostly a subset of the community inventory, as shown in Figure 3. For example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles.



Figure 3: Relationship of Community and Government Operations Inventories

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 U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Community Protocol) and the Local Government Operations Protocol for Accounting and Reporting Greenhouse Gas Emissions (LGO Protocol), both of which are described below.

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 (CO ₂)	1
Methane (CH ₄)	28
Nitrous Oxide (N ₂ O)	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.⁴ 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.

The following activities are included in the LGO inventory :

- Energy and natural gas consumption from buildings & facilities
- Energy and natural gas consumption from streetlights/traffic signals
- Wastewater treatment processes
- On-road transportation from employee commute and vehicle fleet
- Solid Waste treatment processes

Quantifying Greenhouse Gas Emissions

Sources and Activities

Communities contribute to greenhouse gas emissions in many ways. Two central categorizations of emissions are used in the community inventory: 1) GHG emissions that are produced by “sources” located within the community boundary, and 2) GHG emissions produced as a consequence of community “activities”.

Source	Activity
Any physical process inside the jurisdictional boundary that releases GHG emissions into the atmosphere	The use of energy, materials, and/or services by members of the community that result in the creation of GHG emissions.

By reporting on both GHG emissions sources and activities, local governments can develop and promote a deeper understanding of GHG emissions associated with their communities. A purely source-based emissions inventory could be summed to estimate total emissions released within the community’s jurisdictional boundary. In contrast, a purely activity-based emissions inventory could provide perspective

⁴ 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>

on the efficiency of the community, even when the associated emissions occur outside the jurisdictional boundary. The division of emissions into sources and activities replaces the scopes framework that is used in government operations inventories, but that does not have a clear definition for application to community inventories.

Base Year

The inventory process requires the selection of a base year with which to compare current emissions. the City of Largo's LGO greenhouse gas emissions inventory utilizes 2019 as its baseline year, for which the necessary data are available.

Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

- Measurement-based methodologies refer to the direct measurement of greenhouse gas emissions (from a monitoring system) emitted from a flue of a power plant, wastewater treatment plant, landfill, or industrial facility.
- Calculation-based methodologies calculate emissions using activity data and emission factors. To calculate emissions accordingly, the basic equation below is used:

$$\text{Activity Data} \times \text{Emission Factor} = \text{Emissions}$$

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

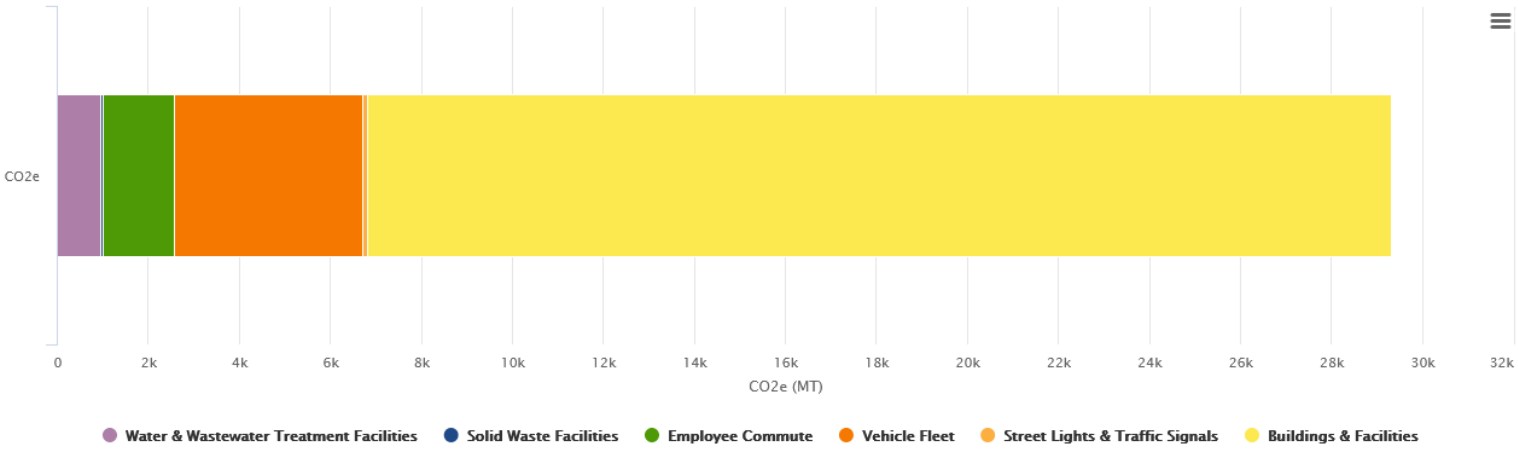
Government operations emissions for 2019 are shown in Table 3 and Figure 6.

Table 2: Local Government Operations Inventory

Sector	Fuel or source	2019 Usage	Usage unit	2019 Emissions (MTCO _{2e})
Buildings & Facilities	Electricity	48783540	kWh	22501
	Natural Gas	29640	Therms	158
Buildings & Facilities total				22659
Street Lights & Traffic Signals	Electricity	178848	kWh	82
Street Lights & Traffic Signals total				82
Vehicle Fleet	Gasoline (off-road)	212	Gallons	1.8767
	Diesel (off-road)	256	Gallons	2.6517
	Gasoline (on-road)	202138.9	Gallons	1774.8
	Diesel (on-road)	233605.6	Gallons	2385.1
Vehicle Fleet total				4165
Transit Fleet	Diesel	N/A		
	Gasoline	N/A		
Transit Fleet total				
Employee Commute	Diesel	183084	VMT	89.084
	Gasoline	3478596	VMT	1471.1
	Biodiesel/Ethanol	N/A		
	Electric	N/A		
	Hybrid Gasoline	N/A		
	PHEVs	N/A		
Employee Commute Total				1560
Electric Power Production	Various Fuels for Power Generation	N/A		
Electric Power Production Total				
Solid Waste	Waste Generation	60.04	Tons	45.038
	Compost			
Solid waste total				45.038
Water and wastewater	Digester Gas Flared			
	Digester Gas Combusted (used for boiler operations)			
	Nitrogen Discharge	47.4/day	Kg N/day	36.015
Water and wastewater total				36.015
Process & Fugitive Emissions	Fugitive Emissions from Natural Gas Distribution	N/A		

Process & Fugitive Emissions total	
Total government emissions	28,547.053

Figure 4 shows the distribution of emissions among the four sectors included in the inventory. Buildings and Facilities represents the majority of emissions, followed by Vehicle Fleet and Employee Commute. Remaining Sectors account for a small portion of emissions.



Next Steps:

The local government operations emissions inventory points to a need for the establishment of an enterprise energy management program within the City of Largo to include:

1. Full inventory of all energy and utility meters and accounts
2. Establishment of a Science-Based Target to reduce GHG emissions
3. Manage and monitor GHG reporting
4. Coordinate and guide the implementation of renewable energy installations and energy efficiency improvements across the organization, in efforts to achieve 100% renewable energy use by 2035
5. Support the creation of projects and programs for the community's transition to 100% renewable energy by 2050
6. Proactively monitor and report on energy usage across utility types as well as electric vehicle energy consumption
7. Coordinate with Departments, utilities, partner organizations, and the community to collaboratively facilitate a renewable energy transition

Conclusion

This inventory marks the completion of Milestone One of the Five ICLEI Climate Mitigation Milestones. The next steps are to forecast emissions, set an emissions-reduction target, and build upon the existing Largo Environmental Action Plan with a more robust climate action plan that identifies specific quantified strategies that can cumulatively meet that target, to be included in the updated Sustainability and Resilience Action Plan (SRAP).

The Intergovernmental Panel on Climate Change (IPCC) states that to meet the Paris Agreement commitment of keeping warming below 1.5°C we must reduce global emissions by 50% by 2030 and reach climate neutrality by 2050. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations reduce their emissions by more than 50%. More than ever, it is imperative that countries, regions, and local governments set targets that are ambitious enough to slash carbon emissions between now and mid-century.

Science-Based Targets (SBT) are calculated climate goals, in line with the latest climate science, that represent a community's fair share of the global ambition necessary to meet the Paris Agreement commitment. To achieve a science-based target, community education, involvement, and partnerships will be instrumental. A SBT will be identified and included in the updated SRAP.

In addition, the City of Largo will continue to track key energy use and emissions indicators on an on-going basis. It is recommended that communities update their inventories on a regular basis, especially as plans are implemented to ensure measurement and verification of impacts. Regular inventories also allow for "rolling averages" to provide insight into sustained changes and can help reduce the change of an anomalous year being incorrectly interpreted. This inventory shows that buildings and facilities as well as communitywide transportation patterns will be particularly important to focus on. Through these efforts and others, the City of Largo can achieve environmental, economic, and social benefits beyond reducing emissions.

Appendix: Methodology Details

Energy

The following tables shows each activity, related data sources, and notes on data gaps.

Table 3: Energy Data Sources

Activity	Data Source	Data Gaps/Assumptions
Local Government Operations		
Electricity consumption	Duke Energy Billing	Assets are not inventoried by utility account, all electricity data from all sources (including Waste Water Treatment Facility) and are calculated cumulatively, with the exception of street lights. Street lights denoted by "Lite" on data provided by Duke Energy.
Natural gas consumption	Clearwater Natural Gas Billing	

Table 4: Emissions Factors for Electricity Consumption

Year	CO ₂ (lbs./MWh)	CH ₄ (lbs./GWh)	N ₂ O (lbs./GWh)
2019	0.13383	5.4490x10 ⁻⁶	7.9742x10 ⁻⁷

Transportation

Table 5: Transportation Data Sources

Activity	Data Source	Data Gaps/Assumptions
Local Government Operations		
Government vehicle fleet	City of Largo	Annual vehicle mileage was not available
Employee commute	City of Largo	<p>Miles averaged based on commute data availability. Process of calculating commute data occurred through ArcGIS Pro. Employee addresses were georeferenced onto a map, then using "Summarize Nearby" tool addresses were located in different intervals in distance from city hall. Intervals of distance chosen were 1,2,3,4,5,7,10,15,20,25,30,40,50, and 60 miles from city hall. No addresses were repeated (ie addresses 3 miles away did not include addresses 1 or 2 miles away).</p> <p>Percent of passenger cars, heavy and light trucks is based on US Department of Transportation Diesel Fuel Statistics data 2015. Heavy trucks omitted due to commute being through private vehicles which are typically not heavy trucks.</p> <p>Total records used for this is 679, however total employees is 930. Due to public safety those 251 records were omitted. Total was averaged based on the 679 employees accounted for.</p>

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	CH ₄ g/mile	N ₂ O g/mile
Gasoline	Passenger car	24.1	0	0
Gasoline	Light truck	17.6	0	0
Gasoline	Heavy truck	5.3713	0	0

Gasoline	Motorcycle	24.1	0	0
Diesel	Passenger car	24.1	5x10 ⁻⁴	0.001
Diesel	Light truck	17.6	0.001	0.0015
Diesel	Heavy truck	6.3925	0.0051	0.0048

Wastewater

Table 7: Wastewater Data Sources

Activity	Data Source	Data Gaps/Assumptions
Local Government Operations		
Nitrogen Discharge	City of Largo	Largo population is 84,000 but service area is 105,000
Digester Gas Combustion/Flaring		

Potable Water

Table 8: Potable Water Data Sources

Activity	Data Source	Data Gaps/Assumptions
Local Government Operations		
Potable Water Usage	City of Largo Utility Billing	Data manually entered based on paper bills.

Solid Waste

Table 9: Solid Waste Data Sources

Activity	Data Source	Data Gaps/Assumptions
Local Government Operations		
Waste Generated	City of Largo	Based on number of stops at municipal locations. Total tons in Largo= 85,781. City stops represent 0.07% of all stops for trash. 0.07% of all tons of waste= 60.04 tons. Types of waste averaged by Pinellas County 2014 Waste Characterization Study.

Inventory Calculations

The 2019 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.



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