

Miami Shores Village



MARCH 2023

Inventory of Communitywide Greenhouse Gas Emissions

Produced by Miami Shores Village with Assistance from Florida League of Cities and ICLEI – Local Governments for Sustainability USA

Credits and Acknowledgements

Esmond K. Scott, Village Manager

Tanya Wilson, Deputy Village Manager

Claudia Hasbun, Planning, Zoning & Resilience Director

Chris Miranda, Public Works Director

Hannah Miller, ICLEI

Wisler Pierre-Louis, Public Works Director City of North Miami

Florida Power & Light

TECO Gas

Miami Dade County Water & Sewer Department

Antonio Augello, Intern, Florida Atlantic University

Florida League of Cities

Miami Shores Village Council

ICLEI-Local Governments for Sustainability USA

Table of Contents

Credits and Acknowledgements	2
Tables and Figures	4
List of Tables	4
List of Figures	4
Executive Summary	4
Key Findings	6
Introduction to Climate Change	7
Greenhouse Gas Inventory as a Step Toward Carbon Neutrality	10
ICLEI Climate Mitigation Milestones	11
Inventory Methodology	12
Understanding a Greenhouse Gas Emissions Inventory	12
Community Emissions Protocol	13
Quantifying Greenhouse Gas Emissions	13
<i>Sources and Activities</i>	13
<i>Base Year</i>	14
<i>Quantification Methods</i>	14
Community Emissions Inventory Results	15
Next Steps:	16
Conclusion	18
Appendix: Methodology Details	19
Energy	19
Transportation	19
Wastewater	20
Potable Water [if reported separately, omit if not]	20
Solid Waste	20
Fugitive Emissions	20
Inventory Calculations	21

Tables and Figures

List of Tables

Table 1: Global Warming Potential Values (IPCC, 2014).....	12
Table 2: Communitywide Emissions Inventory.....	15
Table 3: Energy Data Sources.....	19
Table 4: Emissions Factors for Electricity Consumption	19
Table 5: Transportation Data Sources.....	19
Table 6: MPG and Emissions Factors by Vehicle Type	19
Table 7: Wastewater Data Sources.....	20
Table 8: Potable Water Data Sources	20
Table 9: Solid Waste Data Sources.....	20

List of Figures

Figure 1: Community-wide Emissions by Sector	6
Figure 2: Miami Shores Flooding	11
Figure 3: ICLEI Climate Mitigation Milestones	11
Figure 4: Relationship of Community and Government Operations Inventories	12
Figure 5: Community-wide Emissions by Sector	16



This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/). It may not be used for any commercial purpose. Any non-commercial use of this material must provide attribution to ICLEI Local Governments for Sustainability USA.

Executive Summary

The Miami Shores Village 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. Due to severe flooding in certain areas, in 2017 Miami Shores Village engaged Costal Risk Consulting to perform an environmental vulnerability study for the Village. This study has been the precursor to initiate a series of analysis, initiatives, and other plans to target environmental risks. However, without a science-based inventory of GHG it is difficult and premature to properly implement policies, programs and projects that will have a baseline and targets that will measure our actions.

In June 2022, Miami Shores Village received a scholarship from the Florida League of Cities to participate in the Florida Race to Zero initiative. During this initiative, Miami Shores Village has received technical assistance, expertise, and collaboration from regional and local organizations (ICLEI, City of North Miami, *Florida Power & Light -FPL-*, *Miami-Dade Water & Sewer Department -MDWASD-*, *TECO Energy -TECO-*, and *Miami-Dade Department of Solid Waste Management -SWM.*).

To complete this inventory, Miami Shores Village utilized tools and guidelines from the Local Governments for Sustainability (ICLEI), which provides authoritative direction for greenhouse gas emissions. We used the software called ClearPath, provided by ICLEI to insert data and have clear and concise information. Certain assumptions and modifications within the appropriated parameters were included to the sectors analyzed due to the limited access to data. This report provides estimates of greenhouse gas emissions resulting from activities in Miami Shores Village as reflected in the established base year of 2019.

Based on the inventory results, the following areas have the greatest potential for emissions reduction:

- Transportation and Mobile Sources
- Residential Energy Consumption
- Commercial Energy Consumption

To achieve ambitious emissions reduction, and move toward climate neutrality, Miami Shores Village will need to develop a Climate Action Plan with a set of clear goals and act rapidly following a holistic and integrated approach. Climate action is an opportunity for our community to experience a wide range of co-benefits, such as creating socio-economic opportunities, reducing fossil fuel dependency and inequality, and improving the health of people and nature.

Key Findings

Figure 1 shows communitywide emissions by sector. The largest contributor is Transportation and Mobile Sources with 42% of emissions. The next largest contributors are Residential Energy with 29% and Commercial Energy with 17%. Actions to reduce emissions in all of these sectors will be a key part of a climate action plan. Solid Waste, Water and Wastewater were responsible for the remaining 12% of emissions.

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

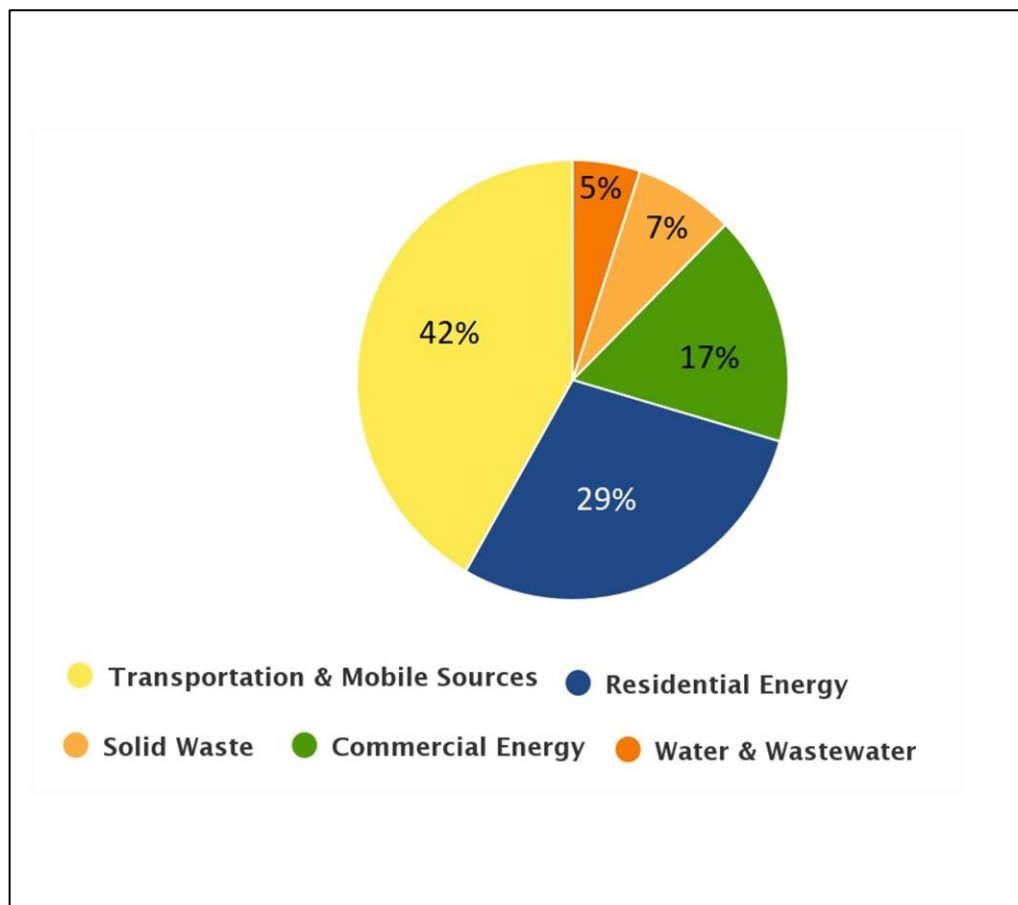


Figure 1: Community-wide Emissions by Sector

Introduction to Climate Change

Naturally occurring gases dispersed in the atmosphere determine the Earth's climate by trapping solar radiation. This phenomenon is known as the greenhouse effect. Overwhelming evidence shows that human activities are increasing the concentration of greenhouse gases (GHG) and changing the global climate. The most significant contributor is the burning of fossil fuels for transportation, electricity generation and other purposes, which introduces large amounts of carbon dioxide and other greenhouse gases into the atmosphere. Collectively, these gases intensify the natural greenhouse effect, causing global average surface and lower atmospheric temperatures to rise, threatening the safety, quality of life, and economic prosperity of global communities. Although the natural greenhouse effect is needed to keep the earth warm, a human enhanced greenhouse effect with the rapid accumulation of GHG in the atmosphere leads to too much heat and radiation being trapped. The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report confirms that human activities have unequivocally caused an increase in carbon emissions¹. Many regions are already experiencing the consequences of global climate change, and Miami Shores Village is no exception.

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

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

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

According to the 2018 [National Climate Assessment](#), the combined effects of changing extreme rainfall events and sea level rise are already increasing flood frequencies, which impacts property values and infrastructure viability, particularly in coastal cities such as Miami Shores Village. Without significant adaptation measures, these regions are projected to experience daily high tide flooding by the end of the century. In 2015, several Southeast coastal cities experienced all-time records of coastal flooding occurrences, including Wilmington, NC (90 days), Charleston, SC (38 days), Mayport, FL (19 days), Miami, FL (18 days), Key West, FL (14 days), and Fernandina Beach, FL (7 days). These flooding occurrences increased more than 50% in 2015 compared to 2014.⁵⁸ In 2016, three all-time records were either tied (14 days at Key West, FL) or broken (50 days at Charleston, SC, and 38 days at Savannah, GA)³. The Miami area nearly matched the 2015 record of 18 days. This increase in high tide flooding frequency is directly tied to sea level rise. High tide flooding is now posing daily risks to businesses, neighborhoods, infrastructure, transportation, and ecosystems in the Southeast region and places such as Miami Shores Village are not exempt.



Fig2. Miami Shores Flooding. Photo Credit: Miami Shores Village, Public Works Department

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

Southeast Florida, including Miami Shores Village, is at particular risk for coastal hazards, such as flooding, erosion, and hurricanes that will continue to intensify with sea-level rise. So many people visit and move to this region to enjoy the beautiful coast, but its seaside location also puts it at extreme risk. In addition, climate change will continue to produce warmer seasons and extreme temperatures that threaten many sectors within Miami Shores Village and the greater region, most notably tourism, public health, and food and beverage⁴. 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 and reduces energy dependence. In addition, when residents save on energy costs, those discretionary funds are more likely to be spent at local businesses and increases investments in the local economy. Reducing fossil fuel use improves air quality, and increases opportunities for walking and bicycling improves residents' health.

The Miami Shores Village has launched its Sustainable Miami Shores initiative in an effort to prioritize resiliency and sustainability projects and mitigate the effects of climate change and sea level rise (SLR). Some of the goals included are to develop an Infrastructure Study with a phasing schedule for the conversion of over 90% of residential areas from septic to sewer system; to develop a tree canopy assessment, secure recurring tree planting grants from Miami-Dade County to increase tree canopy, reduce heat-island effect, improve air quality, and reduce flooding; strengthen the CRS flood mitigation program; utilize grant funding to improve the Bayfront Seawall and fund other resilience projects village wide (MSV, 2022).

Additionally, the Planning and Zoning Department created and implemented new irrigation and fertilizer ordinances promoting resiliency and sustainability as well as educational and communication campaigns to promote resilient and sustainable development in the Village. The Public Works Department is also committed to implementing more resilient and sustainable elements into all future design projects as well as building an up-to-date Geographic Information System (GIS) inventory of all utility infrastructure. Potentially, this tool could help in mapping the sources and volumes of solid waste and improve disposal methods.



⁴ U.S. Global Change Research Program. 2018. National Climate Assessment – Ch 19: Southeast. Retrieved from <https://nca2018.globalchange.gov/chapter/19/>

Greenhouse Gas Inventory as a Step Toward Carbon Neutrality

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

Cities, towns and counties are well situated 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 Miami Shores Village to identify priority sectors for action, while considering climate justice, inclusiveness, local job creation and other benefits of sustainable development.

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

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

To achieve ambitious emissions reduction, and move toward climate neutrality, Miami Shores Village will need to create a Climate Action Plan in order to set clear goals and act rapidly following a holistic and integrated approach. Climate action is an opportunity for our community to experience a wide range of co-benefits, such as creating socio-economic opportunities, reducing fossil fuel dependency and inequality, and improving the health of people and nature.

ACCELERATED CLIMATE ACTION






WHY?

CO-BENEFITS ACROSS SECTORS

- Improving Air Quality
- Protecting Biodiversity
- Local Job Creation
- Clean Energy Transition
- Behaviour Change

HOW?

FIVE ICLEI PATHWAYS

-  Low Emissions
-  Nature Based
-  Equitable and People-Centered
-  Resilient
-  Circular

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 3:

1. Conduct an inventory and forecast of local greenhouse gas emissions;
2. Establish a greenhouse gas emissions Science Based Target⁵;
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 Two and provides a foundation for future work to reduce greenhouse gas emissions in Miami Shores Village.



Figure 3: ICLEI Climate Mitigation Milestones

⁵ 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 Miami Shores Village community as a whole. The government operations inventory is mostly a subset of the community inventory, as shown in Figure 4. 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.

As local governments continue to join the climate protection movement, the need for a standardized approach to quantify GHG emissions has proven essential.

This inventory uses the approach and methods provided by the U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (Community Protocol) which is described below.

Three greenhouse gases are included in this inventory: carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Many of the charts in this report represent emissions in “carbon dioxide equivalent” (CO₂e) values, calculated using the Global Warming Potentials (GWP) for methane and nitrous oxide from the [IPCC 2014th Assessment Report]:



Figure 4: Relationship of Community and Government Operations Inventories

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

Greenhouse Gas	Global Warming Potential
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	28
Nitrous Oxide (N ₂ O)	265

Community Emissions Protocol

Version 1.2 of the U.S. Community Protocol for Accounting and Reporting GHG Emissions⁶ 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 and commercial 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:

- Wastewater processing
- Fugitive emissions from natural gas leakage

Carbon dioxide represents the vast majority 99% of the community emissions and is produced from burning fossil fuels such as coal, gasoline, diesel, and natural gas. Nitrous oxide accounts for about 0.02% of communitywide emissions, primarily from grid electricity (from fuel combusted to create electricity) and gasoline used for passenger vehicles. Methane accounts for about 0.07% of community-wide emissions, and comes primarily from grid electricity (from fuel combusted to create electricity), gasoline used for passenger vehicles, the methane-to-energy plant, flaring of digester gas, and leakage from the local natural gas distribution system

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

⁶ ICLEI. 2012. US Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. Retrieved from <http://www.iclei.org/tools/ghg-protocol/community-protocol>

within the community boundary, and 2) GHG emissions produced as a consequence of community “activities”.

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

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

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

Most emissions sources in this inventory are quantified using calculation-based methodologies. Activity data refer to the relevant measurement of energy use or other greenhouse gas-generating processes such as fuel consumption by fuel type, metered annual electricity consumption, and annual vehicle miles traveled. Please see appendices for a detailed listing of the activity data used in composing this inventory. Known emission factors are used to convert energy usage or other activity data into associated quantities of emissions. Emissions factors are usually expressed in terms of emissions per unit of activity data (e.g. lbs CO₂/kWh of electricity). For this inventory, calculations were made using ICLEI’s ClearPath tool.

1 tonne of CO₂
is equal to...

A 500m³ hot
air balloon



Communitywide Emissions Inventory Results

The total communitywide emissions for the 2019 inventory are shown in Table 2 and Figure 5.

Table 2: Communitywide Emissions Inventory

Sector	Fuel or source	2019 Usage	Usage unit	2019 Emissions (MTCO ₂ e)
Residential energy	Electricity (Florida Power & Light)	240,188	MMBtu	21,363
	Natural Gas	7,038.6	MMBtu	373.19
Residential energy total				21,736.19
Commercial energy	Electricity	133,868	MMBtu	11,907
	Natural gas	17,205	MMBtu	912.21
Commercial energy total				12,819.21
On-road transportation	Gasoline (passenger vehicles)	445,153	MMBtu	31,503
Public Services	Gasoline	183.32	MMBtu	12.994

Garbage and Trash Trucks	Diesel	149.71	MMBtu	11.077
Transportation total				31,527.071
Solid Waste	Waste Generated	4,370.49	Tons	2,854.7
	Flaring of LFG	227,088	MMBtu	1,158.8
	Combustion	46,730	MMBtu	1,619.7
Solid waste total				5,633.2
Water and wastewater	Water Treatment Energy Usage [Omit if included elsewhere]	4177.7	MMBtu	309.10
	Wastewater Treatment Energy Usage [Omit if included elsewhere]	256.70	MMBtu	22.832
	Nitrogen Discharge	5047	kg N/day	3,834.8
Water and wastewater total				2,166.732
Total community-wide emissions				73,882.403

Figure 5 shows the distribution of communitywide emissions by sector. Transportation & Mobile Sources is the largest contributor, followed by Residential Energy and Commercial Energy.

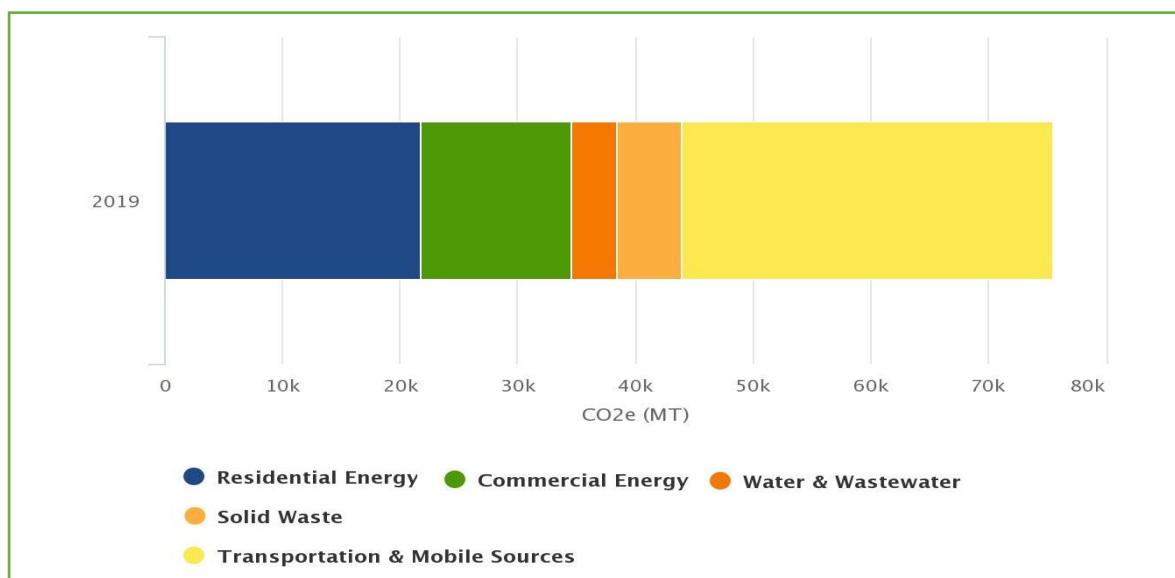


Figure 5: Community-wide Emissions by Sector

Next Steps:

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

- Transportation and Mobile Sources
- Residential Energy
- Commercial Energy
- Solid Waste
- Water & Waste Water

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

Conclusion

This inventory marks the completion of Milestone One of the Five ICLEI Climate Mitigation Milestones. The next steps are to forecast emissions, set an emissions-reduction target, and build upon the existing *Sustainable Miami Shores Initiatives* with a more robust climate action plan that identifies specific quantified strategies that can cumulatively strive to meet the goal of carbon neutrality by 2050 target. The Village's Climate Action Plan will take its cues from and be consistent with the South East Florida Regional Climate Action Plan (RCAP).

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

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

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

Appendix: Methodology Details

Energy

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

Table 3: Energy Data Sources

Activity	Data Source	Data Gaps/Assumptions
Communitywide		
Residential, commercial, and industrial electricity consumption	FPL	
Residential, commercial, and industrial natural gas consumption	FPL	

Table 4: Emissions Factors for Electricity Consumption

Year	CO ₂ (lbs./MWh)	CH ₄ (lbs./GWh)	N ₂ O (lbs./GWh)
2019	21227.88035	2.106827223	0.287294621

Transportation

Table 5: Transportation Data Sources

Activity	Data Source	Data Gaps/Assumptions
Communitywide		
Vehicle miles travelled	Census, Local data	Average calculations
Transit ridership	Miami Dade County	Average calculations
Government vehicle fleet	Local data	

For vehicle transportation, it is necessary to apply average miles per gallon and emissions factors for CH₄ and N₂O to each vehicle type. The factors used are shown in Table 6.

Table 6: MPG and Emissions Factors by Vehicle Type

Fuel	Vehicle type	MPG	CH ₄ g/mile	N ₂ O g/mile
Gasoline	Passenger car	86,812,392	1.5887	0.72054
Gasoline	Light truck	26,205	5.0576 x10 ⁻⁴	3.8783 x10 ⁻⁴
Diesel	Heavy truck	19,371	1.9371 x10 ⁻⁵	2.9056 x10 ⁻⁵

Wastewater

Table 7: Wastewater Data Sources

Activity	Data Source	Data Gaps/Assumptions
Communitywide		
Nitrogen Discharge	North Miami	Sampling only
Digester Gas Combustion/Flaring		
Energy used in wastewater facilities [if reported separately, omit if not]		

Potable Water [if reported separately, omit if not]

Table 8: Potable Water Data Sources

Activity	Data Source	Data Gaps/Assumptions
Communitywide		
Potable Water Energy Use	FPL	Sampling only, multiple agencies area providers

Solid Waste

Table 9: Solid Waste Data Sources

Activity	Data Source	Data Gaps/Assumptions
Communitywide		
Solid Waste	MDC Landfills and local data	Multiple Landfills, Mixed waste, % of moisture

Inventory Calculations

The 2019 inventory was calculated following the US Community Protocol and ICLEI's ClearPath software. As discussed in Inventory Methodology, the IPCC 2014th Assessment was used for global warming potential (GWP) values to convert methane and nitrous oxide to CO₂ equivalent units. ClearPath's inventory calculators allow for input of the sector activity (i.e. kWh or VMT) and emission factor to calculate the final CO₂e emissions.



This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/). It may not be used for any commercial purpose. Any non-commercial use of this material must provide attribution to ICLEI Local Governments for Sustainability USA.