MIAMI FOREVER CARBON NEUTRAL

City of Miami Greenhouse Gas Reduction Plan and Pathway to Carbon Neutrality by 2050

THE CITY OF MIAMI FLORIDA INCORPORATED 1896

MIAMI FOREVER

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Greenhouse Gas Reduction Plan and Roadmap to Carbon Neutrality by 2050

Draft April 2021

Chapter 1: Introduction

Miami Forever Carbon Neutral is the City's Greenhouse Gas Reduction Plan (GHG Plan) and is a roadmap to achieve carbon neutrality by 2050 in the community, strengthen the local economy, and enhance climate justice. The plan is based on five overarching goals that support a GREEN Miami and achievement of the City's GHG reduction targets:

- **G** – Getting Around Miami
- **R** – Renewable Energy
- **E** – Electric Vehicles
- **E** – Energy Efficiency
- **N** – New Economy

As the City emerges from the COVID-19 crisis, this GHG Plan and stated actions provide opportunity for the City's recovery to be green and just. GREEN actions will not only reduce GHG emissions but also build our green economy!

In order to reach carbon neutrality by 2050 and participate in the global effort to keep global warming below 1.5 degrees Celsius, we needed to set a baseline, develop a science-based interim target, and engage key regional stakeholders. This Plan is focused on rapidly decreasing greenhouse gas emissions from sources within City of Miami's jurisdiction, aiming to achieve a 60% reduction in emissions from 2018 levels by 2035.

The Case for Action

Human-caused GHG emissions from activities like burning fossil fuels to produce electricity or driving our cars are the primary contributors to global climate change. 70% of global carbon dioxide emissions (the primary human-caused greenhouse gas) come from cities, which means local governments must be leaders in their commitment to ambitious actions that drastically reduce emissions to avoid the worst impacts of climate change.[1] And, as described in our other climate planning efforts, Resilient305 and Miami Forever Climate Ready, Miami is particularly vulnerable to the impacts of climate change. Miami is a low-lying, subtropical, coastal city which makes it susceptible to flooding due to sea level rise, impacts from intensifying tropical storms, and extreme heat. This confluence of factors paired with population density and exposed assets makes greater Miami one of the most vulnerable areas to climate change in the world. However, with dedicated efforts and investments to climate adaptation and carbon mitigation, Miami can combat these climate challenges and create a resilient and sustainable city for all.

Miami's Greenhouse Gas Reduction Commitments

In November 2019, Miami declared a climate emergency and committed to developing a GHG Reduction Plan. In 2020, the City established a goal of reaching **carbon neutrality/net zero emissions by 2050**, and joined C40 Cities, a global network of cities committed to tackling climate change and increasing the economic and environmental wellbeing of their residents. Member cities use a science-based approach and exchange best practices in taking the urgent and effective actions needed to address the climate crisis and keep global warming below 1.5°C. With C40 Cities' technical guidance, the City set an interim

[1] https://www.c40.org/why_cities

target of **60% reductions below 2018 levels by 2035**. These goals are for citywide emission reductions, which does include emissions from entities that operate within the City but are outside the City's direct control like certain private businesses and some Miami-Dade County services.

The development of this GHG Plan is based on conversations with the C40 Climate Action Plan team and C40's guidance documents, and is supported by C40's technical resources, including a GHG scenario planning tool (Pathways) and action selection and prioritization tool (ASAP).

Miami's Key Greenhouse Gas Reduction Actions

The City of Miami already has a history of climate action to reduce GHG emissions and prepare for and respond to climate risks. Several recent examples include:

- **MiPlan:** The City's first Climate Action Plan and greenhouse gas inventory. MiPlan set out a goal for the City to reduce GHG emissions by 25% below 2006 levels by 2020. By 2018, the City had reduced GHG emissions by ~31%.
- **City Building Retrofits**: During the economic recession in 2008, City of Miami received $4.7 million from the Energy Efficiency and Conservation Block Grant Program (EECBG) to conduct energy efficiency retrofits in City buildings. These retrofits resulted in significant reductions in energy use. In addition, many of the City's outdoor lights have been upgraded to LEDs.
- **LEED Requirement for New Construction**: Miami21, Miami's form-based land use code, includes a LEED silver requirement for all new construction over 50,000 sq. ft. and expedited permitting and density bonuses for green buildings to further incentivize sustainable building design. It also requires cool roofs on most new construction and/or roof replacements to help reduce the urban heat island effect and lower building cooling demand.
- **Miami 21**: Miami21 became the City's effective zoning code in February 2010. The Miami21 Zoning Code is a form-based code guided by tenets of new urbanism and smart growth principles. Its passage facilitated the growth and densification of the urban core.
- **Solar Incentives**: Miami provides expedited permitting and waived permit fees for rooftop solar installations. The City also helps constituents afford solar through the Solar United Neighbors Co-op and PACE financing.
- **Alternative Transportation**: The City operates its own free trolley network with 13 routes and over 5 million rides provided per year. We are currently working to update the Bicycle Master Plan, which will help us create additional dedicated bike lanes. We also partner with private micro-mobility programs, like Citibikes and dockless scooters.
- **Resilient305**: Miami participated in a regional planning process to develop a comprehensive strategy to tackle multiple emerging challenges, including climate change, urbanization, and globalization.
- **Miami Forever Climate Ready**: Miami's climate adaptation strategy to reduce climate risks to the city and its communities, including impacts from flooding, extreme heat, and storms.
- **Google Environmental Insights Explorer Program**: Google has chosen Miami as one of 100 cities nationwide for which they will develop and provide advanced environmental data. This data will help improve the accuracy of future GHG inventories and planning efforts and includes datasets such as an urban tree canopy and emissions from on-road transportation.

Building Miami's Green Economy & Green Workforce

Achieving Miami's GHG targets will require a substantive transformation of the local economy to include more green jobs across various industries. Critical to the City's carbon neutrality agenda is ensuring that local businesses and residents economically benefit from this transition in the form of investment and living wage jobs. The intention of this green economy analysis is to explicitly leverage the transition to carbon neutrality as a pathway to climate justice, a green COVID recovery, and development of an emerging economic sector.

Defining the green economy

The **green economy** is broadly defined as any group of businesses and organizations that use practices that are significantly better in reducing the impact of human activity on the environment[2], including those that mitigate or adapt to the impacts of climate change. Participants in the green economy can be divided into two groups **– those that supply a green output**, such as renewable energy, climate mitigation services, electric vehicles, or mass transit, and **those that consume a green output**.

In recent years, the increasing frequency and intensity of weather events combined with the COVID-19 pandemic have exposed the inequitable nature of the economy, climate change impacts, and access to core social services globally.[3] Investing in the green economy simultaneously brings opportunities for economic diversification, supports climate justice initiatives, and spurs a green and just recovery to the COVID-19 pandemic. The goals of economic diversification and social equity are not new to Miami – the City has doubled down on these priorities since the Great Recession.[4]

The scale of climate change impacts facing our community and the actions needed to transition to a healthy, climate-resilient future and a more sustainable, inclusive economy are far too great for any one economic sector to address alone. The public and private sectors each have key roles to play in positioning the local economy to be responsive to these structural changes and ensuring that the local workforce is prepared for the evolving work required by green jobs. Still, the public sector will play an important role in creating an environment that is welcoming and conducive to growing Miami's green economy, similar to the role the City has played with the tech industry.

Appendix A (pending) provides an evaluation of Miami's current green economy and recommends strategies to grow the local green economy and create inclusive economic opportunity for our residents and workers while supporting the transition to a carbon-free future. This green economy report furthers many objectives established in Resilient305, including goals for building a diverse, inclusive economy, creating youth career opportunities, buying local, and collaborating with local universities.

In Chapter 3, actions with green economy opportunities have been noted with "**$$**".

[2] C40, C40 Green Economy & Innovation Forum webinar on measuring green jobs in cities, 2019.

[3] C40 Cities, Agenda for a Green and Just Recovery, 2020.

[4] Resilient 305, 2019.

Climate Justice

Climate justice begins with recognizing which groups are disproportionately impacted by the environmental and economic consequences of climate change and that climate impacts can exacerbate inequitable social conditions. Typically, those groups tend to be responsible for a relatively low volume of greenhouse gas emissions.

In Miami, climate justice communities are historically underinvested neighborhoods (which tend to be inland), populated by individuals that are low-income, predominantly Black, and recent immigrants. These neighborhoods tend to be viewed as less physically vulnerable to climate change since flooding is less common but they are still vulnerable to climate impacts (hurricanes, extreme heat, flooding, pandemic, recession) and their residents are relatively more socially vulnerable than other parts of the City. Neighborhoods of note in Miami include: Allapattah, Liberty City, Little Havana, Little Haiti/Ti Ayiti, and Overtown.

Inequities experienced by residents of climate justice communities include:

- Utility burden
- Lack of car ownership
- Renters being pushed out of homes due to increasing rent prices
- Uninsured or underinsured
- Prolonged exposure to extreme heat in homes and worksites
- Lack of access to reliable and consistent public transportation
- Live paycheck to paycheck and cannot afford hurricane supplies or to evacuate due to flooding
- Live more than 3 miles from closest grocery store

Throughout the Plan development process, consideration was given to how actions could have disparate impact or benefits across the City and explicit language and programmatic elements have been added to seize climate justice opportunities. This holistic view of climate action is vital in carrying out the City's vision to create a more resilient, safe, and vibrant Miami for all.

Community Engagement Process

In order to produce an equitable plan that represents all of Miami's stakeholders, significant effort was made to inform and engage the public throughout the development of this Plan. Monthly progress updates were given throughout the project development period at the Mayor's Resilience Action Forum, an online, moderated dialogue between the public and City staff focused on climate resilience topics. In addition to that standing update, we had five different methods of collecting feedback. Throughout the engagement process we surveyed to see what areas of the City were being represented and plan to conduct focused engagement in the underrepresented areas.

- Open feedback
    - We began to engage the public by publishing a project website (www.miamigov.com/ghgplan) and inviting people to share both their ideas and concerns about the proposed high-level topics the Plan addresses. For example, increasing rooftop solar and reducing vehicle miles traveled. The survey was open for one month and received 149 responses.

- Virtual workshops
    - Next, the City hosted three identical virtual workshops wherein attendees were briefed on the Plan's goals, answered a survey on their co-benefit criteria priorities, and shared their feedback on specific key actions the City was proposing for the Plan.
- Public draft review
    - After the Plan's release on Earth Day 2021, the Plan will be out for public review for 30 days. Feedback will be solicited via a form or through email for those who are interested in given more in-depth comments. See last page of the Plan for more information on how to provide comment.
- Targeted meetings
    - For key stakeholders and/or stakeholder groups that were not represented in earlier outreach efforts, focused meetings were held to fill knowledge gaps and socialize the plan. For example, through surveying we found that Overtown residents and stakeholders had low representation in engagement efforts prior to the draft plan release so we have scheduled a workshop with a community group to ensure their voices are heard.
- Interviews
    - For the green economy analysis, we sought to pair quantitative jobs data with qualitative anecdotes from professionals working and leading in sectors that are already green or have emerging opportunity. We hosted 13 stakeholder interviews via webcalls to understand their unique perspective and learn more about Miami's green economy potential.

Prior to public engagement, the Division of Resilience and Sustainability staff convened a series of meetings with internal City staff to discuss existing and planned climate actions, as well as feasibility and edits for proposed actions. This feedback was used to inform the emissions forecast and the draft list of actions.

GHG Plan Organization

The GHG Plan is organized into the following four chapters and three technical appendices.

- **Chapter 1 – Introduction** provides an overview of the purpose and context of the GHG Plan, describes Miami's green economy, and summarizes how community members were involved in Plan development.
- **Chapter 2 – Greenhouse Gas Emissions Context and Targets** describes technical aspects of Plan development, including the city's 2018 GHG inventory, future year emissions forecasts, and GHG reduction targets.
- **Chapter 3 – Miami's GHG Actions** presents the Plan's goals and actions needed to meet the interim 2035 target and describes how the full list of Plan actions were prioritized to identify the top 18 for immediate implementation.
- **Chapter 4 – Monitoring Progress and Next Steps** provides a framework for how the City will track and report progress on the Plan's GHG targets and prioritized actions. In addition, there is a brief description of what approaches the City can take to address any remaining emissions in 2050 to demonstrate carbon neutrality.

- **PENDING: Appendix A – Green Economy Report** evaluates Miami's current green economy and identifies strategies to grow the green economy and create inclusive economic opportunity for its residents and workers while supporting the transition to a carbon-free future.
- **Appendix B – Action Evaluation Results** presents the full results of the action evaluation process used to identify the Plan's prioritized actions.
- **PENDING: Appendix C – Implementation Roadmap** includes implementation next steps, City leads, community partners, time frame, and tracking metrics for the Plan's prioritized actions.
- **PENDING: Appendix D – GHG Calculators and Inputs** explains how the City's emission reduction pathway was developed using the C40 Pathways tool and presents a table of Plan goals with corresponding GHG calculators, technology-based strategy inputs, and GHG reductions.

**Note: Appendix A, C, and D will be released with the final version of the plan and are still pending at the time of release of the Draft Plan.*

Chapter 2: Greenhouse Gas Emissions Context and Targets

Miami's 2018 GHG Inventory

A base year inventory establishes a starting point against which GHG Plan progress can be measured. Miami developed a 2018 base year inventory[5] that describes emissions resulting from different activities in our community, like driving cars, powering our homes and businesses, and treating our wastewater. This inventory follows global emissions accounting practices specifically designed to help cities understand how much and from where emissions are created in their communities. In these inventories, GHG emissions are typically reported as metric tonnes of carbon dioxide equivalent or MT CO_2e. This metric helps to reflect the relative strength of different greenhouse gases, such as carbon dioxide, methane, and nitrous oxide, in contributing to climate change. Miami followed the U.S. Community Protocol developed by ICLEI - Local Governments for Sustainability when calculating the 2018 base year inventory.[6] This protocol helps ensure that cities calculate their GHG contributions in a consistent and transparent manner. Miami can also develop future inventories following the same protocol to support an apples-to-apples comparison of emissions over time as one way to monitor overall GHG Plan progress.

Following this process, Miami accounted for the total annual GHG emissions resulting from operating our buildings and vehicles, providing potable water, and treating our wastewater. Citywide emissions totaled approximately 3.3 million MT CO_2e in 2018, and as shown in Figure 2.1 the majority came from on-road transportation (e.g., cars and trucks), commercial building energy use (e.g., stores and offices), and residential building energy use (e.g., homes and apartments). The remaining 2% of emissions came from light rail operations, energy use in manufacturing, fugitive emissions from natural gas distribution[7], and wastewater treatment plant activity.

[5] https://www.miamigov.com/files/sharedassets/public/ghg-inventory-2018-full-report.pdf

[6] Miami originally calculated its 2018 base year inventory using the U.S. Community Protocol. After review with C40, the City updated its inventory to align with the Global Protocol for Community-scale Greenhouse Gas Emission Inventories (GPC). This revision altered the total emissions value from the City's original GHG Inventory document and the value presented in table 2.1 is the final baseline value for Plan purposes.

[7] Fugitive emissions in the City's inventory are attributed to leaks within the natural gas transmission and distribution system. Methane is the largest component of natural gas and is a potent greenhouse gas – 28 times more powerful than carbon dioxide at trapping heat in the atmosphere over a 100-year timeframe.

Figure 2.1 – Miami's 2018 Base Year Inventory

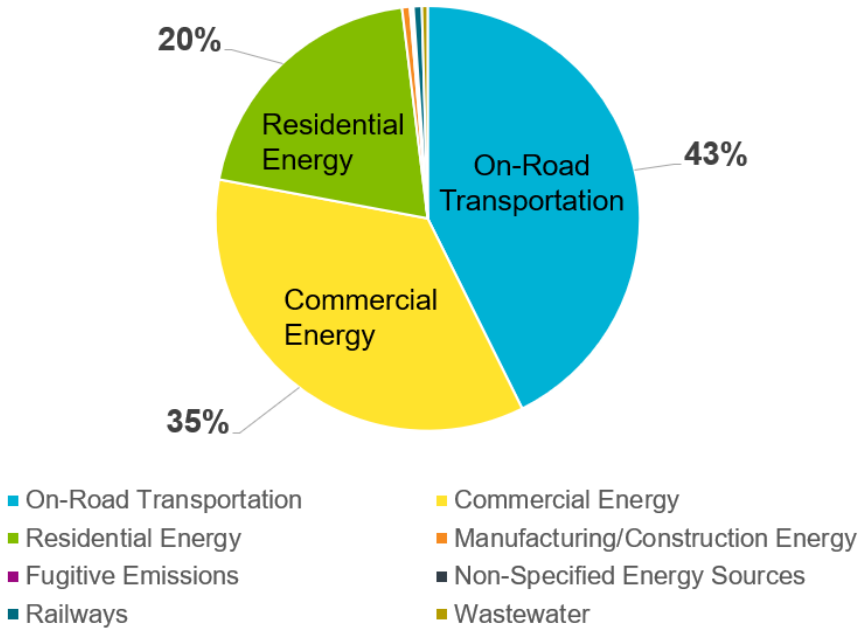


Table 2.1 shows the GHG inventory results organized into sectors and sub-sectors, as well as by fuel type to provide additional detail about our emissions. This information also helps identify areas for GHG reductions and specific GHG Plan actions that can reduce these emissions. This inventory accounts for all greenhouse gas emissions output in the calendar year 2018 within City of Miami boundaries, excluding PortMiami. It is worth noting that solid waste treatment emissions were removed from this Plan analysis based on direction from C40 Cities and GPC Protocol guidance for the BASIC level inventory reporting. In Miami, our community-generated solid waste is sent to a waste-to-energy facility that incinerates waste to produce energy for the regional electric grid, which other communities then consume in their buildings. Therefore, these emissions are represented in other communities' GHG inventory building sectors and addressed through their GHG Plan actions.

Table 2.1 – Miami's 2018 GHG Inventory

Emissions Sector	Emissions Subsector	Fuel Type	Emissions (MT CO_2e)	% Total Emissions
Buildings	Residential	Electricity	643,287	20%
		Natural Gas	19,937	
	Commercial	Electricity	1,019,935	35%
		Natural Gas	125,488	
	Industrial	Electricity	19,635	<1%
		Natural Gas	4,128	

	Fugitive Emissions	Natural Gas Leaks	4,882	<1%
Transportation	Passenger Vehicles	Gasoline	1,045,928	43%
		Diesel	20,768	
	Freight Vehicles	Diesel	339,065	
	Trolley System	Diesel	3,822	<1%
	Metrorail and Metromover	Electricity	17,051	
Wastewater	Wastewater Treatment - Process	NA	12,386	<1%
	Wastewater Treatment - Energy	Electricity	10,080	
		Natural Gas	28	
	Septic Treatment	NA	2,035	
Water	Potable Water Supply	Electricity	7,254	<1%
		Natural Gas	10	
Total			**3,295,718***	**100%**

*The City estimated solid waste emissions in its original 2018 GHG inventory. The emissions were removed from GHG Plan analysis per guidance from C40 Cities based on how the city's solid waste is managed (e.g., incinerated to produce electricity that is supplied to the regional electric grid).

Emissions Forecasts

Estimating future GHG emissions can help us understand how emissions could change over time if no further action is taken, set realistic GHG reduction targets, and focus plan action development on the highest priority emissions sectors. Miami forecasted emissions from the 2018 base year through the 2050 carbon neutrality target year to estimate the total amount of reductions needed to achieve this target.

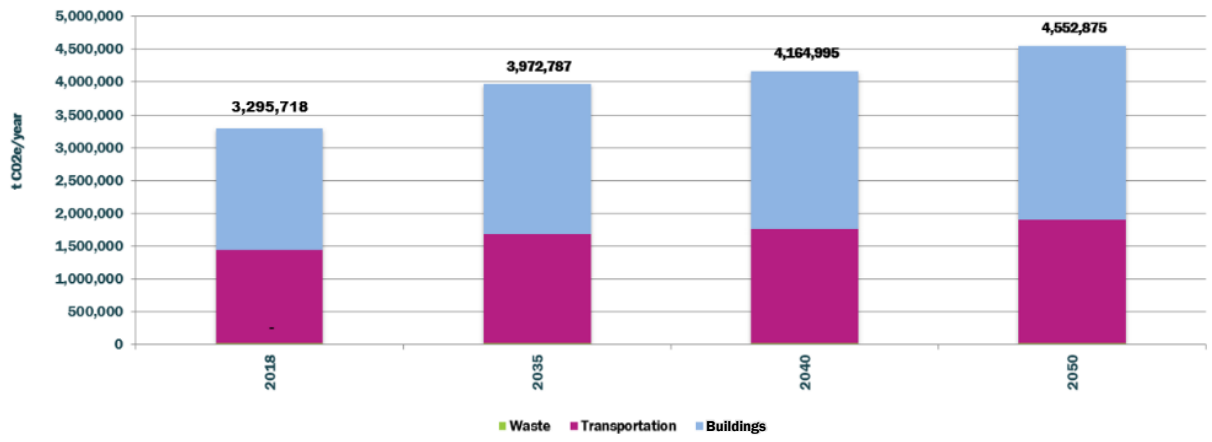
Each emissions source was projected using growth indicators that could serve as a proxy for how emissions might grow in the community. For example, Miami's resident population growth was used as a proxy for how residential energy emissions would grow. In this Plan, the indicators selected were primarily based on local population and employment projections developed by the City of Miami Planning Department. The Plan also used travel demand projections developed by Miami-Dade County to estimate how on-road transportation emissions could change over time. Table 2.2 lists the emissions sources and corresponding growth indicators used in the Plan.

Table 2.2 – Emissions Forecast Growth Indicators

Emissions Source	Growth Indicator	Source
Residential Energy	Population	Miami Planning Department
Commercial Energy	Employment	Miami Planning Department
Manufacturing Industries	Employment	Miami Planning Department
Fugitive Emissions	Natural Gas Growth	Natural Gas growth rates (based on 3 sources above)
On-Road Transportation	Vehicle Miles Traveled	Miami-Dade County SERPM Travel Model
Railways	Vehicle Miles Traveled	Miami-Dade County SERPM Travel Model
Wastewater	Population + Employment	Miami Planning Department

These forecasts represent a "business-as-usual" scenario that shows how emissions will grow over time in the absence of any new City climate policies or action from external stakeholders. Figure 2.2 shows that without any additional action, Miami's emissions will increase by an estimated 38% from 2018 to 2050. This means that to achieve the City's 2050 carbon neutrality target, we need to reduce all emissions in our 2018 base year as well as address all new emissions growth.

Figure 2.2 – Greenhouse Gas Emission Forecasts – 2018-2050



Emissions forecasting is an imprecise science and many variables can influence how our emissions will change over time. However, it is still a useful analysis to frame one potential future emissions scenario that reflects how we think Miami's population and economy will grow. Future GHG Plan updates will revise these forecasts based on newer information to ensure we are continually planning our climate actions in response to a changing emissions profile.

Miami's GHG Reduction Targets – 2035 and 2050

C40's member cities have committed to achieving the goals of the Paris Climate Agreement, which stipulates that global average temperature rise should be kept to well below 2°C above preindustrial levels, and ideally be limited to 1.5°C. To help limit warming to this 1.5°C scenario, the world will need to collectively reach carbon neutrality by 2050 at the latest and achieve negative emissions beyond that through large-scale carbon removal. For cities, per C40's definition, carbon neutrality (also known as net zero emissions)[8], means that GHG emissions have been reduced as much as possible and any remaining emissions are completely cancelled out through offsetting or removed through carbon dioxide removal (CDR)/emissions removal measures. Purchase of offsets is a secondary and last resort measure as all efforts should be taken to eliminate sources of emissions. Staying within the 1.5°C limit is technically possible but will require rapid behavioral and technological transformation at all levels – countries, cities, private sector, and individuals – to enable major emissions cuts and achieve global carbon neutrality by 2050 or sooner.

Miami has set a long-term target of carbon neutrality by 2050 in accordance with the Paris Climate Agreement. The GHG Plan also establishes an ambitious nearer-term or "interim" 2035 target of 60% emissions reduction below 2018 levels. The interim target was defined with input from the C40 Cities Climate Action Plan team and City department staff based on an analysis of the city's emissions forecasts and high-level GHG reduction opportunities. Based on C40's *Deadline 2020* report[9], which sets network targets based on the Paris Climate Agreement and the United Nation's International Panel on Climate Change (IPCC) *Special Report on Global Warming*, member cities are aiming to collectively cut their GHG emissions in half by 2030 and achieve per capita emissions of 2.9 MT CO_2e per person by 2030. Based on the city's emissions and population projections, Miami's 2035 target would result in per capita emissions of 2.0 MT CO_2e per person in 2035, in line with C40's goal. This Plan, and 2035 target, qualifies City of Miami to join the 471 cities, 23 regions, 1,675 businesses, 85 large investors, and 569 universities (as of 2021) worldwide participating in the UN Race to Zero campaign.[10]

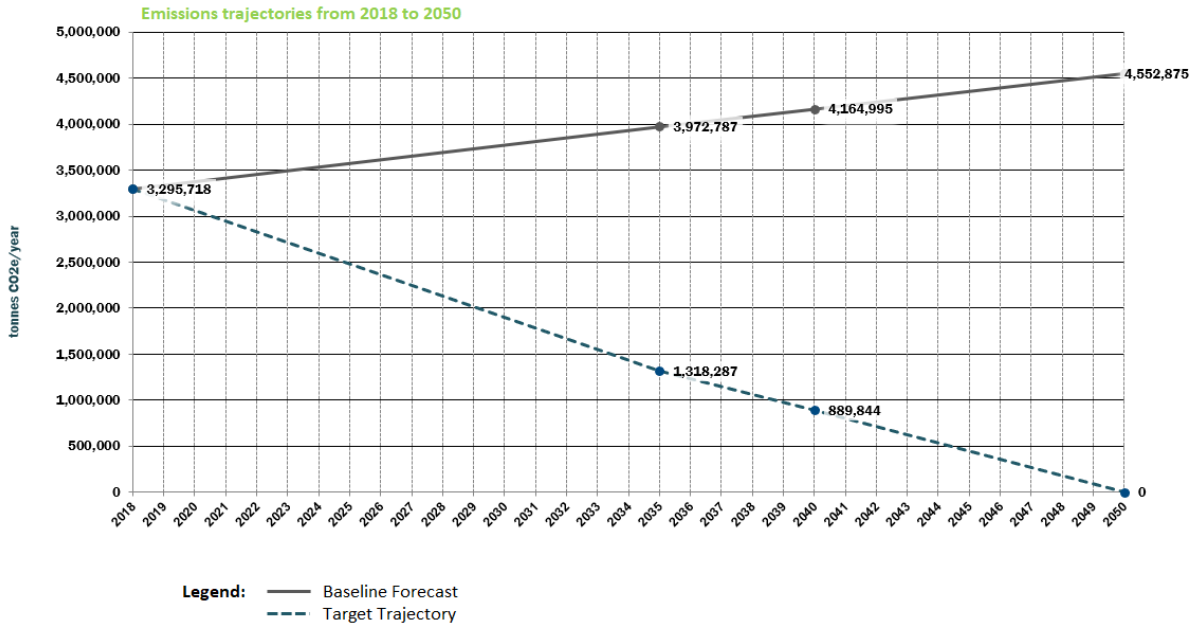
Figure 2.3 shows the city's GHG forecasts (top line) and GHG targets (bottom line); the gap between the two lines represents the amount of GHG reductions needed to achieve the targets.

[8] Carbon neutrality or net zero emissions targets do not mean the City will reduce its emissions locally to zero, but will instead reduce emissions to the maximum extent feasible and then balance its remaining emissions with other actions, such as carbon sequestration or other carbon removal approaches.

[9] https://www.c40.org/researches/deadline-2020

[10] https://unfccc.int/climate-action/race-to-zero-campaign

Figure 2.3 – Miami's GHG Forecasts and Targets



The interim target was defined to balance science-based fair share reduction goals with the City's jurisdiction, to create a target that is a legitimate steppingstone toward long-term carbon neutrality. Achieving this interim target will ensure Miami is on track to meet the Paris Climate Agreement goals and achieve carbon neutrality by 2050. As this is the City's first GHG Plan, we will also continue to evaluate and pursue more aggressive climate action during plan implementation and strive to exceed our established target years.

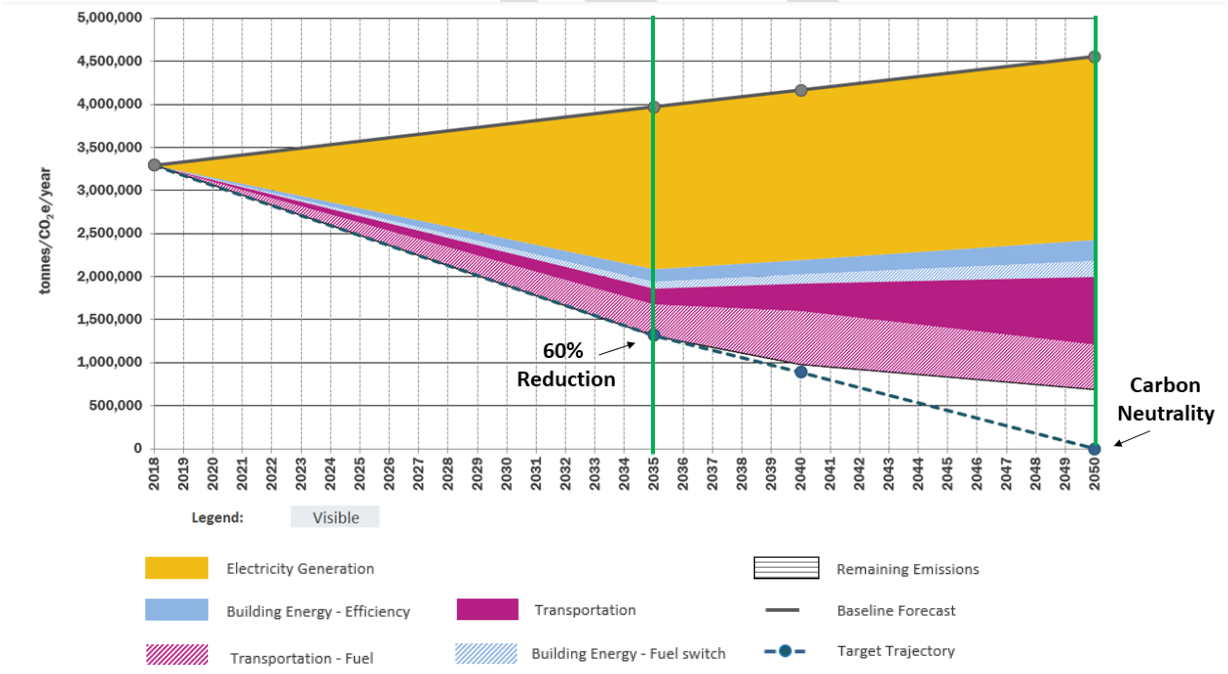
Chapter 3: Miami's GHG Actions

Achieving the 2035 Target

During GHG Plan development, the City evaluated several GHG target achievement options to better understand the opportunities for action within the City's direct control and identify the necessary contributions from outside agencies. The result of this analysis showed that most of Miami's emissions fall outside the direct control of the City. For example, the City of Miami has limited or no control over roadway design, regional transit system improvements, energy procurement within the electric grid, and building code requirements. However, Miami is committed to aggressive emissions reductions in areas where we do have jurisdiction and coalition building and advocacy for aggressive actions by other entities where needed, in order to achieve of our GHG targets.

Using C40's GHG scenario planning tool (Pathways), Miami developed the GHG reduction pathway shown in Figure 3.1. This figure illustrates the City's GHG forecasts (top line), GHG targets (bottom line), and reduction strategies selected to achieve the 2035 target and move toward carbon neutrality by 2050. The colored wedges represent different sectors of GHG action and align with the Plan's GREEN goals. The gap in emissions reductions that begins in 2035 (area with no color) will be addressed in future updates of this GHG Plan.

Figure 3.1 – GHG Reduction Pathway



Within the Plan's GREEN goal framework, five quantified sub-goals and one qualitative sub-goal[11] were also defined in relation to the 2035 GHG target. The sub-goals and their representation within Figure 3.1 are defined below.

- **G** – **Getting Around Miami**
  - *Sub-goal: 15% shift away from private vehicle usage by 2035 (dark purple wedge)*
- **R** – **Renewable Energy**
  - *Sub-goal: 100% carbon-free electricity and energy by 2035 (orange wedge)*
  - *Sub-goal: 60% reduction in natural gas emissions from existing buildings by 2035 (blue wedges)*
  - *Sub-goal: 100% net zero emissions new construction by 2030 (blue wedges)*
- **E** – **Electric Vehicles**
  - *Sub-goal: 36% of passenger trips from electric vehicles by 2035 (light purple wedge)*
- **E** – **Energy Efficiency**
  - Sub-goal: *Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy (dark blue wedge)*
- **N – New Economy**

Miami's GHG pathway reflects existing and planned actions as well as aggressive but feasible new actions by the City, county, state, and federal entities. More information about how we will be tracking progress on our goals can be found in Chapter 4.

Action Selection and Prioritization Process

Miami's GHG Plan actions were assessed using the C40 Cities Action Selection and Prioritization (ASAP) tool—a software tool that documents actions and provides outputs to support the climate action decision-making process through a comparison of action benefits and challenges. ASAP helps users assess the impact of actions based on multiple evaluation criteria, including primary benefits (e.g., GHG emissions reduction), co-benefits (e.g., public health and employment) and feasibility (e.g., costs).

Miami used ASAP to evaluate individual actions' relative emissions reduction potential and their impact on nine co-benefit and feasibility criteria. The GHG reduction scores were based local city data, relevant studies, and results from similar action implementation to evaluate their emissions reduction potential. The co-benefit and feasibility evaluation criteria were developed to align with community and City priorities (see Table 3.1 for a list of criteria and definitions).

Table 3.1 – Action Evaluation Criteria and Definitions

	Evaluation Criteria	**Definition**
Primary Benefits	Greenhouse Gas Emissions Reduction	An estimation of the relative greenhouse gas emissions reduction potential.
Co-Benefits	Public Health	Improve public health through reduced incidents of diseases and/or death attributed to improved indoor and

[11] This sub-goal will be quantified for the subsequent GHG Plan revision

		outdoor air quality, protection from extreme heat, active transport, water quality, access to nutrients, etc.
	Greenspace and Green Infrastructure	Increase greenspace or green infrastructure conservation, creation, or regeneration.
	Employment	Increase employment rate and/or total number of jobs.
	Cost of Living	Reduce daily expenses and provide savings (e.g., utility costs, travel costs, etc.) to residents.
	Climate Justice	Actively address an existing inequity and/or one that would be created via action implementation in climate justice communities
Feasibility Criteria	Additional City Costs	Beyond any funding that is currently secured or identified, how much additional capital would be required to implement, operationalize, and maintain the action?
	Additional Private Costs	Beyond any costs that would otherwise already be incurred, how much additional private capital would be required for businesses or building owners to implement, operationalize, and maintain the action?
	Complexity for the City to Implement	Does the City have the authority to implement this action? Does this action require a policy change and involve multiple departments? How much time and what is the logistical difficulty of completing this action? Are outside resources needed?
	Political Acceptability	Is this action politically popular or would it be politically challenging to implement (e.g., public opinion, stakeholder support or pushback, the number and power of stakeholders)?

For a given action, each evaluation criterion was rated on a qualitative rating scale to reflect the degree to which implementation of the action will impact that criterion. Table 3.2 gives an example of the rating scales used for co-benefit and feasibility criteria. All co-benefits were evaluated using the same rating scale shown in the table, ranging from Very Positive to Very Negative. However, feasibility rating scales were customized to each criterion. Assessing action impacts across multiple criteria helps give a more complete picture of the actions' broader impact beyond GHG reductions. Compete results from the ASAP evaluation process for all Plan actions can be found in Appendix B.

Table 3.2 – Evaluation Rating Scale Examples

Criteria Examples	**Rating Scale**

Public Health	Very Negative	Somewhat Negative	Neutral	Somewhat Positive	Very Positive
Climate Justice	-	Negative	Neutral	Positive	-
Additional City Costs	Very Large Cost	Large Cost	Some Cost	Very Little Cost	No Cost
Complexity to Implement	-	Very Complex	Somewhat Complex	Not Complex	-

The results of the ASAP evaluation were then used to prioritize 18 actions which will help the City:

- Highlight actions that would benefit from deeper analysis in the implementation roadmap
- Sequence first actions that are foundational to our success
- Elevate actions the City must move on in the next 3 years
- Identify action leads and partner departments and outside entities
- Create a short-term workplan

ASAP provides different graphic and tabular outputs to help users interpret the evaluation results, including a ranking of actions by GHG reduction potential (see Figure B1 in Appendix B), actions by co-benefit score (see Figure B2 in Appendix B), and actions by feasibility score (see Figure B3 in Appendix B). The City team identified actions that appear in each of these lists as a starting point for prioritization because these actions provide high GHG reductions, important additional community benefits, and have a higher degree of implementation feasibility. The City team also chose to prioritize actions that provide specific community co-benefits, including positive benefits for climate justice, green infrastructure, and jobs creation.

Following this approach, the City team prioritized 18 actions from the Plan's full list of 40 GHG mitigation actions, which are outlined in green boxes in Figures 3.2-3.4 and highlighted in green in Chapter 3. Six building energy efficiency actions and five electric vehicle actions were prioritized due to their high level of direct GHG impact, city authority to implement, and co-benefits to residents. The remaining actions address carbon-free energy (three actions), mobility (two actions), and additional enabling actions (two actions). Fewer actions were prioritized in these categories because they do not result in large direct GHG reduction impacts or are promoting actions that fall primarily outside of the City's direct control, like advocacy for transportation infrastructure improvements.

GHG Plan Goals and Actions

The following pages introduce the GHG Plan's 40 actions, organized within the overarching goals. As the energy, buildings, and transportation sectors produce 98% of the city's total emissions, Miami has focused its current efforts on actions in these sectors since they will have the largest immediate impact. Six enabling actions are also listed that apply across each of the goal areas and include advocacy actions that identify initial ways the City can try to influence the policy framework for emissions sources outside its direct control. Many of these actions are new ideas that will need research, stakeholder engagement, and planning before they are enacted. Implementation plans for prioritized actions will breakdown the planning process and key milestones (Appendix C).

Key:

- Actions highlighted in green are the City's prioritized actions.
- Actions that have been noted with "**$$**" have green economy opportunities.

Goal 1: GETTING AROUND MIAMI

In 2018, approximately 85% of total passenger trips in Miami were taken in private gas and diesel vehicles. These passenger trips alone generate 32% of total city-wide emissions. The first step to reducing transportation emissions is to reduce the number of miles traveled in private cars by facilitating a transition to other modes of transportation, like Metrorail, Metrobus, trolley, walking, rolling, or biking. To facilitate this shift, we must utilize land use and transportation planning to integrate jobs, housing, and other daily uses with an efficient transit and active transportation (e.g., walking, biking, e-scooters) network. To achieve the stated GHG reductions for this goal, Miami has established a sub-goal for a 15% shift away from 2018 levels of private vehicle use to other forms of transportation by 2035. This goal is in alignment and will work in concert with the Miami-Dade County Climate Action Strategy goal for a 10% shift away from single occupant vehicles by 2030.

Travel mode shifting can reduce the total number of vehicle miles traveled in the city and the total emissions generated per mile traveled, while simultaneously reducing traffic congestion and providing public health benefits from reduced local pollution and increased exercise. Meeting this goal requires City action to promote transit and active transportation, County and Transportation Planning Organization (TPO) action to implement the SMART Plan, and resident action to voluntarily switch to lower-emissions transportation options as part of their daily lives. Travel mode switching can also reduce the total number of private vehicles to be electrified in Goal 3 Electric Vehicles.

Sub-goal: 15% shift away from private vehicles usage

City Authority:

- The City manages the Miami trolley system, owns many of the City's lower capacity local roads, and has local land use planning authority, via Miami21, to define the type, location, and mix of different land uses. However, Miami-Dade County owns and manages the major public transportation system, including Metrorail and Metrobus. In addition, the State of Florida and Miami-Dade County have authority over many of the major arterial streets in the City.

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
T-1: Collaborate with Miami-Dade County and local advocacy groups to increase utilization of biking as a transit method by implementing the Bicycle Master Plan and expanding the number of protected, green bikeways. **$$**	The City is currently updating the Bicycle Master Plan and intends for the plan to be complete by summer 2022. This action also includes greening the bicycle network and installing shade, water fountains, and bike repair infrastructure, where feasible, to improve rider comfort and safety. As the County owns important arterial streets, they will be a key partner.	<u>Resilient305</u> ACTION 12: Develop Mobility Hubs in the 305 <u>MFCR</u> Goal 4: Update and implement bicycle master plan to improve safety

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
		and connectivity of bicycle routes.
T-2: Expand micromobility options throughout the entire city including Citibikes, scooters, and electric bikes. **$$**	Currently, most micromobility options are concentrated in District 2. This action can aid residents without cars and considers free service for specific users.	Resilient305 ACTION 12: Develop Mobility Hubs in the 305 ACTION 14: Drive Into the Future
T-3: Build upon existing transit-oriented development policies in Miami21 to increase residential density, access to goods and services, and decrease single-occupancy vehicle use focusing on areas surrounding Metrorail stations.	Transit-oriented development (TOD) is a type of urban development that centers communities around public transit. Miami's existing TOD policies could be enhanced to include increased inclusionary zoning and mixed-use zoning near Metrorail stations, increased density within a certain distance of a Metrorail station, free commuter parking lots outside the downtown area with shuttle service into the city, increased investments in green space and parks near Metrorail stations, etc.	Resilient305 ACTION 12: Develop Mobility Hubs in the 305
T-4: Adopt transportation demand management ordinance to require certain employers and developers to develop plans to reduce single-occupant vehicle use and traffic during peak hours among employees and residents.	Transportation demand management (TDM) includes strategies for reducing demand for road capacity primarily during peak periods (e.g., incentives for transit, carpooling, and telework). The current Miami TDM suggested measures could become a requirement. Additionally, a zoning ordinance could require any project receiving a parking discount to adopt TDM measures.	
T-5: Reduce emissions from City employee commute by continuing to permit work-from-home and hybrid/flexible schedules, improving public transit	COVID-19 demonstrated that telecommuting is possible and effective for city employees and some local businesses. Teleworking greatly reduces	

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
benefits, and implementing a parking fee.	vehicle miles traveled and local pollution from idling in traffic.	
T-6: Establish parking disincentives, such as parking maximums and dynamic parking prices, to discourage the use of single occupancy gas vehicles. **$$**	Expansion of parking maximums through TODs and Parking Management Districts will discourage the use of vehicles in downtown areas. Dynamic parking prices can maximize revenue (potentially to fund other GHG Plan actions) and can encourage mode switching in areas close to transit.	
T-7: Implement Transit Alliance recommendations to update trolley routes in alignment with Better Bus Project Metrobus route redesign and increase service where possible. **$$**	Implementing the Better Bus Project recommendations on the City's trolley system will improve service and better align trolley service with new County bus routes.	Resilient305 ACTION 13: Design a Better Bus Network MFCR Goal 4: Implement new trolley route recommendations from the Better Bus Project to better coordinate trolley system with other public transit options. Improve ease of use of trolley system by updating user interface of trolley app.
T-8: Work with Miami-Dade County and local advocacy groups to increase utilization of public transit through investments in safety, improving public transit literacy, and campaigns.	The City will support and enhance any County outreach campaign for the bus system through actions such as investing in safety measures and improving public transit literacy.	Resilient305 ACTION 13: Design a Better Bus Network

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
T-9: Improve pedestrian experience and safety through investments in sidewalks such as ADA compliance measures and increasing number of crosswalks, especially in low-medium income areas. **$$**	Increasing pedestrian infrastructure will encourage residents and visitors to walk to their destinations. A primary goal is to finish the Baywalk and Riverwalk.	

Goal 2: RENEWABLE ENERGY

Electricity in Miami is used to cool and heat buildings, provide lighting, and power appliances among other activities. Florida Power and Light (FPL) is the primary electricity provider in Miami, while some residents and businesses also generate their own electricity through on-site renewables like solar power. In 2018, 24.5% of FPL's electricity was generated from carbon-free fuel sources: 1.5% renewables and 23% nuclear. As carbon-based sources currently make up the majority of the electric grid's fuel mix and Miami's high electricity consumption, electricity use was responsible for more than half (52%) of the city's total GHG emissions in 2018. To reduce these emissions and ensure that transportation and building electrification programs reach their maximum potential, Miami's electricity sources must be 100% carbon-free by 2035. This goal is in alignment and will work in concert with the Miami-Dade County Climate Action Strategy approach to expand on-site and off-site renewable energy generation.

FPL projects that its electric grid mix will be 37% carbon-free (17% from renewables) by 2029. To provide 100% carbon-free electricity to residents and businesses, Miami needs to drastically increase the amount of local renewable energy development, encourage a higher carbon-free electric mix from FPL, and promote solar-friendly policies at the state level. The City will also monitor climate action from the Biden administration, including its goal to achieve 100% carbon-free electricity in the national power sector by 2035. Based on guidance from the C40 Climate Action Plan team, Miami has assumed achievement of the Biden administration's goal within the GHG reduction pathway presented at the start of this chapter. This assumption helped to highlight the remaining reductions that are needed from City and regional actions after this sector is fully addressed.

Green Economy

Today, the clean energy industry in Miami provides just over 400 jobs, which is less than 30% of the total jobs in the traditional industry sector. However, clean energy jobs have grown by 16% in the past decade indicating that there is consistent local growth in this industry.[12] In 2019, traditional industries spent nearly $600 million on clean energy in Miami, indicating that there is a market for clean energy and that the market is fueled by traditional sectors. The actions listed below support GHG reductions and create opportunity to drive demand for clean energy even further and increase demand for clean energy jobs.

In Miami, natural gas is primarily used in buildings for water heating, space heating, and cooking. Though only 5% of total emissions in 2018 came from natural gas use in buildings, the building sector is one area where the City has relatively high regulatory control and all emissions sources will need to be addressed to achieve Miami's carbon neutrality goal. By increasing building efficiency, electrifying building systems or powering with zero-carbon energy sources, and ensuring that the electric grid is 100% carbon-free, Miami can achieve zero building sector emissions.

The number of buildings in Miami – homes, offices, stores – is also projected to increase to meet demands of the growing population and workforce. The longer this new construction is permitted to install mixed-fuel systems (e.g., natural gas and electricity appliances/equipment), the more building

[12] AECOM analysis, Emsi 2019 industry data.

retrofits will be required in the future to achieve the carbon neutrality target. Instead, Miami can avoid emissions "lock-in" like this by avoiding construction of new mixed-fuel buildings, and instead require all-electric building designs that can be powered with 100% carbon-free electricity per Goal 2 or require 100% carbon-free building energy systems (such as use of renewable natural gas).

Sub-goal: 100% carbon-free electricity and energy by 2035

City Authority:

- City of Miami cannot directly control the utility fuel mix but does have control over our own buildings and parcels, as well as the zoning code and building permits which can influence building requirements to an extent. We can leverage this influence to expand rooftop solar and grow the City's on-site solar and storage capacity.

Sub-goal: 60% reduction in natural gas emissions from existing buildings

City Authority:

- Though the City cannot require its residents to replace their existing natural gas systems, it can enact policies that encourage the electrification of systems at the end of their operating life or replacement with carbon-free fuel sources, as well as implement a commercial building energy performance standard requiring certain buildings to demonstrate emissions reductions through energy efficiency projects or other retrofits. Meeting this sub-goal will still depend heavily on voluntary action by residents and buildings owners and can be further encouraged with City-provided incentives.

Sub-goal: 100% net zero emissions new construction by 2030

City Authority:

- Via Miami21 and the permit process, the City can regulate new construction. In addition, the City holds its own franchise agreements with natural gas providers.

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
E-1: Provide additional policy and financial incentives to encourage private solar installations and identify incentives that would appeal	Solar incentives are necessary to encourage residents and businesses to voluntarily install solar. Strategies may include streamlining permitting, zoning bonuses, rebates, financing mechanisms, etc. The	Resilient305 ACTION 16: Expand Renewable Energy

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
to owners of affordable housing. **$$**	City already provides free, expedited permits for solar and supports PACE financing.	
E-2: Install solar and storage in public buildings or parking structures where feasible, prioritizing critical facilities.	Resilience Hubs can be used as solar pilot locations to showcase solar and battery storage systems within a facility designated to provide critical services during power outages.	Resilient305 ACTION 16: Expand Renewable Energy ACTION 38: Support Resilience Hubs ACTION 57: Leverage the Power of Purchasing
E-3: Require buildings that are re-roofing to be solar-ready. **$$**	Solar-ready requirements include providing wiring conduits, careful replacement of roof vents, and reserving roof space for future solar photovoltaic (PV) infrastructure. This action can be implemented through a building ordinance.	Resilient305 ACTION 16: Expand Renewable Energy
E-4: Starting in 2022, require all new buildings to be solar-ready and storage-ready.	This requirement would also apply to existing buildings at the time of substantial retrofit. In the future, the policy could be expanded to require new buildings to install solar. Installing a storage-ready solar system will reduce future battery installation costs and provide energy security in the case of a power outage.	Resilient305 ACTION 16: Expand Renewable Energy
E-5: Promote community participation in FPL SolarTogether program, especially among renters, to purchase 100% electricity from solar.	SolarTogether is a community solar program that allows customers to voluntarily pay a monthly premium for solar electricity and later receive credits for savings produced by the program. The program increases access to solar for those who cannot directly install it.	Resilient305 ACTION 16: Expand Renewable Energy

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
E-6: Join FPL SolarTogether program to purchase City's building electricity from solar.	To support utility-level solar and address emissions from City buildings, the City can purchase its electricity from installed solar from FPL. The program will open to cities for enrollment in 2022-2024.	
E-7: Partner with local clean energy non-profits to increase awareness of solar financing, utility savings, fair rates, hurricane proofing, etc., with particular emphasis on messaging to residents in low- and medium-income communities.	The campaign will highlight any of the City's new solar policies instruct people on financing, utility savings, fair rates, hurricane proofing, etc. The process can include developing criteria for certified solar vendors and contractors.	Resilient305 ACTION 16: Expand Renewable Energy
E-8: Make all non-emergency energy use in existing public buildings carbon-free by 2035. Explore and adopt as much clean energy emergency generation and battery storage as possible. **$$**	Energy assets will be inventoried with feasibility analysis for carbon-free replacements, and appliance/equipment replacements will be planned in the capital spending budget. As the City has leased many of its buildings, green initiatives in lease agreements can be considered.	
E-9: Partner with community organizations such as local non-profits, trade organizations, and electric and gas utilities, to develop a carbon-free building education program to provide information and technical assistance. **$$**	As building carbon-free may be a new concept to property owners and contractors, a comprehensive program is needed to guide citywide carbon-free building projects. This program may include a PSA campaign on the benefits of carbon-free energy and resources to provide information about relative benefits of carbon-free energy choices. Resources will be balanced between new construction and renovation projects.	

Goal 3: ELECTRIC VEHICLES

Most of Miami's private vehicle trips are from gas and diesel vehicles. Understanding that not everyone can use public transit or active transportation options, these vehicles must be electrified and powered with 100% carbon-free energy if we are to meet our carbon neutrality goal. Miami has set a sub-goal of electrifying 36% of passenger trips compared to 2018 levels by 2035, which works in tandem with Goal 2: Renewable Energy as the greenhouse gas reduction potential of EVs is dependent on the fuel source for the electricity used to charge vehicles. This goal is in alignment and will work in concert with the Miami-Dade County Climate Action Strategy goals to electrify the County fleet and shift 30% of community vehicles to electric by 2030.

Sub-goal: 36% of passenger trips from electric vehicles

City Authority:

- The adoption of electric vehicles (EVs) comes down to consumer choice, but the City can help create a hospitable market and ecosystem that makes buying and owning an EV easier and more attractive. Miami Parking Authority is a quasi-jurisdictional entity of the City of Miami and is therefore a reliable partner in the expansion of EV chargers in public parking. Miami21 can set requirements for new construction but existing parking, especially privately owned, is more challenging. Lastly, the City has full control over its own fleet, which includes the trolley system, but does not own or operate the Metrobus system or public school buses.

Green Economy

Critical to building an EV-supportive climate will be the availability of EV-trained mechanics and electricians to support EV charging station infrastructure. With more EVs scheduled to arrive in the market within the next year and car companies transitioning to all-electric vehicle stocks, demand for EV mechanics is already expected to grow in the coming years, and the actions presented below will further catalyze this demand. Mechanics, particularly bus and truck mechanics, make well above the living wage ($24 per hour compared to the living wage of $18 per hour), so increased demand for these jobs will create important opportunities for Miami's workforce. While Miami-Dade College already offers an EV mechanic training program, additional training programs could be offered, along with targeted marketing and recruitment strategies. Likewise, increasing awareness of and recruitment to the electrical trade, including marketing its wage and growth benefits, and, specifically, the EV charging station certification, will ensure that Miami has a workforce that is able to facilitate widespread EV adoption and a workforce that is positioned to benefit from it.

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
EV-1: Adopt EV infrastructure and procurement policy to	The City will work with the Electrification Coalition and other	Resilient305

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
electrify 100% of public vehicle fleet, including trolleys by 2035.	technical support teams to develop an EV transition plan. The City will develop information on lessons learned through this process to share with private fleet managers. Emergency response vehicles have been excluded in the near-term, but they will upgrade when feasible.	ACTION 15: It's Electric MFCR Goal 1: Conduct a fleet analysis to determine best vehicles for future electric vehicle (EV) changeover.
EV-2: Partner with Miami Parking Authority to expand EV charging station installations in public locations. **$$**	Increasing EV parking requirements for any public off-street parking facilities will promote the use of EVs around the city. The City will develop a streamlined process for reviewing and approving charging station installations. EV charging infrastructure should be prioritized for grant funding. Miami can partner with FPL and FDOT on this action.	Resilient305 ACTION 15: It's Electric MFCR Goal 4: Support expansion of electric vehicles (EVs) by installing EV charging stations at City-owned properties and changing over fleet vehicles to EVs when possible.
EV-3: Build on EV Capability Ordinance to require EV charger installations in new developments starting in 2025. **$$**	The current EV Capability Ordinance requires new construction over a certain size to install EV-ready spaces for 20% of new off-street parking. Miami could expand upon this ordinance to require the installation of EV chargers.	Resilient305 ACTION 15: It's Electric
EV-4: Partner with major employers to install EV chargers in parking lots/garages. **$$**	Key employers include hospitals, banks, hospitality groups, Miami-Dade College, and Marlins Arena.	Resilient305 ACTION 15: It's Electric ACTION 57: Leverage the Power of Purchasing

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
EV-5: Develop City EV Charging Master Plan to plan and prioritize where future EV chargers should be installed on City owned properties and within the City.	A Master Plan would help the City properly assess where to install EV chargers, so resources are utilized effectively. Miami will collect locational data on charging stations to determine key corridors/locations to prioritize installations, such as along the I-95 corridor in collaboration with the State.	Resilient305 ACTION 12: Develop Mobility Hubs in the 305 ACTION 15: It's Electric
EV-6: Develop technical guidance for building owners/managers to facilitate in EV charging infrastructure installations in existing buildings.	Technical barriers to installing EV chargers can be overcome with the proper guidance and troubleshooting related to common building types/challenges in Miami. Additional guidance will be provided to help private fleets transition to EVs.	Resilient305 ACTION 15: It's Electric
EV-7: Partner with existing electric vehicle non-profits to promote public awareness of the benefits and real costs of EV purchasing and ownership, especially addressing low-income drivers and their concerns.	This campaign includes promoting awareness on the typical cost of EV chargers, cost of charging, charging locations, life-cycle comparisons, incentives, approved vendors, dealerships, and test drive events.	Resilient305 ACTION 15: It's Electric
EV-8: Evaluate implementing an electric vehicle-sharing program within neighborhoods with low car ownership.	This action increases access and familiarizes EVs in low-income neighborhoods and areas of low car ownership. Los Angeles and Sacramento have similar equity focused EV carshare programs.	Resilient305 ACTION 15: It's Electric
EV-9: Evaluate the potential to implement a low emission zone in the urban core.	A low emissions zone is a defined area where access by some polluting vehicles is restricted or deterred. This would promote the use of EVs, alternative fuel vehicles, and active transportation options in downtown areas.	Resilient305 ACTION 12: Develop Mobility Hubs in the 305 ACTION 15: It's Electric

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
EV-10: Investigate the feasibility of internal combustion engine phase out policy.	Some US car manufacturers have announced they will eliminate new fossil fuel vehicles and produce majority EVs while some US states and cities have announced bans on the sale of new fossil fuel vehicles. Miami could investigate the feasibility of an internal combustion engine phase out policy for some or all vehicles in the City.	Resilient305 ACTION 15: It's Electric

Goal 4: ENERGY EFFICIENCY

56% of Miami's citywide emissions come from building natural gas and electricity consumption. Increasing energy efficiency is the first and easiest step to reducing building emissions. This can be done by replacing inefficient appliances, ensuring mechanical and electrical systems are properly maintained, using intelligent monitoring and control systems, or simply changing occupant behaviors.

The buildings sector is one area where the City has relatively high regulatory control. Though increasing building efficiency will depend heavily on voluntary action by residents and buildings owners, the City can implement building transparency and performance standards that would require certain buildings to demonstrate emissions reductions through energy efficiency projects or other retrofits. This goal is in alignment and will work in concert with the Miami-Dade County Climate Action Strategy approaches to benchmark, retune, and retrofit existing buildings and to build ultra-low energy buildings.

Sub-goal: *Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy*[13]

City Authority:

- The Florida Building Commission adopts and updates the Florida Building Code, which sets minimum energy efficiency requirements in all new buildings and buildings undergoing major renovations. The Miami Buildings Department enforces the Code and can also require higher levels of compliance through the City's Zoning Code.

Green Economy

The green buildings sector, which includes energy efficiency contractors, electricians, and other specialty contractors, accounts for 35% of all local green jobs. Traditional, non-green industries spent over $2 billion in the local green buildings industry in 2019 alone. Yet, green buildings jobs makeup just 13% of all buildings and construction jobs, indicating that there is room for growth in green jobs in this industry. Importantly, as demand for green buildings grows and the corresponding demand for specialty contractors grows (spurred by the actions presented below), the local workforce will need to be prepared to fulfill these jobs or otherwise risk losing them to people outside the region. It will be critical for the City and its partners to market green jobs in the buildings industry, particularly to young people and to develop and expand training pathways tailored to these jobs. New or expanded green workforce development opportunities will need to offer training to people entering the workforce and to re-skilling to those already within the buildings and construction industry. Since these jobs tend to pay at or above the living wage, special attention should be given to recruiting and training potential employees from historically marginalized communities.

[13] This sub-goal will be quantified for the subsequent GHG Plan revision

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
B-1: Adopt commercial building energy benchmarking and reporting ordinance for private buildings over 20,000 sq. ft. **$$**	This action aligns with the BE305 Energy Benchmarking program. Tracking and reporting energy consumption is the first step to understanding GHG reduction opportunities in buildings. Larger buildings produce a higher percentage of GHG emissions, so they are targeted through these actions. Implementation would include the education and training of commercial building owners.	Resilient305 ACTION 17: Building Efficiency 305
B-2: Adopt commercial building energy performance standard ordinance for private buildings over 20,000 sq. ft. **$$**	Implementing an energy performance standard is the next step after adopting a benchmarking and reporting ordinance. Commercial property owners will be required to meet energy or GHG reduction targets over a set period. Compliance measures can include periodic audits and retro-commissioning. Certain performance requirements could also be met at point of sale or lease. Fines can be implemented for non-compliant buildings that can be used to help fund retrofits, audits, retro-commissioning, etc.	Resilient305 ACTION 17: Building Efficiency 305 Resilient305 ACTION 37: Prepare Your Property
B-3: Establish a home energy rating and disclosure ordinance to be implemented at point of sale or lease. **$$**	A home energy rating identifies opportunities for energy improvement to homeowners and sends market signals about the benefits of building efficiency. Through this program, resources would be provided for homeowners to improve their rating. Low income populations would be subsidized.	
B-4: Establish a residential energy conservation ordinance (RECO) at the point of property sale or lease with support	Residential property owners would be required to make energy conservation improvements in their homes at the point of property sale or lease. Implementation could include a proscriptive list of improvements, a list of options for user selection, and/or a maximum investment	

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment
mechanisms for low income homeowners. **$$**	threshold. Low income populations would be subsidized.	
B-5: Update green buildings requirement to increase program participation and impact including lowering square footage for compliance, broadening accepted certifications, and increasing necessary level of compliance.	Miami's existing LEED Silver zoning code requirement for buildings with 50,000 sq ft of habitable space could be increased to LEED Gold, Living Building Challenge, or Net Zero. Building square footage thresholds for compliance could also be reduced and modified to increase reach. This action will promote improved monitoring and enforcement of energy-related building code requirements.	Resilient305 ACTION 17: Building Efficiency 305 MFCR Goal 5 Phase 1: Increase enforcement of existing requirement for buildings over 50,000 sq. ft. to be LEED certified or equivalent.
B-6: Require all new public buildings to be built to zero net energy standards starting in 2025.	Requiring new public building construction to be net zero energy will help demonstrate the feasibility of net zero construction in Miami and allow the City to lead by example.	Resilient305 ACTION 17: Building Efficiency 305 ACTION 21: Train for Construction

Goal 5: NEW ECONOMY

To complement and amplify the GHG Plan and the Miami Forever Bond, the City of Miami can take actions now to position itself to benefit from the economic opportunities created from these green investments. Implementation of the GHG Plan actions will inherently green the economy, however, specific actions can be taken to ease this transition and provide enhanced opportunities to Miami's workforce and specifically to marginalized communities. Through targeted partnerships, marketing and recruitment strategies, and workforce development offerings, the City can create economic opportunity for residents while setting itself up as a hub for green, innovative business.

The City of Miami is currently developing sub-goals and actions that are intended to support Miami in growing its green economy and green workforce. The actions are meant to be immediately achievable (in the next one to two years) or achievable within the next five years and will be available in the final GHG Plan.

Additional Enabling Actions

As many emission sources are outside of the City's direct control or influence, enabling legislation and programs are needed to significantly reduce these emissions. Miami can advocate for progressive climate policies at the federal and state levels, or from utility providers, as well as create their own programs that may indirectly provide emissions reductions, such as a jobs training program. Actions that do not have separately quantified GHG reductions but are necessary to support City-led climate action are included below.

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment	GHG Reduction Alignment
A-1: Advocate for climate-forward policies from FPL including protection of net-metering and increased funding for programs to assist low-income residents with energy efficiency upgrades.	These options can help encourage residents to install more solar or purchase solar electricity. Additionally, advocate for increased funding for energy efficiency retrofit programs for low-income households.	Resilient305 ACTION 16: Expand Renewable Energy	Carbon-free Electricity Building Electrification/ Efficiency
A-2: Advocate for climate-forward policies from the Public Service Commission (PSC).	PSC sets Florida Energy Efficiency and Conservation Act (FEECA) conservation goals every five years for utilities to encourage customers to conserve energy and avoid the need to build new power plants. Miami would engage the PSC around enhancing FEECA goals.	Resilient305 ACTION 17: Building Efficiency 305	Building Electrification/ Efficiency
A-3: Advocate for climate-forward policies and financial incentives from the state of Florida, including energy code updates to the Florida Building Code.	Advocate for Florida to update the Florida Building Code to enhance energy efficiency and solar measures, and tax and insurance incentives to support carbon neutrality and climate adaptation projects. These measures will incentivize the installation of solar and building energy efficiency improvements.	Resilient305 ACTION 16: Expand Renewable Energy ACTION 17: Building Efficiency 305 MFCR	Carbon-free Electricity Building Electrification/ Efficiency

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment	GHG Reduction Alignment
		Goal 5 Phase 2: Advocate for changes to the Florida Building Code and participate in the voting process to further strengthen flood risk mitigation and energy and water efficiency measures.	
A-4: Develop a financial and technical assistance program that helps residents, particularly low-income, to pursue climate action. **$$**	This action includes education, investigating financial mechanisms and revenue streams to fund incentives and rebates, and technical support.	Resilient305 ACTION 37: Prepare Your Property	Building Electrification/ Efficiency
A-5: Partner with local universities and trade organizations to elevate and support existing technical job training program for energy efficiency, retrofits, weatherization, solar installations, EV maintenance, EV charging installation, etc. **$$**	Implementing new local, state, and federal climate policies will require a green workforce. Offering a technical job training program will increase local employment and ensure workers are properly trained for new types of business.	Resilient305 ACTION 21: Train for Construction	All Goals
A-6: Create a resilience and sustainability division in the Building	Designated City specialists in each sustainability field can assist in both public and private projects and		All Goals

Actions	Action Details	Resilient305 / Miami Forever Climate Ready Alignment	GHG Reduction Alignment
department and train employees or hire new staff with expertise in solar PVs, battery storage, EV charging, energy efficiency, electrification, and climate adaptation policies. **$$**	develop technical best practices for citywide climate strategy implementation.		

Action Summary

Goal 1: GETTING AROUND MIAMI

Goal 1 Actions:

- T-1: Collaborate with Miami-Dade County and local advocacy groups to increase utilization of biking as a transit method by implementing the Bicycle Master Plan and expanding the number of protected, green bikeways. **$$**
- T-2: Expand micromobility options throughout the entire city including Citibikes, scooters, and electric bikes. **$$**
- T-3: Build upon existing transit-oriented development policies in Miami21 to increase residential density, access to goods and services, and decrease single-occupancy vehicle use focusing on areas surrounding Metrorail stations.
- T-4: Adopt transportation demand management ordinance to require certain employers and developers to develop plans to reduce single-occupant vehicle use and traffic during peak hours among employees and residents.
- T-5: Reduce emissions from City employee commute by continuing to permit work-from-home and hybrid/flexible schedules, improving public transit benefits, and implementing a parking fee.
- T-6: Establish parking disincentives, such as parking maximums and dynamic parking prices, to discourage the use of single occupancy gas vehicles. **$$**
- T-7: Implement Transit Alliance recommendations to update trolley routes in alignment with Better Bus Project Metrobus route redesign and increase service where possible. **$$**
- T-8: Work with Miami-Dade County and local advocacy groups to increase utilization of public transit through investments in safety, improving public transit literacy, and campaigns.
- T-9: Improve pedestrian experience and safety through investments in sidewalks such as ADA compliance measures and increasing number of crosswalks, especially in low-medium income areas. **$$**

Goal 2: RENEWABLE ENERGY

Goal 2 Actions:

- E-1: Provide additional policy and financial incentives to encourage private solar installations and identify incentives that would appeal to owners of affordable housing. **$$**
- E-2: Install solar and storage in public buildings or parking structures where feasible, prioritizing critical facilities.
- E-3: Require buildings that are re-roofing to be solar-ready. **$$**
- E-4: Starting in 2022, require all new buildings to be solar-ready and storage-ready.
- E-5: Promote community participation in FPL SolarTogether program, especially among renters, to purchase 100% electricity from solar.
- E-6: Join FPL SolarTogether program to purchase City's building electricity from solar.
- E-7: Partner with local clean energy non-profits to increase awareness of solar financing, utility savings, fair rates, hurricane proofing, etc., with particular emphasis on messaging to residents in low- and medium-income communities.
- E-8: Make all non-emergency energy use in existing public buildings carbon-free by 2035. Explore and adopt as much clean energy emergency generation and battery storage as possible. **$$**

- E-9: Partner with community organizations such as local non-profits, trade organizations, and electric and gas utilities, to develop a carbon-free building education program to provide information and technical assistance. **$$**

Goal 3: ELECTRIC VEHICLES

Goal 3 Actions:

- EV-1: Adopt EV infrastructure and procurement policy to electrify 100% of public vehicle fleet, including trolleys by 2035.
- EV-2: Partner with Miami Parking Authority to expand EV charging station installations in public locations. **$$**
- EV-3: Build on EV Capability Ordinance to require EV charger installations in new developments starting in 2025. **$$**
- EV-4: Partner with major employers to install EV chargers in parking lots/garages. **$$**
- EV-5: Develop City EV Charging Master Plan to plan and prioritize where future EV chargers should be installed on City owned properties and within the city.
- EV-6: Develop technical guidance for building owners/managers facilitate in EV charging infrastructure installations in existing buildings.
- EV-7: Partner with existing electric vehicle non-profits to promote public awareness of the benefits and real costs of EV purchasing and ownership, especially addressing low-income drivers and their concerns.
- EV-8: Evaluate implementing an electric vehicle-sharing program within neighborhoods with low car ownership.
- EV-9: Evaluate the potential to implement a low emission zone in the urban core.
- EV-10: Investigate the feasibility of internal combustion engine phase out policy.

Goal 4: ENERGY EFFICIENCY

Goal 4 Actions:

- B-1: Adopt commercial building energy benchmarking and reporting ordinance for private buildings over 20,000 sq. ft. **$$**
- B-2: Adopt commercial and public building energy performance standard ordinance that requires property owners to meet energy/GHG reduction targets for buildings over 20,000 sq. ft. **$$**
- B-3: Establish a home energy rating and disclosure ordinance to be implemented at point of sale or lease. **$$**
- B-4: Establish a residential energy conservation ordinance (RECO) at the point of property sale or lease with support mechanisms for low income homeowners. **$$**
- B-5: Update green buildings requirement to increase program participation and impact including lowering square footage for compliance, broadening accepted certifications, and increasing necessary level of compliance.
- B-6: Require all new public buildings to be built to zero net energy standards starting in 2025.

Goal 5: NEW ECONOMY

Actions forthcoming

Additional Enabling Actions

- A-1: Advocate for climate-forward policies from FPL including protection of net-metering and increased funding for programs to assist low-income residents with energy efficiency upgrades.
- A-2: Advocate for climate-forward policies from the Public Service Commission.
- A-3: Advocate for climate-forward policies and financial incentives from the state of Florida including energy code updates to the Florida Building Code.
- A-4: Develop a financial and technical assistance program that helps residents, particularly low-income, to pursue climate action. **$$**
- A-5: Partner with local universities and trade organizations to elevate and support existing technical job training program for energy efficiency, retrofits, weatherization, solar installations, EV maintenance, EV charging installation, etc. **$$**
- A-6: Create a resilience and sustainability division in the Building department and train employees or hire new staff with expertise in solar PVs, battery storage, EV charging, energy efficiency, electrification, and climate adaptation policies. **$$**

Prioritized Actions

The list below presents a summary of the 18 prioritized actions that will be further developed in the implementation roadmap. Following the Draft GHG Plan review process, this list will be moved to Appendix C and further developed as the implementation roadmap for prioritized actions.

- T-1: Collaborate with Miami-Dade County and local advocacy groups to increase utilization of biking as a transit method by implementing the Bicycle Master Plan and expanding the number of protected, green bikeways. **$$**
- T-2: Expand micromobility options throughout the entire city including Citibikes, scooters, and electric bikes. **$$**
- E-1: Provide additional policy and financial incentives to encourage private solar installations and identify incentives that would appeal to owners of affordable housing. **$$**
- E-8: Make all non-emergency energy use in existing public buildings carbon-free by 2035. Explore and adopt as much clean energy emergency generation and battery storage as possible. **$$**
- E-9: Partner with community organizations such as local non-profits, trade organizations, and electric and gas utilities, to develop a carbon-free building education program to provide information and technical assistance. **$$**
- EV-1: Adopt EV infrastructure and procurement policy to electrify 100% of public vehicle fleet, including trolleys by 2035.
- EV-2: Partner with Miami Parking Authority to expand EV charging station installations in public locations. **$$**
- EV-3: Build on EV Capability Ordinance to require EV charger installations in new developments starting in 2025. **$$**
- EV-4: Partner with major employers to install EV chargers in parking lots/garages. **$$**
- EV-6: Develop technical guidance for building owners/managers to facilitate in EV charging infrastructure installations in existing buildings.
- B-1: Adopt commercial building energy benchmarking and reporting ordinance for private buildings over 20,000 sq. ft. **$$**

- B-2: Adopt commercial and public building energy performance standard ordinance that requires property owners to meet energy/GHG reduction targets for buildings over 20,000 sq. ft. **$$**
- B-3: Establish a home energy rating and disclosure ordinance to be implemented at point of sale or lease. **$$**
- B-4: Establish a residential energy conservation ordinance (RECO) at the point of property sale or lease with support mechanisms for low income homeowners. **$$**
- B-5: Update green buildings requirement to increase program participation and impact including lowering square footage for compliance, broadening accepted certifications, and increasing necessary level of compliance.
- B-6: Require all new public buildings to be built to zero net energy standards starting in 2025.
- A-4: Develop a financial and technical assistance program that helps residents, particularly low-income, to pursue climate action. **$$**
- A-6: Create a resilience and sustainability division in the Building department and train employees or hire new staff with expertise in solar PVs, battery storage, EV charging, energy efficiency, electrification, and climate adaptation policies. **$$**

Chapter 4: Monitoring Progress and Next Steps

Successful GHG Plan implementation will require communitywide support – from residents, local businesses, community organizations, City staff, and elected officials – as well as significant policy support beyond the Miami community as described in this plan.

The City is committed to providing the necessary resources and technical support to ensure successful plan implementation, including the following steps:

- **Future GHG inventories** – the City will prepare a GHG inventory every two years to support top-down monitoring of total community emissions
- **Future plan updates** – the City will also perform a comprehensive review of the GHG Plan every five years, at most, to determine if updates are needed to reflect new information and revise its approach, as needed, based on implementation monitoring results
- **Communication channels** – the City will maintain communication with the public to facilitate collaboration and accountability on plan implementation with residents, other community stakeholders, and Miami-Dade County and adjacent cities.
    - www.miamigov.com/climatechange will continue to serve as the City's central hub for updates on all climate plans including Miami Forever Climate Ready.
    - Progress on the Resilient305 strategy can be found at www.resilient305.com.

Implementation Monitoring Approach

When monitoring GHG Plan implementation, two evaluation considerations are important: total community GHG emissions trends and individual action performance. GHG inventories will provide "top down" information about the city's overall emission changes, in total and with more granularity at the emissions sub-sector level. These inventories will be conducted every two years which allows for direct comparison to the 2018 base year inventory and measurement of progress toward the City's 2035 and 2050 reduction targets. This information can help understand which Plan goals are showing progress and which aspects of the community's emissions are facing challenges.

It is also important to understand the effectiveness of each Plan sub-goal and action, which can be considered a "bottom up" evaluation approach. Evaluating progress of individual goals and actions will improve the City's ability to manage and implement the GHG Plan, highlighting opportunities to reinforce successful actions or the need to reevaluate or replace under-performing ones.

To track sub-goal and action performance, the City will need to collect important pieces of data that are related to each. While some of the data may be available from existing reports or processes, improvements in data collection will likely be needed to minimize City efforts during Plan monitoring. We must establish data collection methods that are consistent, simplified, and integrated into daily operations to support long-term Plan monitoring.

Following the Draft GHG Plan review period, the City will develop an implementation roadmap (to be included as Appendix C) that will provide further useful information to support monitoring for the prioritized actions, including identification of lead departments and implementation tracking metrics.

Tracking Our Goals

The Plan is organized around five overarching goals, including five quantified sub-goals and one qualitative sub-goal related to 2035 GHG target achievement. The following table provides a framework for tracking goal progress, including baseline information, implementation metrics, and potential sources for each metric listed. The City will update progress on these metrics every two years during their GHG inventory update.

Table 4.1 – Goal Tracking

Goal 1: GETTING AROUND MIAMI **Sub-goal**: 15% shift away from private vehicle use		
Baseline Information	**Implementation Metrics**	**Metric Sources**
▪ 85% passenger trips by private vehicles (interpolated for 2018 from 2015 and 2045 County-level data)	▪ Primary Metric: Percent of passenger trips from private vehicles	▪ Miami-Dade County TPO Transportation SERPM Model
▪ 70% of commuters drove alone to work (2018 City of Miami data)	▪ Supporting Metric: Commuting travel mode splits	▪ American Community Survey 5-Year Estimates – Commuting Characteristics
Goal 2: RENEWABLE ENERGY **Sub-goal:** 100% carbon-free electricity and energy **Sub-goal:** 60% reduction in natural gas emissions from existing buildings **Sub-goal:** 100% net zero emissions new construction by 2030		
Baseline Information	**Implementation Metrics**	**Metric Sources**
▪ 2018 electric grid mix: 24.5% carbon-free sources (1.5% renewable sources, 23% nuclear	▪ Primary Metric: Electric grid resource mix	▪ FP&L
	▪ Supporting Metric: City solar installation permit data with system kW information	▪ Building Department
▪ Residential - 3,748,422 therms consumed in 2018 ▪ Commercial – 23,593,957 therms consumed in 2018	▪ Primary Metric: Residential and commercial natural gas therm consumption	▪ TECO, NextEra
	▪ Supporting Metrics: ▪ City building permit data describing equipment replacement and fuel switching ▪ Permits for all-electric new construction and permits for mixed-fuel new construction	▪ Building Department ▪ ACEE Website

Goal 3: ELECTRIC VEHICLES **Sub-goal**: 36% of passenger trips from electric vehicles*		
Baseline Information	**Implementation Metrics**	**Metric Sources**
▪ <1% registered vehicles are EV (2020 County-level data)	▪ Primary Metrics: ▪ Registered electric vehicles ▪ Registered autos and pickups	▪ EV Hub – State and County EV Registration Data ▪ FLHSMV – Vehicle and Vessel Report Statistics
	▪ Supporting Metric: City EV charger installation permit data	▪ Building Department
Goal 4: ENERGY EFFICIENCY **Sub-goal:** Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy		
Baseline Information	**Implementation Metrics**	**Metric Sources**
▪ Residential: • 3,748,422 therms consumed in 2018 • 2,100,317 MWh consumed in 2018 ▪ Commercial: • 23,593,957 therms consumed in 2018 • 3,330,062 MWh consumed in 2018	▪ Primary Metric: Residential and commercial natural gas therm consumption	▪ TECO, NextEra
	▪ Supporting Metrics: ACEEE City Energy Efficiency Scorecard	▪ ACEE Website

* County-level data is best readily available source currently known, but city-level sources may become available in the future

Remaining Emissions in 2050

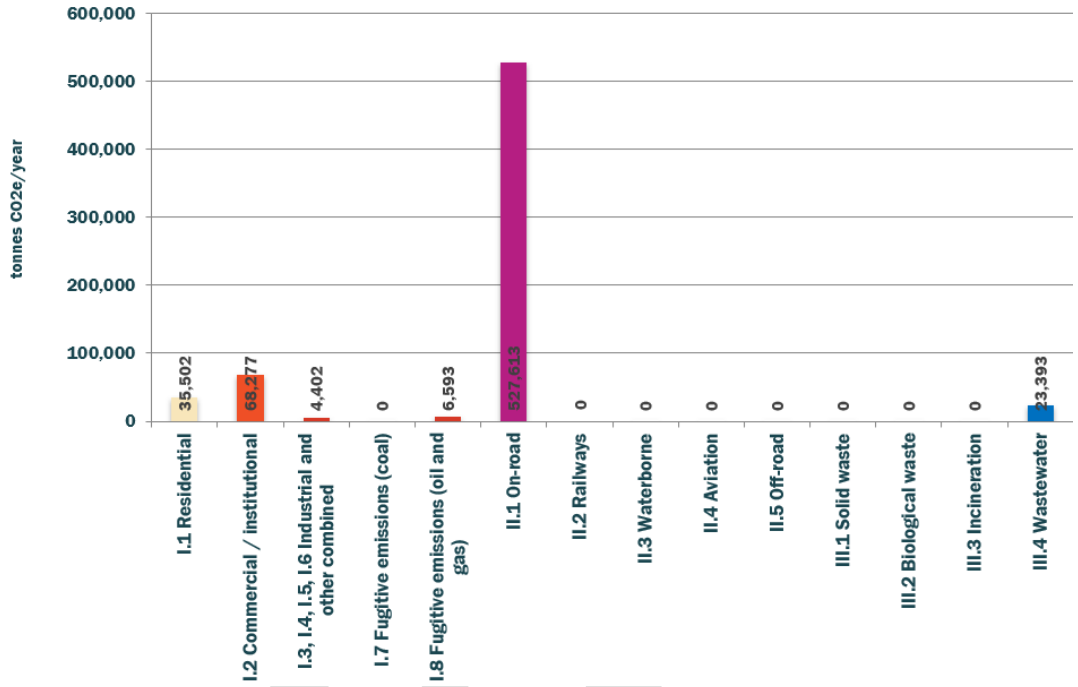
Remaining Emissions Sources

Miami's GHG Plan maximizes efforts to deliver emissions reductions from the city's largest emissions sources, including building energy use, transportation, and the electric grid. Other cities aiming for carbon neutrality like Miami typically do not demonstrate a pathway to zero carbon emissions in their plans, but instead show how to reduce local emissions to the maximum extent feasible. There are technological, regulatory, economic barriers, or other barriers that currently prevent eliminating 100% of carbon emissions. Instead, cities will balance their remaining emissions with different strategies like carbon sequestration or carbon capture and storage. Based on the city's emissions forecasts and the GHG actions presented in this plan, we are likely to still have emissions in 2050 from several sources, shown in Figure 3.5, including:

- passenger vehicles, trucks, and transit buses that have not converted to electric options yet

- natural gas cooking appliances in commercial (e.g., restaurants, hotels, schools) buildings
- natural gas used in the potable water supply
- fugitive emissions from natural gas distribution
- wastewater treatment activities

Figure 3.5 – Emissions Remaining in 2050



These sources represent the remaining emissions that need to be reduced or balanced by 2050 for the City to demonstrate achievement of its carbon neutrality target, and total approximately 690,000 MT CO_2e/yr. Global best practices on how to balance these remaining emissions are currently in development and the City will take a "wait-and-see" approach to determine what is the best solution when the time approaches.

Barriers to GHG Reduction

There are multiple barriers to eliminating 100% of the City's carbon emissions; some are technological while others will require additional funding or more complete market transformations to achieve maximum reductions.

Figure 3.5 shows that the most significant remaining emissions are from on-road transportation, and reflect continued gas and diesel use in a segment of the community vehicle fleet. To completely reduce emissions in this sub-sector, all vehicles must be converted to EV or zero-emissions options. Current EV forecasts anticipate accelerating use of this technology starting in the 2025-2030 timeframe, but do not anticipate 100% market penetration by 2050. And, it would be difficult for Miami to transition all private vehicles to electric options without substantial external assistance in the form of aggressive state or federal legislation or generous financial incentives that prompt residents and businesses to replace fossil fuel vehicles with EVs before their end of useful life. While the City will continue to push for widespread vehicle electrification, a parallel focus on reducing single occupancy vehicle use through increased transit and supportive land use development patterns can also help to reduce the total number of

vehicles that would need to be electrified in the future. An additional barrier to full vehicle electrification is the City's lack of control over public bus fleets, including Metrobus and school buses. Electrification efforts for these vehicles has already begun with Miami-Dade Transit and Miami-Dade County Public Schools, and future Plan updates will be able to reflect GHG reductions from these actions. Miami-Dade County's Climate Action Strategy has committed to electrifying 50% of buses by 2030 and Miami-Dade County Schools has committed to 100% clean energy use by 2030.

Much like on-road emission sources, the City does not have direct control over its water supply or wastewater treatment process and therefore has minimal opportunities to fully reduce these emissions. Technological barriers in wastewater treatment can also limit opportunities to achieve zero emissions in this category. Community efforts to reduce water consumption through water-efficient appliances or other best practices could provide some related GHG reductions in these sub-sectors, but ultimately decisions to fully reduce these emissions fall outside the City's direct control. Therefore, remaining emissions in these sub-sectors are likely to be addressed through the approaches described in the next section.

Many commercial businesses may prefer to use natural gas kitchen equipment over electric options given high upfront costs to replace existing equipment, comfort and proficiency in using existing gas equipment, or specific business needs that require gas equipment. As described elsewhere, this Plan focused on actions to influence the most significant GHG sources in the community and provides a 2035 GHG target achievement pathway that does not specifically focus on commercial cooking appliances. However, in future Plan updates the City may decide to include new policies or programs that address this specific remaining emissions source.

Finally, fugitive emissions from natural gas transmission and distribution are associated with leaks in an infrastructure network maintained by utility companies and overseen by state and federal regulators. The City's best option to reduce these emissions is to minimize use of natural gas citywide through implementation of GHG Plan strategies. An alternative approach is for utility companies to provide 100% carbon-free gas within this distribution network, such as renewable natural gas. The City will also continue to work with utilities on improving efficiency of these distribution systems to minimize leaks and fugitive emissions. Future GHG inventory updates will help demonstrate how these actions have contributed to emissions reductions in this sub-sector too.

Achieving Carbon Neutrality

This GHG Plan outlines how Miami can meet its interim 2035 GHG target and take strides toward 2050 carbon neutrality. However, as described throughout this Plan, there are also are many technological, political, and cultural variables that will influence how our emissions change between now and 2050. We have estimated how emissions could grow in the future and how implementing these actions could reduce those emissions in line with our targets. We have also identified a likely sub-set of remaining emissions that will be challenging to fully reduce before 2050. In order to demonstrate carbon neutrality achievement in the future, we will monitor and evaluate several options in future GHG Plan updates and select a preferred option or suite of options as 2050 comes into sharper focus.

Cities can demonstrate carbon neutrality in different ways, but each method generally tries to balance any remaining emissions with actions that cancel out those emissions elsewhere. These actions can include natural carbon sequestration (such as through forest restoration or regenerative agricultural

practices), industrial-based carbon removal and storage practices, or purchasing carbon offsets from a verified global marketplace to support GHG reduction activities occurring in other locations.

During Plan updates, the City will maintain channels of communication that support ongoing dialogue among residents, community organizations, businesses, elected officials, and City staff. Part of this conversation will include discussing community preferences for how we balance any remaining emissions in 2050 to demonstrate achievement of our carbon neutrality target.

Draft Plan Feedback

Thank you for your interest in the City of Miami's greenhouse gas reduction efforts! The City will be accepting comments from the public until 11:59 PM ET on Sunday, May 23rd. Comments can be submitted via the form found on www.miamigov.com/ghgplan. The form has section breakdowns and guided questions to help develop feedback. Comments via form is preferred, however written comments can also be submitted to resilience@miamigov.com.

From the public, we are trying to gauge level of support for the proposed actions and prioritized actions, any actions you feel are missing, additional opportunities to address equity concerns and/or green economy benefits, any outstanding questions you feel the plan does not address.

We will review all input once the public comment period is over, make necessary updates to the Plan and aim to release a final version in summer 2021.

Appendix A – Green Economy Report (PENDING)

To be provided in the Final Plan.

Appendix B – Action Evaluation Results

Co-Benefit Rating Legend

Very Negative	The action has a negative impact across the community
Somewhat Negative	The action has a negative impact across a small portion of the community or a slightly negative impact across the entire community
Neutral	The action has no impact, or the impact is unknown
Somewhat Positive	The action has a positive impact across a small portion of the community or a slightly positive impact across the entire community
Very Positive	The action has a positive impact across the community

Climate Justice Rating Legend

Negative	The action is relevant to climate justice communities and does not address equity or has a negative impact on equity
Neutral	The action does not address an issue/sector that affects climate justice communities
Positive	The action is relevant to climate justice communities and actively addresses and has a positive impact on equity

Complexity to Implement – City Rating Legend

Very Complex	The City has no authority, requires major policy change, no available staff or expertise
Somewhat Complex	Between not complex and very complex
Not Complex	No authority or policy barriers, staff capacity available

Political Acceptability Rating Legend

Politically Challenging	The action is challenging to implement due to negative public opinion and stakeholder pushback
Neutral or Unclear	The action is neither politically acceptable or challenging due to unclear or truly split public opinion
Politically Acceptable	The action is acceptable to implement due to positive public opinion and stakeholder support

Additional Costs – City and Private

Very Large Cost	City: >$1 million Private: Approx. cost of a solar installation or EV
Large Cost	City: $500k-$1 million Private: Approx. cost of HVAC replacement or EV charger
Some Cost	City: $50k-$500k Private: Approx. cost of making a building EV or solar ready
Very Little Cost	City: $0-$50k Private: Approx. cost of lightbulb or fixture replacement
No Cost	City and Private: $0

Action (priority in yellow)	**Public Health**	**Greenspace and Green Infrastructure**	**Employment**	**Cost of Living**	**Climate Justice**	**Complexity to Implement - City**	**Political Acceptability**	**Additional Costs - City**	**Additional Costs - Private**
T-1: Collaborate with Miami-Dade County and local advocacy groups to increase utilization of biking as a transit method by implementing the Bicycle Master Plan and expanding the number of protected, green bikeways.	Very Positive	Somewhat Positive	Very Positive	Somewhat Positive	Positive	Very Complex	Neutral or Unclear	Very Large Cost	No Cost
T-2: Expand micromobility options throughout the entire city including Citibikes, scooters, and electric bikes.	Somewhat Positive	Neutral	Somewhat Positive	Somewhat Positive	Positive	Very Complex	Politically Challenging	No Cost	No Cost
T-3: Build upon existing transit-oriented development policies in Miami21 to increase residential density, access to goods and services, and decrease single-occupancy vehicle use focusing on areas surrounding Metrorail stations.	Somewhat Positive	Neutral	Neutral	Somewhat Positive	Negative	Very Complex	Politically Acceptable	No Cost	No Cost
T-4: Adopt transportation demand management ordinance to require certain employers and developers to develop plans to reduce single-occupant vehicle use and traffic during peak hours among employees and residents.	Somewhat Positive	Neutral	Neutral	Somewhat Positive	Neutral	Somewhat Complex	Politically Challenging	No Cost	Some Cost
T-5: Reduce emissions from City employee commute by continuing to permit work-from-home and hybrid/flexible schedules, improving public transit benefits, and implementing a parking fee.	Somewhat Positive	Neutral	Neutral	Somewhat Positive	Neutral	Not Complex	Politically Challenging	Very Little Cost	No Cost
T-6: Establish parking disincentives, such as parking maximums and dynamic parking prices, to	Somewhat Positive	Neutral	Somewhat Negative	Somewhat Negative	Negative	Somewhat Complex	Politically Challenging	No Cost	No Cost

Action (priority in yellow)	**Public Health**	**Greenspace and Green Infrastructure**	**Employment**	**Cost of Living**	**Climate Justice**	**Complexity to Implement - City**	**Political Acceptability**	**Additional Costs - City**	**Additional Costs - Private**
discourage the use of single occupancy gas vehicles.									
T-7: Implement Transit Alliance recommendations to update trolley routes in alignment with Better Bus Project Metrobus route redesign and increase service where possible.	Somewhat Positive	Neutral	Somewhat Positive	Very Positive	Positive	Very Complex	Politically Acceptable	Large Cost	No Cost
T-8: Work with Miami-Dade County and local advocacy groups to increase utilization of public transit through investments in safety, improving public transit literacy, and campaigns.	Somewhat Positive	Neutral	Neutral	Somewhat Positive	Positive	Very Complex	Politically Acceptable	Very Little Cost	No Cost
T-9: Improve pedestrian experience and safety through investments in sidewalks such as ADA compliance measures and increasing number of crosswalks, especially in low-medium income areas.	Somewhat Positive	Neutral	Somewhat Positive	Neutral	Positive	Very Complex	Politically Challenging	Very Large Cost	No Cost
E-1: Provide additional policy and financial incentives to encourage private solar installations and identify incentives that would appeal to owners of affordable housing.	Neutral	Neutral	Somewhat Positive	Neutral	Positive	Not Complex	Politically Acceptable	Very Little Cost	No Cost
E-2: Install solar and storage in public buildings or parking structures where feasible, prioritizing critical facilities.	Neutral	Neutral	Neutral	Neutral	Neutral	Very Complex	Politically Acceptable	Very Large Cost	No Cost
E-3: Require buildings that are re-roofing to be solar-ready.	Neutral	Neutral	Somewhat Positive	Neutral	Negative	Somewhat Complex	Neutral or Unclear	No Cost	Some Cost
E-4: Starting in 2022, require all new buildings to be solar-ready and storage- ready.	Neutral	Neutral	Neutral	Neutral	Negative	Somewhat Complex	Neutral or Unclear	No Cost	Some Cost

Action (priority in yellow)	**Public Health**	**Greenspace and Green Infrastructure**	**Employment**	**Cost of Living**	**Climate Justice**	**Complexity to Implement - City**	**Political Acceptability**	**Additional Costs - City**	**Additional Costs - Private**
E-5: Promote community participation in FPL SolarTogether program, especially among renters, to purchase 100% electricity from solar.	Neutral	Neutral	Neutral	Neutral	Neutral	Not Complex	Politically Acceptable	No Cost	No Cost
E-6: Join FPL SolarTogether program to purchase City's building electricity from solar.	Neutral	Neutral	Neutral	Neutral	Neutral	Not Complex	Politically Challenging	Large Cost	No Cost
E-7: Partner with local clean energy non-profits to increase awareness of solar financing, utility savings, fair rates, hurricane proofing, etc., with particular emphasis on messaging to residents in low- and medium-income communities.	Neutral	Neutral	Neutral	Neutral	Positive	Not Complex	Politically Acceptable	No Cost	No Cost
E-8: Make all non-emergency energy use in existing public buildings carbon-free by 2035. Explore and adopt as much clean energy emergency generation and battery storage as possible.	Somewhat Positive	Neutral	Somewhat Positive	Neutral	Neutral	Somewhat Complex	Neutral or Unclear	Large Cost	No Cost
E-9: Partner with community organizations such as local non-profits, trade organizations, and electric and gas utilities, to develop a carbon-free building education program to provide information and technical assistance.	Somewhat Positive	Neutral	Somewhat Positive	Somewhat Negative	Neutral	Not Complex	Neutral or Unclear	Very Little Cost	No Cost
EV-1: Adopt EV infrastructure and procurement policy to electrify 100% of public vehicle fleet, including trolleys by 2035.	Somewhat Positive	Neutral	Neutral	Neutral	Positive	Very Complex	Neutral or Unclear	Large Cost	No Cost
EV-2: Partner with Miami Parking Authority to expand EV charging station installations in public locations.	Somewhat Positive	Neutral	Somewhat Positive	Neutral	Neutral	Somewhat Complex	Politically Acceptable	Some Cost	No Cost

Action (priority in yellow)	**Public Health**	**Greenspace and Green Infrastructure**	**Employment**	**Cost of Living**	**Climate Justice**	**Complexity to Implement - City**	**Political Acceptability**	**Additional Costs - City**	**Additional Costs - Private**
EV-3: Build on EV Capability Ordinance to require EV charger installations in new developments starting in 2025.	Somewhat Positive	Neutral	Somewhat Positive	Neutral	Neutral	Somewhat Complex	Politically Challenging	No Cost	Large Cost
EV-4: Partner with major employers to install EV chargers in parking lots/garages.	Somewhat Positive	Neutral	Somewhat Positive	Neutral	Neutral	Somewhat Complex	Politically Acceptable	No Cost	Large Cost
EV-5: Develop City EV Charging Master Plan to plan and prioritize where future EV chargers should be installed on City owned properties and within the city.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Politically Acceptable	No Cost	No Cost
EV-6: Develop technical guidance for building owners/managers to facilitate in EV charging infrastructure installations in existing buildings.	Neutral	Neutral	Neutral	Neutral	Neutral	Not Complex	Politically Acceptable	No Cost	No Cost
EV-7: Partner with existing electric vehicle non-profits to promote public awareness of the benefits and real costs of EV purchasing and ownership.	Neutral	Neutral	Neutral	Neutral	Positive	Somewhat Complex	Politically Acceptable	No Cost	No Cost
EV-8: Evaluate implementing an electric vehicle-sharing program within neighborhoods with low car ownership.	Neutral	Neutral	Neutral	Neutral	Positive	Not Complex	Politically Acceptable	No Cost	No Cost
EV-9: Evaluate the potential to implement a low emission zone in the urban core.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Neutral or Unclear	Very Little Cost	No Cost
EV-10: Investigate the feasibility of internal combustion engine phase out policy.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Neutral or Unclear	Very Little Cost	No Cost
B-1: Adopt commercial building energy benchmarking and reporting ordinance for private buildings over 20,000 sq. ft.	Neutral	Neutral	Somewhat Positive	Neutral	Neutral	Very Complex	Neutral or Unclear	Some Cost	Very Little Cost

Action (priority in yellow)	**Public Health**	**Greenspace and Green Infrastructure**	**Employment**	**Cost of Living**	**Climate Justice**	**Complexity to Implement - City**	**Political Acceptability**	**Additional Costs - City**	**Additional Costs - Private**
B-2: Adopt commercial building energy performance standard ordinance for private buildings over 20,000 sq. ft.	Neutral	Neutral	Very Positive	Neutral	Neutral	Very Complex	Politically Challenging	Large Cost	Large Cost
B-3: Establish a home energy rating and disclosure ordinance to be implemented at point of sale or lease.	Neutral	Neutral	Very Positive	Somewhat Positive	Negative	Very Complex	Politically Challenging	Very Little Cost	Some Cost
B-4: Establish a residential energy conservation ordinance (RECO) at the point of property sale or lease with support mechanisms for low income homeowners.	Somewhat Positive	Neutral	Very Positive	Very Positive	Positive	Very Complex	Politically Challenging	Very Little Cost	Large Cost
B-5: Update green buildings requirement to increase program participation and impact including lowering square footage for compliance, broadening accepted certifications, and increasing necessary level of compliance.	Somewhat Positive	Somewhat Positive	Neutral	Somewhat Positive	Neutral	Somewhat Complex	Neutral or Unclear	No Cost	Some Cost
B-6: Require all new public buildings to be built to zero net energy standards starting in 2025.	Somewhat Positive	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Neutral or Unclear	Some Cost	No Cost
A-1: Advocate for climate-forward policies from FPL including protection of net-metering and increased funding for programs to assist low-income residents with energy efficiency upgrades.	Neutral	Neutral	Neutral	Neutral	Neutral	Not Complex	Politically Challenging	No Cost	No Cost
A-2: Advocate for climate-forward policies from the Public Service Commission.	Neutral	Neutral	Neutral	Neutral	Neutral	Not Complex	Some Neutral or Unclear	No Cost	No Cost
A-3: Advocate for climate-forward policies and financial incentives from the state of Florida including	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Politically Challenging	No Cost	No Cost

Action (priority in yellow)	**Public Health**	**Greenspace and Green Infrastructure**	**Employment**	**Cost of Living**	**Climate Justice**	**Complexity to Implement - City**	**Political Acceptability**	**Additional Costs - City**	**Additional Costs - Private**
energy code updates to the Florida Building Code.									
A-4: Develop a financial and technical assistance program that helps residents, particularly low-income, to pursue climate action.	Somewhat Positive	Neutral	Somewhat Positive	Somewhat Positive	Positive	Very Complex	Politically Acceptable	Large Cost	No Cost
A-5: Partner with local universities and trade organizations to elevate and support existing technical job training program for energy efficiency, retrofits, weatherization, solar installations, EV maintenance, EV charging installation, etc.	Neutral	Neutral	Very Positive	Neutral	Neutral	Somewhat Complex	Politically Acceptable	Very Little Cost	No Cost
A-6: Create a resilience and sustainability division in the Building department and train employees or hire new staff with expertise in solar PVs, battery storage, EV charging, energy efficiency, electrification, and climate adaptation policies.	Neutral	Neutral	Somewhat Positive	Neutral	Neutral	Somewhat Complex	Politically Acceptable	Some Cost	No Cost

Figure B1 – Action Evaluation – Top GHG Reduction Score Actions

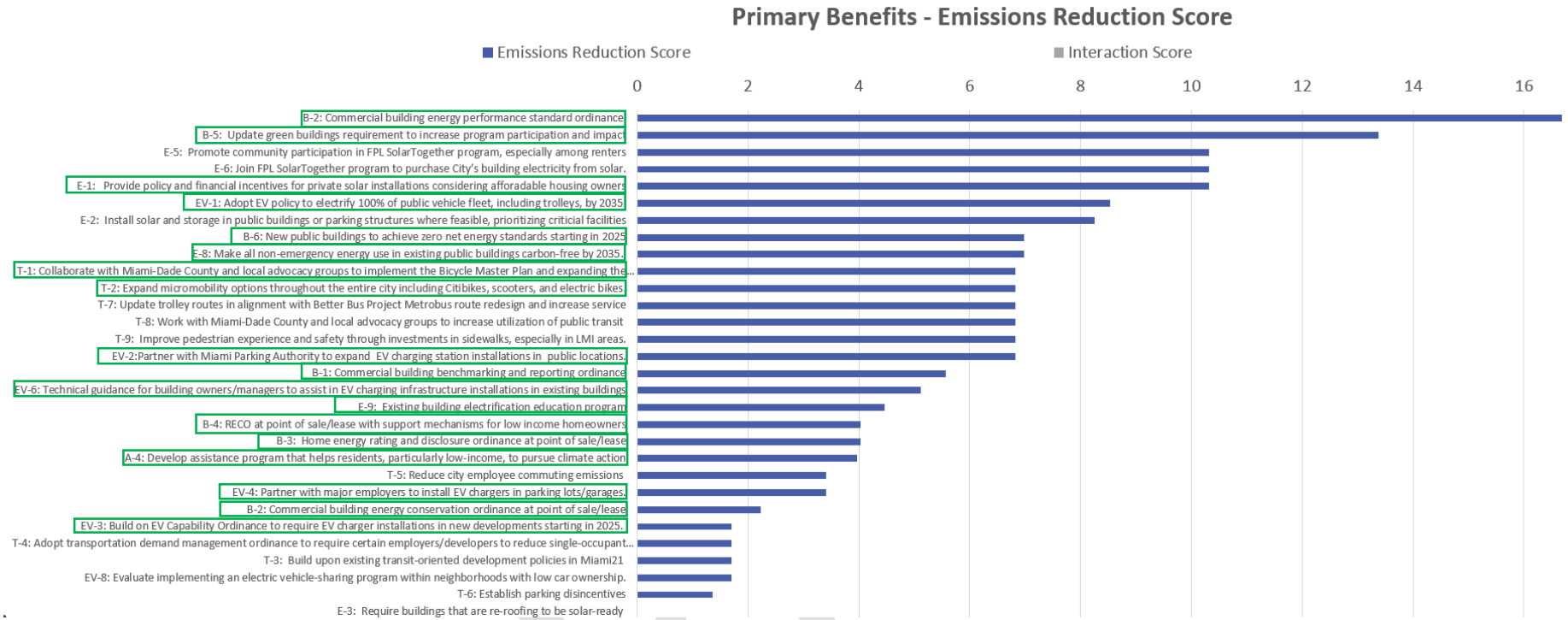


Figure B2 – Action Evaluation – Top Co-Benefit Score Actions

Figure B3 – Action Evaluation – Top Feasibility Score Actions

Appendix C – Implementation Roadmap (PENDING)

To be provided in the Final Plan.

Appendix D – GHG Calculators and Inputs (PENDING)

To be provided in the Final Plan.

Glossary

Term	Definition
Baseline	Climate conditions or greenhouse gas (GHG) emissions snapshot to begin tracking adaptation or reduction progress against
Carbon-free electricity/energy	Energy produced by a resource that generates no carbon emissions, such as solar, nuclear, or hydroelectric
Carbon Neutral	GHG emissions have been reduced as much as possible and any remaining emissions are completely cancelled out through offsetting or removed through carbon dioxide removal (CDR)/emissions removal measures; also known as net zero emissions
Greenhouse Gas	Gases that absorb and emit radiant energy within the thermal infrared range, causing the greenhouse effect. The primary human-produced greenhouse gases are carbon dioxide, methane, nitrous oxide
Micromobility	Transportation by lightweight, low-speed vehicles such as scooters or bicycles, either mechanical or electric
Mitigation	Reduction of annual GHG emissions from a source
Teleworking	A work arrangement in which employees do not commute or travel to a central place of work, such as an office building, warehouse, or store; also called remote working
Zero Carbon	No carbon emissions are being produced (e.g., zero-carbon electricity could be provided by a 100% renewable energy supplier)

Acronyms

- °C = degrees Celsius
- °F = degrees Fahrenheit
- ADA = Americans with Disabilities Act
- ASAP = Action Selection and Prioritization
- BRT = Bus Rapid Transit
- CO_2e/CO_2eq = carbon dioxide equivalent
- CO_2e/yr = carbon dioxide equivalent per year
- CURB = Climate Action for Urban Sustainability
- EV = electric vehicle
- EVSE = electric vehicle supply equipment
- GHG = greenhouse gas
- GHG Plan = Greenhouse Gas Plan
- HVAC = heating, ventilation, and air conditioning
- IPCC = United Nation's International Panel on Climate Change
- kWh = kilowatt-hour
- MFCR = Miami Forever Climate Ready
- MiPlan = Miami Climate Action Plan
- MT CO_2e = metric tons of carbon dioxide equivalent
- MWh = megawatt-hour
- PV = photovoltaic
- R305 = Resilient305
- TDM = Transportation Demand Management
- TOD = Transit Oriented Development
- tonne = Metric tonne (roughly 1.1 US tons)

MIAMI FOREVER CARBON NEUTRAL

City of Miami Greenhouse Gas Reduction Plan and Pathway to Carbon Neutrality by 2050

THE CITY OF MIAMI FLORIDA INCORPORATED 1896

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