Atlanta Regional Commission

DECEMBER 2025

METRO ATLANTA CLIMATE ACTION PLAN

A Comprehensive Climate Action Plan for the Atlanta Metropolitan Statistical Area

PREPARED FOR:

State and Local Climate and Energy Program
U.S. Environmental Protection Agency

Vision

ONE **great** REGION

Atlanta Regional Commission

229 Peachtree Street, NE
Suite 100
Atlanta, Georgia 30303

atlantaregional.org

Mission

Foster thriving communities for all within the Atlanta region through collaborative, data-informed planning and investments

Goals

- **Healthy, safe, livable communities** in the Atlanta Metro area
- **Strategic investments** in people, infrastructure, mobility, and preserving natural resources
- Regional services delivered with **operational excellence** and **efficiency**.
- **Diverse stakeholders engage** and take a regional approach to solve local issues.
- **A competitive economy** that is inclusive, innovative, and resilient.

Values

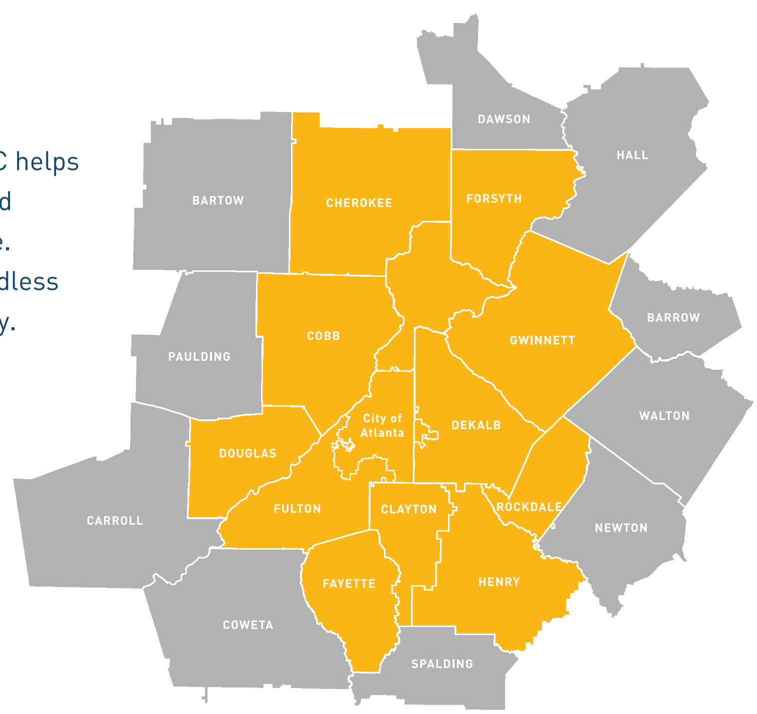
Excellence - A commitment to doing our best and going above and beyond in every facet of our work allowing for innovative practices and actions to be created while ensuring our agency"s and our colleague's success.

Integrity - In our conduct, communication, and collaboration with each other and the region's residents, we will act with consistency, honesty, transparency, fairness and accountability within and across each of our responsibilities and functions.

Equity - We represent a belief that there are some things which people should have, that there are basic needs that should be fulfilled, that burdens and rewards should not be spread too divergently across the community, and that policy should be directed with impartiality, fairness and justice towards these ends.

ARC is the regional planning and inter-governmental coordination agency for the 11-county Atlanta region. ARC helps the region's leadership focus attention, collaboration, and resources on critical issues affecting our collective future. We're here to make the region work for everyone – regardless of age, ethnicity, income, education, background, or ability.

This project has been funded wholly or in part by the United States Environmental Protection Agency (EPA) under assistance agreement number 5D-02D56523-0 to the Atlanta Regional Commission. The contents of this document do not necessarily reflect the views and policies of the EPA, nor does the EPA endorse trade names or recommend the use of commercial products mentioned in this document.



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Key Definitions & Acronyms Used in this Document

Atlanta-Sandy Springs-Alpharetta Metropolitan Statistical Area (Atlanta MSA): the 29-county geographic area as defined by the U.S. Census 2020 MSA population. A list of MSAs eligible to participate in the Climate Pollution Reduction Program can be found in Appendix 15.2 of the EPA's *CPRG: Formula Grants for Planning, Program Guidance for States, Municipalities, and Air Control Agencies.*

Atlanta Regional Commission (ARC): the regional planning and inter-governmental coordination agency for the 11-county Atlanta region. *ARC* serves as the lead agency for Climate Pollution Reduction Grant planning for the Atlanta Metropolitan Statistical Area (MSA).

Climate Pollution Reduction Grant (CPRG): a U.S. EPA program that provides $5 billion in grants to states local governments, tribes, and territories to develop and implement ambitious plans for reducing greenhouse gas emissions and other harmful air pollution. Authorized under Section 60114 of the Inflation Reduction Act, this two-phase program provides $250 million for noncompetitive planning grants, and approximately $4.6 billion for competitive implementation grants.

Comprehensive Climate Action Plan (CCAP): a narrative report that provides an overview of the CPRG planning grantee's significant GHG sources/sinks and sectors, establishes near-term and long-term greenhouse gas emission reduction goals, and provides strategies and identifies measures that address the highest priority sectors to help the grantee meet these goals.

Greenhouse Gas (GHG): a gas that traps heat in the earth's atmosphere, including carbon dioxide (CO), methane (CH4), nitrous oxide (N2O), and fluorinated gases such as hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride.

Priority Climate Action Plan (PCAP): a narrative report that includes a focused list of near-term, high priority, and implementation ready measures to reduce GHG pollution and an analysis of GHG emissions reductions. The *Atlanta MSA PCAP* was submitted to EPA in March 2024.

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This report is based on data, conditions, and other information that is generally applicable as of the date of publication, and the conclusions herein are based on that information. Background information and other data used and referenced in this report were accessed by ARC and created/provided by third parties. Opinions presented herein apply to the existing and reasonably foreseeable conditions at the time of ARC's assessment. Any evaluation of future scenarios involves inherent uncertainties and assumptions. Nevertheless, this document can be used as intended to inform actions most likely to reduce greenhouse gases and provide associated co-benefits to the Atlanta MSA.

1 Introduction

Across the Atlanta-Sandy Springs-Alpharetta Metropolitan Statistical Area (Atlanta MSA), as throughout the Southeast United States, communities are experiencing more frequent and intense storms, flooding, heat waves, droughts, and other impacts of climate change.[i] As the lead organization for the MSA's Climate Pollution Reduction Grants planning process, the *Atlanta Regional Commission* (ARC) takes seriously its responsibility to develop climate action plans that will set up the region and its individual communities to best mitigate greenhouse gas (GHG) emissions in conjunction with protecting human health, increasing economic mobility, and creating a competitive economy that benefits everyone.

This Atlanta MSA Comprehensive Climate Action Plan (CCAP) was developed as part of a U.S. Environmental Protection Agency (EPA) Climate Pollution Reduction Grant (CPRG) program, a four-year planning initiative authorized by the Inflation Reduction Act. It builds on the existing climate-related work of ARC, including the *Green Communities* program, *Livable Centers Initiative*, and the ongoing transportation planning and policy work undertaken by the ARC *Metropolitan Transportation Plan*. It also builds on the climate, clean energy, and sustainability work of many of metro Atlanta's local governments. This CCAP, hereafter referred to as the **Metro Atlanta Climate Action Plan (MACAP),** is intended to serve as a menu of options for local governments, businesses, and residents throughout the region to reduce GHG emissions and create a more sustainable, resilient, and economically competitive future.

1.1 CPRG Overview

The CPRG program provides $5 billion in grants to states, local governments, tribes, and territories to develop and implement ambitious plans for reducing GHG emissions and other harmful air pollution. Authorized under Section 60114 of the Inflation Reduction Act, this two-phase program provides $250 million for noncompetitive planning grants (of which $1 million was awarded to ARC) and approximately $4.6 billion for competitive implementation grants. Phase 1 of the CPRG program provides flexible support to states, local governments, tribes, and territories at all stages of climate planning and implementation process. Planning grant recipients have used the funding to design climate action plans that incorporate measures to reduce GHG emissions in six key sectors: electricity generation/consumption, industry, transportation, buildings, agriculture/natural and working lands, and waste management. ARC applied to be the lead agency for the Atlanta MSA CPRG Phase 1 planning and received its planning grant award on August 28, 2023. ARC must submit the following deliverables to EPA:

- *Priority Climate Action Plan* (PCAP)[ii] – submitted March 1, 2024
- Comprehensive Climate Action Plan (CCAP) – due December 1, 2025
- Status Report at the end of the 4-year grant period – due Fall 2027

Through the grant, EPA seeks to achieve three broad objectives for Phase 1:

- Tackle climate pollution while supporting the creation of good jobs and lowering energy costs for families and individuals,
- Accelerate work to empower community-driven solutions, and,
- Deliver cleaner air by reducing air pollution in places where people live, work, play, and go to school.

The MACAP, as further presented in the sections below, consists of several key components, including a comprehensive GHG inventory, projections for GHG emissions, clearly defined GHG reduction targets, specified measures for GHG reduction, and a thorough benefits analysis covering the entire geographic scope and population addressed by the plan.

The final Status Report, due in 2027, will include information about the implementation status of GHG reduction measures included in the PCAP and CCAP, relevant updates to CCAP analyses and projections, and any next steps or future needs for funding or staffing.

Developing the PCAP, CCAP, and final Status Report require interagency and intergovernmental coordination, and stakeholder and community engagement. Section 1.3, "Approach to Developing the MACAP," describes ARC's approach to coordination and engagement for the development of this plan.

1.2 MACAP Purpose and Scope

The MACAP is the second required deliverable to EPA under Phase 1, the planning grant phase, building upon the work completed in the PCAP. It is a narrative report that includes a robust list of quantified GHG reduction measures based on reduction potential, feasibility, need for funding, co-benefits, and other factors. It also includes an analysis of co-benefits that could result from the implementation of the GHG reduction measures, including reduction of other air pollutants, lowered costs, and improved public health.

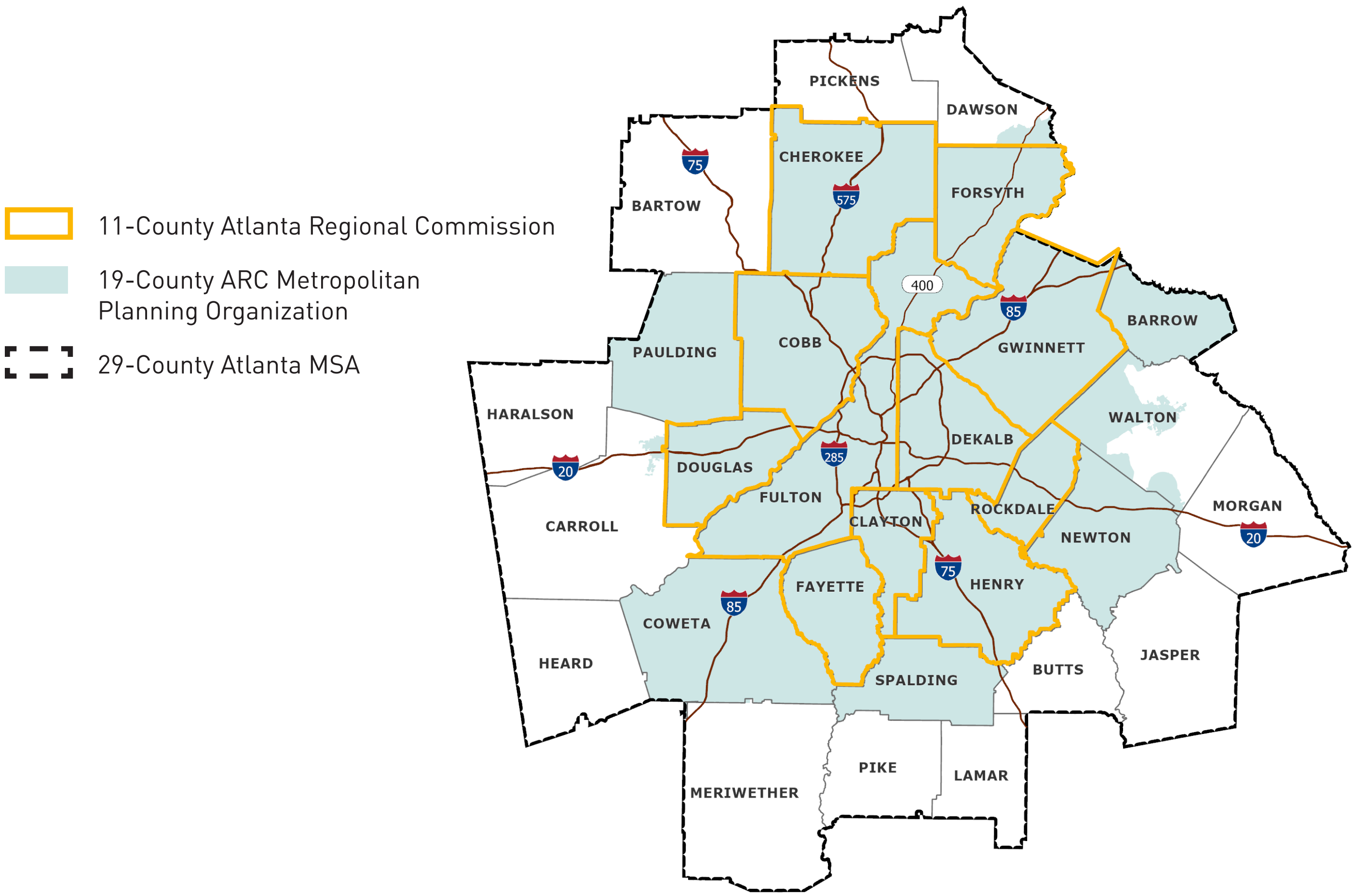
EPA requires multiple elements be included in this plan:

- GHG Inventory
- GHG Emissions Projections
- GHG Reduction Targets
- Quantified GHG Reduction Measures
- Review of Authority to Implement
- Intersection with Other Funding Availability
- Benefits Analysis
- Workforce Planning Analysis

The MACAP also supports investment in policies, practices and technologies that reduce emissions, create high-quality jobs, spur economic growth, and enhance the quality of life for all those who live, work, and play in the Atlanta MSA.

This plan applies to the Atlanta MSA, shown in Figure 1. The MSA consists of 29 counties and 150 municipalities. With a U.S. Census Bureau-estimated population of 6,411,149 as of July 1, 2024[iii], the MSA represents 57 percent of Georgia's population. It covers the spectrum of community types, from its urban core to the surrounding suburban counties and an outer ring of more rural towns and counties.

Figure 1: Map of the Atlanta MSA



ARC is the regional planning and inter-governmental coordination agency for the 11-county Atlanta region, as well as the federally-designated Metropolitan Planning Organization for the 19-county region. ARC helps the region's leadership focus attention, collaboration, and resources on critical issues affecting our collective future. The agency is well accustomed to working with varying geographies to address regional issues and has brought its experience convening diverse perspectives to develop this MACAP with strategies that will be effective across the MSA.

1.3 Approach to Developing the MACAP

This plan is built upon the existing climate-related work of ARC, including the Green Communities program, Livable Centers Initiative, the Regional Transportation Electrification Plan, and the ongoing transportation planning and policy work outlined in the 2025 Metropolitan Transportation Plan (MTP). The MACAP's foundation also includes transportation, community, economic, and natural resources, and sustainability work of the

Cartersville-Bartow Metropolitan Planning Organization and the following regional commissions: Georgia Mountains, Northeast Georgia, Northwest Georgia, and Three Rivers Regional Commissions, as well as the many local governments within the MSA. In February 2024, ARC completed the MTP process required by law. The MTP is a long-range blueprint that details the investments that will be made through 2050 to ensure metro Atlanta's future success and improve the region's quality of life. Three of the four near-term initiatives outlined in the plan have climate-mitigating impacts:

- Mobility plans addressing freight, electrification, and access to health services, among others;
- Environmental plans related to carbon reduction and GHG emissions;
- Understanding disruptive and transformative technologies.

In addition to ARC's climate-related plans, the MACAP process analyzed GHG inventories and GHG mitigation strategies from several local government plans as well as Drawdown Georgia, a statewide initiative working to catalyze a Georgia beyond carbon. The local government plans and initiatives reviewed include:

- City of Atlanta Clean Energy Plan
- City of Atlanta Climate Action Plan
- City of Chamblee Sustainability Plan
- City of Decatur Clean Energy Plan
- City of Decatur 2020 Strategic Plan
- City of Woodstock 2020 Sustainability Plan
- Cobb County Sustainable Practices Policy
- DeKalb County Clean Energy Plan
- Fulton County Sustainability Plan
- Gwinnett County Sustainable Community Policies

Development of the MACAP highlights programs and initiatives that support economic growth and positive community outcomes across the region. This follows guidance from EPA's CPRG program. The plan also emphasizes measures and actions that:

- Have existing authority to implement;
- Have clear co-benefits; and
- Are ready for implementation.

The MACAP includes measures that could be scaled to benefit multiple communities throughout the MSA. The intention of this plan is to be an all-encompassing roadmap that provides necessary ambiguity that allows for local adaptations regarding projects that can help reduce GHGs, improve carbon sinks, and provide additional benefits. The inclusion of or reference to specific projects does not favor specific projects over others that may not be included or referenced.

ARC used feedback from a series of online stakeholder webinars, one-on-one conversations with stakeholders, existing community events, and online surveys to inform this plan. Other state agencies and local jurisdictions provided input and shaped the MACAP as well. ARC also collaborated with the Georgia Environmental Protection Division (EPD) Air Protection Branch to align goals and avoid duplication of actions since EPD is leading the State's CPRG effort. A more comprehensive description of engagement activities that have supported the development of this plan can be found in the Stakeholder Engagement Activities Summary in Appendix A.

2 Greenhouse Gas Inventory

ARC's comprehensive GHG inventory quantifies GHG emissions within the 29-county Atlanta MSA for 2005, 2010, 2015, 2020, and 2022, using 2005 as the base year for tracking GHG reduction targets can be found in Appendix B. The inventory captures direct GHG emissions from the Commercial, Residential, Industry, Transportation, and Agriculture sectors, and indirect GHG emissions associated with electricity consumption in the Commercial, Residential, and Industry sectors. While data constraints prevent direct inclusion of the Waste and Materials Management sector, its GHG emissions are included for reference and estimated to be accounted for within the Commercial and Industry sectors. GHG emission sinks that absorb carbon emissions, categorized by EPA as "Natural and Working Lands," are referred to in this plan as the "Trees and Greenspace" sector. GHG emissions for all sectors are reported in both million metric tons of each GHG and in million metric tons of carbon dioxide equivalent (MMT CO_2e).

2.1 Inventory Methodology

Data for the 29-county Atlanta MSA GHG emissions inventory was primarily sourced from Drawdown Georgia's GHG Emissions Tracker and EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990-2022. [iv]

Drawdown Georgia's Emissions Tracker provides GHG estimates based on publicly available, state-level data downscaled to the county level. This downscaling is achieved by applying local indicator variables to statewide emissions data. Drawdown Georgia's dataset was chosen for the Atlanta MSA inventory because its methodology incorporates diverse indicator variables which yield more accurate county-level emission estimates. Key indicator variables include population and housing characteristics from the Census Bureau's American Community Survey, employment information from the Census Bureau's Quarterly Workforces Indicators dataset, vehicle miles traveled from the U.S. Department of Transportation, forest coverage from the National Land Cover Database, and agriculture crop harvests and animal counts from the Department of Agriculture's Census of Agriculture. Specific methodologies and downscaling algorithms are described in Drawdown Georgia's Local GHG Emissions Tracker Technical Documentation for each economic sector.[v]

The Drawdown Georgia dataset includes GHG emissions for the Consumed Electricity, Commercial, Residential, Industry, Transportation, Agriculture, and Forestry sectors. Consumed Electricity sector emissions specifically reflect Georgia's electricity consumption within the Commercial, Residential and Industry sectors. Although the Waste and Materials Management sector is not reported as a distinct category by Drawdown Georgia, its emissions are integrated within the Commercial and Industry sectors. For reference, estimated Waste and Materials Management sector emissions are included but not added to the total emissions sums in Table 1. These estimates were calculated by applying Atlanta MSA population shares to Waste and Materials Management sector data extracted from EPA's 1990-2022 GHG emissions inventory for Georgia. Greenhouse gas emissions sinks within Drawdown Georgia's Forestry sector are captured in the Trees and Greenspace sector in Table 1.

Drawdown Georgia GHG estimates are provided in metric tons of carbon equivalent (MT CO_2e), which were then converted to MMT CO_2e for the purposes of this plan. To disaggregate CO_2e into individual gases, statewide gas proportions for each sector were calculated using data from EPA's 1990-2022 inventory for Georgia and global warming potentials (GWP) as specified in the Code of Federal Regulations Equation A-1 in 40 CFR Part 98.[vi] These proportions were then applied to Atlanta MSA emissions extracted from the Drawdown Georgia dataset.

The following GHGs are included in this GHG emissions inventory:

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur Hexafluoride (SF_6)
- Nitrogen Trifluoride (NF_3)

Specific inventory years were chosen to provide a comprehensive analysis of sector-based GHG emissions trends in the Atlanta MSA. The year 2005 was selected as the base year for tracking GHG emissions reduction targets, aligning with EPA's recommendations to use 2005 where data are available. To effectively bridge the gap between 2005 and more recent data, 2010 and 2015 were included as interim years, offering valuable insights into emissions trends over time. Emissions during the unique period of the COVID-19 pandemic were captured by selecting 2020, providing a snapshot of the impact of the pandemic on the Atlanta MSA's GHG emissions. Finally, 2022 represents the most recent year for which complete data was available, ensuring the Atlanta MSA inventory reflects the latest possible emissions status.

Further information on the methodology of the Atlanta MSA's comprehensive GHG inventory can be found in the GHG Inventory Technical Support Document included as Appendix B of this plan.

2.2 Inventory Results

This section provides an overview of the Atlanta MSA GHG inventory for the years 2005, 2010, 2015, 2020, and 2022. The full inventory in Appendix B includes emissions data for major economic sectors, expressed in both metric tons of each gas and metric tons of CO_2e.

Table 1 summarizes GHG emissions in MMT CO_2e by economic sector for each inventory year, along with the calculated gross and net total emissions. Gross total emissions represent the sum of all source sectors (Commercial, Residential, Industry, Consumed Electricity, Transportation, and Agriculture). Net total emissions additionally account for carbon sequestration provided by the Trees and Greenspace sector, which acts as a GHG sink.

The Consumed Electricity sector represents indirect GHG emissions resulting from electricity consumed within the Commercial, Residential, and Industry sectors. While presented as a standalone sector in Table 1 for clarity on its overall contribution, its emissions are distributed among the end-use sectors in certain analyses. GHG emissions from the transportation sector reflect only surface transportation sources, including on-road passenger vehicles, trucks, and buses.

Table 1: Atlanta MSA GHG Inventory Emissions by Sector (MMT CO_2e)

Sector	2005 (Base Year)	2010	2015	2020	2022
Commercial	1.93	2.20	2.02	1.91	2.09
Residential	4.61	5.27	4.48	4.74	5.30
Industry	2.4	2.41	2.58	2.75	2.66
Consumed Electricity [1]*	51.69	50.85	38.60	27.92	30.92
Transportation	28.10	26.81	28.91	28.90	33.24
Agriculture	0.86	0.75	0.76	0.73	0.73
Waste and Materials Management [2]*	3.12	4.36	4.21	4.85	4.42
Gross Total Emissions	**89.61**	**88.30**	**77.37**	**66.95**	**74.95**
Trees and Greenspace	-4.87	-4.67	-5.32	-5.10	-5.20
Net Total Emissions	**84.75**	**83.63**	**72.04**	**61.85**	**69.75**

[1] Consumed Electricity represents indirect GHG emissions associated with electricity purchased and used within Commercial, Residential, and Industry sectors.

[2] Waste and Materials Management sector values are included for reference only. Values were calculated from waste facilities in the Commercial and Industry sectors and are excluded from Total Emissions.

Visualizations of these inventory results are presented in Figures 2 through 5. Figures 2 and 3 illustrate the percentage distribution of GHG emissions across sectors for 2005 and 2022. Figure 2 incorporates Consumed Electricity within the Commercial, Residential, and Industry sectors, showing Transportation as the largest contributor in 2005 (31%) and 2022 (44%). Figure 3 separates Consumed Electricity from the end-use sectors, highlighting its significant share of 58% in 2005 and its reduction to 35% in 2022, while Transportation's share increases from 31% to 37% over the same period.

Figure 2: Atlanta MSA 2005 and 2022 GHG Emissions by Economic Sector (Consumed Electricity within Sectors)

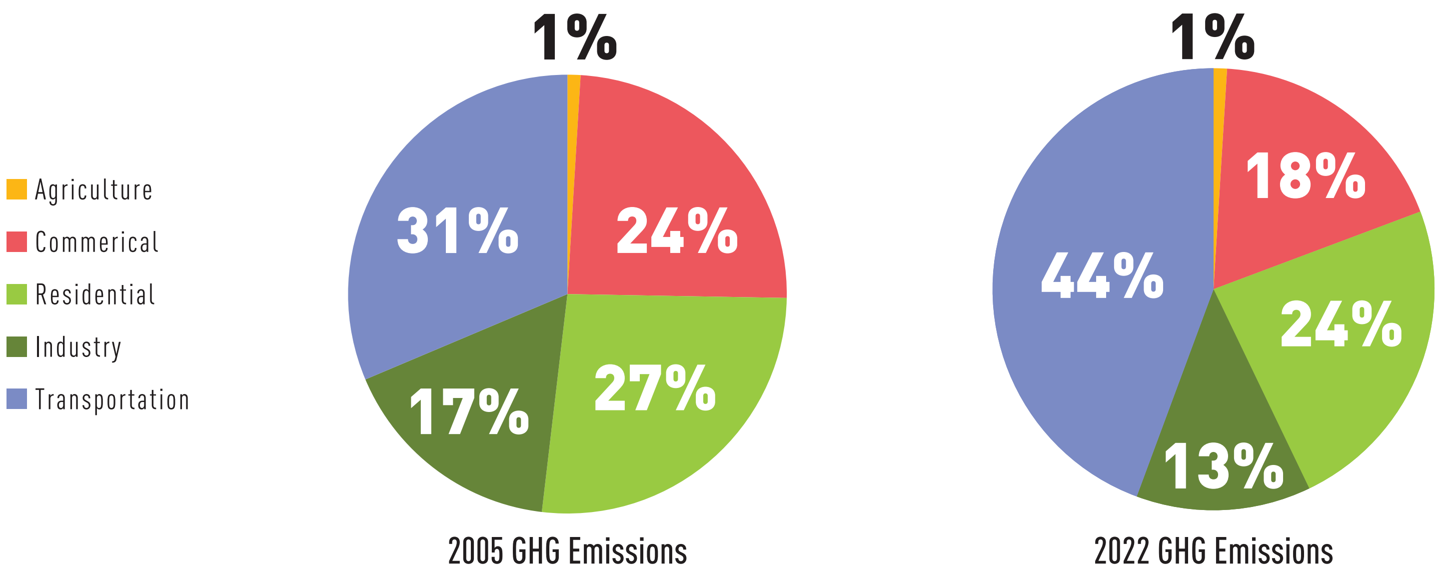
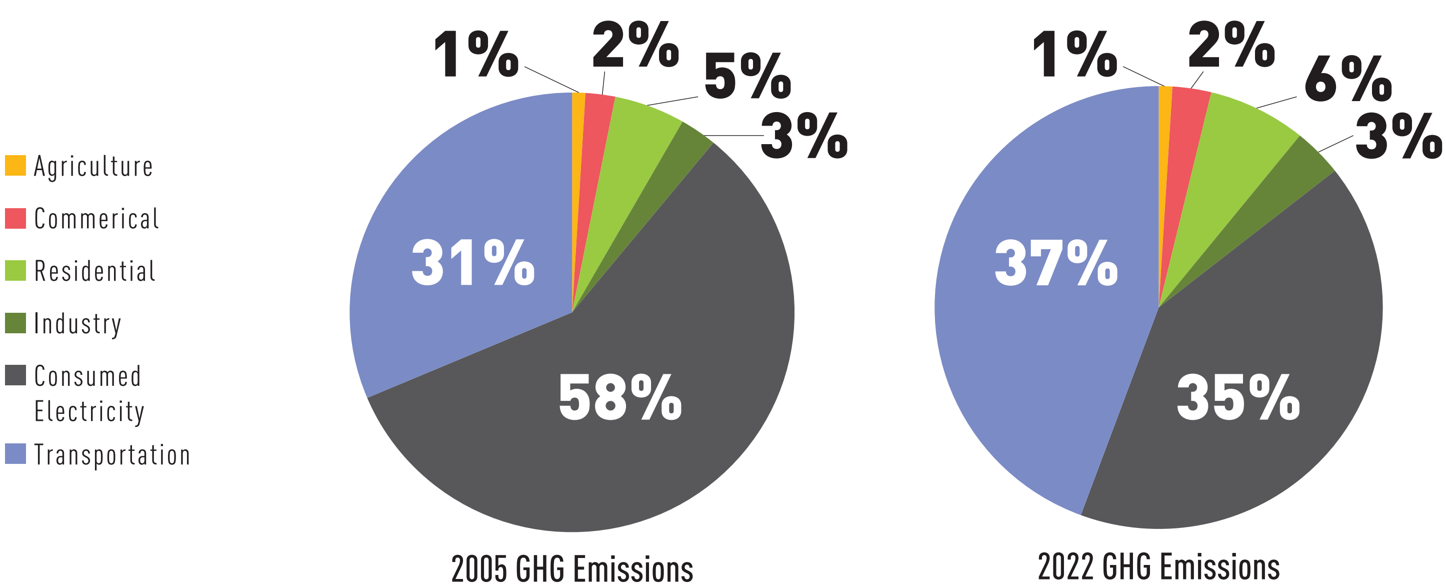


Figure 3: Atlanta MSA 2005 and 2022 GHG Emissions by Economic Sector (Consumed Electricity Seperate)



Figures 4 and 5 provide stacked bar charts for 2005 and 2022, respectively, detailing the breakdown of emissions from Consumed Electricity versus other emissions within the Commercial, Residential, and Industry sectors. In 2005, Consumed Electricity accounted for 38% of Commercial, 37% of Residential, and 24% of Industry sector emissions. In 2022, these proportions shifted slightly to 38% for Commercial, 40% for Residential, and 22% for Industry.

Figure 4: Atlanta MSA 2005 Baseline GHG Emissions by Economic Sector (MMT CO_2e)

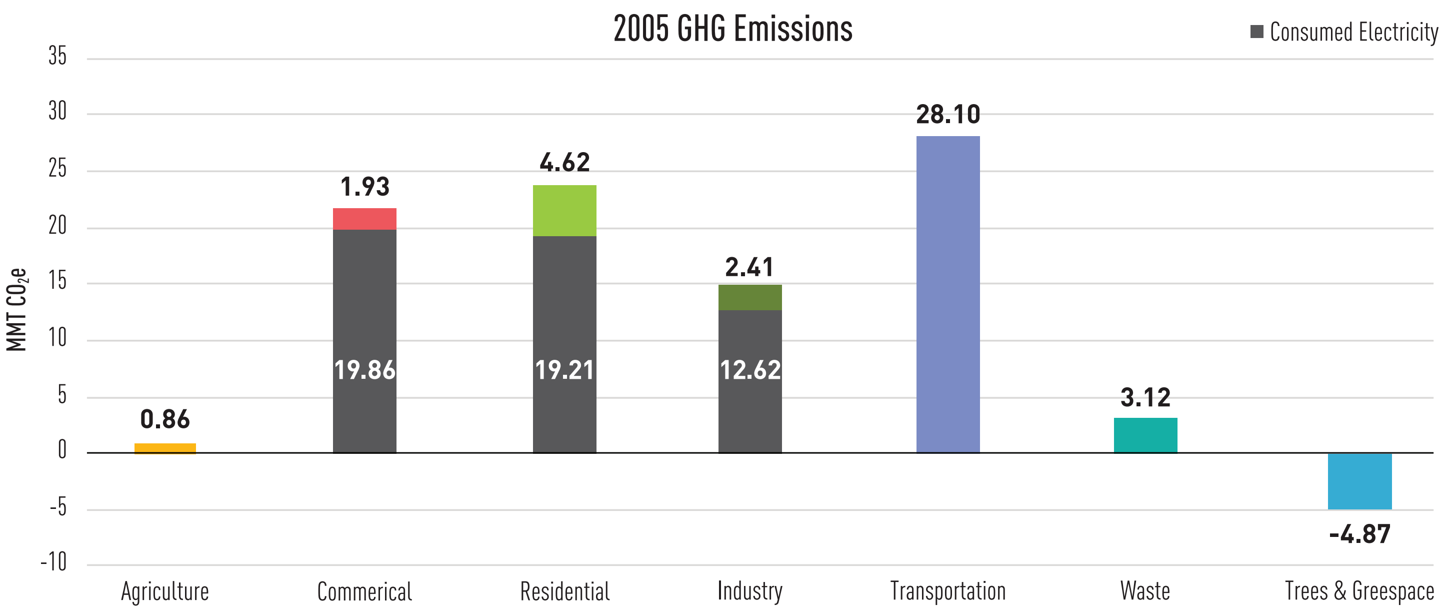
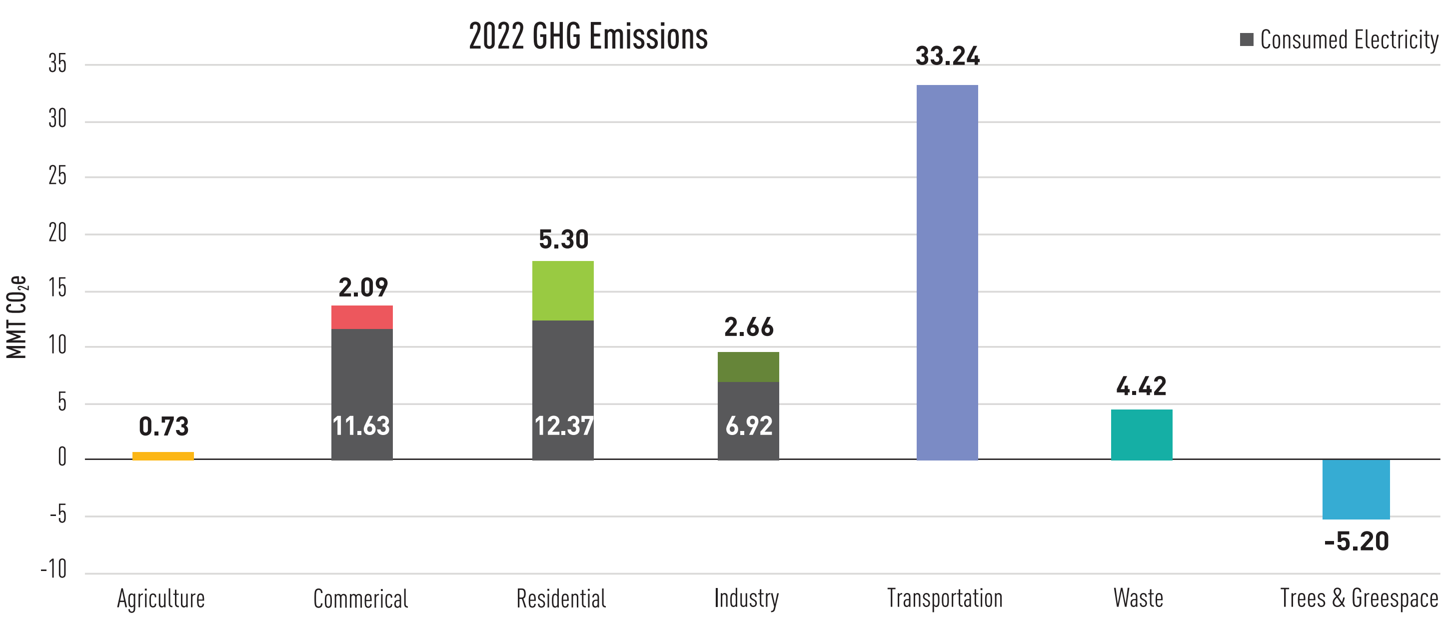


Figure 5: Atlanta MSA 2022 GHG Emissions by Economic Sector (MMT CO_2e)



2.3 Inventory Trends and Analysis

An assessment of the Atlanta MSA GHG inventory from 2005 to 2022 reveals significant shifts in emissions patterns, driven by a combination of policy, economic, and demographic shifts.

Economy-wide Trends

Overall, gross total GHG emissions for the Atlanta MSA show a notable decrease from 89.61 MMT CO_2e in 2005 to 74.95 MMT CO_2e in 2022. The 2020 GHG emissions (66.95 MMT CO_2e) represent a significant drop from 2015 levels (77.37 MMT CO_2e), likely influenced by the global COVID-19 pandemic and associated regional economic slowdowns and reduced activity. Post 2020, emissions show an increase by 2022, likely a result of the post-pandemic recovery in economic and social activities.

Sector-based Trends

Between 2005 and 2020, emissions from **Consumed Electricity** show a steep decline among sectors, falling by 46%. A significant reduction of 39% was observed from 2010 to 2022 (Figure 6). This substantial decrease is attributable to a combination of decarbonization of the electricity grid through increased adoption of cleaner energy sources, energy efficiency improvements in buildings and industries, and potentially shifts in consumption patterns.[vii] Figure 6 illustrates a consistent downward trend in electricity-related emissions across the Commercial, Residential, and Industry sectors from 2005 to 2020, with a slight uptick in 2022.

Figure 6: Atlanta MSA 2005-2022 GHG Emissions for Consumed Electricity in Commercial, Residential, and Industry Sectors

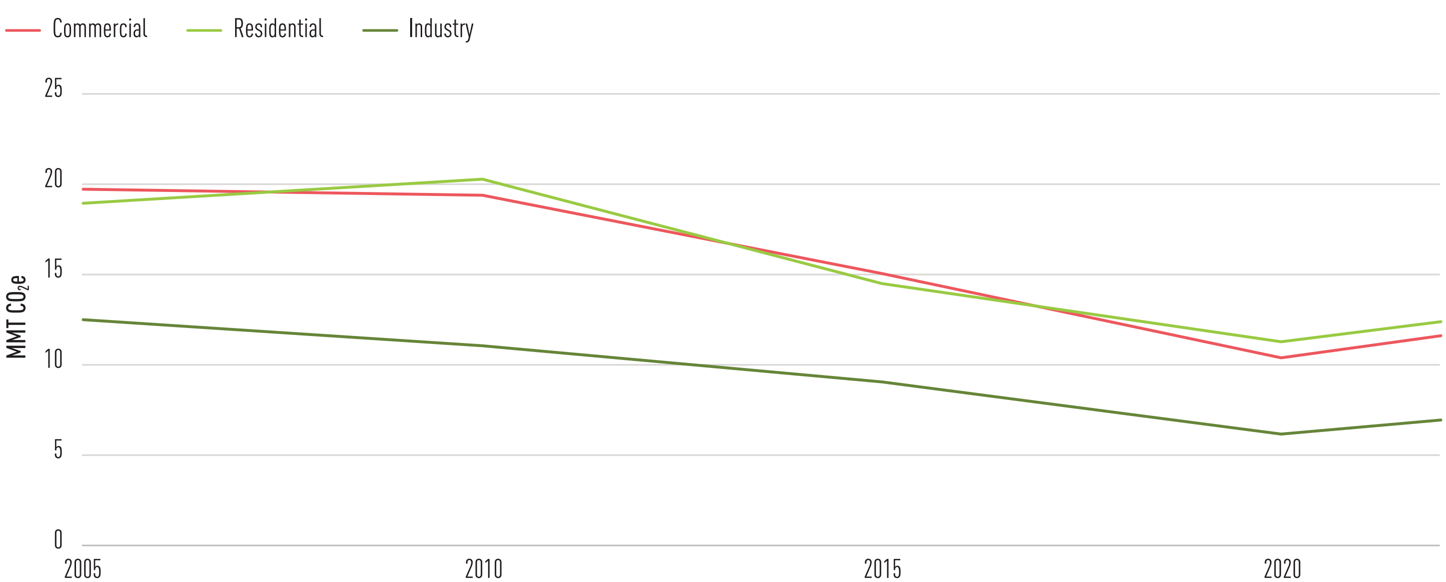
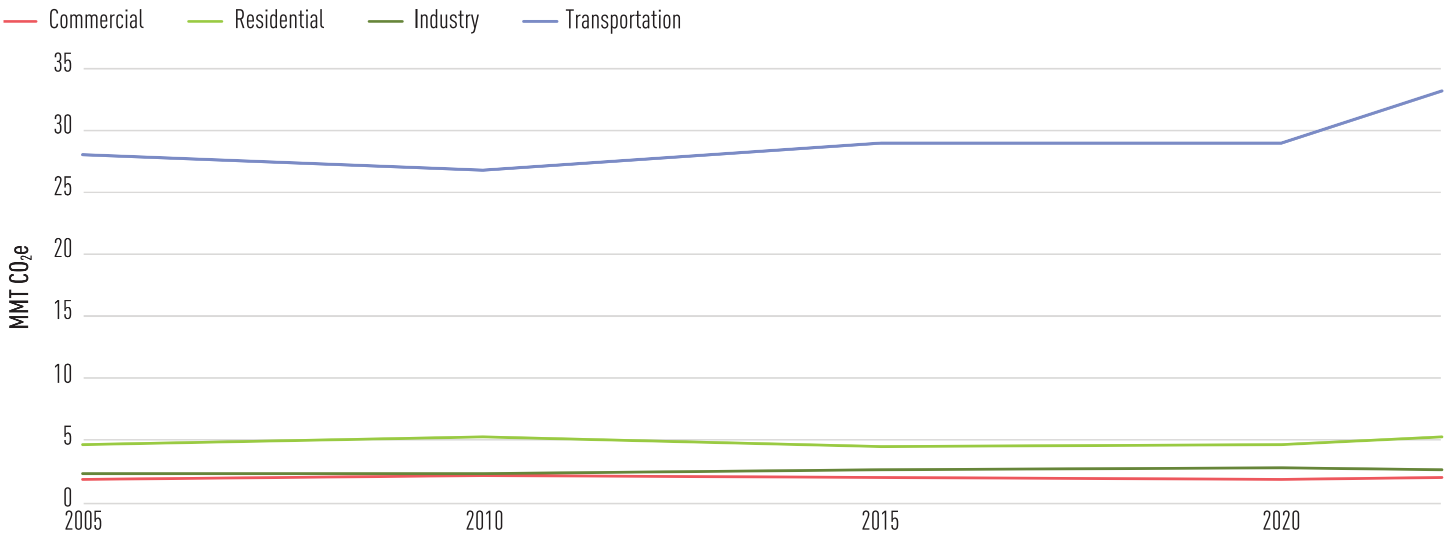


Figure 7 highlights GHG emissions for the Commercial, Residential, Industry, and Transportation sectors, excluding electricity consumption related emissions. Emissions in the **Commercial sector** decreased by 1% from 2005 to 2020, then increased by 10% between 2020 and 2022 (Figure 7). This pattern suggests an initial period of stability, followed by a rebound consistent with post-pandemic economic recovery and growth in commercial activities.[viii]

Figure 7: Atlanta MSA 2005-2022 GHG Emissions for Commercial, Residential, and Industry Sectors (Excluding Consumed Electricity)



The **Residential sector** experienced fluctuating emissions trends over the inventory period (Figure 7). From 2005 to 2010, emissions increased by 14%, followed by a 15% decline between 2010 and 2015. Emissions then rose again, increasing by 6% from 2015 to 2020. Overall, this produced a modest net increase of 3% between 2005 and 2020. However, the most recent period shows a sharper upward trend, with residential emissions increasing by 12% from 2020 to 2022. These shifts likely reflect a combination of changing patterns in residential fuel use and housing growth in the Atlanta MSA.

The **Industry sector** experienced a 14% increase in emissions from 2005 to 2020, followed by a 3% decrease from 2020 to 2022 (Figure 7). The initial rise may reflect industrial expansion, consistent with growth in Georgia's manufacturing output between 2005 and 2020, while the subsequent decline post-2020 could indicate a shift towards more efficient practices within factories and processes, and/or a lingering impact of economic adjustments within the Atlanta MSA.[xi]

Transportation emissions have trended upward, rising 18% between 2005-2022 (Figure 7). While there was a slight decrease between 2005 and 2010, emissions rebounded with a 3% increase from 2005 to 2020 and a substantial 15% increase from 2020 to 2022. This post-pandemic increase suggests more than just a return to pre-pandemic travel patterns, but an increase in vehicle miles traveled, driven by demographic growth and economic activity in the Atlanta MSA, as well as a decrease in the use of public transit.

SPOTLIGHT

COVID-19 Shifts & Transportation Emissions in Metro Atlanta

The onset of the COVID-19 pandemic in 2020 brought an unprecedented shift in commuting patterns across the Atlanta metropolitan area. With much of the workforce transitioning to remote work, the region experienced a sharp reduction in travel demand.

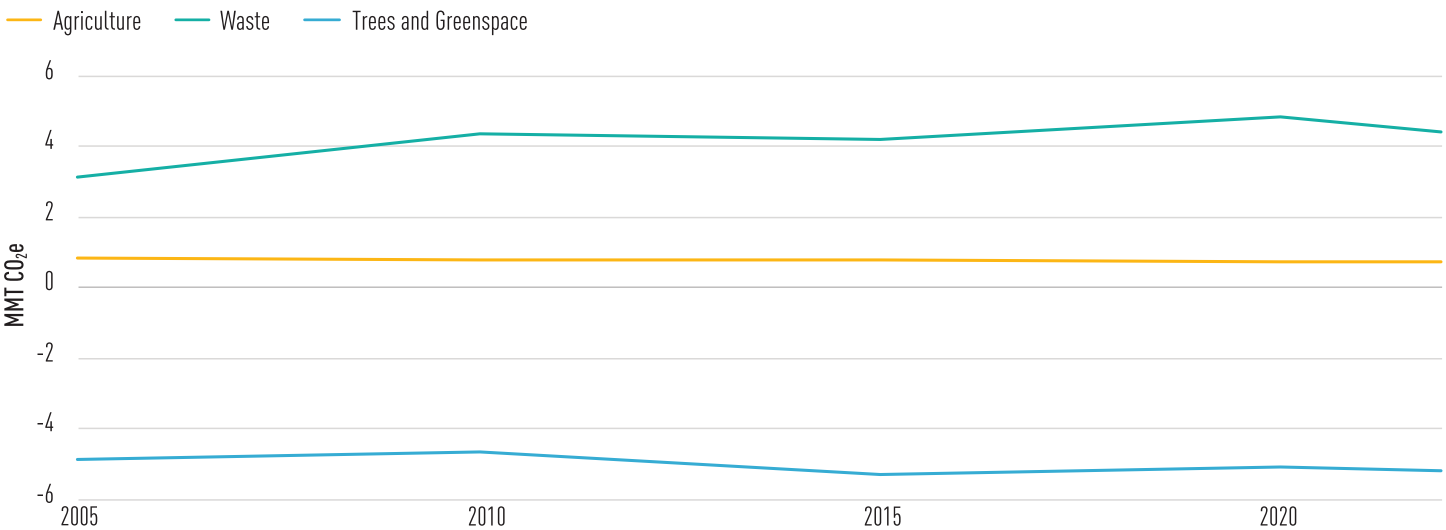
According to the Georgia Commute Options Annual Report, vehicle miles traveled (VMT)—a key measure of travel demand—fell by 13% compared to 2019, breaking a long-term trend of steady increases.[xii] This abrupt decline in daily commuting directly contributed to lower transportation-related greenhouse gas emissions, reflecting how quickly shifts in behavior can influence the region's carbon footprint.

By 2022, VMT levels had largely rebounded to those last seen in 2015, suggesting that as in-person activities returned, so too did much of the region's transportation emissions. At the same time, transit ridership remained below pre-pandemic levels, suggesting a greater reliance on private vehicles. Additionally, the pandemic dramatically accelerated the growth of e-commerce, reshaping freight patterns and fueling additional transportation emissions.[xiii]

According to results from a joint survey by the Owner-Operator Independent Drivers Association (OOIDA) Foundation and the American Transportation Research Institute (ATRI), residential deliveries surged as fleets shifted from long-haul freight to more local hauls of 100 miles or less, increasing the intensity and complexity of last-mile operations.[xiv] Even after the peak of the pandemic, many of these changes have persisted. ATRI's 2025 report An Analysis of the Operational Costs of Trucking found that non-fuel operating costs rose to a record $1.779 per mile in 2024, reflecting persistent pressures from e-commerce-driven demand for more frequent and flexible deliveries.[xv]

Together, the combined effects of reduced transit use, rebounding travel demand, and booming delivery services illustrate how post-pandemic shifts have reshaped transportation emissions in Metro Atlanta, undoing some of the temporary gains of early 2020.

Figure 8: Atlanta MSA 2005-2022 GHG Emissions for Agriculture, Waste, and Trees and Greenspace Sectors



Agriculture emissions decreased by 16% from 2005 to 2020, with a slight 1% increase from 2020 to 2022 (Figure 8). Within the Atlanta MSA, this downward trend is likely driven less by changes in farming practices and more by changes in land use. A 2017 Conservation Innovation Grant (CIG) report by the Conservation Fund found that most counties in the 30-county region surrounding Atlanta experienced farmland losses of more than 25% in recent years.[xvi] This decline in farmland suggests that conversion of agricultural land to residential or commercial development is a primary factor behind reduced agricultural emissions in the region. To address this trend, the Conservation Fund developed a buy-lease-protect-sell model for a revolving fund designed to permanently protect farmland from development. Initial investments began in 2019, with expanded funding secured in fiscal years 2020–2021 to continue efforts aimed at preserving critical farmland in the Atlanta metropolitan area.[xvii]

Emissions from the **Waste and Materials Management sector** experienced a significant 56% increase between 2005 and 2020 (Figure 9), likely reflecting the impacts of population growth, higher consumption, and shifts in waste generation patterns across the region.[xviii] Food residuals alone make up about 12% of Georgia's annual landfill waste, with nearly half of that amount coming from the Atlanta region. However, a 9% decrease in emissions was observed from 2020 to 2022, a reversal that may align with waste mitigation strategies such as landfill methane capture or enhanced recycling and circular economy efforts in the state.[xix] [xx]

The **Trees and Greenspace sector** functions as a carbon sink – absorbing GHGs rather than emitting them – showing negative emissions values across all inventory years (Figure 9). Values remained relatively stable, with a 6% increase in carbon absorption from -4.87 MMT CO_2e in 2005 to -5.20 MMT CO_2e in 2022. The modest change suggests that the region has largely maintained and is modestly improving its sequestration capacity. National Land Cover Database (NLCD) shows measurable shifts in land cover, highlighting development pressures placed on tree canopy and greenspace. [xxi] Yet, localized urban tree canopy assessments within the Atlanta MSA reveal that tree canopy remains high in some areas and has even increased in recent years.[xxii] [xxiii] [xxiv] [xxv] These findings highlight the importance of continued protection and thoughtful management of trees and greenspace, which serve as a significant natural carbon sink.


Georgia Forestry Foundation
Composting
Lower Energy Bills
Rooftop Solar
More of this
Parks & Forests
LET'S TALK CLIMATE CHANGE
Better
Air Quality
Quick
Strengthen
Enhance
Love
Convenient
Approve
Healthier
Value
Clean

3 Near-Term & Long-Term GHG Reduction Targets

The Atlanta MSA aims to reduce economy-wide GHG emissions by 50% below 2005 baseline GHG emissions levels by 2035, and 80-85% below 2005 levels by 2050, getting the region to near net-zero carbon emissions. The year 2005 was selected as the base year for tracking near- and long-term GHG reduction targets, as it aligns with EPA's recommendations and represents the earliest year available in the Drawdown Georgia dataset. Additionally, the availability of comprehensive GHG data for the Atlanta MSA in that year makes it a feasible choice for this plan. While this plan establishes region-wide reduction goals rather than sector-specific targets, ARC is launching a Transportation Carbon Reduction Plan in early 2026 that will build on the MACAP framework and focus on strategies to reduce transportation-related emissions and identify safe, reliable, and cost-effective policies for local governments and agencies.

Table 2: Atlanta MSA GHG Reduction Targets

Year	GHG Target
2035	Reduce economy-wide emissions 50% below 2005 emissions
2050	Reduce economy-wide emissions 80-85% below 2005 emissions ("Near Net Zero")


Enhance
Climate change and resilience
Better
Parks & Forests
Air Quality
Recycling & Reuse
Electric Bikes
University
Commission

4 Business-As-Usual GHG Emission Projections

This section outlines the projected GHG emissions for the Atlanta MSA under a "Business-As-Usual" (BAU) scenario. These projections serve as a baseline to understand future emissions trajectories without the implementation of proposed emissions reduction measures outlined in Section 6 of this plan. Projection results are presented as an economy-wide forecast, with values extending to both 2035 and 2050 to align with the near- and long-term GHG reduction targets for the Atlanta MSA as defined in Section 3.

The BAU projections results serve as a baseline to assess the potential impact of the reduction strategies outlined in Section 5. Projections are presented as a single emissions trajectory over time, consistent with the region's near- and long-term reduction targets (Figure 9, Table 3).

Figure 9: Atlanta MSA Economy-Wide Business-As-Usual GHG Projections, 2025 - 2050, Georgia Tech

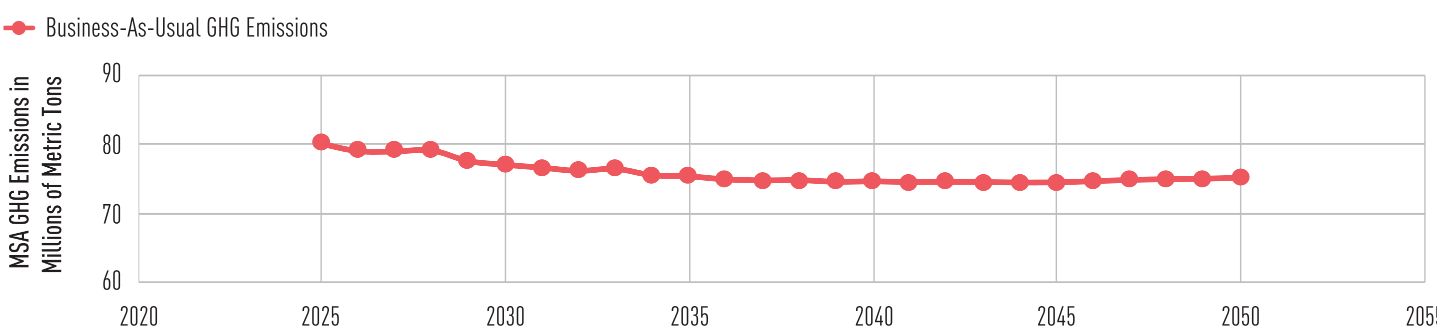


Table 3: Business-as-Usual Economy-wide Projections, US EPA National Emissions Inventory

Sector	2005 Emissions (MMT CO_2e)	2022 Emissions (MMT CO_2e)	2035 Short-Term BAU (MMT CO_2e)	2050 Long-Term BAU (MMT CO_2e)
Economy-wide Emissions	84.75	69.75	75.28	75.10

4.1 Business-As-Usual Projections Methodologies

The BAU emission projections for the Atlanta MSA were developed by Georgia Tech, using the RMI Energy Policy Simulator (EPS) model framework, drawing specifically on the Federal Policy Repeal and Rollback scenario.[xxvi] This scenario was selected by the research project team as the most likely future trajectory for both the U.S. and Georgia, reflecting the potential rollback or repeal of key provisions of the Inflation Reduction Act (IRA) and associated EPA rules.[xxvii] The Repeal and Rollback scenario removes or scales back federal incentives and standards related to clean vehicles, electricity generation, carbon capture, and methane emissions. Additional details on the assumptions underlying this scenario are documented in the EPS repeal scenario technical documentation.[xxviii] The Atlanta MSA BAU projection is based on a downscaled EPS Georgia statewide scenario. Details about how the downscaling was achieved can be found in Appendix C.

5 Greenhouse Gas Reduction Measures Overview

The Metro Atlanta Climate Action Plan includes **24 GHG reduction measures** across the Transportation, Buildings (Residential, Commercial), Industry, Energy, Waste & Materials, and Trees & Greenspace sectors, as well as one cross-sector measure. (Table 4) The Agriculture sector represents only 1% of the MSA's GHG emissions, as such there are no measures for that sector.

These measures are not inclusive of all GHG reduction actions that may be taken by those within the MSA but represent measures that are the most **technologically and economically feasible** now, while leading to **near net-zero GHG emissions by 2050.** Descriptions of quantification methods, including assumptions and methods used by Georgia Tech to calculate the GHG reduction potential of each measure can be found in Appendix D.

Table 4: Summary of Atlanta MSA's Greenhouse Gas Reduction Measures by Sector

		GHG Emissions Reductions in 2035 Compared to the BAU (MMT CO_2e)	GHG Emissions Reductions in 2050 Compared to the BAU (MMT CO_2e)
Transportation			
T1. Light-Duty Electric Vehicles, EV Chargers, and Grid Balancing	Encourage a shift to light-duty electric vehicles from internal combustion engines, increase the installation of EV charging stations, and use EVs to help balance the electric grid.	4.80	5.68
T2. Electrify Fleets	Transition medium- and heavy-duty vehicle fleets to electric vehicles with similar performance capabilities, especially for short-haul and local applications.	2.85	3.68
T3. Reduce Vehicle Miles Traveled	Decrease vehicle miles traveled by enabling greater use of different modes of transportation, such as walking, biking, transit, teleworking, carpooling, and public transit.	0.66	2.23
Total Transportation Sector GHG Emissions Reductions		**8.31**	**11.59**

Buildings – Residential & Commercial

R1. Home Energy Efficiency	Retrofit existing homes to be more energy efficient through updating HVAC systems, switching to newer lighting and appliances, using cool roofing, sealing air ducts, increasing insulation, and other similar methods.	1.92	5.92
R2. Residential Energy Efficiency Codes & Green Building Standards	Support local governments in adopting more efficient residential energy codes and/or green building standards.	0.88	11.60
R3. Electrify Homes	Electrify existing homes by encouraging a switch from gas-powered appliances, water heaters, and HVAC systems to electric systems.	0.60	2.16
C1. Commercial and Multifamily Building Energy Efficiency	Retrofit existing commercial and multifamily buildings to be more energy efficient through updating HVAC systems, using geothermal HVAC, switching to newer lighting and appliances, using cool roofing, sealing air ducts, increasing insulation, and other similar methods.	0.60	3.55
C2. Commercial Energy Efficiency Codes & Green Building Standards	Support local governments in adopting more efficient commercial energy codes and/or green building standards.	0.57	11.00
C3. Electrify Commercial and Multifamily Buildings	Electrify existing commercial and multifamily buildings by encouraging a switch from gas-powered appliances, water heaters, and HVAC systems to electric systems.	0.04	1.98
Total Buildings Sector GHG Emissions Reductions		**4.61**	**36.21**

Industry

I1. Industrial Building Energy Efficiency	Retrofit existing industrial buildings to be more energy efficient through updating HVAC systems, using geothermal HVAC, switching to newer lighting, using cool roofing, and other similar methods.	0.04	0.26
I2. Electrify Industrial Buildings and Processes	Electrify existing industrial buildings by encouraging a switch from gas-powered systems and processes to electric systems and processes.	0.04	0.14
I3. Retrofit Industrial Processes and Equipment	Retrofit existing industrial processes and equipment to more energy efficient processes and systems.	0.68	1.59
I4. Decrease Non-CO_2 GHG Emissions	Decrease non-CO2 GHG Emissions through improved industrial processes.	0.13	0.45
I5. Convert Waste Heat to Energy or HVAC	Capture heat from industrial processes to provide HVAC and/or create electricity.	0.16	0.49
Total Industry Sector GHG Emissions Reductions		**1.04**	**2.93**

Energy

E1. Urban Scale Solar	Increase usage of "urban-scale" solar by installing solar on landfill and wastewater sites and community solar small-acreage sites.	0.02	0.70
E2. Rooftop Solar and Battery Systems	Increase installation of rooftop solar and battery storage systems.	0.09	2.80
E3. Electricity Demand Response	Adopt demand response actions in local government facilities, businesses, and homes by shifting energy use to off-peak times, using power strips, installing smart thermostats, and other similar methods.	-1.07	4.38
E4. Wastewater Gas-to-Energy	Capture biosolids & biogas at wastewater treatment plants for gas-to-energy creation.	0.25	0.66
E5. Landfill Gas-to-Energy	Capture methane at landfills for gas-to-energy creation.	0.07	0.60
Total Energy Sector GHG Emissions Reductions		**-0.64**	**9.15**

Waste & Materials			
WM1. Reduce Construction and Demolition Waste	Reduce construction and demolition waste by designing material-efficient buildings, promoting adaptive reuse of buildings, and deconstructing buildings to reuse and recycle their components rather than sending them to a landfill.	0.42	0.55
WM2. Increase Composting	Reduce the amount of food, yard, and tree waste that goes into landfills by composting.	0.12	0.30
Total Waste & Materials Sector GHG Emissions Reductions		**0.54**	**0.85**
Trees & Greenspaces			
TG1. Add Trees and Green Infrastructure	Increase tree canopy and vegetative coverage through afforestation and green infrastructure.	0.08	0.42
TG2. Restore and Protect Forests	Restore and protect temperate-climate working forests and urban tree canopies through improved forest management.	0.03	0.09
Total Trees & Greenspace Sector GHG Emissions Reductions		**0.11**	**0.51**
Cross-Sector			
CS1. Accelerate Adoption at the Local Level	Provide incentives and technical assistance to increase local government adoption of climate mitigating policies, ordinances, and programs.	0.65	2.90
Total Cross-Sector GHG Emissions Reductions		**0.65**	**2.90**
Total GHG Emissions Reductions Across All Sectors		**14.62**	**64.13**

Each GHG Reduction Measure includes the following information:

Description of the Measure, including relevant background information and specific actions that local governments, businesses, individuals, and others may take to implement the measure.

Geographic Scope of where the measure may be implemented.

Annual GHG Emissions Reductions in 2035 and 2050 that may be achieved through implementing the measure compared to the Business-As-Usual scenario. These reductions are expressed in million metric tons of carbon dioxide equivalent (MMT CO_2e). The **Annual Co-Pollutant Reductions in 2035 and 2050** that result in conjunction with reducing GHGs are also listed in thousand metric tons (Thousand MT) of all co-pollutants combined (CO, $PM_{2.5}$, PM_{10}, NO_x, SO_x, and VOCs). For details on co-pollutant reductions for each measure, see Appendix D.

Net Cost that may be required to implement the measure in 2035 and 2050, expressed in 2024 dollars per metric ton of CO_2e (2024$/MT$CO_2e$). To calculate the short-term costs of mitigating GHG emissions, economists estimate the up-front costs and divide by the number of tons of CO_2e emissions reduced. A positive number indicates costs and a negative number indicates savings.[xxix] More details about net costs can be found in Appendix D.

Primary Co-Benefits that may be achieved along with reducing GHG emissions through implementing the measure. Further details can be found in Appendix E.

Implementation Details, including **Key Implementation Partners**, example **Implementation Milestones and Timelines,** and potential **Metrics to Track Progress.**

The following information is provided under "Opportunities for Action" at the end of each sector:

Funding Opportunities examples that may be available to support implementation of the measure. Additional funding opportunities and further details can be found in Appendix F.

Technical Assistance & Additional Information available from local and national organizations. Further details can be found in Appendix G.

Recommended Policy Actions that decision makers and funders may take to help increase the rate of implementation and realization of benefits of the measure.

Examples of Successful Projects and Programs within the Atlanta MSA.

5.1 Transportation Sector GHG Emission Reduction Measures

Millions of people, services, and goods move through the Atlanta MSA through a variety of ways each day – private vehicles, commercial vehicles, public transit, electric scooters, bicycles, and on foot. There's no single solution to the region's transportation needs. Rather, a balanced approach is required to provide people with access to the places they live, work, and play.

The transportation sector contributes the largest amount of overall emissions in the Atlanta MSA at 44% of total emissions in 2022. These emissions largely result from combustion of fossil fuels in passenger, commercial, and public vehicles. Fuel combustion also results in harmful air pollutants, such as fine particulate matter and carbon monoxide, that represent ongoing public health challenges for communities nearest to roadways.[xxx]

The Transportation measures in this plan aim to reduce GHG emissions through three key methods:

T1. Light-Duty Electric Vehicles, EV Chargers, and Grid Balancing – Encourage a shift to light-duty electric vehicles from internal combustion engines, increase the installation of EV charging stations, and use EV batteries to help balance the electric grid.

T2. Electrify Fleets – Transition medium- and heavy-duty vehicle fleets to electric vehicles with similar performance capabilities, especially for short-haul and local applications.

T3. Reduce Vehicle Miles Traveled – Decrease vehicle miles travelled by enabling greater use of different modes of transportation, such as walking, biking, transit, teleworking, carpooling, and public transit.

Transportation T1 – Light-Duty Electric Vehicles, EV Chargers, and Grid Balancing

A typical passenger vehicle emits about 4.6 metric tons of CO_2 per year, varying based on a vehicle's fuel, fuel economy, and the number of miles driven annually.[xxxi] Additionally, motor vehicles are a leading source of air pollutants, such as ozone and fine particulate matter, that adversely impact public health, from increased susceptibility to cancers to severe respiratory illness. Promoting and enabling the widespread adoption of zero-emissions electric vehicles is an important step towards addressing climate change, improving air quality and public health, and creating a more resilient and economically advantageous future.

EV charging infrastructure is growing within the Atlanta MSA but is not always readily accessible outside of major corridors. Increasing the number of EV chargers that are available within the MSA supports the growing number of EV drivers and allays range anxiety fears that discourage some consumers from switching to EVs. Additionally, transitioning local government, transit, and commercial fleets to EVs will also require EV charging stations. Some of these chargers may be positioned and configured to allow for public charging as well, especially during times when they are not being used by public agencies.

The electric grid operates constantly in real-time, and the amount of electricity generated must always match the amount consumed otherwise the grid is not balanced. A grid imbalance can lead to power outages, equipment damage, and even large-scale blackouts. To balance the power grid both variability and unpredictability of both supply (such as fluctuations in renewable energy sources) and demand (which can change due to weather, time of day, and other factors) must be managed.[xxxii] At home, electric vehicles can be scheduled to charge overnight, a time of day where electricity usage is lower, helping to balance the grid and potentially paying lower utility rates. In the future, it may be possible for EVs to be used by utilities as distributed energy resources, providing power from their EV battery to the grid during times of peak demand and then scheduled to recharge when demand is lower.

Geographic Scope: Light-duty EVs can be effectively used throughout the entire MSA. EV charging installers should prioritize areas that are experiencing EV charging gaps. Utilities may opt to use EV batteries to balance the grid where and when it is most needed within their territories.

Annual GHG Emissions Reductions in 2035: 4.80 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 5.68 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 8.59 Thousand MT

Annual Co-Pollutant Reductions in 2050: 8.84 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: $222

Net Cost (2024$/MTCO$_2$e) 2050: $669

Co-Benefits: Improved Air Quality; Expanded Transportation Options; Better Health and Wellbeing; Lower Costs

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Transit Authorities; Schools & Universities; Businesses; Utilities; Individuals

Implementation Milestones and Timelines – *For individuals*, milestones may include securing EV financing; purchasing an EV; and installing a home EV charger, which may require upgrading the electrical panel. This process can take as little as a week to several weeks, depending on if an electrical panel upgrade it needed. *For fleet managers (businesses, schools & universities, transit authorities, local governments, etc.),* milestones may include securing funding; conducting a procurement process; purchasing light-duty EVs; and installing chargers, which may require upgrading electrical systems and running electricity to parking areas. This process can take as little as 1 – 2 months or as much as 1-2+ years, depending on budgetary, procurement, and electrical requirements.

Metrics to Track Progress – Number of light-duty EVs purchased; number and type of EV chargers installed

Transportation T2 – Electrify Fleets

The electrification of medium- and heavy-duty fleet vehicles to EVs with similar performance capabilities is a key strategy for organizations to reduce GHG emissions and promote a cleaner, more sustainable transportation system.[xxxiii] Fleet electrification can encompass a wide range of vehicles and equipment, such as maintenance vehicles, sanitation trucks, transit and school buses, heavy-duty and medium-duty delivery trucks, and construction equipment.

When transitioning fleets to EVs, it is important to upgrade the facilities and equipment needed to charge and maintain the EV fleet, as well as train fleet technicians to service the vehicles, if service is done in-house. Fleet EV chargers may be positioned and configured to allow for public charging as well, especially during times when they are not being used for operational needs.

Geographic Scope: Medium- and heavy-duty fleet EVs can be effectively used throughout the entire MSA, especially for short-haul and local applications.

Annual GHG Emissions Reductions in 2035: 2.85 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 3.68 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 7.31 Thousand MT

Annual Co-Pollutant Reductions in 2050: 7.07 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: $1,926

Net Cost (2024$/MTCO$_2$e) 2050: -$3,771 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Workforce Development

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Transit Authorities; Schools & Universities; Utilities; Businesses

Implementation Milestones and Timelines – Milestones may include securing funding; conducting a procurement process; purchasing EVs; training maintenance technicians; and upgrading the facilities and equipment needed to charge and maintain the EV fleet, which may require upgrading electrical systems and running electricity to parking areas. This process can take as little as a few months or as much as 1- 2+ years, depending on budgetary, procurement, facility upgrades and electrical requirements.

Metrics to Track Progress – Number of medium- and heavy-duty vehicles purchased

Transportation T3 – Reduce Vehicle Miles Traveled

Vehicle Miles Traveled (VMT) is defined as one vehicle traveling on a road for one mile. VMT is a metric used extensively in transportation planning to track the amount of travel for all vehicles in a geographic region over a given period of time, typically one year. VMT can be decreased by enabling greater use of different modes of transportation, such as walking, biking, teleworking, carpooling, and public transit. Reducing VMT is a key method to decreasing GHGs within the Atlanta MSA.

There are many ways to reduce VMTs, such as:

- Expanding access to micromobility options (e.g., scooters and bicycles)
- Incentivizing electric bicycle use through rebate programs
- Providing sidewalks and multiuse paths that link people to transit stations, neighborhoods, and retail, making it easier for them to choose biking or walking over a car
- Supporting strategies that reduce or optimize travel demand (e.g., Transportation Systems Managements and Operations Strategies (TSMO), congestion pricing, and mobility-as-a-service)
- Supporting sustainable land use practices through funding programs and developer incentives (e.g., smart growth planning, zoning reform, transit-oriented development)
- Enabling greater public transit adoption (e.g., improved service, innovation, expansion, low/no-cost fare programs)[xxxiv]

Geographic Scope: Methods to reduce VMT can be used throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.66 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 2.23 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 26.62 Thousand MT

Annual Co-Pollutant Reductions in 2050: 27.60 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$24 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$318 (savings)

Co-Benefits: Improved Air Quality; Expanded Transportation Options; Better Health and Well being; Lower Costs

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Transit Authorities; Schools & Universities; Businesses; Non-Profit Organizations; Individuals

Implementation Milestones and Timelines – Milestones vary greatly for reducing VMT because the methods for achieving reductions are many. Walking and biking can be done with a pair of good shoes and a bicycle, which takes little time and budget. Constructing multi-use paths, sidewalks, and new transit routes may include securing funding, acquiring land and right-of-way, conducting a procurement process, contracting, engineering, permitting, and construction, which may require a couple of years up to a decade. Making changes to local ordinances, zoning codes, and development standards can take a few months to a couple of years.

Metrics to Track Progress – Annual VMT; miles of new multiuse paths created; number of transit riders; number of people participating in the Georgia Commute Options program; number of electric bicycle rebates provided

Opportunities for Action

Funding Opportunities for transportation measures may include:

Federal Grants & Loans – Charging and Fueling Infrastructure Grants; Low or No Emission Bus Grants; Clean School Bus Program; Bus and Bus Facilities Competitive Grants; Safe Streets and Roads for All; Rural Surface Transportation Grant Program; Pilot Program for Transit Oriented Development; Active Transportation Infrastructure Investment Program

Federal Tax Credits – Elective Pay/Direct Pay Program; Alternative Fuel Refueling Property Credit

State & Local – Electric Vehicle Charger Tax Credits; Electric Transportation Make-Ready Program; Electric Vehicle Charger Rebates; Electric Vehicle Charging Rates; Drive Free for a Year Credit; GDOT Transportation Alternatives Program; Georgia School Bus Grants; Metropolitan Planning Organization Transportation Improvement Program Funding; ARC Livable Centers Initiative

Technical Assistance & Additional Information: Drive Electric Georgia; Clean Cities Georgia; STRIDE Collaborative; Charging Smart Program; Forth Mobility; GO Georgia/Georgia Bikes; PATH Foundation: Georgia Commute Options; ARC Regional Transportation Electrification Plan; Georgia Carbon Reduction Plan; Georgia Rural Statewide Active Transportation Plan; ARC Walk, Bike Thrive! Plan

Policy Actions:

- Increase incentives for EVs and EV chargers for low-income households and small businesses
- Increase funding for clean school buses
- Increase funding for e-bicycle rebate programs
- Increase funding for multi-use paths
- Increase funding for public transit
- Increase funding for plans and projects that result in more compact and walkable communities

Examples of Successful Projects and Programs

- **Local Governments are EV Ready:** Throughout the MSA, local governments are increasing the availability of EV charging stations through local plans and installations. The City of **Sandy Springs** requires all new commercial developments to install EV charging stations, with a minimum of two EV-ready spaces for all parking lots 20 spaces or larger. The City of **Atlanta** requires 20% of spaces in all new commercial and multifamily parking structures be EV ready. It also requires that all new residential homes be equipped with the infrastructure needed to install EV charging stations, such as conduit, wiring and electrical capacity. The City of **Canton** has installed 10 public EV charging stations powered by solar power in its city hall deck. **Peachtree Corners'** Town Center is home to an electric vehicle fast-charging plaza that can charge up to 16 electric vehicles at one time, making it the largest public charging facility in metro Atlanta and one of the largest in Georgia.
- **Clean, Safe School Buses** – Public school systems within the Atlanta MSA have begun converting their bus fleets to electric. They include **Atlanta** Public Schools, **Carrollton** City Schools, **Clayton County** Public Schools, **DeKalb County** School District, **Douglas County** School System, and **Meriweather County** School District. According to Drawdown Georgia, replacing one diesel bus with an electric bus is estimated to eliminate 54,000 pounds of CO2 annually. Students may spend only 10% of their day riding diesel buses to and from school, but those bus rides can contribute up to 33% of a student's air pollution exposure, which can cause respiratory illness and trigger asthma attacks. Transitioning bus fleets to electric reduces operating and maintenance costs while supporting the state's economy, with many buses being manufactured by Blue Bird Corp. in central Georgia. Additionally, when electric buses are not being used to transport students they may be used as small-scale mobile sources of power via their battery storage.
- **Atlanta Electric-Bike (E-bike) Rebate Program:** Funded by a $1 million investment from the City of Atlanta, this program is designed to increase access to sustainable, affordable transportation options, especially for low- and moderate-income residents. In its first year (2024), the program that is managed by the Atlanta Regional Commission provided nearly 600 rebates to Atlantans, 82% of whom were low-income qualified. Overall, rebate recipients are commuting by car approximately 8,800 fewer miles and using their e-bikes to commute approximately 15,000 more miles per month. The rebates also resulted in $1.2M in sales at the 12 locally-owned bike shops participating in the program, which has helped to support these small businesses and the neighborhood commercial districts where they are located.
- **Chattahoochee RiverLands:** The Chattahoochee RiverLands project spans seven counties – **Cobb, Fulton, Douglas, Carroll, Coweta, South Fulton,** and **Gwinnett** – with the goal of connecting 19 cities along 125 miles of the river from Buford Dam to Chattahoochee Bend State Park. The vision stitches together open spaces into an uninterrupted multi-modal trail—expanding connectivity and economic development opportunities in communities that have historically lacked access to the river. Already, the vision has spurred over $169 million in investment and inspired state and federal policy initiatives.

SPOTLIGHT

Clean Cities Georgia Helps Business Fleets Make the Switch to Electric

The Clean Cities and Communities partnership is an initiative of the U.S. Department of Energy focused on strategies to reduce petroleum consumption in transportation. There are nearly 100 Clean Cities Coalitions across the country, and Clean Cities Georgia holds the distinction of being the first coalition, officially designated in 1993. The organization has worked with the public and private sectors over the years to encourage a shift to electric vehicles. One example of their work is helping **Bonduelle Foods**, a food processing company in **Butts County**, to fund electrification infrastructure for their refrigerated trailers and trucks. While many of the trailers could plug into grid-supplied electricity when parked, most never did so because of a lack of electric infrastructure at the company's facility. The new electric chargers provide electricity to existing refrigerated trailers in use by Bonduelle while parked at the facility, reducing diesel emissions.

IMAGINING TOMORROW

"Glad to see a SIGNIFICANT increase use of public transportation by ALL residents. I am also glad to see a decrease in the number of parking lots/parking spaces available in the metro area that encouraged more people to pursue non-car travel options. I appreciated the increase of metro, bus, and shuttle lines allowing us to get places faster, car free. Thanks for making this happen, Atlanta!"

– MACAP Climate Visioning Survey Participant

5.2 Buildings Sector GHG Emission Reduction Measures

The Buildings sector – a combination of commercial and residential sectors – is the second largest source of GHGs in the Atlanta MSA, contributing 42% of total GHGs in 2022, including the electricity buildings consumed. When consumed electricity is not included, buildings contribute 8% of the overall GHG emissions. Within the buildings sector, residential buildings account for 24% of emissions and commercial buildings account for 18% of emissions.

Heating and cooling buildings, as well as on-site fuel combustion, account for a substantial portion of the energy consumed and of emissions contributed. GHGs can be reduced through a variety of approaches, including improving energy efficiency via energy audits, home weatherization, upgraded appliances, energy benchmarking, and adopting energy performance standards. Additionally, electrification of buildings by switching systems and appliances from ones that combust fuels on-site to ones that use electricity, can also reduce emissions over time, especially when done in conjunction with switching to renewable energy.

Substantial co-benefits can also be realized from improving the energy efficiency of buildings. These include reductions in air pollution leading to public health benefits, cost savings from reduced energy use, indoor air quality improvements, increased comfort in cold and warm seasons, higher property values, and increased safety and resilience.

The Building measures in this plan aim to reduce GHG emissions through six key methods – three within residential buildings and three within commercial buildings:

R1. Home Energy Efficiency – Retrofit existing homes to be more energy efficient through updating HVAC systems, switching to newer lighting and appliances, using cool roofing, sealing air ducts, increasing insulation, and other similar methods.

R2. Residential Energy Efficiency Codes & Green Building Standards – Support local governments in adopting more efficient residential energy codes and/or green building standards.

R3. Electrify Homes – Electrify existing homes by encouraging a switch from gas-powered appliances, water heaters, and HVAC systems to electric systems.

C1. Commercial and Multifamily Building Energy Efficiency – Retrofit existing commercial and multifamily buildings to be more energy efficient through updating HVAC systems, using geothermal HVAC, switching to newer lighting and appliances, using cool roofing, sealing air ducts, increasing insulation, and other similar methods.

C2. Commercial Energy Efficiency Codes & Green Building Standards – Support local governments in adopting more efficient commercial energy codes and/or green building standards.

C3. Electrify Commercial and Multifamily Buildings – Electrify existing commercial and multifamily buildings by encouraging a switch from gas-powered appliances, water heaters, and HVAC systems to electric systems.

Buildings R1 - Home Energy Efficiency

An energy efficient house is one that is built or retrofitted to reduce electricity consumption, reducing both environmental impacts and utility bills. This can be achieved through a combination of strategies including but not limited to: better insulation, air sealing, high-performance windows and doors, upgraded heating and cooling systems, upgrading incandescent lighting to LED, and replacing old appliances with newer more efficient models.

A major reason to build and upgrade housing to be more energy efficient is because doing so reduces utility bills, often a large monthly expense for many households. In fact, there's a term for the percentage of income spent on home energy bills – energy burden. According to the American Council for an Energy-Efficient Economy (ACEEE), a high energy burden is considered to be above 6% and a severe energy burden above 10%. In metro Atlanta, 28% of households have a high energy burden (above 6%) and 14% of households have a severe energy burden (above 10%). Additionally, ACEEE finds that certain groups have disproportionally higher energy burdens than the median household, such as older adults (65+), renters, and low-income multifamily building residents.[xxxv] Making the homes of these groups more efficient will mean they will have more money to pay for food, transportation, medical visits, and other necessities.

While there are costs associated with retrofitting existing homes, budgets can be accommodated by retrofitting over time. Additionally, retrofitting expenses can be recouped over a short period of time through tax credits, rebates, and reduced energy bills. Energy-efficient homes are also better equipped to switch to renewable energy, such as solar.

Geographic Scope: Retrofitting homes to be more energy efficient can be effectively done throughout the entire MSA. Retrofitting homes in areas with a higher proportion of older adults and renters – those typically experiencing higher energy burdens – should be prioritized.

Annual GHG Emissions Reductions in 2035: 1.92 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 5.92 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 2.11 Thousand MT

Annual Co-Pollutant Reductions in 2050: 4.81 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$47 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: $118

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs: Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Nonprofits/NGOs; Housing Developers & Builders; Utilities; Individuals

Implementation Milestones and Timelines – *For individuals*, milestones may include scheduling an appointment with a home energy auditor; getting the list of retrofit opportunities for your home; making retrofits; and applying for utility rebates or federal tax credits. This can take as little as two weeks to a year, depending on the retrofits and utility rebate and tax credit timeline. *For local governments, Regional Commissions, NGOs, etc.),* milestones may include developing an initiative to address home energy efficiency; securing funding to implement the initiative; and implementing the initiative. This process can take 1 - 5+ years.

Metrics to Track Progress – Number of homes implementing energy efficiency retrofits; Number of home energy efficiency and/or weatherization programs

Buildings R2 - Residential Energy Efficiency Codes & Green Building Standards

Local governments can reduce energy consumption in their jurisdictions, help homeowners save on their energy bills, and lower greenhouse gas emissions by adopting more efficient energy codes and/or green building standards.

Energy codes are a subset of building codes that set minimum energy efficiency standards for new and renovated buildings. They specify requirements for building components like insulation, windows, air leakage, and HVAC systems to minimize energy consumption and promote energy savings throughout a building's lifespan. The Georgia Department of Community Affairs Board adopts state minimum codes for construction, including the "International Energy Conservation Code (IECC), 2015 Edition, with Georgia Supplements and Amendments", that local governments within the state ensure are followed within their jurisdiction through administrative enforcement.[xxxvi]

Additionally, the Georga Uniform Codes Act provides that local governments may, under certain conditions, adopt local amendments to the state minimum standard codes to reflect local conditions, as long as the amendments do not decrease the effectiveness or energy efficiency of the original code.[xxxvii] Local governments may choose to follow the DCA local amendments process to adopt the 2021 IECC. According to the U.S. Department of Energy, moving to the 2021 IECC code would provide statewide energy savings of 15.1% compared to the current state energy code. This would equate to $317 of annual utility bill savings for the average Georgia household.[xxxviii]

In addition to the mandatory minimum energy codes described above, Georgia also provides for local government adoption of permissive codes, including the National Green Building Standard (NGBS.) The NGBS is a comprehensive green building rating system for residential buildings and land developments, including single-family homes, multifamily buildings, and remodeling projects.[xxxix] It provides guidelines for designing and constructing buildings that are environmentally responsible, resource-efficient, and healthy for occupants.

Geographic Scope: Adopting more efficient residential energy codes and/or green building standards can be done throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.88 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 11.61 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.76 Thousand MT

Annual Co-Pollutant Reductions in 2050: 5.36 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$1,272 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$676 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; State Government; Regional Commissions; Housing Developers and Builders; Nonprofits/NGOs; Individuals

Implementation Milestones and Timelines – *For local governments:* milestones may include consulting with your regional commission or local energy efficiency non-profit organization for assistance with developing amendments to the state energy code and/or developing green building standards; adopting the amendments or standards; updating permitting and inspection processes; and developing educational materials and website for homeowners, builders and developers. This process is estimated to take 1 – 2 years.

Metrics to Track Progress – Number of local governments adopting more efficient energy code amendments or green building standards

Buildings R3 – Electrify Homes

Many homes burn fossil fuels like gas to power appliances that heat indoor spaces, heat water, dry clothing, and cook food. Electrifying residential buildings means replacing gas, fuel oil, or propane appliances and systems with more efficient electric ones. Removing onsite combustion by electrifying appliances can also improve indoor air quality. Examples of electric appliances and systems include heat pump HVAC, heat pump water heaters, and electric or induction cooktops. The state of Georgia and many electric utilities offer rebates to encourage homeowners to switch to electric systems and appliances. Additionally, local governments may choose to encourage developers and home builders to electrify new residential projects by offering incentives such as streamlined permitting, reduced permitting fees, and streamlined inspections.

Residential electrification also reduces GHG emissions and promotes a cleaner, healthier, more sustainable built environment over time as the electricity grid decarbonizes and rooftop solar on homes with battery storage becomes more prevalent.

Geographic Scope: Electrifying residential buildings can be done throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.60 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 2.16 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.57 Thousand MT

Annual Co-Pollutant Reductions in 2050: 2.77 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$350 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$190 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; State Government; Utilities; Housing Developers and Builders; Individuals

Implementation Milestones and Timelines – *For homeowners:* milestones may include researching what rebates and tax credits may be available for replacing existing appliances and heating systems; purchasing and installing new electric appliances and systems, and applying for rebates and/or tax credits. This process is estimated to take as little as 1–6 months. *For local governments:* milestones may include researching examples of incentives for encouraging developers and builders to electrify new residential projects; drafting and adopting new policies; and educating developers and builders about the new incentives. This process is estimated to take up to 1–2 years.

Metrics to Track Progress – Number of rebates requested to retrofit combustion-based systems and appliances to electric; Number of local governments offering electrification incentives to builders and developers

Buildings C1 - Commercial and Multifamily Building Energy Efficiency

Commercial buildings encompass a diverse array of structures such as office buildings, shopping centers, retail stores, warehouses, factories, restaurants, hotels, and even institutional buildings like hospitals and schools. Additionally, the commercial sector includes residential buildings of three stories or more, often referred to as “multifamily” homes. Like energy efficient homes discussed in measure R1, an energy efficient commercial or multifamily building is one that is built or retrofitted to reduce electricity consumption, reducing both environmental impacts and utility bills. This can be achieved through a combination of strategies including but not limited to: updating HVAC systems, using geothermal/ground source HVAC, switching to LED lighting and appliances, installing room occupancy sensors, installing variable speed drives, using cool roofing, sealing air ducts, and other similar methods.

While there are costs associated with retrofitting existing commercial and multifamily buildings, budgets can be accommodated by retrofitting over time. Energy efficiency upgrade expenses can be recouped over a short period of time through tax credits, utility rebates, and reduced energy bills.

Commercial building owners also have the option of contracting with energy services companies (ESCOs) to help them conduct energy audits, identify rebate and tax credit opportunities, and perform energy efficiency retrofits. ESCOs can also provide energy performance contracting (EPC) is a financing method where energy efficiency improvements in buildings or facilities are paid for using the cost savings generated by those improvements.[xli] Additionally, building owners may choose to create an internal green revolving fund to recoup money saved from energy retrofit projects and reinvest in future retrofits. Energy efficient buildings are also better equipped to switch to renewable energy, such as solar, further reducing costs over time.

Local governments can encourage better commercial and multifamily energy efficiency by implementing energy benchmarking programs and developing energy performance standards for existing buildings.[xlii]

Geographic Scope: Retrofitting commercial and multifamily buildings to be more energy efficient can be effectively done throughout the entire MSA. Retrofitting multifamily buildings in areas with a higher proportion of older adults and renters – those typically experiencing higher energy burdens – should be prioritized.

Annual GHG Emissions Reductions in 2035: 0.60 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 3.55 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.10 Thousand MT

Annual Co-Pollutant Reductions in 2050: 1.73 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$4,217 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: $606

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Non-profits/ NGOs; Commercial and Multifamily Developers & Builders; Utilities; Building Owners.

Implementation Milestones and Timelines – *For building owners*, milestones may include scheduling an appointment with your utility provider or an ESCO to obtain an energy audit and a list of retrofit opportunities for your building; determining how to pay for energy efficiency improvements; making retrofits; and applying for rebates or federal tax credits, if relevant. This can take as little as three months to a year, depending on the retrofits and budget/financing timeline. *For local governments, Regional Commissions, NGOs, etc.),* milestones may include developing an initiative to address commercial and multifamily energy efficiency, such as energy benchmarking; securing funding to implement the initiative; and implementing the initiative. This process can take 1 - 5+ years.

Metrics to Track Progress – Number and type of buildings implementing energy efficiency retrofits; Number of local governments adopting energy benchmarking and/or building performance standards

Buildings C2 - Commercial Energy Efficiency Codes & Green Building Standards

Local governments can reduce energy consumption in their communities, help commercial/multifamily building owners save on their energy bills, and lower greenhouse gas emissions by adopting more efficient energy codes and/or green building standards.

Energy codes are a subset of building codes that set minimum energy efficiency standards for new and renovated buildings. They specify requirements for building components like insulation, windows, air leakage, and HVAC systems to minimize energy consumption and promote energy savings throughout a building's lifespan. The Georgia Department of Community Affairs Board adopts state minimum codes for construction, including the International Energy Conservation Code (IECC), 2015 Edition, with Georgia Supplements and Amendments, which includes an allowance for commercial builders to follow the ASHRAE/IESNA 90.1-2013 Standard instead of IECC 2015. Local governments within the state must ensure the mandatory state codes are followed within their jurisdiction through administrative enforcement.

Additionally, the Georga Uniform Codes Act provides that local governments may, under certain conditions, adopt local amendments to the state minimum standard codes to reflect local conditions, providing the amendments do not decrease the effectiveness or energy efficiency of the original code. Local governments may choose to follow the DCA local amendments process to adopt the 2021 IECC and ASHRAE/IESNA 90.1-2022.[xliii]

In addition to the mandatory minimum energy codes described above, Georgia also provides for local government adoption of permissive codes, including the National Green Building Standard (NGBS.) The NGBS is a comprehensive green building rating system for residential buildings and land developments, including multifamily buildings and remodeling projects. It provides guidelines for designing and constructing buildings that are environmentally responsible, resource-efficient, and healthy for occupants.

Geographic Scope: Adopting more efficient commercial energy codes and/or green building standards can be done throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.57 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 11.03 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.26Thousand MT

Annual Co-Pollutant Reductions in 2050: 2.84Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$1,912 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$518 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Commercial/Multifamily Developers and Builders

Implementation Milestones and Timelines – *For local governments:* milestones may include consulting with your regional commission or local energy efficiency non-profit organization for assistance with developing amendments to the state energy code and/or developing green building standards; adopting the amendments or standards; updating permitting and inspection processes; and developing educational materials and website for builders and developers. This process is estimated to take 1 – 2 years.

Metrics to Track Progress – Number of local governments adopting more efficient energy code amendments or green building standards

Buildings C3 – Electrify Commercial and Multifamily Buildings

Many commercial and multifamily buildings burn fossil fuels like gas to power appliances that heat indoor spaces, heat water, dry clothing, and cook food. Electrifying commercial and multifamily buildings means replacing gas, fuel oil, or propane appliances and systems with more efficient electric ones. Removing onsite combustion by electrifying appliances can also improve indoor air quality. Examples of electric appliances and systems include heat pump HVAC, heat pump water heaters, and electric or induction cooktops. Some electric utilities offer rebates to encourage building owners to switch to electric systems and appliances. Additionally, local governments may choose to encourage developers and builders to electrify new commercial and multifamily projects by offering incentives such as streamlined permitting, reduced permitting fees, and streamlined inspections.

Commercial and multifamily building electrification reduces GHG emissions and promotes a cleaner, healthier, more sustainable built environment over time as the electricity grid decarbonizes and rooftop solar on buildings with battery storage becomes more prevalent.

Geographic Scope: Electrifying commercial and multifamily buildings can be done throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.60 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 1.98 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.27 Thousand MT

Annual Co-Pollutant Reductions in 2050: 1.31 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$2 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: $20

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; State Government; Utilities; Commercial/ Multifamily Developers and Builders; Building Owners; Nonprofits/NGOs

Implementation Milestones and Timelines – *For building owners:* milestones may include researching what rebates and tax credits may be available for replacing existing appliances and heating systems; purchasing and installing new electric appliances and systems; and applying for rebates and/or tax credits. This process is estimated to take as little as one-to-six months. *For local governments:* milestones may include researching examples of incentives for encouraging developers and builders to electrify new commercial and multifamily projects; drafting and adopting new policies, and educating developers and builders about the new incentives. This process is estimated to take up to a year.

Metrics to Track Progress – Number of combustion-based systems and appliances retrofitted to electric; Number of local governments offering electrification incentives to builders and developers

Opportunities for Action

Funding Opportunities for Building measures may include:

Federal Grants & Loans – Electric Infrastructure Loans for Distribution, Energy Efficiency, Renewable Energy; Rural Housing Preservation Grant; Rural Energy for America Program (REAP); Renew America's Schools Grants; Energy Efficiency and Conservation Loan Program

Federal Tax Credits – Elective Pay/Direct Pay Program; Energy Efficient Home Improvement Credits

State & Local – Georgia's Home Energy Rebates; Local Utility Rebates; EDA Revolving Loan Fund

Technical Assistance & Additional Information: Southeast Energy Efficiency Alliance; Southface Institute; American Council for an Energy-Efficient Economy; Beneficial Electrification League; ENERGY STAR; U.S. Department of Energy Building Energy Codes Program; U.S. EPA Energy Resources for State and Local Governments; U.S. EPA Clean Energy Financing Toolkit for Decisionmakers; RMI Green Upgrade Calculator; Green Building Initiative; Green Building Certification Inc.; Institute for Market Transformation (IMT)

Policy Actions:

- Increase programs and funding to help homeowners weatherize and make their homes more energy efficient
- Adopt more efficient energy codes and green building standards at the local and state level for residential and commercial buildings
- Increase funding for residential and commercial electrification
- Increase awareness of commercial and multifamily building energy efficiency opportunities
- Increase funding for commercial and multifamily building energy efficiency retrofitting

Examples of Successful Projects and Programs

Community Action Agencies Leading the Way to Weatherization: Weatherization assistance programs provided by community action agencies within the Atlanta MSA enable low-income families to reduce their home energy bills by making their homes more energy efficient while prioritizing resident health and safety. Agencies leading the weatherization charge in metro Atlanta include Area Committee to Improve Opportunities Now (ACTION), Community Action for Improvement Inc., Clayton County Community Services Authority, Community Action for Improvement Inc., Middle Georgia Community Action Agency Inc., Ninth District Opportunity Inc., North Georgia Community Action Inc., and Tallatoona Community Action Partnership Inc.

WeatheRISE ATL: WeatheRISE ATL is a City of Atlanta pilot program that aims to reduce energy burden on households in Atlanta's highest energy burdened neighborhoods through weatherization and energy efficiency upgrades. The benefits to this program include the preservation of naturally occurring affordable housing, a decrease in carbon emissions, improved health outcomes, job training opportunities, and contractor business development.

Invest Atlanta Commercial Property Assessed Clean Energy (C-PACE) Program: Invest Atlanta helps companies make needed structural property repairs and upgrades to save energy and water through C-PACE financing. A wide range of commercial property types qualify for financing including hospitality, retail, mixed-use, and multifamily buildings. Property owners can choose from hundreds of eligible building improvements, including windows and doors, roofing, solar panel arrays, and HVAC units. To date, the program has helped Pullman Yards, the Flatiron Building, Darlington Medical Center, ALI at Lakewood, Origin Hotel, and several other companies make energy saving, water efficient, and resiliency upgrades that are estimated to reduce GHGs by 644 metric tons of CO_2e annually.

IMAGINING TOMORROW

"In 2050, there were communities with tall apartments and townhouses overflowing with plants in window boxes and down the sides of the buildings, everything was green in both senses of the word, and all this was achieved through changing infrastructure in large communities. Having compact and vertical buildings designed to be sustainable, having quality permeable pavement solar panels, and greenspaces not only improves people's quality of life but also helps reduce heat island effect and conserve natural resources."

– MACAP Climate Visioning Survey Participant

SPOTLIGHT

Agnes Scott College's Green Revolving Fund – Reducing Carbon, Increasing Educational Opportunities

Agnes Scott College (ASC) in Decatur, Ga. initiated the Green Revolving Fund (GRF) in 2011 as a practical solution to a common challenge shared by colleges and universities committed to climate neutrality: How can a campus reduce its carbon footprint, through efficiency upgrades, while faced with a limited operating budget? The GRF established a pool of financial resources dedicated to funding energy-efficient and sustainable projects that generate cost savings. The money saved through these projects is then recycled back into the fund for future projects, resulting in an efficient and sustainable funding source for climate neutrality efforts. The Agnes Scott GRF has supported efficiency retrofits totaling close to $2 million, including direct support for several large-scale, innovative projects. Most notably, 10% of the college's 1 million square feet of building space gained geothermal heat and air conditioning. In addition, the GRF has proven to be an effective tool to finance efficiency projects and a key element in advancing two other ASC objectives: engaging students in research to solve real world sustainability challenges and creating a widespread campus culture that supports the goal of advancing climate-neutral initiatives.[xliv]

5.3 Industry Sector GHG Emission Reduction Measures

Metro Atlanta has long been an innovator in industry. From developing new products to finding new ways to make them more efficiently with less time, energy, and materials, the MSA's industries have helped shape the technology of manufacturing and lessened their environmental impact. The Atlanta MSA is ranked among the top 20 metros for manufacturing and hosts a variety of industry segments, including aerospace, automotive, chemicals & materials, electrical and appliances, fabricated metal, food and beverage, life sciences, and paper and packaging. These industries are of great benefit to the economic health of the region; however, more must be done to reduce GHG emissions from this sector.

The Industry sector contributes the third largest number of overall emissions in the Atlanta MSA at 13% of total emissions. The majority of the industry sector's GHGs are emitted through energy use and industrial processes, some of which arise from chemical reactions that take place during production. While there are costs associated with transitioning to new energy sources and new processes, reducing industrial emissions can offer substantial benefits beyond cutting carbon. These include:

- Cutting operational costs through increased energy efficiency and resource optimization
- Decreasing maintenance costs and downtime
- Process improvements
- Increased innovation and competitiveness[xlvi]

The Industry measures in this plan aim to reduce GHG emissions through five key methods:

I1. Industrial Building Energy Efficiency – Retrofit existing industrial buildings to be more energy efficient through updating HVAC systems, using geothermal HVAC, switching to newer lighting, using cool roofing, and other similar methods.

I2. Electrify Industrial Buildings and Processes– Electrify existing industrial buildings by encouraging a switch from gas-powered systems and processes to electric systems and processes.

I3. Retrofit Industrial Processes and Equipment – Retrofit existing industrial processes and equipment to more energy efficient processes and systems.

I4. Decrease Non-CO_2 GHG Emissions – Decrease non-CO_2 GHG Emissions through improved industrial processes.

I5. Convert Waste Heat to Energy or HVAC – Capture heat from industrial processes to provide HVAC and/or create electricity.

Industrial I1 - Industrial Building Energy Efficiency

An energy efficient industrial building is one that is built or retrofitted to reduce electricity consumption. Focused on the building envelope, rather than the industrial processes contained within, this can be achieved through a combination of strategies including but not limited to: updating HVAC systems, using geothermal/ground source HVAC, switching to LED lighting, installing room occupancy sensors, using cool roofing, and sealing air ducts.

Energy-efficient industrial buildings are also better equipped to accommodate renewable energy, such as solar.[xlvii] Energy efficiency upgrade expenses can be recouped over a short period of time through tax credits, utility rebates, and reduced energy bills. Industrial building owners also have the option of contracting with energy services companies (ESCOs) to help them conduct energy audits, identify rebate and tax credit opportunities, and perform energy efficiency retrofits. ESCOs can also provide energy performance contracting (EPC) is a financing method where energy efficiency improvements in buildings or facilities are paid for using the cost savings generated by those improvements.

Geographic Scope: Retrofitting industrial buildings to be more energy efficient can be effectively done throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.04 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 0.26 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.01 Thousand MT

Annual Co-Pollutant Reductions in 2050: 0.13 Thousand MT

Net Cost (2024$/MT$CO_2e$) 2035: -$4,500 (savings)

Net Cost (2024$/MT$CO_2e$) 2050: $615

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Industrial Developers and Builders; Utilities; Building Owners

Implementation Milestones and Timelines – Milestones may include scheduling an appointment with your utility provider, an ESCO, or the Southeastern Industrial Training and Assessment Center (ITAC) to get an energy audit and a list of retrofit opportunities for your building; determining how to pay for energy efficiency improvements, making retrofits; and applying for rebates or federal tax credits, if relevant. This can take as little as three months to a year, depending on the retrofits and budget/financing timeline.

Metrics to Track Progress – Number of Southeastern ITAC audits conducted; Number of retrofit projects implemented via the Southeastern ITAC cost-sharing funding

Industrial I2 – Electrify Industrial Buildings & Processes

Many industrial buildings burn fossil fuels to power building sysems as well as to fuel industrial processes. Encouraging a switch from gas-powered systems and processes to electric and other non-fossil fuel-based systems and processes will help reduce GHGs from this sector. Examples of industrial electrification include providing industrial process heat through a combination of industrial heat pumps, electric boilers (electric resistance heating technologies), thermal energy storage (heat batteries), hydrogen combustion; as well as many other specialized and emerging technologies.[xlvii xlix]

Some electric utilities offer rebates to encourage building owners to switch to electric systems and appliances. Additionally, the U.S. Department of Energy's Southeastern Industrial Training and Assessment Center (ITAC) offers in-depth, no-cost energy, productivity, and waste assessments to small and medium sized industrial facilities. These assessments qualify recipients for up to $300,000 in cost matching funds for each recommendation made in a no-cost ITAC assessment report if other qualifiers are met.[l]

Geographic Scope: Electrifying industrial buildings and processes can be effectively used throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.04 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 0.14 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.02 Thousand MT

Annual Co-Pollutant Reductions in 2050: 0.10 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: $3,226

Net Cost (2024$/MTCO$_2$e) 2050: -$1,542 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Strengthened Local Economy

Implementation Details:

Key Implementation Partners – Industrial Developers & Builders; Utilities; Businesses & Building Owners

Implementation Milestones and Timelines – Milestones may include scheduling an appointment with a utility provider and/or Southeastern ITAC to secure an audit and a list of retrofit opportunities for thebuilding and industrial processes; determining how to pay for electrification improvements; making retrofits; and applying for rebates or federal tax credits, if relevant. This can take a few months to several years, depending on the complexity, scale, and specific processes and budget/financing timeline.

Metrics to Track Progress – Number of Southeastern ITAC audits conducted; Number of retrofit projects implemented via the Southeastern ITAC cost-sharing funding

Industrial I3 – Retrofit Industrial Processes and Equipment

It is important to ensure that industrial processes, whether electric or fuel-based, are as efficienct as possible. One approach to achieve this is through retrofitting. Industrial retrofitting refers to the modification and upgrading of existing machinery with new and advanced features, leading to enhanced performance and increased efficiency. Retrofitting involves the integration of advanced technologies into older equipment, extending the equipenment's service life and enabling it to keeps pace with modern demands.

Retrofitting is typically considered when:

- An older model machine is being phased out
- There is an increase in demand for additional functionality
- There is a need to integrate sensors or accessories into an existing machine to enhance its capabilities
- The business requires higher levels of productivity
- There is a new product or new size to manufacture in the facility.[li]

In addition to enabling equipment to perform at optimal levels, retrofitting can increase productivity, improve machine functionality, reduce downtime through predictive maintenance, facilitate combatibility with Industry 4.0 requirements,[lii] and make facililities more flexible towards changing demand.

Geographic Scope: Retrofit Industrial Processes and Equipment can be effectively done throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.68 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 1.59 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.12 Thousand MT

Annual Co-Pollutant Reductions in 2050: -0.01 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$379 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$538 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Strengthened Local Economy

Implementation Details:

Key Implementation Partners – Industrial Developers and Builders; Businesses and Building Owners

Implementation Milestones and Timelines – Milestones may include scheduling an appointment with the Southeastern ITAC to secure an audit and a list of retrofit opportunities; conducting an economic analysis; undertaking engineering risk assessments; researching to find engineering solutions; designing the retrofits; making the retrofits; and applying for rebates or federal tax credits, if relevant. This can take a few months to several years, depending on the complexity, scale, and specific processes and budget/financing timeline.

Metrics to Track Progress – Number of Southeastern ITAC audits conducted; Number of retrofit projects implemented via the Southeastern ITAC cost-sharing funding

Industrial I4 – Decrease Non-CO_2 GHG Emissions

Non-CO_2 GHGs include methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (F-gases, like hydrofluorcarbons, perfluorcarbons, sulfur hexaflurodies, etc.) These non-CO_2 GHG emissions trap more heat per molecule than CO_2, and are referred to as high-global warming potential (GWP) gases. They also having a longer lifespan in the atmosphere, spanning from decades (methane) to centuries (perfluorocehmicals).[liii] Reductions in non-CO_2 emissions in tandem with CO_2 emissions will be key to addressing long-term climate change.[liv]

Non-CO_2 GHGs are present in many industrial processes and equipment. Nitrous oxide is generated as a byproduct of the production of chemicals such as nitric acid and adipic acid. F-gases are used in refridgeration and cooling systems, the manufacturing of certain metals, and the production of electronics. The amount of these gases that escape into the atmosphere from industry can be reduced by replacing high-GWP refridgerants with climate-friendly alternatives, capturing and safely storing or reusing industrial process gases, and improving leak detection and maintenance programs.[lv]

Geographic Scope: Decreasing non-CO_2 GHG emissions can be effectively done throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.13 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 0.45 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.002 Thousand MT

Annual Co-Pollutant Reductions in 2050: 0.01 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$8 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: $358

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs

Implementation Details:

Key Implementation Partners – Industrial Developers and Builders; Businesses and Building Owners

Implementation Milestones and Timelines – Milestones may include scheduling an appointment with the Southeastern ITAC to secure an audit and a list of retrofit opportunities; conducting an economic analysis; undertaking engineering risk assessments; researching to find engineering solutions; designing the retrofits; making the retrofits; and applying for rebates or federal tax credits, if relevant. This can take a few months to several years, depending on the complexity, scale, and specific processes and budget/ financing timeline.

Metrics to Track Progress – Number of Southeastern ITAC audits conducted; Number of retrofit projects implemented via the Southeastern ITAC cost-sharing funding

Industrial I5 – Convert Waste Heat to Energy or HVAC

According to the U.S. EPA, it is estimated that between 20% to 50% of industry energy input is lost as waste heat in the form of exhause gases, cooling water, and lost heat. By capturing this otherwise wasted energy and putting it to good use, industries can improve efficiency and reduce their reliance on GHG-emitting energy sources. The captured heat can be utilized for a wide variety of purposes – such as powering turbines, warming buildings, or even being converted into electricity using technologies like thermoelectric generators. While currently underutilized, recent developments in heat recovery technology have proven to reduce costs and improve efficiency, significantly enhancing interest in its industrial use.[lvi]

Geographic Scope: Converting waste heat to energy or HVAC can be effectively done throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.16 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 0.49 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.34 Thousand MT

Annual Co-Pollutant Reductions in 2050: 0.62 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$775 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$782 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Strengthened Local Economy

Implementation Details:

Key Implementation Partners – Industrial Developers and Builders; Businesses and Building Owners

Implementation Milestones and Timelines – Milestones may include scheduling an appointment with the Southeastern ITAC to secure an audit; conducting an economic analysis; undertaking engineering risk assessments; researching to find engineering solutions; designing the retrofits; making the retrofits; and applying for rebates or federal tax credits, if relevant. This can take a few months to several years, depending on the complexity, scale, and specific processes and budget/financing timeline.

Metrics to Track Progress – Number of Southeastern ITAC audits conducted; Number of retrofit projects implemented via the Southeastern ITAC cost-sharing funding

Opportunities for Action

Funding Opportunities for Industry measures may include:

Federal Grants & Loans – Critical Material Innovation, Efficiency, And Alternatives Program; Industrial Research and Assessment Center Implementation Grants; Extended Product System Rebates; Advanced Technology Vehicle Manufacturing Loan Program; Advanced Energy Manufacturing and Recycling Grants

Federal Tax Credits – Extension of the Advanced Energy Project Credit (48C); Energy Efficient Commercial Buildings Deduction (179D); Advanced Manufacturing Production Credit (45X)

State & Local – Energy Savings Performance Contracts; Power Purchase Agreements; Commercial Property Assessed Clean Energy (C-PACE) Financing

Technical Assistance & Additional Information: Drawdown Georgia Business Compact; ATL CleanTech Connect; Georgia Cleantech Innovation Hub; Georgia Center of Innovation; Southeastern (Georgia – North Carolina – Florida) Industrial Technology Assessment Center; Georgia Manufacturing Extension Partnership (GaMEP) at Georgia Tech; Center for Climate and Energy Solutions; American Council for an Energy-Efficient Economy; Responsible Business Alliance Emissions Management Tool

Policy Actions:

- Offer grants, tax credits, and catalytic capital to support the development and deployment of clean technologies and green manufacturing
- Invest in research, development, and deployment of emerging technologies like carbon capture and advanced energy storage
- Foster collaboration between governments and the private sector to drive the adoption of sustainable materials and processes
- Provide tools, technical assistance, and robust communication to help the private sector understand climate risks and implement effective strategies

Examples of Successful Projects and Programs

- **Drawdown Georgia Business Compact:** The Drawdown Georgia Business Compact leverages the collective impact of the Georgia business community to achieve net zero carbon emissions in the state. This inclusive initiative seeks diverse participation while building on the leadership of those businesses headquartered and/or operating in Georgia with net-zero carbon emission targets or similar ambitions. Compact partners include: Amazon, Cisco, The Coca-Cola Company, Cox Enterprises, Delta Air Lines, Google, Interface, Kia, Pirelli, Shaw Industries Group, Southwire, UPS, Yamaha Motor Corporation, YKK, and many others.

- **U.S. DOE Southeastern Center of Excellence:** The Department of Energy selected Georgia Institute of Technology as the Southeastern Regional Center of Excellence to enhance and expand the

Industrial Assessment Centers program. This Center, in partnership with Clark Atlanta University, Kennesaw State University and Florida A&M University, serves as a regional hub that collaborates and coordinates with government, nonprofit, labor, and industry actors to train clean energy workers and support small- and medium-sized manufacturers in their respective regions.

IMAGINING TOMORROW

"We're really converted to electronic cars to preserve gas. Oil isn't heavily extracted. Pollution levels have lowered and there's less production of pollutants in factories. Temperatures are moderate and biodiversity is thriving with less invasion of habitats."

– MACAP Climate Visioning Survey Participant

SPOTLIGHT

Yamaha Moves Towards Carbon Neutrality

Yamaha Motor Corporation, USA, is reinforcing its commitment to environmental sustainability by expanding its solar energy installations at two key facilities in metro Atlanta. These include the Southeastern Headquarters in Kennesaw, which houses the Sales and Marketing operations for Yamaha Boats and WaveRunners, and Yamaha Motor Manufacturing Corporation of America in Newnan, where Yamaha WaveRunners are assembled. This strategic move is part of Yamaha's broader goal to achieve carbon neutrality in its manufacturing operations and facilities by 2035. The Kennesaw installation is projected to generate approximately 60% of the facility's electricity, significantly reducing its carbon footprint. Similarly, the Newnan assembly plant expects the solar array to cut down CO2 emissions by about 13,600 tons over the system's lifetime.[lvii]

5.4 Energy Sector GHG Emission Reduction Measures

In Georgia, electricity comes from a diverse mix of sources, with natural gas (41%) and nuclear power (34%) being the dominant fuel types. While decreasing over time, coal still contributes about 13% of Georgia's electricity. Renewables, like solar and hydroelectric, make up about 12% of the state's generation.[lviii] The region's electricity is supplied by a large "energyshed" that includes power facilities from across Georgia and beyond.[lix]

This plan is focused on GHG emissions from the built environment (transportation, buildings, industry, waste & recycling, trees & greenspaces), and **energy consumed by the built environment contributes to a large portion of its GHG emissions.** When energy is included as its own sector, it contributed 35% of GHGs in 2022. In fact, the majority of GHGs produced by residential, commercial, and industrial buildings can be attributed to the electricity consumed by those buildings.

As discussed in previous measures, electricity consumption can be reduced through energy efficiency measures. However, electricity consumption cannot be eliminated entirely. Combining energy efficiency and electrification of buildings along with increasing the amount of renewable energy available to power those buildings can help bring GHG emissions even lower over time.

The Energy measures in this plan aim to reduce GHG emissions through five key methods:

E1. Urban Scale Solar – Increase usage of "urban-scale" solar by installing solar on landfill and wastewater sites and community solar small-acreage sites.

E2. Rooftop Solar and Battery Systems – Increase installation of rooftop solar and battery storage systems.

E3. Electricity Demand Response – Adopt demand response actions in local government facilities, businesses, and homes by shifting energy use to off-peak times, using power strips, installing smart thermostats, and other similar methods.

E4. Wastewater Gas-to-Energy – Capture biosolids & biogas at wastewater treatment plants for gas-to-energy creation.

E5. Landfill Gas-to-Energy – Capture methane at landfills for gas-to-energy creation.

Energy E1 - Urban Scale Solar

In an hour and a half, enough sunlight shines on the earth's surface to power the world's entire energy needs for a year and there is tremendous solar power generation potential within the Atlanta MSA. Solar photovoltaic (solar PV) energy systems come in all shapes and sizes. On the smaller end of the size scale, they can be found on rooftops, powering homes and businesses. On the larger end of the scale, they can be found on 5+ acres of rural land, adding renewable energy to the utility grid. In between is the scale this plan refers to as "urban scale" – that is an installation that is under 5 acres, but larger than a typical rooftop solar PV system.

Urban scale solar for the purposes of this plan includes solar installed at landfills and water/wastewater treatment plants, which often have open spaces that could be suitable to solar. Many landfills are particularly well-suited for solar development because they are often:

- Located near critical electric transmission lines and roads
- Located near areas with high energy demand
- Constructed with large areas of minimal grade needed for optimal siting of solar PV structures
- Offered at lower land costs when compared to open space[lxi]

For many local governments, water and wastewater plants are typically the largest energy users within their operations, often accounting for up to 40% of total energy consumed. Electricity use for moving and treating water often represents 25-30% of operation and maintenance costs.[lxii] Transitioning to solar at water and wastewater facilities can:

- Reduce dependence on grid electricity
- Lower operational costs
- Improve the resilience of this critical infrastructure[lxiii]

Urban scale solar for the purposes of this plan also includes community solar installations. The U.S. Department of Energy defines community solar as, "any solar project or purchasing program, within a geographic area, in which the benefits of a solar project flow to multiple customers such as individuals, businesses, nonprofits, and other groups."[lxiv] Community solar programs make solar more accessible, particularly to those with low-to-moderate incomes, renters, and other community members for whom traditional rooftop solar is unavailable. Rather than putting solar on their own home or building, community solar allows energy users to subscribe to a shared system of solar panels, often located within their community.[lxv]

Geographic Scope: Urban scale solar can be effectively used throughout the entire MSA, however community solar installations may be limited to areas served by utilities that allow for their installation.

Annual GHG Emissions Reductions in 2035: 0.02 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 0.70 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.01 Thousand MT

Annual Co-Pollutant Reductions in 2050: -0.07 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$11 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$849 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Landfill Operators/ Owners; Utilities (Water and Electric)

Implementation Milestones and Timelines – *For landfill and water/wastewater facilities,* milestones may include conducting an energy audit; identifying potential sites for solar PV; calculating potential energy cost savings; securing funding or financing; procuring a solar PV installer; getting permitting and zoning approvals; and installing solar PV, which may require tying into the electric grid. This process will most likely take 1 – 2 years, longer if grid interconnection is required. *For community solar installations,* milestones may include establishing project goals and desired outcomes; identifying suitable sites for solar PV; conducting a feasibility analysis; securing funding or financing; acquiring subscribers; purchasing or leasing land; getting permitting and zoning approvals; procuring a solar PV installer; construction; and grid interconnection. This process can take 2 - 5 years, depending on a variety of factors.

Metrics to Track Progress – Number of solar PV systems installed at landfills; Number of solar PV systems installed at water/wastewater facilities; Number of community solar programs

Energy E2 – Rooftop Solar and Battery Systems

According to the Department of Energy's Office of Energy Saver, "as the cost of using solar to produce electricity goes down each year, many American homes and businesses are increasingly switching to solar."[lxvi] By increasing the use of solar PV as a source of renewable energy across the Atlanta MSA, GHG emissions can be significantly reduced. Solar PV use may include but is not limited to solar-powered central energy plants; solar PV on local government facilities & university campuses; and solar panels on single and multifamily-homes. Solar PV is especially effective when combined with energy efficiency and weatherization upgrades.

Solar PV systems may be installed with battery storage. Adding battery storage to rooftop solar systems provides access to solar power at night when the sun is not shining, helping to save on utility bills around the clock.[lxvii] Battery storage also provides a clean and quiet source of energy during power outages, powering critical healthcare devices like oxygen generators and CPAP machines, as well as wi-fi routers and other home devices.

Geographic Scope: Rooftop solar and battery systems can be effectively used throughout the entire MSA. Areas with a higher proportion of older adults and renters – those typically experiencing higher energy burdens – should be prioritized for rooftop solar.

Annual GHG Emissions Reductions in 2035: 0.09 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 2.80 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.04 Thousand MT

Annual Co-Pollutant Reductions in 2050: -0.30 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$9,778 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$846 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; Schools and Universities; Businesses; Nonprofits/NGOs; Utilities

Implementation Milestones and Timelines – Milestones may include conducting a feasibility analysis; securing financing or funding; obtaining quotes from solar installers; getting permitting approvals; upgrading electrical systems; and installing the solar PV and battery system. This process can take 1 - 2 months to a year.

Metrics to Track Progress – Number of rooftop solar systems installed

Energy E3 – Electricity Demand Response

Electricity demand response (DR) refers to a short-term, voluntary decrease in electricity usage by power customers during times when the electric grid may be stressed, such as hot summer afternoons when air conditioners run more often.[lxviii] Utilities often incentivize DR by offering special time-of-use rate plans and rebates on smart thermostats. Other low-tech options for shifting DR include running appliances at off-peak times, adjusting temperature settings on thermostats, using smart power strips, and putting outdoor lights on timers or motion-sensors. By encouraging power customers to reduce their demand for grid energy at times of grid stress, demand response helps to keep power flowing and reduces the need for the use of peaking power plants.

A peaking power plant, or "peaker plant," is a power plant that grid operators call on at times of particularly high electricity demand on the grid. Peaker plants supply power that is not only high in cost but also typically high in GHG emissions.[lxix] Using electricity DR to reduce peak loads means that GHG emissions can be reduced as well.

Geographic Scope: Electricity demand response can be used throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: -0.92 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 5.61 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: -0.15 Thousand MT

Annual Co-Pollutant Reductions in 2050: 0.56 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$105 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: $176

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; Schools and Universities; Businesses; Individuals; Utilities

Implementation Milestones and Timelines – Milestones include electric customers contacting their utility to determine if a special demand response rate plan applies; determining when and how demand can be shifted (e.g. smart thermostat that can be controlled remotely to raise/lower interior temperatures, running appliances at night, installing smart power strips, etc.); purchasing DR tools; and installing the DR tools within the home, office, or business. This can be done in as little as 1 to 2 weeks for homes and 1 – 2 months for larger buildings.

Metrics to Track Progress – Number of electric customers signed up for time-of-use plans

Energy E4 – Wastewater Gas-to-Energy

Biogas is a byproduct of wastewater treatment as well as landfills that occurs when organic materials such as human or food waste break down or decompose. Biogas is mostly methane and also contains carbon dioxide with smaller amounts of other gases, mostly GHGs. At the wastewater treatment plant, biogas is produced in large cylinders called digesters. In the digesters, tiny organisms that thrive in the non-oxygen digester environment speed up the decomposition of those solids. The biogas that is produced by the organisms can then be used for heating or electricity at the plant or put onto the electric grid as a form of renewable energy.

In the past few years, there has been a movement to add additional food waste and biosolids to wastewater treatment digesters, which has the following benefits:

- Increasing the amount of biogas available for energy production at wastewater treatment plant
- Reducing energy use and costs
- Increasing revenue if energy is sold to the grid
- Decreasing the amount of GHGs produced at landfills
- Preserving landfill space for other materials[lxx]

Geographic Scope: Wastewater gas-to-energy systems can be used throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.25 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 0.66 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 0.01 Thousand MT

Annual Co-Pollutant Reductions in 2050: 0.03 Thousand MT

Net Cost (2024\$/MTCO$_2$e) 2035: -\$12 (savings)

Net Cost (2024\$/MTCO2e) 2050: \$753

Co-Benefits: Improved Air Quality; Lower Costs; Protection of Natural Resources

Implementation Details:

Key Implementation Partners – Local Governments; Utilities (Water & Energy); Waste and Fats/Oils/ Grease Haulers

Implementation Milestones and Timelines – Milestones include securing funding or financing; designing the gas-to-energy system; conducting a procurement process (procurement may be for construction alone or for design-build); and building the system. The process may take 2-3 years.

Metrics to Track Progress – Number of wastewater treatment plants with gas-to-energy systems

Energy E5 – Landfill Gas-to-Energy

Municipal solid waste landfills (landfills) produce methane and carbon dioxide, both GHGs, as the waste buried within them breaks down. Normally, landfill gases (LFGs) escape the site into the air or are captured and burned off on-site. Instead of letting LFGs escape or be burned, they can be converted and used as a source of renewable energy to provide power to the energy grid and/or compressed natural gas fuel for cars.[lxxi]

Installing LFG systems at landfills can capture up to 90% of the methane as well as other hazardous air pollutants that would have been emitted from the site, reducing GHG emissions, reducing air pollution, and reducing exposure to compounds that negatively impact health. LFG systems can also create jobs since their design, construction and operation involve engineers, construction firms, equipment vendors, and utilities or end users of the power produced.[lxxii]

Geographic Scope: Landfill Gas-to-Energy can be used throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.07 MMT CO$_2$e

Annual GHG Emissions Reductions in 2050: 0.60 MMT CO$_2$e

Annual Co-Pollutant Reductions in 2035: 0.01 Thousand MT

Annual Co-Pollutant Reductions in 2050: 0.03 Thousand MT

Net Cost (2024\$/MTCO$_2$e) 2035: -\$614 (savings)

Net Cost (2024\$/MTCO$_2$e) 2050: \$677

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Strengthened Local Economy

Implementation Details:

Key Implementation Partners – Local Governments; Landfill Operators; Utilities

Implementation Milestones and Timelines – Milestones include estimating LFG recovery potential and performing an initial assessment; evaluating project economics; establishing a project structure; drafting a development contract; negotiating energy sales contract; securing permits and approvals; assessing financing options and securing funding; contracting for engineering, procurement, and construction (EPC) and operation and maintenance services; installing the project; and starting up. This process can take 5+ years.

Metrics to Track Progress – Number of landfills planning for and/or operating gas-to-energy project

Opportunities for Action

Funding Opportunities for Energy measures may include:

Federal Grants & Loans – Electric Infrastructure Loans for Distribution, Energy Efficiency, Renewable Energy; Energy Efficiency and Conservation Loan Program; Rural Energy for America Program

Federal Tax Credits – Elective Pay/Direct Pay Program; Alternative Fuel Refueling Property Credit; Clean Electricity Production Credit; Clean Electricity Investment Credit

State & Local – Georgia's Home Energy Rebates; Local Utility Rebates; Local Solarize Programs; Power Purchase Agreements (PPAs)

Technical Assistance & Additional Information: National Community Solar Partnership; Solar Energy Industries Association; Georgia Solar Energy Association; SolSmart; GRID Alternatives; Southeast Energy Efficiency Alliance; World Biogas Association; Peach State Voluntary Emissions Reduction Studies - Expanding Landfill Gas to Energy Project

Policy Actions:

- Incentivize or fund solar PV installation (urban scale and rooftop)
- Increase education and awareness of electricity demand response programs
- Incentivize and increase awareness of gas-to-energy projects (wastewater and landfill)

Examples of Successful Projects and Programs

Solarize Programs: Community-based group purchasing programs, also known as Solarize programs, have led to a significant increase in rooftop solar plus battery systems installed on homes and businesses throughout the Atlanta MSA. Example programs include Solarize **Atlanta**, Solarize **Carrollton-Carroll**, Solarize **Cobb**, Solarize **Decatur-DeKalb**, Solarize **Dunwoody**, Solarize **Forsyth**, Solarize Gwinnett, Solarize **Newton-Morgan**, Solarize **Roswell**, and Solarize Georgia.

DeKalb County Seminole Road Landfill Renewable Fuels Facility: DeKalb County was the first in the nation to generate electricity, renewable natural gas, and renewable compressed natural gas (R-CNG) from landfill gas and provide a fueling station all in one location, the Seminole Road Landfill. The facility generates enough clean energy to meet the needs of 3,000 homes annually, while removing annual greenhouse gas emissions equivalent to 3,300 vehicles. The county converted a significant portion of its vehicle and equipment fleet to run on the R-CNG produced by the facility.

IMAGINING TOMORROW

"In the year 2050, everyone's cars run on solar power, cutting down on car emissions. In the year 2050, buildings' electricity is interdependent on other sources, like vehicles, to reduce cost and increase efficiency."

– MACAP Climate Visioning Survey Participant

SPOTLIGHT

Wastewater-to-Energy: Gwinnett's F. Wayne Hill Water Resources Center (WRC)

The design of the F. Wayne Hill WRC enables operators to recover energy from treatment byproducts to supplement power needs at the plant. Gwinnett County implemented the Gas-to-Energy and Fats, Oils, and Grease/High-Strength Waste Receiving Facilities to reduce energy costs as much as 40% while minimizing the center's carbon footprint. Since the center's biogas energy generator started operation in 2011, the county has realized a savings of over $1,000 per day and used the generator to offset real-time peak power costs as high as $0.75/kWh.[lxxiii]

5.5 Waste & Materials GHG Emission Reduction Measures

Decisions about how goods (such as food, packaging, and building materials) are produced, transported, used, and disposed of can make a big difference in the amount of the resources used, greenhouse gases emitted, environmental impacts created, and waste produced. **In 2022, the Waste & Materials sector contributed approximately 4.42 MMTCO$_2$e of GHG emissions within the Atlanta MSA, up from 3.12 MMTCO$_2$e in 2005.** While this is a small amount compared to Transportation and Buildings, emissions from this sector have been growing over time. In addition to GHGs produced by landfills, emissions also stem from the extraction, transportation, and processing of raw materials for manufacturing.

Effective waste management strategies like waste prevention, reuse, recycling, and composting can significantly reduce these emissions by diverting waste from landfills and lowering energy demand. With space in landfills shrinking, diverting waste from landfills also conserves limited landfill space.

The Waste & Materials measures in this plan aim to reduce GHG emissions through two key methods:

WM1. Reduce Construction and Demolition Waste – Reduce construction and demolition waste by designing material-efficient buildings, promoting adaptive reuse of buildings, and deconstructing buildings to reuse and recycle their components rather than sending them to a landfill.

WM2. Increase Composting – Reduce the amount of food, yard, and tree waste that goes into landfills by composting.

Waste & Materials WM1 - Reduce Construction and Demolition Waste

Construction and demolition (C&D) waste is a type of waste that is not allowed into municipal solid waste landfills and is disposed of within C&D landfills. The waste typically consists of debris generated during the construction, renovation, and demolition of buildings, roads, and other infrastructure.[lxxiv] C&D waste includes items such as concrete, wood/lumber, drywall, metals, bricks, glass, plastics, and asphalt. In 2018, 90% of C&D waste in the U.S. was produced during demolition of buildings and infrastructure, while only 10% was produced during construction.[lxxv]

The majority of concrete from demolition is reused in another form such as aggregate and manufactured products; however, wood, drywall, metals, tile, and other materials often make their way to the C&D landfill despite have the potential for reuse. These materials have "embodied carbon" – the GHG emissions released during the lifecycle of building materials, including extraction, manufacturing, transport, construction, and disposal.[lxxvi] The GHG emissions represented by the materials can be reduced by designing material-efficient buildings; 1) designing buildings with a focus on durability and deconstructability (designing in a way that facilitates ease of deconstruction for reuse of materials); 2) promoting adaptive reuse of buildings; and 3) carefully deconstructing buildings at the end of their useful life to reuse and recycle their components.[lxxvii lxxviii lxxix]

Geographic Scope: Reducing construction and demolition waste can be done throughout the entire MSA. Communities without nearby access to C&D landfills may want to prioritize this measure.

Annual GHG Emissions Reductions in 2035: 0.42 MMT CO2e

Annual GHG Emissions Reductions in 2050: 0.55 MMT CO2e

Annual Co-Pollutant Reductions in 2035: 0.16 Thousand MT

Annual Co-Pollutant Reductions in 2050: 0.44 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$419 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$538 (savings)

Co-Benefits: Lower Costs; Protection of Natural Resources; Strengthened Local Economy

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Schools & Universities; Businesses; Individuals

Implementation Milestones and Timelines – *For construction:* Milestones may include Pre-design phase (defining material efficiency goals, site resource assessment, material and waste management plan, design for deconstruction); Schematic design phase (design and layout optimization, structural envelope strategy, material research and selection, early-stage lifecycle assessment); Design development stage (confirm material and systems selections, value engineering review, update lifecycle assessment, integrate waste management strategies); Construction documentation phase (detailed drawings and specifications, permitting review, comprehensive C&D waste plan); Procurement and construction phase (implement construction waste management, waste tracking and reporting, verification of material specifications); and Post-construction phase (final waste management report, post-occupancy evaluation). This process can take 1- 2+ years. *For deconstruction:* Milestones may include contacting a contractor/consultant; performing a survey and salvage assessment; obtaining necessary permits; preparing the site; deconstructing from the inside out and carefully removing materials; and processing and/or storing salvage materials for reuse. This may take 6-12 months.

Metrics to Track Progress – Number of green building standard ordinances passed by local governments; Number of deconstruction ordinances passed by local governments

Waste & Materials WM2 – Increase Composting

In the U.S., food is the most common material sent to landfills, making up about 24% of municipal solid waste. Yard trimmings and wood are another large source of materials that end up in landfills (~16%.) When landfilled, these materials break down into GHGs that are released into the air, if not put to another use. Additionally, the GHG emissions it took to produce them (growing, harvesting, processing, transporting, storing, cooking, etc.) are wasted.

The good news is that these organic materials (food, yard trimmings, wood/tree mulch) can be composted, which produces fewer GHGs and allows the materials to be put a beneficial use such as compost. Composting can take place at many scales and sizes – backyard, community, on-farm, municipal and regional – and at a range of locations within urban and rural areas. A small-scale system can be as simple as a backyard compost pile, whereas a large-scale system may be a centralized, commercial composting facility processing organic materials from around the region.

Geographic Scope: Composting can effectively be done throughout the entire MSA. To increase composting rates, larger scale facilities should be prioritized.

Annual GHG Emissions Reductions in 2035: 0.12 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 0.30 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: -0.11 Thousand MT

Annual Co-Pollutant Reductions in 2050: -0.57 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: $22

Net Cost (2024$/MTCO$_2$e) 2050: $22

Co-Benefits: Increased Safety and Resilience, Protection of Natural Resources, Strengthened Local Economy

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Schools and Universities; Nonprofits/NGOs; Businesses; Individuals

Implementation Milestones and Timelines – *For individuals:* Milestones may include identifying if there is already a composting site or curbside collection offering in your area, signing up to participate in the program OR identifying where composting could take place at your home; researching composting systems; and purchasing and setting up the composting system. This can take anywhere from 1 week to 1 month. *For communities:* Finding partners who would like to help establish a community composting site; consulting the Georgia EPD Composting website[lxxxi] and your local government for permitting requirements; identifying a site; obtaining any required permits or approvals; purchasing and setting up composting system; and enrolling participants from the community.[lxxxii] This process could take anywhere from 3-12 months. *For local governments:* Milestones may include identifying a local composting facility that can accept organic waste from the city/county; determining whether organic waste will be collected curbside or at drop-off points; securing funding or financing; contracting for the service; educating the public; and enrolling participants. This process can take 6 months to 1+ years.

Metrics to Track Progress – Number of community composting programs; Number of local governments offering composting

Opportunities for Action

Funding Opportunities for Waste & Materials measures may include:

State & Local – Georgia Recycling and Waste Diversion Grant; Georgia Tire Products Grant; ARC/Food Well Alliance Local Food Systems Planning Program; Municipal Fee Adjustments/Landfill Disposal Surcharges

Technical Assistance & Additional Information: Construction and Demolition Recycling Association; Build Reuse; Lifecycle Building Center; Georgia Recycling Coalition; NY Department of Environmental Conservation – Building Material Reuse and Deconstruction Guide & Resources; Institute for Local Self Reliance – Community Composting Done Right; The Composting Collaborative; U.S. Composting Council; Georgia Composting Council; Food Well Alliance

Policy Actions:

- Increase awareness of material-efficient building, adaptive reuse, and deconstruction
- Adopt material-efficient building, adaptive reuse, and deconstruction policies/ordinances
- Increase funding for deconstruction training and workforce development
- Increase awareness of composting options
- Increase funding for composting programs

Examples of Successful Projects and Programs

- **Lifecycle Building Center (LBC):** This nonprofit's mission centers on keeping usable construction materials out of landfills and redirecting them back into the community through reuse. Since 2011, LBC has prevented the disposal of 13.3 million pounds of building materials and generated over $6.47 million in community savings by: 1) providing income-restricted homeowners near LBC's Reuse Center access to these materials at an affordable cost and 2) donating free materials to nonprofits, schools and churches across metro Atlanta, with 496 in-kind material grants awarded to 402 nonprofits through its Nonprofit Material MATCH program. LBC is also supporting the expansion of affordable housing in low-wealth communities, and working with community partners to provide workforce training in deconstruction as well as free educational classes for homeowners.
- **Avondale Community Composting Pilot**: The city of Avondale Estates partnered with CompostNow to launch a 12-month residential curbside composting pilot. Over the course of the first eight months of the pilot, the city engaged with 534 participating households diverting 80,243 pounds of food waste from the landfill–more than 10,000 pounds per month. Instead of becoming a source of methane emissions in a landfill, this food waste became part of a local loop: collected weekly, turned into compost, and destined to enrich soil for edible landscapes at libraries in DeKalb County through partnerships with Food Well Alliance and Roots Down.

IMAGINING TOMORROW

"To make our region sustainable we should focus on recycling and long-term goals on how we can keep our environment clean and nice. Educating the youth to focus on long term and environmentally friendly options on things is important because we are pretty much going to be the ones involved in these things in the future. Keeping everyone involved is also key to help improve our community and environment."

– MACAP Climate Visioning Survey Participant

SPOTLIGHT

ReBuildATL: Breaking Barriers Through Deconstruction

In 2023, the Lifecycle Building Center partnered with multiple community, nonprofit, and educational organizations to develop and implement ReBuildATL: Breaking Barriers Through Deconstruction, a workforce training program. The program offers paid vocational training to individuals seeking to overcome barriers to employment, opening the door for them to find long-term, living-wage jobs in industries needing workers with skills in deconstruction, commercial construction, residential remodeling, facility management, and more. Individuals served by the program receive training in deconstruction, home repair and weatherization, energy efficiency, career advancement skills, financial literacy, OSHA 10 safety certification, and GPRO certification in high-performance construction standards. Beyond providing educational opportunities and new career pathways, the program creates broader community resilience by supporting the transition from a linear resource usage model to a circular, restorative use of finite material resources.[lxxxiii]

5.6 Trees & Greenspace GHG Emission Reduction Measures

In 2022, **metro Atlanta's natural lands sequestered approximately 5.2 MMT of CO_2e, offsetting about 7% of total emissions**, providing an important, low-cost carbon capture technology. When trees perform photosynthesis, they pull CO_2 out of the air, bind it with sugar, then release oxygen. Trees use the sugar to grow trunks, branches, and roots. As long as the tree is living, the majority of the carbon that was captured remains part of the tree. In addition to trees, other plants use photosynthesis to grow by capturing carbon, and healthy soils store carbon as well.[lxxxiv] All of this combines to make natural lands and green spaces a powerful carbon sink – offsetting the emissions made by other sectors such as transportation and buildings.

Trees and greenspaces have a multitude of other benefits besides capturing carbon. They can boost our mental and physical health by reducing stress levels, they clean the air, they provide habitat for a variety of wildlife, they provide shade and reduce ambient temperature levels, and they capture stormwater and help to prevent flooding.[lxxxv]

The Trees and Greenspaces measures in this plan aim to reduce GHG emissions through two key methods:

TG1. Add Trees and Green Infrastructure – Increase tree canopy and vegetative coverage through afforestation and green infrastructure.

TG2. Restore and Protect Forests – Restore and protect temperate-climate working forests and urban tree canopies through improved forest management.

Trees and Greenspace TG1 – Add Tree Canopy and Green Infrastructure

In just one year, the average mature tree can absorb approximately 48 pounds of CO_2 from the atmosphere.[lxxxvi] The rate of carbon absorption varies based on factors such as tree type, age, and climate. In return, trees release oxygen. Forests act as carbon sinks, absorbing CO_2 while they are standing or regrowing, but releasing it when they are cleared or degraded. However, deforestation – the removal of trees – is occurring at a pace that jeopardizes the achievement of the Atlanta MSA's climate goals. Although it may seem like a simple solution to plant more trees, also known as afforestation, a recent U.S Forest Study shows that the nation is cutting down significantly more trees than it is planting, and Georgia is at the top of the list for rate of tree loss.[lxxxvii]

On the flip side, the installation of green infrastructure is on the rise in the U.S., with 61% of local governments surveyed by the Green Infrastructure Leadership Exchange reporting that their green infrastructure spending has increased.[lxxxviii] Green infrastructure (GI) is defined by the GI Ontario Coalition as the natural vegetative systems and green technologies that collectively provide society with a multitude of economic, environmental, health, and social benefits. This includes:

- Urban forests
- Bioswales
- Engineered wetlands
- Rain gardens
- Green roofs and green walls
- Parks and gardens
- Urban agriculture
- Natural heritage systems (a network of connected natural areas, such as forests, wetlands, and river valleys)[lxxxix]

The vegetation and soils found with green infrastructure, whether naturally occurring or manmade, absorb CO_2 and collectively contribute to offsetting other metro Atlanta GHG emissions, as well as providing many other benefits mentioned previously.

Geographic Scope: Green infrastructure and afforestation efforts can be done throughout the entire MSA.

Annual GHG Emissions Reductions in 2035: 0.08 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 0.42 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: 19.03 Thousand MT

Annual Co-Pollutant Reductions in 2050: 16.68 Thousand MT

Net Cost (2024$/MTCO$_2$e) 2035: -$108 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: -$108 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Strengthened Local Economy

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Nonprofits/NGOs; Schools & Universities; Businesses; Land and Property Owners; Individuals

Implementation Milestones and Timelines – *For local governments*: Milestones may include adding trees, greenspace, and green infrastructure elements into their community development plan updates; participating in the national TreeCity USA program; hiring a dedicated arborist and tree maintenance; and holding local tree planting programs and green infrastructure workshops. *For schools and universities:* milestones might include developing curricula around green infrastructure planning, designing and afforestation; partnering with local businesses and nonprofits for service learning and community science programs that enhance tree canopy; and participating in the Tree Campus K-12 and Tree Campus Higher Education programs. These processes can take as little as a few months or several years.

Metrics to Track Progress – Number of trees planted; Amount of tree canopy coverage; Number of green infrastructure installations

Tress and Greenspace TG2 – Restore and Protect Forests

Working forests are actively managed for economic uses such as timber, paper, biomass, and wood pellets. Depending on the private land owner's goals, these forests can provide numerous ecological services, including carbon sequestration. According to the Georgia Forestry Association, the state has over 22 million acres of designated working forests providing commercially available timber. More trees are being grown than harvested on an annual basis, and forest stock in these forests, managed at scale, has been increasing in volume since 1953.[xc]

Younger trees sequester more carbon, due to their higher growth rates. As trees mature, their carbon sequestration rates slow down. Given that working lands are an active process of harvesting and replanting, there is healthy potential for working forests to sequester signficant amounts of carbon. Most of northern Georgia, where the Atlanta MSA is located, is primarily oak-hickory hardwood forest.[xci] The region's oak-hickory hardwood forests are the least likely to see declines in carbon sequestration rates over their lifetime.[xcii] This makes forests across the region viable for carbon sequestration both in terms of conserving land and carefully managing them for economic benefit.

Within developed areas of the MSA, trees in busy downtowns, parks, greenspaces, and neighborhoods are known as urban and community forests. Urban forests need specialized care and maintenance. The first step for local governments to help preserve their tree canopy is to conduct an urban tree canopy inventory. The inventory will give them an idea of where canopy coverage could be improved, establish a plan for tree maintenance, and recommend a list of native trees that would do well in the area. Some communities choose to participate in the TreeCity USA program to help further their tree canopy goals and educate residents on the importance of trees.

Geographic Scope: Rural areas of the MSA contain privately-owned forests, which may be managed and preserved. In suburban and urban areas, the tree canopy on public lands can be managed by local governments.

Annual GHG Emissions Reductions in 2035: 0.03 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 0.09 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: -0.99 Thousand MT

Annual Co-Pollutant Reductions in 2050: -1.32 Thousand MT

Net Cost (2024\$/MTCO$_2$e) 2035: -$155 (savings)

Net Cost (2024\$/MTCO$_2$e) 2050: -$181 (savings)

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Strengthened Local Economy

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions; Forestry Agencies and Organizations; Nonprofits/NGOs; Private Land Owners; Timber Investment Management Organizations

Implementation Milestones and Timelines – *For local governments and regional commissions:* Milestones may include conducting an urban canopy inventory; developing policies that encourage the preservation of forested areas and tree canopy; designating restoration pilot areas; and determining the feasibility of partnering with carbon markets. *For private landowners:* Milestones may include engaging in a stewardship program; working with supporting forestry agencies and organizations to create silvicultural prescriptions; and considering the feasibility of working with the carbon market. These processes can take anywhere from a few months to several years.

Metrics to Track Progress – Amount of tree canopy coverage; Number of urban canopy inventories; Number of landowners participating in a forest stewardship program

Opportunities for Action

Funding Opportunities for Trees & Greenspace measures may include:

Federal Grants & Loans – None at this time

Federal Tax Credits – None at this time

State & Local – Georgia ReLeaf Program; Trees Across Georgia Grant; Making the Shade Program; One Tree Planted Reforestation Program; Arbor Day Foundation Georgia Tree Planting Program; Georgia Conservation Woodland Program; Invasive Plant Control Program; Cost Share & Incentive Programs; Georgia Forest Legacy Program; Land & Water Conservation Grants; Outdoor Recreation Legacy Partnership Program; Conservation Use Tax Value Assessment

Technical Assistance & Additional Information: Arbor Day Foundation; The Nature Conservancy; Trust for Public Land; The Conservation Fund; Southern Conservation Trust; i-Tree; U.S. Forest Service – Urban Forest Inventory and Analysis Program; Georgia Arborist Association; Georgia Tree Council; Georgia Forestry Association; Georgia Forestry Foundation; Forest Stewardship Council; Forest Landowners Association; Georgia DNR Forestry for Wildlife Partnership; Georgia Forestry Commission; Peach State Voluntary Emissions Reduction Studies - Expanding Reforestation Project; Georgia Conservancy; Trees Atlanta; Eco Addendum; Georgetown Green Infrastructure Toolkit; Green Infrastructure Center; Metropolitan North Georgia Water Planning District

Policy Actions:

- Increase funding for tree inventories and forest management programs
- Increase funding for tree planting and maintenance programs
- Adopt tree ordinances that give preference to native trees
- Establish or increase tree recompense adjusted to represent inflation and true cost of tree replacement or conservation value
- Develop transfer of development rights programs

Examples of Successful Projects and Programs

- **Green Infrastructure for New Developments:** Many local governments now require or strongly encourage the installation of green infrastructure for post-construction stormwater management, including **Gwinnett County** and the cities of **Atlanta, Chamblee, Decatur, and Tucker.**
- **Trees Atlanta Front Yard Tree Program:** Trees Atlanta works with 12 jurisdictions within metro Atlanta – **DeKalb County** and the cities of **Atlanta, Brookhaven, Chamblee, Decatur, Doraville, Dunwoody, Hapeville, Mableton, Sandy Springs, Smyrna, and Tucker.** These local governments provide funding to have Trees Atlanta plant trees in residents' yards upon request and at no charge to homeowners. Front yard planting locations allow mature trees to provide shade in public areas, a win-win for both the property owner and the community. In Dunwoody, a total of 189 front yard trees have been planted through this program since 2022. DeKalb County began participating in the program in 2020, with a goal of having 400 trees planted during the first two years of the program, with 100 trees reserved for rights-of-way in commercial corridors and other county-owned properties.
- **Transfer of Development Rights (TDR) Programs:** A TDR program is a voluntary growth management tool in which the potential development of one piece of land is transferred to another piece of land. TDR protects rural character and greenspaces by allowing landowners to sell their development rights from a "sending site" that is preserved to a "receiving site" in an area designated for higher density growth. The cities of **Milton** and **Chattahoochee Hills** have both adopted TDR programs to help preserve the rural character of the communities, while protecting farms, forests, and wildlife habitat. Chattahoochee Hills has designated 70% of its land as protected forests and farmland, and TDR plays a big part in making that possible.
- **Urban Forestry Programs:** Urban forestry programs focus on the planning, care, and management of trees and forests within cities and counties to improve community health, environmental quality, and urban resilience. **DeKalb County** and the cities of **Sandy Springs, Decatur, Milton, Chamblee,** and **Avondale Estates** have active urban forestry programs. As an example, the City of Atlanta's Urban Ecology Framework led it to partner with The Conservation Fund to purchase a 216-acre oak-hickory forest known as Lake Charlotte Nature Preserve. One of the largest greenspace acquisitions in the city's history, this park will protect a critical part of Atlanta's tree canopy and provide a peaceful place for residents to enjoy the outdoors without leaving the city.

SPOTLIGHT

Peachtree Arborists & Trees Atlanta Replanting Program

Atlanta teamed up for a unique public-private-nonprofit partnership. Known as the only regional arboricultural firm that plants a tree for every tree it removes, Peachtree Arborists empowers property owners and managers to designate the location and size of each replacement tree, either on their own property or elsewhere in the region. Because Trees Atlanta works year-round on a rotation of neighborhood planting locations such as parks, museums or other green spaces for local governments around metro Atlanta, clients may opt for the planting to take place in one of these areas. Outside of Trees Atlanta's service coverage area, Peachtree Arborists and the Arbor Day Foundation's affiliates in other cities within the MSA work out similar arrangements. After each tree is planted, a public online satellite map tracks the program's replanting activities, allowing anyone to pinpoint their newly planted tree's location and learn details about the species of each tree. The digital map was donated to the program by Clearion, an Atlanta-based geospatial workforce infrastructure management software. To date, 291 trees have been planted by this "tree-rific" program.

IMAGINING TOMORROW

"Thanks to incentives and grants from the city, lawns and turf grass parks have been mostly converted to high quality native bird habitat and home scale gardens. Most furniture and household items used locally are manufactured locally from the lumber produced from sustainable urban forestry, which also provides well-paying jobs for thousands of residents. Nuts produced by the abundant tree canopy provide thousands of jobs in food and fuel products. A moratorium on development has protected over 100 miles of streams. Due to these major changes (and others) reductions in commuter traffic and increases in soil carbon storage has made Atlanta a leader in innovative and holistic climate solutions."

– MACAP Climate Visioning Survey Participant

5.7 Cross-Sector GHG Emission Reduction Measures

Local governments can have broad impact on GHG emissions produced by a variety of sectors, such as transportation, buildings, and waste. Additionally, local government actions can increase the number of trees and greenspaces available to serve as GHG sinks, sequestering carbon that would otherwise contribute to climate change. These actions may be focused inward on local government operations, buildings, and fleets, but also outward toward the broader community through planning and ordinances.

National and regional programs like LEED for Cities and ARC's Green Communities provide a roadmap for local governments to implement policies and ordinances that can reduce GHGs at the local level.

The Cross-Sector measure in this plan aims to reduce GHG emissions through one key method:

CS1. Accelerate Adoption at the Local Level – Provide incentives and technical assistance to increase local government adoption of climate mitigating policies, ordinances, and programs.

Cross-Sector CS1 - Accelerate Adoption at the Local Level

Much can be done to address climate change in our own communities. Local governments voluntarily participating in ARC's Green Communities certification program have been reducing their GHG emissions through environmental sustainability-focused actions for over 15 years. Such actions include but are not limited to: conducting energy audits on their facilities and making retrofits; incorporating high performance building and energy benchmarking requirements into their codes of ordinance; adopting no-net-loss of trees policies; developing greenspace plans and greenspace goals; encouraging the diversion of waste from landfills through recycling and composting of yard waste materials; transitioning their fleets to alternative-fuel and EVs; expanding EV charging infrastructure and requiring EV chargers in new developments; encouraging transportation mode shifts through pedestrian and bike planning, as well as participation in national bike/walk friendly programs.

Implementing these measures within city and county buildings, fleets, and the broader community not only is sustainable, it shows local residents and businesses what they can do, spurring greater adoption of GHG actions. Additionally, many Green Communities have found that participating in the program fosters civic pride and is a selling point to businesses interested in locating in their jurisdiction.

Geographic Scope: ARC's Green Communities program is open to any local government within ARC's 11-county area. Others within the 19-county MPO may also participate with agreement from their local regional commission. The Green Communities manual is available for any local government within the Atlanta MSA to use as a roadmap and other programs, such as LEED for Cities, are available MSA-wide.

Annual GHG Emissions Reductions in 2035: 0.64 MMT CO_2e

Annual GHG Emissions Reductions in 2050: 2.90 MMT CO_2e

Annual Co-Pollutant Reductions in 2035: NA

Annual Co-Pollutant Reductions in 2050: NA

Net Cost (2024$/MTCO$_2$e) 2035: -$52 (savings)

Net Cost (2024$/MTCO$_2$e) 2050: $3,796

Co-Benefits: Improved Air Quality; Better Health and Wellbeing; Lower Costs; Increased Safety and Resilience

Implementation Details:

Key Implementation Partners – Local Governments; Regional Commissions

Implementation Milestones and Timelines – Milestones include visiting the ARC Green Communities or LEED for Cities website and reading through the program guidance; scheduling a time to meet with program staff to discuss certification options; establishing a Green Team; compiling documentation; and adopting new policies and ordinances, if needed. This process can take months to 1+ years depending on how many measures the local government has already implemented.

Metrics to Track Progress – Number of local governments participating in Green Communities; Number local governments participating in LEED for Cities; Number and type of measures implemented

Opportunities for Action

Funding Opportunities for Cross-Sector measures may include:

Federal Grants & Loans – No direct funding. Funding may be available for implementing measures from the previous sectors.

Federal Tax Credits – No direct tax credits. Credits may be available for implementing measures from the previous sectors.

State & Local – No direct funding. Funding may be available for implementing measures from the previous sectors.

Technical Assistance & Additional Information: ARC's Green Communities Program; LEED for Cities and Communities; Great Plains Institute Climate Ordinance Database; Smart Surfaces Policy Tracker; Sabin Center for Climate Change Law – Model Municipal Ordinances

Policy Actions:

- Increase technical assistance, education, and outreach to assist local governments with adopting GHG measures
- Increase funding for ARC's Green Communities Program and for similar technical assistance and certification programs

Examples of Successful Projects and Programs

- **City of Dunwoody Embraces Green Communities from the Start:** Dunwoody was incorporated as a city on December 1, 2008. ARC's Green Communities program was launched in 2009. As the city was getting started establishing internal operating policies, and local codes and ordinances, it looked to measures in the Green Communities manual for ideas. The city was first certified as a Green Community in 2010 at the Bronze level and since that time has reached Gold.
- **Atlanta 100th LEED-Certified City or Community in the World:** In 2019, the city of Atlanta earned LEED Silver certification, becoming the 100th city or community in the world to certify under the U.S. Green Building Council's LEED for Cities and program. The certification was granted in recognition of the city's commitment to sustainability, human health, and economic prosperity. The program enables cities to measure and communicate performance, focusing on outcomes from ongoing sustainability efforts across an array of metrics, including energy, water, waste, transportation, and human experience (which includes education, prosperity, equity and health & safety.)

5.8 Review of Authority to Implement

Under the EPA CPRG Planning Grants program, each climate action plan must include a review of authority to identify if the planning grant recipient or collaborating partners have existing regulatory or statutory authority to implement the applicable priority GHG emissions reduction measures. ARC has reviewed existing statutory and regulatory authority to implement each measure identified in this plan. This plan is non-regulatory in nature, and the measures contained herein constitute a list of voluntary actions available to cities and counties, transit agencies, schools and universities, utilities, businesses, industries, nonprofits/NGOs, and individuals for implementation. No new regulatory authority is given by CPRG, nor is new authority sought by this plan for CPRG. Any eligible entity wishing to pursue implementation should consult their local laws, rules, and ordinances to see if additional authority is necessary prior to implementation.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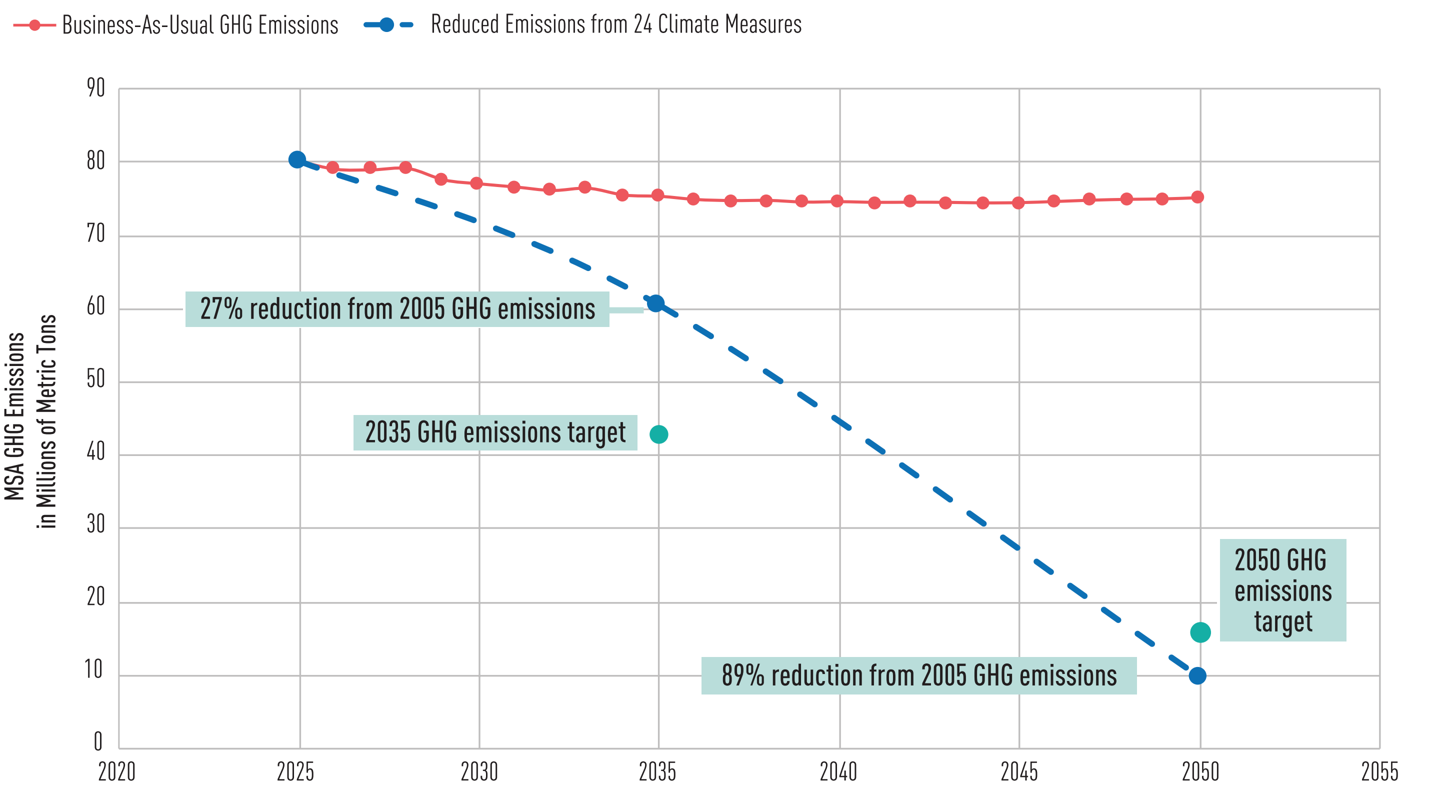
6 Plan As Implemented Projections

This section outlines the projected GHG emissions for the Atlanta MSA under a "Plan As Implemented" scenario where all twenty-four of the GHG reduction measures outlined in section five are fully implemented over time. These projections serve to understand future emissions trajectories in comparison to the BAU projections outlined in Section four of this plan. Projection results are presented as an economy-wide forecast, with values extending to both 2035 and 2050 to align with the near- and long-term GHG reduction targets for the Atlanta MSA as defined in Section three. Information about how these projections were derived can be found in Appendix C.

6.1 Discussion of Projections

When implemented, the suite of 24 GHG reduction measures described in Section five are projected to result in a moderate decrease in emissions by 2035 and a more significant reduction by 2050, when compared to the BAU projection as calculated by Georgia Tech (Figure 10).

Figure 10: Plan As Implemented GHG Emissions Projections Compared to BAU Projections and MSA Targets, 2035 and 2050



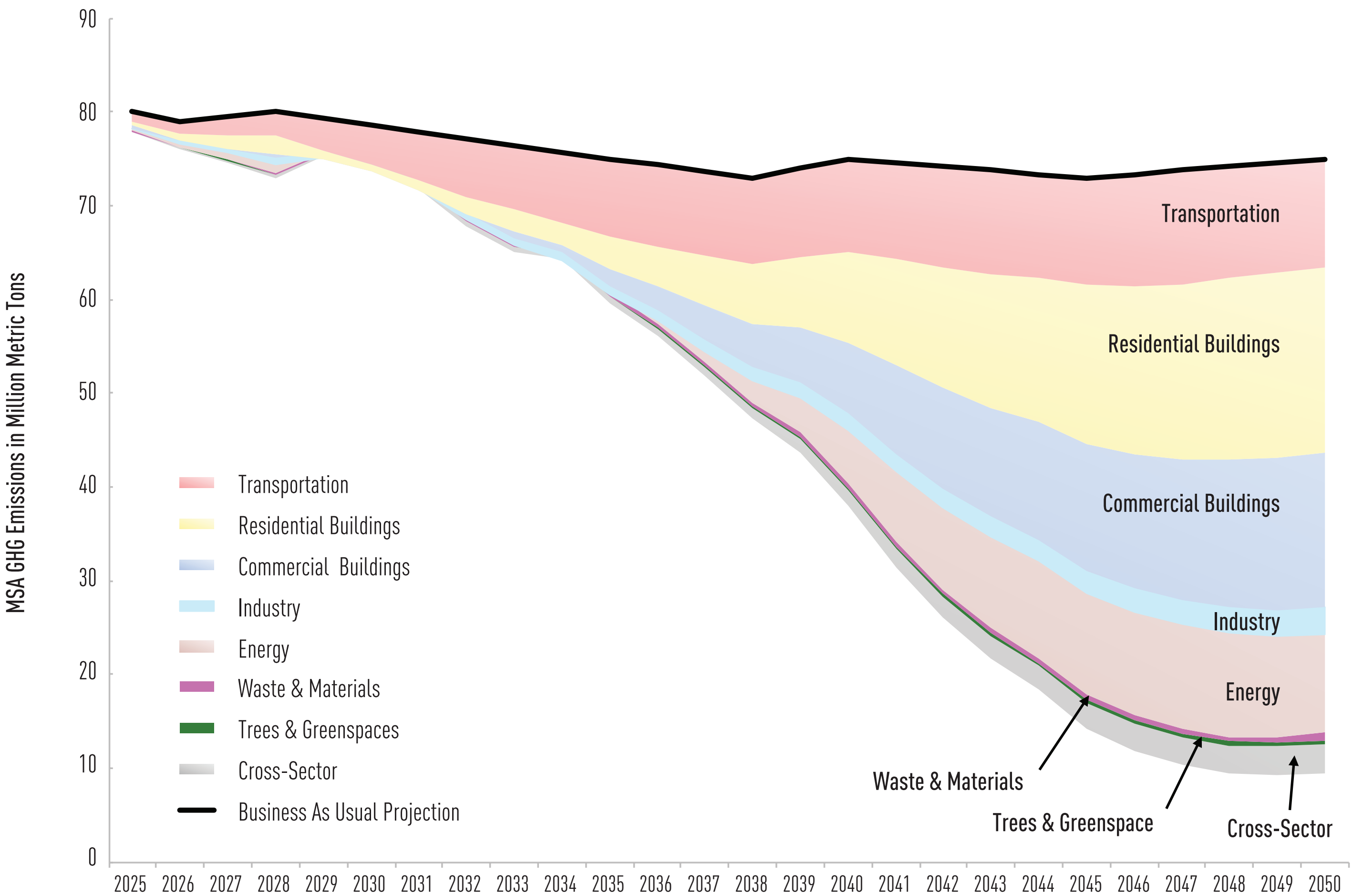
The projected emissions reductions for 2035 represent a 27% reduction from 2005 GHG emissions, which is below the target of 50%. This gap in target achievement can be accounted for by near-term impacts of increased energy demand, which will initially result in additional carbon-based electricity production. In addition, as the federal policy landscape and funding opportunities continue to be unclear, the modeling team made fairly conservative estimates of uptake of the measures in the next 10 years. However, the projected emissions reductions for 2050 represent an 89% reduction from 2005 GHG emissions, which goes above the target of 80 – 85% emissions reductions. This is most likely the result of a better mix of carbon-based and renewable energy sources that is achievable 25 years from now as well as increased uptake of measures over time.

Table 5: Summary of Plan Implemented GHG Reductions by Sector, 2035 & 2050, Georgia Tech

Sector	Annual GHG Reductions 2035 MMT CO_2e	Annual GHG Reductions 2050 MMT CO_2e
Transportation	**8.31**	11.59
Buildings (Residential)	3.40	**19.68**
Buildings (Commercial)	1.21	**16.53**
Industry	1.04	2.93
Energy	-0.64	9.15
Waste & Materials	0.54	0.85
Trees & Greenspace	0.11	0.51
Cross-Sector	0.65	2.90
Totals	**14.62**	**64.13**

The largest near-term GHG reductions should be seen within the transportation sector at 8.31 MMT CO2e. In the long-term, the greatest GHG reductions should be achieved within the buildings sector, with 19.68 MMT CO2e reductions from residential buildings and 16.53 MMT CO2e reductions from commercial buildings (Table 5). The GHG reduction trends by sector are also illustrated in Figure 11.

Figure 11: Plan Implemented GHG Reductions by Sector, 2025 - 2050, Georgia Tech



6.2 Closing the Gap: Longer Term Solutions

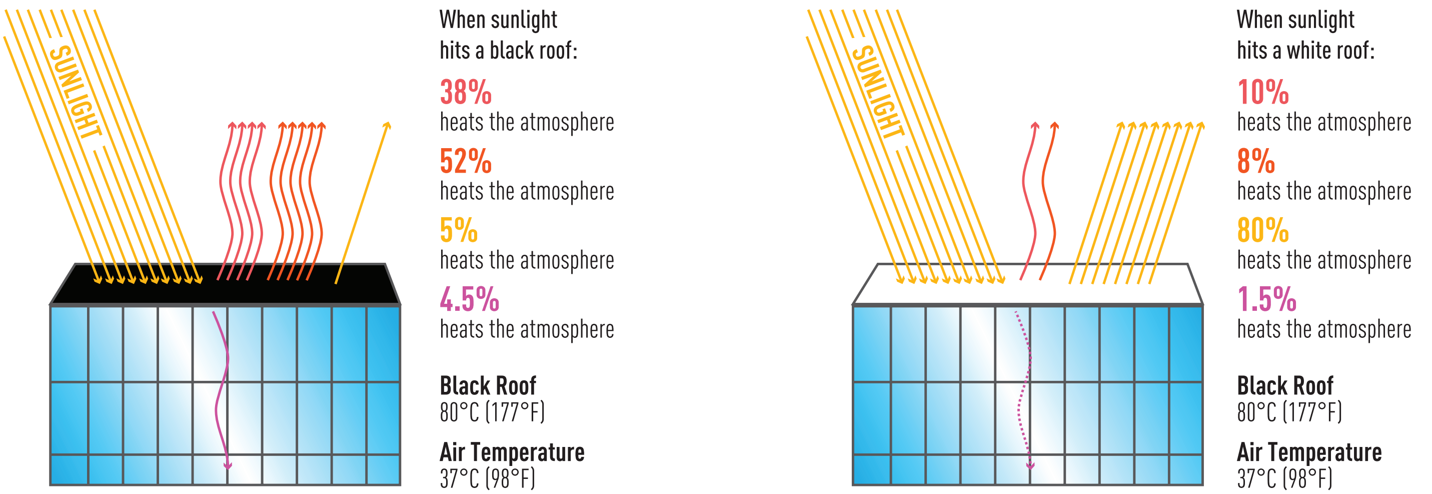
The 24 measures in the MACAP are projected to bring the Atlanta MSA within near-net zero emissions range by 2050. However, it is quite possible for additional actions to become feasible in the coming 10 – 15 years that would close the gap and see the MSA attain 100% net zero emissions by 2050. These are actions that, while currently available, may not yet be ready for broad adoption for technological, economical, or political reasons. The actions most likely to be feasible in for inclusion in future updates to the MACAP include the following opportunities.

Cool Roofs (Buildings Sector)

A cool roof is designed to reflect more sunlight than a conventional roof, absorbing less solar energy and lowering the temperature of the building – just as wearing light-colored clothing keeps you cooler in the summer. Cool roofs are increasingly being adopted as a climate solution because their high solar reflectivity reduces a building's energy consumption for cooling, lowering GHG emissions and energy bills. They also mitigate the urban heat island effect by reflecting heat away from cities, which helps reduce the formation of smog. This simple, low-cost technology is gaining momentum as a practical, scalable strategy for urban resilience and a more sustainable approach to building design, especially in warmer regions.[xciii xciv]

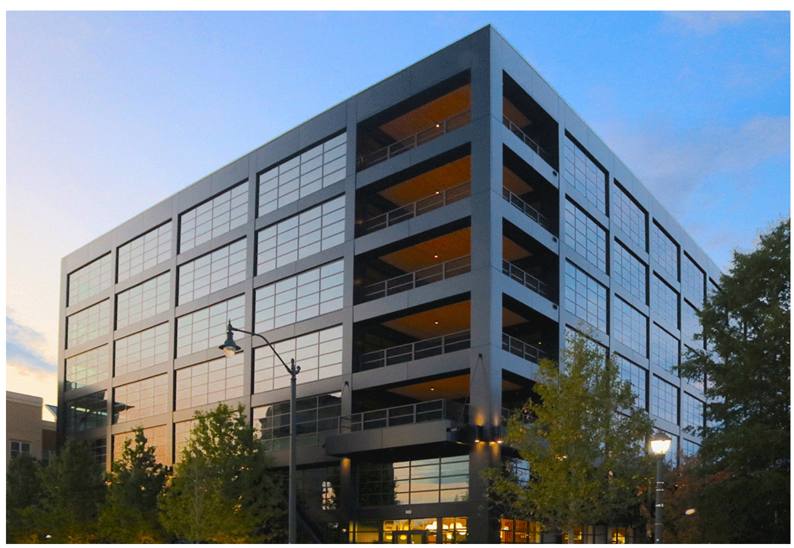
In June 2025, the Atlanta City Council passed a landmark cool roof ordinance. Developed in coordination with public health leaders, urban planners, clean air advocates, and national energy efficiency experts, the ordinance requires new roofs to meet high solar reflectance standards. The policy is projected to cool the city by 2.4°F in peak summer (and up to 6.3°F in certain neighborhoods), reduce over 1,000 metric tons of air pollution, deliver $310 million in direct energy savings to home and building owners, and generate $760 million in net financial benefits. In the future, the Atlanta MSA may see other cities and counties adopt similar ordinances.

Figure 12: Comparison of Conventional vs. Cool Roofs, U.S. DOE



Source: Adapted from data from LBNL Heat Island Group. Numbers do not sum to 100 percent due to rounding.

Mass Timber (Buildings Sector)



Mass timber is an innovative construction material that involves gluing, nailing, or doweling multiple layers of wood to create large, structural elements like panels, beams, and columns. It offers advantages such as a lower carbon footprint, faster construction times, and increased structural strength, making it a competitive alternative to traditional materials like steel and concrete, particularly for multi-story buildings. Additionally, softwoods like pine found in Georgia, can be used for mass timber production, sequestering approximately 1 metric ton of CO_2e per cubic meter of product.

Changing regulations are helping build mass timber's momentum. According to Architectural Record, "until recently, in most American cities, the height limit for wood buildings was 85 feet, about seven stories. But the latest versions of the International Building Code, the model code used by most jurisdictions in the U.S., permit mass-timber structures up to 18 stories. These tall mass-timber provisions have been adopted, either in whole or in part, by eight states, as well as Maryland's Howard County, the city of Denver, and seven cities in Texas."[xcv] To date, the tallest mass timber building in metro Atlanta is T3 West Midtown, at seven stories tall. Waldo's Old Fourth Ward rises to six stories, 619 Ponce to four stories, and the Kendeda Building for Innovative Sustainable Design (Kendeda Building) on Georgia Tech's campus at two stories. "Intro Atlanta" in the Buckhead area of Atlanta is designed to be among the tallest mass timber structures in the U.S. when it is completed with 17 stories of mass timber on top of a four-story concrete podium.

Concrete Clinker Substitution (Industry Sector)

The production of cement, used in countless construction and infrastructure projects, is responsible for nearly 7% of global carbon emissions. Clinker is the ingredient in cement that is used to used to bind the ingredients of concrete – water, sand, and aggregates. Concrete clinker is made by heating a mixture of limestone, clay, and other materials at extremely high temperatures in a kiln, which requires a large amount of energy.[xcvi] Concrete clinker substitution is the process of reducing the high-carbon-emitting clinker content in cement by replacing it with supplementary cementitious materials (SCMs) or fillers. Clinker is the most energy-intensive and carbon-intensive ingredient in cement production, so replacing it with more sustainable materials like fly ash, ground slag, or limestone – often industrial byproducts that would otherwise be waste – helps lower cement's environmental impact and promote a circular economy.[xcvii]

Carbon Capture and Sequestration (Industry Sector)

Carbon capture and sequestration (CCS) is a set of technologies that can greatly reduce CO_2 emissions from new and existing coal- and gas-fired power plants and large industrial sources. CCS is a three-step process that includes: capture of CO_2 from power plants or industrial processes, transport of the captured and compressed CO_2, usually in pipelines; and sequestration – also referred to as storage – of the CO_2 into either deep underground rock formations (geological) or human-engineered (technological) storage methods, such as injecting the captured carbon into concrete as it cures. Geologically-captured CO_2 is injected into formations that are often a mile or more beneath the surface consisting of porous rock that holds the CO_2. Overlying these formations are impermeable, non-porous layers of rock that trap the CO_2 and prevent it from migrating upward.

One example of CSS in action within the Atlanta MSA is the use of CarbonCure-treated concrete in several buildings. The Kendeda Building became one of the first buildings in the Southeast to take advantage of the technology, using CarbonCure-treated concrete for its footings, poured by ready-mix company Thomas Concrete. In 2017, a 12-story office tower along the Atlanta Beltline became the largest building yet to use the CSS method, and CarbonCure concrete was incorporated in a major expansion of the Georgia Aquarium. By using CarbonCure, those three Atlanta buildings have diverted more than 900 metric tons of carbon from the atmosphere, according to the company.[xcviii]

Carbon Pricing (Cross-Sector)

Carbon pricing is a policy tool to lower CO_2 and other GHGs. Currently, when GHGs are produced the public bears the costs of climate change's impacts, which include flooding, drought, heatwaves, and others. The goal of carbon pricing is to shift the responsibility for these costs to those who produce the emissions. When GHG producers and consumers must pay for CO_2 emitted, they have an economic incentive to shift away from fossil fuels, improve energy efficiency, and invest in low-carbon technologies.

There are two main approaches to carbon pricing: a carbon tax and a cap-and-trade system. A carbon tax directly sets a price per ton of GHGs and the reduction in carbon depends on emitters changing their behavior in response. A cap-and-trade, or emissions trading, system sets the total amount of emissions that can be released either at a national, regional, or state scale. The government then issues a limited number of emissions permits, either for free or through an auction. For each ton of GHGs released, the emitter must have a permit. Permits can be traded, so emitters who cannot cost-effectively lower their emissions must buy extra permits from those who can. The resulting carbon price then depends on the supply and demand for permits. Both approaches generate revenue for the government implementing them. This revenue can be used in many ways, such helping taxpayers offset the cost of energy and other goods, training workers for green jobs, and investing in other low-carbon technologies or infrastructure.[xcix]

Virtual Power Plants (Energy Sector)

A virtual power plant (VPP) is a collection of small-scale energy resources that, when aggregated and coordinated with electric grid operations, can provide the same kind of reliability to the grid as traditional power plants. The small-scall components of VPP can include smart thermostats, EVs and chargers, home appliances, solar panels and batteries, and industrial mechanical equipment. Single- and multi-family homes, stores, offices, factories, cars, trucks, and buses can all participate in VPP.[c]

VPPs can help regulators, utility planners and operators, and other grid partners address reliability, affordability, electrification, and decarbonization – all challenges currently facing the electric grid. One upcoming local example of VPPs in action includes Georgia Power's recently proposed pilot program for residential and small commercial customers to install solar and battery systems at their homes and businesses, creating VPPs. Under the proposal, customers would own the solar and battery hardware, but Georgia Power could call on their electricity to use when demand spikes. In return, customers would earn bill credits.[ci]

7 Benefits Analysis

This section highlights the transformative co-benefits of implementing GHG emissions reduction measures. **Co-benefits are positive outcomes or additional advantages** resulting from an action, policy, or project, beyond its primary goal. For example, reducing fossil fuel use also improves air quality and public health, a co-benefit. Each measure included in this plan has been carefully evaluated to determine how it contributes to a healthier, more economically competitive, resilient, and sustainable region. Broadly, the co-benefits are categorized into two key types: **direct and indirect.** While all measures offer both, it is often the indirect co-benefits of GHG reduction measures that deliver the most dynamic and long-lasting impacts to communities.

Direct co-benefits arise from carrying out GHG measures. For example, switching to an EV vehicle directly reduces tailpipe emissions, improves air quality, and results in lower operating and maintenance costs. **Indirect co-benefits** flow from direct benefits. For example, switching to an EV vehicle results in cleaner air, thus indirectly improving public health. Additionally, EV vehicle adoption strengthens the local economy because EVs must be manufactured and many are made in Georgia, another indirect co-benefit. Though these co-benefits are often more difficult to measure or attribute to a single action, they significantly increase the value and effectiveness of GHG reduction strategies by delivering community, economic, and environmental co-benefits.

7.1 Direct Co-Benefit – Co-Pollutant Reductions

The direct co-benefit quantitatively analyzed in this plan is reduction of non-GHG co-pollutants anticipated by implementing the GHG reduction measures detailed in the previous section. Co-pollutants are harmful pollutants released alongside GHGs from sources like vehicles, power plants, and factories. Unlike GHGs, which primarily contribute to climate change, these co-pollutants directly impact air quality and human health. These quantifiable results represent the foundational environmental gains of the climate action efforts within the Atlanta MSA. The co-pollutants analyzed in the MACAP include:

Carbon Monoxide (CO): a colorless, odorless, and poisonous gas released when carbon-based fuels are burned incompletely or inefficiently. In general, cars, trucks, and other fossil-fueled powered machines are the biggest sources of CO pollution. In indoor environments, there is a danger of illness and death when CO is inhaled in high concentrations. In outdoor environments, elevated CO levels heighten risk for people with heart disease.

Particulate Matter ($PM_{2.5}$ and PM_{10}): is a complex mixture of particles, including dust, dirt, soot, smoke, and liquid droplets that are found in the air in sizes small enough to be inhaled. $PM_{2.5}$ is made up of tiny airborne particles with a diameter of 2.5 micrometers or less. PM_{10} is composed of coarse particles that are larger than 2.5 micrometers and smaller than 10 micrometers. PM often comes from the burning of gas, oil, diesel fuel, or wood. They can also be created from industrial-combustion activities and motor vehicle exhaust. PMs can affect waterways, damage forests and crops, and cause aesthetic damage to buildings and landmarks. Their particles are small enough to find their way into the lungs and inhalation can lead to asthma attacks, chronic bronchitis, and premature death, especially in vulnerable groups like children, older adults, and people with pre-existing respiratory or heart conditions.

Nitrogen Oxides (NO_x): refer to a mix of gases – nitric oxide (NO) and nitrogen dioxide (NO_2) – which are produced from vehicles, industrial processes, and natural sources. NO reacts in the atmosphere to form NO_2, a corrosive gas that contributes to the yellow-brown color of smog. Exposure to high levels of NO_2 can irritate the lungs, worsen asthma, and increase risk of respiratory infection.

Sulfur Dioxide (SO_2): is a colorless gas with a sharp, irritating odor, typically generated from burning fossil fuels and smelting sulfur-containing mineral ores. Sulfur oxides from working lands, such as croplands and timberlands, primarily come from agricultural inputs. Exposure to SO_2 can have serious respiratory effects, especially in those with asthma or chronic respiratory conditions. SO_2 forms sulfuric acid when combined with water and oxygen, the main component of acid rain, which is harmful to waterways and forests.

Volatile Organic Compounds (VOCs): are chemicals that easily evaporate into the air and are commonly found in fuels and industrial products. Major sources include petroleum fuels, industrial solvents, and water treatment by-products. Over time, exposure to VOCs can lead to issues with the central nervous system, kidneys, liver, and lungs. They have also been linked to an escalated risk of cancer.

Pre-MACAP Co-Pollutant Levels

According to the US EPA's National Emissions Inventory (NEI), co-pollutants were present in the Atlanta MSA in 2005 at the levels shown in Table 6.[cii] NEI reports primary emissions only, including direct releases of pollutants from point, nonpoint, on-road, and non-road sources.

If the measures outlined in this plan are fully implemented, the MSA should see the following reductions in co-pollutants in 2035 and 2050. These reduction values are derived from the EPS, which accounts for both primary emissions and secondary formation of pollutants in the atmosphere.

Table 6: 2005 Atlanta MSA Co-Pollutant Emissions

Co-Pollutant	2005 in Thousand MT
Carbon Monoxide (CO)	1,191.5
Particulate Matter 2.5 ($PM_{2.5}$)	55.1
Particulate Matter 10 (PM_{10})	210.2
Nitrogen Oxides (NO_x)	223.7
Sulfur Oxides (SO_x)	376.8
Volatile Organic Compounds (VOCs)	213.9
Total Emissions	**2,271.2**

Table 7: Plan Implemented Atlanta MSA Co-Pollutant Reductions in 2035 and 2050 (All Sectors), Totals from Appendix D

Co-Pollutant	2035 in Thousand MT	2050 in Thousand MT
Carbon Monoxide (CO)	27.6	30.3
Particulate Matter 2.5 ($PM_{2.5}$)	2.3	8.3
Particulate Matter 10 (PM_{10})	3.3	9.8
Nitrogen Oxides (NO_x)	23.5	18.8
Sulfur Oxides (SO_x)	-0.3*	-0.1*
Volatile Organic Compounds (VOCs)	8.8	11.5
Total Reductions	**65.1**	**78.7**

* A negative value indicates an increase in co-pollutant.

The MSA should see a modest decrease in co-pollutants in 2035 and 2050 because of implementing the suite of measures in this plan.

Table 8: Plan Implemented Atlanta MSA Co-Pollutant Reductions by Sector in 2035, Totals from Appendix D

Co-Pollutants 2035	Transportation (Thousand MT)	Buildings (Thousand MT)	Industry (Thousand MT)	Energy (Thousand MT)	Waste & Materials (Thousand MT)	Trees & Greenspace (Thousand MT)
Carbon Monoxide (CO)	27.6	0.0004	0.001	0.001	-0.0003*	-0.002*
Particulate Matter 2.5 (PM2.5)	0.5	1.7	0.2	-0.04*	-0.02*	-0.0004*
Particulate Matter 10 (PM10)	1.4	1.7	0.23	-0.04*	-0.03*	-0.001*
Nitrogen Oxides (NOx)	4.5	0.0001	0.0004	-0.0004*	0	19.0
Sulfur Oxides (SOx)	-0.3*	-0.003*	0	0.0004	-0.0001*	-0.001*
Volatile Organic Com-pounds (VOCs)	8.8	0.7	0.05	-0.01*	0.1	-1.0*
Total Reductions	**42.5**	**4.1**	**0.5**	**-0.01***	**0.1**	**18.0**

* A negative value indicates an increase in co-pollutant.

Table 9: Plan Implemented Atlanta MSA Co-Pollutant Reductions by Sector in 2050, Totals from Appendix D

Co-Pollutants 2050	Transportation (Thousand MT)	Buildings (Thousand MT)	Industry (Thousand MT)	Energy (Thousand MT)	Waste & Materials (Thousand MT)	Trees & Greenspace (Thousand MT)
Carbon Monoxide (CO)	30.2	0.02	0.001	0.001	-0.001*	-0.004*
Particulate Matter 2.5 (PM2.5)	0.6	7.2	0.4	0.1	-0.1*	-0.0007*
Particulate Matter 10 (PM10)	1.5	7.8	0.5	0.1	-0.1*	-0.001*
Nitrogen Oxides (NOx)	2.1	0.02	0.001	0.0001	-0.001*	16.7
Sulfur Oxides (SOx)	-0.05*	0.001	0	-0.0001*	-0.0002*	-0.001*
Volatile Organic Com-pounds (VOCs)	9.2	3.8	-0.1*	0.1	-0.03*	-1.3*
Total Reductions	**43.6**	**18.8**	**0.8**	**0.25**	**-0.1***	**15.4**

* A negative value indicates an increase in co-pollutant.

When looking at the co-pollutant reductions by sector in Table 8 and Table 9, most co-pollutant reductions come from the transportation sector followed closely by the buildings (residential and commercial) sector. Sulfur oxides are still being created across several sectors in 2035 and 2050 but at a greatly reduced amount. This can most likely be attributed to an electric grid that is not yet supplied by 100% renewable energy and agricultural inputs in working forests. In 2035, the energy sector continues to contribute a small amount of additional co-pollutants, again most likely due to the mix of energy sources. However, the energy sector sees co-pollutant reductions in 2050, as the electric grid is supplied by a growing amount of clean energy. While trees and greenspaces are excellent carbon sinks, they can contribute to co-pollutant creation whether from agricultural inputs into working forests, producing SO_x, or dense stands of tree canopy temporarily trapping PM. Trees also produce VOCs, such as terpenes from pines and isoprene from oaks.

7.2 Additional Co-Benefits

In addition to a reduction of co-pollutants, the GHG reduction measures outlined in the MACAP will have broader ripple effects through additional co-benefits. The MSA should see improved public health resulting from cleaner air, enhanced energy security from developing renewable energy, job creation in clean energy and sustainability-related industries, and long-term cost savings through increased efficiency and innovation. Co-benefits from the measures have been categorized as follows:

- Improved Air Quality
- Expanded Transportation Options
- Better Health and Wellbeing
- Lower Costs
- Increased Safety & Resilience
- Protection of Natural Resources
- Strengthened Local Economy

A matrix that outlines the specific direct and indirect co-benefits of each measure can be found in Appendix E.

Improved Air Quality

Air quality will improve as the MSA transitions to cleaner modes of travel, energy production, and more efficient buildings and industrial processes. Many of the measures in this plan have a co-benefit of improving air quality. Expanding our renewable energy sources can significantly reduce harmful air pollution from fossil fuel combustion.[ciii] As communities strive for improved air quality, strategies such as electrifying vehicle fleets and investing in EV infrastructure emerge as essential solutions.

More Transportation Options

Increased transportation options offer major benefits across social, environmental, and economic spheres by reducing dependence on cars and creating a more resilient transportation system. A “multi-modal” approach integrates various modes of transport, such as walking, biking, public transit, and ride-share services, to serve a wider range of needs and create more vibrant and resilient communities. EVs offer drivers a cleaner, more environmentally responsible transportation option.

SPOTLIGHT

Health and Economic Benefits of Transportation Solutions in Clayton County, Ga.

Modeling results from EPAs COBRA tool show that transportation mode shift and electrification could generate major public health and economic benefits in Clayton County by 2050. Transportation measures in this plan are projected to reduce Clayton's share of co-pollutant emissions by 41.1 tons of $PM_{2.5}$, 143.9 tons of NO_x, and 630.4 tons of VOCs, though they also result in a modest 3.4-ton increase in SO_2 emissions.

These reductions translate into improvements in health outcomes for Clayton residents. COBRA estimates a reduction in premature deaths primarily linked to decreases in fine particulate matter exposure. Additional benefits include fewer cases of nonfatal heart attacks, fewer respiratory-related hospitalizations, and fewer emergency room visits each year, further lowering healthcare costs. As an example, Figures 13 and 14 show the avoided deaths and avoided asthma attacks across the entire MSA that can be achieved by implementing the GHG reduction measures in this plan.

Altogether, the health and economic benefits of lower carbon transportation solutions in Clayton County are valued at between $2.4 - $4.8 million annually. In a county such as Clayton where residents face persistent air quality and mobility challenges, these co-benefits highlight the importance of integrating health and climate goals in regional transportation planning.[civ]

Figure 13: Plan Implemented Avoided Deaths from Reduced Co-Pollutants, Atlanta MSA, Georgia Tech

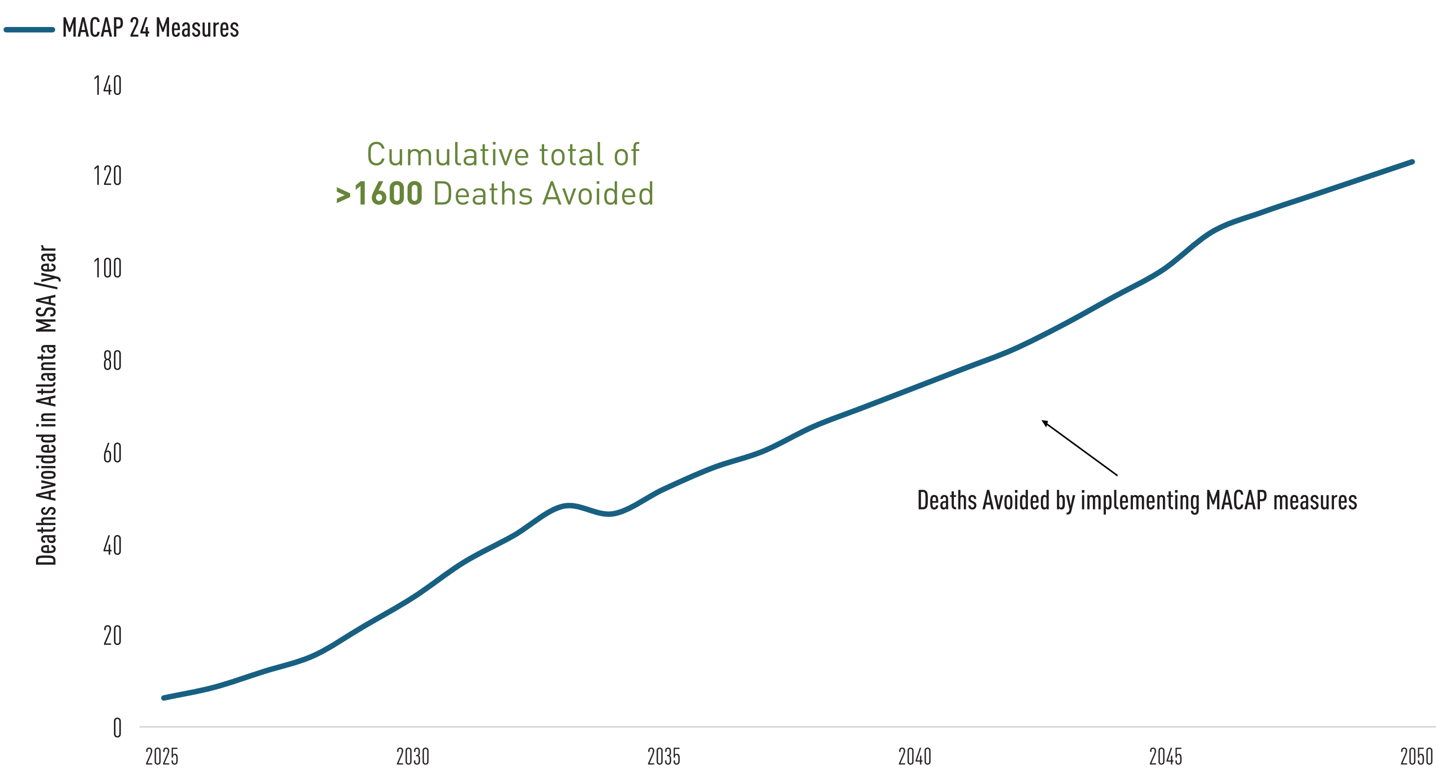
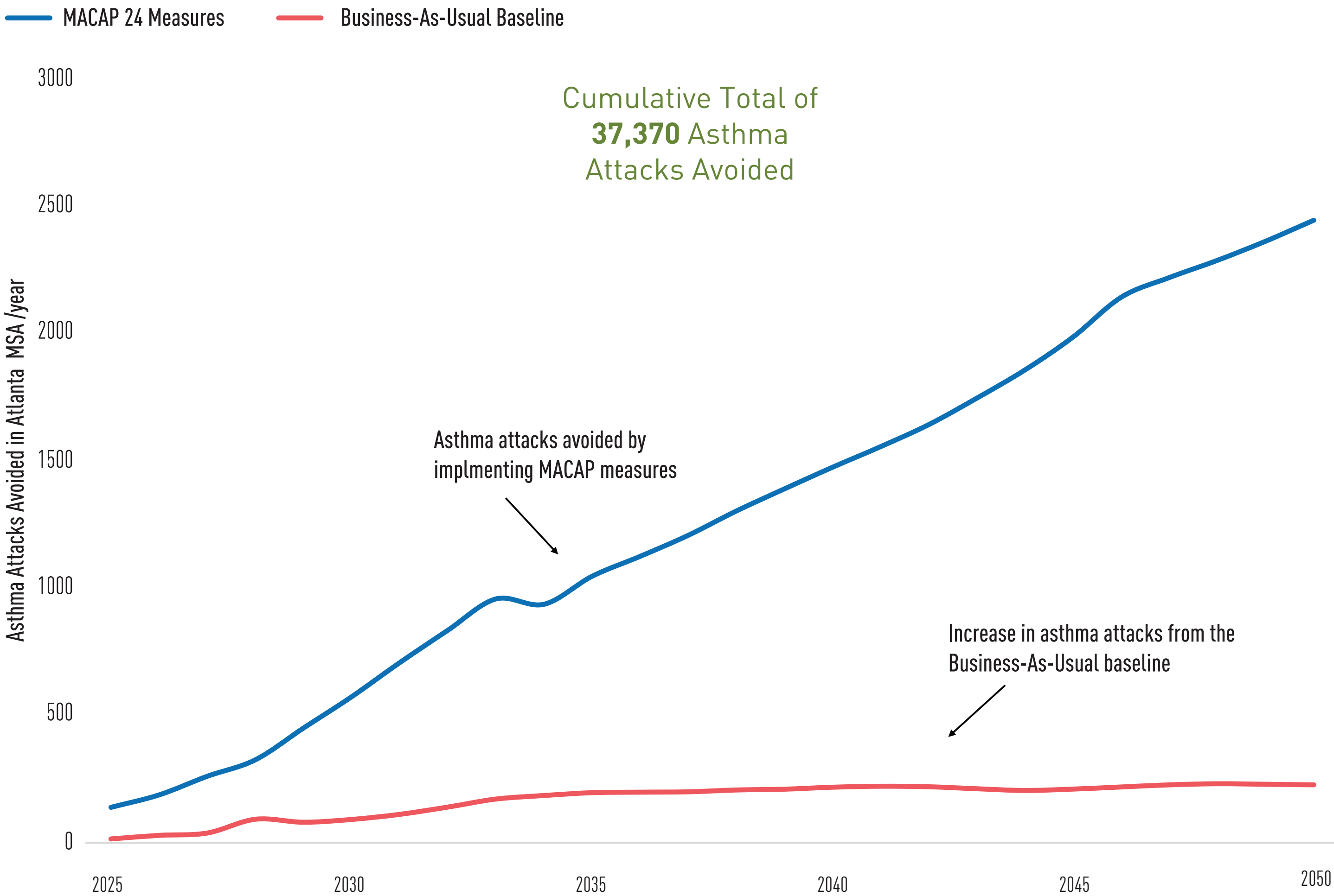


Figure 14: Plan Implemented Avoided Asthma Attacks from Reduced Co-Pollutants, Atlanta MSA, Georgia Tech



Better Health & Wellbeing

By substituting conventional fuels with cleaner alternatives and enhancing sustainable transportation choices, hazardous co-pollutants are reduced, ultimately fostering improved public health outcomes and a stronger, healthier community.[cv] Upgrading buildings, where people spend 90% of their time, can significantly lower sinus infections, allergies and cold prevalence.[cvi] Additional studies have found an increase in productivity and cognitive function for workers employed in energy efficient buildings. Weatherization upgrades have also been found to improve mental health through enhancing comfort and reducing stress from high energy bills. The U.S. EPA notes that experiencing green spaces helps reduce mental fatigue or stress, and additional accessible afforestation efforts can provide more peaceful and appreciative connections with nature and others in the community.[cvii]Findings from the National Institutes of Health uplift that green infrastructure investments provide enhanced feelings of social cohesion, place identity, and in some cases safety in more urban and dense areas.[cvii cix]

Lower Costs

Implementing the measures in this plan can result in lower utility and fuel bills as well as lower operating and maintenance costs. For example, increasing the use of renewable energy in the Atlanta MSA region has the potential to lower utility costs over time, especially when combined with efforts to modernize electricity distribution. This modernization can enhance energy reliability, which is particularly beneficial for families and communities facing challenges in accessing energy due to aging infrastructure and rising utility costs. Building retrofits, such as weatherization and energy efficiency upgrades, can reduce overall energy demand, leading to lower utility expenses for consumers. Updating industrial processes to be more modern and efficient can result in reduced downtime through predictive maintenance. While these are just a few examples, many GHG reduction measures can help decrease costs for individuals, businesses, schools, local governments, utilities, and other stakeholders.

SPOTLIGHT
Energy Burden and Income Stress in Meriwether County, Ga

Results from Greenlink Analytics's GEM tool show that Meriwether County has the lowest median household income and highest utility burden in the Atlanta MSA, with households spending over 10% of annual income on electricity, gas, and water bills. This leaves residents with the region's highest income stress score (7.72).

Measures in this plan can help reduce these costs while cutting emissions. Energy efficiency retrofits and rooftop solar can shrink utility bills. Community-scale investments like urban solar, landfill methane capture, and demand response programs can modernize the grid and lower long-term costs. Transportation solutions such as EV adoption, fleet electrification, and expanded transit, biking, and telework options reduce fuel expenses and improve air quality. Together, these measures highlight how climate action doubles as an affordability strategy, helping high-burden counties like Meriwether benefit from a cleaner, more resilient future (Figure 15.)[cx]

Increased Safety and Resilience

Implementing the measures in this plan can result in increased safety and resilience in a variety of ways – community beautification, a more adaptable electric grid, increased community preparedness, and safer, more welcoming communities. As extreme weather events, such as flooding, heatwaves, and droughts, grow more intense and frequent, communities across the region face increasing vulnerabilities. GHG reduction measures are not only essential for mitigating climate change but also play a critical role in enhancing long-term safety and resilience to these events. By proactively reducing emissions, we help prevent further warming, which is directly linked to the escalation of extreme weather patterns beyond typical seasonal expectations.

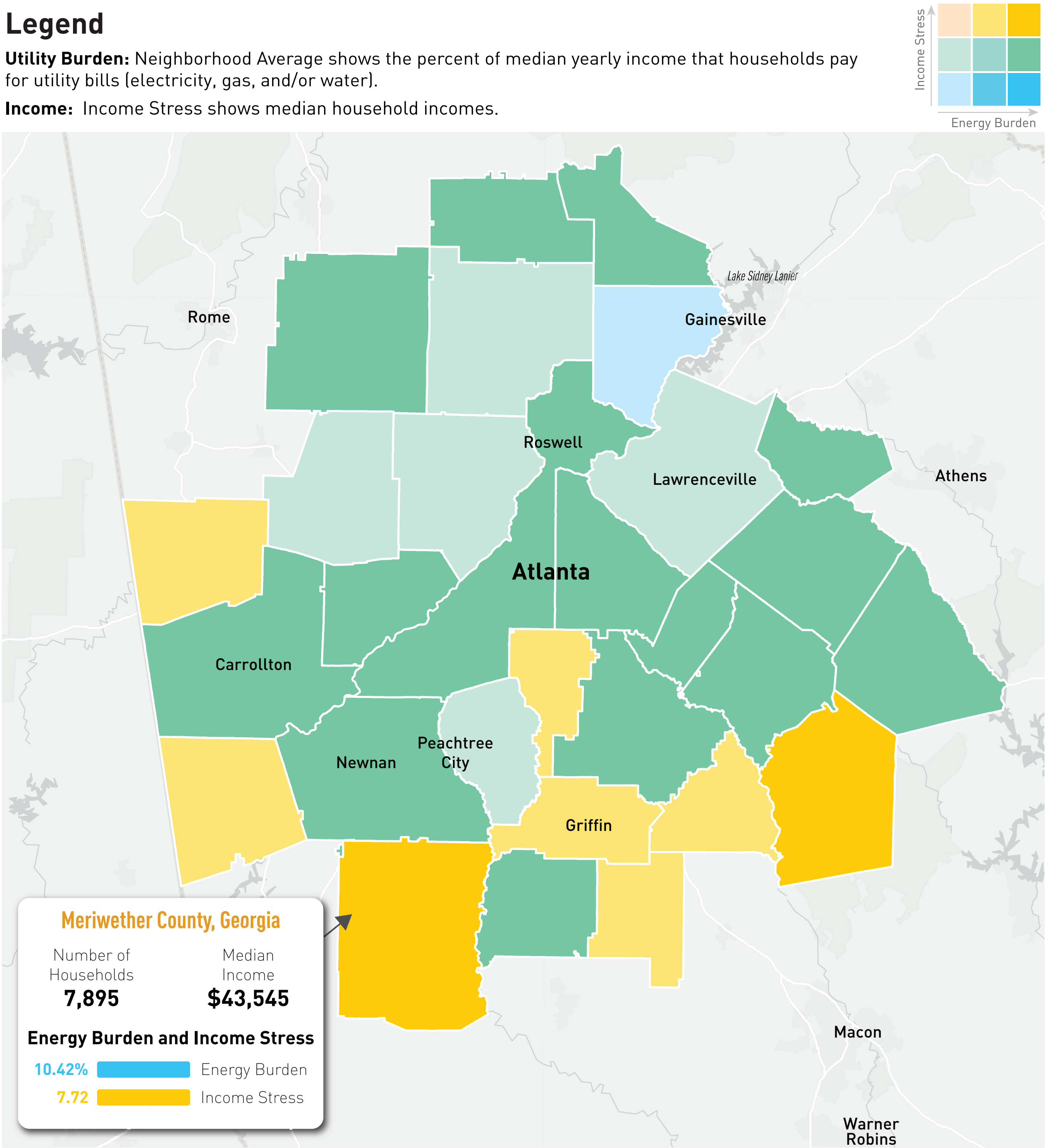
The strategies in this plan can also strengthen our built environment and social infrastructure in ways that improve public safety. For example, lowering energy demand through clean energy and efficiency measures reduces the strain on the electrical grid, helping to prevent blackouts, brownouts, and voltage instability during high-demand events — conditions that are especially dangerous during heatwaves and storms. A more distributed energy system improves grid reliability, reduces the risk of cascading failures, and increases a community's ability to recover from disruptions. Furthermore, investments in green infrastructure, such as urban tree canopy and cool surfaces, not only reduce localized heat and manage stormwater, but also enhance community cohesion.[cix] Studies also show that well-designed public spaces can reduce crime and promote social connectedness, factors that are crucial for community preparedness and resilience in times of crisis.[cxi]

Figure 15: Energy Burden and Income Stress in Meriwether County

Legend

Utility Burden: Neighborhood Average shows the percent of median yearly income that households pay for utility bills (electricity, gas, and/or water).

Income: Income Stress shows median household incomes.



Protection of Natural Resources

Natural resources are raw materials, substances, and organisms found in nature that are useful to humans for survival, development, and economic purposes. These include essential elements like air, water, soil and land, as well as energy sources like fossil fuels. Land and soil resources are the foundation for agriculture, buildings, and ecosystems. Water resources are essential for life.

Landfill space is limited in metro Atlanta and reducing landfill waste, especially through diversion strategies such as building materials reuse and organics composting, conserves space in landfills, prevents the need for landfill expansion into communities, and limits the environmental degradation associated with landfills.[cxii cxiii cxiv] Some of the measures in this plan have the co-benefit of decreasing water consumption—through efficiency upgrades, green building standards, and sustainable land use—ensuring healthier, more hydrologically abundant watersheds and reducing energy use associated with water treatment and distribution, amplifying GHG reductions even more.[cxv]

Strengthened Local Economy

A broad range of GHG reduction measures in the MACAP also act as catalysts for stimulating the local economy, increasing property values, and fostering workforce development, all while delivering environmental and societal co-benefits. In the earlier example, reducing construction and demolition waste through material reuse not only diverts tons of waste from landfills but also bolsters a growing reuse economy sector that supports skilled labor in deconstruction, material recovery, and resale, creating jobs while reducing costs for builders and homeowners. Similarly, capturing methane from landfills to convert into electricity transforms a potent GHG into a renewable energy source, generating revenue through energy sales and creating technical and operational jobs. As local governments adopt more climate-focused policies, ordinances, and programs, such as green building codes or zoning for renewable energy, these regulations attract private investment, encourage long-term planning, and raise neighborhood desirability, ultimately increasing property values. Simultaneously, implementing clean energy and efficiency measures, such as electrifying homes, increasing rooftop solar and battery storage, capturing waste heat from industrial processes, and retrofitting industrial buildings, stimulates innovation, lowers energy costs, and strengthens energy independence. These actions grow demand for high-quality jobs in electrical work, solar installation, HVAC, engineering, and energy auditing. For example, home electrification and rooftop solar not only lower utility bills for residents but also enhance property values by improving energy performance and resilience.

IMAGINING TOMORROW

"Greetings Future Self - I hope as you're writing this you can look out the window and see a great reduction in cars passing by, but a great increase in pedestrians walking, biking, or using public transport. As you walk to work, I hope you no longer have to worry about the beads of sweat running down your face because of the plentiful tree canopy. I hope you no longer have to travel miles away from home to put food on the table and no parts of Atlanta remain a food desert. Finally, I hope that housing isn't just affordable, but accessible & sustainable."

– MACAP Climate Visioning Survey Participant

SPOTLIGHT
Solar Roof Potential in Metro Atlanta

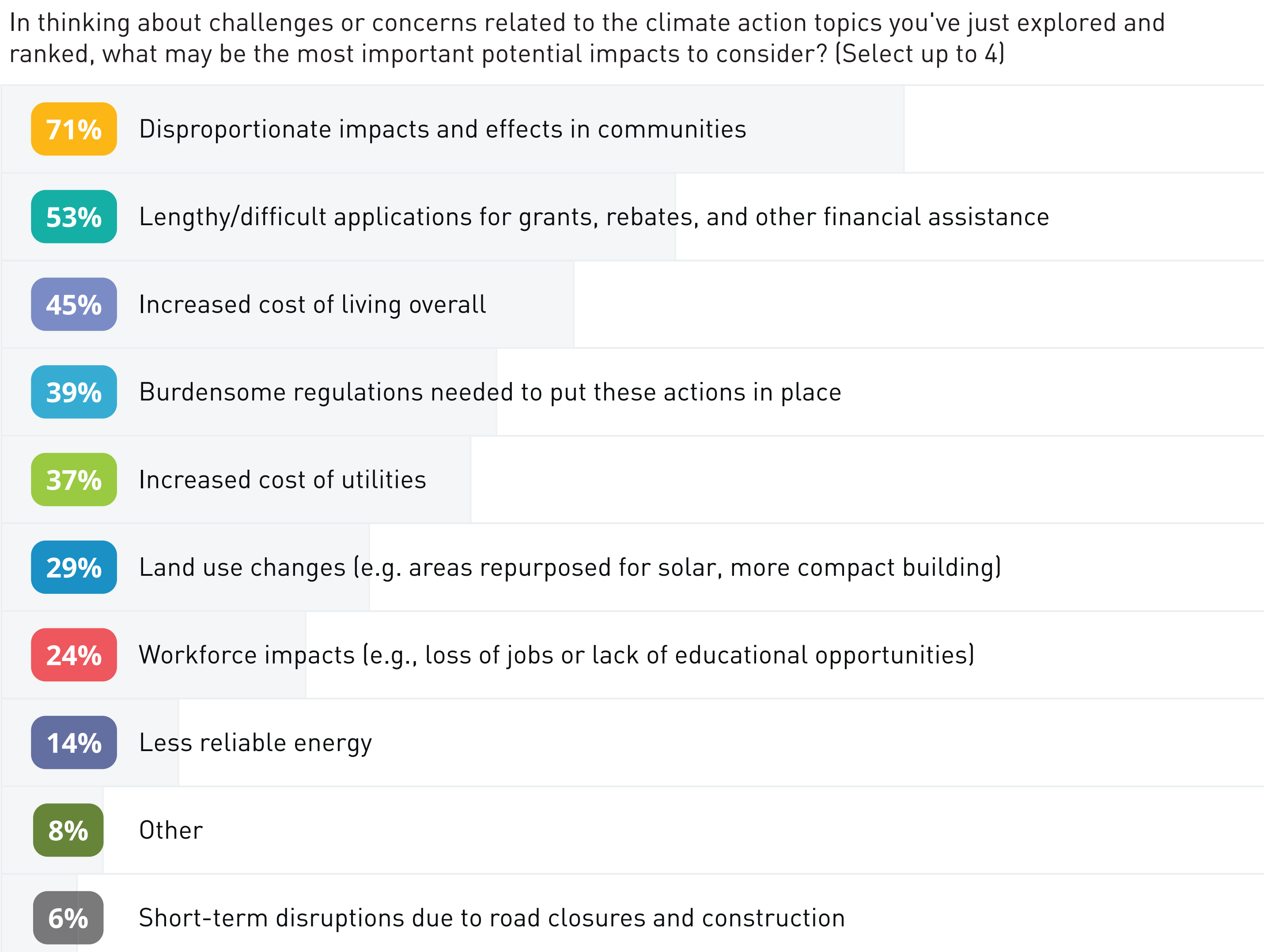
An analysis conducted with the Smart Surfaces Coalition's Benefit Cost Analysis Tool highlights the transformative potential of rooftop solar PV adoption across metro Atlanta. Modeling a scenario in which 70% of roofs within the Atlanta MPO area are topped with solar panels within the next 10 years, results in striking benefits: 1.2 billion metric tons of avoided CO2e over the full analysis timeline of 2025-2050.

The outcomes underscore how large-scale rooftop solar adoption can significantly reduce the region's carbon footprint, while enhancing energy independence and resilience. By integrating renewable generation directly into the built environment, metro Atlanta could not only curb emissions but also advance long-term sustainability goals.[cxvi]

7.3 Potential Disbenefits of GHG Reduction Measures

Communities are meeting myriad challenges as they embrace climate mitigation actions, sparking both excitement and concern about the road ahead. After gathering valuable insights from stakeholders across the MSA, we reached out to them to pinpoint their top four concerns regarding the potential impacts of climate-related initiatives. The findings, visualized in Figure 16, captures the key issues and anticipated hurdles potentially faced in our collective effort to lower GHG emissions across 29 counties.

Figure 16 - Top Challenges & Concerns Related to Climate Actions from the MACAP Climate Priorities Survey



Increased Costs and Disproportional Impacts

Many local governments have historically encountered secondary challenges alongside climate action. One significant issue is "green gentrification"—a byproduct of new climate-friendly infrastructure such as stormwater parks, permeable pavement, and cool roofs, that can lead to an influx of wealthier residents into an area that was previously disinvested. This shift can lead to rising housing costs for renters and increased property taxes for homeowners, often altering the beloved character of these neighborhoods. Simple solutions to prevent green gentrification include inclusionary zoning, rent stabilization and property tax caps for legacy residents.[cxvii]

While clean energy provides more stable, cost-effective power in the long term, as utilities upgrade the electric grid to accommodate more renewable energy, some residents might see their bills rise initially.[cxviii] This can be particularly challenging for low- to moderate-income families. This situation can create financial strain, especially when immediate benefits of green investments aren't felt right away. Sadly, many households struggle to take advantage of utility rebates or lower bills due to a lack of access to smart thermostats or the necessary appliances that would allow their participation. Solutions that may help prevent the impact of higher utility bills include working with communities and established nonprofits providing home weatherization, rooftop solar PV, and connecting home and multifamily building owners to utility rebates and demand-response programs.

Prolonged Processes and Tedious Applications

Prolonged processes and tedious applications are a major barrier to implementing climate solutions, delaying projects and impeding quick deployment of necessary technology. Key contributing factors include complex bureaucratic red tape and challenging financing requirements. Even though grant opportunities do exist, community organizations, local governments, startups, and small businesses seeking grant funding for climate solutions often face complex and resource-intensive application processes, which can be a significant hurdle. While these challenges are not unique to metro Atlanta, there are practical solutions that stakeholders and grantors can implement to simplify the process and enhance access to assistance. Solutions may include:

- Instant rebates at point of sale
- Better interagency integration that links municipal, state, and federal programs to reduce duplication of effort
- Live dashboards that allow applicants to track their application status in real time
- Tiered and clear application processes with shorter, simpler applications for smaller grants and additional, clearly outlined, application requirements for larger grant amounts.

Burdensome Regulations

While striving for ambitious climate goals is important, it can lead to complex and expensive regulations and review processes that are difficult for individuals, businesses, and governments to navigate. For instance, while many Solarize programs have been implemented in metro Atlanta, permitting and review processes vary by local government, with some being more burdensome than others. The additional time required to get permits and inspections adds to the soft costs – those not associated with the solar PV hardware – and therefore increase overall costs for residents and businesses to install solar. Additionally, the promotion of electric vehicles could risk leaning toward impracticality as charging infrastructure is not yet developed at scale. While navigating these complexities, implementers of climate solutions must remain proactive in seeking and applying fail safes to prevent repercussions to reducing GHG emissions.

City of Atlanta's Co-Creating Green Prosperity Initiative Ideation Event

8 Workforce Analysis

As communities within the Atlanta MSA commit to reducing GHGs through the measures outlined in this plan, a skilled and adaptable workforce will be necessary to propel progress toward measures and a carbon free economy. As communities adopt strategies to achieve climate mitigation, demand for public sector collaboration and private sector solutions is likely to increase. Such a trend will simultaneously address environmental concerns and present an economic opportunity to create well-paying jobs and foster innovation across all sectors.

This section summarizes the existing pathways and potential workforce needs to implement the measures identified in the MACAP. Current workforce trends, challenges and opportunities within sectors, and, where data were available, implications within the Atlanta MSA 29-county region are outlined. Potential partners to help address workforce shortages are also highlighted. By growing the MSA region's workforce in support of implementing this plan, communities can benefit from GHG emissions reductions, while also generating economic benefits at the individual, regional, and state level.

8.1 Workforce Analysis Approach

This workforce analysis was drawn from data primarily sourced from reports assessing the Georgia economy, the workforce landscape in metro Atlanta, and programs within the Atlanta MSA. These include reports from:

- Chambers for Innovation and Clean Energy
- E2
- Georgia Institute of Technology
- Georgia Chamber of Commerce
- Metro Atlanta Chamber
- National Waste & Recycling Association
- Technology Association of Georgia
- United States Department of Energy

Available state-based data was assessed and scaled down to the MSA level, creating percentage estimates of job growth where applicable. Some analyses were conducted for the entire MSA using job analytics tools such as Jobs EQ. These datasets are highlighted where relevant. Information provided in this section is not exhaustive and is based off information available at the time of writing this plan. Workforce development in many sectors referenced within this section is evolving and may continue to chang due to funding, policy changes, technology shifts, and other external forces. Additional Workforce Analysis details, including Jobs EQ datasets can be found in Appendix H.

8.2 Job Growth within Priority Industries & Existing Workforce Development Programs

If measures in this plan are implemented, job growth would be expected to occur across numerous sectors and industries within the Atlanta MSA, the result of rapid growth in the cleantech sectors (Solar/Renewable Energy, Energy Efficiency, Electrification, and EV/Mobility) as well as the anticipated increase for green infrastructure implementation and expected retirements of foresters managing working forests. These changes are expected to increase workforce demand in these sectors. The waste and materials sector, which is already experiencing labor shortages,[cxix] should also see growth.

Cleantech (Solar/Renewable Energy, Energy Efficiency, Electrification, and EV/Mobility)

Many GHG reduction measures in this plan focus on advancements in renewable energy, energy efficiency, electrification, and EV/mobility across the transportation, buildings, industry, and energy sectors, all of which are complemented by the state's and region's growing cleantech ecosystem.

As of 2023, Georgia boasts the 15th-largest clean energy workforce in the country, employing about 82,000 people, according to reports from E2[cxx], the U.S. Department of Energy[cxxi], and Chambers for Innovation and Clean Energy.[cxxii]

In Georgia **energy efficiency** is the top overall clean energy employer, followed by **renewable energy** (Figure 17). Ranking at number five in the 2023 Top 10 States for LEED, Georgia has been demonstrating growth in climate action and clean energy for several years, as well as in **green building** through both new building construction and ongoing operations.[cxxiii] More than half of the state's clean energy workers are employed in **construction.**

Notably, **nearly 76% of the state's clean energy workers are located in the Atlanta MSA** (Table 10). Two counties within metro Atlanta also ranked among the top 75 in the nation for clean energy jobs: Fulton County has 13,869 jobs, and Henry County has 9,206 jobs. The clean energy industry is projected to continue its growth, with Georgia positioned as a leader in new projects since 2024. A report from the Technology Association of Georgia indicates that the state has more than 40 new clean energy-related projects in the pipeline, which are expected to create 30,000 new jobs.[cxxiv] Table 11 illustrates the anticipated average annual growth in jobs and number of firms over the next ten years, as well as an increase in industry wages, compared to average wages, along with an overall rise in jobs over the next ten years.

Figure 17: Atlanta MSA Clean Energy Employment by Sectors, E2 2024

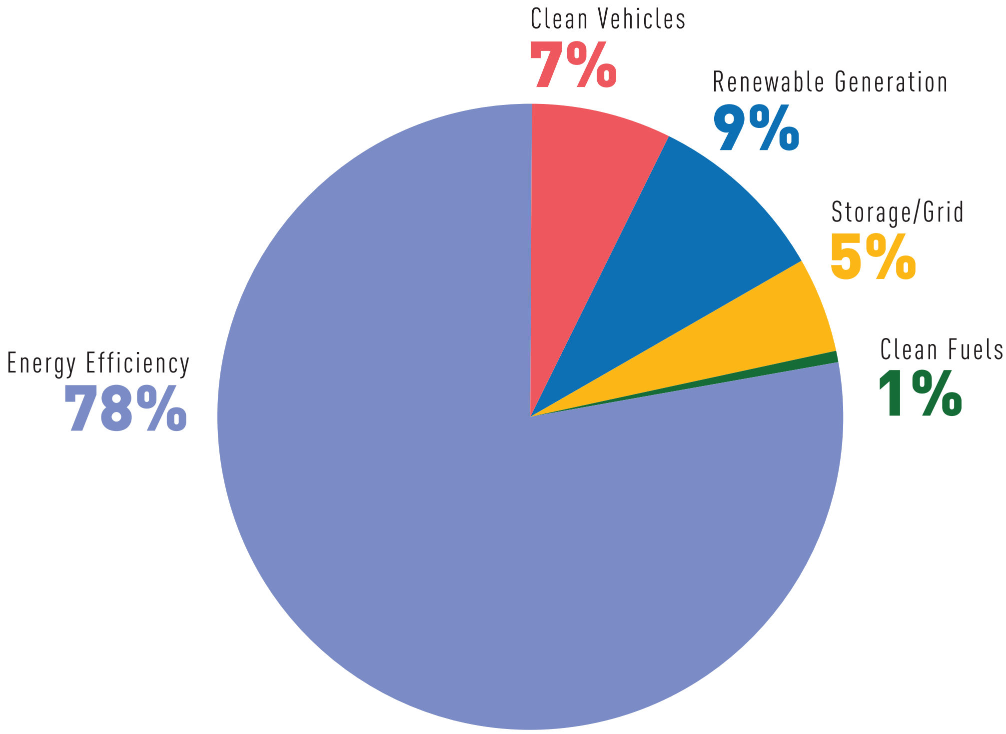


Table 10: Georgia Clean Energy Employment by Metro, E2 2024

Metro Area	Total Clean Energy	Percentage of Clean Energy Jobs*	Renewable Generation	Storage/ Grid	Clean Fuels	Energy Efficiency	Clean Vehicles
Albany, GA	994	1.4%	149	20	<10	717	102
Athens-Clarke County, GA	1,118	1.6%	316	23	<10	687	85
Atlanta-Sandy Springs-Roswell, GA	**53,145**	**75.7%**	**4,991**	**2,615**	**314**	**41,386**	**3,839**
Augusta-Richmond County, GA-SC	3,541	5.0%	750	464	<10	2,088	231
Brunswick, GA	448	0.63%	65	<10	<10	308	65
Chattanooga, TN-GA	520	0.74%	101	49	<10	229	138
Columbus, GA-AL	1,328	1.9%	96	171	<10	917	142
Dalton, GA	1,450	2.1%	1,087	18	<10	243	100
Gainesville, GA	1,361	1.9%	78	28	<10	796	456
Hinesville, GA	113	0.1%	<10	<10	<10	81	26
Macon, GA	1,135	1.6%	123	26	<10	862	115
Rome, GA	378	0.5%	41	<10	<10	192	136
Savannah, GA	2,178	3.1%	152	112	<10	1,699	212
Valdosta, GA	993	1.4%	24	350	10	563	47
Warner Robins, GA	1,480	2%	715	19	<10	534	205

** May not equal 100% due to rounding.*

Table 11: Cleantech Economic Analysis, Metro Atlanta Chamber July 2024

Economic Measure	Georgia
Avg Annual Change in Jobs – 10 Years	4.2%
Avg Wages – Cleantech	$107,146
Avg Wages – Region all	$71,377
Percentage of Region	150.1%
Number of Firms (2022)	1,312
Change – 5 Yr	18.5%
Change – 10 Yr	23.4%

**This data is based upon NAICS codes that cover various aspects of solar/alternative energy and EV/mobility sectors*
Source: Metro Atlanta Chamber, Cleantech Economic Analysis, Jobs EQ July 2024

Also under the cleantech banner are jobs within the **EV and transportation mobility** industries. Most of the emissions from the Atlanta MSA stem from the transportation sector, presenting a significant opportunity for reduction through vehicle electrification and decreased vehicle miles traveled. In 2021, the Georgia Governor announced the Electric Mobility Innovation Alliance[CXXV], led by the Georgia Department of Economic Development. This statewide initiative involves collaboration among government agencies, industries, electric utilities, nonprofits, and other stakeholders, aiming to foster the electric mobility ecosystem in the state and enhance Georgia's position in electrification-related manufacturing and innovation. The 2024 Georgia Cleantech and Sustainability Ecosystem Report notes that this initiative follows a 2019 goal to establish Georgia as the e-mobility capital of the U.S. Companies like SK Group have driven growth in the battery manufacturing sector, while electric vehicle manufacturers such as Kia, Rivian, and Hyundai have made substantial investments to promote electrified transportation in Georgia.

As a result, Georgia is rapidly expanding across multiple segments of the electric vehicle (EV) sector, including cathode and anode manufacturing, chemical and mineral solutions, battery manufacturing, metals and aluminum production, battery recycling, and EV infrastructure development. This growth is creating a more circular EV ecosystem, as highlighted by the Georgia Department of Economic Development and the Technology Association of Georgia. Table 12 lists some of the E-mobility companies operating in Georgia.

SPOTLIGHT

Shine On® and Solar School®– Cherry Street Energy Workforce Development Programs

Cherry Street Energy, headquartered in Marietta, produces and sells renewable power that is free of emissions and predictably priced to businesses, cities, municipalities, institutes of education, and non-profits. Recognizing that it is crucial to spread the opportunities that come with the expanding solar economy, the company created the Shine On® and Cherry Street Solar School® programs. The company is addressing both the surging demand for solar systems and the skilled workforce needed to build and maintain them. The programs training people to become qualified solar professionals through comprehensive education, certification, preparation, skills development, and industry networking. For every 1,000 kW of new capacity created by Cherry Street, the company trains 25 new people in solar power installation. With more than 10,000 kW of new clean energy capacity created, Cherry Street is responsible for the training of over 250 workers across the state.

Table 12: Select E-Mobility Companies Operating within the Atlanta MSA

Company	County	Product
Ascend Elements	Newton	EV battery recycling
EnviroSpark	Fulton	E-mobility charging systems
Heliox	Fulton	E-mobility charging systems
Honeywell	Gwinnett	Sustainable Aviation
Kirchhoff	Newton	Hybrid structure supplier
Rivian	Morgan and Walton	EV manufacturing and supplier
Yamaha Motor Manufacturing	Cobb and Coweta	EV manufacturing and supplier

The state currently leads the nation in private investment for EV manufacturing, resulting in an estimated 40,000 new jobs.[cxxvi cxxvii] This expansion is also being supported through education and training programs. At the high school level, Georgia's Department of Education is collaborating with industry leaders to develop the Electric Vehicle Career Pathway, which includes EV-specific coursework to prepare students for careers in the industry. Additionally, the Quickstart program, part of the Technical College System of Georgia and headquartered in Atlanta, connects employers to workforce training programs, providing company-specific skillsets for workers seeking employment in the EV sector. As an example of regional investments and planning, ARC has adopted a *Regional Transportation Electrification Plan* and has also developed an innovative partnership towards cleantech workforce development, the Clean Tech Infrastructure Accelerator.

SPOTLIGHT
Clean Tech Infrastructure Accelerator

As the demand for EV infrastructure surges in Georgia, fueled by a wave of consumer adoption and manufacturing plant growth, ARC and Goodwill of North Georgia joined forces to meet the challenge of establishing EV charging stations and a skilled workforce to maintain and install the infrastructure. In 2024, ARC and Goodwill of North Georgia were awarded a five-year, $2 million grant from the U.S. Department of Labor, empowering Goodwill to train 250 individuals to become skilled EV technicians. This grant catalyzed the expansion of Goodwill's Clean Tech Academy pilot program, initially created in partnership with Accenture, to multiple locations throughout the Atlanta region, including Atlanta Technical College.

Afforestation, Forest Management, and Green Infrastructure

One of the measures for reducing GHG emissions involves managing, restoring, and conserving naturally forested ecosystems, which requires trained personnel. A 2022 report from the Georgia Forestry Commission indicated that approximately 57,000 employees are working in the forestry industry in Georgia, with around 5,300 of these workers in the **forest management** and logging sector. This sector is particularly relevant to strategies for managing natural and working lands. There are approximately 26 private sector foresters and 6 Georgia Forestry Commission foresters serving the 29-county MSA.[cxxviii]

A major challenge for the forestry industry is its aging workforce, with a higher percentage of employees over age 55 than in other Georgia industries. North Georgia, including the Atlanta MSA, will need more workers to keep up with recent growth and replace departing staff.[cxxix] However, the region lacks local forestry training programs – the nearest are in Tifton and Athens – making it difficult to cultivate homegrown talent and relevant skills. Short-term certification programs offered by local organizations could help address this gap. Examples include the Greening Youth Foundation's Urban Forestry Career Pathways Workforce Program[cxxx] and Eco-Addendum's Greenspace Restoration Corps.[cxxxi]

If implemented, this plan will increase the need for **green infrastructure (GI)** installation and maintenance. This requires a range of skills across industries such as landscaping, plumbing, horticulture, construction, engineering and paving.[cxxxii] GI training in Atlanta has been available through community-focused programs like the Atlanta Watershed Learning Network (AWLN) and workforce development initiatives such as Southface

Institute's Atlanta CREW. For professional certification, contractors, developers, and municipal staff can access online courses through the NPDES Training Institute.

8.3 Workforce Gaps

As discussed above, for the Atlanta MSA to meet its robust climate goals and implement measures listed in this plan, significant growth must occur across all sectors. A wide array of jobs at various entry levels will be available to current and future metro Atlantans. Some of these occupations are listed in Tabe 13 below.

Table 13: Example Occupations Required for MACAP GHG Measure Implementation

Transportation Occupations	Buildings Occupations	Industry Occupations
Software developers: Help connect EV batteries to other vehicle components **Electrical engineers:** Design battery management **Electrical, electronic, & electromechanical assemblers:** Assemble components of electric motors **Electricians:** Run electrical wire and install EV charging stations **Cement masons & concrete finishers:** Pour and finish multiuse paths and sidewalks **E-bike mechanics & technicians:** Diagnose, repair, and perform maintenance	**Insulation workers:** Improve building efficiency **Heating, air conditioning, ventilation (HVAC), and refrigeration mechanics and installers:** Install air source heat pumps **Plumbers, pipefitters, and steamfitters:** Install hot water heat pumps **Construction laborers:** Prepare building sites and construct new buildings **Energy auditors:** Assess buildings to identify energy waste and recommended improvements **Project managers:** Oversee electrification projects	**Manufacturing/Industrial engineers:** Design and optimize manufacturing and industrial processes **Machine operators:** Work on a variety of machines **Robotics technicians:** Install, maintain, and repair automated systems and industrial robots **CNC machinists/operators:** Use computer-controlled machinery to produce precise parts **Industrial production managers:** Oversee production operations and integrate new technologies **Welders:** Use advanced techniques and equipment to join materials
Energy Occupations	**Trees & Greenspace Occupations**	**Waste & Materials Occupations**
Powerline installers and repairmen: Install transmission and distribution lines to connect renewable energy to the grid **Solar installation technicians:** Install, maintain, and troubleshoot solar PV systems **PV System Designer:** Create designs for solar PV systems **Renewable energy plant operators:** Manage plants converting landfill gas or other waste to energy **Energy managers:** Optimize energy use **Energy engineers:** Design systems to generate, store, and consume energy	**Arborists:** Specialize in health and care of individual trees **Foresters:** Manage forests and forest resources **Urban foresters:** Manage trees and greenspaces within cities **Landscape architects:** Design outdoor areas such as parks and green infrastructure **Stormwater engineers:** Manage and design systems that control the flow of rainwater, such as rain gardens and bioswales. **Green roof installers:** Install and maintain green roof systems	**CDL drivers:** Operate large trucks and heavy duty vehicles to collect recyclable materials **Material sorters:** Separate different types of materials **Equipment operators:** Use heavy machinery like loaders and excavators to move waste and materials **Deconstruction workers:** Disassemble buildings and their contents for reuse **Material Managers:** Oversee sorting, tracking, and management of salvaged materials **Architects:** Design material-efficient buildings

Many of these measures align with forecasted job shortages, skills gaps, and certification shortages as identified by using a jobs market research tool, JobsEQ, to develop an aggregate report for all "Green Jobs" within the Atlanta MSA associated with the GHG reduction measures identified in the plan. The United States Department of Labor, Bureau of Labor Statistics (BLS) defines "green jobs" as either: 1) Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources, or 2) Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources. The Jobs EQ forecast compares occupation demand growth to local population growth and the projected educational attainment of metro Atlanta residents. While this is an important analysis for determining local occupation needs, the results should be considered along with other regional data including growth and separation forecasts, unemployment rates, wage trends, and the policy landscape. More information and data from the JobsEQ analysis can be found in Appendix H.

Job Shortages

Job shortages describe a situation where there are not enough available workers for available positions. The top 10 job categories with near-term potential annual deficits over the next 10 years in order of the greatest number of workers required to the least are as follows:

Top 10 Job Shortages

1. Heavy and tractor-trailer truck drivers
2. First-line supervisors of construction trades and extraction workers
3. Construction managers
4. Industrial machinery mechanics
5. Transportation and material moving workers
6. Heating, air conditioning and refrigeration mechanics and installers
7. Painters, construction, and maintenance
8. Transportation, storage, and distribution managers
9. Plumbers, pipefitters and steamfitters
10. Industrial engineers

The job categories above are set by the U.S BLS Standard Occupational Classification system, which in many cases can aggregate multiple job titles into one category based on job duties, skills, educational or training requirements. Therefore, the top 10 job shortage categories cover many distinct roles and positions. Each of the job categories identified above align in some way with occupations needed to implement the GHG measures in this plan.

The anticipated career shortfalls and strong focus on construction trades are consistent with the 2024 USEER report, which found that employers in Georgia reported a 44% overall difficulty in hiring across energy-related trades. These trades include electric power generation; electric power transmission distribution, and storage; energy efficiency; fuels; and motor vehicles sectors. These jobs are distributed across various industries including construction – the largest industry sector in the electric power generation sector, with 40.7% of jobs.

Skill and Certification Gaps

The list of career-based skill gaps differs from the job shortages list. These gaps are calculated by dividing the number of openings by the number of expected candidates with these acquired, specialized skillsets. The skill shortages were assessed across hundreds of Green Jobs derived from our list of GHG reduction measures. For a comprehensive list of the Green Jobs see Appendix H.

Top 10 Skill Shortages

1. Microsoft Office
2. Landscaping
3. Power tools
4. Spanish
5. Backhoes
6. Cabling
7. Manufacturing
8. Autodesk AutoCAD
9. Tape measures
10. Cherry pickers (warehouse and construction)

As with the jobs shortages, the skills gaps identified above align in some way with occupations needed to implement the GHG measures in this plan.

A certifications gap specifically refers to the lack of formal credentials or accreditations needed to demonstrate expertise for a job. Certifications validate skills and knowledge, offering a competitive advantage in the job market by making candidates more attractive to employers and demonstrating commitment to continuous learning. They can lead to career advancement, including promotions and higher salaries, and provide an enhanced reputation and credibility within an industry. Additionally, certifications help individuals stay current with industry changes, build professional networks, and gain confidence in their abilities.

Certification deficits were similarly assessed against the forecasted openings in the Atlanta MSA over the next 10 years and the projected number of qualified candidates. Specifically, current labor market data was used to identify shortages in certifications by comparing the local supply of qualified candidates with certain certifications to the demand from employers that require those credentials.

The top 10 certification gaps in the local green job economy, from largest to smallest, were identified to be:

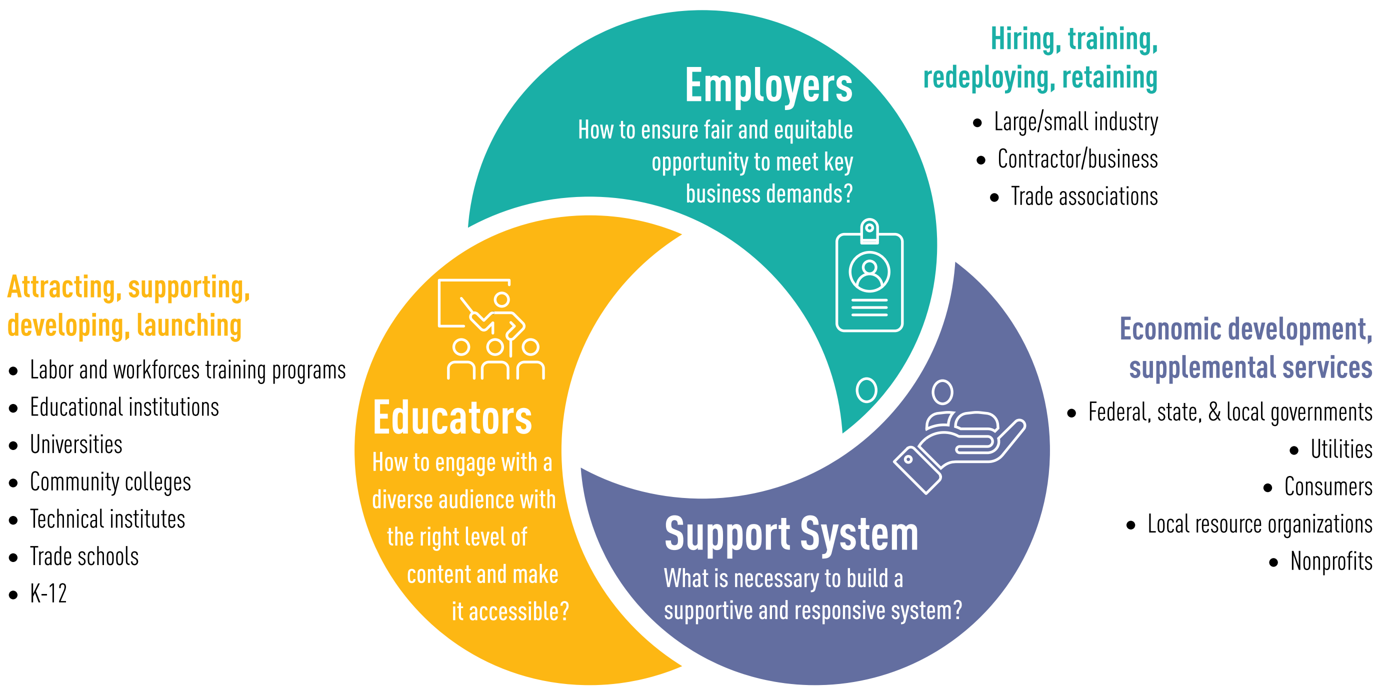
Top 10 Certification Shortages

1. Commercial Driver's License (CDL)
2. Class A Commercial Driver's License (CDL-A)
3. Forklift Certified
4. OSHA 10
5. National Center for Construction Education and Research Certification (NCCER)
6. OSHA 30
7. Transportation Worker Identification Credential (TWIC)
8. Engineer in Training (EIT)
9. Certified Arborist
10. Certified Crane Operator (NCCCO)

8.4 Building the Workforce

To fill the green jobs gaps identified within this plan, a variety of stakeholders must come together to develop green skills plans, implement targeted education and training programs like apprenticeships, and establish lifelong learning frameworks and pathways for workers transitioning into green jobs. This involves identifying specific skills needed for sectors like renewable energy and green construction, increasing awareness of green career paths, fostering industry-education partnerships, and encouraging investment from governments and businesses. Ideally this is not done within silos, rather as part of a carbon-free, green workforce ecosystem, originally proposed by the Brendle Group and Collaborative Climate LLC.[cxxxiii]

Figure 18: Illustrative Example of a Green Workforce Ecosystem, Brendle Group/City and County of Denver



SPOTLIGHT

The Interstate Renewable Energy Council has released a viable tool called *Green Workforce Connect*, which enables both contractors and job seekers to find local employment opportunities and training specific to solar, building performance, and the energy industry. The tool features a resource hub, career maps, guides for contractors, directories, and toolkits for employers, among other resources.

Specific recommendations for the core groups in Figure 18 to collaboratively build the workforce that will be needed to implement the measures in this plan are included below in Table 14.

Table 14: Recommendations for Core Groups in the Green Workforce Ecosystem

Support System	Educators	Employers
Strategic Planning: Develop green skills analysis and plans to map the types and quantities of skills needed, identify job locations, and allocate funding for education and retraining initiatives.	**Focus on Specific Skills:** Prioritize training in areas like STEM, data analysis, project management, renewable energy technologies, and the circular economy.	**Skills Based Hiring:** Focus on candidates' skills and competencies rather than just formal education or traditional experience to access a wider range of talent.
Improve Metrics: Develop and improve the tracking of green workforce metrics.	**Partnerships:** Forge partnerships between educational institutions, businesses, and training providers to develop and deliver flexible, relevant training programs.	**Upskilling and Reskilling:** Companies should invest in their own training programs and provide in-house opportunities for employees to acquire skills.
Incentives and Policies: Offer grants, initiatives and financial mechanisms to encourage upskilling and reskilling, and align skill training requirements with climate policies.	**Hands-On Experience:** Establish and fund pre-apprenticeships, apprenticeships and internships to provide individuals with practical, on-the-job experience.	**Talent Intelligence:** Utilize technology to identify individuals with transferable skills, including career changers and freelancers, to broaden the talent pool.
Public Awareness Campaigns: Promote the need for green skills and raise awareness beginning in K-12 about how the net-zero transition creates job opportunities.	**Certifications:** Offer globally recognized certifications and accreditations for specific green skills to build competence.	**Support Training Providers:** By providing marketing support to help promote their programs and staff time to share expertise in developing training content.
Entrepreneurship: Encourage cleantech and other sustainable entrepreneurship to fill market gaps and drive innovation.	**Navigational Services:** Develop methods to help contractors find and participate in trainings.	
Workforce Housing: Incentivize the development of more workforce housing alongside industrial expansion to shorten commutes and lower costs.		

Existing Partners and Programs within the Green Workforce Ecosystem

Many partners and programs are already contributing to the Green Workforce Ecosystem. While many currently collaborate, there is room for additional convening and leveraging of resources. Some examples are highlighted below. An industry-specific list of programs that support a growing workforce is found in Appendix H.

ATL CleanTech Connect: A partnership between Georgia Tech and the Metro Atlanta Chamber, the ATL CleanTech Connect hosts quarterly social events to engage members of the Greater Atlanta cleantech community to support innovation, ideation, startups and investment in cleantech and sustainability focused businesses. Industry, venture capitalists, Georgia Tech faculty and local leaders lead conversations related to cleantech opportunities in the region.

Be Pro Be Proud Georgia: This initiative, started by the Cherokee Office of Economic Development, is leading the movement to bring a new generation of pride, progress, and professionals to Georgia's skilled workforce. The program encourages collaboration among students, parents, educators, and industry across the state. Partners include Chattahoochee Tech College, Georgia Motor Trucking Association, Georgia Power, Shaw Industries, Vermeer Southeast, and many others.

Building Georgia: This program aims to close workforce gaps in infrastructure construction across Georgia, estimated to be 136,000 jobs following increased funding from the federal Infrastructure Investment & Jobs Act. Building Georgia involves collaboration with stakeholders to advocate for funding, match job seekers with employers, explore funding options, and promote skilled trades in education.

Georgia Cleantech Innovation Hub: This organization creates a broad set of partnerships and programs to enhance market access, connect innovators to talent, capital, and customers, educate cleantech entrepreneurs, and spread a culture of inclusive innovation. Its vision is for Georgia to be the best place for innovators to develop cleantech products, services and companies by minimizing barriers to accessing resources.

Technical College System of Georgia: TCSG provides a unified system of technical education, adult education, and customized business and industry training through programs that use the best available technology and offer easy access to lifelong education and training for all adult Georgians and corporate citizens. It offers over 600 programs including, Advanced CAD Technician, Automation and Robotics Technology, Construction Management, Electric Vehicle Professional, Green Building Technician, and more.

SPOTLIGHT

Building the Workforce in the ATL Clean Energy and Green Economy

The Co-Creating Green Prosperity initiative is dedicated to reshaping communities into beacons of climate resilience by actively reducing GHGs and ensuring that future generations thrive in vibrant, healthy environments. The City of Atlanta recently hosted 14 Green Prosperity Workshops that brought together 425 residents, including children, youth, educators, employers, small business contractors, city employees, older adults, and leaders of community-based organizations. Their collective insights generated over 600 actionable ideas to help small green-sector businesses scale, connect young people to green career pathways, and support property owners in making their homes more energy-efficient. The initiative is currently implementing 15 prioritized solutions co-created with residents. One outcome is the Atlanta *Green Buildings Career Map*—a dynamic tool that highlights careers driving the region's transition to a clean, energy-efficient built environment. Spanning five key sectors, it details skills, salaries, and advancement opportunities for high-opportunity jobs in metro Atlanta's green construction and energy industries.

9 Next Steps

Responding to climate change is one of the defining challenges of this century. Reducing GHGs and associated pollutants is a long-term endeavor essential to the livability, safety, health, and economic prosperity of all communities within the Atlanta MSA. The 24 GHG reduction measures detailed in this plan provide a roadmap for the next steps needed to reduce emissions within metro Atlanta. Significant investments are already taking place, led by nonprofit organizations, local governments, businesses, and regional agencies that are utilizing numerous funding opportunities to begin reducing GHG emissions. While funding may be scarce in the coming years, there are alternative avenues and new partnerships that may coalesce to bring these GHG reduction measures to fruition.

The MACAP demonstrates how stakeholders across the Atlanta MSA can coordinate on ways to innovate and address the climate challenge. ARC will continue to engage communities, organizations, businesses, and agencies throughout the MSA to share the MACAP roadmap and identify ways to put it into action. These activities may include:

- An MSA-wide MACAP roadshow
- Sector-focused implementation training seminars
- Additional analysis of GHGs in specific sectors
- A more in-depth green jobs analysis
- Incorporation of policy recommendations into future ARC planning efforts.

Over the next 18 months, ARC will track the implementation of this plan, including many of the metrics identified for each GHG reduction measure. This information, along with an updated greenhouse gas inventory, will be provided to the EPA in Fall 2027 as a Status Update prior to the closeout of the CPRG grant.

Additional information about the CPRG process and opportunities to engage will be updated on the *Metro Atlanta Climate Action Plan public input page* as well as on *ARC's CPRG website*.

10 List of Appendices

The MACAP appendices exist as separate documents, due to their number and size. They are described below and can be found on *ARC's website*.

A: Stakeholder Engagement Activities Summary: Supplementary information outlining outreach and engagement opportunities conducted during the creation of the MACAP.

B: GHG Inventory Technical Support Document: Description of GHG inventory data, methodology and full GHG inventory including component greenhouse gases.

C: GHG Projections Technical Support Document: Description of data, methodology, and assumptions used to produce the business-as-usual GHG projections.

D: GHG Reduction Measures Technical Support Document: Comprehensive analysis, data, assumptions, and methodologies for each of the 24 MACAP GHG reduction measures calculated by Georgia Tech.

E: Co-Benefits Matrix by GHG Measure: Supplementary information detailing the co-benefits of each of the 24 MACAP GHG reduction measures.

F: Funding Opportunities for Implementing GHG Reduction Measures: Supplementary information detailing potential funding opportunities available to implement GHG reduction measures.

G: Resources for Additional Information & Technical Assistance: Supplementary information outlining sources for additional information as technical assistance that can be useful when seeking to implement GHG reduction measures.

H: Workforce Analysis Support Document: Supplementary information for the workforce analysis including a list of "green jobs" occupations, "green jobs" JobsEQ data, and list of existing workforce development programs and partners.

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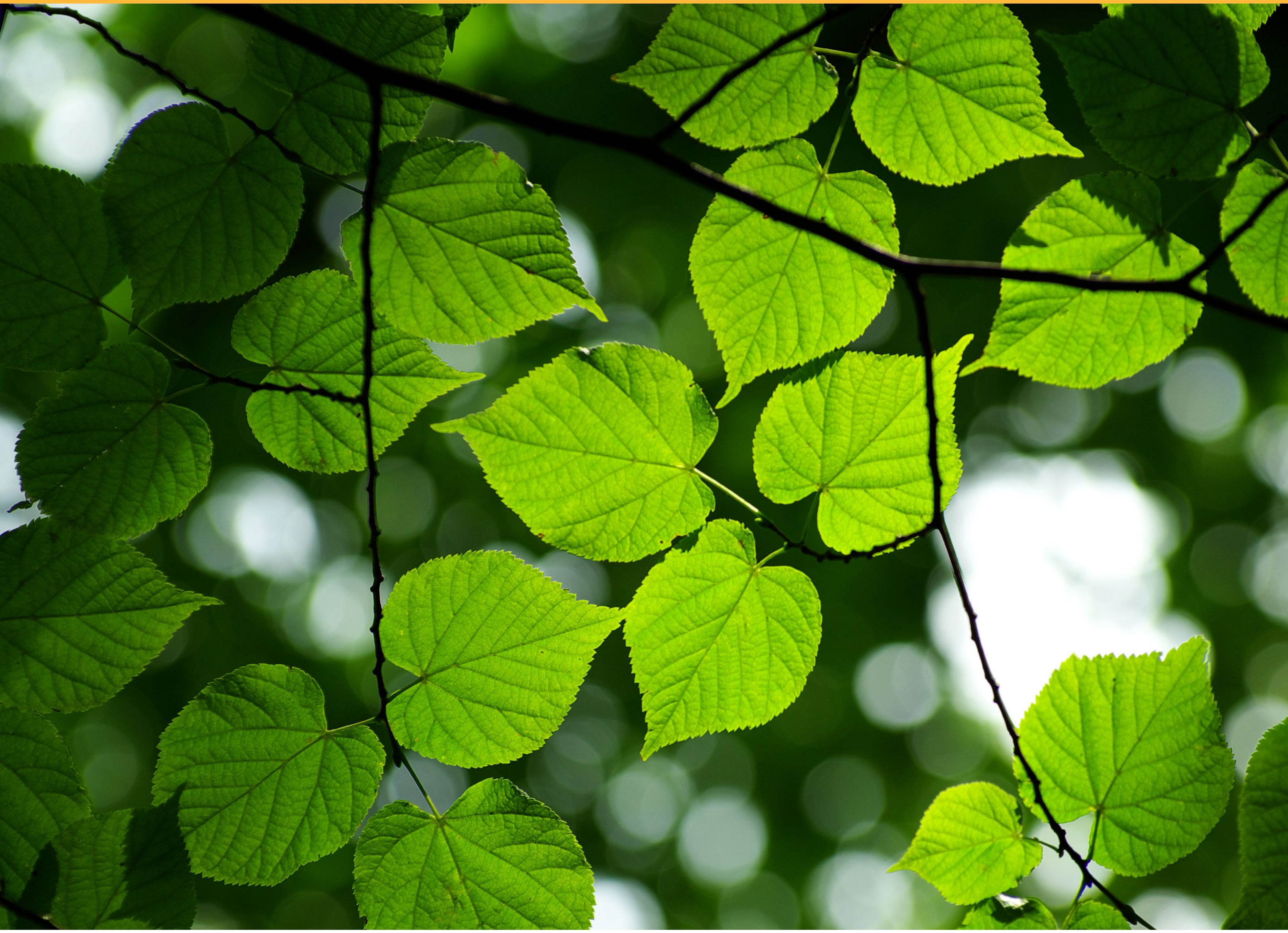

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