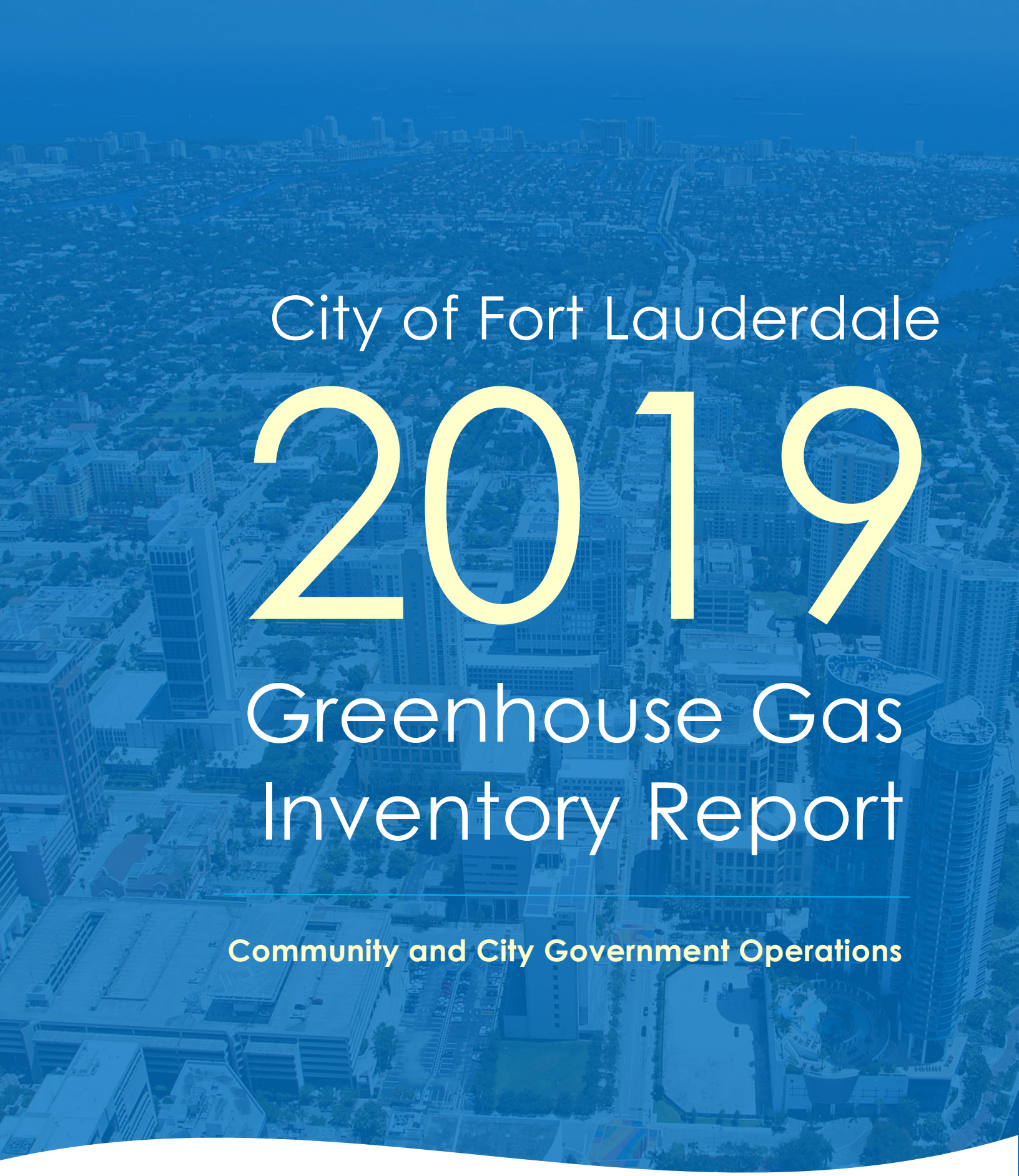


City of Fort Lauderdale

2019 Greenhouse Gas Inventory Report

Community and City Government Operations

CITY OF FORT LAUDERDALE FLORIDA

GREENING OUR ROUTINE CITY OF FORT LAUDERDALE

Original Report Release: 2022
Revised: June 2024

I. Executive Summary

Fort Lauderdale is known as the *Venice of America because of its* abundant access to local waterways and beaches. However, this benefit also makes the City vulnerable to accelerating sea-level rise and other climate change related impacts. In 2010, the City's government committed to addressing these challenges of climate change with its first greenhouse gas emissions (GHG) assessment, GHG reduction goals to reduce emissions 20% by 2020, and subsequent *Sustainability Action Plan*. In 2021, it reaffirmed this commitment and the need to continue reducing GHG emissions with the adoption of a 'net-zero' emissions resolution aspiring for community carbon neutrality by 2050.

This report provides a 2019 GHG emissions inventory that will establish a new baseline against which to measure progress. This provides the basis for future strategies, policies, plans, projects and initiatives across both municipal operations and the broader community to accelerate efforts in advancing the City's Net-Zero goals.

Purpose Statement:

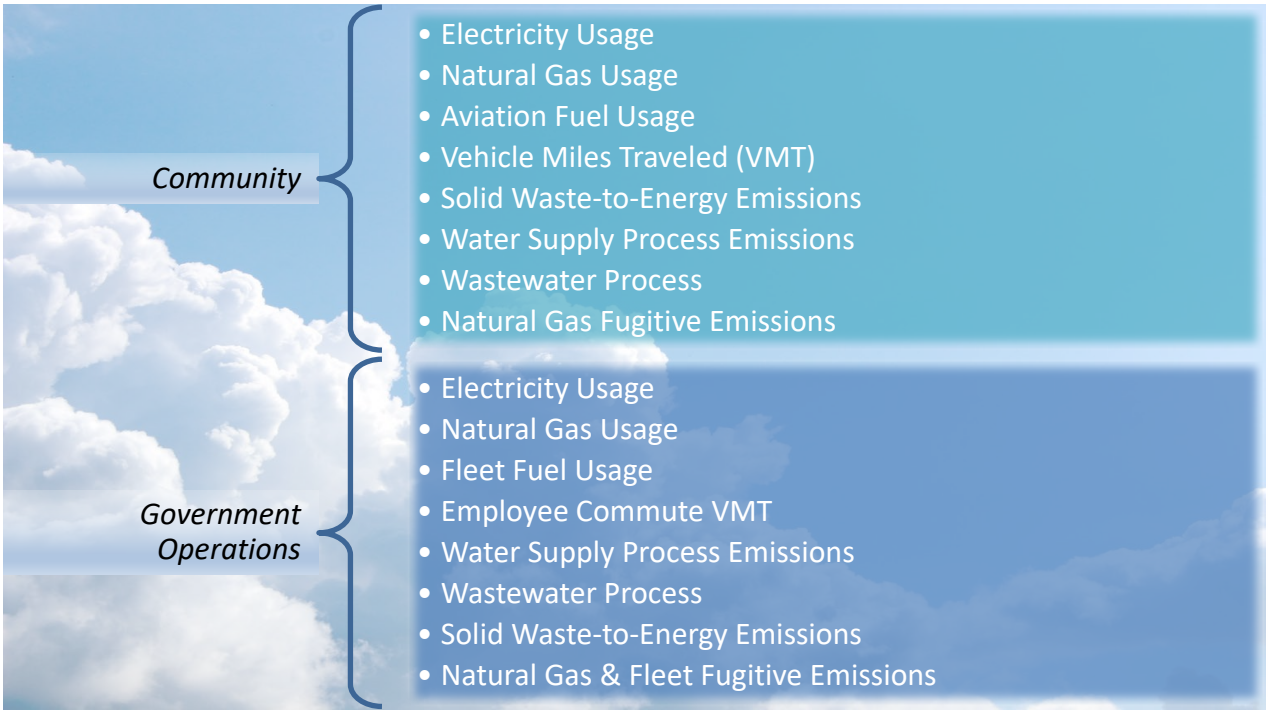
Since completing its first greenhouse gas emissions inventory and Sustainability Action Plan (SAP) in 2010, the City of Fort Lauderdale has made considerable progress towards reducing its environmental impacts. The SAP set goals of reducing GHG emissions in the community and in government operations by 20% between the years 2010 and 2020. This report documents the City's significant progress in both those areas in 2019 achieving 17.3% reductions in the community and 18.9% in government operations. The most significant factors that contributed to these GHG reductions included substantial cleaner energy generation from the electrical utility, completion of the majority of the SAP actions (66%), increased efficiency in buildings, and reduction in fuel consumption related to transportation.

The SAPs goals and actions targeted achievements by the year 2020. For the next phase in the City's efforts to address climate change, a new set of goals and actions were established in the City's Advance Fort Lauderdale Comprehensive Plan. In addition, in December 2021, the City Commission ratified net-zero greenhouse gas emissions goals for both the City's government (2040) and the community it serves (2050). While aspirational, such goals will inevitably require significant effort and investment. To achieve these goals will require alignment with overlapping efforts, regionally, nationally and internationally. To measure progress towards these goals, it is necessary to update the City's GHG inventories for community and local government carbon footprints. This inventory is intended to capture the most significant sources of GHG emissions using replicable and accurate methods setting a new baseline for the year 2019 against which to track progress toward the net-zero goals.

II. Methodology Summary

For this effort, the City of Fort Lauderdale has utilized the ICLEI greenhouse gas protocols and the *Clearpath* reporting platform for GHG inventories for both the community and local government operations. ICLEI is an internationally recognized nonprofit who has worked with local governments for nearly 30 years to evaluate and address their contributions to climate change and greenhouse gas emissions. The emissions sectors included in this inventory are listed below. For the detailed examination of how the City of Fort Lauderdale conducted its assessment, review the 'Methodology' section within this report's Appendix.

Sector Metrics Assessed



Where applicable, tables include conversion to 'million British Thermal Units' (MMBTU) to align all energy inputs to a single unit for an accurate comparison. Emissions' 'Scope' is also identified to provide impact source origination (direct (1), indirect (2), not directly or indirectly controlled by the City or community (3)).

III. Analysis

Community Emissions in 2019

For calendar year 2019, total citywide emissions for the City of Fort Lauderdale community were an estimated **1,851,667**metric tons (MT) of carbon dioxide equivalent (CO_2e), with the distribution of emissions from the following sectors and sources shown in Figures 1 and 2.

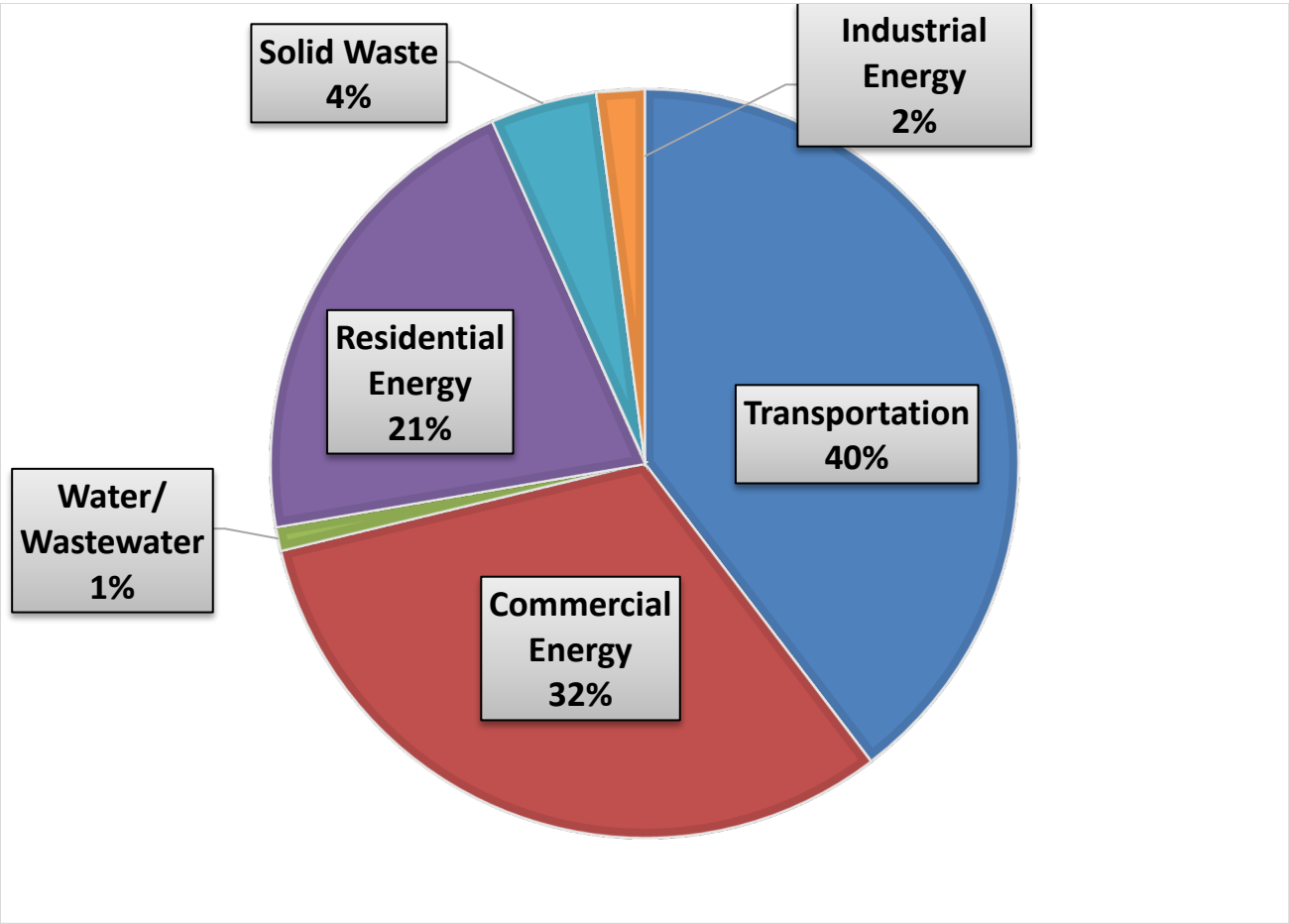


Figure 1: 2019 Sector Contribution to Community Greenhouse Gas Emissions as Percentage of Total Emissions

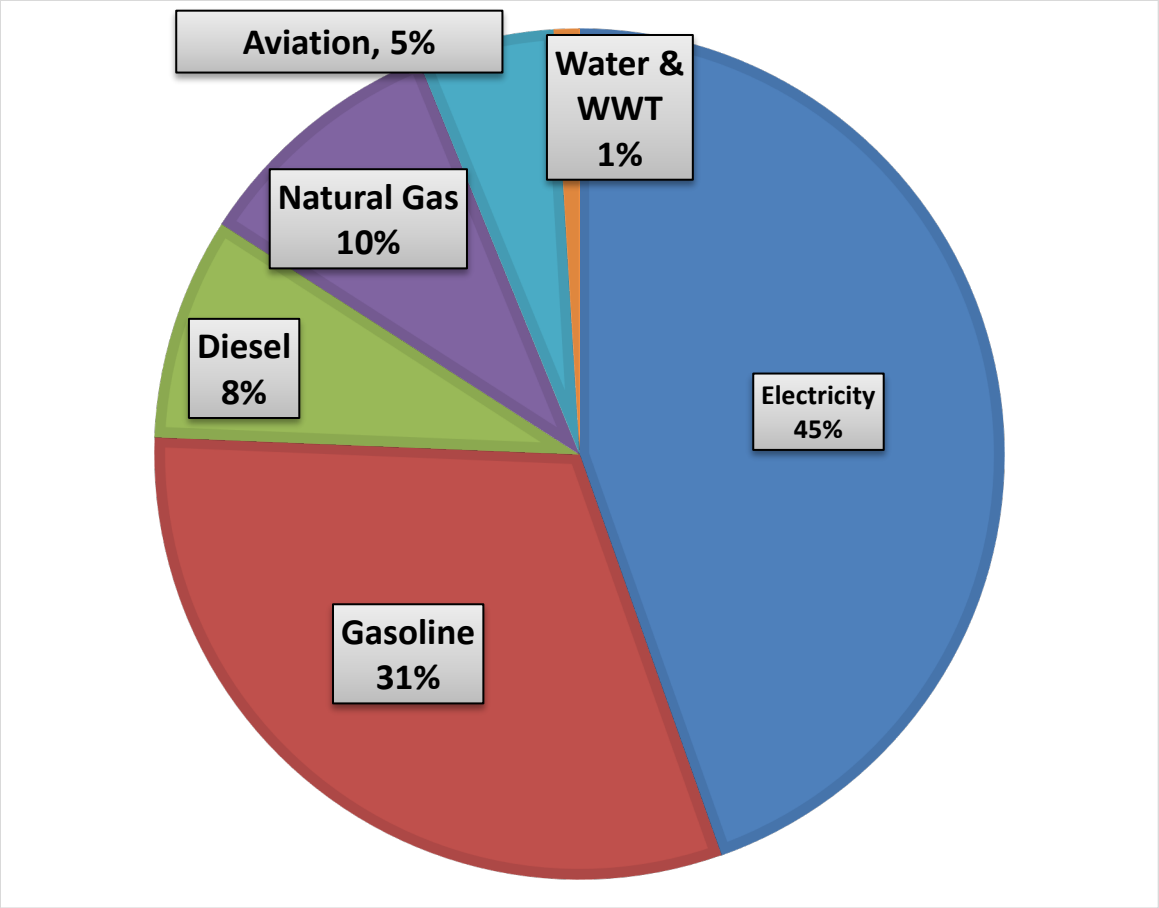


Figure 2: 2019 Energy Source Contribution to Community Greenhouse Gas Emissions as Percentage of Total Energy Usage

As demonstrated in Figure 1, 55% of citywide emissions are derived from the combination of electricity and natural gas energy usage within the residential, commercial, and industrial buildings sectors. The second-largest source of emissions is transportation, accounting for 40%.Transportation emissions encompass on-road and public transit vehicle miles traveled as well as emissions derived from aviation activities from the City's Executive Airport (FXE). Emissions in the Solid Waste sector account for 4% of total community emissions, encompassing annual municipal solid waste sent to Wheelabrator Waste to Energy Facility and residential yard waste collection.

The remainder of emissions (1%) are derived electricity used at the two municipal water treatment plants and George T. Lohmeyer Regional (GTL) Wastewater Treatment Plant (WWTP) as well as N_2O emissions from GTL WWTP. Emissions from errant fugitive emissions, represent less than 1% of the city's total emissions and, thus, were excluded from the pie chart. It should be noted that governmental operations account for 3% of these Community wide CO_2 emissions. The amounts of energy usage and GHG emissions in the community are summarized in Table 1 for each sector and source.

Figure 2 illustrates the contribution of various energy sources to community greenhouse gas emissions in 2019, expressed as a percentage of total energy usage.

Table 1: 2019 Greenhouse Gas Emissions by Sector and Source, Fort Lauderdale Community

Sector	Source	Scope	Usage	Usage Units	Emissions (MT CO_2e)*
Residential Energy	Electricity	2	4,250,439	MMBTU**	377,573
	Natural Gas	1	203,883	MMBTU	11,137
				Residential Energy Total:	**388,710**
Commercial Energy	Electricity	2	5,652,014	MMBTU	502,077
	Natural Gas	1	1,538,810	MMBTU	81,844
				Commercial Energy Total:	**583,921**
Industrial Energy	Electricity	2	160,542	MMBTU	14,261
	Natural Gas	1	452,988	MMBTU	24,042
				Industrial Energy Total:	**38,303**
Water/ Wastewater	Process N_2O Emissions	1	0.00106	CO_2e pp MT	272
	Water / Wastewater Treatment Processes	2	214,734	MMBTU	19,075
				Water / Wastewater Total:	**19,347**
Transportation	On Road (Gasoline)	1	7,014,212	MMBTU	496,457
	On Road (Diesel)	1	1,531,386	MMBTU	113,314
	Public Transit (Diesel)	1	382,943	MMBTU	28,322
	Aviation Fuels (Gasoline & Kerosene)	1	1,173,964	MMBTU	94,591
				Transportation Total:	**732,684**
Solid Waste	Waste-to-Energy Process	3	2,390,391	MMBTU	82,853
	Composting	3	14,877	Tons	2,097
				Solid Waste Total:	**84,950**
Fugitive Emissions	Natural Gas Distribution	1	144	MT	3,752
				Fugitive Total:	**3,752**
				Total Community Emissions (CO_2e MT):	**1,851,667**

*** metric tons of carbon dioxide equivalent**
**** million British Thermal Units**

Government Operations Emissions in 2019

For calendar year 2019, the GHG emissions derived from City operations were an estimated total **50,567 MT** CO_2e, with the distribution of emissions from the following sectors and sources shown in Figures 3 and 4.

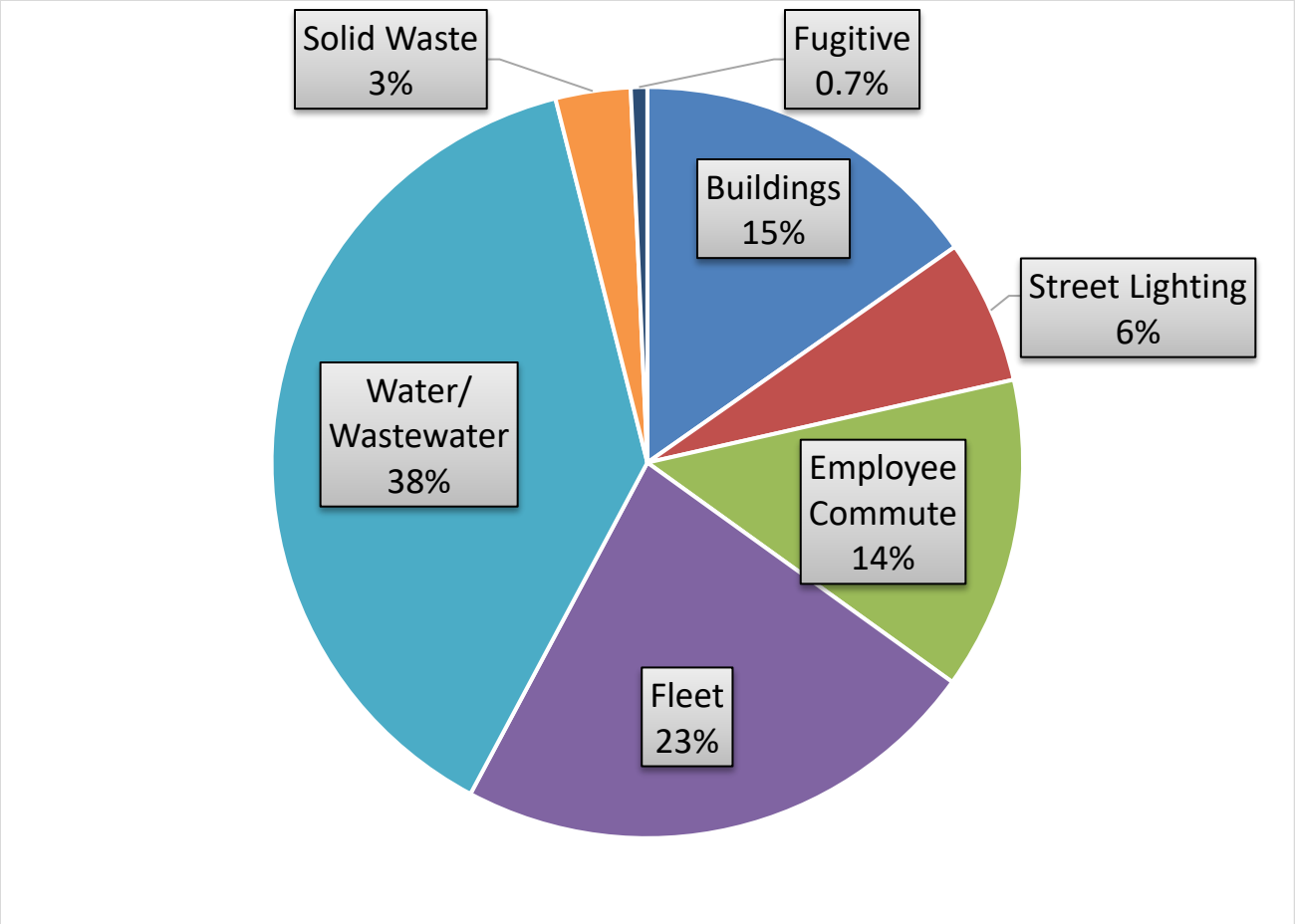


Figure 3: 2019 Sectors Contribution to Local Government Greenhouse Gas Emissions as Percentage of Total Emissions

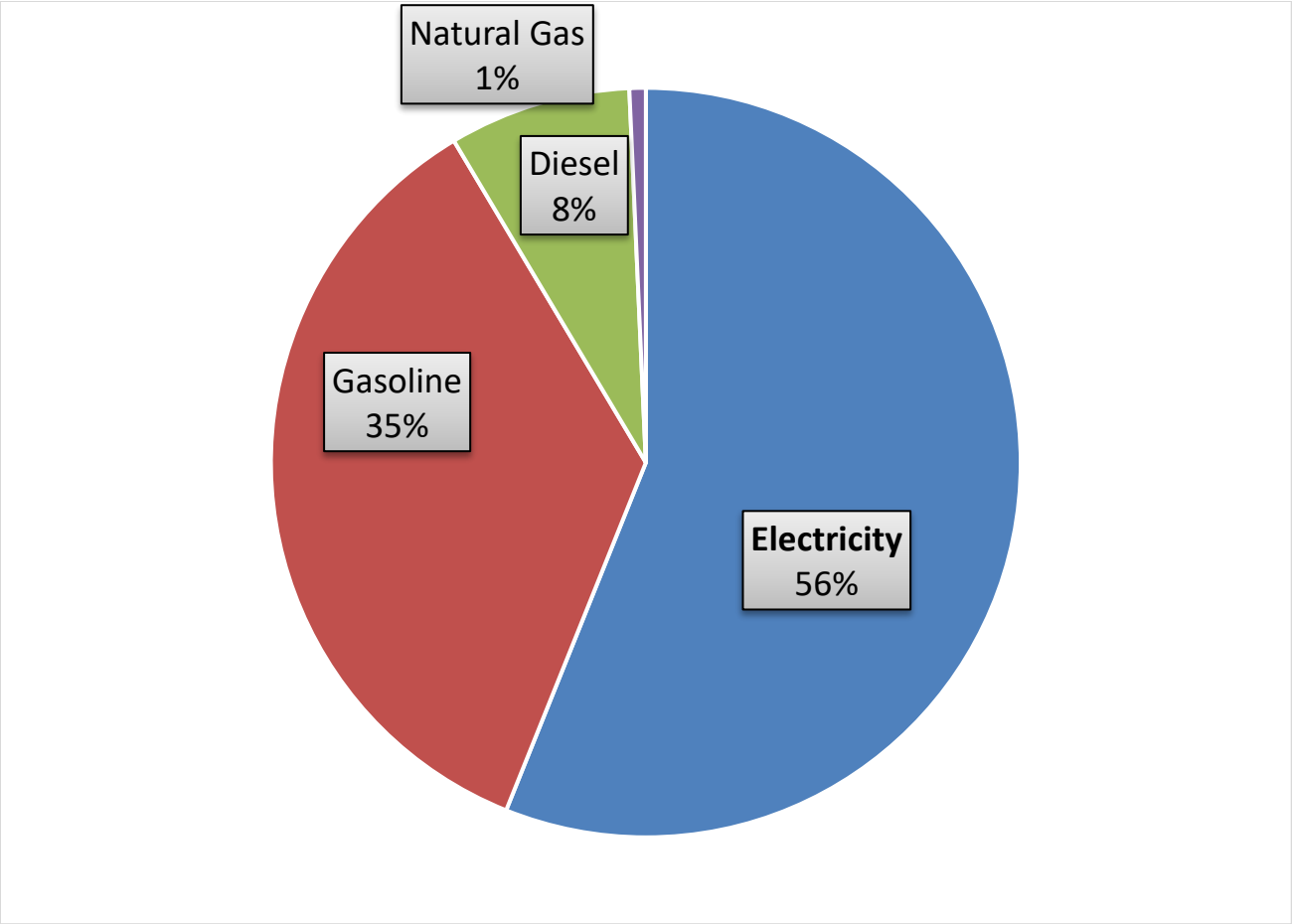


Figure 4: 2019 Energy Sources that Contribute to Local Government Greenhouse Gas Emissions as Percentage of Total Energy Usage

As demonstrated in Figure 3, the greatest share of governmental GHG emissions (38% are derived from its combined utility operation of regional water supply and wastewater treatment facilities which serves Fort Lauderdale residents and some neighboring jurisdictions. Second to this is the City's fleet of vehicles that use gasoline or diesel fossil fuels, with 23% of the total emissions generated. The municipal building portfolio comprises 15% of emissions that are generated from the utilization of electricity and in some instances, natural gas.

Estimated GHG emissions from employee commute account for 14% of total emissions. These emissions are calculated based on estimates of existing employees' commute distance, means of transportation, and schedule, with assumptions made due to limitations of available data. The City of Fort Lauderdale's streetlights constitute 6% of total emissions, solid waste processing attributed 3% of total CO_2 emissions, and a final 0.7% for fugitive emissions emanating from either natural gas distribution or fleet vehicle refrigerants that are periodically replaced. The following table provides a more granular examination:

Table 2: 2019 Greenhouse Gas Emissions by Sector and Source, Fort Lauderdale Government

Sector	Source	Scope	Usage	Unit	Emissions (MT CO_2e)
Buildings	Electricity	2	84,325	MMBTU	7,491
	Natural Gas	1	4,203	MMBTU	224
				Buildings Total:	**7,715**
Water / Wastewater	Water / Wastewater Treatment Processes	2	214,734	MMBTU	19,075
	Process N_2O Emissions	1	0.00106	CO_2e pp MT	272
				Water / Wastewater Total:	**19,347**
Street Lighting	Electricity	2	35,280	MMBTU	3,134
				Street Lighting Total:	**3,134**
Fleet	Diesel (On Road)	1	38,864	MMBTU	2,876
	Diesel (Off Road)	1	7,960	MMBTU	594
	Gasoline (On Road)	1	95,065	MMBTU	6,716
	Gasoline (Off Road)	1	19,471	MMBTU	1,379
				Fleet Total:	**11,565**
Employee Commute	Commute – Gasoline (On Road)	3	96,284	MMBTU	6,815
				Employee Commute Total:	6,815
Solid Waste	Waste-to-Energy Process	3	45,468	MMBTU	1,576
	Composting	3	814	Tons	57
				Solid Waste Total	**1,633**
Fugitive Emissions	Refrigerant	1	0.27	MT	350
	Natural Gas Distribution	3	0.32	MT	8
				Fugitive Total:	**358**
				Total City Government Emissions (CO_2e MT):	**50,567**

*** metric tons of carbon dioxide equivalent**
**** million British Thermal Units**

Comparison to 2010 Baseline Emissions Assessment

Since 2010, the City of Fort Lauderdale has conducted annual emissions inventories for its own operations and community wide. As 2010 represented the first comprehensive assessment of Fort Lauderdale's greenhouse gas emissions and the release of the first version of the City's Sustainability Action Plan, it was the initial baseline to examine progress to date. It should be noted that over the past decade, the GHG inventory methodology has been improved and refined, causing some minor variance due to differences in methodology and available data sources. To align the 2010 assessment with the methodology utilized for the new 2019 baseline, some sectors and sources were revised where feasible to achieve as close of a true comparison as data or assumptions permitted. Because of these improvements, the 2010 inventory data in this report differs from the data presented in earlier reports. Comparisons are approximate as data sources and methodology changed between 2010 and 2019 including changes in relative global warming potentials based on most recent IPCC assessment to the reporting year.

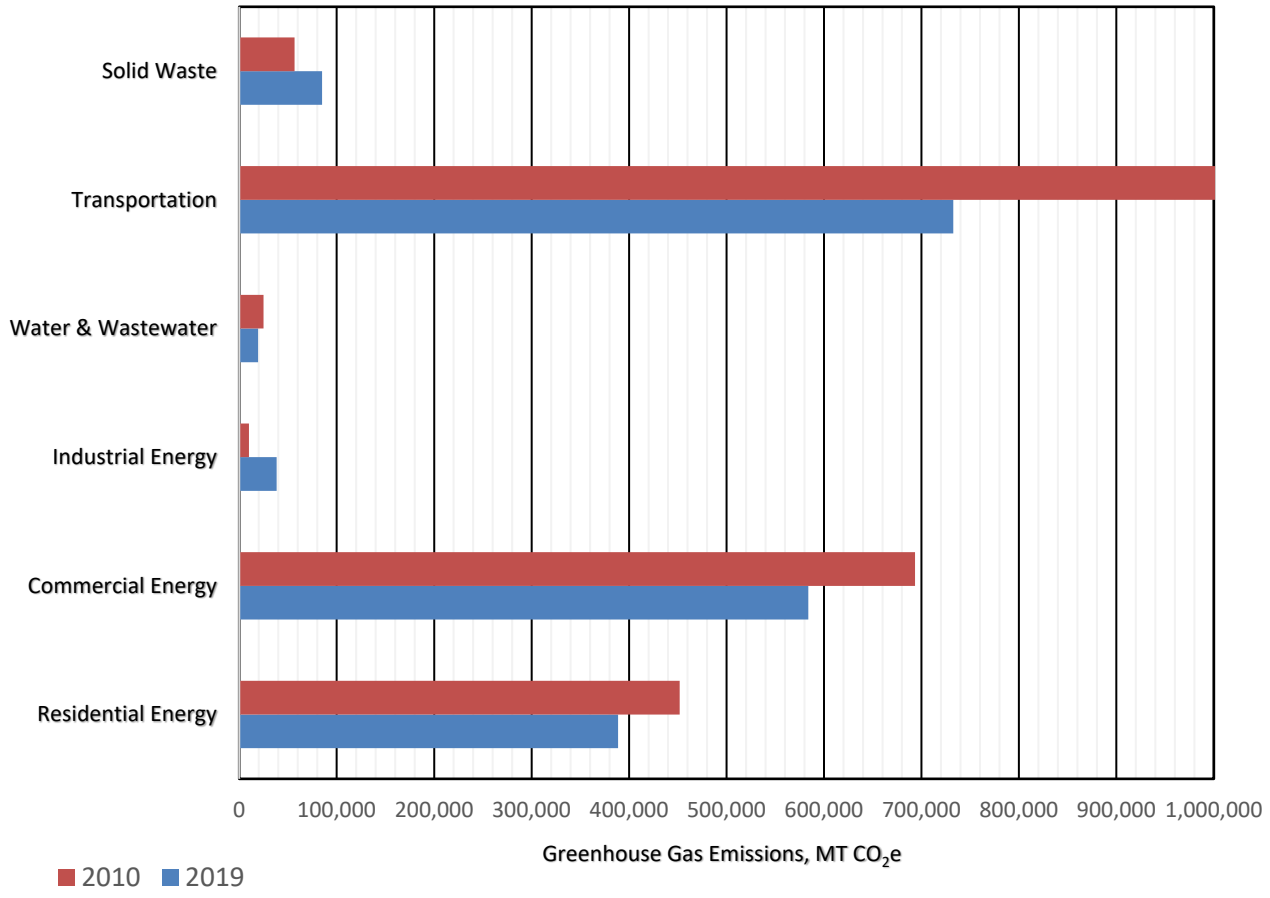


Figure 5: Fort Lauderdale Community Wide Greenhouse Gas Emissions in metric tons of carbon dioxide equivalent ($MTCO_2e$) by Sector, 2010 vs 2019

Table 3: Fort Lauderdale Community Wide Greenhouse Gas Emissions in metric tons of carbon dioxide equivalent ($MTCO_2e$) by Sector, 2010 vs 2019

Sector	2010 MT CO_2e	2019 MT CO_2e	Percent Change
Residential Energy	451,913	388,710	-13.99%
Commercial Energy	693,400	583,921	-15.79%
Industrial Energy	9,924	38,303	+285.9%
Water / Wastewater	24,847	19,347	-22.13%
Transportation	1,001,272	732,684	-26.82%
Solid Waste	56,672	84,950	+49.90%
Fugitive	1,711	3,752	+119.29%
Total:	**2,239,739**	**1,851,667**	**17.3%**

As shown in Figure 5 and Table 3, overall, the Community emissions have decreased by 17.3% since 2010, with increases in the Industrial Energy, Solid Waste, and Fugitive Emissions sectors, offset by larger decreases in residential, commercial, industrial energy, and water / wastewater sector. Regarding Industrial Energy, the 2010 baseline assessment did not accurately capture this sector (as well as the 'Commercial Energy' sector due to incorporating municipal water/wastewater processes rather than parsing out to the 'Government' inventory. This has since been corrected to align with the new 2019 baseline, however, certain data was lacking and, therefore, required utilizing a combination of subsequent years' data and calculating using internal data sources to prorate accordingly. This sector's overall performance should be considered moderate in reliability due to these reasons.

Regarding the Solid Waste sector, this increase can be attributed to varying data sources between the two baseline years (data provided by third party service providers) as well as population growth within the community thus producing more municipal solid waste. It should be again noted that these emissions are derived from the relatively cleaner "waste-to-energy" process for disposal versus a more traditional landfilling process. This sector's overall performance should be considered moderate in reliability due to these reasons.

Regarding fugitive emissions from natural gas, this data was not calculated in the original 2010 baseline assessment and required retroactively implementing with the limited data available. Additionally, the economics of natural gas over the past decade have improved and may also be accounting for consumption growth in line with overall population growth.

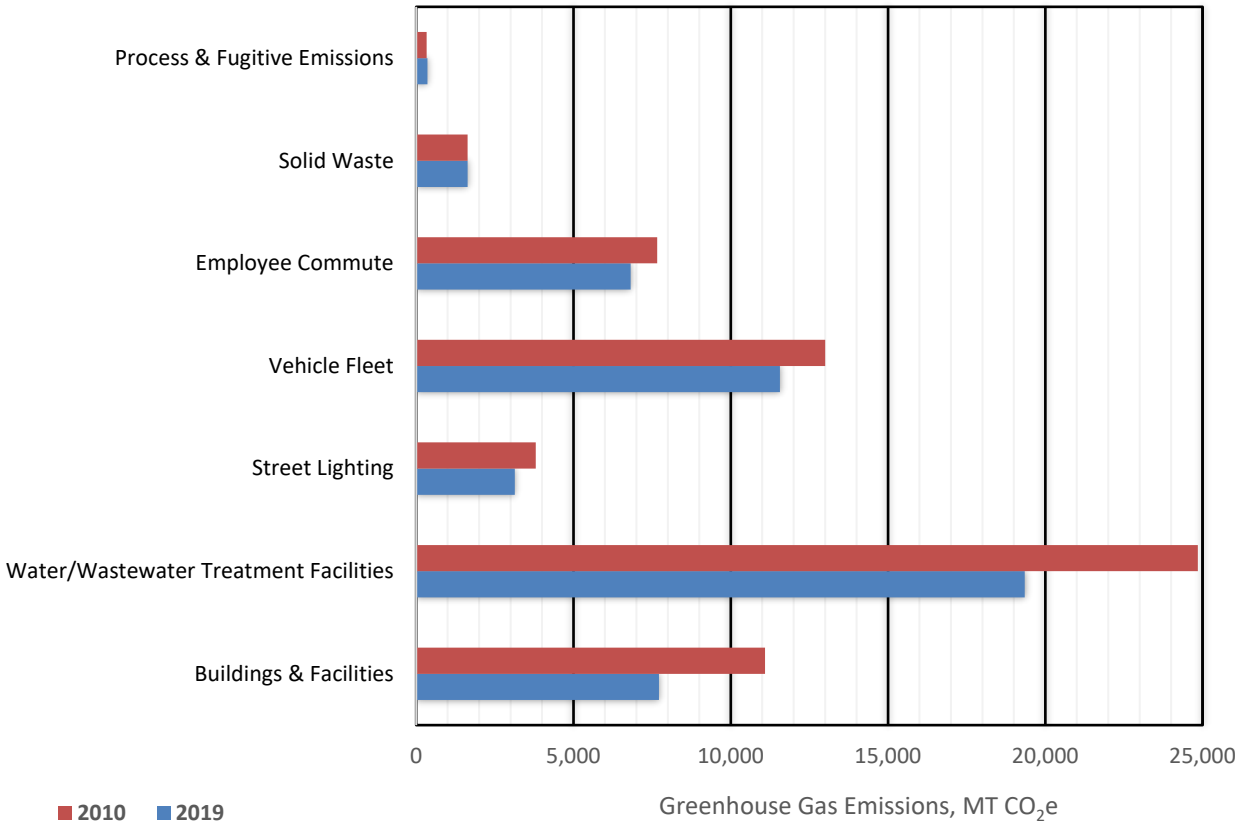


Figure 6: Fort Lauderdale Government Operations Greenhouse Gas Emissions in metric tons of carbon dioxide equivalent ($MTCO_2e$) by Sector, 2010 vs 2019

As shown in Figure 6 and Table 4, overall, City government operations have decreased their respective emissions in all sectors except fugitive emissions through actions outlined in the Sustainability Action Plan. Highlights of the accomplishments from the SAP are provided in Table 5. The most significant reductions were seen in electricity usage in the City's buildings, water/wastewater system and streetlighting. This was driven by less greenhouse gas intensive electricity generation by the City's utility Florida Power and Light and to a lesser degree by reductions in electricity usage in City operations.

Despite an increasing inventory of vehicles (~15%) in the City's fleet, GHG emissions were reduced over the nine-year period. Emissions from employee commute was reduced due to general trends towards more efficient vehicles and decreases in estimated average commute distances despite increases in total number of employees. Unlike the previous 2019 GHG inventory report, this revised version now incorporates the waste generated by government facilities, which includes both waste sent to a waste-to-energy facility and the composting of yard waste. It is worth noting that the tonnage of both yard waste and trash remains consistent for both years due to limited data availability.

Table 4: Fort Lauderdale Government Operations Greenhouse Gas Emissions in metric tons of carbon dioxide equivalent ($MTCO_2e$) by Sector, 2010 vs 2019				
Sector	2010 MT CO_2e	2019 MT CO_2e	Difference, MT CO_2e	Percent Change
Buildings	11,092	7,715	-3,377	-30.4%
Water/Wastewater	24,847	19,347	-5,500	-22.1%
Street Lighting	3,802	3,134	-668	-17.6%
Fleet	13,002	11,565	-1,437	-11.1%
Solid Waste	1,633	1,633	0	0
Employee Commute	7,661	6,815	-846	-11.0%
Fugitive	334	358	+24	+7.2%
Total:	**62,371**	**50,567**	**-11,804**	**-18.9 %**

Table 5: GHG-related Accomplishments from the 2011 Sustainability Action Plan	
Goal	Progress to Date
Leadership	
Lead by Example	In 2011, the City established its Sustainability Division and prioritized related goals in key planning documents including the Strategic Plan, Comp Plan, Vision Plan, and a Net-Zero resolution. In 2015, all full-time staff received mandatory training on climate change impacts and currently a sustainability module has been included in new employee orientation.
Prepare for Climate Change Impacts	City government has institutionalized sea level rise planning in its operations via adoption of projections, creation of the Adaptation Action Area program, stormwater master planning and climate change impacts in almost all master planning efforts. The first comprehensive citywide vulnerability assessment is planned for next year.
Air Quality	
Reduce Government Emissions 20% by 2020	From 2010-2019, City government achieved an 18.9% reduction in greenhouse gas emissions driven by cleaner energy sources, energy efficiency improvements in municipal facilities, and decreased fuel usage.
Reduce Community Emissions 20% by 2020	From 2010-2019, the community achieved an 17.3% reduction in greenhouse emissions citywide driven by cleaner energy provided the electrical utility and increased per capita energy efficiency.
Energy	
Reduce Government Electricity Use 20% by 2020	From 2010-2019, City government achieved a 6.69% decrease in kWh usage from baseline due to ongoing efforts via energy performance contracting, building energy efficiency planning, and installation of efficiency retrofits.
Reduce Community Electricity Use 20% by 2020	From 2010-2019, community electricity usage increased by 2.39% concurrent with a population increase of 12.5% indicating overall per capita decrease. In 2016, the City launched its Property Assessed Clean Energy program to finance energy efficiency improvements for property owners.
Source 20% Government Electricity from Renewable Energy by 2020	City has completed a feasibility study analyzing potential capacity for solar installations on its facilities, analyzed community renewable energy systems installed, and as part of its Net Zero efforts, will seek additional strategies.
Built & Natural Environment	
Incorporate Energy Efficient Building/Land Use into Comprehensive Plan	The Advance Fort Lauderdale 2040 Comprehensive Plan was adopted in 2020 and includes a new 'Climate Change' element promoting land use policies that will reduce emissions in the built and natural environments.
Transportation	
Reduce Government Use of Fossil Fuel	From 2010-2019, City government achieved a 11.2% reduction in fuel usage, despite increasing its fleet inventory, by right sizing, purchasing low-emissions vehicles, reduced idling, optimized routing, and improved maintenance.
Reduce Community Use of Fossil Fuel	City government installed EV charging stations at its parking garages and is exploring options to add more elsewhere. As part of its Net Zero efforts, additional strategies to promote electric vehicles will be pursued.
Reduce Vehicle Miles Traveled	City government actively promotes multimodal transportation and mixed-use development via policy and goals within the new Comprehensive Plan and considered in master planning efforts including the Transit Master Plan.

Appendix

Methodology

The 2019 City of Fort Lauderdale (FTL) greenhouse gas (GHG) emissions inventory was conducted by the Sustainability and Climate Resilience Program in the Sustainability Division of the Public Works Department, utilizing the protocols and software tools developed by the International Council for Local Environmental Initiatives (ICLEI). Completed GHG inventories were reviewed by ICLEI staff for quality assurance.

This inventory addressed GHG emissions from community as a whole and from governmental operations. All datasets were examined for completeness and where gaps existed, assumptions were made and are described in the following methodology. Additionally, to provide a comparison to the previous 2010 baseline, this methodology was retroactively applied to the 2010 inventory. These inventories were intended to evaluate emissions from the most significant greenhouse gas sources in a manner that is reliable, accurate, and replicable into the future and, consequently, focuses on the most significant sources of greenhouse gas emissions.

The ICLEI *Clearpath* tool incorporates multiple emissions calculators with prepopulated factor sets. Users of the platform collect and input the relevant data necessary, select any additional qualifiers applicable to the respective metric, and run the calculator to determine the outputs. Based on the user's inputs, ICLEI *Clearpath* determines relevant information such as greenhouse gas emissions, equivalent energy impact, origination scope, etcetera.

For electricity-related emissions, such as from the Florida Power and Light (FPL) utility, emissions factors are necessary for GHG calculations and can vary from year to year based on changes in respective fuel composition. Electricity emissions factors were obtained from the Florida Power and Light (FPL) and the US Environmental Protection Agency.

The Water and Wastewater sector accounts for emissions generated by two primary activities: energy consumption and nitrous oxide (N_2O) emissions from nitrification and denitrification processes. The source titled "Water / Wastewater Treatment Processes" utilized the ClearPath inventory record to compute emissions from grid electricity use at the municipal water and wastewater treatment facilities. The second inventory record, titled "Process N_2O Emissions," encompasses the release (N_2O) emissions from GTL wastewater treatment facility, regardless of whether the facility employs Nitrification/Denitrification processes. To calculate N_2O, the calculator is populated with the number of people serviced.

Under the Solid Waste sector, the City reports on two emissions-generating activities: incineration and biological treatment recycling processes. The first source titled "Waste-to-Energy Process" accounts for bulk and trash generated by the community, which is then incinerated at the Wheelabrator Waste to Energy Facility. The second record titled "Yard Waste," reports emissions from biological treatment of solid waste by residents only. Since residential yard waste is handled by Waste Management Recycling Facility, it is assumed that the emissions generated by this activity should be counted as composting.

Starting in 2019, ICLEI *Clearpath* recommended the Google Environmental Insights Explorer (EIE) platform as an accurate and reliable tool to calculate transportation emissions and was utilized for the 2019 inventory. The 2010 baseline emissions comparison did not have the EIE data available and relied on prorated assumptions of vehicle miles traveled (VMT) based on a trip model generated by a consultant on behalf of the Florida Department of Transportation.

The following sections describe each calculator used within the ICLEI *Clearpath* platform for this inventory and all relevant inputs to derive this reports' findings. It will also callout, where applicable, any noteworthy items pertaining to each individual metric including variances to the 2010 baseline emissions assessment, assumptions made due to lack of comparable datasets, and unique scenarios. It should be noted that this methodology, while comprehensive, does not include the actual dataset sources as these can be located appended to each metric calculator within the ICLEI *Clearpath* platform.

Updates to the Previous Published Version of this Report

Since the release of the 2019 GHG Inventory report, multiple revisions have been made in the interest of improving accuracy. In January of 2023 the residential sector emissions from non-utility fuel, propane, was added. To comply with the U.S. Community Protocol recommendations for wastewater treatment process emissions, N_2O and water and wastewater kWh usage were incorporated in both government operations and the community inventory reports. Furthermore, changes to the population served by the wastewater treatment plant were made to reflect a more accurate servicing population. The tracking and categorization of natural gas and electricity data is performed by third parties, TECO and FPL, and therefore, the City's ability to review that data for quality assurance and control is limited. As a result, a recent update to the reported electricity used by the Industrial Public Authority (PA) Facility was received by the City in June of 2024. Under the previously published version of this report, the Industrial PA was recorded to have utilized 841,924 kWh for the year 2019. However, the new and corrected entry indicates that the Industrial PA used 42,623,287 kWh of electricity. Consequently, this data was revised in the GHG inventory calculations and the newly reported Scope 2 total for the industrial sector is 14,261 CO_2e MT, reflecting a 0.68% increase in the overall community CO_2 emissions.

In the transportation sector, data gaps were identified, specifically on what fuel type is associated with what aviation type. The suggested implemented methodology was to proportion the fuel types between the aviation types based on FAA records of local and itinerant trips. Furthermore, all aviation types were reported as scope 1 and labeled within jurisdictions. In June 2023, the VMT (Vehicle Miles Traveled) for community transportation entries was revised. For on road the VMT was rectified from 1,452,599,490 to 1,431,801,739.79. This adjustment was made after applying the complete conversion factor from kilometers to miles and excluding public transit VMT from the total calculations. The previous published version of the inventory report also reported VMT miles for public transit as 20,797,807. This has since been rectified to 20,797,755. The computed annual fuel use for a diesel-operated bus in public transit was adjusted to reflect the average fuel consumption of a diesel bus. Other minor changes were made in the conversion calculations, including rectifying the distribution analysis of vehicle types for gasoline and diesel by incorporating local data. To accomplish this, we analyzed FDOT's 2019 county vehicle distribution volumes on 10 of the busiest roads within our jurisdiction. The percentiles of each vehicle type were then multiplied by the national default vehicle type fuel efficiency and fuel mix.

Under the Solid Waste sector, the reported annual yard waste figures were adjusted to reflect the yard waste numbers for fiscal year 2018-2019. It's important to note that since the disposal location for both yard waste and MSW (Municipal Solid Waste) is outside our jurisdiction, the GPC (Greenhouse Gas Protocol) designation for these items was changed to scope 3.

The following revisions were also made in the government operations inventory. In the building sector, a few of the natural gas TECO accounts were determined to be using the same meters. To avoid double counting of emissions, the duplicate meters were excluded from the overall calculations. As a result of this change, the fugitive emissions from natural gas distribution were also adjusted accordingly. Since the City's George T. Lohmeyer Regional Wastewater Treatment

Facility (GTL WWTF) disposal is deep-well injected, and therefore has no surface water discharges, except in emergency situations, N_2O emission from the effluent discharge sent to intracoastal were removed from the government operations inventory.

In June 2023, the inventory was further revised based on recommendations from the ICLEI team. It was advised to include an estimate of waste generated by government facilities. Consequently, information regarding solid waste from government-operated facilities was obtained, including details on container sizes, the number of containers, and the frequency of pick-ups. To calculate the total waste generated, the volume-to-weight conversion factors provided by the U.S. EPA guidelines were utilized. To prevent overestimation, it was assumed that all containers were half full. Employee commute vehicle classifications were revised to include local data. The methodology utilized is consistent with the revisions made to the on-road and public transit VMT of the community transportation entries. Future recommendations made by the ICLEI team were to include off-road diesel used in government building back-up generators.

Community Emissions 2019

Residential Energy

- Calculator(s) Utilized:
  - **Emissions From Grid Electricity**
    - Residential Facility Electricity
      - Inputs: 1,245,220,311 kWh
      - Factor Sets:
        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
      - Data Source: 2019 FPL Community Energy Report
    - Residential Public Authority Electricity
      - Inputs: 158,392 kWh
      - Factor Sets:
        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
      - Data Source: 2019 FPL Community Energy Report
  - **Emissions From Stationary Fuel Combustion**
    - Residential Facility Natural Gas
      - Inputs: 1,708,830.9 therms
      - Data Source: 2019 TECO Community Energy Report
    - Residential Non-utility Fuel Propane
      - Inputs: 33,000 MMBtu
      - Data Source: U.S. Census Bureau and the U.S. Energy Information Administration

Commercial Energy

- Calculator(s) Utilized:
  - **Emissions From Grid Electricity**

- Commercial Facility Electricity
  - Inputs: 1,435,876,751 kWh
  - Factor Sets:
    - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
  - Data Source: 2019 FPL Community Energy Report
- Commercial Public Authority Facility Electricity
  - Inputs: 207,879,258 kWh
  - Factor Sets:
    - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
  - Data Source: 2019 FPL Community Energy Report
    - *Note: Applicable Water and Wastewater kWh usage parsed out from this metric and applied to the Water / Wastewater sector of this inventory, utilizing the internal energy database developed by staff to identify relevant accounts.*
- Public Authority Street Lighting Electricity
  - Inputs: 11,762,585 kWh
  - Factor Sets:
    - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
  - Data Source: 2019 FPL Community Energy Report
- Other Public Authority Facility Electricity
  - Inputs: 521,388 kWh
  - Factor Sets:
    - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
  - Data Source: 2019 FPL Community Energy Report

- **Emissions From Stationary Fuel Combustion**
  - Commercial Facility Natural Gas
    - Inputs: 12,910,545.7 therms
    - Data Source: 2019 TECO Community Energy Report
  - Public Authority Facility Natural Gas
    - Inputs: 2,477,556.6 therms
    - Data Source: 2019 TECO Community Energy Report

Industrial Energy

- Calculator(s) Utilized:
  - **Emissions From Grid Electricity**
    - Industrial Facility Electricity
      - Inputs: 4,415,391 kWh
      - Factor Sets:

        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
      - Data Source: 2019 FPL Community Energy Report
    - Industrial Public Authority Facility Electricity
      - Inputs: 42,623,287kWh
      - Factor Sets:
        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
      - Data Source: 2019 FPL Community Energy Report
        - *Note: Applicable Water and Wastewater kWh parsed out from this metric and applied to the 'Government' inventory, utilizing the internal energy database developed by staff to identify relevant accounts.*
  - **Emissions From Stationary Fuel Combustion**
    - Industrial Facility Natural Gas
      - Inputs: 4,529,883.2 therms
      - Data Source: 2019 TECO Community Energy Report

Transportation & Mobile Sources

- Calculator(s) Utilized:
  - **Aviation Travel**
    - Community Aviation Gasoline (FXE Local)
      - Inputs: 385,315gallons
      - Data Source: FXE Fuel Flowage Report & FAA FXE Flight Log data to prorate fuel usage to scope 1 (local and itinerant) flight counts
    - Community Aviation Kerosene (FXE Local)
      - Inputs: 4,506,203 gallons
      - Data Source: FXE Fuel Flowage Report & FAA FXE Flight Log data to prorate fuel usage to scope 1 (local and itinerant) flight counts
    - Community Aviation Gasoline (FXE Itinerant)
      - Inputs: 385,315 gallons
      - Data Source: FXE Fuel Flowage Report & FAA FXE Flight Log data to prorate fuel usage to scope 1 (local and itinerant) flight counts
    - Community Aviation Kerosene (FXE Itinerant)
      - Inputs: 4,506,203 gallons
      - Data Source: FXE Fuel Flowage Report & FAA FXE Flight Log data to prorate fuel usage to scope 1 (local and itinerant) flight counts
  - **On Road Transportation**
    - Community VMT Gasoline (vehicle miles travelled)
      - Inputs: 1,297,429,582 annual VMT
      - Factor Sets:
        - Transportation: 2019 US National Defaults (updated 2021)

Data Source: Google Environmental Insight Explorer and Florida Department of Transportation
    - *Note: Inputs for vehicle class makeup were rectified to include local data. To do this, FDOT's 2019 county vehicle distribution volumes in 10 of the City's busiest roads were analyzed. The percentiles of each vehicle type were then multiplied by the 2019 national default vehicle type fuel efficiency (provided by ICLEI Clearpath).*
- Community VMT Diesel
    - Inputs: 134,372,157 annual VMT
    - Factor Sets:
        - Transportation: 2019 US National Defaults (updated 2021)
    - Data Source: Google Environmental Insight Explorer and Florida Department of Transportation
        - *Note: Note: Inputs for vehicle class makeup were rectified to include local data. To do this, FDOT's 2019 county vehicle distribution volumes in 10 of the City's busiest roads were analyzed. The percentiles of each vehicle type were then multiplied by the 2019 national default vehicle type fuel efficiency (provided by ICLEI Clearpath).*
- Community Public Transit VMT Diesel
    - Inputs:
        - 20,797,755 annual revenue VMT
        - 2,773,034 annual fuel use
    - Factor Sets:
        - Transportation: 2019 US National Defaults (updated 2021)
        - Grid Electricity: 2019 FPL and eGRID Emissions Factors
    - Data Source: Google Environmental Insight Explorer and Florida Department of Transportation
        - *Note: Inputs for vehicle class makeup percentages and VMT were provided by ICLEI Clearpath default datasets. Fuel use was calculated by taking the average mpg of a diesel bus, 7.5 gallons and multiplying that by the reported Google EIE bus gpc distance.*

Water / Wastewater Treatment Facilities

- Calculator(s) Utilized:
    - **Emissions from Grid Electricity**
        - Water/Wastewater Process Electricity
            - Inputs:
                - 62,917,146 kWh
                - 256,683 Total Population
            - Factor Sets:

        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
      - Data Source: Monthly FPL account data, internally tracked

- Calculator(s) Utilized:
  - **Process N2O Emissions from Wastewater Treatment**
    - Government Water/Wastewater Process N2O Emissions
      - Inputs:
        - 256,683 Total Population
        - 1.25 Industrial-Commercial Discharge Multiplier
      - Data Source: Comprehensive Utilities Strategic Master Plan Table WW1-1 Wastewater Service Area Population Forecast on page WW1-3, 2016 utilizing the year 2020 projection

Solid Waste

- Calculator(s) Utilized:
  - **Combustion of Solid Waste Generated by the Community**
    - Community Solid Waste Combustion
      - Inputs: 239,039.12 short tons of MSW (municipal solid waste)
      - Data Source: 2019 Wheelabrator Broward County Tonnage Report
        - *Note: Accounts for residential and commercial MSW as well as tonnage tracked internally for bulk and construction debris. For bulk waste and c/d (construction/demolition debris), community-wide is also recycled or landfilled and is not reflected in this metric. Additionally, the disposal location is not in our jurisdiction and is therefore labeled Scope 3.*
  - **Biologic Treatment of Solid Waste (Composting)**
    - Community Yard Waste
      - Inputs: 14,877tons of waste composted
      - Source: Solid Waste and Recycling Program internal metrics tracking
        - *Note: The disposal of yard waste happens outside City boundaries and is therefore labeled Scope 3. Also, the current reporting system includes yard waste from both residential and commercial sources, but it fails to capture the total yard waste generated by the community. This is because the City utilizes multiple vendor contracted and City-licensed haulers to manage and process both organic and inorganic waste. Additionally, there is additional organic waste, such as excess seaweed provided by the City, that is not accounted for in the existing metric but is still hauled and composted at one of our owned and operated facilities.*

Process & Fugitive Emissions

- Calculator(s) Utilized:
  - **Fugitive Emissions from Natural Gas Distribution**
    - Community Facility Natural Gas
      - Inputs: 21,626,816.4 therms
      - Data Source: 2019 TECO Community Energy Report

City Government Emissions

Buildings & Facilities

- Calculator(s) Utilized:
  - **Emissions From Grid Electricity**
    - Government Facility Electricity
      - Inputs: 24,707,232 kWh
      - Factor Sets:
        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
      - Data Source: Monthly FPL account data, tracked internally
        - *Note: This metric does not capture either streetlighting or water/wastewater kwh as they are parsed separately to their respective metrics in ICLEI Clearpath (see below).*
  - **Emissions From Stationary Fuel Combustion**
    - Government Facility Natural Gas
      - Input: 42,032 therms
      - Data Source: Annual TECO accounts data, tracked internally

Streetlights & Traffic Signals

- Calculator(s) Utilized:
  - **Emissions From Grid Electricity**
    - Government Street Light Electricity
      - Inputs: 10,337,160 kWh
      - Factor Sets:
        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
      - Data Source: Monthly FPL account data, tracked internally

Vehicle Fleet

- Calculator(s) Utilized:
  - **Fleet Vehicle Emissions**
    - Government Fleet Diesel – On Road
      - Inputs:
        - 281,539 gallons
        - 1,739,169 VMT
      - Factor Sets:

        - Transportation: 2019 US National Defaults (updated 2021)
        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
      - Data Source: 2019 Green Fleet Awards applications submitted by Fleet Services Program
    - Government Fleet Gasoline – On Road
      - Inputs:
        - 760,823 gallons
        - 9,683,502 VMT
      - Factor Sets:
        - Transportation: 2019 US National Defaults (updated 2021)
        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
      - Data Source: 2019 Green Fleet Awards application submitted by Fleet Services Program
  - **Emissions From Off Road Vehicles**
    - Government Fleet Diesel – Off Road
      - Inputs:
        - 57,665 gallons
        - Large Utility
      - Factor Sets:
        - Transportation: 2019 US National Defaults (updated 2021)
      - Data Source: 2019 Green Fleet Awards application submitted by Fleet Services Program
    - Government Fleet Gasoline – Off Road
      - Inputs:
        - 155,831 gallons
        - Small Utility
      - Factor Sets:
        - Transportation: 2019 US National Defaults (updated 2021)
      - Data Source: 2019 Green Fleet Awards application submitted by Fleet Services Program

Employee Commute

- Calculator(s) Utilized:
  - **Employee Commute**
    - Government Commute Gasoline
      - Inputs:
        - 17,679,286 VMT
        - 86.42% Passenger Cars
        - 13.57% Light Trucks
        - 2,653 Total Employees
      - Outputs:
        - 770,721 Fuel Use (gal)

        - Scope 3
    - Factor Sets:
        - Transportation: 2019 US National Defaults (updated 2021)
        - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
    - Data Source: Employee counts derived from annual FTEs in published budget books. Commute distance estimated from database of still active employee zip codes and based on Google maps fastest distance from zip code to Fort Lauderdale City Hall. Assumed 85% of employees drive for 240 days per year. Vehicle classification was determined by taking FDOT Annual Vehicle Classification % of vehicle types and volumes from 10 of the City's major roadways. Revised vehicle breakdown includes 86.42% of passenger cars and 13.57% light truck. The remaining 15% of employees assumed to commute with negligible GHG emissions impact (bicycle, walk, etc.). Employee zip codes with distances greater than 90 miles from City Hall were excluded from this calculation as erroneous and not representative of actual commute distances. No longer active employees were excluded because zip codes in databases were less likely to represent the employee residence during the year of interest and may reflect relocation since the time of interest.

Water & Wastewater Treatment Facilities

- Calculator(s) Utilized:
    - **Emissions from Grid Electricity**
        - Government Water/Wastewater Process Electricity
            - Inputs:
                - 62,917,146 kWh
                - 256,683 Total Population
            - Factor Sets:
                - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)
            - Data Source: Monthly FPL account data, internally tracked
    - **Process N2O Emissions from Wastewater Treatment**
        - Government Water/Wastewater Process N2O Emissions
            - Inputs:
                - 256,683 Total Population
                - 1.25 Industrial-Commercial Discharge Multiplier
            - Factor Sets:
                - Grid Electricity: 2019 FPL (CO_2) and EPA eGRID2019 Emissions Factors (CH_4 and N_20)

- Data Source: Comprehensive Utilities Strategic Master Plan Table WW1-1 Wastewater Service Area Population Forecast on page WW1-3, 2016 utilizing the year 2020 projection

Solid Waste

- Calculator(s) Utilized:
  - **Combustion of Solid Waste**
    - Government Solid Waste Combustion
      - Inputs: 4,546.81 short tons of MSW (municipal solid waste)
      - Data Source: Source: Solid Waste and Recycling Program internal metrics tracking
        - *Note: Accounts for trash generated by City owned facilities. Internal tracking encompasses data related to container sizes, the quantity of containers, and the frequency of pick-ups. The density of waste generated was determined using volume-to-weight conversion factors recommended by the U.S. EPA guidelines. In order to avoid overestimation, it was assumed that all containers were filled to half of their capacity. Furthermore, the disposal site (Wheelabrator South Broward waste-to-energy facility) falls outside our jurisdiction, thus categorizing it as Scope 3.*
  - *Biologic Treatment of Solid Waste (Composting)*
    - *Government Yard Waste*
      - *Inputs: 814 tons of waste composted*
      - *Source: Solid Waste and Recycling Program internal metrics tracking*
        - *Note: Accounts for yard waste generated by City owned facilities. Internal tracking encompasses data related to container sizes, the quantity of containers, and the frequency of pick-ups. The density of waste generated was determined using volume-to-weight conversion factors recommended by the U.S. EPA guidelines. In order to avoid overestimation, it was assumed that all containers were filled to half of their capacity. Furthermore, the disposal of yard waste happens outside City boundaries and is therefore labeled Scope 3.*

Process & Fugitive Emissions

- Calculator(s) Utilized:
  - **Fugitive Emissions from Natural Gas Distribution**
    - Government Facility Natural Gas
      - Inputs: 42,032 therms
      - Data Source: Annual TECO account data
  - **Hydrofluorocarbon & Refrigerant Emissions**

- Government Fleet R134a On/Off Road
  - Inputs:
    - HFC-134a gas type
    - 0.2694339 fugitive gas released
  - Data Source: First Vehicle Service Report, I401 Parts Usage History for R134a

Acknowledgements

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- Florida Power & Light
- TECO Energy
- Google Environmental Insights Explorer
- Florida Department of Transportation
- FTL Human Resources Department
- FTL Public Works Department, Sustainability Division, Fleet Services Program
- FTL Public Works Department, Sustainability Division, Solid Waste & Recycling Program
- FTL Strategic Communications
- ICLEI USA