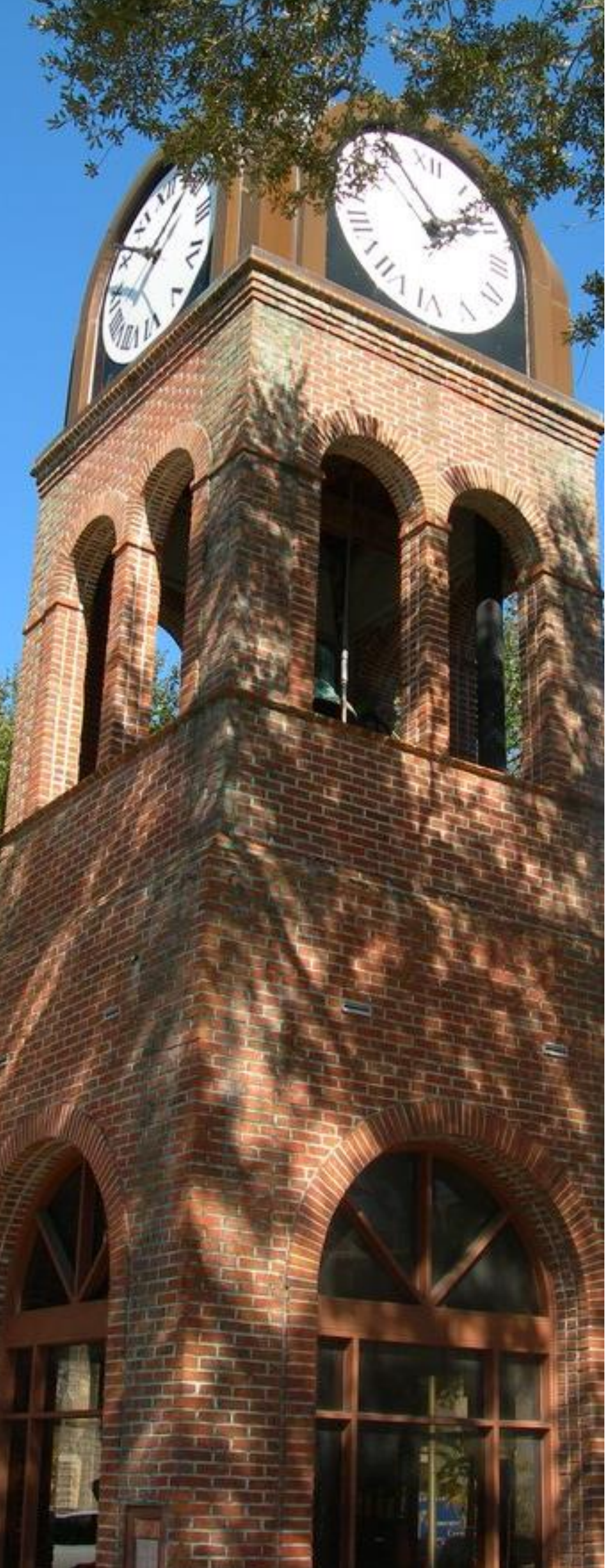

City of Gainesville, FL

2019 Inventory of Community and Government Operations Greenhouse Gas Emissions

August, 2021

Produced by ICLEI - Local Governments for Sustainability USA

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Table of Contents

List of Figures

List of Tables

Executive Summary

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

In November 2019, Gainesville City Commission passed a climate emergency resolution and requested that staff create a carbon emissions dashboard to monitor progress. With several strategic initiatives underway, the city seeks to develop a baseline inventory of greenhouse gas (GHG) emissions to quantify the impact of these actions. Post inventory completion, the City will be well positioned to quantify mitigation targets and model strategies to achieve its goals.

This report provides estimates of greenhouse gas emissions resulting from activities in Gainesville as a whole in 2019 as well as emissions specifically from the City's government operations.

Key Findings

Figure 1 shows community-wide emissions by sector. The largest contributor is Transportation & Mobile Sources with 34% of emissions. The next largest contributors are Commercial Energy (28%) and Industrial Energy (21%). Actions to reduce emissions in all of these sectors will be a key part of a climate action plan. Solid Waste, Residential Energy, Water & Wastewater, Process/Fugitive Emissions and were responsible for the remaining 16% of emissions.

Figure 2 shows local government operations emissions. The Electric Power Production sector accounts for a vast majority (91%) of these emissions. The next largest contributor is Buildings & Facilities (4%), followed by employee commute (2%). Actions to reduce emissions from these sectors will be a key part of any future climate action plan developed by Gainesville. Water and Wastewater Facilities, Street Lights & Traffic Signals, Vehicle/Transit Fleets, Solid Waste Generation, and Fugitive emissions were responsible for the remainder (3%) of local government operations emissions.

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

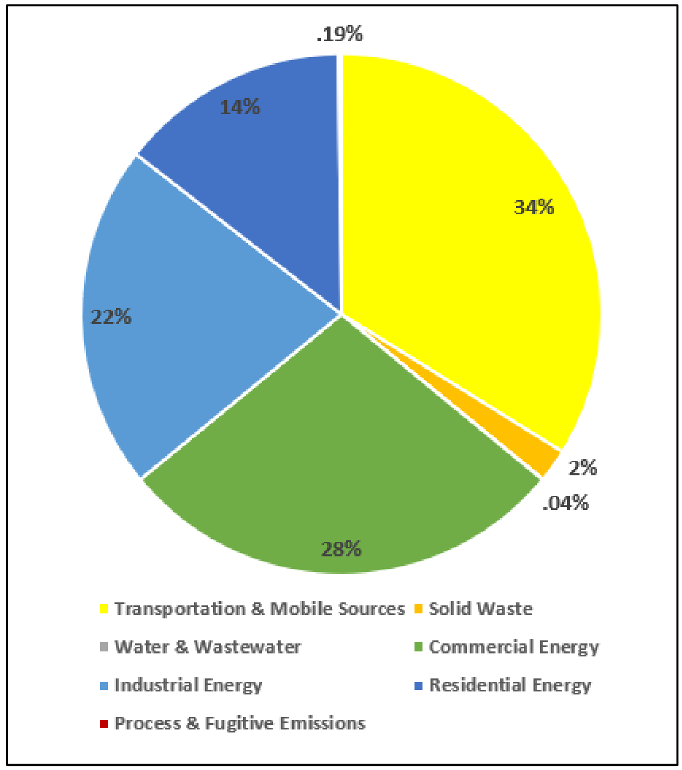

Figure 1. Community-Wide Emissions by Sector

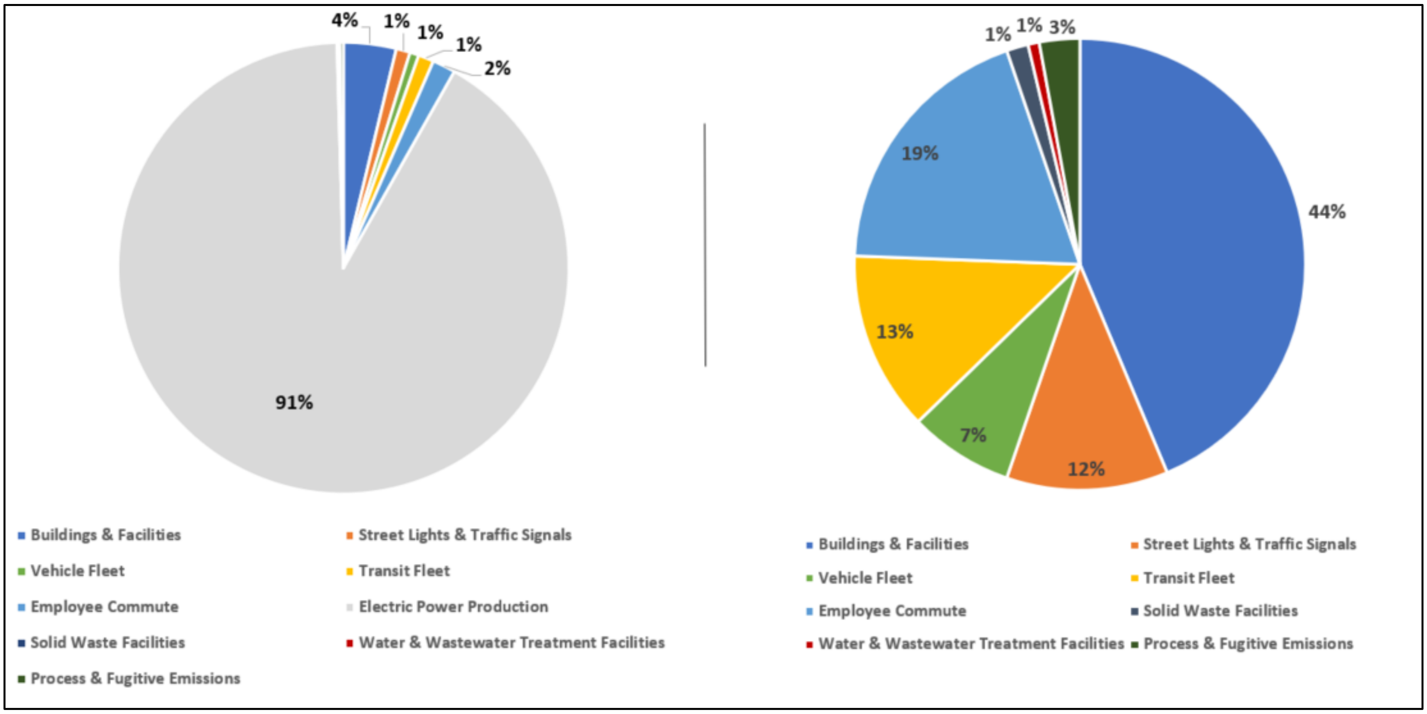

Figure 2. Local Government Operations Emissions by Sector **(right chart omits Electric Power Production emissions)**

Introduction to Climate Change

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence shows that human activities are increasing the concentration of greenhouse gases and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise. Global climate change influences seasonal patterns and intensifies weather events, threatening the safety, quality of life, and economic prosperity of communities everywhere[1]. Many regions are already experiencing the consequences of global climate change, and Gainesville is no exception.

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

[1] International Panel on Climate Change. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp. Retrieved from https://www.ipcc.ch/report/ar5/syr/

[2] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R.

According to the 2018 Fourth National Climate Assessment, the southeast U.S. will experience potentially devastating impacts from seasonal changes and hazards occurring at unprecedented magnitudes. Inland communities in the Southeast have experienced more extreme rainfall events. These extreme rainfall events are projected to increase in frequency and intensity, causing impacts on the local economy, vulnerable industries, and vulnerable populations. For example, since 2014, multiple 500-year rainfall events (events expected to only occur once every 500 years) have occurred, causing billions of dollars in property damage and loss of life[3]. This increase in extreme weather events will also have a vast impact on crucial infrastructure, such as roads, rail lines, and water infrastrucutre[3].

While Floridians are acclimated to heat, rising temperatures are projected to affect all populations, especially vulnerable populations, like the elderly and outdoor workers. In the case of labor productivity, by the end of the century, Heat-related impacts in the Southeast will represent a third of all national projected productivity loses[3].

Many communities in the United States have started to take responsibility for addressing climate change at the local level. Reducing fossil fuel use in the community can have many benefits in addition to reducing greenhouse gas emissions. More efficient use of energy decreases utility and transportation costs for residents and businesses. Retrofitting homes and businesses to be more efficient creates local jobs. In addition, money not spent on energy is more likely to be spent a local businesses and add to the local economy. Reducing fossil fuel use improves air quality, and increasing opportunities for walking and bicycling improves residents' health.

Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

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

Greenhouse Gas Inventory as a Step Toward Carbon Neutrality

Facing the climate crisis requires the concerted efforts of local governments and their partners, which are closest to their community members and are dealing with the impacts of climate change.

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

To complete this inventory, ICLEI utilized its own tools and guidelines, which provide authoritative direction for greenhouse gas emissions accounting and defines climate neutrality as follows:

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

To achieve ambitious emissions reduction, and more toward climate neutrality, Gainesville will need to set a clear goal and advance rapidly following a holistic and integrated approach. The opportunity for our community is that climate action can also lead to a wide range of co-benefits, such as by creating socio-economic opportunities, reducing poverty and inequality, and improving the health of people and nature.

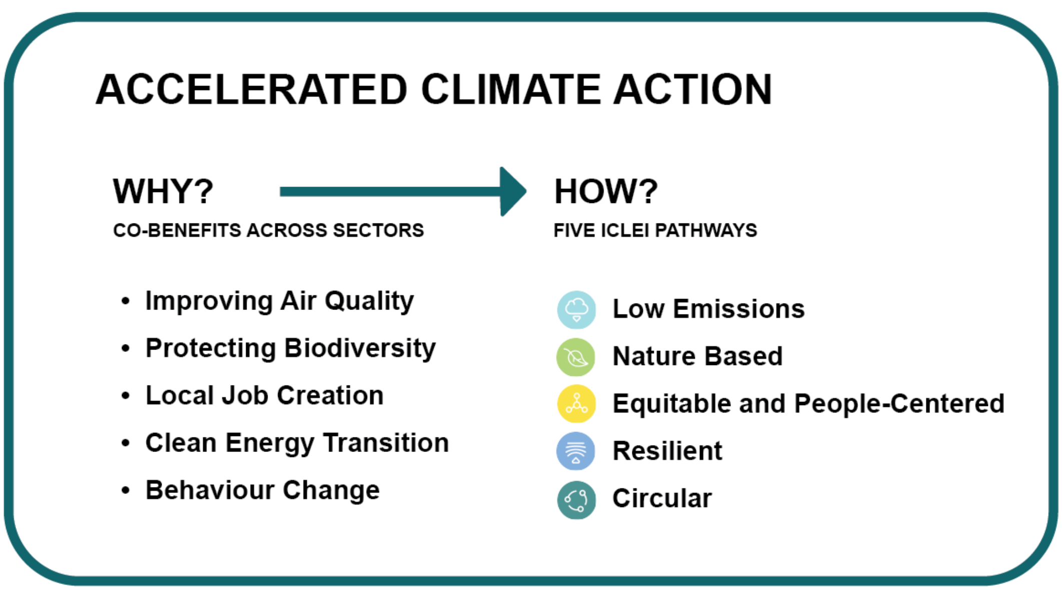

Figure 3- The How & Why of Accelerated Climate Action

ICLEI Climate Mitigation Milestones

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

ICLEI provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions, organized along Five Milestones, also shown in Figure 4:

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

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

Figure 4- ICLEI Climate Mitigation Milestones

[4] Science-Based Targets are calculated climate goals, in line with the latest climate science, that represent your community's fair share of the ambition necessary to meet the Paris Agreement commitment of keeping warming below 1.5°C. To achieve this goal, the Intergovernmental Panel on Climate Change (IPCC) states that we must reduce global emissions by 50% by 2030 and achieve climate neutrality by 2050. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations reduce their emissions by more than 50%.

Inventory Methodology

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline emissions levels and sources and activities generating emissions in the community. This report presents emissions from both the Gainesville community as a whole, and from operations of the Gainesville government. The government operations inventory is mostly a subset of the community inventory, as shown in Figure 5. For example, data on commercial energy use by the community includes energy consumed by municipal buildings, and community vehicle-miles-traveled estimates include miles driven by municipal fleet vehicles.

Figure 5- Relationship of Community and Governme Operations Inventories

As local governments have continued to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential. This inventory uses the approach and methods provided by the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Community Protocol) and the Local Government Operations Protocol for Accounting and Reporting Greenhouse Gas Emissions (LGO Protocol), both of which are described below.

Three greenhouse gases are included in this inventory: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Many of the charts in this report represent emissions in "carbon dioxide equivalent" (CO_2e) values, calculated using the Global Warming Potentials (GWP) for methane and nitrous oxide from the [IPCC 5th Assessment Report]:

Table 1- Global Warming Potential Values (IPCC, 2014)

Greenhouse Gas	Global Warming Potential (Heat Trapping Ability compared to CO_2)
Carbon Dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous Oxide (N_2O)	265

Community Emissions Protocol

Version 1.2 of the U.S. Community Protocol for Accounting and Reporting GHG Emissions[5] was released by ICLEI in 2019, and represents a national standard in guidance to help U.S. local governments develop effective community GHG emissions inventories. It establishes reporting requirements for all community GHG emissions inventories, provides detailed accounting guidance for quantifying GHG emissions associated with a range of emission sources and community activities, and provides a number of optional reporting frameworks to help local governments customize their community GHG emissions inventory reports based on their local goals and capacities.

The community inventory in this report includes emissions from the five Basic Emissions Generating Activities required by the Community Protocol. These activities are:

- Use of electricity by the community
- Use of fuel in residential, commercial, and industrial stationary combustion equipment
- On-road passenger and freight motor vehicle travel
- Use of energy in potable water and wastewater treatment and distribution
- Generation of solid waste by the community

The community inventory also includes the following activities:

- Aviation travel
- Off-road transportation travel /mobile sources activity
- Freight Rail travel
- Landfill gas Flaring
- Wastewater processing
- Fugitive emissions from natural gas leakage

Local Government Operations Protocol

In 2010, ICLEI, the California Air Resources Board (CARB), and the California Climate Action Registry (CCAR) released Version 1.1 of the LGO Protocol.[6] The LGO Protocol serves as the national standard for quantifying and reporting greenhouse emissions from local government operations. The purpose of the LGO Protocol is to provide the principles, approach, methodology, and procedures needed to develop a local government operations greenhouse gas emissions inventory.

The following activities are included in the LGO inventory:

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[5] ICLEI. 2012. US Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Retrieved from http://www.icleiusa.org/tools/ghg-protocol/community-protocol

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

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

- Electricity and natural gas consumption from City buildings & facilities
- Electricity consumption from street lights and traffic signals
- Vehicle fleet fuel consumption
- Employee commute
- Power Production
- Waste generation
- Green Waste Composting
- Wastewater processing
- Fugitive emissions from natural gas leakage

Quantifying Greenhouse Gas Emissions

Sources and Activities

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

By reporting on both GHG emissions sources and activities, local governments can develop and promote a deeper understanding of GHG emissions associated with their communities. A purely source-based emissions inventory could be summed to estimate total emissions released within the community's jurisdictional boundary. In contrast, a purely activity-based emissions inventory could provide perspective on the efficiency of the community, even when the associated emissions occur outside the jurisdictional boundary. The division of emissions into sources and activities replaces the scopes framework that is used in government operations inventories, but that does not have a clear definition for application to community inventories.

Base Year

The inventory process requires the selection of a base year with which to compare current emissions. Gainesville's community greenhouse gas emissions inventory utilizes 2019 as its baseline year, because it is the most recent year for which the necessary data are available.

Quantification Methods

Greenhouse gas emissions can be quantified in two ways:

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

factors. To calculate emissions accordingly, the basic equation below is used:

Activity Data x Emission Factor = Emissions

Most emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see appendices for a detailed listing of the activity data used in composing this inventory.

Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs. CO_2/kWh of electricity). For this inventory, calculations were made using ICLEI's ClearPath tool.

Community Emissions Inventory Results

The total communitywide emissions for the 2019 inventory are shown in Table 2.

Table 2- Communitywide Emissions Inventory

Sector	Fuel or source	2019 Usage	Usage unit	2019 Emissions ($MTCO_2e$)
Residential energy	Electricity	538,045,440	kWh	278,064
	Natural Gas	4,006,267	Therms	21,308
	Propane	22,614	Gallons	132
	Kerosene	4,903	MMBtu	371
Residential energy total				**299,875**
Commercial energy	Electricity	1,111,559,392	kWh	557,743
	Natural gas	6,078,855	Therms	32,331
Commercial energy total				**590,074**
Industrial energy	Electricity	157,717,120	kWh	81,509
	Natural gas	12,644,209	Therms	67,109
	Distillate Fuel Oil No. 2	49,584	Gallons	507
	Various Fuels for Power Generation	-	-	301,273
Industrial energy total				**450,398**
On-road transportation	Gasoline	1,057,085,177	Vehicle Miles Traveled (VMT)	435,554
	Diesel	108,508,743	Vehicle Miles Traveled (VMT)	159,750

Public Transit	Diesel	996,038	Gallons	10,171
	Gasoline	107,944	Gallons	951
Aviation	Jet A (Jet Kerosene)	3,826,419	Gallons	37,433
	Aviation Gasoline	152,802	Gallons	1,274
Off-Road	Diesel	-	-	37,759
	Gasoline	-	-	24,731
	Other Fuels	-	-	2,791
Freight Rail	Diesel	16,814	Gallons	173
Transportation total				**710,587**
Solid Waste	Waste Generated	149,146	Tons	42,886
	Landfill Gas Flaring	70,202	Cubic Feet/Day	78
	Compost	1,916	Tons	133
Solid waste total				**43,097**
Water and wastewater	Wastewater Treatment Process	223,000	Service Population	517
	Effluent Discharge	453	Daily Nitrogen Load	344
Water and wastewater total				**861**
Process & Fugitive Emissions	Fugitive Emissions From Natural Gas Distribution (GRU)	14,965,995	Therms	2,597
	Fugitive Emissions From Natural Gas Distribution (University of Florida)	7,763,336	Therms	1,347
Fugitive total				**3,944**
Total Community-wide Emissions				**2,098,836**

Figure 6 shows the distribution of communitywide emissions by sector. Transportation is the largest contributor, followed Commercial Energy and Industrial Energy.

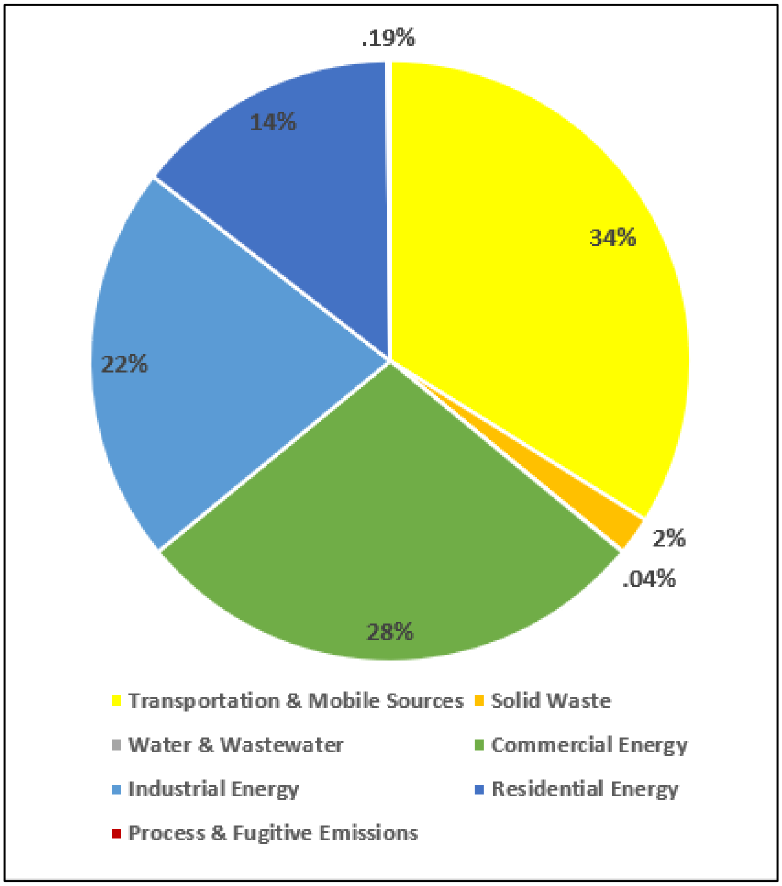

Figure 6- Communitywide Emissions by Sector

Next Steps

The inventory results should be used to focus and prioritize actions to reduce emissions. Based on the inventory results, the following areas have the greatest potential for emissions reduction:

- On-road transportation
  - Vehicle electrification- Transition from internal combustion engine vehicles (passenger, transit fleets, municipal fleets, etc.) to electric-powered
  - Land use/infrastructure planning- Improving infrastructure to incentivize public transit usage, walking, and biking
  - Expand public transportation options
- Power plant electricity generation
  - Decarbonization of GRU Electric Power Production- Transition electricity generation from fossil fuels to non-carbon sources (e.g., solar power)
  - Increase distributed renewable energy (solar)
- Community electricity use
  - Increase and promote building energy efficiency
- Community stationary fuels use
  - Electrify building heating- Convert gas-powered heating applications (e.g., water heaters) to electric-powered

Completion of another GHG inventory in two to five years is recommended in order to assess progress resulting from any actions implemented. The detailed methodology section of this report, as well as notes and attached data files in the ClearPath tool provided to the Gainesville, will be helpful to complete a future inventory consistent with this one.

Government Operations Emissions Inventory Results

Government operations emissions for 2019 are shown in Table 3.

Table 3- Local Government Emissions Inventory

Sector	Fuel or source	2019 Usage	Usage unit	2019 Emissions ($MTCO_2e$)
Buildings & Facilities	Electricity	74,843,691	kWh	38,679
	Natural Gas	90,465	Therms	481
Buildings & Facilities total				**39,161**
Street Lights & Traffic Signals	Electricity	20,097,858	kWh	10,387
Street Lights & Traffic Signals total				**10,387**
Vehicle Fleet	Gasoline (off-road)	19,424	Gallons	172
	Diesel (off-road)	9,675	Gallons	100
	Gasoline (on-road)	7,278,940	Vehicle Miles Traveled	4,309
	Diesel (on-road)	2,483,773	Vehicle Miles Traveled	2,117
Vehicle Fleet total				**6,698**
Transit Fleet	Diesel	1,020,233	Gallons	10,418
	Gasoline	126,089	Gallons	1,111
Transit Fleet total				**11,529**
Employee Commute	Gasoline	41,037,124	Vehicle Miles Traveled	16,457

	Diesel	636,492	Vehicle Miles Traveled	713
Employee Commute total				**17,170**
Electric Power Production	Various Fuels for Power Generation	-	-	947,293
Electric Power Production total				**947,293**
Solid Waste	Waste generation	4,902	Tons	1,265
	Compost	1,916	Tons	133
Solid Waste Total				**1,398**
Water and wastewater	Wastewater Treatment Process	173,000	Service Population	401
	Effluent Discharge	418	Daily Nitrogen Load	318
Water and Wastewater total				**719**
Process & Fugitive Emissions	Fugitive Emissions from Natural Gas Distribution	14,965,995	Therms	2,597
Process & Fugitive Emissions total				**2,597**
Total government emissions				**1,036,952**

Figure 7 shows the distribution of emissions among the four sectors included in the inventory. Electric Power Production represents the vast majority of emissions, followed by Buildings and Facilities and employee commute.

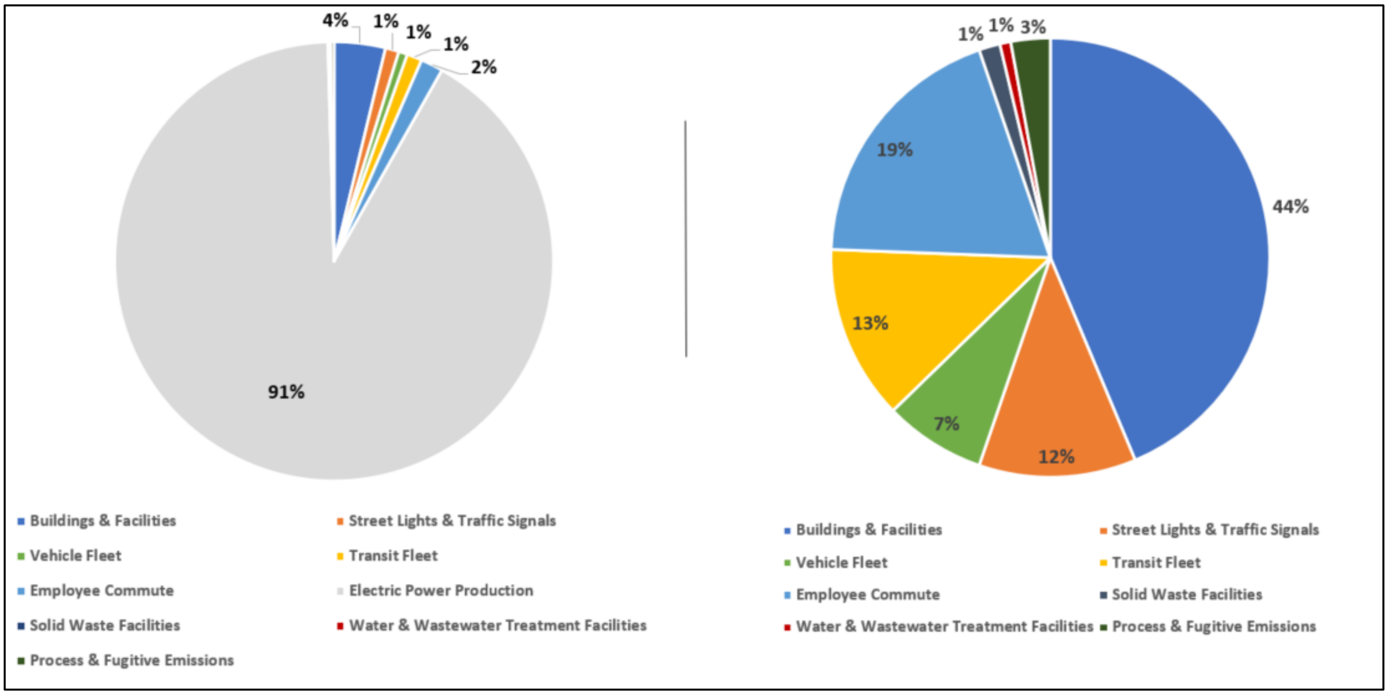

Figure 7- Local Government Operations Emissions by Sector (right chart omits Electric Power Production emissions)

Next Steps

The local government operations emissions inventory points to a need for:

- Decarbonization of Gainesville Regional Utilities' Electric Power Production- Transition electricity generation from fossil fuels to non-carbon sources (e.g., solar power)
- Electrification of transit and vehicle fleets- Transition from internal combustion engine vehicles to electric-powered
- Electrification of building heating- Convert gas-powered heating applications (e.g., water heaters) to electric-powered
- Improving work-from-home/hybrid working options
- Improving access and incentives for employee public transit, walking, and biking options
- Improving waste diversion using composting and recycling

Conclusion

This inventory marks completion of Milestone One of the Five ICLEI Climate Mitigation Milestones. ICLEI recommends the follow steps: forecast emissions, set an emissions-reduction target, and build a robust climate action plan that identifies specific quantified strategies that can cumulatively meet that target. The IPCC's most recent literature and study recommend that the world reach carbon neutrality between 2040 - 2050. It is even more imperative that countries set targets that are ambitious enough to limit the accumulation of carbon between now and mid-century. Science-Based Targets are calculated climate goals, in line with the latest climate science, that represent a community's fair share of the ambition necessary to meet the Paris Agreement commitment of keeping warming below 1.5°C. To achieve this goal, the Intergovernmental Panel on Climate Change (IPCC) states that we must reduce global emissions by 50% by 2030 on the way to climate neutrality by 2050. Equitably reducing global emissions by 50% requires that high-emitting, wealthy nations reduce their emissions by more than 50%. Community education and building partnerships will be instrumental components of our climate efforts.

ICLEI recommends Gainesville to pursue next steps of the Climate Mitigation process. This process includes:

1. Developing a Business-as-Usual Emissions 2050 forecast
2. Developing a Science Based Target (reduction target)
3. Initiating Climate Action Planning
4. Developing and implementing a Climate Action Plan

The city recognizes that science requires ambitious targets that incorporate a fair share consideration of our historic contributions to global GHGs. This understanding means the city should identify strategies that go well beyond 50% reduction by 2030, more likely a 60% reduction. ICLEI recommends this as key consideration as target development and climate action is initiated.

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

Appendix: Methodology Details

Energy

The following table shows each activity related to energy consumption, data source, and notes on data gaps.

Table 4- Energy Data Sources

Activity	Data Source	Data Gaps/Assumptions
Communitywide		
Residential, commercial, and industrial electricity consumption	Gainesville Regional Utilities & University of Florida	• (GRU) Multi-family residential was classified as residential • (GRU) Commercial electricity is General Service Non-Demand and General Service Demand. • (GRU) Any electricity used by transit vehicles was included as commercial. • (GRU) Wastewater/water treatment facilities were reported based upon billing classification. • (UF) Data could not be disaggregated, so all university electricity consumption is reported as commercial • (GRU) Industrial electric is General Service Large Demand (aka Large Power). • (GRU) Hospitals are billed General Service Large Demand (electric)
Residential, commercial, and industrial natural gas consumption	Gainesville Regional Utilities & University of Florida	• (GRU) Multi-family residential was classified as residential

		• (GRU) Commercial natural gas is Small Commercial Firm and General Service Commercial Firm. • (GRU) Usage associated with agricultural buildings was included as commercial. • (GRU) Any natural gas used by transit vehicles was included as commercial. • (GRU) Industrial natural gas is Large Volume Service • (GRU) Hospitals are billed Large Volume Service (gas). • (UF) Natural gas categorized as Industrial is the conversion equivalent of steam directly purchased by UF from Duke Florida • (UF) Natural gas purchased directly from GRU for on-campus use is not presented here because of double counting potential
Residential Kerosene	Energy Information Administration & U.S. Census Bureau	This record uses regional household energy use averages and census household counts
Residential propane	Gainesville's Open Data Portal	
Industrial Distillate Fuel Oil No. 2	EPA FLIGHT	
Electricity Generation	EPA FLIGHT	• Because Gainesville owns GRU, the electricity generation record represents the leftover emissions from electricity generation: (EPA reported Power plant emissions)- (electricity consumption emissions) • This record represents various fuel types/power plants. We are unable to distinguish between which fuels/power plants are represented within these leftover emissions.

Local Government Operations		
Electricity consumption	Gainesville Regional Utilities	
Natural gas consumption	Gainesville Regional Utilities	
Electricity Generation	EPA FLIGHT	Building & Facilities and Street Lights & Traffic Lights emissions were removed from the total to avoid double counting.

Table 5- Emissions Factors for Electricity Consumption

Emissions Factor	CO_2 (lbs./MWh)	CH_4 (lbs./GWh)	N_2O (lbs./GWh)
Gainesville Regional Utilities	1134	125[7]	7[7]
University of Florida	1055.413	69	9

Transportation

Table 6- Transportation Data Sources

Activity	Data Source	Data Gaps/Assumptions
Communitywide		
Vehicle miles travelled	Google Environmental Insights Explorer	VMT provided from Google EIE represents all on-road private vehicles. This does not include Gainesville Regional Transit System activity.
Transit ridership	Gainesville Regional Transit System	
Aviation	Gainesville Regional Airport	GRA provided consumption but could not provide travel bounds.

[7] CH_4 and N_2O emissions factors are sources from the EPA eGRID 2019

Off-road	EPA National Emissions Inventory	Record uses the EPA National Emissions Inventory's County data to extrapolate community-wide emissions (using population). The NEI does not provide N2O emissions for Off-Road.
Freight Rail	Eastern Regional Technical Advisory Committee	
Local Government Operations		
Government vehicle fleet	Department of Transportation and Mobility	A few Government vehicles' miles travelled were measured incorrectly resulting in negative VMT. To properly account for emissions from these vehicles, the fuel use from each vehicle with negative miles was multiplied by the national MPG estimates (shown in the chart below) to estimate their VMT.
Transit Fleet	Gainesville Regional Transit System	
Employee commute	Various Gainesville Employees	To collect Employee Commute data, Gainesville staff were surveyed to determine their commute mileage, vehicle type and fuel type. A 16% response rate was achieved for the survey and the mileage collected from the 16% of employees was extrapolated to estimate commute emissions for all 2,200 employees.

For vehicle transportation, it is necessary to apply average miles per gallon and emissions factors for CH_4 and N_2O to each vehicle type. The factors used are shown in Table 7.

Table 7- MPG and Emissions Factors by Vehicle Type

Fuel	Vehicle type	MPG	CH_4 g/mile	N_2O g/mile
Gasoline	Passenger car	24.37713	0.0183	0.0083
	Light truck	17.86788	0.0193	0.0148
	Heavy truck	5.371652	0.0785	0.0633
	Motorcycle	24.37713	0.0183	0.0083
Diesel	Passenger car	24.37713	0.0005	0.001
	Light truck	17.86788	0.001	0.0015
	Heavy truck	6.392468	0.0051	0.0048

Wastewater/Water

Table 8- Wastewater/Water Data Sources

Activity	Data Source	Data Gaps/Assumptions/Notes
Communitywide & Local Government Operations		
Effluent discharge	Gainesville Regional Utilities & University of Florida	• (GRU) Data represents wastewater generated in-boundary and imported from external jurisdictions • (UF) While the WWTP serves a subset of city population at various times, this record uses an average service population of 50,000.
Wastewater treatment process	Gainesville Regional Utilities & University of Florida	• (GRU) Data represents wastewater generated in-boundary and imported from external jurisdictions • (UF) While the WWTP serves a subset of city population a various times, this record uses an average service populat of 50,000.

Water/Wastewater energy use	Gainesville Regional Utilities & University of Florida	• (GRU) Energy use is included in GRU-provided commercial/industrial data • (UF) All potable water provided by GRU • (UF) Energy use is included in UF provided commercial energy data

Solid Waste

Table 9- Solid Waste Data Sources

Activity	Data Source	Data Gaps/Assumptions
Communitywide		
Waste Generation	Alachua County Transfer Station	
Landfill Gas Flaring	Alachua County Transfer Station	The calculation uses annual Gainesville waste generation, while Total Waste represents total placed. While not directly comparative, this is the best allocation that can be made from the provided data.
Local Government Operations		
Waste Generation	Gainesville Solid Waste Department	
Compost	Gainesville Solid Waste Department	

Process & Fugitive Emissions

Table 10- Process & Fugitive Emissions Data Sources

Activity	Data Source	Data Gaps/Assumptions
Communitywide		
Fugitive Emissions From Natural Gas Distribution	Gainesville Regional Utilities & University of Florida	

Local Government Operations		
Fugitive Emissions From Natural Gas Distribution	Gainesville Regional Utilities & University of Florida	

Inventory Calculations

The 2019 inventory was calculated following the US Community Protocol and ICLEI's ClearPath software. As discussed in Inventory Methodology, the IPCC 5th Assessment was used for global warming potential (GWP) values to convert methane and nitrous oxide to CO_2 equivalent units. ClearPath's inventory calculators allow for input of the sector activity (i.e. kWh or VMT) and emission factor to calculate the final CO_2e emissions.