City of Fort Lauderdale

2020

Greenhouse Gas Inventory Report

Community and City Government Operations

CITY OF FORT LAUDERDALE FLORIDA

GREENING OUR ROUTINE CITY OF FORT LAUDERDALE

Original Report Release: November 2023

I. Introduction

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 and GHG reduction goals to reduce emissions 20% by 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 2040 Comprehensive Plan setting GHG reduction goals of 80% below the levels recorded in 2010 by the year 2050. In addition, in December 2021, the City Commission further advanced City's carbon reduction goals by ratifying net-zero greenhouse gas emissions goals for both the City's government (2040) and the community it serves (2050). Lastly, in early 2022, the City of Fort Lauderdale joined the ICLEI150 Race to Zero, making its net-zero commitment public and committing to take action towards achieving its net-zero goals.

This report accounts for GHG emissions for both the City of Fort Lauderdale Government Operations (Government) and for the entire City of Fort Lauderdale (Community-Wide) for the calendar year 2020. GHG methodology used in this inventory follows the ICLEI U.S. Community Protocol, which is guided by five basic emissions-generating activities; 1) use of electricity by the community; 2) use of fuel in residential and commercial stationary combustion equipment; 3) on-road passenger and freight motor vehicle travel; 4) use of energy in potable water/wastewater treatment and distribution; and 5) generation of solid waste by the community. In 2020, the City of Fort Lauderdale emitted 1,403,732 metric tons (MT) of carbon dioxide equivalents (CO_2e) community-wide representing a 37% decrease from the 2,239,739 metric tons of CO_2e emitted in 2010. This reduction was achieved despite an increase in population and the number of jobs in Fort Lauderdale. In its government operations, the City emitted 49,951 MT CO_2e which represents a 20% decrease since 2010. This reduction was achieved while increasing the fleet inventory and expanding services. It should be noted that emissions in the year 2020 were substantially reduced in part due to the COVID-19 pandemic.

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 toward reducing its environmental impacts. The SAP set goals to achieve a 20% reduction in GHG emissions in both the community and in government operations between the years 2010 and 2020. This report

documents the City's significant progress in both those areas in 2020 achieving 37% reductions in the community and 20 % in government operations.

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. Achieving 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 followed by the 2019 baseline year and against which to track progress toward the net-zero goals.

II. Methodology

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 that 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 a detailed examination of how the City of Fort Lauderdale conducted its assessment, review the 'Methodology' section within this report's Appendix.

Sector Metrics Assessed

Community-Wide

- Electricity Usage
- Natural Gas Usage
- Aviation Fuel Usage
- Vehicle Miles Traveled (VMT)
- Solid Waste-to-Energy Emissions
- Water Supply Process Emissions
- Process N_2O Emissiosn from Wastewater Treatment
- Natural Gas Fugitive Emissions

Government Operations

- Electricity Usage
- Natural Gas Usage
- Fleet Fuel Usage
- Employee Commute VMT
- Water Supply Process Emissions
- Process N_2O Emissiosn from Wastewater Treatment
- Solid Waste-to-Energy Emissions
- Natural Gas & Fleet Fugitive Emissions

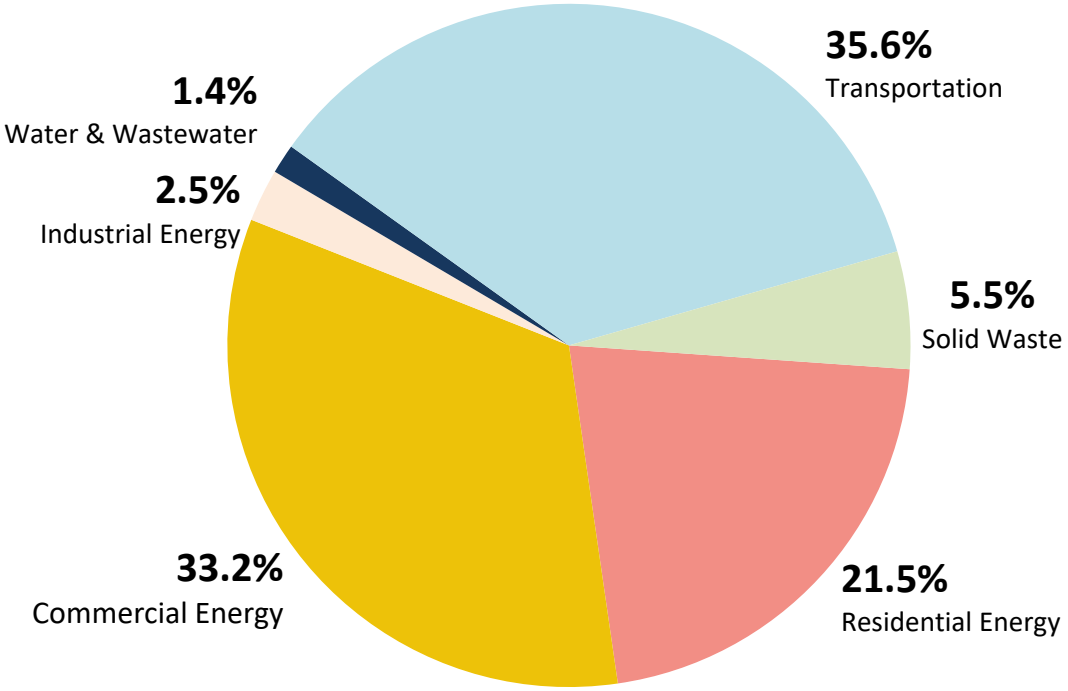
Scope	Definition
Scope 1	GHG emissions from sources located within the City boundary
Scope 2	GHG emissions occurring due to the use of grid-supplied electricity, heat, steam, and/or cooling within the City boundary.
Scope 3	All other GHG emissions that occur outside the City boundary due to activities taking place within the City boundary.

Table 1: Definitions for GHG Emissions Scopes (Source: GHG Protocol for Cities)

III. Analysis

Community-Wide Emissions in 2020

For calendar year 2020, total citywide emissions for the City of Fort Lauderdale community were an estimated **1,403,732 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.



1,403,732 MTCO₂e
Of GREENHOUSE GASES EMITTED IN 2020

Figure 1: Sector Contribution to Community Greenhouse Gas Emissions as Percentage of Total Emissions (2020)

As demonstrated above, the largest portion of community-wide emissions (**35.6%** at 499,489MT CO_2e) are derived from the transportation sector. While the majority of emissions in that category are from on-road travel and public transit (over 83% or 414,881 MT CO_2e), this category also includes emissions derived from aviation at the City's Executive Airport, FXE (84,608 MT CO_2e). The second largest sector of community emissions (**35.7**%) were attributed to the commercial and industrial (C&I) building sectors. Residential buildings compromised **21.5%** (302,486 MT CO_2e) of total emissions, and when combined with C&I building sector, emissions from all community buildings compromised **57.2%** (803,527 MT CO_2e) of total emissions.

The remainder of emissions (5.5%) are derived from solid waste, water/wastewater processing (1.4%) and errant emissions (0.2%). It should be noted that City government operations contribute 3.3% of these community wide emissions.

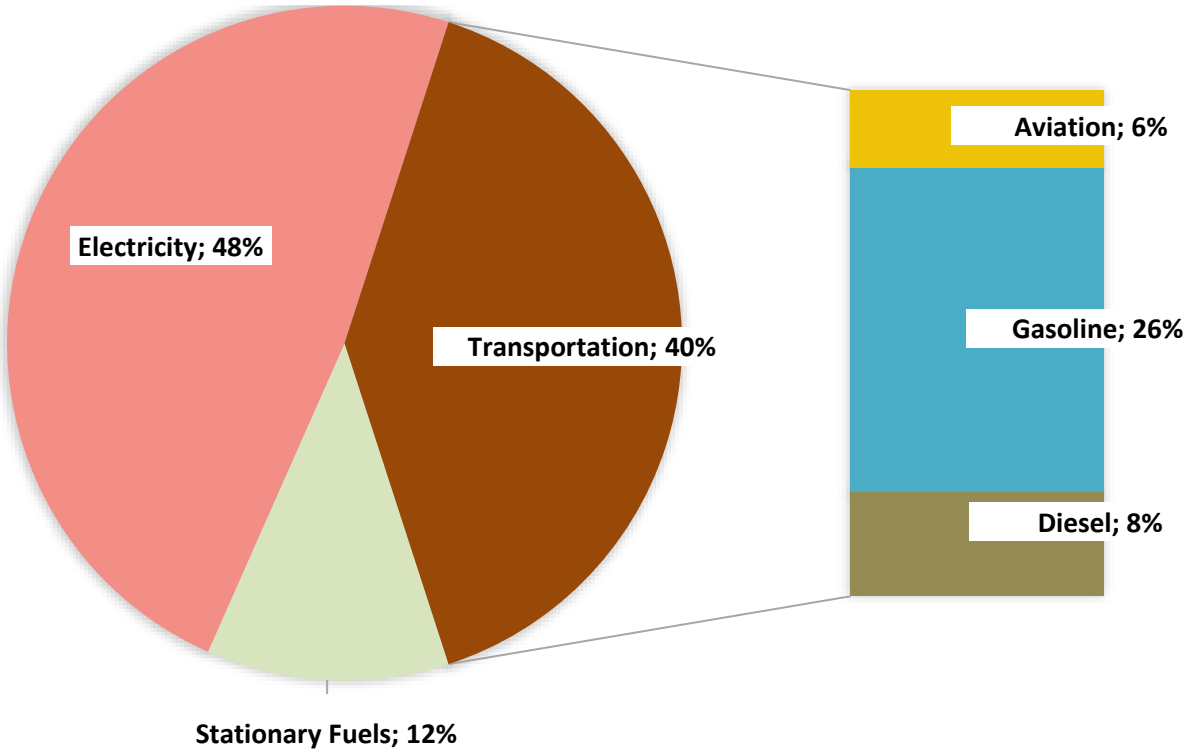


Figure 2: Energy Source Contribution to Community-Wide Greenhouse Gas Emissions as a Fraction of Total Energy Usage in MMBTU (2020)

Several energy sources are associated with multiple sectors. For instance, electricity is a source of energy that is captured within the residential sector, C&I building sector, and water and wastewater processing. In 2020, the largest energy source was electricity at 8,278,182 MMBTU. Stationary fuels which include natural gas and propane contribute to 1,989,455 MMBTU of energy use are also included in the previously mentioned sectors with the exception of water/wastewater processing. The remaining energy source is transportation (including on-road vehicle miles traveled, public transit, and local aviation) is the second largest used energy source (6,851,057 MMBTU).

Government Operations Emissions in 2020

For calendar year 2020, the GHG emissions derived from City operations were an estimated total **49,951 MT** CO_2e, with the distribution of emissions from the following sectors and sources shown in Figures 3 and 4.

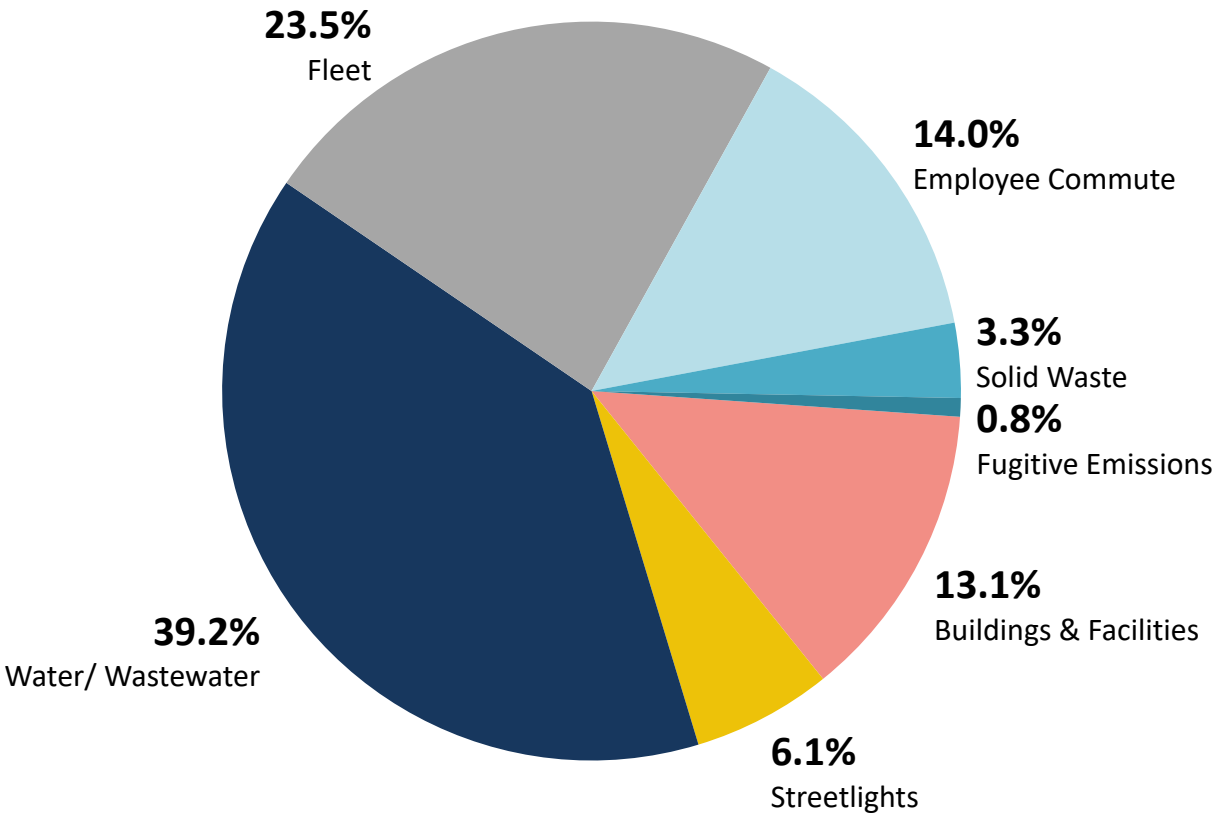


Figure 3: Sector Contribution to Local Government Greenhouse Gas Emissions as Percentage of Total Emissions (2020)

As demonstrated in Figure 3, the greatest share of government GHG emissions (**39.2%** at 19,583 MT CO_2e) are derived from its combined utility operation of 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 **23.5%** (11,747 MT CO_2e) of the total emissions generated. Estimated GHG emissions from employee commute account for **14%** (6,986 MT CO_2e) of total emissions. Employee commute emissions were calculated based on estimates of existing employees' commute distance, means of transportation, and schedule, with assumptions made due to limitations of available data. For

example, vehicle distribution breakdowns were calculated by taking FDOT annual vehicle classification % of vehicle types and volumes from 10 of the city's major roadways.

The municipal building portfolio comprises **13.1%** (6,547 MT CO_2e) of emissions that are generated from the utilization of electricity and natural gas. The City of Fort Lauderdale's streetlights constitute **6.1%** (3,051 MT CO_2e) of total emissions and a final **0.8%** for fugitive emissions emanating from natural gas distribution and fleet vehicle refrigerants that are periodically replaced.

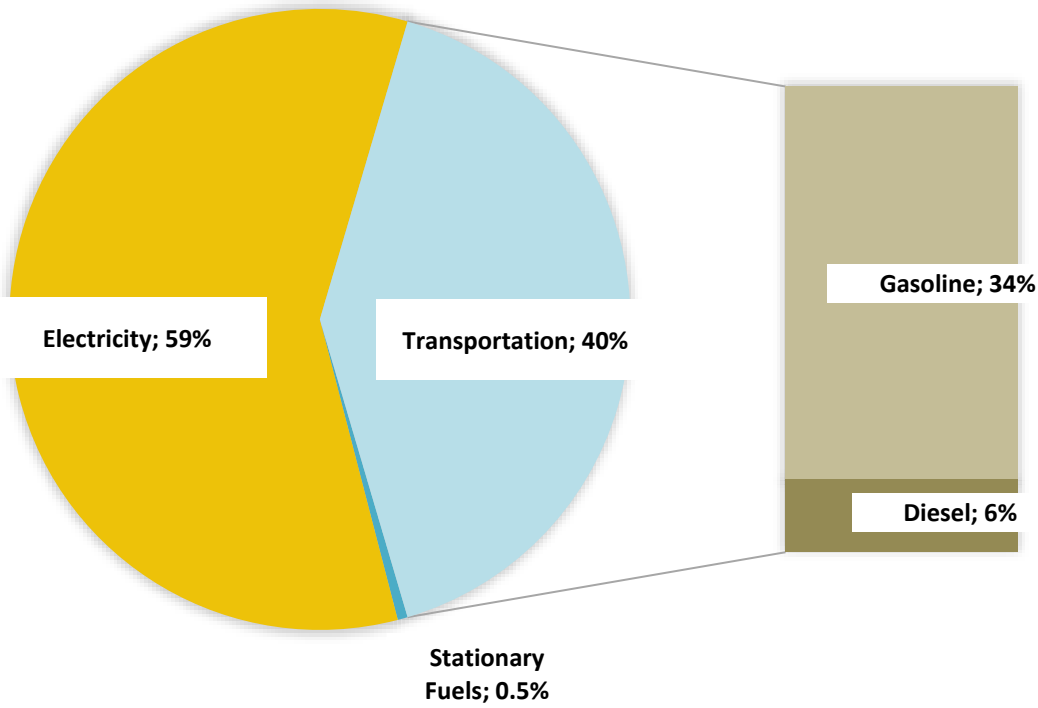


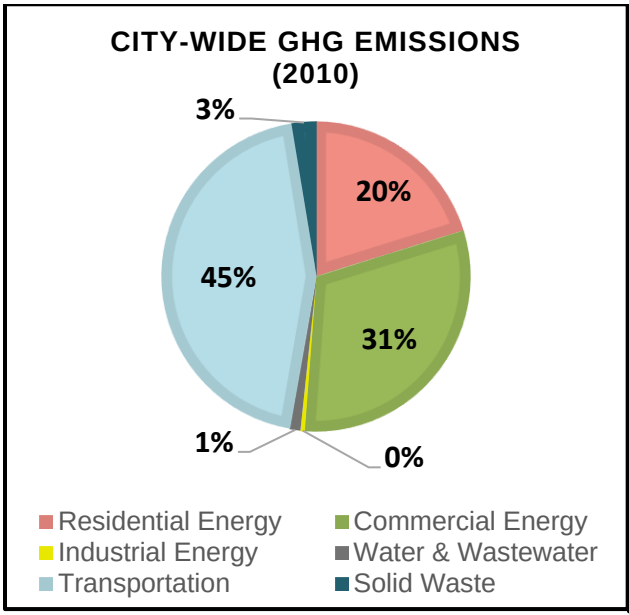
Figure 4: Energy Source Contribution to Fort Lauderdale Government Operations Greenhouse Gas Emissions as a Fraction of Total Energy Usage in MMBTU (2020)

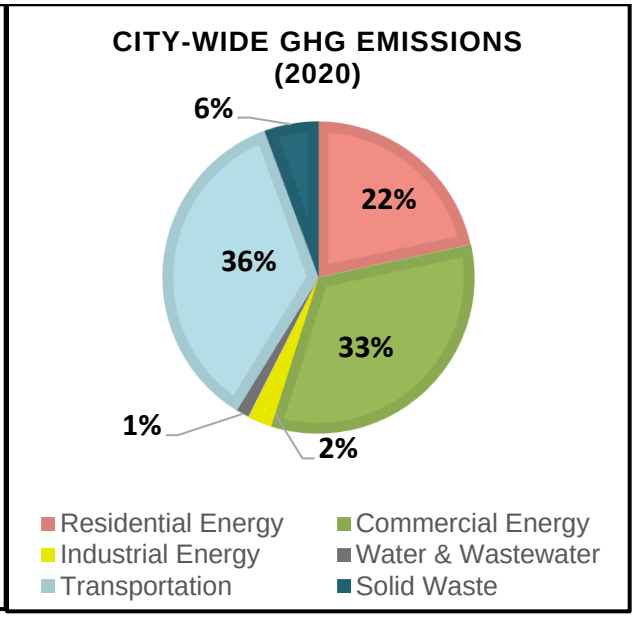
As shown in Figure 4, electricity compromises 59% of City GHG emissions and is a source of energy that is utilized in buildings and facilities sector, streetlights, and water/wastewater processing. In 2020, electricity was the largest energy, accounting for 332,077 MMBTU. For buildings and facilities, the inventory also accounted for stationary fuel in the form of natural gas, which amounted to 2,958 MMBTU. The second-largest energy contribution was transportation (40%), which encompasses both on-road and off-road fuel consumption by fleets, as well as employee commuting. For the energy contribution from gasoline, 51% came from employee commutes, while the remaining 49% was from the fleet.

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. Due to these improvements, the data presented in both the 2019 report and this 2020 report differs from the information presented in the previous 2010 Greenhouse Gas Inventory Report. Comparisons are approximate as data sources and methodology changed between 2010 and 2020 including changes in relative global warming potentials based on most recent IPCC assessment to the reporting year.





Category	MT CO_2e (2010)	MT CO_2e (2020)	Percent Change
Residential Energy	451,913	302,486	-33.06%
Commercial Energy	693,400	466,098	-32.78%
Industrial Energy	9,924	34,943	+252.11%
Water/wastewater	24,847	19,583	-21.19%
Transportation	1,001,272	499,489	-50.11%
Solid Waste	56,672	77,761	+37.21%
Fugitive	1,711	3,372	+97.08%
Total GHG Emissions	2,239,739	1,403,732	-37%*

Figure 5: Sector Contribution to Community Greenhouse Gas Emissions as Percentage of Total Emissions (2010 and 2020)

As shown in Figure 5, overall, the Community emissions have decreased by 37% since 2010, with increases in the Industrial Energy, Solid Waste, and Fugitive Emissions sectors, offset by larger decreases in Residential, Commercial, Water/Wastewater, and Transportation 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.

The increase in the solid waste sector can be attributed to several factors, including the utilization of different data sources between the two baseline years (data provided by third-party service providers) and the population growth within the community, resulting in an increased generation of 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. The emissions from processing municipal solid waste (MSW) occur outside the City's jurisdiction and, therefore, these emissions are considered Scope 3 as per ICLEI Community Greenhouse Gas Protocol.

Fugitive emissions from natural gas were not included in the original 2010 baseline assessment, and therefore, was calculated retroactively using 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.

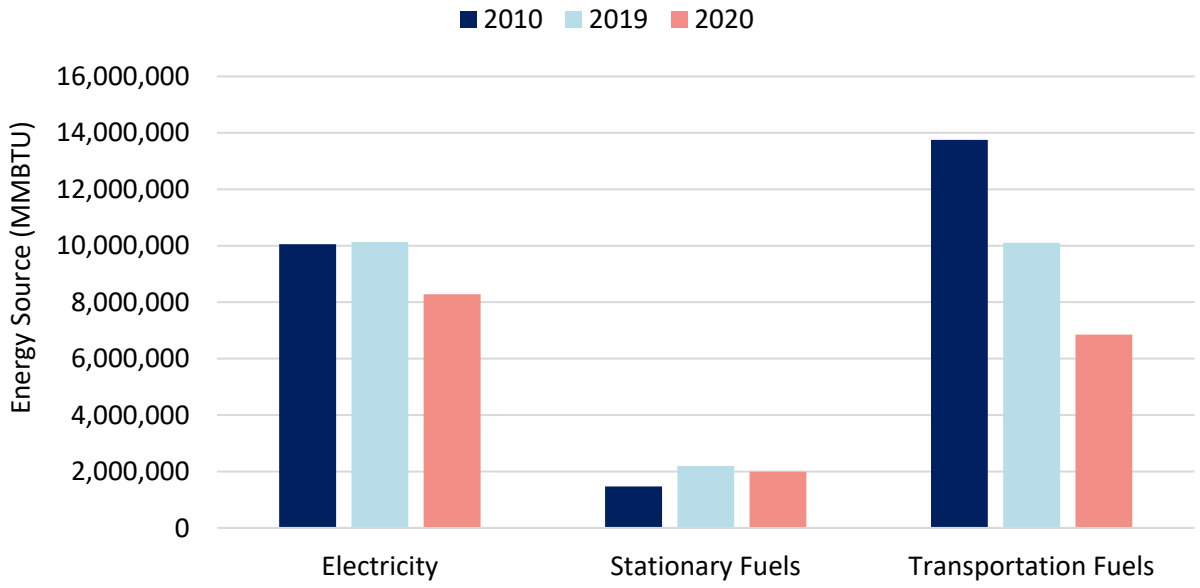


Figure 6: Energy Source Contribution by End-use Sectors (2010, 2019 and 2020)

Figure 6 illustrates the usage of energy sources in Community-wide greenhouse gas emissions for the years 2010, 2019, and 2020. The Community's electricity consumption increased by

approximately 1% from 2010 to 2019, but decreased by 18% from 2010 to 2020, This decrease in electricity consumption led to a corresponding decrease in CO_2 emissions of 30% over the 10-year period.

Greenhouse gas emissions associated with transportation fuels used by on-road vehicles, public transit, and the planes at the City's local airport have significantly decreased by 50% from 2010 to 2020. There are significant differences in the available data and methodologies used for the 2010 and 2020 transportation calculations. Consequently, comparisons of this sector are limited in their accuracy and value. The 2010 VMT use for transportation GHG emissions were calculated by an FDOT consultant from a trip model data based on census data. Starting in 2019, the City transitioned to using Google EIE as the primary source for transportation-related inputs to its GHG inventory. When considering these two data sources, the analysis reveals a 46% reduction in Vehicle Miles Traveled (VMT) in Fort Lauderdale. However, when relying solely on FDOT countywide VMT data, the analysis indicates a 4% decrease between 2010 and 2020.

Community Indicator & Emissions Metric Trends

As shown in Table 2, City of Fort Lauderdale experienced growth across all community indicators. The city's GDP has increased by 23%, population by 14% and number of housing units by roughly 2%.

Community Indicators	2010 (Baseline)	2020	Percentage Change since 2010
Population	165,521	189,321	+14.378%
GDP	$7,541,928	$9,312,969	+23.48%
Housing Units	93,258	95,057	+1.93%

Table 2. Changes in Community Indicators

While the City of Fort Lauderdale achieved emissions reduction of 37% between 2010 and 2020, metrics comparing emissions to population and economic growth suggest even greater achievements in reducing emissions (see Table 3).

Emissions Metrics	Units	2010 (Baseline)	2020	Percentage Change since 2010
Total emissions per capita	MT CO_2e/resident	13.53	7.4	-45.31%
Total emissions per Gross Domestic Product (GDP)	MT CO_2e/$	0.2970	0.1507	-49.26%
Residential energy consumption per person	MMBTU/person	24.4	17.7	-27.5%
Vehicle Miles Travelled (VMT) per capita	VMT/resident	10,922	5,124	-46.34%

Table 3. Changes in Emissions Metrics

Despite a growing community, GHG emissions have decreased every year since the baseline year (see Figure 7).

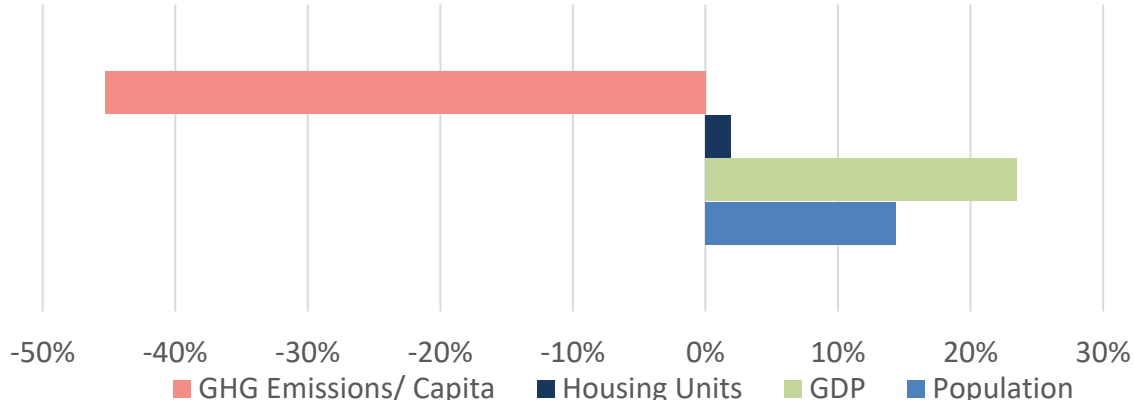
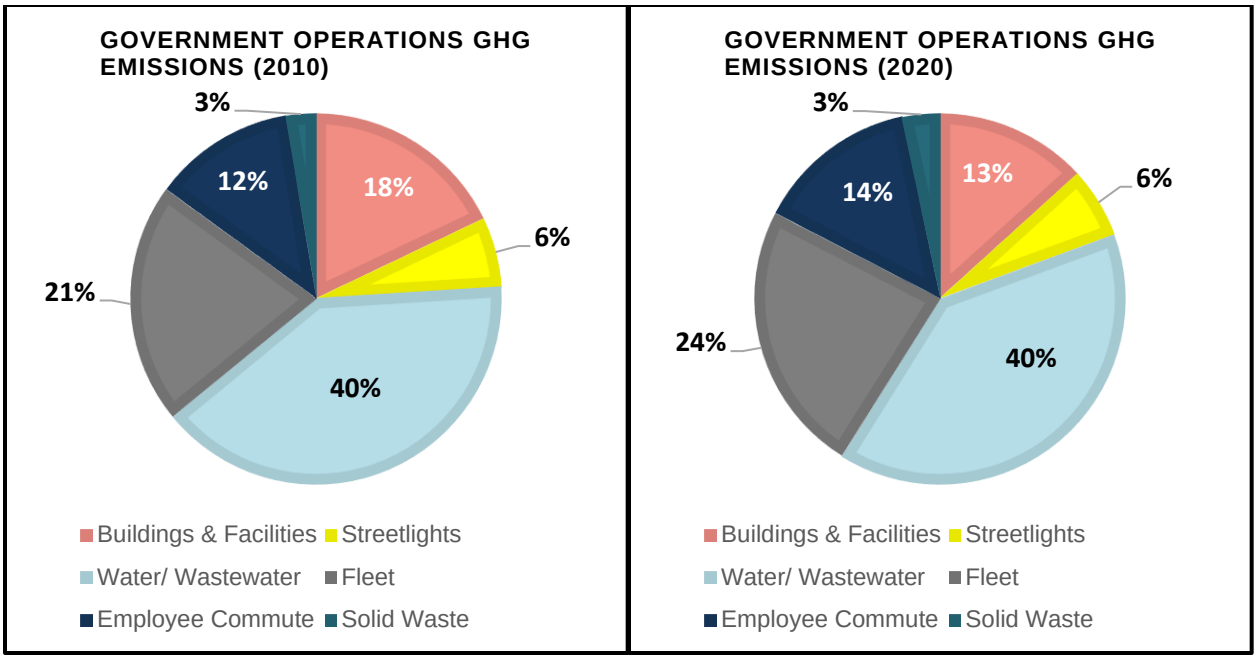


Figure 7: Changes in GHG Emissions and Community Indicators between Calendar Year 2010 and 2020

As shown in Figure 8 and Table 4, overall, City government operations have decreased their respective emissions in all sectors except solid waste and fugitive emissions. The most significant reductions were seen in electricity usage in the City's buildings, water/wastewater system and streetlighting. The reduction in emissions resulted from less greenhouse gas-intensive electricity generation by the City's utility, Florida Power and Light, as well as a decrease in electricity consumption in City operations, despite the increase in the number of electrical accounts used by our buildings and facilities. Throughout the ten-year period, GHG emissions from the City fleet operations showed a reduction in emissions, even with an increasing inventory of vehicles in the City's fleet (15%). Similarly, despite there being increases in estimated average commute distances and the total number of employees, emissions from employee commutes were slightly reduced due to general trends towards more efficient vehicles. The only sector that displayed an increase in emissions was the fugitive emissions. This can be attributed to the increased use of natural gas over the past decade.



Category	CO_2e MT (2010)	CO_2e MT (2020)	Percent Change
Buildings & Facilities	11,092	6,547	-40.98%
Streetlights	3,802	3,051	-19.75%
Water/ Wastewater	24,847	19,583	-21.19%
Fleet	13,002	11,747	-9.65%
Employee Commute	7,661	6,986	-8.81%
Solid Waste	1,633	1,633	0%
Fugitive Emissions	334	404	+20.96
Total	**62,371**	**49,951**	**-20%**

Figure 8: Sector Contribution to Government Operations Greenhouse Gas Emissions as Percentage of Total Emissions (2010 and 2020)

Government Operations Indicators	2010 (Baseline)	2020	Percentage Change since 2010
# of Active Full-Time Employees	2,495	2,698	+8.1%
# Electrical Accounts used by our Buildings and Facilities	254	298	+17.3%
Number of Fleet Vehicles	1,546	1,776	+14.9%
Employee Commute VMT	18,372,575	18,513,295	+0.76%

Table 4. Changes in Community Indicators

Key Findings

City-wide Overall Findings

- Electricity and natural gas usage in residential, commercial, and industrial buildings sectors account for 54.4% of citywide emissions.
- City-wide GHG emissions (in MT CO_2e), have decreased from approximately 2.2 million in 2010 to 1.4 million in 2020 (37% decrease).
- Per capita emissions have declined from 13.53 MT CO_2e per person in 2010 to 7.4 MT CO_2e per person in 2020.
- Energy (primarily from electricity) and transportation emissions contribute to 94.2% of the total emissions, while solid waste and fugitive emissions contribute to roughly 5.8%.

Electricity

- Electricity consumption represents 51 percent of City-wide GHG emissions. The commercial sector is the largest consumer of electricity, followed closely by residential, with industrial consumption comparatively lower.
- Despite a 37% increase in City-wide electricity consumption (kWh) from 2010 to 2020, GHG emissions from the residential and commercial sectors have decreased by 33%, indicating an overall improvement in energy efficiency.
- This is particularly noteworthy given the 14% population increase during the same period.
- Over the 10-year period, the industrial sector stood out as the sole sector in which CO_2e emissions increased.

Natural Gas

- Natural gas supplied to residential, commercial, and industrial sectors is low in comparison to energy provided by electricity production.
- Natural gas consumption has increased 36%, with a per capita rise of 18%. These figures align with historical data on Florida natural gas consumption per capita, which displayed a 20% increase since 2010.
- Notably, in Fort Lauderdale, the combined energy consumption of natural gas and fugitive emissions resulting from natural gas leaks has shown a significant 41% increase

from 2010 to 2020. It's worth noting that GHG emissions from these fugitive natural gas leaks account for less than 0.2 percent of the total emissions.

Water/wastewater

- The City of Fort Lauderdale is responsible for supplying clean water and treating wastewater to the City and some of its neighbors. These activities require a significant amount of energy, and most (99%) of the associated greenhouse gas (GHG) emissions come from electricity usage.
- Nitrous oxide (N_2O) emissions from George T. Lohmeyer Regional wastewater treatment Plant represent less than one percent of the total GHG emissions Citywide.

Transportation

- Transportation, which includes on-road vehicle miles traveled and emissions from aviation at the City's Executive Airport (FXE), accounts for 35.6% of citywide emissions.
- On-road transportation from automobiles and public transit is the primary source of GHG emissions in the City. In 2020, they accounted for 83% of transportation-related emissions.
- Emissions from aviation transportation at the Fort Lauderdale Executive Airport (FXE) decreased by 5% from 2010 to 2020.

Solid Waste

- Solid waste comprises 5.3 percent of city-wide GHG emissions which is small compared to energy and transportation emissions.
- The majority of non-diverted waste collected in the City is combusted at the Wheelabrator Broward waste-to-energy facilities.
- Over the 10-year period, CO_2e from the combustion of solid waste generated by the community and the treatment of yard waste have increased by 37%.

Fugitive Emissions

- Data on fugitive emissions from natural gas was not calculated in the original 2010 baseline assessment and required retroactively implementing with the limited data available.

- GHG emissions from fugitive emissions have experienced a significant increase of 97% between the years 2010 and 2020. This surge can be attributed to increased use of natural gas over the last decade. Rising trends in total natural gas consumption are consistent with state data obtained from the U.S. Energy Information Administration.

Government Operations Overall Findings

- Total emissions from government operations are 49,951 MT CO_2e.
- By category, over half of government emissions are from the operation of water and wastewater treatment plants (40 percent) followed by vehicle fleet (23.5 percent); buildings, facilities; and streetlights (19.2 percent); and employee commute (14 percent).

Electricity in Buildings and Facilities

- Electricity emissions account for 13.5 percent of government operation GHG emissions.
- The most energy intense uses are at the City's water treatment plants (Charles W. Fiveash and Walter E. Peele Dixie) and wastewater treatment plant (George T. Lohmeyer). To provide context, in CY2020, these water and wastewater plants including their associated supporting infrastructure such lift stations, wells, and pumps comprised over 67% of the City's total annual energy consumption.
- The largest opportunity to reduce GHG emissions is in the water and wastewater operations.

Natural Gas in Buildings and Facilities

- Natural gas is used at 21 of the City facilities. Operations of these facilities account for less than 0.3 percent of total GHG government operation emissions.
- By building, Riverland Park was the highest natural gas consumer, followed by Croissant Park Community Center.

Streetlights

- GHG emissions from streetlights account for 6.1% of total government operations.
- Overall, streetlights CO_2e decreased by 19.75% within this timeframe.

Water/wastewater

- Water/wastewater accounted for 39.2% of the government operations GHG emissions.

- The City of Fort Lauderdale is responsible for supplying clean water and treating wastewater within City limits and to some neighboring communities. These activities are energy intensive, with most GHG emissions coming from electricity.
- From 2010 to 2020, the GHG emissions from this sector decreased by 21%.

Fleet

- Fuel sources of the City's Fleet are primarily from gasoline and diesel.
- The number of fleet vehicles increased by +14.9% during calendar year 2010 and 2020 while fleet GHG emissions decreased over the same period.

Employee Commute

- Employee Commute VMT increased by +0.76% since 2010.
- CO_2 emissions decreased by 8.81% due to more efficient vehicles on the road.

Solid Waste

- *The solid waste sector accounted for 3% of total City operation emissions.*

Fugitive Emissions

- Refrigerant emissions in 2020 were associated with hydrofluorocarbon gas types R134a and R1234 for On/Off Road fleet vehicles. Whereas in 2010, the refrigerant types that were utilized included R410a and R134a.
- Fugitive emissions from natural gas distribution were accounted for both the 2010 and 2020 GHG inventory reports.
- Overall, a 21% increase in fugitive emissions can be attributed to the increase in natural gas usage and the economic advantages and affordability of natural gas.

Discussion of Data Observations

In 2020, Fort Lauderdale's citywide GHG emissions totaled 1,403,732 MT CO_2e compared to 2,239,739 MT CO_2e in 2010, indicating a 37% decline in emissions. The reductions seen in the year 2020 were driven by many factors. This substantially exceeded the City's 2020 goals, but the results were in part an anomaly due to methodological improvements in the inventory calculations and changes in patterns of GHG-emitting activities because of the COVID-19 pandemic. The most significant factors that contributed to these GHG reductions in the City have been driven by the factors listed below:

- **Impacts of COVID-19 Pandemic:**

The start of the COVID-19 pandemic in 2020 dramatically shifted behavior patterns related to work and home life across the globe. These behavior changes had a direct correlation with changes in GHG emitting activities, as people spent more time at home, less time at work, drove less, and generated more residential solid waste. This is most noticeable in a 35% drop in GHG emissions from on-road vehicles between 2019 and 2020. In 2021, most people resumed more typical activity patterns and GHG emissions associated with on-road vehicles miles traveled returning to 90% of 2019 levels. However, there may be some lasting impacts of the pandemic on GHG emissions, as remote work is likely to remain a larger part of the workplace than existed pre-COVID, contributing to reductions in transportation emissions as fewer people commute to work daily.

- **Citywide Methodological Improvements:**

The City's GHG inventory methodology has evolved substantially between 2010 and 2020. Most notably, there are significant differences in the available data and methodologies used for the 2010 and 2020 transportation calculations. Consequently, comparisons of this sector are limited in their accuracy and value. The 2010 VMT used for transportation GHG emissions was derived from trip model data based on census data prepared by an FDOT consultant. Starting in 2019, the City transitioned to using Google EIE as the primary source for transportation-related inputs to its GHG inventory. When considering these two data sources, the analysis reveals a 46% reduction in Vehicle Miles Traveled (VMT) in Fort Lauderdale. However, FDOT countywide VMT data indicates a 4% decrease during the same time period.

- **Citywide and Government Operations: Transitioning to Cleaner Energy Generation from the Electrical Utility:**

The City of Fort Lauderdale receives all its electricity from Florida Power and Light (FPL), the primary electrical utility serving the region. Over the years, FPL has made significant improvements to reduce its CO_2 emissions factor, which represents the amount of CO_2 emitted per unit of electricity generated. Since 2010, FPL has achieved a 21% reduction in its CO_2 emissions factor. This reduction can be attributed to its increased usage of renewable energy resources and a decrease in fossil fuel usage. Additionally, the utility has committed to reach net-zero emissions by 2045.

- **Citywide Reduction in Electricity Consumption:**

The City has also reduced GHG emissions from energy consumption in both the residential and commercial sectors. This accomplishment can be attributed to a range of factors. Notably, state building codes have increased energy efficiency requirements over the years; the City has encouraged denser, mixed-use developments; and the City has actively supported initiatives such as the Solar United Neighbors Broward CO-OP and Property Assessed Clean Energy (PACE) program. A few examples of changes to the state building code that have improved energy

efficiency include: Every three years, the Florida Building Code (FBC) undergoes updates from both the electrical and mechanical perspectives. These revisions are necessary to align with the latest technological advancements and equipment improvements, particularly in terms of energy efficiency. Within the FBC, there exists a dedicated chapter called Energy Conservation (EC), which focuses on enhancing energy efficiency. Over the past decade, several noteworthy changes have occurred in the requirements of this section including the following: The following list highlights the more significant requirements:

- Increased requirements for LED lighting. Not less than 90% of the lamps in permanently installed luminaires shall have an efficacy of at least 45 lumens-per-watt or shall utilize lamps with an efficacy of not less than 65 lumens-per-watt.
- More efficient air conditioning systems: The FBC has introduced higher efficiency requirements for the condenser units located outside. This ensures that air conditioning systems are more energy-efficient and contribute to overall energy conservation.
- Lighting harvester sensors: The FBC includes requirements for lighting harvester sensors, which measure the amount of natural lighting entering an interior area. These sensors enable a reduction in artificial lighting levels, accordingly, optimizing energy consumption.
- Occupant sensors: Occupant sensors have been incorporated into various areas to detect periods of inactivity. When no movement is detected over a certain period, these sensors automatically reduce or eliminate lighting in unoccupied spaces, leading to energy savings.
- Lighting control systems in commercial areas: The FBC mandates the use of lighting control systems in commercial spaces, which reduce or eliminate lighting when businesses are closed. This restriction is in line with the EC volume and the National Electrical Code (NEC), which limit the amount of energy used for illumination based on occupancy and necessity.
- Key card activation in hotel guest rooms: Hotels now require a key card to be inserted into a pad in guest rooms, confirming occupancy and allowing lighting and air conditioning to function. This measure ensures energy is not wasted in unoccupied rooms.
- Optimal thermostat placement: Thermostats are now mounted at 5 feet, which is the comfort zone height in a dwelling. This eliminates the need to provide 72-degree conditioned air at the ceiling, reducing energy consumption.
- Gasketed or sealed openings: The EC volume now mandates that openings in ceilings and walls be gasketed or sealed to prevent conditioned air from entering

unconditioned spaces. For example, gaskets are used to eliminate conditioned air leakage caused by recessed lights in ceilings, leading to enhanced energy efficiency.

- Efficiency requirements for transformers and motors: Industrial settings now have stricter requirements for transformers and motors, which must operate at a more efficient level. This ensures that energy is not wasted during their operation.
- Increased insulation requirements: The FBC has raised the insulation requirements for habitable areas in dwellings. This improvement helps reduce the workload on HVAC systems, promoting energy conservation.

In addition, the City of Fort Lauderdale Community Redevelopment Agency (CRA) offers the Property and Business Improvement Program (PBIP) which encourages green building features. The objective of this program is to eliminate slum and blight, remove deterioration, retrofitting and rehabilitation of structures to remove undesirable uses, improve the "energy efficiency" of existing buildings in the CRA, or renovations designed to bring the structure into compliance with the current building codes.

- **Citywide Reduction in On-Road Transportation Emissions:**

On-road transportation emissions have declined by 55% since 2010. This is attributed in part to the use of more efficient vehicles, including an increase in electric vehicles. However, it is important to note that the methodology for on-road transportation has changed substantially since the 2010 baseline emissions were calculated, as mentioned above in the discussion of methodology changes. Additionally, transportation emissions in 2020 were likely atypically low due to COVID-19 pandemic related changes in GHG-emitting behaviors, particularly reductions in vehicle miles travelled as people stayed home more and commuted to work less. There is likely to be a rebound effect in subsequent years as travel activities approach pre-COVID levels.

Government Operations

Since 2010, the greenhouse gas emissions in City operations have decreased by 20%. These reductions in emissions can be attributed to cleaner energy generation by the electric utility, decreased electricity usage at City facilities, and reduced vehicle fuel usage despite increasing the number of vehicles in the fleet. Noteworthy initiatives contributing to these emissions reductions include:

- **Government Operations: Achieving Energy Use Reductions in Government Buildings and Facilities:**

From 2010-2020, City government buildings and facilities (excluding water/ wastewater treatment facilities) achieved a 26% decrease in kWh usage. The City of Fort Lauderdale's Comprehensive Plan Policy CC 2.2.1a addresses more resilient construction practices in all new building construction of city-owned facilities "The City shall incorporate design and operational policies and options where feasible to ensure city owned facilities are net-zero buildings." To achieve this objective, the City has implemented multiple initiatives focused on maximizing

energy efficiency. These include energy performance contracting, which allows for targeted improvements in energy usage and cost savings, as well as development of a Building Energy Efficiency Plan and the installation of efficiency retrofits. The next line items explain this more in detail.

- Under the Energy Performance Contracting model, the City worked with Honeywell to install energy efficiency measures at the TAM Administration Building, City Park Garage, and Fleet Fenceline as well as to convert some streetlights to LED.
- The City of Fort Lauderdale Sustainability Division, with support from the United States Department of Energy technical consultant, Alleghany Science and Technology, underwent a review of targeted buildings for efficiency investment opportunities and developed the Building Energy Efficiency Plan (BEEP) to identify key strategies for energy efficiency and cost reductions. In 2020 the BEEP was finalized.
- The City's Sustainability Division piloted installation of programmable thermostats at a select buildings. These thermostats allow energy savings through better control of set points during occupied periods and automated changes to higher set points during unoccupied times. Since 2017, the City has installed 70 programmable thermostats in its facilities over three phases. Additionally, the City has achieved the energy saving goals that were established in partnership with the Department of Energy Better Buildings Challenge.

- **Government Operations: Decreasing Emissions in the Water/ Wastewater Sector**

Currently, the City's water treatment plants (Charles W. Fiveash and Walter E. Peele Dixie) and wastewater treatment plant (George T. Lohmeyer (GTL)) are the City's most energy-intensive facilities. In 2020, these plants, along with their supporting infrastructure such as lift stations, wells, and pumps, accounted for more than 67% of the City's total annual electricity consumption. To address this significant energy usage, several retrofits have been implemented to optimize operations and reduce consumption. For instance, variable frequency drives have been installed for the large motors used in pumping, allowing for more efficient energy usage. Analysis of waterwater inflow and energy usage has shown that GTL has become more energy efficient per unit of water treated. However, increasing demand has increased energy usage at GTL.

- **Government Operations: Enhancing Fleet Fuel Efficiency and Emissions Reductions**

The City of Fort Lauderdale has established a fuel reduction goal of 10% by 2024, based on a 2018 baseline. To achieve this target, the City has implemented several measures aimed at reducing fossil fuel use. These initiatives include implementing anti-idling measures, optimizing the size of the City fleet, conducting fuel consumption analysis to compare existing and proposed vehicles for maximum efficiency, regularly auditing the fleet to identify underutilized vehicles and equipment, procuring hybrid vehicles and equipment, and purchasing Ultra Low Emission

Vehicles (ULEV). According to the findings of this GHG emissions report, the City has made significant progress in fuel reduction and emissions mitigation. Between 2010 and 2020, total fuel consumption has decreased by 8%, while CO_2e emissions have been reduced by 10% despite a substantial increase in the total number of vehicles in the fleet.

- **Government Operations: Employee Commute Vehicle Miles Traveled Reductions**

Between 2010 and 2020, there was a slight decrease of 0.7% in the total number of commute miles driven by active employees. Furthermore, there have been changes in the distribution of vehicle types and improved fuel efficiencies, resulting in a more efficient commute. As a result, the City has reduced GHG emissions from this sector by 8%. However, it should be acknowledged that these calculations do not account for the impact of the temporary shift to remote work during the pandemic.

- **Government Operations: Unaltered Emissions from Municipal Solid Waste**

Given the constraints of limited data sources, a methodology was recently introduced to calculate emissions derived from waste generated by our facilities based on volume of dumpsters used and frequency of pickups. To ensure consistency, this methodology was retrospectively applied to previous years, including the period from 2010 to 2020. However, due to limited data, it was assumed that the usage was the same in 2010 as 2020. As a result, the reported yard waste and solid waste tonnage inputs for this timeframe remained unchanged.

Appendix

Methodology

The 2020 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, scope, etcetera. The GHG emissions report for 2020 encompasses scope 1, 2, and a limited subset of scope 3 emissions. Scopes 1 and 2 represent direct and indirect emissions that occur within the organizational boundary of the GHG inventory and are under the operational control of the municipal government of the City of Fort Lauderdale. Although the City does not have operational control over them, select scope 3 emissions were included in both the community and government operations inventory. The reported emissions in this inventory consist of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and various fluorinated gases, such as hydrofluorocarbons.

To compute emissions resulting from the use of grid electricity use in various sectors including residential, commercial, industrial, municipal buildings, streetlights and water/wastewater treatment plants, monthly data reports from Florida Power & Light (FPL), the City's utility, were utilized. For electricity-related emissions from the (FPL) utility, emissions factors are necessary for GHG calculations and can vary from year to year based on changes in fuel composition used by the utility. Electricity emissions factors were obtained from the Florida Power and Light (FPL) and the US Environmental Protection Agency. Starting in 2020, FPL began reporting its emissions factors to the Edison Electric Institute (EEI), as did many other US based electric utilities. The EEI reports include two types of emissions factors, the Utility Average Emissions Rate (UAER) and the

Utility Specific Residual Mix Emissions Rate (USRMER). Historically, FPL has reported only the UAER which is the emissions rate regardless of any sold environmental attributes. The USRMER refers to the emissions factors which exclude the contribution of environmental attributes sold to third parties, such as those in the SolarTogether program. The USRMER is the more appropriate measure of emissions factors for use in the City's GHG inventory but is only available starting in 2020. For the 2020 emissions factors the USRMER is 2.7% higher than the UAER. In 2010, the USRMER is unknown but the percent difference likely would have been smaller than the 2020 difference as fewer environmental attributes if any were sold then. For the purposes of the City's GHG inventory the USRMER is used starting in 2020 but the UAER is used for prior years.

ICLEI *Clearpath* recommended the Google Environmental Insights Explorer (EIE) platform as an accurate and reliable tool to calculate on road transportation emissions and was utilized for the 2019 and 2020 inventory. The distribution of vehicle types for each fuel type, gasoline and diesel, was incorporated based on analysis of FDOT's 2020 county vehicle distribution volumes on ten of the busiest roads within Fort Lauderdale. The fuel distribution was estimated for vehicle types was estimated by percentages of for each vehicle class from the national default vehicle type and fuel mix. 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 suggested implemented methodology for aviation emissions 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.

For government operations, emissions from mobile combustion were quantified using the Green Fleet Awards applications submitted by the City's Fleet Services Program. The application provided details including the total number of fleet vehicles, fuel consumption per fuel type, and vehicle miles traveled (VMT). Emissions resulting from employee commutes were calculated based on the total employee VMT and average fuel economy. To estimate the employee commute distances, a database of active employee zip codes was utilized, and the fastest distance from each zip code to Fort Lauderdale City Hall was determined using Google Maps. It was assumed that 85% of employees drive for 240 days per year. The vehicle classification was determined by referencing the Florida Department of Transportation's Annual Vehicle Classification percentages for different vehicle types, along with volumes from 10 of the City's major roadways. The revised breakdown of vehicles includes 86.42% passenger cars and 13.57% light trucks. The remaining 15% of employees were assumed to commute using modes with negligible GHG emissions impact, such as bicycles or walking. For accurate calculation, employee zip codes with distances greater than 90 miles from City Hall were excluded, as they were considered erroneous and not representative of actual commute distances. Inactive employees

were also excluded, as the zip codes in the database were less likely to reflect their residence during the year of interest and may indicate relocation since that time.

To comply with the U.S. Community Protocol recommendations for wastewater treatment process emissions, N_2O and water/wastewater kWh usage were incorporated in both government operations and the community inventory reports. In the community inventory, the GHG emissions from electricity, which are previously attributed to the commercial sector, were specifically allocated to the Water/wastewater sector. This allocation was performed using the internal energy database developed by staff, which helped identify the relevant accounts for accurate reporting. To calculate N_2O emissions from Wastewater Treatment, servicing population data was retrieved by our Public Works department. 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 excluded from the GHG inventory report.

Two calculators were utilized to approximate emissions from solid waste. The first calculator focused on estimating the combustion of solid waste generated by the community which 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. The second calculator estimated emissions resulting from the biological treatment of solid waste, specifically composting. Inputs for this calculator solely comprised yard waste and were obtained from the internal metrics tracking of the Solid Waste and Recycling Program. This only reflects yard waste collected by the City and not by private haulers because of the difficulty of tracking such data. It is worth mentioning that the emissions associated with solid waste were exclusively included in the community's GHG emissions report because data was not available for solid waste generated specifically by City operations.

The calculation of community fugitive emissions from natural gas distribution relied on data provided by the 2020 TECO Community Energy Report. In the case of government operations, fugitive emissions resulting from natural gas distribution to government-owned and operated facilities were accounted for, in addition to hydrofluorocarbon and refrigerant emissions, which encompass gas types R134a and R1234.

Acknowledgements

Developing this GHG inventory as well as refining the original 2010 GHG emissions inventory to the same methodology was conducted by the staff of the City of Fort Lauderdale's by the Sustainability and Climate Resilience Program in the Sustainability Division of the Public Works Department with assistance in data sourcing from the following:

- Florida Power & Light
- Google Environmental Insights Explorer
- Bureau of Economic Analysis
- Bureau of Economic and Business Research (BEBR)
- Florida Department of Transportation (FDOT)
- City of Fort Lauderdale (FTL) Human Resources Department
- FTL Public Works Department, Sustainability Division, Fleet Services Program
- FTL Public Works Department, Sustainability Division, Environmental and Regulatory Affairs
- FTL Public Works Department, Sustainability Division, Solid Waste & Recycling Program
- City of Fort Lauderdale (FTL) Development Services Department
- FTL Strategic Communications
- TECO Energy
- ICLEI USA
- U.S. Census Bureau
- U.S. Energy Information Administration