East Central Florida Region

2019 Regionwide Greenhouse Gas Emissions Inventory Methodology



March, 2022

Produced by the East Central Florida Regional Resilience Collaborative (ECFR$_2$C)
With Assistance from
R2C Greenhouse Gas Inventory Advisory Committee
ICLEI - Local Governments for Sustainability US

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Executive Summary

As part of the guiding framework to increase resilience in our region, the R2C has taken a proactive approach to reduce risks, vulnerabilities, and our greenhouse gas emissions while increasing our sustainability goals. The R2C collectively acknowledges the contribution of greenhouse gas emissions to the long-term stressor of climate change that is exacerbating our vulnerabilities. In addition, we acknowledge the considerable momentum in east central Florida focusing on sustainability, mitigation and adaptation. Emissions can be managed, even if not measured; however, without a baseline, the effectiveness of the intervention or mitigation strategy would be unknown. It is for this reason, and to spur collective action, the R2C launched a regional scale greenhouse gas emissions inventory because reducing our carbon footprint is one of the most relevant efforts our region can face head-on.

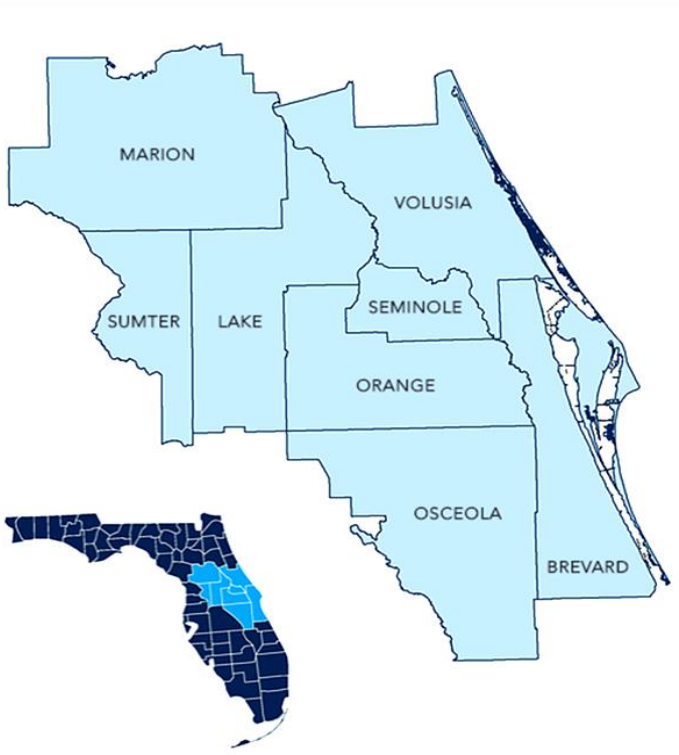
A regionwide greenhouse gas emission inventory helps the region understand the scope and scale of our emissions by studying emission sources and activities and quantifying attributed gas emissions. This type of inventory provides a consistent measurement with a base for informed decision-making and a wide range of emissions reduction opportunities. Moreover, it is an optimal approach to forecast emissions, measure community performance, and transition toward integrated climate action planning.

After identifying community emission generating activities and sources, utilities and local entities were contacted for 2019 baseline year data. Standardized data request workbook templates were developed and shared with each accounted emission generating sector to collect adequate information. The sectors included in this inventory were energy, transportation, and solid waste. Data was collected from twenty-two energy sector (electricity and gas) utilities, nine transportation entities (transit and rail) along with additional on-road vehicle research, and the Florida Department of Environmental Protection for waste information. However, due to a lack of cooperation by some energy utility providers, a combined data source approach was applied to fulfill data gaps by complementing the inventory with Google's Environmental Insights Explorer (EIE) data.

A regionwide GHG emission inventory at this scale is no easy task. It requires diligent work, community cooperation, and building sustainable relationships for future support. However, from this effort, the result will yield more than the development of a regionwide GHG emissions inventory; it establishes an actionable process for duplication and will be a catalyst for a paradigm shift toward resilience.

This report provides estimates of greenhouse gas emissions resulting from activities in the east central Florida region as a whole in 2019. The region comprises eight counties (refer to map below) – Brevard,

Lake, Marion, Orange, Osceola, Seminole, Sumter, and Volusia Counties- with a community of over 4.1 million people.



Key Findings

Figure 1 shows regionwide emissions by category. The largest contributor is transportation with 41% of emissions. The following two largest contributors are residential (30%) and commercial energy (23%). Actions to reduce emissions in these sectors will be an essential component of a climate action plan. Solid waste, industrial energy, and process & fugitive numbers are responsible for the remaining (accounting slightly over 5%) emissions.

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

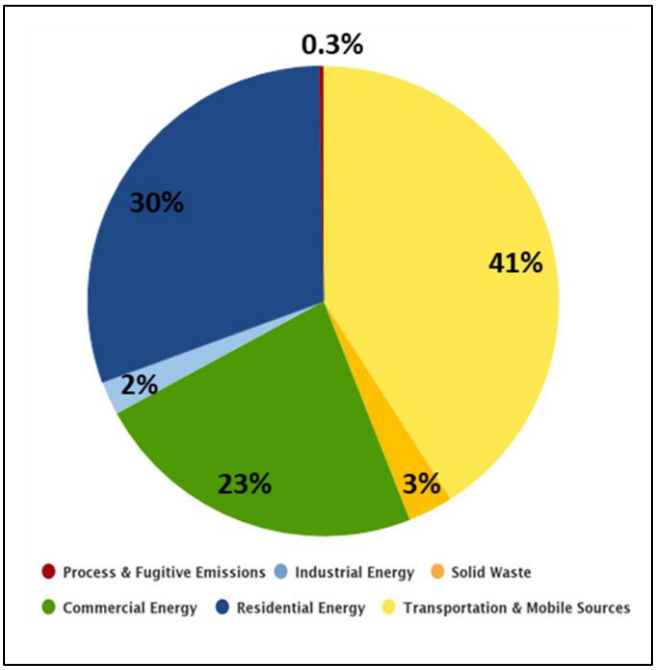


Figure 1: Regionwide Emissions by Category

Inventory Methodology

Understanding a Greenhouse Gas Emissions Inventory

The first step toward achieving tangible greenhouse gas emission reductions requires identifying baseline emission levels, sources, and activities generating emissions in the community. This report presents emissions from eight counties in the East Central Florida region as a whole.

Three greenhouse gases were 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:

Greenhouse Gas	Global Warming Potential
Carbon Dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous Oxide (N_2O)	265

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

Inventory Emissions Reported

This regionwide inventory report includes 2019 baseline year emissions from the following emissions generating activities:

- 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
- Generation of solid waste by the community
- Fugitive emissions from natural gas leakage

Due to the novelty of emissions accounting in the region at a regionwide scale, the above-stated emitting activities were chosen as a first measurable step and opportunity for emissions reduction. Local governments can have significant impact on these sectors by taking proactive actions for the communities they serve.

Quantification Methods

To calculate emissions accordingly using activity data and emission factors, the following equation was 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 the appendices for a detailed listing of the activity data used for emissions calculations.

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.

Data Sources

Due to the unique scale of this regionwide inventory, encompassing eight (8) counties in the East Central Florida region, data collection and calculations were sensibly based and considered under regionwide parameters. Data was individually calculated for each county and later aggregated for a full regional scope of emissions. A combined data source approach of utility activity data and Google's Environmental Insights Explorer estimates were used to complete the inventory.

Sector		Data Source
Energy	*Electricity*	*Utility activity data & EIE estimates*
	Natural Gas	
Transportation	*On-Road*	*EIE Data*
	Rail	*Source activity data*
Waste	*Municipal solid waste*	*Source activity data*

Table 2: Data Sources by Sector

About Google's EIE Data

Google's Environmental Insights Explorer (EIE) was designed to make the foundation for effective climate action — the development of greenhouse gas inventories and the subsequent identification of emissions reduction opportunities — simple, straightforward, and actionable. EIE harnesses unique Google data sources and modeling capabilities to produce estimates of activity and emissions, making them freely available. The data underpinning EIE is primarily based on the same underlying information that is made available in Google Maps and is anonymous and highly aggregated. It is combined with other data sources such as aggregated location history data, building outlines and types, and overhead imagery to create useful environmental insights.

EIE's insights are modeled estimates based on actual measurements of transport activity and building infrastructure. Google uses advanced machine learning techniques to infer transport modes, and applies scaling factors and efficiency factors to estimate overall emissions for a given year. In generating these estimates, EIE worked with the Global Covenant of Mayors for Climate & Energy to make sure its data can connect to global GHG accounting standards and protocols while acknowledging that jurisdictions may make different methodological choices that generate different results.

Methodological Review

Energy Sector

Emissions from the energy sector account for 55% of total emissions. This estimate is attributed to residential, commercial, and industrial energy consumption.

Initially, data collection included utility activity data requests to each energy service provider identified for the East Central Florida region. Since utility activity data is the gold standard approach for emissions calculations and accountability, the ECFR2C, with the understanding of the grand scale of this inventory, worked tirelessly with service providers to guide and assist with data collection efforts to ensure that internal processes were as undemanding as possible. However, after substantial communication efforts to collect the desired necessary data, the ECFR2C made the informed decision to use a combined data source approach to fulfill data gaps due to a lack of timely support from some of the contacted

energy providers. As a result, this inventory utilizes utility-provided data and Google's Environmental Insights Explorer (EIE) data. This combined approach complements activity data and allows for gap estimates. It is important to note that for EIE data, region-relevant adjustments were made for greater regional relevance and result accuracy.

Data requested from utility providers (for ICLEI's ClearPath record entry) included:

1. By county residential, commercial, industrial, street and highway lights, and public authority annual energy consumption
2. Utility's emission factors (CO_2, CH_4, and NO_2)

Identified Energy Providers in the Region

Electric Utilities: *City of New Smyrna Beach, City of Mount Dora, City of Saint Cloud, City of Winter Park Electric, Duke Energy, Florida Municipal Power Agency (includes: City of Bushnell, City of Leesburg, City of Ocala, and Kissimmee Utility Authority), Florida Power & Light (FPL), Orlando Utilities Commission (OUC), *Reedy Creek improvement District, and *Seminole Electric Cooperative (includes: Central Florida Electric Cooperative, Clay Electric Cooperative, **Peace River Electric Cooperative, Sumter Electric Cooperative **Withlacoochee River Electric Cooperative).*

(Regionwide, 77% of the electricity data was utility provided, and 23% was estimated by using EIE).

Natural Gas Utilities: **AmeriGas, *City of Leesburg, *Florida City Gas, *Florida Public Utilities, Lake Apopka Natural Gas District, *Reedy Creek Improvement District, and TECO.*

**No data provided*
***Partial data provided*

Google's Buildings Insights

Using EIE energy activity data calculation as a reference, the ECFR2C was able to estimate and/or acquire square footage for each counties' floor space and assign a building type category to most buildings within the regional county boundaries. In addition, the region applied EIE region-specific energy intensity factors (energy per floor space unit) from the Climate Action for Urban Sustainability (CURB) tool to estimate the total energy consumed. For each jurisdiction, Google assumes a mix of grid-supplied electricity and stationary combustion energy sources based on CURB's energy usage breakdown. However, the region adjusted this breakdown to better represent the fuel and electricity usage within each county.

EIE Energy Data Adjustments

EIE residential and non-residential (including any non-residential energy) electricity (kWh) and natural gas (Therms) activity data were, first, individually calculated for each county, and later aggregated for a regionwide inventory result. These calculations were done using a combination of EIE derived data and county-specific acquired numbers. Data adjustments were made as county-specific data was provided.

Energy Usage/ Activity Data

Electricity (kWh)= Energy Intensity x Floor Space x Electricity Fraction

Natural gas (Therms)= Energy Intensity x Floor Space x NG Fraction

Two approaches were taken to collect county-specific residential and non-residential buildings' square footage/floor space; these included data from each county property appraiser or GIS-based research through the East Central Florida Regional Planning Council. For optimal calculations, priority was given to county-provided data, using GIS-based information to address data gaps.

The ECFR2C was able to obtain county buildings square footage/floor space from four (Lake County, Orange County, Osceola County, and Volusia County) out of the eight counties in the region. For the four remaining counties (Brevard County, Marion County, Seminole County, and Sumter County), GIS square footage data was used. For a higher level of accuracy, these numbers were QA/QC by comparing property

appraiser and GIS numbers from those counties from which data was collected.

Calculation Assumptions

Due to region-specific energy use characteristics, which are greatly influenced by the region's climate, adjustments were made to EIE's estimated electricity and natural gas fraction percentages. In order to calculate emissions with the closest representation of the region's energy fractions, Orange County's fraction percentages were standardized and applied across the region.

	Electricity	*Natural Gas*
Residential	*97.09%*	*2.91%*
Non-residential	*46.34%*	*53.66%*

The grid electricity default "FRCC All (FRCC) eGRID 2019" was used for each county and the aggregated regionwide inventory for emissions factors. This default was applied to EIE data and wherever utility associated emissions factors were missing. This approach resulted in a standardized and consistent regional measure with higher quality results. Additionally, EIE regional energy intensity factors estimated by the CURB Tool were also used to calculate residential and non-residential energy usage.

EIE Use for Electricity Data

About 77% of the electricity activity data was obtained from energy service providers, and 23% was calculated to address the data gap by using EIE estimates. These numbers were used to either substitute missing data by estimating the difference between utility numbers and EIE county total estimates, or to disaggregate whole annual energy consumption numbers provided into residential and commercial (non-residential) activity data by using EIE percent attributable by sector (residential and non-residential).

EIE Use for Natural Gas Data

Similar to electricity data gap estimates, available natural gas utility-derived activity data were used to calculate the difference/missing data based on each EIE natural gas county's total number.

Process and Fugitive Emissions

Incidental emissions created from natural gas distribution account for 0.3% of total emissions.

Natural gas processes and fugitive emissions account for leakage in the local natural gas distribution system. The calculation is based on the total quantity of natural gas consumed aggregated for the region and a 0.3% default leakage rate, as provided by ICLEI's ClearPath Tool. This rate percentage is obtained from the Environmental Defense Fund (EDF) User Guide for Natural Gas Leakage Rate Modeling Tool.

Aggregating Data

Each activity data per county calculated was consequently entered into the ClearPath tool for each county inventory. The resulting emissions "by sector by fuel" were then exported to aggregate and develop a regionwide scope of energy emissions.

Transportation Sector

Emissions from the transportation sector account for 41% of total emissions. This estimate is attributed to on-road vehicles and rail emissions.

In order to develop a GHG emissions inventory with dependable quality and consistent methodology, EIE data were also used for emissions calculations in the transportation sector. Moreover, in addition to aiming for data consistency, several cities around the region performed a comparison between EIE and local transportation organizations' data. After

detailed analysis and sharing of observations, it was concluded that EIE data has greater accuracy and methodology quality in addition to capturing a shift in modes, thus, reinforcing the ECFR2C's decision to utilize EIE data for this 2019 regionwide inventory. However, it is important to note that data was successfully collected from all on-road vehicle organizations in the region (transit and para-transit: Lynx, LakeXpress, SCAT, Votran, and SunTran), building communication with a significant portion of the East Central Florida transportation sector.

Google's Transportation Insights

Using Google's proprietary data, the region was able to characterize the trips taken within the regional boundaries and the trips that crossed the regional boundaries. This data is derived from device Location History data in Google Maps that Google applies a number of privacy filters, aggregation/anonymization techniques, and inference models on. This takes into account movement over all major road classifications, from interstates to local roads. Similar to the population (and occupancy factor) scaling techniques used by transportation models based on Household Travel Surveys, but with a broader and more comprehensive set of inputs, Google can estimate annual vehicle trips by mode and vehicle distance traveled for the region.

Aggregating Data

Each on-road and off-road data set was entered into the ClearPath tool for each county inventory, which yielded transportation-related emissions data by fuel type. These numbers were later aggregated and populated again for the development of a regionwide scope of transportation emissions.

EIE On-Road Transportation Data

For on-road vehicles (passenger cars, transit and para-transit, trucks, and other on-road vehicles), calculations were performed by obtaining vehicle miles traveled (VMT) and vehicle (e.g., motorcycle, light truck, car, etc.) type percentages. VMT was calculated from EIE in-boundary, inbound, and outbound emitting on-road vehicles data from each county data set.

Calculation Assumptions

In order to complete calculations for on-road emissions, percentages for vehicle type by fuel type (diesel or gasoline) data was obtained from ICLEI's "National Default Vehicle Fuel Efficiency and Emission Factors, 2018," where U.S. Energy Information Administration and Environmental Protection Agency's data is aggregated to get emissions factors and miles per gallons. In addition, 2019 US National Defaults (updated 2021) available through the ClearPath Tool were used as transportation factor sets.

Rail (Off-Road) Transportation Data

Rail transportation emissions were calculated from passenger and/or freight data, based on county-wide train miles traveled, local attribution percentage (when available), and fuel consumption (diesel or electric) information. Data was requested from four (SunRail, Amtrak, CSX, and FCEN) of the identified regional rail service companies; however, data was only directly obtained from two (SunRail and Amtrak). In addition, a secondary source was used to collect data from CSX, increasing the inventory's rail coverage, yet, no data was obtained from the FCEN rail company.

Data entry into the ClearPath tool was conducted using the "rail transportation" calculator, recording rail type, fuel usage, and local attribution information.

Waste Sector

Emissions from the waste sector account for 3% of total emissions. This estimate is attributed to municipal solid waste (landfilled, composted, and incinerated waste) emissions.

Municipal Solid Waste (MSW) data was collected directly from the Florida Department of Environmental Protection Agency (FDEP), Division of Waste Management, Waste Registration & Recycling Program. The information was collected per county and included data pertaining to total tons of landfilled waste, composted waste, and incinerated waste and energy generated, when applicable. Data on Florida's MSW material percentages were also collected for factor sets input and emissions calculations into the ClearPath tool. Once each county's MSW data per solid waste record type was completed, these numbers were aggregated and incorporated into the regionwide inventory waste sector for full community emissions scope.

Waste Data Assumptions

For landfilled waste calculations, it was assumed that the landfill methane collection scenario was "typical," based on the ClearPath Tool's options provided. It was also assumed that the landfill moisture content is "wet due to regional average precipitations." For composted waste, the material was classified as "green waste" (i.e., yard waste) due to compost composition, as directed by FDEP. In terms of the waste that is combusted, it was assumed that the percent of total combusted MSW generated in-boundary was 1%.

Regionwide Emissions Inventory Results

Findings: Transportation energy is the largest contributor, followed by residential & commercial energy.

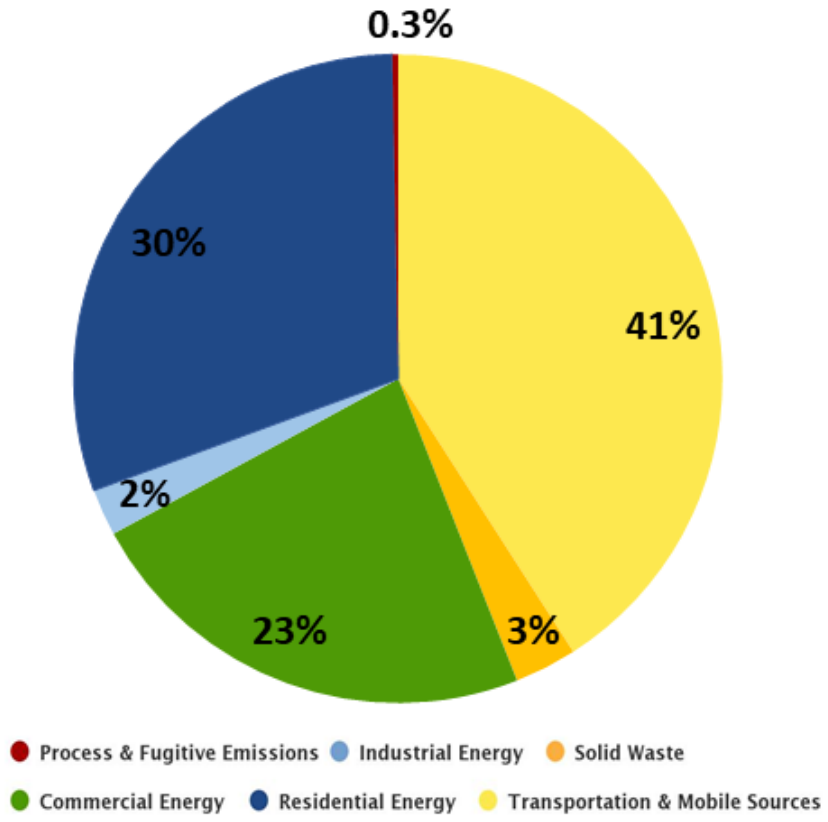


Figure 2: Regionwide Emissions by Category

Table 3: Communitywide Emissions Inventory

Sector	Fuel or source	2019 Usage	Usage unit	2019 Emissions ($MTCO_2e$)
Residential energy	Electricity	34,427,810,716	kWh	13,614,601
	Natural Gas	115,659,468	Therms	615,152
	Other			- 1.00
			Residential energy total	14,229,752
Commercial energy	Electricity	18,805,061,817	kWh	7,459,391
	Natural gas	632,445,810	Therms	3,363,758
	Other			- 1.00
			Commercial energy total	10,823,148
Industrial energy	Electricity	1,982,070,536	kWh	803,415
	Natural Gas	55,068,997	Therms	292,276
	Other			- 2.00
			Industrial energy total	1,095,689
On-road transportation (Passenger vehicle and transit)	Gasoline	33,329,031,223	VMT	13,908,992
	Diesel	3,555,686,820	VMT	5,251,678
Rail	Diesel	5,970,447	Gal.	61,503
			Transportation total	19,222,173
Solid Waste	Waste Sent to Landfill	5,504,141	Tons	1,431,041
	Waste Composted	388,778	Tons	27,070
	Waste Incinerated	156,413	Short Tons	542
			Solid waste total	1,458,653
Process & Fugitive Emissions	Fugitive Emissions from Natural Gas Distribution			139,346
			Fugitive total	139,346
			Total Regionwide emissions	**46,968,761**

Conclusion

This inventory marks the completion of Milestone One of the Five ICLEI Climate Mitigation Milestones. Following this accomplishment, the R2C has continued to work on inventory next steps by estimating emissions forecasted to 2030, establishing an emissions-reduction target, and building upon current regional reduction efforts and other identified high impact actions for emissions reduction.

Establishing a Science-Based Target

Science-Based Targets are calculated climate goals in line with the latest climate science. These targets reflect the need to maintain global temperatures below 1.5°C and a global emissions reduction of 50% by 2030. Thus, in support of the United States goal, the East Central Florida Regional Resilience Collaborative has estimated an absolute target of 54.3% emissions reduction from the 2019 inventory findings. This target builds a shared vision to achieve reduction, spur innovation and collaboration, and it will be used by the East Central Florida Region to define and guide a series of high-impact actions to reduce emissions.

Identified Regionwide High Impact Actions

- Grid Decarbonization
- Vehicle miles traveled (VMT) reduction
- Electric vehicle (EV) adoption
- Commercial/Residential energy efficiency
- Increase residential rooftop solar photovoltaic deployment

While energy and transportation sector reduction actions yield higher levels of emission reductions, emissions from solid waste, wastewater and nature-based solutions, for example, should not be neglected. Even though the aforementioned actions yield less reductions, they support and move the region closer to the 2030 Science-Based Target. For more information on the East Central Florida region's identified high impact actions, refer to the ECFR2C's High Impact Actions Analysis Document.

Upon completion and review of the 2019 regionwide GHG emission inventory results, established science-based target, emissions forecast, and high impact actions analysis, the East Central Florida Planning Council accepted and unanimously supported the development of an Integrated Climate Action Plan in March of 2022. In addition, ECFR2C will continue to track key energy use and emissions indicators on an ongoing basis. This inventory illustrates that residential and non-residential energy consumption in buildings, in addition to transportation/ land use patterns, offer a significant opportunity for reduction with collective action. The region needs bold commitment and action from entities across east central Florida to drastically reduce fossil fuel-based sources for the generation and consumption of energy and transportation services and significantly increase the use of carbon-free and low emitting sources in those sectors. Through these efforts and others, the East Central Florida region can achieve 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
Regionwide		
Residential, commercial, and industrial electricity consumption	Utility provided activity data	• 77% of electricity activity data was provided by utilities
	Utility activity data & EIE estimates	• 23% of the electricity data was estimated using EIE by calculating the difference between utility provided activity data and EIE totals
	Google EIE adjusted data	• Orange County energy fractions were standardized across the region • FRCC All (FRCC) eGRID 2019 emission factors were used across the region
Residential, commercial, and industrial natural gas consumption	Utility provided activity data & EIE estimates	• Data gaps were estimated by calculating the difference between utility provided activity data and EIE totals
	Google EIE adjusted data	• Orange County energy fractions were standardized across the region • FRCC All (FRCC) eGRID 2019 emission factors were used across the region

Table 5: Emissions Factors for Electricity Consumption

Year	CO_2 (lbs./MWh)	CH_4 (lbs./GWh)	N_2O (lbs./GWh)
FRCC All (FRCC) eGRID 2019	861.028	55	7
Duke 2019	1007	40	10
FPL 2019/eGRID2019	664.89	55	7
FMPA 2019	963	55	7
City of Winter Park 2019	768.41	75	10

Transportation

Table 6: Transportation Data Sources

Activity	Data Source	Data Gaps/Assumptions
Region-wide		
Vehicle miles travelled	Google EIE data	For vehicle type percentage by fuel type (diesel or gasoline) data was obtained from ICLEI's "National Default Vehicle Fuel Efficiency and Emission Factors, 2018," where U.S. Energy Information Administration and Environmental Protection Agency's data is aggregated to get emissions factors and miles per gallons. Emissions factors and vehicle type percentages were sourced from ICLEI. ICLEI sourced the data from EPA, EIA, and the Bureau of Transportation Statistics.
Rail fuel consumption	Provider data	Missing data from 1 out of the 4 identified rail service provides in the region

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	24.1	0.0183	0.0083
Gasoline	Light truck	17.6	0.0193	0.0148
Gasoline	Heavy truck	5.371652	0.0785	0.0633
Gasoline	Motorcycle	24.1	0.0183	0.0083
Gasoline	Transit Bus	17.6	0.0193	0.0148
Gasoline	Para-transit Bus	17.6	0.0193	0.0148
Gasoline	Motorcycle	24.1	0.0183	0.0083
Diesel	Passenger car	24.1	0.0005	0.001
Diesel	Light truck	17.6	0.001	0.0015
Diesel	Heavy truck	6.392468	0.0051	0.0048
Diesel	Transit Bus	17.6	0.001	0.0015
Diesel	Para-transit Bus	17.6	0.001	0.0015
Diesel	Motorcycle	24.1	0.0005	0.001

Solid Waste

Table 8: Solid Waste Data Sources

Activity	Data Source	Data Gaps/Assumptions
Region-wide		
Landfilled waste	FDEP Division of Waste Management, Waste Registration & Recycling Program.	• Landfill methane collection scenario was assumed "typical" • Landfill moisture content was assumed "wet" due to regional average precipitation
Composted waste	FDEP Division of Waste Management, Waste Registration & Recycling Program.	• Composted waste type was classified as "green waste" (i.e., yard trash) due to the majority of composition, as guided by the FDEP
Combusted waste	FDEP Division of Waste Management, Waste Registration & Recycling Program.	• Percent of total combusted MSW generated in-boundary was assumed 1%

Fugitive Emissions

Table 9: Fugitive Emissions Data Sources

Activity	Data Source	Data Gaps/Assumptions
Region-wide		
Natural gas usage	EDF User Guide for Natural Gas Leakage Rate Modeling Tool	0.3% default was used

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.