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

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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's primary focus is to directly reduce the source of GHG emissions to get as close to zero emissions as possible. 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 Green 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 new economy!

In order to reach carbon neutrality by 2050 at latest 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 minimum 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] 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.[2] 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 2021, the City adopted a resolution committing to the goal of reaching **net zero emissions by 2050**. On the trajectory to its net zero emissions by 2050 goal, the City set an interim target of **60% reductions below 2018 levels by 2035**. These goals are for citywide emission reductions, which includes

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

[2] More details on Miami's vulnerabilities can be found in Resilient305 and Miami Forever Climate Ready

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 was supported by C40 Cities, a global network of cities committed to tackling climate change and increasing the economic and environmental wellbeing of their residents. Assistance was specifically provided by C40's climate planning team through its Climate Action Planning Framework and was further supported with C40's technical resources, including a GHG scenario planning tool (Pathways), action selection and prioritization tool (ASAP), and guidance for setting ambitious and achievable GHG reduction targets on the path to net zero. C40 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.

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 zoning 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.

This document is one of three strategies guiding City of Miami climate resilience work and should be read in compliment with Resilient305 and Miami Forever Climate Ready.

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
- Low car ownership rates
- Renters being pushed out of homes due to increasing rent prices
- Uninsured or underinsured
- Prolonged exposure to hazardous conditions such as extreme heat and pollution 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 were 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.

Growing Miami's New Green Economy & Green Workforce

Achieving Miami's target of 60% reduction in GHG emissions by 2035 and 100% reduction by 2050, coupled with adapting to the increasing intensity and severity of weather events will require a substantive transformation of the local economy. Critical to Miami Forever Carbon Neutral and Resilient305, among other City climate action commitments, is ensuring that local businesses and residents economically benefit from sustainability and resilience efforts. Prioritizing green investments – those that support GHG mitigation and climate adaptation – will simultaneously facilitate economic development and diversification, achieve GHG mitigation goals, and support climate justice priorities.

Defining the new 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 negative impact of human activity on the environment[3], including those that mitigate or adapt to the impacts of climate change. Participants in the green new 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, including traditional industry sectors like healthcare, hospitality, and government.

Miami's **new green economy** is defined as the businesses and organizations that are supporting the realization of our climate action goals by facilitating access to the goods and services that are essential to reducing the negative impact of human activity on the environment. Importantly, Miami's new green economy realizes our climate justice goals by providing middle-skill, living wage jobs, creating demand for workforce training opportunities, and promoting economic resilience for Miami's socially vulnerable residents.

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 new skills required by green jobs. Still, the public sector will play an important role in creating and fostering an environment that is welcoming and conducive to growing Miami's new green economy, similar to the role the City has played with the tech industry.

Appendix A provides an evaluation of Miami's current green economy, including key industries and assets, green industries that are poised for growth, and occupations that will be positively and negatively impacted by green economic growth. It concludes with actions the City can take to complement its GREEN actions to grow the new green economy and create inclusive economic opportunity for our residents and workers while supporting the transition to a carbon-free future. These actions support and further 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 new economy opportunities have been noted with "$$".

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 participants to see what areas of the City were being represented. We found that there was high representation from the City's coastal areas that tend to have higher-income households, younger populations, and are more digitally connected in comparison to the City at large: Coconut Grove, Coral Way, The Roads, Brickell, Downtown, and Edgewater. There was relatively low representation from inland areas that have lower-income households, older

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

populations, more non-English speaking residents, and historic Black neighborhoods: Flagami, Little Havana, Overtown, Liberty City, and Little Haiti/Ti Ayiti. As these areas with low representation also constitute the City's climate justice communities, it is clear that the City must diversify its engagement practices as it implements this plan to ensure these socially vulnerable communities are included on the road to carbon neutrality.

- 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
    - The City hosted three identical virtual workshops for the GHG reduction actions 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.
    - The City hosted a GHG Plan Townhall with Commissioner Ken Russell to discuss the latest version of the plan, answer questions, and collect additional feedback.
    - The City hosted two virtual information sessions for the New Green Economy report, briefing participants about the content of the report and providing a forum for discussion and questions.
- Public draft review
    - After the Plan's release on Earth Day 2021, the Plan was out for public review for 30 days. Feedback was solicited via a form or through email for those who were interested in giving more in-depth comments.
    - The New Green Economy report was released in September 2021 and was open for public comment through the end of the month.
- 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.
- Interviews
    - For the new 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 web calls 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.

Throughout the plan development process, the City collaborated and aligned actions, where strategic, with Miami-Dade County as they developed their Climate Action Strategy at the same time as the City.

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 new 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 20 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.
- **Appendix A – New Economy Report** evaluates Miami's current new economy and identifies strategies to grow the new 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.
- **Appendix C – Implementation Roadmap** includes implementation next steps, City leads, community partners, time frame, and tracking metrics for the Plan's prioritized actions.
- **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.

Chapter 2: Greenhouse Gas Emissions Context

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[4] 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.[5] 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[6], and wastewater treatment plant activity.

To contextualize the emissions City of Miami generates every year (3.3 million MT CO_2e) is equal to[7][8]:

- Taking 717,684 passenger vehicles off the road for one year.
- The carbon sequestered by 4,043,086 acres of US forests in one year; that forest would be 175x the land area of the City of Miami.
- The carbon sequestered by 54,566,199 tree seedlings grown for 10 years; that's 114 trees per resident of Miami.
- The land area and height of two City of Miamis and one Miami Beach covered in 2 story buildings i.e., 86.3 sq miles at 27 feet high.

[4] https://www.miamigov.com/files/sharedassets/public/ghg-inventory-2018-full-report.pdf
[5] 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.
[6] 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.
[7] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator
[8] https://climate.mit.edu/ask-mit/how-much-ton-carbon-dioxide

Figure 2.1 – Miami's 2018 Base Year Inventory

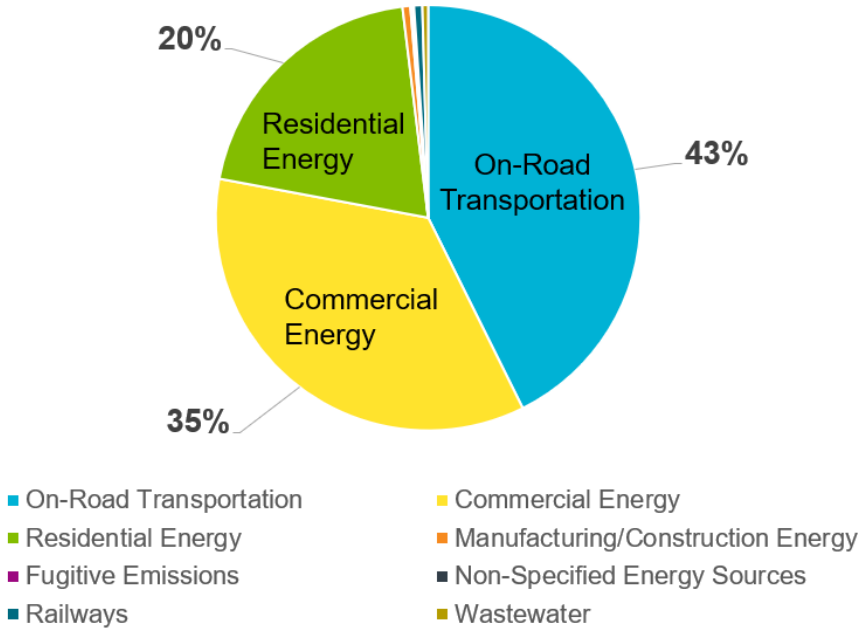


Table 2.1 shows the GHG inventory results organized into sectors and sub-sectors, as well as by fuel type to provide additional detail about our emissions. This information also helps identify areas for GHG reductions and specific GHG Plan actions that can reduce these emissions. This inventory accounts for all greenhouse gas emissions in the calendar year 2018 induced by City of Miami residents and businesses.[9] In the City of Miami, community-generated solid waste is sent to a waste-to-energy facility that incinerates waste to produce energy to power itself and for the regional electric grid. Therefore, these emissions are categorized as stationary energy emissions in our inventory and reported as emissions from "energy sent to the grid." These emissions are documented but not counted in our total as they are counted when the electricity created is used in other communities' building energy sectors and addressed through their GHG Plan actions. The City has limited jurisdiction on the waste sector, but recognizes that waste management has climate and environmental impact and has developed actions to address waste.

[9] PortMiami is not part of the City's jurisdiction. PortMiami is accounted for in the Miami-Dade County Climate Action Strategy.

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%**

*Emissions from solid waste were included in the 2018 GHG Inventory but have been removed, in compliance with GPC guidance, as the primary method of solid waste disposal is waste-to-energy and these emissions are thus accounted for in other categories. See Appendix D for more information.

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 three 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.

Defining Carbon Neutral and Miami's GHG Targets

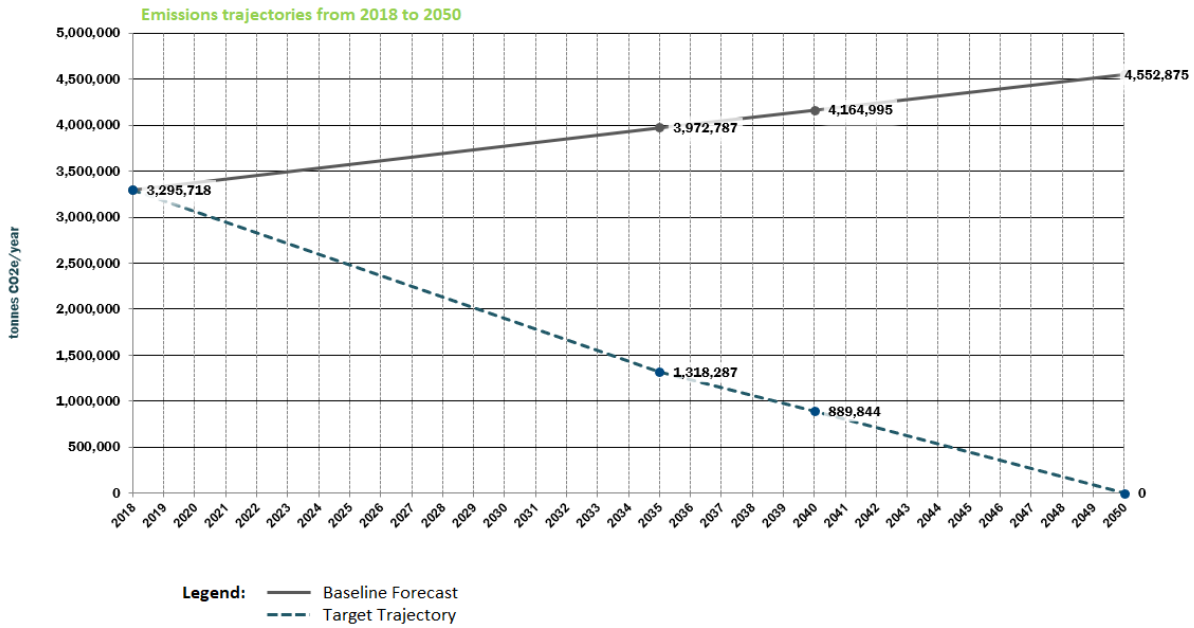
C40's member cities have committed to supporting the global goals of the Paris Climate Agreement, which stipulates that global average temperature rise should be kept to well below 2°C above preindustrial levels, and ideally be limited to 1.5°C. To help limit warming to this 1.5°C scenario, the world will need to collectively achieve net zero greenhouse gas emissions by 2050 and cut emissions in half by 2030. Net zero emissions 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) or emissions removal measures. Purchase of offsets (or carbon credits) 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, if global emissions are halved by 2030, but will require rapid behavioral and technological transformation at all levels – countries, cities, private sector, and individuals.

Miami has set a long-term target of net zero emissions by 2050 in accordance with the Paris Climate Agreement. The City often uses the term carbon neutral to describe this goal as well. While definitions vary, the City uses "carbon neutral" interchangeably with "net zero greenhouse gas emissions" to indicate maximum reduction of carbon dioxide equivalent (CO_2e) emissions plus balancing any remaining emissions the city cannot reduce directly with carbon sequestration or offset actions.

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 City department staff and the C40 Cities climate action planning team based on an analysis of the city's emissions forecasts and GHG reduction opportunities. The target was also informed by research defining what is needed globally to support the Paris Climate Agreement goals.

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. For further information on how the interim target was established, see Appendix D.

Figure 2.3 – Miami's GHG Forecasts and Targets



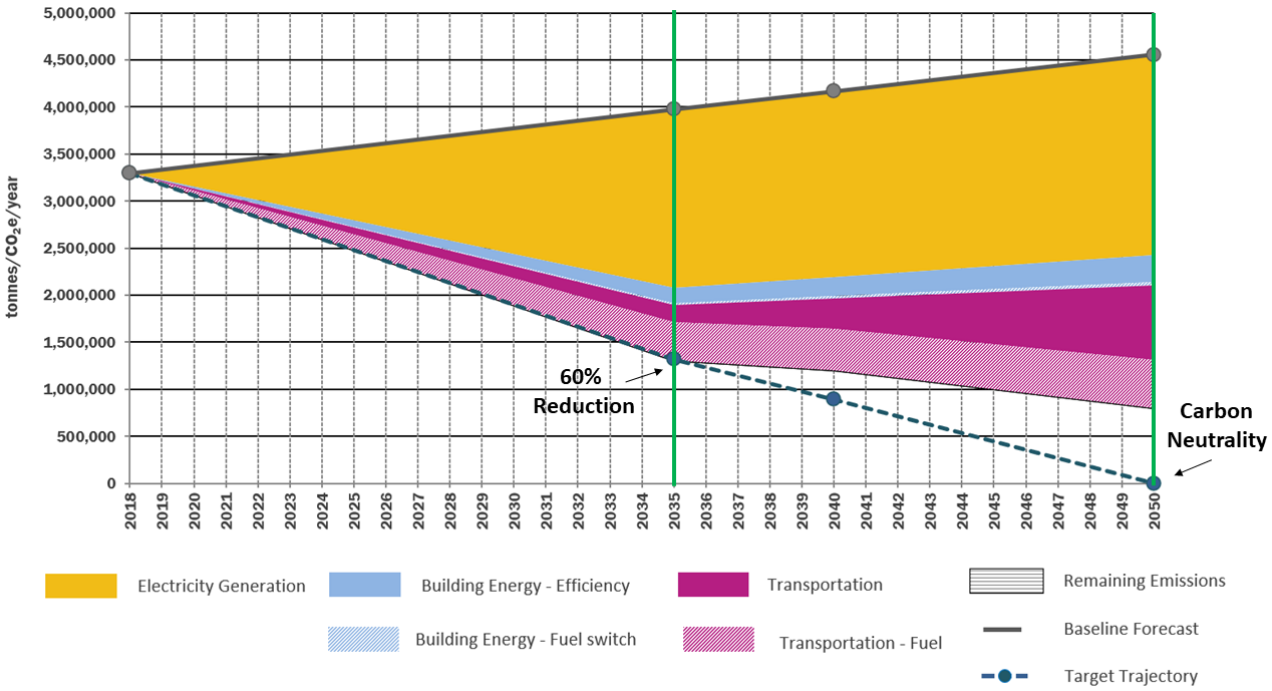
Chapter 3: Miami's GHG Actions

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 to coalition building and advocacy for aggressive actions by other entities where needed, in order to achieve 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, four quantified objectives and five qualitative objectives[10] were also defined in relation to the 2035 GHG target. The objectives and their representation within Figure 3.1 are defined below.

- **G – Getting Around Miami**
  - *Objective: 15% less private vehicle trips compared to 2018 levels by 2035 (magenta wedge)*
- **R – Renewable Energy**
  - *Objective: 100% carbon-free electricity by 2035 (orange wedge)*
  - *Objective: 35% reduction in on-site natural gas emissions compared to 2018 levels by 2035 (light blue wedges)*
- **E – Electric Vehicles**
  - *Objective: 40% of registered passenger vehicles are electric by 2035* (pink wedge)*
- **E – Energy Efficiency**
  - *Objective: Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy (dark blue wedge)*
- **N – New Economy**
  - *Objective: Grow the Green Economy Ecosystem*
  - *Objective: Recruit and Retain Green Workforce*
  - *Objective: Open Occupational Pathways*
  - *Objective: Welcome and Support Green Industry*

**Using County data as proxy for City until better data sources are available.*

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 on 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).

[10] The Energy Efficiency sub-goal will be quantified once more information is gathered via the BE305 program.

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 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. *NOTE*: *Greenspace is a principle considered across all actions, but no specific greenspace actions are included in this plan. For greenspace and tree canopy initiatives, see Miami Forever Climate Ready adaptation strategy.*
	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. *NOTE: For actions that scored negatively, City should work with community climate advocates and related groups to develop zero harm criteria for implementation.*
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 external 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)?

The results of the ASAP evaluation were then used to prioritize 20 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, partner departments, and external entities
- Create a short-term workplan

The prioritized actions are highlighted in green in each of the Goal sections. Seven 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 (two actions), mobility (three actions), and additional enabling actions (three 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. Complete results from the ASAP evaluation process for all Plan actions can be found in Appendix B.

Prioritized Actions

The list below presents a summary of the 20 prioritized actions that will be further developed in the implementation roadmap. Appendix C provides an implementation roadmap for these prioritized actions including key milestones and metrics.

G-1: Reduce emissions for City employee commute.
G-2: 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. **$$**
G-3: Expand micromobility options throughout the entire city including Citibikes, scooters, and electric bikes. **$$**
R-1: Starting in 2024, require all new buildings to be solar-ready and storage-ready.
R-4: Provide additional policy and financial incentives to encourage private solar installations and identify incentives that would appeal to owners of affordable housing. **$$**
EV-1: Develop EV Master Plan to support the growth of electric vehicle ownership.
EV-2: Develop technical guidance for building owners/managers to facilitate in EV charging infrastructure installations in existing buildings.

EV-3: Partner with major employers and multifamily building owners to install EV chargers in parking lots/garages. **$$**
EV-4: Build on EV Capability Ordinance to require EV charger installations in new developments starting in 2025. **$$**
EV-6: Electrify 100% of public vehicle fleet, including trolleys by 2035.
E-1: Implement Building Efficiency 305 (BE305) program requiring energy benchmarking and disclosure for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft. **$$**
E-2: Improve public benefits and green buildings tracking to increase program participation and impact.
E-3: Require all new public buildings to be built to zero net energy standards starting in 2025.
E-4: Adopt a residential, single-family home energy rating and disclosure ordinance. **$$**
E-5: Adopt building performance standard for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft. **$$**
E-6: Establish residential, single-family home energy conservation requirements. **$$**
E-9: Make all non-emergency energy use in existing public buildings carbon-free by 2035. Explore and adopt as much carbon-free emergency energy generation and storage as possible.
A-1: Improve city data on waste streams and disposal. Establish a per capita waste goal.
A-2: Train City employees on emerging resilient and sustainable buildings initiatives and technologies including solar PVs, energy storage, EV charging, energy efficiency, electrification, and climate adaptation policies.
A-11: Develop a financial and technical assistance program that helps residents, particularly low-income, to pursue climate action. **$$**

GHG Plan Goals and Actions

The following pages introduce the GHG Plan's 55 actions, organized within the overarching goals. Of these 55 actions, 33 address GHG mitigation, 9 address the new green economy, and 13 are additional enabling actions. 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. The additional enabling actions 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 the actions in this plan will be initiated by the Division of Resilience and Sustainability (DRS, a division of the Department of Resilience and Public Works), but progress will be implemented in collaboration with relevant City departments and external stakeholders. As many of these actions are new ideas, DRS will help facilitate research, stakeholder engagement, and planning before actions are enacted.

Key:

- Implementation Phases:
  - 1 = significant progress in 1-3 years (by end of 2024)
  - 2 = significant progress in 4-6 years (by end of 2026)
  - 3 = significant progress in 7 or more years (2027 and beyond)
- Actions that are bolded and 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 objective for a 15% reduction from 2018 levels of private vehicle trips 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.

Objective: 15% less private vehicle trips compared to 2018 levels by 2035

City Authority:

- The City manages the Miami trolley system (Dept of Resilience and Public Works), owns many of the City's lower capacity local roads, and has local land use planning authority, via Miami21 Zoning Code and the Miami Comprehensive Neighborhood Plan (MCNP) (Planning Dept), 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. Parking is overseen by the quasi-judicial entity Miami Parking Authority.

PHASE 1 (1-3 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
G-1: Reduce emissions for City employee commute.	COVID-19 demonstrated that working remotely is possible and effective for City employees and some local businesses. The City should continue to permit employees to work from home and monitor participation. Additional measures to	

PHASE 1 (1-3 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
	consider would be improving public transit benefits and implementing a parking fee.	
G-2: 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. $$	As the County controls most public streets, collaboration is necessary for Miami to implement its Bicycle Master Plan. This action includes greening the bicycle network and installing shade, water fountains, and bike repair infrastructure along bike paths to improve rider comfort and safety.	Resilient305 ACTION 12: Develop Mobility Hubs in the 305 MFCR Goal 4 Phase 2: Update and implement bicycle master plan to improve safety and connectivity of bicycle routes.
G-3: Expand micromobility options throughout the entire city including Citibikes, scooters, and electric bikes. $$	Currently, most micromobility options are concentrated in District 2 and safety concerns will need to be addressed prior to expanding. 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
G-4: Develop a Trolley Master Plan including a long-term vision for the program and route updates. **$$**	This work is currently in progress and aims to ensure the trolley program is sustainable long-term, connects with other multimodal options and key locations, is aligned with the Better Bus County bus rerouting, and maintains high quality service across the City.	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

PHASE 1 (1-3 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
		system by updating user interface of trolley app.

PHASE 2 (4-6 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
G-5: 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
G-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.	
G-7: Adopt transportation demand management ordinance to require certain employers and developers to establish plans to reduce single-occupant vehicle use and	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	

PHASE 2 (4-6 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
traffic during peak hours among employees and residents.	zoning ordinance could require any project receiving a parking discount to adopt TDM measures.	
G-8: Work with partner entities to create bus lanes in strategic, key corridors. **$$**	Adding bus-only lanes to busy corridors will motivate residents to use transit to reduce commuting time. The City of Miami does not own the arterial streets that are ideal candidates for bus lanes but does have influence as these street run through City boundaries.	Resilient305 ACTION 13: Design a Better Bus Network
G-9: Work with Miami-Dade County and local advocacy groups to increase utilization of public transit through investments in safety, improving public transit literacy, and campaigns.	The City will support and enhance outreach campaigns for the public transit system through actions such as investing in safety measures and improving public transit literacy.	Resilient305 ACTION 13: Design a Better Bus Network
G-10: Improve pedestrian experience and safety through investments in sidewalks such as ADA compliance measures and increasing number of crosswalks, especially in low-medium income areas. **$$**	Increasing quality pedestrian infrastructure will encourage residents and visitors to walk to their destinations. Strategies include increasing the amount of shaded walkways and greening right-of-ways as well as completing the Baywalk and Riverwalk.	

Better Bus Network
Two out of three transit riders in Miami use buses for their commute. Redesigning the bus network is an opportunity to immediately improve transit service for the largest number of people. That's why, over a two-year period, Transit Alliance Miami developed a redesigned bus network for Miami-Dade County based on community input and a data-driven process. The Board of County Commissioners unanimously approved the proposed Better Bus Network in October 2021; this new network is expected to launch mid-2022. As a next step, Transit Alliance is supporting pilot dedicated bus lanes to determine how to make them faster, more reliable, and more competitive against car travel.

Goal 2: RENEWABLE ENERGY

Electricity in Miami is used to cool and heat buildings, provide lighting, heat water, 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 that powers 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 with the Biden administration's stated goals 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. The achievement of this goal is an underlying assumption of this report and the City's carbon neutrality pathway; therefore, national leadership is essential for the City to reach its goal. This assumption helped to highlight the remaining reductions that are needed from City and regional actions after this sector is fully addressed. On-site photovoltaics, energy storage, and solar thermal hot water can not only assist the clean energy transition but also save constituents money and create greater energy resilience.

New Green Economy

Today, the renewable energy industry in Miami provides over 400 jobs, which is less than 30% of the total jobs in Miami's energy sector. However, renewable energy jobs have grown by 16% in the past decade, showing that there is consistent local growth in this industry.[11] This growth is driven by purchases from Miami's traditional industry sectors (e.g., government, healthcare, tourism). In 2019, traditional industries spent nearly $600 million on renewable energy in Miami. The actions listed below both support GHG reductions and increase demand for renewable energy, which will increase demand for renewable 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 net zero building sector emissions.

[11] AECOM analysis, Emsi 2019 industry data.

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 electric appliances/equipment), the more building retrofits will be required in the future to achieve the carbon neutrality target. Therefore, it is in the City's best interest to minimize the development of new natural gas pipelines and connections to avoid these future emission sources altogether.

Objective: 100% carbon-free electricity by 2035

City Authority:

- The City of Miami cannot directly control the utility fuel mix but does have control over our own buildings and parcels (GSA and DREAM), as well as the zoning code and building permits that can influence building requirements to an extent (Planning Dept). We can leverage this influence to expand solar photovoltaic and solar thermal systems and grow municipal on-site solar and storage capacity.

Objective: 35% reduction in on-site natural gas emissions compared to 2018 levels by 2035

City Authority:

- In 2021 the state of Florida passed legislation that limits local governments' ability to enact or enforce any policies that restrict or prohibit the types or fuel sources of energy production.[12] Though the City cannot require our residents to replace their existing natural gas systems, we can encourage and incentivize upgrading to electric appliances, use of carbon-free energy sources, and the construction of net zero buildings. Meeting this objective will depend heavily on voluntary action by residents and buildings owners but can be further encouraged with City-provided incentives. This objective also includes a target of 5% net zero emissions new construction by 2035. Via Miami21 and the permit process (Planning and Building Dept), the City can regulate new construction. In addition, the City holds its own franchise agreements with natural gas providers.

PHASE 1 (1-3 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
R-1: Starting in 2024, 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	Resilient305 ACTION 16: Expand Renewable Energy

[12] SB 1128/HB 919, https://www.flsenate.gov/Session/Bill/2021/919/BillText/er/PDF

PHASE 1 (1-3 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
	system will reduce future battery installation costs.	
R-2: 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.	
R-3: Promote community participation in FPL SolarTogether program, especially among renters, to purchase 100% of their 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

PHASE 2 (4-6 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
R-4: Provide additional policy and financial incentives to encourage private solar installations and identify incentives that would appeal to owners of affordable housing. $$	Solar incentives are necessary to encourage residents and businesses to voluntarily install solar. The City will need to engage the development community to understand new areas of opportunity in the Zoning code as the City already has solar-friendly permitting. In addition, the City can promote existing financing pathways including Property Assessed Clean Energy (PACE), Solar and Energy Loan Fund (SELF), and Solar United Neighbors (SUN) Co-op.	Resilient305 ACTION 16: Expand Renewable Energy

PHASE 2 (4-6 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
R-5: 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 storage systems within a facility designated to provide critical services during power outages. First step will be feasibility assessments for selected facilities.	Resilient305 ACTION 16: Expand Renewable Energy ACTION 38: Support Resilience Hubs ACTION 57: Leverage the Power of Purchasing
R-6: Partner with community organizations such as local non-profits, trade organizations, and electric and gas utilities, to develop a building electrification 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 split between new construction and renovation projects.	

FPL SolarTogether
In 2019, Florida Power and Light (FPL) announced their 30-by-30 plan to install more than 30 million solar panels by 2030. By 2030, FPL projects that 40% of their fuel mix will be carbon-free with solar accounting for 16%.[13] To help meet their goal, FPL launched the SolarTogether program wherein customers can subscribe and meet up to 100% of their energy usage from solar generated at FPL's current and future Solar Energy Centers – one of which is located in Miami-Dade County. Both utility-grade solar and rooftop solar thermal and photovoltaics are essential to reaching carbon neutrality.

Building Decarbonization
The building sector makes up 55% of City of Miami's greenhouse gas emissions. To decarbonize the building sector and get to zero greenhouse gas emissions, cities must electrify appliances, end use of fossil fuels on-site, and increase energy efficiency. Despite projected growth in population, square footage, and energy use, continued efficiency improvements, are projected to largely avoid emissions growth in the commercial sector and drive modest emissions reductions in the residential sector,

[13] https://source.fpl.com/company/pdf/10-year-site-plan1.pdf

through 2050.[14] The remaining emissions can be mitigated through electric appliances that are powered by carbon-free energy.

[14] Decarbonizing U.S. Buildings | Center for Climate and Energy Solutions: https://www.c2es.org/document/decarbonizing-u-s-buildings/

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 objective of electrifying 40% of registered passenger vehicles 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.

*Objective: 40% of registered passenger vehicles are electric by 2035**

** Using County data as proxy for City until better data sources are available*

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 (GSA), which includes the trolley system (RPW), but does not own or operate the Metrobus system or public school buses.

New Green Economy

Critical to accelerating EV adoption will be the availability charging station infrastructure, electricians to support charging station infrastructure, and technicians to support EV maintenance. 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 the opportunities and benefits of the electrical trade, and specifically the EV charging station certification, including the trade's wage and growth benefits, will ensure that Miami has a workforce that is able to support widespread EV adoption.

PHASE 1 (1-3 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
EV-1: Develop EV Master Plan to support the growth of electric vehicle ownership.	A Master Plan would help the City anticipate and support the growing electric vehicle market. Through this process, the City would develop private sector partners, policies, metrics, and an expanded charger network map. Overall, this plan should help the City understand what supporting infrastructure is needed and where.	Resilient305 ACTION 12: Develop Mobility Hubs in the 305 ACTION 15: It's Electric
EV-2: 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-3: Partner with major employers and multifamily building owners to install EV chargers in parking lots/garages. $$	Key employers include hospitals, banks, universities, and more. The City can provide free and/or expedited permitting.	Resilient305 ACTION 15: It's Electric ACTION 57: Leverage the Power of Purchasing
EV-4: Build on EV Capability Ordinance to require EV charger installations in new developments starting in 2025. $$	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-5: 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-	This campaign includes promoting awareness on the typical cost of EV chargers, cost of charging, charging locations, life-cycle comparisons,	Resilient305 ACTION 15: It's Electric

PHASE 1 (1-3 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
income drivers and their concerns.	incentives, approved vendors, dealerships, and test drive events.	

PHASE 3 (7+ YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
EV-6: Electrify 100% of public vehicle fleet, including trolleys by 2035.	The City will work with the Electrification Coalition and other 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.	Resilient305 ACTION 15: It's Electric MFCR Goal 1 Phase 2: Conduct a fleet analysis to determine best vehicles for future electric vehicle (EV) changeover. Goal 4 Phase 2: Support expansion of EVs by installing EV charging stations at City-owned properties and changing over fleet vehicles to EVs when possible.
EV-7: 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 limited. 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
EV-8: Evaluate implementing an electric vehicle-sharing program within	This action increases access and familiarizes EVs in low-income neighborhoods and areas of low car	Resilient305 ACTION 15: It's Electric

PHASE 3 (7+ YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
neighborhoods with low car ownership.	ownership. Los Angeles and Sacramento have similar equity-focused EV carshare programs.	

Coral Gables Electric Vehicle Fleet
Since 2016, the City of Coral Gables has added over 65 electric vehicles to its city fleet, making it one of the largest government EV fleets in the state. This equates to over 12% of its City fleet being electric, which ranks it near the top of EV fleets around the Country. As part of the City's 10-year Sustainability Management Plan, Coral Gables continues to add to it EV fleet each fiscal year with a established a goal of 78 EVs, which represents 60% of their administrative fleet. The City purchases these EVs via a statewide procurement contract and has supported the fleet by installing dedicated EV support equipment at its maintenance facility, City Hall parking lot, municipal parking garages, and surface parking lots. The City has been able to fund this through its annual vehicle replacement budget. To date, the City has installed over 34 charging points throughout the City, with a goal of expanding to 52 charging points. Similar to City of Miami, the City updated its zoning code in 2019 to require any new developments with 20 or more off-street spaces to require 2% of the parking spaces for EV's with the associated charging stations; 3% be "EV Ready" with the infrastructure installed except EV station and 15% be "EV Capable" with the conduit run with capacity in electrical panels. All of these actions have enabled and inspired the community to start transitioning away from traditional gasoline powered vehicles.

EV Car Sharing Programs
Cities across the country are launching electric vehicle (EV) car sharing programs as a way to socialize EVs with residents, reduce tailpipe emissions, and provide a transportation option to those who do not own a vehicle. Many of these programs have also included equity considerations and investments like sliding-scale payments for low-income residents and installation of EV chargers in neighborhoods that have more low-income residents and lower air quality due to transportation pollution. Notable programs include Boston's Good2Go, Colorado Carshare, Los Angeles' partnership with BlueLA, and the Twin Cities Electric Vehicle Mobility Network. St. Louis launched a program in summer 2020 called St. Louis Vehicle Electrification Rides for Seniors (SiLVERS) which granted electric vehicles to social service agencies that serve low-income seniors to help them run errands.

Low Emission Zones
Low emission zones (LEZs) and clean air zones are at the center of many cities' efforts to tackle the related problems of air pollution, greenhouse gas emissions and traffic congestion. Zones are powerful tools for enacting policies within a designated zone, rather than a whole city, which can allow for cities to pilot innovative policies. In 2008, London began a Low Emission Zone program in the urban core focused on diesel emitting vehicles. The program was enhanced to create a stricter Ultra Low Emission Zone (ULEZ) in London's inner cordon in 2019 wherein only vehicles that meet

strict emissions standards (electric, hydrogen, and plug-in hybrids) are from the ULEZ charge. A 2019 impact evaluation of the ULEZ six month after it was launched indicated that 13,500 fewer polluting cars were being driven into central London every day and there was a significant drop in harmful air pollution.

Goal 4: ENERGY EFFICIENCY

56% of Miami's citywide emissions come from building energy use via electricity and on-site natural gas. 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.

Objective: Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy[15]

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 Building Department enforces the Code and can also require higher levels of compliance through the City's Zoning Code, Miami21.

New Green Economy

The green buildings sector, which includes energy efficiency contractors, electricians, and other specialty contractors, accounts for 35% of Miami's green jobs. Today's green building sector is the result of traditional industries investing in green buildings and retrofits. In 2019, traditional industries spent over $2 billion in Miami's green buildings industry. The buildings sector also offers the opportunity for the growth in green jobs: green building jobs are currently just 13% of all buildings jobs, leaving 87% of jobs in this industry with the opportunity to become green. As implementation of the GHG Plan takes off and demand for green buildings and retrofits grows, there will be corresponding demand for specialty contractors. Miami's workforce will need to be prepared to fill these green buildings jobs or otherwise risk losing them to people outside the region. It will be critical for the City and economic development actors 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 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 underinvested and climate justice communities.

[15] The Energy Efficiency sub-goal will be quantified once more information is gathered via the BE305 program.

PHASE 1 (1-3 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
E-1: Implement Building Efficiency 305 (BE305) program requiring energy benchmarking and disclosure for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft. $$	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 building owners.	Resilient305 ACTION 17: Building Efficiency 305 MFCR Goal 4 Phase 1: Institute Building Efficiency 305 Program
E-2: Improve public benefits and green buildings tracking to increase program participation and impact.	Currently, there is a lack of centralized information about LEED certified buildings, cool roofs, installed rooftop solar and more that can help the City understand how the built environment is responding to climate change. We need to understand the impact and implementation of our current policies if green building requirements are to expand.	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. Goal 5 Phase 1: Refine application and review process for Special Area Plans (SAP) and development on City-owned property
E-3: Require all new public buildings to be built to zero net energy	Requiring all-electric, zero net energy new public building construction would help demonstrate the feasibility of net zero	Resilient305 ACTION 17: Building Efficiency 305

PHASE 1 (1-3 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
standards starting in 2025.	construction in Miami and allow the City to lead by example.	ACTION 21: Train for Construction MFCR Goal 4 Phase 1: Refine design criteria for ensuring new capital projects are designed and constructed with triple bottom line performance goals.
E-4: Adopt a residential, single-family home energy rating and disclosure ordinance. $$	A home energy rating identifies opportunities for energy improvement to homeowners and sends market signals about the benefits of building efficiency. Low-income populations will need financial assistance to improve their ratings.	

PHASE 2 (4-6 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
E-5: Adopt building performance standard for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft. $$	Implementing an energy or emission performance standard is the next step after adopting a benchmarking and reporting ordinance. Large building 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 ACTION 37: Prepare Your Property

PHASE 2 (4-6 YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
E-6: Establish residential, single-family home energy conservation requirements. $$	Residential property owners would be required to make energy conservation improvements in their homes, potentially at the point of property sale or lease. Implementation could include a prescriptive list of improvements, a list of options for user selection, and/or a maximum investment threshold. Low-income populations will need financial assistance to help with compliance. Similar policies, called Residential Energy Conservation Ordinances (RECOs), have been passed in other cities.	
E-7: Develop energy reduction targets for City of Miami municipal buildings.	Once City of Miami better understands and tracks the energy use of its buildings, we can set informed goals on energy reduction and determine most impactful strategies for achievement.	MFCR Goal 1 Phase 1: Establish GHG emission reduction goals and develop multiyear action plan for both City operations and communitywide.
E-8: Provide incentives for construction firms to use locally-sourced materials with low-embodied carbon and high-efficiency fixtures.	This action will contribute to local economic growth, reduce emissions from transporting materials, and reduce operational emissions from the use of efficient fixtures.	Resilient305 Action 23: Buy Local

PHASE 3 (7+ YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
E-9: Make all non-emergency energy use in existing public buildings carbon-free by 2035.	Energy assets will be inventoried with feasibility analysis for carbon-free replacements, and appliance/equipment replacements will be planned in the capital	

PHASE 3 (7+ YEARS)		
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**
Explore and adopt as much carbon-free emergency energy generation and storage as possible. **$$**	spending budget. As the City has leased many of its buildings, green initiatives in lease agreements can be considered.	

Residential Energy Conservation Ordinances (RECO)

Residential Energy Conservation Ordinances (RECOs) typically mandate that a home meet certain energy (and often water) efficiency requirements and establish a process for verifying that such standards have been satisfied. Property owners can comply with a RECO by meeting a prescriptive checklist of energy efficiency and water conservation measures and undergoing a verification inspection by a certified inspector. A RECO can be designed to establish different actions that initiate the compliance process, such as sale of the property, the rental license inspection process, when the property undergoes significant renovation, or as part of a safety inspection. Examples of cities with RECOs or similar programs include: San Francisco, CA; Burlington, VT; and Ann Arbor, MI.

Building Efficiency 305 (BE305)

Building energy consumption accounts for 55% of City of Miami's GHG emissions, and buildings waste up to 30% of energy and water due to inefficiencies and poor operations. Just 2% of buildings are over 20,000 but they account for over 40% of the floor space. BE305, requires these large buildings to track their energy and water consumption so they can use this information to eliminate inefficiencies: saving owners and residents money, reducing carbon footprints, and easing the transition to renewable energy. The program is projected to save buildings owners and residents over $60 million by the end of 2030.

Goal 5: NEW GREEN ECONOMY

Miami's economy will necessarily be transformed by the implementation of the GHG Plan and broader resilience goals. For Miami's climate mitigation and adaptation efforts to be successful, residents and businesses must economically benefit from the green policies, programs, and investments, which have the potential to accelerate job growth and encourage economic diversification in addition to achieving GHG mitigation goals and adapting to climate change. For this reason, the New Green Economy is a central tenant of Miami Forever Carbon Neutral in anticipation of the way Miami's climate actions will help drive an emerging economic sector and diversify the local economy. Growing a New Green Economy – and, thus, achieving our GHG targets and resilience goals - requires building out Miami's green economy ecosystem.

Today, Miami's green economy ecosystem includes many actors that are operating, for the most part, independently of one another and without a supportive ecosystem helping them to grow, hire, increase their impacts on the local economy and provide equitable opportunities. Our goal is to ensure that green industries have a pathway for growth and that the City plays an active role in paving the way for new green economic growth and employment. This includes preparing underemployed workers for new green opportunities, engaging with the current and potential green job holders, fostering connections between stakeholders, and building business and workforce training capacity and synergies across the entire ecosystem.

While the New Green Economy actions will be implemented by the City, efforts to grow the green economy need to involve the Greater Miami region and its economic and workforce development institutions, including the Beacon Council, the Chamber of Commerce, plus a deep bench of colleges, universities, and foundations. All these actors are already active in Miami's green economy ecosystem in some sort of capacity, either by supporting workforce and educational development, recruiting green industries, or funding community needs. Proposed actions for partners are included in Appendix A.

Objective: Grow the Green Economy Ecosystem

Objective: Recruit and Retain a Green Workforce

Objective: Open Occupational Pathways

Objective: Welcome and Support Green Industry

City Authority:

- Just as the City of Miami faces practical constraints on its ability to influence all GHG emissions, the City has similar constraints on its ability to direct and influence the local economy. We can directly make change through a few select channels. For example, we can play an impactful role in creating demand for green goods and services by purchasing those items for City use (such as EVs, EV infrastructure, and building retrofits), investing in green goods and services for public use (such as sustainable transportation and EV infrastructure), making GHG-friendly requirements through permitting and contracting, and through partnerships. The City of Miami-led New Green Economy actions leverage the City's existing resources (e.g., staff), programs (e.g., Summer Youth Connect program, Opportunity Center), authority (e.g., zoning and procurement), and regional leadership to influence Miami's economy.

PHASE 1 (1-3 YEARS)		
Action	**Action Details**	**Resilient 305 & Miami Forever Climate Ready Alignment**
NE-1: Work with regional partners to identify a regional green economy champion and align resilience and adaptation goals.	While ecosystems are not created overnight, coalition building with regional partners, including Miami-Dade County, Beacon Council, the Chamber of Commerce, CareerSource, and non-governmental organizations (NGOs), to identify a green economy champion and align resilience and adaptation goals from Resilient305, Miami Forever Climate Ready, and Miami Forever Carbon Neutral to intentionally foster creation of a functioning, inclusive ecosystem which advances equity and opportunity through innovation. This "champion" will need to have long-term staying power, credibility with a broad array of stakeholder groups, an intense focus on the green economy and climate justice, and access to operational funding.	R305: Action 20: Build an Inclusive Economy, Action 21: Train for Construction, & Action 27: Expand Youth Career Opportunities MFCR: Goal 1: Ensure decisions are data-driven and human centered Goal 2: Inform, prepare, and engage our residents and businesses
NE-2: Dedicate staff to support green economic development goals and implementation of the GHG Plan.	Dedicate additional full-time equivalent (FTE) employee capacity within existing City departments (planning, resiliency, housing & community development) to support the green economy champion and to lead the City's role in growing the green economy ecosystem (which includes the actions detailed in this table).	
NE-3: Develop a plan for expanded, permanent economic development capacity.	Develop business model for expanded City-level economic development capacity, either as a city department or as a public private partnership, to sustain development of a functioning green economy ecosystem, including economic development incentives and workforce development resources to support career and training pathways. This would build upon Venture Miami efforts.	

NE-4: Develop green economy performance metrics.	Performance metrics are essential in placing climate investments and associated job creation in a broader economic, social, and environmental context, and documenting progress toward future goals. The metrics identified in the GHG Plan (e.g., the number of Electric Vehicles in use) will serve as a proxy for measuring the new green economy. The City will develop separate metrics for tracking equity goals, including demographic makeup of industries and occupations, workforce training recruitment and participation, and employment retention.	
NE-5: Offer relevant job trainings through the Opportunity Center and connect job seekers to local employers.	The City's Opportunity Center and other training entities can partner with local green businesses to surface job orders, locate trainings in the City, and prioritize recruiting displaced, underemployed, or unemployed workers from climate justice communities. Through this process the City will gain a better understanding of barriers to employment in the green economy and build relationships with workforce and education partners to develop programming to bridge the identified gaps.	R305: Action 20: Build an Inclusive Economy, Action 21: Train for Construction MFCR: Goal 1: Ensure decisions are data-driven and human-centered, Goal 2: Inform, prepare, and engage our residents and businesses
NE-6: Expand the Miami Summer Jobs Connect program to include internships that align with the new green economy.	Introducing Miami youth to green jobs, particularly jobs that offer living wages and long-term growth opportunities, early in their career can ensure that Miami has a supply of qualified workers to support green economic growth and climate action goals.	Action 27: Expand Youth Career Opportunities

PHASE 2 (4-6 YEARS)		
Action	**Action Details**	**R305 & Miami Forever Climate Ready Alignment**

NE-7: Strengthen the City's procurement requirements so that green and sustainable are not only the preferred option, but the required option.	Update the language in Chapter 22.5 of the City Code, Articles I and III, to require City departments to purchase green goods and services rather than consider them.	R305: Action 20: Build an Inclusive Economy, Action 57: Leverage the Power of Purchasing MFCR: Goal 2: Inform, prepare, and engage our residents and businesses
NE-8: Facilitate expedited design and permitting review of projects that will achieve Miami's GHG and resilience goals.	Expedited review will reduce costs and encourage developers, contractors, and related businesses to pursue sustainable opportunities.	
NE-9: Preserve or enhance zoning that supports green industries.	Growth of Miami's green economy will also change land use needs. It will be important for the City to identify changes in land-use needs and preserve or create zoning that supports green industry needs. Zoning that supports green industries will also facilitate location-based economic development strategies. Formalize resilience and green economy priorities in the City's comprehensive plan.	

Regional Carbon Neutrality Plans

In April 2021, Miami-Dade County Public Schools established of goal of 100% clean energy use by 2030 for better student health and financially responsible stewardship. To achieve this goal, they established a Clean Energy 2030 task force and will deliver an implementation plan no later than February 2022. In October 2021, Miami-Dade County released their Climate Action Strategy, a communitywide plan to cut greenhouse gas emissions 50% by 2030, while creating jobs, improving health, and enhancing quality of life. Both of these commitments align with City of Miami's goals and the global goal of halving emissions by 2030 and reaching global carbon neutrality by 2050. As City of Miami, Miami-Dade County Public Schools, and Miami-Dade County all have large purchasing and political power, the collective influence of these commitments can positively push Miami's economy towards greater sustainability and equity.

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.

Objective: Advocate and Educate

Objective: Integrate Climate into Governance

Objective: Reduce Solid Waste

PHASE 1 (1-3 YEARS)			
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**	**GHG Reduction Alignment**
A-1: Improve city data on waste streams and disposal. Establish a per capita waste goal.	To better understand opportunities for waste reduction, the City will need an updated waste stream characterization study and data from private haulers who service multi-family buildings and commercial businesses. Miami-Dade County has a goal to reduce landfill waste per person by 50 by 2030.		Waste Reduction
A-2: Train City employees on emerging resilient and sustainable buildings initiatives and technologies including solar PVs, energy storage, EV charging, energy efficiency, electrification, and climate adaptation policies.	City staff need to be familiar with green and resilient building practices in order to facilitate permitting and sustainable development. The City will evaluate initial areas of opportunity based on history of permits and current policies.	Resilient305: ACTION 47: Train Employees to Be Resilient MFCR Goal 2 Phase 2: Build staff capacity by incentivizing city employees to pursue relevant professional certifications.	All Goals

PHASE 1 (1-3 YEARS)			
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**	**GHG Reduction Alignment**
A-3: Implement green and sustainable special events program.	Beginning with guidelines and then transitioning to requirements, the City will work with special events in the City to generate less waste, use more sustainable materials, and be more energy efficient.		All Goals
A-4: Train City staff on climate change.	Educating City staff on climate change can help ensure that public decisions are made with climate considerations in mind. This training is intended to cover the basics of the issue and local impacts.	Resilient305: ACTION 47: Train Employees to Be Resilient ACTION 48: RISE to the Rescue MFCR Goal 2 Phase 1: Inform, Prepare, and Engage Residents and Businesses (multiple actions)	All Goals
A-5: Work with existing advocacy organizations and non-profits to improve citywide climate literacy and awareness.	Literacy initiatives should go beyond social media posts and achievements should be communicated widely. The City should provide funding to local organizations to develop PSAs, promote City initiatives, and educate residents.	Resilient305: ACTION 48: RISE to the Rescue ACTION 40: Create a K-12 Plan for Resilience Literacy MFCR Goal 2 Phase 1: Inform, Prepare, and Engage Residents and Businesses (multiple actions)	All Goals

PHASE 1 (1-3 YEARS)			
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**	**GHG Reduction Alignment**
A-6: Improve recycling participation and reduce contamination.	Recycling is required citywide; participation is high but so is contamination. Multi-family buildings with more than three units and commercial businesses must contract recycling services through a private waste hauler but not all do. The City can provide information for residents on how to get recycling started. In addition, new information about contamination in the City's recycling stream will help determine metrics and focus areas to improve the quality of recycled items.	MFCR Goal 2 Phase 1: Enhance existing educational anti-litter and cleanup programs and implement data-based policies	Waste Reduction
A-7: Work with community composting organizations to increase household composting.	Composting greatly reduces the emissions that come from landfilling or combusting organic waste. Having options such as backyard composting, compost pickup/drop-off and community composting at City parks will help make composting more accessible to residents.		Waste Reduction
A-8: Help restaurants and businesses reduce their waste stream by connecting them with resources to reduce single-use plastic, integrate composting, and recover and redistribute surplus food.	Single-use plastics are a major source of marine debris and food waste is a major source of landfill emissions. Restaurants and businesses can voluntarily opt to partner with a number of local organizations who can help educate them on the environmental impacts of their waste stream and provide guidance on how to mitigate. The City can encourage participation and promote these opportunities.		Waste Reduction

PHASE 1 (1-3 YEARS)			
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**	**GHG Reduction Alignment**
A-9: Lobby for climate-forward policies at the state and federal level.	Lobby the federal government, Public Service Commission (PSC) and State of Florida in support of policies and funding that promote climate resilience and carbon mitigation. The PSC is responsible for regulating FPL and the State is responsible for many impactful policies and funding programs including the Florida Building Code.	Resilient305 ACTION 17: Building Efficiency 305 ACTION 16: Expand Renewable Energy ACTION 17: Building Efficiency 305 MFCR 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.	Energy Efficiency and Carbon-Free Buildings Carbon-free Electricity
A-10: Advocate for climate-forward policies from FPL that support carbon-free energy at scale and energy efficiency.	The City can use its soft power to advocate for policies that make solar more economical for customers and encourage the utility towards utility-scale clean energy as expeditiously as possible. Additionally, the City can advocate for energy efficiency retrofit programs for low-income households.	Resilient305 ACTION 16: Expand Renewable Energy MFCR Goal 4 Phase 1: Prioritize and improve coordination and	Carbon-free Electricity Energy Efficiency and Carbon-Free Buildings

PHASE 1 (1-3 YEARS)			
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**	**GHG Reduction Alignment**
		communications with FPL around protocols and efforts to improve energy grid reliability.	

PHASE 2 (4-6 YEARS)			
Actions	**Action Details**	**Resilient305 / Miami Forever Climate Ready Alignment**	**GHG Reduction Alignment**
A-11: 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. The City will work across departments to develop easily accessible guidance that span carbon mitigation and climate resilience.	Resilient305 ACTION 37: Prepare Your Property	Energy Efficiency and Carbon-Free Buildings
A-12: Establish construction and demolition waste diversion requirements.	Construction and demolition (C&D) waste can be a substantial part of the solid waste stream. Establishing diversion requirements can ensure C&D waste is reused or recycled.		Waste Reduction
A-13: Develop end-of-life requirements for solar PV and other relevant renewable energy technologies, including battery storage.	Solar panels and batteries contain toxic chemicals that can pollute the environment and impact public health if not disposed of properly. Developing disposal or recycling requirements for these items can reduce their environmental damage at end-of-life.		Waste Reduction

Action Summary

Goal 1: GETTING AROUND MIAMI

Goal 1 Actions:

G-1: Reduce emissions for City employee commute.
G-2: 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. $$
G-3: Expand micromobility options throughout the entire city including Citibikes, scooters, and electric bikes. $$
G-4: Develop a Trolley Master Plan including a long-term vision for the program and route updates. **$$**
G-5: Build upon existing transit-oriented development policies in Miami21 to increase residential density, access to goods and services, and decrease single-occupancy vehicle use focusing on areas surrounding Metrorail stations.
G-6: Establish parking disincentives, such as parking maximums and dynamic parking prices, to discourage the use of single occupancy gas vehicles.
G-7: Adopt transportation demand management ordinance to require certain employers and developers to establish plans to reduce single-occupant vehicle use and traffic during peak hours among employees and residents.
G-8: Work with partner entities to create bus lanes in strategic, key corridors. **$$**
G-9: 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.
G-10: 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:

R-1: Starting in 2024, require all new buildings to be solar-ready and storage-ready.
R-2: Join FPL SolarTogether program to purchase City's building electricity from solar.
R-3: Promote community participation in FPL SolarTogether program, especially among renters, to purchase 100% of their electricity from solar.
R-4: Provide additional policy and financial incentives to encourage private solar installations and identify incentives that would appeal to owners of affordable housing. $$

R-5: Install solar and storage in public buildings or parking structures where feasible, prioritizing critical facilities.
R-6: Partner with community organizations such as local non-profits, trade organizations, and electric and gas utilities, to develop a building electrification education program to provide information and technical assistance. **$$**

Goal 3: ELECTRIC VEHICLES

Goal 3 Actions:

EV-1: Develop EV Master Plan to support the growth of electric vehicle ownership.
EV-2: Develop technical guidance for building owners/managers to facilitate in EV charging infrastructure installations in existing buildings.
EV-3: Partner with major employers and multifamily building owners to install EV chargers in parking lots/garages. $$
EV-4: Build on EV Capability Ordinance to require EV charger installations in new developments starting in 2025. $$
EV-5: 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-6: Electrify 100% of public vehicle fleet, including trolleys by 2035.
EV-7: Evaluate the potential to implement a low emission zone in the urban core.
EV-8: Evaluate implementing an electric vehicle-sharing program within neighborhoods with low car ownership.

Goal 4: ENERGY EFFICIENCY

Goal 4 Actions:

E-1: Implement Building Efficiency 305 (BE305) program requiring energy benchmarking and disclosure for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft. $$
E-2: Improve public benefits and green buildings tracking to increase program participation and impact.
E-3: Require all new public buildings to be built to zero net energy standards starting in 2025.
E-4: Adopt a residential, single-family home energy rating and disclosure ordinance. $$
E-5: Adopt building performance standard for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft. $$
E-6: Establish residential, single-family home energy conservation requirements. $$

E-7: Develop energy reduction targets for City of Miami municipal buildings.
E-8: Provide incentives for construction firms to use locally-sourced materials with low-embodied carbon and high-efficiency fixtures.
E-9: Make all non-emergency energy use in existing public buildings carbon-free by 2035. Explore and adopt as much carbon-free emergency energy generation and storage as possible.

Goal 5: NEW ECONOMY

NE-1: Work with regional partners, including Miami-Dade County, Beacon Council, and non-governmental organizations (NGOs), to align sustainability and adaptation goals. **$$**
NE-2: Dedicate staff within existing City departments to support green economic development goals and implementation of the GHG Plan. **$$**
NE-3: Develop a Mayor-approved plan for expanded, permanent economic development capacity. **$$**
NE-4: Strengthen the City's procurement requirements so that green and sustainable are not only the preferred option, but the required option. **$$**
NE-5: Facilitate expedited design and permitting review of projects that will achieve Miami's GHG and resilience goals. **$$**
NE-6: Preserve and increase flexibility of job-supportive land uses. **$$**
NE-7: Develop green economy performance metrics based on the GHG Implementation Plan. **$$**
NE-8: Expand the Miami Summer Jobs Connect program to include internships that align with green economy. **$$**

Additional Enabling Actions

A-1: Improve city data on waste streams and disposal. Establish a per capita waste goal.
A-2: Train City employees on emerging resilient and sustainable buildings initiatives and technologies including solar PVs, energy storage, EV charging, energy efficiency, electrification, and climate adaptation policies.
A-3: Implement green and sustainable special events program.
A-4: Train City staff on climate change.
A-5: Work with existing advocacy organizations and non-profits to improve citywide climate literacy and awareness.
A-6: Improve recycling participation and reduce contamination.
A-7: Work with community composting organizations to increase household composting.

A-8: Help restaurants and businesses reduce their waste stream by connecting them with resources to reduce single-use plastic, integrate composting, and recover and redistribute surplus food.
A-9: Lobby for climate-forward policies at the state and federal level.
A-10: Advocate for climate-forward policies from FPL that support carbon-free energy at scale and energy efficiency.
A-11: Develop a financial and technical assistance program that helps residents, particularly low-income, to pursue climate action. $$
A-12: Establish construction and demolition waste diversion requirements.
A-13: Develop end-of-life requirements for solar PV and other relevant renewable energy technologies, including battery storage.

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. These updates will also include comprehensive action level updates on the GHG Plan and adaptation plan.
- **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 of the Plan's 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 objective 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. These updates will also be provided as part of the GHG inventory update.

To track objective 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. We will evaluate methods for alignment with the strategic plan and regular Clearpoint reporting, establishing scheduled status updates at internal Resilience Action Forum meetings, and leveraging the Climate Resilience Committee for external accountability.

The City developed an implementation roadmap (see Appendix C) that provides 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 four quantitative objectives and five qualitative objectives related to 2035 GHG target achievement. The following table provides a framework for tracking GHG-reduction goal progress (excluding the New Economy goal as success metrics have not yet been determined), including baseline information, implementation metrics, and potential sources for each metric listed. The City will coordinate with staff to update progress on these metrics every two years during their GHG inventory update.

Table 4.1 – Goal Tracking

Goal 1: GETTING AROUND MIAMI **Objective**: 15% less private vehicle trips compared to 2018 levels **Target**: 72% of total trips are in private vehicles by 2035		
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 (2015-2019 City of Miami ACS 5-Year Estimate data)	▪ Supporting Metric: Commuting travel mode splits	▪ American Community Survey 5-Year Estimates – Commuting Characteristics
Goal 2: RENEWABLE ENERGY **Objective:** 100% carbon-free electricity **Target**: 100% of electricity is generated by carbon-free sources such as solar, nuclear, and wind/elimination of fossil fuels from the main electricity fuel mix by 2035 **Objective:** 35% reduction in on-site natural gas emissions compared to 2018 levels **Target**: Reduce total natural gas emissions to 94,500 MTCO2e or less by 2035		
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	▪ FPL
	▪ Supporting Metric: City solar installation permit data with system kW information	▪ Building Department
▪ Residential on-site natural gas – 3,748,422 therms consumed in 2018	▪ Primary Metric: Residential and commercial natural gas therm consumption	▪ TECO, Florida City Gas

▪ Commercial on-site natural gas – 23,593,957 therms consumed in 2018	▪ 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
Goal 3: ELECTRIC VEHICLES **Objective/target**: 40% of registered passenger vehicles are electric*		
Baseline Information	**Implementation Metrics**	**Metric Sources**
▪ <1% registered vehicles are EV (2020 County-level data)	▪ Primary Metrics: • Total registered autos and pickups • % of all registered autos that are electric vehicles	▪ EV Hub – State and County EV Registration Data ▪ FLHSMV – Registered Vehicle and Vessel Report Statistics
	▪ Supporting Metric: City EV charger installation permit data	▪ Building Department
Goal 4: ENERGY EFFICIENCY **Objective:** 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 (on-site natural gas) • 2,100,317 MWh consumed in 2018 (electricity)	▪ Primary Metrics: • Residential and commercial natural gas therm consumption • electricity MWh consumption	▪ TECO, Florida City Gas, FPL
▪ Commercial: • 23,593,957 therms consumed in 2018 (on-site natural gas) • 3,330,062 MWh consumed in 2018 (electricity)	▪ Supporting Metrics: ACEEE City Energy Efficiency Scorecard	▪ ACEEE Website

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

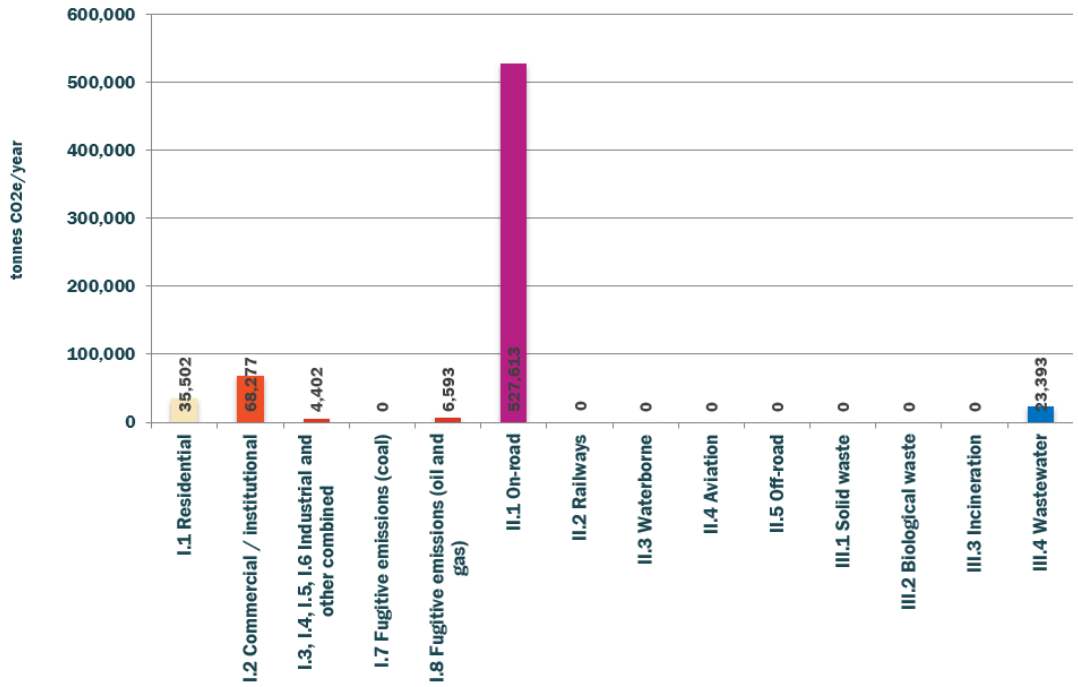
Remaining Emissions in 2050

Remaining Emissions Sources

Miami's GHG Plan shows how to reduce local emissions to the maximum extent feasible and focuses on emissions reductions from the city's largest emissions sources, including building energy use, transportation, and the electric grid. Currently, there are technological, regulatory, economic, and other barriers that prohibit elimination of 100% of carbon emissions. Based on the city's emissions forecasts, the aforementioned barriers, 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 only predict 31% global fleet electrification by 2040 and do not anticipate 100% market penetration by 2050.[16] 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 have 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.

Because the City does not own or operate the public rail or bus fleets and lacks control over many of the major arterial streets in the City, we ultimately have limited authority to influence transit service, infrastructure expansion, or roadway design decisions to increase space for non-automotive travel. These factors limit the City's ability to directly influence travel mode shift to transit, beyond partnership, to overcome the limited regional vehicle travel reduction projections for 2035 and beyond.

In 2021, the state of Florida passed SB 1128/HB 919 that limits local governments' ability to enact or enforce any policies that restrict or prohibit the types or fuel sources of energy production. Therefore, Miami cannot restrict or ban the use of fossil fuels in buildings, which will delay the City's progress toward electrification or using carbon-free energy sources. Because the City can no longer mandate the use of certain fuels, we will need to invest heavily in programs that incentivize voluntary building retrofits or net-zero/all-electric new construction.

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. The Plan focuses on encouraging

[16] BloombergNEF Electric Vehicle Outlook 2020. https://about.bnef.com/electric-vehicle-outlook/#:~:text=Passenger%20EV%20sales%20jumped%20from,sales%20spread%20to%20new%20markets

adoption of electric appliances at the end-of-useful-life of natural gas appliances, but the City is pre-empted from enacting electrification requirements.

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. 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

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 credits 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.

Acknowledgements

The development of this plan was led by City of Miami's Department of Resilience and Public Works Division of Resilience and Sustainability with key guidance and technical expertise from AECOM and C40 Cities. This plan would not be possible without the input, feedback, and collaboration of climate champions in the Miami community and within City of Miami staff.

Individuals from the following organizations both contributed to this report and will be key partners as City of Miami works towards carbon neutrality:

AECOM
Allapattah CDC
Beacon Council
Brickell Energy
Building Association of South Florida
Building Owners and Managers Association
C40 Cities
Catalyst Miami
City of Miami, especially the Resilience Action Group
City of Miami Beach
City of Orlando
City of San Francisco
CLEO Institute
Climate Resilience Committee
Downtown Development Authority
Dream in Green
Florida City Gas
Florida International University
Florida Power and Light
Food Rescue South Florida
Greater Miami Chamber of Commerce
ICLEI
JP Morgan Chase
Miami Climate Alliance
Miami-Dade County
Miami-Dade Transportation Planning Organization
Miami Parking Authority
Oojee
Overtown Community Champions
TECO Gas
Transit Alliance
The Miami Foundation
University of Miami
Ygrene

Lastly, thank you to all the members of the public who participated in our engagement opportunities throughout the development of this plan and provided their feedback. Whether you live, work, play or just care about the City of Miami, we appreciate your advocacy and encourage you to continue as we work to build Miami forever and for all.

Glossary

Term	Definition
Baseline	Climate conditions or greenhouse gas (GHG) emissions snapshot against which to begin tracking adaptation or reduction progress
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
- 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)

Appendix A – New Green Economy Report

Miami Forever Carbon Neutral: Growing the New Green Economy

Analysis of City of Miami's Green Economy and Action Plan for Expansion

Executive Summary

Miami finds itself at a unique and consequential moment in time. With the impact of COVID-19 beginning to wane, our City is preparing for economic recovery and growth. At the same time, challenges linked to climate change and longstanding socioeconomic inequities threaten our communities and economy. As a low-lying, subtropical, coastal city, Miami is particularly vulnerable to the impacts of climate change, including rising sea levels, intensifying tropical storms, and increased extreme heat exposure. These impacts disproportionately effect historically underinvested communities, which tend to be populated by individuals that are low-income, predominantly Black, and recent immigrants (climate justice communities), which serves to further amplify the City's wage disparity and higher unemployment rates among Black and non-white Hispanic residents, both of which worsened during the height of the COVID-19 pandemic. This convergence of factors underscores the immense need – and opportunity – for Miami to create economic development policies and initiatives that address climate change, reduce socioeconomic disparities, and increase economic resilience.

Our carbon mitigation and climate adaptation commitments are directly aligned with our goals to reduce socioeconomic disparities and increase economic resilience. As we achieve our greenhouse gas reduction (GHG) targets – of 60% GHG reduction below 2018 levels by 2035 and 100% GHG reduction by 2050 - and adapt to other facets of climate change, we will simultaneously drive incremental, but ultimately substantive, change in the South Florida economy towards a greener economy. This new green economy will be anchored by industries that either reduce impact on the environment or produce environmentally friendly goods and services. It will also shape how we live and work in our city and region by creating low-emissions alternatives to how we commute, travel and maintain our homes and offices. Overall, this transition will help diversify the regional economy, increase economic resilience, and drive growth in industries that offer living wage jobs and long-term economic opportunity for Miamians. Ensuring that these new green jobs benefit communities that have been historically disinvested is a critical part of Miami's collective climate justice agenda, as detailed in Miami Forever Carbon Neutral and Resilient 305.

Miami is uniquely well-positioned to become a leader in the United States' broader green economy. With billions of dollars in assets and thousands of households vulnerable to the impacts of climate change, Miami serves as an ideal hub for green investment, innovation, and talent. We have already shown decisive leadership in mitigating our role in climate change and protecting our City from future climate change impacts, as evidenced by the adoption of Miami Forever Climate Ready, Resilient 305, and now, Miami Forever Carbon Neutral (the GHG Plan). This New Green Economy Analysis and Action Plan (Green Economy Plan) identifies the elements of Miami's economy that will support climate action and the shift to the new green economy, and outlines strategies that the City, our partners, and residents, can pursue to ensure that the transition to a carbon-free future benefits all of our communities.

About this Report

This report builds on 20 years of research to advance a refined view of the now emerging "green economy" across South Florida and the City of Miami. Two focus areas are included:

1. A broad focus on economic growth, job creation, and capital investment in industries that significantly reduce the impact of human activity on the environment.
2. A tactical focus on jobs within Miami's green industries, which includes industries that can be characterized as "Pure Green", where 100% of the industry output is environmentally friendly, and "Partially Green," where a portion of the industry's output is environmentally friendly (such as the automobile and building construction industries).

The Green Economy Plan includes findings from analysis of these two focus areas to understand the current green economy, including key industries and assets, green industries that are poised for growth, and occupations that will be impacted by climate action. This analysis is followed by near-term (within one to three years) and mid-term (within four to six years) actions that the City can take to create a strong green economy ecosystem – a network of businesses, organizations, customers, and policies that are driving economic growth - to support implementation of Miami Forever Carbon Neutral and the Miami Forever Bond. The City, however, cannot work alone to grow the new green economy – it requires

partners to achieve broad impact. As such, these City-led actions are accompanied by recommendations for the City's partners, businesses, and residents to ensure that the growth of the new green economy benefits Miamians through workforce development training, career pathways, and living-wage jobs. This Plan furthers many objectives established in Resilient305, including goals for building a diverse and inclusive economy, creating youth career opportunities, buying local, and collaborating with local universities.

Key Findings

Key findings from this research include:

- **Miami's green economy and green jobs are resilient and poised for growth:** The "green" components of Miami's green sectors, which were defined as part of this analysis and include Energy, Buildings, Transportation, Waste Management, Sensors, Instruments and related Research and Development (R&D), Education, Regulation & Advocacy, and Climate Resilient Infrastructure, supported 5,150 green jobs in 2019 and roughly $1.1 billion in output. These green sectors experienced 3.8% annualized growth from 2015 to 2019, compared to 1% annualized growth for Miami's non-green industries. Since the onset of COVID-19, green industries have been more resilient (with little to no job losses) in comparison to Miami's traditional sectors, such as Tourism and Professional Services. *(Chapter 4: Green Jobs are Resilient and Poised for Growth)*
- **The growth of Miami's green economy is the result of spending by traditional sectors:** In 2019, traditional sectors, such as Higher Education, Local Government, and Healthcare, spent $5 billion on goods and services from green sectors, primarily Buildings and Transportation. While traditional sectors are not "green" today, transitioning to a green economy requires moving these industries incrementally towards becoming greener through gradual sustainable purchases. This can occur in response to technical advances, market forces, and evolving government policy that facilitates the adoption of green business practices. Local government policies and investments, including those related to electric vehicle (EV) infrastructure, LEED certified buildings, building efficiency guidelines, and adaptation programs, are playing an important role in encouraging green purchases by traditional sectors. *(Chapter 4: Traditional Industry Sectors Will Grow the New Green Economy)*
- **Municipal procurement policies play a key role in catalyzing the new green economy:** Local government currently spends $330 million per year in industries that are part of the green economy – three times the spending of any other sector. The scale of government spending within the local economy underscores the impact that City policies can have in creating demand for green goods and services and for supporting growth of green industries. While local government is spending $330 million annually in industries that are part of the green economy, most of these industries are considered "Partially Green", suggesting that not all government purchases are green – yet. Procurement policies that prioritize climate-friendly investments will have an outsized role in ensuring that local government's spending directly supports the green economy. *(Chapter 4: Traditional Industry Sectors Will Grow the New Green Economy)*
- **Green industries have a higher share of jobs that pay living wages than traditional industries in Miami:** In general, across all occupations, those categorized as green tend to offer higher pay for middle-skilled workers – 65% have a median wage greater than the living wage (compared to 47% of all Miami occupations). Given the rapid growth in the green economy since 2010, the median wage of green jobs has the potential to climb as spending and demand for green jobs increases. Importantly, ensuring equitable access to living wage green jobs will require intentional work from the City and our economic development partners through the development of green career pathways, workforce training opportunities, and hiring support. *(Chapter 4: Green Jobs Are Higher Paying and More Accessible)*
- **There are many occupations that are employed across multiple green industries and demand for these occupations is already expected to grow over the next 10 years – even without the support of Miami's forthcoming climate actions.** The occupations that are employed across multiple green industries provide clear direction to workforce intermediaries and educational institutions on which green occupation pathways should be prioritized in the near-term. *(Chapter 5: Green Occupations)*

Although this analysis uncovers the scale of recent growth in Miami's green economy since 2015, engagement with local civic and nonprofit organizations and the private sector identified parallel weaknesses to be overcome if the new green economy is to grow in step with our GHG Plan:

- **Greater Miami needs a green economy champion:** While there is regional consensus about the importance and potential of Miami's green economy, there is no dedicated champion that can focus solely on the sector's growth. Miami-Dade County, Beacon Council, Catalyst Miami, have all expressed support for scaling a green economy sector but a central entity or person is needed to combine and guide all stakeholders and their efforts. This champion could play a lead role in ensuring that there is a functioning green economy ecosystem to support future job creation, in

conducting outreach with emerging green economy firms to clarify workforce needs and market challenges, and in developing partnerships with local workforce intermediaries and universities.

- **The City of Miami needs designated economic development staff:** While we have made considerable progress in working toward shared goals across sustainability and resilience, with green infrastructure investment being a clear focus, City economic and workforce development efforts related to green jobs appear fragmented. The same is true of the region's economic development actors. The City has limited capacity to engage with emerging green firms to better understand how evolving public sector investments will impact their industries and future job creation. The lack of a city-level economic development arm was noted as a specific concern, alongside the need for more deliberate strategies that leverage City procurement rules to accelerate green opportunities.
- **The City of Miami should prioritize equity and climate action in economic development, especially with COVID-19 recovery dollars:** Although the COVID-19 pandemic and economic recession are beginning to wane, the pandemic has consequentially impacted Miami's economy with many still out of employment, particularly among low-income Black and non-white Hispanic residents. In response, City leaders have the opportunity to leverage federal and state resources to explicitly support job creation in industries best positioned to create living wage jobs, long-term economic opportunity, and address longstanding socioeconomic inequities over the next 10 to 20 years, which includes industries across the green sectors. The decisions made today about economic recovery will shape our community, economy, and environment in the decades to come.

The COVID-19 pandemic has taught us the importance of resilience, equity, and modernization. Now, it is critical that we take decisive action to ensure our economic recovery efforts reflect these tenets. As immediate next steps, the City of Miami will focus on foundational actions that will support the expansion of this new economic sector. To enable this, the City needs to identify full-time equivalent staff time to focus on and begin work on City-specific actions. Beyond the City, key regional stakeholders including neighbor cities, Miami-Dade County, Beacon Council, workforce development intermediaries, green businesses, climate advocacy groups, and educational institutions, need to come together and collectively identify a regional green economy champion. A green economy champion is needed to lead on collaborating with public and private sector leaders; providing leadership and vision related to green economy goals; supporting start-up, retention, and expansion efforts; and taking ownership of green economy metrics (e.g., jobs, recruitment, wages, companies, and opportunities). This "champion", which may be a person, office, entity, or a coalition, will need to have long-term staying power, credibility with a broad audience of stakeholders, institutions, and businesses, an intense focus on the green economy and climate justice, and access to operational funding.

With a regional green economy champion in place, the proposed actions for growing the green economy can begin to take form. As the City updates its GHG Plan, we will maintain open channels of communication with workers, businesses, educational institutions, community organizations, public agencies, and residents to collaborate and report on the positive economic impacts of the GHG Plan and related climate actions.

Chapter 1: Introduction

Miami Forever Carbon Neutral is the City's Greenhouse Gas Reduction Plan (GHG Plan) and serves as a roadmap for Miami to achieve carbon neutrality in the community by 2050, strengthen the local economy, and work towards climate justice. This Green Economy Plan serves as a primer on how implementation of the GHG plan will transform the South Florida economy and workforce based on existing economic conditions and trends. The primary focus of the Green Economy Plan is to uncover Miami's existing green economy ecosystem, including the industries, institutions, and policies that are currently supporting its growth, and identify key characteristics of Miami's green workforce so that the City and its partners can support green economic growth in a way that intentionally supports the creation of living wage and economically resilient career pathways for underserved communities. The Green Economy Plan concludes with actions for both the City and the broader Miami community to strengthen the local green economy ecosystem and workforce. The City-led actions at the conclusion of the Green Economy Plan are subgoals to the GHG Plan and are designed to complement the GREEN goals. The success of Miami's green economy, however, will depend on a broad range of economic development, workforce training, and climate justice actors working together towards a shared vision. To that end, the green economy plan goals are accompanied by proposed actions to be led by partners. These goals and actions are discussed in detail in Chapter 6.

Pursuing both goals in tandem will result in economic progress that is sustainable, resilient, inclusive, and equitable – delivering a green and just recovery from the COVID-19 crisis (Garcetti, et al., 2020).

GHG Plan goals to transition to a GREEN Miami:

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

Green Economy Plan goals to support the new green economy:

- ***G** – Grow the Green Economy Ecosystem*
- ***R** – Recruit and Retain a Green Workforce*
- ***O** – Open Occupational Pathways*
- ***W** – Welcome and Support Green Industry*

Miami's Greenhouse Gas Reduction Commitments & the New Green Economy

Seventy percent of global carbon dioxide emissions (the primary human-caused GHG emissions) originate 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. And, as described in Resilient305 and Miami Forever Climate Ready, Miami is particularly vulnerable to the impacts of climate change, making it all the more critical that we do our part in reducing GHG emissions while adapting to the changing climate. The City's climate vulnerability must be viewed in the context of existing socioeconomic inequities, such as wage disparity and higher unemployment rates among Black or non-white Hispanic residents, which were negatively impacted by the COVID-19 pandemic and will continue to be exacerbated by the impacts of climate change.

Achieving our target of 60% reduction in GHG emissions by 2035 and 100% reduction by 2050, coupled with adapting to the increasing intensity and severity of sea level rise and weather events, will require a substantive transformation of the local economy. To support the GHG Plan's Electric Vehicle goals, for example, the local economy will need to increase access to EV charging infrastructure, EV support services (e.g., technicians), and EV dealerships. Likewise, pursuit of the GHG Plan's Energy Efficiency goals will increase demand in the local economy for energy efficient products, such as HVAC and kitchen systems and windows, and related services, such as building design, specialty contractors, and retrofit specialists. Indeed, each of the GREEN goals will lead to increased demand for green goods and services, which will have the effect of growing market share of Pure Green industries, increasing sales of green goods and services in the Partially Green industries, and pushing Potentially Green industries to adopt green practices. In turn, the local economy is likely to see a decline in demand and market share of non-green goods and services. Businesses and employees in these non-green industries are ideal candidates for economic development support services and reskilling opportunities.

The greening of our economy through the realization of our carbon mitigation and climate adaptation commitments is directly aligned with our goals to reduce socioeconomic disparities and increase economic resilience. This new green economy will diversify the regional economy, increase economic resilience, and create demand for living-wage jobs that are less susceptible to the economic shocks of weather events and global pandemics. Ensuring that these new, green living wage jobs benefit communities that have been historically disinvested is a critical part of our collective climate justice goals.

The scale of climate change impacts facing the City and the mitigation actions needed to transition to a healthy, climate resilient future and a more sustainable, inclusive economy is far too great for any one sector to undertake alone. As such, the public and private sectors each play key roles 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.

Climate Justice & the Green Economy

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, economic recession) and their residents are relatively more socially vulnerable than other parts of the City.

Inequities experienced by residents of climate justice communities include:

- Utility burden
- Low car ownership rates
- Renters being pushed out of homes due to increasing rent prices
- Being uninsured or underinsured
- Prolonged exposure to hazardous conditions such as extreme heat and pollution in homes and worksites
- Lack of access to reliable and consistent public transportation
- Living paycheck to paycheck and being unable to afford hurricane supplies or evacuate due to flooding
- Living more than three miles from the closest grocery store

The GHG Plan and the City's ongoing climate adaptation efforts offer opportunities to begin to address some of these inequities by creating job opportunities and career pathways that are economically resilient, offer living wages, and are specifically targeted for underserved climate justice communities. 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.

Defining the Green Economy

The concept of the "green" or "clean" economy has been evolving for almost 20 years, with initial progress linked to strategies advanced by the Organization for Economic Cooperation and Development (OECD) to encourage job growth in sectors that preserve and/or restore the environment through energy efficiency, resource consumption, decarbonization, and waste diversion. Domestic efforts to define "green jobs" expanded after the Great Recession (2008) as the Federal government's efforts to re-start the economy prioritized green investments (including public transit, clean vehicles, and ecosystem restoration) within the American Recovery and Reinvestment Act (ARRA). This Green Economy Plan

builds on this research to advance a refined view of the now emerging green economy across the City of Miami and South Florida.

The **green economy** is broadly defined as any group of businesses and organizations that use practices that reduce the negative impact of human activity on the environment, including those that mitigate or adapt to the impacts of climate change. Miami's new green economy is defined as the businesses and organizations that are supporting the realization of our climate action goals by facilitating access to the goods and services that are essential to reducing the negative impact of human activity on the environment (C40 Cities, 2019). Participants in the green economy can be categorized into two groups:

- **Producers of green goods and services**, such as renewable energy, climate adaptation services (e.g., environmental or engineering professionals that design habitat protection or flood management projects), electric vehicles, or mass transit; and
- **Consumers of green goods and services**, whether they be local government agencies hiring contractors to rebuild infrastructure that can withstand severe weather events, hospitals adopting more efficient energy systems, or private households purchasing electric vehicles.

For the purposes of this report, businesses that produce green goods or services are organized into industries and sectors based on their product or output. For example, in this analysis, the transportation sector incorporates industries associated with the movement of goods and people, such as public transportation and electric vehicles.

Each green sector includes a range of industries that are: 1) **Pure Green Industries**, or industries that are actively producing or providing green outputs; 2) **Partially Green Industries**, or industries that are not yet producing or consuming 100% green goods or services, but a growing portion of outputs or portions are green; and 3) **Potentially Green Industries**, or industries that have the potential to produce or consume green goods and services in the near future. For example, certain industries, such as fossil fuel reliant transportation services, do not currently provide any green outputs since they contribute GHG emissions. However, as technology advances (such as the creation of synthetic fuel or the adoption of zero-emission electric vehicles), market forces and new policies can push these industries to adopt green practices, i.e., they have the *potential* to become green over time. The spectrum of green industries – Potentially Green to Pure Green – are illustrated in Figure 1 below.

Figure 1. The Spectrum of Green Industries

This Green Economy Plan specifically quantifies the number of green jobs within the Partially Green and Pure Green industries, but also takes stock of the number of jobs in the Potentially Green industries as they too will be impacted by a transition to a greener economy. The methodology for this analysis can be found in the appendix.

Chapter 2: Miami's Economy

Miami's Current Overall Economy

As of 2019, the City of Miami's total economy (which encompasses jobs and firms within the geographic boundary of the City of Miami)[1] supported 300,000 jobs and generated over $67 billion in gross regional product (GRP). Most of those jobs and economic output exist within the sectors of Health & Education, Professional Services, and Leisure/Tourism. While the Professional Services sector has grown in Miami since 2015 and has added around 3,800 jobs despite the 2020 recession, both Health & Education and the Leisure/Tourism sectors lost jobs between 2015 and 2020. Leisure/Tourism lost almost 4,000 jobs from 2019 to 2020 alone, due largely to pandemic closures. However, the main sectors that contribute to the green economy – Transportation, Building Construction & Materials, and Energy – experienced net growth of over 1,000 jobs between 2015 and 2020.

While the City of Miami's economy has experienced net growth since 2015, it faces vast inequities with regards to income and job quality. Median household income estimates alone depict stark wealth disparity in terms of a householder's race. According to 2019 American Community Survey (ACS) 5-year estimates, the median white household earned an income of $97,271, whereas the median Latino/Hispanic household earned $40,925 and Black household earned $29,462 (US Census Bureau, 2019). Overall, 41% of Miami's workers are employed in occupations with median hourly wages that are below the living wage for the region (Emsi, 2021; MIT, 2021).[2]

There are also a substantial number of Miamians who operate within the informal, or "gig", economy, meaning they are not employed by one formal employer. These jobs are harder to quantify as workers in the informal economy are either self-employed or hold multiple, often temporary, jobs, but it has been estimated that around 16% of workers in the Miami metro area are in "non-employer relationships." Miami ranks as the metro area with the highest number of gig workers per capita (Tuohey, Zea, Parker, & Tuttle, 2021). While some of these workers are benefiting from a growing gig economy with more access to opportunities and flexible work schedules, others are likely immigrants who lack access to resources, institutions, and bank accounts that support economic growth (Hall, 2020).

As Miami begins to reduce its GHG emissions, which totaled 3.3 million metric tons of carbon dioxide (MT CO_2e) in 2018, its economy will fundamentally shift and expand to favor goods and services that are better for the environment. As the economy shifts, its jobs and workforce will need to adapt along with it. It is this shift, and expansion, that creates opportunity for Miami to address longstanding socio-economic inequalities.

Miami's Workforce Today

As of January 2021, Miami's workforce (meaning those who live in the City of Miami and are employed or looking for work) was estimated consist of 221,000 people (US Bureau of Labor Statistics, 2021). Meanwhile there are over 300,000 jobs located within the City. The City of Miami's population comprises about 17% of Miami-Dade County, whereas its 300,000 jobs make up 23% of all jobs within the county. Despite there being enough jobs in Miami to employ every resident in its workforce, 67% leave the City for employment, primarily to other cities in Miami-Dade County such as Miami Beach and Coral Gables.[3] Of the 300,000 jobs in the City, only 19% are held by people who also live in the City (56,800 people) while 81% of jobs are held by those who live elsewhere in the region (US Census Bureau, 2019). This employment and commute pattern underscores that the City of Miami is just one actor and one geography within a larger regional economy – and supports the need for efficient, low-emissions public transit systems.

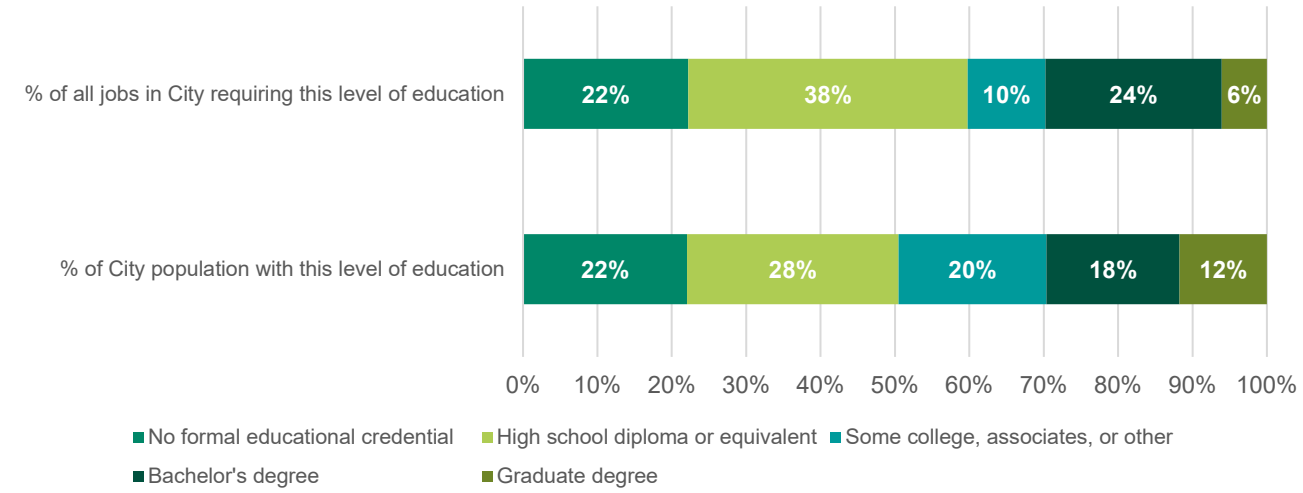
[1] Throughout this report, reference to "Miami" aligns with the "City of Miami" geography, not Miami-Dade County nor other municipalities within Miami-Dade County.

[2] The living wage is defined as the wage needed to pay for non-discretionary expenses, including housing, food, transportation, and childcare. This analysis considers the living wage for Miami-Dade County based on MIT's Living Wage Calculator. The living wage is $16 per hour for one adult with no children and $21.50 per hour per adult for a family of two adults supporting two children.

[3] As most employment data is based on the location of an employer as opposed to employees' residents, jobs and occupation data refer to the location of the employer. Data sources such as the Longitudinal Employer-Household Dynamics (LEHD) Survey provide insight into the relationship between the residential labor force and employment within the City.

While many factors contribute to residents' employment outside of Miami, one important factor is the skills and education mismatch between the local workforce and available occupations. Currently, based on the typical level of education required for entry into an occupation, 60% of jobs located in the City of Miami require only a high school degree or no formal education. Many of these are lower-wage occupations that offer little to no path for upward mobility. Put differently, there are more low-skilled and lower-paying jobs in Miami than there are higher skilled and better paying jobs. Meanwhile, only 10% (30,000) of Miami's jobs are considered middle-skill – requiring less than a bachelor's degree but more than a high school diploma for entry into the occupation – which are often well-paid entry point jobs for those without a full college degree.[4] Focusing economic development opportunities within the City of Miami that match the local workforce's skillset, along with increasing living wage job opportunities, has the dual benefit of reducing commuter travel and, in turn, reducing emissions. A full breakdown of education level requirements for existing jobs and the educational attainment of City of Miami residents is shown in Figure 2.

Figure 2. While 50% of the Miami population has some college education or higher, only 40% of jobs require this level of education



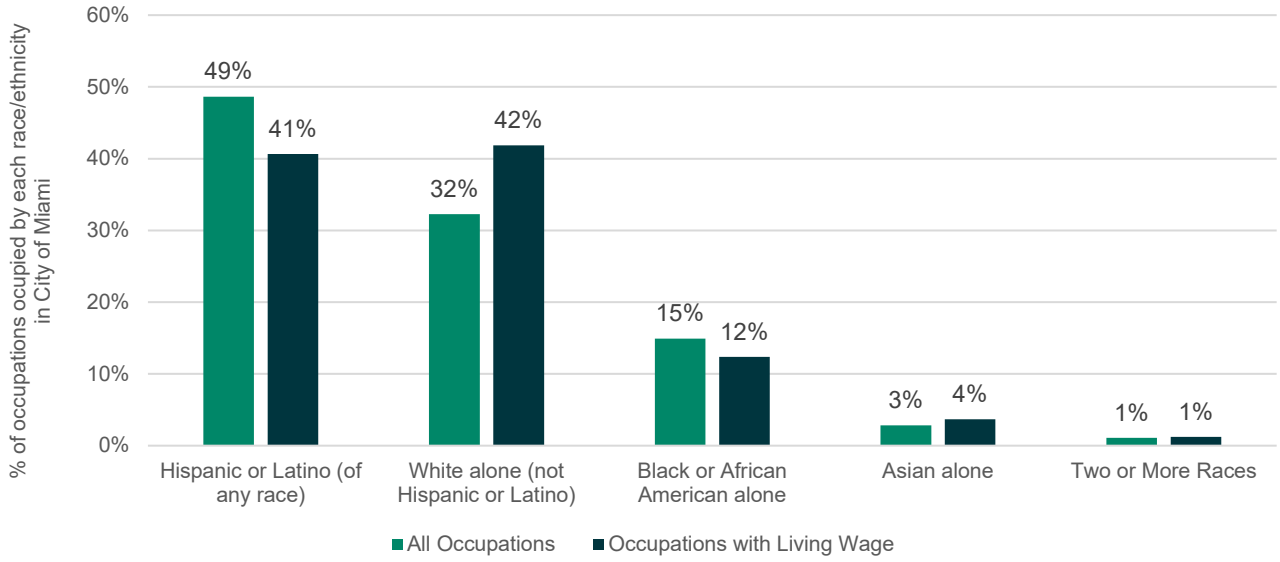
Source: ACS 2019 5-Year Estimates and AECOM Analysis of Emsi Data

Among the approximately 300,000 workers employed in Miami, 47% work in occupations that have a median hourly wage below living wage ($17.90) (MIT, 2021).[5] These jobs are more likely to be held by non-white workers, further perpetuating racial disparities in economic opportunity. Unequal access to well-paying jobs has been a longstanding issue in Miami, with non-white workers facing higher unemployment rates and lower educational attainment (Miami-Dade Beacon Council, 2021). Figure 3 shows the Miami workforce by race, for all occupations and for occupations that pay a living wage. While white workers hold 32% of all jobs in Miami, they are disproportionately likely to be employed in occupations that pay a living wage. The same is true for male workers: 40% of men work in living wage jobs compared to just 35% of women. For this data, Hispanic or Latino refers to individuals of any race of Hispanic or Latino ethnicity, while white includes those of non-Hispanic or Latino origin, whereas Black or African American and Asian may overlap with those in the Hispanic or Latino group (US Census Bureau, 2020).

[4] Typical education level for entry to an occupation is reported by BLS at the national level, so alternate paths to employment may exist at a regional level.

[5] Estimated living wage for two working adults with one child in Miami, FL based on MIT's Living Wage Calculator, which is the same baseline used in JP Morgan's "Trading on Innovation to Expand Opportunity" report.

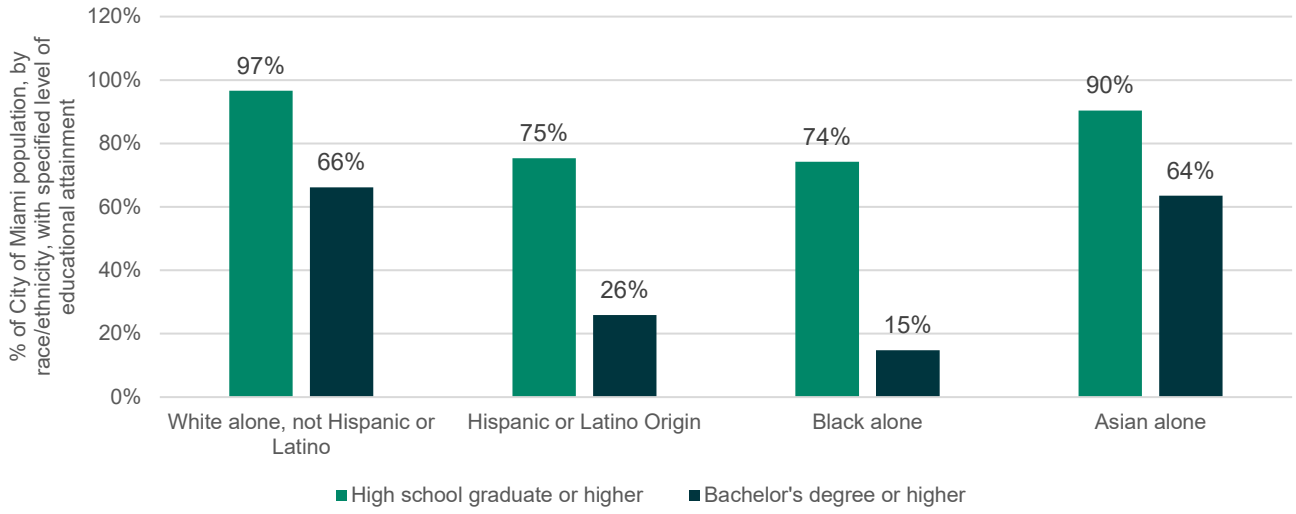
Figure 3. 47% of occupations in the City of Miami offer less than a living wage and Black and non-white Hispanic/Latino workers are more likely to be in occupations that earn less than a living wage[6]



Source: Emsi 2019 Occupation Data

Inequitable access to stable, well-paying occupations is evidenced by the distribution of educational attainment among different racial and ethnic groups, as summarized in Figure 4. White non-Hispanic residents are more likely than Hispanic or Latino and Black Miamians to have graduated high school and obtained a bachelor's degree. Black and Hispanic or Latino residents also face higher rates of unemployment compared to other demographic groups. Figure 5 shows unemployment estimates for 2019, with a rate of 14.2% for Black residents and 3.2% for white residents (US Census Bureau, 2019).[7]

Figure 4. White Miamians are twice as likely to have a college degree than non-white Hispanic/Latino Miamians and five times more likely than Black Miamians[8]



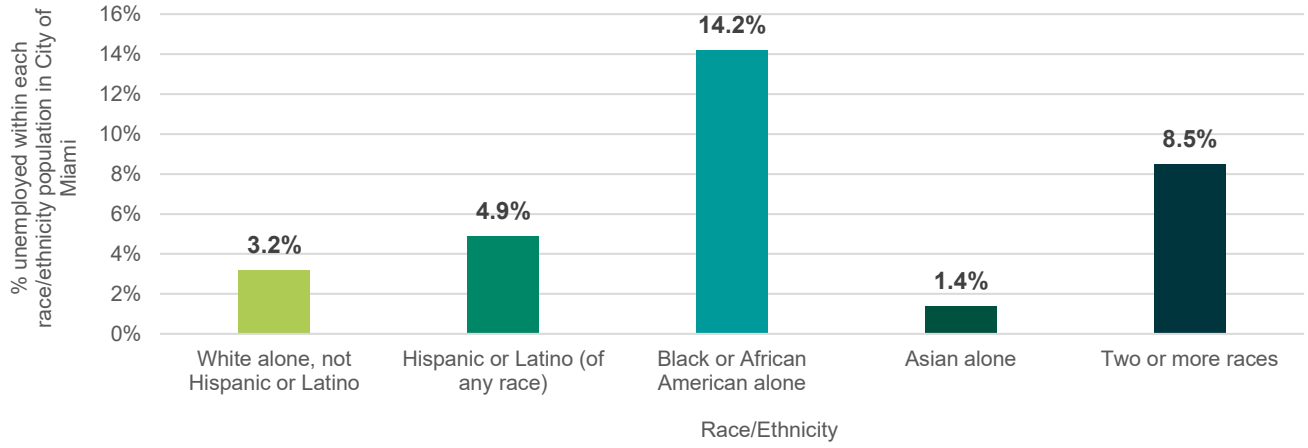
Source: ACS 2019 5-Year Estimates

[6] Emsi occupation demographic data treats 'Hispanic' as an additional race category, removing Hispanic population from other race categories.

[7] Unemployment data were collected prior to the COVID-19 pandemic, which severely impacted employment in 2020 and exacerbated existing inequalities. Preliminary estimates for unemployment in January 2021 in Miami were over 8%. Unemployment disproportionately impacted people in service jobs and Black and non-white Hispanic workers (US Bureau of Labor Statistics, 2020). These numbers further underline the need for economic initiatives that are intended to address racial inequities.

[8] "White" race category refers to white non-Hispanic population.

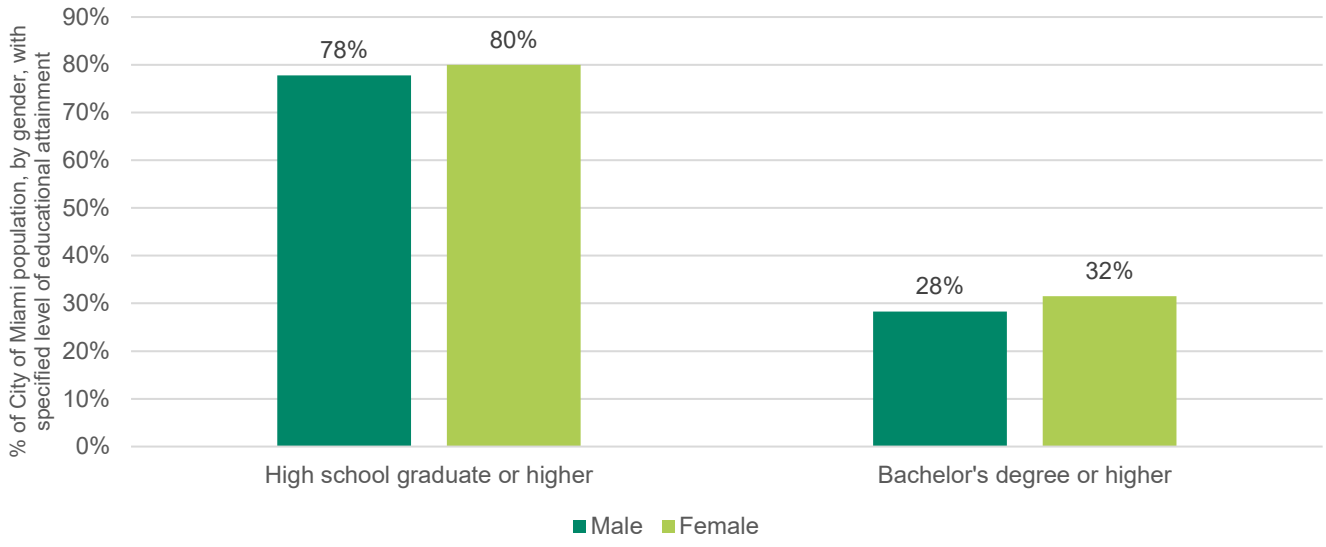
Figure 5. Black Miamians are three times more likely to be unemployed than non-white Hispanic/Latino Miamians



Source: ACS 2019 5-Year Estimates

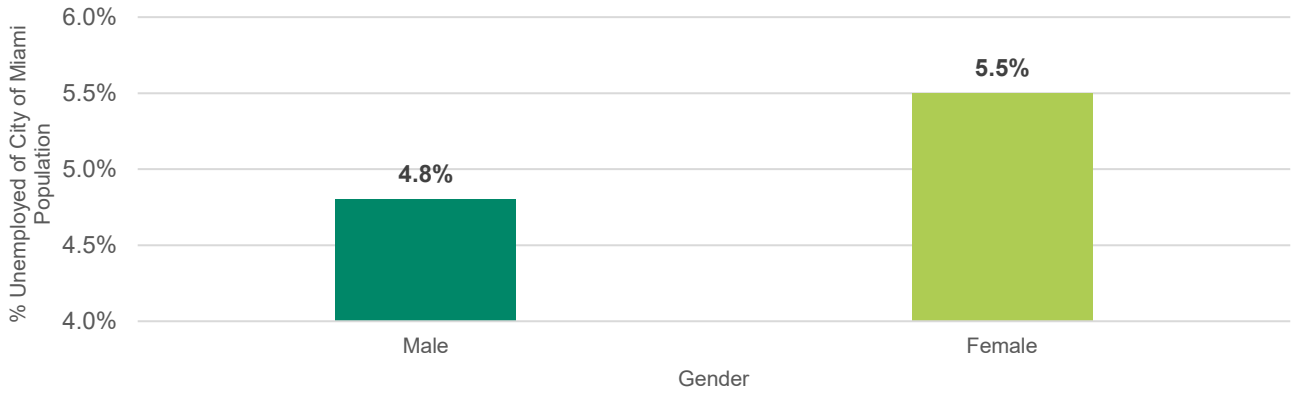
Female residents in the City of Miami have slightly higher levels of educational attainment, as shown in Figure 6. Although women tend to have higher levels of educational attainment, this lead does not translate to employment gains: women face equal levels of unemployment, as shown in Figure 7, and are less likely to work in living wage jobs. Importantly, women face higher rates of unemployment despite being nearly three times as likely to be single heads of households than men. Meanwhile, Black women are nearly four times as likely to be single heads of households, and out of the labor force compared to white women (US Census Bureau, 2019). Women, particularly Black women, are more likely than men to be unemployed while simultaneously responsible for feeding and housing their families.

Figure 6. On average, women in Miami are slightlymore likely to have a high school diploma or higher than men



Source: ACS 2019 5-Year Estimates

Figure 7. Despite higher levels of educational attainment, women face similar unemployment rates as men



Source: ACS 2019 5-Year Estimates

The existing inequities in Miami's economy were exacerbated during the COVID-19 pandemic, underscoring the need for new educational and employment opportunities that offer stable, living wage work, particularly for Black and Brown residents, which can both reduce these socioeconomic inequities and improve the overall resilience of the local economy. Analysis of Miami's green economy today indicates that further investment in the new green economy has a strong potential to address these longstanding inequities.

Chapter 3: Miami's Green Economy

The idea of a national green economy first gained momentum following the 2008 financial crisis when the American Recovery and Reinvestment Act (ARRA) dedicated about 17% of all direct government spending to green investments. Interest in the green economy and its potential for job creation has re-emerged in recent months given proposed federal legislation to help fund economic recovery and infrastructure investment while simultaneously addressing the climate crisis. Although the U.S. lacks a national standard method for tracking the size of the green economy and its growth, a 2019 study estimated that the green economy produced $1.3 trillion in output while employing over 4% of the working age population in 2016 and that employment in the green economy grew by over 20% between 2013 and 2016 (Georgeson & Maslin, 2019).

Industries Driving Miami's Green Economy

Industries driving a local green economy are different in each metropolitan area due to geographic context, environmental challenges, state and local policies, and regional economies. This Green Economy Plan focuses on industries that currently play a role in the City of Miami's green economy and industries that will be impacted by implementation of the GHG Plan and Miami Forever Bond, including Transportation, Energy, Buildings, Waste Management, and Climate Resilient Infrastructure. This Green Economy Plan also evaluates green industries that are not specifically represented in the GHG Plan but have an active and growing presence in the City and region's climate action efforts. These additional green industries include Sensors, Instruments, and R&D, and Regulation and Advocacy. The players in Miami's green economy can be organized into sectors, or groups of industries, that are connected by a shared green output or service. Based on these factors, the City of Miami's green sectors and their associated industries are outlined in Table 1.[9]

[9] While this Green Economy Plan focuses on these dominant sectors, there are many small or emerging industries that are not included in the quantitative analysis of Miami's green economy due to the small size of this industry within city limits. These industries include urban agriculture and food sources, green business development and marketing, and disaster-recovery. However, these small and emerging industries are still a relevant and important, even if small, component of the green economy.

Table 1. Miami's Green Economy Sectors and Example Green Industries and Occupations[10,11]

Transportation

- **Description:** Industries involved in passenger and freight transportation as well as jobs related to the selling, manufacturing, and maintenance of mass public transit and electric vehicles.
- **Related Climate Action Goals:** 15% reduction in personal vehicle trips, 40% of registered passenger vehicles are electric (GHG Plan), Create Mobility Options (R305)
- **Pure Green Industry Examples:** Commuter Rail Systems, Multimodal Transit Systems, Bus and Other Motor Vehicle Transit Systems
- **Partially Green Industry Examples:** Automobile Manufacturing, General Automotive Repair, Freight Transportation, Deep Sea Freight Transportation
- **Example Occupations:** Transportation inspectors, operating engineers, bus and truck mechanics, logisticians, engineers, general and operations managers, sales representatives, electronics engineers, industrial engineers, and public relations specialists

Energy

- **Description:** Industries involved in the generation and transmission of carbon-free energy.
- **Related Climate Action Goals:** 100% carbon-free electricity, 35% reduction in natural gas emissions (GHG Plan), Increase Energy Efficiencies (R305)
- **Pure Green Industry Examples:** Solar Electric Power Generation
- **Partially Green Industry Examples:** Electric Power Distribution, Electric Bulk Power Transmission and Control, Power and Communication Line and Related Structures Construction
- **Example Occupations:** Electrical power line installers, power plant operators, electrical engineers, mechanical engineers, industrial engineers, compliance officers, construction and building inspectors, environmental scientists, economists, and production and operating workers

Buildings

- **Description:** Industries participating in the design, construction, and engineering of energy and resource efficient buildings.
- **Related Climate Action Goals:** Improve energy efficiency and decrease energy consumptions (GHG Plan), Increase Energy Efficiencies (R305), Promote adaptive neighborhoods and buildings (Miami Forever Climate Ready)
- **Pure Green Industry Examples:** No current Pure Green industries in Miami
- **Partially Green Industry Examples:** Commercial and Institutional Building Construction, Roofing Contractors
- **Example Occupations:** Construction and building inspectors, general and operations managers, civil engineers, electrical engineers, architects, plant and systems operators, drilling and boring machine operators, logisticians, compliance officers, and solar energy installation managers

Waste Management

- **Description:** Includes public and private waste haulers, recycling and composting services, and waste remediation industries.
- **Related Climate Action Goals:** Reduce solid waste (GHG Plan), Enhance Natural Systems (R305)
- **Pure Green Industry Examples:** Recyclable Material Merchant Wholesales, Materials Recovery Facilities
- **Partially Green Industry Examples:** Solid Waste Collection, Other Waste Collection
- **Example Occupations:** Biofuels processing technician, chemists, industrial engineers, operating workers, environmental scientists, logistics engineers, bus and truck mechanics, operating engineers, power plant operators, and training and development specialists

Sensors, Instruments, & R&D

- **Description:** Includes industries related to the manufacturing of devices necessary to monitor temperature, environmental controls, emissions, etc., as well as scientific research industries.
- **Related Climate Action Goals:** Supports advancement of all climate action goals, particularly as they relate to technology and engineering
- **Pure Green Industry Examples:** Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
- **Partially Green Industry Examples:** Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)
- **Example Occupations:** Geoscientists, electrical engineers, civil engineers, logistics engineers, mechanical engineers, technologists and technicians, energy engineers, chemists, industrial designers, and public relations specialists

Regulation, Education, & Advocacy

- **Description:** Includes all industries involved in environmental regulation, conservation, restoration, and compliance, as well environmental education, justice and advocacy.
- **Related Climate Action Goals:** Enhance Natural Systems, Communicate the Concept of Resilience (R305), Protect and enhance our waterfront, Inform, prepare, and engage our residents and businesses (Miami Forever Climate Ready)
- **Pure Green Industry Examples:** Environment, Conservation and Wildlife Organizations, Nature Parks and Other Similar Institutions
- **Partially Green Industry Examples:** Grant-making Foundations, Law Firms, Professional Associations (such as Urban Land Institute), Government
- **Example Occupations:** Water resource specialists, urban and regional planners, environmental compliance inspectors, environmental scientists, educators, hazardous materials removal workers, environmental economists, lawyers, public relations specialists, marketing managers

Climate Resilient Infrastructure

- **Description:** Comprises industries involved in Miami's extensive adaptation and resiliency projects to curb future threats of sea-level rise and coastal storms.
- **Related Climate Action Goals:** Safeguard Urban Systems (R305), Invest in resilient and smart infrastructure (Miami Forever Climate Ready)
- **Pure Green Industry Examples:** Water Supply and Irrigation Systems, Water and Sewer Line and Related Structures Construction
- **Partially Green Industry Examples:** Landscaping Services, Highway, Street, and Bridge Construction
- **Example Occupations:** Hydrologists, environmental engineers, civil engineers, power plant operators, urban and regional planners, construction inspectors, landscape architects, architects, construction equipment operators, and transportation planners

Protection and restoration of South Florida's environment is a core component of Miami's green economy.

Miami's network of environmental regulators, management services, and advocacy groups, spurred by the adjacency of high-value natural environments, including Biscayne Bay, the Everglades, the Great Florida Reef, and beaches and ocean, is also a key component of the city's burgeoning green economy. This nature adjacency has fostered a small but notable environmental technology industry that includes technological advancements that track ocean pollution and stormwater management. Concern and appreciation for protecting these natural assets drives policy that further creates demand for green goods and services. Local, state, and federal regulatory agencies have issued requirements and incentives, for both the public and private sectors, to reduce environmental impacts and restore natural habitats. This is evidenced by various regulations impacting the County's Water and Sewer Department (WASD), including the state's requirement to treat wastewater for reuse rather deep well injections and the Environmental Protection Agency's (EPA) consent decree requiring WASD to amend its ocean outfall system, which is leading to multi-billion-dollar capital investments, many of which require specialized contractors to design and execute.

Jobs Within Miami's Current Green Economy

Green jobs within the City of Miami today are concentrated in the Transportation, Buildings, and Waste Management sectors, as illustrated in Figure 8 . Roughly 5,000 jobs (about 1.5% of all jobs within the City of Miami) and about $1 billion in GRP (about 2% of the GRP) contribute directly to the City's green economy.[12] These job numbers are calculated by totaling Pure Green industry jobs with estimates of the number of green jobs within Partially Green industries (a more detailed methodology in the appendix describes the process for determining the concentration of green jobs within Partially Green Industries).[13] As demand for green goods and services grows and the market share of green industries grows, demand for these occupations will also grow. To ensure that local Miamians benefit from green economic growth, regional workforce training actors will need to adapt and expand their curricula to prepare students and workers for green jobs. Further analysis of green occupations is included in Chapter 4.

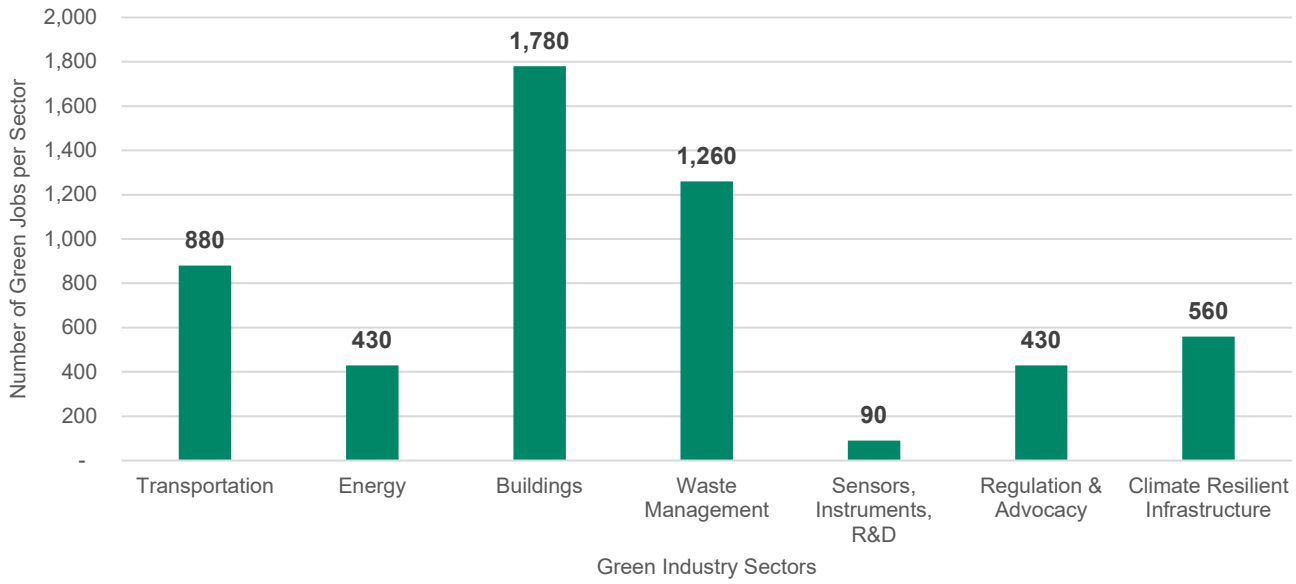
[10] The electrical contractors' industry, which likely captures charging station installation jobs, is included in the green buildings clusters.

[11] While some of these industries are currently lacking green practices, they are an important part of Miami's local economy and have high potential to become greener in the future. For these reasons, they have been captured as part of the green economy analysis.

[12] Emsi employment considers both full time and part time jobs and counts them both equally.

[13] The job numbers and financial values in this Analysis solely include firms operating within the city limits of Miami – not those within greater Miami-Dade County nor neighboring municipalities. However, it is important to acknowledge that Miami's local economy is influenced by regional economic forces within Miami-Dade County and Southeast Florida, and that regional supply and demand also play a role in supporting the City's local green economy.

Figure 8. The Buildings, Transportation, and Waste Management Sectors are the Sectors with the Most Green Jobs in Miami's Current Green Economy



Source: AECOM Analysis, Emsi 2019 Industry Data

Chapter 4: The Potential of the Green Economy

Green Jobs are Resilient and Poised for Growth

Industries that contribute to the City of Miami's green economy grew at a compounded annual rate of 3.8% from 2015 to 2019, adding 5,600 jobs (although these jobs are dispersed among Pure and Partially Green industries), compared to a 1% annual growth rate for Miami's non-green industries and 1.4% for the overall economy (inclusive of green and non-green industries). Green and traditional sectors, as analyzed in this research, are summarized in Table 2. Importantly, during the COVID-19 recession, the green economy showed little to no job loss while jobs in Miami's traditional industries lost over 6,000 jobs (US Bureau of Labor Statistics, 2021).[14] This comparison is illustrated in Figure 9 and Figure 10.

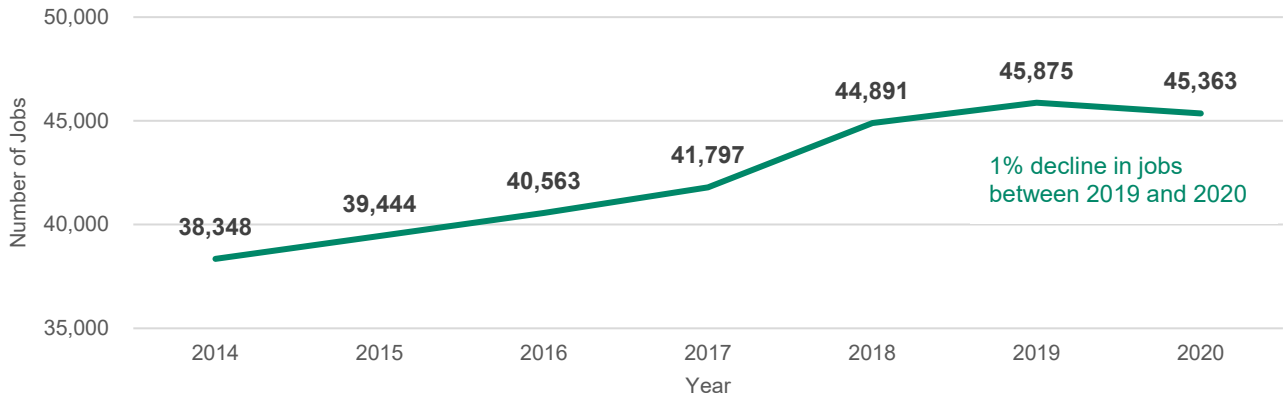
Table 2. Categorization of sectors between Miami's green and traditional economies[15]

Green Economy Sectors	Traditional Economy Sectors
• Transportation • Energy • Buildings • Waste Management • Sensors, Instruments, R&D • Regulation and Advocacy • Climate Resilient Infrastructure	• Heath and Education • Manufacturing • Leisure and Tourism • Federal and State Government • Local Government • Retail/Wholesale/Distribution • Agriculture and Food • Professional Services

Source: AECOM Analysis, Emsi 2019 Industry Data

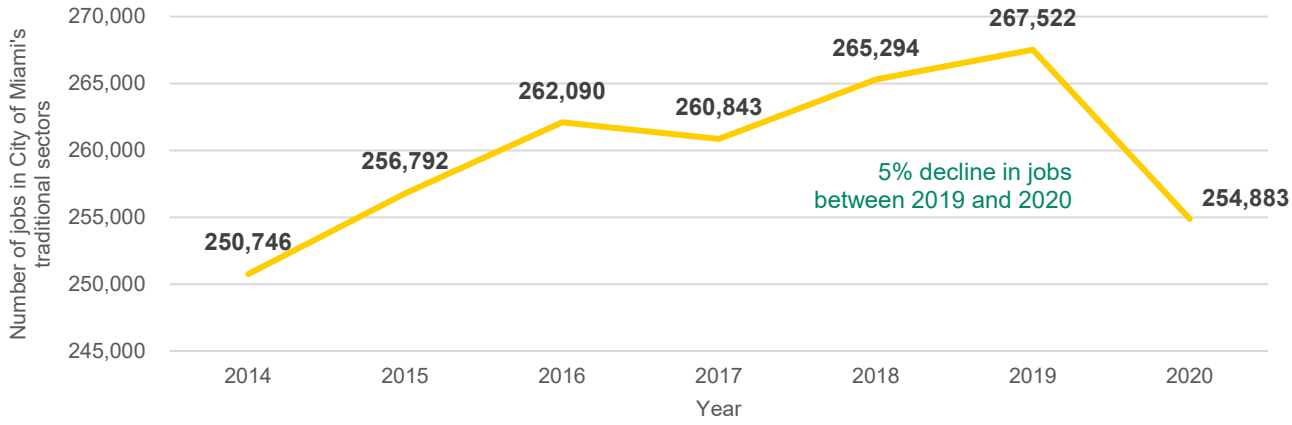
[14] Emsi 2020 employment data is based on BLS QCEW data through Q2 (June 2020), so 2020 estimates are subject to change.
[15] Traditional economy sectors were identified as all other sectors that have a presence in Miami that do not have a large component of pure or partially green industries.

Figure 9. Jobs in the City of Miami's green sectors grew by 20% between 2014 and 2019 and dropped by 1% from 2019 to 2020 as the COVID-19 pandemic impacted business sales and operations



Source: AECOM Analysis, Emsi 2019 Industry Data

Figure 10. Jobs in the City of Miami's traditional sectors grew by 7% between 2014 and 2019 and dropped by 5% from 2019 to 2020 as the COVID-19 pandemic impacted business sales and operations



Source: AECOM Analysis, Emsi 2019 Industry Data

The Impacts of Climate Change Drive Demand for Green Goods and Services

The impacts of climate change, including sea level rise and hurricanes, have led to increased spending by the private sector as more people are investing in weatherization improvements for private property and using alternative financing mechanisms (such as the PACE program) to pay for these improvements.

When considering industries that participate both directly (e.g., Pure and Partially Green industries) and indirectly (e.g., Potentially Green industries) in the green economy, Miami's green economy comprises 30% of Miami's total economic output (GRP) (Emsi, 2020).[16] The industries in Miami's green sectors (e.g., Transportation, Energy, Building Construction, Technical Services, Waste Management, Regulation, and Infrastructure) are estimated to support upwards of 47,400 jobs. Eleven percent of these jobs are green jobs (or jobs that are either in Pure Green industries or the green components of Partially Green industries) while the remaining 89% of jobs have the potential to become green as demand for green goods and services increases.

[16] This estimate is derived from job numbers for Pure and Partially Green industries, with a green intensity ratios used to estimate how many green jobs could exist within these Partially Green industries (details on the green intensity methodology can be found in Appendix II). All employment data is provided by Emsi.

Figure 11. 11% of jobs in Miami's green sectors are considered green, while 89% have the potential to become green as demand for green goods and services grow

Source: AECOM Analysis, Emsi 2019 Industry Data

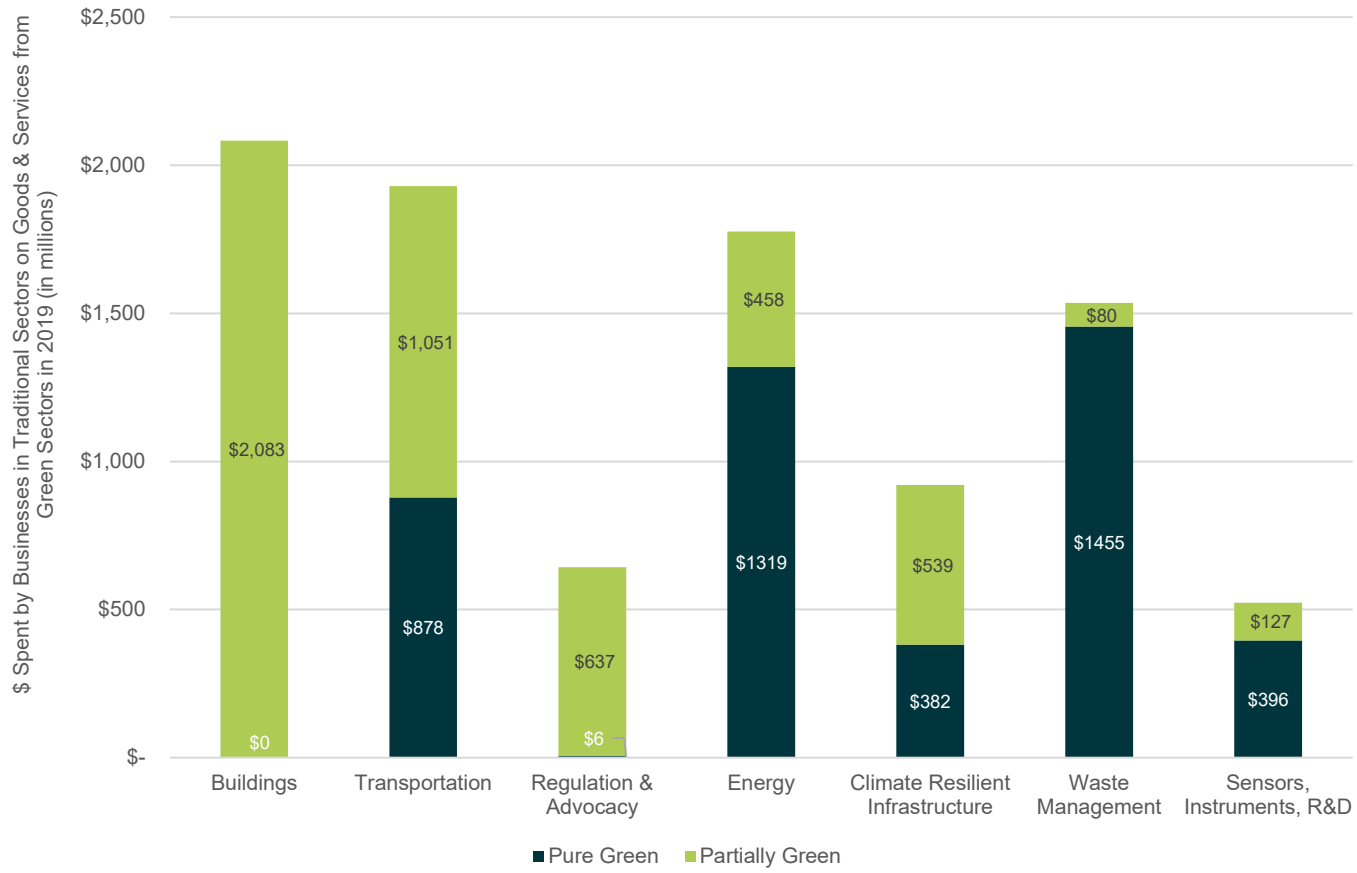
This demonstrates that the City of Miami has strong potential to transition to a green economy, either by transitioning existing jobs to green ones or creating new green jobs, especially as demand for green goods and services increases with the implementation of the GHG Plan and climate adaptation projects.

Traditional Industries Will Grow the New Green Economy

The sectors that have historically been key drivers of the Miami region's economic success, such as Healthcare, Education, and Tourism, also contribute to the green economy as the consumers of green goods and services. Industry purchase data shows that traditional sectors rely on roughly $5 billion in goods and services from green sectors annually, which forms a positive feedback loop between emerging green industries and the City of Miami's broader economy. One clear example is building construction, where traditional industries in Miami spend over $2 billion annually on the construction and renovations of hospitals, offices, apartments, hotels, and commercial buildings. Figure 12 depicts the total amount spent by businesses in traditional, non-green industries on goods and services produced by businesses that participate in the green economy.[17] As traditional sectors adopt greener practices in the future, such as purchasing EVs, investing in solar, or improving energy and water efficiency of buildings, they will rely on firms within Miami's green sectors.

[17] The data should not be interpreted as the amount spent purely on green goods and services, but rather on the overall sectors which encompass evolving green industries. These data illustrate the influence that Miami's traditional economy has had on helping its green businesses grow as it makes decisions on whether and how to make environmentally responsible investments in areas such as green building retrofitting and construction, electrification of buildings and fleets, and sustainable resource management.

Figure 12. Businesses in Miami's traditional sectors spent $5 billion on goods and services from businesses participating in Miami's green sectors in 2019



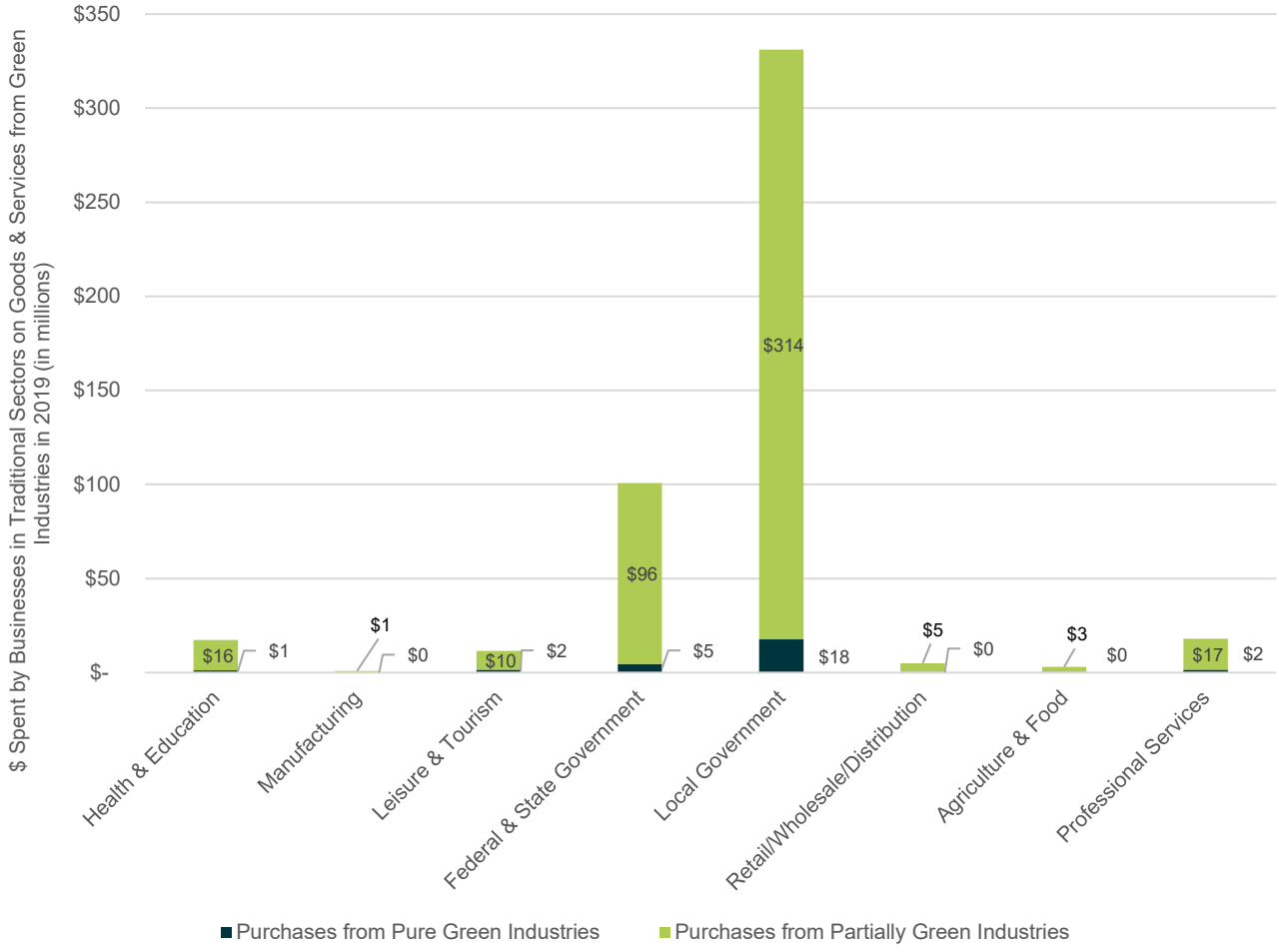
Source: AECOM Analysis, Emsi 2019 Industry Data

Figure 13 shows the average amount spent per industry among traditional sectors on goods and services from either Pure or Partially Green industries. Overall, non-green industries spend about 14% of total purchases in Pure or Partially Green industries. Of these industries, the highest spender is local government, totaling nearly $330 million in green sector purchases in 2019. While local government's purchases from Pure and Partially Green industries are not *all* green, changes in City policies that lead to more green purchases will have significant influence in "greening" the economy. Spending by traditional industries within the green economy to-date has occurred organically – or, rather, without deliberate economic development or government policies driving demand. Given this, incentives, regulations, and broader market forces have clear opportunity to sway Miami's traditional industries to invest in green goods and services. Given this clear economic linkage between green and non-green industries, public policy efforts that encourage the private sector to make green investments will have ripple effects throughout regional economy, and support pursuit of broader carbon reduction goals.

Growth in Renewable Energy Jobs

Today, the renewable energy industry in Miami provides over 400 jobs, which is less than 30% of the total jobs in Miami's energy sector. However, renewable energy jobs have grown by 16% in the past decade. This growth is driven by purchases from Miami's traditional sectors (e.g., government, healthcare, tourism), which amounted to nearly $600 million in 2019. The actions listed below both support GHG reductions and create opportunity to increase demand for renewable energy, which will in turn lead to increased demand for clean renewable energy jobs.

Figure 13. Of Miami's traditional sectors, local government was the largest purchaser of goods and services from Pure and Partially Green industries in 2019



Source: AECOM Analysis, Emsi 2019 Industry Data

The City of Miami is Already Shaping the Green Economy

The City has already instituted sustainability-directed policies which are shaping the new green economy, such as requiring buildings over 50,000 square feet to be LEED certified, allocating a fifth of off-street parking spaces to EVs, and allowing solar panels to not contribute to building height maximums. More policies and investments similar to these are anticipated with the implementation of the GHG Plan and other resilience efforts.

Green Jobs Are Higher Paying and More Accessible

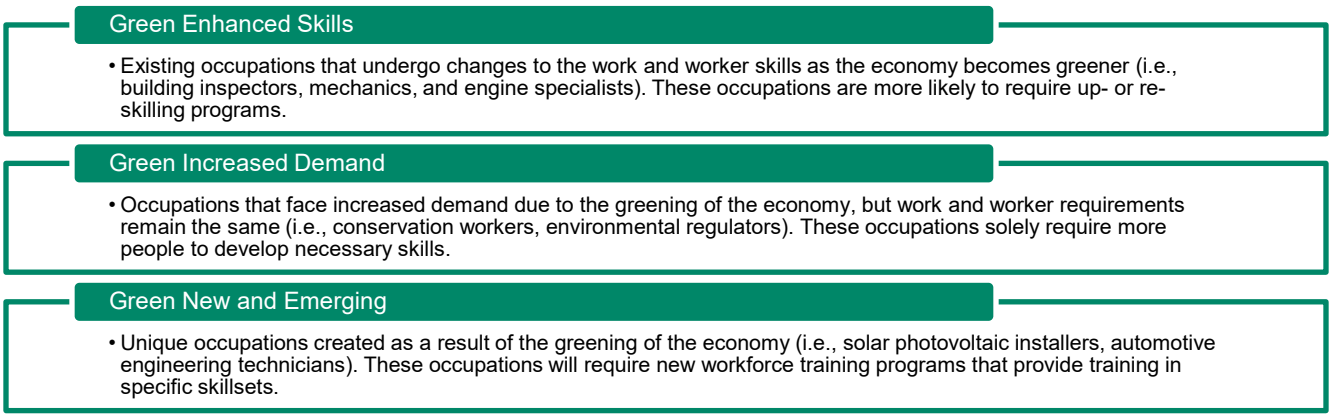
Essential to achieving our broader climate justice agenda is ensuring that underinvested climate justice communities and Black and Brown Miamians have access to living wage career pathways, which the expansion of green industries can provide. Numerous studies confirm that jobs in green industries tend to be higher paying with lower barriers to entry compared to jobs in traditional industries, particularly for renewable energy jobs which tend to require on-the-job training rather than a post-secondary degree (Muro, Tomer, Shivaram, & Kane, 2019). 65% of Miami's green occupations have a median wage that is greater than the local living wage and 60% of them are considered middle skill, which are jobs that require less than a college degree and more than a high school diploma. In comparison, 53% of Miami workers earn a living wage and only 38% of jobs within the broader Miami-Dade County economy are considered middle skill. All green sectors are already expected to grow over the next ten years – even without the implementation of our GHG Plan and broader resilience goals – indicating that growth in the middle-skill, living wage jobs market can be expected.

Chapter 5: Green Occupations

Preparing Miami's workforce for new, greener jobs requires understanding which jobs will be in demand and their associated skillsets. Preparation will also need to identify the occupations that are most at-risk for decreased demand as the economy transitions to become greener. For example, an increase in EVs in Miami, which is a top GHG reduction goal, will increase demand for electricians and EV technicians while reducing demand for workers related to combustion engine vehicles. While it will require efforts to monitor the changing needs of green or greening employers in Miami, some studies have tried to synthesize more broadly how skills for green jobs vary from those for traditional jobs. Skill and knowledge areas for green occupations tend to require more scientific knowledge and technical expertise (Muro, Rothwell, & Saha, 2011). As many technician occupations do not require a college degree, but rather an associate's degree, vocational education or on-the-job training, many green job-specific training programs could be accessed through existing technical training and educational programs, such as those offered through Florida International University (FIU), Miami-Dade College, and other local colleges and universities. We – the City of Miami, educational institutions, workforce and economic development organizations, and the private sector – must work together to anticipate these changes in demand for occupations and skills and prepare our workforce accordingly.

Green occupations are divided into three skillset categories, as summarized in Figure 14, that inform workforce training curriculum design and recruiting (O*NET OnLine, 2020).[18] Occupations in the "green enhanced skills" and "green increased demand" categories already have a presence in Miami and are more likely to have existing workforce training and other skills development resources in place, which will need to be expanded or augmented. "Green, new, and emerging" occupations, meanwhile, are less likely to have training resources and career pathways in place, so developing local talent to fill related jobs will require educational partnerships and curricula development. Full lists of Miami green occupations that fall into each of these workforce training categories are available in Table 12, Table 13, and Table 14 in the Appendix. The tables include wage and skill requirement data.

Figure 14. Green Occupation Workforce Training Categories



[18] Jobs that are defined as green due to the nature of their work can be defined as "green occupations." An analysis of green occupations provides further detail on the activities, skills and education that will be needed in Miami's growing green economy.

Green Buildings & Green Jobs

The green buildings sector, which includes energy efficiency contractors, electricians, and other specialty contractors, accounts for 35% of Miami's green jobs. Today's green building sector is the result of traditional industries investing in green buildings and retrofits. In 2019, businesses in traditional sectors spent over $2 billion in Miami's green buildings industry. The buildings sector also offers the opportunity for the most growth in green jobs: green building jobs are currently just 13% of all buildings jobs, leaving 87% of jobs in this industry to become green jobs. As implementation of the GHG Plan takes off and demand for green buildings and retrofits grows, there will be corresponding demand for specialty contractors. Miami's workforce will need to be prepared to fill the increased demand for green buildings jobs or otherwise risk losing them to people outside the region. It will be critical for the City and economic development actors 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 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 underinvested and climate justice communities.

There are hundreds of green occupations across Miami's core green sectors, all of them with varying growth potential, which can make workforce training prioritization challenging, especially in a context of limited resources. Many occupations, however, are prevalent across multiple green sectors, which makes them ideal targets for workforce training programs. Programs that provide the skills and educational training for multi-industry occupations are more likely to see students match with relevant jobs. Miami's green occupations with the highest "frequencies" across green sectors are summarized in Table 3.

Table 3. High frequency green occupations

Occupation	Compound Annual Job Growth (2015 – 2019)	Median Hourly Earnings	Work Experience Required	Typical Entry Level Education
Construction Laborers	10%	$14.08	None	No formal credential
Laborers and Freight, Stock, and Material Movers	12%	$12.92	None	No formal credential
Laborers and Freight, Stock, and Material Movers	12%	$12.92	None	No formal credential
Electricians	5%	$20.04	None	High school diploma or equivalent
General and Operations Managers	16%	$42.72	5 years or more	Bachelor's degree

Occupation	Compound Annual Job Growth (2015 – 2019)	Median Hourly Earnings	Work Experience Required	Typical Entry Level Education
First-Line Supervisors of Construction Trades and Extraction Workers	8%	$26.92	5 years or more	High school diploma or equivalent
First-Line Supervisors of Mechanics, Installers, and Repairers	2%	$28.42	Less than 5 years	High school diploma or equivalent
Cargo and Freight Agents	9%	$17.97	None	High school diploma or equivalent
Maintenance and Repair Workers, General	8%	$17.01	None	High school diploma or equivalent
Operating Engineers and Other Construction Equipment Operators	11%	$20.97	None	High school diploma or equivalent
Cement Masons and Concrete Finishers	8%	$19.21	None	No formal credential
Civil Engineers	2%	$39.00	None	Bachelor's degree
Roofers	14%	$14.45	None	No formal credential
Bus and Truck Mechanics and Diesel Engine Specialists	4%	$23.49	None	High school diploma or equivalent
Industrial Truck and Tractor Operators	6%	$15.70	None	No formal credential
Sheet Metal Workers	-8%	$19.53	None	High school diploma or equivalent

Occupation	Compound Annual Job Growth (2015 – 2019)	Median Hourly Earnings	Work Experience Required	Typical Entry Level Education
Architects, Except Landscape and Naval	3%	$31.17	None	Bachelor's degree
Helpers--Installation, Maintenance, and Repair Workers	1%	$12.87	None	High school diploma or equivalent
Industrial Machinery Mechanics	4%	$20.01	None	High school diploma or equivalent
Inspectors, Testers, Sorters, Samplers, and Weighers	8%	$17.10	None	High school diploma or equivalent
Production, Planning, and Expediting Clerks	22%	$ 17.98	None	High school diploma or equivalent
Laborers and Freight, Stock, and Material Movers	12%	$12.92	None	No formal credential

*Source: AECOM analysis of Emsi occupation data based on O*NET green occupation classifications*

The Promise of Electric

Critical to accelerating EV adoption will be the availability of charging station infrastructure, electricians to support charging station infrastructure, and technicians to support EV maintenance. 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 in the GHG Plan 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 the opportunities and benefits of the electrical trade, and specifically the EV charging station certification, including the trade's wage and growth benefits, will ensure that Miami has a workforce that is able to support widespread EV adoption.

Chapter 6: Opportunities and Barriers to Growing Miami's New Green Economy

Regional economies are not only comprised of individual companies producing and selling goods and services to customers but also of entire networks of actors – including the public sector, educational institutions, funders, civic leaders, and non-governmental organizations (NGOs) – that contribute to the conditions required to support economic growth. Understanding Miami's existing green economy not only requires identifying green industries and measuring its GRP and living wage jobs, but also understanding which parts of the local and regional ecosystem are supporting (or hindering) sustained green economic growth.

The following summary draws from over 20 interviews with local stakeholders representing public, private, and nonprofit sectors and civic institutions. The summary identifies both facilitators of the green economy and factors that are otherwise inhibiting sustained green economic growth across Miami's growing green economy ecosystem.

Opportunities

- **Local government prioritization of resilience is central to the Miami green economy.** Expected growth in Miami's green economy will, in large part, be driven by the City's planned infrastructure investments under the $400 million Miami Forever Bond and stormwater master plan update and the County's Water and Sewer Department (WASD) capital upgrades related to environmental protection and climate adaptation, among other notable capital investments.
- **Implementation of our GHG Plan will lead to increased green growth in the Buildings, Transportation, and Energy sectors.** The actions that are expected to directly lead to economic growth, including the creation of new jobs, are summarized below:

  Goal 1: GETTING AROUND MIAMI
  - G-2: 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.
  - G-3: Expand micromobility options throughout the entire city including Citi Bikes, scooters, and electric bikes.
  - G-4: Develop a Trolley Master Plan including a long-term vision for the program and route updates.
  - G-8: Work with partner entities to create bus lanes in strategic, key corridors.
  - G-10: 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
  - R-4: Provide additional policy and financial incentives to encourage private solar installations and identify incentives that would appeal to owners of affordable housing.
  - R-6: Partner with community organizations such as local nonprofits, trade organizations, and electric and gas utilities, to develop a building electrification education program to provide information and technical assistance.

  Goal 3: ELECTRIC VEHICLES
  - EV-3: Partner with major employers and multifamily building owners to install EV chargers in parking lots/garages.
  - EV-4: Build on EV Capability Ordinance to require EV charger installations in new developments starting in 2025.

  Goal 4: ENERGY EFFICIENCY
  - E-1: Implement Building Efficiency 305 (BE305) program requiring energy benchmarking and disclosure for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft.
  - E-4: Adopt a residential, single-family home energy rating and disclosure ordinance.

- E-5: Adopt building performance standard for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft.
- E-6: Establish residential, single-family home energy conservation requirements.

Additional Enabling Actions

- A-11: Develop a financial and technical assistance program that helps residents, particularly low-income, to pursue climate action.

- **Miami's colleges, universities, and educational institutions are a critical pillar to the city's overall economic strength and to the local green economy, both in terms of workforce training and research and development**. Today, Miami colleges and universities offer courses that directly support many of its green economy sectors, including environmental engineering and protection (University of Miami, Florida International University), sustainable management (University of Miami, Florida International University), building efficiency (University of Miami) and construction trade programs (Florida International University), and EV-related technical skills (Miami Dade College's advanced automotive service technology certificate). Several of these institutions also serve as workforce intermediaries, providing direct access to technical skills training and employment opportunities. Miami-Dade College and Miami-Dade Unified School District also have a track record of working with construction and development companies to attract students to the construction industry, an industry that, on average, offers living wage jobs and job security. Likewise, Florida International University (FIU) has partnered with JP Morgan Chase and local employers to offer Urban Potential Laboratories (UP Labs) which specifically prepares students for middle-skill jobs in high-demand industries. It is this strong foundation of educational assets, which will need to grow and expand in anticipation of increased demand, that will enable Miami to flourish as a green workforce hub.
- **Small but growing green finance and risk management industries are developing in the South Florida region. The finance and risk sectors have an important role to play in providing capital to Miami's climate adaptation projects and providing funding for growing green industries.** Miami already has a strong presence of banks and financial institutions and the the South Florida economy – and climate – is an ideal setting for testing financial instruments and expanding green investment portfolios. Combined, the Miami Forever Bond, GHG Plan, and Venture Miami signal to investors and financial institutions that there is a growing market for green finance and risk management services. There is also potential to grow existing financial institutions and resources, like the Climate First Bank or Solar and Energy Logan Fund (SELF), and attract green businesses accelerators or venture capital firms that provide seed funding.
- **Growing demand – both nationally and locally – for sustainable, renewable, and green goods and services has led to economies of scale and, thereafter, declining costs, creating a virtuous cycle in which "green" is becoming more and more affordable**. This is also evidenced by FPL's growing investment in solar energy, demand for solar panels on private residences, demand for EVs and charging infrastructure, and the airport's energy efficiency overhauls. The expectation is that costs will continue to decline as demand, in Miami and beyond, leads to increased innovation and reaches higher quantities of scale.

Barriers

- **While there is regional consensus about the importance and potential of Miami's new green economy, there is no champion to focus energy on growing the green economy**. A leader is needed to ensure that a functioning ecosystem is in place to support future job creation, to facilitate creation and access to living wage jobs to our Black and Brown populations, and to develop partnerships with local workforce intermediaries and universities. The pockets of the green economy that are particularly active and visible, such as in the Transportation, Buildings, Energy, and Climate Resilient Infrastructure, are mostly operating independently of one another. The actors within these sectors, including private enterprises, nonprofits, civic organizations, and educational institutions would benefit from stronger connections and alignment of goals and resources.
- **While the City of Miami has made considerable progress in working toward shared goals across sustainability and resilience, City economic and workforce development efforts related to green jobs are fragmented**. The City has limited capacity to engage with emerging green firms to better understand how evolving public sector investments (GHG Plan) will impact their

industries and future job creation. The lack of a city-level economic development arm was noted as a specific concern, alongside need for more deliberate strategies to leverage city procurement rules to accelerate green opportunities.

- **Although the COVID-19 pandemic and economic recession are beginning to wane, the pandemic has had consequential impact on Miami's economy with many Miamians still out of employment, particularly low-income Black and non-white Hispanic residents**. In response, City leaders have the opportunity to leverage federal and state resources to explicitly support job creation in sectors best positioned to drive growth and creation of good jobs over the next 10-20 years, which includes the industries across the green sectors. The decisions made today about economic recovery will have shape the economy, community, and the environment today and in the decades to come.
- **Workforce development programs, middle-skill employers, and Miami's public-school system require partnerships, resources, and clear direction on how to prepare the local workforce for the green economy**. To ensure that Miami has the workforce to support the growth of the green economy, it will need to ensure that its workforce is trained for green occupations. Presently, employers across industries, including Transportation, Buildings, and Technology sectors, hypothesize that the region's skilled talent supply is insufficient to meet current and future demand (JPMorgan Chase & Co., 2015). Meanwhile, lower-skilled younger residents and adults report that it is difficult to access high-demand occupations for a variety of reasons, including skill and education requirements and visibility of opportunities. Indeed, many lower-income residents, particularly Black and non-white Hispanic residents, are most often in need of middle-skill jobs, lack high school diplomas, GEDs, and/or English language proficiency and are thus not necessarily positioned to pursue these opportunities (JPMorgan Chase & Co., 2015).

Chapter 7: Actions that will Catalyze and Support the Growth of a New Green Economy

Today, Miami's green economy ecosystem includes many actors that are operating, for the most part, independently of one another. These actors lack a supportive ecosystem to help them grow, hire, increase their impacts on the local economy, and provide equitable opportunities. Our goal is to ensure that green industries have a pathway for growth and that the City plays an active role in paving the way for new green economic growth and employment. This includes preparing underemployed workers for new green opportunities, engaging with the current and potential green job holders, fostering connections between stakeholders, and building business and workforce training capacity and synergies across the entire ecosystem. While the City has an important role to play in the new green economy, growing an equitable New Green Economy will require partnerships and actors from all sectors of Miami's economic ecosystem. The City-led actions are intended to encourage broader, collective actions from the City's economic development, workforce development, and climate justice stakeholders.

City Authority

As discussed in the GHG Plan, the City of Miami faces practical constraints on its ability to influence all GHG emissions. The same is true for the City's ability to direct and influence the local economy – we can directly make change through just a few select channels. We can play an impactful role in creating demand for green goods and services by purchasing those items, making requirements through permitting and contracting, and leading by example and through partnerships. The City-led New Economy actions leverage the City's existing resources (e.g., staff), programs (e.g., Summer Youth Connect program, Opportunity Center), authority (e.g., zoning and procurement), and regional leadership to influence Miami's economy.

Community Leadership and Regional Action

The green economy is bigger than just the City of Miami and its borders – it extends across the entire South Florida region and beyond. Efforts to grow the green economy need to involve the Greater Miami region and its economic and workforce development institutions, including the Beacon Council, the Chamber of Commerce, plus a deep bench of colleges, universities, and foundations. All these actors are already active in Miami's green economy ecosystem in some sort of capacity, either by supporting workforce and educational development, recruiting green industries, or funding community needs. The proposed partner led actions, detailed in Table 4 along with the City-led actions, could be led by a regional green economy champion or could be dispersed across various entitites working together to grow the green economy.

State of Illinois' Climate and Equitable Jobs Act

In September 2021, Illinois Governor J.B. Pritzker signed the Climate and Equitable Jobs Act, setting the state on a course to phase out fossil fuels in the power sector by 2045. The act more than doubles renewable energy funding, expands energy efficiency programs, and invests $115 million per year for green job creation in disadvantaged communities. The bill includes a comprehensive effort to transition workers and municipalities away from fossil fuels, establishing a "displaced worker bill of rights" to provide training and benefits to transitioning workers, replacing lost local property tax revenue from energy sources, and investing in job training, an incubator program for clean energy firms, and a clean jobs workforce network for "equity-focused populations."

Vancouver's Greenest City Action Plan

Vancouver's Greenest City Action Plan included a major effort to increase the number of green jobs and businesses engaging in greening their operations. This plan included two green economy targets: the first to double the number of green jobs from 18,250 in 2010 by 2020, and the second to double the number of companies actively greening their operations, from the 5% who were in 2011. The effort, still ongoing, significantly increased the number of jobs in green building construction, local food production, and green transportation-related industries.

Toronto's Green Jobs Metrics

The City government of Toronto actively tracks and develops its green jobs and workforce, which it estimated in 2019 to include about 60,000 workers. The City has commissioned research on developing and managing regional economic clusters, emphasizing a firm-neutral, collaborative approach to economic development at the industry level. The City has rolled out a Green Market Acceleration Program (GMAP) to coordinate between green firms, investors, and City officials. Toronto accommodates GMAP participants by lending them use of City-owned infrastructure for research, pilots, and demonstrations.

Los Angeles' Green New Deal & Green Jobs Target

The City of Los Angeles followed up on its 2015 Sustainable City pLAn with its 2019 Green New Deal, setting more aggressive GHG emissions reduction goals and a more ambitious economic agenda. The plan aims for City carbon neutrality by 2050. Among its targets are creating 300,000 green jobs in the City by 2035 and 400,000 by 2050, increasing green sector investment by $2 billion by 2035, and eliminating the gap between City and county unemployment. Initiatives to achieve these goals will include developing green jobs pipelines at community colleges and technical schools, creating private sector partnerships to boost apprenticeships, and offer job retraining for those displaced by the green energy transition and automation. The City also plans to offer more tax incentives, subsidized loans, and regulatory assistance for green investment (City of Los Angeles, 2019).

Colorado Community College System's Career Pathways Website

The Colorado Community College System developed an extensive website focused on careers in advanced manufacturing (Colorado Community College System, 2021). Their effort provides unique industry maps to highlight occupations positioned for near term growth, placed in context with career pathways that provide clarity regarding how to get from lower wage opportunities to higher wage opportunities.

New Green Economy Actions

All of these actions will require continuous engagement with impacted workers, particularly those from waning industries and those who are un- and under-employed, green job holders, and Pure, Partially, and Potentially Green industries. Sustained engagement and collaboration will ensure that the new green economy is working for Miamians.

The objectives of the New Green Economy report spell out GROW. The breakdown of the GROW framework is as follows:

- G – Grow the Green Economy Ecosystem
  - Strong regional economies are underpinned by an ecosystem of actors that each play important roles in facilitating economic growth. To grow Miami's green economy, we must consider all factors that support a growing economic ecosystem, including local leadership and business and industry networks.
- R – Recruit and Retain a Green Workforce
  - A critical component of Miami's economy is its workforce. A workforce that is prepared to capitalize on new and expanded green job opportunities will be attractive to green industries. Likewise, a key driver of this Green Economy Plan is ensuring that our workforce has opportunity to access resilient, living-wage jobs.
- O – Open Occupational Pathways
  - We – the City of Miami, educational institutions, workforce and economic development organizations, and the private sector – must work together to create green occupational pathways – from education to job placement - that allow more Miamians to access living wage jobs.
- W – Welcome and Support Green Industry
  - Inviting and attracting green industries to invest, hire, and grow their businesses here is, ultimately, the goal of this Green Economy Plan. These green industries will not only bring jobs and economic diversity to Miami but will also ease the transition to a carbon-free future. These actions are intended to invite and support green industry in Miami.

Table 4. New Green Economy Actions for City of Miami

Grow the Green Economy Ecosystem		
Phase 1 (1-3 years)		
Action	**Action Details**	**Resilient 305 & Miami Forever Climate Ready Alignment**
NE-1: Work with regional partners to identify a regional green economy champion and align resilience and adaptation goals.	While ecosystems are not created overnight, coalition building with regional partners, including Miami-Dade County, Beacon Council, the Chamber of Commerce, CareerSource, and non-governmental organizations (NGOs), to identify a green economy champion and align resilience and adaptation goals from Resilient305, Miami Forever Climate Ready, and Miami Forever Carbon Neutral to intentionally foster creation of a functioning, inclusive ecosystem which advances equity and opportunity through innovation. This "champion" will need to have long-term staying power, credibility with a broad array of stakeholder groups, an intense focus on the green economy and climate justice, and access to operational funding.	R305: Action 20: Build an Inclusive Economy, Action 21: Train for Construction, & Action 27: Expand Youth Career Opportunities MFCR: Goal 1: Ensure decisions are data-driven and human centered Goal 2: Inform, prepare, and engage our residents and businesses

NE-2: Dedicate staff to support green economic development goals and implementation of the GHG Plan.	Dedicate additional full-time equivalent (FTE) employee capacity within existing City departments (planning, resiliency, housing & community development) to support the green economy champion and to lead the City's role in growing the green economy ecosystem (which includes the actions detailed in this table).	
NE-3: Develop a plan for expanded, permanent economic development capacity.	Develop business model for expanded City-level economic development capacity, either as a city department or as a public private partnership, to sustain development of a functioning green economy ecosystem, including economic development incentives and workforce development resources to support career and training pathways. This would build upon Venture Miami efforts.	
NE-4: Develop green economy performance metrics.	Performance metrics are essential in placing climate investments and associated job creation in a broader economic, social, and environmental context, and documenting progress toward future goals. The metrics identified in the GHG Plan (e.g., the number of Electric Vehicles in use) will serve as a proxy for measuring the new green economy. The City will develop separate metrics for tracking equity goals, including demographic makeup of industries and occupations, workforce training recruitment and participation, and employment retention.	
Recruit and Retain a Green Workforce		
Phase 1 (1-3 years)		
Action	**Action Details**	**R305 & Miami Forever Climate Ready Alignment**
NE-5: Offer relevant job trainings through the Opportunity Center and connect job seekers to local employers.	The City's Opportunity Center and other training entities can partner with local green businesses to surface job orders, locate trainings in the City, and prioritize recruiting displaced, underemployed, or unemployed workers from climate justice communities. Through this process the City will gain a better understanding of barriers to employment in the green economy and build relationships with workforce and education partners to develop programming to bridge the identified gaps.	R305: Action 20: Build an Inclusive Economy, Action 21: Train for Construction MFCR: Goal 1: Ensure decisions are data-driven and human-centered, Goal 2: Inform, prepare, and engage our residents and businesses
Open Occupational Pathways		

Phase 1 (1-3 years)		
Action	**Action Details**	**R305 & Miami Forever Climate Ready Alignment**
NE-6: Expand the Miami Summer Jobs Connect program to include internships that align with the new green economy.	Introducing Miami youth to green jobs, particularly jobs that offer living wages and long-term growth opportunities, early in their career can ensure that Miami has a supply of qualified workers to support green economic growth and climate action goals.	Action 27: Expand Youth Career Opportunities
Welcome and Support Green Industry		
Phase 2 (4-6 years)		
Action	**Action Details**	**R305 & Miami Forever Climate Ready Alignment**
NE-7: Strengthen the City's procurement requirements so that green and sustainable are not only the preferred option, but the required option.	Update the language in Chapter 22.5 of the City Code, Articles I and III, to require City departments to purchase green goods and services rather than consider them.	R305: Action 20: Build an Inclusive Economy, Action 57: Leverage the Power of Purchasing MFCR: Goal 2: Inform, prepare, and engage our residents and businesses
NE-8: Facilitate expedited design and permitting review of projects that will achieve Miami's GHG and resilience goals.	Expedited review will reduce costs and encourage developers, contractors, and related businesses to pursue sustainable opportunities.	
NE-9: Preserve or enhance zoning that supports green industries.	Growth of Miami's green economy will also change land use needs. It will be important for the City to identify changes in land-use needs and preserve or create zoning that supports green industry needs. Zoning that supports green industries will also facilitate location-based economic development strategies. Formalize resilience and green economy priorities in the City's comprehensive plan.	

Table 5. Proposed New Green Economy Actions for Partners

Grow the Green Economy Ecosystem		
Phase 1 (1-3 years)		
Action	**Action Details**	**Resilient 305 & Miami Forever Climate Ready Alignment**
Work with the City of Miami and other regional partners to identify a regional green economy champion and align sustainability and adaptation goals.	While ecosystems are not created overnight, coalition building with regional partners, including Miami-Dade County, Beacon Council, the Chamber of Commerce, CareerSource, and non-governmental organizations (NGOs), to identify a green economy champion can happen within the near-term. This coalition building can include work to align sustainability and adaptation goals from Resilient305, Miami Forever Climate Ready, and Miami Forever Carbon Neutral, which will help to foster a functioning, inclusive ecosystem that advances equity and opportunity through innovation. The green economy "champion" will need to have long-term staying power, credibility with a broad array of stakeholder groups, an intense focus on the green economy and climate justice, and access to operational funding.	R305: Action 20: Build an Inclusive Economy, Action 21: Train for Construction, & Action 27: Expand Youth Career Opportunities MFCR: Goal 2: Inform, prepare, and engage residents and businesses
Identify and grow green financing opportunities.	Access to capital is essential for businesses to grow and hire and to facilitate large-scale public investments. The new green economy champion and/or supporting partners will need to build out the green economy ecosystem by identifying and growing green financing opportunities, either through recruitment of financial firms to the Miami market or expansion of offerings from existing financial organizations.	
Recruit and Retain a Green Workforce		
Phase 1 (1-3 years)		
Action	**Action Details**	**R305 & Miami Forever Climate Ready Alignment**
Develop a resource that highlights green career pathways.	Building off The Miami Foundation's Labor Miami website, creating a resource that outlines various green career pathways, which will help people understand the benefits of a green career and how to start their green career. This resource could highlight educational and skill requirements, transferable skill mapping, and career pathways including steps and skills needed to advance to higher-wage careers.	R305: Action 20: Build an Inclusive Economy MFCR: Goal 2: Inform, prepare, and engage our residents and businesses
Phase 2 (4-6 years)		

Develop a recruitment strategy and marketing campaign to showcase the benefits of green jobs and recruit young people to living wage career pathways.	A recruitment strategy and marketing campaign will aim to match climate justice communities and underserved residents with living wage jobs in the green economy.	R305: Action 20: Build an Inclusive Economy, Action 21: Train for Construction, & Action 27: Expand Youth Career Opportunities MFCR: Goal 2: Inform, prepare, and engage our residents and businesses
Locate green workforce trainings in climate justice communities.	In support of the recruitment strategy to match residents with living wage jobs, green workforce trainings and supportive assets, including certification programs, should have a sustained presence in climate justice communities.	
Open Occupational Pathways		
Phase 1 (1-3 years)		
Action	**Action Details**	**R305 & Miami Forever Climate Ready Alignment**
Create a green jobs consortium tasked with ensuring that Miami's workforce is prepared for the green economy.	In collaboration with the green economy regional champion, this consortium should include representatives from local colleges and universities, (existing) green businesses, trade organizations, local government, economic development organizations, and community groups, particularly those that represent climate justice communities. Work could include updating school programs, training, and apprenticeship curricula meet the needs of green employers, expanding green job-related training opportunities (and reducing barriers to access those opportunities), matching resource needs with resources, connecting employers with potential employees, and standardizing job requirements.	R305: Action 20: Build an Inclusive Economy, Action 21: Train for Construction, & Action 27: Expand Youth Career Opportunities MFCR: Goal 1: Ensure decisions are data-driven and human-centered, Goal 2: Inform, prepare, and engage our residents and businesses
Identify industries and occupations that have the highest projected job growth or are at greatest risk for near-term transition due to climate action efforts.	Identify the green industries and occupations that are expected to see the most job growth in the next decade and identify the non-green industries and occupations that are exacerbating climate change and/or are expected to wane as the national and global market becomes greener. Develop workforce transition pathways that match skills from the declining occupations to skills in green occupations, particularly those that are expected to grow.	
Expand green workforce training programs at colleges, universities, trade associations, and MDUSD, and establish paid green apprenticeship programs.	The green jobs consortium should endeavor to expand the capacity of existing green workforce programs, including Miami Dade College's EV technician certification and University of Miami's green business programs, *and* increase the variety of green	

	training offerings. Encourage partnerships with high schools and community colleges to ensure that high-growth green pathways have a backlog of students and employees. Support the creation of paid apprenticeship programs, similar to WASCO's program, to ease access to green jobs.	
Welcome and Support Green Industry		
Phase 1 (1-3 years)		
Action	**Action Details**	**R305 & Miami Forever Climate Ready Alignment**
Engage with local businesses, property owners, and large employers to encourage the development and implementation of green procurement policies.	Businesses in Miami's traditional sectors spent $5 billion on goods and services from businesses participating in Miami's green sectors in 2019; Yet just 6% of those purchases were from Pure Green industries while 94% ($4.6 billion) of these purchases were from Partially Green industries. Encouraging businesses in Miami's traditional sectors to adopt green procurement policies could have a $4.6 billion impact on greening the economy. This effort should include working with the South Florida Anchor Alliance to integrate GHG mitigation and climate resilience into their equity-focused procurement practices.	R305: Action 57: Leverage the Power of Purchasing
Engage with local businesses to design incentives to support "greening."	Miami has a robust, vibrant local business community that, collectively, are major providers and purchasers of goods and services and major employers. Greening local businesses will be important for achieving GHG mitigation and climate justice goals. To support this transition, we will need to understand what type of support will be helpful for either purchasing green goods or services or to transition to offer green goods or services.	R305: Action 20: Build an Inclusive Economy MFCR: Goal 1: Ensure decisions are data-driven and human centered, Goal 2: Inform, prepare, and engage our residents and businesses
Phase 2 (4-6 years)		
Create a green incubation hub.	Work with Venture Miami to create a mechanism for businesses and entrepreneurs to pitch climate action initiatives related to business and tech solutions and secure funding, startup resources, and use of City assets for testing products and ideas. This concept inspired by Toronto's Green Market Acceleration Program)	

Next Steps

The COVID-19 pandemic has taught us the importance of resilience, equity, and modernization. Now, it is critical that we take decisive action to ensure our economic recovery efforts reflect these tenets. As immediate next steps, the City of Miami will focus on foundational actions that will support the expansion of this new economic sector. To enable this, the City needs to identify full-time equivalent staff time to focus on and begin work on City-specific actions. Beyond the City, key regional stakeholders including neighbor cities, Miami-Dade County, Beacon Council, workforce development intermediaries, green businesses, climate advocacy groups, and educational institutions, need to come together and collectively identify a regional green economy champion. A green economy champion is needed to lead on collaborating with public and private sector leaders; providing leadership and vision related to green economy goals; supporting start-up, retention, and expansion efforts; and taking ownership of green economy metrics (e.g., jobs, recruitment, wages, companies, and opportunities). This “champion”, which may be a person, office, entity, or a coalition, will need to have long-term staying power, credibility with a broad audience of stakeholders, institutions, and businesses, an intense focus on the green economy and climate justice, and access to operational funding.

With a regional green economy champion in place, the proposed actions for growing the green economy can begin to take form. As the City updates its GHG Plan, we will maintain open channels of communication with workers, businesses, educational institutions, community organizations, public agencies, and residents to collaborate and report on the positive economic impacts of the GHG Plan and related climate actions.

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Appendix B – Action Evaluation Results

The City evaluated all plan actions against 9 co-benefit and feasibility criteria. 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. The following tables present the rating scales used for the co-benefit and feasibility criteria. All co-benefits were evaluated using the same rating scale shown in the first table, ranging from Very Positive to Very Negative. Feasibility rating scales were customized to each criterion, as show in the remaining tables. Assessing action impacts across multiple criteria helped to provide a more complete picture of the actions' broader impact beyond GHG reductions.

The ASAP tool provides different graphic and tabular outputs to help users interpret the evaluation results, which are provided in part at the end of this appendix, including a ranking of actions by GHG reduction potential (see Figure B1), actions by co-benefit score (see Figure B2), and actions by feasibility score (see Figure B3). 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.

The remainder of this appendix presents the full evaluation results for each action.

Ratings Legends

Co-Benefit Rating Legend (Public Health, Greenspace and Green Infrastructure, Employment, Cost of Living)

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 Rating Legend

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 Rankings

NOTE: Highlighted actions are prioritized actions

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**
G-1: Reduce emissions for City employee commute.	Somewhat Positive	Neutral	Neutral	Somewhat Positive	Neutral	Not Complex	Politically Challenging	Very Little Cost	No Cost
G-2: 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
G-3: 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
G-4: Develop a Trolley Master Plan including a long-term vision for the program and route updates.	Somewhat Positive	Neutral	Somewhat Positive	Very Positive	Positive	Very Complex	Politically Acceptable	Large Cost	No Cost
G-5: 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

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
G-6: Establish parking disincentives, such as parking maximums and dynamic parking prices, to discourage the use of single occupancy gas vehicles.	Somewhat Positive	Neutral	Somewhat Negative	Somewhat Negative	Negative	Somewhat Complex	Politically Challenging	No Cost	No Cost
G-7: Adopt transportation demand management ordinance to require certain employers and developers to establish 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
G-8: Work with partner entities to create bus lanes in strategic, key corridors.	Somewhat Positive	Neutral	Somewhat Positive	Somewhat Positive	Positive	Very Complex	Neutral or Unclear	Very Large Cost	No Cost
G-9: 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
G-10: 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

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
R-1: Starting in 2024, 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
R-2: 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
R-3: Promote community participation in FPL SolarTogether program, especially among renters, to purchase 100% of their electricity from solar.	Neutral	Neutral	Neutral	Neutral	Neutral	Not Complex	Politically Acceptable	No Cost	No Cost
R-4: 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
R-5: 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
R-6: Partner with community organizations such as local non-profits, trade organizations, and electric and gas utilities, to develop a building electrification 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

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-1: Develop EV Master Plan to support the growth of electric vehicle ownership.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Politically Acceptable	No Cost	No Cost
EV-2: 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-3: Partner with major employers and multifamily building owners to install EV chargers in parking lots/garages.	Somewhat Positive	Neutral	Somewhat Positive	Neutral	Neutral	Somewhat Complex	Politically Acceptable	No Cost	Large Cost
EV-4: 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-5: 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.	Neutral	Neutral	Neutral	Neutral	Positive	Somewhat Complex	Politically Acceptable	No Cost	No Cost
EV-6: 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-7: 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

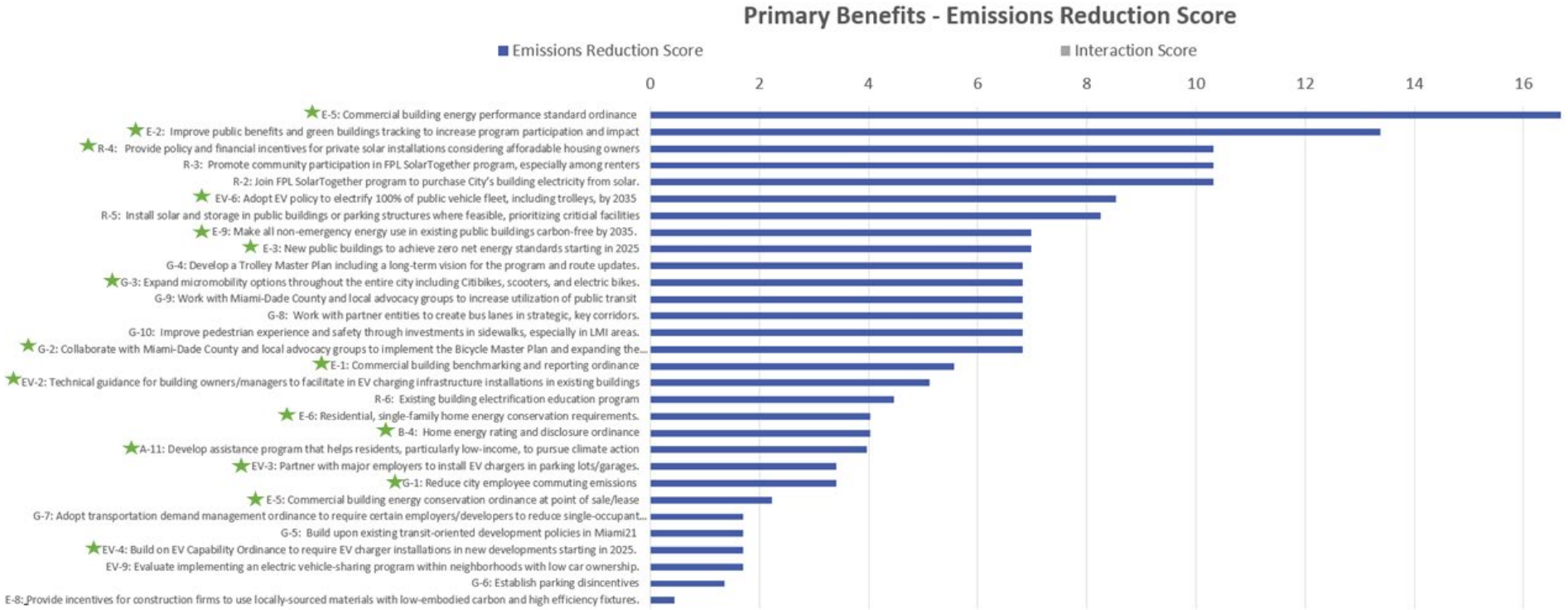
Action (priority in yellow)	Public Health	Greenspace and Green Infrastructure	Employment	Cost of Living	Climate Justice	Complexity to Implement - City	Political Acceptability	Additional Costs - City	Additional Costs - Private
EV-8: Evaluate implementing an electric vehicle-sharing program within neighborhoods with low car ownership.	Neutral	Neutral	Neutral	Neutral	Positive	Not Complex	Politically Acceptable	No Cost	No Cost
E-1: Implement Building Efficiency 305 (BE305) program requiring energy benchmarking and disclosure for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft	Neutral	Neutral	Somewhat Positive	Neutral	Neutral	Very Complex	Neutral or Unclear	Some Cost	Very Little Cost
E-2: Improve public benefits and green buildings tracking to increase program participation and impact.	Somewhat Positive	Somewhat Positive	Neutral	Somewhat Positive	Neutral	Somewhat Complex	Neutral or Unclear	No Cost	Some Cost
E-3: 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
E-4: Adopt a residential, single-family home energy rating and disclosure ordinance.	Neutral	Neutral	Very Positive	Somewhat Positive	Negative	Very Complex	Politically Challenging	Very Little Cost	Some Cost
E-5: Adopt building performance standard for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft	Neutral	Neutral	Very Positive	Neutral	Neutral	Very Complex	Politically Challenging	Large Cost	Large 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-6: Establish residential, single-family home energy conservation requirements.	Somewhat Positive	Neutral	Very Positive	Very Positive	Positive	Very Complex	Politically Challenging	Very Little Cost	Large Cost
E-7: Develop energy reduction targets for City of Miami municipal buildings.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Politically Acceptable	Very Little Cost	No Cost
E-8: Provide incentives for construction firms to use locally-sourced materials with low-embodied carbon and high efficiency fixtures.	Neutral	Neutral	Neutral	Somewhat Positive	Neutral	Somewhat Complex	Politically Acceptable	No Cost	No Cost
E-9: 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
A-1: Improve city data on waste streams and disposal. Establish a per capital waste goal.	Neutral	Neutral	Neutral	Neutral	Neutral	Very Complex	Neutral or Unclear	No Cost	Some Cost
A-2: Train City employees on emerging resilient and sustainable buildings initiatives and technologies including solar PVs, energy storage, EV charging, energy efficiency, electrification, and climate adaptation policies.	Neutral	Neutral	Neutral	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
A-3: Implement green and sustainable special events program.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Politically Acceptable	Very Little Cost	Very Little Cost
A-4: Train City staff on climate change.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Politically Acceptable	Very Little Cost	No Cost
A-5: Work with existing advocacy organizations and non-profits to improve citywide climate literacy and awareness.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Politically Acceptable	No Cost	No Cost
A-6: Improve recycling participation and reduce contamination.	Neutral	Neutral	Neutral	Neutral	Neutral	Not Complex	Politically Acceptable	Very Little Cost	No Cost
A-7: Work with community composting organizations to increase household composting.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Neutral or Unclear	Very Little Cost	No Cost
A-8: Help restaurants and businesses reduce their waste stream by connecting them with resources to reduce single-use plastic, integrate composting, and recover and redistribute surplus food.	Somewhat Positive	Neutral	Somewhat Positive	Neutral	Positive	Not Complex	Politically Acceptable	Very Little Cost	No Cost
A-9: Lobby for climate-forward policies at the state and federal level.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Politically Challenging	No Cost	No Cost
A-10: Advocate for climate-forward policies from FPL that support carbon-free energy at scale and energy efficiency.	Neutral	Neutral	Neutral	Neutral	Neutral	Not Complex	Politically Challenging	No Cost	No Cost
A-11: Develop a financial and technical assistance program	Somewhat Positive	Neutral	Somewhat Positive	Somewhat Positive	Positive	Very Complex	Politically Acceptable	Large 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
that helps residents, particularly low-income, to pursue climate action.									
A-12: Establish construction and demolition waste diversion requirements.	Neutral	Neutral	Somewhat Positive	Neutral	Neutral	Very Complex	Politically Challenging	No Cost	Some Cost
A-13: Develop end-of-life requirements for solar PV and other relevant renewable energy technologies, including battery storage.	Neutral	Neutral	Neutral	Neutral	Neutral	Somewhat Complex	Politically Acceptable	No Cost	Very Little Cost

Figure B1 – Action Evaluation – Top GHG Reduction Score Actions[1]



[1] Starred actions are prioritized actions

Figure B2 – Action Evaluation – Top Co-Benefit Score Actions[2]

[2] Starred actions are prioritized actions

Figure B3 – Action Evaluation – Top Feasibility Score Actions[3]

[3] Starred actions are prioritized actions

Implementation Roadmap Introduction

Miami used the C40 Cities Action Selection and Prioritization (ASAP) tool 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 Appendix B for more information).

The results of the ASAP evaluation were then used to prioritize 20 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

Seven 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 (two actions), mobility (three actions), and additional enabling actions (three 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.

The Implementation Roadmap (Roadmap) supports monitoring and evaluation of the 20 prioritized actions in the GHG Reduction Plan. The Roadmap was developed with input collected through multiple departmental interviews to identify the primary steps for successful action implementation to make significant progress in the next three to five years. It identifies lead entities, partners, implementation milestones, corresponding GHG Plan sub-goals, action baseline status, implementation metrics, initial funding needs, and staffing needs for each of the prioritized actions.

This Roadmap will help improve the City's ability to manage and implement the GHG Reduction Plan. The City will provide updates on these actions at least every two years as part of the GHG Inventory process.

Acronyms

ACS – American Community Survey

DoIT – Department of Innovation and Technology

DREAM – Department of Real Estate Asset Management

FDOT – Florida Department of Transportation

GSA – General Services Administration

MPA – Miami Parking Authority

PZAB – Planning, Zoning, and Appeals Board

RPW – Resilience and Public Works

G-1

Action # and Title:	G-1: Reduce emissions for City employee commute.
Action Details:	COVID-19 demonstrated that working remotely is possible and effective for City employees and some local businesses. The City should continue to permit employees to work from home and monitor participation. Additional measures to consider would be improving public transit benefits and implementing a parking fee.

Implementation Information

Lead Entity	Human Resources
Partners	All City departments
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Centralize data from work from home pilot program. 2. Coordinate a Commute to Work survey for City employees to determine additional areas of opportunity. 3. Evaluate union-related concerns (if any) and work to develop solutions. 4. Ensure reducing employee commute is a consideration for new administrative building project.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	15% shift away from private vehicle trips compared to 2018 levels by 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	% of employees that are eligible for work from home	N/A	Include total employees	2021, Human Resources
	% of all employees that participate in partial work from home	N/A	Include total employees	2021, Human Resources
	City employees commute to work mode split	N/A	Will need to survey employees	

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• No additional resources needed

G-2

Action # and Title:	G-2: 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.
Action Details:	As the County controls most public streets, collaboration is necessary for Miami to implement its Bicycle Master Plan. This action includes greening the bicycle network and installing shade, water fountains, and bike repair infrastructure along bike paths to improve rider comfort and safety.

Implementation Information

Lead Entity	RPW
Partners	Planning, Transit Alliance, Miami-Dade County, FDOT, developers
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Release updated Bike Master Plan. Socialize updated Master Plan with developers, non-profits and other stakeholders. 2. Integrate Bike Master Plan with City Capital Plan. 3. Define City preferences roadway updates (e.g., shading, bike lanes, etc). 4. Create transit-oriented development bike extension policy 5. Update City's application to League of American Bicyclists Bike Friendly Communities program. 6. City to consider playing more active role in bike community through committee participation and other methods of support.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	15% shift away from private vehicle trips compared to 2018 levels by 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	Miles of dedicated bike lane	30.3	Not sharrows	2021, RPW Transportation Division
	Commuter trips by bike	0.9%		2019, ACS 5-year

Funding and Resources

Initial Funding Needs	• Capital funds dedicated to creating new and maintaining existing bike lanes • Marketing and public service announcements on bike safety and awareness

Staffing Needs	• None

G-3

Action # and Title:	G-3: Expand micromobility options throughout the entire city including Citibikes, scooters, and electric bikes.
Action Details:	Currently, most micromobility options are concentrated in District 2 and safety concerns will need to be addressed prior to expanding. This action can aid residents without cars and considers free service for specific users.

Implementation Information

Lead Entity	RPW
Partners	City Commissioners, Citibike, scooter vendors
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Improve enforcement mechanisms for safety violations - shared enforcement across companies. 2. Improve perception of shared mobility programs with City Commissioners. 3. Adopt ordinance approving expansion of scooter program boundaries. Ensure other shared mobility programs are permitted Citywide as well. 4. Continue to pilot scooter corrals. Expand use if successful. 5. Work with Citibikes and County to recommend locations for new Citibike stations. 6. Align shared mobility expansions with bike network improvements.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	15% shift away from private vehicle trips compared to 2018 levels by 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	Types of micromobility options available in the City	3	docked bikes and e-bikes, scooters	2021, Transportation Division of RPW
	Number of Citibike stations	60	In the City of Miami, some are on private property, most in the right-of-way	2021, Transportation Division of RPW
	Number of scooters			2021, Transportation Division of RPW
	Number of e-bikes	100	Citi Bike launching 100 e-	2021, Transportation

			bikes within overall area, including Miami, Miami Beach, Bal Harbor	Division of RPW
	Districts in which micromobility programs are available	1	District 2	2021, Transportation Division of RPW
	Commute trips by bike	0.9%		2019 ACS 5-year

Funding and Resources

Initial Funding Needs	• Capital funds dedicated to creating new and maintaining existing bike lanes • Marketing and public service announcements on safety and awareness
Staffing Needs	• Shared mobility programs needs a dedicated manager (part-time)

R-1

Action # and Title:	R-1: Starting in 2024, require all new buildings to be solar-ready and storage-ready.
Action Details:	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.

Implementation Information

Lead Entity	Planning
Partners	Building, developers, solar advocacy groups and installers, PACE contractors
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Partner with solar advocacy group to review national best practices and craft a draft ordinance. Highlight economic benefits. 2. Review internally with relevant City departments. Consider alignments with Miami21. 3. Socialize with Commissioners and development stakeholders. Make adjustments as needed. 4. Bring ordinance to Commission. Will need two readings.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	100% carbon-free electricity 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	% of new buildings built in [YEAR] that are solar-ready and storage-ready	N/A		Building

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• No additional resources needed

R-4

Action # and Title:	R-4: Provide additional policy and financial incentives to encourage private solar installations and identify incentives that would appeal to owners of affordable housing.
Action Details:	Solar incentives are necessary to encourage residents and businesses to voluntarily install solar. The City will need to engage the development community to understand new areas of opportunity in the Zoning code as the City already has solar friendly permitting. In addition, the City can promote existing financing pathways including Property Assessed Clean Energy (PACE), Solar and Energy Loan Fund (SELF), and Solar United Neighbors (SUN) Co-op.

Implementation Information

Lead Entity	Planning
Partners	Building, developers, SolSmart, solar advocacy groups and installers, PACE contractors
Phase	Phase 2: significant progress in 4-6 years (by end of 2026)
Implementation Milestones	1. Complete SolSmart certification. 2. Partner with solar advocacy group to review national best practices and determine recommendations. 3. Leverage existing building/development advisory groups to seek feedback and ideas for incentives. 4. Collect feedback and craft ordinance proposing a set of solar incentives. 5. Improve internal data collection of installed solar.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	100% carbon-free electricity by 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	# of solar permits granted	N/A		Building
	Per capita solar PV (watts DC per person)	9.99	Shining Cities per capita solar PV rank: 53	Environment America Shining Cities 2020 report[1]
	Total installed solar PV (MW DC)	4.7	Shining Cities total solar PV rank: 52	Environment America Shining Cities 2020 report

[1] https://environmentamerica.org/sites/environment/files/reports/Shining-Cities-2020/EA_Shining_Cities_scrn.pdf

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• No additional resources needed

EV-1

Action # and Title:	EV-1: Develop EV Master Plan to support the growth of electric vehicle ownership.
Action Details:	A Master Plan would help the City anticipate and support the growing electric vehicle market. Through this process the City would develop private sector partners, policies, metrics, and an expanded charger network map. Overall, this plan should help the City understand what supporting infrastructure is needed and where.

Implementation Information

Lead Entity	RPW
Partners	MPA, GSA, FPL, Tesla, EV charging companies, Electrification Coalition, EV advocacy groups
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Conduct research on Miami's EV market: growth projections, owner geography, gap analysis of existing EV charger infrastructure, car dealerships that sell EVs, etc. 2. Establish public-private working group to recommend timing and location of charging infrastructure expansion on City and private properties. Evaluate needs for other support such as policies and tools such as adding EV charging to environmental impact assessment criteria and developing a substantial improvement clause. 3. Create and publish EV Charging Master Plan with map. 4. Seek partnerships and funding for installation of charging infrastructure.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	40% of registered passenger vehicles are electric by 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	Total # of EV chargers in the City	N/A		
	Total # of EV chargers on City-owned property	16		Miami Parking Authority and GSA, 2021

Funding and Resources

Initial Funding Needs	• Consultant potentially needed for market research
Staffing Needs	• No additional resources needed

EV-2

Action # and Title:	EV-2: Develop technical guidance for building owners/managers to facilitate in EV charging infrastructure installations in existing buildings.
Action Details:	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.

Implementation Information

Lead Entity	RPW
Partners	Building, Planning, EV charging companies, EV advocacy groups
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Source existing technical guides. 2. Seek partnership with private buildings and businesses interested in installing EV chargers to understand their questions and concerns. 3. Speak with existing EV installers about common questions and concerns. 4. Determine methods to address with relevant Building and Planning staff. 5. Develop and promote web-based and downloadable guidance.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	40% of registered passenger vehicles are electric by 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	# of EV charger permits granted in [YEAR]	N/A		Building

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• Temp special projects coordinator or consultant to lead development • City needs an electric vehicles subject matter expert

EV-3

Action # and Title:	EV-3: Partner with major employers and multifamily building owners to install EV chargers in parking lots/garages.
Action Details:	Key employers include hospitals, banks, universities, and more. The City can provide free and/or expedited permitting.

Implementation Information

Lead Entity	RPW
Partners	Planning, Building, large employers, EV charging companies
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Seek partnership with private buildings and businesses interested in installing EV chargers. 2. Connect partners with local EV charging companies. 3. Pilot technical guidance materials and other project facilitating products. 4. Consider how projects can partner with Opportunity Center. 5. Promote partners and elevate them as green champions.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	40% of registered passenger vehicles are electric by 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	Total # of EV chargers in the City	N/A		

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• Temp special projects coordinator or consultant to lead development • City needs an electric vehicles subject matter expert

EV-4

Action # and Title:	EV-4: Build on EV Capability Ordinance to require EV charger installations in new developments starting in 2025.
Action Details:	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.

Implementation Information

Lead Entity	Planning
Partners	Building, Zoning, developers, EV advocacy groups
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	Sequence ordinance updates: EV Ready (plug-in ready) and then EV Charger requirement. For each ordinance update, the following steps must occur: 1. Partner with EV advocacy group to review national best practices and craft text amendment. Understand financial commitment. 2. Craft text amendment to existing ordinance and review internally with Planning, Building, and Zoning to ensure enforcement. 3. Socialize with Commissioners and development stakeholders. Make adjustments as needed. 4. Finalized text amendment is put out for public comment, then goes to PZAB, and finally will have two reading at City Commission.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	40% of registered passenger vehicles are electric by 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	Current new parking EV charger requirement	EV capable		Planning, 2021
	# of EV capable spots created since ordinance passed	N/A	Ordinance 13943 requiring 20% of new off-street parking to be EV capable passed in November 2020	Building
	# of EV charger permits	N/A		Building

	granted in [YEAR]			
	Total # of EV chargers in the City	N/A		

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• Potential new position needed to enforce green building ordinances

EV-6

Action # and Title:	EV-6: Electrify 100% of public vehicle fleet, including trolleys by 2035.
Action Details:	The City will work with the Electrification Coalition and other 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.

Implementation Information

Lead Entity	GSA
Partners	Procurement, RPW, Police, Solid Waste, Fire, Electrification Coalition, EV advocacy organizations
Phase	Phase 3: significant progress in 7 or more years (2027 and beyond)
Implementation Milestones	1. Install additional EV chargers at City facilities to support increased City fleet charging needs. 2. Work with Electrification Coalition and other EV advocacy organizations as well as relevant City departments to develop procurement policy and fleet transition plan. 3. Propose Commission procurement policy that requires consideration of electric vehicles for City fleet purchases. 4. Review City union contracts to identify opportunities for EV procurement. 5. Train GSA staff to conduct maintenance on electric vehicles.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	40% of registered passenger vehicles are electric by 2035			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	% of total fleet vehicles that are electric	0%	General Fleet: 730 vehicles. 0 electric vehicles. 107 Hybrid vehicles. Marked Police: 1,300 vehicles. 0 electric vehicles. 0 hybrid vehicles. Administrative Police: 357 vehicles. 0 electric vehicles. 124 hybrid vehicles.	GSA, 2021

			Other Police: 201 vehicles. 0 electric vehicles. 0 hybrid vehicles. Heavy Fleet: 436 vehicles. 0 electric vehicles. 0 hybrid vehicles.	
	% of trolleys that are electric	0%	City has 54 trolleys, 12 owned by County.	RPW, 2021

Funding and Resources

Initial Funding Needs	• Hire a company to provide training or tuition reimbursement for EV maintenance courses for GSA staff.
Staffing Needs	• No additional resources needed

E-1

Action # and Title:	E-1: Implement Building Efficiency 305 (BE305) program requiring energy benchmarking and disclosure for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft.
Action Details:	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 building owners.

Implementation Information

Lead Entity	Building
Partners	GSA, DREAM
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Assign staff to oversee the program and train new hires. 2. Create standard operating procedures for program and finalize internal rule making 3. Develop outreach materials 4. Benchmark applicable City buildings 5. Create guidance on public disclosure for property owners and City staff 6. Integrate program with iBuild 7. Work with FPL on automatic energy data collection 8. Launch online program portal 9. Begin notifying covered building owners of compliance timeline, requirements, and resources

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	# of buildings reporting energy use	N/A	Buildings are required to start reporting energy use in 2023	Building
	Average energy use OR emissions intensity for participating buildings	N/A	Buildings are required to start reporting energy use in 2023	Building
	% of covered residential	N/A	Buildings are required to	Building

	square footage benchmarked		start reporting energy use in 2023	
	% of covered commercial square footage benchmarked	N/A	Buildings are required to start reporting energy use in 2023	Building

Funding and Resources

Initial Funding Needs	• Funding for four positions • IT funding for website/disclosure (multi-year capital)
Staffing Needs	• Four additional staff for BE305

E-2

Action # and Title:	E-2: Improve public benefits and green buildings tracking to increase program participation and impact.
Action Details:	Currently, there is a lack of centralized information about LEED certified buildings, cool roofs, installed rooftop solar and more that can help the City understand how the built environment is responding to climate change. We need to understand the impact and implementation of our current policies if green building requirements are to expand.

Implementation Information

Lead Entity	Planning
Partners	Building
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Identify green public benefits, building code requirements, and optional incentives that the City could better track. 2. Define metrics and check-in milestones for tracking via ePlan, special permits, and other relevant methods. 3. Determine if process updates need to occur to keep tracking streamlined. 4. Determine if increased enforcement and compliance is needed for any of the identified green enhancements.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	Total # of LEED-certified buildings	N/A	Consolidation of Public Benefits covenants underway.	Planning

Funding and Resources

Initial Funding Needs	• Consultant potentially needed to help with process optimization
Staffing Needs	• No additional resources needed

E-3

Action # and Title:	E-3: Require all new public buildings to be built to zero net energy standards starting in 2025.
Action Details:	Requiring all-electric, zero net energy new public building construction would help demonstrate the feasibility of net zero construction in Miami and allow the City to lead by example.

Implementation Information

Lead Entity	RPW
Partners	GSA, DREAM, Building, Parks, green building advocacy groups
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Partner with a green building advocacy group to research net zero building standards and certifications. Determine anticipated financial difference in building to net zero standards. 2. Investigate what new buildings/major renovations are in the pipeline and which departments are involved. 3. Educate department Directors and administrative staff on proposed new standards and benefits. 4. Propose ordinance updating City code.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	# of City public buildings built to zero net energy standards	0		City of Miami, 2021

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• No additional resources needed

E-4

Action # and Title:	E-4: Adopt a residential, single-family home energy rating and disclosure ordinance.
Action Details:	A home energy rating identifies opportunities for energy improvement to homeowners and sends market signals about the benefits of building efficiency. Low-income populations will need financial assistance to improve their ratings.

Implementation Information

Lead Entity	Building
Partners	Code Compliance, Legal, Realtors Association, Miami-Dade County, energy efficiency advocacy groups
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Research existing programs and develop model program. 2. Speak with Legal Dept to determine how disclosure can be required. Consider packaging with proposed home inspection program. 3. Socialize concept with industry groups such as Realtors Association and City staff. 4. Determine alignment with Miami-Dade County on other point of sale disclosures such as floodplain. 5. Propose ordinance to the City code.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	# of qualifying homes that participate	N/A		
	Average EUI or emissions intensity for all participating homes	N/A		

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• Initiative would need a dedicated program manager (similar to BE305 program)

E-5

Action # and Title:	E-5: Adopt building performance standard for commercial, multi-family residential, and City of Miami municipal buildings over 20,000 sq. ft.
Action Details:	Implementing an energy or emission performance standard is the next step after adopting a benchmarking and reporting ordinance. Large building 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.

Implementation Information

Lead Entity	Building
Partners	GSA, DREAM, Planning, local non-profit organizations
Phase	Phase 2: significant progress in 4-6 years (by end of 2026)
Implementation Milestones	1. Complete one cycle of BE305 prior to developing performance targets. 2. Pilot a voluntary program to identify implementation and participation roadblocks. 3. Produce a case study on building performance standards from participants in pilot program. 4. Develop building performance targets, including a timeline, based on carbon neutrality goals, city-wide benchmarking results, and results of pilot program. 5. Propose ordinance to the City code.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	# of buildings participating in performance standards	N/A		Building
	Average energy use OR emissions intensity for participating buildings	N/A		Building

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• No additional resources needed - use same staff as BE305

E-6

Action # and Title:	E-6: Establish residential, single-family home energy conservation requirements.
Action Details:	Residential property owners would be required to make energy conservation improvements in their homes, potentially at the point of property sale or lease. Implementation could include a prescriptive list of improvements, a list of options for user selection, and/or a maximum investment threshold. Low-income populations will need financial assistance to help with compliance. Similar policies, called Residential Energy Conservation Ordinances (RECOs), have been passed in other cities.

Implementation Information

Lead Entity	Building
Partners	Code Compliance, Legal, Realtors Association, Miami-Dade County, energy efficiency advocacy groups
Phase	Phase 2: significant progress in 4-6 years (by end of 2026)
Implementation Milestones	1. Research existing programs and develop model program with the assistance of technical advisors. 2. Determine timing and method of enforcement. Align with BE305 performance standards. 3. Socialize concept with industry groups such as Realtors Association and City staff. 4. Propose ordinance to the City code.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	# of qualifying homes that participate	N/A		
	Average EUI or emissions intensity before and after improvements for all	N/A		

	participating homes			

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• Initiative will need dedicated program staff

E-9

Action # and Title:	E-9: Make all non-emergency energy use in existing public buildings carbon-free by 2035. Explore and adopt as much carbon-free emergency energy generation and storage as possible.
Action Details:	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.

Implementation Information

Lead Entity	GSA
Partners	DREAM, OCI, Legal, electrification advocacy groups
Phase	Phase 3: significant progress in 7 or more years (2027 and beyond)
Implementation Milestones	1. Inventory natural gas assets and buildings using utility bills as a lead. 2. Determine end of useful life of existing equipment. 3. Evaluate relative costs and efficiency of electric appliances. Determine if procurement policy is needed. 4. Develop phase out plan. **Note: City plans to join FPL Solar Together program to purchase electricity for City buildings from utility-grade solar*

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	Improve energy efficiency in buildings to decrease overall energy consumption and support achievement of Goal 2: Renewable Energy			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	On-site natural gas use in City buildings (therms)	2,644,270	Collected as part of 2018 GHG Inventory	TECO, 2018
	Average EUI or emissions intensity for all participating City buildings	N/A		GSA, DREAM

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• No additional resources needed

A-1

Action # and Title:	A-1: Improve city data on waste streams and disposal. Establish a per capita waste goal.
Action Details:	To better understand opportunities for waste reduction, the City will need an updated waste stream characterization study and data from private haulers who service multi-family buildings and commercial businesses.

Implementation Information

Lead Entity	Solid Waste
Partners	DoIT, Private waste haulers
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Identify data gaps in City collected waste and from private haulers. 2. Collect contact information for all approved City waste haulers. Discuss what data they could be sharing with the City now and pathways to meet asks that cannot be met in the short-term. 3. Review contracts for private waste haulers. Determine renewal timelines and areas of enhancement regarding data sharing. 4. Enhance processes for collecting and analyzing collected data, especially data incoming from external parties. 5. Establish per capita waste goals once significant baseline data has been collected (roughly by 2025).

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	All GHG Plan Goals			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	Total waste collected in [YEAR] (tons)	492,718	Correct value found in 2018 GHG Inventory Appendix I (Methodology)	Solid Waste, 2018
	Waste per capita in [YEAR] (tons)	1.09	City population was 451,214 in 2018	Solid Waste, 2018
	% waste diverted to recycling	N/A		

Funding and Resources

Initial Funding Needs	• No additional resources needed
Staffing Needs	• Temp or consultant could assist with data collection and streamlining

A-2

Action # and Title:	A-2: Train City employees on emerging resilient and sustainable buildings initiatives and technologies including solar PVs, energy storage, EV charging, energy efficiency, electrification, and climate adaptation policies.
Action Details:	City staff need to be familiar with green and resilient building practices in order to facilitate permitting and sustainable development. The City will evaluate initial areas of opportunity based on history of permits and current policies.

Implementation Information

Lead Entity	Buildings
Partners	Planning, GSA, RPW, green building technical advisors
Phase	Phase 1: significant progress in 1-3 years (by end of 2024)
Implementation Milestones	1. Review City plans, incoming permits (iBuild), and call center subjects to determine training needs and priorities. 2. Source training for employees. 3. Set up training for Building department Call Center employees. 4. Set up training for Building Service Assistants and other positions.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	All GHG Plan Goals			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	# of green buildings trainings hosted for City staff	N/A		
	# of training participants	N/A		

Funding and Resources

Initial Funding Needs	• Green buildings training budget for City staff
Staffing Needs	• No additional resources needed – intention is to train existing staff

A-11

Action # and Title:	A-11: Develop a financial and technical assistance program that helps residents, particularly low-income, to pursue climate action.
Action Details:	This action includes education, investigating financial mechanisms and revenue streams to fund incentives and rebates, and technical support. The City will work across departments to develop easily accessible guidance that span carbon mitigation and climate resilience.

Implementation Information

Lead Entity	RPW
Partners	Housing and Community Development, Building
Phase	Phase 2: significant progress in 4-6 years (by end of 2026)
Implementation Milestones	1. Create a hub on website for all green building guidance. 2. Develop list of housing improvements and funding thresholds for future grant programs. 3. Expand Keep Safe tool to include single family homes. 4. Produce video series about green home improvements and/or find local Youtubers for collaboration. 5. Research funding programs in other cities and determine if possible to create a regenerating fund.

Goals and Metrics

Corresponding GHG Plan Sub-goal(s)	All GHG Plan Goals			
Implementation Metrics and Baseline (most recent data)	**Metric**	**Baseline Value**	**Details**	**Source**
	$ allocated to residents to take climate action	N/A	This will include direct grants and loans for mitigation and adaptation	

Funding and Resources

Initial Funding Needs	• Grant funds to disperse to residents • Seed funding to create a revolving loan fund (potentially)
Staffing Needs	• If program expands to citywide single-family homes, will need dedicated staff

Appendix D – GHG Targets, Calculators, and Inputs

This chapter provides additional information that was considered when defining Miami's interim GHG reduction target, a description of modifications made to the original solid waste emissions estimates, as well as documentation for the GHG calculator inputs used in the Pathways tool when defining the city's GHG reduction scenario.

Interim Target-Setting Considerations

Selecting an appropriate interim GHG target that supports the City's longer-term carbon neutrality goal was informed, in part, by the 2018 United Nation's International Panel on Climate Change (IPCC) *Special Report on Global Warming of 1.5°C (SR15*), which outlines the need for global emissions to drop at least 45% by 2030 to keep warming to *1.5*°C.[1] It also included C40's 2016 report *Deadline 2020,*[2] which focuses on the need for cities to accelerate action with ambitious interim targets, and assigns categories based on GHG emissions and economic thresholds to help cities plan a "fair-share" of global reductions toward an average per capita emissions of 2.9 MT CO_2e by 2030.

To determine the interim 2035 target, the City first analyzed its assigned Deadline 2020 trajectory and reviewed the feasibility of the strategies needed to achieve the target. The recommended "steep decline" in emissions would require a rapid and dramatic increase in use of public transit and bicycles, conversion of nearly all vehicles to electric, massive reduction in energy use in buildings, and a completely carbon-free energy sector including total phase out of natural gas. The City's lack of foundational policies and programs, limited legislative jurisdiction, and inability to financially support adoption of new technologies determined that the goal was not realistic. The current interim target established in the plan (i.e., 60% reduction below 2018 levels by 2035) reflects goals and strategies that the City feels are ambitious, yet achievable based on existing federal and state law, the city's authority, and market forces. The City will work to implement this plan and add to the City's goals as momentum is established and learning can inform future planning.

Based on Miami's population projections, the City's 2035 target would result in per capita emissions of about 2.0 MT CO_2e per person in 2035. This Plan, and its 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.[3] 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.

[1] https://www.globalcovenantofmayors.org/wp-content/uploads/2019/09/2327_For_cities_by_cities_v18_1.original.pdf

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

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

Solid Waste

The 150,000 tCO_2e created by incinerating Miami's solid waste to create electricity (documented in the 2018 inventory) should be categorized as energy sent to the grid in the stationary emissions sector (per the GPC GHG inventory protocol) because this waste is combusted to produce energy that jurisdictions then consume as electricity. The other 40,000 tCO_2e estimated in the original inventory was miscalculated, attributing characteristics of municipal solid waste to the residue that is created by the waste-to-energy incineration process. Unlike municipal solid waste, that residue does not have carbon content that could decompose in a landfill environment to generate additional greenhouse gas emissions; it is an inert material in relation to greenhouse gas emissions when sent to landfill. Therefore, those original emissions estimates were removed from the GHG planning process in this plan.

Pathways Inputs and Assumptions

The following table documents the GHG calculator inputs used in the Pathways tool to develop Miami's final GHG reduction scenario. The relevant GHG strategies are listed in the first column, GHG calculator implementation assumptions for 2035 and 2050 are shown in the second and third columns, and general implementation assumptions, where relevant, are shown in the fourth column. Note that information is provided as it appears in the Pathways tool, and in most instances is describing the changes to occur from the 2018 base year conditions included in the model.

Strategy	Implementation in 2035	Implementation in 2050	Assumptions
Grid Decarbonization	100% Renewable Energy	100% Renewable Energy	Biden Administration Executive Order: Build a carbon pollution-free electricity sector by 2035[4]
New construction – efficiency (Commercial)	• 100% LED Lighting • 29% of new space heaters are electric; 71% of new space heaters are high-efficiency natural gas boilers • 100% of new cooling systems are electric heat pumps • 5% of new water heaters are electric heat pumps; 95% of new water heaters	• 100% LED Lighting • 40% of new space heaters are electric; 60% of new space heaters are high-efficiency natural gas boilers • 100% of new cooling systems are electric heat pumps • 20% of new water heaters are electric heat pumps; 80% of new water	N/A

[4] https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/

Strategy	Implementation in 2035	Implementation in 2050	Assumptions
	are high-efficiency natural gas boilers 15% of new stoves are electric; 85% of new stoves are natural gas	heaters are high-efficiency natural gas boilers 28% of new stoves are electric; 72% of new stoves are natural gas	
New construction – efficiency (Residential)	• 100% LED Lighting • 100% of new space heater are electric • 100% of new cooling systems are electric • 83% of new water heaters are electric; 17% of new water heaters are high-efficiency natural gas boilers • 86% of new stoves are electric; 14% of new stoves are natural gas	• 100% LED Lighting • 100% of new space heater are electric • 100% of new cooling systems are electric • 86% of new water heaters are electric; 14% of new water heaters are high-efficiency natural gas boilers • 88% of new stoves are electric; 12% of new stoves are natural gas	• N/A
Space cooling – efficiency (Commercial)	• Retrofit 40% of systems to electric heat pumps	• Retrofit 100% of systems to electric heat pumps	• Lifespan of typical cooling systems is roughly 20 years • 100% of equipment owners with electric systems will voluntarily increase equipment efficiency at end of life
Space cooling – efficiency (Residential)	• Retrofit 40% of systems to electric heat pumps	• Retrofit 100% of systems to electric heat pumps	• Lifespan of typical cooling systems is roughly 20 years • 100% of equipment owners with electric systems will voluntarily increase equipment efficiency at end of life

Strategy	Implementation in 2035	Implementation in 2050	Assumptions
Space heating – efficiency/fuel switch (Commercial)	• Retrofit 7% of low-efficiency natural gas boilers to electric heat pumps • Retrofit 40% of low-efficiency natural gas boilers to high-efficiency natural gas boilers	• Retrofit 14% of low-efficiency natural gas boilers to electric heat pumps • Retrofit 65% of low-efficiency natural gas boilers to high-efficiency natural gas boilers • Retrofit 100% of existing electric heaters with electric heat pumps	• Lifespan of typical heating systems is roughly 20 years • 10% of equipment owners will voluntarily electrify gas equipment at end of life • 60% of equipment owners will voluntarily increase equipment efficiency at end of life
Space heating – efficiency/fuel switch (Residential)	• Retrofit 100% of existing electric heaters with electric heat pumps	• Retrofit 100% of existing electric heaters with electric heat pumps	• Lifespan of typical heating systems is roughly 20 years • 100% of equipment owners with electric systems will voluntarily increase equipment efficiency at end of life
Water Heating – efficiency/fuel switch (Commercial)	• Retrofit 7% low-efficiency natural gas boilers to electric heat pumps • Retrofit 40% low-efficiency natural gas boilers to high-efficiency natural gas boilers	• Retrofit 14% low-efficiency natural gas boilers to electric heat pumps • Retrofit 65% low-efficiency natural gas boilers to high-efficiency natural gas boilers	• Lifespan of typical water heating systems is roughly 20 years • 10% of equipment owners will voluntarily electrify gas equipment at end of life • 60% of equipment

Strategy	Implementation in 2035	Implementation in 2050	Assumptions
			owners will voluntarily increase equipment efficiency at end of life
Water Heating – efficiency/fuel switch (Residential)	• Retrofit 7% low-efficiency natural gas boilers to electric heat pumps • Retrofit 11% low-efficiency natural gas boilers to solar hot water heaters • Retrofit 100% of existing electric heaters with electric heat pumps	• Retrofit 14% low-efficiency natural gas boilers to electric heat pumps • Retrofit 28% low-efficiency natural gas boilers to solar hot water heaters • Retrofit 100% of existing electric heaters with electric heat pumps	• Lifespan of typical water heating systems is roughly 20 years • 10% of equipment owners will voluntarily electrify gas equipment at end of life • 100% of equipment owners with electric systems will voluntarily increase equipment efficiency at end of life
Cooking – efficiency/fuel switch (Residential) ***Note: No actions for commercial***	• Retrofit 7% of natural gas stoves with electric stoves	• Retrofit 14% of natural gas stoves with electric stoves	• Lifespan of typical cooking equipment is roughly 20 years • 10% of equipment owners will voluntarily electrify gas equipment at end of life
Mode shift – walk/bike/transit	• 10% shift away from passenger vehicle trips to walking and biking	• 16% shift away from passenger vehicle trips to walking and biking	• Bloomberg Electric Vehicle Outlook 2020[5]: 16% of all VMT from shared

[5] https://about.bnef.com/electric-vehicle-outlook-2020/

Strategy	Implementation in 2035	Implementation in 2050	Assumptions
	• 5% shift away from passenger vehicle trips to transit	• 8% shift away from passenger vehicle trips to transit	mobility usage by 2040
Passenger vehicle – fuel switch/efficiency	• 40% of passenger vehicles, light-duty trucks, and medium-duty trucks are electric	• 50% of passenger vehicles, light-duty trucks, and medium-duty trucks are electric	• Bloomberg Electric Vehicle Outlook 2020[6]: 31% of world's passenger cars are electric by 2040

[6] https://about.bnef.com/electric-vehicle-outlook-2020/

MIAMI FOREVER CARBON NEUTRAL

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

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